Co.03.103578 DFS.01.

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WESTERN PARTITIONS, INC.

A	NO EXCEPTIONS
B	EXCEPTIONS AS NOTED
C	RESUBMIT
D	REJECTED
I	FOR INFORMATION ONLY

SUBMITTAL REVIEW

THIS REVIEW IS FOR CONFORMANCE WITH THE INFORMATION GIVEN AND THE DESIGN CONCEPT EXPRESSED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR REMAINS RESPONSIBLE FOR:

1. COMPLIANCE WITH THE CONTRACT DOCUMENTS
2. COORDINATING & CORRELATING QUANTITIES & DIMENSIONS
3. SELECTING FABRICATION PROCESSES & TECHNIQUES OF CONSTRUCTION
4. COORDINATION OF THIS WORK WITH OTHER TRADES
5. PERFORMING THIS WORK IN A SAFE AND SATISFACTORY MANNER
6. COMPLIANCE WITH THE CONTRACTOR'S CONSTRUCTION SCHEDULE
7. ALL OTHER PROVISIONS OF THE AGREEMENTS

IT IS UNDERSTOOD THAT THE ARCHITECT'S NOTATION ON THE SUBMITTAL IS NOT TO BE CONSTRUED AS AN AUTHORIZATION FOR ADDITIONAL WORK OR ADDITIONAL COST.

PERKINS & WILL Architecture, Interiors, Planning
Reviewed: [signature]
Countersigned: _____ Date: 9/10/04

FIREPROOF SUBMITTAL

JOB NAME: OHSU – PATIENT CARE FACILITY
WPI JOB #: 04-02-5262
SECTION: 07812 CEMENTITIOUS SPRAYED-ON FIREPROOFING
SUBMITTAL DATE: 5/10/2004

ATTACHMENTS:

1) SUBMITTAL NOTES (Page 2)
2) MONOKOTE MK-6/HY PRODUCT & TEST DATA (Page 3 – 4)
3) COPY OF UL DESIGN D779 (Page 5 – 6)
4) COPY OF UL DESIGN D925 (Page 7 – 10)
5) COPY OF UL DESIGN X772 (Page 11 – 12)
6) D779 MANUFACTURES THICKNESS TABLES (Page 13 – 16)
7) D925 MANUFACTURES THICKNESS TABLES (Page 17 – 20)
8) X772 MANUFACTURES THICKNESS TABLES (Page 21 – 25)
9) SHOP DRAWINGS (Page 26 – 61)

APPROVAL

GENERAL CONTRACTOR	ARCHITECT
HOFFMAN ANDERSEN A JOINT VENTURE This submittal has been reviewed for general conformance with the contract documents. Contractor's review does not relieve the Vendor/Subcontractor of responsibility for compliance with all requirements of the contract, including completeness and accuracy of this submittal. ☐ Review includes Hoffman Construction comments. 07812-001 Reviewed By: [signature] Submittal # Date: 5/19/04	RECEIVED MAY 20 2004 PERKINS & WILL

WESTERN PARTITIONS, INC.

OHSU – Patient Care Facility

Fireproofing Submittal Notes

PRODUCTS:

- We are submitting to apply Monokote Type MK-6/HY, per code requirement.

UL DESIGN:

- UL D779 – used for members where concrete thickness is less than 4 ½" above.
- UL D925 – used for members with 4 ½" or more concrete above.
- UL X772 – used for wide flange columns.

NOTES:

- It is our intent to spray the lower flange tip of all wide flange members supporting concrete above to either full flange or half flange tip thickness per *UL Guidelines*. Both thicknesses provide the required hourly rating and are indicated on the manufacturer's thickness tables as well as shop drawings.

APPLIED CODE:

- *UBC – Section 601.4* (Structural Frame) "The structural frame shall be considered to be the columns and the girders, beams, trusses, and spandrels having direct connections to the columns and bracing members designed to carry gravity loads. The members of floor or roof panels that have no connection to the columns shall be considered secondary members and not part of the structural frame."
  - It is our intent to not fireproof braced frame members that do not carry a direct gravity load, per Section 601.4.
- UBC Table 6-A (Fire-Resistive Requirements) Type I FR Construction requires a 3hr rating at the structural frame, a 2hr rating at floors and floor ceilings and a 2hr rating at roofs and roof ceilings.
  - It is our intent to spray fireproof to achieve a 3hr rating at all primary and a 2hr rating at all secondary members per UBC Table 6-A Requirements for Type I FR Construction and per UBC 601.4 Structural Frame definition.
- *UBC Section 1511.4* (Penthouses and Roof Structures - Exception #3) "Enclosures housing only mechanical equipment and located at least 20 feet from adjacent property lines may be of unprotected noncombustible construction."
  - It is our intent not to spray-fireproof the penthouse structure per UBC 1511.4 Exception number three.

Verify w/ City of Portland

If you should have any questions, please feel free to call me at (503) 620-1600

Sincerely,

Jerome Jarrell
Estimator/Project Manager

CORPORATE OFFICE: 8300 SW HUNZIKER ROAD, TIGARD OR 97223 • PHONE: 503-620-1600 • FAX: 503-624-5781

SOUTHERN OREGON REGIONAL OFFICE
P.O. BOX 309, GOLD HILL, OR 97525
PHONE: 541-855-1135 • FAX: 541-855-7958

SEATTLE REGIONAL OFFICE
14214 NE 21ST STREET, BELLEVUE WA 98007
PHONE: 425-562-9676 • FAX: 425-562-9739

CONTRACTOR LICENSES: OREGON 60330 • WASHINGTON: WESTEPI172P6

GRACE

Grace Construction Products

W. R. Grace & Co.-Conn.
149 Buckskin Dr.
Winlock, WA 98596-9350

Tel: (306) 785-3677
Fax: (360) 785-9046
www.graceconstruction.com

July 1, 2004

Mr. Jerame Jarrell
Western Partitions, Inc.
8300 SW Hunziker Road
Tigard, OR 97223

Re: OHSU – Patient Care Facility-Portland, OR

Dear Mr. Jarrell,

This letter is to address the proper UL Design and thickness for the project referenced above. We understand there are hybrid decks with 8" of normal weight concrete that require a 2-hour, unprotected deck, fire rating.

The Grace recommended UL design, based on the above information, is D925 utilizing Monokote® MK-6 H/Y fireproofing material. Please refer to the most current thickness table, for the UL D925 Design (normal weight concrete), which is on our web site listed above.

If you need any other information, please feel free to call me at the above number.

Sincerely,

Donald Long

Donald Long, CSI, CCPR
Technical Sales Representative

W.R. GRACE 150th anniversary

DATA SUBMITTAL

Monokote® Fireproofing Type MK-6/HY

Product Data and Application Instructions

Product Information/Description

Monokote® Type MK-6/HY is a single component, mill-mixed fireproofing plaster which requires only the addition of water on the job site to form a consistent, pumpable slurry. Type MK-6/HY is designed for use on structural steel columns, beams, joists, trusses and floor and roof decking.

Features/Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occupant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL tested and factory inspected
- Universal Building code compliance (ICBO, SBCCI, BOCA, NBCC)

Delivery and Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.
b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel and Concrete Surfaces

a. Prior to the application of Monokote Type MK-6/HY, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.
b. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested in accordance with ASTM E 119, to provide the required fire resistance rating.
c. Many Fire Resistance Designs allow the use of painted metal floor or roof deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local Grace sales representative for details.

Performance Characteristics

Physical Properties	Values*	Test Method
Dry Density, minimum average	240 kg/m³ (15 pcf)	ASTM E 605 UBC STD 7-6
Bond Strength	16.2 KPa (339 psf)	ASTM E 736
Compression, 10% Deformation	68.9 KPa (1,440 psf)	ASTM E 761
Air Erosion	0.000 g/m² (0.000 g/ft²)	ASTM E 859
High Velocity Air Erosion	No continued erosion after 4 hours	ASTM E 859 UMC STD 6-1
Corrosion	Does not contribute to corrosion	ASTM E 937
Bond Impact	No cracking, spalling or delamination	ASTM E 760
Deflection	No cracking, spalling or delamination	ASTM E 759
Resistance to Mold Growth	No growth after 60 days	ASTM G 21
Surface Burning Characteristics	Flame Spread 0 Smoke Developed 0	ASTM E 84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E 1354
Impact Penetration	3.3 cm³	Developed by City of San Francisco
Abrasion Resistance	8.3 cm³	Developed by City of San Francisco

* Same as Monokote Type MK-6s

GRACE
Construction Products

d. Prior to application of Monokote Type MK-6/HY, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Type MK-6/HY.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Mixing

a. Monokote Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 640 - 720 kg/m³ (40 - 45 pcf) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free with a creamy texture. All material is to be thoroughly wet. Target density of 688 ± 16 kg/m³ (43 ± 1 pcf) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequences:
   1. For thicknesses of approximately 13 mm (½ in.) or less, apply in one pass.
   2. For thicknesses of 16 mm (⅝ in.) or greater, apply subsequent passes after the first coat has set.

b. Spatterkote™ SK-3 shall be applied to all flat plate cellular deck units and below all bottomless trench headers prior to application of Type MK-6/HY. Spatterkote shall be applied in accordance with the manufacturer's application instructions.

c. Spatterkote SK-3 shall be applied to roof decking where required prior to application of Monokote.

d. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.

e. Monokote shall have a minimum average dry, in-place density of 240 kg/m³ (15 lb/ft³).

f. Monokote is formulated to be mixed with water at the job site.

g. Monokote Accelerator is to be used with Monokote Type MK-6/HY to enhance set characteristics and product yield. The Monokote Accelerator is injected into the Monokote Type MK-6/HY at the spray gun. Monokote Accelerator shall be mixed and used according to manufacturers recommendations.

h. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun with a properly sized orifice and spray shield, and air pressure at the nozzle of approximately 38 KPa (20 psi) will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due either to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature and Ventilation

a. An air and substrate temperature of 4.4°C (40°F) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select, and the owner will pay for an independent testing laboratory to sample and verify the thickness and density of the fireproofing in accordance with the provisions of ASTM E 605-93, "Standard Test Method for Thickness and Density of Sprayed Fire Resistive Material Applied to Structural Members" or Uniform Building Code Standard No. 7-6 "Thickness and Density Determination for Spray Applied Fireproofing."

b. The architect will select, and the owner will pay an independent testing laboratory to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E 736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary SLIPPERY WHEN WET signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. A Material Safety Data Sheet for Monokote Type MK-6/HY is available upon request by calling 800-778-2880.
Grace Construction Products
62 Whittemore Ave.
Cambridge, MA 02140-1692

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Tel.: 44-(0)-1753-692-929
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W.R Grace (Hong Kong) Limited
Devon House, 20th Floor
979 Kings Road
Quarry Bay, Hong Kong
Tel.: 852-2-590-2828
Fax: 852-2-811-2661

WHEELING-PITTSBURGH STEEL CORP —Lock Form Type, 24 in. wide Types P20LF, P30LF.

Spacing of welds attaching units to supports shall be 12 in. OC max. Adjacent units button-punched or welded 36 in. OC max along side joints. Butt end joints sealed with pressure sensitive tape.

3. Welded Wire Fabric — 6X6-6/6 SWG
4. Shear Connectors — Studs, 3/4 in. diam by 3 to 4-1/2 in. long, headed type or equivalent per AISC specification. Welded to the top flange of the beam through the deck.
5. Trench Header* — (Bearing the UL Listing Mark) — (Optional) — Nom 8 in. wide with bottom pan, constructed of steel with metal edge screeds. The Spray-Applied Fire Resistive Materials thickness of floor units beneath trench header shall be 1-1/8 in. below bottom plane of units with the flutes completely filled. The thicknesses shall extend 4 in. beyond the edges of the trench header.
6. Lightweight Concrete — Expanded shale, clay or slate aggregate by rotary-kiln method, 117 pcf unit weight, 3500 psi compressive strength, vibrated. Min thickness as measured to crests of steel floor and form units, 2-1/2.

   Normal Weight Concrete Siliceous or carbonate aggregate, 150 plus or minus 3 pcf unit weight, 3500 psi compressive strength, vibrated. Min thickness as measured to crests of steel floor and form units, 3 in.
7. Steel Studs With Discs — The studs consist of No. 12 SWG galv steel wire, 3/4 in. long with one end welded to a 1-13/16 in. diam No. 28 MSG galv steel disc. The total number of studs shall average one stud per 72 sq in. of cellular floor unit beneath the trench header. The ends of the studs opposite the disc shall be welded to the cellular floor units in two rows running parallel with the trench header. The distance between the row of studs and the edge of the trench header shall not exceed 4 in. The spacing between the rows shall not exceed 12 in. The spacing between studs in same row shall not exceed 6 in.
8. Spray-Applied Fire Resistive Materials* — Applied by mixing with water and spraying in more than one coat to a final thickness as shown in the following tables to steel surfaces which must be clean and free of dirt, loose scale and oil. Min avg density is 34 pcf with min individual density of 31 pcf. For method of density determination, refer to Design Information Section.

Cellular and Fluted Floor Units

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Concrete Type	Beam	Min Spray Applied Fire Resistive Mtl Thk on		
					Flat Plate	Flutes	Crests & Sides
1	1	1	LW	5/8	3/8	3/8	5/8
1-1/2	1-1/2	1-1/2	LW	13/16	3/8	3/8	5/8
2	1-1/2	2	LW	1-1/16	3/8	3/8	5/8
2	1-1/2	3	LW	1-5/16	3/8	3/8	5/8
1	1	1	NW	7/16	3/8	3/8	5/8
1-1/2	1-1/2	1-1/2	NW	5/8	3/8	3/8	5/8
2	1-1/2	2	NW	7/8	3/8	3/8	5/8
2	1-1/2	3	NW	1-1/16	3/8	3/8	5/8

Fluted Units Only

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Concrete Type	Beam	Min Spray Applied Fire Resistive Mtl Thkns on Crests	
					Flutes	& Sides
1	1	1	LW	5/8	3/8	5/8
1-1/2	1-1/2	1-1/2	LW	13/16	3/8	5/8
2	2	2	LW	1-1/16	3/8	5/8
2	2	3	LW	1-1/2	3/8	5/8
1	1	1	NW	7/16	3/8	5/8
1-1/2	1-1/2	1-1/2	NW	5/8	3/8	5/8
2	2	2	NW	13/16	3/8	5/8
2	2	3	NW	1-1/4	3/8	5/8

YUNG CHI PAINT & VARNISH MFG CO LTD —Type F-1

8A. Spray-Applied Fire Resistive Materials* — Applied by mixing with water and spraying in more than one coat to a final thickness as shown in the following tables to steel surfaces which must be clean and free of dirt, loose scale and oil. Min average density is 28 lb per cu ft with min individual density of 26 lb per cu ft. For method of density determination, refer to Design Information Section.

Cellular and Fluted Floor Units

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Concrete Type	Beam	Min Spray Applied Fire Resistive Mtl Thkns on		
					Flat Plate	Flutes	Crests & Sides
1	1	1	LW	5/8	3/8	3/8	5/8
1-1/2	1-1/2	1-1/2	LW	13/16	3/8	3/8	5/8
2	1-1/2	2	LW	1-1/16	3/8	3/8	5/8
2	1-1/2	3	LW	1-5/16	7/16	7/16	11/16
1	1	1	NW	7/16	3/8	3/8	5/8
1-1/2	1-1/2	1-1/2	NW	5/8	3/8	3/8	5/8
2	1-1/2	2	NW	7/8	3/8	3/8	5/8

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Concrete Type	Beam	Min Spray Applied Fire Resistive Mtl Thk on		
					Flat Plate	Flutes	Crests & Sides
2	1-1/2	3	NW	1-3/8	7/16	7/16	11/16

Fluted Units Only

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Concrete Type	Beam	Min Spray Applied Fire Resistive Mtl Thkns on Crests	
					Flutes	& Sides
1	1	1	LW	5/8	3/8	5/8
1-1/2	1-1/2	1-1/2	LW	13/16	3/8	5/8
2	2	2	LW	1-1/16	3/8	5/8
2	2	3	LW	1-5/16	7/16	11/16
1	1	1	NW	7/16	3/8	5/8
1-1/2	1-1/2	1-1/2	NW	5/8	3/8	5/8
2	2	2	NW	13/16	3/8	5/8
2	2	3	NW	1-5/16	7/16	11/16

YUNG CHI PAINT & VARNISH MFG CO LTD —Type F-1

9. Electrical Inserts — (Not shown) — Items 10 and 11 are required when electrical inserts are used. Preset electrical Inserts Classified as Outlet Boxes and Fittings Classified for Fire Resistance*. Unless specified otherwise for a particular preset electrical insert type, the spacing of the preset electrical inserts shall be not less than 24 in. on center along cellular steel floor units with not more than one preset electrical insert in each 4 sq ft of floor area. The required thickness of Spray-Applied Fire Resistive Materials on the steel floor units with inserts shall be sprayed the entire length and width of the units between supports and shall extend beyond the edge of inserts onto adjacent floor units for a minimum horizontal width of 12 in.

   UNITED STEEL DECK INC —Inserts — (Type 325 Preset Insert with Activation Fittings Types I, III, V, VI or VII). Installed per accompanying installation instructions over factory punched holes in Type AWC2 or AWC3 floor units. May be used for max 2 hr Restrained Assembly Rating only. For use with 12 or 24 in. wide AWC2 or AWC3 units.

