



15 February 2021

John Beebe
Fireproofing Department Estimator/Project Manager

WPI

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Wilsonville, OR 97070
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RE: Project: Block 216
Location: 970 Washington Street, Portland, OR
Contractor: WPI
Global Engineering Judgment: GFPG_BLOCK 216_STEEL ANGLE_PORTLAND OR_001b
Rating: 2-hours

Dear Mr. Beebe:

We have received and reviewed the documentation provided via email regarding the protection of steel angles on the above referenced project. Received were a copy of the Life Safety Checklist as prepared by the City of Portland – Bureau of Development Services, Recheck dated 2 February 2021, and a corresponding letter from GCP Applied Technologies dated 24 November 2020, prepared by John Dalton, GCP Applied Technologies. It is desired that the required 2-hour fire-resistive rating be achieved, in accordance with ASTM E119/UL 263, "Standard Test Methods for Fire Tests of Building Construction and Materials," as well as the 2014 Oregon Structural Specialty Code.

Briefly, per comment #3 of the Portland BDS Recheck, Sheet 007 of the project documents indicates the installation of L4 x 3 x ¼" steel angles that are to be protected utilizing Monokote-1000 HB Spray-Applied Fire Resistive Material (SFRM) as manufactured by GCP Applied Technologies, at a thickness as determined by UL Designs D779 and N852. These thicknesses are based off the designs tested in UL Designs D779 and N852.

UL has not tested for this application. As a result, an Alternative Method per Section 703.3 of the 2014 Oregon Structural Specialty Code is required in the form of an Engineering Judgment to address the firestopping of this condition. Section 703.3 states, "The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119 or UL 263. The required **fire resistance** of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures: 1. Fire-resistance designs documented in sources; 2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721; 3. Calculations in accordance with Section 722; 4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E119 or UL 263; 5. Alternative protection methods as allowed by Section 104.11."

Per UL Best Practice Guide, "For non-traditional shapes such as steel angle, ... it is typical industry practice to utilize a thickness based on a UL design of similar orientation and use. The thickness would be derived from the W/D or HpA of the non-traditional shape provided it is subjected to the same exposure limitations listed in the Wide Flange or HSS design." As mentioned, it is standard industry practice to determine SFRM thicknesses based on calculated A/P and W/D ratios. These ratios are determined by dividing the weight, W, of the steel section in lbs./ft. (or the cross-sectional area, A, of the steel member) by the heated perimeter, D (or P), of protection at the interface of the protection material through which heat is transferred to the steel, in inches. A/P ratio equation for steel members is provided in the Underwriters Laboratories, Inc. (UL) Directory. UL has also not tested for miscellaneous shapes such as L-angles. The thickness are derived from the W/D ratio of the miscellaneous shape. Thicknesses provided were determined based on the derived W/D ratio of the angled steel member and the corresponding design thickness from the indicated UL Design.

Pursuant to our review of the evaluation presented, and utilizing the thickness required as outlined in the UL Design for the appropriate condition, Global believes that substantial justification exists to support the conclusion that the required fire-resistance rating in accordance with ASTM E119 would be obtained for the beam, utilizing the design thicknesses detailed in D779/N852, provided that the Monokote MK-1000 HB product is installed in accordance with manufacturer's written application installation instructions and methods.

This review is limited to those specific assemblies depicted and only for use as part of the above referenced project and cannot be extended to other assemblies or projects. The rating of the fireproofing system is dependent on the performance of the surrounding structure under fire exposure with a maximum possible rating of 2-hours based on the thicknesses provided. The contractor is responsible for the compliant installation of the referenced engineering judgment.

Prepared by: John D. Campbell, P.E.



EXPIRES: Dec 31, 2021

BXUV.D779 - Fire-resistance Ratings - ANSI/UL 263

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 Certified for United States

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

[See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States](#)
[Design Criteria and Allowable Variances](#)

[See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada](#)
[Design Criteria and Allowable Variances](#)

Design No. D779

December 01, 2020

Restrained Assembly Ratings — 1, 1-1/2, 2, 3 & 4 H

Unrestrained Assembly Ratings — 1, 1-1/2, 2, 3 & 4 H

Unrestrained Beam Ratings — 1, 1-1/2, 2, 3 & 4 H

Restricted Load Condition — See Items 1 and 6

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. **Supports** — W8 x 28 or alternate (per Section IV.6 in the front of the Fire Resistance Directory) steel beam or min 8K1 steel joists when joist substitution applied.

