Fire-rated sealants
for floor and wall
through-penetrations

USG

Fire Stop

Systems

While electrical, plumbing and mechanical systems are a necessity in building construction, it is often necessary to pass these systems through hourly fire-resistive floor or wall assemblies. Typically, openings are cut or drilled through the floor or wall, and then the penetrating items are installed.

However, this leaves an opening, or annular space, through which fire can spread. Firestop materials are installed within the openings and around the penetrants to prevent the passage of flames and hot gases through an otherwise fire-resistive assembly.

Fire Spread Prevention

User's Guide

This brochure explains:

- Where fire stop systems are used
- The three types of fire stop systems that USG offers
- How to select and specify the appropriate fire stop system

Overview

The intersection where two fire-rated assemblies meet (for example, a wall assembly and a floor/ceiling assembly) also creates a joint through which fire can spread. To prevent this, fire-rated construction joint assemblies are installed at these intersections.

USG Fire Stop Systems address this problem of openings in the barrier. They consist of mortar-, caulk- and intumescent-type materials that provide reliable firestops.

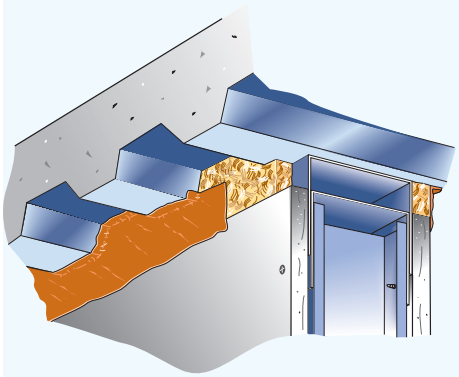
Mortar-type Materials	These materials are applied wet over the forming materials (where applicable). They then set or harden to form a tough, durable seal. Typically used in walls, floors and curtain wall slab-edge conditions where strength and economy are required.
Caulk Materials	These materials are applied from a caulking tube or pail, or are spray-applied. They dry to form a flexible seal. These products are typically used in dynamic joints in head-of-wall designs, as well as certain floor and wall penetrations where movement is anticipated and flexibility is a requirement.
Intumescent-type Materials	Greatly expanding when exposed to high temperatures, these materials are only necessary when the integrity of the penetrants is compromised by high temperature, such as in plastic pipes or some insulated pipes.

Applications

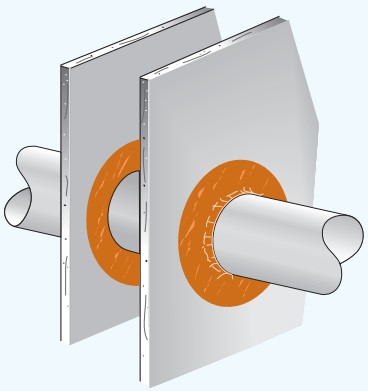
USG Fire Stop Systems consist of special sealants that are trowelled, poured, sprayed, wrapped or caulked around a penetrant (for example, pipe, conduit, duct or cable bundles) through a wall. The sealant prevents the passage of fire through a fire-resistive partition or floor-ceiling assembly.

System Application

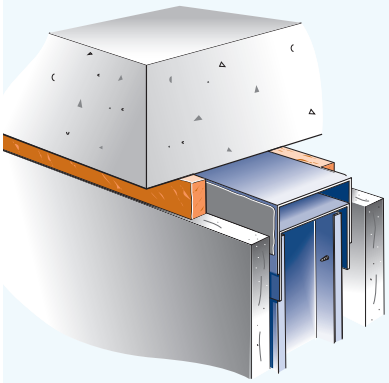
Head-of-Wall Construction Joint with Metal Deck



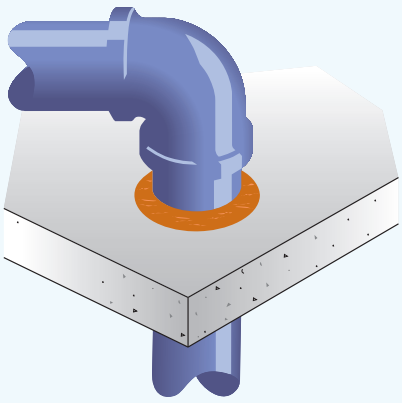
Wall Through-Penetration



Head-of-Wall Construction Joint



Floor Through-Penetration



Components

USG Fire Stop Systems have been comprehensively tested for fire resistance ratings only when all of the system components are used together. Substitutions of any of the components are not recommended and are not supported by USG. Refer to the appropriate product material safety data sheet for complete health and safety information.

Mortar-Type Materials

FIRECODE® Brand Compound

- Provides a strong, durable firestop with exceptional economy
- Applied in wet form and allowed to set or harden
- Mix only what's needed for the application at hand (mix powder-type with water and premixed-type with activator powder)
- Withstands the thermal and mechanical shock of high pressure hose stream testing
- Fresh compound bonds to cured compound, simplifying repairs due to construction damage or changes to penetrating items
- Mixes quickly and easily with water at jobsite
- Consistency of the compound may be changed to suit application
- Once mixed, sets in 2 – 3 hours and bonds to concrete, metals, wood and cable jacketing without the use of primers
- Dries to a red color easily seen and identified by fire marshals
- May be sanded smooth and painted with either latex or oil-based paints
- Refer to submittal sheet J1521 for more information

Caulk-type Materials

FIRECODE Brand Acrylic Firestop Sealant-Type A and FIRECODE Brand Acrylic Firestop Spray Sealant-Type SA

- Simple to install using either a caulking gun or airless spray equipment (FIRECODE Brand Acrylic Firestop Spray Sealant)
- Acrylic, elastomeric material is capable of ± 25% movement in a fire-rated joint
- Available in rust red, a color easily seen and identified by fire marshals
- Lowest installed cost for head-of-wall applications
- Can be painted once fully cured
- Sprayable grade offers savings in head-of-wall applications with long joint runs
- Refer to submittal sheets J1625 and J1626 for more information

SHEETROCK® Brand Acoustical Sealant

- Reduces sound transmission in partition systems to achieve specified STC values
- Seals spaces at perimeters of partitions or around cutouts
- Easily applied on vertical and horizontal surfaces
- Remains flexible when dry
- Off-white, can be painted once fully dry
- Maximizes sound attenuation with complete perimeter seal of both faces
- Acrylic water-based caulking material
- Refer to submittal sheet J678 for more information

Intumescent-Type Materials

FIRECODE Brand Intumescent Acrylic Firestop Sealant-Type IA

- Single-component, water-based sealant that expands when heated to fill any void caused from combustible materials being burned or melted during a fire
- Remains flexible when dry
- Rust red is easily identifiable by fire code officials
- Can be painted once fully cured
- Superb unprimed adhesion
- Cures to a skin in 2 hrs. at 75 °F/50% R.H.; full cure, one week for 1/2″ thickness (cure time depends on thickness)
- Refer to submittal sheet J1627 for more information

Performance Testing

When you specify USG Fire Stop Systems, you are selecting one of the most important elements in the building. For that reason, you should choose the system that ensures superior safety and performance.

Performance Tests

USG Fire Stop Systems result from a program of extensive testing and continuous improvements, backed by over 100 years of experience in the building materials industry.

Testing Methods

All USG products and systems undergo exhaustive testing to ensure that they meet exacting standards. USG's products are Classified as to fire resistance and fire-hazard properties. As part of this protocol, Underwriters Laboratories (UL) periodically audits production of these materials to ensure compliance with necessary properties. UL is an independent, not-for-profit organization that has tested products for public safety for over a century.

Products are manufactured and tested in accordance with ASTM standards. ASTM International is one of the largest voluntary standards development organizations in the world, and is a trusted source for technical standards for materials, products, systems, and services.

The USG Fire Stop Systems tests include:

ASTM E84 (ANSI/UL 723): Surface Burning Characteristics

ASTM E814 (ANSI/UL 1479) and ULC-S115: Standard Test Method for Fire Tests of Through-Penetration Fire Stops

ASTM E1966 (ANSI/UL 2079): Standard Test Method for Fire-Resistive Joint Systems

ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

Testing Results

Fire Resistance

	FIRECODE Brand Compound[a]	FIRECODE Brand Acrylic Firestop Sealant-Type A[b]	FIRECODE Brand Acrylic Firestop Spray Sealant-Type SA[b]	FIRECODE Brand Intumescent Acrylic Firestop Sealant-Type IA[b]	SHEETROCK Brand Acoustical Sealant-Type AS
ASTM E84	•	•	•	•	•
ASTM E814	•	•		•	•
ASTM E1966	•	•	•		•
ASTM E90					•
ASTM E84					
Flame Spread	0	15	15	0	0
Smoke Developed	0	0	0	0	0

Note

(a) Approved by NYC (MEA 341-92-M) and LA City (RR#25212). Recognized by ICBO (ER-5050). Rated non-toxic in accordance with the sixth draft of the University of Pittsburgh test method and the LC50, calculated using the Weil method. (b) Approved by NYC (NEA 119-04-M).

Fire Containment Curtain Walls

Code Requirements

U.S. model building codes require that the gap at the slab edge/curtain wall interface be treated to maintain the same fire integrity as the floor/ceiling. The life-safety fire containment systems have been tested (UL Systems CW-S-1001, CW-S-2001 and CW-S-2002) and accepted or recognized (ICBO ER-2331, California State Fire Marshal, OSHPD) as preventing the passage of flame at the interface for the classification period. See Performance Selector in this resource for more information on fire resistance.

Framing Type	Exterior Finish	THERMAFIBER Fire Span Insulation Thickness	THERMAFIBER Safing Insulation Thickness	FIRECODE Brand Compound Thickness	Maximum Linear Opening Width	Integrity Rating Hr	Insulation Rating Hr	UL System Number
Steel Studs	Conventional Exterior Finish	3″	4″	1″	2-1/2″	2	45 min.	CW-S-1001
Aluminum Mullions	Spandrel Glass	2″	4″	1″	8″	2	45 min.	CW-S-2001
Aluminum Mullions	Spandrel Aluminum	2″	4″	1″	8″	2	45 min.	CW-S-2002

Approximate Coverage Rates

FIRECODE Brand Compound

Dry Powder (lbs.) Compound	Approx. Water Additions (pts.)	Approx. Volume of Applied Firestop (cu. in.)[a]
1	0.5	33.6
5	2.5	172.5
7.5	3.8	257.6
10	5.0	344.9
15	7.5	517.4

FIRECODE Brand Ready-Mixed Compound

Ready-Mixed Compound (qts.)	Approx. Volume of Applied Ready-Mixed Firestop (cu. in)
1.0	57.8
4.0 (1 gal.)	231.0
18.0 (4.5 gal.)	1039.5

Note

(a) Based on approximately 7.5 pints water per 15 lb. bag for wall penetrations. For floor penetrations, approximately 8.3 pints water per 15 lb. bag is recommended and yields approximately 537 cu. in. of applied firestop.

Performance Testing

Approximate Coverage Rates

FIRECODE Brand Acrylic Firestop Sealant (regular and Type SA), FIRECODE Brand Intumescent Acrylic Firestop Sealant–Type IA, SHEETROCK Brand Acoustical Sealant

Package Type	Volume		Approx. Volume of Applied Firestop	1/2″ Sealant Bead
Std. cartridge	10.1 fl. oz.	300 ml	19 cu. in.	7 lin. ft.
Lrg. cartridge	28.8 fl. oz.	850 ml	53 cu. in.	21 lin. ft.
Lrg. cartridge	30.0 fl. oz.	887 ml	54 cu. in.	23 lin. ft.
Sausage	20.3 fl. oz.	600 ml	37 cu. in.	15 lin. ft.
4.5 gal. pail	576.0 fl. oz.	17034 ml	1040 cu. in.	436 lin. ft.
5.0 gal. pail	640.0 fl. oz.	18927 ml	1155 cu. in.	485 lin. ft.

SHEETROCK Brand Acoustical Sealant

Gallon			29 oz. cartridge		
1/4″ bead	3/8″ bead	1/2″ bead	1/4″ bead	3/8″ bead	1/2″ bead
392 ft.	174 ft.	98 ft.	89 ft.	40 ft.	22 ft.

Note

(a) Based on approximately 7.5 pints water per 15 lb. bag for wall penetrations. For floor penetrations, approximately 8.3 pints water per 15 lb. bag is recommended and yields approximately 537 cu. in. of applied firestop.

