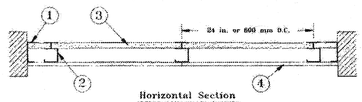
UL LISTINGS FOR FIRE RATED PARTITIONS

Design No. U415

Design No. U415
June 10, 2003

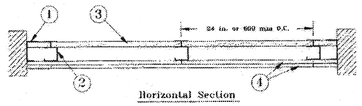
Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr

System A - 1 Hr.



Horizontal Section

System B - 2 Hr.



Horizontal Section

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 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 Item 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.
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 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 or FRX-G gypsum wallboard (Item 4A) 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.
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 1, 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.

CANADIAN GYPSUM COMPANY — Type SLX

UNITED STATES GYPSUM CO — 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.

CANADIAN GYPSUM COMPANY — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRC, WRX

UNITED STATES GYPSUM CO — Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRC, WRX

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

System B - 2 Hr

Gypsum panels, with beveled, square or tapered edges, nom 1/2 in. or 5/8 in. thick, 48 in. or 1200 mm wide, applied vertically or horizontally in two layers. Inner or base layer attached to studs with 1 in. long Type S steel screws spaced 24 in. OC when installed vertically or 16 in. OC when installed horizontally. Outer or face layer attached to studs with 1-5/8 in. long Type S steel screws spaced 12 in. OC when installed vertically and staggered 12 in. from base layer screws or 8 in. OC when installed horizontally and staggered 8 in. from base layer screws. Horizontal joints between inner and outer layers staggered a min of 12 in. Horizontal joints need not be backed by steel framing. Vertical joints centered over studs and staggered 24 in.

CANADIAN GYPSUM COMPANY — 1/2 in. Type C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRC, WRX

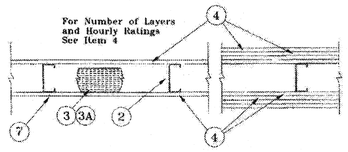
UNITED STATES GYPSUM CO — 1/2 in. Types C, IP-X2, IPC-AR, or WRC; 5/8 in. Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRC, WRX

USG MEXICO S A DE C V — 1/2 in. Types C, IP-X2, IPC-AR or WRC; 5/8 in. Types AR, C,

Design No. U419

Design No. U419
October 09, 2003

Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr (See Items 3 & 4)



1. **Floor and Ceiling Runners —** (Not shown) — Channel shaped, fabricated from min 25 MSG 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 corrosion-protected steel, min width as indicated under Item 4, min 1-1/4 in. flanges and 1/4 in. return, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.
3. **Batts and Blankets* —** (Required as indicated under Item 4) — 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) — 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, 5/8 in. thick	Optional
1	2-1/2	1 layer, 1/2 in. thick	1-1/2 in.
1	1-5/8	1 layer, 3/4 in. thick	Optional
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional
2	3-1/2	1 layer, 3/4 in. thick	3 in.
3	1-5/8	3 layers, 1/2 in. thick	Optional
3	1-5/8	2 layers, 3/4 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 1/2 in. thick	Optional
4	2-1/2	2 layers, 3/4 in. thick	2 in.

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

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

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

4A. **Gypsum Board* —** (As an alternate to Item 4) — 5/8 in. thick, 2 ft. wide, tongue and groove edge, applied horizontally as the outer layer to one side of the assembly. Secured as described in Item 5. Joint covering (Item 7) not required.

CANADIAN GYPSUM COMPANY — Type SHX.

UNITED STATES GYPSUM CO — Type SHX.

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 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. 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 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. **Three-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in., 5/8 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. **Four-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 24 in. OC. Fourth layer- 2-5/8 in. long for 1/2 in. thick panels or 3 in. long for 5/8 in. 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 1/2 in. long Type S-12 steel screws. Not for use with Item 4A.
6A. **Steel Framing Members (Not Shown)* —** (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 6, furring channels and Steel Framing Members as described below:
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 attached to furring channels as described in Item 5. Not for use with Item 4A.
b. **Steel Framing Members* —** Used to attach furring channels (Item 6a) to studs (Item 2). Clips spaced max. 48 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.

PAC INTERNATIONAL INC — Type RSIC-1.