Note: Joists from the N series designs may be substituted for the listed beam (Item 1). When joists are substituted, the restrained rating of the joist must be equal to or greater than the restrained rating of the assembly. Additional joist substitution requirements are contained in the front of the Fire Resistance Directory.

2. Normal Weight or Lightweight Concrete — Normal weight concrete, carbonate or siliceous aggregate, 145 pcf plus or minus 3 pcf unit weight, 3000 psi compressive strength, vibrated. Lightweight concrete, expanded shale, clay, or slate aggregate by rotary-kiln method 102-120 pcf unit weight, 3000 psi compressive strength, vibrated, 4 to 7 percent air. Min thickness as measured to crests of steel floor and form units, 2-1/2 in.

3. Welded Wire Fabric — 6 x 6 - W1.4 x W1.4.

3A. Fiber Reinforcement — As an alternate to Item 3, engineered synthetic fibers added to concrete mix to control shrinkage cracks in concrete. See Fiber Reinforcement (CBXQ) category in the Fire Resistance Directory for names of manufacturers and rates of application.

4. Steel Floor and Form Units — Composite 1-1/2, 2, or 3 in. deep galv units. Min gauge is 22 MSG.

ASC STEEL DECK, DIV OF ASC PROFILES L L C — 32 in. wide Types NH-32, NHN-32; 36 in. wide Types BH-36, BHN-36, BHN-35-1/4, 2WH-36, 2WHS-36, 3WxH-36, 3WH-36, 3W-36, DG3W-36. All units may be galvanized or Prime Shield. Non-cellular decks may be vented designated with a "V" suffix to the product name.

CANAM GROUP INC — 24 in. wide Type P-2432 composite or 36 in. wide Types P-3623, P-3606 and P-3615; 24 or 36 in. wide Type LF3. Type LF3 may be welded or fastened together with min 1 in. long No. 10 self-drilling, self-tapping steel screws 36 in. OC. Types LF3 may be phos/ptd

CANAM STEEL CORP — 24 in. wide Type P-2432 composite or 36 in. wide Types P-3623, P-3606 and P-3615

CANAM STEEL CORP — 24, 30 or 36 in. wide Type BL; 24 or 36 in. wide Types LF1.5, LF2, LF3; 24, 36 in. wide Types LF2, -3 may be welded or fastened together with min 1 in. long No. 10 self-drilling, self-tapping steel screws 36 in. OC. Types BL, LF2, -3, N-Lok may be phos/ptd

KAM INDUSTRIES LTD, DBA CORDECK — 24 in. wide, QL-3, 24 or 36 in. wide, 2 or 3 in. deep QL-99. Units may be welded or fastened together with No. 10 self-drilling, self-tapping screws 60 in. OC. The length of the screws shall be sufficient to fully penetrate adjacent floor units

DECK WEST INC — 36 in. Types 2-DW, 3-DW, B-DW or BA-DW. Units may be welded or fastened together with No. 10 self-drilling, self-tapping screws 60 in. OC. The length of the screws shall be sufficient to fully penetrate adjacent floor units

DESIGN ASSISTANCE CONSTRUCTION SYSTEMS INC — 36 in. wide Type DACS1.5CD, or 24 in. wide Types DACS2.0CD or DACS3.0CD

EPIC METALS CORP — 24 in. wide Types EC150, EC366, 36 in. wide Type EC266

NEW MILLENNIUM BUILDING SYSTEMS L L C — 24 or 36 in. wide Types 2.0CD, 3.0CD, 2.0CFD, 3.0CFD, 3.0CFDES; 24, 30, or 36 in. wide Types 1.5CD, 1.5CDI, 1.5CDR, 1.5CFD. Units may be phos/painted or galvanized.

