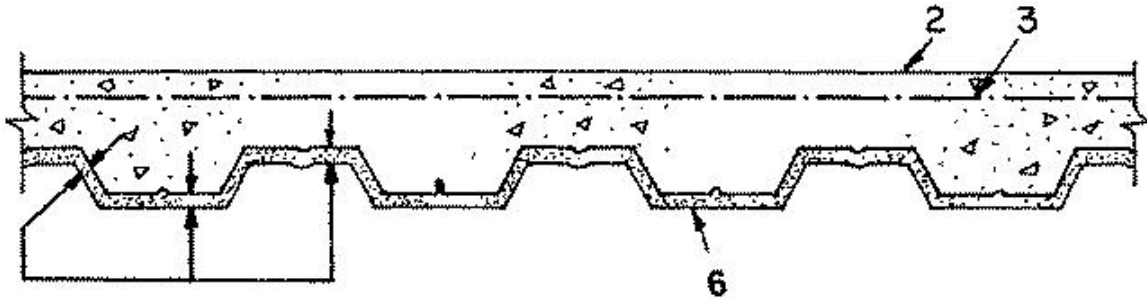


Design No. D779
December 10, 2003

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 beam min size, or steel joist, 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.

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 or 36 in. wide Types CFD-2, CFD-3; 24, 30, or 36 in. wide Type CFD-1.5. Units 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-146. 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 | | Concrete Type |
|-------------------------------|---------------------------------|-----------------------------|--|---------|---------------|
| | | | Crests | Valley | |
| 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 | | 10K1 Joist Spaced | |
| | | | W8x28 | W12x16 | More Than 4 Ft OC | 4 Ft or Less OC |
| 1 | 0 | 1 | 7/16 | 5/8 | 1-1/8 | 15/16 |
| 1 | 1 | 1 | 7/16 | 5/8 | 1-1/8 | 15/16 |
| 1-1/2 | 1 | 1 | 7/16 | 5/8 | 1-5/16 | 1-5/16 |
| 1-1/2 | 1-1/2 | 1-1/2 | 3/4 | 1 | 1-5/8 | 1-7/16 |
| 2 | 1 | 1 | 7/16 | 5/8 | 1-7/16 | 1-7/16 |
| 2 | 2 | 2 | 1 | 1-3/8 | 2-3/16 | 1-15/16 |

| | | | | | | |
|---|------------------------------------|--|--------|------------------------|--------|---------|
| 3 | 1-1/2 | 1-1/2 | 3/4 | 1 | 2-3/16 | 1-15/16 |
| 3 | 3 | 3 | 1-5/16 | 1-3/4 | 3-1/4 | 2-13/16 |
| 4 | 2 | 2 | 1 | 1-3/8 | — | — |
| 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 | | |

*Note: Design load shall stress the 12K3 joist to a maximum tensile strength of 24,000 psi. For guidance on stress level adjustments, refer to the Fire Resistance Ratings with Steel Joists section of the Steel Joist Institute (SJI) publication: "Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders."

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.

| | | Spray Applied Fire Resistive Mtl Thkns In. | | | |
|--------------------------------------|--|---|----------------|---------------|--|
| Restrained Assembly Rating Hr | 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 matted 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

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