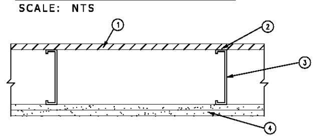
FLOOR/CEILING DETAIL
DESIGN NO. L524

SCALE: NTS



1. Flooring System - The flooring system shall consist of 5/8" in. T & G edge wood structural panels, min grade "Underlayment" or "Single Floor". Face grain of plywood or strength axis of panel to be perpendicular to joists with joints staggered.

2. Flooring Fasteners (Not Shown) - with Type S12 by 1 5/8in. long self-drilling, pilot point, steel screws. The screws are to be spaced 6 in. OC around the perimeter of the floor and at all end (butt) joints of the panels. Spacing in the field to be 10 in. OC.

3. Steel Joists - The joists are channel-shaped, min 7 in. deep with min 1 5/8in. wide flanges and 1/2in.
long stiffening flanges. The joists are fabricated from min No. 18 MSG galv steel. Min yield strength of steel is either 33,000 or 40,000 psi with corresponding max working stress of 20,000 and
24,000 psi. Joists spaced max 24 in. OC. At joist splices bearing on supports, joists are overlapped a min of 3 in.

4. Gypsum Board: Two layers of 1/2" thick gypsum board installed with long dimensions perpendicular to joists. Base layer attached to steel joists using 1 in. long, Type S12 bugle head steel screws place 8 in. OC along butt joints and 12 in. OC in field along the joists. Butt joints to occur beneath joists with screws located 1/2in. for the butt joints. Outer layer attached to assembly using 1 1/2in. long, Type G bugle head steel screws spaced 8 in. OC along butt joints and with 1 5/8in. long, Type S12 bugle head screws spaced 12 in. OC in the field along the joists. Butt joints of outer layer to occure between joists with screws located 3/4in. from the butt joints. Edge joints to be staggered between layers.

AMERICAN GYPSUM CO - Type AG-C

CERTAINTEED GYPSUM INC - Type FRPC, ProRoc Type C

CERTAINTEED GYPSUM CANADA INC - ProRoc Type C

CANADIAN GYPSUM COMPANY - Type C, IP-X2

G-P GYPSUM CORP, SUB OF GEORGIA-PACIFIC CORP - Type 5

LAFARGE NORTH AMERICA INC - Types LGFC-C, LGFC-C/A

NATIONAL GYPSUM CO - Types FSK-C, FSW-C

PABCO BUILDING PRODUCTS LLC, DBA PABCO GYPSUM - Type PG-C

TEMPLE-INLAND FOREST PRODUCTS GROUP - Type TG-C

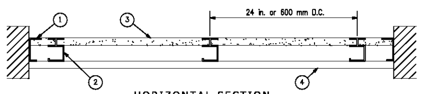
UNITED STATES GYPSUM CO - Type C, IP-X2

USA MEXICO S A DE C V - Type C, IP-X2

NONBEARING WALL RATINGS - 1, 2, 3 OR 4 HR DESIGN NO. U415

SCALE: NTS

SYSTEM A - 1 HR.



HORIZONTAL SECTION

• Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respective

1. Floor, Side and Ceiling Runners —"J" - shaped runner, min 2-1/2 in. deep (min 4 in. deep when System C is used), with unequal legs of 1 in. and 2 in., fabricated from min 24 MSG (min 20 MSG when Item 4A, 4B, 4C, 4D or 7 are used) galv steel. Runners positioned with short leg toward finished side of wall. Runners attached to structural supports with steel fasteners located not greater than 2 in. from ends and not greater than 24 in. OC. "E" - shaped studs (Item 2A) may be used as side runners in place of "J" - shaped runners.

2. Steel Studs —"C-H" - shaped studs, min 2-1/2 in. deep (min 4 in. deep when System C is used), fabricated from min 25 MSG (min 20 MSG when Items 2D, 4A, 4B, 4C, 4D or 7 is used) galv steel. Cut to lengths 3/8 to 1/2 in. less than floor-to-ceiling height and spaced 24 in. or 600 mm OC (max 16 in. OC when Items 4A, 4B, 4C, or 4D are used).

2A. Steel Studs —(Not Shown) —"E" - shaped studs installed back to back in place of "C-H" - shaped studs (Item 2) "E" - shaped studs secured together with steel screws spaced a maximum 12 in. OC. Fabricated from min 25 MSG (min 20 MSG when Item 2D, 4A, 4B or 7 is used) galv steel, min 2-1/2 in. deep (min 4 in. deep when System C is used), with one leg 1 in. long and two legs 3/4 in. long. Shorter legs 1 in. apart to engage gypsum liner panels. Cut to lengths 3/8 to 1/2 in. less than floor to ceiling heights.

