2

CITY OF PORTLAND, OREGON - BUREAU OF DEVELOPMENT SERVICES

1900 SW Fourth Avenue, Suite 5000 • Portland, Oregon 97201 • www.portlandonline.com/bds • Fax 503-823-7425

Facility Permit Plan Intake Form

FOR INTAKE, STAFF USE ONLY		Building/Mechanical	JIM Z
Date Received	10/31/17	Electrical	
Building Registration #		Plumbing	
Fixed Bid		Fire	TODD B
Bin #		Planning	11/2
Building Permit #	17-256196 DFS 01 FA	BES	
Mechanical #		PDOT	
Plumbing Permit #		Structural	
Electrical Permit #		Other	

1

2

APPLICANT: Complete all sections below that apply to the project. Please print legibly.

Print Name Derek Hille Sign Name Derek Hille

Street Address 11775 SW Greenburg Road

City Portland State OR Zip Code 97223

Day Phone 503-407-4682 FAX 503-214-5358 email derekh@officespaceplanners.com

Plans / permits available for pick up at 1900 SW 4th Avenue, 2nd fl oor between 8:00 am to 5:00 pm

Contact Name for plan/permit pick up Derek Hille

Day Phone 503-407-4682 email derekh@officespaceplanners.com

Project Building Name / # Wells Fargo Center

Project Address or Location 1300 SW 5th Ave, SD Floor, Portland, OR 90201

Project Name and Description Spray Applied Fireproofing - Reference 17-256196 FA

(PR#) 192314-04095-LL (SD) – SD LEVEL; HAZARDOUS MATERIAL ABATEMENT

Total Project Value $ 110,000.00 Project Reference #/Billing ID # 00-187676-FC

Building Contractor Western Partitions, Inc. CCB # 60330

MechanicalContractor CCB #

Electrical Contractor CCB# License #

Plumbing Contractor CCB# License #

17-256196 DFS 01 FA

☑ **Building Permit**

No. of Stories 41

Const. Type I-FR

Y	Alarms Required	
Y	Smoke Det. Req'd	
Y	Sprinklers Req'd	
N	Struct. Eng / Calcs Submitted	

☐ **Mechanical Permit**

Mechanical Valuation

Description

☐ **Electrical Permit**

Please provide a completed standard electrical permit application form. You may mail or deliver it to 1900 SW 4th Avenue, Portland, Oregon 97201 or FAX to 503-823-7425.

☐ **Plumbing Permit**

Number of Fixtures

Back Flow Devices

Water Service (# of Feet)

Medical Gas

Other

City of Portland
REVIEWED FOR CODE COMPLIANCE
NOV 08 2017
17-256196 DFS 01 FA
Permit Number

1

B1

EST. 1972

Spray Applied Fireproofing Submittal

Job Name: Wells Fargo Center SD Level

WPI Job #: 17-0671
Section: Spray Applied Fireproofing
Submittal Date: October 2017

Table Of Contents:

General Notes (2)
Product Data (3-4)
UL Designs (5-25)
Test Reports (26-33)
Certificates (34)
Shop Drawings (35)
Approved Applicator (36)

APPROVAL

GENERAL CONTRACTOR	ARCHITECT
	City of Portland REVIEWED FOR CODE COMPLIANCE NOV 0 8 2017 17-256196 DFS 01 FA Permit Number

local: 503.620.1600 toll free: 800.783.0315 fax: 503.624.5781 | 8300 SW Hunziker Road, Tigard OR 97223 | www.westernpartitions.com
OR: 60330 | WA: WESTEPI172P6 | NV: 0067767

2

17-256196 DFS 01 FA

B1

EST. 1972

Wells Fargo - SD Level

Fireproofing Submittal Notes

PRODUCT

- We are submitting to apply the following fireproofing products at structural members as indicated on included shop drawings:
  - Monokote Retro-Guard RG - Replacement Fireproofing.

UL TESTING

- **Protected Floor:**

UL D798 - submitted for 2 hour protected floor assembly with 5 3/4" of concrete.
UL D739 - submitted for 2 hour protected trench header.
UL N852 - submitted for substitution of 2 & 3 hour floor beams into UL D798.

GENERAL NOTES

Please reference submitted documentation and drawings for thickness requirement and application intent for further clarification.

If you should have any questions, please feel free to call me direct at (503)624-5373

Sincerely,
John Beebe
Fireproofing Department Estimator

RETRO-GUARD® RG

Replacement fireproofing

Designed to meet all IBC Bond Strength Requirements

Product Description

Retro-Guard® RG replacement fireproofing is a single component, mill-mixed gypsum plaster based product which requires only the addition of water on the job site to form a consistent, pumpable slurry. RG can be used on structural steel columns, beams, joists, trusses, flat plate cellular and fluted decking.

Features & Benefits

Retro-Guard Cementitious Fireproofing has been specifically developed by Grace Construction Products to meet the needs of the fireproofing respray contractor. Retro-Guard offers the following advantages:

- **Adjustable Bond Strengths** - can be applied to reach over 1,000 psf when applied at densities at or above 18 pcf.
- **Quick set**—in 7 to 10 minutes with the use of Monokote® Accelerator and Injection System
- **Less overspray**—work close to steel, less cleanup
- **No noxious fumes** or irritating particulates released during or after application
- **Hard** durable surface
- **Fully UL fire tested** and classified for use with the most post-removal lock downs in the industry
- **Dries to a light blue color**—easily identified and differentiated

Materials

a. Material shall be Retro-Guard RG replacement fireproofing as manufactured by GCP Applied Technologies.

b. Mixing water shall be clean, fresh and suitable for domestic consumption, and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material.

c. Lock down agents shall be UL Classified for use with Retro-Guard RG. Refer to the ULI Fire Resistance Directory current edition for products listed with Retro-Guard under Classification Category CBUI.

Delivery & 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 the proper Underwriters Laboratories Inc. identification.

Mixing

a. Retro-Guard shall be mixed by machine in a conven-tional 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 40–45 pcf (640–720 kg/m³) 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. Where possible, the mixer blades shall then be stopped and all the Retro-Guard fire-proofing added. The mixer blades shall then be restarted. If the mixer blades are left running, Retro-Guard should be added to the mixer as quickly as possible. Mixing shall continue only until all material is thoroughly wet and no lumps remain. Target density of 43 ± 1 pcf (688 ± 16 kg/m³) is most desir-able. Overmixing Retro-Guard will reduce pumping rate and will adversely affect final in-place density and hangability. Undermixing Retro-Guard will negatively affect in-place density and yield.

Steel Surfaces

a. Prior to the application of Retro-Guard an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be

Performance Characteristics

Physical Properties	Recommended Specification	Typical Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m³) 18 pcf (288 kg/m³)	15 pcf (240 kg/m³) 18 pcf (288 kg/m³)	ASTM E605
Bond strength	430 psf (20.6 KPa) at 15 pcf 1,000 psf (47.9 KPa) at 18 pcf	883 psf (42.3 KPa) at 15 pcf 1,527 psf (73.1 KPa) at 18 pcf	ASTM E736 ASTM E736
Compression, 10% deformation	1,200 psf (51 KPa)	1,440 psf (68.9 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft² (0.00 g/m²)	0.000 g/ft² (0.00 g/m²)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond Impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E1354
Impact penetration	Max 6 cm³ abraded	3.3 cm³	City of San Francisco
Abrasion resistance	Max 15 cm³ abraded	8.3 cm³	City of San Francisco

fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, rust 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 abatement contractor, or general contractor.

b. The project architect shall determine if the painted/primed steel or lock down agent on the steel to receive fireproofing have been tested in accordance with ASTM E119, 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 galva-nized 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.

d. Prior to application of Retro-Guard, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Retro-Guard.

e. In advance of the application of the fireproofing, a bond test shall be conducted on all painted/primed steel surfaces or steel that has been covered with a lock down agent to determine if the paint or lock down agent will impair the ambient bond of the fireproofing.

f. Where cellular steel decking is present, both cellular and fluted decking requires the application of Spatterkote® SK-3 before application of Retro-Guard RG. The thickness of SK-3 is incorporated into the total fireproofing thickness.

g. Fireproofing to the underside of steel roof deck assemblies shall be done only after roofing applica-tion is complete and roof traffic has ceased.

Application

a. Application of Retro-Guard Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply second passes after the first coat has set.
   The use of the Monokote Accelerator Injection System is required to obtain optimal job site appli-cation performance. The use of the Monokote Accelerator Injection System will provide quick set material (usually seven to ten minutes after appli-cation), greater in-place yield, and the ability to spray an area in essentially one continuous opera-tion. Second coat can be applied as soon as first material applied has set.

b. Prior to application of Retro-Guard, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Retro-Guard.

c. Spatterkote SK-3 shall be applied to all deck areas when flat plate cellular steel decking is present, and as specified in some roof deck designs. Consult current UL Directory for specific use. Spatterkote shall be applied in accordance with manufacturer's application instructions.

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

e. Retro-Guard shall have a minimum average dry in-place density of 15 lbs/ft³ (240 kg/m³).

f. Retro-Guard shall be mixed with water at the job site.

g. Monokote Accelerator when used shall be mixed and used according to the manufacturers recommendations.

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

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.5°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum or 24 hours after application of Retro-Guard.

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 fresh air exchange rate of 4 times per hour until the material is dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

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. Retro-Guard is SLIPPERY WHEN WET.
The General Contractor and Applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs.

b. A Material Safety Data Sheet for Retro-Guard is available on our web site at www.gcpat.com or call toll free at 866-333-3SBM.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate, and is offered for consideration, investigation and verification by the user, but we do not warrant the results to be obtained. Please read all statements, recommendations, and suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation, or suggestion is intended for any use that would infringe any patent, copyright, or other third party right.

Retro-Guard, Monokote and Spatterkote are trademarks, which may be registered in the United States and/or other countries, of GCP Applied Technologies Inc. This trademark list has been compiled using available published information as of the publication date and may not accurately reflect current trademark ownership or status.

© Copyright 2016 GCP Applied Technologies Inc. All rights reserved.

GCP Applied Technologies Inc., 62 Whittemore Avenue, Cambridge, MA 02140 USA.

In Canada, GCP Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

Printed in U.S.A. GCP0083a RG-121-0516

gcp applied technologies

ONLINE CERTIFICATIONS DIRECTORY

Design No. J712
BXUV.J712
Fire-resistance Ratings - ANSI/UL 263

Page Bottom

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. J712

June 19, 2014

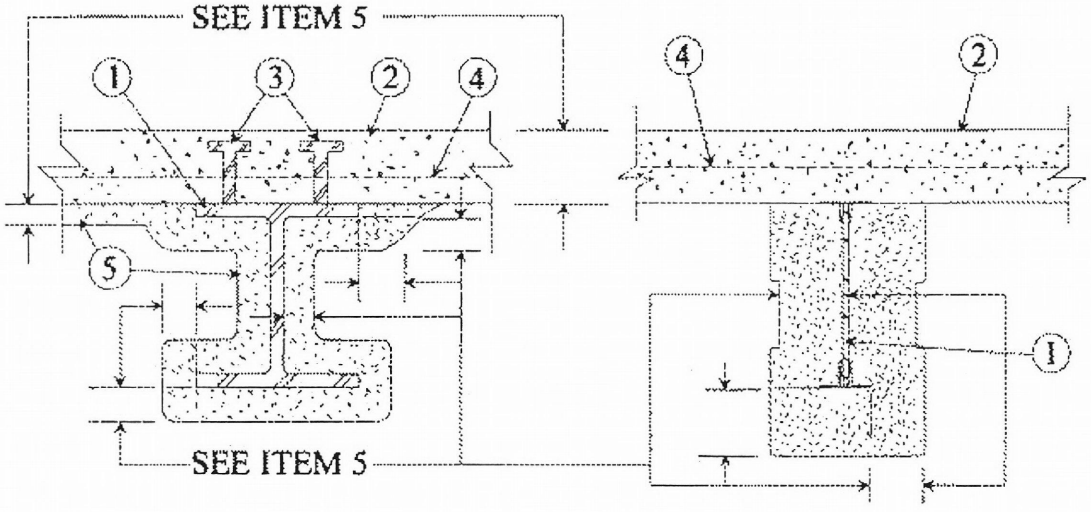
Restrained Assembly Ratings — 1-1/2, 2, 3 or 4 Hr (See Item 5)

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)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



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, MK-10 HB Extended Set and RG.For method of density determination, see Design Information Section, Sprayed Material.