OEG BUILDING MATERIALS — Types 1-1/2", 2" and 3" deep Composite Decks

STEEL MASTERS INTERNATIONAL DEPENDABLE STEEL — 36 in. wide Types 2WH-36, 3WH-36. Units may be phos/painted or galvanized.

VERCO DECKING INC - A NUCOR CO — FORMLOK™ deck types PLB, B, BR, PLN3, N3, PLN, N, PLW2, W2, PLW3, W3. Units are min 24 in. wide and may be galvanized or phos./ptd. Deck may be vented or non-vented.

VULCRAFT, DIV OF NUCOR CORP — 24, 30 or 36 in. wide Types 1.5VL1, 1.5PLVLI; 24 or 36 in. wide Types 2VL1, 2.0PLVLI, 3VL1, 3.0PLVLI. Units may be phos/ptd. 36 in. wide Types 1.5 SB, 1.5 SBR; 24 or 36 in wide Types 2.0 SB, 3.0 SB, 36 in. wide Type High Strength 1.5 SBI, 36 in. wide Type High Strength 1.5 SBN; Units may be phos/ptd

5. Shear Connectors — (Optional) — Studs, 3/4 in. diam by 4-1/2 in. long, headed type or equivalent per AISC specification. Welded to top flange of the beam, or top chord of the joist, through the deck.

6. Spray-Applied Fire Resistive Materials — Applied by mixing with water and spraying to steel surfaces which must be clean and free of dirt, loose scale and oil. When steel deck is used, the area between the steel deck and the beams top flange shall be filled. Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 22/19 pcf respectively for Types Z-106, Z-106/G, 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. Application to steel deck requires the installation of expanded metal lath with Type Z-146, Z-146T, Z-146PC, Z-156, Z-156T and Z-156PC only. See Item 7. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Spray Applied Fire Resistive Mtl Thkns In. on Steel Deck		Concrete Type
			Crests	Valley	
1	0	1	0	0	LW
1	1	1	5/16	5/16	NW or LW
1-1/2	1	1	5/16(a)	5/16(a)	NW or LW
1-1/2	1-1/2	1-1/2	5/16(a)	5/16(a)	NW or LW
2	1	1	3/8(b)	3/8	NW or LW
2	2	2	3/8(b)	3/8	NW or LW
3	1-1/2	1-1/2	11/16	1/2	NW or LW
3	3	3	11/16	1/2	NW or LW
4	2	2	1-1/2	1-1/8	LW
4	4	4	1-1/2	1-1/8	LW
4	2	2	1-7/16	13/16	NW
4	4	4	1-7/16	13/16	NW

(a) Min thickness of 3/8 in. required when 1-1/2 in. deep fluted units are used.

(b) Min thickness of 1/2 in. is required in crests of 1-1/2 in. deep fluted units for the 2 h Restrained Assembly Rating.

Restrained Assembly Rating Hr	Unrestrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Beam Thickness			
			Light Weight Concrete		Normal Weight Concrete	
			full flange	1/2 flange##	full flange	1/2 flange##
			W8x28	W8x28	W8x28	W8x28
			Beam	Beam	Beam	Beam
1	0	1	5/16	7/16	5/16	7/16
1	1	1	5/16	7/16	5/16	7/16

1 1/2	1	1	5/16	7/16	5/16	7/16
1 1/2	1 1/2	1 1/2	11/16	3/4	5/8	3/4
2	1	1	5/16	7/16	5/16	7/16
2	2	2	1	1	7/8	1-1/16
3	1 1/2	1 1/2	11/16	3/4	5/8	3/4
3	3	3	1-5/16	1-7/16	1-7/16	1-11/16
4	2	2	1	1	7/8	1-1/16
4	4	4	1-5/8	1-15/16	2	2-5/16

Applicable when the thickness applied to the beams' lower flange edges is reduced to one-half. Thickness applied to beams' lower flange edges shall be a min of 1/4 in.