2B. Furring Channels —(Optional, Not Shown) —For use with single or double layer systems. Resilient furring channels fabricated from min 25MSG corrosion protected steel, installed horizontally, and spaced vertically a max 24 in. OC. Flange portion of channel attached to each intersecting "C-H" or "E" stud on side of stud opposite the 1 in. liner panels with 1/2 in. long Type S or S-12 pan-head steel screws. When furring channels are used, wallboard to be installed vertically only. Not to be used with Type FRX-G gypsum wallboard, Type RB-LBG (Item 4A), Type Nelco (Item 4B) or cementitious backer units (Item 7).

2C. Furring Channels —For use with System I - "Hat" - shaped, 25 MSG galv steel furring channels attached directly over the inner layers of wallboard to each stud with 2 in. long Type S pan head steel screws. Screws alternate from top flange to bottom flange at each stud intersection. Furring channels spaced vertically max 24 in. OC.

2D. Steel Framing Members• —(Optional, Not Shown) —For use with single or double layer systems. Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum wallboard, Type RB-LBG (Item 4A), Type Nelco (Item 4B) or cementitious backer units (Item 7):
a. Furring Channels —Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board installed vertically only and attached to furring channels as described in Item 4.

b. Steel Framing Members• —Used to attach furring channels (Item 2Da) to studs (Item 2 or 2A). Clips spaced max. 24 in. OC., and secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.
PAC INTERNATIONAL L L C —Types RSIC-1, RSIC-1 (2.75)

2E. Steel Framing Members• —(Optional, Not Shown) —Furring channels and Steel Framing Members as described below:
a. Furring Channels —Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.Gypsum board attached to furring channels as described in Item 4.

b. Steel Framing Members• —Used to attach furring channels (Item 2Ea) to studs. Clips spaced 24 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips.
STUDCO BUILDING SYSTEMS —RESILMOUNT Sound Isolation Clips - Type A237R

2F. Steel Framing Members• —(Optional, Not Shown) —For use with single or double layer systems. Furring channels and Steel Framing Members as described below. Not to be used with Type FRX-G gypsum wallboard, Type RB-LBG (Item 4A), Type Nelco (Item 4B) or cementitious backer units (Item 7):
a. Furring Channels —Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board installed vertically only and attached to furring channels as described in Item 3.

b. Steel Framing Members• —Used to attach furring channels (Item 2Da) to studs (Item 2 or 2A). Clips spaced max. 24 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.
PLITEQ INC —Type GENIECLIP

3. Gypsum Board• —Gypsum liner panels, nom 1 in. thick, 24 in. or 600 mm (for metric spacing) wide. Panels cut 1 in. less in length than floor to ceiling height. Vertical edges inserted in "H" portion of "C-H" studs or the gap between the two 3/4 in. legs of the "E" studs. Free edge of end panels attached to long leg of vertical "J" - runners with 1-5/8 in. long Type S steel screws spaced not greater than 12 in. OC. When wall height exceeds liner panel length, liner panel may be butted to extend to the full height of the wall. Horizontal joints need not be backed by steel framing. In System I, butt joints in liner panels are staggered min 36 in. Butt joints backed with 6 in. by 22 in. strips of 3/4 in. thick gypsum wallboard (Item 4). Wallboard strips centered over butt joints and secured to liner panels with six 1-1/2 in. long Type G steel screws, three screws along the 22 in. dimension at the top and bottom of the strips.
CGC INC —Type SLX

UNITED STATES GYPSUM CO —Type SLX

USG BORAL DRYWALL SFZ LLC —Type SLX

USG MEXICO S A DE C V —Type SLX

4. Gypsum Board• —

System A —1 Hr

Gypsum panels, with beveled, square or tapered edges, nom 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally, attached to studs with 1 in. long Type S steel screws spaced 12 in. when installed vertically or 8 in OC when installed horizontally. Horizontal joints need not be backed by steel framing.

CGC INC —Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

UNITED STATES GYPSUM CO —Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SGX, SHX, ULIX, ULX, WRC, WRX, USGX. When ULIX is used, Item 6, Batts and Blankets• is required and minimum stud depth is 4 in.

USG BORAL DRYWALL SFZ LLC —Types C, SCX, SGX, USGX

USG MEXICO S A DE C V —Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULX, USGX, WRC, WRX

Systems A, B, C, E, F, G, H, I

Joints on outer layers of gypsum boards (Item 4 and 4A) covered with paper tape and joint compound. Paper tape and joint compound may be omitted when gypsum boards are supplied with square edges. Exposed screw heads covered with joint compound.

6. Batts and Blankets• —

Systems A, B, E, F, G, H, I

(Optional) —Mineral wool or glass fiber batts partially or completely filling stud cavity. Any mineral wool or glass fiber batt mineral bearing the UL Classification Marking as to Fire Resistance.

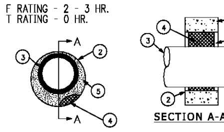
System A With Type ULIX Gypsum Boards

Placed in stud cavities, any min. 3-1/2 in. thick glass fiber insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance. See Batts and Blankets (BKNV or BZJZ) Categories for names of Classified companies.