Note:
See UL N852 for individual beam requirements.

Slab Thkns In		Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr				
Carbonate Aggregate	**Siliceous Aggregate**	**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

			Beam Thickness	
Restrained Assembly Rating Hr	**Unrestrained Assembly Rating Hr**	**Unrestrained Beam Rating Hr**	**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, MK-10 HB Extended Set.

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

GCP APPLIED TECHNOLOGIES INC — Types MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, MK-10 HB Extended Set, 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.

Slab Thkns In		Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr				
Carbonate Aggregate	Siliceous Aggregate	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

			Beam Thickness	
Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	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 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 Z-106, Z-106/G, Z-106/HY.

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

GCP APPLIED TECHNOLOGIES INC — 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.

Slab Thkns In		Spray Applied Fire Resistive Mtl Thkns on Slab In. Restrained or Unrestrained Assembly Rating Hr				
Carbonate Aggregate	Siliceous Aggregate	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

			Beam Thickness	
Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	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 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 — Type Z-146 investigated for exterior use.

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

GCP APPLIED TECHNOLOGIES INC — 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, MK-10 HB Extended Set, see Item 5; Types Z-106, Z-106/G, Z-106/HY see Item 5A; Type Z-146 see Item 5B.

			Joist thickness		
Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	12K3** more than 4 ft OC	12K3** 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, MK-10 HB Extended Set, Z-106, Z-106/G, Z-106/HY, Z-146 investigated for exterior use.

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

GCP APPLIED TECHNOLOGIES INC — Types MK-6 GF, MK-6/HY, MK-6/HB, MK-6S, MK-10 HB, MK-10 HB Extended Set, 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.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2014-06-19

© 2016 UL LLC

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2016 UL LLC".

Design No. N852
BXUV.N852
Fire-resistance Ratings - ANSI/UL 263

Page Bottom

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. N852

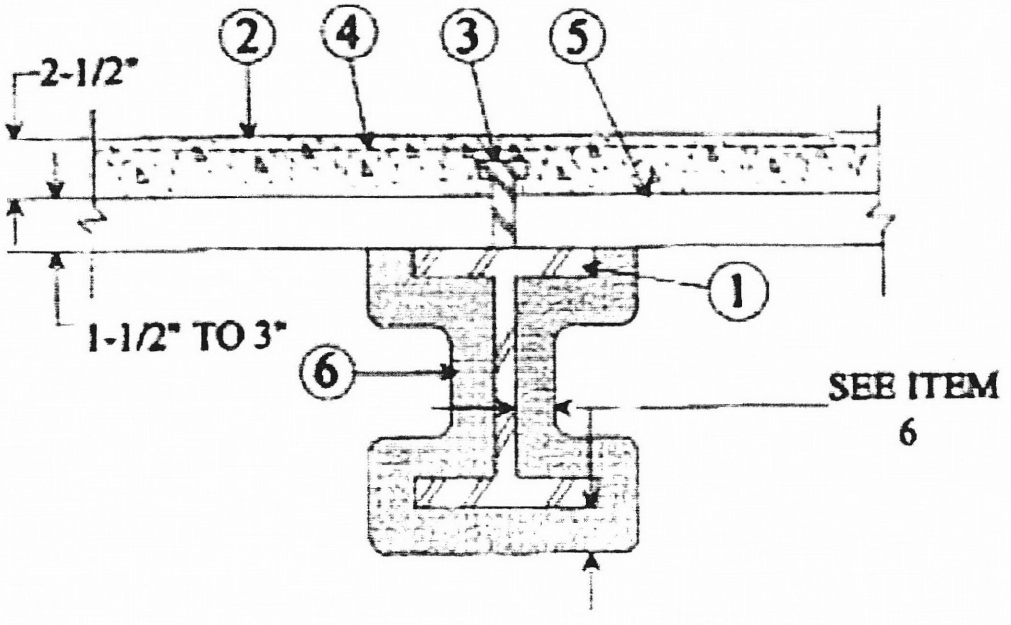
January 27, 2016

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

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

Loading Determined by Allowable Stress Design Method or Load and Resistance Factor Design Method published by the American Institute of Steel Construction, or in accordance with the relevant Limit State Design provisions of Part 4 of the National Building Code of Canada

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. **Steel Beam —** W8x28 min size.

2. **Normal Weight Concrete —** Compressive strength, 4000 psi. Either carbonate or siliceous aggregate may be used. Unit weight, 145 +/- 3 pcf.

2A. **Light Weight Concrete —** Compressive strength, 3000 psi. Either expanded shale, clay or slate aggregate by rotary-kiln method. Unit weight, 110 +/- 3 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 or cellular 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. 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 avg and min ind density of 40/36 pcf respectively for Types AV650, Z-146, Z-146PC and Z-146T cementitious mixture. Min avg and min ind density of 50/45 pcf respectively for Types AV800, Z-156, Z-156T and Z-156PC. For method of density determination, see Design Information Section.

The thickness of Spray-Applied Fire Resistive Materials shown in the table below are only applicable when the beams are supporting floor assemblies containing only fluted floor and form units, topped with normal weight concrete (Item 2).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	5/16	5/16
1-1/2	7/16	9/16
2	11/16	13/16
2(+)	9/16	3/4
3	1-3/16	1-5/16
4	1-11/16	1-7/8

(+) Rating applicable only when a minimum of 4-1/2 in. of normal weight concrete provided over deck crests.

The thickness of Spray-Applied Fire Resistive Materials shown in the table below are only applicable when the beams are supporting floor assemblies containing corrugated or cellular floor and form units, topped with normal weight concrete (Item 2).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	3/8	3/8
1-1/2	9/16	11/16
2	7/8	1-1/16
2(+)	3/4	15/16
3	1-9/16	1-11/16
4	2-1/4	2-7/16

(+) Rating applicable only when a minimum of 4-1/2 in. of normal weight concrete provided over deck crests.

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 (Item 2).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	3/8	3/8
1-1/2	7/16	5/8
2	11/16	7/8
2(+)	9/16	13/16
3	1-3/16	1-7/16
4	1-11/16	1-15/16

(+) Rating applicable only when a minimum of 4-1/2 in. of normal weight concrete provided over deck crests.

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 corrugated or cellular floor or form units with normal weight concrete (Item 2).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	1/2	1/2
1-1/2	9/16	13/16
2	7/8	1-1/8
2(+)	3/4	1-1/16
3	1-9/16	1-7/8
4	2-1/4	2-9/16

(+) Rating applicable only when a minimum of 4-1/2 in. of normal weight concrete provided over deck crests.

The thickness of Spray-Applied Fire Resistive Materials shown in the table below are only applicable when the beams are supporting floor assemblies containing only fluted floor and form units, topped with light weight concrete (Item 2A).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**

1	3/8	3/8
1-1/2	8/16	5/8
2	13/16	15/16
3	1-5/16	1-9/16
4	1-7/8	2-1/8

The thickness of Spray-Applied Fire Resistive Materials shown in the table below are only applicable when the beams are supporting floor assemblies containing cellular or corrugated floor and form units, topped with light weight concrete (Item 2A).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	1/2	1/2
1-1/2	5/8	13/16
2	1-1/16	1-3/16
3	1-11/16	2
4	2-7/16	2-13/16

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 light weight concrete (Item 2A).

	Min Thkns In.	
Rating Hr	**Restrained Beam**	**Unrestrained Beam**
1	1/2	1/2
1-1/2	9/16	3/4
2	7/8	1-1/16
3	1-3/8	1-11/16
4	1-15/16	2-1/4

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 corrugated or cellular floor or form units with light weight concrete (Item 2A).

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

ARABIAN VERMICULITE INDUSTRIES — Types MK-6/HY, MK-6/HY Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-1000/HB, MK-1000/HB Extended Set, Z-106, Z-106/G, Z-146 investigated for exterior use. Types AV650 and AV800 investigated for external use.

GRACE KOREA INC — Types MK-6/HY, MK-6/HY Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-1000/HB, MK-1000/HB Extended Set, Z-106, Z-106/G, Z-106/HY, Z-146 investigated for exterior use.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY Extended Set, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, MK-1000/HB, MK-1000/HB Extended Set, RG, Z-106, Z-106/G, Z-106/HY, Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC investigated for exterior use.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2016-01-27

© 2016 UL LLC

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2016 UL LLC".

BXUV.N852

Beam for Unprotected Floor/Ceiling, Fluted or Corrugated Decking

Unrestrained Beam Thicknesses (Normal Weight Concrete)

GCP Applied Technologies Inc. — Types MK-6/HY, MK-10 HB, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, RG, Z-106, Z-106/G, Z-106/HY, Z-146, Z-146T, Z-146 PC, Z-156, Z-156T, Z-156PC, MK-1000/HB, MK-1000/HB Extended Set

