



Lakeview Operations  
6100 Carillon Point  
Kirkland WA 98033

Project # 1631

GLY CONSTRUCTION

Date: 10/15/2015

Transmitted To: Lewis Chu, Gensler

Transmitted By: Tim Grant  
GLY Construction

Copy to: Keith Nielson, Gensler

These drawings are:  
 NO EXCEPTION TAKEN  
 REVISED AS NOTED  
 NOT APPROVED. CORRECT AND RESUBMIT  
 This does not relieve the supplier from responsibility for error, accuracy or details, dimensions, quantities, or conformance with the contract documents.  
 GLY CONSTRUCTION  
 By TJG Date 10-15-15

Submission Package No.	Description	Due Date	Package Action
084-078100-0	Fireproofing Shop Drawings + Prodcut Data	10/22/2015	IN REVIEW

Tranmitted For	Delivered Via
Approval	Sharepoint

Item	Spec Section	Qty	Description	Notes	Item Action
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**Gensler SUBMITTAL REVIEW**

NO EXCEPTIONS TAKEN.  
 MAKE CORRECTIONS AS NOTED. Resubmittal not required unless Contractor cannot comply with corrections noted.  
 REVISE AS NOTED AND RESUBMIT.  
 RESUBMIT PROPERLY. Submittal not reviewed for reasons noted.  
 NOT REVIEWED. Submittal not required by Contract Documents.  
 RECEIVED FOR CLIENT'S RECORD ONLY. Submittal not reviewed.

Gensler has reviewed this Submittal, but only for the purpose of checking for conformance with the design intent expressed in the Contract Documents. Gensler's action on a specific item does not indicate approval of an assembly of which the item is a component, nor of an item as delivered and installed if it does not conform to the Contract Documents.

Contractor is responsible for checking for deviations between this Submittal and differing information or conditions in the Contract Documents and field conditions; for determining or substantiating the accuracy and completeness of other details such as dimensions and quantities; for substantiating instructions for installation or performance of equipment or systems designed by Contractor; for construction means, methods, techniques, schedules, sequences, procedures, and fabrication processes; for errors and omissions in Submittals; for coordination of the Work of the trades, safety precautions and performing the Work in a safe and satisfactory manner and in conformance with the Contract Documents.

If more than one submittal review stamp appears on this Submittal, the most stringent action and notations thereon apply. Signature of a submittal review stamp by Gensler or a consultant does not imply that it has reviewed work not within its professional discipline or scope of services.

By: Lewis Chu Date: Tue Oct 20, 2015

Project No: 32.0867.000

Submittal: 084-078100-0 Fireprng Shop Dwg and Pro Data - G

\\gensler.ad\Projects\32\32.0867.000\Documentation\6\65\084-078100-0 Fireproofing

**ENGINEERS REVIEW**  
DCI ENGINEERS

No Exceptions Taken  
 Note Markings  
 Revise & Resubmit

By: DLJ Date: 10/19/2015

ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE TO THE DESIGN CONCEPT AND CONTRACT DOCUMENTS. REVIEW OF THE SPECIALTY STRUCTURAL ENGINEERS (SSE) DESIGN IS FOR CONFORMANCE TO DESIGN CRITERIA AND COMPATIBILITY WITH THE DESIGN OF THE BUILDING AND DOES NOT RELIEVE THE SSE OF RESPONSIBILITY FOR THAT DESIGN. MARKINGS OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR FROM COMPLIANCE WITH THE PROJECT PLANS AND SPECIFICATIONS, NOR DEPARTURES THEREFROM. THE CONTRACTOR REMAINS RESPONSIBLE FOR DETAILS AND ACCURACY; FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; FOR SELECTING FABRICATION PROCESSES; FOR TECHNIQUES OF ASSEMBLY; AND FOR PERFORMING WORK IN A SAFE MANNER.

DCI only reviewed members requiring fireproofing. Fireproofing material and hour rating, not by DCI. - DCI

Remarks

Tim Grant  
Signature

10/15/2015  
Signed Date

**ANNING-JOHNSON COMPANY**

**14700 NE 95<sup>TH</sup> STREET**

**REDMOND, WA 98052**

**PHONE: 425-885-1990**

**FAX: 425-869-5824**

PROJECT NAME: Lakeview TI  
ARCHITECT: Gensler  
CONTRACTOR: GLY  
SPEC SECTIONS: Spray-applied Fire Resistive Materials – 078100  
PREPARED BY: Ryan Marshall  
206.418.9025

The following product data is being submitted for approval:

<b>Manufacturer</b>	<b>Product</b>	<b>Type</b>	<b>Location</b>
ISOLATEK	LOW DENSITY FIREPROOFING	CAFCO 300AC	TYPICAL FIREPROOFING
ISOLATEK	ADDITIVE TO LOW DENSITY FIREPROOFING	QUICK SET	TYPICAL FIREPROOFING
ISOLATEK	BOND SEAL	CAFCO BOND SEAL	PRIMED STEEL
ISOLATEK	LETTERS FROM ISOLATEK		
ISOLATEK	ALL – LEED INFORMATION		
ANNING JOHNSON	LOCATION/THICKNESS DRAWINGS		

**SEE FIREPROOFING SUBMITTAL DRAWINGS FOR UL DESIGNS AND THICKNESSES**

**Hour Rating / Member / Thickness / UL**

- 2 Hour L6x4x5/16 1-3/4" per UL N759 4.16
- 2 Hour W08x024 7/8" per UL N759 2.83
- 2 Hour W08x058 5/8" per UL N759 2.64
- 2 Hour Plate 1/2" 1" per UL X790
- 2 Hour Plate 3/4" 1" per UL X790
- 2 Hour Plate 3/8" 1-1/8" Thick per UL X790
- 3 Hour W08x013 1-5/8" per UL N759 4.67
- 3 Hour W08x018 1-1/2" per UL N759 4.32
- ▲ 3 Hour HSS 03x03x1/4 2-1/8" per UL X790 4.34

**FIREPROOF THICKNESS DRAWINGS**

**FIREPROOFING CONTRACTOR:**  
**ANNING-JOHNSON COMPANY**  
 14700 NE 95TH ST, SUITE 201  
 REDMOND, WA 98052

**PREPARED BY:**  
**RYAN MARSHALL**  
 NFCA DRI-SFRM/IFRM 206-418-9025

**FIREPROOFING PRODUCT:**  
**CAFCO 300AC BY ISOLATEK - SFRM**  
**CONTACT:**  
**TERRY WILDEBOER 206-546-8645**

**UL N759 BEAMS, X790 COLUMNS**  
**3 HOUR RATING PRIMARY MEMBERS**  
**2 HOUR RATING SECONDARY MEMBERS**

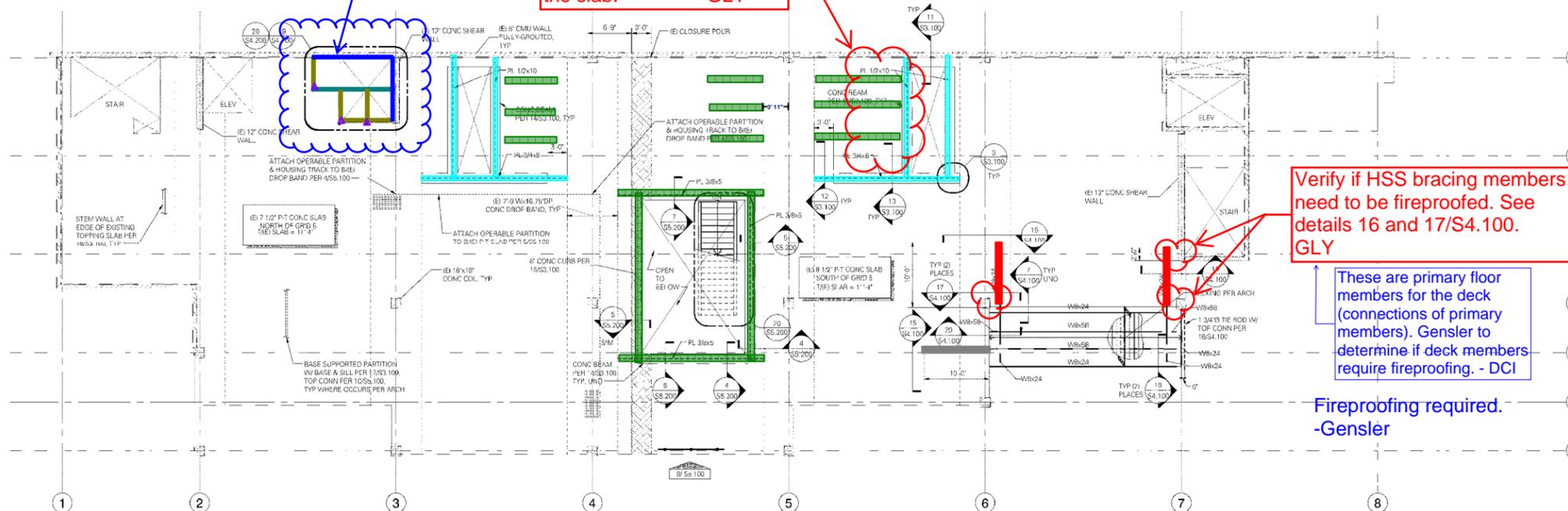
NO FIREPROOFING REQUIRED FOR  
 AHU PLATFORM STRUCTURAL  
 MEMBERS. THEY ARE NOT PART OF  
 BUILDING STRUCTURE.  
 -Gensler

Plates above and below  
 the slab.  
 GLY

Verify if HSS bracing members  
 need to be fireproofed. See  
 details 16 and 17/S4.100.  
 GLY

These are primary floor  
 members for the deck  
 (connections of primary  
 members). Gensler to  
 determine if deck members  
 require fireproofing. - DCI

Fireproofing required.  
 -Gensler



TYPICAL FRAMING PLAN NOTES  
 PER LEVEL 1 - FRAMING PLAN

LEVEL 2 - FRAMING PLAN  
 SCALE: 1/8" = 1'-0"

Project Name  
 LAKEVIEW OPERATIONS

Project Number  
 15011-0109

Description  
 STRUCTURAL - FRAMING  
 PLANS

Scale  
 As indicated

**S2.100**

## FIREPROOF THICKNESS DRAWINGS

**FIREPROOFING CONTRACTOR:**  
**ANNING-JOHNSON COMPANY**  
 14700 NE 95TH ST, SUITE 201  
 REDMOND, WA 98052

**PREPARED BY:**  
**RYAN MARSHALL**  
**NFCA DRI-SFRM/IFRM 206-418-9025**

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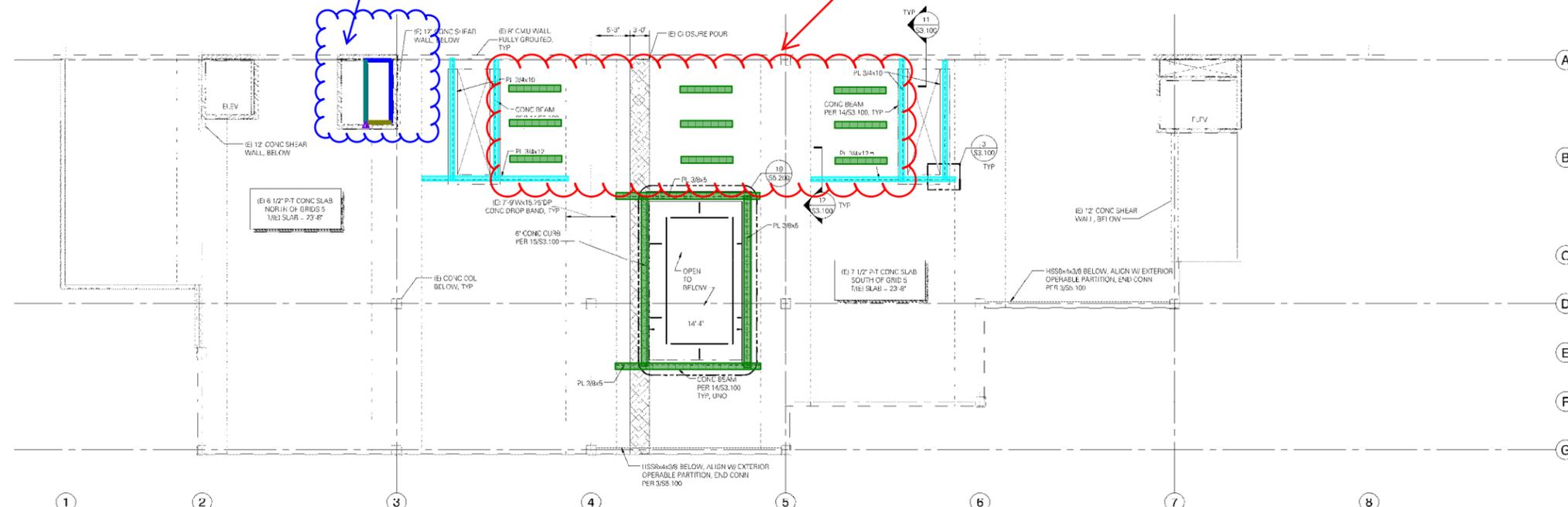
**UL N759 BEAMS, X790 COLUMNS/MISC**  
**3 HOUR RATING PRIMARY MEMBERS**  
**2 HOUR RATING SECONDARY MEMBERS**

### Hour Rating / Member / Thickness / UL

- 2 Hour L6x4x5/16 1-3/4" per UL N759 4.16
- 2 Hour Plate 3/4" 1" per UL X790
- 2 Hour Plate 3/8" 1-1/8" Thick per UL X790
- 3 Hour W08x013 1-5/8" per UL N759 4.67
- 3 Hour W08x018 1-1/2" per UL N759 4.32
- ▲ 3 Hour HSS 03x03x1/4 2-1/8" per UL X790 4.34

NO FIREPROOFING REQUIRED FOR  
 AHU STRUCTURAL MEMBERS. THEY ARE  
 NOT PART OF BUILDING STRUCTURE.  
 -Gensler

Plates per RFI 061



TYPICAL FRAMING PLAN NOTES  
 PER FOUNDATION/GARAGE PLAN

ROOF PLAN  
 SCALE: 1/8" = 1'-0"

Project Name  
**LAKEVIEW OPERATIONS**

Project Number  
 15011-0109

Description  
**STRUCTURAL -  
 FOUNDATION & ROOF  
 PLAN**

Scale  
 As indicated

**S2.200**



# CAFCO® 300 AC

## Spray-Applied Fire Resistive Material

CAFCO 300 AC is Isolatak International's newest commercial density wet-mix Spray-Applied Fire Resistive Material (SFRM). Its enhanced strength and durability combined with its superior thermal performance makes CAFCO 300 AC the most innovative wet-mix on the market today.

