BOSS® PRODUCTS

- **BOSS 136 Fireblock/Draftstop Sealant:** a single component, non-slumping, noncombustible, fire rated sealant used as a filler for Fireblocking and Draftstopping in the annular spaces around cables, ducts, pipes, vents and other penetrations or voids in the building or home envelope.

- **BOSS 137 Firestop Spray Coating:** a water based, elastomeric Firestop coating that is designed to be sprayed, brushed or rolled over static or dynamic fire rated construction joints. Tested to the stringent ASTM E-1399 and UL2079 for the flexibility requirements of Firestopping these joints allowing for seismic, wind sway and thermal expansion/contraction of construction joints.

- **BOSS 139 Fire Mortar:** a noncombustible silicate cement that can withstand high temperatures for the purpose of sealing and repairing of chimneys, fireplaces and wood-burning stoves.

- **BOSS 350 Flame Retardant Duct Sealant:** a high performance, flame retardant, siliconized duct sealant designed for use in low, medium or high velocity HVAC duct systems.

- **BOSS 760 Silicone Firestop Sealant:** a single component, non-slumping, low modulus neutral cure silicone Firestop sealant. Highly adhesive and flexible, will not crack under vibration, seismic or thermal shock movement.

- **BOSS 810 Non-Intumescent Latex Firestop Sealant:** a single component, acrylic latex, multi-purpose sealant that remains extremely flexible and is ideal for horizontal and vertical construction joints and penetrations that may be subject to vibration or dynamic movement. Soap & Water cleanup.

- **BOSS 812 Draft/Smoke Stop Foam:** an expanding foam designed to prevent the movement of smoke, gases and air drafts thereby slowing the spread of fires due to the lack of oxygen to feed the flames. 812 also has excellent insulation and acoustical properties, may be painted after cure and building inspection. For use in non-rated construction.

- **BOSS 813 Expanding Firestop Foam:** an expanding foam that has been tested as a UL Classified Firestop product. Due to it's high expansion capabilities, it is excellent for the use of filling annular spaces and intercises that have multiple penetrating items such as cables or pipes. 813 may be installed with the BOSS 136 or 814 products to complete the Firestop system.

- **BOSS 814 Intumescent Latex Firestop Sealant:** a single component, elastomeric, intumescent Firestop sealant that expands rapidly to form a char when exposed to high heat or flame to fill the void created while combustible penetrants such as plastic pipe or cables are melted in a fire. Because of it's elastomeric properties this is also an excellent product for the use in firestop penetrations where vibration or movement may be a concern.

- **BOSS 815 Firestop Insert for Electrical Outlet Boxes:** an intumescent pad that is inserted into the back of an electrical box, designed to expand and fill the void within the box to stop the fire at this point. Adhesive backed for easy installation. Available in two sizes: 2"x4" & 4"x4"

- **BOSS 816 Intumescent Firestop Sealant:** a single component, elastomeric, intumescent Firestop sealant that expands rapidly to form a char when exposed to high heat or flame to fill the void created while combustible penetrants such as plastic pipe or cables are melted in a fire. Protected against mold growth in both wet and dry stages.

- **BOSS 817 Wrap Strip:** a pre-formed strip of highly intumescent material designed to Firestop plastic and insulated pipe penetrations. Supplied in 12' rolls, ready to cut to length.

- **BOSS 818 Fire Rated Putty Pads:** an adhesive, moldable, fire-rated pad designed to be applied to the exterior of electrical boxes. Simple peal off labels ready to be applied in seconds by hand.

- **BOSS 819 Pipe Collar:** a factory formed steel collar filled with highly intumescent material designed for simple application to plastic pipe penetrations. Available in: 2", 3" and 4" Pipe Sizes.

Firestop System Index

BOSS Firestop Product Descriptions

Product No.	Product Description	Fire Test Compliance
BOSS 136	Firestop /Draftstop Sealant	ASTM E-136/UL136
BOSS 137	Firestop Spray Coating	ASTM E- 1399/UL2079
BOSS 139	Fire Mortar	ASTM E-136
BOSS 350	Flame Retardant Duct Sealant	ASTM E-84/UL723
BOSS 760	Silicone Firestop Sealant	ASTM E-814/UL1479
BOSS 810	Non-Intumescent Latex Firestop Sealant	ASTM E-814/UL1479
BOSS 812	Draft/Smoke Stop Foam	ASTM E-84 Class A
BOSS 813	Expandable Foam Firestop Sealant	ASTM E-84, E-814/UL1479
BOSS 814	Intumescent Latex Firestop Sealant	ASTM E-814/UL1479
BOSS 815	Intumescent Insert for Electrical Boxes	UL CLIV
BOSS 816	Intumescent Firestop Sealant (advanced)	ASTM E-814/UL1479
BOSS 817	Intumescent Firestop Wrap Strip	ASTM E-814/UL1479
BOSS 818	Intumescent Electrical Box Putty Pads	UL CLIV
BOSS 819	Intumescent Firestop Pipe Collars	ASTM E-814/UL1479

Passive Fire Protection products are tested to various test requirements, please check with your local building code for the requirements within your municipality.

Firestop Systems are tested to worse case senario, use this guide as a rule of thumb.

1. Any pipe or conduit with a diameter smaller than the listed value may be used.
2. Any pipe or conduit with a wall thickness heavier than the listed value may be used.
3. Any cable tray with a width and / or loading depth narrower than the listed value may be used.
4. Any cable with similar insulation / jacketing and smaller size or gauge may be used.
5. A rated Firestop system "F" rating may be applied to a wall or floor of equal or lesser "F" rating, the system then is rated at the lesser "F" rating.
6. References to tested systems are as follows:

UL indicates Underwriters Laboratories, Inc. (US)
cUL indicates Underwriters Laboratories, Inc. to Canadian Standards (Canada)
FM indicates Factory Mutual Research
SP indicates Underwriters Laboratories of Canada
SWR indicates Southwest Research Institute
ITS indicates ETL Intertek Testing Services (formerly Warnock Hersey)
OPL indicates Omega Point Laboratories, now owned & operated by ITS

Brief Definitions: Firestop & Draftstop

• **ASTM E-84:** "Surface Burning Characteristics of Building Materials" or ASTM E-84 usually refers to the flame spread or smoke development characteristics of a product (i.e. wall paper, coatings, carpet, etc.)

• **ASTM E-119:** "Fire Test of Building Construction and Materials", constructed to evaluate the ability of a fire-resistive floor or wall assembly to perform its barrier function, resisting the passage of heat, flames, hot gasses, and smoke in a fire situation.

• **ASTM E-136:** "Test Method for Behavior of Materials in a vertical Tube Furnace at 1400 degrees F". This test evaluates the ability of a material to be considered non-combustible. Weight loss of the test sample and heat rise due to the flammable content of the sample, are key criteria.

• **ASTM E-814 / UL1479:** "Standard Method of Fire Tests of Through Penetration Firestops". ASTM E-814 is a test to measure the performance of Firestop sealants in through penetration applications. The wall / ceiling / floor unit will be exposed to a furnace at temperatures ranging from 1725 to 2000° for a certain amount of time. At the conclusion of the test, the assembly will be subjected to a hose stream test. To pass the test, a fire-stop must stop the fire from traveling from the exposed side of the wall to the other side of the wall. It also must withstand the exposure to the hose stream test (30 psi if less than a four hour rating is achieved).

• **ASTM E-1966 / UL2079:** "Tests for Fire Resistance of Building Joint Systems". Expansion (Floor to Floor, Wall to Floor, Wall to Wall & Head of Wall) Joints that are first tested to the ASTM E-1399 where the joint is cycled (typically 500 times) through an intended range of movement before it is exposed to fire temperatures as those stated above. For the Head of Wall (HW-D) and Wall to Wall (WW-D) the joint is exposed to a hose stream test similar to the above after the fire temperature exposure test.

• **Draft Stop:** A material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor-ceiling assemblies and roof-ceiling assemblies and attics. This may apply in residential and commercial construction.

• **Fireblocking:** Building materials installed to resist the free passage of flame and gasses to other areas of the building through small concealed spaces. This applies mainly to residential One & Two Family homes only.

• **Fireproofing:** The application of fire retardant cementitious, fibrous, wrap, or intumescent products to bare, unprotected steel structural beams, columns, or decks of a building. Fireproofing is most commonly spray applied, although it is possible to trowel apply as well. Fireproofing is designed to prevent the flash spread of fire, but will not prevent smoke and toxic gasses from traveling to unprotected areas.

• **Firestopping:** The installation of specially designed materials into an opening in a fire rated separation (floor, ceiling or wall) to contain the spread of fire, smoke, and toxic gas between areas of a building. Firestopping is commonly needed in such areas as mechanical, plumbing, and electrical penetrations, head of wall, edge of slab, and expansion construction joints. It is intended to buy time to exit the area of a fire and prevent the spread of the fire before it can be brought under control.

Metallic Pipe / Conduit / HVAC Duct

Assembly	Penetrant	Boss Product	U.L. System	F-Rating	Page
Minimum 2 ½" Concrete Floor or 3" Concrete Wall	Multiple- Max 6" Steel, / 2" Conduit, / ¾" Copper Tubing, / 4" Copper Pipe	816	C-AJ-1591	2 Hr.	6
	Multiple Pipes including jacketed and insulated.	816	C-AJ-8194	2 Hr.	8
Minimum 4 ½" Concrete Floor or Wall	Max 8" Steel Pipe, 4" Copper Pipe/Tubing, 6" Conduit	814	C-AJ-1555	2 Hr.	10
	Max 24" Steel/ Iron Pipe, / 6" Copper Pipe/Tubing, / 4" Conduit	816	C-AJ-1585	3 Hr.	11
	Multiple- Max 1 ½" Flexible Steel or Aluminum Conduit	816	C-AJ-1592	3 Hr.	13
	Mineral Fiber Pipe Insulation- Max 12" Steel/Iron Pipe, / 4" Copper Tubing/Pipe	816	C-AJ-1593	3 Hr.	15
	Foamglass Insulation- Max 8" Schedule 30 Steel/Iron Pipe	816	C-AJ-5319	2 Hr.	17
	Glass Fiber Covering- Max 24" Steel/Iron Pipe, / 6" Copper Tubing/Pipe	816	C-AJ-5322 C-AJ-5323	2 Hr. 3 Hr.	19 21
	Max 24" x 12" 24 Gauge or Heavier Steel Duct	816	C-AJ-7134	2 Hr.	23
	Max 36" x 20" 24 Gauge or Heavier Steel Duct	816	C-AJ-7135	2 Hr.	25
	Max 30" x 10" 24 Gauge or Heavier Steel Duct	816	C-AJ-7137	3 Hr.	26
	Max 24" 22 Gauge or Heavier Steel Duct	816	C-AJ-7138	3 Hr.	27
	Multiple- Max 2 Pipes including insulated- Max 1" Copper Tubing/Pipe & Steel Pipe	816	C-AJ-8195		28
Minimum 9" Concrete Floor or Wall	Max 4" Steel Pipe or Conduit	760 or 814	C-BJ-1048	1 Hr.	30
	Max 4" Steel Pipe or Conduit	814, 810, 760	C-BK-1037	2 Hr.	31
	Max 4" Steel Pipe or Conduit	136 or 139	C-BK-1038	2 Hr.	32
	Max 2" Copper Pipe	814	C-BK-1039	2 Hr.	33
Wood Joist Floor/ Ceiling	Max 4" Steel/Iron Pipe & Conduit, / Max 3" Copper Tubing/Pipe	816	F-C-1157	2 Hr.	34
	One or More Max 1 ½" Flexible Steel Conduit	816	F-C-1158	2 Hr.	36
	Insulated Pipe- Max 3" Copper Pipe/Tubing or Steel Pipe	816	F-C-5082	2 Hr.	38
	Max 6" x 30 MSG or Heavier Steel Duct	816	F-C-7052	2 Hr.	41
Floor-Ceiling Concrete Floor over Metal or Steel Deck Steel Joist with Gypsum Ceiling	Max 4" Steel/Iron Pipe and Conduit, / Max 3" Copper Tubing/Pipe	816	F-E-1025	1 Hr.	43
	Max 6" x 30 MSG or Heavier Steel Duct	816	F-E-7009	1 Hr.	45
Minimum 5" Concrete Wall	Steel Sleeve- Max 1 ¼" Flexible Gas Pipe	814	W-J-1132	2 Hr.	46
Minimum 6" Concrete Wall	Max 24" Steel/Iron Pipe, / Max 4" Steel Electrical Metallic Tubing, / Max 6" Steel Conduit, / Max 6" Copper Pipe/Tubing	816	W-J-1209	2 Hr.	47
	Multiple- Max 3" Steel/Iron Pipe and Conduit	816	W-J-1211	2 Hr.	49

Assembly	Penetrant	Boss Product	U.L. System	F-Rating	Page
Minimum 6" Concrete Wall	One or More Max 1 ½" Flexible Steel Conduits	816	W-J-1212	2 Hr.	51
	Max ¾" Steel/Iron Pipe, ¾" Copper Pipe/Tubing/Conduit	816/813	W-J-1213	2 Hr.	52
	Max 6" Glass Pipe	816	W-J-2228	2 Hr.	54
	Foamglas Insulated- Max 6" Steel/Iron Pipe or Copper Tubing	816	W-J-5141	2 Hr.	56
	Insulated Covering- Max 12" Steel/Iron Pipe, / Max 6" Copper Pipe/Tubing	816	W-J-5142	2 Hr.	58
	Insulated Foam Covering- Max 12" Steel/Iron Pipe, / Max 6" Copper Pipe/Tubing	816	W-J-5143	2 Hr.	60
	Max 23" x 23" 24 Gauge or Heavier Steel Duct	814	W-J-7090	2 Hr.	62
	Max 67" x 18" 24 Gauge or Heavier Steel Duct	816	W-J-7105	2 Hr.	63
	Max 30" x 24" 24 Gauge or Heavier Steel Duct	816	W-J-7106	2 Hr.	65
	Multiple- Max Four 1" and Three 4" Steel/Iron Pipe, Conduit or Copper Pipe/Tubing	816	W-J-8046	2 Hr.	67
Gypsum Wall	Max 1 ¼" Flexible Steel Gas Pipe	814	W-L-1307	2 Hr.	69
	Max 4" Steel/Iron Pipe and Conduit	814	W-L-1409	2 Hr.	71
	Max 24" Steel/Iron Pipe, / Max 4" Conduit, / Max 6" Copper Pipe/Tubing	816	W-L-1433	2 Hr.	73
	Multiple- Max 3" Steel/Iron Pipe and Conduit	816	W-L-1435	2 Hr.	75
	Max ½" Aluminum or Steel Flexible Metal Conduit	816	W-L-1436	2 Hr.	77
	One or More Max 1 ½" Flexible Steel Conduits	816	W-L-1437	2 Hr.	78
	Max 24" Steel/Iron Pipe, / Max 6" Rigid Steel Conduit, / Max 4" EMT, / Max 1" Flexible Steel Conduit, / Max 6" Copper Pipe/Tubing	816	W-L-1438	2 Hr.	80
	Max ¾" Steel/Iron Pipe, ¾" Copper Pipe/Tubing/Conduit	816/813	W-L-1439	2 Hr.	82
	Max 6" Glass Pipe	816	W-L-2536	2 Hr.	84
	Foamglas Insulated- Max 10" Steel/Iron Pipe, / Max 6" Copper Tubing	816	W-L-5280	2 Hr.	86
	Foam Insulated- Max 12" Steel/Iron Pipe, / Max 6" Copper Pipe/Tubing	816	W-L-5284	2 Hr.	88
	Max 23" x 23" 24 Gauge or Heavier Steel Duct	814	W-L-7150	2 Hr.	90
	Max 67" x 18" 24 Gauge or Heavier Steel Duct	816	W-L-7183	2 Hr.	92
	Max 4" 30 MSG or Heavier, / Max 6" 28 MSG or Heavier, / Max 20" 22 MSG or Heavier Steel Vent Duct	816	W-L-7184	2 Hr.	94
	Max 24" x 30" 24 Gauge or Heavier Steel Duct with Max 1 ½" Batt or Blanket	816	W-L-7185	2 Hr.	96
	Multiple Max 4" Steel, Iron, Copper Pipe/Tubing & Conduit & Cables	816	W-L-8083	2 Hr.	98

Through-penetration Firestop Systems

System No. C-AJ-1591

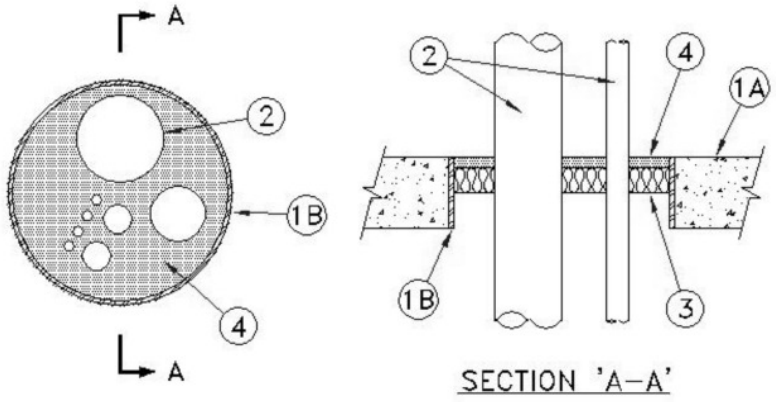
July 02, 2008

F Rating — 2 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



1A. **Floor or Wall Assembly —** Min 2-1/2 in (64 mm) thick floor or 3 in. (76 mm) thick wall of reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 15-1/4 in. (387 mm).

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

1B. **Metallic Sleeve (Optional) —** Nom 15-1/4 in. (387 mm) diam (or smaller), Schedule 30 (or heavier) steel pipe sleeve, cast or grouted into floor or wall assembly, flush with floor or wall surfaces.

2. **Through Penetrants —** A max of eight pipes, conduits or tubing to be installed within the opening. The space between pipes, conduits or tubing shall be min 1/2 in. (13 mm) to max 3 in. (76 mm). The space between pipes, conduits or tubing and periphery of opening shall be min 1/2 in. (13 mm) to max 5 in. (127 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 6 in. (152 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Conduit —** Nom 2 in. (51 mm) diam (or smaller) electrical metallic tubing.

C. **Copper Tubing —** Nom 3/4 in. (19 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe —** Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Packing Material —** Min 2 in. (51 mm) thick mineral wool insulation of min 4 pcf (64 kg/m^3) firmly pressed into opening as a permanent form. Insulation material to be recessed by min depth of 1/2 in. (13 mm) from top surface of floor or both surfaces of wall.

4.. **Fill, Void, or Cavity Materials* - Caulk —** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-8194

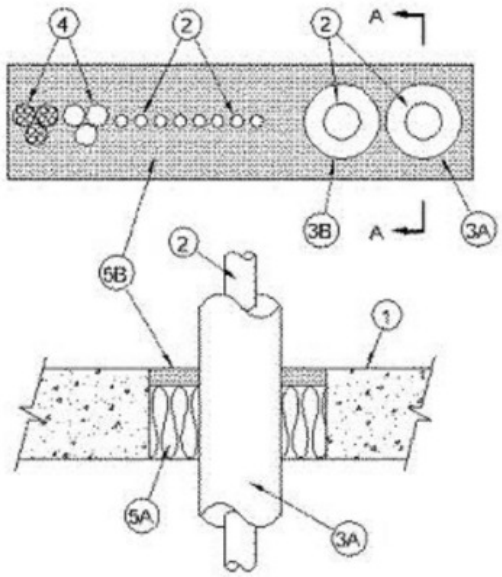
June 24, 2008

F Rating — 2 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



SECTION 'A-A'

1. **Floor or Wall Assembly —** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete floor, or min 3 in. (76 mm) thick reinforced lightweight or normal concrete wall. Wall may also be constructed of any UL classified **Concrete Blocks***. Max area of opening is 144 sq in. (929 cm2) with max dimension of 24 in. (610 mm).

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

1A. **Steel Deck/Floor Assembly —** (Not Shown) —As an alternate to Item 1, the floor assembly may consist of a fluted steel deck/concrete floor assembly. The floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** 1-1/2 to 3 in. (38 to 76 mm) deep galv fluted units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

2. **Through-Penetrants —** Max ten pipes, conduits or tubing to be installed within the opening. The space between pipes, conduits or tubing shall be a min 3/8 in. (10 mm) to max 1 in. (25 mm). The space between pipes, conduits or tubing and periphery of opening shall be min 1/2 in. to max 3 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of pipes, conduits or tubing may be used:

A. Max eight steel or iron or Type L copper pipe, tubing or conduit of nom 3/4 in. (19 mm) diam.

B. Max two steel or iron or Type L copper pipe, tubing or conduit of nom 2 in. (51 mm) diam (or smaller).

3. Either or both of the following types of pipe coverings may be used on two of the metallic pipes or tubing having a nom diam of 2 in. (51 mm) or less.

A. **Tube Insulation - Plastics+ —** Nom 1 in. (25 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The insulated pipe or tubing shall be spaced a nom 1-1/4 in. (32 mm) from the other through-penetrants. The annular space between the insulated pipe or tubing and periphery of the opening shall be a min of 1/2 in. (13 mm) to max 1-3/4 in. (44 mm).

See **Plastics+ (QMFZ2)** category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5 VA may be used.

B. **Pipe and Equipment Covering Materials —** Nom 1 in. (25 mm) thick hollow cylindrical glass fiber units, nom 3.5 pcf (56 kg/m3), 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 insulated pipe or tubing shall be spaced a nom 1-1/4 in. (32 mm) from the other through-penetrants. The annular space between the insulated pipe or tubing and periphery of the opening shall be a min of 1/2 in. (13 mm) to max 1-3/4 in. (44 mm).

See **Pipe and 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.

4. **Cables —** Max two cable bundles to be installed within the opening. Each bundle to consist of 3 cable lengths of cables specified below. Cable to be tightly bundled and supported on both sides of floor or wall. The annular space between cable bundles and periphery of the opening shall be min 3/8 in. (10 mm) to max 2-5/8 in. (67 mm).

A. Max 400 pair No. 24 AWG (or smaller) telephone cables with PVC insulation and jacket.

B. Max 3/C, No. 2/0 AWG (or smaller) copper conductor, PVC jacketed aluminum clad or steel clad cable.

5. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 2 in. (51 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or both surfaces of wall to accommodate the required thickness of fill material.

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 and both surfaces of wall. Fill material to be forced into interstices of cable group to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

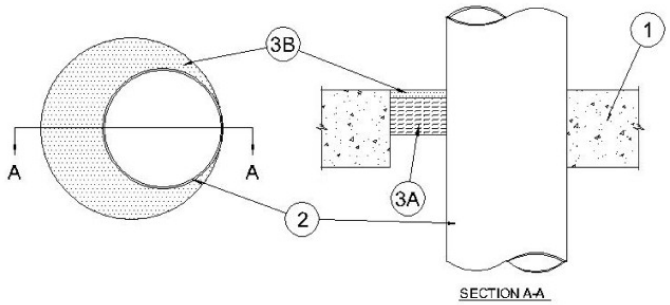
Through-penetration Firestop Systems

System No. C-AJ-1555

December 04, 2009

F Rating — 2 Hr

T 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/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 11-1/4 in. (284 mm)

    See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** One metallic pipe, tubing or conduit installed concentrically or eccentrically within the firestop system. An annular space of min 0 in. (point contact) to max 2-3/4 in. (70 mm) is required between the penetrant and the periphery of the opening. Pipe, tubing or conduit to be rigidly supported on each side of the floor assembly. The following types and sizes of metallic pipes, tubing or conduit may be used:

    A. **Steel Pipe —** Nom 8 in. (203 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

    B. **Copper Pipe —** Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

    C. **Copper Tubing —** Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tubing.

    D. **Conduit —** Nom 6 in. (152 mm) diam (or smaller) steel conduit or nom 4 in. diam (or smaller) steel electrical metallic tubing.

3. **Firestop System —** The firestop system shall consist of the following:

    A. **Packing Material —** Min 2 in. (51 mm) thickness of min 4 pcf (64 kg/m^3) 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 as required to accommodate the required thickness of fill material.

    B. **Fill, Void or Cavity Material* - Caulk —** 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.

    ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-1585

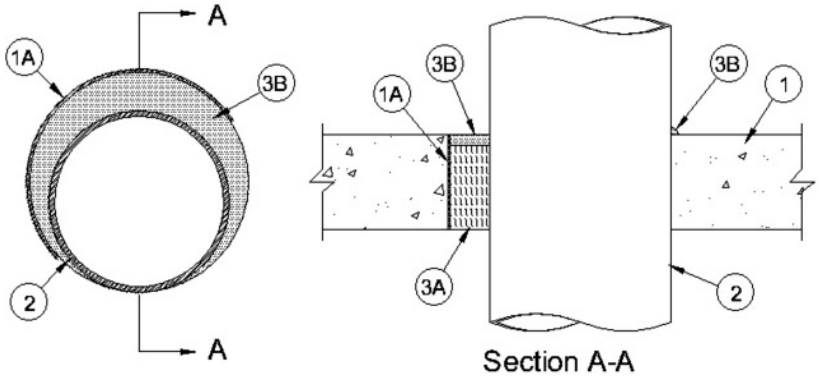
April 10, 2008

F Ratings — 3 Hr (See Item 3B)

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



1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced normal weight (140-150 pcf or 2200-2400 kg/m^3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 26 in. (660 mm). If the firestop system is installed within a hollow-core hollow-core precast concrete unit, max diam of opening shall be 7 in. (178 mm).

See **Concrete Block** (CAZT) and **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.

1A. **Metallic Sleeve —** (Not shown, Optional) — Nom 8 in. (203 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces. The use and the max diam of the steel sleeve is dependent upon the type and max diam of the through penetrant (Item 3) and type and min fill material thickness as tabulated in Item 3B.

2. **Through Penetrants —** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe, conduit or tubing and the periphery of the opening shall be min 0 in. (point contact) to a max 1-7/8 in. (48 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 24 in. (610 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 24 in. (610 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT) or nom 6 in. (152 mm) diam (or smaller) steel conduit.

D. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

E. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 4 pcf (64 m^3) mineral wool batt insulation firmly packed into opening or min 1 in. (25 mm) diam backer rod friction fitted into the opening as a 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. When the floor is constructed of hollow-core precast concrete units, packing material shall be recessed from both surfaces of floor to accommodate the required thickness of fill materials. In floors, the packing material may be removed after the fill material cures.

B. **Fill, Void or Cavity Material* — Sealant —** Fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall. At the point contact location between through penetrant and concrete, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the concrete/through penetrant interface on the top surface of floor and on both surfaces of wall. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed symmetrically on both sides of floor, flush with both floor surfaces. The F Rating of the firestop system is dependent upon the use and the max diam of the steel sleeve, type and max diam of the through penetrant and type and min fill material thickness as tabulated below:

Use of Steel Sleeve	Max Diam of Steel Sleeve In.	Type of Through Penetrant	Max Diam of Through Penetrant In.	Type of Fill Mtl	Min Fill Mtl Thkns In.	F Rating Hr
Not permitted	—	Steel or Iron Pipe	24 (610)	Boss 816	1/2 (13)	3
Permitted	8 (203)	Steel or Iron Pipe	6 (152)	Boss 816	1/2 (13)	3
Permitted	8 (203)	Copper Pipe, Copper Tube or Steel Conduit	6 (152)	Boss 816	1/2 (13)	3
Permitted	6 (152)	Steel EMT	4 (102)	Boss 816	1/2 (13)	3

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-1592

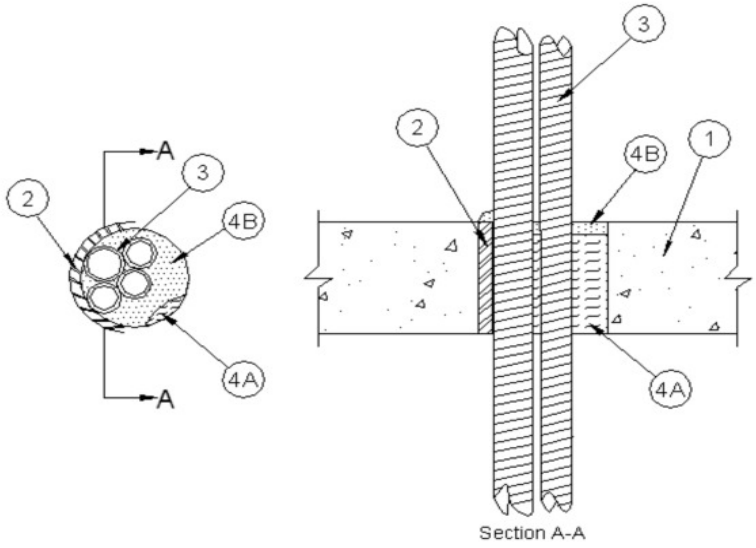
June 24, 2008

F Ratings — 2 and 3 Hr (See Item 3)

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



Section A-A

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/m^3) 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***. The max diam of the opening is dependent upon the type of through penetrant (Item 3) used. If flexible steel conduit is installed within the opening, the max diam of the opening is 6 in. (152 mm) If flexible aluminum conduit is installed within the opening, the max diam of the opening is 4 in. (102 mm).

> See **Concrete Block (CAZT)** and **Precast Concrete Units (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Steel Sleeve —** (Optional) — Nom 6 in. (152 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces. The max diam of the steel sleeve is dependent upon the type of through penetrant used. If flexible steel conduit is used, the max diam of the steel sleeve is 6 in. (152 mm). If flexible aluminum conduit is used, the max diam of the steel sleeve is 4 in. (102 mm).

3. **Through Penetrants —** (One or more nom 1-1/2 in. (38 mm) diam (or smaller) flexible steel conduit or one or more nom 1 in. (25 mm) diameter (or smaller) flexible aluminum conduit bundled together and installed within the opening. Max diam of through penetrant bundle shall not exceed 4 in. (102 mm) and 2-1/2 in. (64 mm) for flexible steel conduit and flexible aluminum conduit, respectively. The space between the through penetrants shall be a min 0 in. (point contact) to a max 1/4 in. (6 mm). The annular space between the through penetrants and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm) for flexible steel conduit. The annular space between the through penetrants and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm) for flexible aluminum conduit. Through penetrants to be rigidly supported on both sides of floor or wall assembly.

See **Flexible Metal Conduit (DXUZ)** category in the Electrical Construction Materials Directory for names of manufacturers.

The F Rating of the firestop system is dependent upon the type of through penetrant used. If flexible aluminum conduit is used, the F Rating of the firestop system is 2 hr. If flexible steel conduit is used, the F Rating of the firestop system is 3 hr.

4. **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/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Additional packing material shall be forced into interstices of flexible aluminum conduit to max extent possible. 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.

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. At the point contact location between penetrating items and concrete, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the concrete/penetrating item interface on the top surface of floor and on both surfaces of wall or hollow-core precast concrete units. Additional sealant shall be forced into interstices of through penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-1593

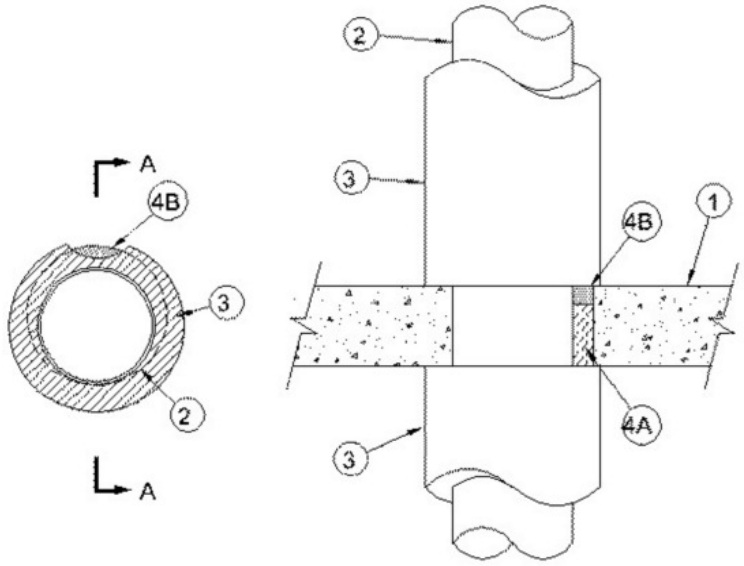
June 24, 2008

F Rating — 3 Hr

T Ratings — 1-3/4 and 2Hr (see Item 2)

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



SECTION 'A-A'

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/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Floor may also be constructed of any 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Max diam of opening 14 in. (356 mm). When precast concrete units are used the max diam of opening is 7 in. (127 mm).

See **Concrete Blocks (CAZT)** and **Precast Concrete Units* (CFTV)** categories in Fire Resistance Directory for names of manufacturers.

2. **Through-Penetrant —** One metallic pipe or tubing installed concentrically or eccentrically within opening. Annular space between penetrant and periphery of opening shall be min of 0 in. (point contact) to max 1-1/4 in. (32 mm) for steel/iron through penetrants and max 2 in. (51 mm) for copper through penetrants. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of penetrants may be used:

A. **Steel Pipe —** Nom 12 in. (305 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.
C. **Steel Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
D. **Copper Tubing —** Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tubing.
E. **Copper Pipe —** Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

When penetrant diameter is 4 in. (102 mm) or smaller the T Rating is 2 h. When penetrant diameter is greater than 4 in. (102 mm) the T Rating is 1-3/4 h.

3. **Pipe Covering Materials* —** (Partial Insulation) — Max 2 in. (51 mm) thick unfaced mineral fiber pipe insulation having a nom density of 4 pcf (64 kg/m^3) (or heavier) and sized to fit the outside diam of pipe or tube. Pipe insulation installed around penetrant and shall extend 12 in. (305 mm) below floor and 36 in. (914 mm) above floor or 36 in. (914 mm) beyond both surfaces of wall. Pipe insulation secured with min 8 AWG steel wire spaced 12 in. (305 mm) OC. All longitudinal and transverse joints to be sealed with 4 in. (102 mm) wide aluminum foil tape.

IIG MINWOOL L L C — High Temperature Pipe Insulation 1200, High Temperature Pipe Insulation BWT and High Temperature Pipe Insulation Thermaloc

4. **Firestop System —** The details of the firestop system shall be as follows:
A. **Packing Material —** Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m^3) 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 to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Materials* — Sealant —** Min 1/2 in. (13 mm) thickness of sealant applied within the annulus, flush with top surface of floor or with both surfaces of wall. In floors of precast concrete units, sealant shall be installed symmetrically on both sides of the floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

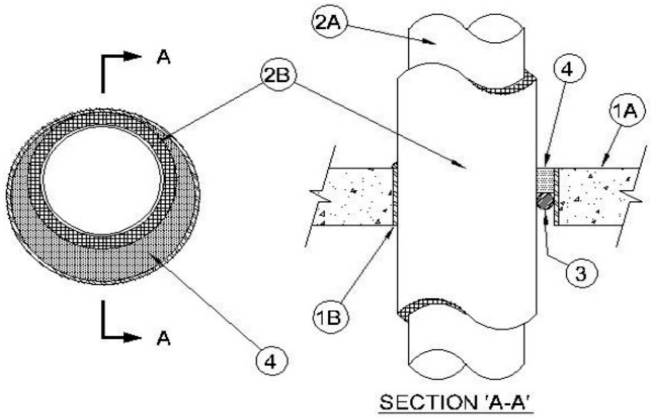
Through-penetration Firestop Systems

System No. C-AJ-5319

April 10, 2008

F Rating — 2 Hr

T Rating — 1/2 Hr



SECTION 'A-A'

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 Blocks***. Max diam of opening is 17-1/2 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

1B. **Metallic Sleeve (optional) —** Nom 18 in. (or smaller) Schedule 10 (or heavier) steel pipe sleeve, cast or grouted into floor or wall assembly.
2A. **Through Penetrants —** One nom 8 in. (or smaller) Schedule 30 (or heavier) steel or iron pipe. Pipe to be firmly supported on both sides of opening. Pipe installed concentrically or eccentrically such that the annular space between the insulated pipe and the periphery of the opening is min 0 in. (point of contact) to max 2-1/8 in.
2B. **Pipe Covering Material* —** Cellular Glass Insulation - Nom 3 in. thick cellular glass units sized to the outside diam of the metallic pipe and supplied in 18 or 24 in. long, half sections. Pipe insulation installed on pipe in accordance with manufacturer's instructions. The insulation material may be jacketed with 0.010 in. thick aluminum sheet wrapped tightly around with a min 2 in. overlap. Jacket to be installed with edge abutting surface of caulk fill material (Item 4) on top surface of floor or both surfaces of wall. Jacket to be well secured with metallic bands.

PITTSBURGH CORNING CORP — FOAMGLAS

3. **Packing Material —** Min 1 in. diam foam backer rod 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 thickness of fill material.

4. **Fill, Void, or Cavity Materials* —** Caulk. Min 1 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall. Additional material to be installed to form a min 3/8 in. bead at the concrete/penetrating item interface on the top surface of the floor and both surfaces of the wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

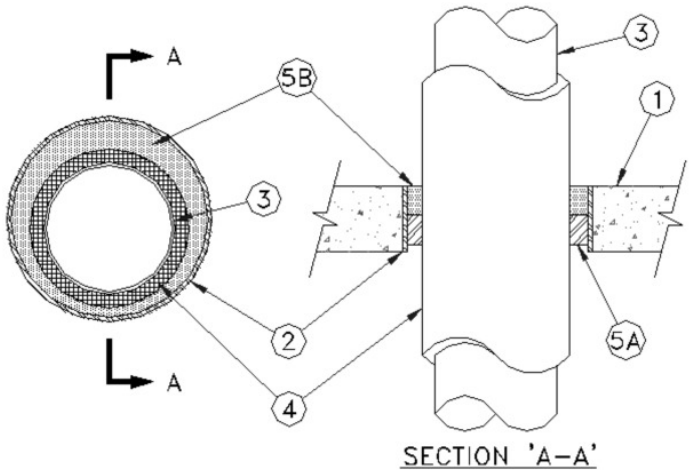
Through-penetration Firestop Systems

System No. C-AJ-5322

July 02, 2008

F Rating — 2 Hr

T Rating — 3/4 Hr and 1 Hr (See Item 5)



1. **Floor or Wall Assembly —** Min 4-1/2 in. thick reinforced light weight or normal weight (100-150 pcf) concrete floor or min 6 in. thick reinforced light weight or normal weight concrete wall. Floor may also be constructed of any min 6 in. thick UL Classified hollow core **Precast Concrete Units***. When precast concrete units are used, the max diam of opening is 7 in. Wall may also be constructed of any UL Classified **Concrete Units***. Max diam of opening is 29-1/2 in.

See **Concrete Blocks (CAZT)** and **Precast Concrete Units (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** (Optional) — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces.
3. **Through Penetrants —** 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 or tubing may be used:

A. **Steel Pipe —** Nom 24 in. diam (or smaller) Schedule 20 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 24 in. diam (or smaller) cast or ductile iron pipe.
C. **Copper Tubing —** Nom 4 or 6 in. diam (or smaller) Type L (or heavier) copper tubing. See table below.
D. **Copper Pipe —** Nom 4 or 6 in. diam (or smaller) Regular (or heavier) copper pipe. See table below.

4. **Pipe Covering* —** Nom 2 in. thick hollow cylindrical glass fiber units, of min 4.5 pcf density, 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 insulated pipe and periphery of the opening is specified in the table below.

See **Pipe and 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 2 in. thickness of min 4 pcf mineral wool batt insulation or nom 1 in. diam foam backer rod (see table below) 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.

B. **Fill, Void, or Cavity Materials* - Sealant —** Min 1, 1-3/4 or 2 in. thickness (see table below) of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

Type of Pipe	Nom Pipe Diam, in.	Annular Space, in.	Type of Packing Material	Thickness of Sealant, in.	F Rating Hr.	T Rating Hr.
Steel and Iron Pipe	24	5/8 to 1-1/4	Mineral Wool	2	2	3/4
Copper Tube and Pipe	4	5/8 to 1-1/4	Mineral Wool	2	2	3/4
Steel and Iron Pipe	24	5/8 to 1-1/4	Mineral Wool	2	2	1
Copper Tube and Pipe	6	5/8 to 1-1/2	Mineral Wool	1	2	1
Steel and Iron Pipe	12	5/8 to 1-1/2	Mineral Wool	1	2	1
Steel and Iron Pipe	12	1/2 to 3/4	Foam Backer Rod	1-3/4	2	3/4

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-5323

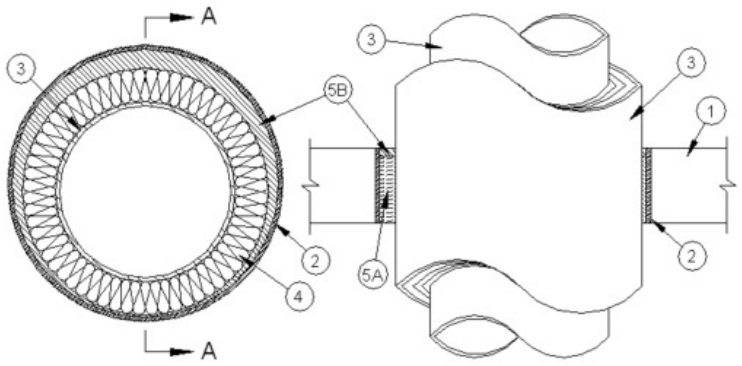
September 08, 2008

F Rating — 3 Hr

T Ratings —1-1/2 and 1-3/4 Hr (See Item 3)

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



Section A-A

1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete floor or min 5 in. (127 mm) thick reinforced light weight or normal weight concrete wall. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow core **Precast Concrete Units***. When precast concrete units are used, the max diam of opening is 7 in. (178 mm). Wall may also be constructed of any UL Classified **Concrete Units***. Max diam of opening is 30 in. (762 mm).

See **Concrete Blocks (CAZT)** and **Precast Concrete Units (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces.
3. **Through Penetrant —** 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 or tubing may be used:

A. **Steel Pipe —** Nom 24 in. (610 mm) diam (or smaller) Schedule 20 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 24 in. (610 mm) diam (or smaller) cast or ductile iron pipe.
C. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.
D. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

When copper through penetrants are used the T Rating is 1-1/2 h. When steel or iron through penetrants are used the T Rating is 1-3/4 h.

4. **Pipe Covering* —** Nom 2 in. (51 mm) thick hollow cylindrical glass fiber units, nom 3.5 pcf (56 kg/m^3) density, 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. Annular space between insulated pipe and periphery of the opening shall be min 1/4 in. (6 mm) to max 1-1/4 in. (32 mm).

See **Pipe and 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/m^3) mineral wool batt firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the required thickness of fill material. When the floor is constructed of hollow-core precast concrete units, packing material shall be recessed from both surfaces of floor to accommodate the required thickness of fill material.

B. **Fill, Void, or Cavity Materials* — 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. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed symmetrically on both sides of floor, flush with both floor surfaces.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-7134

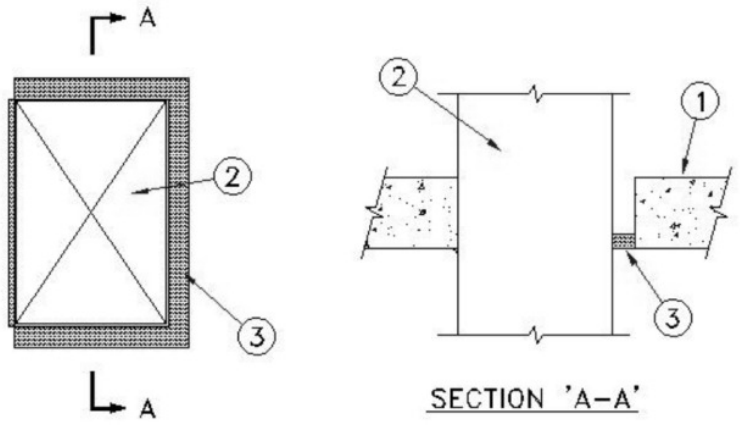
September 08, 2008

F Rating — 2 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



1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 364 sq. in. (2348 cm^2) with max dimension of 26 in. When precast concrete units are used the max area of opening is 49 sq. in. (316 cm^2) with max dimension of 7 in. (178 mm).

See **Concrete Blocks (CAZT)** and **Precast Concrete Units* (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Nom 24 by 12 in. (610 by 305 mm) (or smaller) 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 0 in. (point contact) to max 2 in. (51 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 —** (Not Shown) - Min 1 in. (25 mm) thick polystyrene board, firmly packed into opening as a permanent form. Packing material to be recessed from bottom or top surface of floor or from one surface of wall to accommodate the required thickness of fill material.

B. **Fill, Void, or Cavity Materials* - Sealant —** Min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with either the top or bottom surface of floor or one surface of wall. When wall is constructed of concrete blocks, fill material shall be installed within the annular space on both sides of the wall. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed on the bottom side of

the floor. At the point contact location between duct and concrete a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the concrete/duct interface on the same side of floor or wall as the sealant in the annular space bottom or top surface of floor or one surface of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-7135

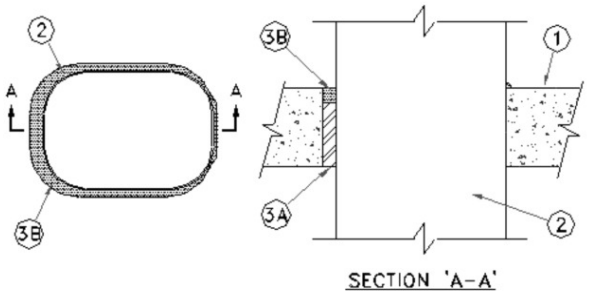
July 07, 2008

F Rating — 2 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



1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete floor or min 5 in. (127 mm) thick light weight or normal weight concrete wall. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 715 sq in. (4613 cm^2) with max dimension of 37-1/4 in. (946 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Nom 36 by 20 in. (915 by 508 mm) (or smaller) by No. 24 gauge (or heavier) galv steel, oval HVAC duct. One steel duct to be positioned within the firestop system. The annular space shall be min 0 in. (point of contact) to max 2 in. (51 mm). Duct to be rigidly supported along its entire perimeter 8 in. (203 mm) from both surfaces of floor or wall assembly.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 4 in. thickness of min 4 pcf (64 kg/m^3)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 from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void, or Cavity Materials* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus over the mineral wool insulation, flush with top surface of floor or both surfaces of wall. A 3/8 in. (10 mm) diam bead of the sealant shall be applied along the point of contact of the duct and periphery of the opening at top surface of floor or both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

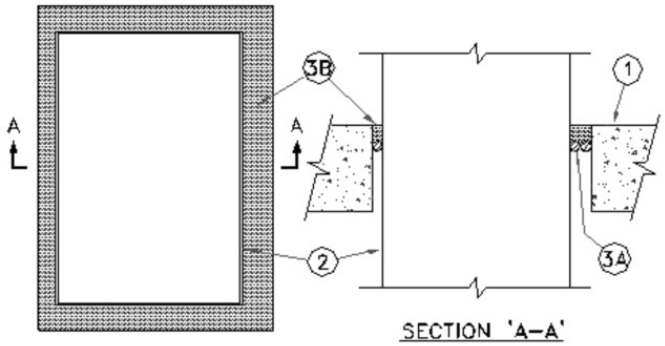
Through-penetration Firestop Systems

System No. C-AJ-7137

July 10, 2008

F Rating — 3 Hr

T Rating — 0 Hr



1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Floor may also be constructed of any min 8 in. (203 mm) thick UL Classified hollow core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 384 sq. in. (0.25 m^2) with max dimension of 32 in. (813 mm). When precast concrete units are used the max area of opening is 49 sq. in. (316 cm^2) with max dimension of 7 in. (178 mm).

See **Concrete Blocks** (CAZT) and **Precast Concrete Units*** (CFTV) categories in the FireResistance Directory for names of manufacturers.

2. **Steel Duct —** Max 30 by 10 in. (762 by 254 mm) No. 24 gauge (or heavier) galv steel duct. One steel duct to be positioned within the firestop system. The annular space shall be min 1/2 in. (13 mm) to max 1-1/2 in. (38 mm). Duct to be rigidly supported along its entire perimeter 4 in. (102 mm) from both floor or wall surfaces.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Nom 1 in. (25 mm) diam foam backer rod or min 4 pcf (64 kg/m^3) 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 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 the top surface of floor or both surfaces of wall. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed on both sides of the floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-7138

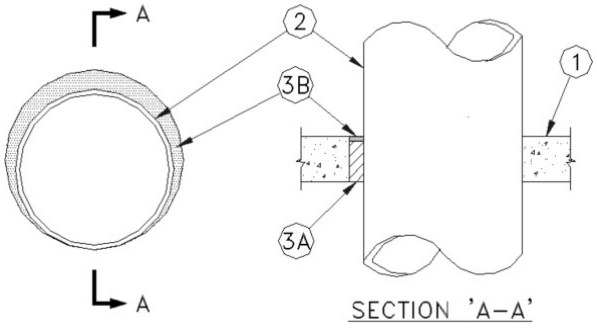
July 10, 2008

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



1. **Floor or Wall Assembly —** Min 4-1/2 in. (114 mm) thick floor or 5 in. (127 mm) thick wall of reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 28 in. (711 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Max 24 in. (610 mm) diam No. 22 gauge (or heavier) steel HVAC duct to be installed either concentrically or eccentrically within the firestop system. The annular space between duct and periphery of opening shall be min 0 in (point contact) to max 4 in. (102 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 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 to accommodate the required thickness of fill material.

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. Additional fill material installed to form a min 1/4 in. (6 mm) bead at the point of contact of the duct and periphery of the opening on the top floor surface or both wall surfaces.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-8195

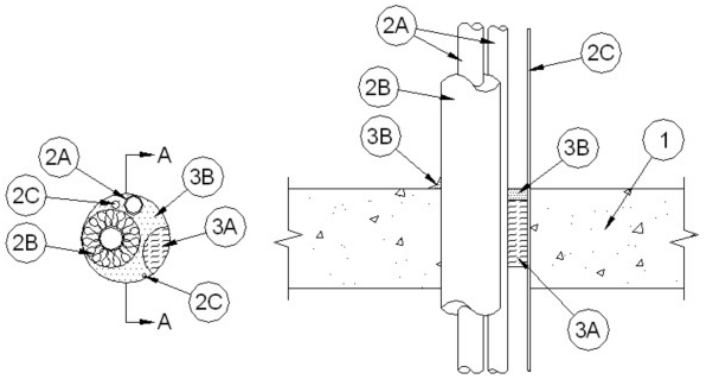
June 24, 2008

F Rating — 2 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



Section A-A

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/m^3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in. (102 mm).

See **Concrete Blocks (CAZT)** and **Precast Concrete Units (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** Metallic pipes, tubing or cable to be installed either concentrically or eccentrically within the firestop system. Penetrants to be rigidly supported on both sides of floor assembly. The following types and sizes of penetrants may be used:

A. **Metallic Pipes —** Max two metallic pipes or tubing. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 2-1/4 in. (57 mm). The following types and sizes of metallic pipes or tubing may be used:

A1. **Copper Tubing —** Nom 1 in. (25 mm) diam (or smaller) Type M (or heavier) copper tube.

A2. **Copper Pipe —** Nom 1 in. (25 mm) diam (or smaller) Regular (or heavier) copper pipe.

A3. **Steel Pipe —** Nom 1 in. (25 mm) diam (or smaller) Schedule 10 steel pipe.

B. **Tube Insulation - Plastics+ —** Nom 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The tube insulation may be installed on all tubing. The annular space between the insulated penetrating item and uninsulated metallic pipes, conduit or tubing shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm) The

annular space between the insulated penetrating item and the periphery of the opening shall be min 0 in. (point contact) to max 2-1/4 in. (57 mm).

See **Plastics (QMFZ2)** category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5A may be used.

C. **Cables —** Max two cables spaced min 0 in. (point contact) from tube insulation or min 1/2 in. 13 mm) from other penetrants. The annular space between cable and periphery of opening is min 0 in. (point contact) to max 2-1/4 in. (57 mm). Cables to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of cables may be used:
C1. Max 7/C No. 24 AWG (or smaller) control cable with polyvinyl chloride (PVC) insulation and jacket.
C2 NMax 2/C No. 10 AWG (or smaller) thermostat wire.

3. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material —** Min 3 in. (76 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 both surfaces of wall to accommodate the required thickness of fill material. When the floor is constructed of hollow-core precast concrete units, packing material shall be recessed from both surfaces of floor to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Materials* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or both surfaces of wall. Min 1/2 in. (13 mm) diam bead of fill material applied to the penetrant/concrete interface at the point contact location on the top surface of floor or both surfaces of wall. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed flush with both surfaces of floor. Sealant shall be forced into interstices between penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

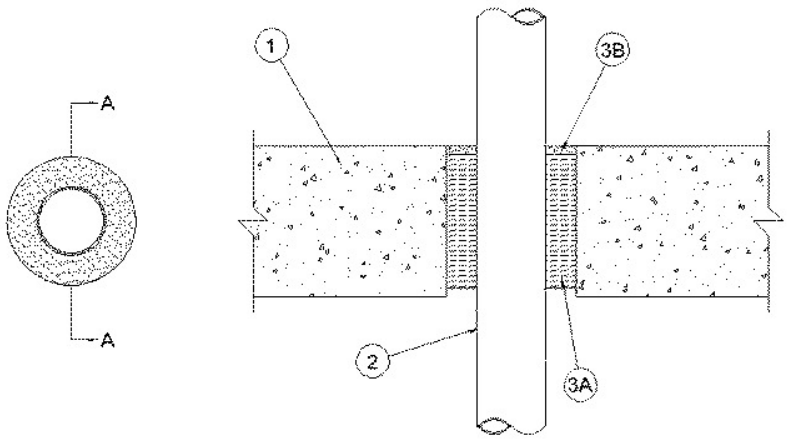
Through-penetration Firestop Systems

System No. C-BJ-1048

November 05, 2008

F Rating - 1 h

T Rating - 0 h



SECTION A-A

1. **Floor or Wall Assembly· —** Min 9 1/4 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Max diam of opening is 8 in. Wall may also be constructed of any UL Classified **Concrete Blocks*.**

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants· —** One metallic pipe, conduit, or tubing to be installed concentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be 1-3/4 to 2-13/16 in. 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 tubes may be used:

A. **Steel Pipe· —** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
B. **Iron Pipe· —** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit· —** Nom 4 in. diam (or smaller) steel electrical metallic tubing or steel conduit.

3. **Firestop System· —** The firestop system shall consist of the following:

A. **Packing Material· —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall.

ACCUMETRIC L L C — Boss 760 Silicone, Boss 814, Latex Boss 814 Intumescent B.