   The holes cut in the insert cover for passage of wires shall be no more that 1/8 in. larger diam than the wire. For abandonment of insert see installation instructions.

   Required Spray-Applied Fire Resistive Materials thickness on AWC2 or AWC3 units depends on the type of activation fitting and the hourly ratings, as follows.

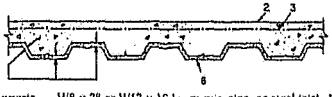
Type of Activation Fitting	Restrained Assembly Rating Hr	Min Spray Applied Fire Resistive Mtl Thk In.
I, VI, VII or X	1, 1-1/2 or 2	3/4
III or V	1 or 1-1/2	3/4
V	2	7/8
III	2	15/16

10. Fasteners — (Not shown) — Required with Item 9. — Min 12 by 1 in., Type A, with high-low threads and a flat head. For powder actuated attachment, any standard concrete and steel fastener with a min length of 1-1/4 in. min shank diam of 0.145 in. and a min 1/16 by 1/2 in. diam washer. Fasteners spaced 12 in. OC in both directions to secure latch to floor units. Fasteners secured only to valley portion of the floor units and therefore shall not penetrate the cell areas of the cellular floor units.
11. Metal Lath — (Not shown) — Required with Item 9. — 3/8 in. diamond mesh, 2.5 lb/sq yd painted or galvanized expanded steel. Adjacent pieces of lath overlapped 3 in.

*Bearing the UL Classification Mark

Design No. D779

Restrained Assembly Ratings — 1, 1-1/2, 2, 3 & 4 H
Unrestrained Assembly Ratings — 1, 1-1/2, 2, 3 & 4 H
Unrestrained Beam Ratings — 1, 1-1/2, 2, 3 & 4 H



1. Supports — W8 x 28 or W12 x 16 or min mtl. size, or steel joist, 16K1 or 16K2 min size with a max tensile stress of 30,000 psi or 12K3 min size with a max tensile stress of 24,000 psi.
2. Normal Weight or Lightweight Concrete — Normal weight concrete, carbonate or siliceous aggregate, 145 pcf plus or minus 3 pcf unit weight, 3000 psi compressive strength, vibrated. Lightweight concrete,

expanded shale, clay, or slate aggregate by rotary-kiln method 102-120 pcf unit weight, 3000 psi compressive strength, vibrated, 4 to 7 percent air. Min thickness as measured to crests of steel floor and form units, 2-1/2 in.

3. Welded Wire Fabric — 6 x 6 - W1.4 x W1.4.

3A. *Fiber Reinforcement — As an alternate to Item 3, engineered synthetic* fibers added to concrete mix to control shrinkage cracks in concrete. See Fiber Reinforcement (CBXQ) category in the Fire Resistance Directory for names of manufacturers and rates of application.

4. Steel Floor and Form Units — Composite 1-1/2, 2, or 3 in. deep galv units. Min gauge is 22 MSG.

CONSOLIDATED SYSTEMS INC —24 in. wide Types CFD-2, 3, 24, 30, or 36 in. wide Type CFD-1.5. Units may be phos/ptd.

DECK WEST INC —36 in. Type 2-DW, 3-DW, B-DW or BA-DW. Units may be welded or fastened together with No. 10 self-drilling, self-tapping screws 60 in. OC. The length of the screws shall be sufficient to fully penetrate adjacent floor units.

EPIC METALS CORP —24 in. wide Types EC150, EC366, 36 in. wide Type EC266.

H H ROBERTSON —24 in. wide, QL-3, 24 or 36 in. wide, 2 or 3 in. deep QL-99. Units may be welded or fastened together with No. 10 self-drilling, self-tapping screws 60 in. OC. The length of the screws shall be sufficient to fully penetrate adjacent floor units.

UNITED STEEL DECK INC —24, 30 or 36 in. wide Type BL; 24 or 36 in. wide Types LF1.5, LF2, LF3; 24, 36 in. wide Types LF2, -3 may be welded or fastened together with min 1 in. long No. 10 self-drilling, self-tapping steel screws 36 in. OC. Types BL, LF2, -3, N-Lok may be phos/ptd.

VERCO MFG CO —24, 30, or 36 in. wide Type B, BR; 24 or 36 in. wide Types W2, W3. Units may be phos/ptd.

VULCRAFT DIV OF

NUCOR CORP —24, 30 or 36 in. wide Type 1.5VL1; 24 or 30 in. wide Types 2VL1, 3VL1. Units may be phos/ptd.

WHEELING CORRUGATING CO, DIV OF

WHEELING-PITTSBURGH STEEL CORP —30 in. wide Types SB150, -150N, -150NR, -150R; 24 in. wide Type SB200 or -300; 24 or 36 in. wide Types P20LF, SB-P21LF, -P31LF; 36 in. wide Types 1.5 SB, 1.5 SBR; 24 or 36 in wide Types 2.0 SB, 3.0 SB; Units may be phos/ptd. 24 or 36 in. wide Types 212 V-Grip, 312 V-Grip, 30 or 36 in. wide 1-1/2 V-Grip. Types 1-1/2 V-Grip, 212 V-Grip, and 312 V-Grip may be phos/ptd.

5. Shear Connectors — (Optional) — Studs, 3/4 in. diam by 4-1/2 in. long, headed type or equivalent per AISC specification. Welded to top *flange of the beam, or top chord of the joist, through the deck.*

6. Spray-Applied Fire Resistive Materials — Applied by mixing with water and spraying to steel surfaces which must be clean and free of dirt, loose scale and oil. When steel deck is used, the area between the *steel deck and the beams top flange shall be filled. Min avg and min* ind density of 15/14 pcf respectively. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G. Min avg and min ind density of 40/36 pcf respectively for Z-148. Application to steel deck requires the installation of expanded metal lath with Type Z-146 only. See Item 7B. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. on Steel Deck Crests	Valley	Concrete Type
1	0	1	0	0	LW
1	1	1	5/16	5/16	NW or LW
1-1/2	1	1	5/16(a)	5/16(a)	NW or LW
1-1/2	1-1/2	1-1/2	5/16(a)	5/16(a)	NW or LW
2	1	1	3/8(b)	3/8	NW or LW
2	2	2	3/8(b)	3/8	NW or LW
3	1-1/2	1-1/2	11/16	1/2	NW or LW
3	3	3	11/16	1/2	NW or LW
4	2	2	1-1/2	1-1/8	LW
4	4	4	1-1/2	1-1/8	LW
4	2	2	1-7/16	13/16	NW
4	4	4	1-7/16	13/16	NW

(a) — Min thickness of 3/8 in. required when 1-1/2 in. deep fluted units are used.

(b) — Min thickness of 1/2 in. is required in crests of 1-1/2 in. deep fluted units for the 2 h Restrained Assembly Rating.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thk In. on Beam W8x28	W12x16	10Ki Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1	0	1	7/16	5/8	1-7/16	1-7/16
1	1	1	7/16	5/8	1-7/16	1-7/16
1-1/2	1	1	7/16	5/8	2-3/16	1-15/16
1-1/2	1-1/2	1-1/2	3/4	1	2-3/16	1-15/16
2	1	1	1-5/16	1-3/4	3-1/4	2-13/16
2	2	2	1	1-3/8	—	—
3	1	1	1-5/8	2-3/16	—	—
3	2	2	1-5/8	2-3/16	—	—
3	3	3	1-5/8	2-3/16	—	—
4	2	2	1-5/8	2-3/16	—	—
4	4	4	1-5/8	2-3/16	—	—

Restrained & Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Min Thkns In. For 12K3 or 16K2 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1	1	15/16	15/16
1-1/2	1-1/2	1-1/4	1-3/16
2	2	1-9/16	1-1/2
3	3	2-1/4	2-1/8

The thicknesses of Spray-Applied Fire Resistive Materials shown in the table below are applicable when the thickness applied to the beams' lower flange edges is reduced to one-half.

Restrained Assembly Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	on Beam W8x28	W12x16
1	0	1	7/16+	5/8
1	1	1	7/16+	5/8
1-1/2	1	1	7/16+	5/8
1-1/2	1-1/2	1-1/2	3/4	1
2	1	1	7/16+	5/8
2	2	2	1	1-3/8
3	1-1/2	1-1/2	3/4	1
3	3	3	1 7/16	1-15/16
4	2	2	1	1-3/8
4	4	4	1-15/16	2-5/8

ARABIAN VERMICULITE INDUSTRIES —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, Sonophone 1, Sonophone 5, Sonophone 35, Z-106, Z-106/G, Z-146 investigated for exterior use, Sonotex 35 .

→ *W R GRACE & CO.-CONN*

CONSTRUCTION PRODUCTS DIV —Types MK-6/HY, MK-6/HY Extended Set, MK-6s, RG, Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G, Z-146 investigated for *exterior use, Monokote Acoustic 35.*

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G, Z-146 investigated for *exterior use, Monokote Acoustic 35.*

7. Metal Lath — (Optional, not shown) — May be used to facilitate the spray application of spray-applied resistive material on steel bar joists. The diamond mesh, 3/8 in. expanded steel lath, 1.7 lb per sq yd min is *secured to one side of each steel joist with No. 18 SWG galv steel wire* at joist web and bottom chord members, spaced 15 in. O.C. max. When used, the metal lath is to be fully covered with spray-applied resistive material with no min thickness requirements for material applied onto the lath between chords and web members.

7A. Non-Metallic Fabric Mesh — (Optional, not shown) — As an alternate to the optional use of metal lath, glass fiber fabric mesh, weighing approximately 2.5 oz per sq yd or equivalent may be used to facilitate the spray application. The mesh is secured to one side of each web member. The method of attaching the mesh must be sufficient to hold the mesh and the spray applied resistive material in place during application until it has cured. An acceptable method to attach the mesh is by embedding the mesh in min 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced a max of 12 in. O.C. along the top chord of the bar joist. Another method to secure the mesh is by 1-1/4 in. long by 1/2 in. wide hairpin clips from No 18 SWG or heavier steel wire.

7B. Metal Lath — (Not Shown) —(Required with Z-146. Sonophone 35, and Monokote Acoustic 35, otherwise optional)—Metal lath shall be 3/8 in. expanded diamond mesh, weighing 2.5 lb per sq yd. Secured to underside of steel deck with No. 12 by 3/8 in. pan head self-drilling, self-tapping screws and steel washers with an outside diam of 1/2 in. screws spaced 12 in OC in both directions with lath edges overlapped approx 3 in.

*Bearing the UL Classification Mark

Restrained Assembly Rating Hr	Concrete (Type)	Concrete Topping Thkns In.
2	Normal weight, Carbonate Agg.	4-1/2
2	Normal weight, Siliceous Agg.	4-3/8
2	Lightweight	3-7/8
3	Normal weight, Carbonate Agg.	5-0
3	Normal weight, Siliceous Agg.	5-3/8
3	Lightweight	4-0

2. *Negative Reinforcement — For floor spans with concrete cast continuous over the supporting beams. Deformed bars designed to resist the support moments of the concrete slab in accordance with the latest ACI Building Code specifications.*
3. Steel Floor and Form Units* — Composite 1-1/2 in. or 3 in. deep galv fluted units. Min. gauges are No. 22 MSG. The Unrestrained Assembly Rating is 1-1/2 h for units with clear spans not more than 9 ft, 3 in.
   VULCRAFT, DIV OF
   NUCOR CORP — 24, 30 or 36 in. wide Type 1.5 VLI; 24 or 36 in. wide Types 2 VLI, 3 VLI.
4. Fiber Reinforcement* — (Not Shown) — Engineered synthetic fibers added to concrete mix to control shrinkage cracks in concrete. Fibers added to concrete mix at rate of 1 lb of fiber for each cu yard of concrete.
   ALLIED FIBERS —Type Polypolan — ®
5. Spray-Applied Fire Resistive Materials* — Spray applied in one or more coats to a final thickness as shown in the table below, to steel surfaces which must be clean and free of dirt, loose scale and oil. When fluted units are used, the crest areas above the beam shall be filled with fiber. Min avg density of 15 pcf and min ind density of 11 pcf. For method of density determination, refer to Design Information Section.

Unrestrained Beam Rating Hr	Restrained Assembly Rating Hr	Spray Applied Fire Resistive Mtl Thk In.
1	1, 1-1/2	3/8
1-1/2	1-1/2, 2	11/16
2	2, 3	1*
3	3	1-9/16t

   ISOLATEK INTERNATIONAL —Type D-C/F or Type H investigated for exterior use. Type EBS or Type X adhesive/surface sealer optional.

*Thickness may be reduced to 7/8 in. when the floor consists of normal weight concrete topping over min 2 in. deep deck.

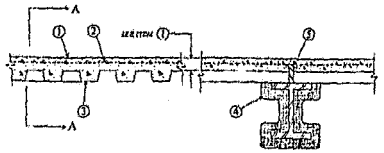
†The thickness at the tip of the bottom flange of the beam may be reduced to 1/2.

6. Shear Connector Studs — Optional — Steel studs welded to the valleys of the steel deck. Designed in accordance with the AISC specifications.

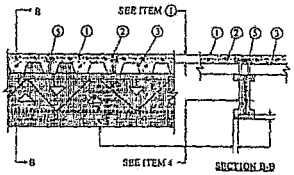
Bearing the UL Classification Mark

Design No. D925

Restrained Assembly Ratings — 3/4, 1, 1-1/2, 2 or 3 Hr (See Items 1, 6 and 10)
Unrestrained Assembly Rating — 0 Hr (See Items 3, 4, 4A and 10)
Unrestrained Beam Ratings — 1, 1-1/2, 2, 3 and 4 Hr (See Items 4, 4A and 10)



SECTION A-A



Supports W8x28 or W12x16 steel beam or steel joists, 10K1 or 16K2 min size with a max tensile stress of 30,000 psi or 12K3 min size with a max tensile stress of 24,000 psi. Or joist girders (not shown), composite or noncomposite. Welded or bolted to end supports. Joist Girder designed per S.J.I. specifications for a max tensile stress of 30 ksi. May be either uncoated or provided with a shop coat of paint. For the 2 h or less Restrained or Unrestrained Beam Ratings, top and bottom chords shall each consist of two angles with a min total area of 0.96 and 0.77 sq in., respectively. Web members shall be either round bars or angles. Min area of the end diagonal web shall be 0.444 sq in. Min area of each of the first six interior diagonal webs shall be 0.408 sq in. All other interior webs shall have a min area of 0.196 sq in. For the 3 h Restrained or Unrestrained Beam Ratings, each of the top and bottom chords shall each consist of two angles with a min total area of 1.74 sq in. Web members shall be either round bars or angles. Min area of each of the first five end diagonal webs shall be 0.886 sq in. All other interior webs shall have a min area of 0.441 sq in. Compression web members with a slenderness ratio greater than 60, shall be limited to 80 percent of their allowable design load. Bridging per S.J.I. specifications is required when noncomposite joists are used. For noncomposite joists, steel filler pieces of proper size, 1 to 2 in. long shall be welded to and between the top chord angles at midway between all top chord panel points. As alternate to double angles, (not shown) structural tee sections may be used for top and bottom chords as follows:

Restrained or Unrestrained Beam Rating Hr	Min Size Section Top Chord	Bottom Chord
1, 1-1/2 or 2	ST1.5X3.75	ST1.5X2.85
3 or 4	ST3X6.25	ST3X6.25

1. *Normal Weight or Lightweight Concrete — Normal weight concrete carbonate or siliceous aggregate, 3500 psi compressive strength, vibrated. Lightweight concrete expanded shale, or slate aggregate by rotary-kiln method, or expanded clay aggregate by rotary-kiln or sintered-grate method, 3000 psi compressive strength, vibrated, 4 to 7 percent entrained air.*

Restrained Assembly Rating Hr	Concrete (Type)	Concrete Unit Weight pcf	Concrete Thkns In
1	Normal Weight	147-153	3-1/2
1-1/2	Normal Weight	147-153	4
2	Normal Weight	147-153	4-1/2
3	Normal Weight	147-153	5-1/4
3/4 or 1 (See Item 6)	Lightweight	107-113	2-1/2
1	Lightweight	107-120	2-5/8
1-1/2	Lightweight	107-113	3
2	Lightweight	107-113	3-1/4
2	Lightweight	107-116	3-1/4*
2	Lightweight	114-120	3-1/2
3	Lightweight	107-113	4-3/16
3	Lightweight	114-120	4-7/16

*For use with 2 or 3 in. steel floor and form units only.

2. Welded Wire Fabric — 6 x 6, 10 x 10 SWG.
3. Steel Floor and Form Units* — Composite 1-1/2, 1-5/8, 2 or 3 in. deep galv units or 4-1/2 in. deep noncomposite galv units. Fluted units may be uncoated or phosphatized/painted. Min gauges are 22 MSG for fluted and 20/20 MSG for cellular units. The following combinations of units may be used:
   (1) All 18, 24, 26 28 or 36 in. wide cellular.
   (2) All fluted.
   (3) One or two 3 in. deep, 12 in. wide, 18/18 MSG min cellular units, alternating with 3 in. deep fluted or other cellular.
   (4) Any blend of fluted and 18, 24, 26, 28, or 36 in. wide cellular.
   (5) 3 in. deep, 30 in. wide cellular with 8-1/8 in. wide valley along-

side joints may be used when 3/8 in. diam reinforcing bars are placed 1-1/2 in. to each side of side joints and 1 in. above bottom of units.