Performance Selector

Steel/Iron Metallic

Penetrating Item and	Floor, Roof or Wall	Firestopping Material	Forming	Annular Space		Rating		UL System	Reference	
Diameter	**Type**	**Minimum Depth**	**Material**	**Minimum**	**Maximum**	**F**	**T**	**Number**	**ARL**	**Index**
Steel or iron pipe, up to 6″	CW, CF	1″ Type AS	3-1/2″, min. 4 pcf	3/8″	3/4″	3	0	C-AJ-1020	SA727	**1**
Steel or iron pipe, up to 6″	CW, CF	2″ Type AS	2-1/2″, min. 4 pcf	3/8″	1″	3	0	C-AJ-1020	SA727	**2**
Steel or iron pipe up to 24″	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	1-15/16″	3	0	C-AJ-1081	SA727	**3**
Steel or iron pipe up to 10″	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4″	3	0	C-AJ-1081	SA727	**4**
Steel or iron pipe up to 12″	CW, CF	1/2″ Type A	4″, min. 4 pcf	1/4″	1″	2	0	C-AJ-1347	SA727	**5**
Steel or iron pipe up to 4″	CW, CF	1/2″ Type A	4″, min. 4 pcf	0″	7/8″	2	0	C-AJ-1347	SA727	**6**
Steel or iron pipe up to 8″	CW, CF	1/2″ Type IA	4″, min. 4 pcf	1/2″	1-3/8″	2	0	C-AJ-1348	SA727	**7**
Steel or iron pipe up to 8″	CW, CF	1/2″ Type A	4″, min. 4 pcf[a]	1/2″	1″	2	1	C-AJ-5146	SA727	**8**
Insulated steel or iron pipe up to 2″	CW, CF	1″ Type IA	Foam Backer[a]	1/8″	1/4″	2	1	C-AJ-5147	SA727	**9**
Insulated steel or iron pipe up to 8″	CW, CF	1″ Type IA	Foam Backer	1/2″	0″-1-3/8″	2	1-1/2	C-AJ-5148	SA727	**10**
Steel or iron pipe up to 4″	CW, CF	1″ Type IA	3-1/2″, min., 4 pcf[a]	1/2″	1-1/2″	2	1/2-1	C-AJ-5149	SA727	**11**
Steel or iron pipe up to 8″	FSD	1/2″ Type A	4″, min. 4 pcf	1/4″	1-5/8″	3	0	F-A-1020	SA727	**12**
Insulated steel or iron pipe up to 8″	FSD	1/2″ Type A	4″, min. 4 pcf[a]	1/4″	5/8″	3	1	F-A-5014	SA727	**13**
Steel or iron pipe up to 8″	WF	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	1/4	F-C-1069	SA727	**14**
Insulated steel or iron pipe up to 4″	WF	1/2″ Type IA	Foam Backer[a]	0″	7/8″	1	3/4-1	F-C-5042	SA727	**15**
Steel or iron pipe up to 12″	CW, CF	1/2″ Type IA	Foam Backer	0″	1″	2	0	W-J-1091	SA727	**16**
Steel or iron pipe up to 4″	GW	1″ Type FC	2-1/2″, min. 4 pcf	1/4″	2-1/4″	2	0	W-L-1027	SA727	**17**
Steel or iron pipe up to 6″	GW	1″ Type FC	2-1/2″, min. 4 pcf	1″	1-5/8″	2	0	W-L-1027	SA727	**18**
Steel or iron pipe up to 4″	GW	1/2″ Type FC or RFC	2-1/2″, min. 4 pcf	1/4″	1-5/8″	1	0	W-L-1039	SA727	**19**
Steel or iron pipe up to 3-1/2″	GW	1″ Type FC or RFC	—	1/4″	1-5/8″	2	0	W-L-1063	SA727	**20**
Steel or iron pipe up to 4″	GW	1″ Type AS	2-1/2″, min. 4 pcf	1/4″	1-1/4″	2	0	W-L-1064	SA727	**21**
Steel or iron pipe up to 1″	GW	1″ Type FC or RFC	2-1/2″, min. 4 pcf	3/8″	1-5/8″	2	1-2	W-L-1065	SA727	**22**
Steel or iron pipe up to 4″	GW	1″ Type FC or RFC	—	1/4″	1-1/4″	1	0-1	W-L-1087	SA727	**23**
Insulated steel pipe up to 4″	GW	1/4″ Type FC or RFC	—	1/4″	1/2″	2	1	W-L-5043	SA727	**24**
Insulated steel pipe up to 3-1/2″	GW	1″ Type FC or RFC	—	1/2″	5/8″	2	3/4	W-L-5044	SA727	**25**
Insulated steel or iron pipe up to 4″	GW	1″ Type IA	Foam Backer[a, c]	0″	3/8″	2	1/2	W-L-5114	SA727	**26**
Insulated steel or iron pipe up to 8″	GW	1/2″ Type IA	Foam Backer[a, c]	1/4″	1-1/8″	1-2	1/2-1	W-L-5115	SA727	**27**
Insulated steel or iron pipe up to 8″	GW	1″ Type IA	Foam Backer[c]	0″	1/2″	2	2	W-L-5116	SA727	**28**

Conduit

Nominal 4″	CW, CF	1″ Type AS	3-1/2″, min. 4 pcf	3/8″	3/4″	3	0	C-AJ-1020	SA727	**29**
Nominal 4″	CW, CF	2″ Type AS	2-1/2″, min. 4 pcf	3/8″	1″	3	0	C-AJ-1020	SA727	**30**
Steel conduit up to 6″ or metallic tubing up to 4″	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4″	3	0	C-AJ-1081	SA727	**31**
Nominal 4″	CW, CF	1/2″ Type A	4″, min. 4 pcf	0″	7/8″	2	0	C-AJ-1347	SA727	**32**
Nominal 4″	CW, CF	1/2″ Type IA	4″, min. 4 pcf	1/2″	1-3/8″	2	0	C-AJ-1348	SA727	**33**
Insulated nominal 4″	CW, CF	1″ Type IA	3-1/2″, min. 4 pcf[a]	1/2″	1-1/2″	2	1/2-1	C-AJ-5149	SA727	**34**
Nominal 4″	FSD	1/2″ Type A	4″, Min. 4 pcf	1/4″	1-5/8″	3	0	F-A-1020	SA727	**35**
Nominal 4″	WF	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	1/4	F-C-1069	SA727	**36**
Nominal 2″ flex. pipe	WF	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	3/4	F-C-1070	SA727	**37**
Nominal 4″	CW	1/2″ Type IA	Foam Backer	0″	1″	2	0	W-J-1091	SA727	**38**
Steel conduit or metallic tubing up to 4″	GW	1″ Type FC	2-1/2″, min. 4 pcf	1/4″	2-1/4″	2	0	W-L-1027	SA727	**39**
Nominal 4″ or metallic tubing up to 4″	GW	1/2″ Type FC or RFC	2-1/2″, min. 4 pcf	1/4″	1-5/8″	1	0-1	W-L-1039	SA727	**40**
Steel conduit or metallic tubing up to 3-1/2″	GW	1″ Type FC or RFC	—	1/4″	1-5/8″	2	0	W-L-1063	SA727	**41**
Steel conduit or metallic tubing up to 4″	GW	1″ Type AS	2-1/2″, min. 4 pcf	1/4″	1-1/4″	2	0	W-L-1064	SA727	**42**
Nominal 1″ or metallic tubing up to 1″	GW	1″ Type FC or RFC	2-1/2″, min. 4 pcf	3/8″	1-5/8″	2	2	W-L-1065	SA727	**43**
Nominal 4″ or metallic tubing up to 4″	GW	1″ Type FC or RFC	—	1/4″	1-1/4″	1	0-1	W-L-1087	SA727	**44**

(a) Pipe covering material (b) Minimum depth dependent upon annular space dimensions (c) Optional (d) Ceramic fiber (e) 2-hr. wall (f) 2-hr. (two layers 7/8″ backer rod); 1-hr. (bond breaker tape) (g) Two layers 7/8″ backer rod (h) Formerly Type A-SP

Performance Selector

Copper

Penetrating Item and	Floor, Roof or Wall	Firestopping Material	Forming	Annular Space		Rating		UL System	Reference	
Diameter	**Type**	**Minimum Depth**	**Material**	**Minimum**	**Maximum**	**F**	**T**	**Number**	**ARL**	**Index**
Pipe up to 6″	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4″	3	0	C-AJ-1081	SA727	**45**
Tubing and pipe up to 4″	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4″	3	0	C-AJ-1081	SA727	**46**
Tubing and pipe up to 4″	CW, CF	1/2″ Type A	3″, min. 6 pcf[d]	0″	7/8″	2	0	C-AJ-1347	SA727	**47**
Tubing and pipe up to 4″	CW, CF	1″ Type IA	4″, min. 4 pcf	1/2″	1-3/8″	2	0	C-AJ-1348	SA727	**48**
Insulated tubing and pipe up to 4″	CW, CF	1/2″ Type A	4″, min. 4 pcf	3/8″	1-1/2″	1-1/2-2	1/2-1	C-AJ-5146	SA727	**49**
Insulated tubing and pipe up to 2″	CW, CF	1″ Type IA	Foam Backer	1/8″	1/4″	2	1	C-AJ-5147	SA727	**50**
Insulated tubing and pipe up to 4″	CW, CF	1″ Type IA	3-1/2″, min. 4 pcf	1/2″	1-1/2″	2	1/2-1	C-AJ-5149	SA727	**51**
Tubing and pipe up to 4″	FSD	1/2″ Type A	4″, min. 4 pcf	1/4″	1-5/8″	3	0	F-A-1020	SA727	**52**
Insulated tubing and pipe up to 4″	FSD	1/2″ Type A	4″, min. 4 pcf	1/4″	5/8″	3	1	F-A-5014	SA727	**53**
Tubing and pipe up to 4″	WF	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	1/4	F-C-1069	SA727	**54**
Insulated tubing and pipe up to 4″	WF	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	3/4-1	F-C-5042	SA727	**55**
Tubing and pipe up to 4″	CW	1/2″ Type IA	Foam Backer	0″	1″	2	0	W-J-1091	SA727	**56**
Pipe up to 6″	GW	1″ Type FC	2-1/2″, min. 4 pcf	1″	1-5/8″	2	0	W-L-1027	SA727	**57**
Pipe up to 4″	GW	1/2″ Type FC or RFC	2-1/2″, min. 4 pcf	1/4″	1-5/8″	1	0	W-L-1039	SA727	**58**
Tubing up to 4″	GW	1″ Type FC or RFC	—	1/4″	1-5/8″	2	0	W-L-1063	SA727	**59**
Tubing up to 4″	GW	1″ Type FC or RFC	—	1/4″	1-1/4″	1	0	W-L-1087	SA727	**60**
Insulated tubing up to 4″	GW	1/4″ Type FC or RFC	2″, min. 4 pcf[a]	1/4″	1/2″	2	1	W-L-5043	SA727	**61**
Insulated pipe or tubing up to 4″	GW	1″ Type FC or RFC	1″, min. 4 pcf[a]	1/2″	5/8″	2	3/4	W-L-5044	SA727	**62**
Insulated tubing and pipe up to 4″	GW	1″ Type IA	Foam Backer[c]	0″	3/8″	2	1/2	W-L-5114	SA727	**63**
Insulated tubing and pipe up to 3″	GW	1/2″ Type IA	Foam Backer[c]	1/4″	1-1/8″	1-2	1/2-1	W-L-5115	SA727	**64**

Cables

Cables	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4″	3	0	C-AJ-3045	SA727	**65**
Cables	CW, CF	1/2″ Type IA	4″, min. 4 pcf	Varies	Varies	2	0-1/2-1	C-AJ-3174	SA727	**66**
Cables	CW, CF	1/2″ Type IA	4″, min. 4 pcf	3/4″	3-3/16″	2	1/2	C-AJ-3175	SA727	**67**
Cables	WF	1/2″ Type IA	Foam Backer[c]	Varies	Varies	1	3/4	F-C-3054	SA727	**68**
Cables	GW	1″ Type FC or RFC	3″, min. 4 pcf	1/4″	4-1/2″	2	0	W-L-3023	SA727	**69**
Cables	GW	1/2″ Type FC or RFC	3-7/8″, min. 4 pcf	1/2″	3-7/8″	1	0-1	W-L-3034	SA727	**70**
Cables	GW	1/2″ Type IA	Foam Backer[c]	1/2″	1-1/2″	1-2	1/4-1/2	W-L-3162	SA727	**71**
Cables	GW	1/2″ Type IA	Foam Backer[c]	1/4″	1″	1-2	1/4-1/2	W-L-3163	SA727	**72**

Air Ducts

Steel duct, Nom. 18″ x 6″	CW, CF	1″ Type IA	1″, min. 4 pcf	Varies	1″	3	0	C-AJ-7062	SA727	**73**
Steel duct, Nom. 4″	CW, CF	1/2″ Type IA	4″, min. 4 pcf	1/2″	1-3/8″	2	0	C-AJ-7063	SA727	**74**
Steel duct, 24-ga., up to 3″ x 10″	GW	1/2″ Type FC or RFC	2-1/2″, min. 4 pcf	7/16″	1-5/8″	1	0	W-L-7001	SA727	**75**
Steel duct, 28-ga. galv., nom. 4″ x 6″	GW	1″ Type FC or RFC	2-1/2″, min. 4 pcf	1/2″	1-5/8″	2	1/2	W-L-7002	SA727	**76**
4″, 26-ga., galv. steel vent duct	GW	1/2″ Type IA	Foam Backer[c]	0″	1″	1-2	0	W-L-7057	SA727	**77**

Glass Pipe

Glass pipe, nom. N	GW	1/2″ Type IA	Foam Backer[c]	1/2″	1-1/8″	1	0	W-L-2227	SA727	**78**

(a) Pipe covering material (b) Minimum depth dependent upon annular space dimensions (c) Optional (d) Ceramic fiber (e) 2-hr. wall (f) 2-hr. (two layers 7/8″ backer rod); 1-hr. (bond breaker tape) (g) Two layers 7/8″ backer rod (h) Formerly Type A-SP