*Bearing the UL Classification Mark

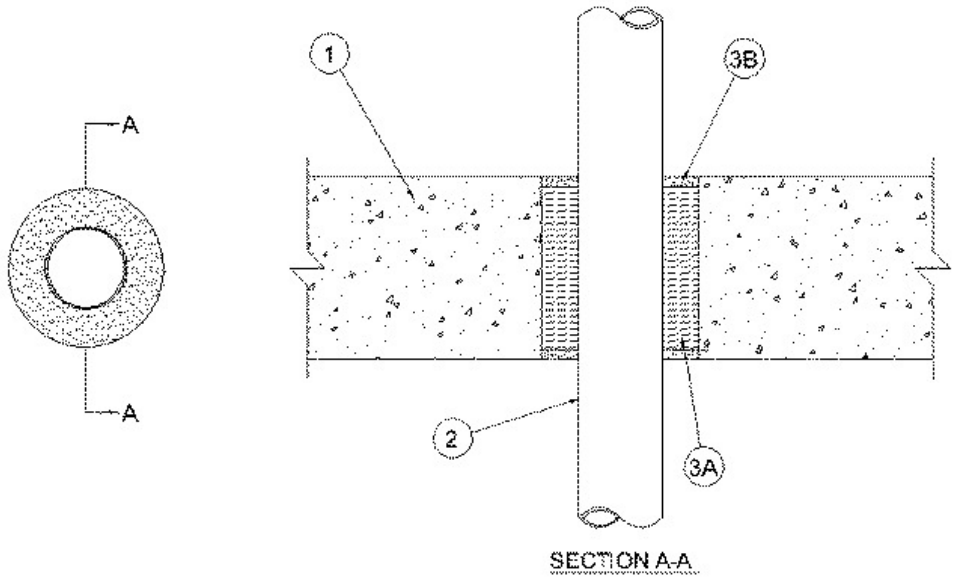
Through-penetration Firestop Systems

System No. C-BK-1037

November 10, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor or Wall Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 6 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One metallic pipe or conduit to be installed concentrically within the firestop system. The annular space between pipe or conduit and periphery of opening shall be ¾ in. Pipe or conduit to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or conduits may be used:

A. **Steel Pipe —** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 4 in. diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 4 in. diam (or smaller), rigid steel conduit.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 1/2 in. thickness of fill material applied within annulus, flush with both surfaces of floor or wall.

ACCUMETRIC L L C — Boss 814, Boss 810, Boss 760 Silicone

*Bearing the UL Classification Mark

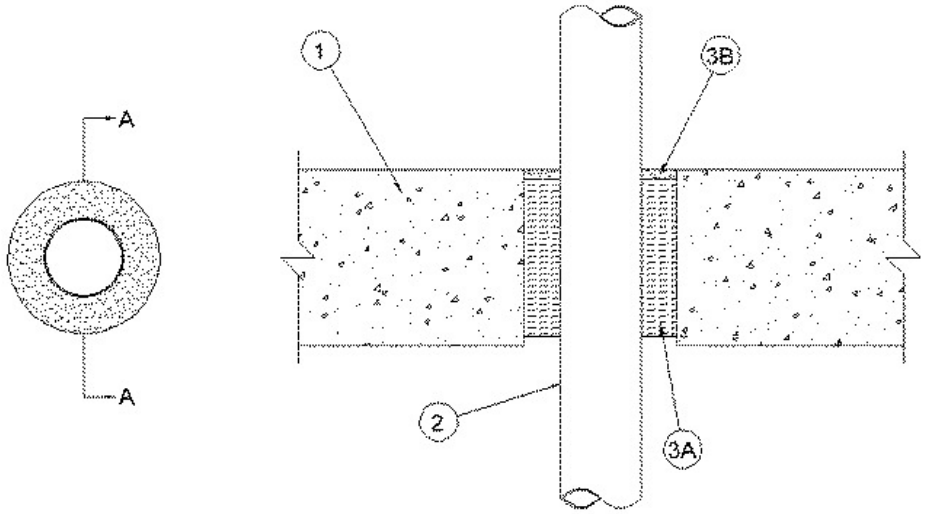
Through-penetration Firestop Systems

System No. C-BK-1038

November 10, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor or Wall Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 6 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One metallic pipe or conduit to be installed concentrically within the firestop system. The annular space between pipe or conduit and periphery of opening shall be 5/8 in. Pipe or conduit to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or conduits may be used:

A. **Steel Pipe —** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 4 in. diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 4 in. diam (or smaller) rigid steel conduit.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall.

ACCUMETRIC L L C — Boss 136, Boss 139

*Bearing the UL Classification Mark

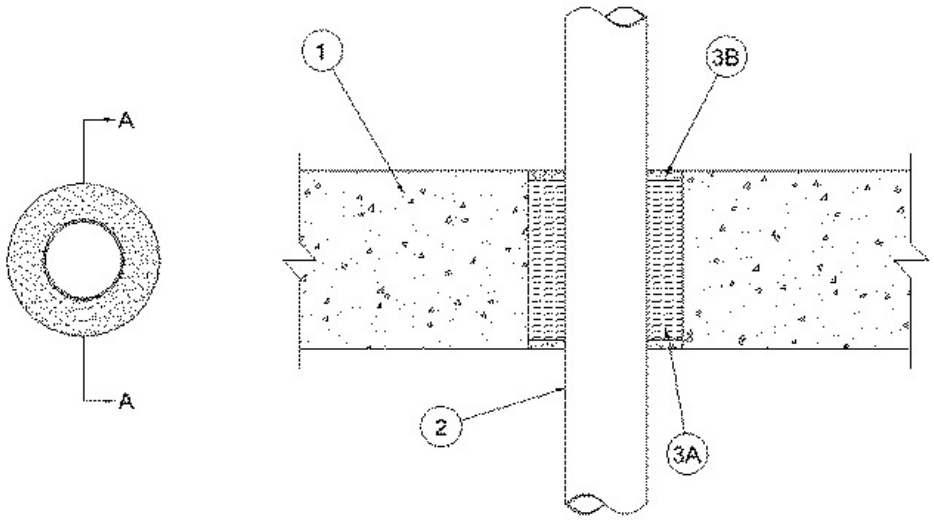
Through-penetration Firestop Systems

System No. C-BK-1039

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor or Wall Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 6 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One metallic pipe or tubing to be installed concentrically within the firestop system. The annular space between pipe or tubing and periphery of opening shall be 1-15/16 in. Pipe or tubing 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. **Copper Tubing —** Nom 2 in. diam (or smaller) Type K (or heavier) copper tubing.

B. **Copper Pipe —** Nom 2 in. diam (or smaller) Regular copper pipe.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 1/2 in. thickness of fill material applied within annulus, flush with both surfaces of floor or wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-1157

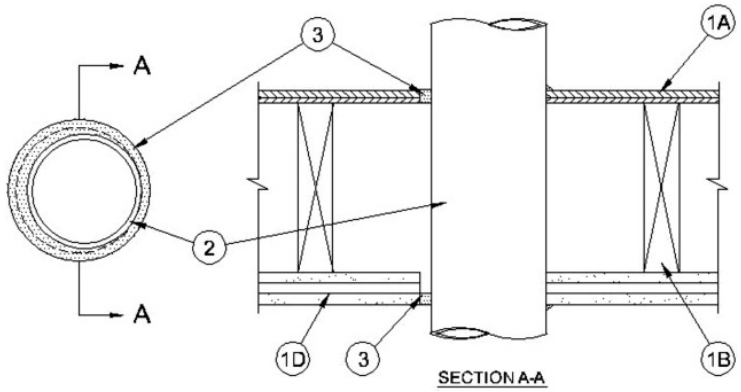
April 11, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 1/2 and 1 Hr (See Item 2)

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



1. **Floor Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design Nos. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 5 in.(127 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped.

C. **Furring Channels —** (Not Shown) — In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of wallboard (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between wallboard and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board secured to wood joists or furring channels as specified in the individual Floor-Ceiling Design. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels as specified in the individual Floor-Ceiling Design. Max diam of ceiling opening is 5 in. (127 mm).

The F Rating of the firestop system is equal to the hourly fire rating of the floor-ceiling assembly in which it is installed.

1.1 **Chase Wall (Not Shown, Optional) —** The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
A. **Studs —** Nom 2 by 6 in. (51 by 152 mm) lumber or double nom 2 by 4 in. (51 by 102 mm) lumber studs.
B. **Sole Plate —** Nom 2 by 6 in. (51 by 152 mm) lumber or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted.
C. **Top Plate —** The double top plate shall consist of two nom 2 by 4 in. (51 by 102 mm)lumber plates or two sets of nom 2 by 4 in. (51 by 102 mm) lumber plates tightly butted. Max diam of opening is 5 in. (127 mm).
D. **Gypsum Board* —** Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.
2. **Through Penetrants —** One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The space between pipes, conduits or tubing and periphery of opening is dependent upon the type of penetrant within the firestop system. 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 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe. The annular space within the firestop system shall be a 0 in. (point contact) to max 1/2 in. (13 mm).
B. **Iron Pipe —** Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe. The annular space within the firestop system shall be a 0 in. (point contact) to max 1/2 in. (13 mm).
C. **Conduit —** Nom 4 in. diam (or smaller) steel electrical metallic tubing or rigid galv steel conduit. The annular space within the firestop system shall be a 0 in. (point contact) to max 1/2 in. (13 mm).
D. **Copper Tubing —** Nom 3 in. (76 mm) diam (or smaller) Type L (or heavier) copper tubing. The annular space within the firestop system shall be a 0 in. (point contact) to max 7/8 in. (22 mm).
E. **Copper Pipe —** Nom 3 in. (76 mm) diam (or smaller) Regular (or heavier) copper pipe. The annular space within the firestop system shall be a 0 in. (point contact) to max 7/8 in. (22 mm).

The T Rating of the firestop system is dependent upon the type of penetrant, used within the firestop system. If a steel or iron pipe, steel electrical metallic tubing or rigid galv steel conduit is used, the T Rating is 1 hr. If a copper tube or copper pipe is used, the T Rating is 1/2 hr.

3. **Fill, Void or Cavity Material* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with the top surface of the floor or sole plate. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling or bottom top plate. At point contact, min 3/8 in. (10 mm) diam bead of fill material applied at penetrant/floor or sole plate interface and at penetrant/ceiling or top plate interface. Additional sealant shall be applied in such a manner that the sealant overlaps a min ½ in. (13 mm) beyond the periphery of the opening on the top surface of the floor or sole plate and bottom surface of ceiling or bottom top plate.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-1158

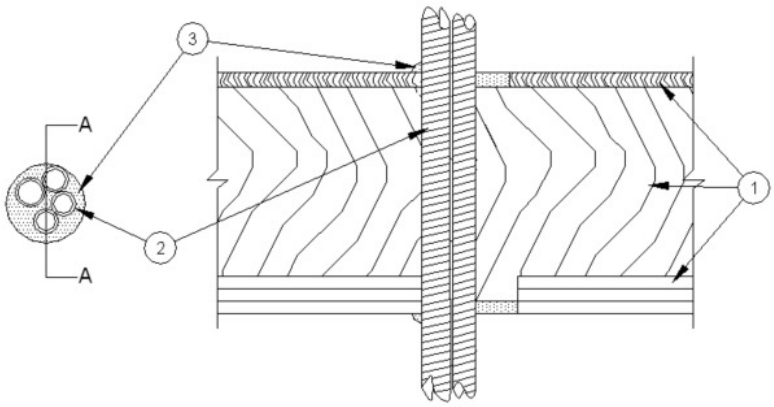
July 07, 2008

F Rating — 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



SECTION A-A

1. **Floor Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design Nos. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 4 in. (102 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped.

C. **Furring Channels —** In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of board (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between board and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board secured to wood joists or furring

channels as specified in the individual Floor-Ceiling Design. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels as specified in the individual Floor-Ceiling Design. Max diam of ceiling opening is 4 in. (102 mm).

The F Rating of the firestop system is equal to the hourly fire rating of the floor-ceiling assembly in which it is installed.

1.1 **Chase Wall —** (Not Shown, Optional) The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 6 in. (51 by 152 mm) lumber or double nom 2 by 4 in. (51 by 102 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 6 in. (51 by 152 mm) lumber or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted.

C. **Top Plate —** The double top plate shall consist of two nom 2 by 6 in. (51 by 152 mm) lumber plates or two sets of nom 2 by 4 in. (51 by 102 mm) lumber plates tightly butted. Max diam of opening is 4 in. (102 mm).

D. **Gypsum Board* —** Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.

2. **Through Penetrants —** One or more nom 1-1/2 in. (38 mm) diam (or smaller) flexible steel conduit bundled together and installed within the opening. Max diam of through penetrant bundle shall be 3 in. (76 mm). The space between the through penetrants shall be a min of 0 in. (point contact) to a max of 1/4 in. (6 mm). The annular space between the through penetrants and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Through penetrants to be rigidly supported on both sides of floor-ceiling assembly assembly.

See **Flexible Metal Conduit** (DXUZ) category in the Electrical Construction Materials Directory for names of manufacturers.

3. **Fill, Void or Cavity Material* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, on the top surface of the floor or sole plate. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling or bottom top plate. Additional min 1/8 in. (3.2 mm) thickness of sealant shall extend a min 1/2 in. (13 mm) beyond the periphery of the opening on the top surface of the floor or sole plate and bottom surface of the ceiling or bottom top plate. At point contact, min 3/8 in. (10 mm) diam bead of fill material applied at penetrant/floor or sole plate interface and at penetrant/ceiling or top plate interface. Additional sealant shall be forced into interstices of through penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-5082

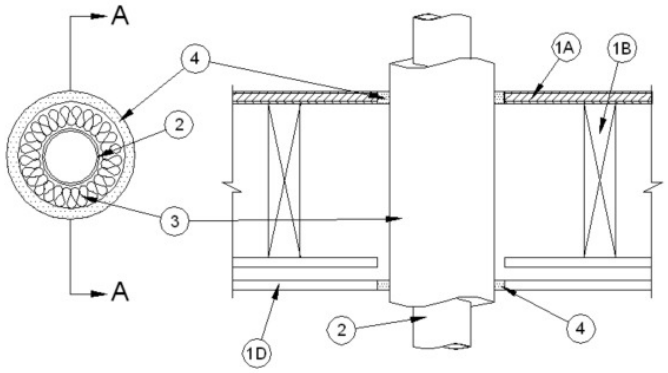
July 02, 2008

F Ratings - 1 and 2 Hr (See Item 1)

T Ratings - 1 and 1-1/2 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



SECTION A-A

1. **Floor-Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design No. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture* as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 6 in. (152 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies, nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped.

C. **Furring Channels —** (Not Shown) - In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of gypsum board (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between gypsum board and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board nailed to wood joists. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels. Max diam of ceiling opening is 6 in. (152 mm).

The F and T Ratings of the firestop system are dependent upon the hourly rating of the assembly in which the firestop system is installed as shown in the table below:

Rating of Assembly, Hr	F Rating, Hr	T Rating, Hr
2	2	1-1/2
1	1	1

1.1 **Chase Wall —** (Not Shown, Optional)- The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 8 in. (51 by 203 mm) lumber or double nom 2 by 4 in. (51 by 102 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 8 in. (51 by 203 mm) lumber or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted. Max diam of opening is 6 in. (152 mm).

C. **Top Plate —** The double top plate shall consist of two nom 2 by 8 in. (51 by 203 mm) lumber plates or two sets of nom 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted. Max diam of opening is 6 in. (152 mm).

D. **Gypsum Board* —** Thickness, type, number of layers and fasteners shall be as specified in individual Wall and Partition Design.

2. **Through Penetrants —** One metallic tube or pipe to be installed within the firestop system. Tube or pipe to be rigidly supported on both sides of floor-ceiling assembly. The following types and sizes of metallic tubes or pipes may be used:

A. **Copper Tubing —** Nom 3 in. (76 mm) diam (or smaller) Type L (or heavier) copper tubing.

B. **Copper Pipe —** Nom 3 in. (76 mm) diam (or smaller) Regular (or heavier) copper pipe.

C. **Steel Pipe —** Nom 3 in. (76 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

3. **Pipe Coverings —** One of the following types of pipe coverings shall be used:

A. **Pipe and Equipment Covering Materials* —** Nom 1 in. (25 mm) 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 lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated penetrating item and the periphery of the opening shall be a min of 3/8 in. (10 mm) to a max of 5/8 in. (16 mm).

See **Pipe and 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.

B. **Pipe Covering Materials* —** Nom 1 in. (25 mm) thick mineral fiber pipe insulation sized to the outside diam of pipe or tube. Pipe insulation secured with min 8 AWG steel wire space max 12 in. (305 mm) OC. The annular space between the insulated through penetrant and the periphery of the opening shall be a min of 3/8 in. (10 mm) to a max 5/8 in. (16 mm).

IIG MINWOOL L L C — High Temperature Pipe Insulation 1200, High Temperature Pipe Insulation BWT or High Temperature Pipe Insulation Thermaloc.

C. **Sheathing Material* —** Used in conjunction with Item 3B. Foil-scrim-kraft or all service jacket material shall be wrapped around the outer circumference of the pipe insulation (Item 3B) with the kraft side exposed. Longitudinal joints and transverse joints sealed with metal fasteners or butt tape.

See **Sheathing Materials (BVDV)** category in the Building Materials Directory for names of manufacturers. Any sheathing material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4. **Fill, Void or Cavity Materials* - Sealant —** Min 3/4 in. (19 mm) thickness of sealant applied within annular space, flush with top surface of floor. Min 5/8 in. (16 mm) thickness of sealant applied within the annular space, flush with bottom surface of gypsum board ceiling or lower top plate of chase wall assembly.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-7052

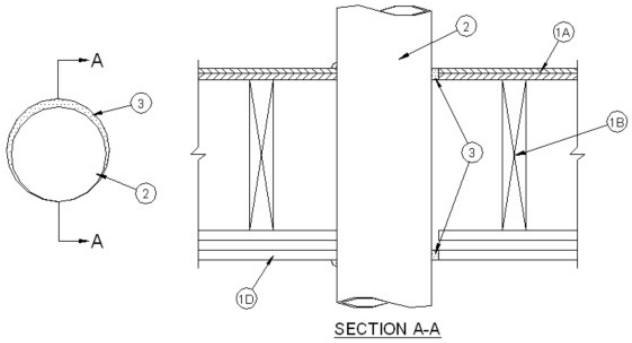
July 02, 2008

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 1 and 1-1/2 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



1. **Floor-Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design Nos. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 6-1/2 in. (165 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped.

C. **Furring Channels —** (Not Shown) — In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of gypsum board (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between gypsum board and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board secured to wood joists or furring channels as specified in the individual Floor-Ceiling Design. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels as specified in the individual Floor-Ceiling Design. Max diam of ceiling opening is 6-1/2 in. (165 mm).

The hourly F and T Ratings of the firestop system are dependent on the hourly fire rating of the floor-ceiling/chase wall assembly in which it is installed as shown in the following table:

Rating of Assembly, Hr	F Rating, Hr	T Rating, Hr
2	2	1-1/2
1	1	1

1.1 **Chase Wall —** (Not Shown, Optional) — The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 8 in. (51 by 203 mm) lumber or double nom 2 by 6 in. (51 by 152 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 8 in. (51 by 203 mm) lumber or parallel 2 by 6 in. (51 by 152 mm) lumber plates, tightly butted.

C. **Top Plate —** The double top plate shall consist of two nom 2 by 8 in. (51 by 203 mm) lumber plates or two sets of nom 2 by 6 in. (51 by 152 mm) lumber plates tightly butted. Max diam of opening is 6-1/2 in. (165 mm).

D. **Gypsum Board* —** Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.

2. **Through Penetrant —** Nom 6 in. (152 mm) diam (or smaller) by No. 30 MSG (or heavier) steel duct. One steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space within the firestop system shall be a min 0 in. (point contact) to a max 1/2 in. (13 mm). Steel duct to be rigidly supported on both sides of floor-ceiling assembly.

3. **Fill, Void or Cavity Material* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied flush with annulus on top surface of floor or sole plate. Min 1/2 in. (13 mm) thickness of fill material applied flush with annulus on bottom surface of ceiling or on bottom surface of lower top plate of chase wall assembly. At point contact, min 3/8 in. (10 mm) diam bead of fill material applied at penetrant/floor or sole plate interface and at penetrant/ceiling or top plate interface.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-E-1025

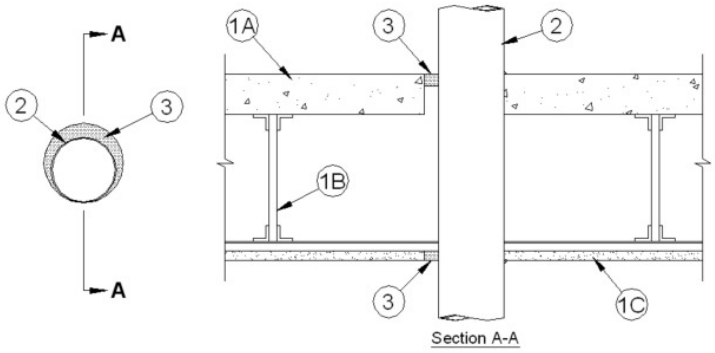
July 10, 2008

F Rating — 1 Hr

T Rating — 1 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



Section A-A

1. **Floor-Ceiling Assembly —** The 1 hr fire-rated concrete and steel joist Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual G500 Series Design in the UL Fire Resistance Directory, as summarized below:

A. **Concrete Floor —** Normal weight or lightweight (100-150 pcf or 1600-2400 kg/m^3) concrete over metal lath or steel deck as specified in the individual G500 Series Design. Max diam of floor opening is 5 in. (127 mm).

B. **Joists —** Steel joists or **Structural Steel Members*** as specified in the individual G500 Series Design.

C. **Gypsum Board* —** Min 5/8 in. (16 mm) thick, screw-attached to furring channels as specified in the individual G500 Series Design. Max diam of ceiling opening is 5 in. (127 mm).

2. **Through Penetrant —** One metallic pipe, conduit or tube to be installed either concentrically or eccentrically within the opening. Penetrant to be located approx midway between joists and rigidly supported on both sides of floor-ceiling assembly. The space between pipes, conduits or tubing and periphery of opening is dependent upon the type of penetrant within the firestop system. The following types and sizes of metallic pipe, conduit or tubing may be used:

A. **Steel Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe. The annular space within the firestop system shall be 0 in. (point contact) to max 1/2 in. (13 mm).

B. **Iron Pipe —** Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe. The annular space within the firestop system shall be 0 in. (point contact) to max 1/2 in. (13 mm).

C. **Conduit —** Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or rigid galv steel conduit. The annular space within the firestop system shall be 0 in. (point contact) to max 1/2 in. (13 mm).

D. **Copper Tubing —** Nom 3 in. (76 mm) diam (or smaller) Type L (or heavier) copper tubing. The annular space within the firestop system shall be 0 in. (point contact) to max 7/8 in. (22 mm).

E. **Copper Pipe —** Nom 3 in. (76 mm) diam (or smaller) Regular (or heavier) copper pipe. The annular space within the firestop system shall be 0 in. (point contact) to max 7/8 in. (22 mm).

3. **Fill, Void or Cavity Materials* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling. At point contact locations, min 1/4 in. (6 mm) diam bead of fill material applied at penetrant/concrete interface on top surface of floor and penetrant/gypsum board interface on bottom surface of ceiling.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-E-7009

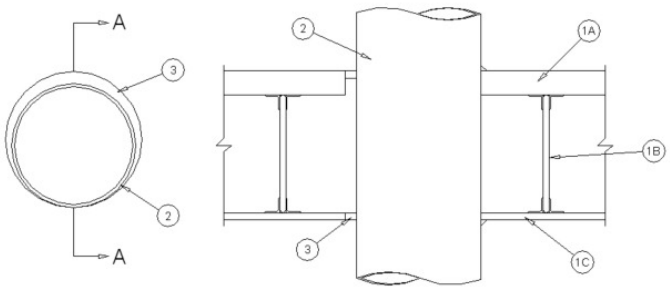
July 10, 2008

F Rating — 1 Hr

T Rating — 1 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



SECTION A-A

1. **Floor-Ceiling Assembly —** The 1 hr fire-rated concrete and steel joist Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual G500 Series Design in the UL Fire Resistance Directory, as summarized below:

A. **Concrete Floor —** Normal weight or lightweight (100-150 pcf or 1600-2400 kg/m^3) concrete over metal lath or steel deck as specified in the individual G500 Series Design. Max diam of floor opening is 6-1/2 in. (165 mm).

B. **Joists —** Steel joists or **Structural Steel members*** as specified in the individual G500 Series Design.

C. **Gypsum Board* —** Min 5/8 in. (16 mm) thick, screw-attached to furring channels as specified in the individual G500 Series Design. Max diam of ceiling opening is 6-1/2 in. (165 mm).

2. **Through Penetrant —** Nom 6 in. (152 mm) diam (or smaller) by No. 30 MSG (or heavier) steel duct. One steel duct to be installed either concentrically or eccentrically within the firestop system. The annular space within the firestop system shall be min 0 in. (point contact) to a max 1/2 in. (13 mm). Steel duct to be located approx midway between joists and rigidly supported on both sides of floor-ceiling assembly.

3. **Fill, Void or Cavity Materials* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling. At point contact locations, min 1/4 in. (6 mm) diam bead of fill material applied at penetrant/concrete interface on top surface of floor and penetrant/gypsum board interface on bottom surface of ceiling.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

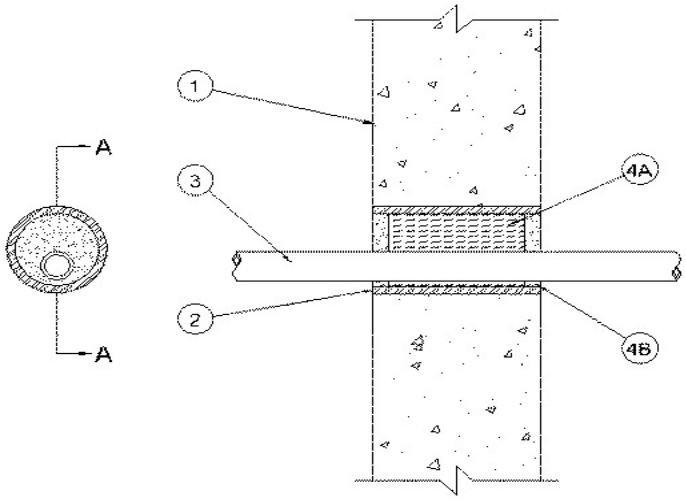
Through-penetration Firestop Systems

System No. W-J-1132

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** Min 5 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 3 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Sleeve —** Nom. 3 in diam (or smaller) Schedule 40 (or heavier) steel pipe cast or grouted into wall. Length of steel sleeve to be equal to thickness of wall.
3. **Through Penetrant —** One nom 1-1/4 in. OD (or smaller) flexible steel gas pipe, to be installed concentrically or eccentrically within the firestop system. The annular space shall be min ¼ in. to max 1-1/8 in. Piping to be rigidly supported on both sides of wall assembly.

OMEGA FLEX INC

4. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material —** Min 4 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Materials* - Sealant —** Min 1/2 in. thickness of fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

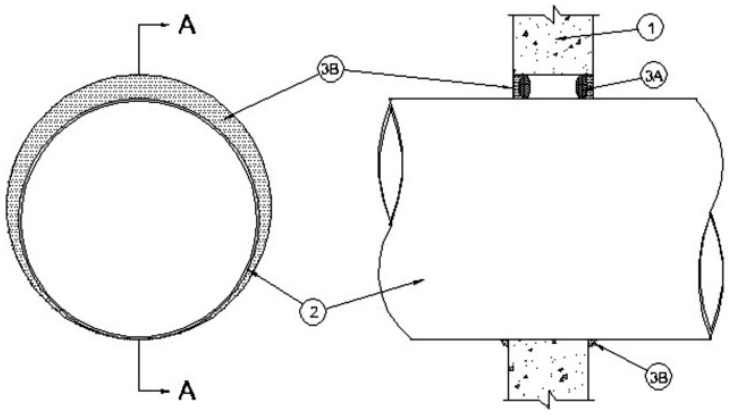
Through-penetration Firestop Systems

System No. W-J-1209

April 11, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** Min 6 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 26 in.

See **Concrete Block** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** 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 is dependent upon the type of fill material used as shown in Item 3B. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduit or tubing may be used:

A. **Steel Pipe —** Nom 24 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 24 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. diam (or smaller) steel electrical metallic tubing or nom 6 in. diam (or smaller) steel conduit.
B. **Iron Pipe —** Nom 24 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. diam (or smaller) steel electrical metallic tubing or nom 6 in. diam (or smaller) 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. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** Used to prevent the leakage of fill material during installation. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrant and concrete, a min 3/8 in. diam bead of fill material shall be applied at the concrete/through penetrant interface on both surfaces of wall. The annular space within the firestop system shall be min 0 in. (point contact) to max 2 in.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-1211

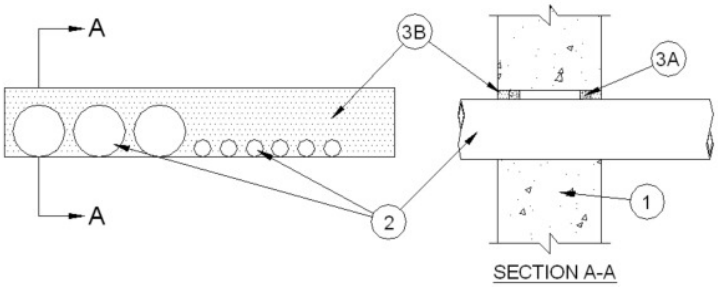
July 02, 2008

F Rating — 2 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



1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 90-1/2 sq in. (584 cm^2) with max dimensions of 22-5/8 in. (575 mm).

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One or more through penetrants to be installed within the opening. Only three through penetrants shall have a nom diam greater than 1 in. (25 mm). The space between the through penetrants shall be a nom 1/2 in. (13 mm). The annular space between through penetrants and periphery of opening shall be min 0 in. (point contact) to max 1/2 in. (13 mm) for through penetrants having a nom diam greater than 1 in. The annular space between through penetrants and periphery of opening shall be min 0 in. (point contact) to max 2-1/8 in. (54 mm) for through penetrants having a nom diam of 1 in. (25 mm) or less. Through penetrants to be rigidly supported on both sides of wall assembly. The following types and sizes of through penetrants may be used:

A. **Steel Pipe —** Nom 3 in. (76 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 3 in. (76 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 3 in. (76 mm) diam (or smaller) steel electrical metallic tubing or galv steel conduit.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** (Optional) — Used to prevent the leakage of fill material during installation. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrants and concrete, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the concrete/through penetrant interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

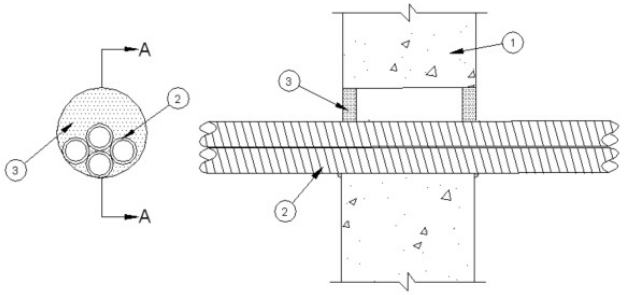
Through-penetration Firestop Systems

System No. W-J-1212

July 02, 2008

F Rating — 2 Hr

T Rating — 0 Hr



1. **Wall Assembly —** Min 6 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 6 in.

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One or more nom 1-1/2 in. diam (or smaller) flexible steel conduits to be installed within the opening. Max diam of through penetrant bundle shall be 4 in. The space between the through penetrants shall be a min of 0 in. (point contact) to a max of 1/4 in. The annular space between the through penetrants and periphery of opening shall be min 0 in. (point contact) to max 2 in. Conduit to be rigidly supported on both sides of wall assembly.

See **Flexible Metal Conduit (DXUZ)** category in the Electrical Construction Materials Directory for names of manufacturers.

3. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrant and concrete, a min 3/8 in. diam bead of fill material shall be applied at the concrete/through penetrant interface on both surfaces of wall. Additional sealant shall be forced into interstices of through penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

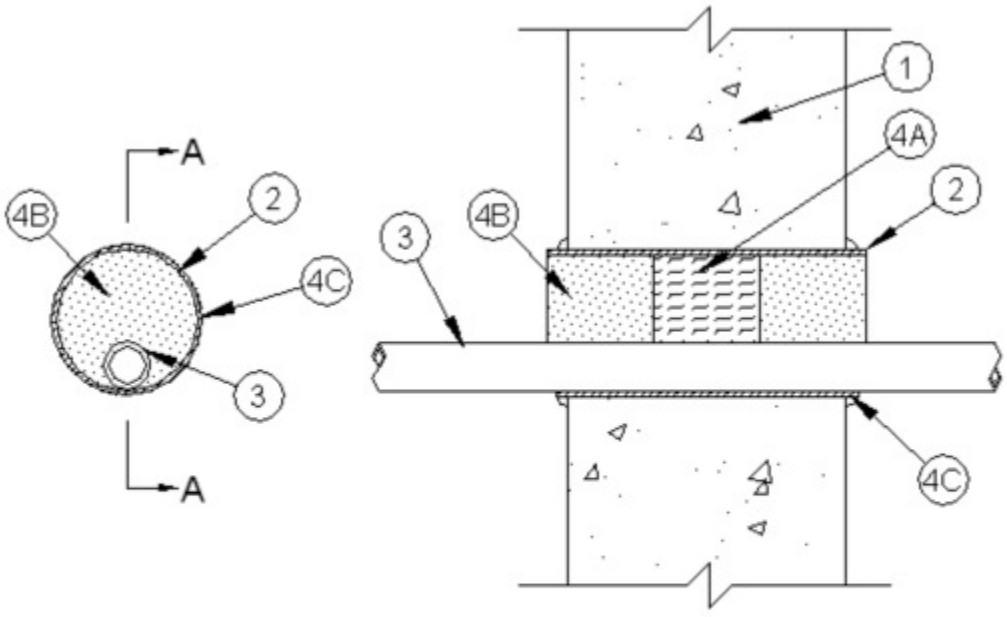
Through-penetration Firestop Systems

System No. W-J-1213

July 07, 2008

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

1. **Wall Assembly —** Min 6 in. (152 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 3 in. (76 mm).

See **Concrete Blocks** (CAZT) category in the UL Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** Cylindrical sleeve fabricated from nom 0.034 in. (0.86 mm) thick (or lighter) galv sheet steel and having a min 1/2 in. (13 mm) lap along the longitudinal seam. Length of steel sleeve to be equal to the thickness of the wall plus a min 1/2 in. (13 mm), such that when installed, the ends of the steel sleeve extend a min 1/4 in. (6 mm) to a max 1 in. (25 mm) beyond each surface of the wall. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the opening and releasing the coil to let it uncoil against the circular openings in the concrete.

3. **Through Penetrant —** One metallic pipe, tubing or conduit to be installed concentrically or eccentrically within opening. The annular space between the through penetrant and the periphery of opening shall be min 0 in. (0 mm, point contact) to max 2 in. (51 mm). Through penetrant to be rigidly supported on both sides of wall assembly. The following types and sizes of through penetrants may be used:

A. **Steel Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing —** Nom 3/4 in. (19 mm) diam (or smaller) Type L (or heavier) copper tube.

D. **Copper Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) Regular (or heavier) copper pipe.

E. **Conduit —** Nom 3/4 in. (19 mm) diam (or smaller) electric metallic tubing (EMT) or rigid steel conduit.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 2 in. (52 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Foam —** Min 2-1/4 in. (57 mm) thickness of fill material applied within the annulus on both sides of mineral wool insulation. Foam installed flush with both ends of steel sleeve.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

C. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) diam bead of fill material applied at the steel sleeve/concrete interface on both sides of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-2228

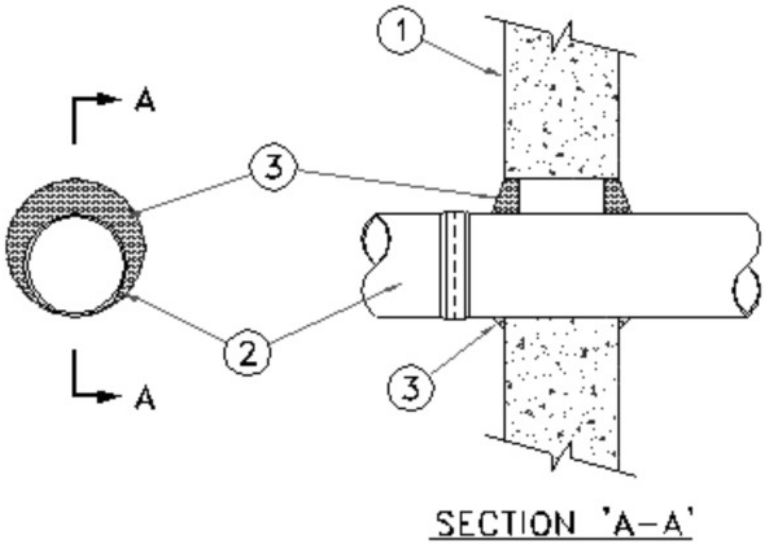
July 10, 2008

F Rating — 2 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



1. **Wall Assembly —** Min 6 in. (152 mm) thick normal weight or lightweight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 8 in. (203 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrating Products* - Glass Pipe —** Nom 6 in. (152 mm) diam (or smaller) glass pipe installed concentrically or eccentrically in opening, for use in closed (process or supply) or vented (drain, waste or vent) piping systems. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 1-3/8 in. (35 mm). Pipe to be rigidly supported on both sides of wall assembly. Pipe connections to be located min 3 in. (76 mm) from wall surfaces.

SCHOTT NORTH AMERICA INC

3. **Fill, Void, or Cavity Materials* - Sealant —** Min thickness of 5/8 in. (16 mm) applied within the annulus between pipe and periphery of the opening, flush with both surfaces of wall assembly. Additional sealant to be applied such that a min 1/4 in. (6 mm) crown is formed around the through penetrant on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-5141

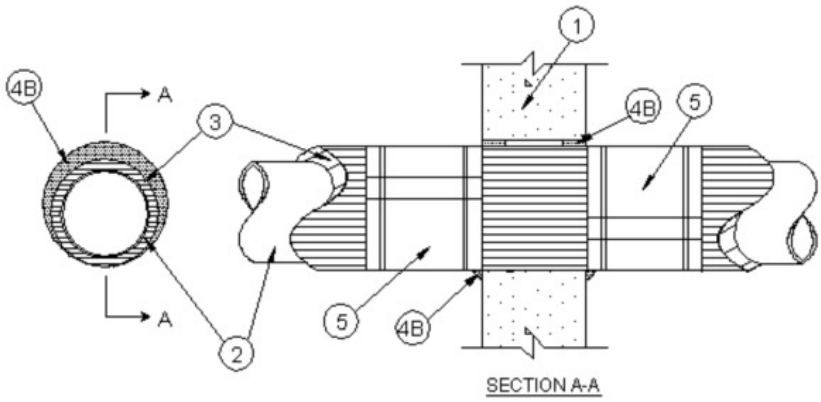
June 24, 2008

F Rating — 2 Hr

T Rating — 1 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 —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 18 in. (457 mm).

See **Concrete Block (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** One metallic pipe to be installed either concentrically or eccentrically within the firestop system. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes may be used:

A. **Steel Pipe —** Nom 6in. (152 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 6 in. (152 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

3. **Through Penetrating Product* — Cellular Glass Insulation —** Nom 3 in. (76 mm) thick cellular glass units sized to the outside diam of the through-penetrant and supplied in nom 24 in. (610 mm) long half sections or nom 18 in. (457 mm) long segments. Pipe insulation installed on pipe in accordance with the manufacturer's instructions. The annular space between insulated pipe and periphery of opening shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm).

PITTSBURGH CORNING CORP — FOAMGLAS

4. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** (Not Shown) — Used to prevent the leakage of fill material during installation is 2 hr fire-rated assemblies. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the insulated through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

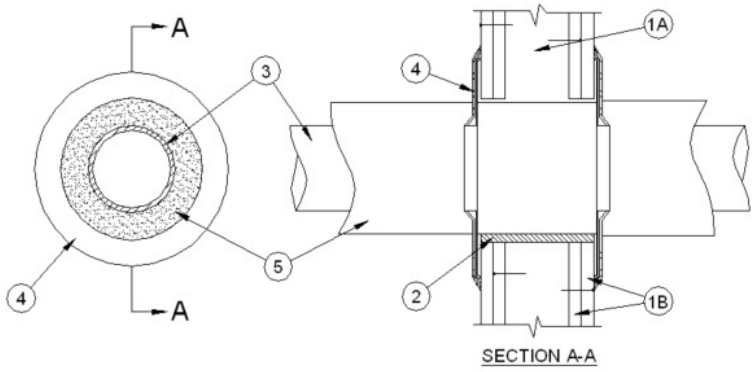
Through-penetration Firestop Systems

System No. W-J-5142

June 24, 2008

F Rating — 2 Hr

T Ratings — 1 and 1-1/2 Hr (See Item 2)



1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 18-5/16 in. (465 mm). The diam of the opening shall be min 1 in. (25 mm) to max 3 in. (76 mm) larger than the outside diam of pipe covering (see Item 3).

See **Concrete Blocks (CAZT)** in Volume 1 of the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One metallic pipe or tube installed concentrically or eccentrically within the firestop system. Pipe or tube to be rigidly supported on both sides of the wall. The following types and sizes of through penetrants may be used:

A. **Steel Pipe —** Nom 12 in. (305 mm) diam (or smaller) Schedule 30 (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 L (or heavier) copper tubing.
D. **Copper Pipe —** Nom 6 in. diam (152 mm) (or smaller) Regular (or heavier) copper pipe.

The T Rating is 1 hr when copper penetrant is used. The T Rating is 1-1/2 hr when steel or iron penetrant is used.

3. **Pipe Covering* —** One of the following types of pipe coverings shall be used:

A. **Pipe and Equipment Covering Materials* —** Nom 2 in. (51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m^3) 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 butt tape supplied with the product. The annular space between the insulated through penetrant and the periphery of the opening shall be min 0 in. (0 mm, point contact) to max 1-9/16 in. (40 mm).

See **Pipe and 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.

B. **Pipe and Equipment Covering Materials* —** Nom 2 in. (51 mm) thick unfaced mineral fiber pipe insulation having a min density of 3.5 pcf (56 kg/m^3) and sized to the outside diam of the pipe or tube. Pipe insulation secured with min 18 AWG steel wire spaced 12 in. (305 mm) OC. The annular space between insulated penetrating item and the periphery of the through opening shall be min 0 in. (0 mm, point contact) to max 1-9/16 in. (40 mm).
C. **Sheathing Material* —** Used in conjunction with Item 3B. Foil-scrim-kraft or all service jacket material shall be wrapped around the outer circumference of the pipe insulation (Item 3B) with the kraft side exposed. Longitudinal and transverse joints sealed with metal fasteners or butt tape.

See **Sheathing Materials* (BVDV)** category in the Building Materials Directory for names of manufacturers. Any sheathing material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material —** Nom 1 in. (25 mm) foam backer rod firmly packed into the opening as a permanent form to prevent leakage of fill material during installation. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material*- Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with each surface of wall. At point contact location, a min 3/8 in. (10 mm) bead of fill material shall be applied to the wall/pipe covering interface on both surfaces of the wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-5143

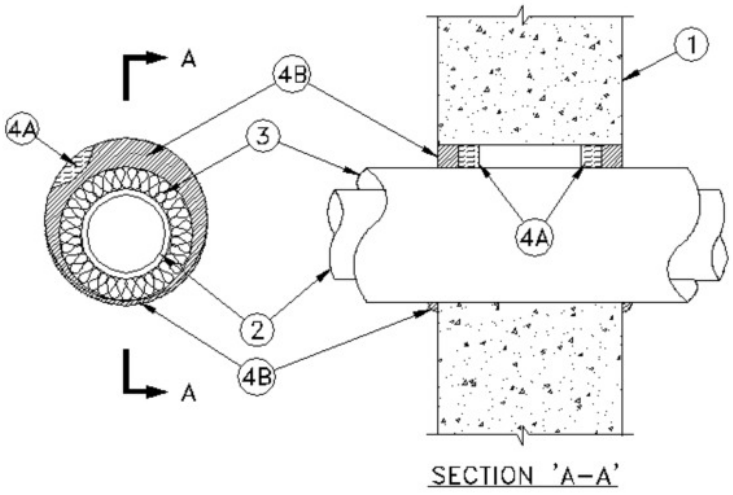
July 07, 2008

F Rating — 2 Hr

T Rating — 1/2 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 —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 15-1/4 in. (387 mm). The inside diam of the opening shall be min 1 in. (25 mm) larger than the outside diam of the pipe covering (see Item 3).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** 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 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 L (or heavier) copper tubing.
D. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

The max diam of the through penetrant is dependent upon the type of fill material used, as shown in Item 4B.

3. **Tube Insulation — Plastics+ —** Nom 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between the insulated through penetrant and the periphery of the opening shall be a min of 0 in. (0 mm, point contact) to a max 1 in. (25 mm).

See **Plastics+** (QMFZ2) category in the Plastics Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL94 Flammability Classification of 94-5VA may be used.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Forms used to prevent leakage of fill material during installation. Forms to be rigid sheet or polyurethane backer rod, cut to fit the contour of the penetrating item and friction fitted into opening on both sides of wall. Forms to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between insulated through penetrant and periphery of opening, a min 3/8 in. (10 mm) diam bead of fill material shall be applied on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+Bearing the UL Recognized Component Mark

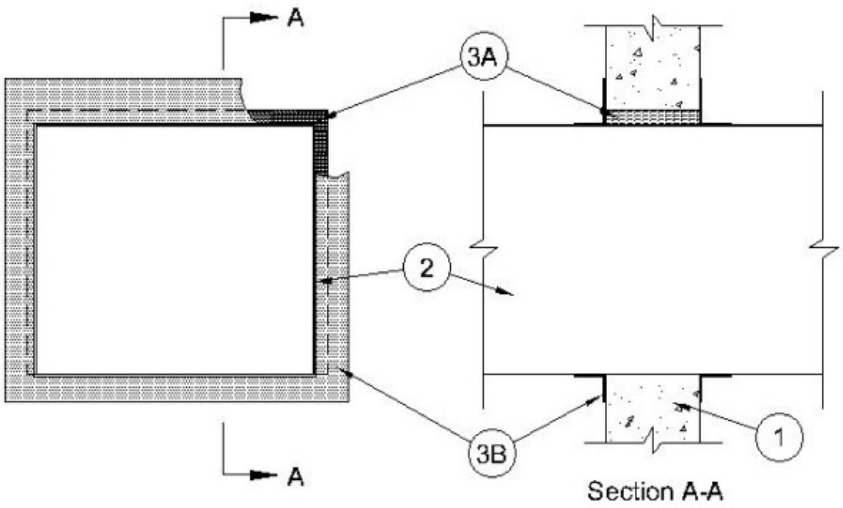
Through-penetration Firestop Systems

System No. W-J-7090

March 21, 2008

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

1. **Wall Assembly —** Min 6 in.(152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 576 sq in.(0.37 m^2) with a max dimension of 24 in (610mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Max 23 by 23 in. No. 24 gauge (or heavier) steel duct to be installed either concentrically or eccentrically within the opening. The annular space shall be min 0 in. (point contact) to max 1 in. (25 mm). Duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 6 in.(152 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form, flush with both surfaces of wall.

B. **Fill Void or Cavity Material*— Caulk —** Min 3/16 in. (5 mm) wet thickness of fill material sprayed or brushed to completely cover mineral wool packing material on each side of the wall and to overlap a min of 2 in. onto wall and duct surfaces.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-7105

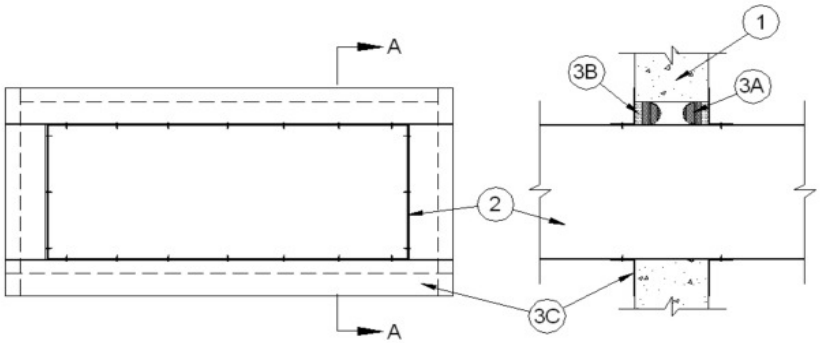
July 10, 2008

F Rating — 2 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



SECTION A-A

1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max size of opening is 1470 sq in. (0.95 m^2) with a max dimension of 70 in. (1.78 m).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Max 67 by 18 in. (1702 by 457 mm) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The space between the steel duct and periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. (89 mm). Steel duct to be rigidly supported on both sides of the wall assembly.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Polyethylene backer rod, mineral wool batt insulation, fiberglass batt insulation or foam plastic sheets friction fitted into annular space. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between steel duct and concrete, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the concrete/steel duct interface on both surfaces of wall assembly.

C. **Steel Retaining Angles —** Min No. 22 gauge galv steel angles sized to lap steel duct a min of 2 in. (51 mm) and lap wall surfaces a min 1-1/2 in. (38 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max 6 in. (152 mm) OC.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-7106

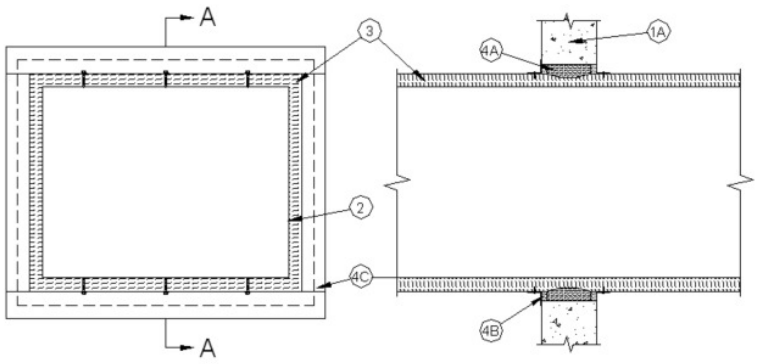
July 10, 2008

F Rating — 2 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



SECTION A-A

1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max size of opening is 1050 sq in. (0.68 m^2) with a max dimension of 35 in. (889 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Steel Duct —** Max 30 by 24 in. (762 by 610 mm) No. 24 gauge (or heavier) steel duct to be installed eccentrically within the opening. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Batts and Blankets* —** Max 1-1/2 in. (38 mm) thick glass fiber batt or blanket (min 3/4 pcf or 12 kg/m^3) jacketed on the outside with a foil-scrim-kraft facing. Longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the batt or blanket shall be compressed 50% such that the annular space within the firestop system shall be min 1 in. (25 mm) to max 2-3/4 in. (70 mm).

See **Batts and Blankets** - (BKNV) category in the Building Materials Directory for names of manufacturers. Any batt or blanket meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index 50 or less may be used.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 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. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 816

C. **Steel Retaining Angles —** Min No. 22 gauge galv steel angles sized to lap steel duct a min of 2 in. (51 mm) and lap wall surfaces a min 1-1/2 in. (38 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max 6 in. (152 mm) OC.

*Bearing the UL Classification Mark

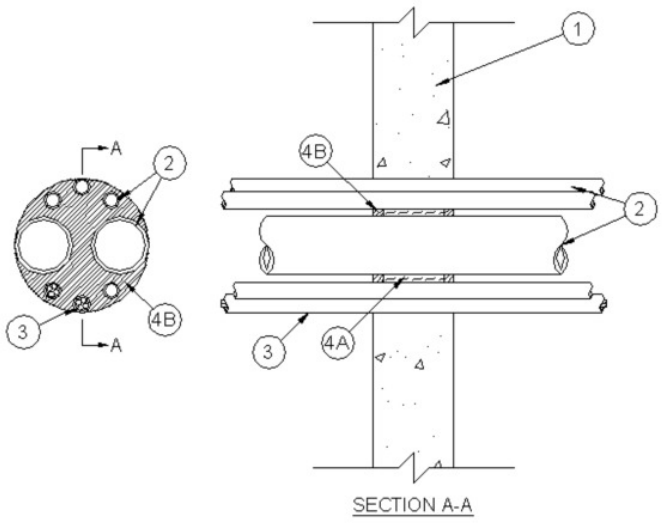
Through-penetration Firestop Systems

System No. W-J-8046

June 24, 2008

F Rating— 2 Hr

T Ratings — 0 and 1 Hr (See Items 2 and 3)



1. **Wall Assembly —** Min 6 in. (152 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 10 in. (254 mm).

See **Concrete Blocks (CAZT)** in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** A max of four 1 in. (25 mm) diam and three 4 in. (102 mm) diam (or smaller) metallic pipes, conduits or tubing to be installed within the firestop system. The annular space between the pipes, conduits or tubing and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Separation between pipes, conduits or tubing shall be min 1/2 in. (13 mm) to max 1-5/8 in. (156 mm). Pipes, conduits or tubing to be rigidly supported on both sides of the wall assembly. The following types and sizes of pipes, conduits and tubes may be used:

A. **Steel Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. (102 mm) diam (or smaller) rigid steel conduit or steel electrical metallic tubing (EMT).
D. **Copper Pipe —** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
E. **Copper Tube —** Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tube.
F. **Copper Pipe —** Nom 1 in. (25 mm) diam Type K copper pipe.

When any metallic penetrant is used the T Rating is 0 hr.

3. **Cables —** Nom 3 in. (76 mm) diam (or smaller) tight bundle of cables. Cable bundle spaced min 1 in. (25 mm) from other penetrants. Annular space between cable bundle and periphery of opening to be min 0

in. (point contact) to max 1-1/2 in. (38 mm). Cable bundle to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 400 pair, 24 AWG telephone communication cable with PVC insulation and jacket.
B. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
C. Max 7/C No. 12 AWG copper conductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.
D. Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
E. Type RG 59/U coaxial cable with polyethylene (PE) insulation and PVC jacket.

When cable bundle is used without any metallic penetrant the T Rating is 1 hr.