PENETRATION FIRESTOP DETAIL
DESIGN NO. CAJ-1081

SCALE: NTS

F RATING - 2 - 3 HR.
T RATING - 0 HR.



SECTION A-A

1. Floor or Wall Assembly Min 3-3/4 in. (2-Hr Rating) or min 4-1/2 in. (3-Hr Rating) thick reinforced lightweight or normal weight (100-150 pcf) concrete floor, or min 4-3/4 in. (2-Hr Rating) or min 5 in. (3-Hr Rating) thick reinforced lightweight or normal weight (100-150 pcf) concrete wall. Wall may also be constructed of any UL Classified Concrete Blocks•. Max diam of opening is 16 in.

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

2. Metallic Sleeve (Optional) 15/32 Nom 16 in. diam (or smaller) steel pipe, conduit or steel EMT cast or grouted into floor or wall assembly, flush with floor or wall surfaces.

3. Through Penetrants One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. Steel Pipe Nom 10 in. diam (or smaller) Schedule 10 (or heavier) steel pipe. The annular space shall be min 1/4in. to max 4 in.

B. Steel Pipe Nom 24 in. diam (or smaller) Schedule 10 (or heavier) steel pipe. The annular space shall be min 1/4in. to max 1-15/16 in.

C. Conduit Nom 6 in. diam (or smaller) steel conduit or nom 4 in. diam (or smaller) electrical metallic tubing. The annular shall be min 1/4in. to max 4 in.

D. Copper Tubing Nom 6 in. diam (or smaller) Type M (or heavier) copper tubing. The annular space shall be min 1/4in. to max 1-13/16 in.

E. Copper Tubing Nom 4 in. (or smaller) Type M (or heavier) copper tubing. The annular space shall be a min 1/4in. to max 4 in.

4. Forming Material• Min 2-3/4 in. (2-Hr Rating)or min 3 in. (3-Hr Rating) thickness of min 3.5 pcf mineral fiber insulation firmly packed into opening as a permanent form. Forming material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.

THERMAFIBER L L C - Type SAF

5. Fill, Void or Cavity Material• - Sealant Min 1 in. thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall. Dry mix material mixed with water at a rate of 2.1 parts dry mix to 1 part water by weight in accordance with the accompanying installation instructions.

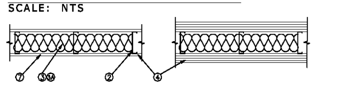
UNITED STATES GYPSUM CO - Type FC

5A. Fill, Void or Cavity Material• Not Shown 15/32 Two component fill material used as an alternate to Item 5. Min 1 in. thickness of fill material applied within the annulus, flush with top side of floor or both surfaces of wall. Ready-mixed component mixed with accelerator component at a rate of 66 parts of ready-mixed component to 1 part accelerator component by weight in accordance with the accompanying installation instructions.

UNITED STATES GYPSUM CO - Type RFC
•Bearing the UL Classification Mark

FIRE RESISTANCE DETAIL
DESIGN NO. U419

SCALE: NTS



1. Floor and Ceiling Runners (Not shown) 15/32 Channel shaped, fabricated from min 25 MSG (min 20 MSG when Item 4A is used) corrosion-protected steel, min width to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners 24 in. OC max.

2. Steel Studs Channel shaped, fabricated from min 25 MSG (min 20 MSG when Item 4A is used) corrosion-protected steel, min width as indicated under Item 4, min 1-1/4 in. flanges and 1/4in. return, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4in less than assembly height.
3. Batts and Blankets• (Required as indicated under Item 4) 15/32 Mineral wool batts, friction fitted between studs and runners. Min nom thickness as indicated under Item 4. See Batts and Blankets (BKNV or BZJZ) Categories for names of Classified companies.

3A. Batts and Blankets• (Optional) 15/32 Placed in stud cavities, any glass fiber or mineral wool insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance. See Batts and Blankets (BKNV or BZJZ) Categories for names of Classified companies.

4. Gypsum Board• Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems)staggered a min. of 12 in. The thickness and number of layers for the 1 hr, 2 hr, 3 hr and 4 hr ratings are as follows:

Wallboard Protection on Each Side of Wall

Rating	Min Stud Depth	No. of Layers & Thkns of Panel	Min Thkns of Insulation (Item 3)
1	3-1/2	1 layer, 5/8in. thick	Optional
1	2-1/2	1 layer, 1/2in. thick	1-1/2 in.
1	1-5/8	1 layer, 3/4in. thick	Optional
2	1-5/8	2 layers, 1/2in. thick	Optional
2	1-5/8	2 layers, 5/8in. thick	Optional
3	1-5/8	3 layers, 1/2in. thick	Optional
3	1-5/8	2 layers, 3/4in. thick	Optional
3	1-5/8	3 layers, 5/8in. thick	Optional
4	1-5/8	4 layers, 5/8in. thick	Optional
4	1-5/8	4 layers, 1/2in. thick	Optional
4	2-1/2	2 layers, 3/4in. thick	2 in.