(6) Corrugated, 1-5/16 in. deep, 30 in. wide, 24 MSG min galv units with shear wires factory welded to deck corrugations. Welded to *supports 12 in. OC. through welding washers. For shear wire* spacing of 8 in. or less the steel deck stress shall not exceed 20 KSI. For shear wire spacing greater than 8 in. OC. but less than or equal to 12 in. OC. steel deck stress shall not exceed 12 KSI. ASC Pacific Inc.

24 in. wide Types B, BF-24, BR, BMOD, BRMOD, N, NF, 2W24, 3W24, 2WF24, 3WF24; 30 in. wide Types, B, BF-30, BR; 36 in. wide Types B-36, 2W36, 3W36, 2WF36, 3WF36; 24 or 30 in. wide Types ASC2 or ASC3.

CHENG HO STEEL CO LTD —24 or 36 in. wide Types LF2, LF3.

CONSOLIDATED SYSTEMS INC —24 in. wide Types CFD-2, CFD-3; 24, 30 or 36 in. wide Type CFD-1.5; 24 or 36 in. wide Types Mac-Lok 2, Mac-Lok 3; 24 in. wide, Types B2C, B2FC, NC, NFC; 30 in. wide Type B3C; 12 in. wide Mac-Way cellular 45 MOW, 2-633 MTWA, 3-633 MTWA, 3-633 MTWV, 3-633 MTWV+, 24 in. wide Type Versa-Dek.

EPIC METALS CORP —24 in. wide Types EC150, ECP150, EC300, ECP300, EC366, ECP366, EC150, EC300 inverted, Epicore A; 30 in. wide Types ECB150, ECBR150; 36 in. wide Types EC266.

H H ROBERTSON —QL Types, 2+ in. wide 3 or 3 inverted, UKX, UKX-3, 2 in. 99, AKX, 21 or 21 inverted, 121, NKX, TKX; 24 or 30 in. wide GKX, GKX-A; 36 in. wide 99, AKX, WKX; 24 26, 94, 36 in. wide NKX; 1.5NKC, NKC, AKX, 2 or 3 in. TKC; 12 in. wide noncomposite Sec. 12; 17 in. wide 21; 26 or 28 in. wide UKX, 87.5 cm wide. Side joints of QL, 99, 121, WKX, TKX, TKC, and Metric units — QL-77-900; QLC-78-900; may be welded together 60 in. OC. Side joints of 99, AKX, WKX, GKX, GKX-A, TKX and Metric units — QL-77-900 and QLC-78-900 may be fastened toge[illegible] with min 1 in. long No. 12x14 self-drilling, self-tapping steel screws 36 in. OC.

HAMBRO STRUCTURAL SYSTEMS, DIV OF

CANAM STEEL CORP —36 in. wide, 1-1/2 in. Type P3615HB. The max superimposed loadings for Type P3615HB units shall not exceed 250 PSF. For single spans, the use of the units shall be limited to 5 ft. 6 in., 6 ft 0 in. and 6 ft 6 in. max spans for the 22, 20 and 18 gauge units, respectively. For multiple spans, 18 gauge units may be used on a max 7 ft 6 in. span with a max total superimposed loading of 240 PSF.

MARLYN STEEL DECKS INC — Type 1.5 CF, 2.0 CF or 3.0 CF.

UNITED STEEL DECK INC —24 in. wide, Types 1-1/2, 2 or 3 in. LOK-Floor and LOK-Floor Cell; 36 in. wide, Types *2 or 3 in. LOK-Floor and LOK-Floor Cells;* 24 in. wide, Types N-LOK and N-LOK Cell; 24, 30 or 36 in. wide, Type 1-1/2 in. B-LOK and B-LOK Cell.

VALLEY JOIST — 24 or 36 in. wide Types WVC 1-1/2 or WVC 2.

VERCO MFG CO —Formlok Types, 24 or 36 in. wide, W2, W2CD, W3 and W3CD; 24 in. wide, B, BCD, BR, N and NCD; 30 in. wide, B, BCD and BR; 36 in. B, BCD and BR, 12 in. wide W2 or W3 units may be blended with 24 or 36 in. wide W2 or W3 units, respectively.

VULCRAFT, DIV OF

NUCOR CORP —24, 30 or 36 in. wide, Type 1.5 VL, 1.5 VLI, 1.5 VLP; 24 or 36 in. wide Types 2VLI, 2VLP, 3VLI, 3 VLP.

WALKER SYSTEMS INC —24 in. wide Types 2 or 3 in. WDR.

WHEELING CORRUGATING CO, DIV OF

WHEELING-PITTSBURGH STEEL CORP —30 in. wide Types SB-150, -150N, +150NR, -150R; 30 or 36 in. wide Types SB-B16LF, -B16LFR; 24 or 36 in. wide Types P20LF, SB-P21LF, -P31LF, 24 in. wide Types P20LF, SB-200, -300. 36 in. wide Types 1.5 SB, 1.5 SBR; 24 or 36 in wide Types 2.0 SB, 3.0 SB; Type SB-B16LFR may be phos/ptd; 30 in. wide, Types 1-1/2 in. V-Grip, 1-1/2 in. RV-Grip; 24 or 36 in. wide Types 212V-Grip, 312V-Grip; 36 in. wide Types 212VW3-Wireway, 312VW3-Wireway. Types 1-1/2 in. *V-Grip, 212V-Grip and 312V-Grip may be phos/ptd*

Components for field-assembled cellular metal raceway units:

Raceway Bottom — 24 or 36 in. wide Types 212 VS, 312 VS .

Raceway Cover Plate — Types CP-12, CP-16

Raceway Divider — Type DC-20, DC-25.

Raceway Isolation Trough — Types T-20, T-25, T-30.

Spacing of welds attaching units to supports shall be 12 in. OC for 12, 24 and 36 in. wide units, four welds per sheet for 30 in. wide units, 6 in. OC for 18 in. wide and Sec. 12 units. Unless noted otherwise, adjacent units button-punched or welded together 36 in. OC alongside joints. Adjacent 18 in. wide units welded together 30 in. OC alongside joints. For 3 Hr Rating. units with overlapping type side joints welded together 24 in. OC max. *The Unrestrained Assembly Rating is equal to the Unrestrained* Beam Rating for a max of 3 Hr and is limited to the following floor units and spans:

(a) 1-1/2, 2 and 3 in. deep, 24 in. wide, 22 MSG or thicker fluted with clear spans not more than 7 ft, 8 in.

(b) 1-1/2, 2 and 3 in. deep, 24 in. wide, 20 MSG or thicker fluted with clear spans not more than 8 ft, 8 in.

(c) 1-1/2 and 2 in. deep, 24 in. wide, 16 MSG or thicker fluted and *18/18 MSG* or thicker cellular with clear spans not more than 9 ft, 11 in.

(d) 3 in. deep, 36 in. wide, 18 MSG or thicker fluted and 24 in. wide, 20/18 MSG or thicker cellular with clear spans not more than 13 ft, 2 in.

For assemblies utilizing 3-1/4 in. lightweight concrete topping with a max Restrained Assembly Rating of 2 Hr, the Unrestrained Assembly Rating is equal to the Unrestrained Beam Rating and is *limited to the following floor units and spans:*

(a) 1-1/2, 2, and 3 in. deep, 24 or 36 in. wide, 22 MSG fluted and 20/20 MSG cellular with clear spans not more than 9 ft, 6 in.

(b) 2 and 3 in. deep, 24 or 36 in. wide 20 MSG fluted and 20/20 *MSG cellular with clear spans not more than 10 ft, 0 in.*

(c) 3 in. deep, 24 in. wide, 20 MSG fluted and 20/20 MSG cellular with clear spans not more than 13 ft, 2 in.

4. Spray-Applied Fire Resistive Materials — Applied by mixing with *water and spraying in one or more coats to a final thickness as shown* in the tables below, to steel beam surfaces which must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf, respectively for Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, RG. *Min avg and min ind density of 22/19,* respectively for Types Z-106. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thk In. W8x28 Beam	W8x28 Beam Supporting All Fluted Floor Units w/Lightweight Concrete	W12x16 Beam	W12x16 Beam Supporting All Fluted Floor Unit
1	1	1	1/2.	7/16.	11/16.	5/8.
			11/16**	5/8**	1-1/8**	1**
1-1/2	1	1	1/2.	7/16.	11/16.	5/8.
			11/16**	5/8**	1-1/8**	1**
1-1/2	1-1/2	1-1/2	13/16.	3/4.	1-1/8.	1.
			1-1/16**	1**	1-7/16**	1-3/8**
2	1	1	1/2.	7/16.	11/16.	5/8.
			11/16**	5/8**	1-1/8**	1**
2	2	2	1-1/16.	1.	1-7/16.	1-3/8.
			1-5/16**	1-3/16**	1-13/16**	1-9/16**
3	1-1/2	1-1/2	13/16	3/4	1-1/8	1
3	3	3	1-9/16	1-5/16	2-1/8	1-3/4
3	3	4	2	1-5/8	2-11/16	2-3/16

**This thickness applies when optional Item 10 is used over 3-1/4 in. light weight concrete topping.

The thicknesses of Spray-Applied Fire Resistive Materials shown in the table below are applicable when the thickness applied to the beams' lower flange edges is reduced to one-half that shown in the table.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thk In. W8x28 Beam	W8x28 Beam Supporting All Fluted Floor Units w/Lightweight Concrete	W12x16 Beam	W12x16 Beam Supporting All Fluted Floor Unit
1	1	1	9/16	7/16+	3/4	5/8
1-1/2	1	1	9/16	7/16+	3/4	5/8
1-1/2	1-1/2	1-1/2	7/8	3/4	1-3/16	1
2	1	1	9/16	7/16+	3/4	5/8
2	2	2	1-3/16	1	1-5/8	1-3/8
3	1-1/2	1-1/2	7/8	3/4	1-3/16	1
3	3	3	1-3/4	1-5/16	2-3/8	2-1/8
3	3	4	2-5/16	2-1/16	3-1/8	2-3/4

+Thickness applied to beams' lower flange edges shall be a minimum of 1/4 in.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. For 10K1 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC	Joist Girder
1	1	1	1-1/8	15/16	1-1/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-3/4
2	1	1	1-7/16	1-7/16	—
2	2	2	2-3/16	1-7/8	2-1/4
3	3	3	3-1/2	2-13/16	2-7/8
3	3	4	—	—	2-7/8

Restrained & Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Min Thkns In. For 12K3 or 16K2 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1	1	15/16	15/16
1-1/2	1-1/2	1-1/2	1-3/8
2	2	2-1/16	1-7/8
3	3	3-1/2	2-13/16

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray-Applied Resistive Materials Thk, In. W8x28 supporting Fluted Floor Units and Normal Weight Concrete Only
1	1	1	3/8
1-1/2	1-1/2	1-1/2	5/8
2	1	1	3/8
2	2	2	7/8
3	1-1/2	1-1/2	5/8
3	3	3	1-7/16
3	3	4	2

ARABIAN VERMICULITE INDUSTRIES —Types MK-4, MK-6/CBF, -6/ED, -6/HY, -6/HY Extended Set, -6s, Sonophone 1.

W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV—Types: KM-60I, MK-6/HY, MK-6/HY Extended Set, MK-6s, RG, Monokote Acoustic 1, Z-106/G, Z-106, Monokote Acoustic 5.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, Monokote Acoustic 1, Z-106/G, Z-106, Monokote Acoustic 5

4A. Alternate Spray-Applied Fire Resistive Materials — Applied by mixing with water and spraying in one or more coats to a final thickness as shown in the tables below to steel beam surfaces which must be clean and free of dirt, loose scale and oil. The thicknesses shown in the table below are applicable to beams supporting all fluted floor or form units. Min avg and min ind density of 22/19 pcf respectively. For density determination refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thk In. W8x28 Beam Supporting Fluted Floor Units Only W/Lightweight Concrete
1	1	1	1/2, 5/8**
1-1/2	1-1/2	1-1/2	3/4, 1**
2	1	1	1/2, 5/8**
2	2	2	1, 1-3/16**
3	1-1/2	1-1/2	3/4
3	3	3	1-5/16
3	3	4	1-5/8

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. For 10K1 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC	Joist Girder
1	1	1	1-1/8	15/16	1-1/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-3/4
2	1	1	1-7/16	1-7/16	—
2	2	2	2-3/16	1-7/8	2-1/4
3	3	3	3-1/2	2-13/16	2-7/8
3	3	4	—	—	2-7/8

Restrained & Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Min Thkns In. For 12K3 or 16K2 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1	1	15/16	15/16

Restrained & Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Min Thkns In. For 12K3 or 16K2 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1-1/2	1-1/2	1-1/2	1-3/8
2	2	2-1/16	1-7/8
3	3	3-1/2	2-13/16

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray-Applied Resistive Materials Thk, In. W8x28 supporting Fluted Floor Units and Normal Weight Concrete Only
1	1	1	3/8
1-1/2	1-1/2	1-1/2	5/8
2	1	1	3/8
2	2	2	7/8
3	1-1/2	1-1/2	5/8
3	3	3	1-7/16
3	3	4	2

**This thickness applies when optional Item 10 is used over 3-1/4 in. light weight concrete topping.

W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV—Type Z-106/HY.

GRACE KOREA INC —Type Z-106/HY.

4B. Alternate Spray-Applied Fire Resistive Materials — Applied by mixing with water and spraying in one or more coats to a final thickness as shown in the tables below to steel beam surfaces which must be clean and free of dirt, loose scale and oil. The thicknesses shown in the table below are applicable to beams supporting all fluted floor or form units. Min avg and min ind density of 40/36 pcf respectively. For density determination refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thk In. W8x28 Beam Supporting Fluted Floor Unit Only W/ Lightweight Concrete
1	1	1	7/16, 5/8**
1-1/2	1-1/2	1-1/2	3/4, 1**
2	1	1	7/16, 5/8**
2	2	2	1, 1-3/16**
3	1-1/2	1-1/2	3/4
3	3	3	1-5/16
3	3	4	1-5/8

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. For 10K1 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC	Joist Girder
1	1	1	1-1/8	15/16	1-1/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-3/4
2	1	1	1-7/16	1-7/16	—
2	2	2	2-3/16	1-7/8	2-1/4
3	3	3	3-1/2	2-13/16	2-7/8
3	3	4	—	—	2-7/8

Restrained & Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Min Thkns In. For 12K3 or 16K2 Joist Spaced More Than 4 Ft OC	4 Ft or Less OC
1	1	15/16	15/16
1-1/2	1-1/2	1-1/2	1-3/8
2	2	2-1/16	1-7/8
3	3	3-1/2	2-13/16

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray-Applied Resistive Materials Thk, In. W8x28 supporting Fluted Floor Units and Normal Weight Concrete Only
1	1	1	3/8
1-1/2	1-1/2	1-1/2	5/8
2	1	1	3/8
2	2	2	7/8
3	1-1/2	1-1/2	5/8
3	3	3	1-7/16

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray-Applied Resistive Materials Thk, In. W8x28 supporting Fluted Floor Units and Normal Weight Concrete Only
3	3	4	2

**This thickness applies when optional Item 10 is used over 3-1/4 in. light weight concrete topping.

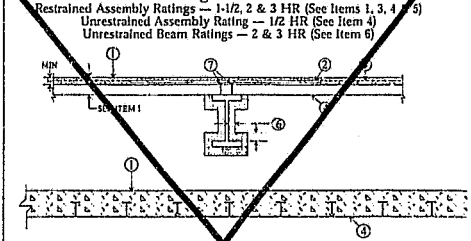
ARABIAN VERMICULITE INDUSTRIES —Type Z-146 investigated for exterior use, Sonophone 35.
W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV —Types Z-146 investigated for exterior use, Monokote Acoustic 35.
GRACE KOREA INC —Types Z-146 investigated for exterior use, Monokote Acoustic 35.