Plastic

Penetrating Item and	Floor, Roof or Wall	Firestopping Material	Forming	Annular Space		Rating		UL System	Reference	
Diameter	**Type**	**Minimum Depth**	**Material**	**Minimum**	**Maximum**	**F**	**T**	**Number**	**ARL**	**Index**
1-1/2″, 2″, 3″ or 4″ sched. 40 PVC pipe	CW, CF	Wrap, Type A or Type IA[c]	—	Varies	Varies	2	1	C-AJ-2301	SA727	**79**
4″ sched. 40 PVC or ABS pipe	CW, CF	Wrap, Type A or Type IA[c]	—	1/4″	Varies	2	2	C-AJ-2304	SA727	**80**
1-1/2″ or 2″ sched. 40 PVC pipe	CW, CF	1/2″ Type IA	Foam Backer	3/8″	3/4″	2	1-1/2	C-AJ-2295	SA727	**81**
or SDR17 CPVC pipe		1″ Type 1A	Foam Backer	1/4″	3/8″	2	1-1/2			
3/4″ PEX tube or 1″ ENT	CW, CF	1/2″ Type IA	Foam Backer[c]	1/4″	7/16″	2	1-1/2-1-3/4	C-AJ-2296	SA727	**82**
1″ sched. 40 PVC pipe	FSD	1″ Type IA	Foam Backer	1/4″	7/16″	3	1-1/2	F-A-2062	SA727	**83**
4″ sched. 40 PVC pipe or 4″ SDR17 CPVC pipe or 4″ sched. 40 PVC conduit	CW, CF	1/2″ Type IA	Foam Backer[c]	0″	1-1/2″	1	1	F-A-2063	SA727	**84**
6″ sched. 40 PVC or 6″ SDR135 CPVC pipe	CF	Wrap, Type A or Type IA[c]	—	Varies	Varies	2-3	1-1/2-2-1/2	F-A-2064	SA727	**85**
3″ sched. 40 PVC or ABS pipe	WF	Wrap, 1/2″ Type IA	Foam Backer[c]	0″	1/2″	1	3/4	F-C-2179	SA727	**86**
1-1/2″ sched. 40 PVC or ABS pipe	WF	1/2″ Type IA	Foam Backer[c]	0″	1″	1	1	F-C-2180	SA727	**87**
1-1/2″ sched. 40 PVC or ABS pipe	WF	1/2″ Type IA	Foam Backer[c]	0″	1″	1	1	F-C-2181	SA727	**88**
3″ sched. 40 PVC pipe or 3″ SDR17 CPVC pipe or 3″ sched. 40 PVC conduit	WF	1/2″ Type IA	Foam Backer[c]	0″	1/2″	1	1	F-C-2182	SA727	**89**
4″ sched. 40 PVC or sched. 40 ABS or SDR17 CPVC pipe	WF	1/2″ Type IA	Foam Backer[c]	0″	1/2″	1	3/4	F-C-2183	SA727	**90**
2″ SDR13.5 CPVC pipe	CW	1/2″ Type IA	Foam Backer	1/4″	1-3/8″	2	0	W-J-2068	SA727	**91**
2″, 3″ or 4″ sched. 40 PVC pipe	GW	Wrap, Type A or Type IA[c]	—	Varies	Varies	2	1	W-L-2220	SA727	**92**
Up to 4″ sched. 40 PVC or 1-1/4″ SDR135 CPVC pipe	GW	Wrap, Type A or Type IA[c]	—	Varies	Varies	1	0-1	W-L-2221	SA727	**93**
6″ sched. 40 PVC pipe	GW	Wrap, 1/4″ Type A or Type IA	—	0″	3/8″	2	1-1/2	W-L-2222	SA727	**94**
2″ SDR13.5 CPVC pipe	GW	1/2″ Type IA	Foam Backer[e]	1/4″	1-3/8″	1-2	1-2	W-L-2223	SA727	**95**
3/4″ PEX tube or 1″ EMT	GW	1/2″ Type IA	Foam Backer[c]	1/4″	3/8″	1-2	3/4-1-1-1/2-1-3/4	W-L-2224	SA727	**96**
1-1/2″ sched. 40 PVC pipe	GW	1″ Type IA	Foam Backer[c]	1/4″	5/8″	2	2	W-L-2225	SA727	**97**
2″ sched. 40 PVC pipe	GW	1/2″ Type IA	Foam Backer[c]	0″	7/8″	1	0	W-L-2226	SA727	**98**

(a) Pipe covering material (b) Minimum depth dependent upon annular space dimensions (c) Optional (d) Ceramic fiber (e) 2-hr. wall (f) 2-hr. (two layers 7/8″ backer rod); 1-hr. (bond breaker tape) (g) Two layers 7/8″ backer rod (h) Formerly Type A-SP

Performance Selector

8″ Blank (No Penetrant)

Penetrating Item and	Floor, Roof or Wall	Firestopping Material	Forming	Annular Space		Rating		UL System	Reference	
Diameter	**Type**	**Minimum Depth**	**Material**	**Minimum**	**Maximum**	**F**	**T**	**Number**	**ARL**	**Index**
4-1/2″ concrete floor, 5″ concrete wall	CW, CF	1″ Type FC or RFC	3″, min. 4 pcf	—	8″	3	0-1	C-AJ-0032	SA727	**99**

Construction Joint Systems

	Floor, Roof or Wall	Firestopping Material	Forming	Joint	Move-ment	Comp./	Assembly	UL System	Reference	
	Type	**Minimum Depth**	**Material**	**Width**	**Class**	**Exten**	**Rating**	**Number**	**ARL**	**Index**
Floor joint	CF	1/2″ Type A	4″, min. 2.5 pcf	max. 2″	—	—	2	F-F-S-0028	SA727	**100**
Head-of-wall or roof assembly (slip track)	FSD/CF, GW	1/2″ Type FC or RFC	1-1/2″, min. 4 pcf	max. 5/8″	II & III	80%/ 60%	1	HW-D-0001	SA727	**101**
Head-of-wall or roof assembly (slip track)	FSD/CF, GW	2-1/2″ Type FC or RFC	—	max. 5/8″	II & III	80%/ 60%	2	HW-D-0002	SA727	**102**
Head-of-wall or roof assembly (slip track)	CW, CF	1″ Type FC or RFC	min. 4 pcf	max. 1″	II & III	25%/ 12%	2	HW-D-0009	SA727	**103**
Head-of-wall, flat	CF, GW	1/2″ Type A	(6)	nom. 1″	II & III	25%	1-2	HW-D-0158	SA727	**104**
Head-of-wall, flat	CW, CF	1/2″ Type A	(7)	nom. 1″	II & III	25%	2	HW-D-0159	SA727	**105**
Head-of-wall perpendicular/parallel	FSD/CF, GW	1/8″ Type SA	min. 4 pcf	nom. 1″	II & III	25%/ 25%	1-2	HW-D-0160	SA727	**106**
Head-of-wall perpendicular/parallel	FSD/CF, CW	1/8″ Type SA	min. 4 pcf	nom. 1″	II & III	25%/ 25%	2	HW-D-0161	SA727	**107**
Head-of-wall perpendicular/parallel	FSD/CF, GW	5/8″ Type A or AS	min. 4 pcf (optional when type A is used)	max. 1/2″	II & III	25% 25%	1-2	HW-D-0262	SA727	**108**
Head-of-wall or roof assembly	FSD/CF, GW	1/2″ Type FC or RFC	3-1/2″, min. 4 pcf	max. 1/2″	—	—	1	HW-S-0001	SA727	**109**
Head-of-wall or roof assembly	FSD/CF, GW	1″ Type FC or RFC	3-1/2″, min. 4 pcf	max. 1/2″	—	—	2	HW-S-0001	SA727	**110**
Head-of-wall	FSD/CF, GW	1″ Type AS	min. 4 pcf density mineral wool	max. 5/8″	II & III	25%	2	HW-D-0372	SA727	**111**
Wall joint	CF	1/2″ Type AS	—	max. 1/2″	—	—	1	HW-S-0032	SA727	**112**
Wall joint	CF	1″ Type AS	—	max. 1/2″	—	—	2	HW-S-0032	SA727	**113**
Wall joint	CF	1/2″ Type AS	min. 4 pcf	max. 1/2″	—	—	1	HW-S-0035	SA727	**114**
Wall joint	FSD/CF	1″ Type AS	min. 4 pcf	max. 1/2″	—	—	2	HW-S-0035	SA727	**115**
Wall joint	CW	1/2″ Type A	4″, min. 2.5 pcf	max. 2″	—	—	2	WW-S-0036	SA727	**116**

Codes for Type of Floor, Roof or Wall:
CF–Concrete Floor
CW–Concrete Wall
FSD–Fluted Steel Deck
GW–Gypsum Wall
WF–Wood Floor

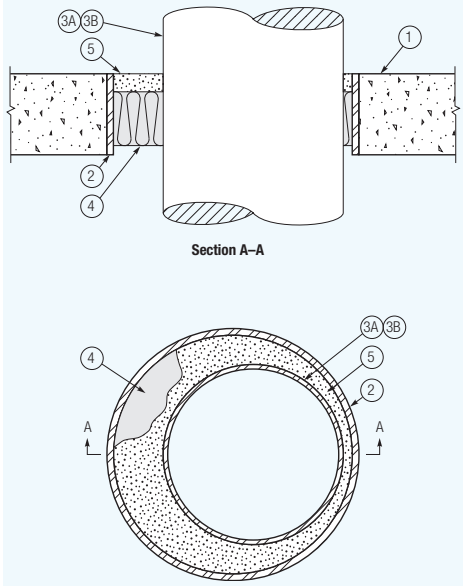
Codes for Firestopping Material:
Type A–Firecode Acrylic Firestop Sealant (regular)
Type SA–Firecode Acrylic Firestop Spray Sealant (Type SA)
Type AS–Sheetrock Brand Acoustical Sealant
Type IA–Firecode Intumescent Acrylic Firestop Sealant-Type IA
Type FC–Firecode Compound
Type RFC–Ready-Mixed Firecode Compound
Wrap–TREMstop D Intumescent Wrap Strips

(a) Pipe covering material (b) Minimum depth dependent upon annular space dimensions (c) Optional (d) Ceramic fiber (e) 2-hr. wall (f) 2-hr. (two layers 7/8″ backer rod); 1-hr. (bond breaker tape) (g) Two layers 7/8″ backer rod (h) Formerly Type A-SP

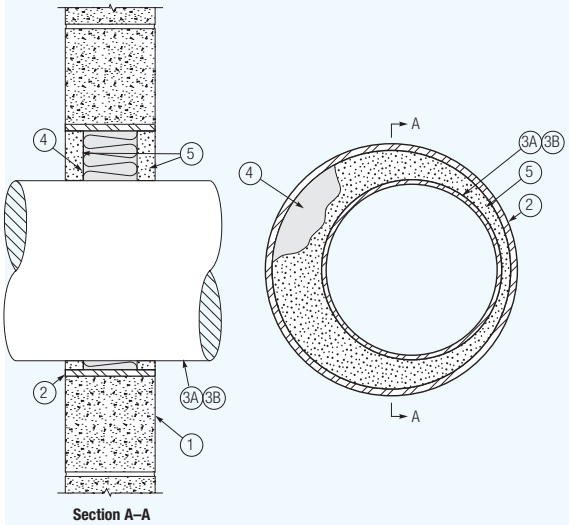
Penetration Fire Tests

Mortar-Type Materials

Fire Tests	UL System	Test Criteria	Description
Floor/Wall Assembly	**C-AJ-1081 (Pipe)**	**F-Rating** 3 Hr. **T-Rating** 0 Hr.	1. Concrete floor or wall assembly, minimum 4-1/2″ thickness floor, minimum 6-1/2″ wall. The annular space range shall be minimum 1/4″ to maximum 4″ for 10″ diameter steel pipe, 4″ or 6″ diameter conduit, 4″ diameter copper tubing, or cables. The annular space range shall be minimum 1/4″ to maximum 1-15/16″ for 24″ diameter steel pipe, and minimum 1/4″ to maximum 1-13/16″ for 6″ diameter copper tubing or copper pipe. 2. Steel sleeve (optional). 3. Metallic pipe: A Steel pipe: 24″ diameter (or smaller) schedule 10 (or heavier) steel pipe. B Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or 6″ steel conduit. C Copper tubing: 6″ diameter (or smaller) Type M (or heavier) copper tubing. D Cables: 100-pair 24 AWG with PVC insulation minimum 10 to 40% maximum fill. 4. Forming material: Minimum 3″ of mineral wool insulation[b] (minimum 3.5 pcf) firmly packed into the opening as a permanent form. 5. Type FC or RFC: Minimum 1″ thick compound applied within the opening, flush with the top surface of the floor or both surfaces of the wall.
	C-AJ-3045 (Cable)[a]		



Section A–A

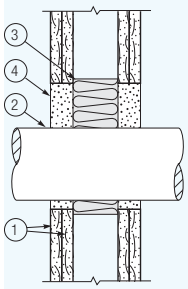
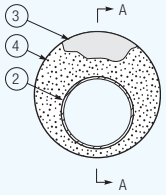
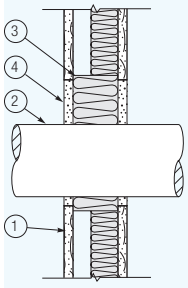
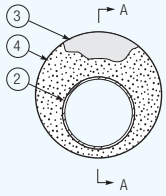


Section A–A

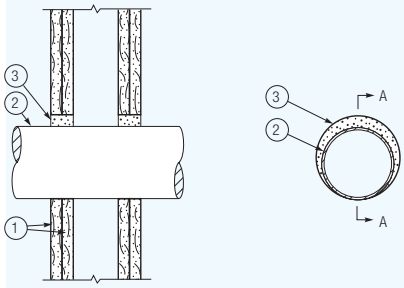
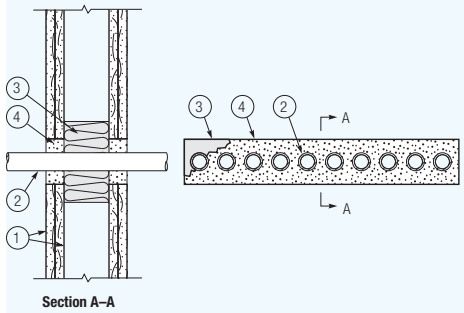
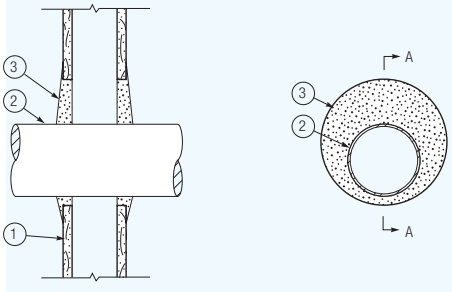
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Penetration Fire Tests

Mortar-Type Materials

Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-1027[a]**		
  **Section A–A**	**F-Rating** 2 Hr. **T-Rating** 0 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Metallic pipe: A Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. A minimum 1/4″ to maximum 2-1/4″ annular space between pipe and periphery of opening is required. B Copper tubing: 6″ diameter (or smaller) Type M (or heavier) copper tubing. A minimum 1″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required. C Steel pipe: 4″ diameter (or smaller) schedule 10 (or heavier) steel pipe. A minimum 1/4″ to maximum 2-1/4″ annular space between pipe and periphery of opening is required. D Steel pipe: 6″ diameter (or smaller) schedule 10 (or heavier) steel pipe. A minimum 1″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (minimum 3.5 pcf) firmly packed into the opening as a permanent form. 4. Type FC: Minimum 1″ thick compound applied within opening, flush with both surfaces of the wall.
Wall Assembly	**W-L-1039[a]**		
  **Section A–A**	**F-Rating** 1 Hr. **T-Rating** 0 & 1 Hr. (see item 2 below)	1. Gypsum wallboard/stud wall assembly. 2. Metallic pipe: A Steel pipe: 4″ diameter (or smaller) schedule 10 (or heavier) steel pipe. A minimum 1/4″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required; 0 hr. T Rating. B Iron pipe: 4″ diameter (or smaller) cast or ductile iron pipe. A minimum 1/4″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required; 0 hr. T Rating. C Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. A minimum 1/4″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required; 0 hr. T Rating. A 1/2″ diameter (or smaller) electrical metallic tubing or steel conduit has a 1 hr. T Rating; larger than 1/2″ diameter has a 0 hr. T Rating. D Copper tubing: 4″ diameter (or smaller) Type M (or heavier) copper tubing. A minimum 1/4″ to maximum 1-5/8″ annular space between pipe and periphery of opening is required; 0 hr. T Rating. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (min. 4.0 pcf) firmly packed into the opening as a permanent form. 4. Type FC or RFC: Minimum 1/2″ thick compound applied within opening, flush with both surfaces of the wall.