Designed only to be used with our QWIK-SET System, CAFCO 300 AC offers exceptional yield and unmatched application efficiencies. It provides hourly fire resistance ratings to various floor and roof assemblies, steel beams, columns and joists typical of commercial construction projects.

CAFCO 300 AC is applied exclusively by CAFCO licensed and trained contractors. Our technical staff works closely with building team members to meet all fire protection needs.

### CODE COMPLIANCES

CAFCO 300 AC satisfies the requirements of the following:

- IBC - International Building Code
- New York City - MEA
- City of Los Angeles
- NBC - National Building Code of Canada

### MAJOR SPECIFICATIONS

CAFCO 300 AC complies with the requirements of the following specifications:

- General Services Administration (GSA): AIA/SC/GSA:07811
- Department of the Navy NAVFACENCOM Guide Specification NFGS 07810, Sprayed-On Fireproofing
- Veterans Administration (VA): H-08-1
- U.S. ARMY Corps of Engineers CEGS-07811
- U.S. Environmental Protection Agency (EPA): Regulation 40
- Construction Specification Canada (CSC) TEK-AID

### FIRE TEST PERFORMANCE

CAFCO 300 AC is classified by Underwriters Laboratories (UL) and Underwriters Laboratories of Canada (ULC) in accordance with ASTM E119 (UL 263, CAN/ULC-S101).

These tests have resulted in ratings of up to 4 hours for:

- Floor Assemblies
- Beams
- Joists
- Columns
- Roof Assemblies

CAFCO 300 AC has also been tested in accordance with ASTM E84 (UL723, CAN/ULC-S102) and has the following Surface Burning Characteristics

Flame Spread.....0  
Smoke Developed.....0

### THERMAL PROPERTIES

CAFCO 300 AC is also a thermal insulator. This benefit is important in reducing heat loss, particularly when the product is applied to the underside of a roof deck. The R-value added by CAFCO 300 AC may allow a reduction in roof insulation.

Product	Conductivity (k)*	Resistance (R/inch)
CAFCO 300 AC	0.581 BTU in/hr ft <sup>2</sup> F @ 75°F (0.0838 W/mK @ 24°C)	1.83

\*When tested in accordance with ASTM C518

Physical Performance			
Characteristic	ASTM Method	Standard Performance*	Tested Performance**
Density	E605	15 pcf (240 kg/m <sup>3</sup> )	15 pcf (240 kg/m <sup>3</sup> )
Combustibility	E136	Noncombustible	Noncombustible
Cohesion/Adhesion	E736	150 psf (7.2 kPa)	412 psf (19.7 kPa)
Deflection	E759	No Cracks or Delaminations	No Cracks or Delaminations
Bond Impact	E760	No Cracks or Delaminations	No Cracks or Delaminations
Compressive Strength	E761	750 psf (35.9 kPa)	3,167 psf (151.6 kPa)
Air Erosion Resistance	E859	Less than 0.025 g/ft <sup>2</sup> (0.27 g/m <sup>2</sup> )	0.000 g/ft <sup>2</sup> (0.000 g/m <sup>2</sup> )
Corrosion Resistance	E937, Mil. Std. 810	Does Not Promote Corrosion of Steel	Does Not Promote Corrosion of Steel
Sound Absorption	C423		0.50 NRC 1" (25mm) on deck and beam
Fungal Resistance	G21	No Growth After 28 Days	Passed

\* Standard performance based on General Services Administration AIA/SC/GSA/07811. Refer to UL design for density requirement. For further information refer to the application manual.

\*\* Values represent independent laboratory tests under controlled conditions.



# CAFCO 300 AC Guide Specification

## PART 1 – GENERAL

- 1.1 Work included
- 1.1.1 Provide all labor, materials, equipment and services necessary for, and incidental to, the complete and proper installation of all sprayed fire protection and related work as shown on the drawings or where specified herein, and in accordance with all applicable requirements of the Contract Documents.
- 1.1.2 The material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction.
- 1.2 Quality Assurance
- 1.2.1 Work shall be performed by a firm with expertise in the installation of fire protection or similar materials. This firm shall be licensed or otherwise approved by the spray-applied fire resistive material manufacturer.
- 1.2.2 Before proceeding with the fire protection work, approval of the proposed material thicknesses and densities shall be obtained from the architect and other applicable authorities having jurisdiction.
- 1.3 Related Sections
- 1.3.1 Section 05100 – Structural Steel.
- 1.3.2 Section 05300 – Metal Decking.
- 1.3.3 Section 07200 – Insulation.
- 1.3.4 Section 07270 – Firestopping.
- 1.3.5 Section 07812 – Intumescent Coatings.
- 1.3.6 Section 09200 – Lath and Plaster.
- 1.3.7 Section 09900 – Painting.
- 1.4 References
- A. ASTM E84 – Surface Burning Characteristics of Building Materials.
- B. ASTM E119 – Fire Tests of Building Construction and Materials.
- C. ASTM E605 – Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.
- D. ASTM E736 – Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- E. ASTM E759 – Effect of Deflection of Sprayed Fire-Resistive Materials Applied to Structural Members.
- F. ASTM E760 – Effect of Impact on Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.
- G. ASTM E761 – Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.
- H. ASTM E859 – Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- I. ASTM E937 – Corrosion of Steel by Sprayed Fire-Resistive Materials Applied to Structural Members.
- J. CAN / ULC-S101 – Standard Methods of Fire Tests of Building Construction and Materials.
- K. CAN / ULC-S102 – Steiner Tunnel Test.
- 1.4.1 Underwriters Laboratories of Canada (ULC) List of Equipment and Materials.
- 1.4.2 Underwriters Laboratories, Inc (UL) Fire Resistance Directory.
- 1.4.3 Uniform Building Code Standard No. 7-6 (current edition); Thickness and Density Determination for Spray-Applied Fire Protection.
- 1.4.4 AWCI Publication: Technical Manual 12-A Standard Practice for the Testing and Inspection of Field-Applied Sprayed Fire Resistive Materials; an Annotated Guide.

- 1.5 Submittals
- 1.5.1 Manufacturer's Data: Submit Manufacturer's specification, including certification as to be required to show material compliance with Contract Documents. Test Data: Independent laboratory test results shall be submitted for all specified performance criteria.
- 1.5.2 Test Data: Independent laboratory test results shall be submitted for all specified performance criteria.
- 1.6 Delivery, Storage and Handling
- 1.6.1 Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaging shall bear the UL labels for fire hazard and fire-resistance classifications.
- 1.6.2 Store materials above ground, in a dry location, protected from the weather. Damaged packages found unsuitable for use should be rejected and removed from the project.
- 1.7 Project Conditions
- 1.7.1 When the prevailing outdoor temperature at the building is less than 40° F (4°C), a minimum substrate and ambient temperature of 40° F (4°C) shall be maintained prior to, during, and a minimum of 24 hours after application of spray-applied fire resistive material. If necessary for job progress, General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels.
- 1.7.2 General Contractor shall provide ventilation to allow proper drying of the sprayed fire protection during and subsequent to its application.
- 1.7.2.1 In enclosed areas, ventilation shall not be less than 4 complete air changes per hour.
- 1.8 Sequencing/Scheduling
- 1.8.1 All fire protection work on a floor shall be completed before proceeding to the next floor.
- 1.8.2 The Contractor shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

## PART 2 – PRODUCTS

- 2.1 Acceptable Manufacturers. The spray-applied fire resistive material shall be manufactured under the CAFCO® brand name, by authorized producers.
- 2.2 Materials
- 2.2.1 Materials shall be CAFCO 300 AC, (UL/ULC designation: Type 300AC) applied to conform to the drawings, specifications and following test criteria:
- 2.2.1.1 Deflection: When tested in accordance with ASTM E759, the material shall not crack or delaminate when the non-concrete topped galvanized deck to which it is applied is subjected to a one time vertical centerload resulting in a downward deflection of 1/120th of the span.
- 2.2.1.2 Bond Impact: When tested in accordance with ASTM E760, the material shall not crack or delaminate from the concrete topped galvanized deck to which it is applied.
- 2.2.1.3 Cohesion/Adhesion (bond strength): When tested in accordance with ASTM E736, the material applied over uncoated or galvanized steel shall have an average bond strength of 150 psf (7.2 kPa).

- 2.2.1.4 Air Erosion: When tested in accordance with ASTM E859, the material shall not be subject to losses from the finished application greater than 0.025 grams per sq. ft. (0.27 grams per square meter).
- 2.2.1.5 Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 750 psf (35.9 kPa).
- 2.2.1.6 Corrosion Resistance: When tested in accordance with ASTM E937, the material shall not promote corrosion of steel.
- 2.2.1.7 Surface Burning Characteristics: When tested in accordance with ASTM E84 or CAN/ULC-S102, the material shall exhibit the following surface burning characteristics:  
Flame Spread ..... 0  
Smoke Developed ..... 0
- 2.2.1.8 Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL / ULC design or as required by the authority having jurisdiction.
- 2.2.2 The material shall have been tested and classified by Underwriters Laboratories, Inc. (UL) or Underwriters Laboratories of Canada (ULC) in accordance with the procedures of UL 263 (ASTM E119) or CAN/ULC-S101.
- 2.2.3 Spray-applied fire resistive materials shall be applied at the appropriate minimum thickness and density to achieve the following ratings:  
Floor assemblies \_\_\_\_hr.  
Roof assemblies \_\_\_\_hr.  
Beams \_\_\_\_hr.  
Girders \_\_\_\_hr.  
Columns \_\_\_\_hr.  
Joists \_\_\_\_hr.
- 2.2.4 Potable water shall be used for the application of spray-applied fire resistive materials.
- 2.2.5 Spray-applied fire resistive materials shall be free of all forms of asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall provide certification of such upon request.

## PART 3 – EXECUTION

- 3.1 Preparation
- 3.1.1 All surfaces to receive spray-applied fire resistive material shall be free of oil, grease, loose mill scale, dirt, paints/primers or other foreign materials which would impair satisfactory bonding to the surface. Manufacturer shall be contacted for procedures on handling primed/painted steel. Any cleaning of surfaces to receive spray fire protection shall be the responsibility of the General Contractor or Steel Erector, as outlined in the structural steel or steel deck section.
- 3.1.2 Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of spray-applied fire resistive materials.
- 3.1.3 The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of spray-applied fire resistive materials is complete in an area.
- 3.1.4 The spray-applied fire resistive material shall only be applied to steel deck which has been fabricated and erected in accordance with the criteria set by the Steel Deck Institute.
- 3.1.5 When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.
- 3.2 Application
- 3.2.1 Equipment, mixing and application shall be in accordance with the manufacturer's written application instructions.
- 3.2.2 The application of spray-applied fire resistive material shall not commence until certification has been received by the General Contractor that surfaces to receive sprayed fire protection have been inspected by the applicator and are acceptable to receive spray-applied fire resistive material.
- 3.2.3 All unsuitable substrates must be identified and made known to the General Contractor and corrected prior to application of the spray-applied fire resistive material.
- 3.2.4 Spray-applied fire resistive material shall not be applied to steel floor decks prior to the completion of concrete work on that deck.
- 3.2.5 The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roofing is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and after construction roof traffic has ceased.
- 3.2.6 Proper temperature and ventilation shall be maintained as specified in 1.7.1, 1.7.2 and 1.7.2.1
- 3.2.7 Provide masking, drop cloths or other suitable coverings to prevent overspray from coming in contact with surfaces not intended to be sprayed.
- 3.2.8 CAFCO BOND-SEAL (Type EBS) adhesive shall be applied as per the appropriate UL/ULC fire resistance design and manufacturer's written recommendations.
- 3.3 Repairing and Cleaning
- 3.3.1 All patching of and repair to spray-applied fire resistive material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage.
- 3.3.2 After the completion of the work in this section, equipment shall be removed and all surfaces not to be sprayed shall be cleaned to the extent previously agreed to by the applicator and General Contractor.
- 3.4 Inspection and Testing
- 3.4.1 The spray-applied fire resistive material shall be tested for thickness and density in accordance with one of the following procedures: ASTM E605 – Standard Test Method of Sprayed Fire-Resistive Materials Applied to Structural Members. AWCI Publication: Technical Manual 12-A Standard Practice for the Testing and Inspection of Field-Applied Sprayed Fire Resistive Materials; an Annotated Guide. UBC Standard No. 7-6 – Thickness and Density Determination for Spray-Applied Fire Protection.
- Product Availability
- Isolatek International Spray-Applied Fire Resistive Materials are available to trained, licensed contractors around the world from strategically located production and distribution points in the U.S., Canada, Mexico, Europe and the Pacific Basin.