FULL FLANGE TIP THICKNESS (in.)							HALF FLANGE TIP THICKNESS (in.)				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size x Wt	W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
5/16	9/16	3/4	1 1/4	1 3/4	W18 x 55	0.963	3/8	5/8	13/16	1 5/16	1 13/16
5/16	1/2	3/4	1 3/16	1 5/8	W18 x 60	1.040	3/8	9/16	13/16	1 1/4	1 11/16
5/16	1/2	11/16	1 1/8	1 9/16	W18 x 65	1.130	3/8	9/16	3/4	1 3/16	1 5/8
5/16	1/2	11/16	1 1/16	1 1/2	W18 x 71	1.220	3/8	1/2	11/16	1 1/8	1 9/16
5/16	1/2	11/16	1 1/8	1 9/16	W18 x 76	1.130	3/8	9/16	3/4	1 3/16	1 5/8
5/16	7/16	5/8	1	1 7/16	W18 x 86	1.270	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 3/8	W18 x 97	1.420	3/8	1/2	5/8	1 1/16	1 3/8
5/16	3/8	9/16	7/8	1 1/4	W18 x 106	1.550	3/8	7/16	5/8	1	1 5/16
5/16	3/8	1/2	13/16	1 3/16	W18 x 119	1.720	3/8	7/16	9/16	15/16	1 3/16
3/8	5/8	7/8	1 7/16	2	W21 x 44	0.746	7/16	11/16	15/16	1 9/16	2 1/16
5/16	9/16	13/16	1 5/16	1 7/8	W21 x 50	0.838	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	3/4	1 1/4	1 3/4	W21 x 57	0.952	3/8	5/8	13/16	1 3/8	1 13/16
5/16	9/16	3/4	1 1/4	1 3/4	W21 x 62	0.952	3/8	5/8	13/16	1 3/8	1 13/16
5/16	1/2	3/4	1 3/16	1 5/8	W21 x 68	1.040	3/8	9/16	13/16	1 1/4	1 11/16
5/16	1/2	11/16	1 1/8	1 9/16	W21 x 73	1.110	3/8	9/16	3/4	1 1/4	1 5/8
5/16	7/16	5/8	1 1/16	1 7/16	W21 x 83	1.260	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 3/8	W21 x 93	1.400	3/8	1/2	5/8	1 1/16	1 3/8
5/16	7/16	5/8	1	1 7/16	W21 x 101	1.300	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 5/16	W21 x 111	1.430	3/8	7/16	5/8	1 1/16	1 3/8
5/16	3/8	9/16	7/8	1 1/4	W21 x 122	1.570	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	7/8	1 3/16	W21 x 132	1.680	3/8	7/16	9/16	15/16	1 1/4
5/16	3/8	1/2	13/16	1 1/8	W21 x 147	1.870	3/8	3/8	9/16	7/8	1 1/8
5/16	9/16	13/16	1 5/16	1 7/8	W24 x 55	0.828	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 1/4	1 3/4	W24 x 62	0.934	3/8	5/8	13/16	1 3/8	1 13/16
5/16	9/16	3/4	1 1/4	1 3/4	W24 x 68	0.942	3/8	5/8	13/16	1 3/8	1 13/16
5/16	1/2	3/4	1 3/16	1 5/8	W24 x 76	1.050	3/8	9/16	13/16	1 1/4	1 11/16
5/16	1/2	11/16	1 1/8	1 9/16	W24 x 84	1.150	3/8	9/16	3/4	1 3/16	1 5/8
5/16	7/16	5/8	1	1 7/16	W24 x 94	1.280	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	11/16	1 1/16	1 1/2	W24 x 104	1.240	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	1	1 3/8	W24 x 117	1.380	3/8	1/2	11/16	1 1/16	1 7/16
5/16	3/8	9/16	7/8	1 1/4	W24 x 131	1.540	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	13/16	1 3/16	W24 x 146	1.700	3/8	7/16	9/16	15/16	1 1/4
5/16	3/8	1/2	13/16	1 1/8	W24 x 162	1.880	3/8	3/8	9/16	7/8	1 1/8
5/16	1/2	3/4	1 3/16	1 11/16	W27 x 84	1.030	3/8	9/16	13/16	1 5/16	1 11/16
5/16	1/2	11/16	1 1/8	1 9/16	W27 x 94	1.150	3/8	9/16	3/4	1 3/16	1 5/8
5/16	7/16	11/16	1 1/16	1 1/2	W27 x 102	1.240	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 3/8	W27 x 114	1.390	3/8	1/2	5/8	1 1/16	1 7/16
5/16	3/8	9/16	7/8	1 1/4	W27 x 129	1.560	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	7/8	1 1/4	W27 x 146	1.550	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	13/16	1 3/16	W27 x 161	1.700	3/8	7/16	9/16	15/16	1 1/4
5/16	3/8	1/2	13/16	1 1/8	W27 x 178	1.870	3/8	3/8	9/16	7/8	1 1/8
5/16	1/2	3/4	1 3/16	1 11/16	W30 x 90	1.020	3/8	9/16	13/16	1 5/16	1 3/4
5/16	1/2	11/16	1 1/8	1 9/16	W30 x 99	1.120	3/8	9/16	3/4	1 3/16	1 5/8
5/16	1/2	11/16	1 1/16	1 1/2	W30 x 108	1.210	3/8	1/2	11/16	1 3/16	1 9/16
5/16	7/16	5/8	1	1 7/16	W30 x 116	1.300	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 3/8	W30 x 124	1.390	3/8	1/2	5/8	1 1/16	1 7/16
5/16	7/16	9/16	15/16	1 5/16	W30 x 132	1.470	3/8	7/16	5/8	1	1 3/8
5/16	3/8	9/16	7/8	1 3/16	W30 x 173	1.660	3/8	7/16	9/16	15/16	1 1/4
5/16	3/8	1/2	13/16	1 1/8	W30 x 191	1.850	3/8	3/8	9/16	7/8	1 1/8
5/16	3/8	1/2	3/4	1 1/16	W30 x 211	2.010	3/8	3/8	1/2	13/16	1 1/16
5/16	1/2	11/16	1 1/16	1 1/2	W33 x 118	1.210	3/8	1/2	11/16	1 3/16	1 9/16
5/16	7/16	5/8	1	1 7/16	W33 x 130	1.320	3/8	1/2	11/16	1 1/16	1 7/16
5/16	7/16	5/8	15/16	1 5/16	W33 x 141	1.430	3/8	7/16	5/8	1 1/16	1 3/8
5/16	3/8	9/16	7/8	1 1/4	W33 x 152	1.530	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	13/16	1 3/16	W33 x 169	1.700	3/8	7/16	9/16	15/16	1 1/4
5/16	3/8	1/2	13/16	1 1/8	W33 x 201	1.790	3/8	3/8	9/16	7/8	1 3/16
5/16	3/8	1/2	3/4	1 1/16	W33 x 221	1.970	3/8	3/8	1/2	13/16	1 1/8
5/16	3/8	7/16	11/16	1	W33 x 241	2.130	3/8	3/8	1/2	3/4	1 1/16
5/16	7/16	5/8	1	1 7/16	W36 x 135	1.290	3/8	1/2	11/16	1 1/8	1 1/2
5/16	7/16	5/8	15/16	1 5/16	W36 x 150	1.430	3/8	7/16	5/8	1 1/16	1 3/8

BXUV.N852

Beam for Unprotected Floor/Ceiling, Fluted or Corrugated Decking

Unrestrained Beam Thicknesses (Normal Weight Concrete)

GCP Applied Technologies Inc. — Types MK-6/HY, MK-10 HB, MK-6/HB, MK-6s, MK-6 GF, MK-6 GF Extended Set, RG, Z-106, Z-106/G, Z-106/HY, Z-146, Z-146T, Z-146 PC, Z-156, Z-156T, Z-156PC, MK-1000/HB, MK-1000/HB Extended Set

FULL FLANGE TIP THICKNESS (in.)						HALF FLANGE TIP THICKNESS (in.)				
1 hr	1.5 hr	2 hr	3 hr	4 hr	Size x Wt W/D	1 hr	1.5 hr	2 hr	3 hr	4 hr
5/16	7/16	9/16	15/16	1 5/16	W36 x 160 1.510	3/8	7/16	5/8	1	1 5/16
5/16	3/8	9/16	7/8	1 1/4	W36 x 170 1.600	3/8	7/16	5/8	15/16	1 1/4
5/16	3/8	1/2	13/16	1 3/16	W36 x 182 1.720	3/8	7/16	9/16	15/16	1 3/16
5/16	3/8	1/2	13/16	1 1/8	W36 x 194 1.810	3/8	3/8	9/16	7/8	1 3/16
5/16	3/8	1/2	3/4	1 1/16	W36 x 210 1.960	3/8	3/8	1/2	13/16	1 1/8
5/16	3/8	1/2	3/4	1 1/16	W36 x 230 1.950	3/8	3/8	1/2	13/16	1 1/8
5/16	3/8	7/16	3/4	1	W36 x 245 2.080	3/8	3/8	1/2	13/16	1 1/16
5/16	3/8	7/16	11/16	15/16	W36 x 256 2.370	3/8	3/8	7/16	11/16	15/16
5/16	3/8	7/16	11/16	1	W36 x 260 2.180	3/8	3/8	1/2	3/4	1
5/16	3/8	7/16	11/16	15/16	W36 x 280 2.350	3/8	3/8	7/16	3/4	15/16
5/16	3/8	3/8	5/8	7/8	W36 x 300 2.500	3/8	3/8	7/16	11/16	15/16
1/2	7/8	1 1/4	1 15/16	2 3/4	Other 0.37	9/16	15/16	1 5/16	2 1/8	2 7/8
1/2	7/8	1 3/16	1 15/16	2 3/4	Other 0.38	9/16	15/16	1 5/16	2 1/8	2 13/16
1/2	13/16	1 3/16	1 15/16	2 11/16	Other 0.39	9/16	15/16	1 5/16	2 1/16	2 13/16
1/2	13/16	1 3/16	1 7/8	2 11/16	Other 0.40	9/16	15/16	1 1/4	2 1/16	2 3/4
1/2	13/16	1 3/16	1 7/8	2 11/16	Other 0.41	9/16	15/16	1 1/4	2 1/16	2 3/4
7/16	13/16	1 3/16	1 7/8	2 5/8	Other 0.42	9/16	7/8	1 1/4	2	2 3/4
7/16	13/16	1 1/8	1 13/16	2 5/8	Other 0.43	9/16	7/8	1 1/4	2	2 11/16
7/16	13/16	1 1/8	1 13/16	2 9/16	Other 0.44	9/16	7/8	1 1/4	2	2 11/16
7/16	13/16	1 1/8	1 13/16	2 9/16	Other 0.45	9/16	7/8	1 3/16	2	2 5/8
7/16	13/16	1 1/8	1 13/16	2 9/16	Other 0.46	9/16	7/8	1 3/16	1 15/16	2 5/8
7/16	3/4	1 1/8	1 3/4	2 1/2	Other 0.47	1/2	7/8	1 3/16	1 15/16	2 5/8
7/16	3/4	1 1/8	1 3/4	2 1/2	Other 0.48	1/2	7/8	1 3/16	1 15/16	2 9/16
7/16	3/4	1 1/16	1 3/4	2 1/2	Other 0.49	1/2	7/8	1 3/16	1 7/8	2 9/16
7/16	3/4	1 1/16	1 3/4	2 7/16	Other 0.50	1/2	13/16	1 3/16	1 7/8	2 1/2
7/16	3/4	1 1/16	1 11/16	2 7/16	Other 0.51	1/2	13/16	1 1/8	1 7/8	2 1/2
7/16	3/4	1 1/16	1 11/16	2 7/16	Other 0.52	1/2	13/16	1 1/8	1 7/8	2 1/2
7/16	3/4	1 1/16	1 11/16	2 3/8	Other 0.53	1/2	13/16	1 1/8	1 13/16	2 7/16
7/16	3/4	1 1/16	1 11/16	2 3/8	Other 0.54	1/2	13/16	1 1/8	1 13/16	2 7/16
7/16	3/4	1 1/16	1 5/8	2 3/8	Other 0.55	1/2	13/16	1 1/8	1 13/16	2 7/16
7/16	3/4	1	1 5/8	2 5/16	Other 0.56	1/2	13/16	1 1/8	1 13/16	2 3/8
7/16	11/16	1	1 5/8	2 5/16	Other 0.57	1/2	13/16	1 1/16	1 3/4	2 3/8
7/16	11/16	1	1 5/8	2 5/16	Other 0.58	1/2	13/16	1 1/16	1 3/4	2 3/8
3/8	11/16	1	1 5/8	2 1/4	Other 0.59	1/2	3/4	1 1/16	1 3/4	2 5/16
3/8	11/16	1	1 9/16	2 1/4	Other 0.60	1/2	3/4	1 1/16	1 3/4	2 5/16
3/8	11/16	1	1 9/16	2 1/4	Other 0.61	1/2	3/4	1 1/16	1 11/16	2 5/16
3/8	11/16	1	1 9/16	2 3/16	Other 0.62	7/16	3/4	1 1/16	1 11/16	2 5/16
3/8	11/16	15/16	1 9/16	2 3/16	Other 0.63	7/16	3/4	1 1/16	1 11/16	2 1/4
3/8	11/16	15/16	1 9/16	2 3/16	Other 0.64	7/16	3/4	1 1/16	1 11/16	2 1/4
3/8	11/16	15/16	1 1/2	2 3/16	Other 0.65	7/16	3/4	1	1 11/16	2 1/4
3/8	11/16	15/16	1 1/2	2 1/8	Other 0.66	7/16	3/4	1	1 5/8	2 3/16
3/8	11/16	15/16	1 1/2	2 1/8	Other 0.67	7/16	3/4	1	1 5/8	2 3/16
3/8	5/8	15/16	1 1/2	2 1/8	Other 0.68	7/16	3/4	1	1 5/8	2 3/16
3/8	5/8	15/16	1 1/2	2 1/16	Other 0.69	7/16	11/16	1	1 5/8	2 3/16
3/8	5/8	15/16	1 7/16	2 1/16	Other 0.70	7/16	11/16	1	1 5/8	2 1/8
3/8	5/8	15/16	1 7/16	2 1/16	Other 0.71	7/16	11/16	1	1 9/16	2 1/8
3/8	5/8	7/8	1 7/16	2 1/16	Other 0.72	7/16	11/16	1	1 9/16	2 1/8
3/8	5/8	7/8	1 7/16	2 1/16	Other 0.73	7/16	11/16	15/16	1 9/16	2 1/8
3/8	5/8	7/8	1 7/16	2	Other 0.74	7/16	11/16	15/16	1 9/16	2 1/16
3/8	5/8	7/8	1 7/16	2	Other 0.75	7/16	11/16	15/16	1 9/16	2 1/16
3/8	5/8	7/8	1 3/8	2	Other 0.76	7/16	11/16	15/16	1 1/2	2 1/16
3/8	5/8	7/8	1 3/8	2	Other 0.77	7/16	11/16	15/16	1 1/2	2 1/16
3/8	5/8	7/8	1 3/8	1 15/16	Other 0.78	7/16	11/16	15/16	1 1/2	2
3/8	5/8	7/8	1 3/8	1 15/16	Other 0.79	7/16	11/16	15/16	1 1/2	2
3/8	5/8	7/8	1 3/8	1 15/16	Other 0.80	7/16	11/16	15/16	1 1/2	2
3/8	5/8	7/8	1 3/8	1 15/16	Other 0.81	7/16	11/16	15/16	1 1/2	2
5/16	9/16	13/16	1 5/16	1 7/8	Other 0.82	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 5/16	1 7/8	Other 0.83	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 5/16	1 7/8	Other 0.84	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 5/16	1 7/8	Other 0.85	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 5/16	1 7/8	Other 0.86	3/8	5/8	7/8	1 7/16	1 15/16
5/16	9/16	13/16	1 5/16	1 13/16	Other 0.87	3/8	5/8	7/8	1 7/16	1 7/8