CANADIAN GYPSUM COMPANY - 1/2in. thick Type C, IP-X2 or IPC-AR; 5/8in. thick [illegible] IP-X1, IP-X2, IPC-AR, SCX, SHX, WRX or WRC; 3/4in. thick Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

UNITED STATES GYPSUM CO - 1/2in. thick Type C, IP-X2, IPC-AR or WRC; 5/8in. thick Type SCX, SHX, WRX, IP-X1, AR, C, WRC, FRX-G, IP-AR, IP-X2, IPC-AR; 3/4in. thick Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

USG MEXICO S A DE C V - 1/2in. thick Type C, IP-X2, IPC-AR or WRC; 5/8in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, [illegible] SHX, WRX, WRC; 3/4in. thick Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

4A. Gypsum Board• As an alternate to Item 4) 15/32 5/8in. thick gypsum panels installed as described in Item 4 with Type S-12 steel screws of length and spacing of the screws as specified under Item 5.

CANADIAN GYPSUM COMPANY - Type FRX

UNITED STATES GYPSUM CO - Type FRX

USG MEXICO S A DE C V - Type SHX

5. Fasteners (Not shown) - Type S or S-12 steel screws used to attach panels to studs (Item 2) or furring channels (Item 6). Single layer systems: 1 in. long for 3/4in. thick panels, for 1/2 and 5/8in. thick panels or 1-1/4 in. long for 3/4in. thick panels, spaced 8 in. OC when panels are applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. Two layer systems: First layer- 1 in. long for 1/2 and 5/8in. thick panels or 1-1/4 in. long for 3/4in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2in., 5/8in. thick panels or 2-1/4 in. long for 3/4in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. Three-layer systems: First layer- 1 in. long for 1/2in., 5/8in.thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2in., 5/8in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2in., 5/8in. thick panels or 2-5/8 in. long for 5/8in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. Four-layer systems: First layer- 1 in. long for 1/2in., 5/8in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2in., 5/8in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2in. thick panels or 2-5/8in. long for 5/8in. thick panels,spaced 24 in. OC. Fourth layer - 2-5/8in. long for 1/2in. thick panels or 3 in. long for 5/8in. thick panels,spaced 12 in. OC. Screws offset min. 6 in. from layer below.
6. Furring Channels (Optional, not shown, for single or double layer systems) - Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 2 in. long Type S-12 steel screws. Not for use with Item 4A.

7. Joint Tape and Compound Vinyl or casein, dry or premixed joint compound applied in two coats to joints and screw heads of outer layers. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layer panels. Paper tape a joint compound may be omitted when gypsum panels are supplied with a square edge.

8. Siding, Brick or Stucco (Optional, not shown) - Aluminum, vinyl or steel siding, brick veneer or stucco, meeting the requirements of local code agencies, installed over gypsum panels. Brick veneer attached to studs with corrugated metal wall ties attached to each stud with steel screws, not more than each sixth course of brick.

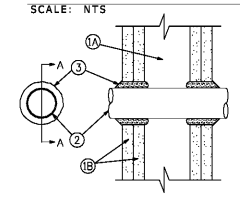
9. Caulking and Sealants• (Optional, not shown) - A bead of acoustical sealant applied around the partition perimeter for sound control.

UNITED STATES GYPSUM CO - Type AS

•Bearing the UL Classification Mark

PENETRATION FIRESTOP DETAIL
DESIGN NO. W-L-1001

SCALE: NTS



SECTION A-A

(Formerly System No. 147)
F Ratings 1 1, 2, 3 and 4 Hr (See Items 2 and 3)
T Ratings - 0, 1, 2, 3, and 4 Hr (See Item 3)
L Rating At Ambient - less than 1 CFM/sq ft
L Rating At 400 F - less than 1 CFM/sq ft

1. Wall Assembly The 1, 2, 3 or 4 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Designs in the UL Fire Resistance Directory and all include the following construction features:

A. Studs Wall framing may consist of either wood studs (max 2 h fire rated assemblies) or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC with nom 2 by 4 in. lumber end plates and cross braces. Steel studs to be min 3 5/8in. wide by 1-3/8 in. deep channels spaced max 24 in. OC.

B. Gypsum Board• Nom 1/2 or 5/8in. thick, 4 ft. wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam
of opening is 13-1/2 in.

2. Pipe or Conduit Nom 12 in. diam (or smaller) Schedule 10 (or heavier) steel pipe, nom 12 in. diam (or smaller) service weight (or heavier) cast iron soil pipe, nom 12 in. diam (or smaller) Class 50 (or heavier) ductile iron pressure pipe, nom 6 in. diam.(or smaller) steel conduit, nom 4 in. diam (or smaller) steel electrical metallic tubing, nom 6 in. diam (or smaller) Type L or (or heavier) copper tubing or nom 1 in. diam (or smaller) flexible steel conduit. When copper pipe is used, max F Rating of firestop system (Item 3) is 2 h. Steel pipes or conduits larger than nom 4 in. diam may only be used in walls constructed using steel channel studs. A max of one pipe or conduit is permitted in the firestop system. Pipe or conduit to be installed near center of stud cavity width and to be rigidly supported on both sides of wall assembly.

