

Design No. P936

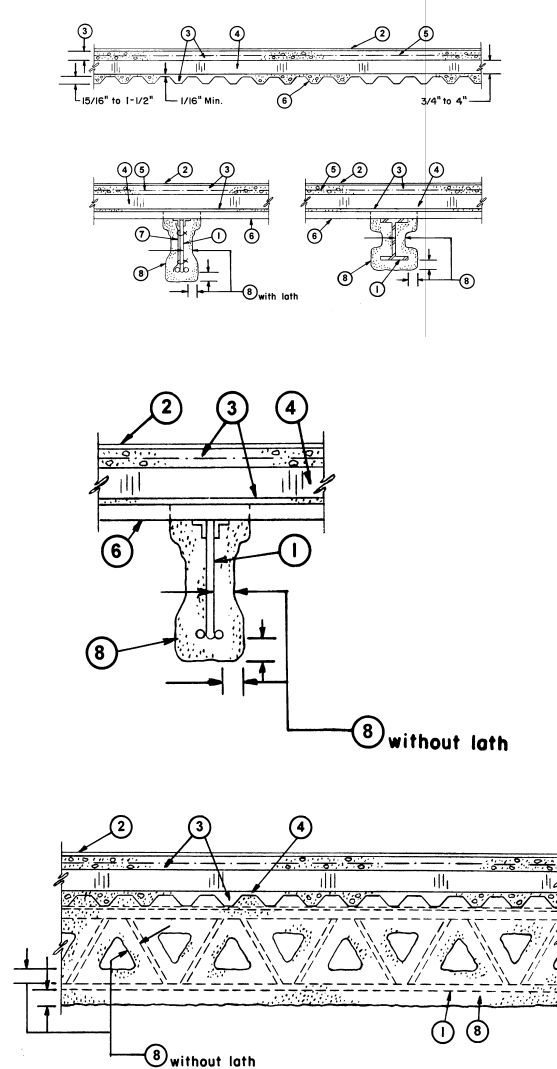
Restrained Assembly Ratings — 1, 1-1/2 or 2 Hr (See Items 3, 5, 6 and 8)

Unrestrained Assembly Rating — 0 Hr (See Item 6)

Unrestrained Beam Rating — 1, 1-1/2 or 2 Hr (See Items 3, 5, 6 and 8)