Design No. X854
BXUV.X854
Fire-resistance Ratings - ANSI/UL 263

Page Bottom

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263

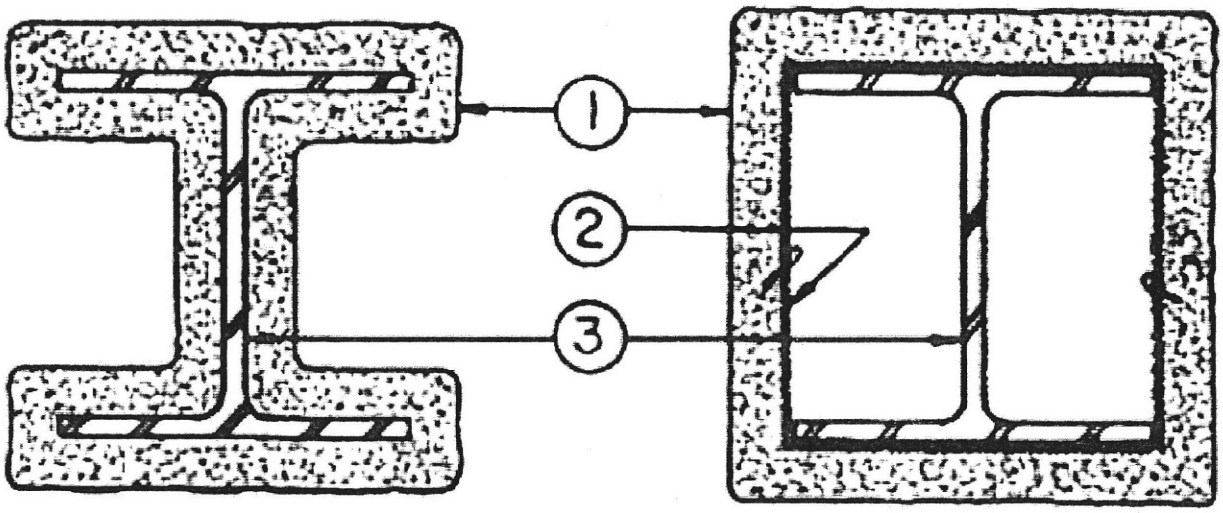
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

Design No. X854

April 08, 2014

Ratings — 1, 1-1/2, 2, 3 and 4 h.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



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, Z-106/HY. 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.

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 = 0.338 to 6.76

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:

TABLE 1

		Min Thk (In.)				
Col Size	W/D	1 Hr	1-1/2 Hr	2 Hr	3 Hr	4 Hr
W4x13	0.556	11/16	1-3/16	1-5/8	2-1/2	3-3/8
W5x16	0.55	11/16	1-3/16	1-5/8	2-1/2	3-3/8
W5x19	0.644	5/8	1-1/8	1-7/16	2-5/16	3-1/8
W6x9	0.338	15/16	1-1/2	2	2-1/2	3-13/16
W6x12	0.448	13/16	1-3/8	1-13/16	2-1/2	3-3/4
W6x15	0.431	13/16	1-3/8	1-13/16	2-1/2	3-13/16
W6x16	0.584	11/16	1-3/16	1-9/16	2-7/16	3-5/16
W6x20	0.563	11/16	1-3/16	1-9/16	2-1/2	3-3/8
W6x25	0.696	5/8	1-1/16	1-3/8	2	2-11/16
W8x13	0.421	13/16	1-3/8	1-7/8	2-1/2	3-13/16
W8x15	0.481	3/4	1-5/16	1-3/4	2-1/2	3-5/8
W8x18	0.499	3/4	1-1/4	1-11/16	2-1/2	3-1/2
W8x21	0.577	11/16	1-3/16	1-9/16	2-1/2	3-5/16
W8x24	0.591	11/16	1-1/8	1-9/16	2-7/16	3-5/16
W8x28	0.688	5/8	1-1/16	1-3/8	2	2-11/16
W8x31	0.665	5/8	1-1/16	1-7/16	2-5/16	3-1/16
W8x35	0.749	9/16	1	1-5/16	2	2-11/16
W8x40	0.849	9/16	3/4	1-1/8	1-11/16	2-1/2
W8x48	1	1/2	3/4	1	1-11/16	2-5/16
W8x58	1.2	7/16	3/4	13/16	1-3/8	1-15/16
W8x67	1.37	3/8	5/8	3/4	1-1/4	1-11/16
W10x12	0.347	7/8	1-1/2	2	2-1/2	3-13/16
W10x15	0.429	13/16	1-3/8	1-7/8	2-1/2	3-13/16
W10x17	0.482	3/4	1-5/16	1-3/4	2-1/2	3-5/8
W10x19	0.538	3/4	1-1/4	1-5/8	2-1/2	3 7/16
W10x22	0.523	3/4	1-1/4	1-11/16	2-1/2	3-1/2
W10x26	0.612	11/16	1-1/8	1-1/2	2-3/8	3-1/4
W10x30	0.699	5/8	1-1/16	1-3/8	2	2-11/16
W10x33	0.661	5/8	1-1/16	1-7/16	2-5/16	3-1/8
W10x39	0.78	9/16	1	1-1/4	2	2-11/16
W10x45	0.888	1/2	3/4	1-1/8	1-11/16	2-1/2
W10x49	0.84	9/16	3/4	1-1/8	1-11/16	2-1/2
W10x54	0.922	1/2	3/4	1-1/16	1-11/16	2-1/2

W10x60	1.01	1/2	3/4	1	1-5/8	2-5/16
W10x68	1.15	7/16	3/4	7/8	1-7/16	2
W10x77	1.28	7/16	11/16	3/4	1-5/16	1-13/16
W10x88	1.45	3/8	5/8	11/16	1-3/16	1-5/8
W10x100	1.64	3/8	9/16	11/16	1-1/8	1-1/2
W10x112	1.81	5/16	1/2	11/16	1-1/8	1-1/2
W12x14	0.363	7/8	1-1/2	2	2-1/2	3-13/16
W12x16	0.41	13/16	1-7/16	1-7/8	2-1/2	3-13/16
W12x19	0.485	3/4	1-5/16	1-3/4	2-1/2	3-5/8
W12x22	0.56	11/16	1-3/16	1-5/8	2-1/2	3-3/8
W12x26	0.531	3/4	1-1/4	1-5/8	2-1/2	3 7/16
W12x30	0.607	11/16	1-1/8	1-1/2	2-7/16	3-1/4
W12x35	0.703	5/8	1-1/16	1-3/8	2	2-11/16
W12x40	0.734	5/8	1	1-5/16	2	2-11/16
W12x45	0.829	9/16	15/16	1-3/16	1-15/16	2-11/16
W12x50	0.909	1/2	3/4	1-1/16	1-11/16	2-1/2
W12x53	0.855	9/16	3/4	1-1/8	1-11/16	2-1/2
W12x58	0.925	1/2	3/4	1-1/16	1-11/16	2-7/16
W12x65	0.925	1/2	3/4	1-1/16	1-11/16	2-7/16
W12x72	1.02	1/2	3/4	15/16	1-5/8	2-1/4
W12x79	1.11	7/16	3/4	7/8	1-1/2	2-1/8
W12x87	1.22	7/16	11/16	13/16	1-3/8	1-15/16
W12x96	1.34	3/8	11/16	3/4	1-1/4	1-3/4
W12x106	1.47	3/8	5/8	11/16	1-3/16	1-5/8
W12x120	1.65	5/16	9/16	11/16	1-1/8	1-1/2
W12x136	1.86	5/16	1/2	11/16	1-1/8	1-1/2
W12x152	2.04	5/16	1/2	11/16	1-1/16	1-7/16
W12x170	2.26	1/4	7/16	5/8	15/16	1-5/16
W12x190	2.5	1/4	5/16	9/16	7/8	1-3/16
W12x210	2.73	1/4	5/16	1/2	13/16	1-1/8
W12x230	2.96	1/4	5/16	1/2	3/4	1-1/16
W12x252	3.2	1/4	5/16	7/16	3/4	1
W12x279	3.5	1/4	5/16	7/16	11/16	7/8
W12x305	3.76	1/4	5/16	3/8	5/8	7/8
W12x336	4.06	1/4	1/4	3/8	9/16	13/16
W14x22	0.476	3/4	1-5/16	1-3/4	2-1/2	3-5/8
W14x26	0.559	11/16	1-3/16	1-5/8	2-1/2	3-3/8
W14x30	0.562	11/16	1-3/16	1-9/16	2-1/2	3-3/8
W14x34	0.633	5/8	1-1/8	1-7/16	2-3/8	3 3/16
W14x38	0.706	5/8	1-1/16	1-3/8	2	2-11/16
W14x43	0.752	9/16	1	1-5/16	2	2-11/16
W14x48	0.835	9/16	15/16	1-3/16	1-15/16	2-11/16
W14x53	0.915	1/2	3/4	1-1/16	1-11/16	2-1/2

W14x61	0.928	1/2	3/4	1-1/16	1-11/16	2-7/16
W14x68	1.04	1/2	3/4	15/16	1-5/8	2-1/4
W14x74	1.12	7/16	3/4	7/8	1-1/2	2-1/16
W14x82	1.23	7/16	11/16	13/16	1-3/8	1-7/8
W14x90	1.08	7/16	3/4	7/8	1-9/16	2-1/8
W14x99	1.18	7/16	3/4	13/16	1-7/16	2
W14x109	1.29	7/16	11/16	3/4	1-5/16	1-13/16
W14x120	1.42	3/8	5/8	3/4	1-3/16	1-11/16
W14x132	1.56	3/8	9/16	11/16	1-1/8	1-9/16
W14x145	1.64	3/8	9/16	11/16	1-1/8	1-1/2
W14x159	1.78	5/16	9/16	11/16	1-1/8	1-1/2
W14x176	1.96	5/16	1/2	11/16	1-1/16	1-1/2
W14x193	2.14	5/16	7/16	5/8	1	1-3/8
W14x211	2.32	1/4	7/16	5/8	15/16	1-5/16
W14x233	2.55	1/4	5/16	9/16	7/8	1-3/16
W14x257	2.78	1/4	5/16	1/2	13/16	1-1/8
W14x283	3.03	1/4	5/16	1/2	3/4	1
W14x311	3.3	1/4	5/16	7/16	11/16	15/16
W14x342	3.58	1/4	5/16	7/16	5/8	7/8
W14x370	3.84	1/4	5/16	3/8	5/8	13/16
W14x398	4.09	1/4	1/4	3/8	9/16	13/16
W14x426	4.32	1/4	1/4	3/8	9/16	3/4
W14x455	4.59	1/4	1/4	5/16	1/2	11/16
W14x500	4.95	1/4	1/4	5/16	1/2	11/16
W14x550	5.34	1/4	1/4	5/16	7/16	5/8
W14x605	5.82	1/4	1/4	1/4	7/16	9/16
W14x665	6.21	1/4	1/4	1/4	3/8	9/16
W14x730	6.76	1/4	1/4	1/4	3/8	1/2
W16x26	0.499	3/4	1-1/4	1-11/16	2-1/2	3-1/2
W16x31	0.592	11/16	1-1/8	1-9/16	2-7/16	3-1/4
W16x36	0.617	11/16	1-1/8	1-1/2	2-3/8	3 3/16
W16x40	0.686	5/8	1-1/16	1-3/8	2-1/4	3-1/16
W16x45	0.767	9/16	1	1-1/4	2	2-11/16
W16x50	0.846	9/16	3/4	1-1/8	1-11/16	2-1/2
W16x57	0.963	1/2	3/4	1	1-11/16	2-3/8
W16x67	0.936	1/2	3/4	1-1/16	1-11/16	2-7/16
W16x77	1.07	7/16	3/4	15/16	1-9/16	2-3/16
W16x89	1.22	7/16	11/16	13/16	1-3/8	1-15/16
W16x100	1.37	3/8	5/8	3/4	1-1/4	1-11/16
W18x35	0.602	11/16	1-1/8	1-1/2	2-7/16	3-1/4
W18x40	0.688	5/8	1-1/16	1-3/8	2	2-11/16
W18x46	0.786	9/16	15/16	1-1/4	2	2-11/16
W18x50	0.778	9/16	1	1-1/4	2	2-11/16