5. Shear-Connector-Studs-Optional — Studs 3/4 in. diam by 3 in. long, for 1-1/2 in. deep form units to 5-1/4 in. long for 3 in. deep form units, headed type or equivalent per AISC specifications. Welded to the top flange of the beam through the steel form units.
6. Electrical Inserts — (Not shown) Classified as "Outlet Boxes and Fittings Classified for Fire Resistance" .
   H H ROBERTSON —Preset Inserts.
   For use with 2-1/2 in. lightweight concrete topping over QL-WKX steel floor units. Installed over factory-punched holes in floor units per accompanying installation instructions. Spacing shall not be more than one insert in each 14 sq ft of floor area with spacing along floor units not less than 48 in. OC. The holes cut in insert cover for passage of wires shall be no more than 1/8 in. larger diam than wire. Restrained Assembly Rating is 3/4 hr with Tapmate II-FS-1 and 1 hr with Tapmate II-FS-2 inserts.
   H H ROBERTSON —Tapmate II-FS-1, II-FS-2; Series KEB.
   WALKER SYSTEMS INC —After set inserts, Single-service after set inserts installed per accompanying installation instructions in 2-1/2 in. diam hole core-drilled through min 3-1/4 in. thick concrete topping to top of cell of any min 3 in. deep cellular steel floor unit specified under Item 3. Spacing shall be no more than one insert in each 10 sq ft of floor area in each span with a min center to center spacing of 16 in. If the high potential and low potential raceways of the cellular steel floor unit are separated by a valley filled with concrete, the center to center spacing of the high potential and low potential single-service after set inserts may be reduced to a min of 7-1/2 in. Restrained Assembly Rating is 2 hr or less with internally protected Type 436 after set insert with Type M4-, M6- or M8- Series single-service activation fitting.
   WALKER SYSTEMS INC —Internally protected Type 436 after set insert with Type M4-, M6- or M8- Series single-service activation fitting.
7. Roof Covering Materials* — (Optional, not shown) Consisting of materials compatible with insulations described herein which provide Class A, B or C coverings. See Roofing Materials and Systems Directory - Roof Covering Materials (TEVT).
8. Insulating Concrete — (not shown) Optional. Various types of insulating concrete prepared and applied in the thickness indicated:
   A. Vermiculite Concrete — (not shown) Optional.
      1. Blend 6 to 8 cu ft of Vermiculite Aggregate* to 94 lb Portland Cement and air entraining agent. Min thickness of 2 in. as measured to the top surface of the structural concrete or foamed plastic (Item 9) when it is used.
         ELASTIZELL CORP OF AMERICA —Types MS 16-U, MSV 200.
         SIPLAST INC
         VERMICULITE PRODUCTS INC
      2. Blend 3.5 cu ft. of Type NVC Concrete Aggregate* or Type NVS Vermiculite Aggregate* to 94 lb Portland Cement Slurry coat, 1/8 in. thickness beneath foamed plastic (Item 9) when used, 1 in. min topping thickness.
         SIPLAST INC
         VERMICULITE PRODUCTS INC
         Vermiculite concrete may be covered with Roof Covering Materials (Item 7).
   B. Cellular Concrete-Roof Topping Mixture* — Concentrate mixed with water and Portland Cement per manufacturers specifications. 28-day min compressive strength of 190 psi as determined with ASTM C495 66.
      CELCORE INC — Cast dry density 31 (+ or -) 3.0 psf
      CELLULAR CONCRETE L L C — Cast dry density of 37 (+ or -) 3.0 pcf.
      ELASTIZELL CORP OF AMERICA —Type II, Mix #1 of cast dry density 39 (+ or -) 3.0 pcf, Mix #2 of cast dry density 40 (+ or -) 3.0 pcf, Mix #3 of cast dry density 47 (+ or -) 3.0 pcf.
      LITE-CRETE INC —Cast dry density of 29 (+ or -) 3.0 pcf.
      SIPLAST INC —Mix No. 1 or 2. Cast dry density of 32+3 (Mix No. 1) or 36+3 (mix No. 2) pcf.
   C. Perlite Concrete — Mix consists of 6.2 cu ft Perlite Aggregate* to 94 lbs of Portland cement and I-1/2 pt air entraining agent. Compressive strength 80 psi min.
      See Perlite Aggregate (CFFX) category for names of Classified companies.
   D. Cellular Concrete-Roof Topping Mixture* — Foam Concentrate mixed with water, Portland Cement and UL Classified Vermiculite Aggregate per manufacturer's application instructions. Cast dry density of 33 (+ or -) 3.0 pcf and 28-day compressive strength of min 250 psi as determined in accordance with ASTM C495-86.
      CELLULAR CONCRETE L L C — Mix No. 3.
      SIPLAST INC —Mix No. 3.
   E. Floor Topping Mixture* (Optional, not shown) — Approx 4.5 gal of water to 41 lbs of NVS Premix floor topping mixture. Slurry coat 1/8 in. thickness beneath foamed plastic (Item 9) when used, 1 in. min topping thickness.
      SIPLAST INC
      Floor Topping Mixture may be covered with Built-Up or Single Membrance Roof Covering.
9. Foamed Plastic* — (Optional-not shown) For use only with vermiculate or cellular concretes or Floor Topping mixture (Item 8E) -Rigid polystyrene foamed plastic insulation having slots and/or holes sandwiched between vermiculite concrete slurry which is applied to the normal or lightweight concrete surface and concrete topping. Max thickness to be 8 in.
   SIPLAST INC
   VERMICULITE PRODUCTS INC
10. Roof Insulation-Mineral and Fiber Boards* or Foamed Plastic* — (Optional, not shown) — Mineral and fiber boards or polyisocyanurate roof insulation applied over concrete floor with no restriction on board thickness. When mineral and fiber boards or polyisocyanurate roof insulation are used the unrestrained beam rating shall be increased by a min of 1/2 hr. See Mineral and Fiber Boards (CERZ) or Foamed Plastic (CCVW) category for names of Manufacturers.

*Bearing the UL Classification Mark

Design No. D926

Restrained Assembly Ratings — 1-1/2, 2 & 3 HR (See Items 1, 3, 4 & 5)
Unrestrained Assembly Rating — 1/2 HR (See Item 4)
Unrestrained Beam Ratings — 2 & 3 HR (See Item 6)



Support — W8x28 min size steel beam or W10x22 min size steel beam.

1. Normal Weight Concrete — Normal weight concrete carbonate or siliceous aggregate 145 plus or minus 3 pcf unit weight, min 2500 psi compressive strength, vermiculated.

Restrained Assembly Rating Hr	Concrete Thkns In. Carbonate Aggregate	Siliceous Aggregate
1-1/2	4-3/4	4-3/4
2	4-3/4	5
3	5-3/4	6-1/8

2. Negative Reinforcement — For floor spans with concrete cast continuous over the supporting beams, and steel deck is continuous over support. Deformed bars designed to resist the support moments of the concrete slab in accordance with the latest ACI Building Code specifications
3. Welded Wire Fabric — For use with 2 and 3 hr ratings optional for 1/2 hr ratings. 6 x 6 - W1.4 x W1.4.
4. Steel Floor and Form Units* — Composite 2-3/4 in. deep galv fluted units. Min gauges are No 20 MSG. Units may be used for simple floor spans or for continuous spans over supports. Units welded to supports

Fire Resistive Materials (Item 2) to form the completed column protection. See table below for appropriate thickness.

Rating Hr	Min Thks In.
4	1-7/16
3	1-1/8
2	3/4
1-1/2	5/8
1	9/16

PARK DEROCHIE COATINGS LTD —Type 2

2. Spray-Applied Fire Resistive Materials* — See table under Item 1 for appropriate thicknesses. Spray-Applied Fire Resistive Materials to be forced through lath of building units such that entire space between building unit edges is filled. Prepared by mixing with water according to instructions on each bag of mixture. Mixture is sprayed and/or trowel-applied over lath as shown. Min average density of 60 pcf with min individual density of 55 pcf. For method of density determination, see General Information Section, preceding these designs. Surface of material may be lightly finished with a trowel. As an option, the column and/or lath surfaces may be primed.

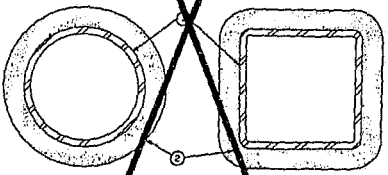
CARBOLINE CO —Type 201

3. Metal Lath — 3.4 lb/sq yd galvanized expanded steel. Secured to column with copper coated steel pins welded to column web along vertical centerline and spaced maximum 12 in. OC. Welded pins bent 90 degrees after installation of lath.
4. Wire Ties — Normally No. 18 SWG galvanized steel wire used to tie the metal lath embedded in building unit. Wire ties spaced maximum 10 in. OC. along vertical centerline of column flange.
5. Ribs (Not Shown) — Nominally 2 in. thick cellular glass insulation cut to fit snugly between column flanges and spaced nominally 12 in. OC. Ribs secured by trowel-applied Spray-Applied Fire Resistive Materials over the three edges of insulation in contact with column flanges and web.
6. Steel Column — W10X49 minimum size.

*Bearing the UL Classification Mark

Design No. X771

Ratings — 3, 2, 1, 1-1/2, 2, 3 and 4 h



1. Steel Pipe or Tube Column — Steel circular pipe with diameter (OD) ranging from a minimum of 3 in. to a maximum of 32 in. with a minimum wall thickness of 3/16 in.
Steel square or rectangular tube with outside wall dimensions ranging from a minimum of 3 in. to a maximum of 32 in. and a minimum wall thickness of 3/16 in.
The A/P ratio of the steel pipe or tube (see Item 2) shall range from 0.18 to 2.0.
2. Spray-Applied Fire Resistive Materials* — Applied by mixing with water and spraying in one or more coats to steel surfaces which must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G. For method of density determination, see Design Information Section, preceding these designs.
The hourly rating of the structural member is dependent upon the ratio of A/P and the thickness of Spray-Applied Fire Resistive Materials, where A is the cross sectional area of the pipe or tube and P is the heated perimeter. The A/P ratio of a circular pipe is determined by:

$$A/P_{pipe}=\frac{t(d-t)}{d}$$

Where:
d = the outer diameter of the pipe (in.)
t = the wall thickness of the pipe (in.)
The A/P ratio of a rectangular or square tube is determined by:

$$A/P_{tube}=\frac{t(a+b-2t)}{a+b}$$

Where:
a = the outer width of the tube (in.)
b = the outer length of the tube (in.)

t = the wall thickness of the tube (in.)
The thickness of Spray-Applied Fire Resistive Materials for ratings of 3/4, 1, 1-1/2, 2, 3 and 4 h of a steel pipe or tube can be determined by the equation:

$$h=\frac{R-0.20}{4.43(A/P)}$$

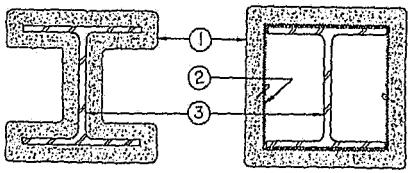
Where:
R = the hourly rating (hrs).
h = the thickness of Spray-Applied Fire Resistive Materials, minimum 1/4 in., maximum 3-7/8 in.

ARABIAN VERMICULITE INDUSTRIES —Types MK-5, MK-6/CBF, MK-6/ED, MK-6/HY, MK-6s, Sonophone 1, Sonophone 5, Z-106, Z-106/G.
GRACE CANADA INC —Types MK-4, MK-5.
GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6s, Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G.
PYROK INC —Type LD.
SOUTHWEST VERMICULITE CO —Types 4, 5, 5EF, 5GP, 5MD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD.
VERMICULITE PRODUCTS INC —Types MK-4, MK-5.
W R GRACE & CO - CONN
CONSTRUCTION PRODUCTS DIV —Types MK-4, MK-5, MK-6/HY, MK-6s, Monokote Acoustic 1, Monokote Acoustic 5, RG, Z-106, Z-106/G.

*Bearing the UL Classification Mark

Design No. X772

Ratings — 1, 1-1/2, 2, 3 and 4 h.



1. Spray-Applied Fire Resistive Materials* — Applied by mixing with water and spraying in more than one coat to the thicknesses shown below, to steel surfaces which are clean and free of dirt, loose scale, and oil. Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G. For method of density determination, see Design Information Section, Sprayed Material.
The thickness of Spray-Applied Fire Resistive Materials to be applied to all surfaces of the column (Item 1) required for rating periods of 1 h, 1-1/2 h, 2 h, 3 h, 4 h may be determined by the equation:

$$h=\frac{R}{1.05(W/D)+0.61}$$

Where:
h = Spray-Applied Fire Resistive Materials thickness in the range 0.25-3.875 in.
R = Fire resistance rating in hours (1 - 4 h)
D = Heated perimeter of steel column in inches
W = Weight of steel column in lbs per foot
W/D = 0.33 to 6.62
As an alternate to the equation, the minimum thickness of Spray-Applied Fire Resistive Materials required for various fire resistance ratings of contour sprayed or boxed columns may be determined from the table below:

Min Col Size	W/D	Min Thk In. 1 Hr	1-1/2 Hr	2 Hr	3 Hr	4 Hr
W6X9	0.33	1-1/8	1-1/2	2	2-1/2	3-13/16
W6x16	0.57	13/16	1-1/4	1-11/16	2-1/2	3-5/16
W8x28	0.67	3/4	1-3/16	1-3/8	2	2-11/16
W10x49	0.83	11/16	7/8	1-1/8	1-11/16	2-1/2
W14x228	2.49	5/16	1/2	9/16	7/8	1-1/4
W14x730	6.62	5/16	5/16	5/16	3/8	9/16

The thicknesses contained in the table below are applicable when the Spray-Applied Fire Resistive Materials applied to columns' flange tips are reduced to one half that shown in the table below:

Min. Col Size	W/D	Min Thk In. 1 Hr	1-1/2 Hr	2 Hr	3 Hr	4 Hr
W6x9	0.33	1-1/8	1-5/8	2-1/16	2-15/16	3-13/16
W6x16	0.57	7/8	1-5/16	1-3/4	2-9/16	3-3/8
W8x28	0.67	13/16	1-3/16	1-1/2	2-1/4	2-15/16
W10x49	0.83	3/4	1-1/16	1-3/8	2-1/16	2-3/4
W14x233	2.49	5/16	1/2	11/16	1-3/16	1-5/8
W14x730	6.62	5/16	5/16	5/16	9/16	3/4

ARABIAN VERMICULITE INDUSTRIES —Types MK-5, MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, *Sonophone* 1, *Sonophone* 5, Z-106, Z-106/G.

GRACE CANADA INC —Types MK-4 or MK-5.

W R GRACE & CO - CONN CONSTRUCTION PRODUCTS DIV —Types MK-4, MK-5, MK-6/HY, MK-6/HY Extended Set, MK-6s, RG, Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6s, Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G.

PYROK INC —Type LD.

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

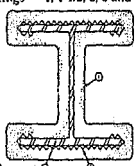
VERMICULITE PRODUCTS INC —Type MK-4 or MK-5.

2. Metal Lath — (Optional for contour application) — 3.4 lb/sq yd galvanized or painted expanded steel lath. Lath shall be lapped 1 in. and tied together with No. 18 SWG galvanized steel; wire spaced vertically 6 in. O.C.
3. Steel Column — Wide flange steel column, min sizes as shown in the tables below.

*Bearing the UL Classification Mark

Design No. X776

Ratings — 1, 1-1/2, 2, 3 and 4 Hrs.



1. Spray-Applied Fire Resistive Materials* — See table below for required thicknesses. Where metal lath is present, thicknesses are measured to surface of lath, all other thicknesses are measured to steel surface. Prepared by mixing with water according to instructions printed on each bag of mixture. Mixture can be spray or trowel applied in one or more coats to the column and lath surfaces which must be clean and free of dirt, loose scale, and oil. Minimum average density of 28 lb/cu ft, with minimum individual value of 25 lb/cu ft for the Type 239. For method of density determination, see Design Information Section, Sprayed Material. Surface of material may be lightly finished with a trowel. As an option, column surfaces may be primed.

Rating Hr	Min Thkns In.
1	1/2
1-1/2	7/8
2	1-1/16
3	1-1/2
4	1-7/8

CARBOLINE CO —Type 239. Investigated for exterior use.

CARBOLINE KOREA LTD —Type 239. Investigated for exterior use.

CARBOLINE MIDDLE EAST L L C —Type 239. Investigated for exterior use.

CARBOLINE SOUTHEAST ASIA PTE LTD —Type 239. Investigated for exterior use.

CDC CARBOLINE (INDIA) PVT LTD —Types 239, CDC Crete 239. Investigated for exterior use.

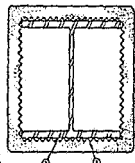
CENTRAL PAINTS IND INC LTD —Type 239.

2. Reinforcing Mesh or Metal Lath — Reinforcing mesh No. 19 SWG galv steel wire twisted to form 2 in. hexagons with straight No. 19 SWG galv steel wire woven into mesh and spaced 3 in. apart for stiffness. Mesh placed around column flanges and secured in position by means of furring clips (Item No 2A) in lieu of the reinforcing mesh, galv expanded steel lath, weighing 3.4 lb/sq yd may be used. Lath secured to column by wrapping tightly around flanges a min of 1-1/2 in. toward web of column.
2A. Furring Clips — (Not Shown) — Required only when reinforcing mesh is used. Clips consist of No. 11 SWG galv steel wire, 1 in. deep with 1-1/2 and 1-3/4 in. long legs. Clips spaced vertically 12 in. O.C. on column flange edges over reinforcing mesh.
3. Steel Column — Min size of column, W10X49.

*Bearing the UL Classification Mark

Design No. X777

Ratings — 1, 1-1/2, 2, 3 and 4 Hrs.



1. Spray-Applied Fire Resistive Materials* — See table below for required thicknesses. Thicknesses are measured to surface of lath. Prepared by mixing with water according to instructions printed on each bag of mixture. Mixture can be spray or trowel applied in one or more coats to the column and lath surfaces which must be clean and free of dirt, loose scale, and oil. Minimum average density of 28 lb/cu ft, with minimum individual value of 25 lb/cu ft for the Type 239. For method of density determination, see Design Information Section, Sprayed Material. Surface of material may be lightly finished with a trowel. As an option, column surfaces may be primed.

Rating Hr	Min Thkns In.
1	1/2
1-1/2	7/8
2	1-1/16
3	1-1/2
4	1-7/8

CARBOLINE CO —Type 239. Investigated for exterior use.

CARBOLINE KOREA LTD —Type 239. Investigated for exterior use.

CARBOLINE MIDDLE EAST L L C —Type 239. Investigated for exterior use.

CARBOLINE SOUTHEAST ASIA PTE LTD —Type 239. Investigated for exterior use.

CDC CARBOLINE (INDIA) PVT LTD —Types 239, CDC Crete 239. Investigated for exterior use.

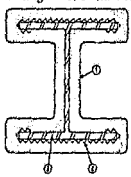
CENTRAL PAINTS IND INC LTD —Type 239.