ISOLATEK INTERNATIONAL is registered with the  
AIA Continuing Education System (AIA/CES)

**For Further Information**



CAFCO Technical and Sales Representatives are always available to lend assistance. Additional printed materials, including Material Safety Data Sheets, and other product literature, are available upon request. For more information about our CAFCO line of sprayed fire protection, thermal and acoustical treatments, Intumescent Coatings, thermal barriers and CAFCO-BOARD® or for the name of the Sales Representative in your area, please contact:

**In the United States:** Isolatek International, Stanhope, New Jersey Tel: 800.631.9600 Fax: 973.347.9170  
**In Mexico & Central America:** Cafco Mexico S.A. de C.V., Mexico D.F. Tel: 525.254.6683 Fax: 525.531.7826  
**In Canada:** Cafco Industries, Toronto (Ontario) Tel: 888.873.0003 Fax: 416.679.2933  
**In Asia/Pacific:** Tel: 60.3.5121.3886 Fax: 60.3.5121.4886

For more detailed product information, visit our website at  
[www.isolatek.com](http://www.isolatek.com) or contact us at [technical@isolatek.com](mailto:technical@isolatek.com)



The performance data herein reflect our expectations based on tests conducted in accordance with recognized standard methods under controlled conditions. The applicator, general contractor, property owner and/or user MUST read, understand and follow the directions, specifications and/or recommendations set forth in Isolatek International's publications concerning use and application of these products, and should not rely merely on the information contained in this product data sheet. Isolatek International is not responsible for property damage, bodily injuries, consequential damages, or losses of any kind that arise from or are related to the applicator's, general contractor's, or property owner's failure to follow the recommendations set forth in Isolatek International's publications. The sale of these products shall be subject to the Terms and Conditions of Sale set forth in the Company's invoices.



Total Passive  
Fire Protection



**SHORT FORM APPLICATION GUIDE**  
**CAFECO® 300 AC™**



*This is an abbreviated guide and is not intended as a substitute for the Long Form CAFECO 300 AC Application & Installation Manual. Applicator shall completely and fully read and understand the Long Form Application & Installation Manual prior to applying this product.*

**PUMP REQUIREMENTS:**

Mechanical Piston, Hydraulic Piston or Rotor Stator type, open throat, screw feed pump with minimum "No. 4" soft rubber stators must be used.

**MIXER REQUIREMENTS:**

Paddle or ribbon-type mortar mixer with safety cover and provision for quick dumping of mix directly into the pump hopper. Mixers capable of operating speeds of 35 to 40 RPM, are required. *Note: Continuous mixers may be used but a decrease in yield may occur. Mixers operating at less than required operating speeds may result in short "pot life".*

**WATER REQUIREMENTS:**

One bag of product requires 7.75 to 8.75 US Gallons (29 to 33 L) of potable water per bag. **A calibrated water meter is required** to ensure constant water volume per mix. *Note: The "five gallon bucket" method is unacceptable.*

**MIX TIME:**

Product is mixed by first adding potable water to the mixer and then product. Mix for two (2) minutes to achieve the target mixer slurry density. **In a multiple bag mix, the mix time begins after the last bag has been added to the mixer. Do not mix more material than can be used in 30 minutes.**

**HOSE SET-UP:**

High pressure plaster type hose. Typical diameters (ID) and lengths are listed below.

<u>Total Hose Length</u>	<u>Diameter (ID)</u>	<u>Length</u>
367 feet (112 m)	3 in (76 mm)	@ Max. 50 ft (15 m)
	2 in (51 mm)	@ 200 ft (61 m)
	1-1/2 in (38 mm)	@ 50 ft (15 m)
	1-1/4 in (32 mm)	@ 25 ft (8 m)
	1 in (25 mm)	@ 25 ft (8 m)
	3/4 in (19 mm)	@ 17 ft (5 m)

**Note: Using more than 17 ft. (5 m) of 3/4 in. (19 mm) I.D. whip hose can cause excessive back pressure on pump.**

Flexible hose length shall not exceed 367 ft. (112 m). Hose couplings shall be screw-on type connect/disconnect that do not restrict product flow. Steel tapered reducers must be used when a reduction in hose is necessary. Brass or aluminum couplings or reducers must not be used.

Metal standpipe 2 in. (51 mm) to 3 in. (76 mm) I.D. must be used when pumping height exceeds 5 stories or 60 feet (18 m) or when total length (horizontal plus vertical) of material hose exceeds 367 ft. (112 m). Aluminum standpipe must not be used.

**NOZZLE REQUIREMENTS:**

The spray nozzle assembly must consist of a min. 3/4 in. (19mm) I.D. aluminum pole with a blow-off type nozzle cap. Nozzle orifice shall be nominal 5/8 in. (16 mm) I.D. **Note: A 5/8 in. (16 mm) I.D. orifice with the minimum amount of air needed for spraying is required for optimum coverage/density.**

**INTRODUCTION OF QWIK-SET:**

**ISOLATEK® QWIK-SET is required.** Typically introduced in-line. When using a 1 in. (25 mm) material hose, the QWIK-SET should be introduced max. 25 ft. (8 m) back from the nozzle; when using a 3/4 in. (19 mm) material hose, the QWIK-SET should be introduced max. 17 ft. (5 m) back from the nozzle. As an alternative, QWIK-SET can be introduced at the nozzle. Refer to ISOLATEK QWIK-SET Short Form Application Guide for further information.

**NOZZLE DISTANCE:**

The distance between the nozzle and substrate will vary according to the type of equipment and nozzle used but must be between 12 in. (305 mm) and 24 in. (610 mm).

**NOZZLE AIR PRESSURE:**

Use the amount of air at the nozzle that results in an even thickness build, texture and proper density. Excessive air will decrease yield. Air pressure should make a dull buzzing noise rather than a high pitched sound.

**THICKNESS PER PASS:**

Apply 1/2 in. (13 mm) to 5/8 in. (16 mm) on the first pass, 3/4 in. (19 mm) to 1 in. (25 mm) on subsequent passes. **Note: Do not apply more than 1-1/2 in. (32 mm) of product in a 24 hour period. These are final expanded (accelerated) thicknesses.**

**APPLICATION TEMPERATURE:**

A minimum substrate and ambient temperature of 40°F (4°C) shall be maintained prior to, during and a minimum of 24 hours after the application.

**SURFACE PREPARATION:**

Ensure surfaces are clean and free of dirt, oil, grease, loose mill scale, paints/primers (other than those approved by Isolatak) and any other materials that may impair adhesion. For applications to primed steel, contact Isolatak Technical Services Department. **Note: Some substrates require the use of CAFCO® BOND-SEAL (adhesive), CAFCO® PRE-COAT, or metal lath. Refer to the CAFCO 300 AC Long Form Application Manual for specific requirements.**

**SET-TIME:**

CAFCO 300 AC will set in approximately 10 - 20 minutes depending on temperature and humidity conditions. Do not re-temper the product after it sets. See ISOLATEK QWIK-SET Short Form Application Guide for further information.

**VENTILATION:**

Provide a minimum of 4 complete air exchanges per hour until the material is dry.

**CALCULATING MIXER DENSITIES:**

1. Weigh an empty 1036cc CAFCO cup and tare the scale to account for the cup weight.
2. Fill the cup with material from the pump hopper. Then gently tap the cup on a hard surface to eliminate all air pockets.
3. Level the material with top of cup.
4. Weigh the filled cup in grams.
5. Compare weight in grams to the mixer density in chart below.

**SAFETY PRECAUTIONS:**

**CAFCO 300 AC is slippery when mixed with water. Do not allow wet material to remain on scaffolds, ladder rungs or floors. Walking on wet material may result in slips or falls.** Signage must be posted in areas where the spray application of CAFCO 300 AC is ongoing to warn other trades of slip hazards.

**ESTIMATING CAFCO 300 AC MIXER DENSITY FROM WET CUP WEIGHTS**

WET CUP WEIGHT (Grams)	MIXER DENSITY	
	Using 8.5 US Gals (32 L) Water PCF	Water (kg/m <sup>3</sup> )
748	45	(721)
781	47	(753)
815	49	(785)
846	51	(817)
880	53	(849)
914	55	(881)

Cup Size = 1036cc

**CALCULATING NOZZLE DENSITIES:**

(Estimating Yield/Bag from Nozzle Wet Cup Weights)

1. Weigh an empty 1036cc CAFCO cup and tare the scale to account for the cup weight.
2. While the pump and atomizing air are running, place the nozzle inside cup and slowly pull back as the cup fills.
3. Level CAFCO 300 AC with the top of cup, being careful not to compress the CAFCO 300 AC. Leveling should be repeated until the material stops swelling in cup. When leveling the CAFCO 300 AC, angle the spatula so that it is cutting the excess material as opposed to troweling/compressing it.
4. Weigh the filled cup in grams.
5. Using the chart below, determine the corresponding density and yield based on the water usage rate and the weight of the cup.
6. Adjust the QWIK-SET flow rate and repeat the steps above until the desired density and yield are achieved.

7.75 gal (29 L)/bag Nozzle Cup weight in grams (Net mat'l wt./1 litre cup)	8.25 gal (31.2 L)/bag Nozzle Cup weight in grams (Net mat'l wt./1 litre cup)	8.50 gal (32.2 L)/bag Nozzle Cup weight in grams (Net mat'l wt./1 litre cup)	8.75 gal (33.1 L)/bag Nozzle Cup weight in grams (Net mat'l wt./1 litre cup)	DRY DENSITY (Estimated) PCF (kg/m <sup>3</sup> )	YIELD Est. Gross Yield/Bag Bd. ft. (M <sup>2</sup> @1 mm)
590	610	622	632	17.5 (280)	40 (94)
575	595	607	617	17 (272)	41 (97)
540	560	569	582	16 (256)	43 (101)
510	525	534	547	15 (240)	46 (109)

Note: If you are having difficulty achieving these nozzle cup weights, please contact the Isolatak International Technical Service Department for assistance.  
\* Nozzle weights are based on a cup with a volume of 1036cc.

Note: UL minimum average density for CAFCO 300 AC is 15 pcf (240 kg/m<sup>3</sup>) and the minimum individual density is 14 pcf (224 kg/m<sup>3</sup>). Please refer to the CAFCO 300 AC Application/Installation Manual for detailed information. When applying CAFCO 300 AC to cellular deck a minimum average density of 17.5 pcf (280 kg/m<sup>3</sup>) and a minimum individual density of 16.0 pcf (256 kg/m<sup>3</sup>) must be maintained. **Warning: Exceeding 46 bd.ft./bag (109 M<sup>2</sup>@1mm) will result in densities below 15 pcf (240 kg/m<sup>3</sup>)**

**NOTE:** Only the listed equipment, nozzles and procedures are approved for applying CAFCO 300 AC. Deviations from these requirements will result in product not meeting claims as published in the literature. For additional information, please contact the Technical Service Department.



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## MATERIAL SAFETY DATA SHEET

### Section 1 – Chemical Product / Company Information

**Product Name:** CAFCO® 300, CAFCO® 300SB, CAFCO® 300ES, CAFCO® 300ACTM, CAFCO® 300HSTM  
**Effective Date:** August 21, 2012

ISOLATEK® TYPE 300, ISOLATEK® TYPE 300SB, ISOLATEK® TYPE 300ES, ISOLATEK® TYPE 300ACTM, ISOLATEK® TYPE 300HSTM

**Product Use/Class:** Spray-Applied Fire Resistive Materials (SFRM)  
**Supersedes:** 7/27/12

**Manufacturer:** United States Mineral Products Company  
dba Isolatek International  
41 Furnace Street  
Stanhope, NJ 07874 USA  
973-347-1200  
**Preparer:** R&D Department

**CHEMTREC Transportation Emergency Phone #:** 800-424-9300 / 703-527-3887 (Int'l)

### Section 2 – Composition / Information On Ingredients

Chemical Name	CAS Number	Wt. % (Max.)
Calcium Sulfate, Hemihydrate	26499-65-0	50 - 75
Vermiculite	1318-00-9	15 - 35
Cellulose	065996-61-4	1 - 10
Calcium Carbonate	1317-65-3	1 - 10
Quartz	014808-60-7	0 - 5

### Section 3 – Hazards Identification

**Emergency Overview:** A granular powder that poses little immediate hazard. However, components may contain trace amounts of crystalline silica (quartz). Prolonged exposure to respirable crystalline silica (quartz) may cause cancer.

**Effects of Overexposure – Eye Contact:** May cause irritation to the eyes.

**Effects of Overexposure – Skin Contact:** May cause skin irritation. Prolonged exposure may cause alkali burns.

**Effects of Overexposure – Inhalation:** May cause irritation to upper respiratory system.

**Effects of Overexposure – Ingestion:** May cause gastro – intestinal irritation.

**Effects of Overexposure – Chronic Hazards:** Dust may cause inflammation of the cornea. Dermatitis may occur in sensitive individuals. Inhalation over long periods may overload lung clearance mechanisms; make lungs more vulnerable to disease. Prolonged inhalation of respirable crystalline silica may result in lung disease (silicosis, lung cancer).

**Primary Route(s) of Entry:** Skin Contact, Skin Absorption, Inhalation, Ingestion, Eye Contact

**Medical Conditions Prone to Aggravation by Exposure:** Sensitive skin; respiratory conditions.

### Section 4 – First Aid Measures

**First Aid – Skin Contact:** Wash with soap and water. If persistent irritation occurs, seek medical attention.

**First Aid – Eye Contact:** Flush eyes with clean water for at least 15 minutes. Seek medical attention if irritation persists.

**First Aid – Inhalation:** Breathe fresh air. Seek medical attention if irritation persists.

**First Aid – Ingestion:** If swallowed do not induce vomiting. Seek immediate medical attention.

## Section 5 – Fire Fighting Measures

**Flash Point:** Not Applicable  
**Lower Explosive Limit:** Not Applicable  
**Upper Explosive Limit:** Not Applicable

### NFPA Rating

**Health:** 1  
**Flammability:** 0  
**Reactivity:** 0

**Extinguishing Media:** Not Applicable. Product will not burn.  
**Unusual Fire & Explosion Hazards:** None  
**Special Firefighting Procedures:** None

## Section 6 – Accidental Release Measures

**Steps To Be Taken If Material Is Released Or Spilled:** Sweep up material and place in disposal containers. Avoid inhalation of dust. Wet material should be treated with an inert absorbent material and placed in disposal containers. Dispose of material in accordance with all federal, state, and local regulations. Use personal protective equipment as necessary.