W18x55	0.85	9/16	3/4	1-1/8	1-11/16	2-1/2
W18x60	0.923	1/2	3/4	1-1/16	1-11/16	2-7/16
W18x65	0.997	1/2	3/4	1	1-11/16	2-5/16
W18x71	1.08	7/16	3/4	7/8	1-9/16	2-1/8
W18x76	0.971	1/2	3/4	1	1-11/16	2-3/8
W18x86	1.09	7/16	3/4	7/8	1-9/16	2-1/8
W18x97	1.22	7/16	11/16	13/16	1-3/8	1-15/16
W18x106	1.33	3/8	11/16	3/4	1-1/4	1-3/4
W18x119	1.48	3/8	5/8	11/16	1-3/16	1-5/8
W21x44	0.672	5/8	1-1/16	1-3/8	2-1/4	3-1/16
W21x50	0.754	9/16	1	1-1/4	2	2-11/16
W21x57	0.857	9/16	3/4	1-1/8	1-11/16	2-1/2
W21x62	0.846	9/16	3/4	1-1/8	1-11/16	2-1/2
W21x68	0.926	1/2	3/4	1-1/16	1-11/16	2-7/16
W21x73	0.989	1/2	3/4	1	1-11/16	2-5/16
W21x83	1.12	7/16	3/4	7/8	1-1/2	2-1/16
W21x93	1.24	7/16	11/16	13/16	1-3/8	1-7/8
W21x101	1.13	7/16	3/4	7/8	1-1/2	2-1/16
W21x111	1.24	7/16	11/16	13/16	1-3/8	1-7/8
W21x122	1.35	3/8	11/16	3/4	1-1/4	1-3/4
W21x132	1.45	3/8	5/8	11/16	1-3/16	1-5/8
W21x147	1.61	3/8	9/16	11/16	1-1/8	1-1/2
W24x55	0.749	9/16	1	1-5/16	2	2-11/16
W24x62	0.844	9/16	3/4	1-1/8	1-11/16	2-1/2
W24x68	0.837	9/16	15/16	1-3/16	1-15/16	2-11/16
W24x76	0.933	1/2	3/4	1-1/16	1-11/16	2-7/16
W24x84	1.02	1/2	3/4	15/16	1-5/8	2-1/4
W24x94	1.14	7/16	3/4	7/8	1-1/2	2-1/16
W24x104	1.07	7/16	3/4	15/16	1-9/16	2-3/16
W24x117	1.2	7/16	3/4	13/16	1-3/8	1-15/16
W24x131	1.33	3/8	11/16	3/4	1-1/4	1-3/4
W24x146	1.48	3/8	5/8	11/16	1-3/16	1-5/8
W24x162	1.63	3/8	9/16	11/16	1-1/8	1-1/2
W27x84	0.921	1/2	3/4	1-1/16	1-11/16	2-1/2
W27x94	1.03	1/2	3/4	15/16	1-5/8	2-1/4
W27x102	1.11	7/16	3/4	7/8	1-1/2	2-1/8
W27x114	1.23	7/16	11/16	13/16	1-3/8	1-7/8
W27x146	1.35	3/8	11/16	3/4	1-1/4	1-3/4
W27x161	1.48	3/8	5/8	11/16	1-3/16	1-5/8
W27x178	1.63	3/8	9/16	11/16	1-1/8	1-1/2
W30x99	1	1/2	3/4	1	1-11/16	2-5/16
W30x108	1.09	7/16	3/4	7/8	1-9/16	2-1/8
W30x116	1.16	7/16	3/4	13/16	1-7/16	2

W30x124	1.24	7/16	11/16	13/16	1-3/8	1-7/8
W30x132	1.32	3/8	11/16	3/4	1-1/4	1-3/4
W30x173	1.47	3/8	5/8	11/16	1-3/16	1-5/8
W30x191	1.62	3/8	9/16	11/16	1-1/8	1-1/2
W30x211	1.76	5/16	9/16	11/16	1-1/8	1-1/2
W33x118	1.08	7/16	3/4	7/8	1-9/16	2-1/8
W33x130	1.18	7/16	3/4	13/16	1-7/16	2
W33x141	1.28	7/16	11/16	3/4	1-5/16	1-13/16
W33x152	1.37	3/8	5/8	3/4	1-1/4	1-11/16
W33x201	1.58	3/8	9/16	11/16	1-1/8	1-1/2
W33x221	1.73	5/16	9/16	11/16	1-1/8	1-1/2
W33x241	1.87	5/16	1/2	11/16	1-1/8	1-1/2
W36x135	1.15	7/16	3/4	7/8	1-7/16	2
W36x150	1.27	7/16	11/16	3/4	1-5/16	1-7/8
W36x160	1.35	3/8	11/16	3/4	1-1/4	1-3/4
W36x170	1.43	3/8	5/8	3/4	1-3/16	1-5/8
W36x182	1.52	3/8	5/8	11/16	1-1/8	1-9/16
W36x194	1.62	3/8	9/16	11/16	1-1/8	1-1/2
W36x210	1.74	5/16	9/16	11/16	1-1/8	1-1/2
W36x230	1.69	5/16	9/16	11/16	1-1/8	1-1/2
W36x245	1.79	5/16	9/16	11/16	1-1/8	1-1/2
W36x260	1.9	5/16	1/2	11/16	1-1/8	1-1/2
W36x280	2.03	5/16	1/2	11/16	1-1/16	1-7/16
W36x300	2.17	1/4	7/16	5/8	1	1-3/8

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:

TABLE 2

Member		**Half Flange Tip Thickness**				
Min Col Size	**W/D**	**1 hr**	**1.5 hr**	**2 hr**	**3 hr**	**4 hr**
W4x13	0.556	7/8	1 5/16	1-11/16	2 9/16	3 3/8
W5x16	0.550	7/8	1 5/16	1-11/16	2 9/16	3 3/8
W5x19	0.644	13/16	1 3/16	1 9/16	2 3/8	3 1/8
W6x9	0.338	1-1/8	1 5/8	2 1/16	3 1/8	4 3/16
W6x12	0.448	15/16	1 7/16	1 7/8	2 13/16	3-13/16
W6x15	0.431	1	1 7/16	1-15/16	2 7/8	3-14/16
W6x16	0.584	7/8	1 1/4	1-11/16	2 1/2	3 5/16
W6x20	0.563	7/8	1 1/4	1-11/16	2 1/2	3 3/8
W6x25	0.696	3/4	1 1/8	1 1/2	2 1/4	2 15/16
W8x13	0.421	1	1 7/16	1-15/16	2 7/8	3-14/16
W8x15	0.481	15/16	1 3/8	1-13/16	2 3/4	3 11/16
W8x18	0.499	15/16	1 3/8	1-13/16	2-11/16	3 9/16
W8x21	0.577	7/8	1 1/4	1-11/16	2 1/2	3 5/16
W8x24	0.591	7/8	1 1/4	1-11/16	2 1/2	3 5/16

W8x28	0.688	13/16	1 3/16	1 1/2	2 1/4	2 15/16
W8x31	0.665	13/16	1 3/16	1 9/16	2 5/16	3 1/16
W8x35	0.749	3/4	1 1/8	1 7/16	2 3/16	2 7/8
W8x40	0.849	11/16	1	1 3/8	2	2-11/16
W8x48	1.000	5/8	15/16	1 1/4	1-13/16	2 7/16
W8x58	1.200	9/16	13/16	1 1/8	1 5/8	2 3/16
W8x67	1.370	1/2	3/4	1	1 1/2	2
W10x12	0.347	1-1/16	1 9/16	2 1/16	3 1/8	4 3/16
W10x15	0.429	1	1 7/16	1-15/16	2 7/8	3-14/16
W10x17	0.482	15/16	1 3/8	1-13/16	2 3/4	3 11/16
W10x19	0.538	7/8	1 5/16	1 3/4	2 9/16	3 7/16
W10x22	0.523	7/8	1 5/16	1 3/4	2 5/8	3 1/2
W10x26	0.612	13/16	1 1/4	1 5/8	2 7/16	3 1/4
W10x30	0.699	3/4	1 1/8	1 1/2	2 1/4	2 15/16
W10x33	0.661	13/16	1 3/16	1 9/16	2 5/16	3 1/8
W10x39	0.780	3/4	1 1/16	1 7/16	2 1/8	2 13/16
W10x45	0.888	11/16	1	1 5/16	2	2 5/8
W10x49	0.840	11/16	1 1/16	1 3/8	2 1/16	2-11/16
W10x54	0.922	11/16	1	1 5/16	1-15/16	2 9/16
W10x60	1.010	5/8	15/16	1 1/4	1-13/16	2 7/16
W10x68	1.150	9/16	7/8	1 1/8	1-11/16	2 1/4
W10x77	1.280	9/16	13/16	1 1/16	1 9/16	2 1/16
W10x88	1.450	1/2	3/4	1	1 7/16	1-15/16
W10x100	1.640	7/16	11/16	7/8	1 5/16	1 3/4
W10x112	1.810	7/16	5/8	13/16	1 1/4	1 5/8
W12x14	0.363	1-1/16	1 9/16	2 1/16	3 1/16	4 1/8
W12x16	0.410	1	1 1/2	1-15/16	2 15/16	3-15/16
W12x19	0.485	15/16	1 3/8	1-13/16	2-11/16	3 5/8
W12x22	0.560	7/8	1 5/16	1-11/16	2 9/16	3 3/8
W12x26	0.531	7/8	1 5/16	1 3/4	2 5/8	3 7/16
W12x30	0.607	13/16	1 1/4	1 5/8	2 7/16	3 1/4
W12x35	0.703	3/4	1 1/8	1 1/2	2 1/4	2 15/16
W12x40	0.734	3/4	1 1/8	1 1/2	2 3/16	2 15/16
W12x45	0.829	11/16	1 1/16	1 3/8	2 1/16	2 3/4
W12x50	0.909	11/16	1	1 5/16	1-15/16	2 9/16
W12x53	0.855	11/16	1	1 3/8	2	2-11/16
W12x58	0.925	11/16	1	1 5/16	1-15/16	2 9/16
W12x65	0.925	11/16	1	1 5/16	1-15/16	2 9/16
W12x72	1.020	5/8	15/16	1 1/4	1-13/16	2 7/16
W12x79	1.110	5/8	7/8	1 3/16	1 3/4	2 5/16
W12x87	1.220	9/16	13/16	1 1/16	1 5/8	2 1/8
W12x96	1.340	1/2	3/4	1	1 1/2	2
W12x106	1.470	1/2	3/4	15/16	1 7/16	1 7/8