2. Metal Lath — 3.4 lb/sq yd expanded steel, wrapped around the column to form a boxed configuration. Lath lapped 1 in. at vertical joint opposite web, and tied together with No. 18 SWG galv steel wire spaced vertically 6 in. O.C.
3. Steel Column — Min size of column, W10X49.

*Bearing the UL Classification Mark

Design No. X778

Ratings — 2, 3 and 4 Hr



1. Spray-Applied Fire Resistive Materials* — See table below for required thicknesses. Where metal lath is present, thicknesses are measured to surface of lath, all other thicknesses are measured to steel surface. Prepared by mixing with water according to instructions printed on each bag of mixture. Mixture can be spray or trowel applied in one or more coats to the column and lath surfaces which must be clean and free of dirt, loose scale, and oil. Minimum average density of 28 lb/cu

Protected Floor/Ceiling - 2 1/2" Minimum Concrete, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106, Z-106/G Z-106/HY, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-779

Concrete Weight: NWC or LWC — **ICBO 4607 Table** 2A

FULL FLANGE TIP THICKNESS							*HALF-FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Member Size xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
1/2	7/8	1 1/8	1 1/2	1 7/8	W4 x13	0.65	1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	7/8	1 1/8	1 1/2	1 7/8	W5 x16	0.65	1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	13/16	1 1/16	1 3/8	1 11/16	W5 x19	0.76	1/2	13/16	1 1/16	1 1/2	2
5/8	1 1/16	1 7/16	1 7/8	2 5/16	W6 x9	0.39	5/8	1 1/16	1 7/16	2 1/16	2 3/4
9/16	1	1 5/16	1 11/16	2 1/16	W6 x12	0.51	9/16	1	1 5/16	1 7/8	2 1/2
9/16	1	1 5/16	1 11/16	2 1/16	W6 x15	0.51	9/16	1	1 5/16	1 7/8	2 1/2
1/2	7/8	1 1/8	1 1/2	1 13/16	W6 x16	0.66	1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	7/8	1 1/8	1 1/2	1 13/16	W6 x20	0.67	1/2	7/8	1 1/8	1 5/8	2 3/16
7/16	3/4	1	1 5/16	1 5/8	W6 x25	0.82	7/16	3/4	1	1 7/16	1 15/16
11/16	1 1/8	1 1/2	1 15/16	2 3/8	W8 x10	0.37	11/16	1 1/8	1 1/2	2 1/8	2 13/16
5/8	1	1 5/16	1 3/4	2 3/16	W8 x13	0.47	5/8	1	1 5/16	1 15/16	2 9/16
9/16	15/16	1 1/4	1 5/8	2	W8 x15	0.54	9/16	15/16	1 1/4	1 13/16	2 7/16
9/16	15/16	1 1/4	1 5/8	2	W8 x18	0.57	9/16	15/16	1 1/4	1 3/4	2 3/8
1/2	7/8	1 1/8	1 1/2	1 13/16	W8 x21	0.66	1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	7/8	1 1/8	1 7/16	1 13/16	W8 x24	0.69	1/2	7/8	1 1/8	1 9/16	2 1/8
7/16	3/4	1	1 5/16	1 5/8	W8 x28	0.80	7/16	3/4	1	1 7/16	1 15/16
1/2	13/16	1 1/16	1 3/8	1 11/16	W8 x31	0.79	1/2	13/16	1 1/16	1 1/2	2
7/16	3/4	1	1 1/4	1 9/16	W8 x35	0.88	7/16	3/4	1	1 3/8	1 7/8
7/16	11/16	7/8	1 3/16	1 7/16	W8 x40	1.00	7/16	11/16	7/8	1 5/16	1 3/4
3/8	5/8	13/16	1 1/16	1 5/16	W8 x48	1.18	3/8	5/8	13/16	1 3/16	1 9/16
3/8	9/16	3/4	15/16	1 3/16	W8 x58	1.41	3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/16	W8 x67	1.61	3/8	1/2	11/16	15/16	1 1/4
5/8	1 1/8	1 7/16	1 7/8	2 3/8	W10 x12	0.38	5/8	1 1/8	1 7/16	2 1/16	2 13/16
5/8	1	1 5/16	1 3/4	2 1/8	W10 x15	0.48	5/8	1	1 5/16	1 7/8	2 9/16
9/16	15/16	1 1/4	1 5/8	2	W10 x17	0.54	9/16	15/16	1 1/4	1 13/16	2 7/16
9/16	15/16	1 3/16	1 9/16	1 15/16	W10 x19	0.59	9/16	15/16	1 3/16	1 3/4	2 5/16
9/16	15/16	1 3/16	1 9/16	1 15/16	W10 x22	0.59	9/16	15/16	1 3/16	1 3/4	2 5/16
1/2	7/8	1 1/8	1 7/16	1 13/16	W10 x26	0.69	1/2	7/8	1 1/8	1 9/16	2 1/8
1/2	13/16	1 1/16	1 3/8	1 11/16	W10 x30	0.79	1/2	13/16	1 1/16	1 1/2	2
1/2	13/16	1 1/16	1 3/8	1 11/16	W10 x33	0.77	1/2	13/16	1 1/16	1 1/2	2
7/16	3/4	15/16	1 1/4	1 9/16	W10 x39	0.90	7/16	3/4	15/16	1 3/8	1 13/16
7/16	11/16	7/8	1 3/16	1 7/16	W10 x45	1.03	7/16	11/16	7/8	1 1/4	1 11/16
7/16	11/16	15/16	1 3/16	1 7/16	W10 x49	0.99	7/16	11/16	15/16	1 5/16	1 3/4
3/8	5/8	7/8	1 1/8	1 3/8	W10 x54	1.09	3/8	5/8	7/8	1 1/4	1 5/8
3/8	5/8	13/16	1 1/16	1 5/16	W10 x60	1.20	3/8	5/8	13/16	1 1/8	1 9/16
3/8	9/16	3/4	1	1 3/16	W10 x68	1.35	3/8	9/16	3/4	1 1/16	1 7/16
3/8	1/2	11/16	7/8	1 1/8	W10 x77	1.52	3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	13/16	1	W10 x88	1.72	3/8	1/2	5/8	7/8	1 3/16
3/8	7/16	9/16	3/4	15/16	W10 x100	1.93	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	11/16	7/8	W10 x112	2.14	3/8	7/16	9/16	3/4	1
5/8	1 1/16	1 7/16	1 7/8	2 5/16	W12 x14	0.40	5/8	1 1/16	1 7/16	2 1/16	2 3/4
5/8	1	1 3/8	1 3/4	2 3/16	W12 x16	0.45	5/8	1	1 3/8	1 15/16	2 5/8
9/16	15/16	1 1/4	1 11/16	2 1/16	W12 x19	0.53	9/16	15/16	1 1/4	1 13/16	2 7/16
9/16	7/8	1 3/16	1 9/16	1 15/16	W12 x22	0.61	9/16	7/8	1 3/16	1 11/16	2 1/4
9/16	7/8	1 3/16	1 9/16	1 15/16	W12 x26	0.60	9/16	7/8	1 3/16	1 11/16	2 5/16
1/2	7/8	1 1/8	1 7/16	1 13/16	W12 x30	0.69	1/2	7/8	1 1/8	1 9/16	2 1/8
1/2	13/16	1 1/16	1 3/8	1 11/16	W12 x35	0.79	1/2	13/16	1 1/16	1 1/2	2
7/16	3/4	1	1 5/16	1 5/8	W12 x40	0.85	7/16	3/4	1	1 7/16	1 7/8
7/16	11/16	15/16	1 3/16	1 1/2	W12 x45	0.95	7/16	11/16	15/16	1 5/16	1 3/4
3/8	11/16	7/8	1 1/8	1 7/16	W12 x50	1.04	3/8	11/16	7/8	1 1/4	1 11/16
7/16	11/16	15/16	1 3/16	1 7/16	W12 x53	0.99	7/16	11/16	15/16	1 5/16	1 3/4

Protected Floor/Ceiling - 2 1/2" Minimum Concrete, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106, Z-106/G Z-106/HY, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness

Concrete Weight: NWC or LWC

U. L. Design No. D-779

ICBO 4607 Table 2A

FULL FLANGE TIP THICKNESS							HALF-FLANGE TIP THICKNESS				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Member		1 hr	1.5 hr	2 hr	3 hr	4 hr
					Size xWt.	W/D					
3/8	11/16	7/8	1 1/8	1 7/16	W12 x54	1.04	3/8	11/16	7/8	1 1/4	1 11/16
3/8	11/16	7/8	1 1/8	1 7/16	W12 x55	1.04	3/8	11/16	7/8	1 1/4	1 11/16
3/8	5/8	7/8	1 1/8	1 3/8	W12 x58	1.08	3/8	5/8	7/8	1 1/4	1 5/8
3/8	5/8	7/8	1 1/8	1 3/8	W12 x65	1.09	3/8	5/8	7/8	1 1/4	1 5/8
3/8	5/8	13/16	1 1/16	1 5/16	W12 x72	1.20	3/8	5/8	13/16	1 1/8	1 9/16
3/8	9/16	3/4	1	1 3/16	W12 x79	1.32	3/8	9/16	3/4	1 1/16	1 7/16
3/8	9/16	11/16	15/16	1 1/8	W12 x87	1.44	3/8	9/16	11/16	1	1 3/8
3/8	1/2	11/16	7/8	1 1/16	W12 x96	1.57	3/8	1/2	11/16	15/16	1 1/4
3/8	1/2	5/8	13/16	1	W12 x106	1.73	3/8	1/2	5/8	7/8	1 3/16
3/8	7/16	9/16	3/4	15/16	W12 x120	1.94	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	11/16	7/8	W12 x136	2.17	3/8	7/16	9/16	3/4	1
3/8	3/8	1/2	5/8	13/16	W12 x152	2.40	3/8	3/8	1/2	11/16	15/16
3/8	3/8	7/16	5/8	3/4	W12 x170	2.66	3/8	3/8	7/16	5/8	7/8
3/8	3/8	7/16	9/16	11/16	W12 x190	2.93	3/8	3/8	7/16	5/8	13/16
3/8	3/8	3/8	1/2	5/8	W12 x210	3.21	3/8	3/8	3/8	9/16	3/4
3/8	3/8	3/8	1/2	9/16	W12 x230	3.47	3/8	3/8	3/8	1/2	11/16
3/8	3/8	3/8	7/16	9/16	W12 x252	3.76	3/8	3/8	3/8	1/2	5/8
3/8	3/8	3/8	7/16	1/2	W12 x279	4.10	3/8	3/8	3/8	7/16	5/8
3/8	3/8	3/8	3/8	1/2	W12 x305	4.41	3/8	3/8	3/8	7/16	9/16
3/8	3/8	3/8	3/8	7/16	W12 x336	4.78	3/8	3/8	3/8	3/8	9/16
9/16	13/16	1 1/4	1 11/16	2 1/16	W14 x22	0.52	9/16	15/16	1 1/4	1 13/16	2 7/16
9/16	7/8	1 3/16	1 9/16	1 15/16	W14 x26	0.61	9/16	7/8	1 3/16	1 11/16	2 1/4
1/2	7/8	1 3/16	1 1/2	1 7/8	W14 x30	0.83	1/2	7/8	1 3/16	1 11/16	2 1/4
1/2	13/16	1 1/8	1 7/16	1 3/4	W14 x34	0.71	1/2	13/16	1 1/8	1 9/16	2 1/8
1/2	13/16	1 1/16	1 3/8	1 11/16	W14 x38	0.79	1/2	13/16	1 1/16	1 1/2	2
7/16	3/4	1	1 5/16	1 5/8	W14 x43	0.85	7/16	3/4	1	1 7/16	1 7/8
7/16	11/16	15/16	1 1/4	1 1/2	W14 x48	0.94	7/16	11/16	15/16	1 5/16	1 13/16
7/16	11/16	7/8	1 3/16	1 7/16	W14 x53	1.03	7/16	11/16	7/8	1 1/4	1 11/16
3/8	11/16	7/8	1 1/8	1 3/8	W14 x61	1.07	3/8	11/16	7/8	1 1/4	1 5/8
3/8	5/8	13/16	1 1/16	1 5/16	W14 x68	1.19	3/8	5/8	13/16	1 1/8	1 9/16
3/8	9/16	3/4	1	1 1/4	W14 x74	1.28	3/8	9/16	3/4	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W14 x82	1.41	3/8	9/16	3/4	1 1/16	1 3/8
3/8	9/16	3/4	1	1 1/4	W14 x90	1.27	3/8	9/16	3/4	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W14 x99	1.39	3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/8	W14 x109	1.53	3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	13/16	1 1/16	W14 x120	1.67	3/8	1/2	5/8	15/16	1 1/4
3/8	7/16	5/8	13/16	15/16	W14 x132	1.83	3/8	7/16	5/8	7/8	1 1/8
3/8	7/16	9/16	3/4	15/16	W14 x145	1.94	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	11/16	7/8	W14 x159	2.11	3/8	7/16	9/16	3/4	1 1/16
3/8	3/8	1/2	11/16	13/16	W14 x176	2.32	3/8	3/8	1/2	3/4	15/16
3/8	3/8	1/2	5/8	3/4	W14 x193	2.53	3/8	3/8	1/2	11/16	7/8
3/8	3/8	7/16	9/16	11/16	W14 x211	2.74	3/8	3/8	7/16	5/8	13/16
3/8	3/8	7/16	9/16	11/16	W14 x233	3.00	3/8	3/8	7/16	9/16	13/16
3/8	3/8	3/8	1/2	5/8	W14 x257	3.27	3/8	3/8	3/8	9/16	3/4
3/8	3/8	3/8	1/2	9/16	W14 x283	3.57	3/8	3/8	3/8	1/2	11/16
3/8	3/8	3/8	7/16	9/16	W14 x311	3.88	3/8	3/8	3/8	1/2	5/8
3/8	3/8	3/8	7/16	1/2	W14 x342	4.21	3/8	3/8	3/8	7/16	5/8
3/8	3/8	3/8	3/8	1/2	W14 x370	4.51	3/8	3/8	3/8	7/16	9/16
3/8	3/8	3/8	3/8	7/16	W14 x398	4.80	3/8	3/8	3/8	3/8	9/16
3/8	3/8	3/8	3/8	7/16	W14 x426	5.09	3/8	3/8	3/8	3/8	1/2
3/8	3/8	3/8	3/8	7/16	W14 x455	5.38	3/8	3/8	3/8	3/8	1/2

Protected Floor/Ceiling - 2 1/2" Minimum Concrete, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106, Z-106/G Z-106/HY, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-779