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 and 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

Design No. G703

Design No. G703
July 09, 2004

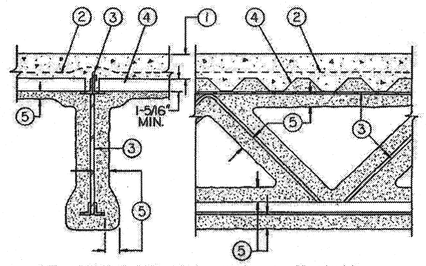
Restrained Assembly Ratings — 1, 1-1/2, 2 or 3 h

(See Items 1, 4 and 5)

Unrestrained Assembly Ratings — 1, 1-1/2 or 2 h

(See Items 1, 4 and 5)

Unrestrained Beam Ratings — 1, 1-1/2 or 2 (See Item 5)



1. **Normal-Weight Or Lightweight Aggregate Concrete —** Normal weight concrete carbonate or siliceous aggregate, 150 pcf unit weight, 3500 psi compressive strength, vibrated. Lightweight concrete, expanded shale, clay or slate aggregate by rotary-kiln method, 117 pcf unit weight 3500 psi compressive strength, vibrated, 2 oz air entrainment per bag of cement. The thickness of

concrete topping over the top plane of the steel deck varies according to the spacing of the structural steel members, the hourly rutings and whether or not the steel deck is protected. When no Spray-Applied Fire Resistive Materials protection is used on the steel deck, the thickness of concrete topping over the top plane of the steel deck shall be as specified in the following table:

Restrained or Unrestrained Assembly Rating Hr	Normal Weight Concrete Topping Thk In		Lightweight Concrete Topping Thk In		Min Thk of Concrete From Top Plane of Steel Deck to Bottom of Reinforcement In.
	Joist Spacing 48 In. OC Max	Joist Spacing 66 In. OC Max	Joist Spacing 48 In. OC Max	Joist Spacing 66 In. OC Max	
1 h	3-1/8	3-7/8	2-3/8	3-7/8	1
1-1/2 h	3-7/8	3-7/8	2-7/8	3-7/8	1-1/8
2 h	4-5/8	4-5/8	3-3/8	3-7/8	1-1/4

When the steel deck is protected with the Spray-Applied Fire Resistive Materials, the min thickness of normal weight or lightweight concrete topping above the top plane of the steel deck, and the min thickness of concrete from the top plane of steel deck to the wire fabric, shall be as follows:

Restrained or Unrestrained Assembly Rating Hr	Min Concrete Topping Thk In		Min Thk of Concrete From Top Plane of Steel Deck to Bottom of Reinforcement In.
	Joist Spacing 48 In. OC Max	Joist Spacing 66 In. OC Max	
2 h or less	2-3/8	2-3/8	1-1/8
3 h	2-3/8	3-7/8	1-1/4

2. **Welded Wire Fabric/Reinforcing Bars —** As required, to develop the structural capacity of the floor in accordance with the applicable ACI specifications.
3. **Structural Steel Members* —** Composite joists with vertical leg of top chord angles embedded in concrete slab. Min area of steel angles for the top and bottom chord members shall be 0.708 sq in. each, and the min area of web members shall be 0.442 sq in. when the sprayed material is applied directly to the joists.

Min area of steel angles for the top and bottom chord members may be reduced to 0.560 sq in. each, and the min area of web members to 0.299 sq in. when the joists are protected with greater thickness of Spray-Applied Fire Resistive Materials

with or without the metal lath or the nonmetallic fabric, as covered in the Table under Item 5. Max joist spacing is 48 or 66 in. OC depending on the thickness and type of concrete topping, the hourly ratings, and the thickness of protection material applied to the steel deck (see Items 1 and 5.

VESCOM STRUCTURAL SYSTEMS INC — Type V.

4. **Steel Floor and Form Units —** For max 2 h ratings, nom 1-5/16 in. deep uncoated or galv corrugated steel form units. For 3 h ratings, composite or noncomposite, min 1-1/2 in. deep, 22 gauge uncoated or galv fluted steel floor units. The steel floor and form units are not considered in calculating the load carrying capacity of the floor.
5. **Spray-Applied Fire Resistive Materials* —** All surfaces to which material is applied must be free of dirt, loose scale and oil before spraying. Applied by mixing with water and spraying in more than one coat to the required thickness on the joists and the steel form units as tabulated below.

