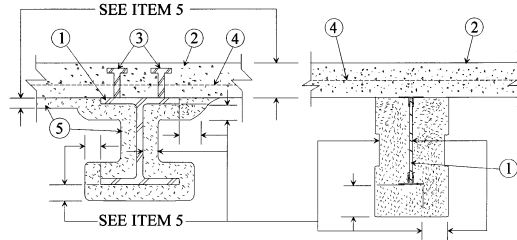


Design No. J712

Restrained Assembly Ratings — 1-1/2, 2, 3 or 4 Hr (See Item 5)
Unrestrained Assembly Ratings — 1-1/2, 2, 3 or 4 Hr (See Item 5)
Unrestrained Beam Ratings — 1-1/2, 2, 3 or 4 Hr (See Item 5)
Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Supports** — W8x28 steel beam min size or 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. **Normal Weight Concrete** — Normal weight concrete, carbonate or siliceous aggregate, 145 + or - 3 pcf unit weight, 3500 psi compressive strength, vibrated. Thickness of the slab shall vary according to the Restrained and/or Unrestrained Assembly Rating, the type of aggregate, and the thickness of the Spray-Applied Fire Resistive Materials protection of the bottom of the slab as shown in Item 5. For ratings up to 2 h, the min concrete cover shall be 3/4 in. For the 3 and 4 h ratings, the min concrete cover shall be 1 in.
3. **Shear Connector** — (Optional) — Studs 3/4 in. in diam headed type or equivalent per AISC specifications. Welded to top flange of beam.
4. **Reinforcing Steel** — (Not shown) — Min No. 3 (3/8 in. diam) deformed bars. Min areas of reinforcing steel must be provided in accordance with the latest (ACI) Specifications.
5. **Spray-Applied Fire Resistive Materials*** — See table below for appropriate thicknesses. Prepared by mixing with water and spray-applied in one or more coats to beam surfaces or to bottom of slab which must be clean and free of dirt, loose scale and oil. Min avg and min ind densities of 15/14 pcf respectively for Types MK-6/ED, MK-6/CBF, MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB and RG. For method of density determination, see Design Information Section, Sprayed Material.

Carbonate Aggregate	Slab Thkns In	Siliceous Aggregate	Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr				
			1	1-1/2	2	3	4
2-1/2		2-1/2	9/16	5/8	15/16	1-1/4	—
2-3/4		3	—	9/16	11/16	1-1/8	1-1/2
3		3-1/2	—	—	9/16	1	1-3/8
3-1/4		3-3/4	—	—	1/2	15/16	1-1/4
4		4-1/2	—	—	—	1/2	15/16
5		5-1/2	—	—	—	—	1/2

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Beam Thickness	
			full flange	1/2 flange#
1, 1-1/2 or 2	1	1	7/16	7/16+
1-1/2, 2 or 3	1-1/2	1-1/2	3/4	3/4
2, 3 or 4	2	2	1	1
3 or 4	3	3	1-5/16	1-9/16
4	4	4	1-5/8	2-1/16

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

+Thickness applied to beam's lower flange shall be a min of 1/4 in.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness			
			10K1 more than 4 ft OC	10K1 less than 4 ft OC	16K2 more than 4 ft OC	16K2 less than 4 ft OC
1	1	1	1-1/8	15/16	15/16	15/16
1-1/2	1	1	1-5/16	1-5/16	1-1/2	1-3/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-1/2	1-3/8
2	1	1	1-7/16	1-7/16	2-1/16	1-7/8
2	2	2	2-3/16	1-7/8	2-1/16	1-7/8
3	3	3	3-1/4	2-13/16	3-1/4	2-13/16

ARABIAN VERMICULITE INDUSTRIES —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HB, MK-6s, MK-10 HB.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB.

W R GRACE & CO - CONN —Types MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, RG.

- 5A. **Alternate Spray-Applied Fire Resistive Materials*** — See table below for appropriate thicknesses. Prepared by mixing with water and spray-applied in one or more coats to beam surfaces or to bottom of slab which must be clean and free of dirt, loose scale and oil. Min avg and min ind densities of 22/19 pcf respectively. For method of density determination, see Design Information Section, Sprayed Material.

Carbonate Aggregate	Slab Thkns In	Siliceous Aggregate	Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr				
			1	1-1/2	2	3	4
2-1/2		2-1/2	9/16	5/8	15/16	1-1/4	—
2-3/4		3	—	9/16	11/16	1-1/8	1-1/2
3		3-1/2	—	—	9/16	1	1-3/8
3-1/4		3-3/4	—	—	1/2	15/16	1-1/4
4		4-1/2	—	—	—	1/2	15/16
5		5-1/2	—	—	—	—	1/2

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Beam Thickness	
			full flange	1/2 flange##
1, 1-1/2 or 2	1	1	7/16	7/16+
1-1/2, 2 or 3	1-1/2	1-1/2	3/4	3/4
2, 3 or 4	2	2	1	1
3 or 4	3	3	1-5/16	1-9/16
4	4	4	1-5/8	2-1/16

##The thickness of Spray-Applied Fire Resistive Materials shown are applicable when the thickness applied to the beam's lower flange edges are reduced to one-half that shown in the table.