3. Fill, Void or Cavity Material• 15/32 Caulk Caulk fill material installed to completely fill annular space between pipe or conduit and gypsum wallboard and with a min 1/4in. diam bead of caulk applied to perimeter of pipe or conduit at its egress from the wall. Caulk installed symmetrically on both sides of wall assembly. The hourly F Rating of the firestop system is dependent upon the hourly fire rating of the wall assembly in which it is installed, as shown in the following table. The hourly T Rating of the firestop system is dependent upon the type or size of the pipe or conduit and the hourly fire rating of the wall assembly in which it is installed, as tabulated below:

Max Pipe or Conduit	Diam In. Annular Space In.	F Rating Hr	T Rating Hr
1	0 to 3/16	1 or 2	0+, 1 or 2
1	1/4 to 1/2	3 or 4	3 or 4
4	0 to 1-1/2	1 or 2	0
6	1/4 to 1/2	3 or 4	0
12	3/16 to 3/8	1 or 2	0

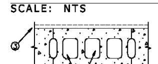
+When copper pipe is used, T Rating is 0 h.

MINNESOTA MINING & MFG CO - CP 25WB+.

•Bearing the UL Classification Mark

FIRE RESISTANCE DETAIL
DESIGN NO. U901

SCALE: NTS



1. Concrete Blocks• Various designs. Classification B-4 (4 hr). See Concrete Blocks category for lists of eligible manufacturers.

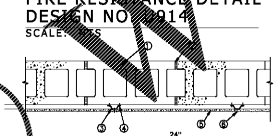
2. Mortar Blocks laid in full bed of mortar, nom. 3/8in. thick, of not less than 2-1/4 and not more than 3-1/2 parts of clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. Portland Cement Stucco or Gypsum Plaster If used, add 1/2 hr to classification.

4. Loose Masonry Fill If all core spaces are filled with loose dry expanded slag, burned clay or shale (rotary kiln process), water repellent vermiculite masonry fill insulation, or silicone treated perlite loose fill insulation, Class D-2 (2 hr) or D-3 (3 hr) concrete blocks will provide a 4 hr fire resistance rating.
•Bearing the UL Classification Mark

FIRE RESISTANCE DETAIL
DESIGN NO. U914

SCALE: NTS



1. Concrete Blocks• Various designs. Classification D-2 (2 hr). See Concrete Blocks category for list of eligible manufacturers.

2. Mortar Blocks laid in full bed of mortar, nom 3/8in. thick, of not less than 2-1/4 and not more than 3-1/2 parts clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. Furring Channels Min 0.019 in. thick (25 gauge) galv steel, 1-3/8 in. wide on top and 2-3/4 in. wide at bottom by 7/8in. deep. Spaced 24 in. OC perpendicular to floor with a channel parallel to and approximately 3 in. above floor and 3 in. below ceiling. Clearance between vertical and horizontal channels 1/2in.
4. Channel Fasteners 1-1/4 in. long masonry screws with 3/16in. body and 5/16in. diameter head. Fasteners spaced 24 in. O.C. with the fasteners staggered on each long leg of the furring channel.
4A. Steel Framing Members• (Not Shown) - Alternate method used to attach furring channels (Item 3) to concrete Blocks (Item 1). Clips spaced 48 in. OC., and secured to blocks with 1/4in. dia. By 3 in. long concrete expansion anchor (Item 4B) through the center grommet. Furring channels are friction fitted into clips.
PAC INTERNATIONAL - Type RSIC-1.

4B. Concrete Expansion Anchor (Not Shown) - 1/4in. dia. by 3 in. long carbon steel, pre-assembled, nail drive expansion anchor with mushroom head driven into the web of the concrete block. Min. embedment in concrete block of 1-3/8 in. and evaluated in accordance with ASTM E 488 to have ultimate load capacities of 980 lbs (tension) and 1400 lbs (shear) when used in 2000 psi concrete.

5. Gypsum Board• 1/2in. thick, 4 ft wide, secured to furring channels with wallboard fasteners (Item 6). Gypsum plaster not more than 1/16in. thick may be applied to wallboard in addition to joint treatment.

AMERICAN GYPSUM CO - Types AG-C, AGX-C.

BORAL GYPSUM INC - Type BG-C.

CANADIAN GYPSUM COMPANY - Types C, IP-X2, IPC-AR.

CONTINENTAL GYPSUM COMPANY - Types CG-C, CGS-5, CGTC-C.

G-P GYPSUM CORP, SUB OF

GEORGIA-PACIFIC CORP - Type 5.

JAMES HARDIE GYPSUM INC - Type Max"C".