## Section 7 – Handling And Storage

**Handling:** Avoid inhalation of dust. Avoid skin & eye contact. Wear skin and eye protection during use. Use normal personal hygiene to remove materials, contaminants; wash clothing separately before re-use.

**Storage:** Keep dry. Keep containers closed when not in use. Store in a cool, dry place with adequate ventilation.

## Section 8 – Exposure Controls / Personal Protection

Chemical Name	CAS Number	Exposure Limits (8-hour TWA) (mg/m <sup>3</sup> )			
		OSHA PEL	ACGIH TLV	NIOSH	Mexico
Calcium Sulfate, Hemihydrate	26499-65-0	15 (T), 5 (R)	10 (R)	10 (T), 5 (R)	10 (R)
Calcium Carbonate	1317-65-3	15 (T), 5 (R)	n/a	10 (T), 5 (R)	10 (R)
Quartz	14808-60-7	30 (T), 10 (R)	0.025 (R)	0.05 (R)	0.10 (R)
		(T) - Total (R) - Respirable			

**Engineering Controls:** Fans may be necessary to control nuisance dust levels.

**Respiratory Protection:** Wear a NIOSH approved disposable dust mask (N-95, or equivalent) to prevent exposure above the limits specified.

**Skin Protection:** Wear gloves and use hand creams to prevent dry skin.

**Eye Protection:** Wear proper eye protection; at minimum, safety glasses with side shields.

**Work / Hygienic Practices:** Use bag opening procedures which minimize dust release. Use anti-slip surfaces on working platforms – material is slippery when wet.

## Section 9 – Physical And Chemical Properties

**Boiling Point (°F):** N/A  
**Appearance & Odor:** Light grey or tan, light green or light red, granular powder; no odor.  
**Vapor Pressure (mm Hg):** N/A  
**Vapor Density (air=1):** N/A  
**Solubility in Water:** Negligible  
**Specific Gravity (H<sub>2</sub>O=1):** N/A  
**Melting Point (°F):** >1800°F (981° C)  
**Evaporation Rate:** N/A  
**Physical State:** Solid  
**% Volatiles:** 0  
**PH:** 8 - 11

## Section 10 – Stability And Reactivity

Stability: (under normal conditions):	Stable
Conditions to Avoid:	Contact with strong acids
Incompatibility (Materials to Avoid):	Strong Acids
Hazardous Decomposition Products:	CO, CO <sub>2</sub>
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	N/A

## Section 11 – Toxicological Information

<u>Ingredient</u>	<u>CAS Number</u>	<u>LD50/LC50</u>					
		No Data Available					
		<u>IARC</u>			<u>NTP</u>		<u>OSHA</u>
<u>Carcinogenicity</u>		Group 1	Group 2A	Group 2B	Known	Suspect	
Calcium Sulfate, Hemihydrate		NO	NO	NO	NO	NO	NO
Vermiculite		NO	NO	NO	NO	NO	NO
Cellulose		NO	NO	NO	NO	NO	NO
Calcium Carbonate		NO	NO	NO	NO	NO	NO
Quartz		YES	NO	NO	YES	NO	YES

## Section 12 – Ecological Information

Ecological Information: No Data Available

## Section 13 – Disposal Information

Disposal Information: Non hazardous product (U.S. (EPA, 40 CFR 261). Dispose of waste in accordance with applicable regulations.

## Section 14 – Transportation Information

Proper Shipping Name: Not Applicable  
 Technical Name: Not Applicable  
 Hazard Class: Non-Hazardous  
 UN/NA Number: Not Applicable  
 Additional Notes: None

## Section 15 – Regulatory Information

U.S. Federal Regulations SARA 311/312					
	Immediate Health (Acute)	Delayed Health (Chronic)	FIRE	PRESSURE	REACTIVE
	No	Yes	No	No	No

U.S. State Regulations	State Hazardous Substance List						
	CAS NUMBER	CA	MA	MN	NJ	PA	RI
	26499-65-0	No	No	No	Yes	Yes	No
	1317-65-3	No	No	No	Yes	No	Yes
	14808-60-7	No	No	Yes	Yes	Yes	Yes

### California Proposition 65

Warning: This product contains substances know to the State of California to cause cancer, birth defects or other reproductive harm.

**INTERNATIONAL REGULATIONS AS FOLLOWS:**

**Chemical Inventory Status**

All chemicals in this product are listed or exempt from listing in the following:

<b>U.S</b>	<b>Canada</b>		<b>Europe</b>		<b>Australia</b>	<b>Korea</b>
TSCA	DSL	NDSL	EINECS	ELINCS	AICS	ECL
Yes	Yes	No	Yes		Yes	Yes

**CANADIAN WHMIS**

This MSDS has been prepared in compliance with Controlled Product Regulations and contains all information required.

CANADIAN WHMIS CLASS: D2A

**HMIS Ratings**

Health: 1                      Flammability: 0                      Reactivity: 0                      Personal Protection: e

VOLATILE ORGANIC COMPOUNDS, GR/LTR MIXED (UNTHINNED): 0

**Section 16 – Other Information**

Prepared By: Research Department, U.S.A.  
Telephone: (973) 347-1200

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof. **VENDOR SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** In no event shall the vendor be liable for special, indirect or consequential damages.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in this data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes all risks in his use of the material.



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# ICC-ES Report

## ESR-1649

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Reissued 07/2015  
This report is subject to renewal 07/2016.

**DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION**  
**SECTION: 07 81 00—APPLIED FIREPROOFING**

### REPORT HOLDER:

**ISOLATEK INTERNATIONAL**

**41 FURNACE STREET  
STANHOPE, NEW JERSEY 07874**

### EVALUATION SUBJECT:

**CAFCO® BLAZE-SHIELD® TYPE II, CAFCO® BLAZE-SHIELD® TYPE DC/F, CAFCO® BLAZE-SHIELD® TYPE HP, CAFCO® TYPE 300, CAFCO® Type 300 AC, CAFCO® Type 300 HS, CAFCO® TYPE 300 ES, CAFCO® TYPE 300 SB, CAFCO® TYPE 400, CAFCO® Type 400 AC, CAFCO® Type 400 ES AND FENDOLITE® M-II SPRAYED FIRE-RESISTIVE MATERIALS; CAFCO® FIBER-PATCH TYPE P AND FENDOLITE TG (TROWEL GRADE) HAND-APPLIED FIRE-RESISTIVE MATERIALS; CAFCO® BOND-SEAL AND CAFCO® PRE-COAT TYPE PC ADHESIVES; CAFCO® QWIK-SET FIRE-RESISTIVE MATERIAL ADDITIVE/ACCELERATOR**



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**ICC-ES Evaluation Report**
**ESR-1649**

Reissued July 2015

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**DIVISION: 07 00 00—THERMAL AND MOISTURE  
PROTECTION**
**Section: 07 81 00—Applied Fireproofing**
**REPORT HOLDER:**
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**EVALUATION SUBJECT:**

**CAFCO® BLAZE-SHIELD® TYPE II, CAFCO® BLAZE-SHIELD® TYPE DC/F, CAFCO® BLAZE-SHIELD® TYPE HP, CAFCO® TYPE 300, CAFCO® Type 300 AC, CAFCO® Type 300 HS, CAFCO® TYPE 300 ES, CAFCO® TYPE 300 SB, CAFCO® TYPE: 400, CAFCO® Type 400 AC, CAFCO® Type 400 ES AND FENDOLITE® M-II SPRAYED FIRE-RESISTIVE MATERIALS; CAFCO® FIBER-PATCH TYPE P AND FENDOLITE TG (TROWEL GRADE) HAND-APPLIED FIRE-RESISTIVE MATERIALS; CAFCO® BOND-SEAL AND CAFCO® PRE-COAT TYPE PC ADHESIVES; CAFCO® QWIK-SET FIRE-RESISTIVE MATERIAL ADDITIVE/ACCELERATOR**

**1.0 EVALUATION SCOPE**
**Compliance with the following codes:**

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 1997 *Uniform Building Code*™ (UBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)<sup>†</sup>

<sup>†</sup>The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

**Properties evaluated:**

- Fire resistance
- Physical properties
- Durability
- Protective Covering (Fendolite M-II) Section 4.3.9

**2.0 USES**

**2.1 CAFCO BLAZE-SHIELD Type II, CAFCO BLAZE-SHIELD Type DC/F, and CAFCO BLAZE-SHIELD Type HP Sprayed Fire-resistive Materials:**

**2.1.1 Fire-resistance-rated Assemblies:** CAFCO BLAZE-SHIELD Type II, CAFCO BLAZE-SHIELD Type DC/F, and CAFCO BLAZE-SHIELD Type HP sprayed materials provide fire protection for structural steel columns and beams, steel roof and floor assemblies, steel trusses,

concrete pan joists, and cold-formed steel stud walls and partitions that require a fire-resistance rating. These materials are limited to interior exposures.

**2.1.2 Use in Ventilation Shafts, Plenums and Elevator Shafts:** BLAZE-SHIELD Type II and BLAZE-SHIELD Type HP sprayed fire-resistive materials may be installed in areas of a building, such as ventilation shafts, plenums and elevator shafts, where the maximum velocity of the air stream is 1,250 feet per minute (381 m/min), provided the in-place dry density of the materials is verified to comply with Section 3.1 of this report.

**2.2 CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES Sprayed Fire-resistive Materials:**

**2.2.1 Fire-resistance-rated Assemblies:** CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES sprayed materials provide fire protection for interior structural steel columns and beams, steel roof and floor assemblies, and steel trusses that require a fire-resistance rating. These materials are limited to interior exposures.

**2.2.2 Use in Ventilation Shafts, Plenums and Elevator Shafts:** CAFCO Type 300, CAFCO Type 300 ES, CAFCO Type 300 SB, and CAFCO Type 400 sprayed fire-resistive materials may be installed in areas of a building, such as ventilation shafts, plenums and elevator shafts, where the maximum velocity of the air stream is 1,250 feet per minute (381 m/min), provided the in-place dry density of the materials is verified to comply with Section 3.2 of this report.

**2.3 CAFCO Fiber-Patch Type P Fire-resistive Material:**

CAFCO FIBER-PATCH Type P is hand- or trowel-applied to patch damaged CAFCO BLAZE-SHIELD Type DC/F, BLAZE-SHIELD Type II, BLAZE-SHIELD Type HP, CAFCO 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO 300 ES, CAFCO 300 SB, CAFCO 400, CAFCO Type 400 AC, and CAFCO Type 400 ES sprayed fire-resistive materials.

**2.4 Fendolite Type M-II Sprayed Fire-resistive Material and Fendolite TG Trowel-applied Fire-resistive Material:**

These materials provide fire protection for structural steel columns and beams, and steel roof and floor assemblies that require a fire-resistance rating. These materials may be used for interior and exterior (exposed to the weather) applications.

## 2.5 CAFCO BOND-SEAL:

CAFCO BOND-SEAL is used as an adhesive coat where specifically required in this report before application of CAFCO BLAZE-SHIELD Type II, CAFCO BLAZE-SHIELD Type DC/F, CAFCO BLAZE-SHIELD Type HP, CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials.

## 2.6 CAFCO PRE-COAT Type PC:

CAFCO PRE-COAT Type PC is an adhesive that is used as an adhesive coat where specifically required in this report with cellular steel floor deck units before application of CAFCO 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials.

## 2.7 CAFCO Qwik-Set:

CAFCO Qwik-Set may be added to CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400 AC or CAFCO Type 400 ES fire-resistive materials as a field-application aid.

## 3.0 DESCRIPTION

### 3.1 CAFCO BLAZE-SHIELD:

CAFCO BLAZE-SHIELD Type DC/F, BLAZE-SHIELD Type II, and BLAZE-SHIELD Type HP fire-resistive materials are proprietary formulations of slag wool and inorganic binders containing silicates and calcium sulfates. The BLAZE-SHIELD fire-resistive materials are noncombustible when tested in accordance with ASTM E136 (UBC Standard 2-1), and have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 (UBC Standard 8-1).

BLAZE-SHIELD Type DC/F fire-resistive materials must have minimum average and individual in-place, dry densities of 13 and 11 pcf (208 and 176 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 1 through 6 of this report for a given fire-resistance rating.

BLAZE-SHIELD Type II fire-resistive material must have minimum average and individual in-place, dry densities of 13 and 11 pcf (208 and 176 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 1 through 6 of this report for a given fire-resistance rating. When used in ventilation shafts, plenums and elevator shafts, BLAZE-SHIELD Type II fire-resistive material must have minimum average and individual in-place, dry densities of 16 and 13 pcf (256 and 208 kg/m<sup>3</sup>), respectively.

BLAZE-SHIELD Type HP material must have minimum average and individual in-place, dry densities of 22 and 19 pcf (352 and 304 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 1 through 6 of this report for a given fire-resistance rating. When used in ventilation shafts, plenums and elevator shafts, BLAZE-SHIELD Type HP material must have minimum average and individual in-place, dry densities of 22 and 19 pcf (352 and 304 kg/m<sup>3</sup>), respectively.

CAFCO BLAZE-SHIELD Type DC/F, BLAZE-SHIELD Type II, and BLAZE-SHIELD Type HP fire-resistive materials are packaged in 55-pound (25 kg) bags. The shelf life of unopened bags of the material is six months provided the bags are stored on pallets (above ground or floor) in a dry location.