+Thickness applied to beam's lower flange shall be a min of 1/4 in.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 10K1 more than 4 ft OC	10K1	16K2	16K2
				less than 4 ft OC	more than 4 ft OC	less than 4 ft OC
1	1	1	1-1/8	15/16	15/16	15/16
1-1/2	1	1	1-5/16	1-5/16	1-1/2	1-3/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-1/2	1-3/8
2	1	1	1-7/16	1-7/16	2-1/16	1-7/8
2	2	2	2-3/16	1-7/8	2-1/16	1-7/8
3	3	3	3-1/4	2-13/16	3-1/4	2-13/16

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

GRACE KOREA INC —Types Z-106, Z-106/G, Z-106/HY.

W R GRACE & CO - CONN —Types Z-106, Z-106/G, Z-106/HY.

5B. Alternate Spray-Applied Fire Resistive Materials* — See table below for appropriate thicknesses. Prepared by mixing with water and spray-applied in one or more coats to beam surfaces or to bottom of slab which must be clean and free of dirt, loose scale and oil. Min avg and min ind densities of 40/36 pcf respectively. Min avg and min ind density of 40/36 pcf respectively for Types Z-146, Z-146PC and Z-146T cementitious mixture. Min avg and min ind density of 50/45 pcf respectively for Types Z-156, Z-156T and Z-156PC.

For method of density determination, see Design Information Section Sprayed Material.

Carbonate Aggregate	Slab Thkns In	Siliceous Aggregate	1	Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr			
				1-1/2	2	3	4
2-1/2	2-1/2	2-1/2	9/16	5/8	15/16	1-1/4	—
2-3/4	3	3	—	9/16	11/16	1-1/8	1-1/2
3	3-1/2	3-1/2	—	—	9/16	1	1-3/8
3-1/4	3-3/4	3-3/4	—	—	1/2	15/16	1-1/4
4	4-1/2	4-1/2	—	—	—	1/2	15/16
5	5-1/2	5-1/2	—	—	—	—	1/2

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Beam Thickness	
			full flange	1/2 flange##
1, 1-1/2 or 2	1	1	7/16	7/16+
1-1/2, 2 or 3	1-1/2	1-1/2	3/4	3/4
2, 3 or 4	2	2	1	1
3 or 4	3	3	1-5/16	1-9/16
4	4	4	1-5/8	2-1/16

##The thickness of Spray-Applied Fire Resistive Materials shown are applicable when the thickness applied to the beam's lower flange edges are reduced to one-half that shown in the table.

+Thickness applied to beam's lower flange shall be a min of 1/4 in.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 10K1 more than 4 ft OC	10K1	16K2	16K2
				less than 4 ft OC	more than 4 ft OC	less than 4 ft OC
1	1	1	1-1/8	15/16	15/16	15/16
1-1/2	1	1	1-5/16	1-5/16	1-1/2	1-3/8
1-1/2	1-1/2	1-1/2	1-5/8	1-7/16	1-1/2	1-3/8
2	1	1	1-7/16	1-7/16	2-1/16	1-7/8
2	2	2	2-3/16	1-7/8	2-1/16	1-7/8
3	3	3	3-1/4	2-13/16	3-1/4	2-13/16

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

GRACE KOREA INC —Z-146 investigated for exterior use.

W R GRACE & CO - CONN — Types Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC investigated for exterior use.

5C. Alternate Spray-Applied Fire Resistive Materials* — Applied by mixing with water and spraying in more than one coat to final thicknesses as shown in the illustration above and in the table below to steel surfaces which must be clean and free of dirt, loose scale and oil. For minimum and maximum density of: Types MK-6/CBF, MK-6/ED, MK-6 GF, MK-6/HY, MK-6/HB, MK-6s, MK-10 HB, see Item 5; Types Z-106, Z-106/G, Z-106/HY see Item 5A; Type Z-146 see Item 5B.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Joist thickness 12K3** more than 4 ft OC	12K3**	12K5**
				less than 4 ft OC	12K5**
1	1	1	15/16	15/16	15/16
1 1/2	1 1/2	1 1/2	1-1/2	1-3/8	1-1/2
2	2	2	2-1/16	1-7/8	2-1/16
3	3	3	3-1/4	2-13/16	3-1/16

**Design load shall stress the 12K3 joist to a maximum tensile strength of 24,000 psi, which represents 80% of the maximum allowable design loading. Based on the Steel Joist Institute (SJI) Publication, "Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders" for guidance on how to increase the design loading accordingly.

ARABIAN VERMICULITE INDUSTRIES —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, Z-106, Z-106/G, Z-106/HY, Z-146 investigated for exterior use.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, Z-106, Z-106/G, Z-106/HY, Z-146 investigated for exterior use.

W R GRACE & CO - CONN —Types MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, RG, Z-106, Z-106/G, Z-106/HY, Z-146 investigated for exterior use.

6. **Metal Lath** — (Not Shown) —(Required with Z-146, otherwise optional) — Metal lath shall be 3/8 in., expanded diamond mesh, weighing 2.5 lb per sq yd. Secured to underside of slab through steel washers with an outside diam of 1/2 in. Fasteners spaced 12 in. OC in both directions with lath edges overlapped approx 3 in.
7. **Metal Lath** — (Not Shown) — (Required on both sides of joists with Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC, otherwise optional) - Metal lath may be used to facilitate the spray application of Spray-Applied Fire Resistive Materials on steel bar joist 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.

*Bearing the UL Classification Mark