4. **Firestop System —** The firestop system shall consist of the following items:

A. **Packing Material —** Foam plastic backer material or backer rod or mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material. When annular space between penetrants and/or between penetrants and edge of opening is 3/4 in. (19 mm) or less packing material is optional.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact locations, min 1/2 in (13 mm) diam bead of fill material applied at through penetrant/concrete interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

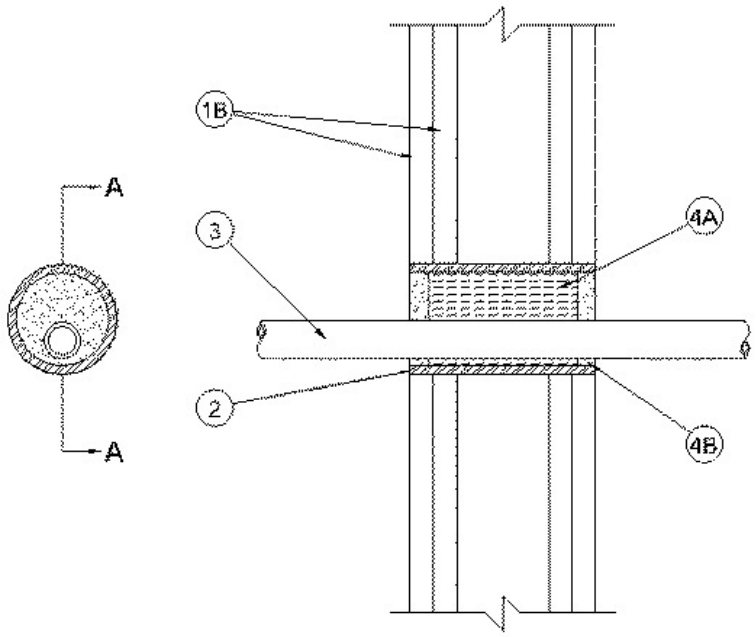
Through-penetration Firestop Systems

System No. W-L-1307

November 06, 2008

F Rating — 1 and 2 Hr

T Rating — 0 Hr



SECTION A-A

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 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.

B. **Gypsum Board* —** One or two layers of nom 5/8 in. thick gypsum board as specified in the individual Wall and Partition Design. Max diam of opening is 3 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. 3 in diam (or smaller) Schedule 40 (or heavier) steel pipe sleeve friction fit in nom 3 in. diam opening. Length of steel sleeve to be equal to thickness of wall.

3. **Through Penetrant —** One nom 1-1/4 in. diam (or smaller) flexible steel gas pipe, to be installed concentrically or eccentrically within the firestop system. The annular space shall be min ¼ in. to max 1-1/8 in. Piping to be rigidly supported on both sides of wall assembly.

OMEGA FLEX INC

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 4 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill Void or Cavity Materials* - Sealant —** Min ½ in. thickness of fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

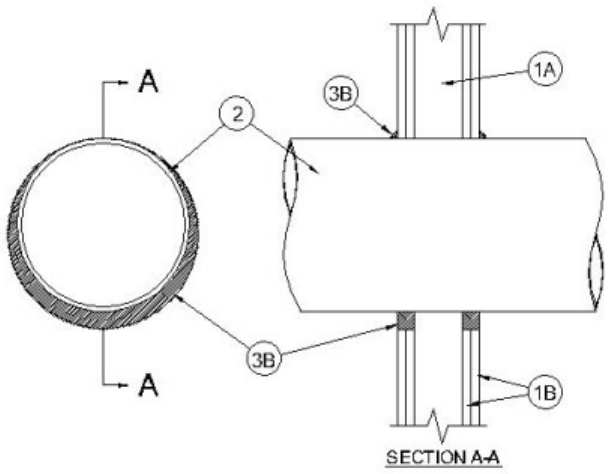
Through-penetration Firestop Systems

System No. W-L-1409

March 21, 2008

F Ratings — 1 and 2 Hr (See I Item 1)

T 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 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Wall framing consists of steel channel studs Steel studs to be min 3-1/2 in.(89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** One or two layers of nom 5/8 in.(16 mm) thick gypsum wallboard as specified in the individual Wall and Partition Design. Max diam of opening is 14 in. (356 mm).

2. **Through Penetrants —** One metallic pipe, conduit or tubing to be installed concentrically or eccentrically 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 4in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe. A nom annular space of 0 (point contact) to 1-1/4 in. (32 mm) is required within the firestop system.

B. **Iron Pipe —** Nom 4 in.(102 mm) diam (or smaller) Schedule 10 (or heavier) cast iron pipe. A nom annular space of 0 (point contact) to 1-1/4 in.(32 mm) is required within the firestop system.

C. **Conduit —** Nom 4 in. (102 mm) (or smaller) steel conduit or nom 4 in. (102 mm) diam (or smaller) steel electrical metallic conduit A nom annular space of 0 (point contact) to 1 in. is required within the firestop system.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material — (Optional, Not Shown) —** In 2 hr wall assemblies, foam backer rod firmly packed into opening as a permanent form. Packing material to be recessed from each surface of the wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* - Caulk —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus on both surfaces of the wall assembly. A min 1/2 in.(13 mm) diam bead of caulk shall be applied to the pipe/gypsum board interface at the point contact location on both sides of wall.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-1433

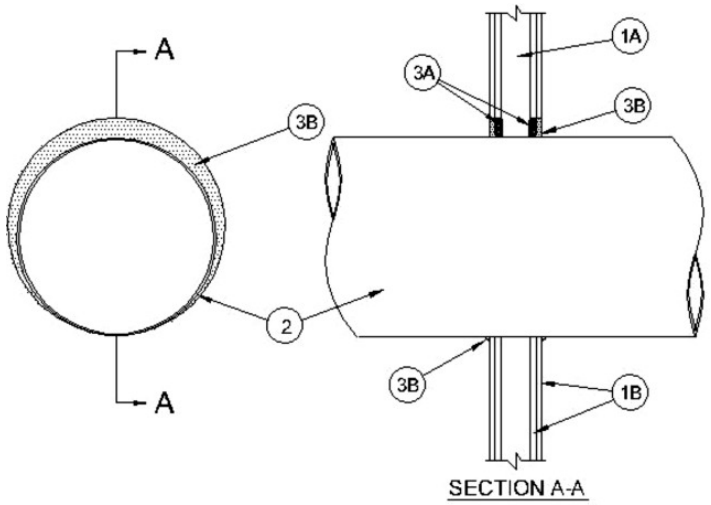
April 11, 2008

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



SECTION A-A

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 described in the individual U300, U400 or V400 Series Wall and Partition Design 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) 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. (102 to 152 mm) wider and 4 to 6 in. (102 to 152 mm) higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. (51 to 76 mm) clearance is present between the penetrating item and the framing in all four sides.

B. **Gypsum Board* —** 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, or U400 or V400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 26-3/8 in. (670 mm) for steel stud walls. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls.

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 Penetrant —** 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 is dependent upon the type of fill material used as shown in Item 3B. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduit or tubing may be used:

A. **Steel Pipe —** Nom 24 in. (610 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 24 in. (610 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or nom 6 in. diam (or smaller) steel conduit.

D. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

E. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** Use to prevent the leakage of fill material during installation in 2 hr fire-rated assemblies. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrant and gypsum board, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall. The annular space within the firestop system shall be min 0 in. (point contact) to max 2 in. (51 mm).

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-1435

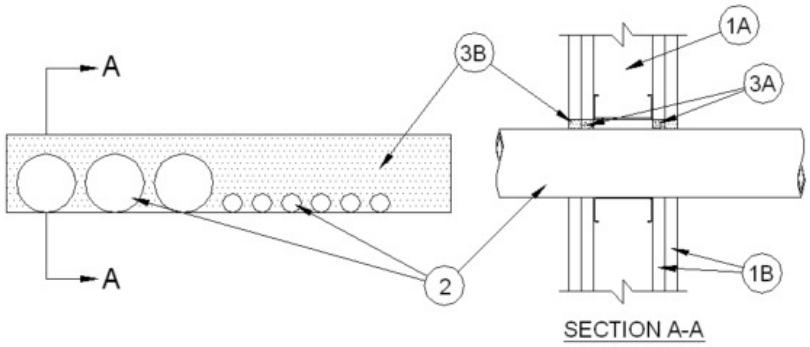
July 02, 2008

F Rating — 1 and 2 Hr (See Item 1B)

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



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 described in the individual U300, U400 or V400 Series Wall and Partition Design 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC. Additional framing members to be installed in stud cavity containing the through penetrants to form a rectangular box around the through penetrants.

B. **Gypsum Board* —** 8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. 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 area of opening is 90-1/2 sq in. (584 cm^2) with max dimensions of 22-5/8 in. (575 mm) for steel stud walls. Max area of opening is 58 sq in. (374 cm^2) with max dimensions of 14-1/2 in. (368 mm) for wood stud walls.

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 or more through penetrants to be installed within the opening. Only three through penetrants shall have a nom diam greater than 1 in. (25 mm). The space between the through penetrants shall be a nom 1/2 in. (13 mm). The annular space between through penetrants and periphery of opening shall be min 0 in. (point contact) to max 1/2 in. (13 mm) for through penetrants having a nom diam greater than 1 in. (25 mm). The annular space between through penetrants and periphery of opening shall

be min 0 in. (point contact) to max 2-7/8 in. (73 mm) for through penetrants having a nom diam 1 in. (25 mm) or less. The through penetrants to be rigidly supported on both sides of wall assembly. The following types and sizes of through penetrants may be used:

A. **Steel Pipe —** Nom 3 in. (76 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 3 in. (76 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 3 in. (76 mm) diam (or smaller) steel electrical metallic tubing or galv steel conduit.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** (Optional) Used to prevent the leakage of fill material during installation in 2 hr fire-rated assemblies. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrants and gypsum board, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

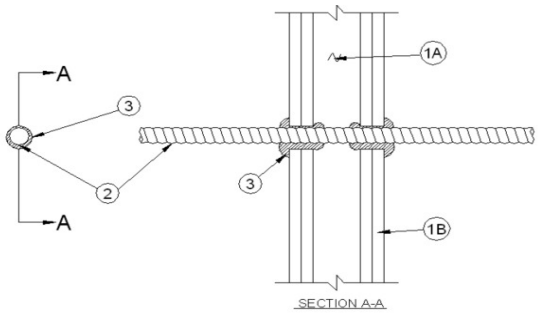
Through-penetration Firestop Systems

System No. W-L-1436

July 07, 2008

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 1/2 Hr



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 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 in.) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** Min 5/8 in. (16 mm) thick. 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 1-3/8 in. (35 mm).

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-Penetrating Product* —** Nom 1/2 in. (13 mm) diam (or smaller) aluminum or steel Flexible Metal Conduit+ installed in accordance with the National Electrical Code (NFPA No. 70). The annular space shall be min 1/8 in. (3.2 mm) to a max 1/4 in. (6 m). Conduit to be rigidly supported on both sides of wall assembly.

INTERNATIONAL METAL HOSE CO

3. **Fill, Void or Cavity Material* — Sealant —** Fill material applied to completely fill the annular space between the through-penetrating product and the periphery of the opening to max extent possible. In 2 hr fire-rated assemblies, additional fill material to be installed such that a min 3/8 in. (10 mm) crown is formed around the penetrating item and lapping 1/2 in. (13 mm) beyond the periphery of the opening. In 1 hr fire-rated assemblies, additional fill material to be installed such that a min 1 in. (25 mm) crown is formed around the penetrating item and lapping a min 1/2 in. (13 mm) beyond the periphery of the opening.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-1437

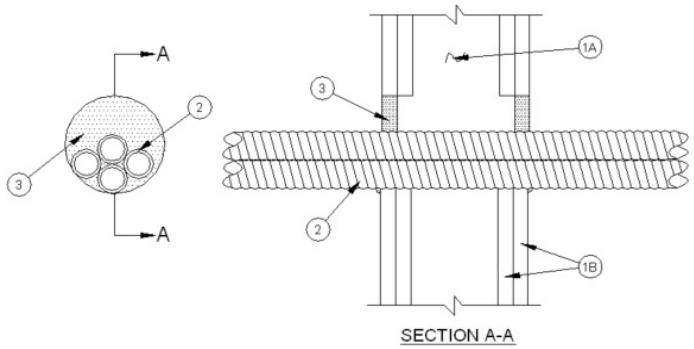
July 07, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr

L Rating at Ambient — 1.7 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



SECTION A-A

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 described in the individual U300, U400 or V400 Series Wall and Partition Design 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (406 mm) OC.

B. **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 U300, U400 or V400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 6 in. (152 mm).

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 or more nom 1-1/2 in. (38 mm) diam (or smaller) flexible steel conduits bundled together and installed within the opening. Max diam of through penetrant bundle shall be 4 in. (102 mm). The space between the through penetrants shall be a min of 0 in. (point contact) to a max of 2 in. (51 mm). The annular space between the through penetrants and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm). Conduit to be rigidly supported on both sides of wall assembly.

See **Flexible Metal Conduit** (DXUZ) category in the Electrical Construction Materials Directory for names of manufacturers.

3. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrants and gypsum board, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall. Additional sealant shall be forced into interstices of through penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

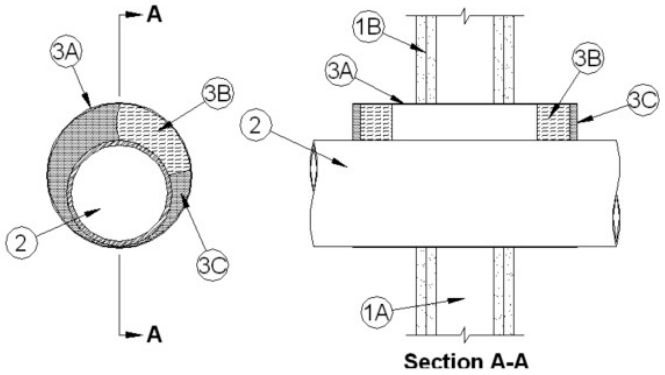
Through-penetration Firestop Systems

System No. W-L-1438

July 07, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



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 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 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC. Additional framing members to be used to completely frame the opening when the opening size exceeds the stud spacing.

B. **Gypsum Board* —** Min 5/8 in. (16 mm) thick. Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max diam of opening is 26-3/8 in. (670 mm). Max diam of opening is 14-1/2 in. (368 mm) when wood studs are used.

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, conduit or tube installed concentrically or eccentrically within the firestop system. Annular space to be min 0 in. (point contact) to max 2 in. (51 mm). 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 24 in. (610 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 24 in. (610 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit —** Nom 6 in. (152 mm) diam (or smaller) rigid steel conduit, nom 4 in. (102 mm) diam (or smaller) electrical metallic tubing (EMT) or nom 1 in. (25 mm) diam (or smaller) flexible steel conduit.

D. **Copper Pipe or Tubing —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe or Type L (or heavier) copper tube.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Metallic Sleeve —** A steel sleeve consisting of Schedule 5 (or heavier) steel pipe, rigid steel conduit or EMT friction-fitted into wall assembly flush with or extending a max 4 in. (102 mm) beyond each surface of the wall assembly.

A1. **Metallic Sleeve —** As an alternate to Item 3A, Cylindrical sleeve fabricated from min 0.018 in. (0.46 mm) thick (28 gauge) galv sheet steel and having a min 1 in. (25 mm) lap along the longitudinal seam. Sheet steel coiled to a diam less than circular cutouts in wall assembly, inserted through both sides of wall and allowed to uncoil against the circular cutouts in the wall assembly. Sleeve to be installed flush with or extending max 4 in. (102 mm) beyond each surface of the wall assembly.

B. **Packing Material —** Min 2 in. (51 mm) thickness of nom 4 pcf (64 kg/m^3) mineral wool batt insulation tightly-packed into ends of steel sleeve and recessed as required to accommodate required thickness of fill material (Item 3C).

C. **Fill, Void or Cavity Materials* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annular space flush with edges of steel sleeve on both sides of the wall assembly. Nom 3/8 in. (10 mm) diam bead of fill material to be applied at the point contact location between the metallic penetrant and the steel sleeve. Additional nom 3/8 in. (10 mm) diam bead of fill material applied at the steel sleeve/gypsum board interface when sleeve projects beyond the surface of the wall assembly.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

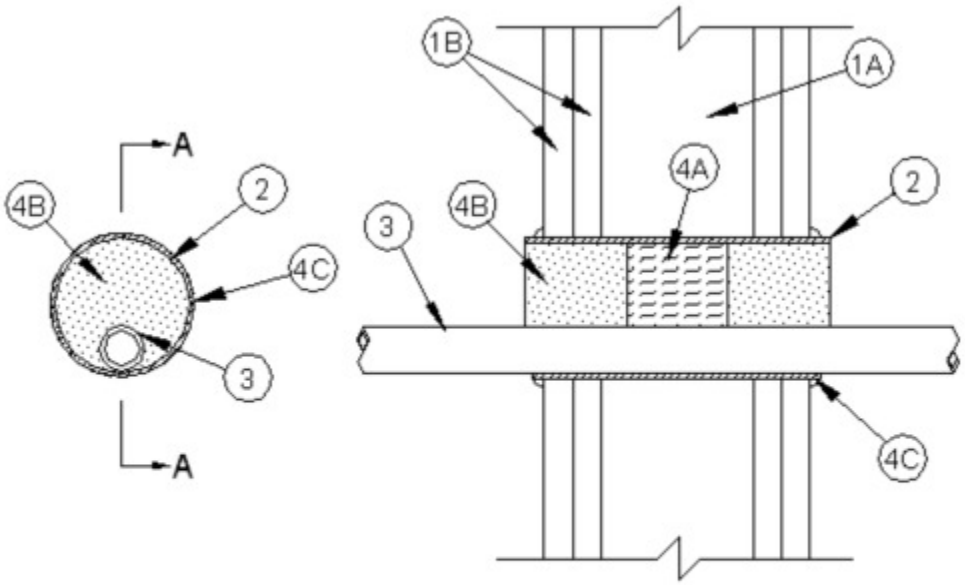
Through-penetration Firestop Systems

System No. W-L-1439

July 07, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



Section A-A

1. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel 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 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.

B. **Gypsum Board* —** Min 5/8 in. (16 mm) thick gypsum board. Max diam of opening shall be 3 in. (76 mm).

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. **Metallic Sleeve —** Cylindrical sleeve fabricated from nom 0.034 in. (0.86 mm) thick (or lighter) galv sheet steel and having a min 1/2 in. (13 mm) lap along the longitudinal seam. In 2 hr wall assemblies, length of steel sleeve to be equal to the thickness of the wall plus a min 1/2 in. (13 mm), such that when installed, the ends of the steel sleeve extend a min 1/4 in. (6 mm) to a max 1 in. (25 mm) beyond each surface of the wall. In 1 hr wall assemblies, length of steel sleeve to be equal to the thickness of the wall plus a nom 2 in. (51 mm), such that when installed, the ends of the steel sleeve extend a nom 1 in. (22 mm) beyond each surface of the wall. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the opening and releasing the coil to let it uncoil against the circular cutouts in the gypsum board layers.

3. **Through Penetrant —** One metallic pipe, tubing or conduit to be installed concentrically or eccentrically within opening. The annular space between the through penetrant and the periphery of opening shall be min 0 in. (0 mm, point contact) to max 2 in. (51 mm). Through penetrant to be rigidly supported on both sides of wall assembly. The following types and sizes of through penetrants may be used:

A. **Steel Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing —** Nom 3/4 in. (19 mm) diam (or smaller) Type L (or heavier) copper tube.

D. **Copper Pipe —** Nom 3/4 in. (19 mm) diam (or smaller) Regular (or heavier) copper pipe.

E. **Conduit —** Nom 3/4 in. (19 mm) diam (or smaller) electric metallic tubing (EMT) or rigid steel conduit.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 2-1/8 in. (54 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Foam —** Min 2-1/4 in. (57 mm) thickness of fill material applied within the annulus on both sides of mineral wool insulation. Foam installed flush with both ends of steel sleeve.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

C. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) diam bead of fill material applied at the steel sleeve/gypsum board interface on both sides of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-2536

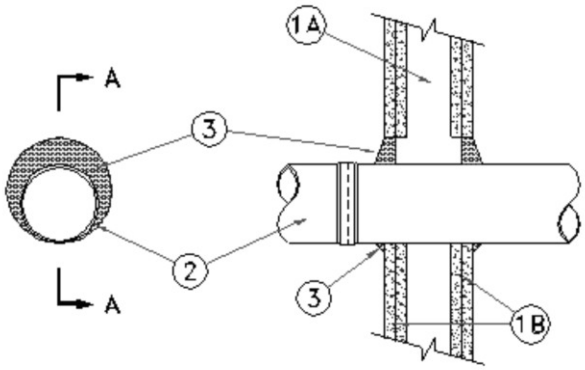
July 10, 2008

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



SECTION 'A–A'

1. **Wall Assembly —** The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the material 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** Nom 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board thickness, type, number of layers, fastener types and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 8 in. (203 mm).

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 Penetrating Products* - Glass Pipe —** Nom 6 in. (152 mm) diam (or smaller) glass pipe installed concentrically or eccentrically in opening, for use in closed (process or supply) or vented (drain, waste or vent) piping systems. The annular space between pipe and periphery of opening shall be min 0 in. to max 1-3/8 in. (35 mm). Pipe to be rigidly supported on both sides of wall assembly. Pipe connections to be located min 3 in. (76 mm) from wall surfaces.

SCHOTT NORTH AMERICA INC

3. **Fill, Void, or Cavity Materials* - Sealant —** Min thickness of 5/8 in. (16 mm) applied within the annulus between pipe and periphery of the opening, flush with both surfaces of wall assembly. Additional sealant to be applied such that a min 1/4 in. (6 mm) crown is formed around the through penetrant on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-5280

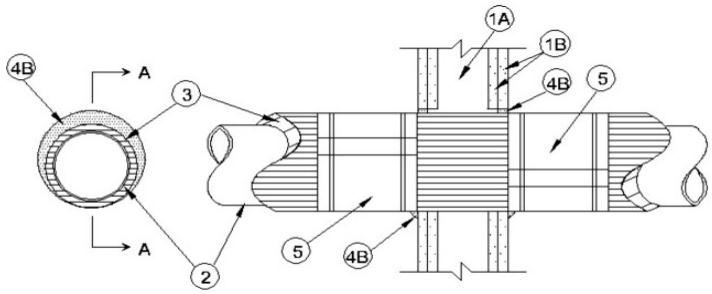
April 11, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 0, 3/4, 1and 1-1/2 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



SECTION A-A

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 described in the individual U300, U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Wall framing may be 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.

B. **Gypsum Board* —** 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The ypsum wallboard 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 18 in. (457 mm) for steel stud walls. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls.

The hourly F and T Ratings of the firestop system are dependent on the hourly fire rating of the wall assembly in which it is installed as shown in the table below:

Rating of Wall Hr	Penetrant Diam/Type	F Rating Hr	T Rating Hr	Sealant
2	6 in. (152 mm) copper, steel or iron	2	1	Boss 816
1	6 in. (152 mm) copper, steel or iron	1	0	Boss 816

2. **Through Penetrant —** One metallic pipe to be installed either concentrically or eccentrically within the firestop system. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes 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. **Copper Tubing —** Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

3. **Through Penetrating Product* — Cellular Glass Insulation —** Nom 3 in. (76 mm) thick cellular glass units sized to the outside diam of the through-penetrant and supplied in nom 24 in. (610 mm) long half sections or nom 18 in. (457 mm) long segments. Pipe insulation installed on pipe in accordance with the manufacturer's instructions. The annular space between insulated pipes and periphery of opening shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm).

PITTSBURGH CORNING CORP — FOAMGLAS

4. **Firestop System —** The firestop system shall consist of the following:

A. **Forms —** (Not Shown) — Used to prevent the leakage of fill material during installation in 2 hr fire-rated assemblies. Forms to be rigid sheet material or polyurethane backer rod, cut to fit the contour of the insulated through penetrant and friction fitted into the opening on both sides of wall. Forms to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus flush with both surfaces of wall. After installation of the metal jacket (Item 5), min 3/8 in. (10 mm) diam bead of fill material shall be applied to the metal jacketing/fill material interface on both sides of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-5284

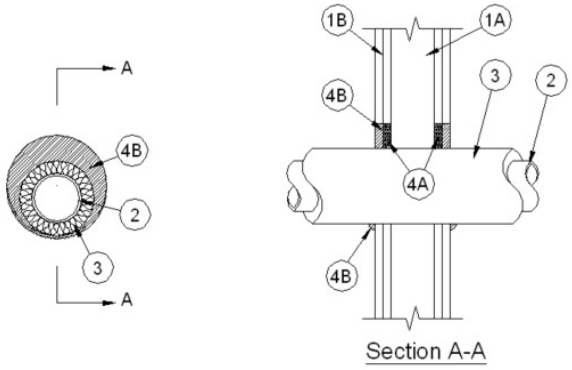
June 24, 2008

F Rating — 1 and 2 Hr (See Item 1B)

T Rating — 1/2 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 board/stud wall assembly shall be constructed of the materials and in the manner described 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 —** 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 with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** Min 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 U300, U400 or V400 Series Designs in the UL Fire Resistance Directory. Max diam of opening in wood stud walls is 14-1/2 in. (368 mm) Max diam of opening in steel stud walls is 18-3/4 in. (476 mm).

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 installed either concentrically or eccentrically 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 L (or heavier) copper tubing.

D. **Copper Pipe —** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

The max diam of the through penetrant is dependent upon the type of fill material used, as shown in Item 4B.

3. **Tube Insulation — - Plastics+ —** Nom 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The annular space between the insulated through penetrant and the periphery of the opening shall be a min of 0 in. (0 mm, point contact) to a max 1 in. (25 mm).

See **Plastics+ (QMFZ2)** category in the Plastics Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL94 Flammability Classification of 94-5VA may be used.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Forms used to prevent leakage of fill material during installation in 2 hr fire-rated wall assemblies. Forms to be rigid sheet or polyurethane backer rod, cut to fit the contour of the penetrating item and friction fitted into opening on both sides of wall. Forms to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Sealant —** Min 5/8 in. (19 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between insulated through penetrant and gypsum board, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/insulated through penetrant interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+Bearing the UL Recognized Component Mark

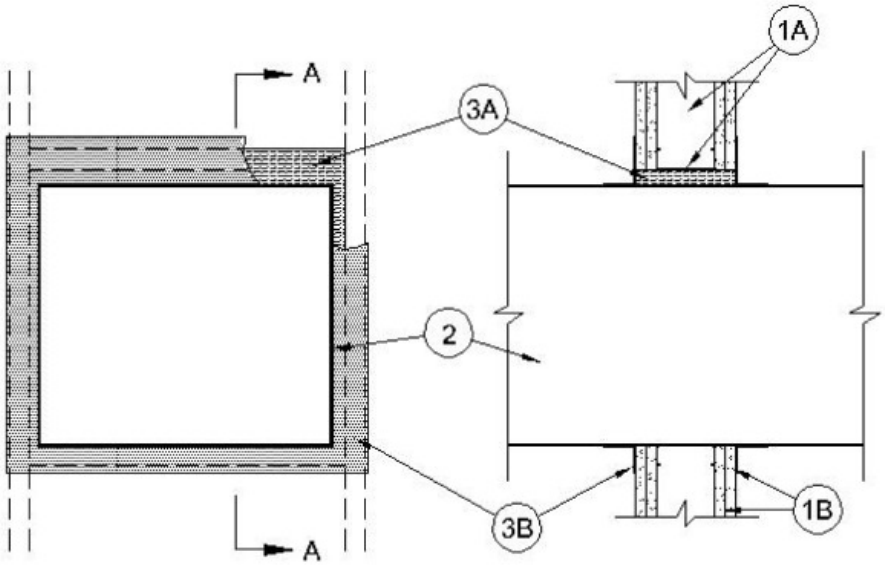
Through-penetration Firestop Systems

System No. W-L-7150

March 21, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



Section A-A

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 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 steel channel studs. 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 (1219 mm) wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual U400 or V400 Wall and Partition Design. Max area of opening is 576 sq in.(0.37 m^2) with a max dimension of 24 in. (610 mm).

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 Duct —** Max 23 by 23 in. (584 by 584 mm) No. 24 gauge (or heavier) steel duct to be installed either concentrically or eccentrically within the opening. The annular space shall be min 0 in. (point contact) to max 1 in. (25 mm) Duct to be rigidly supported on both sides of wall assembly.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 6 in. thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form, flush with both surfaces of wall.

B. **Fill Void or Cavity Material*— Caulk —** Min 3/16 in.(5 mm) wet thickness of fill material sprayed or brushed to completely cover mineral wool packing material on each side of the wall and to overlap a min of 2 in. (51 mm) onto gypsum board and duct surfaces.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-7183

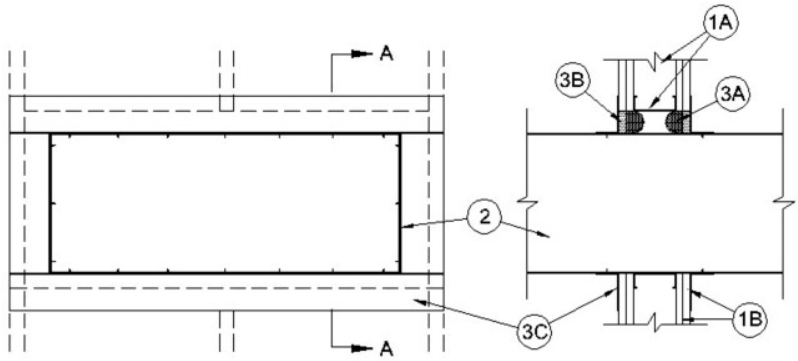
April 11, 2008

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



SECTION A-A

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 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 steel channel studs. Steel studs to be min 3-5/8 in. (92 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 (1.2 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual U400 or V400 Wall and Partition Design. Max size of opening is 1470 sq in. (9484 mm) with a max dimension of 70 in. (1778).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall in which it is installed.

2. **Steel Duct —** Nom 67 in. (1702 mm) by 18 in. (457 mm) (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The space between the steel duct and periphery of opening shall be min 0 in. (point contact) to max 3-1/2 in. (89 mm). Steel duct to be rigidly supported on both sides of the wall assembly.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Polyethylene backer rod, mineral wool batt insulation, fiberglass batt insulation or foam plastic sheets friction fitted into annular space for 2 hr fire-rated wall assemblies only. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between

steel duct and gypsum wallboard, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/steel duct interface on both surfaces of wall assembly.

ACCUMETRIC L L C — Boss 816

C. **Steel Retaining Angles —** Min No. 22 gauge galv steel angles sized to lap steel duct a min of 2 in. (51 mm) and lap wall surfaces a min 1-1/2 in. (38 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max 6 in. (152 mm) OC.

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-7184

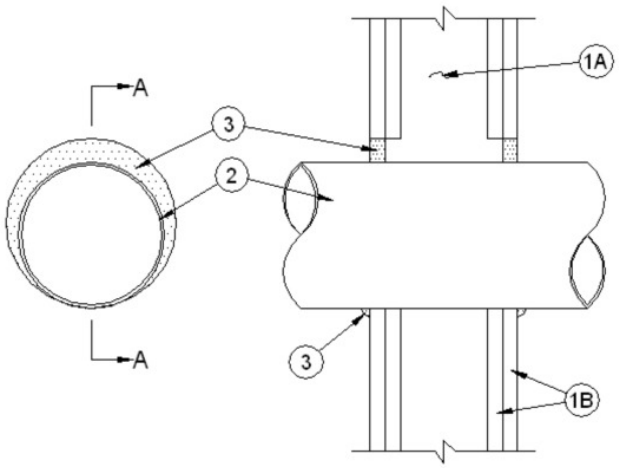
July 07, 2008

F Ratings — 1 and 2 Hr (See Item 1B)

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



SECTION A-A

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 described in the individual U300, U400 or V400Series Wall and Partition Design 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 with nom 2 by 4 in. (51 by 102 mm) lumber end plates and cross braces. Steel studs to be min 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. 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 as shown in table below.

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 Penetrant —** One nom 4 in. (102 mm) diam (or smaller) No. 30 MSG (or heavier), or one nom 6 in. (152 mm) diam (or smaller) No. 28 MSG (or heavier), or nom 20 in. (508 mm) diam (or smaller) No. 22 MSG (or heavier) steel vent duct to be installed either concentrically or eccentrically within the firestop system (see table below). The annular space between duct and periphery of opening shall be min 0

in. (point contact) to max value shown in table below. Duct to be rigidly supported on both sides of wall assembly.

3. **Packing Material —** (not shown). Nom 1 in. (25 mm) foam backer rod firmly packed into the opening as a permanent form in 2 hr fire-rated wall assemblies to prevent leakage of fill material during installation. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

4. **Fill, Void or Cavity Materials* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrant and gypsum board, a min 3/8 in. (10 mm) diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall.

Max Diam of Through Opening In. (mm)	Max Duct Diam In. (mm)	Min Duct Thickness MSG	Annular Space In. (mm)
7 (178)	6 (152)	28	0 to 1 (0 to 25)
22 (559)	20 (508)	22	0 to 2 (0 to 51)

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-7185

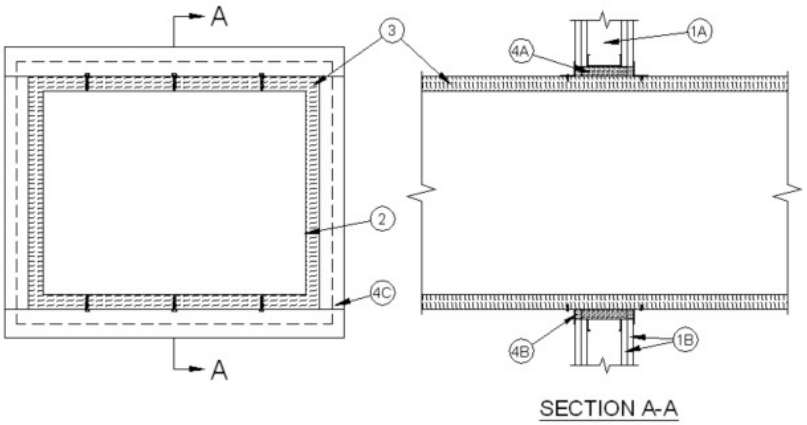
July 10, 2008

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



SECTION A-A

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 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. Additional framing members shall be used to completely frame around opening.

B. **Gypsum Board* —** Min 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 and orientation shall be as specified in the individual U300 or U400 Wall and Partition Design. Max size of opening is 210 sq in. (1355 cm^2) with a max width of 14-1/2 in. (368) for wood studs. Max size of opening is 1050 sq in. (0.68 m^2) with a max width of 30 in. (762 mm) for steel studs.

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall in which it is installed.

2. **Steel Duct —** Max 24 by 30 in. (610 by 762 mm) No. 24 gauge (or heavier) steel duct to be installed eccentrically within the framed opening. Steel duct to be rigidly supported on both sides of wall assembly.

3. **Batts and Blankets* —** Max 1-1/2 in. (38 mm) thick glass fiber batt or blanket (min 3/4 pcf or 12 kg/m^3) jacketed on the outside with a foil-scrim-kraft facing. Longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the batt or blanket shall be compressed 50% such that the annular space within the firestop system shall be min 1 in. (25 mm) to max 2-3/4 in. (70 mm).

See **Batts and Blankets** - (BKNV) category in the Building Materials Directory for names ofmanufacturers. Any batt or blanket meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index 50 or less may be used.

4. **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/m^3) 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 as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 816

C. **Steel Retaining Angles —** Min No. 22 gauge galv steel angles sized to lap steel duct a min of 2 in. (51 mm) and lap wall surfaces a min 1-1/2 in. (38 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max 6 in. (152 mm) OC.

*Bearing the UL Classification Mark

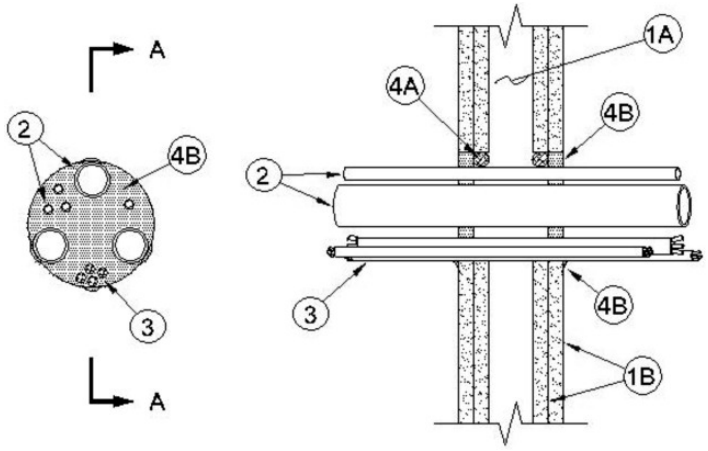
Through-penetration Firestop Systems

System No. W-L-8083

October 02, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 0, 1/2 and 1 Hr (See Items 2 and 3)



SECTION 'A-A'

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 or Partition Design 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 3-5/8 in. wide and spaced max 24 in.

B. **Gypsum Board* —** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design.Max diam of opening is 10 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 —** A max of four 1 in. diam and three 4 in. diam (or smaller) metallic pipes, conduits or tubing to be installed within the firestop system. The annular space between the pipes, conduits or tubing and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/2 in. Separation between pipes, conduits or tubing shall be min 1/2 in. to max 1-5/8 in. Pipes, conduits or tubing to be rigidly supported on both sides of the wall assembly. The following types and sizes of pipes, conduits and tubes may be used:

A. **Steel Pipe —** Nom 4 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. diam (or smaller) rigid steel conduit or nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).
D. **Copper Pipe —** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
E. **Copper Tube —** Nom 4 in. diam (or smaller) Type L (or heavier) copper tube.
F. **Copper Pipe —** Nom 1 in. diam Type K copper pipe.

When any metallic penetrant is used the T Rating is 0 hr.

3. **Cables —** Nom 3 in. diam (or smaller) tight bundle of cables. Cable bundle spaced min 1 in. from other penetrants. Annular space between cable bundle and periphery of opening to be min 0 in. (point contact) to max 1-1/2 in. Cable bundle to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 400 pairs, 24 AWG telephone communication cable with PVC insulation and jacket.
B. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
C. Max 7/C No. 12 AWG copper conductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.
D. Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
E. Type RG 59/U coaxial cable with polyethylene (PE) insulation and PVC jacket.

When cable bundle is used without any metallic penetrant the T rating is 1/2 hr and 1 hr for 1 hr and 2hr fire rated wall assemblies, respectively.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Foam plastic backer material or backer rod or mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material. When annular space between penetrants and/or between penetrants and edge of opening is 3/4 in. or less packing material is optional.
B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact locations, min 1/2 in diam bead of fill material applied at through penetrant/gypsum board interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Non-Metallic Pipe

Assembly	Penetrant	Boss Product	U.L. System	F-Rating	Page
Minimum 4 ½" Concrete Floor or Wall	Max 15" Opening	816	C-AJ-0129	3 Hr	101
	Max 4" PVC, CPVC or ABS Pipe	817	C-AJ-2501	3 Hr.	102
	Max 2" PVC, CPVC Pipe, Rigid Conduit and Electrical Tubing	816	C-AJ-2608	3 Hr.	104
	Max 4" PVC or ABS Pipe for Use in Vented Piping Systems (Drain, Waste or Vent)	816	F-A-2187	2 Hr.	106
Minimum 9 ¼" Concrete Floor or Wall	Max 1 ½" PVC or CPVC Pipe	814	C-BJ-2015	1 Hr.	107
Minimum 9" Concrete Floors or Walls	Max 2" PVC or CPVC Pipe	814 & 819	C-BJ-2025	2 Hr.	108
	Max 4" PVC or CPVC, Max 2" PEX Tubing	814	C-BK-2035	2 Hr.	110
	Max 4" PVC or CPVC Pipe	814 & 819	F-B-2023	2 Hr.	111
Wood Joist Floor/Ceiling	PVC or ABS Closet Flange- Max 4" PVC or ABS Pipe	816	F-C-2375	1 Hr.	112
	Max 1 ½" PVC or ABS Pipe and Drain Fittings with PVC Bathtub Waste/Overflow Fitting	816	F-C-2379	1 Hr.	114
	Multiple- Max 3 Max of 1 Tube is 1", / Max Three ¾" Aluminum PEX	816	F-C-2380	2 Hr.	116
Minimum 4 7/8" Concrete Wall	Max 3" PVC or CPVC Pipe	814 & 819	W-J-2166	2 Hr.	119
	Max 2" PVC, CPVC or ABS Pipe	814 & 819	W-J-2167	2 Hr.	120
Minimum 6" Concrete Wall	Max 4" PVC, CPVC or ABS Pipe	817	W-J-2174	2 Hr.	122
	Max 2" PVC, CPVC, ABS Pipe and Rigid Conduit	816	W-J-2219	2 Hr.	123
Gypsum Wall	Max 3" PVC or CPVC Pipe	814 & 819	W-L-2409	2 Hr.	124
	Max 2" PVC, CPVC and ABS	814 & 819	W-L-2410	1 Hr.	126
	Max 4" PVC, CPVC and ABS	817	W-L-2419	2 Hr.	128
	Max 2" PVC, CPVC ABS and Rigid Conduit	816	W-L-2519	2 Hr.	130

Through-penetration Firestop Systems

System No. C-AJ-0129

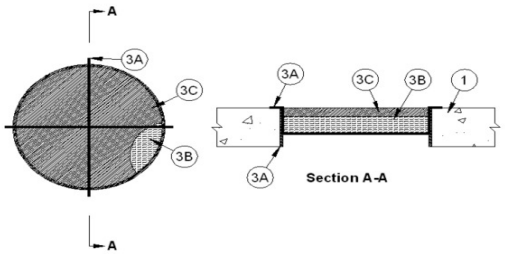
June 24, 2008

F Ratings — 2 and 3 Hr (See item 3)

T Ratings — 1/2 and 2 Hr (See item 3)

L Rating at Ambient - Less than 1 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 Blocks***. Max diam of opening is 15 in. (381 mm).

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** (Optional)-Nom 14 in. (356 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces.
3. **Firestop System —** The firestop system shall consist of the following:

A. **Wire Hangers —** Two No. 9 gauge steel wire bend in a U-shaped hanger and placed in the opening one over the other to form an "X" design.

B. **Packing Material —** Min 2 in. (51 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form as shown in the table below . 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.

C. **Fill, Void or Cavity Material* — Sealant —** Min 1 in. (25 mm) thickness of fill material applied within annulus, flush with top surface of floor or with both surfaces of wall. If cracking occurs after the fill material cures, the cracks shall be sealed with sealant.

F Rating Hr	T Rating Hr	Metallic Sleeve	Wire Hangers
3	1/2	Permitted	Not required
2	2	Not Permitted	Required

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

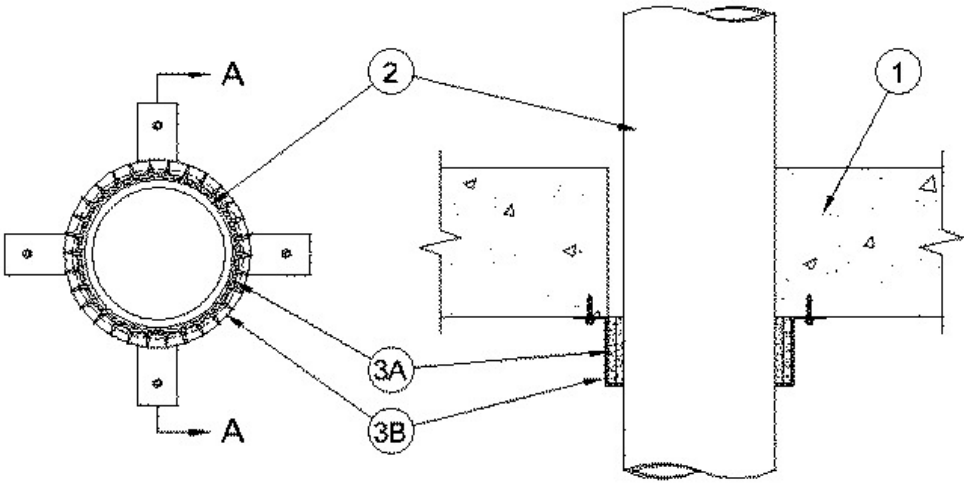
Through-penetration Firestop Systems

System No. C-AJ-2501

November 07, 2008

F Rating — 3 Hr

T Rating — 3 Hr



SECTION A-A

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 Blocks*.** The diam of opening shall be 5 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One nonmetallic penetrant installed concentrically within the firestop system. The annular space between pipe and periphery of opening shall be min 0 (point contact) to max 1/2 in. Pipe to be rigidly supported on both sides of the floor assembly. The following types and sizes of non-metallic pipe may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 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.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 4 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

C. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 4 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.

3. **Firestop System —** The details of the firestop system shall be as follows:

A. **Fill, Void or Cavity Materials* - Wrap Strip —** Two layers of nom 1/4 in. thick intumescent elastomeric material faced on one side with a plastic film, supplied in 2 in. wide strips. Strips tightly wrapped around nonmetallic pipe (film side exposed) with the edges butted against the underside of the concrete floor or both sides of wall surface. Butted ends in successive layers shall be offset. Wrap strip layers temporarily held in position using tape, wire or equivalent.

ACCUMETRIC L L C — Boss 817 Wrap Strip

B. **Steel Collar —** Collar fabricated from coils of precut 0.016 in. thick (No. 30 MSG) galv sheet steel available from wrap strip manufacturer. Collar shall be nom 2 in. deep with min 1 in. wide by 1-1/4 in. long anchor tabs on 4 in. centers for securement to underside of concrete floor and both sides of concrete wall. In addition, collar contains retainer tabs, ½ wide by ¾ in. long located opposite the anchor tabs. Collar shall be wrapped over the wrap strip, with ends overlapping min 1 in. The retainer tabs are folded 90 deg towards the pipe to maintain the annular space around the pipe and to retain the wrap strip. Steel collar tightened around wrap strips and through penetrant using min 1/2 in. wide by 0.028 in. thick stainless steel hose clamp installed at midheight of the collar. Collar secured to bottom surface of the floor or both surfaces of wall at each anchor tab by means of min 1/4 in. diam by 1-1/4 in. long steel expansion bolts or steel Tapcon® concrete anchors in conjunction with 1/4 in. by 5/8 in. diam fender washers.

*Bearing the UL Classification Mark

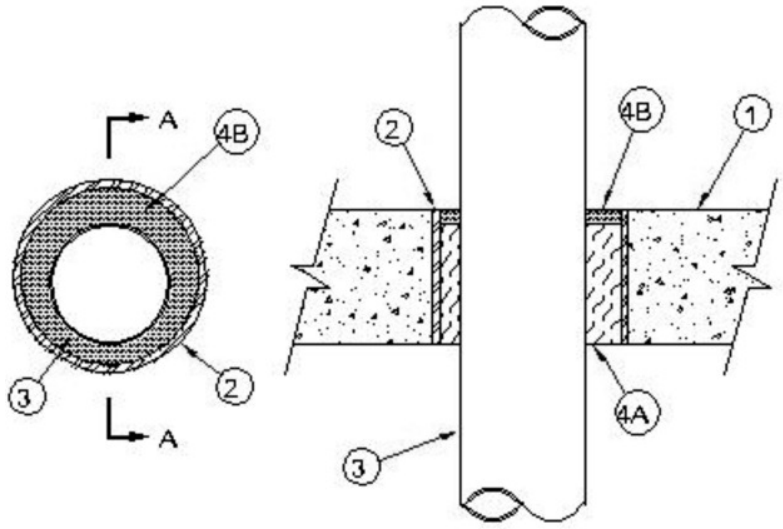
Through-penetration Firestop Systems

System No. C-AJ-2608

April 10, 2008

F Rating — 3 Hr

T Ratings — 2-1/2 Hr



SECTION 'A-A'

1. **Floor or Wall Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete floor or min 5 in. thick reinforced light weight or normal weight concrete wall. Floor may also be constructed of any min 6 in. thick hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in.

See **Concrete Blocks** (CAZT) or **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.

2. **Steel Sleeve —** (optional) - Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe cast or grouted into floor or wall assembly, flush with floor or wall surfaces.

3. **Through Penetrant —** One nonmetallic pipe, conduit or tube to be installed eccentrically or concentrically within the firestop system. The annular space between the pipe, conduit or tube and the periphery of the opening shall be min 0 in. (point contact) to max 1-3/4 in. Pipe, conduit or tube to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes, conduits and tubes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. diam (or smaller) Schedule 40,cellular or solid core polyvinyl chloride (PVC) pipe for use in closed (process or supply) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR17 chlorinated polyvinyl chloride (CPVC) pipe for use in closed (process or supply) piping systems.

C. **Rigid Nonmetallic Conduit+ —** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code (NFPA 70).

D. **Electrical Nonmetallic Tubing+ —** Nom 2 in. diam (or smaller) PVC tubing installed in accordance with Article 331 of the National Electrical Code (NFPA 70).

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 compressed and tightly packed into opening. Packing material recessed from top surface of floor or both surfaces of wall or precast concrete units to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. thickness of fill material installed within annulus, flush with top surface of floor or both surfaces of wall assembly. In floors constructed of precast hollow core units, fill material installed to min 1/2 in. depth flush with each surface of the floor. At the point of contact of pipe and concrete a min 1/2 in. diam bead of fill material shall be applied at top surface of floor or both surfaces of wall or precast concrete units.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+Bearing the UL Listing Mark

Through-penetration Firestop Systems

System No. F-A-2187

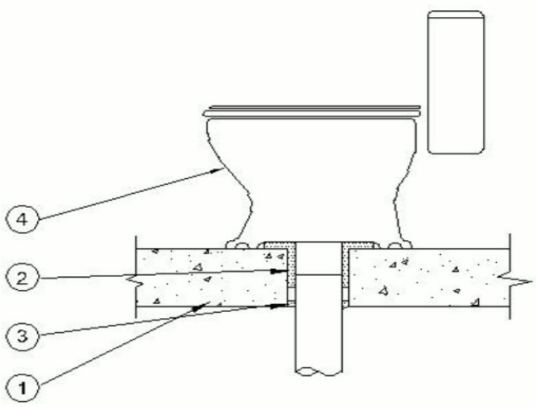
July 02, 2008

F Rating — 2 Hr

T Rating — 2 Hr

L Rating at Ambient - Less than 1 CFM/sq ft

L Rating at 400° F - Less than 1 CFM/sq ft



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick lightweight or normal weight concrete (100-150 pcf or 1600-2400 kg/m^3). Max diam of opening is 6 in. (152 mm).
2. **Nonmetallic Pipe —** One nonmetallic drain pipe with max 4 in. (102 mm) diam toilet flange installed either concentrically or eccentrically within the firestop system. The annular space between drain pipe and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Pipe to be rigidly supported on underside of floor assembly. The following types and sizes of nonmetallic pipes, fittings and flanges may be used:

    A. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 40 solid core or cellular core PVC pipe for use in vented (drain, waste or vent) piping system.

    B. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 40 cellular core or solid core ABS pipe for use in vented (drain, waste or vent) piping systems.

3. **Fill, Void or Cavity Material* - Sealant —** Min 1 in.(25 mm) thickness of fill material applied within the annulus, flush with bottom surface of floor. At point contact location between concrete and pipe, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe/concrete interface on bottom surface of floor assembly. A min 1/2 in. (13 mm) diam bead of fill material shall also be applied around top edge of toilet flange.

    `ACCUMETRIC L L C — Boss 816

4. **Water Closet —** Floor mounted vitreous china water closet.

*Bearing the UL Classification Mark

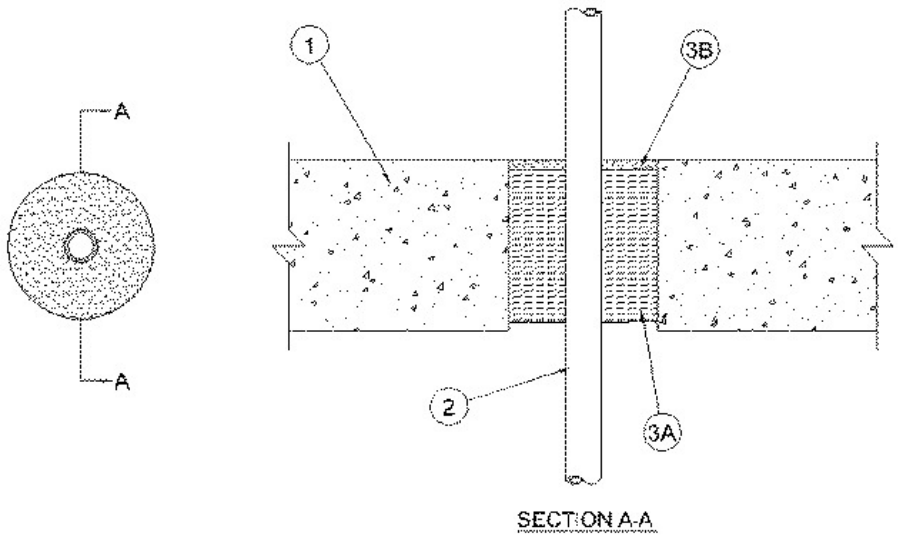
Through-penetration Firestop Systems

System No. C-BJ-2015

November 05, 2008

F Rating - 1 h

T Rating - 0 h



SECTION A-A

1. **Floor or Wall Assembly· —** Min 9-1/4 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Max diam of opening is 8 in. Wall may also be constructed of any UL Classified **Concrete Blocks*.**

See **Concrete Blocks** category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants· —** One nonmetallic pipe to be installed concentrically within opening. The annular space between pipe and periphery shall be 3-1/16 in. Pipe to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe· —** Nom 1- 1/2 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe· —** Nom 1-1/2 in. diam (or smaller) SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System· —** The firestop system shall consist of the following:

A. **Packing Material· —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 Materials* - Sealant· —** Min 1/2 in. thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

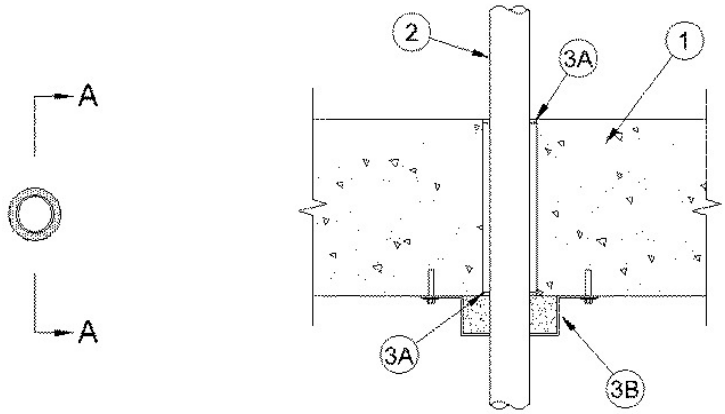
Through-penetration Firestop Systems

System No. C-BJ-2025

November 05, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor or Wall Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Wall may also be constructed of any min 9 in. thick UL Classified **Concrete Blocks***. Max diam of opening is 2-3/4 in.

See **Concrete Block** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One nonmetallic pipe to be installed concentrically within opening. The annular space between pipe and periphery shall be 3/16 in. Pipe to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Materials* - Sealant —** Min 1/4 in. thickness of fill material applied within annulus, flush with both surfaces of floor or wall.

ACCUMETRIC L L C — Boss 814

B. **Firestop Device* —** Galvanized or stainless steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant in accordance with accompanying installation instructions. Device incorporates four anchor tabs for

securement to underside of the concrete floor or both surfaces of the wall by means of 1/4 in. diam by 1-1/2 in. long steel expansion bolts.