ARABIAN Vermiculite Industries — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-10 HB, MK-10 HB Extended Set, 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

GCP Korea Inc — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-10 HB, MK-10 HB Extended Set, 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

GCP Applied Technologies Inc — Types MK-6/HY, MK-6/HY Extended Set, MK-6/HB, MK-10 HB, MK-10 HB Extended Set, 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

6A. **Sprayed Fiber*** — (Optional, Not Shown) Sprayed Fiber, Classified for Surface Burning Characteristics (BNST), having a maximum applied density of 3.5 pcf applied over Spray-Applied Fire Resistive Material (Item 6) on both Steel Floor and Form Units (Item 4) and Supports (Item 1) in accordance with the following tables:

Allowable Sprayed Fiber Thickness over SFRM applied to Steel Deck (Item 4)

Installed SFRM Thickness (in.) on Deck	SFRM Density (lb/ft ³)			
	15	22	40	50
Sprayed Fiber Thickness (in.)				
0	6-11/16	8	8	8
5/16	5-3/8	7-7/8	8	8
3/8	5-1/16	7-7/16	8	8
11/16	3-3/4	5-1/2	8	8
1-7/16	9/16	13/16	8	8
1-1/2	1/4	3/8	8	8

Note: Installed SFRM thickness on deck refers to thickness applied to crests of steel deck.

Allowable Sprayed Fiber Thickness over SFRM applied to Beams (Item 1)

Installed SFRM Thickness (in.) on Beam	SFRM Density (lb/ft ³)			
	15	22	40	50
Sprayed Fiber Thickness (in.)				
5/16	8	8	8	8
7/16	8	8	8	8
5/8	8	8	8	8
11/16	8	8	8	8
3/4	8	8	8	8
7/8	8	8	8	8
1	8	8	8	8
1-1/16	8	8	8	8
1-5/16	7-3/4	8	8	8
1-7/16	7-1/4	8	8	8
1-5/8	6-7/16	8	7-7/8	8
1-11/16	6-3/16	8	7-1/8	8
1-15/16	5-1/16	7-7/16	4-5/16	5-3/8
2	4-13/16	7-1/16	3-9/16	4-7/16
2-5/16	3-1/2	5-1/8	0	0

INTERNATIONAL CELLULOSE CORP — Type K13, URE-K, or SonaSpray FC

7. Metal Lath — (Not Shown) — (Required with Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC, otherwise optional)— Metal lath shall be 3/8 in. expanded diamond mesh, weighing 2.5 lb per sq yd. Secured to underside of steel deck with No. 12 by 3/8 in. pan head self-drilling, self-tapping screws and steel washers with an outside diam of 1/2 in. screws spaced 12 in. OC in both directions with lath edges overlapped approx 3 in.

*** 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 2020-12-01

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BXUV.N852 - Fire-resistance Ratings - ANSI/UL 263

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- 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.
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Design No. N852

July 13, 2017

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
3(#)	1-1/16	1-1/4
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.

(#) Rating applicable only when a minimum of 5-1/4 in. of normal weight concrete provide 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
3(#)	1-7/16	1-9/16

4	2-1/4	2-7/16
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(+) Rating applicable only when a minimum of 4-1/2 in. of normal weight concrete provided over deck crests.

(#) Rating applicable only when a minimum of 5-1/4 in. of normal weight concrete provide 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).

Rating Hr	Min Thkns In.	
	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
3(#)	1-1/16	1-3/8
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.

(#) Rating applicable only when a minimum of 5-1/4 in. of normal weight concrete provide 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).

Rating Hr	Min Thkns In.	
	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
3(#)	1-7/16	1-13/16
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.

(#) Rating applicable only when a minimum of 5-1/4 in. of normal weight concrete provide 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).

Rating Hr	Min Thkns In.	
	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.

GCP 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.

GCP APPLIED TECHNOLOGIES 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, 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.

7. Metal Lath — (Optional for contour applications, required for boxed applications) — 3.4 lb/sq yd expanded steel. May be tied to lath hangers with No. 18 SWG steel wire spaced 6 in. OC max. or fastened directly to the steel with welds, screws, or powder actuated fasteners.

*** 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 2017-07-13

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MONOKOTE[®] MK-1000 HB

Product data and application instructions

Product Description

MONOKOTE[®] MK-1000 HB is a single component, spray applied, mill-mixed fire resistive plaster. It has approval for use on structural steel members and fluted decking to provide up to four hours of fire protection, and on flat plate cellular decking for up to three hours with SPATTERKOTE[®] SK-3.

