MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE* (Inches) 4 hour	3 hour	2 hour	1 hour
15. Exterior or interior walls (continued)	15-1.29	2½" × 2½" clay face brick with cored holes over ½" gypsum sheathing on 3⅝" metal studs 16" on center. The brick is tied to studs with 22 gauge hot dipped galv. ½" Type X gypsum wallboard* on interior surface. Sheathing is attached to studs with 1" long, No. 11 gage, galvanized nails. Inner layer of wallboard placed horizontally or vertically and nailed 8" on center with 6d cooler* or wallboard* nails. Outer layer of wallboard* placed horizontally or vertically and nailed 8" on center with 8d cooler* or wallboard* nails. All joints staggered with vertical joints over studs. Outer layer joints covered with joint compound, fastener heads covered with joint compound. 0.020 inch (No. 20 galvanized sheet gage) corrugated galvanized steel wall ties ⅞" by 6½" attached to each stud with two 8d cooler* or wallboard* nails every sixth course of bricks.	—	—	10	—
	15-1.6*	2" × 6" fire-resistance-treated wood studs 16" on center. Interior face has two layers of ½" Type X gypsum with the base layer placed vertically and attached with 6d box nails 12" on center. The face layer is placed horizontally and attached with 8d box nails 8" on center at joints and 12" on center elsewhere. The exterior face has a base layer of ½" Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1" by No. 18 gage self-furring expanded metal lath attached with 8d box nails 8" on center at joints and 12" on center elsewhere. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures per sack of cement.	—	—	8½	—
	15-1.7*	2" × 6" wood studs 16" on center. The exterior face has a layer of ½" Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1" by No. 18 gage self-furring expanded metal lath attached with 8d by 2½" long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a ½" scratch coat, a bonding agent and a ⅛" brown coat and a finish coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures per sack of cement. The interior is covered with ½" gypsum lath with 1" hexagonal mesh of 0.035 inch (No. 20 B.W. gage) woven wire lath furred out ¾" and 1" perlite or vermiculite gypsum plaster. Lath nailed with 1½" by No. 13 gage for ⅜" and furred plasterboard glued nails spaced 7" on center. Mesh attached by 1½" by No. 12 gage by ¾" head nails with ½" furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate.	—	—	8½	—
	15-1.8*	2" × 6" wood studs 16" on center. The exterior face has a layer of ½" Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1½" by No. 17 gage self-furring exterior lath attached with 8d by 2½" long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a ½" scratch coat, a bonding agent and a ⅛" brown coat and a finish coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures per sack of cement. The interior is covered with ½" gypsum lath with 1" hexagonal mesh of 0.035 inch (No. 20 B.W. gage) woven wire lath furred out ¾" and 1" perlite or vermiculite gypsum plaster. Lath nailed with 1½" by No. 13 gage for ⅜" and furred plasterboard glued nails spaced 7" on center. Mesh attached by 1½" by No. 12 gage by ¾" head nails with ½" furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate.	—	—	8½	—
	15-1.9	4" No. 18 gage, nonload-bearing metal studs, 16" on center, with 1" portland cement lime plaster (measured from the back side of the ½" gypsum expanded metal lath) on the exterior surface. Interior surface to be covered with 1" gypsum plaster on ⅜" gypsum expanded metal lath proportioned by weight—1:2 for scratch coat, 1:3 for brown, gypsum to sand. Lath on one side of the partition, fastened to ⅞" channels pencil rods supported by No. 20 gage metal clips, spaced 48" on center vertically and 24" apart on stud. 4" thick mineral fibreboard batts friction fitted between the studs.	—	—	6½*	—
	15-1.10	Steel studs 0.060" thick, 4" deep or 6" or 8" on 24" centers, with ½" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flat flange hex head screws, 1" long, spaced 8" on center with two ½" x ½" x ⅛" flat-faced welds, and 4" foot attached to the GFRC also with ½" thick GFRC bonding pads that extend 2½" beyond the GFRC edge on the ½" thick GFRC. Interior surface to have two layers of ½" Type X gypsum wallboard* The first layer of wallboard to be attached with 1"-long Type S buglehead screws spaced 24" on center and the second layer is attached with 1⅝"-long Type S screws spaced at 12" on center. Cavity is to be filled with 3" of pcf (nominal) mineral fiber batts. GFRC has 1½" ceramic packed with mineral fiber and caulked on the exterior.	—	—	6½	—