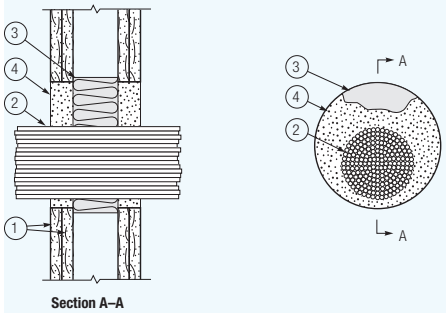
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-1063[a]**		
		**F-Rating** 2 Hr. **T-Rating** 0 Hr.	1. Gypsum wallboard/stud wall assembly. The annular space range shall be minimum 1/4″ to maximum 1-5/8″. 2. Metallic pipe: A Steel pipe: 3-1/2″ diameter (or smaller) Schedule 10 (or heavier) steel pipe. B Conduit: 3-1/2″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. C Copper tubing: 4″ diameter (or smaller) Type M (or heavier) copper tubing. 3. Type FC or RFC: Minimum 1″ thick compound applied within opening, flush with both surfaces of the wall.
Wall Assembly	**W-L-1065[a]**		
 Section A–A		**F-Rating** 2 Hr. **T-Rating** 2 Hr.	1. Gypsum wallboard/stud wall assembly. The annular space range shall be minimum 3/8″ to maximum 1-5/8″. 2. Metallic pipe (conduit): Multiple 1″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit, with maximum 3″ by 20″ dimension. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening as a permanent form. 4. Type FC or RFC: Minimum 1″ thick compound applied within opening, flush with both surfaces of the wall.
Wall Assembly	**W-L-1087[a]**		
 Section A–A		**F-Rating** 1 Hr. **T-Rating** 0 & 1 Hr.	1. Gypsum wallboard/stud wall assembly. The annular space range shall be minimum 1/4″ to maximum 1-1/4″. 2. Metallic pipe: A Steel pipe: 4″ diameter (or smaller) Schedule 10 (or heavier) steel pipe. B Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. C Copper tubing: 4″ diameter (or smaller) Type M (or heavier) copper tubing. 3. Type FC or RFC: Minimum 5/8″ thick compound applied within opening, flush with both surfaces of the wall. Additional compound is applied such that a min. 3/8″ crown is formed around the penetrating item.

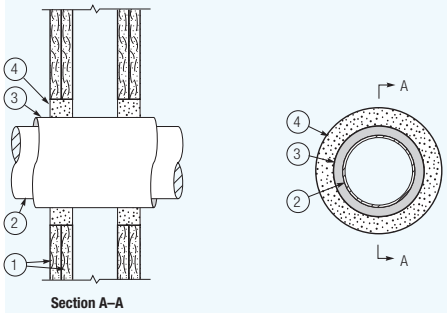
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Penetration Fire Tests

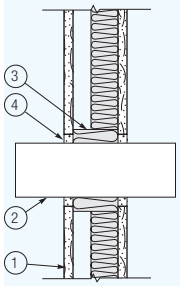
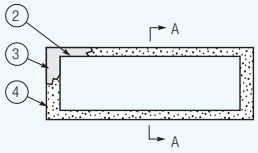
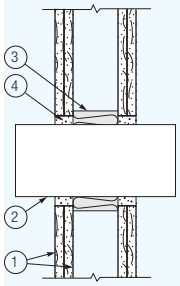
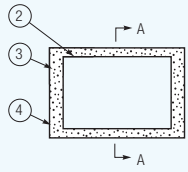
Mortar-Type Materials

Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-3023 and 3034[a]**		
 Section A–A		**F-Rating** 1 & 2 Hr. **T-Rating** 0 & 1 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Cables: 100-pair 24 AWG with PVC insulation minimum 10 to 40% maximum fill (see table below). 3. Forming material: Mineral wool insulation[b] (minimum 3.5 pcf) firmly packed into the opening as a permanent form; see table below for minimum required thickness. 4. Type FC or RFC: Minimum thickness of compound as specified in the table below, applied within opening, flush with the top surface.

Wall Assembly Fire Rating (%)	Maximum Fill (in.)	Annular Space Thickness (in.)	Forming Material Thickness (in.)	Minimum Sealant	F Rating (hours)	T Rating (hours)
1	40	1/2 to 3-7/8	2-1/2	1/2	1	0
1	10	1/2 to 3-7/8	2-1/2	1/2	1	1
2	4	1/4 to 4-1/2	3	1	2	0

Wall Assembly	**W-L-5044[a]**		
 Section A–A		**F-Rating** 2 Hr. **T-Rating** 3/4 Hr.	1. Gypsum wallboard/stud wall assembly. A nominal 1/2″ to 5/8″ annular space is required. 2. Metallic pipe: A Copper tubing: 4″ diameter (or smaller) Type M (or heavier) copper tubing. B Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper pipe. C Steel pipe: 3-1/2″ diameter (or smaller) schedule 10 (or heavier) steel pipe. 3. Forming material: Nominal 1″ thick hollow cylindrical heavy-density (minimum 3.5 pcf) glass-fiber jacketed on the outside with an all-service jacket. 4. Type FC or RFC: Minimum 1″ thick compound applied within opening, flush with both surfaces of the wall.

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

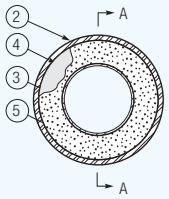
Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-7001[a]**		
 Section A–A 		**F-Rating** 1 Hr. **T-Rating** 0 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Air duct: Up to 3″ by 10″ prefabricated 24 ga. sheet metal air duct. Minimum 7/16″ to maximum 1-5/8″ annular space between duct and periphery of opening is required. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (minimum 3.5 pcf) firmly packed into the opening as a permanent form. 4. Type FC or RFC: Minimum 1/2″ thick compound applied within opening, flush with both surfaces of the wall.
Wall Assembly	**W-L-7002[a]**		
 Section A–A 		**F-Rating** 2 Hr. **T-Rating** 1/2 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Air duct: Up to 4″ by 6″ prefabricated No. 28 MSG galvanized sheet metal air duct. Minimum 1/2″ to maximum 1-5/8″ annular space between duct and periphery of opening is required. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (minimum 3.5 pcf) firmly packed into the opening as a permanent form. 4. Type FC or RFC: Minimum 1″ thick compound applied within opening, flush with both surfaces of the wall.

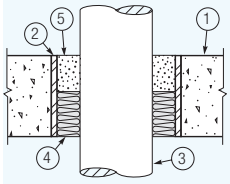
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Penetration Fire Tests

Caulk-Type Materials

Fire Tests	UL System	Test Criteria	Description
Floor/Wall Assembly	**C-AJ-1020[a]**		





Section A–A

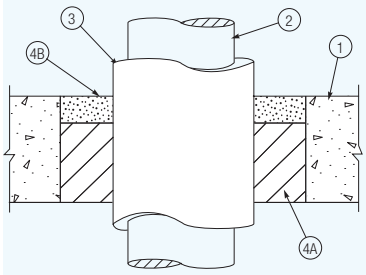
F-Rating
3 Hr.

T-Rating
1 Hr.

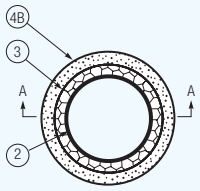
1. Concrete floor or wall assembly, minimum 4-1/2″ thickness floor/minimum 6-1/2″ wall.
2. Steel sleeve (optional).
3. Metallic pipe:
   - A Steel pipe:
     6″ diameter (or smaller) Schedule 10 (or heavier) steel pipe.
   - B Conduit:
     4″ diameter (or smaller) electrical metallic tubing (EMT) or 6″ diameter rigid steel conduit.
4. Forming material:
   Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening as a permanent form; see table below for minimum required thickness.
5. Type AS or Type SS:
   Minimum thickness of sealant as specified in the table below, applied within the opening, flush with the top surface of the floor or both surfaces of the wall.

Maximum Pipe Diameter (%)	Maximum EMT	Annular Space (in.)	Forming Material Thickness (in.)	Minimum Sealant Thickness (in.)	F Rating (hours)	T Rating (hours)
1-1/2	—	3/8 to 2-1/8	2-1/2	2	3	1
6	4	3/8 to 3/4	3-1/2	1	3	0
6	4	3/8 to 1	2-1/2	2	3	0

Fire Tests	UL System	Test Criteria	Description
Floor/Wall Assembly	**C-AJ-5146[a]**		



Section A–A



F-Rating
2 Hr.

T-Rating
1/2 & 1 Hr.

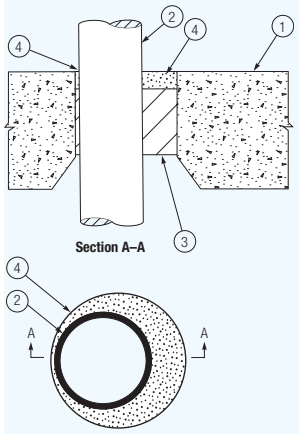
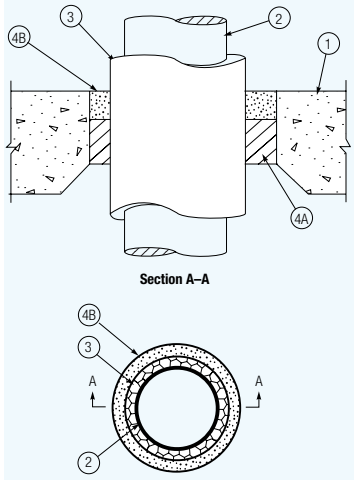
1. Concrete floor or wall assembly, minimum 4-1/2″ thickness.
2. Metallic pipe:
   - A Steel pipe:
     8″ diameter (or smaller) Schedule 40 (or heavier) steel.
   - B Iron pipe:
     8″ diameter (or smaller) cast or ductile iron.
   - C Copper pipe:
     4″ diameter (or smaller) regular (or heavier) copper.
   - D Copper tubing:
     4″ diameter (or smaller) Type L (or heavier) copper tubing.
3. Pipe covering:
   Nominal 1″ thick (or less) glass fiber insulation.
4. Firestop treatment:

Pipe Type	Annular Space (in.)	T Rating (Hours)
Steel Pipe	1/2 to 1	1
Iron Pipe	1/2 to 1	1
Copper Pipe	3/8 to 1-1/2	1/2
Copper Tubing	3/8 to 1-1/2	1/2

4A Forming material:
Minimum 4″ thick mineral wool insulation (minimum 4.0 pcf) firmly packed into the opening as a permanent form.

4B Type A:
Minimum 1/2″ thick sealant applied within opening, flush with the top of the floor or both sides of the wall.

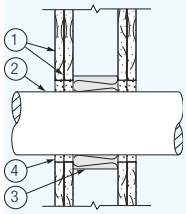
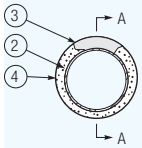
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Tests	UL System	Test Criteria	Description
Fluted Steel Deck Assembly	**F-A-1020[a]**		
	**F-Rating** 3 Hr. **T-Rating** 0 Hr.	1. 2″ steel fluted deck, minimum 3-1/2″ thickness concrete topping. The annular space range shall be minimum 1/4″ to maximum 1-5/8″ for this firestop system. 2. Metallic pipe: A Steel pipe: 8″ diameter (or smaller) Schedule 40 (or heavier) steel. B Iron pipe: 8″ diameter (or smaller) cast or ductile iron. C Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper. D Copper tubing: 4″ diameter (or smaller) Type L (or heavier) copper tubing. E Conduit: 4″ diameter (or smaller) steel conduit or EMT. 3. Forming material: Minimum 4″ thick mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening as a permanent form. 4. Type A: Minimum 1/2″ thick sealant applied within the opening, flush with the top surface of the floor.
Fluted Steel Deck Assembly	**F-A-5014[a]**		
	**F-Rating** 3 Hr. **T-Rating** 1 Hr.	1. Steel fluted deck, minimum 3-1/2″ thickness concrete topping. The annular space shall be minimum 1/4″ to maximum 5/8″ within the firestop system. 2. Metallic pipe: A Steel pipe: 8″ diameter (or smaller) Schedule 40 (or heavier) steel. B Iron pipe: 8″ diameter (or smaller) cast or ductile iron. C Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper. D Copper tubing: 4″ diameter (or smaller) Type L (or heavier) copper tubing. 3. Pipe covering: Nominal 1″ thick (or less) glass fiber insulation. 4A Forming material: Minimum 4″ thick mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening as a permanent form. 4B Type A: Minimum 1/2″ thick sealant applied within opening, flush with the top surface of the floor.

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Penetration Fire Tests

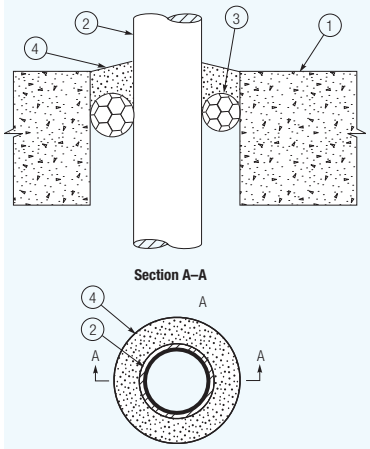
Caulk-Type Materials

Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-1064[a]**		
 **Section A–A** 		**F-Rating** 2 Hr. **T-Rating** 0 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Metallic pipe or conduit: A Steel pipe: 4″ diameter (or smaller) Schedule 10 (or heavier) steel pipe. B Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. The annular space shall be a minimum of 1/4″ to a maximum of 1-1/4″. 3. Forming material: Minimum 2-1/2″ thick mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening as a permanent form. 4. Type AS or Type SS: Minimum 1″ layer of sealant applied within the opening, flush with both surfaces of the wall.