### 3.2 CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES Sprayed Fire-resistive Materials:

CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials are proprietary formulations of inorganic aggregate and binders containing silicates, calcium sulfates and aluminates. The materials have a flame-spread index less than 25 and smoke-developed index less than 450 when tested in accordance with ASTM E84 (UBC Standard 8-1) or UL723.

CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES and CAFCO Type 300 SB materials must have minimum average and individual in-place, dry densities of 15.0 and 14.0 pcf (240 and 224 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 7 through 11 of this report, with the exception of cellular deck in Table 8, for a given fire-resistance rating. Cellular deck in Table 8 requires minimum average and individual in-place densities of 17.5 and 16.0 pcf (280 and 256 kg/m<sup>3</sup>), respectively. When used in ventilation shafts, plenums and elevator shafts, CAFCO Type 300, CAFCO Type 300 ES and CAFCO Type 300 SB materials must have minimum average and individual in-place, dry densities of 15.0 and 14.0 pcf (240 and 224 kg/m<sup>3</sup>), respectively.

CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES must have minimum average and individual in-place dry densities of 22.0 and 19.0 pcf (352 and 304 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 7 through 11 of this report for a given fire-resistance rating. When used in ventilation shafts, plenums, and elevator shafts, CAFCO Type 400 material must have minimum average and individual in-place dry densities of 22.0 and 19.0 pcf (352 and 304 kg/m<sup>3</sup>), respectively.

CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials are dry-blended products packaged in 55-pound (25-kg) bags. The shelf life of unopened bags is ten months, provided the bags are stored on pallets (above ground or floor) in a dry location.

### 3.3 CAFCO FIBER-PATCH Type P:

The material, consisting of a proprietary formulation of slag wool and inorganic binders containing silicates and calcium sulfates, is noncombustible when tested in accordance with ASTM E136 (UBC Standard 2-1), and has a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 (UBC Standard 8-1) or UL723. CAFCO FIBER-PATCH Type P material must have a minimum individual in-place, dry density of 17.5 pcf (280 kg/m<sup>3</sup>).

CAFCO FIBER-PATCH Type P material is packaged in 25-pound (11.3-kg) bags. The shelf life of unopened bags of the material is six months provided the bags are stored on pallets (above ground or floor) in a dry location.

### 3.4 Fendolite® Type M-II:

Fendolite Type M-II fire-resistive material is a proprietary formulation of portland cement and vermiculite aggregate containing calcium silicates, calcium aluminates, and aluminosilicates. The material is noncombustible when tested in accordance with ASTM E136 (UBC

Standard 2-1), and has a flame-spread index less than 25 and smoke-developed index less than 450 when tested in accordance with ASTM E84 (UBC Standard 8-1) or UL723.

Fendolite Type M-II must have minimum average and individual dry in-place densities of 44 and 40 pcf (704 and 640 kg/m<sup>3</sup>), respectively, for the thicknesses specified in Tables 12 through 14 of this report for a given fire-resistance rating.

Fendolite Type M-II fire-resistive material is packaged in 50-pound (22.7-kg) bags. The shelf life of unopened bags of the material is 24 months, provided the bags are stored on pallets (above ground or floor) in a dry location.

### 3.5 CAFCO BOND-SEAL:

CAFCO BOND-SEAL is a polyvinyl acetate copolymer adhesive that is an off-white liquid, packaged in 5-gallon (19 L) containers. The shelf life of unopened containers is eight months, provided they are stored on pallets (above ground or floor) in a dry location where the temperature stays above 32°F (0°C).

### 3.6 CAFCO PRE-COAT Type PC:

CAFCO PRE-COAT Type PC is a grey, dry, blended fibrous powder packaged in 50-pound (22.7 kg) bags. Unopened bags of the material have a shelf life of ten months when stored on pallets (above ground or floor) in a dry location where the temperature stays above 32°F (0°C).

### 3.7 CAFCO Qwik-Set:

CAFCO Qwik-Set is a water-soluble, off-white, inorganic-acid-salt powder that is packaged in 50-pound (22.7 kg) bags. The shelf life of unopened bags of the material is ten months, provided they are stored on pallets (above ground or floor) in a dry location.

## 4.0 DESIGN, INSTALLATION, APPLICATION, AND SPECIAL INSPECTION

### 4.1 Design:

**4.1.1 CAFCO BLAZE-SHIELD:** The minimum average thicknesses of CAFCO BLAZE-SHIELD Type DC/F, BLAZE-SHIELD Type II, and BLAZE-SHIELD Type HP fire-resistive materials for each hourly fire-resistance rating are shown in Table 1 for steel columns, Table 2 for steel decks and beams of (protected) floor assemblies, Table 3 for steel beams of (unprotected) floor assemblies, Table 4 for concrete floor systems, Table 5 for steel decks and beams of (protected) roof assemblies, and Table 6 for steel beams of (unprotected) roof assemblies.

The thickness of the fire-resistive material applied to a truss element that can be simultaneously exposed to fire on all sides must be determined on the same basis as for columns, as specified in Table 1. The thickness of the fire-resistive material applied to a truss element that directly supports floor or roof construction must be determined on the same basis as for beams and girders, as specified in Tables 2 or 3 for floor construction and in Tables 5 and 6 for roof construction.

**4.1.2 CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES Sprayed Fire-resistive Materials :** The minimum average thicknesses of CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials for each hourly fire-resistance rating are shown in Table 7 for steel columns, Table 8 for steel decks

and beams of (protected) floor assemblies, Table 9 for steel beams of (unprotected) floor assemblies, Table 10 for steel decks and beams of (protected) roof assemblies, and Table 11 for steel beams of (unprotected) roof assemblies.

The thickness of the fire-resistive material applied to a truss element that can be simultaneously exposed to fire on all sides must be determined on the same basis as for columns, as specified in Table 7. The thickness of the fire-resistive material applied to a truss element that directly supports floor or roof construction must be determined on the same basis as for beams and girders, as specified in Tables 8 or 9 for floor construction and in Tables 10 and 11 for roof construction.

**4.1.3 Fendolite Type M-II:** The minimum average thicknesses of Fendolite Type M-II fire-resistive material for each hourly fire-resistance rating are shown in Table 12 for steel columns, Table 13 for steel decks and beams of (protected) floor assemblies, Table 14 for steel beams of (unprotected) floor assemblies, Table 15 for steel decks and beams of (protected) roof assemblies, and Table 16 for steel beams of (unprotected) roof assemblies.

### 4.2 Installation:

**4.2.1 Site Conditions:** When the temperature at the building site is less than 40°F (4.4°C), the temperature of the steel substrate and its surrounding environment must be maintained at 40°F (4.4°C) or higher before, during and a minimum of 24 hours after application of sprayed fire-resistive material. Enclosures with heat must be used to maintain the required substrate and ambient temperatures during this period.

**4.2.2 Surface Conditions:** Surfaces that receive spray- or trowel-applied fire-resistive material and adhesive must be free of oil, grease, dirt, loose mill scale or any other condition that impairs adhesion.

### 4.3 Application:

**4.3.1 CAFCO BLAZE-SHIELD Type DC/F, BLAZE-SHIELD Type II, and BLAZE-SHIELD Type HP Fire-resistive Materials:** These materials are pneumatically conveyed in a dry state through the application machine, hose and nozzle. Water is added at the nozzle in accordance with the manufacturer's published instructions, and volume is adjusted to provide for proper spray pattern. Continuous application builds the fire-resistive material to the required thickness in either single or multiple passes. The fire-resistive material must fill all cavities between the upper beam flange and steel floor or roof units. Fire-resistive material rebound may be used for filling the cavities.

**4.3.2 CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES Fire-resistive Materials:** These materials are mixed with water in a plaster mixer at the jobsite to a uniform consistency. The mixed materials are pumped through an application machine, hose, and nozzle where air pressure is added at the nozzle to adjust the spray pattern. Continuous application builds the fire-resistive materials to the required thickness in either single or multiple passes. The fire-resistive material must fill all cavities between the upper beam flange and steel floor or roof units. Fire-resistive material rebound may be used for filling the cavities.

**4.3.2.1 CAFCO PRE-COAT Type PC:** CAFCO PRE-COAT Type PC is applied to steel decking before application of CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES, Type 300 SB,

CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES as noted in Table 8 of this report. One bag of dry material is mixed with 5.5 to 6.0 gallons (20.8 to 22.7 liters) of potable water. The mixture is sprayed at a rate sufficient to provide a minimum 70 percent coverage of deck area. CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES, Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES must be applied before the adhesive mixture dries completely.

**4.3.2.2 CAFCO BOND-SEAL:** CAFCO BOND-SEAL is field-mixed with potable water at a ratio of 3:1, by volume, and applied at a rate of 450 square feet per gallon (11 m<sup>2</sup>/liter). The fire-resistive material must be applied to steel surfaces before the adhesive mixture dries completely, which depends on site conditions.

**4.3.2.3 CAFCO Qwik-Set:** CAFCO Qwik-Set is added to CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES or Type 300 SB at or near the application equipment nozzle to reduce the set time of the fire-resistive materials. The solution consists of one 50-pound (22.7 kg) bag of CAFCO Qwik-Set mixed and fully dissolved in 12.5 gallons (47 L) of potable water. The solution is added to the fire-resistive material at a rate that results in a ratio of one bag of CAFCO Qwik-Set to 18 or more bags of CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES or Type 300 SB.

CAFCO Qwik-Set is added to CAFCO Type 400 AC, and CAFCO Type 400 ES at or near the application equipment nozzle to reduce the set time of the fire-resistive materials. The solution consists of one 50-pound (22.7 kg) bag of CAFCO Qwik-Set mixed and fully dissolved in 30 gallons (114 L) of potable water. The solution is added to the fire-resistive material at a rate that results in a ratio of one bag of CAFCO Qwik-Set to 35 or more bags of CAFCO Type 400 AC or 400 ES.

**4.3.3 Fendolite Type M-II Fire-resistive Material:** This material is mixed with potable water in a plaster mixer at the jobsite to a uniform consistency. The mixed material is pumped through an application machine, hose, and nozzle where air pressure is added at the nozzle to adjust the spray pattern. Continuous application builds the fire-resistive material to the required thickness in either single or multiple passes. The fire-resistive material must fill all cavities between the upper beam flange and steel floor or roof units. Fire-resistive material rebound may be used for hand-filling the cavities.

**4.3.4 Fire-resistive Material Thickness:** The average thickness of the sprayed fire-resistive materials applied to structural elements must not be less than the minimum average thickness specified in Tables 1 through 16 of this report. The thickness must be determined in accordance with ASTM E605 (UBC Standard 7-6). Samples of the sprayed fire-resistive materials must be selected in accordance with Sections 1705.13.4 and 1705.13.4.2 of the 2012 IBC, Sections 1704.12.4.1 and 1704.12.4.2 of the 2009 IBC or Sections 1704.10.3.1 and 1704.10.3.2 of the 2006 IBC. Minus and positive thickness tolerance limits are as follows:

**4.3.4.1 Minus Tolerance:** The thickness of fire-resistive material must be corrected by applying additional material at any location where the calculated average thickness of the material is less than that listed in this report, or where an individual measured thickness reading has a minus tolerance greater than 1/4 inch (6.4 mm) for thicknesses of 1 inch (25.4 mm) or greater, or greater than 25 percent of the required thicknesses for thicknesses less than 1 inch (25.4 mm).

**4.3.4.2 Positive Tolerance:** An individual measured thickness, exceeding the thickness specified in this report by 1/4 inch (6.4 mm) or more, is recorded as the thickness specified in the table plus 1/4 inch (6.4 mm).

**4.3.5 Fire-resistive Material Density:** The minimum average and individual in-place dry density of the sprayed fire-resistive materials must not be less than the values specified in Sections 3.1 through 3.4 of this report. Density of the sprayed fire-resistive material must be determined in accordance with ASTM E605 (UBC Standard 7-6).

**4.3.6 Fire-resistive Material Bond Strength:** The cohesive/adhesive bond strength of the cured sprayed fire-resistive material applied to steel elements must be at least 150 psf (7.18 kN/m<sup>2</sup>). The cohesive/adhesive bond strength must be determined in accordance with Section 1705.13.6 of the 2012 IBC, Section 1704.12.6 of the 2009 IBC, Section 1704.10.5 of the 2006 IBC or with Section 7.605 of UBC Standard 7-6, as applicable.

**4.3.7 Patching:** A maximum area of 432 square inches (278 709 mm<sup>2</sup>) of a fire-resistance-rated assembly described in this report that specifies CAFCO BLAZE-SHIELD Type DC/F, Type II, or Type HP fire-resistive materials may be patched, provided the following guidelines are met:

- (a) The material used for patching is either the same material designation type as the fire-resistance material being patched or CAFCO FIBER-PATCH Type P material.
- (b) All areas to be patched must be cleaned, down to the substrate, of loose, poorly adhered material, including dirt and any other foreign material.
- (c) The patching material is keyed into the existing material surrounding the patch. The integrity of the surrounding material must be sound. The surrounding material must be pre-wetted before application of the patching material.
- (d) CAFCO BOND-SEAL adhesive is required on steel decking that does not contain concrete (roof decking) and on all cellular decks.
- (e) When the patching material is the same material designation type as the fire-resistance material being patched, the minimum individual in-place dry density, as specified in this report, and the minimum thickness of the material, as specified in the tables of this report, must be maintained.
- (f) Any clips or hangers being patched around must be totally encased in material at the point of attachment to the structural member at a thickness equal to or greater than that being applied to the structural member.

A maximum area of 144 square inches (92 903 mm<sup>2</sup>) of a fire-resistance-rated assembly described in this report that specifies CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES, Type 300 SB, Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials may be patched, provided the guidelines (a) through (f) in Section 4.3.7 of this report are met.

A maximum area of 144 square inches (92 903 mm<sup>2</sup>) of a fire-resistance-rated assembly described in this report that specifies Fendolite Type M-II fire-resistive material may be patched, provided the material used for patching is Fendolite Type M-II, and guidelines (b) through (f) in Section 4.3.7 are met.