Concrete Weight: NWC or LWC — **ICBO 4607 Table** 2A

FULL FLANGE TIP THICKNESS								*HALF-FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Member			1 hr	1.5 hr	2 hr	3 hr	4 hr
					Size xWt.	W/D						
3/8	3/8	3/8	3/8	3/8	W14 x500	5.82		3/8	3/8	3/8	3/8	7/16
3/8	3/8	3/8	3/8	3/8	W14 x550	6.30		3/8	3/8	3/8	3/8	7/16
3/8	3/8	3/8	3/8	3/8	W14 x605	6.80		3/8	3/8	3/8	3/8	3/8
3/8	3/8	3/8	3/8	3/8	W14 x665	7.34		3/8	3/8	3/8	3/8	3/8
3/8	3/8	3/8	3/8	3/8	W14 x730	7.90		3/8	3/8	3/8	3/8	3/8
9/16	15/16	1 1/4	1 5/8	2	W16 x26	0.55		9/16	15/16	1 1/4	1 3/4	2 3/8
1/2	7/8	1 1/8	1 1/2	1 7/8	W16 x31	0.65		1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	7/8	1 1/8	1 7/16	1 13/16	W16 x36	0.69		1/2	7/8	1 1/8	1 9/16	2 1/8
1/2	13/16	1 1/16	1 3/8	1 11/16	W16 x40	0.76		1/2	13/16	1 1/16	1 1/2	2
7/16	3/4	1	1 5/16	1 5/8	W16 x45	0.85		7/16	3/4	1	1 7/16	1 7/8
7/16	11/16	15/16	1 1/4	1 1/2	W16 x50	0.94		7/16	11/16	15/16	1 5/16	1 13/16
3/8	11/16	7/8	1 1/8	1 3/8	W16 x57	1.07		3/8	11/16	7/8	1 1/4	1 5/8
3/8	11/16	7/8	1 1/8	1 3/8	W16 x67	1.07		3/8	11/16	7/8	1 1/4	1 5/8
3/8	5/8	13/16	1 1/16	1 1/4	W16 x77	1.22		3/8	5/8	13/16	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W16 x89	1.40		3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/16	W16 x100	1.55		3/8	1/2	11/16	15/16	1 5/16
1/2	7/8	1 1/8	1 1/2	1 13/16	W18 x35	0.66		1/2	7/8	1 1/8	1 5/8	2 3/16
1/2	13/16	1 1/16	1 3/8	1 11/16	W18 x40	0.75		1/2	13/16	1 1/16	1 1/2	2 1/16
7/16	3/4	1	1 5/16	1 9/16	W18 x46	0.86		7/16	3/4	1	1 7/16	1 7/8
7/16	3/4	1	1 1/4	1 9/16	W18 x50	0.87		7/16	3/4	1	1 3/8	1 7/8
7/16	11/16	15/16	1 3/16	1 1/2	W18 x55	0.95		7/16	11/16	15/16	1 5/16	1 3/4
7/16	11/16	7/8	1 3/16	1 7/16	W18 x60	1.03		7/16	11/16	7/8	1 1/4	1 11/16
3/8	5/8	7/8	1 1/8	1 3/8	W18 x65	1.11		3/8	5/8	7/8	1 3/16	1 5/8
3/8	5/8	13/16	1 1/16	1 5/16	W18 x71	1.21		3/8	5/8	13/16	1 1/8	1 1/2
3/8	5/8	7/8	1 1/8	1 3/8	W18 x76	1.11		3/8	5/8	7/8	1 3/16	1 5/8
3/8	5/8	13/16	1	1 1/4	W18 x86	1.24		3/8	5/8	13/16	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W18 x97	1.39		3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/8	W18 x106	1.52		3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	13/16	1	W18 x119	1.68		3/8	1/2	5/8	15/16	1 1/4
1/2	13/16	1 1/16	1 7/16	1 3/4	W21 x44	0.73		1/2	13/16	1 1/16	1 9/16	2 1/16
7/16	3/4	1	1 5/16	1 5/8	W21 x50	0.83		7/16	3/4	1	1 7/16	1 15/16
7/16	11/16	15/16	1 1/4	1 1/2	W21 x57	0.93		7/16	11/16	15/16	1 3/8	1 13/16
7/16	11/16	15/16	1 1/4	1 1/2	W21 x62	0.94		7/16	11/16	15/16	1 5/16	1 13/16
7/16	11/16	7/8	1 3/16	1 7/16	W21 x68	1.03		7/16	11/16	7/8	1 1/4	1 11/16
3/8	5/8	7/8	1 1/8	1 3/8	W21 x73	1.10		3/8	5/8	7/8	1 3/16	1 5/8
3/8	5/8	13/16	1	1 1/4	W21 x83	1.24		3/8	5/8	13/16	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W21 x93	1.38		3/8	9/16	3/4	1 1/16	1 3/8
3/8	9/16	3/4	1	1 1/4	W21 x101	1.20		3/8	9/16	3/4	1 1/8	1 7/16
3/8	9/16	3/4	15/16	1 3/16	W21 x111	1.41		3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/8	W21 x122	1.54		3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	7/8	1 1/16	W21 x132	1.66		3/8	1/2	5/8	15/16	1 1/4
3/8	7/16	5/8	13/16	15/16	W21 x147	1.83		3/8	7/16	5/8	7/8	1 1/8
7/16	3/4	1	1 5/16	1 5/8	W24 x55	0.82		7/16	3/4	1	1 7/16	1 15/16
7/16	3/4	15/16	1 1/4	1 1/2	W24 x62	0.92		7/16	3/4	15/16	1 3/8	1 13/16
7/16	11/16	15/16	1 1/4	1 1/2	W24 x68	0.93		7/16	11/16	15/16	1 3/8	1 13/16
7/16	11/16	7/8	1 3/16	1 7/16	W24 x76	1.02		7/16	11/16	7/8	1 1/4	1 11/16
3/8	5/8	13/16	1 1/16	1 3/8	W24 x84	1.13		3/8	5/8	13/16	1 3/16	1 5/8
3/8	5/8	13/16	1	1 1/4	W24 x94	1.26		3/8	5/8	13/16	1 1/8	1 1/2
3/8	5/8	13/16	1 1/16	1 1/4	W24 x104	1.22		3/8	5/8	13/16	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W24 x117	1.36		3/8	9/16	3/4	1 1/16	1 7/16
3/8	1/2	11/16	7/8	1 1/8	W24 x131	1.52		3/8	1/2	11/16	1	1 5/16

Protected Floor/Ceiling - 2 1/2" Minimum Concrete, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106, Z-106/G Z-106/HY, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-779

Concrete Weight: NWC or LWC — **ICBO 4607 Table** 2A

FULL FLANGE TIP THICKNESS					Member		HALF-FLANGE TIP THICKNESS				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
3/8	1/2	5/8	13/16	1	W24 x146	1.88	3/8	1/2	5/8	15/16	1 1/4
3/8	7/16	5/8	3/4	15/16	W24 x162	1.85	3/8	7/16	5/8	7/8	1 1/8
7/16	11/16	7/8	1 3/16	1 7/16	W27 x84	1.02	7/16	11/16	7/8	1 1/4	1 11/16
3/8	5/8	13/16	1 1/16	1 3/8	W27 x94	1.13	3/8	5/8	13/16	1 3/16	1 5/8
3/8	5/8	13/16	1 1/16	1 1/4	W27 x102	1.23	3/8	5/8	13/16	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W27 x114	1.36	3/8	9/16	3/4	1 1/16	1 7/16
3/8	1/2	11/16	7/8	1 1/8	W27 x146	1.53	3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	13/16	1	W27 x161	1.68	3/8	1/2	5/8	15/16	1 1/4
3/8	7/16	5/8	3/4	15/16	W27 x178	1.85	3/8	7/16	5/8	7/8	1 1/8
3/8	5/8	7/8	1 1/8	1 3/8	W30 x99	1.10	3/8	5/8	7/8	1 3/16	1 5/8
3/8	5/8	13/16	1 1/16	1 5/16	W30 x108	1.20	3/8	5/8	13/16	1 1/8	1 9/16
3/8	9/16	3/4	1	1 1/4	W30 x116	1.26	3/8	9/16	3/4	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W30 x124	1.37	3/8	9/16	3/4	1 1/16	1 7/16
3/8	9/16	11/16	15/16	1 1/8	W30 x132	1.45	3/8	9/16	11/16	1	1 3/8
3/8	1/2	5/8	7/8	1 1/16	W30 x173	1.88	3/8	1/2	5/8	15/16	1 1/4
3/8	7/16	5/8	13/16	1	W30 x191	1.82	3/8	7/16	5/8	7/8	1 1/8
3/8	7/16	9/16	3/4	7/8	W30 x211	2.00	3/8	7/16	9/16	13/16	1 1/16
3/8	5/8	13/16	1 1/16	1 5/16	W33 x118	1.19	3/8	5/8	13/16	1 1/8	1 9/16
3/8	9/16	3/4	1	1 1/4	W33 x130	1.31	3/8	9/16	3/4	1 1/16	1 7/16
3/8	9/16	3/4	15/16	1 3/16	W33 x141	1.41	3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/8	W33 x152	1.51	3/8	1/2	11/16	1	1 5/16
3/8	1/2	5/8	13/16	1	W33 x201	1.78	3/8	1/2	5/8	7/8	1 3/16
3/8	7/16	9/16	3/4	15/16	W33 x221	1.94	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	11/16	7/8	W33 x241	2.11	3/8	7/16	9/16	3/4	1 1/16
3/8	9/16	3/4	1	1 1/4	W36 x135	1.28	3/8	9/16	3/4	1 1/8	1 1/2
3/8	9/16	3/4	15/16	1 3/16	W36 x150	1.41	3/8	9/16	3/4	1 1/16	1 3/8
3/8	1/2	11/16	7/8	1 1/8	W36 x160	1.50	3/8	1/2	11/16	1	1 5/16
3/8	1/2	11/16	7/8	1 1/16	W36 x170	1.59	3/8	1/2	11/16	15/16	1 1/4
3/8	1/2	5/8	13/16	1	W36 x182	1.69	3/8	1/2	5/8	15/16	1 3/16
3/8	7/16	5/8	13/16	1	W36 x194	1.80	3/8	7/16	5/8	7/8	1 3/16
3/8	7/16	9/16	3/4	15/16	W36 x210	1.94	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	3/4	15/16	W36 x230	1.92	3/8	7/16	9/16	13/16	1 1/8
3/8	7/16	9/16	3/4	7/8	W36 x245	2.04	3/8	7/16	9/16	13/16	1 1/16
3/8	7/16	9/16	11/16	7/8	W36 x260	2.10	3/8	7/16	9/16	3/4	1
3/8	3/8	1/2	11/16	13/16	W36 x280	2.31	3/8	3/8	1/2	3/4	15/16
3/8	3/8	1/2	5/8	3/4	W36 x300	2.47	3/8	3/8	1/2	11/16	15/16
11/16	1 1/8	1 1/2	1 15/16	2 3/8	Other	0.37	11/16	1 1/8	1 1/2	2 1/8	2 13/16
5/8	1 1/8	1 7/16	1 7/8	2 3/8	Other	0.38	5/8	1 1/8	1 7/16	2 1/16	2 13/16
5/8	1 1/16	1 7/16	1 7/8	2 5/16	Other	0.39	5/8	1 1/16	1 7/16	2 1/16	2 3/4
5/8	1 1/16	1 7/16	1 7/8	2 5/16	Other	0.40	5/8	1 1/16	1 7/16	2 1/16	2 3/4
5/8	1 1/16	1 7/16	1 7/8	2 5/16	Other	0.41	5/8	1 1/16	1 7/16	2	2 11/16
5/8	1 1/16	1 3/8	1 13/16	2 1/4	Other	0.42	5/8	1 1/16	1 3/8	2	2 11/16
5/8	1 1/16	1 3/8	1 13/16	2 1/4	Other	0.43	5/8	1 1/16	1 3/8	2	2 11/16
5/8	1 1/16	1 3/8	1 13/16	2 3/16	Other	0.44	5/8	1 1/16	1 3/8	1 15/16	2 5/8
5/8	1	1 3/8	1 3/4	2 3/16	Other	0.45	5/8	1	1 3/8	1 15/16	2 5/8
5/8	1	1 3/8	1 3/4	2 3/16	Other	0.46	5/8	1	1 3/8	1 15/16	2 9/16
5/8	1	1 5/16	1 3/4	2 3/16	Other	0.47	5/8	1	1 5/16	1 15/16	2 9/16
5/8	1	1 5/16	1 3/4	2 1/8	Other	0.48	5/8	1	1 5/16	1 7/8	2 9/16
9/16	1	1 5/16	1 11/16	2 1/8	Other	0.49	9/16	1	1 5/16	1 7/8	2 1/2
9/16	1	1 5/16	1 11/16	2 1/8	Other	0.50	9/16	1	1 5/16	1 7/8	2 1/2
9/16	1	1 5/16	1 11/16	2 1/16	Other	0.51	9/16	1	1 5/16	1 7/8	2 1/2

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Unprotected Floor/Ceiling - Concrete Thickness Varies, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-925

Concrete Weight: NWC — **ICBO 4607 Table** 3

FULL FLANGE TIP THICKNESS					Member		HALF FLANGE TIP THICKNESS				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
7/16	3/4	1	1 1/2	1 7/8	W4 x13	0.65	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	3/4	1	1 1/2	1 7/8	W5 x16	0.65	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	11/16	15/16	1 3/8	1 3/4	W5 x19	0.76	1/2	13/16	1 1/16	1 11/16	2 1/8
9/16	15/16	1 1/4	1 7/8	2 3/8	W6 x9	0.39	5/8	1 1/16	1 1/2	2 5/16	2 15/16
1/2	13/16	1 1/8	1 11/16	2 1/8	W6 x12	0.51	9/16	1	1 5/16	2 1/16	2 5/8
1/2	13/16	1 1/8	1 11/16	2 1/8	W6 x15	0.51	9/16	1	1 5/16	2 1/16	2 5/8
7/16	3/4	1	1 1/2	1 7/8	W6 x16	0.66	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	3/4	1	1 1/2	1 13/16	W6 x20	0.67	1/2	7/8	1 3/16	1 13/16	2 5/16
3/8	5/8	7/8	1 5/16	1 5/8	W6 x25	0.82	7/16	3/4	1 1/16	1 5/8	2 1/16
9/16	15/16	1 5/16	1 15/16	2 3/8	W8 x10	0.37	11/16	1 1/8	1 1/2	2 5/16	3
1/2	7/8	1 3/16	1 3/4	2 3/16	W8 x13	0.47	5/8	1	1 3/8	2 1/8	2 3/4
1/2	13/16	1 1/8	1 5/8	2 1/16	W8 x15	0.54	9/16	15/16	1 5/16	2	2 9/16
1/2	3/4	1 1/16	1 5/8	2	W8 x18	0.57	9/16	15/16	1 1/4	1 15/16	2 1/2
7/16	3/4	1	1 1/2	1 7/8	W8 x21	0.66	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	11/16	1	1 7/16	1 13/16	W8 x24	0.69	1/2	7/8	1 1/8	1 3/4	2 1/4
3/8	5/8	7/8	1 7/16	2	W8 x28	0.80	7/16	3/4	1 1/16	1 11/16	2 5/16
7/16	11/16	15/16	1 3/8	1 11/16	W8 x31	0.79	1/2	13/16	1 1/16	1 5/8	2 1/8
3/8	5/8	7/8	1 1/4	1 9/16	W8 x35	0.88	7/16	3/4	1	1 9/16	2
3/8	9/16	13/16	1 3/16	1 7/16	W8 x40	1.00	7/16	11/16	15/16	1 7/16	1 13/16
3/8	1/2	3/4	1 1/16	1 5/16	W8 x48	1.18	3/8	5/8	13/16	1 5/16	1 5/8
3/8	7/16	5/8	15/16	1 3/16	W8 x58	1.41	3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	9/16	7/8	1 1/16	W8 x67	1.61	3/8	1/2	11/16	1 1/16	1 5/16
9/16	15/16	1 1/4	1 7/8	2 3/8	W10 x12	0.36	5/8	1 1/8	1 1/2	2 5/16	3
1/2	13/16	1 3/16	1 3/4	2 3/16	W10 x15	0.48	5/8	1	1 3/8	2 1/8	2 11/16
1/2	13/16	1 1/8	1 5/8	2 1/16	W10 x17	0.54	9/16	15/16	1 5/16	2	2 9/16
1/2	3/4	1 1/16	1 9/16	1 15/16	W10 x19	0.59	9/16	15/16	1 1/4	1 7/8	2 7/16
1/2	3/4	1 1/16	1 9/16	1 15/16	W10 x22	0.59	9/16	15/16	1 1/4	1 7/8	2 7/16
7/16	11/16	1	1 7/16	1 13/16	W10 x26	0.69	1/2	7/8	1 1/8	1 3/4	2 1/4
7/16	11/16	15/16	1 3/8	1 11/16	W10 x30	0.79	1/2	13/16	1 1/16	1 5/8	2 1/8
7/16	11/16	15/16	1 3/8	1 11/16	W10 x33	0.77	1/2	13/16	1 1/16	1 11/16	2 1/8
3/8	5/8	7/8	1 1/4	1 9/16	W10 x39	0.90	7/16	3/4	1	1 1/2	1 15/16
3/8	9/16	13/16	1 3/16	1 7/16	W10 x45	1.03	7/16	11/16	15/16	1 3/8	1 13/16
3/8	9/16	13/16	1 3/16	1 1/2	W10 x49	0.99	7/16	11/16	15/16	1 7/16	1 7/8
3/8	9/16	3/4	1 1/8	1 3/8	W10 x54	1.09	3/8	5/8	7/8	1 3/8	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W10 x60	1.20	3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	11/16	1	1 3/16	W10 x68	1.35	3/8	9/16	3/4	1 3/16	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W10 x77	1.52	3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1	W10 x88	1.72	3/8	1/2	5/8	1	1 1/4
3/8	3/8	1/2	3/4	15/16	W10 x100	1.93	3/8	7/16	5/8	15/16	1 3/16
3/8	3/8	1/2	11/16	7/8	W10 x112	2.14	3/8	7/16	9/16	7/8	1 1/16
9/16	7/8	1 1/4	1 7/8	2 5/16	W12 x14	0.40	5/8	1 1/16	1 1/2	2 1/4	2 15/16
5/8	1	1 3/8	1 3/4	2 3/16	W12 x16	0.45	5/8	1	1 3/8	2 1/8	2 3/4
1/2	13/16	1 1/8	1 11/16	2 1/16	W12 x19	0.53	9/16	15/16	1 5/16	2	2 9/16
7/16	3/4	1 1/16	1 9/16	1 15/16	W12 x22	0.61	9/16	7/8	1 1/4	1 7/8	2 7/16
7/16	3/4	1 1/16	1 9/16	1 15/16	W12 x26	0.60	9/16	7/8	1 1/4	1 7/8	2 7/16
7/16	11/16	1	1 7/16	1 13/16	W12 x30	0.69	1/2	7/8	1 1/8	1 3/4	2 1/4
7/16	11/16	15/16	1 3/8	1 11/16	W12 x35	0.79	1/2	13/16	1 1/16	1 5/8	2 1/8
3/8	5/8	7/8	1 5/16	1 5/8	W12 x40	0.85	7/16	3/4	1	1 9/16	2
3/8	5/8	13/16	1 3/16	1 1/2	W12 x45	0.95	7/16	11/16	15/16	1 1/2	1 7/8
3/8	9/16	3/4	1 1/8	1 7/16	W12 x50	1.04	3/8	11/16	15/16	1 3/8	1 13/16

Unprotected Floor/Ceiling - Concrete Thickness Varies, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-925