LAFARGE NORTH AMERICA INC - Types LGFC-C, LGFC-C/A.

NATIONAL GYPSUM CO - Type FSW-C.

PABCO GYPSUM, DIV OF

PACIFIC COAST BUILDING PRODUCTS INC - Type PG-C.

STANDARD GYPSUM L L C - Type SG-C.

TEMPLE-INLAND FOREST PRODUCTS CORP - Type TG-C.

UNITED STATES GYPSUM CO - Types C, IP-X2, IPC-AR.

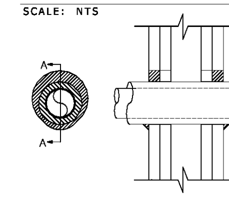
USG MEXICO S A DE C V - Types C, IP-X2, IPC-AR.

6. Wallboard Fasteners 1 in. long, self-drilling, self-tapping steel screws with bugle heads. Fasteners attached to each furring channel and spaced 8 in. OC at butt joints and 12 in. OC in the field of the board parallel with furring channels. Clearance tween fasteners and edges of wallboard 3/4 in.

7. Joint System 15/32 (Not shown) Paper tape embedded in cementitious compound over joints. Paper tape and exposed screw heads covered with two layers of compound. Edges of compound feathered out.
•Bearing the UL Classification Mark

PENETRATION FIRESTOP DETAIL
DESIGN NO. W-L-5028

SCALE: NTS



SECTION A-A

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

A. Studs - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.

B. Gypsum Board• - 5/8in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening i
s 7-1/2 in.

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

2. Through Penetrants - One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:

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

B. Copper Tubing - Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.

C. Copper Pipe - Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

3. Tube Insulation - Plastics+ - Nom 3/4in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system.

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

The hour T Rating of the firestop system is dependent on the hourly fire rating of the wall assembly in which it is installed, the size and type of through penetrant and the pipe covering thickness, as shown in the table below:

Wall Assembly Rating Hr	Type +	Through Penetrant Max Diam In	
1	A	[illegible]	[illegible]
1	A,B, OR C	[illegible]	[illegible]
2	A	[illegible]	2
2	A,B, OR C	2	2

+Indicates penetrant type as [illegible] in Item 2.

4. Fill, Void or Cavity Material• - Sealant - Min 5/8in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum wallboard, a min 1/2in. diam bead of fill material shall be applied at the pipe covering/gypsum wallboard interface on both surfaces of wall.

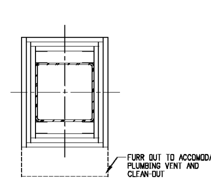
HILTI CONSTRUCTION CHEMICALS, DIV OF

HILTI INC - FS-ONE Sealant

•Bearing the UL Classification Mark

FIRE RESISTANCE DETAIL
DESIGN NO. X528

SCALE: NTS



1. Steel Column Min sizes of W-shaped and tubular steel columns which appear in the AISC Steel Construction Manual as shown under Item 2.

2. Gypsum Board• For 1 Hr rating, any 5/8in. or 1/2in. thick gypsum wallboard Classified for use in fire resistance assemblies. For 2 Hr and 3 Hr ratings, any 5/8in. or 1/2in. thick gypsum wallboard Classified for use in other 2 Hr, 3 Hr or 4 Hr Column Designs. Min total thickness of layersin inches for the various ratings and min column sizes are as follows:

W Shaped Column Min Column Size	Rating (Hr) 1	2	3	Corner Details For Various Rating 1 Hr	2 Hr	3 Hr
Total thickness (In.)						
W4x13	1	1-1/2	2-1/4	B	C	D
W6x15.5	1	1-1/2	2-1/4	B	C	D
W10x49	1/2	1-1/8	1-7/8	A	B	C

Applied in layers as noted in the above illustrations. Boards are to be applied vertically without horizontal joints.

See Gypsum Board (CKNX) category for names of manufacturers.

2A. Gypsum Board• As an alternate to Item 2-3/4in. thick gypsum wallboard. For 2 Hr rating, 1-1/2 in. total thickness, installed in accordance with corner detail B. For 3 Hr rating, 2-1/4 in. total thickness installed in accordance with corner detail C. Boards are to be applied vertically without horizontal joints.

CANADIAN GYPSUM COMPANY - Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

UNITED STATES GYPSUM CO - Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

USG MEXICO S A DE C V - Type IP-X3, ULTRACODE, ULTRACODE SHC or ULTRACODE WRC.

3. Steel Stud 1-5/8 in. wide with 1-5/16 and 1-7/16 in. legs having a 1/4- in. folded flange, fabricated from No. 25 MSG galv steel. Length to be 1/2in. less than the assembly height.

3A. As an alternate to Item 3 Steel Framing Members• galv. steel clips spaced 4 ft OC and 1-1/4 in. from top and bottom of column. A No. 28 MSG galv steel support angle with 1-1/4 in. length shall be placed over clips and secured with screws attaching the wallboards. The clips for use with wide flange columns only.