Restricted Load Condition — See Items 1, 8, 8A and 8B

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Supports — Steel Beam** — W6x16 or W8x28 min size. **Steel Joists** 10K1 or 16K2 min size with a max tensile stress of 30,000 psi or 12K3 or 12K5 min size with a max tensile stress of 24,000 psi.
2. **Roof Covering*** — Consisting of hot mopped or cold application materials compatible with insulations described herein which provide Class A, B or C coverings. See Roofing Materials and Systems Directory-Roof Covering Materials (TEVT).
- 2A. **In lieu of Item 2, roof covering consisting of single-ply Roofing Membrane*** — that is either ballasted, adhered or mechanically attached as permitted under the respective manufacturer's Classification. See Fire Resistance Directory — Roofing Membranes (CHCI).
3. **Vermiculite Concrete** — 6 cu ft of **Vermiculite Aggregate*** to 94 lb of Portland cement and 0.11 lb of air entraining agent mixed with approx 25 gal of water. Min compressive strength shall be 125 psi when tested in accordance with ASTM C495. Min thickness above foamed plastic is 2 in. Min thickness between top of steel deck and bottom of foamed plastic shall be 1/16 in. when wire mesh (Item 5) is used and 1/8 in. when the wire mesh is not used. When foamed plastic (Item No. 4 or 4A) is not used the topping thickness of Vermiculite Concrete over the crests of steel deck shall be a min of 2-3/16 in. for the 1 and 1-1/2 h ratings and 2-3/8 in. for the 2 h rating. The max Vermiculite Concrete thickness shall be determined by job site conditions.
 ELASTIZELL CORP OF AMERICA —Types MS16-U, MSV 200
 MANDOVAL LTD
 MANDOVAL VERMICULITE PRODUCTS INC
 PALMETTO VERMICULITE CO
 SIPLAST INC
 THE STRONG CO INC
 VERMICULITE PRODUCTS INC
- 3A. **As an alternate to Item 3, Cellular Concrete— Roof Topping Mixture*** — Foam concentrate mixed with water and Portland cement per manufacturer's specifications. Cast dry density and 28-day compressive strength of min 190 psi as determined in accordance with ASTM C495-66. Min thickness above foamed plastic is 2 in. Min thickness between top of steel deck and bottom of foamed plastic shall be 1/8 in. When foamed plastic is not used, the min thickness of Roof Topping Mixture* above the top of the steel deck shall be 2-3/4 in.
 CELCORE INC —Cast dry density of 31 (+ or -) 3.0 pcf
 CONCRETE INTERNATIONAL INC — Cast dry density 38 (+ 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.
- AERIX INDUSTRIES** —Cast dry density 37 (+ or -) 3.0 pcf.
- SIPLAST INC** —Mix #2. Cast dry density of 36 (+ or -) 3.0 pcf.
- 3B. **As an alternate to Item 3** — Perlite Concrete — Mix consists of 6 cu ft of **Perlite Aggregate*** to 94 lb of Portland cement and 1-1/2 pints of air-entraining agent. Thickness of Perlite concrete topping to be 2 in. min from the top plane of the foamed plastic. Min thickness between the top of steel deck and the bottom of the foamed plastic shall be 1/8 in.
See **Perlite Aggregate** (CFFX) category in Fire Resistive Directory for names of Classified Companies.
- 3C. **As an alternate to Item 3** — Cellular Concrete — Roof Topping Mixture* — Foam Concrete 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. A 1/8 in. min slurry coat shall be employed below the foamed plastic (Item 4). The cellular concrete topping thickness, above the foamed plastic, shall be 2 in. min. When foamed plastic is not used, the min thickness of Roof-Topping Mixture, above the top of the steel deck, shall be 2-3/4 in.
AERIX INDUSTRIES —Mix #3
SIPLAST INC —Mix #3
4. **Foamed Plastic*** — (Optional) — Foamed plastic insulation boards with holes and/or slots. Nom size 24 by 48 in. Thickness shall be 3/4 in. to 8 in.
SIPLAST INC
VERMICULITE PRODUCTS INC
- 4A. **Foamed Plastic*** — Nom 24 by 48 in., 48 by 48 in. or 30 by 60 in. by max 8 in. thick polystyrene foamed plastic insulation boards with holes symmetrically placed having a max density of 2.0 pcf. For use only with cellular concrete roof topping.
STARRFOAM MFG INC
- 4B. **Foamed Plastic*** — (Optional) — Nom 24 by 48 by max 8 in. thick polystyrene foamed plastic insulation boards having a density of 2.5 pcf max. Each insulation board shall contain six nom 3 in. diam holes oriented in two rows of three holes each, with the holes spaced 12 in. OC transversely and 16 in. OC longitudinally.
See **Foamed Plastic*** (BRYX) category in the Building Materials Directory or **Foamed Plastic*** (CCVW) category in Fire Resistance Directory for list of Classified Companies.
5. **Wire Mesh** — No. 19 SWG galv steel wire twisted to form 2 in. hexagons. In addition, straight No. 16 SWG galv steel wire woven into mesh and spaced 3 in. apart for stiffness. Mesh installed without attachment perpendicular to supports and overlapped 6 in. at the sides. As an alternate, 4 by 8 in., No 12/14 SWG or 2 by 2 in., No 14/14 SWG welded wire fabric may be used. The wire mesh may be omitted for the **1 and 1-1/2 h ratings**. Thickness of Vermiculite Concrete between the top of the roof deck and the bottom of the foamed plastic insulation shall be 1/8 in. min when wire mesh is not used.