Min Area of Joist Chord Sq In.	Min Area of Joist Web Sq In.	Thk of Spray Applied Fire Resistive Mtl in. on Steel Deck			Hr Rating		
		Normal Weight Concrete Topping	Lightweight Concrete Topping	on Joist	Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr
0.708	0.442	3/8	—	1-1/2	1	1	1
0.708	0.442	3/4*	3/8	1-1/2	2	2*	2*
0.708	0.442	1-1/4	1	1-1/2	3	2	2
0.560	0.299	3/8	—	2-1/2**	1	1	1
0.560	0.299	3/4	3/8	2-1/2**	2	2	2

Min avg and min ind density of 15/14 pcf, respectively. Min avg and min ind density of 19/18 pcf respectively for Type 7GP and 7HD. For method of density determination, see Design Information Section, Sprayed Materials.

* — The 3/4 in. thickness may be reduced to 1/2 in. when (a)the joist spacing does not exceed 48 in. OC or (b)the Unrestrained Assembly and

** — The 2-1/2 in. thickness of Spray-Applied Fire Resistive Materials shown may be reduced to 2 in. when the metal lath or the nonmetallic fabric mesh is used.

ARABIAN VERMICULITE INDUSTRIES — Type MK-5.

GRACE CANADA INC — Type MK-5.

GRACE KOREA INC — Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6s, Monokote Acoustic 1 .

PYROK INC — Type LD.

SOUTHWEST VERMICULITE CO — Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD.

W R GRACE & CO - CONN

CONSTRUCTION PRODUCTS DIV — Types MK-4, MK-5, MK-6/HY, MK-6s, Monokote Acoustic 1 , RG .

6. **Metal Lath** — (Optional, not shown) — Metal lath may be used to facilitate the spray application of Spray-Applied Fire Resistive Materials to steel bar joists. The diamond mesh, 3/8 in. expanded steel lath, 1.7 to 3.4 lb/sq yd should be secured to one side of each steel joist with 18 SWG galv steel wire at joist web and bottom chord members, spaced 15 in. OC max. When used, the metal lath is to be fully covered with Spray-Applied Fire Resistive Materials with no min thickness requirements.
7. **Non-Metallic Fabric Mesh** — (Optional, not shown) — As an alternate to metal lath, glass fiber fabric mesh - weighing approximately 2.5 oz/sq yd, polypropylene fabric mesh - weighing approximately 1.25 oz/sq yd, or equivalent, may be used to facilitate the spray application. The mesh should be secured to each joist web member and/or the chords to hold the mesh and the spray-applied resistive material in place during application. One method for attaching the mesh is by embedding it in 1/4 in. long beads of hot melted glue spaced a max of 12 in.

OC along the top chord of the bar joist. Another method is by using 1-1/4 in. long by 1/2 in. wide hairpin clips formed from 18 SWG or heavier steel wire.

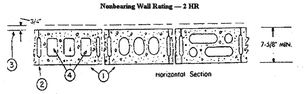
*Bearing the UL Classification Mark

Design No. U905

Design No. U905
January 02, 1997

Bearing Wall Rating — 2 HR.

Nonbearing Wall Rating — 2 HR



Horizontal Section

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. 3/8 in. 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

*Bearing the UL Classification Marking

NOTICE:
SUBMIT ACTUAL PHYSICAL AND STRUCTURAL PROPERTY DATA FROM STEEL FRAMING MANUFACTURER.

BEA
IN ASSOCIATION WITH:
GORRILL-PALMER CONSULTING ENGINEERS
PERATROVICH, NOTTINGHAM, & DRAGE
WINTON SCOTT ARCHITECTS
HALEY & ALDRICH

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

PROJECT NUMBER 009215.00

PIN 009215.00

BRUNO E. RAMOS No. 2644 LICENSED ARCHITECT STATE OF MAINE

	PROJ. MANAGER	PAUL POTTLE
	DESIGN-DETAILED	
	CHECKED-REVIEWED	
	DESIGN2-DETAILED2	
	DESIGN3-DETAILED3	
1	REVISIONS 1	–
2	REVISIONS 2	–
3	REVISIONS 3	–
4	REVISIONS 4	–
	FIELD CHANGES	–

BY	DATE		
		SIGNATURE	
		P. LICENCE NUMBER	
		ARC 2644	
		DATE	
		10/8/2004	

CITY OF PORTLAND
OCEAN GATEWAY PHASE 1

UL LISTING

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