W12x120	1.650	7/16	11/16	7/8	1 5/16	1 3/4
W12x136	1.860	7/16	5/8	13/16	1 3/16	1 9/16
W12x152	2.040	3/8	9/16	3/4	1 1/8	1 1/2
W12x170	2.260	3/8	9/16	11/16	1 1/16	1 3/8
W12x190	2.500	5/16	1/2	5/8	15/16	1 1/4
W12x210	2.730	5/16	7/16	5/8	7/8	1 3/16
W12x230	2.960	5/16	7/16	9/16	13/16	1 1/8
W12x252	3.200	5/16	7/16	9/16	13/16	1 1/16
W12x279	3.500	1/4	3/8	1/2	3/4	15/16
W12x305	3.760	1/4	3/8	1/2	11/16	15/16
W12x336	4.060	1/4	5/16	7/16	5/8	7/8
W14x22	0.476	15/16	1 3/8	1-13/16	2 3/4	3 11/16
W14x26	0.559	7/8	1 5/16	1-11/16	2 9/16	3 3/8
W14x30	0.562	7/8	1 1/4	1-11/16	2 1/2	3 3/8
W14x34	0.633	13/16	1 3/16	1 5/8	2 3/8	3 3/16
W14x38	0.706	3/4	1 1/8	1 1/2	2 1/4	2 15/16
W14x43	0.752	3/4	1 1/8	1 7/16	2 3/16	2 7/8
W14x48	0.835	11/16	1 1/16	1 3/8	2 1/16	2 3/4
W14x53	0.915	11/16	1	1 5/16	1-15/16	2 9/16
W14x61	0.928	11/16	1	1 5/16	1-15/16	2 9/16
W14x68	1.040	5/8	15/16	1 3/16	1-13/16	2 3/8
W14x74	1.120	9/16	7/8	1 1/8	1-11/16	2 1/4
W14x82	1.230	9/16	13/16	1 1/16	1 5/8	2 1/8
W14x90	1.080	5/8	7/8	1 3/16	1 3/4	2 5/16
W14x99	1.180	9/16	13/16	1 1/8	1 5/8	2 3/16
W14x109	1.290	9/16	13/16	1 1/16	1 9/16	2 1/16
W14x120	1.420	1/2	3/4	1	1 7/16	1-15/16
W14x132	1.560	1/2	11/16	15/16	1 3/8	1-13/16
W14x145	1.640	7/16	11/16	7/8	1 5/16	1 3/4
W14x159	1.780	7/16	5/8	13/16	1 1/4	1 5/8
W14x176	1.960	3/8	9/16	3/4	1 1/8	1 1/2
W14x193	2.140	3/8	9/16	3/4	1 1/16	1 7/16
W14x211	2.320	3/8	1/2	11/16	1	1 3/8
W14x233	2.550	5/16	1/2	5/8	15/16	1 1/4
W14x257	2.780	5/16	7/16	5/8	7/8	1 3/16
W14x283	3.030	5/16	7/16	9/16	13/16	1 1/16
W14x311	3.300	1/4	3/8	1/2	3/4	1
W14x342	3.580	1/4	3/8	1/2	11/16	15/16
W14x370	3.840	1/4	3/8	7/16	11/16	7/8
W14x398	4.090	1/4	5/16	7/16	5/8	7/8
W14x426	4.320	1/4	5/16	7/16	5/8	13/16
W14x455	4.590	1/4	5/16	3/8	9/16	3/4
W14x500	4.950	1/4	5/16	3/8	9/16	3/4

W14x550	5.340	1/4	1/4	3/8	1/2	11/16
W14x605	5.820	1/4	1/4	5/16	1/2	5/8
W14x665	6.210	1/4	1/4	5/16	7/16	9/16
W14x730	6.760	1/4	1/4	5/16	7/16	9/16
W16x26	0.499	15/16	1 3/8	1-13/16	2-11/16	3 9/16
W16x31	0.592	13/16	1 1/4	1 5/8	2 7/16	3 1/4
W16x36	0.617	13/16	1 1/4	1 5/8	2 7/16	3 3/16
W16x40	0.686	13/16	1 3/16	1 9/16	2 5/16	3 1/16
W16x45	0.767	3/4	1 1/16	1 7/16	2 1/8	2 7/8
W16x50	0.846	11/16	1 1/16	1 3/8	2 1/16	2-11/16
W16x57	0.963	5/8	15/16	1 1/4	1 7/8	2 1/2
W16x67	0.936	11/16	1	1 5/16	1-15/16	2 9/16
W16x77	1.070	5/8	7/8	1 3/16	1 3/4	2 5/16
W16x89	1.220	9/16	13/16	1 1/16	1 5/8	2 1/8
W16x100	1.370	1/2	3/4	1	1 1/2	2
W18x35	0.602	13/16	1 1/4	1 5/8	2 7/16	3 1/4
W18x40	0.688	13/16	1 3/16	1 1/2	2 1/4	2 15/16
W18x46	0.786	3/4	1 1/16	1 7/16	2 1/8	2 13/16
W18x50	0.778	3/4	1 1/16	1 7/16	2 1/8	2 13/16
W18x55	0.850	11/16	1	1 3/8	2	2-11/16
W18x60	0.923	11/16	1	1 5/16	1-15/16	2 9/16
W18x65	0.997	5/8	15/16	1 1/4	1-13/16	2 7/16
W18x71	1.080	5/8	7/8	1 3/16	1 3/4	2 5/16
W18x76	0.971	5/8	15/16	1 1/4	1 7/8	2 1/2
W18x86	1.090	5/8	7/8	1 3/16	1 3/4	2 5/16
W18x97	1.220	9/16	13/16	1 1/16	1 5/8	2 1/8
W18x106	1.330	1/2	3/4	1	1 1/2	2
W18x119	1.480	1/2	3/4	15/16	1 7/16	1 7/8
W21x44	0.672	13/16	1 3/16	1 9/16	2 5/16	3 1/16
W21x50	0.754	3/4	1 1/8	1 7/16	2 3/16	2 7/8
W21x57	0.857	11/16	1	1 3/8	2	2-11/16
W21x62	0.846	11/16	1 1/16	1 3/8	2 1/16	2-11/16
W21x68	0.926	11/16	1	1 5/16	1-15/16	2 9/16
W21x73	0.989	5/8	15/16	1 1/4	1 7/8	2 7/16
W21x83	1.120	9/16	7/8	1 1/8	1-11/16	2 1/4
W21x93	1.240	9/16	13/16	1 1/16	1 5/8	2 1/8
W21x101	1.130	9/16	7/8	1 1/8	1-11/16	2 1/4
W21x111	1.240	9/16	13/16	1 1/16	1 5/8	2 1/8
W21x122	1.350	1/2	3/4	1	1 1/2	2
W21x132	1.450	1/2	3/4	1	1 7/16	1-15/16
W21x147	1.610	7/16	11/16	7/8	1 5/16	1 3/4
W24x55	0.749	3/4	1 1/8	1 7/16	2 3/16	2 7/8
W24x62	0.844	11/16	1 1/16	1 3/8	2 1/16	2-11/16

W24x68	0.837	11/16	1 1/16	1 3/8	2 1/16	2-11/16
W24x76	0.933	11/16	1	1 5/16	1-15/16	2 9/16
W24x84	1.020	5/8	15/16	1 1/4	1-13/16	2 7/16
W24x94	1.140	9/16	7/8	1 1/8	1-11/16	2 1/4
W24x104	1.070	5/8	7/8	1 3/16	1 3/4	2 5/16
W24x117	1.200	9/16	13/16	1 1/8	1 5/8	2 3/16
W24x131	1.330	1/2	3/4	1	1 1/2	2
W24x146	1.480	1/2	3/4	15/16	1 7/16	1 7/8
W24x162	1.630	7/16	11/16	7/8	1 5/16	1 3/4
W27x84	0.921	11/16	1	1 5/16	1-15/16	2 9/16
W27x94	1.030	5/8	15/16	1 3/16	1-13/16	2 3/8
W27x102	1.110	5/8	7/8	1 3/16	1 3/4	2 5/16
W27x114	1.230	9/16	13/16	1 1/16	1 5/8	2 1/8
W27x146	1.350	1/2	3/4	1	1 1/2	2
W27x161	1.480	1/2	3/4	15/16	1 7/16	1 7/8
W27x178	1.630	7/16	11/16	7/8	1 5/16	1 3/4
W30x99	1.000	5/8	15/16	1 1/4	1-13/16	2 7/16
W30x108	1.090	5/8	7/8	1 3/16	1 3/4	2 5/16
W30x116	1.160	9/16	7/8	1 1/8	1-11/16	2 1/4
W30x124	1.240	9/16	13/16	1 1/16	1 5/8	2 1/8
W30x132	1.320	9/16	13/16	1 1/16	1 9/16	2 1/16
W30x173	1.470	1/2	3/4	15/16	1 7/16	1 7/8
W30x191	1.620	7/16	11/16	7/8	1 5/16	1 3/4
W30x211	1.760	7/16	5/8	7/8	1 1/4	1-11/16
W33x118	1.080	5/8	7/8	1 3/16	1 3/4	2 5/16
W33x130	1.180	9/16	13/16	1 1/8	1 5/8	2 3/16
W33x141	1.280	9/16	13/16	1 1/16	1 9/16	2 1/16
W33x152	1.370	1/2	3/4	1	1 1/2	2
W33x201	1.580	1/2	11/16	15/16	1 3/8	1-13/16
W33x221	1.730	7/16	5/8	7/8	1 1/4	1-11/16
W33x241	1.870	7/16	5/8	13/16	1 3/16	1 9/16
W36x135	1.150	9/16	7/8	1 1/8	1-11/16	2 1/4
W36x150	1.270	9/16	13/16	1 1/16	1 9/16	2 1/16
W36x160	1.350	1/2	3/4	1	1 1/2	2
W36x170	1.430	1/2	3/4	1	1 7/16	1-15/16
W36x182	1.520	1/2	11/16	15/16	1 3/8	1 7/8
W36x194	1.620	7/16	11/16	7/8	1 5/16	1 3/4
W36x210	1.740	7/16	5/8	7/8	1 1/4	1-11/16
W36x230	1.690	7/16	11/16	7/8	1 5/16	1-11/16
W36x245	1.790	7/16	5/8	13/16	1 1/4	1 5/8
W36x260	1.900	7/16	5/8	13/16	1 3/16	1 9/16
W36x280	2.030	3/8	9/16	3/4	1 1/8	1 1/2
W36x300	2.170	3/8	9/16	3/4	1 1/16	1 7/16

ARABIAN VERMICULITE INDUSTRIES — Types MK-6/HY, MK-6/HY Extended Set, MK-6/GF, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, Z-106, Z-106/G, Z-106/HY.

GRACE KOREA INC — Types MK-6/HY, MK-6/HY Extended Set, MK-6/GF, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, Z-106, Z-106/G, Z-106/HY.

W R GRACE & CO - CONN — Types MK-6/HY, MK-6/HY Extended Set, MK-6/GF, MK-10 HB, MK-10 HB Extended Set, MK-6/HB, MK-6s, RG, Z-106, Z-106/G, Z-106/HY, MK-1000/HB, MK-1000/HB Extended Set, Z-146, Z-146PC, Z-146T, Z-156, Z-156T and Z-156PC (Types Z-146, Z-146PC, Z-146T, Z-156, Z-156PC, Z-156T also investigated for exterior use).

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 columns (36 ksi yield), min/max sizes as specified above.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2014-04-08

© 2016 UL LLC

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2016 UL LLC".

UL Evaluation Report

UL ER4339-02

Issued: August 15, 2016

Visit UL's On-Line Certifications Directory: www.UL.com/erdirectory for current status of Report.