	15-1.11	Steel studs 0.060" thick, 4" deep or 6" or 8" on 24" centers, respectively, with ½" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flat anchors at 24" on center, with 3" leg welded to studs with two ½"-long flare-bevel welds, and 4" foot attached to the GFRC also with ½" thick GFRC bonding pads that extend 2½" beyond the GFRC edge on the ½" thick GFRC. Interior surface to have one layer of ½" Type X gypsum wallboard* attached with 1⅝"-long Type S buglehead screws spaced 12" on center. Cavity is to be filled with 3" of pcf (nominal) mineral fiber batts. GFRC has 1½" ceramic packed with mineral fiber and caulked on the exterior.	—	—	—	6½
	15-1.12	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with ½" Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2½" Type S drywall screws, spaced 12" on center. Cavity filled with 3½" mineral wool insulation.	—	—	—	6½
	15-1.13*	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with ½" Type X gypsum wallboard and sheathing, respectively, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2½" Type S drywall screws, spaced 12" on center. Cavity to be filled with 3½" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	6½
	15-1.14*	2" × 4" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with ½" Type X gypsum wallboard and sheathing, respectively, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2½" Type S drywall screws, spaced 12" on center. Cavity to be filled with 2½" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	4½
	15-1.15*	2" × 6" (51mm x 152 mm) wood studs at 16" centers with double top plates, single bottom plate; interior side covered with ½" Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs and fastened with 2½" Type S drywall screws, spaced 12" on center; exterior side covered with ½" wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound; wood structural panels (sheathing or strand board) fastened with 6d common nails (8vgal) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with 3½" mineral wool insulation. Rating established from the gypsum-covered side only.	—	—	—	6½
	15-1.16	2" x 6" wood studs at 24" centers with double top plates, single bottom plate; interior and exterior side covered with two layers of ½" Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs, first layer fastened with 2½" Type S drywall screws, spaced 24" on center; and face layer fastened with Type S drywall screws, spaced 8" on center. Wallboard joints covered with paper tape and joint compound. Fastener heads covered with joint compound. Cavity to be filled with 3½" mineral wool insulation.	—	—	7½	—
	15-1.17	2" x 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with ½" Type X gypsum wallboard, 4' wide, applied horizontally wallboard, and fastened with 2½" Type S drywall screws, spaced 12" on center; wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with ½" wood structural panels (sheathing or strand board), applied vertically, horizontal joints blocked and fastened with 6d common nails (8vgal) — 12" on center in the field, 6" on center along the panel edges. Cavity to be filled with 3½" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	4½
	15-1.18*	2" x 6" (51mm x 152 mm) wood studs at 16" centers with double top plates, single bottom plate; interior side covered with ½" Type X gypsum wallboard, 4' wide, applied horizontally or vertically with vertical joints over studs and fastened with 2½" Type S drywall screws, spaced 12" on center, exterior side covered with ½" wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound; wood structural panels (sheathing or strand board) fastened with 6d common nails (8vgal) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with 3½" mineral wool insulation. Rating established from the gypsum-covered side only.	—	—	—	6½
16. Exterior wall rated for fire resistance from the inside only in accordance with Section 706.5	16-1.19	2" x 6" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with ½" Type X gypsum wallboard, 4' wide, applied horizontally wallboard, and fastened with 2½" Type S drywall screws, spaced 12" on center; wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with ½" wood structural panels (sheathing or strand board), applied vertically, horizontal joints blocked and fastened with 6d common nails (8vgal) — 12" on center in the field, 6" on center along the panel edges. Cavity to be filled with 3½" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	4½

