



**Fire Resistance Ratings - ANSI/UL 263**

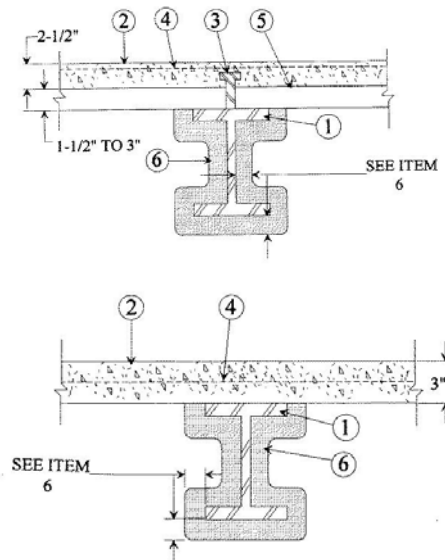
**Design No. N782**

August 03, 2006

**Restrained Beam Ratings — 1, 1-1/2, 2, 3 and 4 Hr**

**Unrestrained Beam Ratings — 1, 1-1/2, 2, 3 and 4 Hr**

**Load Restricted for Canadian Applications — See Guide [BXUV7](#)**



1. **Steel Beam** — W8x28 min size.
  2. **Normal Weight or Lightweight Concrete** — Compressive strength, 3000 psi. For normal weight concrete either carbonate or siliceous aggregate may be used. Unit weight, 148 pcf. For lightweight concrete unit weight 110 pcf.
  3. **Shear Connector** — (Optional) — Studs, 3/4 in. diam headed type or equivalent per AISC specifications. Welded to the top flange of beam through the steel floor units.
  4. **Welded Wire Fabric** — (Optional) — 6x6-10/10 SWG.
  5. **Steel Floor and Form Units\*** — 1-5/16 in. deep corrugated units; or 1-1/2 to 3 in. deep fluted units welded to beam.
  6. **Spray-Applied Fire Resistive Materials\*** — Applied by mixing with water and spraying in more than one coat to the beam to the final thicknesses shown below. When fluted or corrugated steel floor units are used, crest areas shall be filled with Spray-Applied Fire Resistive Materials above the beam. Beam surfaces must be clean and free of dirt, loose scale and oil. Min average 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/HY, Z-106/G. Min average and min ind. density of 40/36 pcf respectively for Type Z-146. For method of density determination, see Design Information Section.
- The thicknesses of Spray-Applied Fire Resistive Materials shown in the table below are applicable when the beams are supporting solid concrete slabs or floor assemblies containing only fluted floor or form units with lightweight concrete.

Rating Hr	Min Thkns In.	
	Restrained Beam Rating Hr	Unrestrained Beam Rating Hr
1	7/16	7/16
1-1/2	7/16	3/4
2	11/16	1
3	1-3/16	1-5/16
4	1-5/8	1-5/8

The thickness of Spray-Applied Fire Resistive Materials shown in the table below are only applicable when the beams are supporting solid, normal weight, concrete slabs or floor assemblies containing only fluted floor or form units, topped with normal weight concrete.

	Min Thkns In.	
Rating Hr	Restrained Beam Rating Hr	Unrestrained Beam Rating Hr
1	3/8	3/8
1-1/2	3/8	5/8
2	9/16	7/8
3	1	1-7/16
4	1-7/16	2

The thickness 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 by one-half and the beams are supporting solid concrete slabs or floor assemblies containing only fluted floor or form units with lightweight concrete.

	Min Thkns In.	
Rating Hr	Restrained Beam Rating Hr	Unrestrained Beam Rating Hr
1	7/16+	7/16+
1-1/2	7/16+	3/4
2	11/16	1
3	1-3/16	1-7/16
4	1-11/16	1-15/16

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

The thickness 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 by one-half and the beams are supporting solid concrete slabs or floor assemblies containing only fluted floor or form units with normal weight concrete.

	Min Thkns In.	
Rating Hr	Restrained Beam Rating Hr	Unrestrained Beam Rating Hr
1	7/16+	7/16+
1-1/2	7/16+	3/4
2	11/16	1-1/16
3	1-3/16	1-11/16
4	1-11/16	2-5/16

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

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

**W R Grace & Co - Conn** — Types MK-6/HY, MK-6/HY Extended Set, MK-6s, RG Monokote Acoustic 1, Monokote Acoustic 5, Z-106, Z-106/G, Z-106/HY, 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-106/HY, Z-146 investigated for exterior use, Monokote Acoustic 35.

\*Bearing the UL Classification Mark

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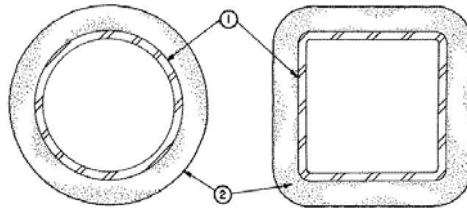
# UL Online Certifications Directory

## Fire Resistance Ratings - ANSI/UL 263

### Design No. X771

July 10, 2004

Ratings — 3/4, 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 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 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 19/18 pcf respectively for Types 7GP and 7HD. 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:

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

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:

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

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 FIREPROOFING PRODUCTS CO** — Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 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

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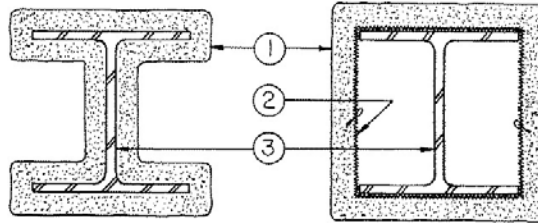
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## Fire Resistance Ratings - ANSI/UL 263

### Design No. X772

July 10, 2004

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. Min avg and min ind density of 19/18 pcf respectively for Types 7GP and 7HD. 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 FIREPROOFING PRODUCTS CO** — Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 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.

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