ACCUMETRIC L L C — Boss 819 Pipe Collar

*Bearing the UL Classification Mark

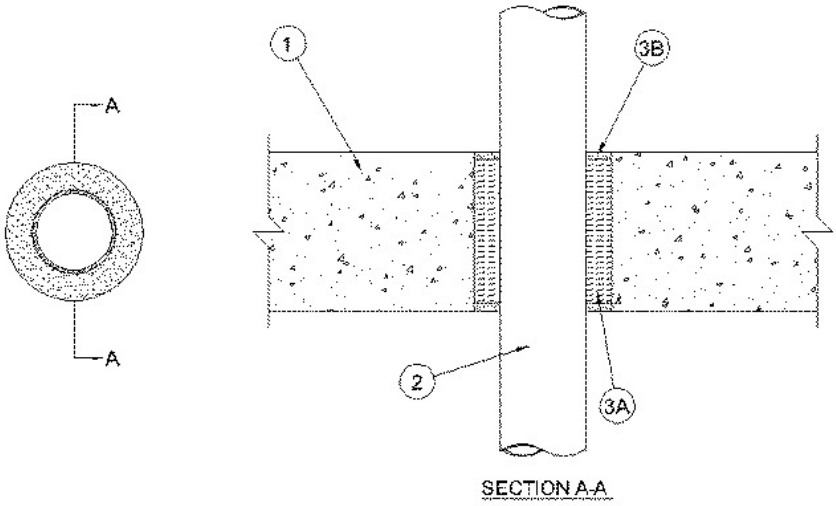
Through-penetration Firestop Systems

System No. C-BK-2035

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor or Wall Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 6 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One nonmetallic pipe to be installed concentrically within opening. The annular space between pipe and periphery of opening shall be ¾ in. Pipe to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 4 in. diam (or smaller) SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.

C. **Crosslinked Polyethylene (PEX) Tubing —** Nom 2 in. diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 8 in. thickness of min 2.8 pcf mineral wool batt insulation firmly packed into opening as a permanent form. 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 Materials* - Sealant —** Min 1/2 in. thickness of fill material applied within annulus, flush with both surfaces of floor or wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

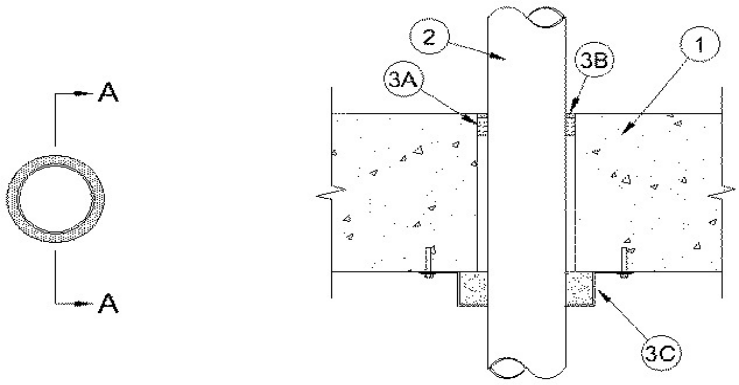
Through-penetration Firestop Systems

System No. F-B-2023

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Floor Assembly —** Min 9 in. thick lightweight or normal weight (100-150 pcf) reinforced concrete. Max diam of opening is 5 in.
2. **Through Penetrants —** One nonmetallic pipe to be installed concentrically within opening. The annular space between pipe and periphery of opening shall be 1/4 in. Pipe to be rigidly supported on both sides of the floor assembly. The following types and sizes of nonmetallic pipes may be used:

   A. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

   B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 4 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.
3. **Firestop System —** The firestop system shall consist of the following:

   A. **Packing Material —** Min 1 in. thickness of min 10 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor as required to accommodate the required thickness of fill material.

   B. **Fill Void or Cavity Materials* - Sealant —** Min 1/4 in. thickness of fill material applied within annulus, flush with top surface of floor.

   ACCUMETRIC L L C — Boss 814

   C. **Firestop Device* —** Galv steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant in accordance with accompanying installation instructions. Device incorporates four anchor tabs for securement to underside of the concrete floor by means of 1/4 in. diam by 1-1/2 in. long steel expansion bolts.

   ACCUMETRIC L L C — Boss 819 Pipe Collar

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-2375

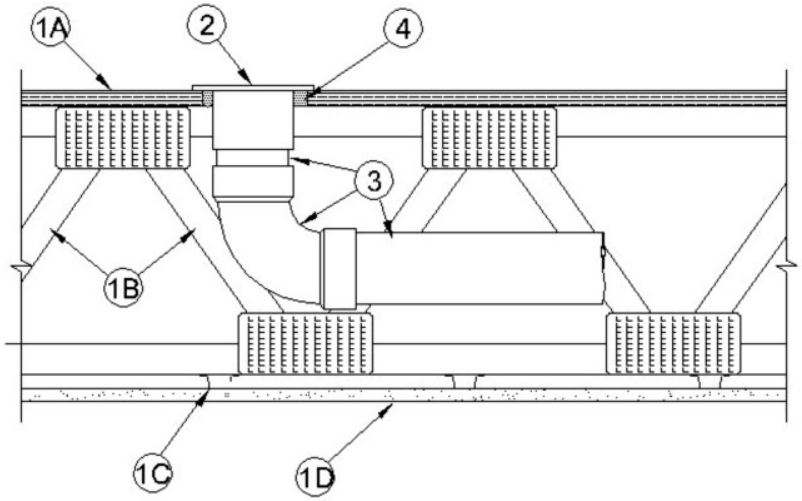
April 11, 2008

F Rating — 1 Hr

T Rating — 1 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — Less than 1 CFM/sq ft



1. **Floor-Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory, as summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of opening is 5 in. (127 mm).

B. **Wood Joists —** Nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped. As an alternate to lumber joists, nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists trusses or **Structural Wood Members*** with bridging as required with ends firestopped.

C. **Furring Channels —** (Not Shown) — Resilient galv steel furring installed perpendicular to wood joists (Item 1B) between gypsum board (Item 1D) and wood joists as required in the individual Floor-Ceiling Design.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. Gypsum board secured to wood joists as specified in the individual Floor-Ceiling Design.

2. **Closet Flange —** Polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS) closet flange installed in hole-sawed opening in flooring system with flange secured to top of flooring with steel screws. Diam of circular opening through flooring (Item 1A) to be max 1/2 in. (13 mm) larger than outside diam of closet flange.

3. **Drain Piping —** Nom 4 in. (102 mm) diam (or smaller) Schedule 40 PVC or ABS drain piping and fittings. Short length of pipe with 90 degree elbow fitting cemented into bottom socket of closet flange. Drain piping to soil stack cemented into elbow.
4. **Fill, Void or Cavity Material* — Sealant —** Fill material forced into annulus between closet stub and periphery opening in flooring to max extent possible, flush with bottom surface of floor. Additional fill material to be installed such that a min 3/8 in. (10 mm) crown is formed around the closet stub on bottom surface of floor.

ACCUMETRIC L L C — Boss 816

5. **Water Closet —** (Not Shown) — Floor mounted vitreous china water closet.

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-2379

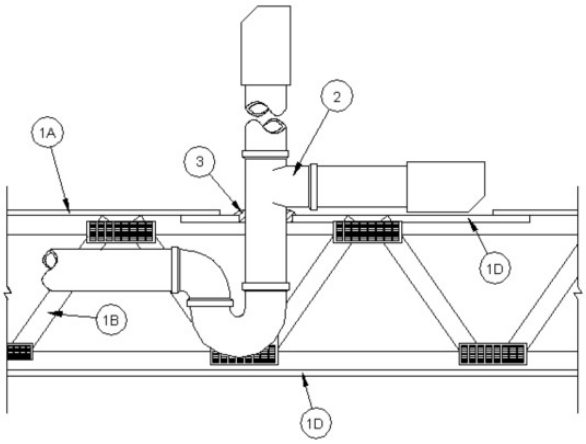
June 24, 2008

F Rating — 1 Hr

T Rating — 1 Hr

L Rating at Ambient - Less than 1 CFM/sq ft

L Rating at 400° F - Less than 1 CFM/sq ft



1. **Floor-Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory, as summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Rectangular cutout in flooring to accommodate the bathtub drain piping (Item 2) to be max 8 by 12 in. (203 by 305 mm).

B. **Wood Joists —** Nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped. As an alternate to lumber joists, nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required with ends firestopped.

C. **Furring Channels —** (Not Shown) — Resilient galv steel furring installed perpendicular to wood joists (Item 1B) between gypsum board (Item 1D) and wood joists as required in the individual Floor Ceiling Design.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. Gypsum board secured to wood joists as specified in the individual Floor-Ceiling Design. One piece of gypsum board, min 4 in. (102 mm) longer and wider than the cutout in the flooring, screw-attached to bottom of flooring concentric with cutout by means of 1 in. (25 mm) long Type S steel screws spaced max 5 in. (127 mm) OC. Diam of opening hole-sawed through the gypsum board patch to be 1 in. (25 mm) larger than outside diam of bathtub drain piping (Item 2).

2. **Drain Piping —** Nom 1-1/2 in. (38 mm) diam Schedule 40 solid or cellular core polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS) pipe and drain fittings cemented together and provided with PVC bathtub waste/overflow fitting. Pipe to be installed either concentrically or eccentrically within the firestop system. The annular space within the firestop system shall be a min 3/8 in. (10 mm) to a max 5/8 in. (16 mm).
3. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material to be applied within annulus between the tee of the drain fitting and gypsum board patch on the top surface of the floor. An additional 1/4 in. (6 mm) crown of fill material shall be applied around tee of drain fitting on top surface of the gypsum board patch.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-2380

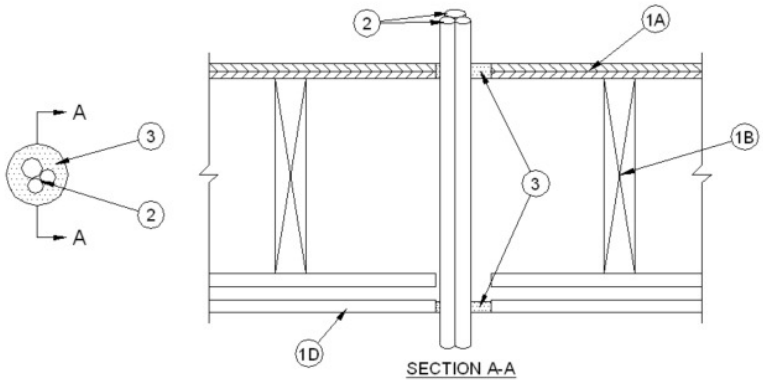
July 07, 2008

F Ratings — 1 and 2 Hr (See Item 3)

T Ratings — 1 and 2 Hr (See Item 3)

L Rating at Ambient - Less than 1 CFM/sq ft

L Rating at 400° F - Less than 1 CFM/sq ft



1. **Floor-Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design Nos. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3 in. (76 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped.

C. **Furring Channels —** (Not Shown) — In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of gypsum board (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between gypsum board and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board secured to wood joists or furring channels as specified in the individual Floor-Ceiling Design. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels as specified in the individual Floor-Ceiling Design. Max diam of ceiling opening is 3 in. (76 mm).

The hourly F and T Ratings of the firestop system are dependent upon the hourly rating of the floor-ceiling assembly in which it is installed, type of through penetrant and type of fill material as shown in Item 3 .

1.1 **Chase Wall —** (Not Shown, Optional) — The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 6 in. (51 by 152 mm) lumber or double nom 2 by 4 in. (51 by 102 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 6 in. (51 by 152 mm) lumber or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted. Max diam of opening is 3 in. (76 mm).

C. **Top Plate —** The double top plate shall consist of two nom 2 by 6 in. (51 by 152 mm) lumber plates or two sets of nom 2 by 4 in. (51 by 102 mm) lumber plates tightly butted. Max diam of opening is 3 in. (76 mm).

D. **Gypsum Board* —** Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.

2. **Through Penetrant —** The following types of through penetrants shall be used:

A. **Cross-Linked Polyethylene Tubing —** A max of three SDR 9 (or heavier) cross-linked polyethylene (PEX) tubing for use in closed (process or supply) piping systems. Of the three tubes, a max of one shall have a nom diam greater than 3/4 in. (19 mm). The max diam of one tube is 1 in. (25 mm). The annular space between the tubing and the periphery of the opening shall be a min 3/16 in. (4.8 mm) and a max of 1 in. (25 mm). The space between the tubing shall be a min 0 in. (point contact) to a max 1/4 in. (6 mm). Tubing to be rigidly supported on both sides of the floor-ceiling assembly.

B. **Aluminum Cross-Linked Polyethylene Tubing —** A max of three nominal 3/4 in. (19 mm) diameter SDR 9 (or heavier) aluminum cross-linked polyethylene (AL PEX) tubing for use in closed (process or supply) piping systems. The annular space between the tubing and the periphery of the opening shall be a min 1/8 in. (3.2 mm) and a max of 1 in. (25 mm). The space between the tubing shall be a min 0 in. (point contact) to a max 1/4 in. (6 mm). Tubing to be rigidly supported on both sides of the floor-ceiling assembly.

The hourly F and T Ratings of the firestop system are dependent upon the hourly rating of the floor-ceiling assembly in which it is installed, type of through penetrant and type of fill material as shown in Item 3.

3. **Fill, Void or Cavity Material* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied flush with annulus on top surface of floor or sole plate. Min 1/2 in. (13 mm) thickness of fill material applied flush with annulus on bottom surface of ceiling or on bottom surface of lower top plate of chase wall assembly. Additional fill material forced within the group of tubing to max extent possible on the top surface of floor or sole plate and bottom surface of ceiling or on bottom surface of lower plate of chase wall assembly.

The hourly F and T Ratings of the firestop system are dependent upon the hourly rating of the floor-ceiling assembly in which it is installed and type of through penetrant, as shown in the table below:

Rating of Assembly, Hr	Type of Through Penetrant	F Rating, Hr	T Rating, Hr
1	PEX	1	1
1	AL PEX	1	1
2	AL PEX	2	2
1	PEX	1	1
2	PEX	2	2

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

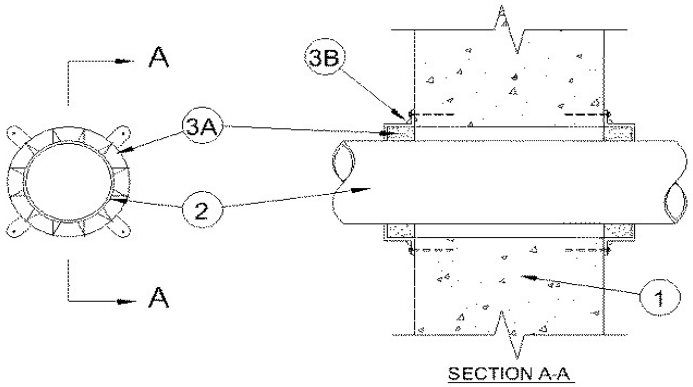
Through-penetration Firestop Systems

System No. W-J-2166

November 06, 2008

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** Min 4-7/8 in. or 6-1/8 in. thick lightweight or normal weight (100-150 pcf) concrete for 1 and 2 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in.

See **Concrete Blocks** (CAZT) category in the UL Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** One nonmetallic pipe to be centered within the firestop system. Annular space to be min 1/4 in. Pipe to be located near the center of the stud cavity width and to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 3 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 3 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Firestop Device* —** Galvanized or stainless steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant and to both surfaces of wall in accordance with accompanying installation instructions. Device incorporates four anchor tabs for securement to both surfaces of the wall by means of 1/4 in. diam by 1-1/2 in. long steel expansion bolts.

ACCUMETRIC L L C — Boss 819 Pipe Collar

B. **Fill Void or Cavity Materials* - Sealant —** Min 3/16 in. thick bead of fill material applied around annulus at the firestop device / wall surface interface on both sides of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

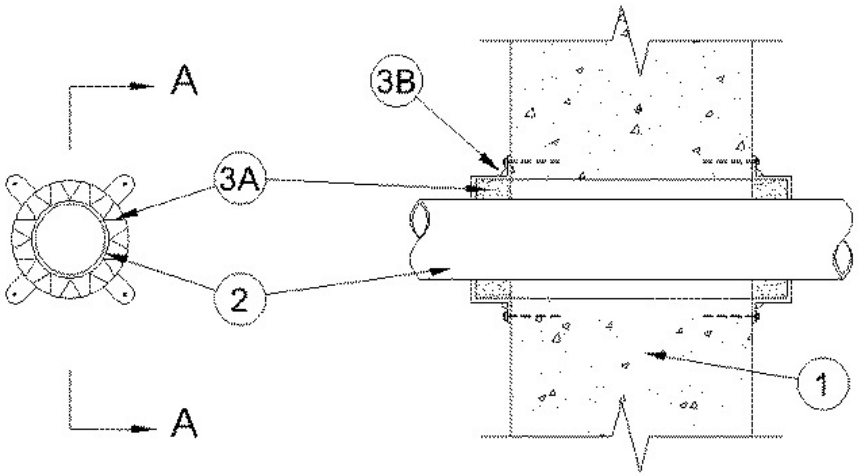
Through-penetration Firestop Systems

System No. W-J-2167

November 06, 2008

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** Min 4-7/8 in. thick lightweight or normal weight (100-150 pcf) concrete for 1 hr rated assemblies. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 3 in.

See **Concrete Blocks** (CAZT) category in the UL Fire Resistance Directory for names of manufacturers.

2. **Through Penetrant —** One nonmetallic pipe to be centered within the firestop system. Annular space to be min 5/16 in. Pipe to be located near the center of the stud cavity width and to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply).

C. **Rigid Nonmetallic Conduit+ —** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Articles 347 and 710 of the National Electrical Code (NFPA No. 70).

D. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Firestop Device* —** Galvanized or stainless steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant and to both surfaces of wall in accordance with accompanying installation instructions. Device incorporates four anchor tabs for securement to both surfaces of the wall by means of 1/4 in. diam by 1-1/2 in. long steel expansion bolts.

ACCUMETRIC L L C — Boss 819 Pipe Collar

B. **Fill Void or Cavity Materials* - Sealant —** Min 3/16 in. thick bead of fill material applied around annulus at the firestop device / wall surface interface on both sides of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

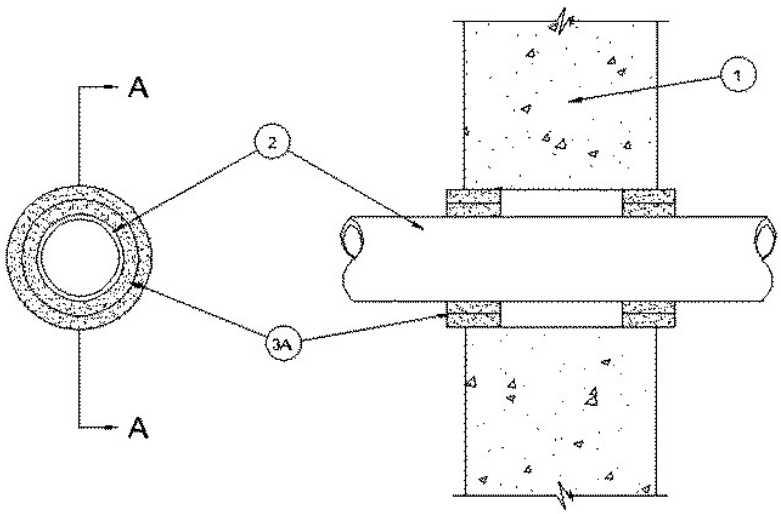
Through-penetration Firestop Systems

System No. W-J-2174

November 07, 2008

F Rating — 2 Hr

T Rating — 2 Hr



SECTION A-A

1. **Wall Assembly —** Min 6 in. thick lightweight or normal weight (100-150 pcf) concrete wall assembly. Wall may also be constructed of any UL Classified **Concrete Blocks*.** Max diam of opening is 5-1/2 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** One nonmetallic pipe to be centered within the firestop system. A nom annular space of 1/2 in. is required within the firestop system. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

C. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 4 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Material* - Wrap Strip —** Two layers of nom 1/4 in. thick by 2 in. wide intumescent wrap strip individually wrapped around the outer circumference of the pipe and slid into the annular space on each side of wall such that wrap strip extends ¾ in. beyond each surface of wall. Butted ends in successive layers shall be offset. Wrap strip secured with tape, wire or tie wire.

ACCUMETRIC L L C — Boss 817 Wrap Strip

*Bearing the UL Classification Mark

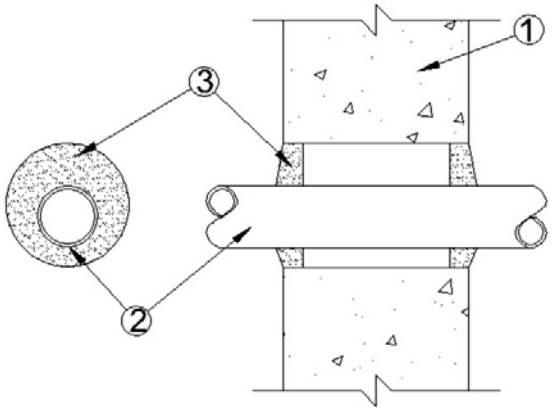
Through-penetration Firestop Systems

System No. W-J-2219

April 11, 2008

F Rating — 2 Hr

T Rating — 0 Hr



1. **Wall Assembly —** Min 6 in. thick normal weight or lightweight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Nonmetallic Pipe —** One nonmetallic pipe or conduit to be installed either concentrically or eccentricity within the firestop system. The annular space between the through penetrant and the periphery of the opening shall be a min 5/8 in. to a max 1 in. Pipe or conduit to be rigidly supported on both sides of wall assembly. The following types of nonmetallic pipes or conduits may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. 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.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

C. **Rigid Nonmetallic Conduit+ —** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code, (NFPA No. 70).

D. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 2 in. diam Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

3. **Fill, Void, or Cavity Materials* - Sealant —** Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. Additional fill material to be installed such that a min ¼ in. thick crown is formed around the through penetrant on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

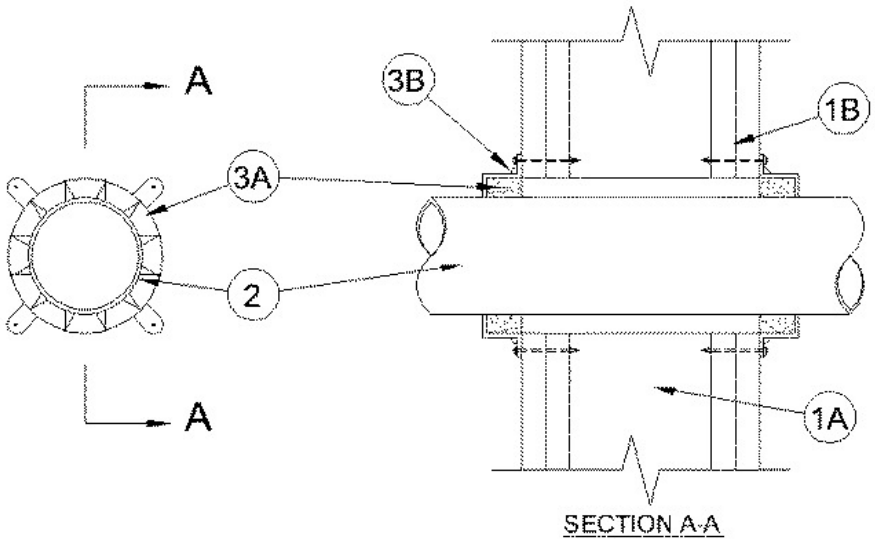
Through-penetration Firestop Systems

System No. W-L-2409

November 06, 2008

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



SECTION A-A

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 shall consist of either wood or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.

B. **Gypsum Board* —** Min 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers and orientation shall be as specified in the individual U300 or U400 Wall and Partition Design. Max diam of opening is 4 in.

The hourly F Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrant —** One nonmetallic pipe to be centered within the firestop system. Annular space to be min 1/4 in. Pipe to be located near the center of the stud cavity width and to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 3 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 3 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Firestop Device* —** Galvanized or stainless steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant and to both surfaces of wall in accordance with accompanying installation instructions. Device incorporates

four anchor tabs for securement to the wall by means of 1/8 in. diam by 2 in. long steel hollow wall anchors in conjunction with 1/4 in. by 5/8 in. diam washers.

ACCUMETRIC L L C — Boss 819 Pipe Collar

B. **Fill Void or Cavity Materials* - Sealant —** Min 3/16 in. thick bead of fill material applied around annulus at the firestop device / wall surface interface on both sides of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

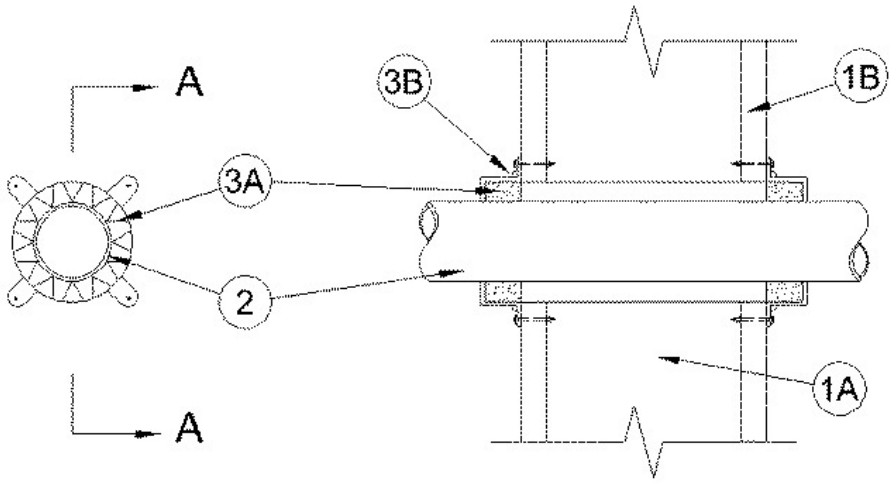
Through-penetration Firestop Systems

System No. W-L-2410

November 06, 2008

F Rating — 1 Hr

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** The 1 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 shall consist of either wood or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.

B. **Gypsum Board* —** Min 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers and orientation shall be as specified in the individual design. Max diam of opening is 3 in.

2. **Through Penetrant —** One nonmetallic pipe to be centered within the firestop system. Annular space to be min 5/16 in. Pipe to be located near the center of the stud cavity width and to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid core PVC pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply).

C. **Rigid Nonmetallic Conduit+ —** Nom 2 in. diam (or smaller) Schedule 40 PVC conduit installed in accordance with Articles 347 and 710 of the National Electrical Code (NFPA No. 70).

D. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 2 in. diam (or smaller) Schedule 40 solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Firestop Device* —** Galvanized or stainless steel collar lined with an intumescent material sized to fit specific diam of the through penetrant. Device to be installed around the through penetrant and to both surfaces of wall in accordance with accompanying installation instructions. Device incorporates

four anchor tabs for securement to the wall by means of 1/8 in. diam by 2 in. long steel hollow wall anchors in conjunction with 1/4 in. by 5/8 in. diam washers.

ACCUMETRIC L L C — Boss 819 Pipe Collar

B. **Fill Void or Cavity Materials* - Sealant —** Min 3/16 in. thick bead of fill material applied around annulus at the firestop device / wall surface interface on both sides of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

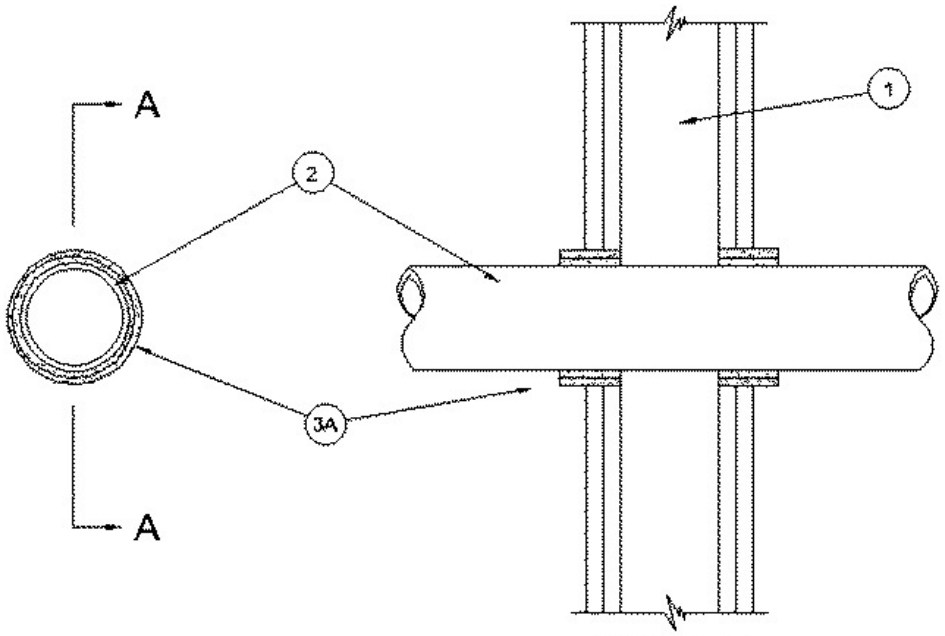
Through-penetration Firestop Systems

System No. W-L-2419

November 07, 2008

F Rating — 2 Hr

T Rating — 2 Hr



SECTION A-A

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 shall consist of either wood 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.

B. **Gypsum Board* —** Min 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual U300 or U400 Wall and Partition Design. Max diam of opening is 5-1/2 in.

2. **Through Penetrants —** One nonmetallic pipe to be centered within the firestop system. A nom annular space of 1/2 in. is required within the firestop system. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

B. **Polyvinyl Chloride (PVC) Pipe —** Nom 4 in. diam (or smaller) Schedule 40 (or heavier) cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

C. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 4 in. diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Material* - Wrap Strip —** Two layers of nom 1/4 in. thick by 2 in. wide intumescent wrap strip individually wrapped around the outer circumference of the pipe and slid into the annular space such

that wrap strip extends ¾ in. beyond both surfaces of wall. Butted ends in successive layers shall be offset. Wrap strip secured with tape, wire or tie wire.

ACCUMETRIC L L C — Boss 817 Wrap Strip

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-2519

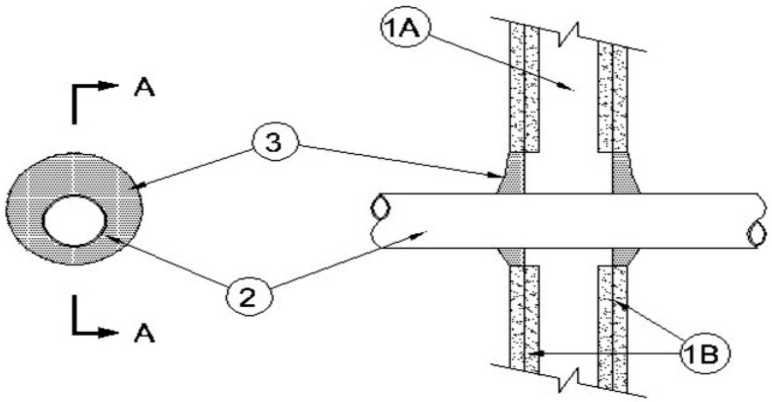
April 11, 2008

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



SECTION 'A-A'

1. **Wall Assembly —** The 1 or 2 hr fire rated gypsum wallboard/stud wall assembly shall be constructed of the material 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board* —** Nom 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board thickness, type, number of layers, fasteners type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 4 in. (102 mm).

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. **Nonmetallic Pipe —** One nonmetallic pipe or conduit to be installed either concentrically or eccentricity within the firestop system. The annular space between the through penetrant and the periphery of the opening shall be a min 5/8 in.(16 mm) to a max 1 in. (25 mm). Pipe or conduit to be rigidly supported on both sides of wall assembly. The following types of nonmetallic pipes or conduits may be used:

A. **Polyvinyl Chloride (PVC) Pipe —** Nom 2 in. (51 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.

B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe —** Nom 2 in. (51 mm) diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

C. **Rigid Nonmetallic Conduit+ —** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code, (NFPA No. 70).

D. **Acrylonitrile Butadiene Styrene (ABS) Pipe —** Nom 2 in. (51 mm) diam Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

3. **Fill, Void, or Cavity Materials* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Additional fill material to be installed such that a min 1/4 in. (6 mm) thick crown is formed around the through penetrant at both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+ Bearing the UL Listing Mark

Cables - Datacom or Electrical

Assembly	Penetrant	Boss Product	U.L. System	F-Rating	Page
Minimum 4 ½" Concrete Floor or Wall	Multiple Copper & CATV Communications & Power Cable Combinations	813 & 136 or 139	C-AJ-3249	2 Hr.	134
Minimum 4 ½" Concrete Floor and Minimum 5" Concrete Wall	Max 3" Diameter Bundle of Telecom Cables w/Max 6" Diameter Steel Sleeve Opening	816	C-AJ-3295	2 Hr.	135
	One Busway Max 19" x 6" w/Max 345 Square Inch Opening	816	C-AJ-6040	3 Hr.	137
Minimum 4 ½" Concrete Floor and Minimum 6" Concrete Wall	Max 19%Fill of Telecom, Coaxial, Metal Clad & Fiber Optic Cables w/Max 6" Diameter Opening	816	C-AJ-3296	3 Hr.	139
	Max 1" Metallic & Insulated Pipe w/Mixed Electrical Cables in Max 4" Diameter Opening	816	C-AJ-8195	2 Hr.	141
Wood Joist Floor/Ceiling	Multiple Communication Cable Combinations	813 & 136 or 139	F-C-3090	1 Hr.	145
	Telecom, Romex, Coaxial & Metal Clad Cables w/Max 4" Diameter Opening	816	F-C-3104	2 Hr.	147
Floor/Ceiling Concrete Floor over Metal or Steel Deck Steel Joist w/Gypsum Ceiling	Telecom, Romex, Coaxial & Metal Clad Cables w/Max 4" Diameter Opening	816	F-E-3016	1 Hr.	149
Minimum 4 ½" Concrete Wall	Telecom, Romex, Coaxial & Metal Clad Cables w/Max 4" Diameter Opening	814	W-J-3161	2 Hr.	151
Minimum 5" Concrete Wall	Multiple Communications Cable Combinations & Fiber Optics	814	W-J-3101	2 Hr.	153
Minimum 4 7/8" (1 Hr) or 6 1/8" (2 Hr.) Concrete Wall	Max 64% Fill of Coaxial, SER, Romex Cables w/Max 5" Diameter Opening	816	W-J-3176	1 & 2 Hr.	154
Minimum 6" Concrete Wall	Max 19% Fill of Multiconductor & Telecom Cables w/Max 4 ½" Diameter Opening & Max 4" Diameter Sleeve	816	W-J-3175	2 Hr.	156
	Multiple Copper & CATV Communication Cable Combinations	813 & 814	W-J-3153	2 Hr.	158
	Multiple Metallic Pipes and Cables w/Max 10" Diameter Opening	816	W-J-8046	2 Hr.	160
Gypsum Wall	Multiple Copper & CATV Communication Cable Combinations	813 & 814	W-L-3298	2 Hr.	162
	Multi-conductor, Telephone & Fiber Optic Cables w/Nom ¾" Diameter Opening	814	W-L-3222	1 & 2 Hour	164
	Max 64% Fill of Coaxial, Telecom, Metal Clad & SER Cables w/Max 5" Diameter Opening	816	W-L-3342	2 Hr.	165
	Max 64% Fill of Coaxial, Telecom, Metal Clad & SER Cables w/Max 4" Diameter Opening	814	W-L-3315	1 & 2 Hr.	167
	Max 19% Fill of Multi-conductor & Telecom Cables w/Max 4 ½" Opening & Max 4" Sleeve	816	W-L-3345	2 Hr.	169
	Multiple Max 4" Steel, Iron, Copper Pipe/Tubing & Conduit & Cables w/Max 10" Diameter Opening	816	W-L-8083	2 Hr.	171

Electrical Outlet Box

Gypsum Wall	Electrical Box 2 1/8” x 4” x 2 1/8”	815	CLIV.R16844	2 Hr.	173
Gypsum Wall	Electrical Box 4” x 4” x ½”	815	CLIV.R16844	2 Hr.	173
Gypsum Wall	Electrical Box 4” x 4” x 2 1/8”	815	CLIV.R16844	2 Hr.	174
Gypsum Wall	Electrical Box Max 4” x 4”	818	CLIV.R20964	2 Hr.	175

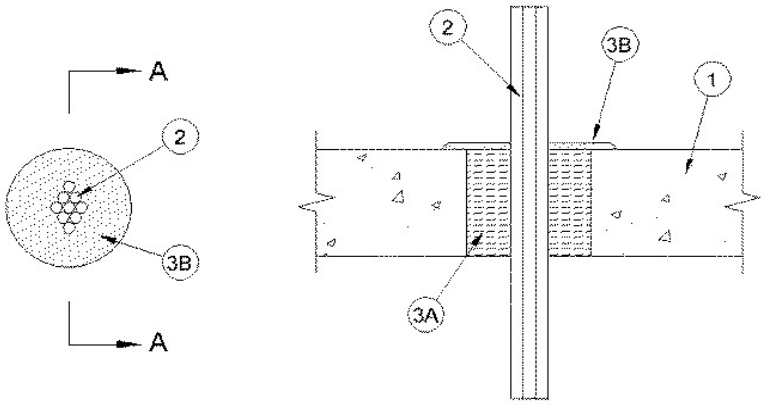
Through-penetration Firestop Systems

System No. C-AJ-3249

November 07, 2008

F Rating — 2 Hr

T Rating — 2 Hr



Section A-A

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/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 5 in. (127 mm).

See **Concrete Blocks** (CAZT) category in Fire Resistance Directory for names of manufacturers.

2. **Cables —** Aggregate cross-sectional area of cables in opening to be max 2 percent of the cross-sectional area of the opening. Cable bundle to be centered within opening and rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 2/C No. 18 AWG with polyvinyl chloride (PVC) insulation and jacket materials.

B. Max 4 pair No. 24 AWG telephone cable with PVC insulation and jacket materials.

C. Max RG/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacket materials.

D. Max 3/C (with ground) No. 14 AWG (or smaller) nonmetallic sheathed (Romex) cable with PVC insulation and jacket materials.

3. **Firestop System —** The details of the firestop system shall be as follows:

A. **Fill, Void or Cavity Materials* - Foam —** Min 4-1/2 in. (114 mm) thickness of fill material within the annulus, flush with top surface of floor or with both surfaces of wall.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

B. **Fill, Void or Cavity Materials* - Sealant —** Min 1/4 in. (6 mm) thickness of fill material applied over foam (Item 3B) on top surface of floor or on both surfaces of wall. Fill material shall overlap a min of 1 in. (25 mm) beyond periphery of opening on top surface of floor or on both surfaces of wall.

ACCUMETRIC L L C — Boss 136 or 139 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-3295

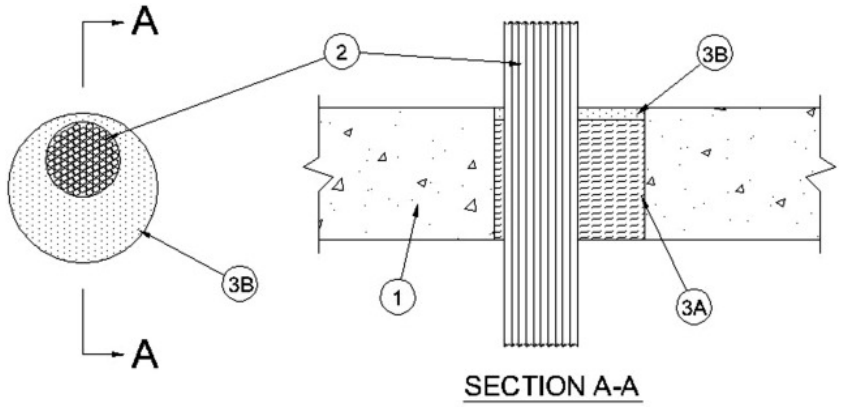
April 10, 2008

F Rating — 2 Hr

T Rating — 0 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — 1.4 CFM/sq ft



SECTION A-A

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/m^3) 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.

2. **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:

A. Max 100 pair No. 24 AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.

B. Max 3/C No. 2/0 AWG (or smaller) aluminum conductor service entrance cable with PVC insulation and jacket.

C. Max 3/C with ground No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.

D. 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.

E. Max RG59/U (or smaller) copper conductor coaxial cable with fluorinated ethylene insulation and jacketing.
F. Max 62.5/125 fiber optic cable with PVC insulation and jacketing.
G. Max RG/6 No. 18 AWG Type copper conductor CATV coaxial cable with PVC insulation and jacket.
H. 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

ALFLEX CORP

KAF-TECH INC

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/m^3) 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.
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 or hollow-core precast concrete units. Additional sealant shall be forced into interstices of cable bundle to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+Bearing the UL Listing Mark

Through-penetration Firestop Systems

System No. C-AJ-6040

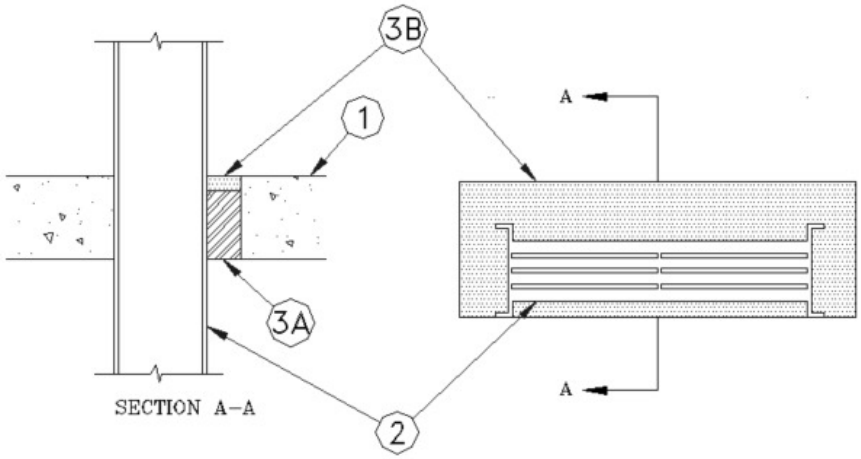
July 07, 2008

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



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/m^3) concrete floor or min 5 in. (127 mm) thick reinforced lightweight or normal concrete wall. Wall may also be constructed of any UL classified **Concrete Blocks***. Max area of opening is 345 sq.in. (2226 cm^2) with max dimension of 28-1/2 in. (724 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Busway+ —** Nom 19 in. (483 mm) wide (or smaller) by 6 in. (102 mm) deep "I" shaped aluminum and steel enclosure containing factory mounted aluminum bars rated for 600 V, 4000A.

One busway to be installed within the opening. The annular space between the flange tip of the busway and the periphery of the opening shall be min 0 in. (point contact) to max 5-1/8 in. (130 mm). The annular space between the web section of the busway and the periphery of the opening shall be a nom 8 in. (203 mm). Busway to be rigidly supported on both sides of floor or wall assembly. The busway shall bear the UL Listing Mark and shall be installed in accordance with all provisions of the National Electrical Code, NFPA 70.

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. Packing material to be recessed from top surface of floor or from both surfaces of wall to accommodate the thickness of fill material.
B. **Fill, Void, or Cavity Materials* - Caulk —** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor and both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+ Bearing the UL Listing Mark.

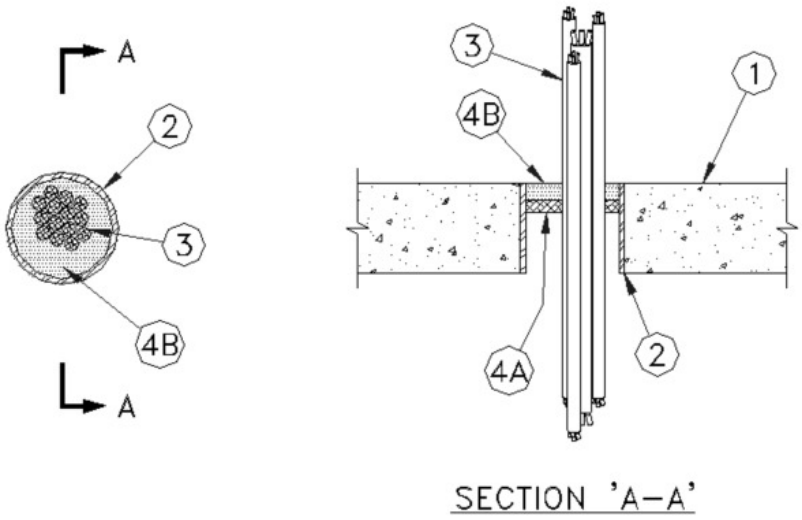
Through-penetration Firestop Systems

System No. C-AJ-3296

July 10, 2008

F Rating — 3 Hr

T Rating — 1/2 Hr



SECTION 'A–A'

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/m^3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 6 in. (152 mm).

See **Concrete Blocks** (CAZT) and **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** (Optional) — Nom 6 in. (152 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces.

3. **Cables —** Aggregate cross-sectional area of cables in sleeve or opening to be max 19 percent of the cross-sectional area inside the sleeve/opening or a max 2-9/16 in. (65 mm) diam cable bundle may be used. The annular space between cables and periphery of opening shall be min of 0 in. (point contact) to max 3-1/8 in. (79 mm). Cables to be bundled together and rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of cable may be used:

A. Max 400 pair No. 24 AWG telephone communication cable with PVC insulation and jacket.

B. Max 62.5/125 fiber optic cable with PVC insulation and jacketing.

C. Max 4/C No. 2/0 AWG (or smaller) aluminum or copper conductor aluminum or steel jacketed Metal-Clad or Armored-Clad cable.

D. Max 7/C No. 12 AWG copper conductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.

E. Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.

F. Type RG 59/U coaxial cable with polyethylene (PE) insulation and PVC jacket.

4. **Firestop System —** The details of the firestop system shall be as follows:

A. **Packing Material —** Min 1 in. (25 mm) thick backer rod, mineral wool or fiberglass batt insulation firmly packed into opening as a permanent form. 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. When the floor is constructed of hollow-core precast concrete units, packing material shall be installed symmetrically on both sides of floor and recessed from both floor surfaces.

B. **Fill, Void or Cavity Materials* —** Min 1in. (25 mm) thickness of fill material applied within annulus, flush with top surface of floor or both surfaces of wall assembly. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed symmetrically on both sides of floor, flush with both floor surfaces.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. C-AJ-8195

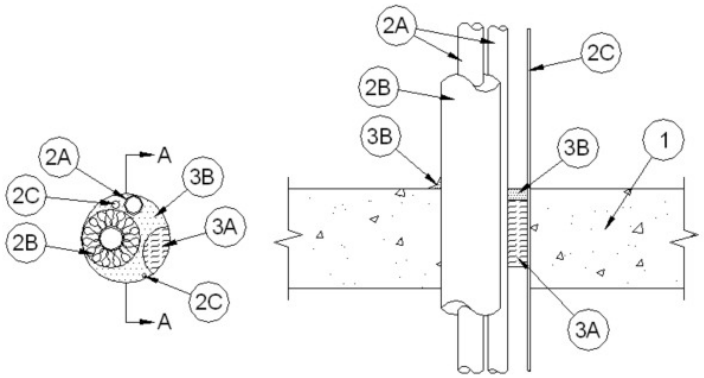
June 24, 2008

F Rating — 2 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



Section A-A

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/m^3) concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in. (102 mm).

See **Concrete Blocks (CAZT)** and **Precast Concrete Units (CFTV)** categories in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** Metallic pipes, tubing or cable to be installed either concentrically or eccentrically within the firestop system. Penetrants to be rigidly supported on both sides of floor assembly. The following types and sizes of penetrants may be used:

A. **Metallic Pipes —** Max two metallic pipes or tubing. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 2-1/4 in. (57 mm). The following types and sizes of metallic pipes or tubing may be used:

A1. **Copper Tubing —** Nom 1 in. (25 mm) diam (or smaller) Type M (or heavier) copper tube.

A2. **Copper Pipe —** Nom 1 in. (25 mm) diam (or smaller) Regular (or heavier) copper pipe.

A3. **Steel Pipe —** Nom 1 in. (25 mm) diam (or smaller) Schedule 10 steel pipe.

B. **Tube Insulation - Plastics+ —** Nom 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. The tube insulation may be installed on all tubing. The annular space between the insulated penetrating item and uninsulated metallic pipes, conduit or tubing shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm) The

annular space between the insulated penetrating item and the periphery of the opening shall be min 0 in. (point contact) to max 2-1/4 in. (57 mm).

See **Plastics (QMFZ2)** category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5A may be used.

C. **Cables —** Max two cables spaced min 0 in. (point contact) from tube insulation or min 1/2 in. 13 mm) from other penetrants. The annular space between cable and periphery of opening is min 0 in. (point contact) to max 2-1/4 in. (57 mm). Cables to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of cables may be used:
C1. Max 7/C No. 24 AWG (or smaller) control cable with polyvinyl chloride (PVC) insulation and jacket.
C2 NMax 2/C No. 10 AWG (or smaller) thermostat wire.

3. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material —** Min 3 in. (76 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 both surfaces of wall to accommodate the required thickness of fill material. When the floor is constructed of hollow-core precast concrete units, packing material shall be recessed from both surfaces of floor to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Materials* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or both surfaces of wall. Min 1/2 in. (13 mm) diam bead of fill material applied to the penetrant/concrete interface at the point contact location on the top surface of floor or both surfaces of wall. When the floor is constructed of hollow-core precast concrete units, fill material shall be installed flush with both surfaces of floor. Sealant shall be forced into interstices between penetrants to max extent possible.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Wall & Floor Penetration Fire Stops

Fire stops provide a fire resistant seal around electrical or mechanical service items that penetrate or pass through a fire resistant wall or floor.

The performance of a fire stop is measured by subjecting it to a standard time-temperature fire exposure and hose stream according to ASTM E 814. The hourly rating is established based on the period of resistance to the fire exposure while meeting the following criteria:

1. Fire shall not propagate to the unexposed side of the fire stop, nor shall any visible flaming be observed.

2. The temperature measured by any individual thermocouple on the unexposed side of the fire stop material 1" from or in the field of the penetration shall not exceed 325°F (163°C) above its initial temperature.

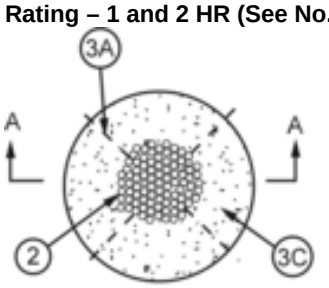
3. Following the fire exposure period, no opening shall develop that permits a projection of water beyond the unexposed surface during a hose stream application to the stop.

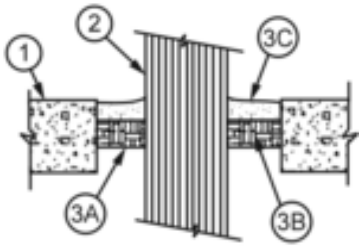
Some designs have been evaluated for wall installations only, while others are for walls or floors.

Unless otherwise noted, the fire rating is applicable from either side of the fire stop. For floor installations, the fire rating applies when the underside is exposed to fire.

Fire Stop Design 585

FIRE STOP DESIGN 585
Rating – 1 and 2 HR (See No. 3)





SECTION A-A

1.FLOOR OR WALL. Min 4-1⁄2 in. (114 mm) thick, 100 to 150 pcf (1600 to 2400 kg/m^3) weight concrete floor or wall, or min nominal 8 in. (203 mm) thick concrete block wall. Max dia. opening 15 in. (381 mm).

2.CABLES. The following type cables may be used, max 11% fill area. Maintain min distance of 4-1⁄2 in. (114 mm) between edge of opening and cables. The hourly rating depends on the type of cable used. The rating is 2 hour if there are no cable penetrations.

a.Max 50 pair No. 24 AWG telephone cable with PVC insulation and jacket, O.D. of 0.63 in. (16 mm). Rating is 1 hour.

b.Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket, O.D. of 0.46 in. (12 mm). Rating is 2 hour.

c.Max 7/C, No. 12 AWG cable with PVC or XLPE insulation and PVC jacket, O.D. of 0.565 in. (14 mm). Rating is 1 hour.

3.FIRE STOP COMPONENTS.

a.Wire Supports. Two U-shaped No. 9 ga.steel wire support.

b.Forming Material. Mineral fiber batt insulation, min 2 in. (51 mm) thick having a min density of 4 pcf (64 kg/m^3). Firmly compress material within opening. Surface recess 1 in. (25 mm) from top surface of floor or from each surface of wall. Install loose ceramic fiber insulation between cables.

c.Fill Material. Compound applied to fill floor opening to a min depth of 1 in. (25 mm) with additional material applied around cables to form 1⁄8 in. (3 mm) cant. In walls, compound shall be applied at both sides.

Accumetric LLC
350 Ring Rd, Elizabethtown, Kentucky 42701, USA

Design Component	Product	Listing Country	Product Type	Certification Type
3c	Boss 816 Sealant	United States of America	Fill Material	FM Approved

Fire Stop Design 585

Category:	Penetration Seal
Design Number:	585
Rating:	1, 2
Construction:	Floor, Wall
Penetrant:	Cable or Cable Tray
Wall Material Type:	Concrete
Joint Type:	na
Min. Wall Thickness (in.):	4 1/2
Min. Wall Thickness (mm):	114
Min. Floor Thickness (in.):	4 1/2
Min. Floor Thickness (mm):	114

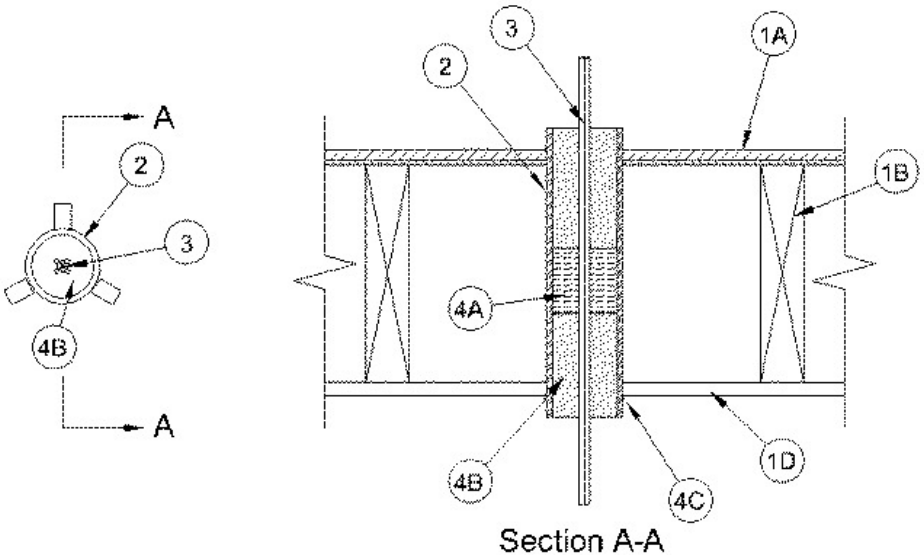
Through-penetration Firestop Systems

System No. F-C-3090

November 07, 2008

F Rating — 1 Hr

T Rating — 1 Hr



Section A-A

1. **Floor or Wall Assembly —** The 1 hr fire-rated wood joist, wood truss or combination wood and steel truss Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual L500 Series Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3 in. (76 mm).