- 5A. **Fiber Reinforcement*** — (Optional, not for use to achieve 2 hr. ratings) - For use only with Roof-Topping Mixtures* manufactured by Cellular Concrete LLC. In lieu of Wire Mesh (Item 5), Fiber Reinforcement may be added to roof topping mixtures (Items 3A or 3C).
FORTA CORP — Types Econo-Mono, Mini-Mono, Mighty-Mono, Stucco-Bond, Econo-Net, Master-Cast, Super-Net, Ultra-Net.
6. **Steel Roof Deck** — (Unclassified) — Noncomposite design, vented or nonvented units, 9/16 in., 15/16 in., 1-5/16 in., 1-1/2 or 2 in. deep galv units, nom 24 to 36 in. wide. When vented or nonvented 9/16 in. deep galv units are used, the **Restrained Assembly and Beam Ratings shall not exceed 1-1/2 h**. Welded to supports with 3/8 in. puddle welds through weld washers spaced 15 in. OC. Adjacent units overlapped one corrugation. Max support spacings 8 ft OC unless otherwise noted for specific Classified units and their recommended loadings. Steel thickness to be No. 24 MSG min when supports are spaced not more than 8 ft OC, No. 26 MSG min when supports are spaced not more than 6 ft OC and No. 28 MSG, 9/16 in. deep steel deck may be used when supports are spaced 4 ft OC. Roof deck units to be loaded not more than 75 percent of their max allowable bending stress. For clear spans not more than 7 ft., 8-3/8 in. the **Unrestrained Assembly Rating is equal to the Restrained Assembly Rating**, or **Classified Steel Floor and Form Units*** conforming to the same installation, steel thickness, loading requirements and **Restrained Assembly Rating** as described for unclassified units.
ASC STEEL DECK, DIV OF ASC PROFILES L
L C —Types CP32, (1-3/8), B, Ventform and 2W. Two or three - 10 ft - 0 in. continuous spans may be used for Types B or 2W units, and 12 ft - 0 in. simple or continuous spans may be used for Type N units, provided that the total loading on these spans is based on the allowable steel stress and the deflection limitation criteria using the steel (noncomposite) section properties of these units.
CANAM STEEL CORP — Type P-3606, P-3615, and P-3012.
CANAM STEEL CORP —Types B, UFX, UFXV, UFX-36, UFXV-36
CONSOLIDATED SYSTEMS INC —Consoliform and Comvent Types EHD, HD, S, SD. Media-Dek Type 1 (vented and non-vented) and Media-Dek Type 2, Type R.
DECK WEST INC —36 in. wide Type B-DW, BA-DW or 3-DW. The Type 3-DW units made from 22 ga or heavier steel may be used for a maximum 10 ft., 0 in. spans, provided that the total loading on these spans is based on the allowable steel stresses and the deflection limitation criteria using the steel (noncomposite) section properties of these units.
EPIC METALS CORP —Type Metricform
MARLYN STEEL DECKS INC —Types B, BV, EF, EVF, F, HF, HVF, SF, SVF
H H ROBERTSON —Type QL-3 or Sec. 3 with or without up-punched integral hanger tabs and 3 in. QL-99. The 3 in. deep Type QL-99 units made from 22 ga or heavier steel may be used for max 10 ft, 0 in. spans, provided the total loading on these spans is based on the allowable steel stresses and the deflection limitation criteria using the steel (noncomposite) section properties of these units.
ROOF DECK INC —Vented or Nonvented Types EHD Multi-Rib, HD Multi-Rib, S Multi-Rib.
VERCO DECKING INC - A NUCOR CO —Types PLB, B, 2"B, 2" B Ventlok, Vercor, Vercor-Ventlok, PLW2, W-2, System 80, PLN and N. Two or three 10 ft 0 in. continuous spans may be used for the following units under the following conditions: (A) For Types PLB, B, PLW2 and W-2 units the total loading on these spans shall be based on the allowable steel stress or the deflection limitation criteria using the steel (noncomposite) section properties of these units. (B) For System 80 the min gauge of units is 18 MSG and use is limited to three continuous spans. (C) For 2"B and 2" B Ventlok the total loading on these spans shall be limited to 80 percent of the allowable steel bending stress, or the deflection limitation criteria. Types PLN and N deck may be used on simple or continuous 12 ft 0 in. spans with the total loading on these spans limited by the allowable bending stress and/or the deflection limitation criteria.
VULCRAFT, DIV OF NUCOR CORP —Types 0.6C, 0.6CPR, 0.6CPRV, 0.6CSV, 1.0C, 1.0CSV, 1.3C, 1.3CSV, 1.5C, 2C, 3C, 1.5B, 1.5BI, 3N, 3NI. Type 1.5B units made from 21MSG or heavier steel may be used on simple or continuous 10 ft 0 in. spans with the total load on these spans limited by the allowable bending stress and/or the deflection criteria of this deck. Type 3N made from 22MSG or heavier steel may be used on simple or continuous 12 ft 0 in. spans with the total load on these spans limited by the allowable bending stress and/or the deflection criteria of this deck.
7. **Metal Lath** — (Not Shown) — (Required on both sides of joists with Z-146, otherwise optional) — Metal lath is used to facilitate the spray application of Spray-Applied Fire Resistive Materials on steel bar joists and trusses. The diamond mesh, 3/8 in. expanded steel lath, 1.7 to 3.4 lb per sq yd, 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. OC max. When used, the metal lath is to be fully covered with Spray-Applied Fire Resistive Materials with no min thickness requirements.
- 7A. **Non-Metallic Fabric Mesh** — (Optional) — As an alternate to metal lath, glass fiber fabric mesh, weighing approximately 2.5 oz per