A maximum area of 5 square feet (0.46 m<sup>2</sup>) of a fire-resistance-rated assembly described in this report that specifies Fendolite Type M-II fire-resistive material may be patched, provided the material used for patching is Fendolite TG (Trowel Grade), and guidelines (b) through (f) in Section 4.3.7 are met.

**4.3.8 Primed or Painted Surfaces:** CAFCO and Fendolite fire-resistive materials may cover primed or painted wide-flange steel members, subject to the following guidelines:

- (a) Beam flange width is a maximum of 12 inches (305 mm)
- (b) Column flange width is a maximum of 16 inches (406 mm)
- (c) Beam or column web depth is a maximum of 16 inches (406 mm)
- (d) Round pipe column outer diameter or tube column width is a maximum of 12 inches (305 mm)
- (e) Bond tests of five specimens in accordance with ASTM E736 are used to verify the bond strength of the fire-resistive material to a painted or primed steel beam or column at the jobsite. The minimum average bond strength shall be 80 percent, or a minimum individual bond strength shall be 50 percent, of the bond strength of the same fire-resistive material applied to bare, clean, 1/8-inch-thick (3.2 mm) steel plate. At a minimum, the cohesive/adhesive bond strength of the cured in-place fire-resistive material applied to primed or painted structural elements must not be less than 150 psf (7.18 kN/m<sup>2</sup>).
- (f) Where bond-strength values are less than the minimum values specified in item (e), above, for fire-resistance-rated assemblies with CAFCO BLAZE-SHIELD Type DC/F, Type II, Type HP, Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES, Type 300 SB, Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials, CAFCO BOND-SEAL adhesive must be applied to the primed or painted surfaces, and the bond-strength tests must be repeated.
- (g) Where bond-strength values are less than the minimum values specified in item (e) for fire-resistance-rated assemblies with Fendolite Type M-II fire-resistive material, an adhesive recommended by Isolatak International is applied to the primed or painted surfaces, and the bond-strength tests are repeated. Regardless of the actual cohesive/adhesive bond strength of the Fendolite Type M-II fire-resistive material, an adhesive must always be applied to steel substrates primed with an alkyd-based primer having a pH between 12.0 and 12.5 before the Fendolite Type M-II fire-resistive material is sprayed to the primed steel.

When beam or column dimensions exceed the values in items (a), (b) or (c) of Section 4.3.8, a mechanical break must be installed on the beam or column to ensure a mechanical bond of the sprayed fire-resistive material. A mechanical break consists of one or more minimum 1.7-pound-per-square-yard (0.65 kg/m<sup>2</sup>) metal lath strips, or No. 20 gage galvanized hexagonal wire lath, mechanically fastened to the flange or web, or both, either by weld, screw or powder-actuated fastener. Fasteners must be spaced a maximum of 12 inches (305 mm) on center, on each longitudinal edge of the strip, so that the clear spans do not exceed the limits established in conditions specified in items (a), (b) or (c) of Section 4.3.8.

At least 25 percent of the width of the oversized flange or web must be covered by the metal lath that is a minimum of 3 1/2 inches (89 mm) wide.

#### 4.3.9 Protective Covering:

**4.3.9.1 IBC:** In areas enforcing the IBC, and where the spray-applied fire-resistive material covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise or other activity, the steel beams, columns or vertical members must be protected with Fendolite Type M-II applied at the required thickness in accordance with this report, or the fire-resistive material must be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection, but not less than 5 feet (1524 mm) from the finished floor in accordance with 2012 and 2009 IBC Section 704.9 or 2006 IBC Section 714.4.

**4.3.9.2 UBC:** In areas enforcing the UBC, the fire-resistive material applied to steel columns, beams and ceilings less than 8 feet (2438 mm) above the finished floor must be protected with Fendolite Type M II applied at the required thickness in accordance with this report, or the exposed fire-resistive material must be protected from damage by encasement in a furred wallboard or cement-plaster/lath enclosure, or by other means approved by the code official.

#### 4.4 Special Inspection:

Special inspections must be provided in accordance with Section 1705.13 of the 2012 IBC, Section 1704.12 of the 2009 IBC, Section 1704.10 of the 2006 IBC or Section 1701.4 of the UBC, as applicable.

### 5.0 CONDITIONS OF USE

The CAFCO® BLAZE-SHIELD® Type II, Type DC/F, and Type HP Fire-resistive Materials; CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, Type 300 ES, Type 300 SB, Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES Fire-resistive Materials; FENDOLITE® M-II Fire-resistive Material; CAFCO Fiber-Patch Type P and FENDOLITE TG (Trowel Grade) Hand-applied Fire-resistive Materials; CAFCO BOND-SEAL and CAFCO Pre-Coat Type PC Adhesives; and the CAFCO Qwik-Set Fire-resistive Material Additive/Accelerator described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Installation must comply with this report, the manufacturer's published installation instructions and the applicable code. When the manufacturer's published installation instructions differ from this report, this report governs.
- 5.2 Use of CAFCO BLAZE-SHIELD Type II, CAFCO BLAZE-SHIELD Type DC/F, CAFCO BLAZE-SHIELD Type HP, CAFCO Type 300, CAFCO Type 300 AC, CAFCO Type 300 HS, CAFCO Type 300 ES, CAFCO Type 300 SB, CAFCO Type 400, CAFCO Type 400 AC, and CAFCO Type 400 ES fire-resistive materials is limited to interior applications.
- 5.3 Use of FENDOLITE M-II and Type TG fire-resistive materials is for interior and exterior (exposed to the weather) applications.
- 5.4 Minimum thickness and density of applied fire-resistive material must comply with this report.
- 5.5 Special inspection must be provided as set forth in Section 4.4 of this report.

- 5.6 The CAFCO® Type 300 HS and CAFCO® Type 300 ES sprayed fire-resistant material (SFRM) recognized in this report has been evaluated for use in high-rise buildings up to 420 feet (128 m) in height in accordance with 2012 and 2009 IBC Section 403.2.4 and Table 403.2.4.
- 5.7 The CAFCO® Type 400, CAFCO® Type 400 AC, CAFCO® Type 400 ES, Fendolite Type M-II and CAFCO® BLAZE-SHIELD® Type HP 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 2012 and 2009 IBC Section 403.2.4 and Table 403.2.4.

## 6.0 EVIDENCE SUBMITTED

Data in compliance with the ICC-ES Acceptance Criteria for Spray-applied and Intumescent Mastic Coating Fire-protection Materials (AC23), dated December 2012.

## 7.0 IDENTIFICATION

Bags and containers of the fire-resistive materials, adhesives, and fire-resistive material additive/accelerator are labeled with the company name (Isolatek International) and address, product name, storage and date of manufacture information, and the evaluation report number (ESR-1649).

TABLE 1—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO STEEL COLUMNS

STEEL COLUMN		W/D RATIO <sup>1</sup> RANGE	A/P RATIO <sup>2</sup>	FIRE-RESISTANCE RATING					
Structural Shape	Size			4-Hour	3-Hour	2-Hour	1-Hour		
		Minimum Average Thickness of Sprayed Fire-resistive Materials <sup>3,4</sup> (Inches)							
Wide-flange Steel Columns <sup>5,8</sup>	W14×730	$W/D \geq 6.68$	—	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$		
	W14×233	$2.49 \leq W/D \leq 6.67$	—	$\frac{1^3}{8}$ ( $\frac{1^1}{2}$ )	1 ( $\frac{1^1}{8}$ )	$\frac{1^1}{2}$ ( $\frac{5}{8}$ )	$\frac{3^3}{8}$ ( $\frac{1^1}{2}$ )		
	W12×106	$1.44 \leq W/D \leq 2.48$	—	2 ( $\frac{2^1}{4}$ )	$\frac{1^1}{2}$ ( $\frac{1^5}{8}$ )	1 ( $\frac{1^1}{8}$ )	$\frac{1^1}{2}$ ( $\frac{5}{8}$ )		
	W10×49	$0.83 \leq W/D \leq 1.45$	—	$\frac{2^1}{8}$ ( $\frac{2^1}{2}$ )	$\frac{3^1}{4}$ (2)	$\frac{1^1}{4}$ ( $\frac{1^1}{2}$ )	$\frac{3^1}{4}$ ( $\frac{7}{8}$ )		
	W8×28	$0.67 \leq W/D \leq 0.82$	—	3 ( $\frac{3^1}{2}$ )	$\frac{2^1}{4}$ ( $\frac{2^5}{8}$ )	$\frac{1^1}{2}$ ( $\frac{1^3}{4}$ )	$\frac{3^1}{4}$ ( $\frac{7}{8}$ )		
	W6×16	$0.57 \leq W/D \leq 0.66$	—	$\frac{3^1}{4}$ ( $\frac{3^1}{4}$ )	$\frac{2^1}{2}$ ( $\frac{2^2}{4}$ )	$\frac{1^5}{8}$ ( $\frac{1^3}{4}$ )	$\frac{3^1}{4}$ ( $\frac{7}{8}$ )		
	W8×10	$0.33 \leq W/D \leq 0.56$	—	NR (NR)	4 (NR)	$\frac{2^5}{8}$ (3)	$\frac{1^3}{8}$ ( $\frac{1^1}{2}$ )		
Wide-flange Steel Column with Gypsum Wallboard Assembly (See Figure 1)	W8×28	$W/D \geq 0.67$	—	$\frac{2^7}{8}$	2	$\frac{1^1}{4}$	$\frac{3^1}{4}$		
Steel Hollow Structural Sections (HSS) <sup>7</sup>	HSS4×4× $\frac{1}{2}$	—	0.418	$\frac{2^3}{8}$	$\frac{1^3}{4}$	$\frac{1^1}{8}$	$\frac{1^1}{2}$		
	HSS4×4× $\frac{3}{8}$	—	0.323	$\frac{3^1}{4}$	$\frac{2^3}{8}$	$\frac{1^1}{4}$	$\frac{5^1}{8}$		
	HSS4×4× $\frac{5}{16}$	—	0.273	NR	$\frac{2^5}{8}$	$\frac{1^5}{8}$	$\frac{5^1}{8}$		
	HSS4×4× $\frac{1}{4}$	—	0.222	NR	$\frac{3^1}{8}$	2	$\frac{3^1}{4}$		
	HSS4×4× $\frac{3}{16}$	—	0.168	NR	NR	$\frac{2^3}{8}$	1		
Steel Pipe <sup>7</sup>	Standard Weight (Std.)	12 × 0.375	—	0.36	$\frac{2^1}{8}$	2	$\frac{1^1}{4}$	$\frac{1^1}{2}$	
		10 × 0.365	—	0.35	$\frac{2^1}{8}$	$\frac{2^1}{8}$	$\frac{1^3}{8}$	$\frac{1^1}{2}$	
		8 × 0.322	—	0.31	$\frac{3^3}{8}$	$\frac{2^3}{8}$	$\frac{1^1}{2}$	$\frac{5^1}{8}$	
		6 × 0.280	—	0.27	NR	$\frac{2^3}{4}$	$\frac{1^3}{4}$	$\frac{3^1}{4}$	
		5 × 0.258	—	0.25	NR	3	$\frac{1^1}{8}$	$\frac{3^1}{4}$	
		4 × 0.237	—	0.22	NR	$\frac{3^3}{8}$	$\frac{2^1}{4}$	$\frac{7^1}{8}$	
		Extra Strong (X-Strong)	4 × 0.337	—	0.31	$\frac{3^3}{8}$	$\frac{2^3}{8}$	$\frac{1^1}{2}$	$\frac{5^1}{8}$
		Double Extra-Strong (XX-Strong)	4 × 0.674	—	0.57	$\frac{1^1}{8}$	$\frac{1^3}{8}$	$\frac{7^1}{8}$	$\frac{3^1}{8}$

For SI: 1 Inch = 25.4 mm; 1 lb/sq.yd = 0.38 kg/m<sup>2</sup>.

<sup>1</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.1.1.3 of the 2012 IBC, Section 721.5.1.1.3 of the 2009 and 2006 IBC or Section 7.703.1 of UBC Standard 7-7, as applicable.

<sup>2</sup>A/P = Cross-sectional-area-to-heated-perimeter ratio, where A is the cross-sectional area of the structural steel column in square inches and P is the inside perimeter of the fire-resistive material in inches.

<sup>3</sup>NR = Not recognized.

<sup>4</sup>The values shown in parentheses are the minimum thickness of sprayed fire-resistive material for wide-flange steel columns (profile shape) where the material thickness at each flange tip is reduced to 50 percent of the thickness shown in parentheses. Fire-resistive material thickness shown without parentheses must be used when the column flange tips are covered with sprayed fire-resistive material at the thickness shown.

<sup>5</sup>Fire-resistive protection may be applied directly to the wide-flange steel column contour (contour profile) or column boxed with minimum 1.7 lbs. per sq. yd. metal lath (box profile).

<sup>6</sup>Thickness of sprayed fire-resistive material, T, applied to wide-flange steel columns may be calculated according to Section 722.5.1.3 of the 2012 IBC, Section 721.5.1.3 of the 2009 and 2006 IBC or Section 7.703.3 of UBC Standard 7-7, provided the columns have full protection at each flange tip (tabulated thicknesses shown without parentheses).

(a) When  $0.32 \leq W/D \leq 0.55$ , and  $T \geq \frac{3}{8}$  inch, the material-dependent constants C<sub>1</sub> and C<sub>2</sub> are equal to 0.95 and 0.45, respectively.

(b) When  $0.56 \leq W/D \leq 7.0$ , and  $T \geq \frac{3}{8}$  inch, the material-dependent constants C<sub>1</sub> and C<sub>2</sub> are equal to 1.01 and 0.66, respectively.