B. **Joists —** Nom 2 by 10 in. (51 by 254 mm) deep (or deeper) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends firestopped or steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends firestopped.

C. **Furring Channels —** (Not Shown) - Resilient galv steel furring channels installed perpendicular to wood joists (Item 1B) as required in the individual Floor-Ceiling Design.

D. **Gypsum Board* —** Nom 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. Max diam of opening is 3 in. (76 mm).

1. **Chase Wall —** (Optional, Not Shown) - The through penetrant (Item 2) may be routed through a 1 hr fire rated single, double or staggered wood stud/gypsum board chase wall constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 6 in. (51 by 152 mm), or double nom 2 by 4 in. (51 by 102 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 6 in. (51 by 152 mm) or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted. Max diam of opening is 3 in. (76 mm).

C. **Top Plate —** The double top plate shall consist of two nom 2 by 6 in. (51 by 152 mm) or two sets of parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted. Max diam of opening is 3 in. (76 mm).

D. **Gypsum Board* —** Thickness, type, number of layers and fasteners shall be as specified in the individual Wall and Partition Design.

2. **Steel Sleeve —** Cylindrical sleeve fabricated from min 0.030 in. (0.76 mm) thick galv sheet steel and having a min 1 in. (25 mm) lap along the longitudinal seam. Length of sleeve to be equal to thickness of floor-ceiling assembly plus 2 in. (51 mm) such that, when installed, the ends of the sleeve will project approx 1 in. (25 mm) above the top surface of floor and 1 in. (25 mm) below the bottom surface of ceiling or lower top plate of chase wall assembly. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the openings and releasing the coil to let it uncoil against the circular cutouts in the plywood floor and gypsum board ceiling or top plates of chase wall assembly. As a final step, three nom 1/2 in. (13 mm) wide by 1 in. (25 mm) long mounting tabs shall be formed bent at 90° towards the surface of the floor.

3. **Cables —** Aggregate cross-sectional area of cables in opening to be max 5 percent of the aggregate cross-sectional area of the opening. Cable bundle to be centered within opening and rigidly supported on both sides of floor-ceiling assembly. Any combination of the following types and sizes of cables may be used:

A. Max 2 /C No. 18 AWG with polyvinyl chloride (PVC) insulation and jacket materials.

B. Max 4 pair No. 24 AWG telephone cable with PVC insulation and jacket materials.

C. Max RG/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacket materials.

D. Max 3/C (with ground) No. 14 AWG (or smaller) nonmetallic sheathed (Romex) cable with PVC insulation and jacket materials.

4. **Firestop System —** The details of the firestop system shall be as follows:

A. **Packing Material —** Min 3 in. (76 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor and bottom surface of ceiling or lower top plate of chase wall assembly to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Foam —** Min 4-1/2 in. (114 mm) thickness of fill material applied within the annulus on both top and bottom surfaces of mineral wool insulation. Foam installed flush with both ends of steel sleeve.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

C. **Fill, Void or Cavity Material* - Sealant —** Prior to the fabrication of the mounting tabs of the steel sleeve (Item 2), min 1/4 in. (6 mm) diam bead of fill material applied around the outer circumference of steel sleeve at on top surface of floor and bottom surface of ceiling or lower top plate of chase wall assembly.

ACCUMETRIC L L C — Boss 136 or 139 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. F-C-3104

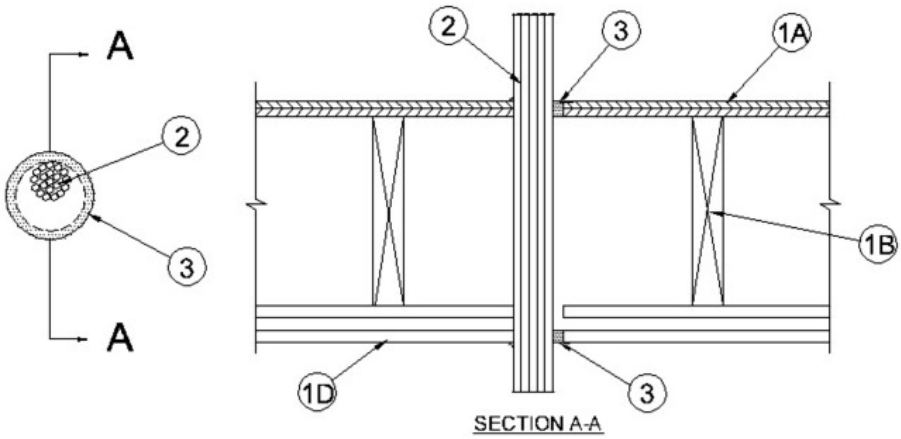
April 11, 2008

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 — 1.4 CFM/sq ft



1. **Floor Ceiling Assembly —** The 1 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The 2 hr fire-rated wood joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in Design Nos. L505, L511 or L536 in the UL Fire Resistance Directory. The general construction features of the floor-ceiling assembly are summarized below:

A. **Flooring System —** Lumber or plywood subfloor with finish floor of lumber, plywood or **Floor Topping Mixture*** as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 4 in. (102 mm).

B. **Wood Joists* —** For 1 hr fire-rated floor-ceiling assemblies nom 10 in. (254 mm) deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or **Structural Wood Members*** with bridging as required and with ends fireblocked. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. (51 by 254 mm) lumber joists spaced 16 in. (406 mm) OC with nom 1 by 3 in. (25 by 76 mm) lumber bridging and with ends fireblocked.

C. **Furring Channels (Not Shown) —** In 2 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between first and second layers of gypsum board (Item 1D). Furring channels spaced max 24 in. (610 mm) OC. In 1 hr fire-rated assemblies, resilient galv steel furring installed perpendicular to wood joists between gypsum board and wood joists as specified in the individual Floor-Ceiling Design. Furring channels spaced max 24 in. (610 mm) OC.

D. **Gypsum Board* —** Nom 4 ft (1.2 m) wide by 5/8 in. (16 mm) thick as specified in the individual Floor-Ceiling Design. First layer of gypsum board secured to wood joists or furring channels as specified in the individual Floor-Ceiling Design. Second layer of gypsum board (2 hr fire-rated assembly) screw-attached to furring channels as specified in the individual Floor-Ceiling Design. Max diam of ceiling opening is 4 in. (102 mm).

The F Rating of the firestop system is equal to the hourly fire rating of the floor-ceiling assembly in which it is installed.

1.1 **Chase Wall —** (Optional, Not Shown) — The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs —** Nom 2 by 6 in. (51 by 152 mm) lumber or double nom 2 by 4 in. (51 by 102 mm) lumber studs.

B. **Sole Plate —** Nom 2 by 6 in. (51 by 152 mm) lumber or parallel 2 by 4 in. (51 by 102 mm) lumber plates, tightly butted.

C. **Top Plate —** The double top plate shall consist of two nom 2 by 6 in. (51 by 152 mm) lumber plates or two sets of nom 2 by 4 in. (51 by 102 mm) lumber plates tightly butted. Max diam of opening is 4 in. (102 mm).

D. **Gypsum Board* —** Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.

2. **Cables —** Max 3-1/2 in. (89 mm) diam bundle tight bundle of cables to be installed either concentrically or eccentrically within the firestop system. The annular space between cable bundle and the periphery of the opening shall be a min 0 in. (point contact) to max 1/2 in. (13 mm). Penetrants to be rigidly supported on both sides of floor-ceiling assembly. The following types and sizes of cables may be used:

A. Max 100 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with PVC insulation and jacketing.

B. Max 3/C No. 2/0 AWG (or smaller) aluminum conductor SER cable with PVC insulation and jacketing.

C. Max 3/C with ground No. 12 AWG (or smaller) Type NM (Romex) nonmetallic sheathed cable with PVC insulation and jacketing.

D. Max 7/C No. 12 AWG (or smaller) power/control cables with PVC insulation and jacketing.

E. Max RG/U (or smaller) copper conductor coaxial cable with fluorinated ethylene insulation and jacketing materials.

2A. **Through Penetrating Products* —** Max 4/C with ground No. 2 AWG (or smaller) aluminum or copper conductor aluminum jacketed Metal-Clad+ cable. Max one cable to be installed within the cable bundle. Max diam of cable bundle including this metal clad cable not to exceed 3-1/2 in. (89 mm).

ALCAN CABLE, DIV OF ALCAN ALUMINUM

CORP

3. **Fill, Void or Cavity Material* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with the top surface of the floor or sole plate. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling or top plate. Fill material to forced within interstices of cable bundle to max extent possible. At point contact, min 3/8 in. (10 mm) diam bead of fill material applied at cable bundle/floor or sole plate interface and at cable bundle/ceiling or top plate interface. Additional sealant shall be applied in such a manner that the sealant overlaps a min 1/2 in. (13 mm) beyond the periphery of the opening on the top surface of the floor or sole plate and bottom surface of ceiling or bottom top plate.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

+Bearing the UL Listing Mark

Through-penetration Firestop Systems

System No. F-E-3016

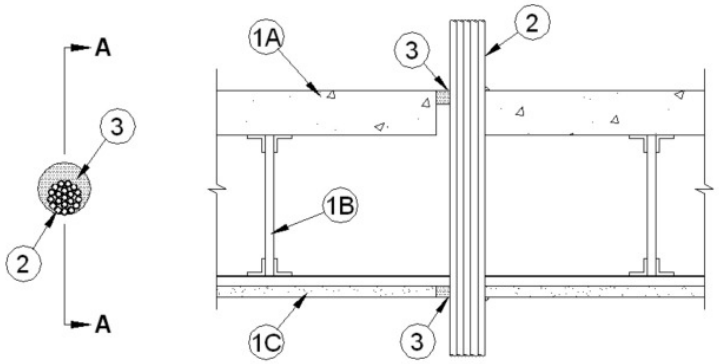
July 10, 2008

F Rating — 1 Hr

T Rating — 1 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — 1.4 CFM/sq ft



Section A-A

1. **Floor -Ceiling Assembly —** The 1 hr fire-rated concrete and steel joist Floor-Ceiling assembly shall be constructed of the materials and in the manner described in the individual G500 Series Design in the UL Fire Resistance Directory, as summarized below:

A. **Concrete Floor —** Normal weight or lightweight (100-150 pcf or 1600-2400 kg/m^3) concrete over metal lath or steel deck as specified in the individual G500 Series Design. Max diam of floor opening is 4 in. (102 mm).

B. **Joists —** Steel joists or **Structural Steel Members*** as specified in the individual G500 Series Design.

C. **Gypsum Board* —** Min 5/8 in. (16 mm) thick, screw-attached to furring channels as specified in the individual G500 Series Design. Max diam of ceiling opening is 4 in. (102 mm).

2. **Cables —** Max 3-1/2 in. (89 mm) diam tight bundle of cables to be installed either concentrically or eccentrically within the firestop system. The annular space between cable bundle and the periphery of the opening shall be min 0 in. (point contact) to max 1/2 in. (13 mm). Penetrants to be located approx midway between joists and rigidly supported on both sides of floor-ceiling assembly. The following types and sizes of cables may be used:

A. Max 100 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) insulation and jacketing.

B. Max 3/C No. 2/0 AWG (or smaller) aluminum conductor SER cable with PVC insulation and jacketing.

C. Max 3/C with ground No. 12 AWG (or smaller) Type NM (Romex) nonmetallic sheathed cable with PVC insulation and jacketing.

D. Max 7/C No. 12 AWG (or smaller) power/control cables with PVC insulation and jacketing.

E. Max RG/U (or smaller) copper conductor coaxial cable with fluorinated ethylene insulation and jacketing materials.

2A. **Through Penetrating Products* —** Max 4/C with ground No. 2 AWG (or smaller) aluminum or copper conductor aluminum jacketed Metal-Clad+ cable. Max one cable to be installed within the cable bundle. Max diam of cable bundle including metal clad cable not to exceed 3-1/2 in. (89 mm).

ALCAN CABLE, DIV OF ALCAN ALUMINUM

CORP

3. **Fill, Void or Cavity Materials* — Sealant —** Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with top surface of floor. Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with bottom surface of ceiling. Fill material to forced within interstices of cable bundle to max extent possible. At point contact locations, min 1/4 in. (6 mm) diam bead of fill material applied at penetrant/concrete interface on top surface of floor and penetrant/gypsum board interface on bottom surface of ceiling.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

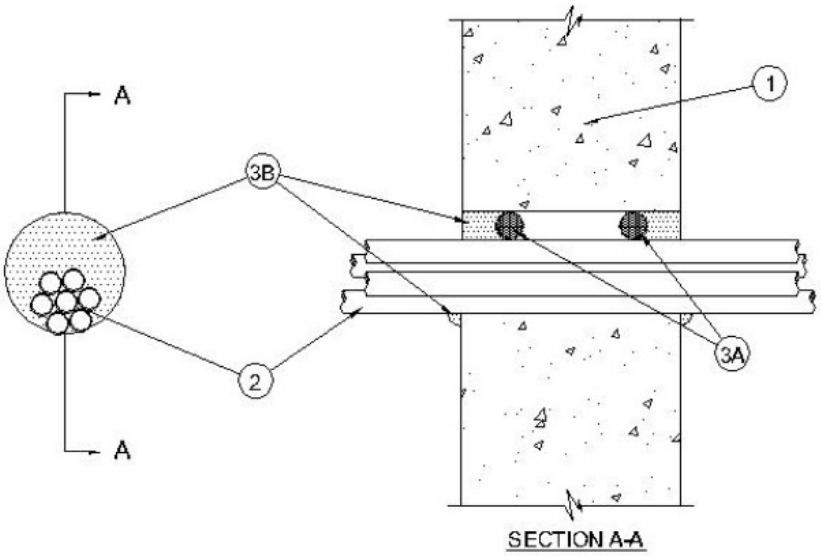
Through-penetration Firestop Systems

System No. W-J-3161

March 21, 2008

F Rating — 2 Hr

T Rating — 1/2 Hr



1. **Wall Assembly —** Min 4-1/2 in. (114 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4 in.(102 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cables —** Aggregate cross-sectional area of cables to be min 25 percent to max 64 percent of the aggregate cross-sectional area of the opening. Cables to be tightly bundled and rigidly supported on both sides of wall assembly. The annular space between cables and periphery of opening shall be min 0 in. (point contact) to max 2 in. Any combination of copper conductor cables of the following types and sizes may be used:

A. Max 2/C with ground, No. 12 AWG MC (BX) cable with polyvinyl chloride (PVC) insulation on conductors inside a steel armored jacket.
B. Max 3/C with ground, No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
C. Max 3/C with ground, No. 10 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.

D. Max 25 pair, No. 20 AWG (or smaller) copper conductor telephone cable with XLPE/PVC insulation, with or without PVC jacket.
E. Max RG59/U (or smaller) television coaxial cable with fluorinated ethylene insulation and jacketing.
F. Max 4 pair, No. 24 AWG (or smaller) copper conductor data cable with Hylar insulation and jacketing.
G. Max 2/C, No. 22 AWG (or smaller) copper conductor alarm cable with PVC insulation.
H. Max 1/C, No. 14 AWG (or smaller) Type MTW or THHN or THWN or gas & oil res II 600V (UL) or AWM VW-1 power cable.
I. Max 1/C, No. 10 AWG (or smaller) Type THHN or THWN gasoline & oil resistant II 600V VW-1 E116364 (UL) power cable.
J. Max 4/C, No. 18 AWG Type CL-2 Barostat II Sun res (UL) Listed thermostat cable.
K. Max 3/C, No. 4/0 with ground, AWG aluminum Triple E Alloy AA8176 Type SE cable Style U Type XHH-W-2 CDRS E32071 (UL) service entrance cable.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** (Optional) - Foam backer rod firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material* - Caulk —** Min 5/8 in.(16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location, a 1/2 in.(13 mm) diam bead of caulk applied at interface of cables and periphery of opening on both surfaces of wall.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

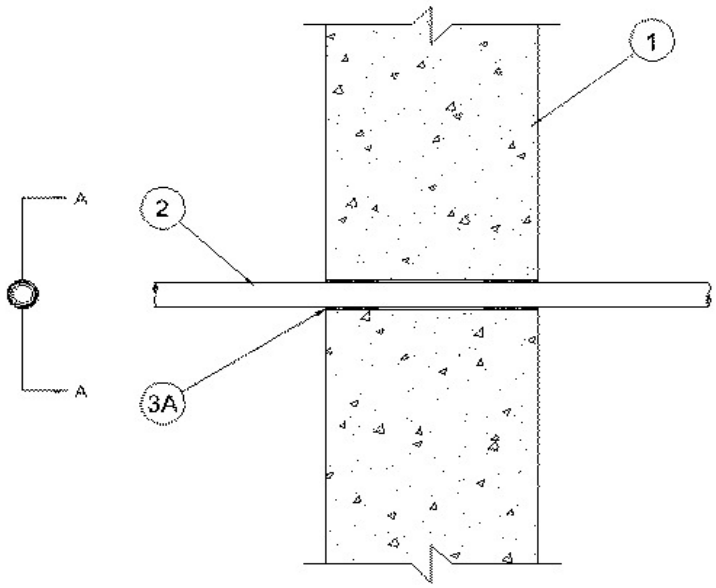
Through-penetration Firestop Systems

System No. W-J-3101

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



SECTION A-A

1. **Wall Assembly —** Min 5 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Diameter of opening is 3/4 in.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Cables —** One multi-conductor cable centered within a nom ¾ in. opening. Cable to be rigidly supported on both sides of the wall assembly. The following types and sizes of cables may be used:

A. Max 25 pr telephone cable No. 24 AWG (or smaller). Max diam. 0.40 in.

B. Max seven conductor No. 12 AWG (or smaller). Max diam ½ in. wire cable.

C. Max. 50 cond. (or smaller) fiber optic cable. Max. diam 0.68 in.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Materials* - Sealant —** Min 1-1/4 in. fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

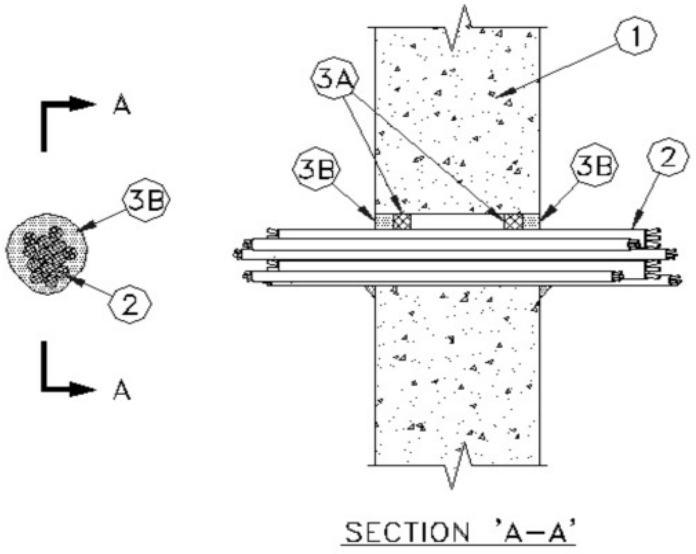
Through-penetration Firestop Systems

System No. W-J-3176

July 10, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 1/2 and 1 Hr (See Item 1)



SECTION 'A–A'

1. **Wall Assembly —** Min 4-7/8 in. (124 mm) and 6-1/8 in. (156 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete for 1 and 2 hr rated assemblies, respectively. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 5 in. (127 mm).

See **Concrete Blocks** (CAZT) in Volume 1 of the Fire Resistance Directory for names of manufacturers.

The hourly T Rating is 1/2 hr and 1 hr for 1 and 2 hr rated assemblies, respectively.

2. **Cables —** Aggregate cross-sectional area of cables to be max 64 percent of the cross-sectional area of the opening. Cables to be tightly bundled and rigidly supported on both sides of wall assembly. The annular space between the cables and the periphery of opening shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm). Any combination of following types and sizes of copper conductor cables may be used:

A. Max 3/C with ground, No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.

B. Max 1/C No. 350 kcmil (or smaller) copper conductor cable with cross-linked polyethylene (XLPE) jacket.

C. Max 7/C No. 12 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation with XLPE or PVC jacket.

D. Max 400 pair No. 24 AWG copper telephone cables, with Polyvinyl Chloride (PVC) insulation and jacket.

E. Max 4/C No. 2/0 (or smaller) aluminum or copper conductor, aluminum or steel jacketed metal-clad or armored-clad cable.

F. Max RG/6 No. 18 AWG Type CATV copper conductor coaxial cable with Polyvinyl Chloride (PVC) insulation and jacket.

G. Max 3/C No. 2/0 AWG (or smaller) copper or aluminum conductor SER cables with PVC nsulation and jacket.

H. Max RG59/U (or smaller) television coaxial cable with fluorinated ethylene insulation and jacketing.

I. Max 62.5/125 micron fiber optic cables with PVC insulation and jacket.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** (Optional) — Mineral wool or fiberglass insulation or foam backer rod compressed and firmly packed into annular space from each end of opening and recessed 5/8 in. (16 mm) from each wall surface.

B. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location, 1/2 in. (13 mm) diam bead of sealant applied at interface of cables and periphery of opening on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-J-3175

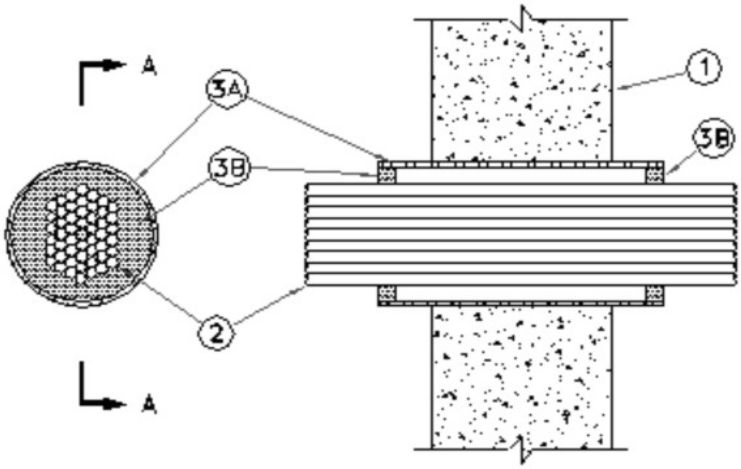
July 10, 2008

F Rating — 2 Hr

T Rating — 1 Hr

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — 1.4 CFM/sq ft



SECTION 'A-A'

1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 4-1/2 in. (114 mm).

See **Concrete Blocks** (CAZT) in Volume 1 of the Fire Resistance Directory for names of manufacturers.

2. **Cables —** Aggregate cross-sectional area of cables in opening to be max 19 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. to max 2 in. (51 mm). The following types and sizes of cables may be used:

A. Max 7/C No. 16 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.

B. Max 4 pairs No. 24 AWG (or smaller) copper conductor data cables with Hylar insulation and jacket.

C. Max 2/C No. 12 AWG (or smaller) cables with PVC insulation and jacket.

D. Max 62.5/125 micron fiber optic cables with PVC insulation and jacket.

E. Type RG59/U coaxial cables with polyethylene (PE) insulation and PVC jacket.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Metallic Sleeve —** Nom 4 in. (102 mm) diam (or smaller) steel, iron or EMT sleeve with min 0.083 in. (2.1 mm) wall thickness, tightly fitted into 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. Sleeve is optional when wall thickness is equal to or greater than 8 in. (203 mm).

B. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with ends of steel 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 interfaces of the sleeve and both wall surfaces.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

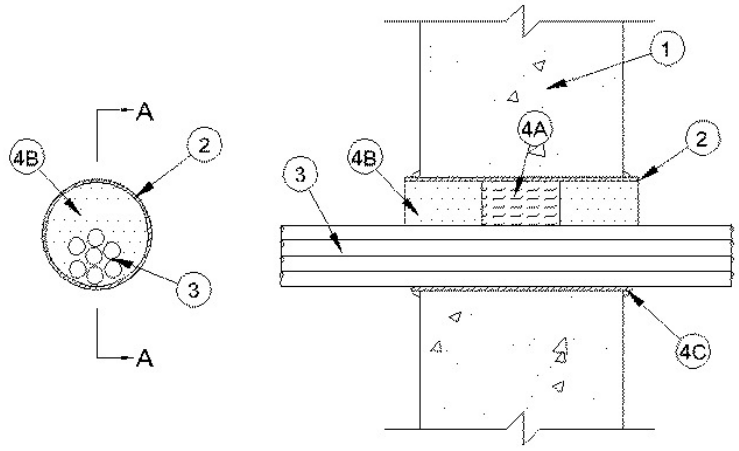
Through-penetration Firestop System

System No. W-J-3153

November 06, 2008

F Rating — 2 Hr

T Rating — 0 Hr



Section A-A

1. **Wall Assembly —** Min 6 in. (152 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL **Classified Concrete Blocks***. Max diam of opening is 3 in. (76 mm).

See **Concrete Blocks** (CAZT) category in the UL Fire Resistance Directory for names of manufacturers.

2. **Metallic Sleeve —** Cylindrical sleeve fabricated from min 0.034 in. (0.86 mm) thick galv sheet steel and having a min 1/2 in. (13 mm) lap along the longitudinal seam. Length of steel sleeve to be equal to the thickness of the wall plus a min 1/2 in. (13 mm), such that when installed, the ends of the steel sleeve extend a min 1/4 in. (6 mm) to a max 1 in. (25 mm) beyond each surface of the wall. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the opening and releasing the coil to let it uncoil against the circular openings in the concrete.

3. **Cables —** Aggregate cross-sectional area of cables in opening to be max 34 percent of the aggregate cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening shall be min 0 in. (0 mm, point contact) to max 1-1/4 in. (32 mm). Cables to be rigidly supported on both surfaces of the wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 4 pair No. 24 AWG copper conductor Cat5e or Cat 6 telephone cable with polyvinyl chloride (PVC) insulation and jacket materials.

B. Max 12 core No. 26 AWG shielded multi coax cable with foam high density polyethylene insulation and PVC jacket.

C. Max 1/C No. 8 AWG copper conductor cable with PVC insulation and nylon jacket materials.

D. Max 100 pair No. 24 AWG copper conductor telephone cable with PVC insulation and jacket materials.

E. Max RG/6 (or smaller) coaxial cable with fluorinated ethylene (FE) or PVC insulation and jacket materials.

F. Max 7/C No. 12 AWG copper conductors with PVC insulation and jacket materials.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 2 in. (52 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Foam —** Min 2-1/4 in. (57 mm) thickness of fill material applied within the annulus on both sides of mineral wool insulation. Foam installed flush with both ends of steel sleeve.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

C. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) diam bead of fill material applied at the steel sleeve/concrete interface on both sides of wall.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

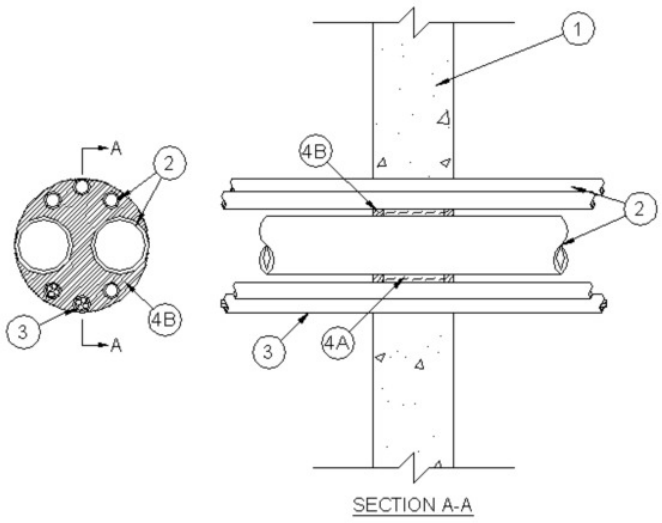
Through-penetration Firestop Systems

System No. W-J-8046

June 24, 2008

F Rating— 2 Hr

T Ratings — 0 and 1 Hr (See Items 2 and 3)



1. **Wall Assembly —** Min 6 in. (152 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 10 in. (254 mm).

See **Concrete Blocks (CAZT)** in the Fire Resistance Directory for names of manufacturers.

2. **Through Penetrants —** A max of four 1 in. (25 mm) diam and three 4 in. (102 mm) diam (or smaller) metallic pipes, conduits or tubing to be installed within the firestop system. The annular space between the pipes, conduits or tubing and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Separation between pipes, conduits or tubing shall be min 1/2 in. (13 mm) to max 1-5/8 in. (156 mm). Pipes, conduits or tubing to be rigidly supported on both sides of the wall assembly. The following types and sizes of pipes, conduits and tubes may be used:

A. **Steel Pipe —** Nom 4 in. (102 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. (102 mm) diam (or smaller) rigid steel conduit or steel electrical metallic tubing (EMT).
D. **Copper Pipe —** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
E. **Copper Tube —** Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tube.
F. **Copper Pipe —** Nom 1 in. (25 mm) diam Type K copper pipe.

When any metallic penetrant is used the T Rating is 0 hr.

3. **Cables —** Nom 3 in. (76 mm) diam (or smaller) tight bundle of cables. Cable bundle spaced min 1 in. (25 mm) from other penetrants. Annular space between cable bundle and periphery of opening to be min 0

in. (point contact) to max 1-1/2 in. (38 mm). Cable bundle to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 400 pair, 24 AWG telephone communication cable with PVC insulation and jacket.
B. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
C. Max 7/C No. 12 AWG copper conductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.
D. Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
E. Type RG 59/U coaxial cable with polyethylene (PE) insulation and PVC jacket.

When cable bundle is used without any metallic penetrant the T Rating is 1 hr.

4. **Firestop System —** The firestop system shall consist of the following items:

A. **Packing Material —** Foam plastic backer material or backer rod or mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material. When annular space between penetrants and/or between penetrants and edge of opening is 3/4 in. (19 mm) or less packing material is optional.

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact locations, min 1/2 in (13 mm) diam bead of fill material applied at through penetrant/concrete interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

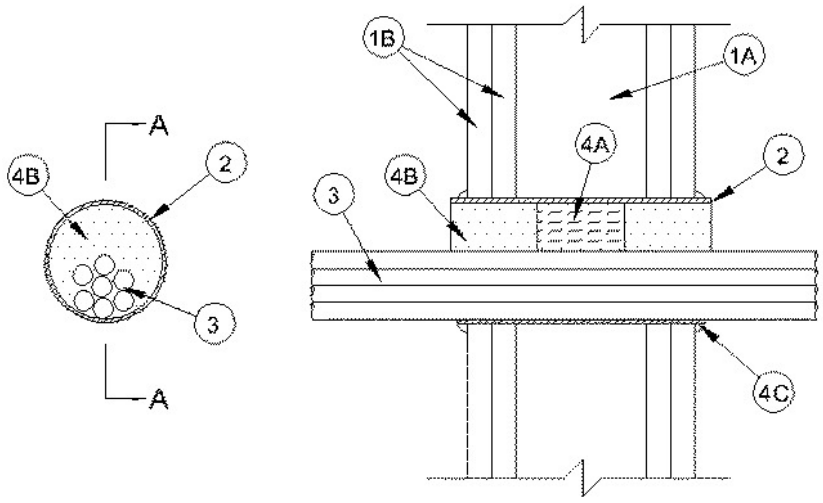
Through-penetration Firestop Systems

System No. W-L-3298

November 06, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



Section A-A

1. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel 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 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 24 in. (610 mm) OC.

B. **Gypsum Board* —** Min 5/8 in. (16 mm) thick gypsum board. Max diam of opening shall be 3 in. (76 mm).

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. **Metallic Sleeve —** Cylindrical sleeve fabricated from min 0.034 in. (0.86 mm) thick galv sheet steel and having a min 1/2 in. (13 mm) lap along the longitudinal seam. In 2 hr wall assemblies, length of steel sleeve to be equal to the thickness of the wall plus a min 1/2 in. (13 mm), such that when installed, the ends of the steel sleeve extend a min 1/4 in. (6 mm) to a max 1 in. (25 mm) beyond each surface of the wall. In 1 hr wall assemblies, length of steel sleeve to be equal to the thickness of the wall plus a nom 2 in. (51 mm), such that when installed, the ends of the steel sleeve extend a nom 1 in. (25 mm) beyond each surface of the wall. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the opening and releasing the coil to let it uncoil against the circular cutouts in the gypsum board layers.

3. **Cables —** Aggregate cross-sectional area of cables in opening to be max 34 percent of the aggregate cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening

shall be min 0 in. (0 mm, point contact) to max 1-1/4 in. (32 mm). Cables to be rigidly supported on both surfaces of the wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 4 pair No. 24 AWG copper conductor Cat5e or Cat 6 telephone cable with polyvinyl chloride (PVC) insulation and jacket materials.

B. Max 12 core No. 26 AWG shielded multi coax cable with foam high density polyethylene insulation and PVC jacket.

C. Max 1/C No. 8 AWG copper conductor cable with PVC insulation and nylon jacket materials.

D. Max 100 pair No. 24 AWG copper conductor telephone cable with PVC insulation and jacket materials.

E. Max RG/6 (or smaller) coaxial cable with fluorinated ethylene (FE) or PVC insulation and jacket materials.

F. Max 7/C No. 12 AWG copper conductors with PVC insulation and jacket materials.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Min 2-1/8 in. (54 mm) thickness of min 4 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* - Foam —** Min 2-1/4 in. (57 mm) thickness of fill material applied within the annulus on both sides of mineral wool insulation. Foam installed flush with both ends of steel sleeve.

ACCUMETRIC L L C — Boss 813 FR Expanding Foam

C. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) diam bead of fill material applied at the steel sleeve/gypsum board interface on both sides of wall.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

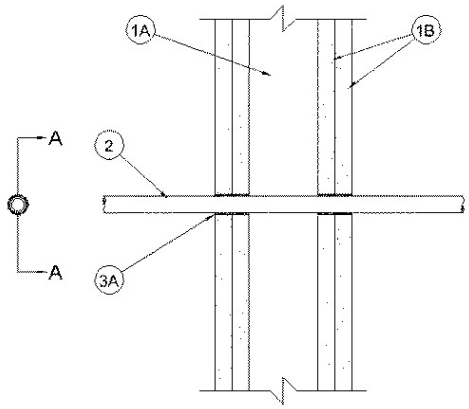
Through-penetration Firestop Systems

System No. W-L-3222

November 06, 2008

F Ratings — 1 and 2 Hr

T Rating — 0 Hr



SECTION A-A

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 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.

B. **Gypsum Board* —** One or two layers of nom 5/8 in. thick gypsum board as specified in the individual Wall and Partition Design. Nom. diam of opening is 3/4 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. **Cables —** One multi-conductor cable centered within a nom ¾ in. diam opening. Cable to be rigidly supported on both sides of wall assembly. The following types and sizes of cables may be used:

A. Max 25 pr telephone cable No. 24 AWG (or smaller). Max diam 0.40 in.

B. Max seven conductor No. 12 AWG (or smaller). Max diam ½ in. wire cable.

C. Max. 50 cond. (or smaller) fiber optic cable. Max. diam 0.68 in.

3. **Firestop System —** The firestop system shall consist of the following:

A. **Fill, Void or Cavity Materials* - Sealant —** Min 1-1/4 in. fill material applied within annulus, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 814

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-3342

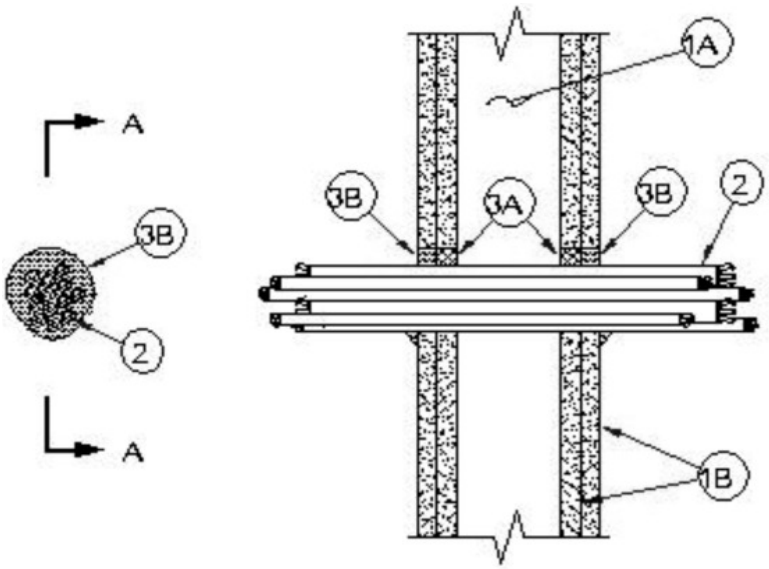
April 11, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 1/2 and 1 Hr (See Item 1)

L Rating at Ambient — Less than 1 CFM/sq ft (See Item 3)

L Rating at 400° F — Less than 1 CFM/sq ft (See Item 3)



SECTION 'A-A'

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 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.

B. **Gypsum Board* —** One or two layers of nom 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. Max diam of opening is 5 in. (127 mm).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly. The hourly T Rating is 1/2 and 1 Hr for 1 and 2 Hr rated assemblies, respectively.

2. **Cables —** Aggregate cross-sectional area of cables to be max 64 percent of the cross-sectional area of the opening. Cables to be tightly bundled and rigidly supported on both sides of wall assembly. The annular space between the cables and the periphery of opening shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm). Any combination of following types and sizes of copper conductor cables may be used:

A. Max 3/C with ground, No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
B. Max 1/C No. 350 kcmil (or smaller) copper conductor cable with cross-linked polyethylene (XLPE) jacket.
C. Max 7/C No. 12 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation with XLPE or PVC jacket.
D. Max 400 pair No. 24 AWG copper telephone cables, with Polyvinyl Chloride (PVC) insulation and jacket.
E. Max 4/C No. 2/0 (or smaller) aluminum or copper conductor, aluminum or steel jacketed metal-clad or armored-clad cable.
F. Max RG/6 No. 18 AWG Type CATV copper conductor coaxial cable with Polyvinyl Chloride (PVC) insulation and jacket.
G. Max 3/C No. 2/0 AWG (or smaller) copper or aluminum conductor SER cables with PVC insulation and jacket.
H. Max RG59/U (or smaller) television coaxial cable with fluorinated ethylene insulation and jacketing.
I. Max 62.5/125 micron fiber optic cables with PVC insulation and jacket.

3. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material —** (Optional) — Mineral wool or fiberglass insulation or foam backer rod compressed and firmly packed into annular space from each end of opening and recessed 5/8 in. (16 mm) from each wall surface.
B. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location, 1/2 in. (13 mm) diam bead of sealant applied at interface of cables and periphery of opening on both surfaces of wall. The fill material to be applied within the interstices of the cables to max extent possible for the L Ratings to apply.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

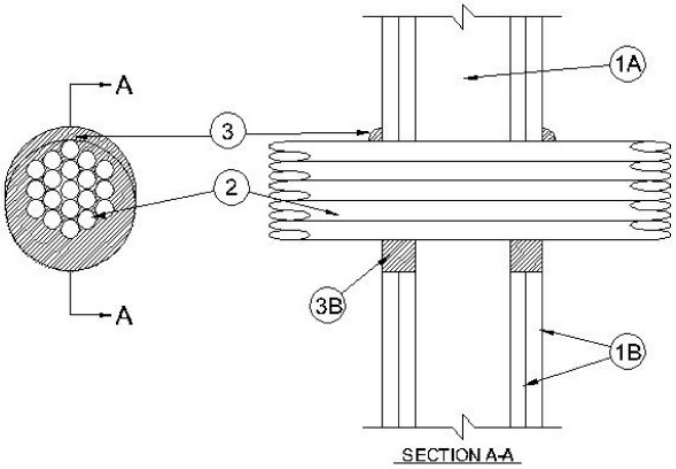
Through-penetration Firestop Systems

System No. W-L-3315

March 21, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 1/2 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 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. (52 by 102 mm) lumber spaced 16 in.(406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in.(610) OC.

B. **Gypsum Board* —** One or two layers of nom 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. Max diam of opening is 4 in.(102 mm).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly.

2. **Cables —** Aggregate cross-sectional area of cables to be min 25 percent to max 64 percent of the aggregate cross-sectional area of the opening. Cables to be tightly bundled and rigidly supported on both sides of wall assembly. The annular space between the cables and the periphery of opening shall be min 0 in. (point contact) to max 2 in. Any combination of following types and sizes of copper conductor cables may be used:

A. Max 2/C with ground, No. 12 AWG MC (BX) cable with polyvinyl chloride (PVC) insulation on conductors inside a steel armored jacket.

B. Max 3/C with ground, No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.

C. Max 3/C with ground, No. 10 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
D. Max 25 pair, No. 20 AWG (or smaller) copper conductor telephone cable with XLPE/PVC insulation, with or without PVC jacket.
E. Max RG59/U (or smaller) television coaxial cable with fluorinated ethylene insulation and jacketing.
F. Max 4 pair, No. 24 AWG (or smaller) copper conductor data cable with Hylar insulation and jacketing.
G. Max 2/C, No. 22 AWG (or smaller) copper conductor alarm cable with PVC insulation.
H. Max 1/C, No. 14 AWG (or smaller) Type MTW or THHN or THWN or gas & oil res II 600V (UL) or AWM VW-1 power cable.
I. Max 1/C, No. 10 AWG (or smaller) Type THHN or THWN gasoline & oil resistant II 600V VW-1 E116364 (UL) power cable.
J. Max 4/C, No. 18 AWG Type CL-2 Barostat II Sun res (UL) Listed thermostat cable.
K. Max 3/C, No. 4/0 with ground, AWG aluminum Triple E Alloy AA8176 Type SE cable Style U Type XHH-W-2 CDRS E32071 (UL) service entrance cable.

3. **Firestop System —** The firestop system shall consist of the following:
A. **Packing Material — (Optional, Not Shown) —** For 2 hr wall assemblies, foam backer rod firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material* - Caulk —** Min 5/8 in.(16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At point contact location, 1/2 in. (13 mm) diam bead of caulk applied at interface of cables and periphery of opening on both surfaces of wall.

ACCUMETRIC L L C — Boss 814 Sealant

*Bearing the UL Classification Mark

Through-penetration Firestop Systems

System No. W-L-3345

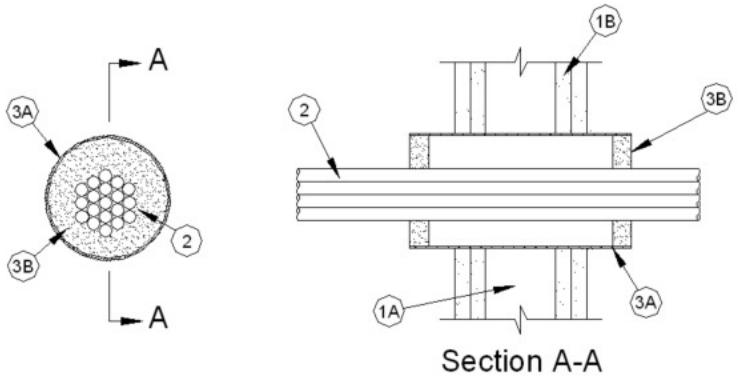
July 07, 2008

F Ratings — 1 & 2 Hr (See Item 1)

T Ratings — 1/2 and 1 Hr (See Item 1)

L Rating at Ambient — Less than 1 CFM/sq ft

L Rating at 400° F — 1.4 CFM/sq ft



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 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.

B. **Gypsum Board* —** 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum wallboard 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 4-1/2 in. (114 mm).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

The hourly T Rating is 1/2 hr and 1 hr for 1 and 2 hr rated assemblies, respectively.

2. **Cables —** Aggregate cross-sectional area of cables in opening to be max 18.6 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 2 in. (51 mm). The following types and sizes of cables may be used:

A. Max 7/C No. 16 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.

B. Max 4 pairs No. 24 AWG (or smaller) copper conductor data cables with Hylar insulation and jacket.

C. Max 2/C No. 12 AWG (or smaller) cables with PVC insulation and jacket.
D. Max 62.5/125 micron fibre optic cables with PVC insulation and jacket.
E. Type RG59/U coaxial cables with polyethylene (PE) insulation and PVC jacket.

3. **Firestop System —** The firestop system shall consist of the following:

A. **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), tightly fitted into 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.

B. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with ends of steel 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 interfaces of the sleeve and both wall surfaces.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

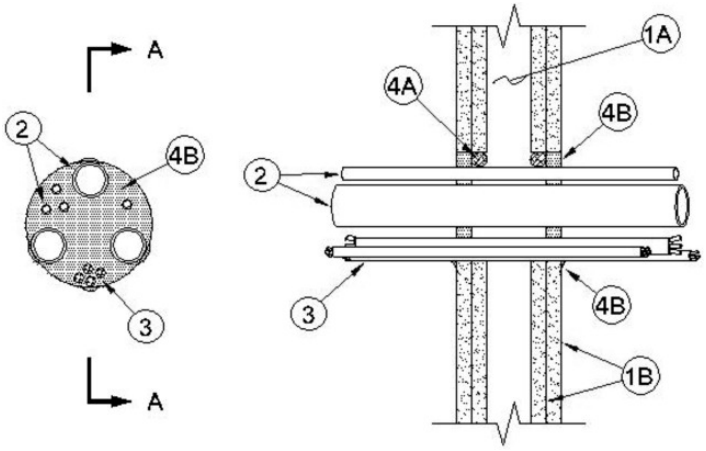
Through-penetration Firestop Systems

System No. W-L-8083

October 02, 2008

F Ratings — 1 and 2 Hr (See Item 1)

T Ratings — 0, 1/2 and 1 Hr (See Items 2 and 3)



SECTION 'A-A'

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 or Partition Design 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 3-5/8 in. wide and spaced max 24 in.

B. **Gypsum Board* —** Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design.Max diam of opening is 10 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 —** A max of four 1 in. diam and three 4 in. diam (or smaller) metallic pipes, conduits or tubing to be installed within the firestop system. The annular space between the pipes, conduits or tubing and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/2 in. Separation between pipes, conduits or tubing shall be min 1/2 in. to max 1-5/8 in. Pipes, conduits or tubing to be rigidly supported on both sides of the wall assembly. The following types and sizes of pipes, conduits and tubes may be used:

A. **Steel Pipe —** Nom 4 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. **Iron Pipe —** Nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. **Conduit —** Nom 4 in. diam (or smaller) rigid steel conduit or nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).
D. **Copper Pipe —** Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
E. **Copper Tube —** Nom 4 in. diam (or smaller) Type L (or heavier) copper tube.
F. **Copper Pipe —** Nom 1 in. diam Type K copper pipe.

When any metallic penetrant is used the T Rating is 0 hr.

3. **Cables —** Nom 3 in. diam (or smaller) tight bundle of cables. Cable bundle spaced min 1 in. from other penetrants. Annular space between cable bundle and periphery of opening to be min 0 in. (point contact) to max 1-1/2 in. Cable bundle to be rigidly supported on both sides of wall assembly. Any combination of the following types and sizes of cables may be used:

A. Max 400 pairs, 24 AWG telephone communication cable with PVC insulation and jacket.
B. 4/C No. 14 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable with XLPE insulation.
C. Max 7/C No. 12 AWG copper conductor power and control cables; XLPE or PVC insulation with XLPE or PVC jacket.
D. Max RG59/U (or smaller) coaxial cable with fluorinated ethylene insulation and jacketing.
E. Type RG 59/U coaxial cable with polyethylene (PE) insulation and PVC jacket.

When cable bundle is used without any metallic penetrant the T rating is 1/2 hr and 1 hr for 1 hr and 2hr fire rated wall assemblies, respectively.

4. **Firestop System —** The firestop system shall consist of the following:

A. **Packing Material —** Foam plastic backer material or backer rod or mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material. When annular space between penetrants and/or between penetrants and edge of opening is 3/4 in. or less packing material is optional.
B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact locations, min 1/2 in diam bead of fill material applied at through penetrant/gypsum board interface on both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Wall Opening Protective Materials

ACCUMETRIC L L C R16844
350 RING RD
ELIZABETHTOWN, KY 42701 USA

BOSS 815 Electrical Outlet Insert, for use with max 2-1/8 by 4 by 2-1/8 in deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 h fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 1-7/8 in. wide by 2-13/16 in. high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical code, (NFPA 70). Outlet boxes installed with steel cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

BOSS 815 Electrical Outlet Insert, for use with max 4 by 4 by 2-1/8 in deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 3-11/16 in. wide by 3-3/4 in high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

BOSS 815 Electrical Outlet Insert, for use with max 4 by 4 by 1-1/2 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in.deep wood studs and with max 4 by 4 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in.deep steel studs and constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 3-11/16 in wide by 3-3/4 in high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical Code, (NFPA 70). Outlet boxes installed with plastic cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Wall Opening Protective Materials

Canada

ACCUMETRIC L L C R16844
350 RING RD
ELIZABETHTOWN, KY 42701 USA

BOSS 815 Electrical Outlet Insert, for use with max 2-1/8 by 4 by 2-1/8 in deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 h fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 1-7/8 in. wide by 2-13/16 in. high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical code, (NFPA 70). Outlet boxes installed with steel cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

BOSS 815 Electrical Outlet Insert, for use with max 4 by 4 by 2-1/8 in deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 3-11/16 in. wide by 3-3/4 in high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

BOSS 815 Electrical Outlet Insert, for use with max 4 by 4 by 1-1/2 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in.deep wood studs and with max 4 by 4 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in.deep steel studs and constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 3-11/16 in wide by 3-3/4 in high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with Article 370-16 of the National Electrical Code, (NFPA 70). Outlet boxes installed with plastic cover plates. When inserts are used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Wall Opening Protective Materials

ACCUMETRIC L L C R20964
411 E DIXIE HWY
ELIZABETHTOWN, KY 42701 USA

Boss 818 Putty Pads for use with max 4 by 4 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 1 and 2 h fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory. Min 1/8 in. thick moldable putty pads are to be installed to completely cover the exterior surfaces of the outlet box (except for the side of the outlet box against the stud) and completely seal against the stud within the stud cavity. When moldable putty pad outlet box protective material is used on boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Head of Wall, Expansion & Control Joints

Assembly	Boss Products	U.L. System	Movement Capability	F-Rating	Page
Gypsum Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0409	25%	1-4 Hr.	177
Gypsum Wall / Floor Slab or Pre Cast	137	HW-D-0410	25%	1-4 Hr.	182
Gypsum Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0411	25%	1 & 2 Hr.	185
Gypsum Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0412	12.5%	1 & 2 Hr.	187
Concrete Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0413	12.5%	2 Hr.	190
Concrete Wall / Floor Slab or Precast	137	HW-D-0414	25%	2 & 3 Hr.	192
Concrete Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0415	25%	2 & 3 Hr.	194
CMU Block Wall / Fluted Floor or Roof	137	HW-D-0416	12.5%	3 Hr.	197
Concrete Wall / Fluted Floor Ceiling or Roof Deck	137	HW-D-0417	12.5%	2 Hr.	200
Gypsum Wall / Fluted Floor Ceiling or Roof Deck	816	HW-D-0507	25%	1 & 2 Hr.	203
Concrete Wall / Floor Slab or Precast	816	HW-D-0508	13%	4 Hr.	208
Concrete Wall / Fluted Floor Ceiling or Roof Deck	816	HW-D-0509	25%	2 Hr.	210
Concrete Wall / Floor Slab or Precast	816	HW-D-0510	12.5%	2 Hr.	213
Gypsum Wall / Fluted Floor Ceiling or Roof Deck	816	HW-D-0511	25%	1 & 2 Hr.	215
Concrete Wall / Floor Slab or Precast	816	HW-D-1071	15%	3 Hr.	218
Gypsum Wall / Floor Slab or Precast	816	BW-S-0018		1 & 2 Hr.	220
Concrete Floor to Floor	816	FF-D-0067	12.5%	4 Hr.	222
Concrete Floor to Floor	816	FF-D-0068	25%	2 Hr.	224
Concrete Floor to Floor	816	FF-D-1084	15%	3 Hr.	225
Concrete Floor to Concrete Wall	816	FW-D-0044	12.5%	4 Hr.	227
Concrete Floor to Concrete Wall	816	FW-D-0045	25%	2 Hr.	229
Concrete Floor to Concrete Wall	816	FW-D-1068	15%	3 Hr.	230
Concrete Wall to Wall	816	WW-D-0075	13%	4 Hr.	232
Concrete Wall to Wall	816	WW-D-0081	12.5%	2 Hr.	234
Concrete Wall to Wall	816	WW-D-1076	15%	3 Hr.	235

Joint Systems

System No. HW-D-0409

October 31, 2008

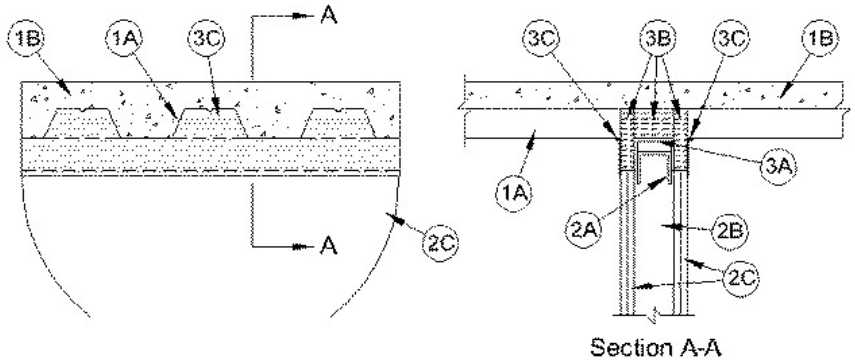
Assembly Ratings — 1, 2, 3 and 4 Hr (See Items 2 and 4)

L Rating at Ambient — Less than 1 CFM/Lin Ft

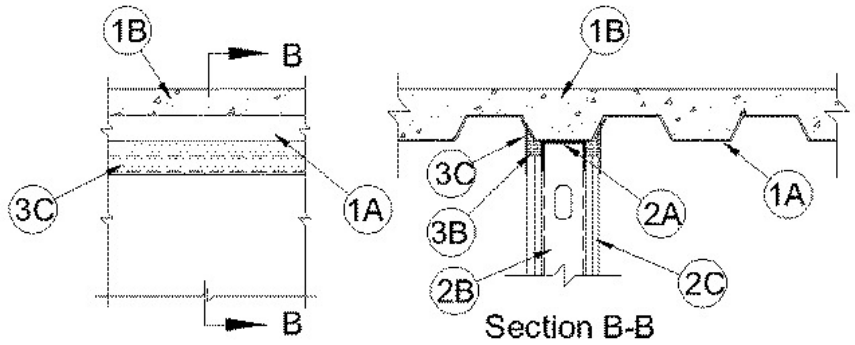
L Rating at 400 F — Less than 1 CFM/Lin FT

Nominal Joint Width — 1-1/2 and 2 In. (See Item 3)

Class II Movement Capabilities — 25% Compression or Extension



Configuration A



Configuration B

1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) reinforced concrete, as measured from the top plane of the floor units.