COLUMN & BEAM INC - Types CB, CB1Clips.

4. Corner Beads No. 28 MSG galv steel, 1-1/4 in. legs to be attached to the wallboard with No. 6 by 1 in. screws spaced 12 in. OC max.

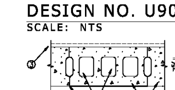
5. Tie Wire No. 18 SWG steel wire spaced 24 in. OC used with second layer of wallboard.

6. Screws For attaching first layer of wallboard to steel studs, and third layer of wallboard to 2 in. by 2 in. steel angle (25 Ga) to be No. 6 by 1 in. (or 1-1/4 in. for 3/4in. thick wallboard) Phillips head self-drilling, self-tapping double lead screwspaced 24 in. OC For attaching second layer of wallboard to steel studs and fourth layer of wallboard to 2 in. by 2 in. steel angle
(25 Ga) to be No. 6 by 1-3/4 in. (or 2-1/4 in. for 3/4in. thick wallboard) steel screws of the same type spaced 12 in. OC For attaching third layer of wallboard to steel studs to be No. 8 by 2-1/4 in. screws of the same type spaced 12 in. OC

7. Finishing System (Not Shown) - Joint compound applied over corner beads to a thickness of 1/16in.
•Bearing the UL Classification Mark

FIRE RESISTANCE DETAIL
DESIGN NO. U905

SCALE: NTS



1. Concrete Blocks• Various designs. Classification D-2 (2 hr). See Concrete Blocks category for list of eligible manufacturers.

2. Mortar Blocks laid in full bed of mortar, nom. 3/8in. thick, of not less than 2-1/4 and not more than 3-1/2 parts of clean sharp sand to 1 part Portland cement (proportioned by volume) and not more than 50 percent hydrated lime (by cement volume). Vertical joints staggered.

3. Portland Cement Stucco or Gypsum Plaster Add 1/2 hr to classification if used. Where combustible members are framed in wall, plaster or stucco must be applied on the face opposite framing to achieve a max. Classification of 1-1/2 hr. Attached to concrete blocks (Item 1).

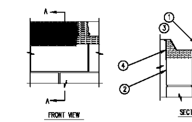
4. Loose Masonry Fill If all core spaces are filled with loose dry expanded slag, expanded clay or shale (Rotary Kiln Process), water repellant vermiculite masonry fill insulation, or silicone treated perlite loose fill insulation add 2 hr to classification.

5. Foamed Plastic• (Optional-Not Shown) - 1-1/2 in. thick max, 4 ft wide sheathing attached to concrete blocks (Item 1).

CELOTEX CORP - Type Thermax

JOINT FIRESTOP DETAIL
DESIGN NO. HW-D-0181

SCALE: NTS



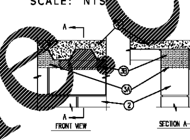
1. Metal roof deck assembly (non fire-rated)
2. Concrete wall assembly (2-hr fire rated):
A. Lightweight or normal weight concrete wall (min. 6 in. thick)
B. Any UL/ULC classified concrete block wall.
3. Mineral wall (min. 4 pcf density) compressed 33 percent and inserted into joint, flush with both sides of wall. (see no. 3 below)
4. Minimum 1/8in. (wet) thickness Hilti CP 672 firestop joint spray to completely cover mineral wool and to overlap a minimum 1/2in. onto concrete wall and metal deck on both sides of wall assembly.

Notes:
1. Steel floor units may be sprayed with a minimum 5/16in. thickness to maximum 1-3/4in thickness of UL classified monokote type MK-6/HY fireproofing manufactured by W.R. Grace
2. When the steel deck is coated with fireproofing, Hilti CP 672 shall overlap the steel a min. 1/2in and overlap the fireproofing a min. 2 in. on both sides of the wall.
3. T-Rating may not equal F-rating in accordance with UL 2079
4. Fire-Rating of joint is only as good as performance of metal roof deck assembly under fire conditions.

All configuration shown are suggestions only and must be approved by the specifying architects or engineers for the project.
This is not a UL Classified systems, But a modification of the closest applicable system (Reference: UL System No. HW-D-0181)

JOINT FIRESTOP DETAIL
DESIGN NO. HW-D-0098

SCALE: NTS



1. Floor Assembly The fire rated fluted steel unit/concrete floor assembly shall be constructed of the materials and in a manner described in the individual D700 or D900 Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. Steel Floor and Form Units• Max 2 in. deep galv steel fluted floor units.

B. Concrete Min 2-1/2 in thick reinforced concrete as measured from top plane of the floor units.

C. Spray-Applied Fire Resistive Materials• (Optional) - (Not Shown) - Prior to the installation of the
forming material and fill, void or cavity material (Items 3A, 3B) the steel floor units may be sprayed with a min 5/16in. to max 1-3/4 in. thickness of firesistive material.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV - Type MK-6-HY

1A. Roof Assembly (Not Shown) - As an alternate to the floor assembly, a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling
Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. Steel Roof Deck Max 2 in. deep galv steel fluted roof deck.