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Intumescent-Type Materials

Fire Tests	UL System	Test Criteria	Description
Floor/Wall Assembly	**C-AJ-2295[a]**		



F-Rating
2 Hr.

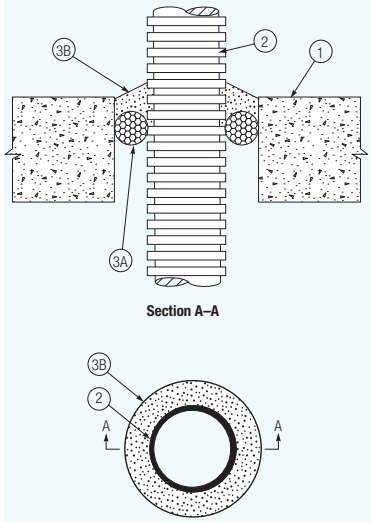
T-Rating
1-1/2 Hr.

1. Concrete floor or wall assembly, minimum 4-1/2″ thickness.
2. Plastic pipe:
   - A 3″ diameter (or smaller) Schedule 40 PVC pipe.
   - B 3″ diameter (or smaller) SDR17 CPVC pipe.

   Note: For use in closed (process or supply) piping systems.
3. Forming material:
   Foam backer rod firmly packed into the opening as a permanent form.
4. Type IA:
   Sealant applied within opening, flush with top surface of the floor or both surfaces of the wall assembly as shown in the table below. When required, apply additional sealant such that a min. 1/8″ crown is formed around the penetrating item.

Max. Pipe Diameter (in.)	Annular Space (in.)	Min. Sealant Thickness (in.)	Sealant Crown Required
2	1/4 to 3/8	1/2	yes
3	3/4 to 7/8	2	no

Floor/Wall Assembly	C-AJ-2296[a]



F-Rating
2 Hr.

T-Rating
1-1/2 Hr.

1. Concrete floor or wall assembly, minimum 4-1/2″ thickness.
2. Electrical nonmetallic tubing:
   1″ diameter (or smaller) corrugated wall ENT. The annular space shall be minimum 1/4″ to maximum 7/16″ within firestop system.

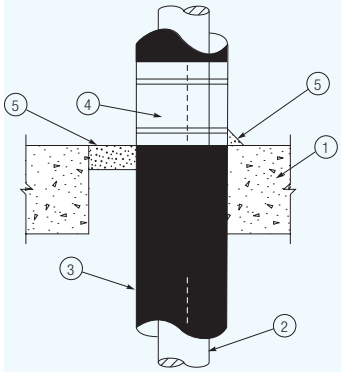
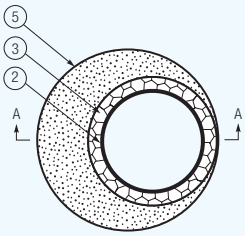
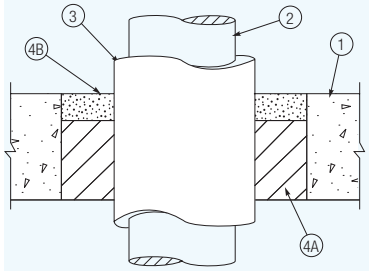
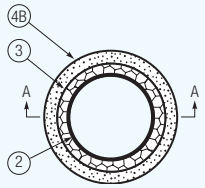
3A Forming material (optional):
Foam backer rod firmly packed into the opening as a permanent form.

3B Type IA:
Minimum 1/2″ thick sealant applied within annulus, flush with top surface of the floor or both surfaces of the wall. Additional sealant to be installed such that a min. 1/4″ crown is formed around the penetrating item.

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information.

Penetration Fire Tests

Intumescent-Type Materials

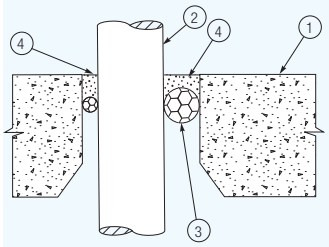
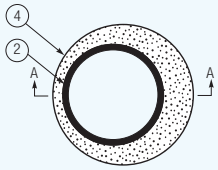
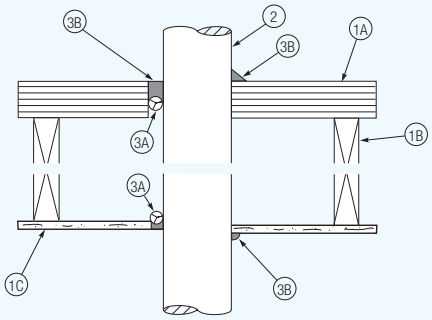
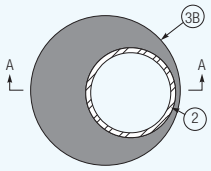
Fire Tests	UL System	Test Criteria	Description
Floor/Wall Assembly	**C-AJ-5148[a]**		
 Section A–A 	**F-Rating** 1 Hr. **T-Rating** 1/4 Hr.	1. Concrete floor or wall assembly, minimum 4-1/2″ thickness. The annular space shall be minimum 0″ to maximum 1-3/8″ within the firestop system. 2. Metallic pipe: A Steel pipe: 8″ diameter (or smaller) Schedule 10 (or heavier) steel pipe. B Iron pipe: 8″ diameter (or smaller) cast or ductile iron. 3. Pipe covering: Nom. 3″ thick cellular glass insulation. 4. Metal jacket: Minimum 10″ wide aluminum jacket tightly wrapped around the pipe insulation, secured with a hose clamp. Jacket to be abutting the surface of the sealant on the top surface of the floor or both surfaces of the wall. 5. Type IA: Minimum 1″ thickness of sealant applied within the opening, flush with the top surface of the floor or both surfaces of the wall assembly. A minimum 1/2″ diameter cant (45° angle) bead of sealant shall be applied at the insulation/concrete interface at the point contact locations.
Floor/Wall Assembly	**C-AJ-5149[a]**		
 Section A–A 	**F-Rating** 2 Hr. **T-Rating** 1 Hr.	1. Concrete floor or wall assembly, minimum 4-1/2″ thickness. 2. Metallic pipe: A Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper pipe. B Copper tubing: 4″ diameter (or smaller) Type L (or heavier) copper tubing. C Steel pipe: 4″ diameter (or smaller) Schedule 40 (or heavier) steel pipe. D Iron pipe: 4″ diameter (or smaller) cast or ductile iron pipe. E Conduit: 4″ diameter (or smaller) EMT or steel conduit. 3. Pipe covering: Glass fiber insulation; see the table below for thickness and annular space.

Maximum Pipe Diameter (in.)	Pipe Covering Thickness (in.)	Annular Space Thickness (in.)	Forming Material Thickness (in.)	Minimum Sealant	F Rating (hours)	T Rating (hours)
4	2	1/2 to 1-3/8	4	1/2	2	1

4A Forming material:
Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the opening to the minimum required thickness in the table above.

4B Type IA:
Minimum thickness of sealant as specified in the table above, applied within the opening, flush with the top surface of the floor or both surfaces of the wall.

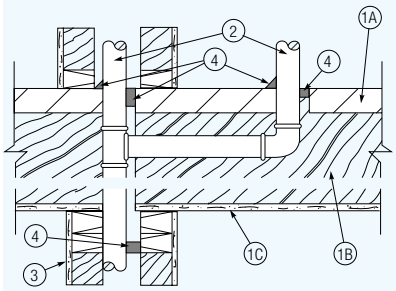
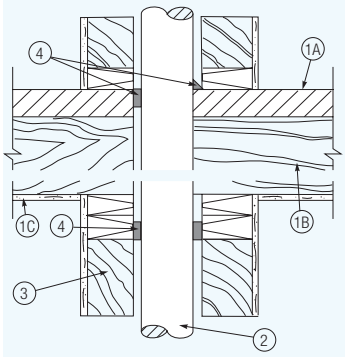
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Tests	UL System	Test Criteria	Description
Fluted Steel Deck Assembly	**F-A-2062[a]**		
 Section A–A 	**F-Rating** 2 Hr. **T-Rating** 1-1/2 Hr.	1. Steel fluted deck, minimum 3-1/2″ thickness concrete topping. The annular space shall be minimum 1/4″ to maximum 7/16″ within the system. 2. Plastic pipe: 1″ diameter (or smaller) Schedule 40 PVC pipe for use in closed or open piping systems. 3. Forming material: Closed-cell polyethylene backer rod firmly packed into the opening as a permanent form. 4. Type IA: Minimum 1″ thick sealant applied within the opening, flush with the top surface of the floor.	
Wood Floor Assembly	**F-C-1069[a]**		
 Section A–A 	**F-Rating** 1 Hr. **T-Rating** 1/4 Hr.	1. Floor/ceiling assembly: A Flooring system: 5/8″ thick plywood/2″ x 4″ continuous wood decking. B Wood joist: Nom. 2″ x 10″ lumber joist. C Ceiling system: 1 layer of 5/8″ gypsum wallboard, per UL Design. 2. Metallic pipe: A Steel pipe: 8″ diameter (or smaller) schedule 40 (or heavier) steel pipe. B Iron pipe: 8″ diameter (or smaller) cast or ductile iron pipe. C Conduit: 4″ diameter (or smaller) electrical metallic tubing (EMT) or steel conduit. D Copper tubing: 4″ diameter (or smaller) Type L (or heavier) copper tubing. E Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper pipe. Annular space from minimum 0″ to maximum 7/8″. 3. Forming and fire stop materials: A Forming material (optional): Foam backer rod packed into opening as a permanent form. B Type IA: Minimum 1/2″ thick sealant applied within the annulus, flush with the top of the floor and bottom of the ceiling assemblies. Additional sealant to be applied such that a minimum 1/2″ crown is formed around the penetrating item.	

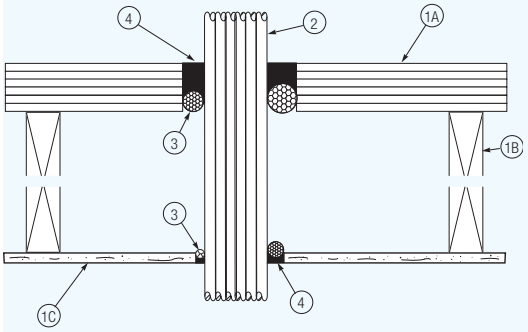
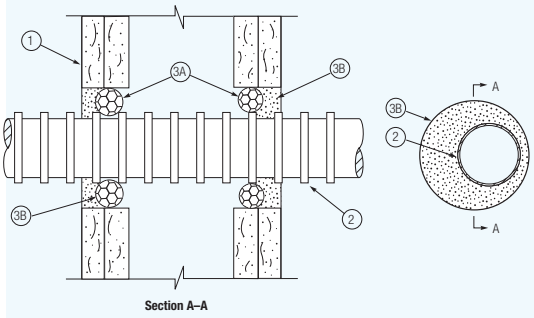
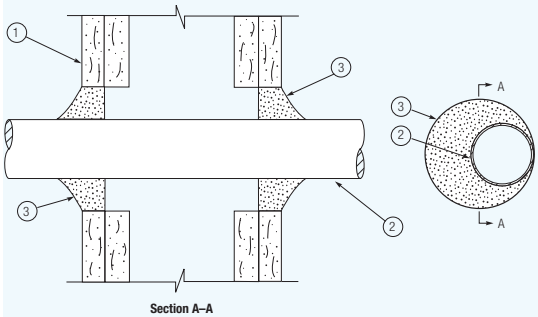
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Penetration Fire Tests

Intumescent-Type Materials

Fire Tests	UL System	Test Criteria	Description
Wood Floor Assembly	**F-C-2181[a]**		
	**F-Rating** 1 Hr. **T-Rating** 1 Hr.	1. Floor/ceiling assembly: A Floor system: Lumber or plywood subfloor topped with finish floor. B Wood joists: Nom. 10″ deep (or deeper) lumber, steel or combination joists or trusses. C Ceiling system: 1 layer of 5/8″ gypsum wallboard per UL Design. 2. Plastic pipe-Pipe with sanitary tee and drain piping. Annular space from 0″ to maximum 1″: A Nom. 1-1/2″ diameter (or smaller) schedule 40 (or heavier) solid or cellular-core PVC pipe. B Nom. 1-1/2″ diameter (or smaller) schedule 40 (or heavier) solid or cellular-core ABS pipe. 3. Chase wall: Through penetrants shall be routed through a 1-hr. fire rated gypsum wallboard chase wall. 4. Type IA: Minimum 1/2″ thick sealant applied within annulus, flush with the top surface of the floor. Minimum 1/4″ cant (45° angle) bead applied at point contact and drain pipe penetration. Minimum 1/4″ material applied within annulus, flush with bottom surface of top plate.
Wood Floor Assembly	**C-AJ-2296[a]**		
	**F-Rating** 1 Hr. **T-Rating** 1 Hr.	1. Floor/ceiling assembly: A Floor system: Lumber or plywood subfloor topped with finish floor. B Wood joists: Nom. 10″ deep (or deeper) lumber, steel or combination joists or trusses. C Ceiling system: 1 layer of 5/8″ gypsum wallboard per UL Design. 2. Plastic pipe: Annular space from 0″ to maximum 1/2″: A Nom. 3″ diameter (or smaller) schedule 40 or cellular-core PVC pipe for use in closed or open piping systems. B Nom. 3″ diameter (or smaller) SDR17 CPVC pipe for use in closed or open piping systems. C Nom. 3″ diameter (or smaller) Schedule 40 rigid non-metallic conduit. 3. Chase wall: Through penetrant shall be routed through a 1-hr. fire rated gypsum wallboard chase wall: 4. Type IA: Minimum 1/2″ thickness of sealant applied within annulus, flush with the top surface of the floor. Minimum 1/4″ cant (45° angle) bead applied at point contact. Minimum 1/4″ thickness of material applied within annulus, flush with bottom surface of top plate.