C. **Spray-Applied Fire Resistive Material* —** (Optional, Not Shown) - Prior to the installation of the joint system (Item 3) all surfaces of the steel floor units to be sprayed with the thickness of material specified in the individual D700 Series Design.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, RG and MK-6S

1A. **Roof Assembly — (Not Shown) —** As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 or P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** For P900 Series Designs, min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck. For P700 Series Designs, roof insulation shall be as specified in the individual design.

C. **Spray-Applied Fire Resistive Material* —** (Optional, Not Shown) - Prior to the installation of the joint system (Item 3) all surfaces of the roof deck to be sprayed with the thickness of material specified in the individual P700 Series Design.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, RG and MK-6S

The hourly fire rating of the floor or roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly.

2. **Wall Assembly —** The max separation between bottom of steel floor units, roof deck or spray-applied fire resistive material (if used) and top of wall (at time of installation of joint system) is dependent upon the type of floor or roof assembly, hourly rating of the wall and configuration of the joint system, as shown in table under Item 3. Wall may be perpendicular to direction of the fluted steel floor units or roof deck (Configuration A) or parallel to and centered under the valleys of the steel floor units or roof deck (Configuration B). The 1, 2, 3 or 4 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with min 1-1/4 in. (32 mm) flanges. Studs and gypsum board must have a min 1/4 in. (6 mm) engagement onto the flanges of the ceiling runner at the furthest point of extension of the joint. When U shaped deflection channel is used, ceiling runner is installed within the U-shaped deflection channel (Item 3B) with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel. When deflection channel is not used, ceiling runner installed perpendicular to or parallel with direction of the fluted steel deck prior to the application of the spray-applied fire resistive material (if used). Ceiling runner secured to steel deck valleys with steel masonry anchors or welds spaced max 24 in. (610 mm) OC.

A1. **Light Gauge Framing* — Slotted Ceiling Runner —** When the nom joint width is less than or equal to 1-3/4 in. (44 mm) or when the thickness of the spray-applied fire resistive material is less than 1 in. (25 mm), slotted ceiling runner may be used as an alternate to the ceiling runner in Item 2A. Slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed perpendicular to or parallel with direction of fluted steel deck prior to the application of the spray-applied fire resistive material (if used). Slotted ceiling runner secured to steel deck valleys with steel masonry anchors spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3a) shall not be used.

METAL-LITE INC — The System

SLIPTRACK SYSTEMS INC — SLP-TRK

A2. **Light Gauge Framing* — Clipped Ceiling Runner —** As an alternate to the ceiling runner in Item 2A, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 3 in. (76 mm). Clipped ceiling runner installed perpendicular to or parallel with direction of fluted steel deck prior to the application of the spray-applied fire resistive material (if used). Clipped ceiling runner secured to steel deck valleys with steel masonry anchors spaced max 24 in. (610 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. **Light Gauge Framing* —Vertical Deflection Clip —** (Optional) Steel clips can be used in conjunction with steel studs (Item 2B), ceiling runner (Item 2A) or deflection channel (Item 3A). Clips installed over the top of studs and inserted within the ceiling runner or deflection channel. Clip shall be secured to the ceiling runner or deflection channel with No. 8 self drilling, self tapping steel fasteners through holes provided within the clip. Clip may be secured to the stud with No. 6 pan head steel screw through holes provided within the clip. As an alternate, the legs of the clip may be installed over the top of the stud without attachment in accordance with manufacturer's installation instructions.

FLEX-ABILITY CONCEPTS L L C — Three Legged Dog Deflection Clip

A4. **Light Gauge Framing*- Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner installed perpendicular to or parallel with direction of fluted steel deck and secured to steel deck valleys with steel masonry anchors spaced max 24 in. (610 mm) OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

B. **Studs —** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. Studs and gypsum board must have a min 1/4 in. (6 mm) engagement onto the flanges of the ceiling runner at the furthest point of extension of the joint. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total thickness of 5/8 in., 1-1/4 in., 1-1/2 in. or 2 in. (16, 32, 38 or 51 mm) on each side of wall for 1, 2, 3 and 4 hr fire rated wall assemblies, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory, except that a max 1-1/2 or 2 in. (38 or 51 mm) gap shall be maintained between the top of the gypsum board and the bottom surface of the steel floor units or roof deck as specified in Item 3 below. The top row of screws shall be installed into the studs 4-3/4 in. (121 mm) below the valleys of the steel floor units, roof deck or spray-applied fire resistive material (if used).

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is dependent upon the hourly rating of the wall, type of assembly, and configuration of joint system. The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width. The hourly rating of the joint system is dependent upon the joint configuration, type of floor or roof assembly, max hourly rating of the wall assembly and max width of the joint as shown in the table below:**

Type of Assembly	Rating of Wall Assembly, Hr	Joint Configuration	Max Joint Width, In (mm)	Hourly Rating, Hr
D900 or P900	1, 2, 3 & 4	A	1-1/2 or 2 (38 or 51)	1, 2, 3 & 4
D900 or P900	1 & 2	B	1-1/2 or 2 (38 or 51)	1 & 2
D700 or P700	1, 2 & 3	A	1 (25)	1, 2 & 3
D700 or P700	1 & 2	B	1 (25)	1 & 2

The joint system consists of a deflection channel, forming material and fill material, as follows:

Joint Configuration A

For unprotected steel floors units or roof decks (D900 or P900 Series Designs), max separation between bottom of floor or roof and top of wall (at time of installation of joint system) is 1-1/2 in. (38 mm) for 1 hr fire rated assemblies and 2 in. (51 mm) for 2, 3 and 4 hr fire rated assemblies. For protected steel floors units or roof decks (D700 or P700 Series Designs), max separation between bottom of spray-applied fire resistive material and top of wall (at time of installation of joint system) is 1 in. (25 mm).

A. **Deflection Channel —** (Optional) - Nom 3-3/4 in. (95 mm) wide by 3 in. (76 mm) deep U-shaped channel formed from min 25 gauge galv steel. Deflection channel installed perpendicular to direction of the fluted steel deck and secured to the steel deck valleys with steel masonry anchors or by welds spaced max 12 in. (305 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Forming Material* —** Min 4-7/8 in., 6 in., 6-5/8 in. or 7-5/8 in. (124, 152, 168 or 194 mm) depth of 4 pcf (64 kg/m^3) mineral wool batt insulation for 1, 2, 3 and 4 hr fire rated assemblies, respectively, cut to the shape of the fluted deck, approx 25 percent larger than the area of the flutes and compressed into the fluted area of the steel floor or roof deck above the ceiling channel. Additional strips of min 4 pcf (64 kg/m^3) density- mineral wool batt insulation cut to a thickness equal to the overall thickness of the gypsum board, are compressed 50 percent in thickness and installed cut edge first to fill the gap between

the top of the gypsum board and bottom of the steel floor units or roof deck. The forming material shall be installed flush with both surfaces of the wall.

The type and manufacturer of forming material used within the joint system is dependent upon the hourly rating of the wall assembly as shown in the table below:

Rating of Wall, hr	Manufacturer of Mineral Wool	Type of Mineral Wool
1, 2, & 3	Fibrex Insulation Inc	FBX Safing Insulation
1, 2, & 3	W. R. Grace	FlameSafe Mineral Wool
1, 2, 3, & 4	Roxul Inc	SAFE Mineral Wool
1 & 2	Rock Wool Manufacturing	Delta Safing Insulation
1, 2 & 3	Thermafiber Inc	SAF

FIBREX INSULATIONS INC — FBX Safing Insulation
ROCK WOOL MANUFACTURING CO — Delta Safing Insulation
ROXUL INC — SAFE Mineral Wool Batts
THERMAFIBER INC — SAF
W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B1. **Spray-Applied Fire Resistive Material* (Not Shown) —** As an alternate to the forming material (Item 3A) within the flutes, min 4-7/8 in., 6 in., 6-5/8 in., or 7-5/8 in. (124, 152, 168 or 194 mm) depth of spray-applied fire resistive material, for 1, 2, 3, and 4 hr fire rated assemblies, respectively, installed into the flutes of the steel floor or roof deck between the top of the wall and the bottom of the steel floor units or roof deck. Material shall be excluded from the joint immediately above the top of the gypsum board assemblies. The spray-applied fire resistive material is mixed with water in accordance with the mixing instructions on the bag and is sprayed and/or troweled to fill the flute above the wall. The min average density of the spray applied fire resistive material shall be 15 pcf (240 kg/m^3) with a min individual density of 14 pcf. (224 kg/m^3). See Design Information in Volume 1 of the Fire Resistance Directory for method of density determination.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Types MK-6/HY, MH-6/HY ES, RG, MK-6s, Z-106/G, Z-106, Z-106/HY and Z-146.

B2. **Forming Material* - Plugs —** (Not Shown) As an alternate to the forming material and spray-applied fire resistive material (Items 3B and 3B1), mineral wool plugs preformed to the shape of the fluted floor units, may be used within the flutes. Plugs shall be friction fit to completely fill the flutes above the ceiling channel. The plugs shall project beyond each side of the ceiling runner, flush with wall surfaces. Additional forming material, described in Item 3B, to be used in conjunction with the plugs to fill the gap between the top of gypsum board and bottom of steel floor units or roof deck. **Plugs to be used in max 2 hr fire rated wall assemblies.**

ROCK WOOL MANUFACTURING CO — Deck Plugs

C. **Fill, Void or Cavity Material* — Sealant —** For assemblies incorporating mineral wool insulation within the flutes, min 1/8 in. (3 mm) wet thickness of fill material spray or brush applied on each side of the wall in the fluted area of the steel floor units or roof decks and between the top of the wall and the bottom of the steel floor units roof deck. Sealant shall overlap a min 1/2 in. (13 mm) onto wall and steel floor units or roof deck on both sides of wall or spray-applied fire resistive material, if used. For assemblies incorporating spray-applied fire resistive materials within the flutes, min 1/8 in. (3 mm) wet thickness of fill material spray or brush to cover the mineral wool insulation within the joint between the top of the wall and the bottom of the steel floor units roof decks. Sealant shall overlap a min 1/2 in. (13 mm) onto wall and a min 1/2 in. (13 mm) above the joint onto the spray-applied fire resistive material within the flutes on both sides of wall. When optional through penetrant (Item 4) is used, fill material to overlap a min of 1/2 in. (13 mm) onto conduit or EMT on both sides of wall.

Joint Configuration B

For unprotected steel floor units or roof decks (D900 or P900 Series Designs), max separation between bottom of floor or roof and top of wall (at time of installation of joint system) is 1-1/2 and 2 in. (38 and 51 mm) for 1 and 2 hr fire rated assemblies, respectively. For protected steel floor units or roof decks (D700 or P700 Series Designs), max separation between bottom of spray-applied fire resistive material and top of wall (at time of installation of joint system) is 1 in. (25 mm).

A. **Deflection Channel —** Nom 3-3/4 in. (95 mm) wide by 3 in. (76 mm) deep U-shaped channel formed from min No. 22 ga galv steel. Deflection channel centered on valley of steel floor or roof deck and secured with steel fasteners or by welds spaced max 12 in. (305 mm) OC (prior to application of spray-applied fire resistive material, if used). The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.
B. **Forming Material* —** Strips of min 4 pcf (64 kg/m^3) mineral wool batt insulation, cut to a thickness equal to the overall thickness of the gypsum board and compressed 50 percent in width. Mineral wool strips inserted into the gap between the top of the gypsum board and bottom of the steel floor units, roof deck or spray-applied fire resistive material, (if used), flush with both surfaces of the wall.

The type and manufacturer of forming material used within the joint system is dependent upon the hourly rating of the wall assembly as shown in the table below:

Rating of Wall, hr	Manufacturer of Mineral Wool	Type of Mineral Wool
1, 2 & 3	Fibrex Insulation Inc	FBX Safing Insulation
1, 2 & 3	W. R. Grace	FlameSafe Mineral Wool
1, 2 & 3	Roxul Inc.	SAFE Mineral Wool
1 & 2	Rock Wool Manufacturing	Delta Safing Insulation
1, 2 & 3	Thermafiber Inc	SAF

FIBREX INSULATIONS INC — FBX SAFING INSULATION

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool Batts

THERMAFIBER INC — SAF

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

C. **Fill, Void or Cavity Material* -Sealant —** Min 1/8 in. (3 mm) wet thickness of fill material spray or brush applied on each side of the wall to completely cover mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto gypsum board and steel floor units, roof deck or spray-applied fire resistive material, if used on both sides of wall.

ACCUMETRIC L L C — Boss 137

4. **Through Penetrant —** (Optional, Not Shown) - Max 1-1/2 in. (38 mm) diam steel conduit or steel electrical metallic tubing (EMT) may be installed parallel with and within the flutes of the steel floor or roof deck when Joint Configuration A is used. The conduit or EMT shall be located near the mid-depth of the steel deck with a clearance of 1/2 to 1-1/2 in. (13 to 38 mm) between the conduit or EMT and the steel deck. Conduit or EMT to be rigidly supported on both sides of the wall assembly. A max of one conduit or EMT is permitted in an individual flute. When a conduit or EMT is installed in the flute of the steel deck, the max assembly rating of the joint system is 2 hr.

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0410

October 31, 2008

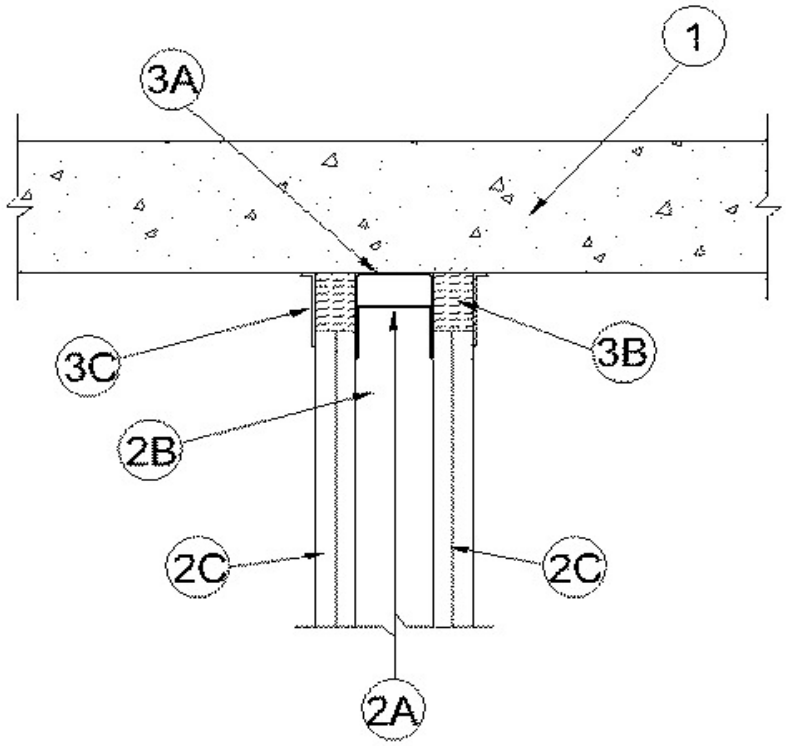
Assembly Rating — 1, 2, 3 and 4 Hr (See Item 2)

L Rating at Ambient — Less than 1 CFM/Lin Ft

L Rating at 400 F — Less than 1 CFM/Lin Ft

Nominal Joint Width — 1-1/2 and 2 In. (See Item 3)

Class II Movement Capabilities — 25% Compression & Extension



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick steel reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Floor may also be constructed of any min 6 in. thick UL Classified hollow-core **Precast Concrete Units*** .

See **Precast Concrete Units** (CFTV) category in the Fire Resistance Directory for names of manufacturers.

The hourly fire rating of the floor assembly shall be equal or greater than the hourly fire rating of the wall assembly.

2. **Wall Assembly —** The 1, 2, 3 or 4 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with 3 in. flanges. When U-shaped deflection channel is used, ceiling runner is installed within the U-shaped deflection channel (Item 3B) with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel . When deflection channel is not used, ceiling runner is secured to concrete floor slab with steel masonry anchors spaced a max 12 in. (305 mm) OC.

A1. **Light Gauge Framing* - Slotted Ceiling Runner —** When the nom joint width is less than or equal to 1-3/4 in. (mm , slotted ceiling runner may be used as an alternate to the ceiling runner in Item 2A. Slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel

studs (Item 2B). Slotted ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 12 in. (305 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

METAL-LITE INC — The System

SLIPTRACK SYSTEMS INC — SLP-TRK

A2. **Light Gauge Framing* — Clipped Ceiling Runner —** As an alternate to the ceiling runner in Item 2A , clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 3-1/4 in. Clipped ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 12 in. OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. **Light Gauge Framing* —Vertical Deflection Clip* —** (Optional) Steel clips can be used in conjunction with steel studs (Item 2B), ceiling runner (Item 2A) or deflection channel (Item 3A). Clips installed over the top of studs and inserted within the ceiling runner or deflection channel. Clip shall be secured to the ceiling runner or deflection channel with No. 8 self drilling, self tapping steel fasteners through holes provided within the clip. Clip may be secured to the stud with No. 6 pan head steel screw through holes provided within the clip. As an alternate, the legs of the clip may be installed over the top of the stud without attachment in accordance with manufacturer's installation instructions.

FLEX-ABILITY CONCEPTS L L C — Three Legged Dog Deflection Clip

A4. **Light Gauge Framing*- Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

DENMAR STEEL INC — Type SCR

B. **Studs —** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. long wafer head steel screws at midheight of slot on each side of wall. Stud spacing not to exceed 24 in. OC.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total thickness of 5/8 in., 1-1/4 in., 1-1/2 in., or 2 in. (16, on each side of wall for 1, 2, 3 and 4 hr fire rated wall assemblies, respectively . Wall to be constructed as specified in the individual U400 Series Design in the UL Fire Resistance Directory, except that a nom 1-1/2 or 2 in. gap (see Item 3) shall be maintained between the top of the gypsum board and the bottom surface of the floor. The top row of screws shall be installed into the studs 4-3/4 in. below floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System — The max separation between bottom of floor and top of wall (at time of installation of joint system) is dependent upon the hourly rating of the wall. Max separation between bottom of floor and top of wall (at time of installation of joint system) is 1-1/2 in. for 1 hr fire rated assemblies and 2 in. for 2, 3 and 4 hr fire rated assemblies. The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system shall consist of an optional deflection channel , and forming and fill materials as follows:

A. **Deflection Channel —** (Optional) A nom 3-3/4 in. wide by min 3 in. deep min 25 gauge steel U-shaped channel. Deflection channel secured to concrete floor slab with steel masonry anchors spaced max 12 in. OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Forming Material* —** Strips of min 4 pcf mineral wool batt insulation cut to a thickness equal to the overall thickness of the gypsum board and compressed 50 percent in thickness and installed cut edge first to fill the gap between the top of the wall and bottom of the floor. The forming material shall be flush with both surfaces of the wall.

The type and manufacturer of forming material used within the joint system is dependent upon the hourly rating of the wall assembly as shown in the table below:

Rating of Wall, hr	Manufacturer of Mineral Wool	Type of Mineral Wool
1, 2, & 3	Fibrex Insulation Inc	FBX Safing Insulation
1, 2, & 3	W. R. Grace	FlameSafe Mineral Wool
1, 2, 3, & 4	Roxul Inc	SAFE Mineral Wool
1 & 2	Rock Wool Manufacturing	Delta Safing Insulation

FIBREX INSULATIONS INC — FBX Safing Insulation

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — Safe, SAF Mineral Wool

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

C. **Fill, Void or Cavity Material* — Sealant —** Min 1/8 in. (3 mm) wet thickness of fill material spray or brush applied over mineral wool on each side of the wall between the top of the wall and the bottom of the concrete floor and overlapping a min 1/2 in. (13 mm) onto the concrete floor and gypsum board on both sides of wall.

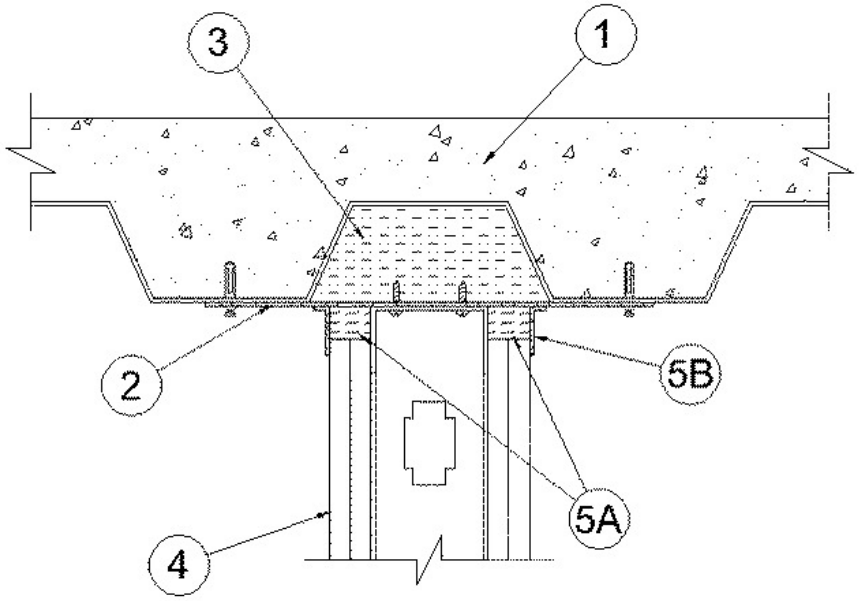
ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

System No. HW-D-0411

October 31, 2008

Assembly Rating — 1 and 2 Hr (See Item 1)
Nominal Joint Width — 1 In.
Class II Movement Capabilities — 25% Compression and Extension
L Rating At Ambient — Less Than 1 CFM/Lin Ft
L Rating At 400 F — Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** The fire-rated fluted steel floor unit/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete, as measure from the top plane of the floor units.

2. **Steel Straps —** Min 2 in. (51 mm) wide 16 MSG galv steel straps cut to a lentgh length to span the flute and overlap the adjacent valleys of fluted floor units by 1-1/2 in. (38 mm). Straps spaced max 24 in. (610 mm) OC and fastened to floor assembly with 1/4 in. (6 mm) diam by 1-1/2 in. (38 mm) long steel concrete anchors.

3. **Forming Material* - Plugs —** Preformed mineral wool plugs, formed to the shape of the fluted floor units, friction fit to completely fill the flutes above the steel straps. Adjacent lengths of plugs to be tightly butted with butted seams spaced min 24 in. (610 mm) apart along the length of the plugs.

ROCK WOOL MANUFACTURING CO — Deck Plugs

4. **Wall Assembly —** The 1 or 2 h fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with 2 in. (51 mm) flanges. Ceiling runner installed parallel to direction of fluted steel floor units, directly beneath steel straps and secured to straps with two No. 8 self-drilling, self-tapping steel screws per strap.

B. **Studs —** Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 in. (13 mm) to 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and resting on the floor runner and with top nesting in ceiling runner without attachment. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** For 1 hr assembly, one layer of 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. For 2 hr assembly, two layers of 5/8 in. (16 mm) thick gypsum board are specified in the individual Wall and Partition Design. For both hourly ratings, a nom 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the bottom surface of the steel floor units and the top row of screws shall be installed into the studs 3 in. (76 mm) below the valleys of the steel floor units.

5. **Joint System — Max separation between bottom of floor and top of wall is 1 in. (25 mm) The joint system is designed to accommodate a max 25 percent compression or extension from its installed width.** The joint system consists of a forming material and a fill material between the top of the gypsum board and the bottom of the floor, as follows:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) density mineral wool batt insulation cut shall be cut into strips to fill the gap between the top of gypsum board and bottom of the floor units. The width of the strips shall be equal to the total thickness of the gypsum board. The strips of mineral wool are compressed 50 percent in thickness and firmly packed into the gap between the top of the gypsum board and bottom of the mineral wool plug or steel floor units.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL INC — SAFE Mineral Wool Batts

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material sprayed or troweled on each side of the wall to completely cover the mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto gypsum board, steel floor units and steel straps on both sides of the wall.

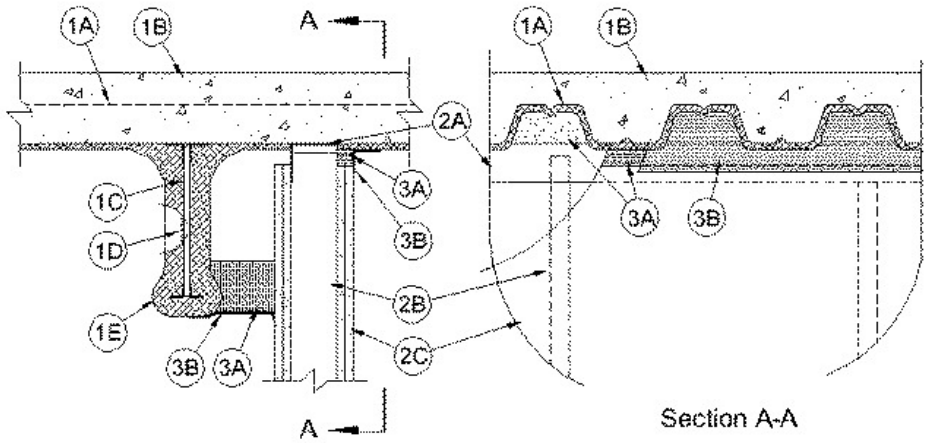
ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0412

October 31, 2008
Assembly Ratings — 1 and 2 Hr (See Item 2)
Nominal Joint Width - 1 In.
Class II Movement Capabilities - 12.5% Compression or Extension
L Rating At Ambient - Less Than 1 CFM/Lin Ft
L Rating At 400 F - Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the floor assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The floor assembly shall include the following construction features:

A. **Steel Floor and Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support —** Steel beam or open-web steel joist, as specified in the individual D700 or D900 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and 1 to 6 in. (25 to 152 mm) from wall assembly.

D. **Steel Lath —** When structural steel support (Item 1C) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m^2) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

E. **Spray-Applied Fire Resistive Material* —** After installation of the ceiling runner (Item 2A), steel floor units and structural steel supports to be sprayed with the thickness of material specified in the individual D700 or D900 Series Design. The flutes of the steel floor units above the structural steel supports and above the ceiling runner (Item 2A) shall be filled with spray-applied fire resistive material. As an alternate, the spray-applied fire resistive material in the flutes above the ceiling runner may be applied to follow the contour of the steel floor units. Excess material shall be removed from the flanges of the ceiling runner beyond the required thickness of spray-applied fire resistive material on the steel floor units.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, MK-6s, RG

1A. **Roof Assembly —** (Not Shown) — As an alternate to the floor assembly (Item 1), a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 or P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** For P700 Series Designs, min 3/4 in. (19 mm) thick **Mineral and Fiber Board*** insulation applied in one or more layers directly over steel roof deck or over gypsum board sheathing

laid atop steel roof deck as specified in the individual design. For P900 Series Designs, min 2-1/4 in. thick poured insulating concrete, as measured from the top plane of the roof deck as specified in the individual design.

C. **Roof Covering* —** Hot-mopped or cold-application materials compatible with mineral and fiber board insulation.

D. **Structural Steel Support —** Steel beam or open-web steel joist, as specified in the individual P700 or P900 Series Roof-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and min 2 in. (51 mm) to max 6 in. (152 mm) from wall assembly.

E. **Steel Lath —** When structural steel support (Item 1D) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m^2) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

F. **Spray-Applied Fire Resistive Material* —** After installation of the ceiling runner (Item 2A), steel roof deck and structural steel supports to be sprayed with a thickness of spray applied fire resistive material as specified in the individual P700 or P900 Series Roof-Ceiling design. The flutes of the steel deck above the structural steel supports and above the ceiling runner (Item 2A) shall be filled with spray-applied fire resistive material. As an alternate, the spray-applied fire resistive material in the flutes above the ceiling runner may be applied to follow the contour of the steel roof deck. Excess material shall be removed from the flanges of the ceiling runner beyond the required thickness of spray-applied fire resistive material on the steel roof deck.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, MK-6s, RG

2. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with min 1-1/4 in. (32 mm) to max 3 in. (76 mm) flanges. Ceiling runner is secured to steel floor units (Item 1A) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Ceiling runner to be installed parallel with structural steel support and located such that a max clearance of 4 in. (102 mm) is present between the finished wall and the spray-applied fire resistive material at the lowest elevation of the structural steel support.

A1. **Light Gauge Framing* — Slotted Ceiling Runner —** As an alternate to the ceiling runner in Item 2A, ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Ceiling runner secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC.

SLIPTRACK SYSTEMS INC — SLP-TRK

A2. **Light Gauge Framing* — Clipped Ceiling Runner —** As an alternate to the ceiling runner in Items 2A and 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm). Clipped ceiling runner secured with steel fasteners spaced max 24 in. (610 mm) OC.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

B. **Studs —** Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 in. to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in and secured to floor runner. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 (13 mm) long wafer head steel screws at midheight of slot on each side of wall. Studs to nest in ceiling runner without attachment.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total 5/8 in. (16 mm) or 1-1/4 in. (32 mm) thickness on each side of wall for 1 and 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory except that a max 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the bottom plane of the spray applied fire resistive material on the steel deck on both sides of the wall assembly. When no spray-applied fire resistive material is used on the steel deck, a max 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the bottom plane of the steel deck. The screws attaching the gypsum board to the studs along the top of the wall shall be located 1 in. (25 mm) below the bottom of the ceiling runner. No gypsum board attachment screws shall be driven into the ceiling runner. Where the top of the wall assembly is inaccessible above the lowest elevation of the structural steel support, the gypsum board attachment screws may be omitted.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System —** Max separation between bottom plane of steel deck or spray-applied fire resistive material and top of gypsum board (at time of installation of joint system) is 1 in. (25 mm). Separation distance between spray applied fire resistive material on structural support member and surface of wall is min 1 in. (25 mm) to max 4 in. (102 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width as measured between the bottom plane of the steel deck or the spray-applied fire resistive material on the steel deck and the top of the gypsum board. The joint system shall consist of forming and fill materials, as follows:

A. **Forming Material* —** Nom 4 pcf (64 kg/m^3) density mineral wool batt insulation. Sections of mineral wool batt cut to a width of 4 in. (102 mm) and stacked to attain a thickness which is 50 percent greater than the width of the linear gap between the spray applied fire resistive material on the structural steel member and the surface of the wall assembly. Stacked sections of mineral wool compressed 33 percent in thickness and installed cut edge first into linear gap until the bottom edge is flush with the bottom surface of the spray applied fire resistive material on the structural steel member. When no spray-applied fire resistive material is used on the steel deck or when the spray-applied fire resistive material in the flutes above the wall follows the contour of the steel deck, sections of mineral wool batt cut to the shape of the fluted deck and stacked to a min 6 in. (152 mm) thickness shall be installed in the flutes of the steel floor or roof deck between the top of the ceiling runner and the steel deck or spray-applied fire resistive material. The mineral wool batt insulation is to be installed flush with the gypsum board surface on the side of the wall opposite the structural steel support. Additional sections of mineral wool batt insulation are compressed 50 percent in thickness and are installed cut edge first to completely fill the gap above the top of the gypsum board.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Sealant —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material spray or brush applied over the forming material on each side of the wall. Fill material to overlap a min of 1/2 in. (13 mm) onto the gypsum board and a min of 2 in. (51 mm) onto the steel deck or the spray-applied fire resistive material on the steel deck and on the spray-applied fire resistive material on the structural steel support member on each side of the wall.

ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0413

October 31, 2008

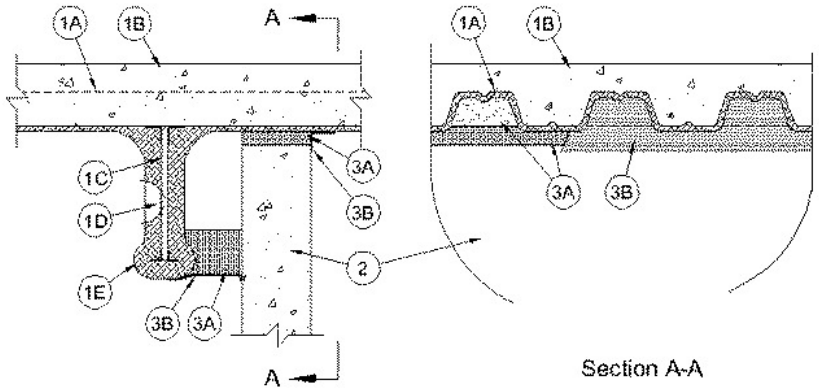
Assembly Rating — 2 Hr

Nominal Joint Width — 1 In.

Class II Movement Capabilities — 12.5% Compression or Extension

L Rating At Ambient — Less Than 1 CFM/Lin Ft

L Rating At 400 F — Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the floor assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The floor assembly shall include the following construction features:

A. **Steel Floor and Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support —** Steel beam or open-web steel joist, as specified in the individual D700 or D900 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and min 2 in. (51 mm) to max 6 in. (152 mm) from wall assembly.

D. **Steel Lath —** When structural steel support (Item 1C) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m^2) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

E. **Spray-Applied Fire Resistive Material* —** Steel floor units and structural steel supports to be sprayed with the thickness of material specified in the individual D700 or D900 Series Design. The flutes of the steel floor units above the structural steel supports shall be filled with spray-applied fire resistive material. The spray-applied fire resistive material in the flutes above the wall shall be applied to follow the contour of the steel floor units.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, MK-6s, RG

1A. **Roof Assembly —** (Not Shown) — As an alternate to the floor assembly (Item 1), a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 or P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** For P700 Series Designs, min 3/4 in. (19 mm) thick **Mineral and Fiber Board*** insulation applied in one or more layers directly over steel roof deck or over gypsum board sheathing laid atop steel roof deck as specified in the individual design. For P900 Series Designs, min 2-1/4 in. thick poured insulating concrete, as measured from the top plane of the roof deck as specified in the individual design.

C. **Roof Covering* —** Hot-mopped or cold-application materials compatible with mineral and fiber board insulation.

D. **Structural Steel Support —** Steel beam or open-web steel joist, as specified in the individual P700 or P900 Series Roof-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and min 2 in. (51 mm) to max 6 in. (152 mm) from wall assembly.

E. **Steel Lath —** When structural steel support (Item 1D) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m^2) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

F. **Spray-Applied Fire Resistive Material* —** Steel roof deck and structural steel supports to be sprayed with a thickness of spray applied fire resistive material as specified in the individual P700 Series Roof-Ceiling design. The flutes of the steel deck above the structural steel supports shall be filled with spray-applied fire resistive material. The spray-applied fire resistive material in the flutes above the wall shall be applied to follow the contour of the steel roof deck.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, MK-6s, RG

2. **Wall Assembly —** Min 6 in. (152 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System —** Max separation between bottom plane of steel deck or spray-applied fire resistive material on the steel deck and the top of the concrete or concrete block wall (at time of installation of joint system) is 1 in. (25 mm). Separation distance between spray applied fire resistive material on structural support member and surface of wall is min 1 in. (25 mm) to max 4 in. (102 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width as measured between the bottom plane of the steel deck or the spray-applied fire resistive material on the steel deck and the top of the concrete or concrete block wall. The joint system shall consist of forming and fill materials, as follows:

A. **Forming Material* —** Nom 4 pcf (64 kg/m^3) density mineral wool batt insulation. Sections of mineral wool batt cut to a width of 4 in. (102 mm) and stacked to attain a thickness which is 50 percent greater than the width of the linear gap between the spray applied fire resistive material on the structural steel member and the surface of the wall assembly. Stacked sections of mineral wool compressed 33 percent in thickness and installed cut edge first into linear gap until the bottom edge is flush with the bottom surface of the spray applied fire resistive material on the structural steel member. On the opposite side of the wall, sections of mineral wool batt insulation cut to the width of the wall inserted edge-first between the top of the wall and the steel deck or the spray-applied fire resistive material on the valleys of the steel deck, compressed approx 50 percent in thickness beneath each valley and flush with the wall surface. Additional pieces of mineral wool batt cut to the shape of the steel deck flute, stacked to a min 6 in. (152 mm) thickness and installed in the flutes above the wall flush with the wall surface.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Sealant —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material spray or brush applied over the forming material on each side of the wall. Fill material to overlap a min of 1/2 in. (13 mm) onto t he steel deck or the spray-applied fire resistive material on the steel deck and on the spray-applied fire resistive material on the structural steel support member on each side of the wall.

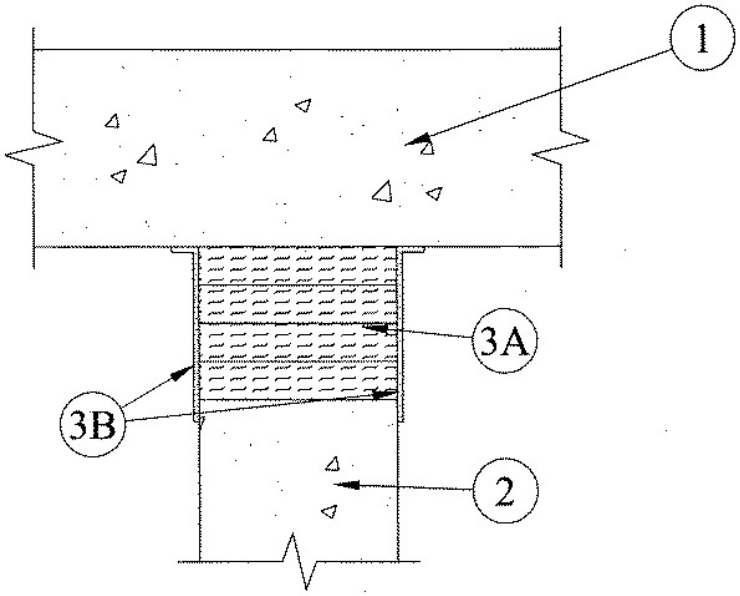
ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0414

October 31, 2008
Assembly Rating — 2 and 3 Hr (See Item 3A)
Nominal Joint Width — 2 In.
Class II Movement Capabilities — 25% Compression or Extension
L Rating At Ambient — Less Than 1 CFM/Lin Ft
L Rating At 400 F — Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.

   See **Precast Concrete Units** (CFTV) category in the Fire Resistance Directory for names of manufacturers.

   The hourly fire rating of the floor assembly shall be equal or greater than the hourly fire rating of the wall assembly.

2. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

   See **Concrete Blocks*** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

   The hourly fire rating of the joint system is equal to the hourly fire rating of the wall assembly.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is 2 in. (51 mm). The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width.** The joint system shall consist of the following:

   A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 6 or 6-5/8 in. (152 or 168 mm) for 2 and 3 hr rated assemblies, respectively, and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and that the compressed batt sections are recessed from each surface of the wall as required to accommodate the required thickness of fill material.

   FIBREX INSULATIONS INC — FBX Safing Insulation
   IIG MINWOOL L L C — MinWool-1200 Safing
   ROCK WOOL MANUFACTURING CO — Delta Board.
   ROXUL INC — SAFE Mineral Wool
   THERMAFIBER INC — SAF Mineral Wool
   W R GRACE & CO - CONN
   CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Spray —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry wet thickness of fill material applied within the joint, flush with each surface of wall and lapping a min 1/2 in. (13 mm) onto the bottom surface of the floor and each surface of wall.

ACCUMETRIC L L C — Boss 137

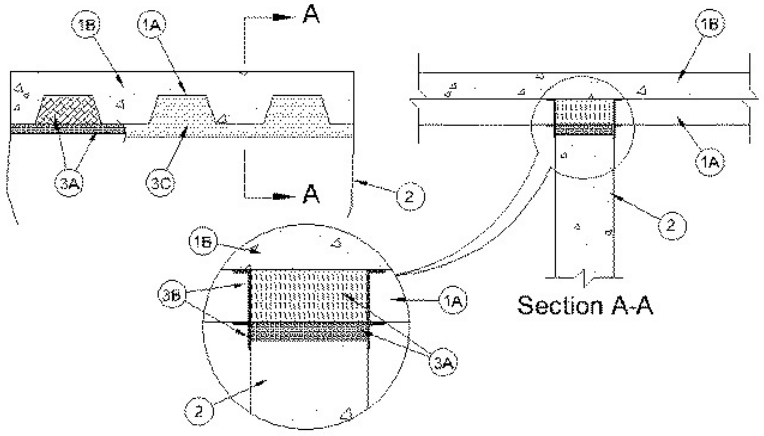
*Bearing the UL Classification Mark

Joint Systems

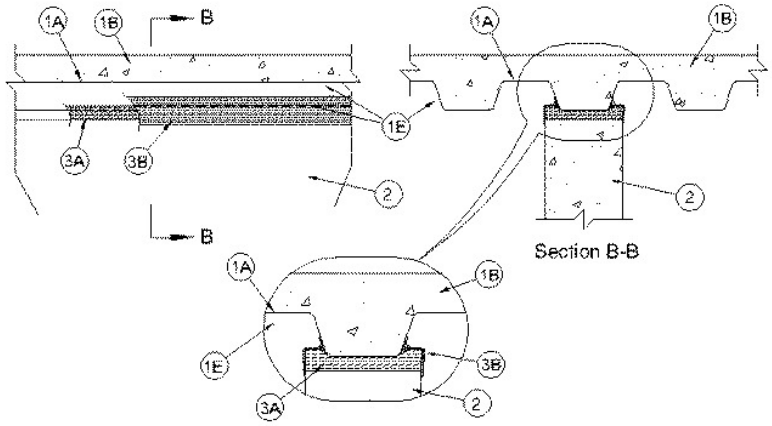
System No. HW-D-0415

November 04, 2008

Assembly Ratings - 2 and 3 Hr (See Items 3 and 4)
Nominal Joint Width — 1 and 2 In. (See Item 3)
Class II Movement Capabilities — 25% Compression or Extension
L Rating At Ambient — Less Than 1 CFM/Lin Ft
L Rating At 400 F — Less Than 1 CFM/Lin Ft



Joint Configuration A



Joint Configuration B

1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete, as measured from the top plane of the floor units.

The hourly fire rating of the floor assembly shall be equal or greater than the hourly fire rating of the wall assembly.

1A. **Floor Assembly —** As an alternate to Item 1,the fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 Series Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete, as measured from the top plane of the floor units.

C. **Spray-Applied Fire Resistive Material* —** Prior to the installation of the joint system (Item 3) all surfaces of the steel floor units to be sprayed with the thickness of material specified in the individual D700 Series Design.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, RG and MK-6S.

1B. **Roof Assembly — (Not Shown) —** As an alternate to Items 1 and 1A, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck.

1C. **Roof Assembly —** As an alternate to Items 1, 1A, and 1B, a fire rated protected fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** As specified in the individual P700 Series Design.

C. **Spray - Applied Fire Resistive Materials* —** (Not Shown)—Prior to the installation of the joint system (Item 3), the roof assembly shall be sprayed with the type and thickness of fire resistive material indicated in the individual P700 Series design.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, RG and MK-6S.

2. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. For Joint Configuration B, wall to be centered beneath valley of fluted steel floor or roof deck.

See **Concrete Blocks*** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

For Joint Configuration A, the hourly assembly rating of the joint system is equal to the hourly fire rating of the wall assembly. For Joint Configuration B, the max assembly rating of the joint system is 2 hr.

3. **Joint System — For unprotected steel floors units or roof decks (D900 or P900 Series Designs), max separation between bottom of floor or roof and top of wall (at time of installation of joint system) is 2 in. (51 mm). For protected steel floors units or roof decks (D700 or P700 Series Designs), max separation between bottom of spray-applied fire resistive material and top of wall (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width. The hourly assembly rating of the joint system is dependent upon the joint configuration and the max hourly fire rating of the wall assembly. When Joint Configuration B is used, max Assembly Rating of joint system is 2 hr.** The joint system shall consist of the following:

Joint Configuration A

A. **Forming Material* —** Min 6 or 6-5/8 in. (152 or 168 mm) thickness of 4 pcf (64 kg/m^3) mineral wool batt insulation, for 2 and 3 hr rated assemblies, respectively, cut to the shape of the fluted deck, approx 25 percent larger than the area of the flutes and compressed into the flutes of the steel floor units, roof deck or spray-applied fire resistive material. Additional min 6 or 6-5/8 in. (152 or 168 mm) wide sections of mineral wool batt insulation, for 2 and 3 hr rated assemblies, respectively, are compressed 50 percent in thickness and installed cut edge first to fill the gap between the top of the wall and bottom of the steel floor units, roof deck or spray-applied fire resistive material. The forming material shall be installed flush with both surfaces of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation
IIG MINWOOL L L C — MinWool-1200 Safing
ROCK WOOL MANUFACTURING CO — Delta Safing Insulation
ROXUL INC — SAFE Mineral Wool
THERMAFIBER INC — SAF Mineral Wool
W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

A1. **Spray-Applied Fire Resistive Material* (Not Shown) —** As an alternate to the forming material (Item 3A) within the flutes, min 6 or 6-5/8 in. (152 or 168 mm) depth of spray-applied fire resistive material, for 2 and 3 hr rated assemblies, respectively, installed into the flutes of the steel floor, roof deck or spray-applied fire resistive material. Material shall be excluded from the max 2 in. (51 mm) wide joint immediately above the top of the

concrete wall. The spray-applied fire resistive material is mixed with water in accordance with the mixing instructions on the bag and is sprayed and/or troweled to completely fill the opening above the wall. The min average density of the spray applied fire resistive material shall be 15 pcf (240 kg/m^3) with a min individual density of 14 pcf (224 kg/m^3). See Design Information of Volume 1 of the Fire Resistance Directory for method of density determination.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY, MK-6/HY ES, RG, MK-6S, Z-106/G, Z106, Z106-HY and Z-146.

A2. **Forming Material* - Plugs —** (Not Shown) As an alternate to the forming material and spray-applied fire resistive material (Items 3A and 3A1), mineral wool plugs preformed to the shape of the fluted floor units, may be used within the flutes. Plugs shall be friction fitted to completely fill the flutes, flush with wall surfaces. Additional forming material, described in Item 3A, to be used in conjunction with the plugs to fill the gap between the top of concrete wall and bottom of steel floor units, roof deck or spray-applied fire resistive material. **Plugs to be used in max 2 hr fire rated wall assemblies.**

ROCK WOOL MANUFACTURING CO — Deck Plugs

B. **Fill, Void or Cavity Material* — Sealant —** Min 1/8 in. (3 mm) wet thickness of fill material spray or brush applied on each side of the wall in the flutes of the steel floor units or roof deck and between the top of the wall and the bottom of the steel floor units or roof deck and overlap a min 1/2 in. (13 mm) onto concrete wall and steel floor units, roof deck or spray-applied fire resistive material on both sides of wall. When optional through penetrant (Item 4) is used, fill material to overlap a min of 1/2 in. (13 mm) onto conduit or EMT on both sides of wall.

ACCUMETRIC L L C — Boss 137

Joint Configuration B

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) density mineral wool batt insulation cut into strips with a width equal to the overall thickness of the wall. Strips are compressed 50 percent in thickness and installed cut edge first to fill the gap between the top of the wall and the bottom of the steel floor units, roof deck or spray-applied fire resistive material. The forming material shall be installed flush with both surfaces of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation
IIG MINWOOL L L C — MinWool-1200 Safing
ROCK WOOL MANUFACTURING CO — Delta Safing Insulation
ROXUL INC — SAFE Mineral Wool
THERMAFIBER INC — SAF Mineral Wool
W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Sealant —** Min 1/8 in. (3 mm) wet thickness of fill material spray or brush applied on each side of the wall to completely cover the mineral wool forming material and to overlap a min 1/2 in. (13 mm) onto concrete wall and steel floor units, roof deck or spray-applied fire resistive material on both sides of wall.

ACCUMETRIC L L C — Boss 137

4. **Through Penetrant —** (Optional, Not Shown) — Max 1-1/2 in. (38 mm) diam steel conduit or steel electrical metallic tubing (EMT) may be installed parallel with and within the flutes of the steel floor or roof deck when Joint Configuration A is used. The conduit or EMT shall be located near the mid-depth of the steel deck with a clearance of 1/2 to 1-1/2 in. (13 to 38 mm) between the conduit or EMT and the steel deck. Conduit or EMT to be rigidly supported on both sides of the wall assembly. A max of one conduit or EMT is permitted in an individual flute. **When a conduit or EMT is installed in the flute of the steel deck, the max assembly rating of the joint system is 2 hr.**

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0416

November 05, 2008

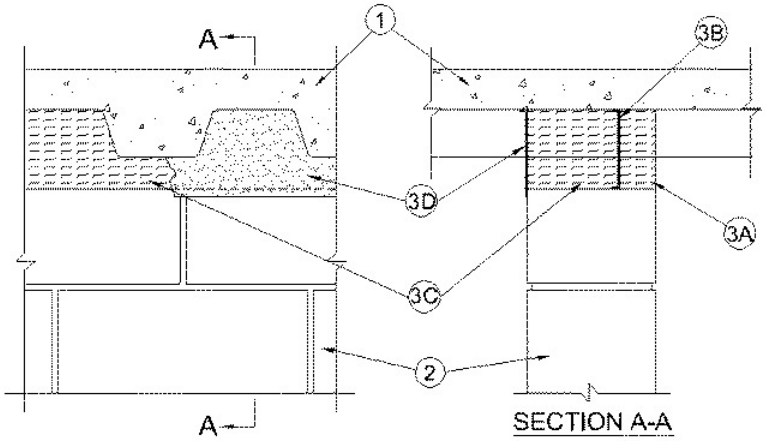
Assembly Rating — 3 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 12.5% Compression or Extension

L Rating At Ambient — Less Than 1 CFM/Lin Ft

L Rating At 400 F — Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** The fire rated fluted steel unit/concrete floor assembly shall be constructed of the materials and in a manner described in the individual D900 Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete as measured from top plane of the floor units.

1A. **Roof Assembly — (Not Shown) —** As an alternate to the floor assembly, a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials in the manner describe in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 2 in. (51 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the floor units.

2. **Wall Assembly —** Min 8 in. (203 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified Concrete Blocks*.

See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor or roof and top of wall at time of installation of joint system is 2 in. (51 mm) The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width.** The joint system shall consist of the following:
A. **Forming Material —** Nom pcf (64 kg/m^3) mineral wool batt insulation, min 2 in. (51 mm) wide, compressed and firmly packed to fill the flutes and the gap between the top of the wall and bottom of the floor or roof as a permanent form on one side of the wall. Batt insulation cut to the shape of the fluted steel deck, approx 33 percent larger than the flutes. Pieces compressed and installed cut edge first into the flutes above the top of the wall. Additional pieces of batt insulation, min 2 in. (51 mm) wide, installed edge-first into joint opening between bottom of fluted steel deck and top of wall, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness. Compressed batt sections are flush with one surfaces of wall. Adjoining lengths of batt to be tightly butted with butted seams spaced min 48 in. (1.22 m) apart along the length of the joint.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL ASIA SDN BHD — SAFE Mineral Wool

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry wet thickness of fill material sprayed or troweled into the joint to completely cover mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto wall and steel deck, within joint cavity.

ACCUMETRIC L L C — Boss 137

C. **Forming Material —** Nom pcf (64 kg/m^3) mineral wool batt insulation, min 6 in. (152 mm) wide, compressed and firmly packed to completely fill the flutes and the gap between the top of the wall and bottom of the floor or roof as a permanent form. Batt insulation cut to the shape of the fluted steel deck, approx 33 percent larger than the flutes. Pieces compressed and installed cut edge first into the flutes above the top of the wall. Additional pieces of batt insulation, min 6 in. (152 mm) wide, installed edge-first into joint opening between bottom of fluted steel deck and top of wall, parallel with joint direction, such that batt sections are compressed min 50 percent in. thickness. Compressed batt sections are flush with one surface of wall. Adjoining lengths of batt to be tightly butted with butted seams spaced min 48 in. (1.22 m) apart along the length of the joint.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL ASIA SDN BHD — SAFE Mineral Wool

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

D. **Fill, Void or Cavity Material* —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material sprayed or troweled on one side of the wall to completely cover mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto wall and steel deck on accessible side of wall.

ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

Joint Systems

System No. HW-D-0417

November 05, 2008

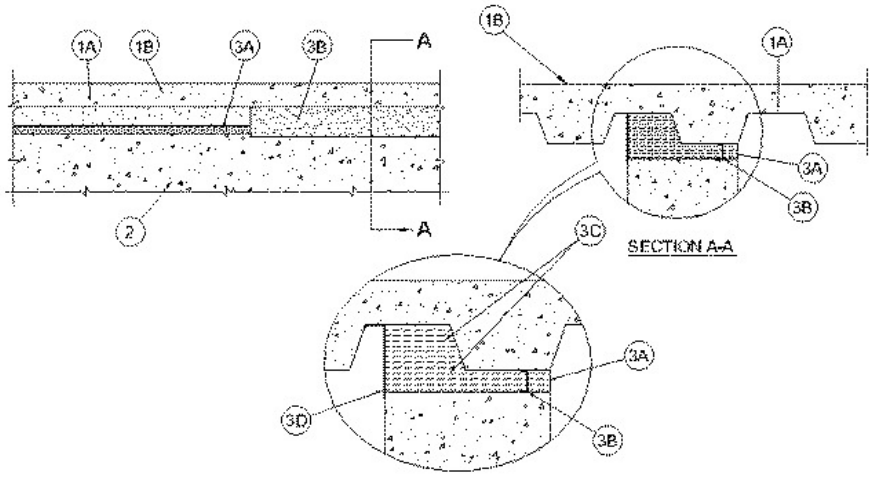
Assembly Rating — 3 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 12.5% Compression or Extension

L Rating At Ambient — Less Than 1 CFM/Lin Ft

L Rating At 400 F — Less Than 1 CFM/Lin Ft



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D900 Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf of 1600-2400 kg/m^3) concrete, as measured from the top plane of the floor units.

C. **Spray-Applied Fire Resistive Material* (Optional, Not Shown) —** Prior to the installation of the Forming Material and Fill, Void or Cavity Materials (Items 3A through 3D), all surfaces of the steel floor units to be sprayed with the thickness of material specified in the individual D700 Series Design.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY ES, RG and MK-6S

1A. **Roof Assembly - (Not Shown) —** As an alternate to the floor assembly (Item 1), a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 2 in. (51 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the floor units.