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm², 1 cubic foot = 0.0283 m³, 1 pound = 0.454 kg.

a. Studs may be replaced or supplemented with equivalent nonbearing walls of the same construction and rating.

b. Thickness shown for brick and clay tile units is the minimum permissible. Thickness shown for concrete masonry units and clay masonry is equivalent thickness defined in Section 721.2.1 for concrete masonry and Section 721.6.1.1 for clay masonry. Where cell webs are solid, grouted or filled with silicone-treated perlite base-fill insulation, vermiculite base-fill insulation, or expanded clay, shale or slate lightweight aggregate, the equivalent thickness shall be the thickness of the block or brick using normal dimensions as defined in Chapter 21. Equivalent thickness may also include the thickness of applied plaster and lath or gypsum wallboard, where specified.

c. Where a range of aggregate is specified, the value for any given parcel to be surface contacting the cross is at least 75 percent of the gross cross-sectional area measured in the same plane.

d. Shall be used for nonbearing purposes only.

e. For all of the constructions with gypsum wallboard described in this table, gypsum base for veneer plaster of the same thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and finished with conventional joint treatment.

f. The fire-resistance ratings provided for concrete masonry units meeting the equivalent thickness requirements of Chapter 721 are based on the ASTM C 90 specification in effect at the time of the publication of the 1997 Uniform Building Code. Concrete masonry units complying with ASTM C 90 but not meeting the equivalent thickness requirements of Chapter 721 are permitted to be used based on a fire-resistance rating of not less than 2 hours.

g. The fire-resistance rating of concrete masonry units composed of a combination of aggregate types or whose manufacture is applied directly to the concrete masonry shall be determined in accordance with ACI 216.1/TMS 216.1. Lightweight aggregates shall have a maximum combined density of 60 pounds per cubic foot.

h. See also Note 5. The equivalent thickness shall be permitted to include the thickness of cement plaster or 1.3 times the thickness of gypsum plaster applied on to the surface of the wall facing the fire exposure.

i. Concrete walls shall be reinforced with horizontal and vertical reinforcement equal to or greater than that required by Chapter 19.

j. Studs are welded steel wire mesh with 0.18 inch (No. 7 B.W. gage) flange wire and 0.18 inch (No. 7 B.W. gage) cross wires.

k. Nailable metal studs consist of two channel studs spot welded back to back with a nailable compact web forming a nailing groove.

l. Wood structural panels shall be permitted to be installed between the fire protection and the wood studs on either the interior or exterior side of the wood frame assemblies in this table, provided the length of the fasteners used to attach the fire protection are increased by an amount at least equal to the thickness of the wood structural panel.

m. Minimum thickness of studs shall be reduced to 38 percent of allowable f^b, with the maximum not greater than 38 percent of the calculated stress with studs having a slenderness ratio Le/d of 33.

n. For properties of cooler or wallboard mats, see ASTM C 514, ASTM C 947 or ASTM F 1863.

o. Ceramic fiber-ceramic cotings (fibers not designated as PROPRIETARY on the listing) in the SA 600 shall be accepted as of herein listed.

p. NCMA TEK 3-8 shall be permitted for the design of fire walls.

q. The design stress of studs shall be equal to a maximum of 100 percent of the allowable f^b, calculated in accordance with Section 2306.

FW-D-0007

SCALE: NONE

6 GL01

TABLE 720.1(2)