UL Category Code: ULFE

CSI MasterFormat®

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Sub-level 2: 07 80 00 – Fire and Smoke Protection
Sub-level 3: 07 81 00 – Applied Fireproofing
Sub-level 4: 07 81 16 – Cementitious Fireproofing

COMPANY:

GCP Applied Technologies
Fire Operating Unit
62 Whittemore Ave.
Cambridge, MA 02140
gcpappliedtech.com

1. SUBJECT:

Product Trade Name	UL Product Designation
MONOKOTE® MK-6®/GF	Type MK-6 GF
MONOKOTE® MK-6®/HY®	Type MK-6/HY
MONOKOTE® MK-6®/HY® EXTENDED SET (MK-6/HY ES)	Type MK-6/HY Extended Set
MONOKOTE® MK-6s	Type MK-6s
MONOKOTE® MK-10/HB	Type MK-10 HB
MONOKOTE® MK-10/HB EXTENDED SET (MK-10/HB ES)	Type MK-10 HB Extended Set
MONOKOTE® MK-1000/HB	Type MK-1000/HB
MONOKOTE® MK-1000/HB EXTENDED SET (MK-1000/HB ES)	Type MK-1000/HB Extended Set
RETRO-GUARD® RG	Type RG
MONOKOTE® Z-106/HY®	Type Z-106/HY
MONOKOTE® Z-106/G	Type Z-106/G

(Continued on next page)

Product Trade Name	UL Product Designation
MONOKOTE® Z-146	Type Z-146
MONOKOTE® Z-146T	Type Z-146T
MONOKOTE® Z-156	Type Z156
MONOKOTE® Z-156T	Type Z-156T
Spatterkote SK-3	Type SK-3
Monokote Accelerator	-
Firebond Concentrate	-
Monokote Patching Compound	Monokote Patching Compound

2. SCOPE OF EVALUATION

- 2015, 2012, 2009, 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009, 2006 *International Mechanical Code*® (IMC)
- ICC-ES Acceptance Criteria for Sprayed Fire-Resistant Materials (SFRMs), Intumescent Fire-Resistant Coatings and Mastic Fire-Resistant Coatings Used to Protect Structural Steel Members (AC23), dated December 2012
- ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated June 2014

The products were evaluated for the following properties:

- Fire Resistance (ANSI/UL 263, ASTM E119)
- Surface Burning Characteristics (ANSI/UL 723, ASTM E84)
- Cohesive / adhesive bond (ASTM E736)
- Deflection (ASTM E759)
- Impact Resistance (ASTM E760)
- Compressive Strength (ASTM E761)
- Air-stream Resistance (ASTM E859)
- Mold Growth and Humidity Resistance (ASTM G21)
- Environmental Exposures (ANSI/UL 263, ASTM E119)

3. REFERENCED DOCUMENTS

- ANSI/UL 263, 14th Ed. (ASTM E119), Fire Tests of Building Construction and Materials
- ANSI/UL 723, 10th Ed. (ASTM E84), Test for Surface Burning Characteristics of Building Materials
- ASTM E736-00 (2011), Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
- ASTM E759-92 (2011), Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
- ASTM E760-92 (2011), Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
- ASTM E761-92 (2011), Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
- ASTM E859-93 (2011), Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
- ASTM G21-09, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

4. USES

Monokote® MK-6/GF, MK-6/HY, MK-6/HY Extended Set (MK-6/HY ES, MK-6s, MK-10/HB, MK-10/HB Extended Set (MK-10/HB ES), MK-1000/HB, MK-1000/HB Extended Set (MK-1000/HB ES), Z-106/HY, Z-106/G, Z-146, Z-146T, Z-156, Z-156T, and Retro-Guard® RG are spray-applied cementitious fire-resistive materials intended for fire-resistance-rated applications on structural steel framing members in various concrete or steel roof-ceiling and floor-ceiling systems.

The SFRMs covered in this report are also approved for use in plenums, in accordance with 2015, 2012, 2009, and 2006 IMC Section 602.2.1.

Spatterkote SK-3, Monokote Accelerator, and Firebond Concentrate are additional materials that may be used in conjunction with the Monokote® products, to aid in the application process.

5. PRODUCT DESCRIPTION

5.1 General:

Monokote® MK-6/GF, MK-6/HY, MK-6/HY Extended Set (MK-6/HY ES), MK-6s, MK-10/HB, MK-10/HB Extended Set (MK-10/HB ES), MK-1000/HB, and MK-1000/HB Extended Set (MK-1000/HB ES) are standard-density spray-applied fire resistive materials (SFRMs) intended for use in new construction. Retro-Guard® RG is a standard density spray-applied fire resistive material used in re-spray or replacement applications.

Monokote® Z-106/HY and Z-106/G are medium density spray-applied fire resistive materials intended for use in new construction applications.

Monokote® Z-146, Z-146T, Z-156, and Z-156T are high density spray-applied fire resistive materials that are acceptable for use in exterior locations. The designations with T have an integral corrosion inhibitor for use in harsh environmental conditions.

Spatterkote SK-3 is a cementitious spray-applied fire resistive material that is applied prior to specific SFRM products, on certain galvanized steel floor and roof units, as shown in the appropriate UL Fire-Resistive Designs listed on the CHPX.R4339 Classification Card.

Monokote Accelerator is an optional set accelerator that can be mixed with the Monokote® MK-6/GF, MK-6/HY, MK-6/HY ES, MK-6s, MK-10/HB, MK-10/HB ES, MK-1000/HB, MK-1000/HB ES, Retro-Guard® RG, Z-106/HY, and Z-106/G SFRM products.

Firebond Concentrate is a material that may be applied prior to the Monokote® MK-6/HY, MK-6s, MK-10 HB, MK-10/HB ES, Z-106/HY, and Retro-Guard® RG products, as a bonding agent on concrete surfaces and primed structural members or as an encapsulant over the finished surface of the Monokote® MK-6/GF, MK-6/HY, MK-6/HY Extended Set (MK-6/HY ES), MK-6s, MK-10/HB, MK-10/HB Extended Set (MK-10/HB ES), MK-1000/HB, MK-1000/HB Extended Set (MK-1000/HB ES), Z-106/HY, Z-106/G, Z-146, Z-146T, Z-156, Z-156T, and Retro-Guard® RG SFRM.

The SFRMs covered in this report have a flame spread index of 25 or less and a smoke developed index of 50 or less when tested in accordance with ANSI/UL 723 (ASTM E84).

The following table summarizes the minimum average and minimum individual required densities for each product covered in this report:

Product Trade Name	Minimum Average Density (pcf)	Minimum Individual Density (pcf)
MONOKOTE® MK-6/GF	15	14
MONOKOTE® MK-6/HY	15	14
MONOKOTE® MK-6/HY EXTENDED SET (MK-6/HY ES)	15	14
MONOKOTE® MK-6s	15	14
MONOKOTE® MK-10/HB	15	14
MONOKOTE® MK-10/HB EXTENDED SET (MK-10/HB ES)	15	14
MONOKOTE® MK-1000/HB	18	17
MONOKOTE® MK-1000/HB EXTENDED SET (MK-1000/HB ES)	18	17
RETRO-GUARD® RG	15	14
MONOKOTE® Z-106/HY	22	19
MONOKOTE® Z-106/G	22	19
MONOKOTE® Z-146	40	36
MONOKOTE® Z-146T	40	36
MONOKOTE® Z-156	50	45
MONOKOTE® Z-156T	50	45

6. INSTALLATION

6.1 General:

The SFRMS covered in this report must be installed in accordance with this report and the manufacturer's published installation instructions, which must be available during installation at the jobsite.

The SFRMs are mill-mixed and machine-applied, using one or more coats to achieve the required thickness. To ensure an accurate spray pattern, air pressure and pumping rates shall be adjusted accordingly. The products may be hand-patched using the guidelines outlined in the UL CHPX.R4339 Classification Card. The thickness and densities of each product shall comply with the requirements of the various assemblies and applications as specified in the corresponding designs listed on the CHPX.R4339 Classification Card. The materials shall be applied quickly after mixing, without re-tempering. The equipment and mixer shall be kept clean prior to mixing the material.

The Monokote® MK-6/GF, MK-6/HY, MK-6/HY ES, MK-6s, MK-10/HB, MK-10/HB ES, MK-1000/HB, MK-1000/HB ES, Retro-Guard® RG, Z-106/HY, and Z-106/G SFRM products covered in this report may be injected with Monokote Accelerator in the field, to aid in product yield and the setting process.

6.2 Preparation of Substrate for SFRM Application

Prior to application, the substrate to receive the SFRMs shall be free of any substances or conditions that interfere with adhesion of the material, in accordance with 2015, 2012, 2009 IBC Section 704.13.3. Primers, paints, and encapsulants are allowed, provided they comply with 2015, 2012, 2009 IBC Sections 704.13.3.1 and 704.13.3.2.

Spatterkote SK-3 shall be "spatter" applied to the substrate prior to the SFRMS installed in accordance with the corresponding Fire-Resistive Designs as shown in the CHPX.R4339 Classification Card. Thickness of the Spatterkote SK-3 is included in the total final thickness of the SFRM.

Firebond Concentrate is an encapsulant material that may be used with Monokote® MK-6/GF, MK-6/HY, MK-6/HY Extended Set (MK-6/HY ES), MK-6s, MK-10/HB, MK-10/HB Extended Set (MK-10/HB ES), MK-1000/HB, MK-1000/HB Extended Set (MK-1000/HB ES), Z-106/HY, Z-106/G, Z-146, Z-146T, Z-156, Z-156T, and Retro-Guard® RG applied at 500 ft^2/gal. Firebond Concentrate shall be applied to primed or painted surfaces as a bonding agent for SFRMs to obtain the minimum bond strengths in the field as required by 2015, 2012, 2009 IBC Section 704.13.3.2(4).

If minimum bond strengths are not met at the jobsite, and for wide flange and certain HSS structural steel shape dimensions that do not meet the conditions specified in 2015, 2012, 2009 IBC Section 704.13.3.2 for allowing primers, paints, and encapsulants at the jobsite, a mechanical break is required. Refer to the various UL Fire-Resistive Designs in the CHPX.R4339 Classification Card, as well as the Guide Information Card for UL Category Code BXUV for specific requirements on the required mechanical break to facilitate the spray application of SFRMs.

6.3 Fire Resistive Assemblies

The SFRMs covered in this report shall be installed as specified in one or more of the UL Fire-Resistive Designs as listed in the CHPX.R4339 Classification Card, for each of the corresponding SFRMs. Refer to the table in Section 1 of this report for the UL Product Designation for each Trade Name.

6.4 Thickness Tolerances

The minus tolerance of the SFRM thickness must be no greater than 1/4 inch, or 25% of a design thickness of less than 1 inch. When applicable, additional material must be applied to meet this tolerance.

When an individually measured SFRM thickness exceeds the design thickness by 1/4 inch or more, the thickness shall be recorded as the design thickness plus 1/4 inch.

6.5 Special Inspections for SFRMs

Special inspections are required for the SFRMs covered in this report, in accordance with 2015 IBC Section 1705.14, 2012 IBC Section 1705.13, 2009 IBC Section 1704.12, or 2006 IBC Section 1704.10.

6.6 SFRMs Recognized for Exterior Use: Physical Property Requirements

Monokote® Z-146, Z-146T, Z-156, and Z-156T have been evaluated for exterior use in accordance with AC23 and may be applied on exposed structural shapes less than 8 ft (2438 mm) from a floor, landing, or occupied space.

Where the applied SFRMs are subject to impact damage, they shall be protected with corner guards or any other substantial jacket of metal or noncombustible material to at least 5 ft (1524 mm) from the finished floor, in accordance with 2015, 2012, 2009 IBC Section 704.9, or 2006 IBC Section 714.4.

6.7 Installation within Plenums

The SFRMs covered in this report have been found to be suitable for use in plenums based on:

- The listing and labeling requirements of 2015, 2012, 2009, and 2006 IMC Section 602.2.1 for flame spread and smoke developed, and
- The Air-stream Resistance and Mold Growth and Humidity Resistance requirements of ASTM E859 and ASTM G21, respectively.