C. **Spray-Applied Fire Resistive Materials* (Not Shown, Optional) —** Prior to the installation of Forming Material and Fill, Void or Cavity Material (Items 3A through 3D), the roof assembly shall be sprayed with the type and thickness of fire resistive material indicated in the individual P700 Series design.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY ES, RG and MK-6S

2. **Wall Assembly —** Min 8 in. (203 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall shall be installed parallel with the flutes of the steel floor and roof deck units (Item 1A). Wall may also be constructed of any UL Classified 3 hr fire rated **Concrete Blocks***. When wall is constructed of concrete blocks, the top course of block shall be filled with concrete, grout or mortar.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufactures.

3. **Joint System — Max separation between bottom of steel floor units, roof deck or spray-applied fire resistive material (if used) and top of the wall at time of installation of joint system is 2 in. (51 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width.** The joint system consists of the following:
A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation cut into strips min 2 in. (51 mm) wide compressed 50 percent in thickness and inserted into the gap between the top of the wall and the bottom of the steel floor units, roof deck or sprayed-applied fire resistive material (if used) flush with one surface of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL ASIA SDN BHD — SAFE Mineral Wool

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* —** Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material sprayed or troweled into joint to completely cover mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto wall and steel deck, roof deck or sprayed-applied fire resistive material (if used) within joint cavity.

ACCUMETRIC L L C — Boss 137

C. **Forming Material —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation cut into strips min 6 in. wide, compressed 50 percent in thickness and inserted into the gap between he top of the wall and the bottom of the steel floor units, roof deck or sprayed-applied fire resistive material (if used) butting edge of the installed forming material Item 3A. When the void beneath the steel floor unit or roof deck is located entirely above the wall, the void shall be completely filled with mineral wool insulation compressed 50 percent in thickness. When void beneath the steel deck is located in part above the wall, that portion of the void above the wall shall be packed with additional strips of mineral wool batt insulation compressed 50 percent in thickness flush with the surface of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROXUL ASIA SDN BHD — SAFE Mineral Wool

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe mineral Wool

D. **Fill, Void or Cavity Material* —** Min 1/8 in. (3.2 mm) thickness or 1/16 in. (1.6 mm) dry wet thickness of fill material sprayed or troweled to completely cover mineral wool forming material and to overlap a min of 1/2 in. (13 mm) onto wall and steel floor unit, roof deck or sprayed-applied fire resistive material (if used) on accessible side of the wall.

ACCUMETRIC L L C — Boss 137

*Bearing the UL Classification Mark

Joint Systems

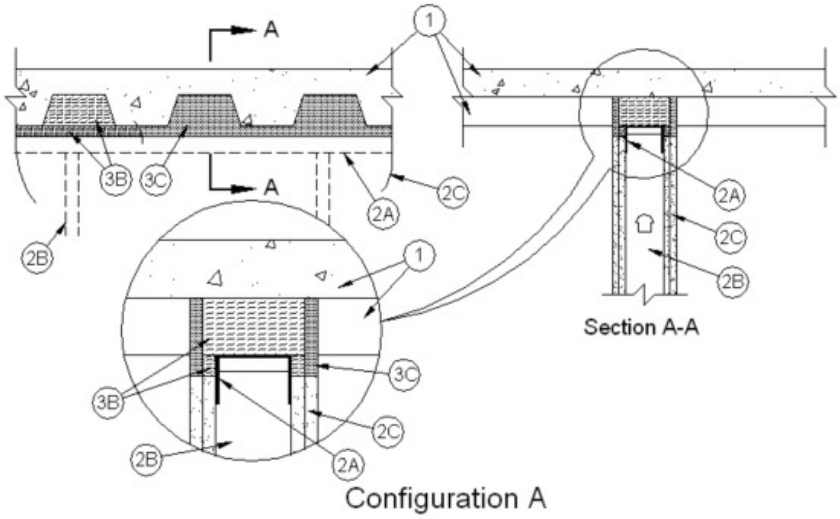
System No. HW-D-0507

July 02, 2008

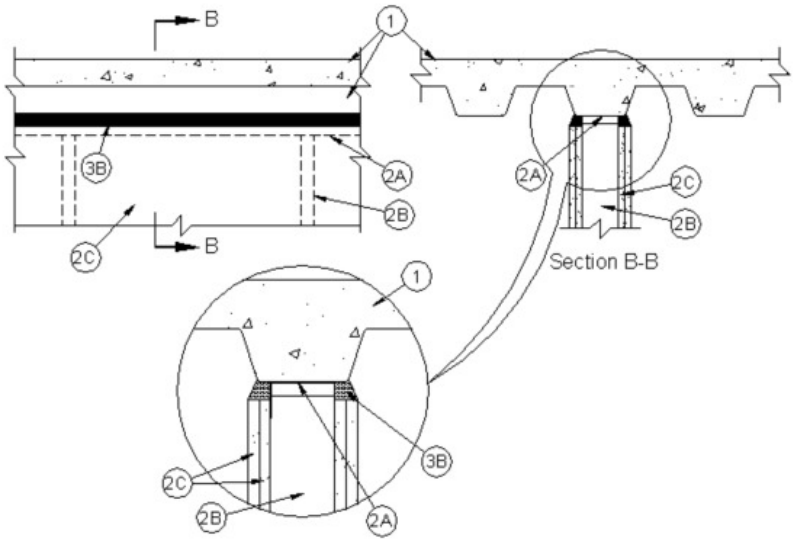
Assembly Ratings — 1 and 2 Hr (See Item 2)

Nominal Joint Width — 1 In.

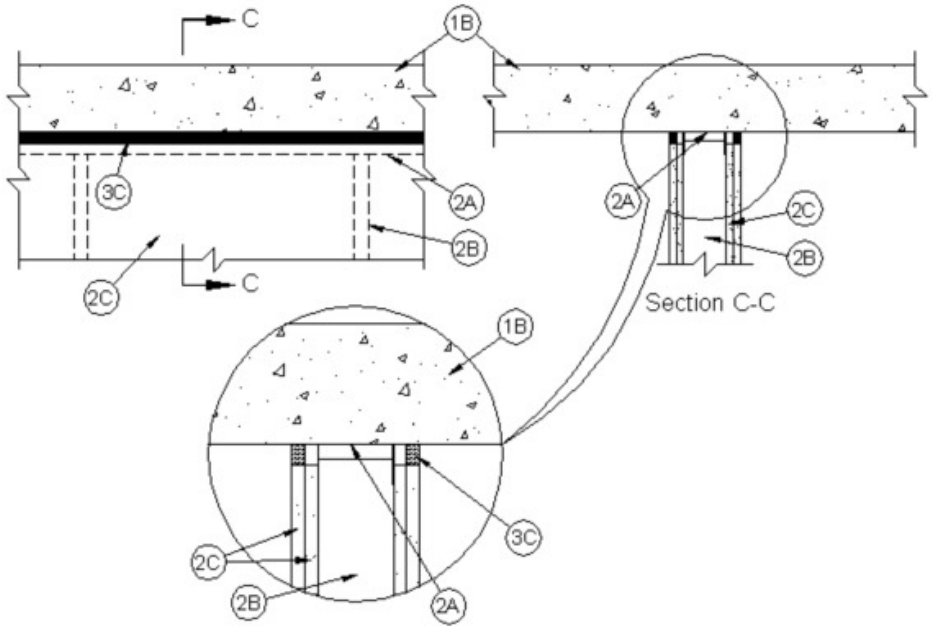
Class II Movement Capabilities — 25% Compression



Configuration A



Configuration B



Configuration C

1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 3 in. (76 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly —** (Not Shown) — As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck Max —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck.

C. **Roof Covering —** Hot-mopped or cold application materials compatible with concrete.

1B. **Floor Assembly —** As an alternate to the floor and roof assemblies (Items 1 and 1A), the floor may consist of a min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) concrete slab.

2. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with min 1-1/4 in. (32 mm) flanges. Studs and gypsum board must have a min 1/4 in. (6 mm) engagement onto the flanges of the ceiling runner at the furthest point of extension of the joint. Ceiling runner installed perpendicular to steel deck (Configuration A) or centered on valleys of steel deck(Configuration B). When U shaped deflection channel (Item 3A) is used, ceiling runner is installed within the U-shaped deflection channel with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel. When deflection channel is not used, ceiling runner secured to valleys with steel masonry anchors or by welds spaced max 24 in. (610 mm) OC. When concrete slab floor assembly

(Item 1B) is used and deflection channel is not used, ceiling runner secured to concrete floor slab (Configuration C) with steel masonry anchors spaced max 24 in. (610 mm) OC.

A1. **Light Gauge Framing* — Clipped Ceiling Runner —** As an alternate to the ceiling runner in Item 2A, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm). Clipped ceiling runner secured to valleys of steel deck with steel masonry anchors spaced max 24 in. (610 mm) OC. When concrete slab floor assembly (Item 1B) is used, slotted ceiling secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A2. **Light Gauge Framing* — Slotted Ceiling Runner —** Slotted ceiling runner may be used as an alternate to the ceiling runner in Item 2A. Slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner secured to valleys of steel deck with steel masonry anchors spaced max 24 in. (610 mm) OC. When concrete slab floor assembly (Item 1B) is used, slotted ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

SCAFCO STEEL STUD MANUFACTURING CO

BRADY CONSTRUCTION INNOVATIONS INC,

DBA SLIPTRACK SYSTEMS — SLP-TRK

A3. **Light Gauge Framing* —Vertical Deflection Clip* —** (Optional) Steel clips can be used in conjunction with steel studs (Item 2B), ceiling runner (Item 2A) or deflection channel (Item 3A). Clips installed over the top of studs and inserted within the ceiling runner or deflection channel. Clip shall be secured to the ceiling runner or deflection channel with No. 8 self drilling, self tapping steel fasteners through holes provided within the clip. Clip may be secured to the stud with No. 6 pan head steel screw through holes provided within the clip. As an alternate, the legs of the clip may be installed over the top of the stud without attachment in accordance with manufacturer's installation instructions.

FLEX-ABILITY CONCEPTS L L C — Three Legged Dog Deflection Clip

A4. **Light Gauge Framing*- Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner secured to valleys of steel deck with steel masonry anchors spaced max 24 in. OC. When concrete slab floor assembly (Item 1B) is used, slotted ceiling runner secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

DENMAR STEEL INC — Type SCR

B. **Studs —** Steel studs to be min 3-5/81/2 in. (89 mm) wide. Studs cut 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and secured to floor runner. Studs and gypsum board must have a min 1/4 in. (6 mm) engagement onto the flanges of the ceiling runner at the furthest point of extension of the joint. When deflection channel (Item 3A) is used, steel studs attached to ceiling runner (Item 2A) with sheet metal screws located 1/2 in. (13 mm) below bottom of deflection channel. When

deflection channel is not used, steel studs shall not be secured to ceiling runner. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board sheets installed to min total thickness of 5/8 in. (16 mm) and 1-1/4 in. (32 mm) on each side of wall for 1 and 2 hr fire-rated assemblies, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that a nom 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the lower surface of the floor or roof deck. The screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. (25 mm) below the bottom of the edge of the ceiling runner.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System — Max separation between bottom of steel deck or concrete floor and top of wall (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 25 percent compression from its installed width.** The joint system shall consist of forming and fill materials, with or without a deflection channel (Item 3A), as follows:

Joint Configuration A

A. **Deflection Channel —** (Optional, Not Shown) — Nom 3 in. (76 mm) deep by min 25 gauge galv steel channel sized to accommodate ceiling runner (Item 2A). Deflection channel installed perpendicular to direction of fluted steel deck and secured to valleys of steel deck with steel masonry anchors or welds spaced max 24 in. (610 mm) OC. When concrete slab floor assembly (Item 1B) is used, deflection channel secured to concrete floor slab with steel masonry anchors spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner nests inside the deflection channel without attachment.

B. **Forming Material* —** Min 3-1/2 in. (89 mm) or 4-7/8 in. (124 mm) depth of 4 pcf (64 kg/m^3) mineral wool batt insulation, for 1 and 2 hr rated wall assemblies, respectively, cut to the shape of the fluted deck, approx 20 percent larger than the area of the flutes and compressed into the flutes of the steel floor unit or roof deck flutes above the ceiling channel. For 2 hr assembly, an additional 2 in. (51 mm) thick by 1 in. (25 mm) wide sections of mineral wool batt insulation compressed 50 percent in thickness and installed cut edge first to fill the 1 in. (25 mm) gap between the top of gypsum board and bottom of the steel floor units or roof deck. The forming material shall be recessed 5/8 in. (16 mm) from each side of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B1. **Forming Material* - Plugs —** (Optional-Not Shown) As an alternate to the forming material (Item 3A), mineral wool plugs preformed to the shape of the fluted floor units or roof deck, may be used within the flutes. Plugs shall be friction fitted to completely fill the flutes above the ceiling channel. In the 2 hr fire rated wall assemblies, the plugs shall project beyond each side of the ceiling runner and recessed from each surface of wall to accommodate the required thickness of fill material. In the 1 hr fire rated wall assemblies, the plugs shall be

flush with ceiling runner and recessed from each surface of wall to accommodate the required thickness of fill material. Additional forming material, described in Item 3A, to be used in conjunction with the plugs to fill the gap between the top of gypsum board and bottom of steel floor units or roof deck.

ROCK WOOL MANUFACTURING CO — Deck Plugs

C. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. thickness of fill material installed on each side of the wall in the flutes of the steel floor or roof deck and between the top of the wall and the bottom of the steel floor or roof deck flush with each surface of wall.

ACCUMETRIC L L C — Boss 816

Joint Configuration B

A. **Deflection Channel —** (Optional, Not Shown) - Nom 3 in. (76 mm) deep by min 25 ga steel U-shaped channel centered on valleys of steel floor units or roof deck. Deflection channel secured with steel fasteners or by welds spaced max 24 in. (610 mm) OC. Deflection channel installed perpendicular to direction of fluted steel deck and secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC. When floor assembly (Item 1B) is used, deflection channel secured to concrete floor slab with steel fasteners spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.
B. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material installed on each side of the wall between the top of the wall and bottom of floor unit or roof deck, flush with both sides of the wall.

ACCUMETRIC L L C — Boss 816

Joint Configuration C

A. **Deflection Channel —** (Optional, Not Shown) — Nom 3 in. (76 mm) deep by min 25 gauge steel U-shaped channel. Deflection channel secured to concrete floor with steel fasteners spaced max 24 in. (610 mm) OC. Deflection channel secured to concrete floor with steel fasteners spaced max 24 in. (610 mm) OC. The ceiling runner is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.
B. **Packing Material —** For optional use in 2 hr fire rated assemblies. Foam backer rod friction fitted into joint opening and recessed to accommodate the required thickness of fill material.
C. **Fill, Void or Cavity Material* - Sealant —** Min 5/8 in. (16 mm) thickness of fill material installed on each side of the wall between the top of the wall and bottom of floor, flush with each surface of wall. The use of bond breaker tape is optional.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

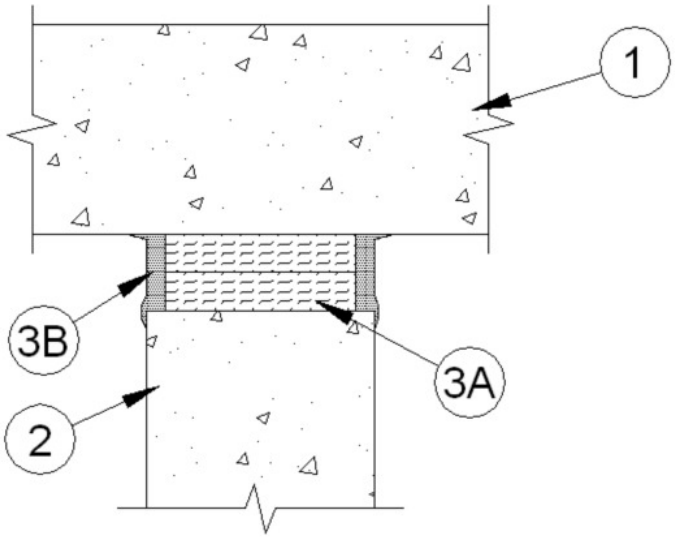
System No. HW-D-0508

June 24, 2008

Assembly Rating — 4 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 13% Compression or Extension



1. **Floor Assembly —** Min 5-1/2 in. (140 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.
2. **Wall Assembly —** Min 6 in. (152 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System —** Max width of joint (at time of installation of joint system) is 2 in. (51 mm). System is designed to accommodate a max 13 percent compression or extension from its installed width. The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 5 in. (127 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and such that the compressed batt sections are recessed from both surfaces of wall as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. (610 mm) apart along the length of the joint.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with both surfaces of wall. A min 1/8 in. (3 mm) thick crown of fill material shall be applied to lap a min of 1/2 in. (13 mm) onto the surface of the wall and onto the floor on each side of the wall assembly.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

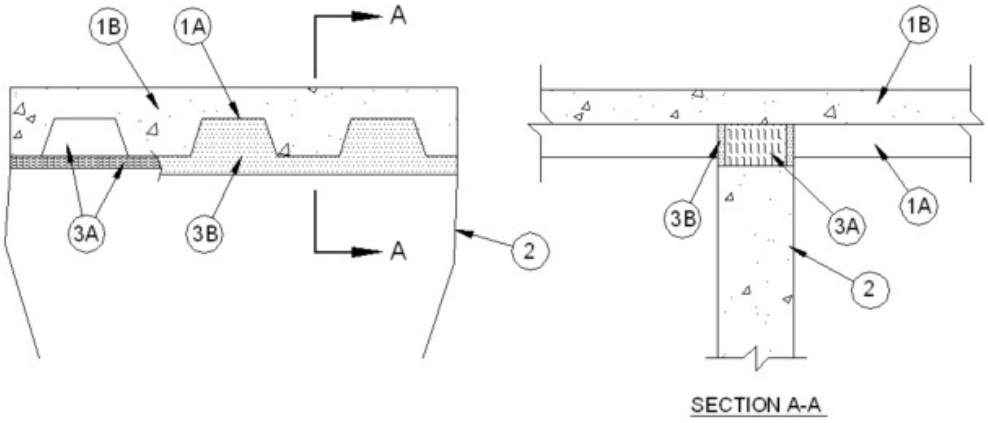
System No. HW-D-0509

July 07, 2008

Assembly Rating — 2 Hr

Nominal Joint Width — 1 In.

Class II Movement Capabilities — 25% Compression



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Form Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 3 in. (76 mm) thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly - (Not Shown) —** As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck Max —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck.

C. **Roof Covering —** Hot-mopped or cold application materials compatible with concrete.

2. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced light or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall to be perpendicular to (Joint Configuration A), or parallel to and centered under the valley (Joint Configuration B) of the steel floor units or roof deck. Wall may also be constructed of any UL Classified **Concrete Blocks*.**

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor or roof and top of wall (at time of installation of joint system) is 1 in. (25 mm).** The joint system is designed to accommodate a max 25 percent compression

from it's installed width. The joint system shall consist of a forming material and fill material in the flutes of the steel floor unit or roof deck and between the top of the wall and bottom of the steel floor unit or roof deck as follows:

Joint Configuration A

A. **Forming Material* —** Min 4-3/4 in. (121 mm) width of 4 pcf (64 mm) mineral wool batt insulation, cut to the shape of the fluted deck, approximately 20 percent larger then the area of the flutes and compressed into the flutes of the steel floor units or roof deck. Additional min 4-3/4 in. (121 mm) wide sections of mineral wool batt insulation are compressed 50 percent in thickness and installed cut edge first to fill the gap between the top of the wall and bottom of the steel floor units or roof deck. The forming material shall be recessed 5/8 in. (16 mm) from each side of the wall.

FIBREX INSULATIONS INC — FBX Safing Insulation

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAF M

W R GRACE & CO - CONN — FlameSafe Mineral Wool

A1. **Forming Material*-Plugs —** (Not Shown) As an alternate to the forming material (Item 3A), mineral wool plugs preformed to the shape of the fluted floor units or roof deck, may be used within the flutes. Plugs shall be friction fitted to completely fill the flutes. The plugs shall be recessed from each surface of wall to accommodate the required thickness of fill material. Additional forming material, described in Item 3A, to be used in conjunction with the plugs to fill the gap between the top of concrete wall and bottom of steel floor units or roof deck.

ROCK WOOL MANUFACTURING CO — Deck Plugs

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. . (16 mm) thickness of fill material installed on each side of the concrete wall in the flutes of the steel floor unit or roof deck and between the top of the wall and the bottom of the steel floor unit or roof deck flush with each surface of concrete wall.

ACCUMETRIC L L C — Boss 816

Joint Configuration B

A. **Forming Material* —** Min 4 pcf (64 mm) density mineral wool batt insulation compressed 50 percent in thickness and as necessary in width, and inserted into opening between the top of the wall and the steel floor unit or roof deck and recessed from both surfaces of wall to accommodate the required thickness of fill material.

FIBREX INSULATIONS INC — FBX Safing Insulation

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. . (16 mm) thickness of fill material installed flush with both sides of the wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

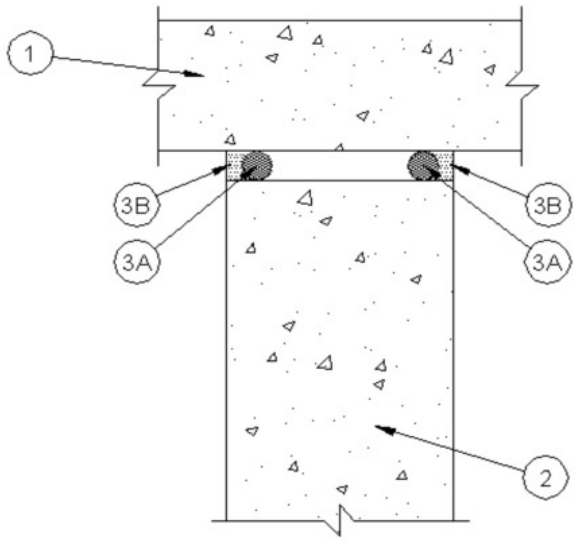
System No. HW-D-0510

July 07, 2008

Assembly Rating — 2 Hr

Nominal Joint Width — 1 In.

Class II Movement Capabilities — 12.5% Compression or Extension



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100 - 150 pcf or 1600-2400 kg/m^3) structural concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** (CFTV) category in the Fire Resistance Directory for names of manufacturers.

2. **Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100 - 150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is 1 in. (25 mm) The joint system is designed to accommodate a max 12.5 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Packing Material —** (Optional) Open or closed cell polyurethane foam backer rod used as a form to prevent the leakage of fill material. Packing material to be recessed from both surfaces of the wall as required to accommodate the required thickness of fill material.
B. **Fill, Void or Cavity Material* - Sealant —** Fill material applied within the joint, flush with both surfaces of wall. Min fill material thickness is 1/2 in. (13 mm).

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

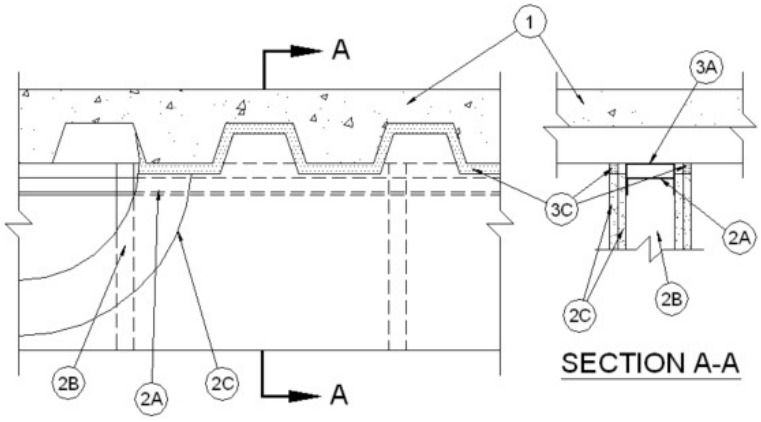
System No. HW-D-0511

July 10, 2008

Assembly Ratings — 1 and 2 Hr (See Item 2)

Nominal Joint Width — 1 In.

Class II Movement Capabilities — 25% Compression



1. **Floor Assembly —** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor And Floor Units* —** Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete —** Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

1A. **Roof Assembly — (Not Shown) —** As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck —** Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation —** Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck.

2. **Wall Assembly —** The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners —** Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with 3 in. (76 mm) flanges. When U shaped deflection channel (Item 3A) is used, ceiling runner is installed within the U-shaped deflection channel with 1 in. (25 mm) gap maintained between the top of ceiling runner and top of deflection channel. When deflection channel is not used, ceiling runner installed perpendicular to the direction of the fluted steel deck and secured to valleys with steel masonry anchors or weld spaced a max 12 in. (305 mm) 0C.

A1. **Light Gauge Framing* —Slotted Ceiling Runner —** Slotted ceiling runner may be used as an alternate to the ceiling runner in Item 2A. Slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed perpendicular to direction of fluted steel floor deck and secured to valleys with steel masonry anchors spaced max 12 in. (305 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

SCAFCO STEEL STUD MANUFACTURING CO

BRADY CONSTRUCTION INNOVATIONS INC,

DBA SLIPTRACK SYSTEMS — SLP-TRK

A2. **Light Gauge Framing* — Clipped Ceiling Runner —** As an alternate to the ceiling runner in Item 2A, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm) Clipped ceiling runner installed perpendicular to direction of fluted steel deck and secured to valleys with steel masonry anchors spaced max 12 in. (305 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. **Light Gauge Framing* —Vertical Deflection Clip* —** (Optional) Steel clips can be used in conjunction with steel studs (Item 2B), ceiling runner (Item 2A) or deflection channel (Item 3A). Clips installed over the top of studs and inserted within the ceiling runner or deflection channel. Clip shall be secured to the ceiling runner or deflection channel with No. 8 self drilling, self tapping steel fasteners through holes provided within the clip. Clip may be secured to the stud with No. 6 pan head steel screw through holes provided within the clip. As an alternate, the legs of the clip may be installed over the top of the stud without attachment in accordance with manufacturer's installation instructions.

FLEX-ABILITY CONCEPTS L L C — Three Legged Dog Deflection Clip

A4. **Light Gauge Framing*- Notched Ceiling Runner —** As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner installed perpendicular to direction of fluted steel floor deck and secured to valleys with steel masonry anchors spaced max 24 in. (610 mm) OC. When notched ceiling runner is used, deflection channel (Item 3A) shall not be used.

DENMAR STEEL INC — Type SCR

B. **Studs —** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and secured to floor runner. When deflection channel (Item 3A) is used, steel studs attached to ceiling runner (Item 2A) with sheet metal screws located 1/2 in. (13 mm) below bottom of deflection channel. When deflection channel is not used, studs to nest in ceiling runners without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board sheets installed to a min total 5/8 or 1-1/4 in. (16 or 32 mm) thickness on each side of wall for a 1 or 2 hr fire-rated wall, respectively. Wall to be constructed as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory, except that the gypsum board is cut to fit the contour of the steel floor units with a nom 1 in. (25 mm) gap. In addition, the top row of screws shall be installed 1/2 to 1 in. (13 to 25 mm) below the bottom edge of the ceiling runner flange.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 25 percent compression from it's installed width.** The joint system shall consist of a material with or without a deflection channel as follows:

A. **Deflection Channel —** (Optional) — Nom 3 in. (76 mm) deep by min 25 gauge galv steel U-shaped channel sized to accommodate ceiling runner(Item 2A). Deflection channel installed perpendicular to direction of fluted steel deck and secured to valleys with steel masonry anchors or by welds spaced max 12 in. (305 mm) OC. The ceiling runner is installed within the deflection channel to maintain a 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. The ceiling runner is not fastened to the deflection channel.

B. **Packing Material —** (Not Shown) — Optional in 2 hr fire rated assemblies, foam backer rod friction fitted into joint opening and recessed to accommodate the required thickness of fill material.

C. **Fill, Void or Cavity Material* — Sealant —** Min 5/8 in. (16 mm) thickness of fill material applied on each side of wall between the top of the gypsum board and all surfaces of the steel floor unit, flush with each surface of the wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

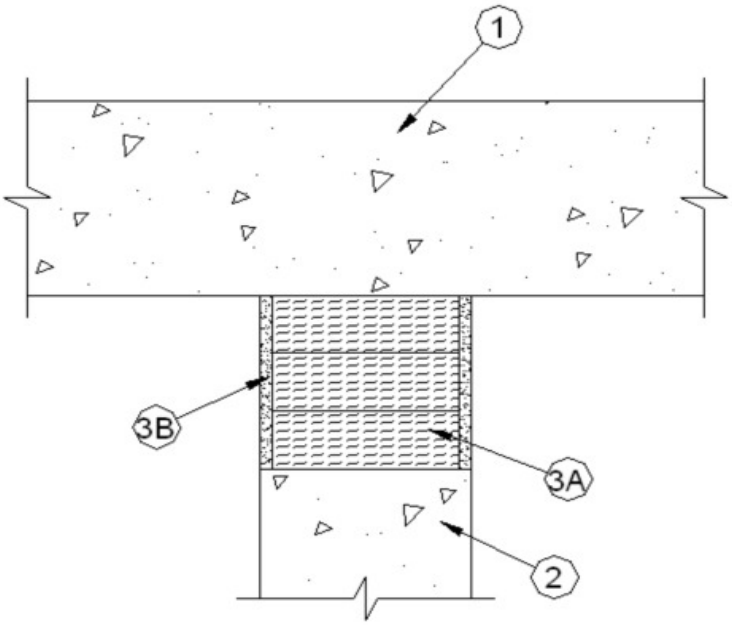
System No. HW-D-1071

July 02, 2008

Assembly Rating—3 Hr

Nominal Joint Width— 2 and 3-1/2 In. (See Item 3A)

Class II Movement Capabilities—15% Compression or Extension



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***

    See **Precast Concrete Units (CFTV)** category in the Fire Resistance Directory for names of manufacturers.

2. **Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

    See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

3. **Joint System — Max separation between bottom of floor and top of wall (at time of installation of joint system) is dependent upon the type of forming material used within the joint system as shown**

on Item 3A. The joint system is designed to accommodate a max 15 percent compression or extension from it's installed width. The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 4 in. (102 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 42 percent in thickness and that the compressed batt sections are recessed from each surface of the wall as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. (610 mm) apart along the length of the joint.

Max width of joint (at time of installation of joint system) is dependent upon the manufacturer and type of forming used within the joint system as shown in the table below:

Manufacturer of Forming Material	Type of Forming Material	Width of Joint, In. (mm)
FBX Insulation	FBX Safing Insulation	3-1/2 (89)
W R Grace	FlameSafe Mineral Wool	3-1/2 (89)
Roxul	SAFE Mineral Wool	2 (51)

FIBREX INSULATIONS INC — FBX Safing Insulation

ROXUL INC — SAFE Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material*—Sealant —** Min 1/4 in. (6 mm) thickness of fill material applied within the joint, flush with each surface of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

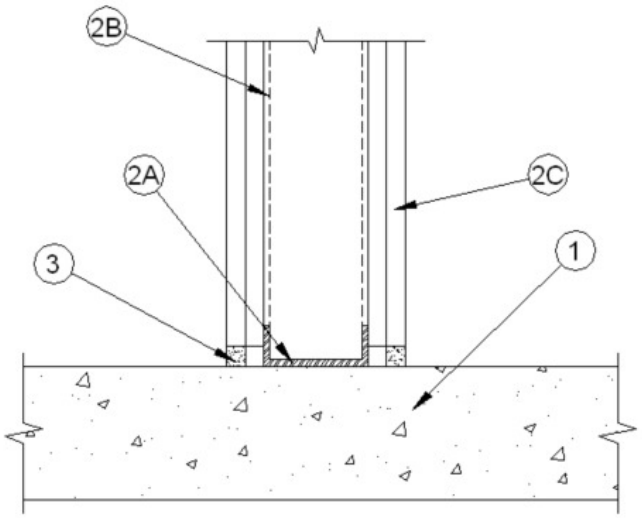
Joint Systems

System No. BW-S-0018

June 24, 2008

Assembly Ratings — 1 and 2 Hr (See Item 2)

Joint Width — 1 In. Max



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/cu meter)) structural concrete. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufacturers.

2. **Wall Assembly —** The 1 or 2 h fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL Fire Resistance Directory. The wall shall include the following construction features:

A. **Steel Floor Runner —** Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Floor runners to be provided with min 1-1/4 in. (32 mm) flanges. Runners secured with steel fasteners spaced 12 in. (305 mm) OC.

B. **Studs —** Steel studs to be min 3-5/8 in. (92 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board* —** Gypsum board installed to a min total thickness of 5/8 in. (16 mm) or 1-1/4 in. (32 mm) on each side of wall for a 1 or 2 hr rated wall, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory except that a max 1 in. (32 mm) gap shall be maintained between the bottom of the gypsum board and the top of the concrete floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System —** Max separation between top of floor and bottom of gypsum board is 1 in. (25 mm). The joint system consists of a packing material and a fill material, as follows:

A. **Packing Material —** (Optional, Not Shown) — Foam backer rod firmly packed into the gap between the bottom of the gypsum board and the top of the concrete floor and recessed from each surface of the wall to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material*-Sealant —** Min 5/8 in. (16 mm) thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

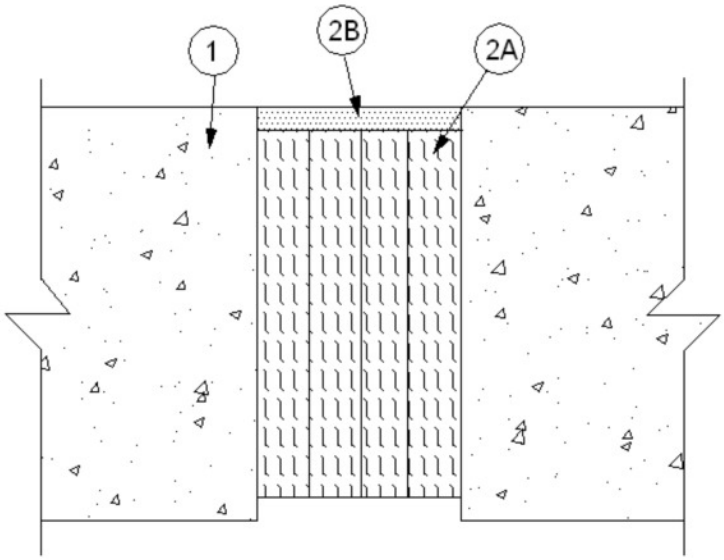
System No. FF-D-0067

June 24, 2008

Assembly Rating — 4 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 12.5% Compression or Extension



1. **Floor Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.
2. **Joint System — Max width of joint (at time of installation of joint system) is 2 in. (51 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 5-1/2 in. (140 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and that the compressed batt sections are recessed from top surface of the floor as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. (610 mm) apart along the length of the joint.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) thickness of fill material applied within the joint, flush with top surface of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

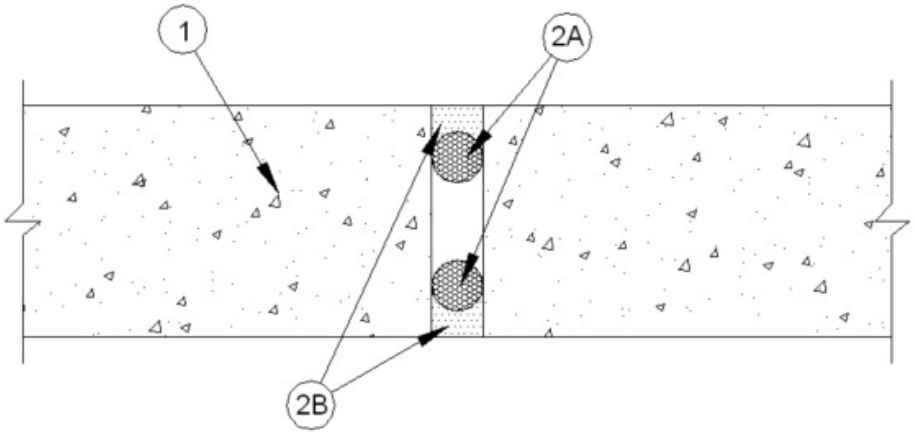
System No. FF-D-0068

July 07, 2008

Assembly Rating — 2 Hr

Nominal Joint Width - 1 in.

Class II Movement Capabilities - 25% Compression or Extension



1. **Floor Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.
2. **Joint System — Max width of joint (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Packing Material —** (Optional) Open or closed cell polyurethane foam backer rod used as a form to prevent the leakage of fill material. Packing material to be recessed from both surfaces of the floor to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with both surfaces of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

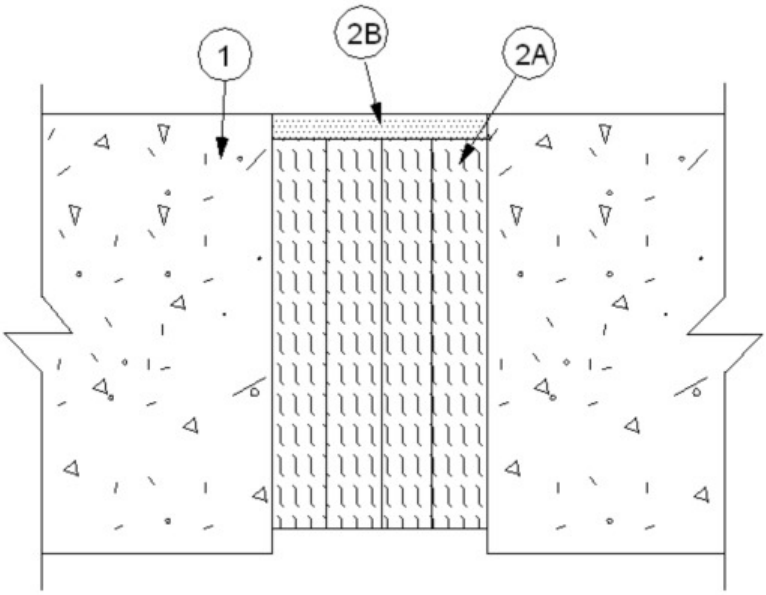
System No. FF-D-1084

July 02, 2008

Assembly Rating — 3 Hr

Nominal Joint Width — 2 and 3-1/2 In. (See Item 2A)

Class II Movement Capabilities — 15% Compression or Extension



1. **Floor Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete.
2. **Joint System — Max width of joint (at time of installation of joint system) is dependent upon the type and manufacturer of the forming material as shown in Item 2A . The joint system is designed to accommodate a max 15 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 4 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 42 percent in thickness and that the compressed batt sections are recessed from top surface of the floor as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. apart along the length of the joint. **Max width of joint (at time of installation of joint system) is dependent upon the manufacturer and type of forming used within the joint system as shown in the table below:**

Manufacturer of Forming Material	Type of Forming Material	Max width of Joint, In.
FBX Insulation	FBX Safing Insulation	3-1/2
W R Grace	FlameSafe Mineral Wool	3-1/2
IIG Minwool L L C	MinWool-1200 Safing	2
Rock Wool Manufacturing	Delta Safing	2
Roxul	SAFE Mineral Wool	2
Thermafiber	SAF Mineral Wool	2

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* — Sealant —** Min 1/4 in. thickness of fill material applied within the joint, flush with top surface of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

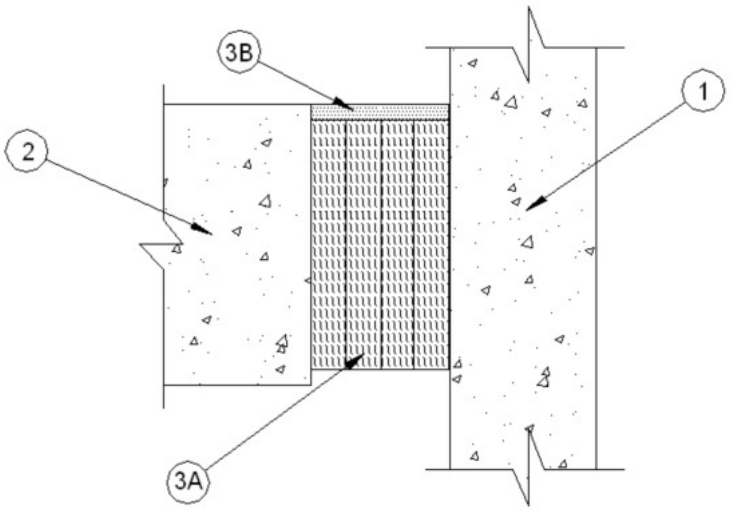
System No. FW-D-0044

June 24, 2008

Assembly Rating — 4 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 12.5% Compression or Extension



1. **Wall Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified Concrete Blocks*.

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Floor Assembly —** Min 6 in. (152 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

3. **Joint System — Max separation between edge of floor and face of wall (at time of installation of joint system) is 2 in. (51 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 5-1/2 in. (140 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 33 percent in thickness and that the compressed batt sections are recessed from top surface of the floor as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. (610 mm) apart along the length of the joint.

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/4 in. (6 mm) thickness of fill material applied within the joint, flush with top surface of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

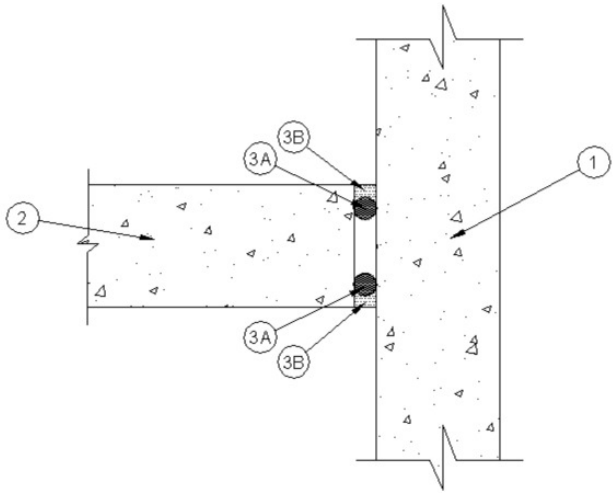
System No. FW-D-0045

July 07, 2008

Assembly Rating — 2 Hr

Nominal Joint Width — 1 in.

Class II Movement Capabilities — 25% Compression or Extension



1. **Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100 - 150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Floor Assembly —** Min 4-1/2 in. (114 m) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete.

3. **Joint System — Max separation between edge of floor and face of wall (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Packing Material —** (Optional) Open or closed cell polyurethane foam backer rod used as a form to prevent the leakage of fill material. Packing material to be recessed from both surfaces of the floor to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with both surfaces of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

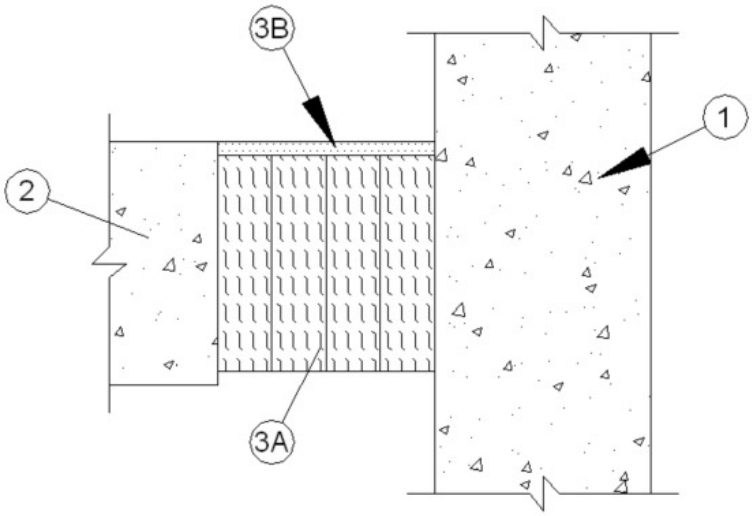
System No. FW-D-1068

July 02, 2008

Assembly Rating—3 Hr

Nominal Joint Width—2 and 3-1/2 In. (See Item 3A)

Class II Movement Capabilities—15% Compression or Extension



1. **Wall Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Floor Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete.

3. **Joint System — Max separation between edge of floor and face of wall (at time of installation of joint system) is dependent upon the type and manufacturer of the forming material as shown in Item 3A. The joint system is designed to accommodate a max 15 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 4 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 42 percent in thickness and that the compressed batt sections are recessed from top surface of the floor as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. apart along the length of the joint. Max width of joint (at time of installation of joint system) is dependent upon the manufacturer and type of forming used within the joint system as shown in the table below:

Manufacturer of Forming Material	Type of Forming Material	Max width of Joint, In.
FBX Insulation	FBX Safing Insulation	3-1/2
W R Grace	FlameSafe Mineral Wool	3-1/2
IIG Minwool L L C	MinWool-1200 Safing	2
Rock Wool Manufacturing	Delta Safing	2
Roxul	SAFE Mineral Wool	2
Thermafiber	SAF Mineral Wool	2

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material*—Sealant —** Min 1/4 in. thickness of fill material applied within the joint, flush with top surface of floor.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

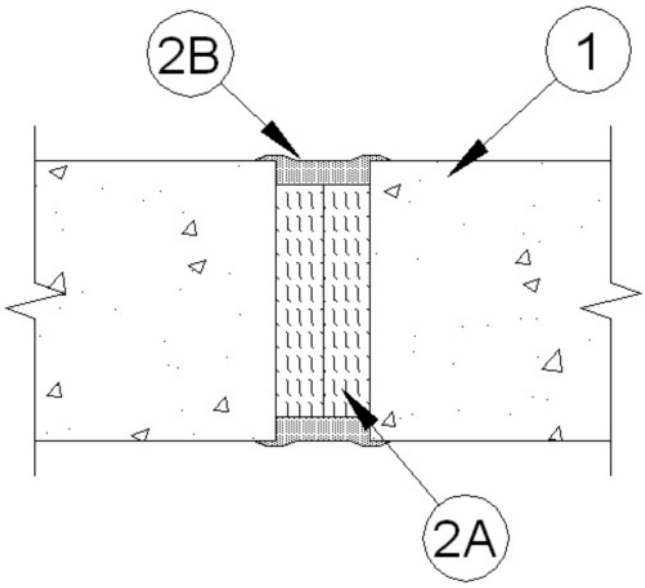
System No. WW-D-0075

July 07, 2008

Assembly Rating — 4 Hr

Nominal Joint Width — 2 In.

Class II Movement Capabilities — 13% Compression or Extension



1. **Wall Assembly —** Min 6 in. (152 mm) thick steel-reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any 4 hr fire rated UL Classified **Concrete Blocks*.**

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Joint System — Max width of joint (at time of installation of joint system) is 2 in. (51 mm). System is designed to accommodate a max 13 percent compression or extension from its installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf (64 kg/m^3) mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 5 in. (127 mm) and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 50 percent in thickness and such that the compressed batt sections are recessed from both surfaces of wall as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. (610 mm) apart along the length of the joint.

FIBREX INSULATIONS INC — FBX Safing Insulation

IIG MINWOOL L L C — MinWool-1200 Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Insulation

ROXUL INC — SAFE Mineral Wool

THERMAFIBER INC — SAF Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with both surfaces of wall. A min 1/8 in. (3 mm) thick crown of fill material shall be applied to lap a min of 1/2 in. (13 mm) onto the surface of the wall on each side of the joint on each side of the wall assembly.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

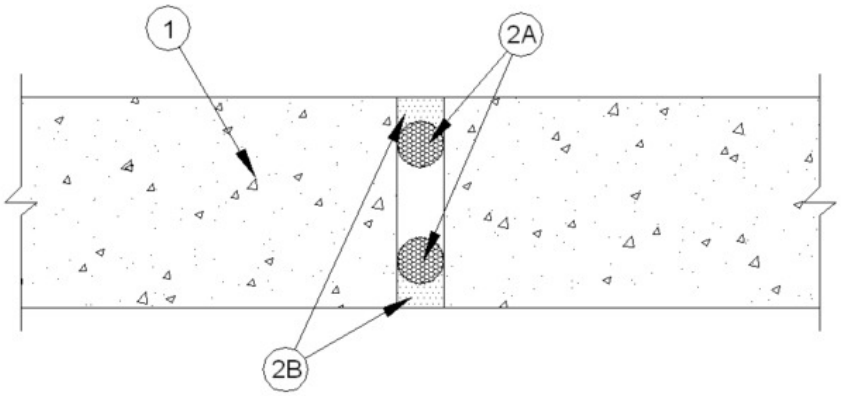
System No. WW-D-0081

July 10, 2008

Assembly Rating — 2 Hr

Nominal Joint Width - 1 In.

Class II Movement Capabilities - 12.5% Compression or Extension



1. **Wall Assembly —** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100 - 150 pcf or 1600-2400 kg/m^3) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***.

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers

2. **Joint System — Max width of joint (at time of installation of joint system) is 1 in. (25 mm). The joint system is designed to accommodate a max 12.5 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Packing Material —** (Optional) - Open or closed cell polyurethane foam backer rod used as a form to prevent the leakage of fill material. Packing material to be recessed from both surfaces of the wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* - Sealant —** Min 1/2 in. (13 mm) thickness of fill material applied within the joint, flush with both surfaces of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Joint Systems

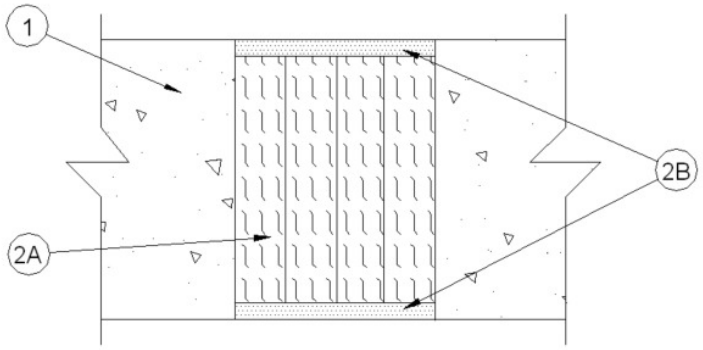
System No. WW-D-1076

July 02, 2008

Assembly Rating—3 Hr

Nominal Joint Width— 2 and 3-1/2 In. (See Item 2A)

Class II Movement Capabilities—15% Compression or Extension



1. **Wall Assembly —** Min 4-1/2 in. thick reinforced lightweight or normal weight (100 - 150 pcf) structural concrete. Wall may also be consturcted of any UL Classified **Concrete Blocks***.

See **Concrete Blocks (CAZT)** category in the Fire Resistance Directory for names of manufacturers.

2. **Joint System — Max width of joint (at time of installation of joint system) is dependent upon the type of mineral wood used within the joint system as shown in Item 2A. The joint system is designed to accommodate a max 15 percent compression or extension from it's installed width.** The joint system shall consist of the following:

A. **Forming Material* —** Min 4 pcf mineral wool batt insulation installed in joint opening as a permanent form. Pieces of batt cut to min width of 4 in. and installed edge-first into joint opening, parallel with joint direction, such that batt sections are compressed min 42 percent in thickness and that the compressed batt sections are recessed from each surface of the wall as required to accommodate the required thickness of fill material. Adjoining lengths of batt to be tightly-butted with butted seams spaced min 24 in. apart along the length of the joint.

Max width of joint (at time of installation of joint system) is dependent upon the manufacturer and type of forming used within the joint system as shown in the table below:

Manufacturer of Forming Material	Type of Forming Material	Width of Joint, In
FBX Insulation	FBX Safing Insulation	3-1/2
W R Grace	FlameSafe Mineral Wool	3-1/2
Roxul	SAFE Mineral Wool	2

FIBREX INSULATIONS INC — FBX Safing Insulation

ROXUL INC — SAFE Mineral Wool

W R GRACE & CO - CONN — FlameSafe Mineral Wool

B. **Fill, Void or Cavity Material*- Sealant —** Min 1/4 in. thickness of fill material applied within the joint, flush with each surface of wall.

ACCUMETRIC L L C — Boss 816

*Bearing the UL Classification Mark

Assembly	BOSS Products	U.L. System	F-Rating	Notes
Other BOSS Fire Protection Products				
Fire Retardant HVAC Duct Sealant	350	n/a	n/a	ASTM E-84
Residential Pipes & Cables Draftstop	812	n/a	n/a	ASTM E-84
Residential & Commercial Pipes & Cables Draft & Smoke Seal	136 & 139	n/a	n/a	ASTM E-136

BOSS FIRESTOP PRODUCTS

APPENDIX

TECHNICAL DATA SHEETS

Please visit our website for more information and to download Material Safety Data Sheets in printable format.

www.bossproducts.com

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Fax: 270-765-2412
350 Ring Road, Elizabethtown, KY 42701
USA

BOSS®

PRODUCT INFORMATION

BOSS® 136 Fireblock/Draftstop Sealant

DESCRIPTION

BOSS® 136 Fireblock/Draftstop Sealant is a single component fire rated sealant and is a noncombustible filler caulking used for fireblocking applications in the annular space around wires, pipes, ducts, vents, cable lines and other penetrations to the building envelope. It is a non-slumping sealant that sets to form a hard surface. **BOSS® 136** can be applied to any gap or penetration where the specification is noncombustible and/or ASTM-E136 rated. **BOSS® 136** is to be used for interior applications only.

The noncombustible specification is common to one and two family construction and to non-rated penetrations in multi family and commercial construction. **BOSS® 136** is colored red for ease of inspection.

In the event of a fire **BOSS® 136** will prevent the spread of fire, smoke and toxic gases through penetration openings.

BOSS® 136 has been tested and meets the American Society for Testing Materials E-136. To pass this test a material must withstand 1,400 degrees Fahrenheit without exhibiting signs of flaming after the first thirty seconds in the test apparatus.

BOSS® 136 serves to form a "gasket or seal against air infiltration" as required by the Model Energy Code in both the performance and prescriptive versions.

BOSS® 136 Applicable Standards include:

- UBC page 1-387, 1997 edition.
- CABO Section 602.7 item 4, 1995 edition
- BOCA (NBC) 704.4.1.1 1996
- ASTM E-136

FEATURES

- **BOSS® 136** is completely non toxic and contains no asbestos or PCBs.
- Noncombustible
- Applied with a conventional caulking gun
- Easily applied sealant with water clean up capabilities
- An accredited fire block/smoke seal caulk
- Single component system, no mixing necessary and no additions required
- Meets residential construction code approvals including I.R.C.
- For interior applications only
- Available in NEW 11.0 Oz. Net Wt. aerosol can
- Excellent adhesion to a wide variety of substrate material

HOW TO USE

- Cut nozzle to desired bead size. Insert cartridge into standard caulking gun.
- For a smooth seal, hold at 45° angle and apply by pushing sealant ahead of nozzle.
- Apply at 40°F or above.
- To ensure good adhesion, all surfaces should be clean and free of dust, oil, loose materials or any other substances.
- Make sure that **BOSS® 136** makes complete contact with the entire surface of the opening and also the surface of the penetrating items.