Concrete Weight: NWC — **ICBO 4607 Table** 3

FULL FLANGE TIP THICKNESS					Member		*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
3/8	9/16	13/16	1 3/16	1 1/2	W12 x53	0.99	7/16	11/16	15/16	1 7/16	1 7/8
3/8	9/16	3/4	1 1/8	1 7/16	W12 x54	1.04	3/8	11/16	15/16	1 3/8	1 13/16
3/8	9/16	3/4	1 1/8	1 7/16	W12 x55	1.04	3/8	11/16	15/16	1 3/8	1 13/16
3/8	9/16	3/4	1 1/8	1 3/8	W12 x58	1.08	3/8	5/8	7/8	1 3/8	1 3/4
3/8	9/16	3/4	1 1/8	1 3/8	W12 x65	1.09	3/8	5/8	7/8	1 3/8	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W12 x72	1.20	3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	11/16	1	1 1/4	W12 x79	1.32	3/8	9/16	13/16	1 3/16	1 9/16
3/8	7/16	5/8	15/16	1 3/16	W12 x87	1.44	3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	5/8	7/8	1 1/16	W12 x96	1.57	3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1	W12 x106	1.73	3/8	1/2	5/8	1	1 1/4
3/8	3/8	1/2	3/4	15/16	W12 x120	1.94	3/8	7/16	3/8	15/16	1 3/16
3/8	3/8	1/2	11/16	7/8	W12 x136	2.17	3/8	7/16	9/16	13/16	1 1/16
3/8	3/8	7/16	5/8	13/16	W12 x152	2.40	3/8	3/8	1/2	3/4	1
3/8	3/8	7/16	5/8	3/4	W12 x170	2.66	3/8	3/8	1/2	11/16	15/16
3/8	3/8	3/8	9/16	11/16	W12 x190	2.93	3/8	3/8	7/16	11/16	7/8
3/8	3/8	3/8	1/2	5/8	W12 x210	3.21	3/8	3/8	7/16	5/8	13/16
3/8	3/8	3/8	1/2	5/8	W12 x230	3.47	3/8	3/8	3/8	9/16	3/4
3/8	3/8	3/8	7/16	9/16	W12 x252	3.76	3/8	3/8	3/8	9/16	11/16
3/8	3/8	3/8	7/16	1/2	W12 x279	4.10	3/8	3/8	3/8	1/2	5/8
3/8	3/8	3/8	3/8	1/2	W12 x305	4.41	3/8	3/8	3/8	1/2	5/8
3/8	3/8	3/8	3/8	7/16	W12 x336	4.78	3/8	3/8	3/8	7/16	9/16
1/2	13/16	1 1/16	1 11/16	2 1/16	W14 x22	0.52	9/16	15/16	1 5/16	2	2 5/8
7/16	3/4	1 1/16	1 9/16	1 15/16	W14 x26	0.61	9/16	7/8	1 1/4	1 7/8	2 7/16
7/16	3/4	1	1 1/2	1 7/8	W14 x30	0.63	1/2	7/8	1 3/16	1 7/8	2 3/8
7/16	11/16	15/16	1 7/16	1 13/16	W14 x34	0.71	1/2	13/16	1 1/8	1 3/4	2 1/4
7/16	11/16	15/16	1 3/8	1 11/16	W14 x38	0.79	1/2	13/16	1 1/16	1 5/8	2 1/8
3/8	5/8	7/8	1 5/16	1 5/8	W14 x43	0.85	7/16	3/4	1	1 9/16	2
3/8	5/8	13/16	1 1/4	1 1/2	W14 x48	0.94	7/16	11/16	15/16	1 1/2	1 7/8
3/8	9/16	13/16	1 3/16	1 7/16	W14 x53	1.03	7/16	11/16	15/16	1 3/8	1 13/16
3/8	9/16	3/4	1 1/8	1 7/16	W14 x61	1.07	3/8	11/16	7/8	1 3/8	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W14 x68	1.19	3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	11/16	1	1 1/4	W14 x74	1.28	3/8	5/16	13/16	1 3/16	1 9/16
3/8	7/16	5/8	15/16	1 3/16	W14 x82	1.41	3/8	9/16	3/4	1 1/8	1 7/16
3/8	1/2	11/16	1	1 1/4	W14 x90	1.27	3/8	9/16	13/16	1 1/4	1 9/16
3/8	1/2	5/8	15/16	1 3/16	W14 x99	1.39	3/8	9/16	3/4	1 1/8	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W14 x109	1.53	3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1 1/16	W14 x120	1.67	3/8	1/2	11/16	1	1 5/16
3/8	3/8	9/16	13/16	1	W14 x132	1.83	3/8	7/16	5/8	15/16	1 1/4
3/8	3/8	1/2	3/4	15/16	W14 x145	1.94	3/8	7/16	5/8	15/16	1 3/16
3/8	3/8	1/2	11/16	7/8	W14 x159	2.11	3/8	7/16	9/16	7/8	1 1/8
3/8	3/8	7/16	11/16	13/16	W14 x176	2.32	3/8	3/8	1/2	13/16	1
3/8	3/8	7/16	5/8	3/4	W14 x193	2.53	3/8	3/8	1/2	3/4	15/16
3/8	3/8	3/8	9/16	3/4	W14 x211	2.74	3/8	3/8	7/16	11/16	7/8
3/8	3/8	3/8	9/16	11/16	W14 x233	3.00	3/8	3/8	7/16	5/8	13/16
3/8	3/8	3/8	1/2	5/8	W14 x257	3.27	3/8	3/8	3/8	5/8	3/4
3/8	3/8	3/8	1/2	9/16	W14 x283	3.57	3/8	3/8	3/8	9/16	3/4
3/8	3/8	3/8	7/16	9/16	W14 x311	3.88	3/8	3/8	3/8	1/2	11/16
3/8	3/8	3/8	7/16	1/2	W14 x342	4.21	3/8	3/8	3/8	1/2	5/8
3/8	3/8	3/8	3/8	1/2	W14 x370	4.51	3/8	3/8	3/8	7/16	5/8
3/8	3/8	3/8	3/8	7/16	W14 x398	4.80	3/8	3/8	3/8	7/16	9/16

Unprotected Floor/Ceiling - Concrete Thickness Varies, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-925

Concrete Weight: NWC — **ICBO 4607 Table** 3

FULL FLANGE TIP THICKNESS					Member		*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
3/8	3/8	3/8	3/8	7/16	W14 x425	5.09	3/8	3/8	3/8	7/16	9/16
3/8	3/8	3/8	3/8	7/16	W14 x455	5.38	3/8	3/8	3/8	3/8	1/2
3/8	3/8	3/8	3/8	3/8	W14 x500	5.82	3/8	3/8	3/8	3/8	1/2
3/8	3/8	3/8	3/8	3/8	W14 x550	6.30	3/8	3/8	3/8	3/8	7/16
3/8	3/8	3/8	3/8	3/8	W14 x605	6.80	3/8	3/8	3/8	3/8	7/16
3/8	3/8	3/8	3/8	3/8	W14 x665	7.34	3/8	3/8	3/8	3/8	3/8
3/8	3/8	3/8	3/8	3/8	W14 x730	7.90	3/8	3/8	3/8	3/8	3/8
1/2	13/16	1 1/8	1 5/8	2	W16 x26	0.55	9/16	15/16	1 5/16	2	2 9/16
7/16	3/4	1	1 1/2	1 7/8	W16 x31	0.65	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	11/16	1	1 7/16	1 13/16	W16 x36	0.69	1/2	7/8	1 1/8	1 3/4	2 1/4
7/16	11/16	15/16	1 3/8	1 3/4	W16 x40	0.76	1/2	13/16	1 1/16	1 11/16	2 1/8
3/8	5/8	7/8	1 5/16	1 5/8	W16 x45	0.85	7/16	3/4	1	1 9/16	2
3/8	5/8	13/16	1 1/4	1 1/2	W16 x50	0.94	7/16	11/16	15/16	1 1/2	1 7/8
3/8	9/16	3/4	1 1/8	1 7/16	W16 x57	1.07	3/8	11/16	7/8	1 3/8	1 3/4
3/8	9/16	3/4	1 1/8	1 7/16	W16 x67	1.07	3/8	11/16	7/8	1 3/8	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W16 x77	1.22	3/8	5/8	13/16	1 1/4	1 5/8
3/8	7/16	5/8	15/16	1 3/16	W16 x89	1.40	3/8	9/16	3/4	1 1/8	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W16 x100	1.56	3/8	1/2	11/16	1 1/16	1 3/8
7/16	3/4	1	1 1/2	1 7/8	W18 x35	0.66	1/2	7/8	1 3/16	1 13/16	2 5/16
7/16	11/16	15/16	1 3/8	1 3/4	W18 x40	0.75	1/2	13/16	1 1/8	1 11/16	2 3/16
3/8	5/8	7/8	1 5/16	1 5/8	W18 x46	0.86	7/16	3/4	1	1 9/16	2
3/8	5/8	7/8	1 1/4	1 9/16	W18 x50	0.87	7/16	3/4	1	1 9/16	2
3/8	5/8	13/16	1 3/16	1 1/2	W18 x55	0.95	7/16	11/16	15/16	1 1/2	1 7/8
3/8	9/16	13/16	1 3/16	1 7/16	W18 x60	1.03	7/16	11/16	15/16	1 3/8	1 13/16
3/8	9/16	3/4	1 1/8	1 3/8	W18 x65	1.11	3/8	5/8	7/8	1 5/16	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W18 x71	1.21	3/8	5/8	13/16	1 1/4	1 5/8
3/8	9/16	3/4	1 1/8	1 3/8	W18 x76	1.11	3/8	5/8	7/8	1 5/16	1 3/4
3/8	1/2	11/16	1	1 1/4	W18 x86	1.24	3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	5/8	15/16	1 3/16	W18 x97	1.39	3/8	9/16	3/4	1 1/8	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W18 x106	1.52	3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1 1/16	W18 x119	1.66	3/8	1/2	11/16	1	1 5/16
7/16	11/16	15/16	1 7/16	1 3/4	W21 x44	0.73	1/2	13/16	1 1/8	1 11/16	2 3/16
3/8	5/8	7/8	1 5/16	1 5/8	W21 x50	0.83	7/16	3/4	1 1/16	1 9/16	2 1/16
3/8	5/8	13/16	1 1/4	1 9/16	W21 x57	0.93	7/16	11/16	1	1 1/2	1 15/16
3/8	5/8	13/16	1 1/4	1 1/2	W21 x62	0.94	7/16	11/16	15/16	1 1/2	1 7/8
3/8	9/16	13/16	1 3/16	1 7/16	W21 x68	1.03	7/16	11/16	15/16	1 3/8	1 13/16
3/8	9/16	3/4	1 1/8	1 3/8	W21 x73	1.10	3/8	5/8	7/8	1 5/16	1 3/4
3/8	1/2	11/16	1	1 1/4	W21 x83	1.24	3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	5/8	15/16	1 3/16	W21 x93	1.38	3/8	9/16	3/4	1 3/16	1 1/2
3/8	1/2	11/16	1	1 1/4	W21 x101	1.29	3/8	9/16	13/16	1 3/16	1 9/16
3/8	7/16	5/8	15/16	1 3/16	W21 x111	1.41	3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	5/8	7/8	1 1/8	W21 x122	1.54	3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	7/8	1 1/16	W21 x132	1.66	3/8	1/2	11/16	1	1 5/16
3/8	3/8	9/16	13/16	1	W21 x147	1.83	3/8	7/16	5/8	15/16	1 1/4
3/8	5/8	7/8	1 5/16	1 5/8	W24 x55	0.82	7/16	3/4	1 1/16	1 5/8	2 1/16
3/8	5/8	13/16	1 1/4	1 9/16	W24 x62	0.92	7/16	3/4	1	1 1/2	1 15/16
3/8	5/8	13/16	1 1/4	1 9/16	W24 x68	0.93	7/16	11/16	1	1 1/2	1 15/16
3/8	9/16	13/16	1 3/16	1 7/16	W24 x76	1.02	7/16	11/16	15/16	1 7/16	1 13/16
3/8	9/16	3/4	1 1/16	1 3/8	W24 x84	1.13	3/8	5/8	7/8	1 5/16	1 11/16
3/8	1/2	11/16	1	1 1/4	W24 x94	1.26	3/8	5/8	13/16	1 1/4	1 9/16

Unprotected Floor/Ceiling - Concrete Thickness Varies, Fluted Decking

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

Flange Protection: Full and Half Flange Thickness — **U. L. Design No.** D-925

Concrete Weight: NWC — **ICBO 4607 Table** 3

FULL FLANGE TIP THICKNESS								*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Member			1 hr	1.5 hr	2 hr	3 hr	4 hr
					Size xWt.	W/D						
3/8	1/2	11/16	1 1/16	1 5/16	W24 x104	1.22		3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	5/8	15/16	1 3/16	W24 x117	1.36		3/8	9/16	3/4	1 3/16	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W24 x131	1.52		3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1 1/16	W24 x146	1.68		3/8	1/2	11/16	1	1 5/16
3/8	3/8	1/2	3/4	15/16	W24 x162	1.85		3/8	7/16	5/8	15/16	1 3/16
3/8	9/16	13/16	1 3/16	1 7/16	W27 x84	1.02		7/16	11/16	15/16	1 7/16	1 13/16
3/8	9/16	3/4	1 1/16	1 3/8	W27 x94	1.13		3/8	5/8	7/8	1 5/16	1 11/16
3/8	1/2	11/16	1 1/16	1 5/16	W27 x102	1.23		3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	5/8	15/16	1 3/16	W27 x114	1.36		3/8	9/16	3/4	1 3/16	1 1/2
3/8	7/16	5/8	7/8	1 1/8	W27 x146	1.53		3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1 1/16	W27 x161	1.68		3/8	1/2	11/16	1	1 5/16
3/8	3/8	1/2	3/4	15/16	W27 x178	1.85		3/8	7/16	5/8	15/16	1 3/16
3/8	9/16	3/4	1 1/8	1 3/8	W30 x99	1.10		3/8	5/8	7/8	1 5/16	1 3/4
3/8	1/2	11/16	1 1/16	1 5/16	W30 x108	1.20		3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	11/16	1	1 1/4	W30 x116	1.28		3/8	9/16	13/16	1 3/16	1 9/16
3/8	1/2	5/8	15/16	1 3/16	W30 x124	1.37		3/8	9/16	3/4	1 3/16	1 1/2
3/8	7/16	5/8	15/16	1 1/8	W30 x132	1.45		3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	9/16	7/8	1 1/16	W30 x173	1.66		3/8	1/2	11/16	1	1 5/16
3/8	3/8	9/16	13/16	1	W30 x191	1.82		3/8	7/16	5/8	15/16	1 1/4
3/8	3/8	1/2	3/4	15/16	W30 x211	2.00		3/8	7/16	9/16	7/8	1 1/8
3/8	1/2	11/16	1 1/16	1 5/16	W33 x118	1.19		3/8	5/8	13/16	1 1/4	1 5/8
3/8	1/2	11/16	1	1 1/4	W33 x130	1.31		3/8	9/16	13/16	1 3/16	1 9/16
3/8	7/16	5/8	15/16	1 3/16	W33 x141	1.41		3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	5/8	7/8	1 1/8	W33 x152	1.51		3/8	1/2	11/16	1 1/16	1 3/8
3/8	3/8	9/16	13/16	1	W33 x201	1.78		3/8	1/2	5/8	15/16	1 1/4
3/8	3/8	1/2	3/4	15/16	W33 x221	1.94		3/8	7/16	5/8	15/16	1 3/16
3/8	3/8	1/2	11/16	7/8	W33 x241	2.11		3/8	7/16	9/16	7/8	1 1/8
3/8	1/2	11/16	1	1 1/4	W36 x135	1.28		3/8	9/16	13/16	1 3/16	1 9/16
3/8	7/16	5/8	15/16	1 3/16	W36 x150	1.41		3/8	9/16	3/4	1 1/8	1 7/16
3/8	7/16	5/8	7/8	1 1/8	W36 x160	1.50		3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	7/8	1 1/16	W36 x170	1.59		3/8	1/2	11/16	1 1/16	1 3/8
3/8	7/16	9/16	13/16	1 1/16	W36 x182	1.69		3/8	1/2	11/16	1	1 5/16
3/8	3/8	9/16	13/16	1	W36 x194	1.80		3/8	7/16	5/8	15/16	1 1/4
3/8	3/8	1/2	3/4	15/16	W36 x210	1.94		3/8	7/16	5/8	15/16	1 3/16
3/8	3/8	1/2	3/4	15/16	W36 x230	1.92		3/8	7/16	5/8	15/16	1 3/16
3/8	3/8	1/2	3/4	7/8	W36 x245	2.04		3/8	7/16	9/16	7/8	1 1/8
3/8	3/8	1/2	11/16	7/8	W36 x230	2.16		3/8	7/16	9/16	13/16	1 1/16
3/8	3/8	7/16	11/16	13/16	W36 x280	2.31		3/8	3/8	1/2	13/16	1
3/8	3/8	7/16	5/8	3/4	W36 x300	2.47		3/8	3/8	1/2	3/4	1
9/16	15/16	1 5/16	1 15/16	2 3/8	Other	0.37		11/16	1 1/8	1 1/2	2 5/16	3
9/16	15/16	1 1/4	1 7/8	2 3/8	Other	0.38		5/8	1 1/8	1 1/2	2 5/16	3
9/16	15/16	1 1/4	1 7/8	2 3/8	Other	0.39		5/8	1 1/16	1 1/2	2 5/16	2 15/16
9/16	7/8	1 1/4	1 7/8	2 5/16	Other	0.40		5/8	1 1/16	1 1/2	2 1/4	2 15/16
9/16	7/8	1 1/4	1 7/8	2 5/16	Other	0.41		5/8	1 1/16	1 7/16	2 1/4	2 7/8
9/16	7/8	1 1/4	1 13/16	2 5/16	Other	0.42		5/8	1 1/16	1 7/16	2 3/16	2 7/8
9/16	7/8	1 1/4	1 13/16	2 1/4	Other	0.43		5/8	1 1/16	1 7/16	2 3/16	2 13/16
9/16	7/8	1 3/16	1 13/16	2 1/4	Other	0.44		5/8	1 1/16	1 7/16	2 3/16	2 13/16
1/2	7/8	1 3/16	1 3/4	2 3/16	Other	0.45		5/8	1	1 3/8	2 1/8	2 3/4
1/2	7/8	1 3/16	1 3/4	2 3/16	Other	0.46		5/8	1	1 3/8	2 1/8	2 3/4
1/2	7/8	1 3/16	1 3/4	2 3/16	Other	0.47		5/8	1	1 3/8	2 1/8	2 3/4