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sq yd, polypropylene fabric mesh, weighing approximately 1.25 oz per sq yd or equivalent, is used to facilitate the spray application. The mesh is secured to one side of each joist web member. The method of attaching the mesh must be sufficient to hold the mesh and the spray-applied Spray-Applied Fire Resistive Materials in place during application until it has cured. An acceptable method to attach the mesh is by embedding the mesh in minimum 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced a maximum of 12 in. OC 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 formed from No. 18 SWG or heavier steel wire.

8. **Spray-Applied Fire Resistive Materials*** — Applied by mixing with water and spraying in more than one coat to the final thickness shown below to joist or beam surfaces which are clean, free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf respectively. For method of density determination refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In. Min Thkns on Beam
1	1	W6x16 9/16
1-1/2	1-1/2	1-1/16
2	1-1/2	1-7/16
2	2	1-1/2

Restrained Beam Rating Hr	Unrestrained Beam Rating Hr	10K1 More than 4 ft OC	10K1 4 ft or Less OC
1	1	1-1/8	1
1-1/2	1	1-7/16	1-7/16
1-1/2	1-1/2	1-5/8	1-7/16
2	1	1-7/8	1-7/8
2	2	2-3/16	1-7/8

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

*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."

ARABIAN VERMICULITE INDUSTRIES —Types MK-6/CBF, MK-6/ED, MK-/HY, MK-6/HB, MK-6S, Sonophone 1, HK6-HY Extended Set, MK-10 HB, MK-10 HB Extended Set.

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CONSTRUCTION PRODUCTS DIV —Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6S, RG, MK-10 HB, MK-10 HB Extended Set, Sonotex 1.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-6S, MK-10 HB, MK-10 HB Extended Set, Sonotex 1.

- 8A. **Spray-Applied Fire Resistive Materials*** — (Not Shown) — In lieu of Item 8 the following Spray-Applied Fire Resistive Materials may be applied by mixing with water and spraying in multiple coats to final thicknesses shown below. Min avg and Min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G, Z-106/HY. For method of density determination, refer to Design Information Section, Sprayed Material.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In. Min Thkns on Beam
1	1	in W6x16 9/16
1-1/2	1-1/2	1-1/16
2	1-1/2	1-7/16
2	2	1-1/2

Restrained Beam Rating Hr	Unrestrained Beam Rating Hr	10K1 More than 4 ft OC	10K1 4 ft or Less OC
1	1	1-1/8	1
1-1/2	1	1-7/16	1-7/16
1-1/2	1-1/2	1-5/8	1-7/16
2	1	1-7/8	1-7/8
2	2	2-3/16	1-7/8

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

*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."

ARABIAN VERMICULITE INDUSTRIES —Types Sonophone 5, Z-106, Z-106/G, Z-106/HY

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CONSTRUCTION PRODUCTS DIV — Monokote Acoustic 5, KM-601, Z-106, Z-106/G, Z-106/HY

GRACE KOREA INC — Monokote Acoustic 5, Z-106, Z-106/G, Z-106/HY

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8B. **Spray-Applied Fire Resistive Materials*** — (Not Shown) — In lieu of Item 8 or 8A the following Spray-Applied Fire Resistive Materials may be applied by mixing with water and spraying in multiple coats to final thicknesses shown below. Min avg and min ind density 40/36 pcf respectively. For method of density determination, refer to Design Information Section, Sprayed Material.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In.	
		Min Thkns on Beam in W6x16	
1	1	9/16	
1-1/2	1-1/2	1-1/16	
2	1-1/2	1-7/16	
2	2	1-1/2	

Restrained Beam Rating Hr	Unrestrained Beam Rating Hr	10K1	10K1
		More than 4 ft OC	4 ft or Less OC
1	1	1-1/8	1
1-1/2	1	1-7/16	1-7/16
1-1/2	1-1/2	1-5/8	1-7/16
2	1	1-7/8	1-7/8
2	2	2-3/16	1-7/8

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

*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."

ARABIAN VERMICULITE INDUSTRIES —Type Z-146, investigated for exterior use, Sonophone 35.

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CONSTRUCTION PRODUCTS DIV —Type Z-146, investigated for exterior use, Monokote Acoustic 35.

GRACE KOREA INC —Type Z-146, investigated for exterior use, Monokote Acoustic 35.

*Bearing the UL Classification Mark