RATED FIRE-RESISTANCE PERIODS FOR CONCRETE WALLS AND PARTITIONS a,b,c,g

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE* (Inches) 4 hour	3 hour	2 hour	1 hour
1. Brick of clay or shale	1-1.1	Solid brick of clay or shale*	6	4.9	3.8	2.7
	1-1.2	Hollow brick, not filled	5.0	4.3	3.4	2.3
	1-1.3	Hollow brick unit wall, grout or filled with perlite vermiculite or expanded shale aggregate	6.6	5.5	4.4	3.0
	1-2.1	4" nominal thick units at least 75 percent solid backed with a hat-shaped metal furring channel ⅞" thick formed from 0.021" sheet metal attached to the brick wall on 24" centers with approved fasteners, and ½" Type S gypsum wallboard attached to the metal furring strips with 1" long Type S screws spaced 8" on center	—	—	3*	—
2. Combination of clay brick and load-bearing brick	2-1.1	4" solid brick and 4" tile (at least 40 percent solid).	—	8	—	—
	2-1.2	4" solid brick and 8" tile (at least 40 percent solid).	12	—	—	—
3. Concrete masonry units	3-1.1[14]	Expanded slag or pumice.	4.7	4.0	3.2	2.1
	3-1.2[4]	Expanded clay, shale or slate.	5.1	4.4	3.6	2.8
	3-1.3[4]	Lightweight cinders or air-cooled slag.	5.9	5.0	4.0	2.7
	3-1.4[4,5]	Siliceous or clinkers or air-cooled slag.	6.7	5.7	4.5	3.0
4. Solid concrete[6]	4-1.1	Siliceous aggregate concrete.	7.0	6.2	5.0	3.5
		Carbonate aggregate concrete.	6.6	5.7	4.6	3.2
		Sand-lightweight concrete.	5.4	4.6	3.8	2.7
		Lightweight concrete.	5.1	4.4	3.6	2.5
5. Glazed or unglazed facing tile, unfaced-floating	5-1.1	One 2" unit cored 15 percent maximum and one 4" unit cored 25 percent maximum with ¼" mortar-filled collar joint. Unit positions reversed in alternate courses.	—	$4^1/_2$	—	—
	5-1.2	One 2" unit cored 13 percent maximum and one 4" unit cored 40 percent maximum with ¼" mortar-filled collar joint. Unit positions stair with ¼" gypsum plaster. Two webs tied together every fourth course with No. 22 gage corrugated metal tie.	—	$4^1/_2$	—	—
	5-1.3	One unit with three cells in wall thickness, cored 29 percent maximum.	—	—	6	—
	5-1.4	One 2" unit cored 22 percent maximum and one 4" unit cored 41 percent maximum with ¼" gypsum plaster applied to one face and scored vertical every third course with 0.030" (No. 22 galvanized sheet steel gage) corrugated metal tie.	—	—	6	—
	5-1.5	One 4" unit cored 25 percent maximum with ¼" gypsum plaster on one side.	—	—	$4^1/_2$	—
	5-1.6	One 4" unit with two cells in wall thickness, cored 22 percent maximum.	—	—	—	4
	5-1.7	One 4" unit cored 30 percent maximum with ¼" vermiculite gypsum plaster on one side.	—	—	$4^1/_2$	—
	5-1.8	One 4" unit cored 39 percent maximum with ¼" gypsum plaster on one side.	—	—	—	$4^1/_2$

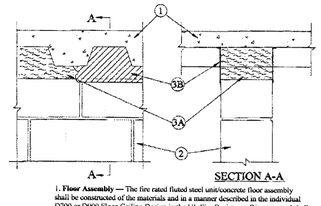
System No. HW-D-0098

December 04, 2001

Assembly Rating — 2 Hr

Nominal Joint Width - 1 In.

Class II and III Movement Capabilities- 12.5% Compression or Extension



SECTION A-A

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 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 the 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 5/16 in. to max 1-3/4 in. thickness of fire resistive material.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY

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

A. **Steel Roof Deck** — Max 3 in. deep galv steel fluted roof deck.

B. **Spray—Applied Fire Resistive Materials*** — (Not Shown)—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.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY

2. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and 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 5/16 in. to max 1-3/4 in. thickness of fire resistive 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 3 in. deep galv steel fluted roof deck.

B. **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 in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck** — Max 3 in. deep galv steel fluted roof deck.

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

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Type MK-6/HY

2. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and 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 5/16 in. to max 1-3/4 in. thickness of fire resistive 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, 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 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. **Spray—Applied Fire Resistive Materials*** — (Not Shown Prior to the installation of the steel ceiling runners, Forming Material and Fill, Void or Cavity Material (Items 2A, 3A, 3B), 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 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 to 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** — Non 4.0 pcf mineral wool batt insula compressed and firmly packed to completely fill the flutes and gap between the top of the wall and bottom of the floor or roof permanent form. Batt insulation cut to the shape of the flutes st deck, approx 33 percent larger than the flutes. Pieces compress and installed vertically into the flutes above the top of the wall. Additional pieces of batt insulation, min 6 in. wide, installed cl first into joint opening between bottom of fluted steel deck and of wall, parallel with joint direction, such that batt sections are compressed min 33 percent in direction of joint opening. Compressed batt sections are flush with both surfaces of wall. Adjoining lengths of batt to be tightly butted with butted seams spaced min 48 in. apart along the length of the joint.