B. Roof Insulation Min 2-1/4 in. thick poured insulating concrete, as measured from the top plane of the floor units.

1B. Roof Assembly As an alternate to Items 1 and 1A, a fire rated protected fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 Series Roof-Ceiling Design
n the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. Steel Roof Deck Max 2 in. deep galv steel fluted roof deck.

B. Spray - Applied Fire Resistive Materials• (Not Shown) 15/32 Prior to the installation of the steel ceiling runners, Forming Material and Fill, Void or Cavity Material (Items 2A, 3A, 3B), the roof assembly shall be sprayed with the type and thickness of fire resistive material indicated in the individual P700 Series design.

2. Wall Assembly Min 6 in. thick steel-reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified Concrete Blocks•. See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.

3. Joint System Max separation between bottom of floor or roof and top of wall at time of installation of joint system is 1 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width. The joint system shall consist of the following:

A. Forming Material Nom 4.0 pcf mineral wool batt insulation compressed and firmly packed to completely fill the flutes and the gap between the top of the wall and bottom of the floor or roof as a permanent form. Batt insulation cut to the shape of the fluttled steel deck, approx 33 percent larger than the flutes. Pieces compressed and installed vertically into the flutes above the top of the wall. Additional pieces of batt insulation, min 6

HILTI INC - CP777 Speed Plugs

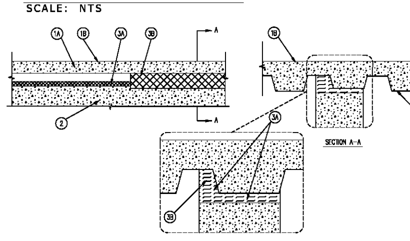
B. Fill, Void or Cavity Material• Min 1/8in. wet thickness of fill material sprayed or troweled on each side of the wall to completely cover mineral wool forming material and to overlap a min of 1/2 in. onto wall and steel deck on both sides of wall. When spray-applied fire resistive material• is applied to the steel steel deck, the fill material is to overlap the wall a min of 1/2in. and the spray-applied fire resistive material a min of 2 in. on both sides of wall

HILTI CONSTRUCTION CHEMICAL, DIV OF

HILTI INC - CP672 Firestop Spray

JOINT FIRESTOP DETAIL
DESIGN NO. HW-D-0181

SCALE: NTS



1. Floor Assembly The 2 hr fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 Floor-Ceilng Design in the UL Fire Resistance Directory and shall include the following construction features:

A. Steel Floor And Form Units• Max 3 in. deep galv steel fluted floor units.

B. Concrete Min 2-1/2 in. thick reinforced concrete, as measured from the top plane of the floor units.

C. Spray-Applied Fire Resistive Materals• (Optional) 15/32 (Not Shown) 15/32 Prior to the installation of the forming material and fill, void or cavity material (Item 3A, 3B) the steel floor units may be sprayed with a
min 5/16 to max 1-3/4 in. thickness of fire resistive material in accordance with the specifications in the individual D700 Series Design.

HILTI CONSTRUCTION CHEMICALS, DIV OF

HILTI INC 15/32 Type MK-6-HY

2. Wall Assembly Min 8 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall shall be installed parallel with the flutes of the steel floor and form units (Item 1A). Wall may
also be constructed of any UL Classified 2 fire rated Concrete Blocks•. When wall is constructed of concrete blocks, the top course of block shall be filled with concrete, grout or mortar.

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

3. Joint System Max separation between bottom of spray-applied fire resistive and top of the wall at time of installation of joint system is 1 in. The joint system is designed to accommodate a max 12.5 percent compression or extension from its installed width. The joint system consists of the following:

A. Forming Material• Min 4 pcf mineral wool batt insulation cut into strips with a width approx equal to the overall thickness of the wall. Strips compressed 33 percent in thickness and inserted into the gap between the top of the wall and the bottom of the floor units. When the void beneath the
protected steel deck is located entirely above the wall, the void shall be completely filled with mineral wool insulation compressed 33 percent in thickness. When void beneath the steel deck is located in part abo
the wall, that portion of the void above the wall shall be packed with additional strips of mineral wool batt insulation compressed 33 percent in thickness.

ROCK WOOL MANUFACTURING CO 15/32 Delta Board

B. Fill, Void or Cavity Material• Min 1/8in. wet thickness of fill material sprayed or troweled on each side of the wall to completely cover mineral wool forming material and to overlap a min of 1/2 in. onto wall and steel deck on both sides of wall. When spray-applied fire resistive material• is applied to the steel floor and form units, the fill material is to overlap the wall a min of 1/2in. and the spray-applied fire resistive material a min of 2 in. on both sides of wall.

HILTI CONSTRUCTION CHEMICAL, DIV OF

HILTI INC. - CP672 Firestop Spray

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