The SFRMs are suitable for use in plenums with the following maximum air velocities:

SFRM	Maximum Allowed Air Velocity (fpm)
MK-6/GF, MK-6/HY, MK-6/HY ES, MK-10/HB, MK-10/HB ES, MK-1000/HB, MK-1000/HB ES, Retro-Guard RG, Z-106/HY	1,370 (based on max. tested speed of 2,740 fpm)
MK-6s, Z-106/G	1,320 (based on max. tested speed of 2,640 fpm)
Z-146, Z-146T, Z-156, Z-156T	4,500 (based on max. tested speed of 9,000 fpm)

7. CONDITIONS OF USE

7.1 General:

The SFRMs described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 2 of this report, subject to the following conditions:

7.2 The products must be manufactured, identified, and installed in accordance with this report, the manufacturer's published installation instructions, and the applicable code. If there is a conflict between the manufacturer's installation instructions and this report, the report governs.

7.3 All assemblies shall be built in accordance with the applicable published UL designs, or as otherwise described in this report.

7.4 The density, thickness, and bond strength of the Monokote® SFRMs in this report must be measured in accordance with 2015 IBC Section 1705.14, 2012 Section 1705.13, 2009 IBC Section 1704.12, or 2006 IBC Section 1704.10.

7.5 The Monokote® MK-10/HB and MK-10/HB Extended Set (MK-10/HB ES) SFRMs recognized in this report have been evaluated for use in high-rise buildings up to 420 feet (128 m) in height in accordance with 2015, 2012, 2009 IBC Section 403.2.4 and Table 403.2.4.

7.6 The Monokote® Retro-Guard® RG, MK-1000/HB, MK-1000/HB Extended Set (MK-1000/HB ES), Z-106/HY, Z-106/G, Z-146, Z-146T, Z-156, and Z-156T SFRMs recognized in this report have

been evaluated for use in high-rise buildings up to and greater than 420 feet (128 m) in height in accordance with IBC Section 403.2.4 and Table 403.2.4.

7.7 See UL's Online Certification Directory under UL File R4339 for Spray-applied Fire-Resistive Materials (CHPX) evaluated as a part of fire-resistance-rated assemblies in accordance with ANSI/UL 263.

7.8 The SFRMs covered in this Evaluation Report are manufactured by GCP Applied Technologies, located at the manufacturing location(s) named below, under the UL LLC Listing/Classification and Follow-Up Service Program, which includes inspections in accordance with the quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC 10.

Location	Plant ID (if applicable)
Irondale, AL	IR
Santa Ana, CA	SA
Ajax, Canada	A or AJ

8. SUPPORTING EVIDENCE

8.1 Manufacturer's product literature and installation instructions.

8.2 Data in accordance with ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated June 2014.

8.3 Data in accordance with ICC-ES Acceptance Criteria for Sprayed Fire-Resistant Materials (SFRMs), Intumescent Fire-Resistant Coatings and Mastic Fire-Resistant Coatings Used to Protect Structural Steel Members (AC23), dated December 2012.

8.4 UL Classification reports in accordance with ANSI/UL 263 (ASTM E119). See UL Product Certification Category, Spray-applied Fire-Resistive Materials (CHPX).

8.5 UL Classification reports in accordance with ANSI/UL 723 (ASTM E84). See UL Product Certification Category, Cementitious Cement and Plaster Mixtures (BLPR).

9. IDENTIFICATION

The products described in this evaluation report are identified by a marking bearing the report holder's name [GCP Applied Technologies], the plant identification, the UL Listing/Classification Mark, and the evaluation report number UL ER4339-02. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Listing/Classification Mark certificate.

10. USE OF UL EVALUATION REPORT

10.1 The approval of building products, materials or systems is under the responsibility of the applicable authorities having jurisdiction.

10.2 UL Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL.

10.3 The current status of this report, as well as a complete directory of UL Evaluation Reports may be found at UL.com via our On-Line Certifications Directory:

www.UL.com/erdirectory

© 2016 UL LLC

This UL Evaluation Report is not an endorsement or recommendation for use of the subject and/or product described herein. This report is not the UL Listing or UL Classification Report that covers the subject product. The subject product's UL Listing or UL Classification is covered under a separate UL Report. UL disclaims all representations and warranties whether express or implied, with respect to this report and the subject or product described herein. Contents of this report may be based on data that has been generated by laboratories other than UL that are accredited as complying with ISO/IEC Standard17025 by the International Accreditation Service (IAS) or by any other accreditation body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). The scope of the laboratory's accreditation shall include the specific type of testing covered in the test report. As the accuracy of any non-UL data is the responsibility of the accredited laboratory, UL does not accept responsibility for the accuracy of this data.

Product Certificate

CERTIFICATE OF COMPLIANCE

Certificate Number	20160711-R4339
Report Reference	R4339-19981005
Issue Date	2016-JULY-11

Issued to: GCP Applied Technologies Inc
FIRE OPERATING UNIT
62 WHITTEMORE AVE
CAMBRIDGE MA 02140

This is to certify that representative samples of SPRAY-APPLIED FIRE-RESISTIVE MATERIALS;
CEMENTITIOUS CEMENT AND PLASTER MIXTURES;
FIRE-RESISTANCE RATINGS - ANSI/UL 263;
CEMENTITIOUS MIXTURES; and
FIRE AND SMOKE PROTECTION
Type Designation: RG

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 263, Fire Tests of Building Construction and Materials;
UL 723, Test for Surface Burning Characteristics of Building Materials;
CAN/ULC-S101M, Standard Methods of Fire Endurance Tests of Building Construction and Materials;
CAN/ULC-S102M, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

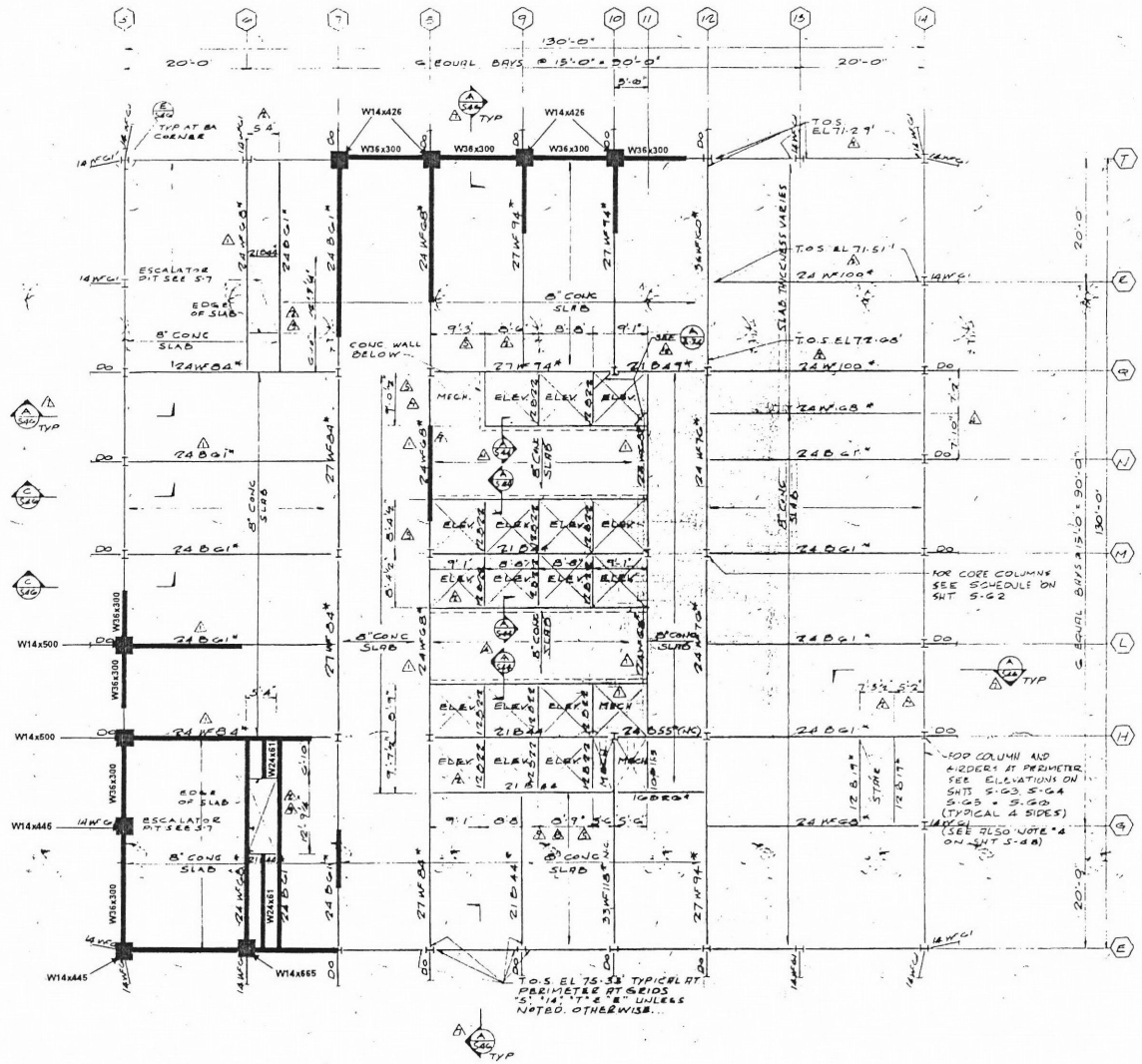
Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

Shop Drawings



UL J712/N852 2 Hour Beams
- W24x61 - 13/16"

UL J712/N852 3 Hour Beams
- W24x61 - 1 1/4"
- W24x68 - 1 1/4"
- W24x84 - 1 1/8"
- W27x94 - 1 1/8"
- W36x300 - 5/8"

UL X854 3 Hour Columns
- W14x426 - 9/16"
- W14x445 - 1/2"
- W14x500 - 1/2"
- W14x665 - 3/8"

3	12/31/79	REV. ELEV. MACH. FLOOR FRAMING	K	1	2/14/80	ADD ELEV. MACH. ELEV.	K	5	7/14/80	ADD BM. DIM. & W/144	JK
2	7/9/80	ADD ELEV. BMS	CC	2	7/17/80	ADD STRUTS & W/SIG	JK	6	7/24/80	ADD BM. DIM.	JK
1	8/29/80	REMOVE ELEV. MACH. FLR. COLS & ELEV. FRAMING	K	3	9/26/80	REV. NOTE #2	JK	7	9/30/80	ADD BM. DIM. & ELEV. BM'S SIDE & REV. T.O.S. EL. & DIM. @ GRIDS "S" & "T"	JK
				4	10/29/80	REV. DIM. DIM.	FA	8	11/5/80	REV. FRAMING AT ESCALATORS & MISC.	JK

FIRST NATIONAL BANK OF OREGON
PORTLAND OREGON

1ST (PLAZA) FLOOR FRAMING
TOWER BLDG

S-45

gcp applied technologies
GRACE CONSTRUCTION & PACKAGING

PMB 260 2212 Queen Anne Ave. N.
Seattle, WA 98109
USA

GCPat.com

Ken L. Dzioba, CSI, CDT
Senior Sales Representative-
Fire Protection Products
+1 253 459 0753 Mobile
Ken.dzioba@gcpat.com

April 18, 2017

John Beebe
Fireproofing Department Estimator
WPI
26055 SW Canyon Creek Road
Wilsonville, OR 97070

RE: Approved Applicator

To whom it may concern:

This letter is to verify that WPI has been through all applicable and appropriate training in GCP Applied Technologies Monokote® Fireproofing products. They are qualified to install all fire protection systems manufactured by GCP Applied Technologies in accordance with GCP's published instructions.

We trust that this information meets your needs. Please feel free to reach out to me should you require additional information.

Sincerely,

Ken L. Dzioba

Ken L. Dzioba, CSI, CDT
Senior Sales Representative
Fire Protection Products
GCP-Applied Technologies

Carbon Copy - John A. Dalton; GCP-Applied Technologies