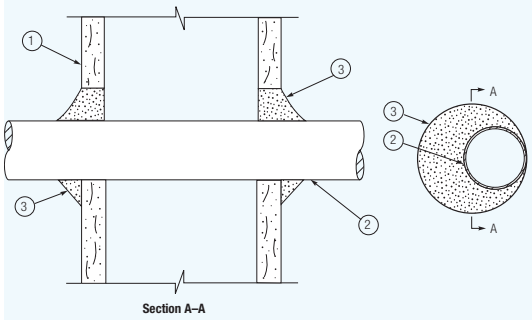
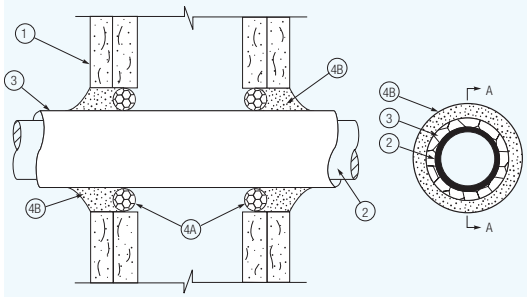
Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information.

Fire Tests	UL System	Test Criteria	Description
Wood Floor Assembly	**F-C-3054[a]**		
		**F-Rating** 2 Hr. **T-Rating** 3/4 Hr.	1. Floor/ceiling assembly: A Floor system: 5/8″ thick plywood/2″ x 4″ continuous wood decking. B Trusses: 2″ x 4″ lumber in conjunction with galv. steel plates or 2″ x 10″ wood floor joist. C Ceiling system: 1 layer of 5/8″ gypsum wallboard per UL Design. 2. Cables: The following types and sizes of cable may be used: A Maximum three-conductor with ground No. 10 AWG (or smaller) PVC insulation and jacket. B Maximum 100-pair No. 24 AWG (or smaller) PVC insulation and jacket. C Maximum 7/C No. 12 AWG copper conductor control cables. The annular space shall be 1/2″. 3. Forming material (optional): Foam backer rod firmly packed into opening as a permanent form. 4. Type IA: Minimum 1/2″ thick sealant applied within annulus, flush with the top surface of the floor and bottom of ceiling assembly.
Wall Assembly	**W-L-2224[a]**		
		**F-Rating** 1 & 2 Hr. **T-Rating** 3/4, 1, 1-1/2 & 1-3/4 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Tubing: Annular space from minimum 1/4″ to 3/8″ maximum. A Nominal 1″ diameter (or smaller) corrugated wall ENT constructed of PVC. B Nominal 3/4″ diameter (or smaller) PEX tubing. 3A Forming material (optional): In 2-hr. wall, foam backer rod firmly packed into the opening as a permanent form. 3B Type IA: Minimum 1/2″ thick sealant applied within annulus, flush with both sides of the wall assembly.
Wall Assembly	**W-L- 2225[a]**		
		**F-Rating** 2 Hr. **T-Rating** 2 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Plastic pipe: 1-1/2″ diameter (or smaller) Schedule 40 PVC pipe for use in closed or open piping systems. The annular space shall be minimum 1/4″ to maximum 5/8″ within the firestop system. 3. Type IA Minimum 1″ thick sealant applied within the opening. Additional sealant to be applied such that a minimum 3/8″ crown is formed around the penetrating item.

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information.

Penetration Fire Tests

Intumescent-Type Materials

Fire Tests	UL System	Test Criteria	Description
Wall Assembly	**W-L-2226[a]**		
 Section A–A	**F-Rating** 1 Hr. **T-Rating** 0 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Plastic pipe: 2″ diameter (or smaller) Schedule 40 solid-core PVC or SDR17 CPVC pipe for use in closed or open piping systems. The annular space shall be minimum 0″ to maximum 7/8″ within the firestop system. 3. Type IA: Minimum 1/2″ thick sealant applied within the opening. Additional sealant to be applied such that a minimum 1/4″ crown is formed around the penetrating item	
Wall Assembly	**W-L-5115[a]**		
 Section A–A	**F-Rating** 2 Hr. **T-Rating** 0 & 1 Hr.	1. Gypsum wallboard/stud wall assembly. 2. Metallic pipe: A Steel pipe: 8″ diameter (or smaller) Schedule 10 (or heavier) steel pipe. B Iron pipe: 8″ diameter (or smaller) cast or ductile iron pipe. C Copper tubing—4″ diameter (or smaller) Type L (or heavier) copper tubing. D Copper pipe: 4″ diameter (or smaller) regular (or heavier) copper. The annular space shall be minimum 1/4″ to maximum 1-1/8″ within the firestop system. 3. Pipe covering: Nom. 1″ thick (or less) glass fiber insulation. 4A Forming material (optional): Foam backer rod firmly packed into the opening as a permanent form. 4B Type IA: Minimum 1″ thick sealant applied within annulus, flush with both sides of wall assembly. Additional sealant to be installed such that a minimum 3/8″ crown is formed around the penetrating item.	

Note
(a) Refer to the UL Fire Resistance Directory for Through-Penetration Firestop Systems or contact United States Gypsum Company for complete information.

Construction Joint Fire Tests

Construction joints are used at locations where two fire-rated assemblies intersect. These locations include:

- Wall to floor/ceiling or roof/ceiling (head-of-wall application)
- Wall to wall (building expansion joint application)
- Floor to floor (building expansion joint application)
- Floor to wall

Construction joints are evaluated in accordance with the Standard ASTM E1966 (ANSI/UL 2079) for their ability to resist flame and temperature transmission as well as the hose stream.

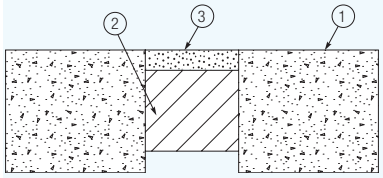
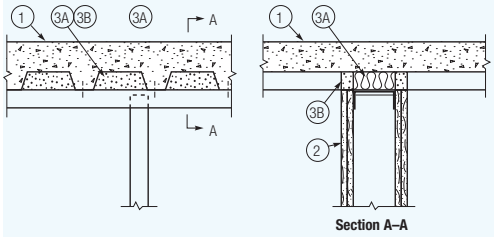
A special variation to construction joints is the intersection of a fire-rated floor and an exterior curtain wall. According to UL, curtain wall slab edge conditions are not suitable for evaluation under UL 2079 because curtain walls are primarily non-fire-rated assemblies.

Underwriters Laboratories has evaluated several United States Gypsum Company head-of-wall assemblies under the Standard UL 2079. These assemblies are recognized by ICBO (ER-2331).

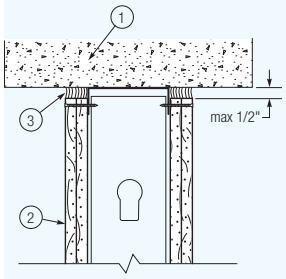
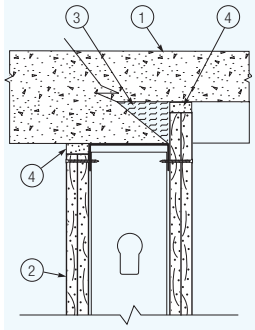
These assemblies are separated into static (no floor or roof movement) and dynamic (to accommodate deflection). Allowable movement is noted in the separate designs.

Construction Joint Fire Tests

Static Joints

Fire Tests	UL System	Test Criteria	Description
Floor Joint	**FF-S-0028**[a]		
		**Assembly Rating** 2 Hr. **L-Rating at Ambiant** Less than 1 cfm/lin. ft. **L-Rating at 400 °F** Less than 1 cfm/lin. ft.	1. Concrete floor assembly, minimum 4-1/2″ thickness; maximum joint width 2″. 2. Forming material: Minimum 4″ of mineral wool insulation[b] (minimum 2.5 pcf) firmly packed into the opening as a permanent form. 3. Type A: Minimum 1/2″ wet thickness of sealant applied within the opening, flush with the top surface of the floor
Head-of-Wall Joint System	**HW-S-0001**[a]		
For fluted steel deck/concrete floor or roof/ceiling and gypsum wallboard wall  Section A–A		**Assembly Rating** 1 & 2 Hr. **Joint Width** 1/2″ Maximum	1. Floor or roof assembly: Maximum 3″ deep fluted deck with minimum 2-1/2″ concrete floor or maximum 1-1/2″ deep fluted roof deck per UL Design. 2. Gypsum wallboard/stud wall assembly: 1-hr. or 2-hr. fire-rated wall. 3. Joint treatment system: A Forming material: Minimum 2-1/2″ of mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. B Fill material: Type FC or RFC: For 1-hr. rating, minimum 1/2″ thick compound is applied on each side of the wall; for 2-hr. rating, minimum 1″ thick compound is applied on each side of the wall.

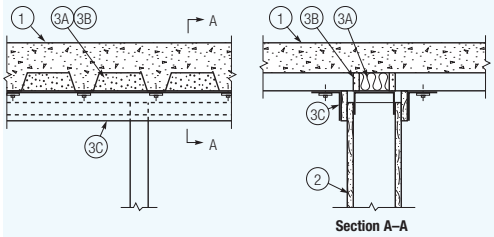
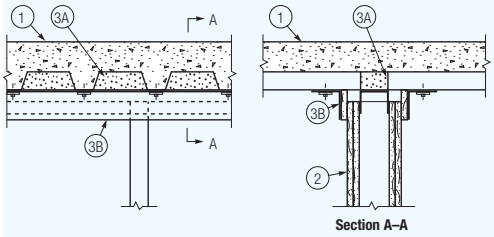
Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Tests	UL System	Test Criteria	Description
Head-of-Wall Joint System	**HW-S-0032[a]**		
For concrete floor slab and gypsum wallboard wall  	**AssemblyAssembly Rating** 1 & 2 Hr. **Joint Width** 1/2″ Maximum	1. Floor assembly: Concrete floor slab. 2. Gypsum wallboard/stud wall assembly: 1-hr. or 2-hr. fire-rated wall. 3. Fill material: Type AS: Thickness to match overall thickness of wallboard on each side of wall assembly.	
Head-of-Wall Joint System	**HW-S-0035[a]**		
For concrete floor slab and gypsum wallboard wall  	**Assembly Rating** 1 & 2 Hr. **Joint Width** 1/2″ Maximum	1. Steel deck/concrete floor assembly: Maximum 3″ deep fluted deck with minimum 2-1/2″ concrete floor. 2. Gypsum wallboard/stud wall assembly: 1-hr. or 2-hr. fire-rated wall; wallboard cut to follow contour of fluted deck, with a maximum 1/2″ gap. 3. Forming material: Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. 4. Fill material: Type AS: Thickness to match overall thickness of wallboard on each side of wall assembly.	

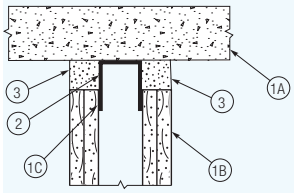
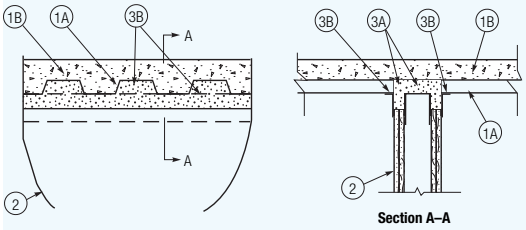
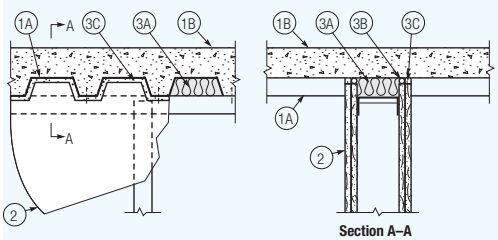
Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Construction Joint Fire Tests

Dynamic Joints

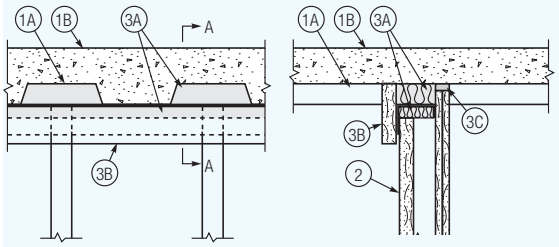
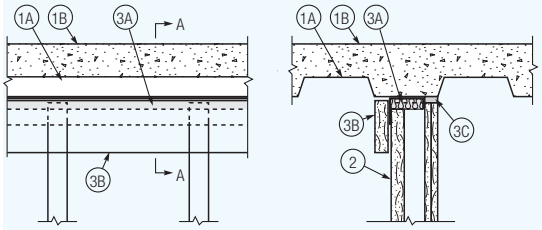
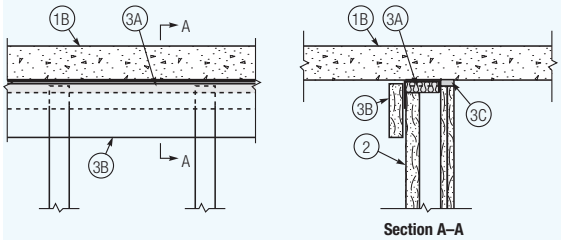
Fire Tests	UL System	Test Criteria	Description
Head-of-Wall Joint System	**HW-D-0001[a]**		
For fluted steel deck/concrete floor or roof/ceiling and gypsum wallboard wall  Section A–A	**Assembly Rating** 1 Hr. **Joint Width** 5/8″ Maximum **Movement Capabilities** 100% Compression, 60% Extension, Class II & III Movement	1. Floor or roof assembly: Maximum 3″ deep fluted deck with minimum 2-1/2″ concrete floor or maximum 1-1/2″ deep fluted roof deck per UL Design. 2. Gypsum wallboard/stud wall assembly. 3. Joint treatment system: A Forming material: Minimum 1-1/2″ of mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. B Fill material: Type FC or RFC: Minimum 1/2″ thickness of compound is applied within the recess of each floor unit flute. C Restraining angles: Minimum 2-1/2″ by 2-1/2″ angle formed from minimum 25-ga. steel, with one leg lined with a 2-1/2″ wide piece of the same gypsum wallboard used for the wall.
Head-of-Wall Joint System	**HW-D-0002[a]**		
For fluted steel deck/concrete floor or roof/ceiling and gypsum wallboard wall  Section A–A	**Assembly Rating** 2 Hr. **Joint Width** 5/8″ Maximum **Movement Capabilities** 80% Compression, 60% Extension, Class II & III Movement	1. Floor or roof assembly: Maximum 3″ deep fluted deck with minimum 2-1/2″ concrete floor or maximum 1-1/2″ deep fluted roof deck per UL Design. 2. Gypsum wallboard/stud wall assembly. 3. Joint treatment system: A Forming and fill materials: Minimum 1-1/2″ of mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. Type FC or RFC—Minimum 1″ thickness of compound is applied within the recess of each floor unit flute flush with the vertical flange of the ceiling track on each side of the wall. B Restraining angles: Minimum 2-1/2″ by 2-1/2″ angle formed from minimum 25-ga. steel, with one leg lined with a 2-1/2″ wide piece of the same gypsum wallboard used for the wall.

Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Tests	UL System	Test Criteria	Description
Head-of-Wall Joint System	**HW-D-0158[a]**		
For concrete floor and gypsum wallboard wall 	**Assembly Rating** 1 & 2 Hr. **Joint Width** 1″ Maximum **Movement Capabilities** 25% Compression; Class II & III Movement	1. Assembly materials: A Concrete floor, minimum 4-1/2″ thickness. B Gypsum wallboard/stud wall assembly. C Steel floor and ceiling runners: minimum 25 MSG galv. steel channels mechanically fastened to the lower surface of the floor assembly. 2. Bond breaker: A Install Bond Breaker Tape prior to applying sealant. As an alternate for the 2-hr. rating: Install two 7/8″ diameter polyurethane backer rods. 3. Type A: Minimum 1/2″ thickness of sealant applied within the opening, flush with both surfaces of the wall.	
Head-of-Wall Joint System	**HW-D-0160[a]**		
For fluted steel deck/concrete floor assembly and gypsum wallboard wall 	**Assembly Rating** 1 & 2 Hr. **Joint Width** 1″ Maximum **Movement Capabilities** 25% Compression or Extension; Class II & III Movement	1. Floor or roof assembly: A Maximum 3″ deep fluted deck. B Minimum 2-1/2″ thick reinforced concrete floor. 2. Gypsum wallboard/stud wall assembly. 3. Joint configuration: A Forming material: Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. B Type SA: Minimum 1/8″ dry thickness of fill material sprayed or brushed on each side of the wall to completely cover the mineral wool.	
Head-of-Wall Joint System	**HW-D-0262[a]**		
For fluted steel deck/concrete floor assembly and gypsum wallboard wall 	**Assembly Rating** 1 & 2 Hr. **Joint Width** 1/2″ Maximum **Movement Capabilities** 25% Compression or Extension; Class II & III Movement	1. Floor or roof assembly: A Maximum 3″ deep fluted galvanized steel deck with minimum 2-1/2″ thick reinforced concrete floor. B Concrete floor, minimum 4-1/2″ thickness 2. Gypsum wallboard/stud assembly: 1 hr. or 2 hr. fire-rated wall. Wallboard to follow contour of fluted deck, with a maximum 1/2″ gap. 3. Joint Configuration: A Forming material: Mineral wool insulation[b] (minimum 4.0 pcf) firmly pressed into the flutes of the steel deck as a permanent form. B Forming material (optional): In 2 hr. fire-rated wall assemblies, foam backer rod friction-fit into joint opening and recessed a minimum 5/8″ from each surface of wall. C Type A or AS: Minimum 5/8″ thickness of fill material applied within joint opening on each side of the wall, flush with each surface of the wall. **Note** (a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.	

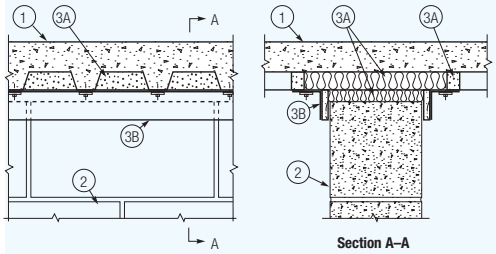
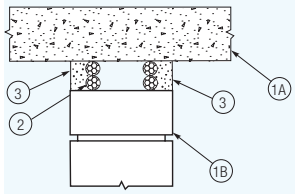
Construction Joint Fire Tests

Dynamic Joints

Fire Tests	UL System	Test Criteria	Description
Shaft Wall Head-of-Wall Joint System	**HW-D-0372[a]**		
For fluted steel decks/concrete floor and gypsum wallboard shaft wall		**Assembly Rating** 2 Hr. **Joint Width** 5/8″ Maximum **Movement Capabilities** 25% Compression or Extension; Class II & III Movement	1. Floor assembly: A Maximum 3″ deep galvanized fluted deck with minimum 2-1/2″ thick reinforced concrete. B Concret floor, minimum 2-1/2″ thickness. 2. Gypsum Shaft Wall assembly: 2 hr. fire-rated shaft wall per Design No. U415, System B. Wallboard to follow contour of fluted deck or concrete floor, with a maximum 5/8″ gap. 3. Joint configuration: A Forming material: Mineral wool insulation[b] (minimum 4.0 pcf) firmly pressed into the flutes of the steel deck as a permanent form. Nominal 1″ thick by 3″ wide strips friction fitted within top J-runner. B Wall cladding: 5-3/4″ wide strip of 1″ liner panel cut to contour of fluted deck and screw attached to long leg (shaft side) of J-runner. As an alternate, two 5-3/4″ wide strips of 1/2″ thick gypsum board cut to contour of fluted deck may be screw attached to long leg of J-runner. The gap between the fluted deck and wall board shall be minimum 1/8″ to maximum 1/2″. C Type AS: Minimum 1″ thick sealant installed on finished side of shaft wall.
Perpendicular			
			
Parallel			
			
Flat Slab			
			

Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

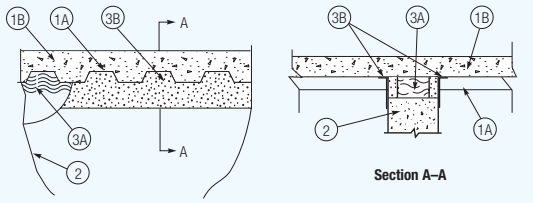
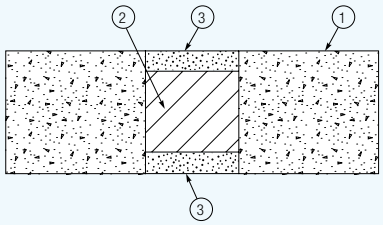
Masonry Dynamic Joints

Fire Tests	UL System	Test Criteria	Description
Head-of-Wall Joint System	**HW-D-0009[a]**		
For fluted steel/concrete floor or roof/ceiling and concrete block wall  Section A–A	**Assembly Rating** 2 Hr. **Joint Width** 1″ Maximum **Movement Capabilities** 25% Compression 12% Extension; Class II & III Movement	1. Floor or roof assembly: Maximum 3″ deep fluted deck with minimum 2-1/2″ concrete floor or minimum 4-1/2″ structural concrete floor slab; or maximum 1-1/2″ deep fluted roof deck per UL Design. 2. Concrete or block wall. 3. Joint treatment system: A Forming and fill materials: Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. Type FC or Type RFC: Minimum 1″ thickness of compound is applied within the recess of each floor unit flute flush with the vertical flange of the ceiling track on each side of the wall. B Restraining angles: Minimum 2-1/2″ by 2-1/2″ angle formed from minimum 25-ga. steel, with one leg lined with a 2-1/2″ wide piece of the same gysum wallboard used for the wall.
Head-of-Wall Joint System	**HW-D-0159[a]**		
For concrete floor  	**Assembly Rating** 2 Hr. **Joint Width** 1″ Maximum **Movement Capabilities** 25% Compression; Class II & III Movement	1. Joint materials: A Concrete floor, minimum 4-1/2″ thickness. B Concrete or block wall, minimum 5″ thickness. 2. Forming material: Install 2 layers of 7/8″ diameter polyurethane backer rod, friction fitted within the opening to accommodate the required thickness of sealant. 3. Type A: Minimum 1/2″ thickness of sealant applied within the opening, flush with both surfaces of the wall assembly.

Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Construction Joint Fire Tests

Masonry Dynamic Joints

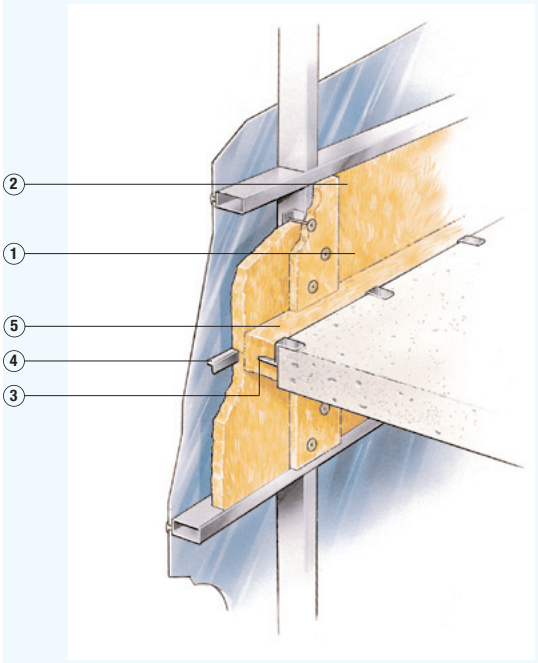
Fire Tests	UL System	Test Criteria	Description
Head-of-Wall Joint System	**HW-D-0161[a]**		
For fluted steel deck/concrete floor assembly and concrete block wall 		**Assembly Rating** 2 Hr. **Joint Width** 1″ Maximum **Movement Capabilities** 25% Compression or Extension; Class II & III Movement	1. Floor or roof assembly: A Maximum 2″ deep fluted deck. B Minimum 2-1/2″ thick reinforced concrete floor. 2. Concrete or block wall. 3. Joint configuration: A Forming material: Mineral wool insulation[b] (minimum 4.0 pcf) firmly packed into the flutes of the steel deck as a permanent form. B Type SA: Minimum 1/8″ dry thickness of fill material sprayed or brushed on each side of the wall to completely cover the mineral wool.
Wall Joint	**WW-S-0036[a]**		
		**Assembly Rating** 2 Hr. **Joint Width** 2″ Maximum **L-Rating at Ambient** Less Than 1 cfm/lin. ft. **L-Rating at at 400 °F** Less Than 1 cfm/lin. ft.	1. Joint materials: Concrete or block wall, minimum 5″ thickness. 2. Forming material: Minimum 4″ of mineral wool insulation[b] (minimum 2.5 pcf) firmly packed into the opening as a permanent form. 3. Type A: Minimum 1/2″ wet thickness of sealant applied within the opening, flush with both surfaces of the wall assembly.

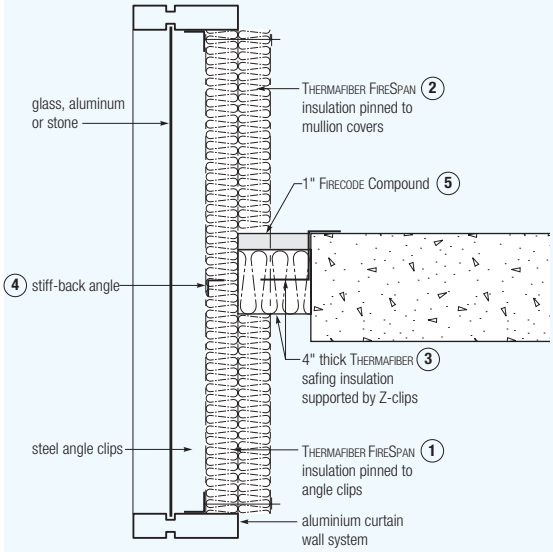
Note
(a) Refer to the UL Fire Resistance Directory for Building Joint Systems or contact United States Gypsum Company for complete information. (b) Bearing the UL Classification Marking.

Fire Containment Curtain Wall System

Aluminum Framed

Curtain Wall Systems	UL System	Description
Design Criteria	CW-S-2001 or CW-S-2002	





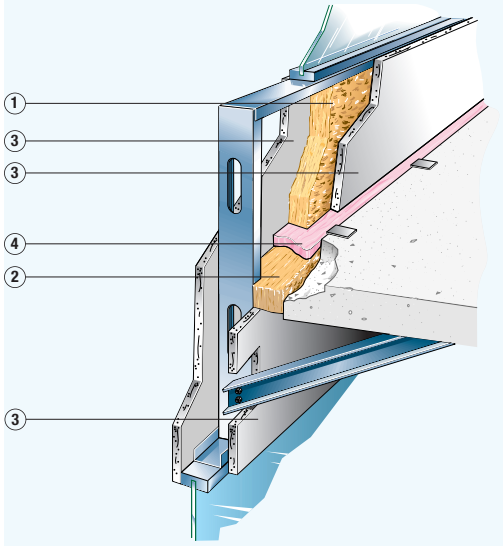
The following checklist contains important details that must be included in a Fire Containment System used in an aluminum-framed curtain wall system with aluminum,glass or stone spandrel panels.(See specific test design for details.)

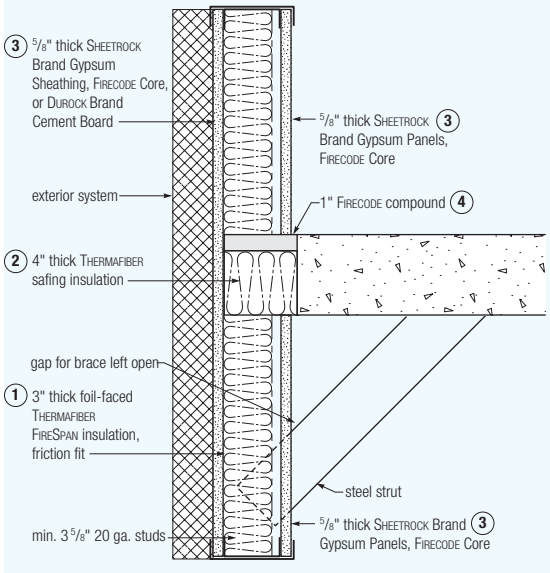
1. Foil-Faced THERMAFIBER Curtain Wall or FIRESPAN Insulation is mechanically attached to mullions and transoms using impaling pins, screws or other positive mechanical attachment.
2. Exposed aluminum mullions must be protected with Foil-Faced THERMAFIBER Curtain Wall or FIRESPAN Insulation mullion covers.
3. Safing insulation is compression fit (minimum 1/2″ wider than opening) into safe-off area (2″- 8″) and supported with safing “Z” clips.
4. A light steel angle or channel is placed horizontally at the safing line,attached to vertical mullions—either within the insulation at a horizontal splice,or behind the insulation and attached to vertical mullions.This detail prevents bowing of curtain wall insulation due to the compression fit of the safing insulation.
5. Minimium 1″ thick FIRECODE Compound installed over forming material (Safing Insulation) to form a tight smoke seal and effective thermal barrier.