Wide Flange Columns

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

U.L. Design No. X-772, Y-715

Shape: W Shapes

ICBO 4607 Table No. 1A

FULL FLANGE TIP THICKNESS					Member			HALF FLANGE TIP THICKNESS				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size	xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
7/8	1 5/16	1 3/4	2 1/2	3 7/16	W4	x13	0.54	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 7/16	W5	x16	0.54	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 3/16	1 9/16	2 3/8	3 1/8	W5	x19	0.64	7/8	1 5/16	1 3/4	2 9/16	3 3/8
1 1/16	1 1/2	2	2 1/2	3 13/16	W6	x9	0.33	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 7/16	1 15/16	2 1/2	3 13/16	W6	x12	0.43	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 7/16	1 15/16	2 1/2	3 13/16	W6	x15	0.42	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 11/16	2 1/2	3 5/16	W6	x16	0.57	7/8	1 5/16	1 3/4	2 9/16	3 3/8
7/8	1 5/16	1 11/16	2 1/2	3 3/8	W6	x20	0.56	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
3/4	1 1/8	1 3/8	2	2 11/16	W6	x25	0.69	13/16	1 3/16	1 1/2	2 1/4	2 15/16
1 1/16	1 5/8	2 1/8	3 3/16	NR	W8	x10	0.32	NR	NR	NR	NR	NR
1	1 1/2	1 15/16	2 1/2	3 13/16	W8	x13	0.41	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 5/8	W8	x15	0.47	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 9/16	W8	x18	0.49	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 11/16	2 1/2	3 5/16	W8	x21	0.57	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 11/16	2 1/2	3 5/16	W8	x24	0.58	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 3/16	1 3/8	2	2 11/16	W8	x28	0.67	13/16	1 3/16	1 1/2	2 1/4	2 15/16
13/16	1 3/16	1 9/16	2 3/8	3 1/8	W8	x31	0.65	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 1/8	1 3/8	2	2 11/16	W8	x35	0.73	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W8	x40	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W8	x48	0.99	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 5/8	2 3/16	W8	x58	1.16	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W8	x67	1.34	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1 1/16	1 1/2	2	2 1/2	3 13/16	W10	x12	0.34	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 7/16	1 15/16	2 1/2	3 13/16	W10	x15	0.42	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 5/8	W10	x17	0.48	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 7/16	W10	x19	0.53	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 1/2	W10	x22	0.52	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 5/8	2 7/16	3 1/4	W10	x26	0.61	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 1/8	1 3/8	2	2 11/16	W10	x30	0.7	13/16	1 3/16	1 1/2	2 1/4	2 15/16
13/16	1 3/16	1 9/16	2 3/8	3 1/8	W10	x33	0.65	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 1/8	1 3/8	2	2 11/16	W10	x39	0.76	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W10	x45	0.87	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W10	x49	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W10	x54	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W10	x60	1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 1/4	W10	x68	1.13	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/8	W10	x77	1.26	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W10	x88	1.43	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 6/16	1 3/4	W10	x100	1.61	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	7/8	1 1/4	1 11/16	W10	x112	1.76	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1 1/16	1 1/2	2	2 1/2	3 13/16	W12	x14	0.36	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 1/2	1 15/16	2 1/2	3 13/16	W12	x16	0.41	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 5/8	W12	x19	0.48	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 11/16	2 1/2	3 3/8	W12	x22	0.55	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 7/16	W12	x26	0.53	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 5/8	2 7/16	3 1/4	W12	x30	0.6	7/8	1 5/16	1 3/4	2 9/16	3 3/8

Wide Flange Columns

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG
U.L. Design No. X-772, Y-715
Shape: W Shapes
ICBO 4607 Table No. 1A

FULL FLANGE TIP THICKNESS					Member			*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size	xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
3/4	1 1/8	1 3/8	2	2 11/16	W12	x35	0.7	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	W12	x40	0.72	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	1 1/16	1 3/8	2	2 11/16	W12	x45	0.81	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W12	x50	0.89	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W12	x53	0.84	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W12	x58	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W12	x65	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W12	x72	1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W12	x79	1.1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W12	x87	1.2	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/16	W12	x96	1.32	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W12	x106	1.44	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 3/4	W12	x120	1.62	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	13/16	1 1/4	1 5/8	W12	x136	1.82	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	9/16	3/4	1 1/8	1 1/2	W12	x152	2.01	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	9/16	11/16	1 1/16	1 3/8	W12	x170	2.22	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	1/2	11/16	1	1 5/16	W12	x190	2.46	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/16	1/2	9/16	7/8	1 3/16	W12	x210	2.68	5/16	1/2	11/16	1 3/16	1 5/8
5/16	7/16	9/16	7/8	1 1/8	W12	x230	2.91	5/16	1/2	11/16	1 3/16	1 5/8
5/16	7/16	9/16	13/16	1 1/16	W12	x252	3.15	5/16	1/2	11/16	1 3/16	1 5/8
1/4	3/8	1/2	3/4	1	W12	x279	3.44	5/16	1/2	11/16	1 3/16	1 5/8
1/4	3/8	1/2	11/16	15/16	W12	x305	3.7	5/16	1/2	11/16	1 3/16	1 5/8
1/4	5/16	7/16	5/8	7/8	W12	x336	4.02	5/16	1/2	11/16	1 3/16	1 5/8
15/16	1 3/8	1 13/16	2 1/2	3 5/8	W14	x22	0.47	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 11/16	2 1/2	3 3/8	W14	x26	0.55	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 11/16	2 1/2	3 3/8	W14	x30	0.55	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 5/8	2 7/16	3 3/16	W14	x34	0.62	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 1/8	1 3/8	2	2 11/16	W14	x38	0.69	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	W14	x43	0.73	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	1 1/16	1 3/8	2	2 11/16	W14	x48	0.81	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W14	x53	0.89	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W14	x61	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W14	x68	1.01	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W14	x74	1.09	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W14	x82	1.2	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 3/8	W14	x90	1.06	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 1/4	W14	x99	1.16	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/16	W14	x109	1.27	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	1 15/16	W14	x120	1.39	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	11/16	15/16	1 3/8	1 7/8	W14	x132	1.52	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 3/4	W14	x145	1.61	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	7/8	1 1/4	1 11/16	W14	x159	1.75	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	13/16	1 3/16	1 9/16	W14	x176	1.93	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	9/16	3/4	1 1/8	1 7/16	W14	x193	2.1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	1/2	11/16	1	1 3/8	W14	x211	2.28	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/16	1/2	9/16	7/8	1 1/4	W14	x228	2.49	5/16	1/2	11/16	1 3/16	1 5/8

Wide Flange Columns

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

U.L. Design No. X-772, Y-715

Shape: W Shapes

ICBO 4607 Table No. 1A

FULL FLANGE TIP THICKNESS					Member			*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size	xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
5/16	1/2	9/16	7/8	1 1/4	W14	x233	2.52	5/16	1/2	11/16	1 3/16	1 5/8
5/16	7/16	9/16	7/8	1 3/16	W14	x257	2.72	5/16	1/2	11/16	1 3/16	1 5/8
5/16	7/16	9/16	13/16	1 1/8	W14	x283	2.96	5/16	1/2	11/16	1 3/16	1 5/8
5/16	7/16	9/16	13/16	1 1/16	W14	x311	3.22	5/16	1/2	11/16	1 3/16	1 5/8
1/4	3/8	1/2	3/4	15/16	W14	x342	3.5	5/16	1/2	11/16	1 3/16	1 5/8
1/4	3/8	1/2	11/16	15/16	W14	x370	3.75	5/16	1/2	11/16	1 3/16	1 5/8
1/4	5/16	7/16	5/8	7/8	W14	x398	4	5/16	1/2	11/16	1 3/16	1 5/8
1/4	5/16	7/16	5/8	13/16	W14	x426	4.24	5/16	1/2	11/16	1 3/16	1 5/8
1/4	5/16	7/16	5/8	13/16	W14	x455	4.48	5/16	1/2	11/16	1 3/16	1 5/8
1/4	5/16	3/8	9/16	3/4	W14	x500	4.86	5/16	1/2	11/16	1 3/16	1 5/8
1/4	1/4	3/8	1/2	11/16	W14	x550	5.26	5/16	1/2	11/16	1 3/16	1 5/8
1/4	1/4	5/16	1/2	5/8	W14	x605	5.69	5/16	1/2	11/16	1 3/16	1 5/8
1/4	1/4	5/16	7/16	5/8	W14	x665	6.14	5/16	1/2	11/16	1 3/16	1 5/8
1/4	1/4	5/16	3/8	9/16	W14	x730	6.62	5/16	5/16	5/16	9/16	3/4
15/16	1 3/8	1 13/16	2 1/2	3 9/16	W16	x26	0.49	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 11/16	2 1/2	3 5/16	W16	x31	0.58	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 5/8	2 7/16	3 1/4	W16	x36	0.6	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 3/16	1 3/8	2	2 11/16	W16	x40	0.67	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	W16	x45	0.75	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W16	x50	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W16	x57	0.94	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W16	x67	0.92	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 3/8	W16	x77	1.05	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W16	x89	1.2	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W16	x100	1.34	3/4	1 1/16	1 3/8	2 1/16	2 3/4
13/16	1 1/4	1 11/16	2 1/2	3 5/16	W18	x35	0.59	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 3/16	1 3/8	2	2 11/16	W18	x40	0.67	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/16	1 3/8	2	2 11/16	W18	x46	0.77	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	W18	x50	0.76	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W18	x55	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W18	x60	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 1/2	W18	x65	0.98	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W18	x71	1.07	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 1/2	W18	x76	0.95	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W18	x86	1.07	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W18	x97	1.2	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/16	W18	x106	1.3	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W18	x119	1.45	3/4	1 1/16	1 3/8	2 1/16	2 3/4
13/16	1 3/16	1 9/16	2 5/16	3 1/8	W21	x44	0.66	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 1/8	1 3/8	2	2 11/16	W21	x50	0.74	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W21	x57	0.84	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W21	x62	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W21	x68	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 1/2	W21	x73	0.97	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W21	x83	1.1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 5/8	2 1/8	W21	x93	1.22	3/4	1 1/16	1 3/8	2 1/16	2 3/4

Wide Flange Columns

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

Shape: W Shapes

U.L. Design No. X-772, Y-715

ICBO 4607 Table No. 1A

FULL FLANGE TIP THICKNESS					Member			*HALF FLANGE TIP THICKNESS*				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size	xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
5/8	7/8	1 1/8	1 11/16	2 5/16	W21	x101	1.11	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W21	x111	1.21	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W21	x122	1.33	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W21	x132	1.43	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	11/16	15/16	1 3/8	1 13/16	W21	x147	1.58	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/4	1 1/8	1 3/8	2	2 11/16	W24	x55	0.73	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W24	x62	0.83	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	1 1/16	1 3/8	2	2 11/16	W24	x68	0.82	13/16	1 3/16	1 1/2	2 1/4	2 15/16
11/16	7/8	1 1/8	1 11/16	2 1/2	W24	x76	0.91	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W24	x84	1	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 1/4	W24	x94	1.12	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 3/8	W24	x104	1.05	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W24	x117	1.18	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/16	W24	x131	1.32	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	15/16	1 7/16	1 7/8	W24	x146	1.46	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 3/4	W24	x162	1.61	3/4	1 1/16	1 3/8	2 1/16	2 3/4
11/16	7/8	1 1/8	1 11/16	2 1/2	W27	x84	0.9	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 7/16	W27	x94	1.01	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W27	x102	1.09	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/8	1 5/8	2 3/16	W27	x114	1.21	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W27	x146	1.33	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	15/16	1 7/16	1 7/8	W27	x161	1.46	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 3/4	W27	x178	1.61	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 1/2	W30	x99	0.98	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 5/16	W30	x108	1.07	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 1/4	W30	x116	1.14	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 5/8	2 1/8	W30	x124	1.22	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/16	W30	x132	1.29	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W30	x173	1.44	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	11/16	15/16	1 3/8	1 13/16	W30	x191	1.59	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	7/8	1 1/4	1 11/16	W30	x211	1.74	3/4	1 1/16	1 3/8	2 1/16	2 3/4
5/8	7/8	1 1/8	1 11/16	2 3/8	W33	x118	1.06	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 3/16	W33	x130	1.17	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/8	W33	x141	1.26	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W33	x152	1.35	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	11/16	15/16	1 3/8	1 13/16	W33	x201	1.55	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	15/16	1 5/16	1 11/16	W33	x221	1.7	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	13/16	1 3/16	1 5/8	W33	x241	1.85	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	7/8	1 1/8	1 11/16	2 1/4	W36	x135	1.14	3/4	1 1/16	1 3/8	2 1/16	2 3/4
9/16	13/16	1 1/16	1 9/16	2 1/8	W36	x150	1.26	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 1/2	2	W36	x160	1.34	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	3/4	1	1 7/16	1 15/16	W36	x170	1.42	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1/2	11/16	15/16	1 3/8	1 7/8	W36	x182	1.52	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 3/4	W36	x194	1.61	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	7/8	1 1/4	1 11/16	W36	x210	1.74	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	11/16	7/8	1 5/16	1 11/16	W36	x230	1.89	3/4	1 1/16	1 3/8	2 1/16	2 3/4

Wide Flange Columns

Products: Monokote® Type MK-6/HY, MK-6s, Z-106
Z-106/G, Z-146 and Retro-Guard® RG

U.L. Design No. X-772, Y-715

Shape: W Shapes

ICBO 4607 Table No. 1A

FULL FLANGE TIP THICKNESS					Member			HALF FLANGE TIP THICKNESS				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size	xWt.	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
7/16	5/8	13/16	1 1/4	1 5/8	W36	x245	1.79	3/4	1 1/16	1 3/8	2 1/16	2 3/4
7/16	5/8	13/16	1 3/16	1 9/16	W36	x260	1.89	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	9/16	3/4	1 1/8	1 1/2	W36	x280	2.03	3/4	1 1/16	1 3/8	2 1/16	2 3/4
3/8	9/16	3/4	1 1/16	1 7/16	W36	x300	2.17	3/4	1 1/16	1 3/8	2 1/16	2 3/4
1 1/16	1 1/2	2	2 1/2	3 13/16	Other		0.37	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 1/2	2	2 1/2	3 13/16	Other		0.38	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 1/2	2	2 1/2	3 13/16	Other		0.39	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 1/2	2	2 1/2	3 13/16	Other		0.4	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 1/2	1 15/16	2 1/2	3 13/16	Other		0.41	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 7/16	1 15/16	2 1/2	3 13/16	Other		0.42	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
1	1 7/16	1 15/16	2 1/2	3 13/16	Other		0.43	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 7/16	1 7/8	2 1/2	3 3/4	Other		0.44	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 7/16	1 7/8	2 1/2	3 3/4	Other		0.45	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 7/8	2 1/2	3 11/16	Other		0.46	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 5/8	Other		0.47	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 5/8	Other		0.48	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 9/16	Other		0.49	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
15/16	1 3/8	1 13/16	2 1/2	3 9/16	Other		0.5	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 1/2	Other		0.51	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 1/2	Other		0.52	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 7/16	Other		0.53	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 3/4	2 1/2	3 7/16	Other		0.54	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 11/16	2 1/2	3 3/8	Other		0.55	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
7/8	1 5/16	1 11/16	2 1/2	3 3/8	Other		0.56	1 1/8	1 5/8	2 1/16	2 15/16	3 13/16
13/16	1 1/4	1 11/16	2 1/2	3 5/16	Other		0.57	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 11/16	2 1/2	3 5/16	Other		0.58	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 11/16	2 1/2	3 5/16	Other		0.59	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 5/8	2 7/16	3 1/4	Other		0.6	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 5/8	2 7/16	3 1/4	Other		0.61	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 1/4	1 5/8	2 7/16	3 3/16	Other		0.62	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 3/16	1 5/8	2 3/8	3 3/16	Other		0.63	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 3/16	1 9/16	2 3/8	3 1/8	Other		0.64	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 3/16	1 9/16	2 3/8	3 1/8	Other		0.65	7/8	1 5/16	1 3/4	2 9/16	3 3/8
13/16	1 3/16	1 9/16	2 5/16	3 1/8	Other		0.66	7/8	1 5/16	1 3/4	2 9/16	3 3/8
3/4	1 3/16	1 3/8	2	2 11/16	Other		0.67	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 3/16	1 3/8	2	2 11/16	Other		0.68	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.69	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.7	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.71	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.72	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.73	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.74	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.75	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/8	1 3/8	2	2 11/16	Other		0.76	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/16	1 3/8	2	2 11/16	Other		0.77	13/16	1 3/16	1 1/2	2 1/4	2 15/16
3/4	1 1/16	1 3/8	2	2 11/16	Other		0.78	13/16	1 3/16	1 1/2	2 1/4	2 15/16