The product has been designed to obtain bond strengths in excess of 1,000 psf making it an attractive material for meeting the 2009 IBC building requirements for bond strength for buildings in excess of 420 feet tall. The capability of meeting the bond strength requirements with a high yielding spray applied fire resistant material makes MONOKOTE[®] MK- 1000 HB fire resistive plasters a cost effective option.

Features & Benefits

MONOKOTE[®] cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occupant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL fire tested and factory inspected
- Building Code compliant

Delivery & Storage

- All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper UL labels for fire hazard and fire resistance classifications.
- The material shall be kept dry until ready for use. Packages of material shall be kept off of the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

- Prior to the application of MONOKOTE® MK-1000 HB fire resistive plasters, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent 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 general contractor.
- The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.
- Many Fire Resistance Designs allow the use of painted metal floor or roof-deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.
- Prior to application of MONOKOTE® MK-1000 HB fire resistive plasters, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MONOKOTE® MK-1000 HB.
- Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.
- No fireproofing shall be applied prior to completion of concrete work on steel decking.
- Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed and inspected.
- Other trades shall install clips, hangers, support sleeves, and other attachments that penetrate the fireproofing, prior to application of the fireproofing.

Performance Characteristics

PHYSICAL PROPERTIES	RECOMMENDED SPECIFICATION	TYPICAL VALUES	TEST METHOD
Dry density, minimum average	18 pcf (288 kg/m ³)	18 pcf (288 kg/m ³)	ASTM E605
Bond strength	1,000 psf (28.7 KPa)	1,528 psf (46.3 KPa)	ASTM E736
Compression, 10% deformation	50 psi (344 KPa)	53 psi (385.0 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft ² (0.00 g/m ²)	0.000 g/ft ² (0.00 g/m ²)	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/m ² total, 20 kw/m ² peak heat release	Less than 5 MJ/m ² total, 20 kw/m ² peak heat release	ASTM E1354

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Mixing

- MONOKOTE® fireproofing shall be mixed by machine in a conventional, 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 43–53 pcf (690–850 kg/m³) of material.
- Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 48 ± 1 pcf (770 ± 16 kg/m³) is most desirable. Overmixing MONOKOTE® will reduce pumping rate.

Application

- Application of MONOKOTE® Fireproofing can be made in the following sequence:
 1. For thicknesses of approximately 1/2 in. (13 mm) or less, apply in one pass.
 2. For thicknesses of 5/8 in. (16 mm) or greater, apply subsequent passes after the first coat has set.
- SPATTERKOTE® SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom and to roof decking where required prior to application of MONOKOTE®. SPATTERKOTE® shall be applied in accordance with manufacturer's application instructions.
- MONOKOTE® Fireproofing material shall not be used if it contains partially set, frozen or caked material.
- The minimum average density shall be that required by the manufacturer, listed in the UL Fire Resistance Directory for each rating indicated, ICBO Evaluation Report, as required by the authority having jurisdiction, or minimum average 18 lbs/ft³ (288 kg/m³), whichever is greater.
- MONOKOTE® shall be mixed with water at the job site.
- MONOKOTE® Accelerator is to be used with MONOKOTE® Fireproofing to enhance set characteristics and product yield. The MONOKOTE® Accelerator is injected into the MONOKOTE® Fireproofing at the spray gun. MONOKOTE® Accelerator shall be mixed and used according to manufacturers recommendations.
- MONOKOTE® is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous 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 MONOKOTE® does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

- The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the MONOKOTE®. Additionally, the air and substrate temperature during application and for a minimum of 24 hours after application shall be no less than 40°F (4.5°C).
- 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 substantially dry.

Field Tests

- 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 applicable building code.
- 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.
- 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

- MONOKOTE® is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.
- Safety Data Sheets (SDS) for MONOKOTE® MK-1000 HB fire resistive plasters are available on our web site or by calling 866-333-3SBM.

gcpat.com | North America customer service: 1-866-333-3726

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Last Updated: 2021-02-05

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