Always follow cartridge directions. Clean the area to be treated so that it is free of all particles and debris. For large openings, mineral wool fibers can be used as a backer to help hold the product in place until cured. Steel screen wire can be stapled in place over the material when a large opening is overhead or configured such that the material will not support its own weight during cure.

TEMPERATURE RANGE

BOSS® 136 freezes in the cartridge at temperatures below 32°F. The product can be warmed and applied at any temperature but will not cure below 40°F. Freeze thaw cycles do not alter the cured product. Cure time may exceed 72 hours at non-freezing temperature.

CAUTION

- Keep from freezing
- Do not take internally
- Keep out of reach of children

CONTAINS

Sodium Silicate CAS# 1344-09-8.

SPECIFICATIONS

Meets **ASTM E-136**, standard test method for behavior of materials in a vertical tube furnace at 1400°F. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997), Section 796, Fire Block and Draft Stop. BOCA-SBCCI-ICBO-NFPA Building Codes. Consult your local code official for the proper use of product.

CLASSIFIED C UL US
NONCOMBUSTIBLE BUILDING MATERIALS IN ACCORDANCE WITH ASTM E-136 <9NA6>

NFPA® MEMBER 05-06

ALSO CLASSIFIED IN ACCORDANCE WITH ASTM E 136-96a, "Standard test method for the behavior of materials in a vertical tube furnace at 750°C."

COLOR

BOSS® 136 Fireblock/Draftstop Sealant is red in color for ease of inspection.

PACKAGING

BOSS® 136 Fireblock/Draftstop Sealant is available in standard 10.1 and 28 Fl. Oz. cartridges, 5 gallon pails and new 11.0 Oz. Net Wt. aerosol cans.

STORAGE AND SHELF LIFE

BOSS® 136 should not be stored where the ambient temperaures exceed 120°F, or below 35°F. Should freezing occur, insure that product is defrosted fully prior to use. Shelf life is 12 months from the date of shipment. Ensure stock is rotated.

USERS PLEASE READ

The information and data contained herein is believed to be accurate and reliable; however, it is the user's responsibility to determine suitability of use. Since the supplier cannot know all the uses, or the conditions of use to which these products may be exposed, no warranties concerning the fitness or suitability for a particular use or purpose are made.

It is the user's responsibility to thoroughly test any proposed use of our products and independently conclude satisfactory performance in the application.

Likewise, if the application, product specifications or manner in which our products are used requires government approval or clearance, it is the sole responsibility of the user to obtain sure authorization.

The supplier warrants only that its products will meet its specifications. There is no warranty of merchantability or fitness for use, nor any other express or implied warranty. The users exclusive remedy and the suppliers sole liability is limited to refund of the purchase price or replacement of any product shown to be otherwise than as warranted. The supplier will not be liable for incidental or consequential damages of any kind.

Suggestions of uses should not be taken as inducements to infringe any patents.

MADE IN U.S.A.

BOSS® PRODUCTS

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Suriyawong, Bangrak
Bangkok, 10500 Thailand
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FAX (662)634-3066

www.bossproducts.com

BOSS®

PRODUCT INFORMATION

BOSS® 137 Firestop Spray Coating

TYPICAL PROPERTIES

Color	Red
Weight	10.4 ± 0.4 lbs/gal (1.2 ± 0.05 kg/L)
Viscosity	50,000 cps (average) 24 ± 0.1°C @10 rpm
Storage Temperature	40°F to 90°F (4°C to 32°C)
Application Temperature	40°F to 90°F (4°C to 32°C)
Flame Spread (UL 723/ASTM E84)	0
Smoke Developed (UL 723/ASTM E84)	0

*Information on this data sheet is subject to change without notice and should not be used for writing specifications.
For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 137 Firestop Spray Coating is a water-based. elastomeric coating that is designed for spray applications onto joints between fire-resistive assemblies and perimeter barrier (curtain wall) assemblies. **BOSS® 137** cures to a strong, flexible seal. The coating has been tested to dynamic movement conditions in accordance with ASTM E1399 relating to seismic, wind sway and thermal expansion/contraction environments. It has been specifically formulated for ease of application and provides an efficient solution for firestopping joint systems.

FEATURES

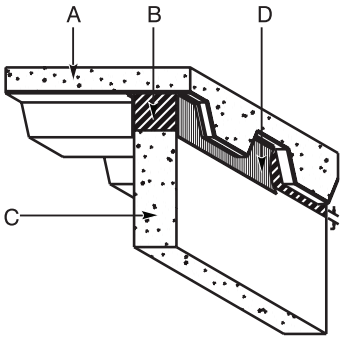
- Head of wall applications
- Metallic and HVAC penetrations
- Listed in systems with up to 4 hour fire rating
- Excellent adhesion and thickness build
- Elastomeric
- Easy application and water clean-up
- Sprayable or brushable
- Paintable

HOW TO USE

- Apply to clean, dry substrates when the air and substrate temperature is between 40°F and 90°F (4°C and 32°C).
- Do not apply when the air or substrate temperature is below 32°F (0°C).
- Apply using airless spray equipment designed for application of heavy bodied latex paint
- The larger horsepower machines have larger diameter intakes and allow higher application rates and better performance in colder temperatures.
- Spray guns can be fitted with a range of wide angle and narrow pattern tips to match the specific job, thereby minimizing overspray and waste.
- For best results any filters should be removed from the spray gun and handle before use as these filters can restrict flow and spray pattern.
- Apply **BOSS® 137** uniformly over mineral wool compressed into gaps, voids or joint openings to obtain a minimum 0.125 in. (3.18 mm) wet film thickness.
- Overlap coating a minimum of 0.5 in. (13 mm) wet film thickness beyond all edges of the opening onto surrounding construction surfaces.
- Small or touch-up areas may be sprayed or brushed.
- See specific system design for installation details.
- Clean all equipment with soap and water immediately after use. For short stoppage intervals, the spray gun may be immersed in water to prevent clogging of the spray tip.
- Reseal unused coating tightly in its original container.

SPECIFICATIONS

BOSS® 137 is classified by UL Laboratories. ASTM E1399 tested, “cyclic movement and measuring the minimum and maximum joint width of architectural joint systems”. ASTM E1966 (UL 2079) tested, “test method for fire resistive joint systems”. Perimeter barrier tested per ASTM E5.11.14 (draft) using the intermediate scale multi-story test apparatus. Sound transmission tested in accordance with ASTM E90.



HEAD OF WALL–2 & 3 Hr. (UL HW-D-0415)

A=Max. 3 in. (76 mm) deep-fluted steel deck with a min. 2.5 in. (64 mm) of concrete topping (Monokote optional).

B=Mineral wool (4 pcf) compressed a min. 50% in the fluted area and in the joint area.

C=Min. 6 in. (152 mm) concrete or CMU block wall capable of a 3 hour rating.

D=**BOSS® 137** min. 0.125 in. (3.2 mm) (wet) overlapping a min. 0.5 in. (13 mm) onto wall and decking.

Tested to UL 2079 with a cyclic movement of 500 cycles @ 10 cycles/minute.

Max. 50% total movement (compression and extension)

Refer to UL designs for full system description

CAUTION

Keep from freezing. Do not take internally. KEEP OUT OF THE REACH OF CHILDREN.

PACKAGING

BOSS® 137 Firestop Spray Coating is available in 5 gallon containers.

SHIPPING LIMITATIONS

None

STORAGE AND SHELF LIFE

When stored in original unopened container at or below 90°F (32°C), **BOSS® 137** Firestop Spray Coating has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use.

USERS PLEASE READ

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MADE IN U.S.A.

BOSS® PRODUCTS

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www.bossproducts.com

BOSS®

PRODUCT INFORMATION

BOSS® 139 Fire Mortar

TECHNICAL & PERFORMANCE DATA

Color	Black
Specific Gravity	1.46
Consistency	Thick gunable paste
Working Time	15 minutes
Flexibility	None
Service Temperature	0°F to 1400°F
Application Temperature	0°F to 120°F
Curing Time	Full cure in 24 hours when properly fired
Tested To	ASTM E-136

*Information on this data sheet is subject to change without notice and should not be used for writing specifications.
For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 139 Fire Mortar is a non combustible silicate cement that can withstand extremely high temperatures. Formulated for repairing chimneys, fireplaces and sealing wood-burning stoves and appliances, this product has strong adhesion and sets to become rock hard when fired. **BOSS 139** Fire Mortar cannot be used in areas where there is constant movement, or where wet conditions exist or may occur. **BOSS 139** Fire Mortar has been tested and exceeds ASTM E-136 and can withstand temperatures of up to 1400°F. Can be used in wood frame construction where an ASTM E-136 non combustible sealant is specified and where allowed by the building code. This includes sealing around pipes, ducts, vents and chimneys at ceiling and floor level before drywall is applied.

FEATURES

- Can withstand extremely high heat
- Apply using a standard caulking gun
- Dries rock hard when cured and fired
- Safe to use and handle
- No harmful odors
- Water clean-up (prior to curing)
- VOC compliant
- Contains NO asbestos fillers of any kind

HOW TO USE

All surfaces should be clean and dry and free of loose dirt or grease. For best results, dampen application area first with water.

- Cut nozzle to desired bead size. Insert cartridge into standard caulking gun.
- Gun along or around penetrations and voids.
- Press mortar into voids with wet putty knife.
- Clean excess material immediately with a damp cloth. This material is almost impossible to remove after it has cured.
- Start a low burning fire for approximately 1 hour to allow product to dry.
- Increase heat gradually and allow mortar to cure for 1 to 2 hours, or until rock hard.
- Allow to cure for 24 hours between layers.

TEMPERATURE RANGE

BOSS® 139 freezes in the cartridge at temperatures below 32°F. The product can be warmed and applied at any temperature but will not cure below 40°F. Freeze thaw cycles do not alter the cured product. Cure time may exceed 72 hours at non-freezing temperature.

CAUTION

- Keep from freezing
- Do not take internally
- Keep out of reach of children

CONTAINS

Sodium Silicate CAS# 1344-09-8.

SPECIFICATIONS

Tested to **ASTM E-136**, standard test method for behavior of materials in a vertical tube furnace at 1400°F. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997), Section 796, Fire Block and Draft Stop. BOCA-SBCCI-ICBO-NFPA Building Codes. Consult your local code official for the proper use of product.

NFPA® MEMBER
05-06

COLOR

BOSS® 139 Fire Mortar is black in color for ease of inspection.

PACKAGING

BOSS® 139 Fire Mortar is available in standard 10.1 Fl. Oz. cartridges.

STORAGE AND SHELF LIFE

When stored in the original unopened container at or below 70°F, **BOSS® 139** has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use. Ensure stock is rotated.

USERS PLEASE READ

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MADE IN U.S.A.

BOSS® PRODUCTS

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BOSS®

PRODUCT INFORMATION

BOSS® 350 Flame Retardant Duct Sealant

TYPICAL PROPERTIES

Color	Gray
% Non-Volatile, by weight	81%
% Volume Shrinkage: ASTM C-733-87	28%
Weight per gallon, approximate	13.5 lb./gal.
pH	8.0
Tack-Free Time: ASTM D-2377-84	<25 minutes
Weather Resistance: ASTM C-732-82	No washout, discoloration, loss of adhesion or cracking after 500 hours of weathering
Peel Strength: Aluminum	30.0 pounds force
Low Temperature Flexibility: ASTM C-734-82	No cracking through to substrate or adhesion loss
Extrudability after package aging (freeze-thaw stability): ASTM C-731-187	16.1 grams/second
Volatile Organic Content (VOC minus water)	47 grams/liter

*Information on this data sheet is subject to change without notice and should not be used for writing specifications.
For additional information on specific applications, contact Accumetric, LLC

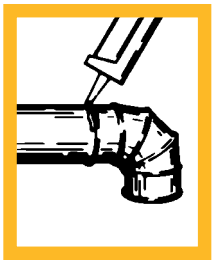
DESCRIPTION

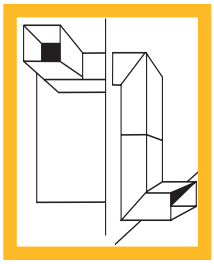
BOSS® 350 Siliconized Duct Sealant is high performance, flame retardant duct sealant designed for use in high, medium or low velocity heating and air conditioning systems. **BOSS® 350** provides excellent strength, flexibility and resistance to heat and cold, forming a seal against air leakage.

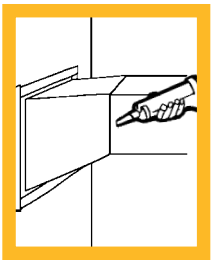
BOSS® 350 Siliconized Duct Sealant cures to a tough, tack-free, flexible sealant and remains flexible at low and high temperatures. Do not apply below 40°F (4.4°C). Do not thin. Use in conjunction with metal fasteners to hold assembly together.

USES

- Sealing pipe joints
- Ductwork
- Ductwork seams


Ducting Elbow Joint


Ductwork


Ductwork Seams

ASTM SPECIFICATIONS

BOSS® 350 conforms to the ASTM specification C-834-76 by meeting all the requirements as listed below:

	REQUIRED	TEST RESULTS
C-731 Extrudability	2 g/s min.	10.2 g/s
C-732 Artificial Weathering	No washout, discoloration, loss of adhesion or cracking after 500 hours of weathering	Meets requirements
C-733 Volume Shrinkage	30% max.	28%
C-734 Low Temperature Flexibility	No cracking through to substrates or adhesion loss	Meets requirements
C-736 Extension Recovery	Recovery 75% min. Adhesion loss 25% max.	92.7% 25%
D-2202 Slump	0.15 inches max.	0.08 inches
D-2203 Staining	3 max.	0
D-2377 Tack-Free Time	No adhesion to polyethylene film after 72 hours at room temperature	<1 hour

HOW TO USE

BOSS® 350 Siliconized Duct Sealant should only be used where slight joint movement is anticipated. In extremely deep joints, use foam joint filler.

Tooling is recommended and, if possible, should be completed in one continuous stroke.

Tool joints within ten minutes of application. If masking tape has been used to obtain a cleaner joint it should be removed before the tack-free skin forms.

CAUTION: Do not apply when building material or air temperature is below 40°F (4.4°C). **BOSS® 350** is not recommended for continuous water immersion.

SPECIFICATIONS

BOSS® 350 Siliconized Duct Sealant meets the following specifications: ASTM C834, ASTM E 84, Surface Burn Test and UL 723.

CLASSIFIED C UL US

UL 723

CAULKING AND SEALANTS SURFACE BURNING CHARACTERISTICS <51HM>

Surface burning characteristics applied to inorganic reinforced cement board. Applied in two 2 in. wide by 1/32 in. thick strips, 8 in. OC.

Flame Spread–0
Smoke Developed–0

CLEAN UP

Excess caulk should be cleaned off tools and nonporous surfaces while it is in the uncured state, using a wet cloth. Cured compounds should be cut away.

STORAGE AND SHELF LIFE

When stored in original unopened container at or below 90°F (32°C), **BOSS® 350** Siliconized Duct Sealant has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use. After a container has been opened and the entire contents have not been used, extrude 3/8" of material past nozzle opening. When ready to use pull out cured plug. Sealant is ready to use.

CAUTION

DIRECT CONTACT OF UNCURED SEALANT IRRITATES EYES AND MAY IRRITATE SKIN. OVEREXPOSURE TO VAPOR MAY IRRITATE EYES, NOSE, AND THROAT. Avoid eye and skin contact. Use with adequate ventilation. Do not handle contact lenses with sealant on hands. IN CASE OF EYE CONTACT, flush eyes with water for 15 minutes. Obtain medical attention. IN CASE OF SKIN CONTACT, remove from skin and flush with water.
KEEP OUT OF THE REACH OF CHILDREN.

SHIPPING LIMITATIONS

None.

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MADE IN U.S.A.

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BOSS® PRODUCTS

TECHNICAL DATA SHEET

BOSS® 760 Firestop Silicone

TYPICAL PROPERTIES

Color	Red
Specific Gravity	1.40
Consistency (ASTM C639-5)	Non Slump
Tack Free Time	35 minutes
Ultimate Elongation	385%
Hardness Shore A (ASTM C661)	35-40 cured
Joint Movement	±25%
Application Temperature	20°F to 120°F
Curing Time	Full cure in 14 days
Tested To	ASTM E-814 (UL 1479)

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For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 760 Firestop Silicone is a single part, low modulus neutral cure silicone firestop. **BOSS® 760** will prevent the spread of toxic gasses, smoke and fire. **BOSS® 760** is not affected by UV radiation, will not crack and is capable of sustaining constant vibration and seismic and thermal shock.

BOSS® 760 has been tested to ASTM E-814 (UL 1479) and meets the criteria for fire/smoke/draft stop for BOCA – CABO – UBC – SBCCI – IRC – IBC.

FEATURES

- **Remains flexible**
- **Interior/exterior use**
- **VOC compliant**
- **Can be used on virtually any surface**
- **Safe to use and handle**
- **Easy tooling**
- **Apply using a standard caulk gun**

HOW TO USE

- Cut nozzle to desired bead size and puncture inner seal. Insert cartridge into standard caulking gun.
- For a smooth seal, hold at 45° angle and apply by pushing sealant ahead of nozzle.
- Apply at 40°F or above.
- To ensure good adhesion, all surfaces should be clean and free of dust, oil, loose materials or any other substances.
- Make sure that **BOSS® 760** makes complete contact with the entire surface of the opening and also the surface of the penetrating items.

Always follow cartridge directions. Clean the area to be treated so that it is free of all particles and debris. For large openings, mineral wool fibers can be used as a backer to help hold the product in place until cured. Steel screen wire can be stapled in place over the material when a large opening is overhead or configured such that the material will not support its own weight during cure.

TEMPERATURE RANGE

BOSS® 760 should be stored at temperatures from 40°F (4°C) to 90°F (32°C). Should the product freeze, bring back to 40°F (4°C) and apply. Once applied and cured, product will stand high and low temperatures, and will not alter the performance. **BOSS® 760** will not shrink during or after curing.

CAUTION

DIRECT CONTACT OF UNCURED SEALANT IRRITATES EYES AND MAY IRRITATE SKIN. OVEREXPOSURE TO VAPOR MAY IRRITATE EYES, NOSE AND THROAT. Avoid eye and skin contact. Use with adequate ventilation. Do not handle contact lenses with sealant on hands. IN CASE OF EYE CONTACT, flush eyes with water for 15 minutes. Obtain medical attention. IN CASE OF SKIN CONTACT, remove from skin and flush with water. KEEP OUT OF REACH OF CHILDREN.

CONTAINS

Amorphous Silica CAS# 112945-52-5, Methyltri Silane CAS# 22984-54-9, Calcium Carbonate CAS# 1317-65-3.

SPECIFICATIONS

Meets **ASTM E-814 (UL 1479)**, standard test method for fire tests of through penetration firestops. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997), Section 796, Fire Block and Draft Stop. BOCA-SBCCI-ICBO-NFPA Building Codes.

CLASSIFIED C UL US
FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
<9NA6>

NFPA® MEMBER 05-06

COLOR

BOSS® 760 Silicone Firestop Sealant is red in color for ease of inspection.

PACKAGING

BOSS® 760 Silicone Firestop Sealant is available in standard 10.1 and 28 Fl. Oz. cartridges, 20 Oz. sausages, 5 gallon pails and new 11.0 Oz. Net Wt. aerosol cans.

STORAGE AND SHELF LIFE

When stored in the original unopened container at or below 70°F, **BOSS® 760** has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use. Ensure stock is rotated.

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BOSS® PRODUCTS

TECHNICAL DATA SHEET

BOSS® 810 Non-Intumescent Latex Firestop Sealant

TYPICAL PROPERTIES

Color	Red
Specific Gravity	1.62
Consistency (ASTM C639-5)	Non Slump
Skin Forming Time	<25 minutes
Ultimate Elongation	440%
Joint Movement	±7.5%
Application Temperature	40°F to 120°F
Curing Time	Full cure in 7 days
Freeze/Thaw	5 Cycles
Tested To	ASTM E-814 (UL 1479), ASTM E-84 (UL 723)

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For additional information on specific applications, contact Accumetric, LLC

FEATURES

- **Interior/exterior use on virtually any surface**
- **Remains flexible**
- **VOC compliant**
- **Excellent freeze/thaw properties**
- **Safe to use and handle**
- **Water clean-up**
- **12 month shelf life**
- **Apply using a standard caulk gun**

DESCRIPTION

BOSS® 810 Non-Intumescent Latex Firestop Sealant is a single part, acrylic, multi-purpose non-intumescent firestop sealant that will prevent the spread of toxic gases, smoke and fire. **BOSS® 810** is extremely flexible and is ideal for both horizontal and vertical joints subject to vibration or dynamic movement. **BOSS® 810** adheres to almost any surface. It can be used for interior or exterior applications, and can be painted (after inspection). **BOSS® 810** has been tested to ASTM E-814 (UL 1479) and meets the criteria for fire/smoke/draft stop for BOCA – CABO – UBC – SBCCI – IRC – IBC.

HOW TO USE

- Cut nozzle to desired bead size. Insert cartridge into standard caulking gun.
- For a smooth seal, hold at 45° angle and apply by pushing sealant ahead of nozzle.
- Apply at 40°F or above.
- To ensure good adhesion, all surfaces should be clean and free of dust, oil, loose materials or any other substances.
- Make sure that **BOSS® 810** makes complete contact with the entire surface of the opening and also the surface of the penetrating items.

Always follow cartridge directions. Clean the area to be treated so that it is free of all particles and debris. For large openings, mineral wool fibers can be used as a backer to help hold the product in place until cured. Steel screen wire can be stapled in place over the material when a large opening is overhead or configured such that the material will not support its own weight during cure.

TEMPERATURE RANGE

BOSS® 810 will freeze in the cartridge at temperatures below 32°F (0°C). Therefore, store at between 40°F (4°C) and a maximum of 120°F (42°C). If freezing occurs, bring back to 40°F (4°C) prior to use. It is not recommended to frequently allow product to freeze. Once cured, **BOSS® 810** will withstand freeze/thaw cycles.

CAUTION

- Keep from freezing
- Do not take internally
- Keep out of reach of children

CONTAINS

Acrylic Polymer CAS Proprietary, Calcium Carbonate CAS# 1317-65-3, Mineral Spirtits CAS# 8052-41-3, Butyl Benzyl Phthalate CAS# 85-68-7, Ethylene Glycol CAS# 107-21-1.

SPECIFICATIONS

Meets **ASTM E-814 (UL 1479)**, standard test method for fire tests of through penetration firestops. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997), Section 796, Fire Block and Draft Stop. BOCA-SBCCI-ICBO-NFPA Building Codes. Meets **ASTM E-84 (UL 723).**

CLASSIFIED C UL US
FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
<9NA6>

NFPA® MEMBER 05-06

COLOR

BOSS® 810 Non-Intumescent Latex Firestop Sealant is red in color for ease of inspection.

PACKAGING

BOSS® 810 Non-Intumescent Latex Firestop Sealant is available in standard 10.1 and 28 Fl. Oz. cartridges, 20 Oz. sausages and 5 gallon pails.

STORAGE AND SHELF LIFE

When stored in the original unopened container at or below 95°F, **BOSS® 810** has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use. Ensure stock is rotated.

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BOSS®

PRODUCT INFORMATION

BOSS® 812 Draft/Smoke Stop Foam

TYPICAL PROPERTIES

ASTM D-1622
Density ..... 1.25 lbs./ft³

Theoretical Yield ..... 1/2" bead=880 ft.

ASTM C-518
Thermal Conductivity ..... 0.22 - 0.26 Btu-in/hr-F-ft²

ASTM C-518
R Value ..... 3.8 - 4.5 hr-F-ft²/Btu
Tack Free (1" bead) ..... 10 minutes (73°F & 50% RH)
Can Be Cut (1" bead) ..... 90 minutes (73°F & 50% RH)
Fully Cured (1" bead) ..... 24 hours (73°F & 50% RH)

ASTM E-84-04 UL 723
Fire Testing ..... Flame Spread-15, Smoke Developed-15

DIN 53429
Water Absorption 1%

IN HOUSE TESTING
Temperature Resistance ..... 40°F up to 194°F (long term)
40°F up to 266°F (short term)

VOC ..... 1.494#/gal, 179g/liter

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DESCRIPTION

BOSS® 812 Draft/Smoke Stop Foam prevents the spread of smoke and toxic gasses from one compartment to another, thereby slowing down the spread of fire, due to lack of air to fuel the flames.

BOSS® 812 has excellent insulation and acoustic properties, and is also paintable (after inspection).

BOSS® 812 has been tested to ASTM E-84 and is classified as Class A.

FEATURES

- Will adhere to almost any substrate
- Can be used to seal around copper, PVC pipes and conduits. In addition to large spaces left after the installation of waste water pipes, ducting etc.
- Prevents the spread of smoke and toxic gasses
- Installed in seconds, reducing labor costs by up to 90%
- Ideal for single and two family homes
- Paintable (after inspection)
- Can be used on vertical or horizontal applications
- Excellent acoustic and thermal insulation
- Unaffected by moisture or humidity after curing
- CFC Free
- Very cost effective
- Reduces energy costs
- Prevents intrusion of insects and pests

HOW TO USE

- Ensure surfaces are clean and free of dust, loose particles and grease.
- As **BOSS® 812** cures by moisture absorption, ensure that the surfaces are moistened with water prior to application. This can be best achieved using a hand sprayer with clean fresh water.
- Shake can thoroughly 15-20 times and then turn the can upside down prior to pressing the trigger.
- The foam should be applied into gaps and openings from the bottom first, working up as each layer is allowed to part cure (for large openings). For small openings spray around the opening, as the foam will expand very quickly and fill the space.
- If the atmosphere is very dry, a light water spray will speed up the curing process.
- Dries tack-free within 5 minutes and cures within 1 hour (depending on thickness and depth of the foam).
- Cured foam can be cut and sanded after curing.

COLOR

BOSS® 812 Draft/Smoke Stop Foam is salmon red/pink in color.

PACKAGING

BOSS® 812 Draft/Smoke Stop Foam is available in 24 Oz. cans, which are packaged 12 cans to a case.

SPECIFICATIONS

Meets ASTM E84-04 and UL 723 regarding caulk and sealants surface burning characteristics applied to inorganic cement board.

Flame Spread. 15
Smoke Developed. 15

STORAGE AND SHELF LIFE

BOSS® 812 should be stored where the ambient temperature will not exceed 130°F or drop below 40°F. Shelf life is 12 months from date of manufacture. Ensure stock is rotated at all times.

DANGER!

Extremely flammable. **Contents under pressure.** Do not smoke while using nor use near open flame. Container may explode if heated in any manner. Store can at temperatures below 120°F. Do not puncture or incinerate. Vapors may cause flash fire. Do not expose to direct sunlight or store in enclosed vehicle. Foam is combustible. Do not expose to flame or high heat.

EYE IRRITANT. May irritate or cause allergic reaction to skin. Inhalation of vapor may result in respiratory allergies including asthma. Persons with known isocyanate allergies should avoid any skin or respiratory contact with product ingredients. Use with adequate ventilation or suitable respiratory protective equipment. Wear protective clothing to avoid skin contact. Wear eye protection.

FIRST AID: Inhalation - move immediately to fresh air. **Eye contact -** flush eyes immediately for 15 minutes. **Skin contact -** wash affected area immediately with plenty of soap and water. Get medical assistance in all cases (show label when possible). For further health and safety information consult the current Material Safety Data Sheet available from **BOSS® Products** at 800-928-2677.

KEEP OUT OF REACH OF CHILDREN.

CONTAINS: Diphenylmethanedisocyanate, Polyol and Butane/Propane.

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www.bossproducts.com

BOSS®

PRODUCT INFORMATION

BOSS® 813 Expanding Firestop Foam

TECHNICAL & PERFORMANCE DATA

Flammability Class ..... B1 according to DIN 4102, part 1

Tack Free Time - depending on temperature & humidity
..... 5-10 minutes

Cut Time - depending on temperature & humidity
..... (1.2" Dia.) 15-20 minutes

Hardening Time - depending on temperature & humidity
..... 5-12 hours

Elongation at break 15-20%

Temperature Resistance ..... -40°F to 210°F

Application Temperature
..... 41°F (surfaces), 68°F-77°F (can)

Water Absorption ..... Max. 2% Vol.

Tensile Strength ..... 0,071 - 0,076 MPa

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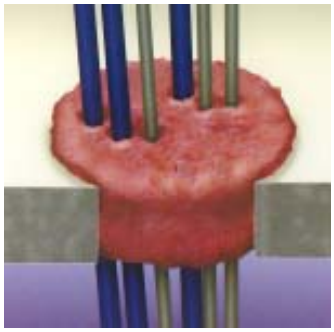
For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 813 Expanding Firestop Foam is the FIRST Firestopping Foam on the market today that is UL Certified and has passed the strict ASTM E-814 and UL 1479 testing procedures. By passing ASTM-E-814 **BOSS® 813** can be used on any commercial or residential construction where the code calls for a UL system for penetration of cables, etc. through drywall, concrete or wood. (Please consult the UL directory for a full list of approved systems).
BOSS® 813 prevents the spread of fire, smoke and toxic gasses from one compartment to another, while still maintaining the integrity of the Firewall.
BOSS® 813 has excellent insulation and acoustic properties, and is also paintable (after inspection).
BOSS® 813 meets or exceeds all building codes including the new International Building Code.
BOSS® 813 has been tested to ASTM E-814 , UL 1479 and ASTM E-84. Classified for 1 and 2 hour assemblies.

FEATURES

- Will adhere to almost any substrate
- Installed in seconds, reducing labor costs by up to 90%
- Ideal for hotels, hospitals, prisons, condominiums, single and two family homes
- Paintable
- Can be used on vertical or horizontal applications
- Excellent acoustic and thermal insulation
- Unaffected by moisture or humidity after curing
- CFC Free



HOW TO USE

- Ensure surfaces are clean and free of dust, loose particles and grease.
- As **BOSS® 813** cures by moisture absorption, ensure that the surfaces are moistened with water prior to application. This can be best achieved using a hand sprayer with clean fresh water.
- Shake can thoroughly 15-20 times and then turn the can upside down prior to pressing the trigger.
- The foam should be applied into gaps and openings from the bottom first, working up as each layer is allowed to part cure (for large openings). For small openings spray around the opening, as the foam will expand very quickly and fill the space.
- If the atmosphere is very dry, a light water spray will speed up the curing process.
- Dries tack-free within 5 minutes and cures within 5-12 hours (depending on thickness and depth of the foam).
- Cured foam can be cut and sanded after curing.

COLOR

BOSS® 813 Expanding Firestop Foam is salmon red/pink in color.

PACKAGING

BOSS® 813 Expanding Firestop Foam is available in 24 Oz. cans, which are packaged 12 cans to a case.

SPECIFICATIONS

Meets **ASTM E-814 (UL 1479)**, standard test method for fire tests of through penetration firestops. Passed as a Class 1 in a **ASTM E-84** for surface burning of building materials. Conforms to ALL building codes as well as the new International Residential Building Code.
Flame Spread – 10
Smoke Developed – 35

CLASSIFIED C UL US
FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY <86JY>

NFPA® MEMBER 05-06

STORAGE AND SHELF LIFE

BOSS® 813 should be stored where the temperature is between +50°F to 68°F. High temperatures can shorten the storage life. Shelf life is 9 months from date of manufacture. Containers should be stored in an upright vertical position. Ensure stock is rotated at all times.

CAUTION

CONTAINER MAY EXPLODE IF HEATED. EXTREME DANGER. CONTENTS MAY CATCH FIRE. Do not puncture or burn. Store away from heat. Do not smoke. Use only in a well ventilated area. Keep away from flames, such as pilot light and any object that sparks, such as an electric motor. May irritate skin and eyes. May cause allergic skin or respiratory reaction. **FIRST AID TREATMENT:** Contains polymeric isocyanate prepolymer and hydrofluorocarbon propellant. If in eyes, rinse well with water. If breathed in, move person into fresh air. If breathing is difficult, consult a physician. If swallowed, call a Poison Control Center immediately. **KEEP OUT OF REACH OF CHILDREN.** Refer to Material Safety Data Sheet.

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BOSS® PRODUCTS

TECHNICAL DATA SHEET

BOSS® 814 Intumescent Latex Firestop Sealant

TYPICAL PROPERTIES

Color	Red
Specific Gravity	1.42
Consistency (ASTM C639-5)	Non Slump
Skin Forming Time	15 minutes @ 75°F
Ultimate Elongation	600%
Joint Movement	±12.5%
Application Temperature	40°F to 120°F
Curing Time	Full cure in 14 to 20 days
Freeze/Thaw	Excellent
Tested To	ASTM E-814 (UL 1479)

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For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 814 UL Classified Intumescent Latex Firestop Sealant is a one part, elastomeric, intumescent firestop sealant that expands when exposed to fire or extreme heat, forming an insulated char. **BOSS® 814** will prevent the spread of toxic gases, smoke and fire. **BOSS® 814** is suitable for adhesion to almost any surface and remains flexible, making it ideal for both horizontal and vertical joints, subject to vibration or dynamic movement. **BOSS® 814** can be used for interior or exterior applications, and can be painted (after inspection). **BOSS® 814** has been tested to ASTM E-814 (UL 1479) and meets the criteria for fire/smoke/draft stop for BOCA – CABO – UBC – SBCCI – IRC.

FEATURES

- **Interior/exterior use on virtually any surface**
- **Remains flexible**
- **VOC compliant**
- **Excellent freeze/thaw properties**
- **Safe to use and handle**
- **Water clean-up**
- **12 month shelf life**
- **Apply using a standard caulk gun**

HOW TO USE

- Cut nozzle to desired bead size. Insert cartridge into standard caulking gun.
- For a smooth seal, hold at 45° angle and apply by pushing sealant ahead of nozzle.
- Apply at 40°F or above.
- To ensure good adhesion, all surfaces should be clean and free of dust, oil, loose materials or any other substances.
- Make sure that **BOSS® 814** makes complete contact with the entire surface of the opening and also the surface of the penetrating items.

Always follow cartridge directions. Clean the area to be treated so that it is free of all particles and debris. For large openings, mineral wool fibers can be used as a backer to help hold the product in place until cured. Steel screen wire can be stapled in place over the material when a large opening is overhead or configured such that the material will not support its own weight during cure.

TEMPERATURE RANGE

BOSS® 814 will freeze in the cartridge at temperatures below 32°F (0°C). Therefore, store at between 40°F (4°C) and a maximum of 120°F (42°C). If freezing occurs, bring back to 40°F (4°C) prior to use. It is not recommended to frequently allow product to freeze. Once cured, **BOSS® 814** will withstand freeze/thaw cycles.

CAUTION

- Keep from freezing
- Do not take internally
- Keep out of reach of children

CONTAINS

Acrylic Latex (CAS Proprietary); Aluminum Trihydrate (CAS# 21645-51-2); Polyphosphate (CAS# 6833-79-9); Benzoate Esters (CAS# 27138-31-4 & 120-55-8); Starch (CAS# 9005-25-8).

SPECIFICATIONS

Meets **ASTM E-814 (UL 1479)**, standard test method for fire tests of through penetration firestops. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997), Section 796, Fire Block and Draft Stop. BOCA-SBCCI-ICBO-NFPA Building Codes.

CLASSIFIED C UL US

FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
<9NA6>

NFPA® MEMBER 05-06

COLOR

BOSS® 814 Intumescent Latex Firestop Sealant is red in color for ease of inspection.

PACKAGING

BOSS® 814 Intumescent Latex Firestop Sealant is available in standard 10.1 and 28 Fl. Oz. cartridges, 20 Oz. sausages, 5 gallon pails and new 11.0 Oz. Net Wt. aerosol cans.

STORAGE AND SHELF LIFE

When stored in the original unopened container at or below 95°F, **BOSS® 814** has a shelf life of 12 months from date of shipment. Containers should always be kept sealed when not in use. Ensure stock is rotated.

USERS PLEASE READ

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MADE IN U.S.A.

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www.bossproducts.com

BOSS®

PRODUCT INFORMATION

BOSS® 815 Firestop Insert for Electrical Outlet Boxes

DESCRIPTION

BOSS® 815 Firestop Insert is an intumescent pad that is inserted into electrical outlet boxes to provide a firestop rating of 1 or 2 hours in gypsum wallboard assemblies. These single component pads have an adhesive back that adheres to the back inside wall of single or double metal outlet boxes. When exposed to fire, these pads expand to completely fill the outlet box and seal any openings, preventing the transfer of heat and flame into the wall cavity and maintaining the fire resistance rating. **BOSS® 815** Firestop Inserts are an alternative to the more traditional putty pads which are installed on the outside of the electrical outlet box. The product is available in two sizes: 2" X 4" for single outlet boxes and 4" X 4" for double outlet boxes.

FEATURES

- Cost effective – fast and easy to install
- Peel and stick to inside of metal electrical outlet box
- Safe to use, completely non-toxic
- Two standard sizes available – no trimming required
- Intumescent - expands when exposed to heat and fire
- Meets all accoustical requirements

HOW TO USE

Remove any dirt and construction debris from inside the electrical outlet box. Peel off the protective paper from the adhesive and place the pad against the inside back wall of the box, firmly pushing in place to ensure a strong adhesion. If the outlet box has a ground screw on the inside back panel, make a slit in the pad to access the screw but do not cut any of the pad material away.

PACKAGING

BOSS® 815 Firestop Inserts are available in two sizes: 2" X 4" for single outlet boxes and 4" X 4" for double outlet boxes.

NFPA® MEMBER
05-06

STORAGE AND SHELF LIFE

BOSS® 815 Firestop Inserts should be stored in their original container at temperatures between 35°F (2°C) and 120°F (49°C). Keep stock rotated.

LIMITATIONS

Use only in the tested configurations, or as recommended by Accumetric, LLC.

CAUTION

DIRECT CONTACT OF UNCURED SEALANT IRRITATES EYES AND MAY IRRITATE SKIN. OVEREXPOSURE TO VAPOR MAY IRRITATE EYES, NOSE AND THROAT. Avoid eye and skin contact. Use with adequate ventilation. Do not handle contact lenses with sealant on hands. IN CASE OF EYE CONTACT, flush eyes with water for 15 minutes. Obtain medical attention. IN CASE OF SKIN CONTACT, remove from skin and flush with water. Do not use solvents to remove from skin. IN CASE OF INGESTION, call physician immediately. Clean spills immediately with scrapers and water. Keep container upright and tightly closed, do not reuse. **KEEP OUT OF REACH OF CHILDREN.**

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BOSS®

PRODUCT INFORMATION

BOSS® 816 Intumescent Firestop Sealant

TECHNICAL & PERFORMANCE DATA

Color	Red
pH	7 to 8
Volatile Organic Content	Negligible
Skin Forming Time	30 minutes @ 77°F
Density	12.5 ± 0.5 lbs./gal.
Elastomeric	Yes
Curing Time @77°F	21 to 28 days
Freeze/Thaw	Excellent
STC Rating	51
Tested To	ASTM E 90-99

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For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 816 UL Classified Intumescent Firestop Sealant is a fire rated, general purpose sealant for use on through-penetrations and construction joints. It is a single component, non-sag, water based sealant and smoke seal that is easy to apply and clean up. **BOSS® 816** will prevent the spread of toxic gases, water, smoke and fire through joint openings and through penetrations. **BOSS® 816** is suitable for adhesion to almost any surface and remains flexible, making it ideal for both horizontal and vertical joints, subject to vibration or dynamic movement. It bonds quickly, has excellent adhesion and is non-toxic. **BOSS® 816** is protected against mold growth with a combination of biocides in both wet and dry stages. It has been tested to ASTM E-814 (UL 1479) and ASTM E1966 (UL 2079).

FEATURES

- Bonds quickly with excellent adhesion
- Mildew Resistant
- Remains flexible
- VOC compliant
- Excellent freeze/thaw properties
- Safe to use and handle
- Water based and paintable
- 2 year shelf life

HOW TO USE

- Cut nozzle to desired bead size. Insert cartridge into standard caulking gun.
- For a smooth seal, hold at 45° angle and apply by pushing sealant ahead of nozzle.
- Apply at 40°F or above.
- To ensure good adhesion, all surfaces should be clean and free of dust, oil, loose materials or any other substances.
- Make sure that **BOSS® 816** makes complete contact with the entire surface of the opening and also the surface of the penetrating items.
- Clean tools with water immediately after use.

Always follow cartridge directions. Clean the area to be treated so that it is free of all particles and debris. For large openings, mineral wool fibers can be used as a backer to help hold the product in place until cured. Steel screen wire can be stapled in place over the material when a large opening is overhead or configured such that the material will not support its own weight during cure.

TEMPERATURE RANGE

BOSS® 816 will freeze in the cartridge at temperatures below 32°F (0°C). Therefore, store at between 35°F (2°C) and a maximum of 120°F (49°C). If freezing does occur, thaw completely before use. Once cured, **BOSS® 816** will withstand freeze/thaw cycles.

STORAGE AND SHELF LIFE

When stored in the original unopened container at or below 120°F, **BOSS® 816** has a shelf life of 24 months from date of shipment. Containers should always be kept sealed when not in use. Ensure stock is rotated.

SPECIFICATIONS

Meets **ASTM E-814 (UL 1479)**, standard test method for fire tests of through penetration firestops. Conforms to BOCA National Building Code (1996), CABO one and two family dwelling code (1995), Uniform Building Code (1997). See UL Fire Resistance Directory for a list of systems that have been established for **BOSS® 816**.

CLASSIFIED C UL US
FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
15WV

NFPA® MEMBER
05-06

COLOR

BOSS® 816 Intumescent Firestop Sealant is red in color for ease of inspection.

PACKAGING

BOSS® 816 Intumescent Firestop Sealant is available in standard 10.1 and 28 Fl. Oz. cartridges, 20 Oz. sausages and 5 gallon pails.

CAUTION

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BOSS®

PRODUCT INFORMATION

BOSS® 817 Wrap Strip

TECHNICAL & PERFORMANCE DATA

Color	Black
Sizes (approx.)	1" X 1/4" X 12' (25mm X 6mm X 3.66m)
	2" X 1/4" X 12' (50mm X 6mm X 3.66m)
Asbestos Fillers	None
Solvents	None
Hazardous Ingredients	None
Intumescence Activation	
	Expansion begins at 375°F (190°C)
Expansion Greatest	575°F (302°C) to 1100°F (593°C)
Freeze/Thaw	Excellent

*Information on this data sheet is subject to change without notice and should not be used for writing specifications.
For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 817 Wrap Strips are a pre-formed strip of highly intumescent firestop material that is designed to be used to seal plastic and insulated pipe applications. Supplied in 12-foot rolls, the strips can be cut to the desired length, which eliminates waste. When exposed to heat, **BOSS® 817** Wrap Strips intumesce to form a hard insulating char that very quickly prevents the spread of flames, smoke, and toxic gases.

APPLICATIONS

BOSS® 817 Wrap Strips are used to provide firestopping to penetrations such as plastic and insulated pipes.

FEATURES

- Flexible and easy to install
- Cost effective
- Long length means less waste
- Highly intumescent - quickly expands when exposed to heat and fire
- Forms a very hard insulating char when burned
- Very flexible, for ease in installation
- Excellent freeze/thaw characteristics
- Water resistant

SPECIFICATIONS

BOSS® 817 Wrap Strips are classified by Underwriters Laboratories as a Fill, Void or Cavity Material. **BOSS® 817** Wrap Strips are tested at positive pressure for a minimum .01 inches (2.5 Pa) of water in accordance with ASTM E-814 (UL 1479) test standards. The following UL system numbers have been established for **BOSS® 817** Wrap Strips: C-AJ-2501, C-AJ-2502, F-C-2305, F-C-2306, W-J-2174, W-L-2419.

For specific test criteria and to view these systems, consult the UL Fire Resistance Directory or call Accumetric, LLC.

ASTM E-84, UL 723 Tunnel Test:

Flame Spread	5
Smoke Index	5

INSTALLATION INSTRUCTIONS:

Cut the **BOSS® 817** Wrap Strip to the desired length and tightly wrap around the penetrant to completely fill the annular space or as required by the system design. Push the strip into the opening to the required depth. If a cold smoke seal is required, apply the recommended **BOSS®** firestop sealant into the opening over the wrap strip.

PACKAGING

BOSS® 817 Wrap Strips are available in 1" and 2" widths and lengths of 12 feet (3.66m).

STORAGE AND SHELF LIFE

BOSS® 817 Wrap Strips should be stored in a dry, covered area at a temperature between 35°F (2°C) and 120°F (49°C). The product should be used on a first in, first out basis.

LIMITATIONS

Use only in the tested configurations, or as recommended by Accumetric, LLC.

CAUTION

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BOSS®

PRODUCT INFORMATION

BOSS® 818 Fire Rated Putty Pads

TECHNICAL & PERFORMANCE DATA

Color	Terra-cotta
Size	7” X 7” X 1/8” (18cm X 18cm X 0.3cm)
Asbestos Fillers	None
Water Soluble	No
Solids	100%
Intumescence Activation	Expansion begins at 220°F (104°C)
Specific Gravity	1.48G/CC
Application	By hand
Cure Time	N/A as product is effective immediately on application

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For additional information on specific applications, contact Accumetric, LLC

DESCRIPTION

BOSS® 818 Putty Pads are one component, moldable, fire-rated pads for through penetration fire stop systems. They are pre-shaped and easily inserted by hand into openings such as outlet boxes, electrical and mechanical cabinets. In the event of a fire, **BOSS® 818** Putty Pads intumesce to form an insulating char that prevents the spread of flames, smoke, and toxic gases through openings. **BOSS® 818** Putty Pad systems are rated for up to 2 hours in accordance with ASTM E-814 (UL 1479) and ULC/CAN4-S115-M Test Standards.

APPLICATIONS

BOSS® 818 Putty Pads are designed to seal penetrations in metal, electrical and mechanical cabinets, and outlet boxes.

FEATURES

- Single part putty system with no mixing required
- Easy to install by hand
- Adheres to all common building substrates, including electrical conduits
- Does not contain any volatile solvents or asbestos fillers, so is safe to use in confined spaces
- Intumescent - expands when exposed to heat and fire
- DOT Classification: Not regulated
- Has excellent acoustic properties

SPECIFICATIONS

BOSS® 818 Putty Pads are tested to a minimum 0.01 inch of water, positive pressure, in accordance with ASTM E-814 (UL 1479).

For specific test criteria and to view Listings, consult the UL Fire Resistance Directory or call Accumetric, LLC.

ASTM E-84, UL 723 Tunnel Test:

Flame Spread 5
Smoke Index 15

STC Rating 49
(tested in accordance with ASTM E-90-97)

INSTALLATION INSTRUCTIONS:

Remove the protective liner from one side of the pad. Align with the side of the box partially overlapping the stud and press to adhere. Working with the hands, continue to press the pad around to the opposite side of the box, slightly overlapping the edge. If the wall membrane has been installed, pack putty pad into the gaps between the box and the gypsum board, slightly overlapping the wallboard surface. If the wallboard has not been installed, ensure that the pad overlaps the front edge of the box so that the putty can be compressed around the edge of the box once the wallboard is installed.

To fit around conduits and cables, cut slits in the pad and press to the surface of the box around these penetrations. Trim excess at corners and apply to conduit fittings connected to the box. Remove exposed liner. As an option, the putty may be packed inside the conduit fittings to prevent the passage of smoke.

For a 1 to 2 hour fire rating, only one thickness of **BOSS® 818** Putty Pad is required (1/8").

PACKAGING

BOSS® 818 Fire Rated Putty Pads are available in 20 ct. packages. Each Pad is 7" X 7" X 1/8" (18 cm X 18 cm X 0.3 cm).

STORAGE AND SHELF LIFE

BOSS® 818 Putty Pads should be stored in a dry, covered area at a temperature between 35°F (2°C) and 120°F (49°C). The product should be protected from freezing, but if freezing does occur, make sure the product thaws completely before using. **BOSS® 818** Putty Pads have a minimum shelf life of 24 months if stored correctly and should be used on a first in, first out basis. Product older than 24 months should be inspected prior to use.

LIMITATIONS

Keep dry. Do not expose to water.

CAUTION

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PRODUCT INFORMATION

BOSS® 819 Pipe Collar

DESCRIPTION

BOSS® 819 Pipe Collars consist of a zinc coated, factory formed, galvanized 22 gauge steel shell which contains a heat reactive intumescent material. When exposed to temperatures of approximately 300°F the graphite based intumescent material begins to expand rapidly (intumesce) to form a solid insulating char plug, and continues to expand up to approximately 1100°F, which effectively closes and seals openings where plastic pipes penetrate the fire-rated walls and floors. **BOSS® 819** Pipe Collars are available in sizes to suit 2", 3" and 4" pipes.

FEATURES

- Easy installation - saves labor costs
- Intumescent material unaffected by moisture
- UL Classified - complies with all Building Codes
- Rapid expansion for maximum effect
- Approved for a wide range of applications and penetrations
- Tested on PVC, ABS, FRPP, CPVC
- Economical
- Ideal for Retro-fit installations
- Corrosion resistant
- Unique side-lock closure for speedy installation

APPLICATIONS

BOSS® 819 Pipe Collars are used to seal PVC, CPVC and ABS pipes which penetrate through 1 and 2 hour fire-rated walls and floors, and are suitable for most common types of construction including concrete floors, concrete walls, concrete block walls and gypsum drywall assemblies. They are suitable for use on Schedule 40 plastic pipes in both closed and vented (DWV) conditions.

SPECIFICATIONS

BOSS® 819 Pipe Collars are tested in accordance with ASTM E-814 (UL 1479) and are UL Classified for a 1 and 2 hour rating. For specific test criteria and to view listings, consult the UL Fire Resistance Directory or call Accumetric, LLC.

PACKAGING

BOSS® 819 Pipe Collars are available in 2”, 3” and 4” sizes, packed in boxes of 24.

LIMITATIONS

Keep dry. Do not expose to water. Not recommended for external use. There are no other limitations for the use of **BOSS® 819** Pipe Collars.

CAUTION

DIRECT CONTACT OF UNCURED SEALANT IRRITATES EYES AND MAY IRRITATE SKIN. OVEREXPOSURE TO VAPOR MAY IRRITATE EYES, NOSE AND THROAT. Avoid eye and skin contact. Use with adequate ventilation. Do not handle contact lenses with sealant on hands. IN CASE OF EYE CONTACT, flush eyes with water for 15 minutes. Obtain medical attention. IN CASE OF SKIN CONTACT, remove from skin and flush with water. Do not use solvents to remove from skin. IN CASE OF INGESTION, call physician immediately. Clean spills immediately with scrapers and water. Keep container upright and tightly closed, do not reuse. **KEEP OUT OF REACH OF CHILDREN.**

HOW TO USE

BOSS® 819 Pipe Collars are very easy to install, and there is no requirement to cut lengths of intumescent material on site as the collars are supplied ready to go with the intumescent material already in the collar.

1. Select the correct size of collar to suit the diameter of the pipe.

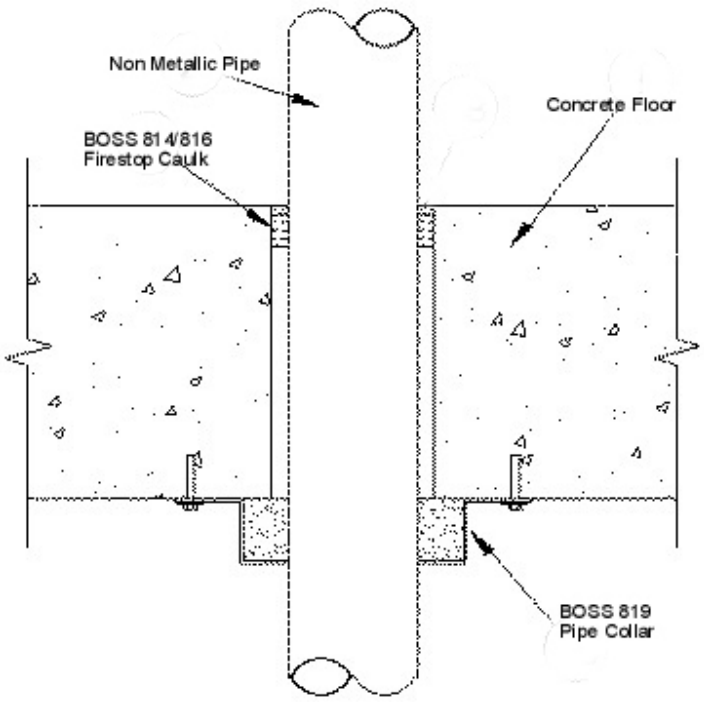
2. Check that any annular space between pipe and the opening is within the limits defined by the tested construction.

3. Fit the collar around the pipe on the underside of the floor or on both sides of the wall, by sliding together the fixing mechanism and firmly placing it against the wall or floor.

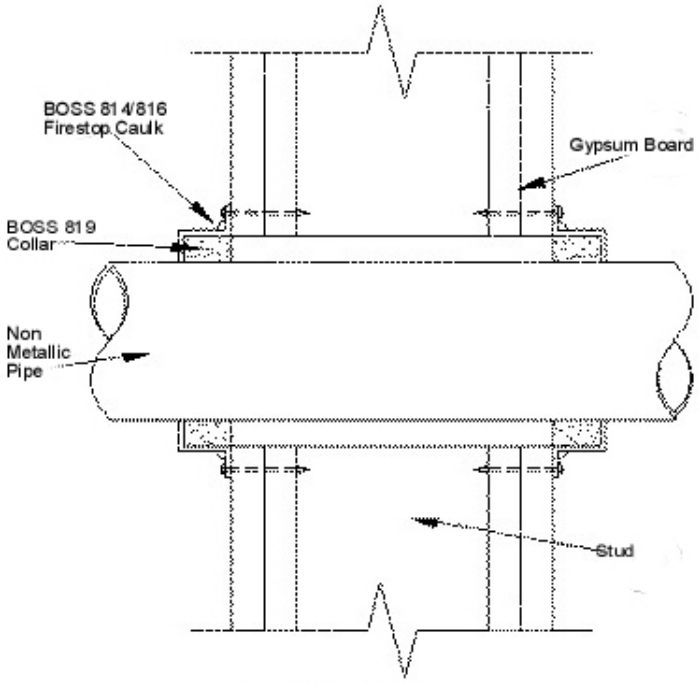
4. If required, mark the wall or floor surface through the slots in the integral fixing lugs, and pre-drill suitable size holes for the appropriate anchors.

   For installation in concrete use 1/4" diameter x 1-1/2" long steel expansion bolts. For installation in gypsum board, use 1/8" diameter x 2" long steel hollow wall anchors.

5. After the **BOSS® 819** Pipe Collar is attached, a 3/16" bead of BOSS® 814 or BOSS® 816 Intumescent Caulk should be applied at the interface of the collar and the surface of the wall or floor to provide an adequate smoke seal.



CONCRETE INSTALLATION



DRYWALL INSTALLATION

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