<sup>7</sup>Thickness of sprayed fire-resistive material applied to steel hollow section (HSS) columns and steel pipe columns may be calculated using the following equation, provided the minimum tube column size is 4×4× $\frac{3}{16}$  and the minimum pipe column size is 4×0.237-inch:

$$\frac{R - 0.38}{3.58(A / P)}$$

where:

- T = Thickness of sprayed fire-resistive material: 0.35" ≤ T ≤ 3.50"
- R = Fire resistance rating (hours)
- A = Cross-sectional area of the pipe or tubular column (square inches)
- P = Heated perimeter of the pipe or tubular column (inches)

**TABLE 2—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING				
			4-Hour	3-Hour	2-Hour	1-Hour	
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)				
<b>Floor Assembly A (with Minimum 2 1/2-Inch-thick Concrete Fill)</b>							
A1	Floor Assembly: a. Minimum 1 1/2-inch-deep steel decking <sup>2</sup> <ul style="list-style-type: none"> <li>• Metal deck thickness, minimum gage: fluted No. 22 gage, cellular No. 20/20 gage (minimum 0.034-inch base-metal thickness).</li> <li>• Maximum usage of cellular units is 1:1 blend with fluted units.</li> </ul> b. Normal-weight or structural sand-lightweight concrete fill <sup>3</sup> . minimum 2 1/2-inch thick concrete fill over the top of flutes:	Top of Flute	NR	3/4	1/2	1/2	
		Bottom of Flute/Cellular	NR	1/2	3/8	3/8	
A2a	Floor Beams <sup>4,5,6,7</sup>	Supporting Normal-weight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	1 (1 1/8)	3/4 (7/8)	1/2 (5/8)	3/8 (3/8)
			Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1 1/4 (1 3/8)	1 (1)	5/8 (3/4)	3/8 (1/2)
			Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1 1/2 (1 3/4)	1 1/4 (1 3/8)	3/4 (1)	3/8 (5/8)
			Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	2 1/4 (2 5/8)	1 3/4 (1 7/8)	1 1/8 (1 3/8)	5/8 (7/8)
A2b	Steel Joists	Steel Joist (see footnote 8)	NR	3 1/4	2 1/8	1 1/4	
		Steel Joist (see footnote 9)	NR	NR	1 1/2	1 1/2	
		Steel Joist (see footnote 10)	NR	NR	2 1/8	1 <sup>(11)</sup>	
A3e	Floor Beams <sup>4,5,6</sup>	Supporting Structural Sand- Lightweight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	1 1/2	1	5/8	3/8
			Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1 3/4	1 1/4	7/8	1/2
			Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	2 1/4	1 5/8	1	1/2
			Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	3 1/4	2 1/4	1 1/2	3/4
A3b	Steel Joists	Steel Joist (see footnote 8)	NR	3 1/4	2 1/8	1 1/4	
		Steel Joist (see footnote 9)	NR	NR	2	2	
		Steel Joist (see footnote 10)	NR	NR	2 1/4	1 1/8 <sup>(11)</sup>	
A4	Standard Trench Header: 36-inch wide, maximum	Top of Flute <sup>12</sup>	NR	1 3/8	1 3/8	1 1/8	
		Bottom of Flute/Cellular <sup>12</sup>	NR	1 1/8	1 1/8	7/8	
	Bottomless Trench Header <sup>2,13,14</sup> : 36-inch wide, maximum	Top of Flute <sup>12</sup>	NR	2 1/4	1 3/4	1 1/4	
		Bottom of Flute/Cellular <sup>12</sup>	NR	2 1/8	1 5/8	1	
A5a	Electric Inserts <sup>16,18</sup> : Installed in decks supporting normal-weight concrete, where the concrete is not removed from deck valleys and the insert is on top	(See footnote 17)	NR	5/8	1/2	3/8	
A5b	Electric Inserts <sup>16,18</sup> : Installed in decks supporting light-weight concrete, where the concrete is not removed from the deck valleys and the insert is on top	(See footnote 17)	NR	1	3/4	5/8	
A6a	Electric Inserts <sup>18</sup> : Installed in decks supporting normal-weight concrete, where the inserts penetrate the sides of the deck cells without concrete in the valleys between the cells under the inserts	(See footnote 17)	NR	1 1/4	7/8	5/8	
A6b	Electric Inserts <sup>18</sup> : Installed in decks supporting light-weight concrete, where the inserts penetrate the sides of the deck cells without concrete in the valleys between the cells under the inserts	(See footnote 17)	NR	1 1/2	1 1/8	5/8	

**TABLE 2—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES (Continued)**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING			
			4-Hour	3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (inches)			
A7e	Electric Inserts with Internal Modification <sup>16</sup> . Installed in decks supporting normal-weight concrete, where the inserts penetrate the sides of the deck cells without concrete in the valleys between the cells under the inserts	(See footnote 17)	NR	3/4	1/2	3/8
A7b	Electric Inserts with Internal Modification <sup>16</sup> . Installed in decks supporting light-weight concrete, where the inserts penetrate the sides of the deck cells without concrete in the valleys between the cells under the inserts	(See footnote 17)	NR	NR	3/4	1/2
<b>Floor Assembly B (with Minimum 2-Inch-thick Concrete Fill)</b>						
B1	Floor Assembly: a. Minimum 2-Inch-deep steel decking. Metal deck thickness, minimum gage: fluted No. 22 gage (minimum 0.028-inch base-metal thickness), cellular Nos. 20/20 gage (minimum 0.034-inch base-metal thickness) <sup>2</sup> b. Normal-weight or structural sand-lightweight concrete fill <sup>3</sup> . Minimum 2-Inch thick concrete fill over the top of flutes.	Top of Flute	NR	1 1/4	3/4	5/8
		Bottom of Flute/Cellular	NR	1 1/8	3/4	5/8
B2	Floor Beams <sup>4,5,8</sup> Supporting Normal-weight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	NR	7/8	5/8	3/8
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	NR	1	3/4	3/8
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	NR	1 1/4	1	1/2
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	NR	1 7/8	1 1/2	3/4
B3	Floor Beams <sup>4,5,8</sup> Supporting Structural Sand-Lightweight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	NR	7/8	5/8	3/8
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	NR	1 1/8	3/4	3/8
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	NR	1 3/8	1	1/2
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	NR	2	1 1/2	3/4
B4a	Standard Trench Header: 36-inch wide, maximum (2-inch wide steel deck flutes)	Top of Flute <sup>12</sup>	NR	NR	1 1/8	7/8
		Bottom of Flute/Cellular <sup>12</sup>	NR	NR	7/8	3/4
B4b	Standard Trench Header: 36-inch wide, maximum (3-inch wide steel deck flutes)	Top of Flute <sup>12</sup>	NR	NR	7/8	5/8
		Bottom of Flute/Cellular <sup>12</sup>	NR	NR	3/4	5/8
B4c	Bottomless Trench Header <sup>13,14</sup> : 36-inch wide, maximum	Top of Flute <sup>12</sup>	NR	2 1/2	1 3/4	1 1/4
		Bottom of Flute/Cellular <sup>12</sup>	NR	2 3/8	1 5/8	1
B5a	Electric Inserts <sup>15</sup> . Installed in decks supporting normal-weight concrete, where inserts penetrate sides of deck cells without concrete in valleys between cells under inserts	(See footnote 17)	NR	NR	3/4	5/8
B5b	Electric Inserts <sup>16</sup> . Installed in decks supporting normal-weight concrete, where inserts contain internal modifications and penetrate side of deck cells without concrete in valleys between cells under inserts	(See footnote 17)	NR	NR	3/4	5/8

For SI: 1 inch = 25.4 mm; 1 psi = 6.89 kPa; 1 lb/sq.yd = 0.38 kg/m<sup>2</sup>; 1ft<sup>2</sup> = 0.092m<sup>2</sup>; 1 pcf = 16.018 Kg/m<sup>3</sup>.

<sup>1</sup>NR = not recognized.

<sup>2</sup>BOND-SEAL adhesive must be applied to Nos. 20/20 gage (minimum 0.034-inch base-metal thickness) cellular and No. 22 gage (minimum 0.028-inch base-metal thickness) fluted steel decks that are 36 inches wide or larger, and to bottomless trench headers before application of sprayed fire-resistive material. The adhesive is optional for heavier gage units.

<sup>3</sup>Normal-weight concrete: Minimum 3,000 psi compressive strength, [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] minimum unit weight of 147 pcf, and either carbonate or siliceous aggregates. Light-weight Concrete: Minimum 3,000 psi compressive strength, [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] and minimum unit weight of 110 pcf. Concrete must encapsulate minimum 6×6-W1.4×W1.4 welded-wire fabric.

<sup>4</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>5</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 721.5.2.2 of the IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is 3/8 inch.

<sup>6</sup>Sprayed fire-resistive material must be applied directly to either the beam contour or a boxed beam formed with minimum 3.4 lb/sq. yd. expanded steel lath attached in an approved manner.

<sup>7</sup>The values in parentheses are the minimum thickness of sprayed fire-resistive material on the beam when the thickness on the lower flange tip is reduced by 50 percent of the thickness shown in parentheses. The values shown without parentheses are the minimum sprayed fire-resistive material on the beam when the flange tips are covered with sprayed fire-resistive material at the thickness shown.

**TABLE 2—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES (continued)**

<sup>8</sup>Steel Joist Description: Top chord must be two angles, minimum 1 1/2"×1 1/2"× 0.156"; bottom chord must be two round bars, minimum 0.675" diameter; end reaction bearing plates must be two angles, minimum 2"×2"× 0.192"; minimum 4 15/16" long; and web members must be round bars, minimum 0.774" diameter, with a second web member at each end consisting of 0.654" diameter round bar.

<sup>9</sup>Steel Joist Description: Top chord must be two angles, minimum total area of 1.26 sq. in.; bottom chord must be two angles, minimum total area of 1.07 sq. in.; and web members must be round bars, minimum area of 0.31 sq. in.

<sup>10</sup>Steel Joist Description: Minimum linear weight must be 4.9 lbs/ft. and a minimum joist depth must be 8 inches. Steel joist top chord must be two angles, minimum 1 1/4"×1 1/4"×0.127"; bottom chord must be two round bars, minimum 0.566" diameter, or two angles, minimum 1"×1"×0.125"; end reaction bearing plates must be two angles, minimum 1 1/2"×2"× 0.188"; minimum 5 1/16" long; end web members must be round bars, minimum 0.565-inch diameter.

<sup>11</sup>When bottom chords are angles, the fire-resistive material thickness must be increased by 1/4 inch on the bottom chords only.

<sup>12</sup>Sprayed fire-resistive material thickness under all trench headers must extend minimum 4 inches beyond each side of the trench header.

<sup>13</sup>Minimum metal thickness of bottomless trench headers must be No. 20 gage (minimum 0.034-inch base-metal thickness) for fluted decks and Nos. 20/18 gage (minimum 0.034-inch/0.045-inch base-metal thickness) or Nos. 20/20 gage (minimum 0.034-inch base-metal thickness) for cellular decks.

<sup>14</sup>The flat portion of Nos. 20/20 gage (minimum 0.034-inch base-metal thickness) cellular steel floor units with bottomless trench headers must have welded steel studs with discs under the trench header. The studs must be No. 12 gage galvanized steel wire attached to 1 3/16-inch-diameter No. 28 gage (minimum 0.014-inch base-metal thickness) galvanized steel discs, installed in rows spaced maximum 22 inches o. c. parallel to the trench. An average of one stud per 236 sq. in. of cellular floor units beneath the trench must be provided, with 24 inches between studs, and 4 inches between studs and trench edge. Stud and discs are not required where 20/18 or heavier gage steel is used.

<sup>15</sup>Minimum Insert spacing must be 30 in. o. c. along cellular steel floor units, and 18 in. o. c. in the transverse direction with not more than one insert for each 6 sq. ft. of floor area. Active inserts do not exceed more than one for each 12 sq. ft.

<sup>16</sup>Unused electrical inserts must be packed with a mineral wool block and covered with concrete or sand cement grout.

<sup>17</sup>Fire-resistive material thickness must extend the entire width and length of cellular units between supports and extend 12 inches past the insert edges.

<sup>18</sup>Maximum of one insert for each 7 1/2 sq. ft. of floor, with not less than 25 1/2 inches between inserts.

**TABLE 3—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO BEAMS OR JOISTS IN UNPROTECTED FLOOR ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING			
			4-Hour	3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (inches)			
1	Floor Assembly: a. Minimum 1 1/2-inch-deep steel decking. Minimum No. 22 gage (minimum 0.028-inch base-metal thickness). b. Normal-weight or structural sand-lightweight concrete fill <sup>2</sup> . c. Beam protection requires minimum 2 1/2 inches of concrete over the top flute. d. Minimum concrete fill thickness for the floor assembly rating is a separate consideration <sup>3</sup> .	No fire-resistive material applied to the steel deck soffit (See Figure 2).	—	—	—	—
2	Floor Beams <sup>4,5,8,7,8</sup>  Supporting: • Fluted Steel Decking • Normal-weight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	1	3/4	1/2	3/8
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1 1/4	1	5/8	3/8
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1 5/8	1 1/4	3/4	3/8
3	Steel Joists <sup>8,9</sup>	Steel Joist (See footnote 10)	NR	3 1/4	2 1/8	1 1/4
		Steel Joist (See footnote 11)	NR	NR	NR	1 <sup>(12)</sup>
4	Floor Beams <sup>4,5,8,7,8</sup>  Supporting: • Fluted, Cellular or Corrugated Steel Decking; or Blended Fluted/Cellular Decking. • Structural Sand-Light-weight Concrete Fill	Min. W8×67 (W/D ≥ 1.60)	1 1/2	1	5/8	3/8
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1 3/4	1 1/4	7/8	1/2
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	2 1/4	1 5/8	1	1/2
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	3 1/4	2 1/4	1 1/2	3/4
5	Steel Joists <sup>8,9</sup>	Steel Joist (See footnote 10)	NR	3 1/4	2 1/8	1 1/4
		Steel Joist (See footnote 11)	NR	NR	NR	1 1/8 <sup>(12)</sup>

For SI: 1 inch = 25.4 mm. 1 lb/sq. yd. = 0.38 kg/m<sup>2</sup>, 1 pcf = 16.018 Kg/m<sup>3</sup>, 1 psi = 6.89 kPa.