ROCK WOOL MANUFACTURING CO — Delta Board

A1. **Forming Material*—Plugs** — (Optional-Not Shown) Performed mineral wool plugs, formed to the shape of the fluted floor units, friction fit to completely fill the flutes above the ceiling runner. The plugs shall be flush with both wall surfaces. Additional forming material, described in Item 3A, to be used in conjunction with the plugs to fill the gap between the top of the wall and the bottom of the steel floor units.

HILTI CONSTRUCTION CHEMICALS, DIV OF

HILTI INC — CP777 Speed Plugs

B. **Fill, Void or Cavity Material*** — Min 1/8 in. 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 1/2 in. and the spray-applied fire resistive material a min of 2 in. on both sides of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF

HILTI INC — CP672 Firestop Spray

*Bearing the UL Classification Mark

HW-D-0098

SCALE: NONE

4 GL01

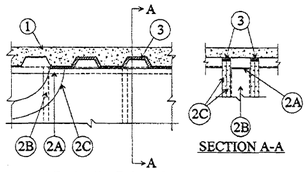
System No. HW-D-0077

December 08, 2004

Assembly Rating — 1 or 2 Hr (See Items 2 and 3)

Nominal Joint Width — 3/4 In.

Class II Movement Capabilities — 17% Compression or Extension



SECTION A-A

1. **Floor Assembly** — The fire-rated fluted steel floor unit/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Floor-Ceiling Design in the 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 Materials** — (Optional, Not Shown) — Prior to the installation of the ceiling runner and Fill, Void or Cavity Materials (Item 3), the steel floor units may be sprayed with a min 5/16 in. thickness to a max 11/16 in. thickness of fire resistive 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 3 in. deep galv steel fluted roof deck.

B. **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 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.

2. **Wall Assembly** — Min 6-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor may also be constructed of any 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufacturers. 2.

3. **Wall Assembly** — The 1 or 2 h fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL *Fire Resistance Directory*. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL *Fire Resistance Directory*. The wall shall include the following construction features:

A. **Steel Floor Runner** — Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to' accommodate steel studs (Item 2C). Floor runners to be provided with min 1-1/4 in. flanges. Runners secured with steel fasteners spaced 12 in. (305 mm) OC.

B. **Studs** — Steel studs to be min 3-1/2 in. wide, (89 mm) Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board*** — Gypsum board installed to a min total thickness of 5/8 or 1-1/4 in. (16 or 32 mm) on each side of wall for a 1 or 2 hr rated wall, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory, except that a max 1 in. (25 mm) gap shall be maintained between the bottom of gypsum board and top of concrete floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Fill, Void or Cavity Material* - Caulk or Sealant** — Max separation between top of floor and bottom of gypsum board is 1 in. (25 mm). Min 5/8 in. (16 mm) thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall.

3M COMPANY — FB1000 NS, FB-2000, FB-2000+, FireDam 150+, IC 15WB, CP 25WB+, or FB-3000 WT

*Bearing the UL Classification Mark

BW-S-0007

SCALE: NONE

2 GL01

System No. BW-S-0007

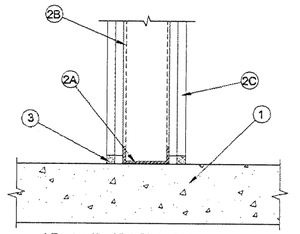
September 08, 2004

Assembly Ratings — 1 and 2 Hr (See Item 2)

L Rating at Ambient — Less Than 1 CFM/lin ft

L Rating at 400° F — Less Than 1 CFM/lin ft

Joint Width — 1 in. Max



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor may also be constructed of any 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***.

See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufacturers. 2.