Fire Containment Curtain Wall System

Steel Stud Framed

Curtain Wall Systems	UL System	Description
Design Criteria	CW-S-1001	





The following checklist contains important details that must be included in a Fire Containment System used in a steel stud-framed curtain wall system. (See specific test design for details.)

1. Foil-Faced THERMAFIBER FIRESPAN Insulation is friction-fit between the steel studs.
2. Safing insulation is compression fit (minimum 1/2″ wider than opening) into safe-off area (2″- 8″) and supported with safing “Z” clips, 24″ o.c. maximum
3. 5/8″ thick SHEETROCK Brand FIRECODE Core Gypsum Sheathing or 1/2″ or 5/8″ thick DUROCK Brand Cement Board, is screw-attached to the exterior face of the studs. 5/8″ thick SHEETROCK Brand FIRECODE Core Gypsum Panels are screw-attached to the interior face of the studs.
4. Minimium 1″ thickness of FIRECODE Compound Type FC or RFC installed over forming material (Safing Insulation) to form a tight smoke seal and effective thermal barrier.

Good Design Practices

Use this section as a reference if questions arise during the design or application of USG Fire Stop Systems.

This section is an overview of good design, application, installation and safety concerns that should be addressed when USG's products and systems are used. This section outlines some major issues, but is not intended to be a comprehensive review. No attempt is made at completeness.

We recommend that architects and contractors seek the assistance of safety professionals, especially at the professional construction site, because there are many factors to consider that are not included here. For more information on safety and material handling, please refer to Chapter 13 in *The Gypsum Construction Handbook, Centennial Edition.*

1	**System Performance**	United States Gypsum Company conducts tests on products and systems to meet performance requirements of established test procedures specified by various agencies. Upon written request we will provide test certification for published fire, structural and other pertinent data covering systems designed and constructed according to our published specifications. Substitutions of any of the components are not recommended and are not endorsed by the United States Gypsum Company.
2	**Additional Information**	See your sales representative or call 800 USG-4YOU.
3	**Floor/Ceiling Applications**	USG Fire Stop System installed in floor/ceiling applications is not designed to support loads from pedestrian or vehicular traffic.
4	**Storage**	SHEETROCK Brand Acoustical Sealant, FIRECODE Brand Acrylic Firestop Sealant, and FIRECODE Brand Intumescent Acrylic Firestop Sealant can be stored up to one year in unopened containers in dry areas under 80º F. Protect from freezing. FIRECODE Brand Compound can be stored up to 9 months under good storage conditions. Close opened bags as tightly as possible and store in a dry place. Protect FIRECODE Brand Premixed Compound from freezing.

Application Guide Specifications

This guide specification is provided to assist you in specification of USG Fire Stop Systems. If you have additional questions or would like more information regarding this or other USG products and systems, please contact USG at 800 USG.4YOU.

Part 1: General

1.1 Scope

Specify to meet requirements.

1.2 Qualifications

All materials described in this folder, manufactured by or for United States Gypsum Company, shall be installed in accordance with its printed directions.

1.3 Delivery and Storage of Materials

All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.4 Environmental Conditions

In cold weather, installation of firestopping products shall not begin until the building is enclosed, with permanent heating and cooling in operation, and building temperatures maintained above 40 °F. Maintain minimum surface, water, mix and air temperature of 40 °F during application. Maintain minimum temperature of 50 °F within the building during and after installation for FIRECODE Compound and SHEETROCK Brand Acoustical Sealant.

Adequate ventilation shall be provided to carry off excess moisture. Not to be applied to moist or contaminated surfaces or areas continuously immersed in water.

Protect material from freezing and maintain temperature below 80 °F. FIRECODE Compound not recommended for sustained extreme high temperature applications. Temperatures should not exceed those typically found with domestic hot water systems (approximately 140 °F). SHEETROCK Brand Acoustical Sealant should not be used in applications where the surround materials (partitions, floor, penetrations, etc.) will exceed sustained temperatures of 150 °F. FIRECODE Acrylic Firestop Sealant and FIRECODE Intumescent Acrylic Firestop Sealant-Type IA should not be used where temperatures exceed 105 °F.

Part 2: Materials

2.1 Materials

A. Forming Material (if required by system): Nominal 4 lb./cu. ft. mineral wool insulation, unfaced, 4″ thick, ( ) wide, ( ) long.

B. Firestopping

1. FIRECODE Compound, (15-lb. bag.) (4.5 gal. pail).
2. FIRECODE Intumescent Acrylic Firestop Sealant-Type IA, (10.15 oz. cartridge) (20.3 oz. sausage) (4.5 gal. pail).
3. FIRECODE Acrylic Firestop Sealant, (10.15 oz. cartridge) (28.8 fl. oz. cartridge) (4.5 gal. pail).
4. FIRECODE Acrylic Firestop Spray Sealant (Type SA), 4.5 gal. pail.
5. SHEETROCK Brand Acoustical Sealant (29 oz. cartridge) (5 gal. pail).

Part 3: Execution

3.1 Safing Insulation Application

Clean substrate of dirt, dust, grease, oil, efflorescence, loose material or other matter. With a serrated knife, cut nominal 4 lb./cu. ft. mineral wool insulation slightly wider than the opening. Compress and tightly fit minimum thickness (per system specifications) of insulation with nominal density of 4 lb./cu. ft. around penetrant.

3.2 Firestopping Sealant Application

A. Trowel and Caulk Gun Application

Mix FIRECODE Brand Compound according to directions on package and apply with trowel, putty knife or spatula. SHEETROCK Brand Acoustical Sealant can be applied using a trowel, putty knife, spatula or caulking gun equipment. FIRECODE Brand Intumescent Acrylic Firestop Sealant-Type IA and FIRECODE Acrylic Firestop Sealant may be applied using conventional caulking equipment. Apply the firestopping sealant to minimum thickness (per system specifications) on top of safing insulation (where applicable). Ensure that firestopping sealant is in contact with all surfaces and that the entire opening is filled with safing (if required for system applications) and firestopping sealant. The specific system design will specify the necessary amount of forming material and the permitted joint or annular space.

B. Spray Application—Mixing

FIRECODE Compound powder—Use drinkable water and clean mixing equipment. Mix 8.5 to 9.0 pints water per 15 lbs. of FIRECODE Brand Compound. Mix powder thoroughly into water until powder is completely wet. Mix until smooth. Let initial mix soak approximately one minute. Remix approximately one minute, adding water necessary to achieve desired working consistency.

FIRECODE Compound premixed—Activated compound should be thinned with water. Mix using drinkable water and clean mixing equipment. Use 0.5 pints water per gallon of FIRECODE Compound premixed.

Product will be stable for approximately one hour of spraying time.

Do not retemper. Hardening cannot be prevented or delayed by dilution with water. Do not intermix previously mixed or sprayed material into freshly mixed material. Intermixing will accelerate the chemical setting of FIRECODE Brand Compound, causing short working time, resulting in substandard bond and unsatisfactory surface matrix harness. Do not intermix with other joint compounds. Store bags in a dry place. If moisture damage occurs, do not use any set lumps of material.

Spray Equipment (FIRECODE Compound)

Roto/stator (Moyno pump) or peristaltic pump may be used. Use minimum length material hose with minimal line splices to reduce clogging. Product will be tank stable for one hr. of spraying time. Pump and hose must be primed with water prior to spray application. Clean equipment thoroughly between and after applications. Use plaster system scouring sponges to prevent buildup inside hoses.

Rotor/stator (Moyno pump)—Use Robbins-Myers 2L4 pump or similar equipment as minimum pump size, with pole gun with 1/4″ to 3/8″ round orifice. Use 3/4″ to 1″ i.d. material hose, 3/8″ atomizing hose and 1/2″ air line from the compressor to the pump.

Peristaltic pump—Use pump with minimum 1″ i.d. internal pumping and material hose. Use pole gun with 1/4″ to 3/8″ round orifice. Use minimum 1″ i.d. material hose, 3/8″ atomizing hose and 1/2″ air line from the compressor to the pump.

Application Guide Specifications

Application (Firecode Compound)

Spray application rate of Firecode Brand Compound is approximately 2 gal. (462 cu. in.) per min. Typical spray patterns are between 1′-2′ using 20-30 psi air pressure. The spray gun should be held as close to the penetration being filled as possible to reduce overspray and waste, typically 1′-2′. Avoid excessive air pressure. Material may be applied up to a 1″ finished thickness in a single coat; however, best results are achieved by building up to the finished thickness in 1/2″ coats. Firecode Brand Compound will stiffen approximately 15 min. after spray application, allowing for quick recoating or hand tooling. Set time of the sprayed material will be approximately 30% less than for the unpumped material.

Do not recycle material that has been pumped (such as wipedown or initial flushes of material). The pumping process accelerates set. If recycled material is mixed with fresh product, the material will set faster than normal and will set up in the equipment. The practice of recycling sprayed material will result in bond failure and unsatisfactory surface matrix hardness.

Do not let material sit in the hose for longer than 20 minutes If longer breaks are needed, flush out the hose with water and then restart.

Spray Equipment (Firecode Brand Acrylic Firestop Spray Sealant-Type SA)

Working pressure shall be minimum 2000 psi with a delivery rate of minimum 1.0 gpm. The spray tip orifice shall be 0.0239. A larger tip may be used if the pump can support it. The fluid line is minimum 3/8″ i.d. for a length of up to 50′. Equipment should be flushed with water at the end of the day. Airless spray equipment operates at extremely high pressures. Protective clothing, gloves and eye protection are required.

Application (Firecode Brand Acrylic Firestop Spray Sealant-Type SA)

Apply Firecode Acrylic Firestop Spray Sealant (Type SA) to the required depth using spray equipment, brush or trowel. The application should extend 1/2″ onto both the deck and wall surfaces to ensure proper installation of the sealant over the entire joint area. Masking tape can be used to create a neat appearance.

About the cover:

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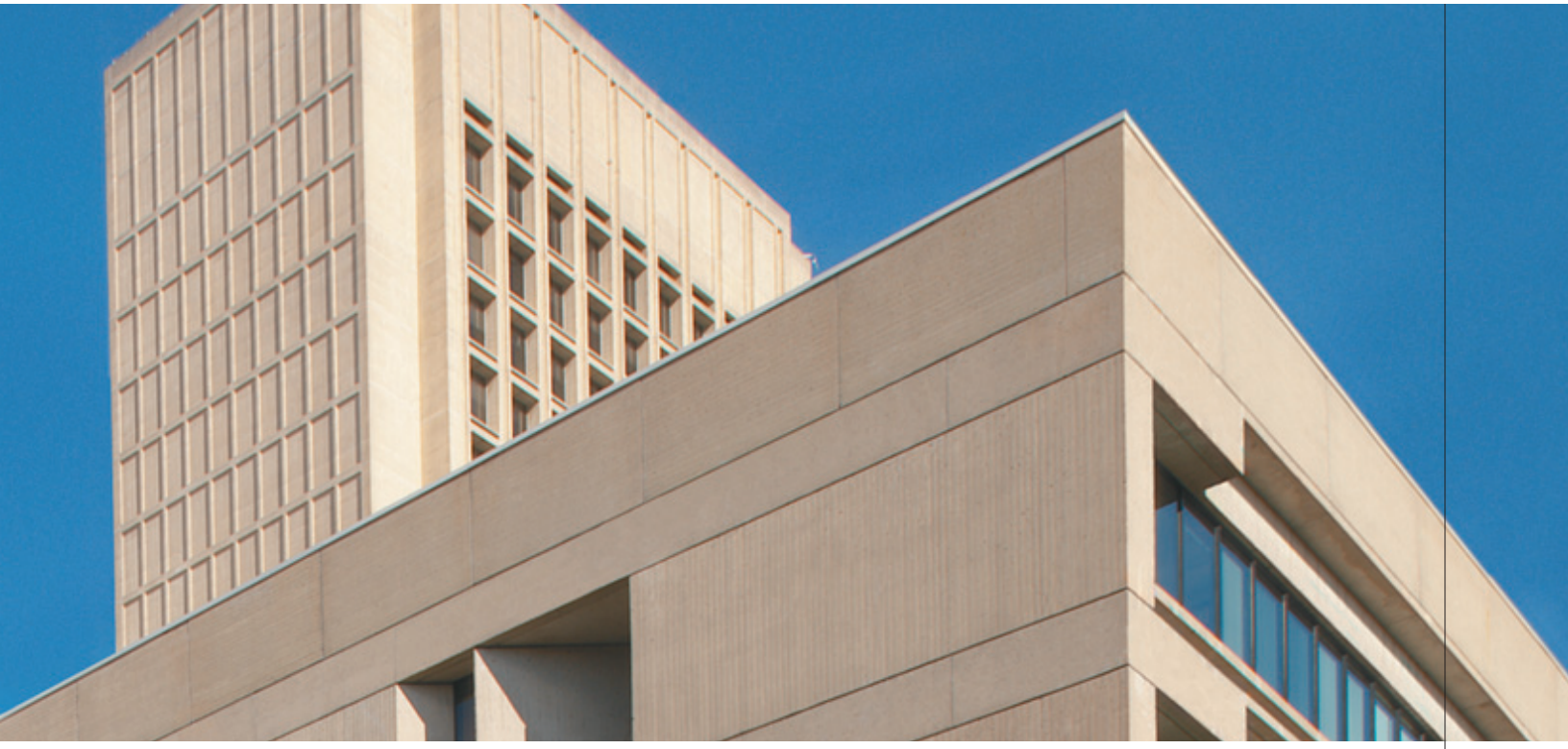

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