2. **Wall Assembly** — The 1 or 2 h fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall or Partition Design in the UL *Fire Resistance Directory*. In addition, the wall may incorporate a head-of-wall joint system constructed as specified in the HW Series Joint Systems in the UL *Fire Resistance Directory*. The wall shall include the following construction features:

A. **Steel Floor Runner** — Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to' accommodate steel studs (Item 2C). Floor runners to be provided with min 1-1/4 in. flanges. Runners secured with steel fasteners spaced 12 in. (305 mm) OC.

B. **Studs** — Steel studs to be min 3-1/2 in. wide, (89 mm) Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board*** — Gypsum board installed to a min total thickness of 5/8 or 1-1/4 in. (16 or 32 mm) on each side of wall for a 1 or 2 hr rated wall, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory, except that a max 1 in. (25 mm) gap shall be maintained between the bottom of gypsum board and top of concrete floor.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Fill, Void or Cavity Material* - Caulk or Sealant** — Max separation between top of floor and bottom of gypsum board is 1 in. (25 mm). Min 5/8 in. (16 mm) thickness of fill material installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall.

3M COMPANY — FB1000 NS, FB-2000, FB-2000+, FireDam 150+, IC 15WB, CP 25WB+, or FB-3000 WT

*Bearing the UL Classification Mark

HW-D-0077

SCALE: NONE

3 GL01

CENTENNIAL HILLS COMMUNITY CENTER PENETRATION AND ASSEMBLY SCHEDULE

Item Num.	Penetrating item : size, composition and insulation type OR other assembly description	Location or Material Penetrating through	ASSEMBLY(S)	Detail Location
	JOINT AND WALL ASSEMBLIES:			
1.	Joint Connection at top of 1-Hr. Rated gyp. bd. Wall to Metal Deck (non-rated)	Joint Assembly	HW-D-0077	3/G1.07
2.	Joint Connection at top of CMU masonry wall (1 hour) to Metal Deck (non-rated)	Joint Assembly	HW-D-0098	4/G1.07
3.	Joint Connection at bottom of 1-hr. Rated gyp. Bd. Wall to Conc. Floor.	Joint Assembly	BW-S-0007	2/G1.07
4.	Joint Connection of Concrete Floor Slab to CMU Masonry Wall	Joint Assembly	FW-D-0007	6/G1.07
5.	Joint Connections around Open Web Joists	Joint Assembly, at One-Hour Gypsum Board Wall – at rated Riser Rooms and Electrical Rooms	Firestop around joints utilizing products from HW-D-0077	3/G1.07
6.	Nom. 6" thick CMU Masonry Wall (1-Hr. rating required, except at exterior walls)	Fire Riser Rooms 414 and 616, Electrical Rooms 323 and 609, and Storage rooms 516, 517, and 518	1 hr. fire resistance rating per 2003 IBC, Table 720.1(2), Item 3.1, 1 hr.	5/G1.07
7.	1-Hr. gypsum board wall: 5/8" gypsum board ea. side 6" stud at 16" on center	Fire Riser Room 414 and Electrical Room 323	U425	1/G1.08
8.	2-Hr. (exceeds requirements) gypsum board wall Fire Ceiling Assembly with 18 ga. C stud option, used Roof-Ceiling Assembly horizontally for ceiling.	Fire Riser Rooms 414 & 616, and Storage rooms 516, 517, and 518	ESR-1338, Item No. 4.3.6 with C-Stud Alternative, ICC/ES Report for horizontal rated walls.	5/G1.08
	PENETRATION ASSEMBLIES:			
9.	Nom 36-in. dia. Steel Pipe or schedule 10 (or heavier steel pipe), Nom. 30-in. dia. or smaller cast or ductile iron pipe, nom. 6-in.-dia. or smaller Type L (or heavier) copper tubing, Nom. 6-in. dia. or smaller regular (or heavier) Copper pipe, Nom. 4-in. dia. or smaller steel electrical metallic tubing or 6-in. dia. Steel conduit. No insulation	1-Hr. Gyp. Board Wall	W-L-1054	2/G1.08
10.	4 to 6-inch steel pipe or type K Copper pipe (4-6"), no insulation	1-Hr. 8-inch CMU Masonry Wall	C-AJ-1278