**TABLE 3—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO BEAMS OR JOISTS IN UNPROTECTED FLOOR ASSEMBLIES (continued)**

<sup>1</sup>NR = Not recognized.

<sup>2</sup>Normal-weight concrete must have a minimum compressive strength of 3,000 psi, [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] unit weight of 147 pcf, and either carbonate or siliceous aggregates. Structural sand-lightweight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] and a unit weight of 110 pcf. Concrete must encapsulate 6×6-W1.4×W1.4 smooth welded-wire reinforcement complying with ASTM A185.

<sup>3</sup>Minimum concrete slab or fill thickness for the floor assembly and fire-resistive rating desired must comply with Sections 721 and 722.2.2.1 of the 2012 IBC, Sections 720 or 721.2.2.1 of the 2009 and 2006 IBC, or Section 710.1 of the UBC or Section 7.708 of UBC Standard 7-7, as applicable, or with a current ICC-ES evaluation report.

<sup>4</sup>Sprayed fire-resistive material must be applied directly either to exposed beam contour or a boxed beam formed with minimum 3.4 lb/sq. yd. expanded steel lath attached in an approved manner.

<sup>5</sup>When sprayed fire-resistive material is applied to wide-flange steel beams described in Items 2 and 4, the required thickness of fire-resistive material applied to the lower flange tip may be reduced to one-half of the tabulated value. Refer to Figure 2.

<sup>6</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>7</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC and Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is <sup>3</sup>/<sub>8</sub> inch.

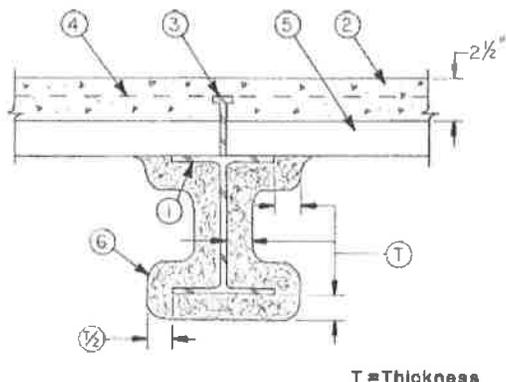
<sup>8</sup>The fluted deck crest area above the beam or joist must be filled with the sprayed fire-resistive material.

<sup>9</sup>The design of the steel joists must comply with Section 2007 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable, with a maximum design stress of 30 ksi.

<sup>10</sup>Steel Joist Description: Top chord must be two angles, minimum 1<sup>1</sup>/<sub>2</sub>"×1<sup>1</sup>/<sub>2</sub>"×0.156"; bottom chord must be two round bars, minimum 0.675" diameter; end reaction bearing plates must be two angles, minimum 2"×2"×0.192"; minimum 4<sup>15</sup>/<sub>16</sub>" long; and web members must be round bars, minimum 0.774" diameter.

<sup>11</sup>Steel Joist Description: Minimum linear weight must be 4.9 lbs/ft. and a minimum joist depth must be 8 inches. Steel joist top chord must be two angles, minimum 1<sup>1</sup>/<sub>4</sub>"×1<sup>1</sup>/<sub>4</sub>"×0.127"; bottom chord must be two round bars, minimum 0.566" dia., or two angles, minimum 1"×1"×0.125"; end reaction bearing plates must be two angles, minimum 1<sup>1</sup>/<sub>2</sub>"×2"×0.188"; minimum 5<sup>1</sup>/<sub>16</sub>" long; and web members must be round bars, minimum 0.565-inch dia.

<sup>12</sup>When bottom chords are angles, the fire-resistive material thickness must be increased by <sup>1</sup>/<sub>4</sub> inch on the bottom chords only.



**FIGURE 1—SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO BEAMS IN UNPROTECTED FLOOR ASSEMBLIES (Refer to Table 3)**

- (1) Unrestrained Steel Beam or Joist.
- (2) Normal-weight or Structural Sand-lightweight Concrete.
- (3) Shear Connector (optional).
- (4) Welded Wire Fabric.
- (5) Steel Floor and Form Units (1<sup>1</sup>/<sub>2</sub> in. deep fluted units)
- (6) Blaze-Shield Type DC/F, Type II and Type HP Sprayed Fire-resistive Materials.

**TABLE 4—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO CONCRETE FLOOR SYSTEMS**

ASSEMBLY			FIRE-RESISTANCE RATING			
			4-Hour	3-Hour	2-Hour	1-Hour
Assembly No.	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)			
1	Cast-in-place Concrete Slab-Joist Construction <sup>1,2</sup> : Normal-weight concrete: minimum 3,000 psi compressive strength, minimum 147 pcf unit weight. Concrete slab: Minimum 2 1/2-inch thick; Maximum 30-inch clear span. Concrete slab must encapsulate 6×6–W2.9×W2.9 welded-wire fabric. Minimum concrete joist width: 5 inches Minimum total depth of concrete joist plus slab: 8 1/2 inches Minimum 3/4-inch concrete cover for steel reinforcement.	Slab Soffit	3/4	1 1/4	1 1/4	7/8
		Joist	3/4	5/8	5/8	0
2	Precast, Prestressed Normal-weight Concrete Construction: Single or double-stemmed joists: 4 ft. ≤ unit width ≤ 10 ft. Minimum 1 1/2-inch precast concrete slab thickness. Concrete topping <sup>3</sup> (optional). Minimum 1 inch thick when used. Minimum total concrete slab (precast, or precast plus topping) thickness, t: 2-hour rated assembly: t = 2 inches 3-hour rated assembly: t = 3 1/2 inches 4-hour rated assembly: t = 4 5/8 inches	Slab Soffit	7/8	7/8	7/8	—
		Joist	1 3/8	1 1/4	3/4	—
3	Precast, Prestressed Structural Sand-lightweight Concrete Construction: Single or double-stemmed joists: 4 ft. ≤ unit width ≤ 10 ft. Minimum 1 1/2-inch precast concrete slab thickness. Concrete topping <sup>3</sup> (optional). Minimum 1-inch thick when used. Minimum total concrete slab (precast, or precast plus topping) thickness, t: 2-hour rated assembly: t = 1 1/2 inches 3-hour rated assembly: t = 2 3/4 inches 4-hour rated assembly: t = 4 inches	Slab Soffit	7/8	7/8	7/8	—
		Joist	1 3/8	1 1/8	3/4	—

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa.

<sup>1</sup>Four-hour fire-resistance-rated cast-in-place concrete assembly: Sprayed fire-resistive materials must be applied to 3/8-inch diamond-mesh expanded metal lath, mechanically fastened to the concrete construction.

<sup>2</sup>Three-, two- and one-hour fire-resistance-rated cast-in-place concrete assemblies: Sprayed fire-resistive materials must be applied directly to the contour of the concrete construction.

<sup>3</sup>Concrete topping is optional. It may be used to increase the total concrete slab thickness to the required value indicated for the hourly-rated assemblies. When topping is used, minimum 3,000 psi compressive strength concrete [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] having a minimum 1-inch topping thickness is required.

**TABLE 5—BLAZE-SHIELD TYPE DC/F, TYPE II, AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
			3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)		
<b>Roof Assembly A (with Polyisocyanurate Foamed Plastic Insulation Boards)</b>					
A1	Roof Assembly <sup>2</sup> : Minimum 1 1/2-inch-deep fluted steel roof deck; Minimum No. 22 gage (minimum 0.028-inch base-metal thickness). Gypsum Cover Board <sup>3</sup> (optional): When required, minimum 5/8-inch-thick Type X gypsum wallboard, adhered or fastened to the roof deck, placed under insulation board. Insulation Type <sup>4,5</sup> : Polyisocyanurate foamed plastic insulation board. Required minimum thickness as indicated in table. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>6</sup> (min. 2" insulation w/ gyp. board)	NR	1 1/4	1 1/2
		Steel Deck <sup>6</sup> (min. 1" insulation w/ gyp. board)	NR	1 3/8	1 1/2
		Steel Deck <sup>6</sup> (min. 0" insulation w/ gyp. board)	NR	1 5/8	5/8
		Steel Deck <sup>6</sup> (min. 3" insulation)	NR	2 1/8	7/8
		Steel Deck <sup>6</sup> (min. 2" insulation)	NR	2 3/8	1
		Steel Deck <sup>6</sup> (min. 1" insulation)	NR	3 1/4	1 1/4
		Steel Deck <sup>6</sup> (min. 0" insulation)	NR	3 1/4	2 1/8

**TABLE 5—BLAZE-SHIELD TYPE DC/F, TYPE II, AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES (continued)**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
			3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)		
<b>Roof Assembly A (with Polyisocyanurate Foamed Plastic Insulation Boards) (Continued)</b>					
A2	Wide-flange Steel Beams <sup>7,8</sup> (with or without gypsum wallboard on steel roof deck)	Min. W8×28 (W/D ≥ 0.80)	1 <sup>3</sup> / <sub>8</sub>	1	5 <sup>5</sup> / <sub>8</sub>
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1 <sup>1</sup> / <sub>2</sub>	1	5 <sup>5</sup> / <sub>8</sub>
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	1 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	7 <sup>7</sup> / <sub>8</sub>
A3	Steel Joists <sup>9,10,11</sup> (with or without gypsum wallboard on steel roof deck)	Min. 10K1 and mid-span bridging	NR	1 <sup>3</sup> / <sub>4</sub>	NR
		Min. 12K3 and mid-span bridging	NR	1 <sup>3</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>8</sub>
<b>Roof Assembly B (with Polystyrene Foamed Plastic Roof Insulation Boards)</b>					
B1	Roof Assembly <sup>2</sup> : Minimum 1 <sup>1</sup> / <sub>2</sub> -inch-deep fluted steel roof deck; Minimum No. 22 gage (minimum 0.028-inch base-metal thickness). Coverboard <sup>3</sup> : Minimum 5 <sup>5</sup> / <sub>8</sub> -inch-thick Type X gypsum wallboard, adhered or fastened to the roof deck, placed under insulation board. Insulation Type <sup>4,5</sup> : Polystyrene Insulation boards, applied in one or more layers, adhered to the wallboard coverboard. Maximum 2.5 pcf density. Total insulation thickness, <i>t</i> , is as follows: 1" ≤ <i>t</i> ≤ 8" Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>6</sup>	NR	1 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>
B2	Wide-flange Steel Beams <sup>7,8</sup> (with gypsum wallboard on steel roof deck)	Min. W8×28 (W/D ≥ 0.80)	1 <sup>3</sup> / <sub>8</sub>	1	5 <sup>5</sup> / <sub>8</sub>
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1 <sup>1</sup> / <sub>2</sub>	1	5 <sup>5</sup> / <sub>8</sub>
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	1 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	7 <sup>7</sup> / <sub>8</sub>
B3	Steel Joists <sup>9,10,11</sup> (with gypsum wallboard on steel roof deck)	Min. 10K1 and mid-span bridging	NR	1 <sup>3</sup> / <sub>4</sub>	NR
		Min. 12K3 and mid-span bridging	NR	1 <sup>3</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>8</sub>
<b>Roof Assembly C (with Mineral or Fiber Roof Insulation Boards)</b>					
C1	Roof Assembly <sup>2</sup> : Minimum 1 <sup>1</sup> / <sub>2</sub> -inch-deep fluted steel roof deck; Minimum No. 22 gage (minimum 0.028-inch base-metal thickness). Insulation Type <sup>4,5</sup> : Mineral or fiber boards applied in one or more layers; Total insulation thickness, <i>t</i> : 1" ≤ <i>t</i> ≤ 4 <sup>7</sup> / <sub>8</sub> " Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>6</sup>	NR	1 <sup>7</sup> / <sub>8</sub>	1
C2	Wide-flange Steel Beams <sup>7,8</sup>	Min. W8×28 (W/D ≥ 0.80)	1 <sup>3</sup> / <sub>8</sub>	1	5 <sup>5</sup> / <sub>8</sub>
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	1 <sup>7</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	1
C3	Steel Joists <sup>9,10,11</sup>	Min. 12K3 and mid-span bridging	NR	2 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>

**TABLE 5—BLAZE-SHIELD TYPE DC/F, TYPE II, AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES (continued)**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
			3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)		
<b>Roof Assembly D (with Fiberglass Roof Insulation Boards)</b>					
D1	Roof Assembly <sup>2</sup> : Minimum 1½-inch-deep fluted steel roof deck; Minimum No. 22 gage (minimum 0.028-inch base-metal thickness). Insulation Type 4,5: Fiberglass insulation boards applied in one or more layers; Total insulation thickness, $t$ : $\frac{3}{4}'' \leq t \leq 4\frac{7}{8}''$ Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>8</sup>	NR	1 <sup>7</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
D2	Wide-flange Steel Beams <sup>7,8</sup>	Min. W8×28 (W/D ≥ 0.80)	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>8</sub>
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1 <sup>1</sup> / <sub>2</sub>	1 <sup>3</sup> / <sub>8</sub>	7 <sup>7</sup> / <sub>8</sub>
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	2	1 <sup>7</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
D3	Steel Joists <sup>9,10,11</sup>	Min. 12K3 and mid-span bridging	NR	2 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>
		Min. 10K1 and mid-span bridging	NR	NR	1 <sup>1</sup> / <sub>2</sub>

For SI: 1 inch = 25.4 mm, 1 lb =/sq.yd. = 0.38 kg/m<sup>2</sup>, 1 oz/sq.yd. = 0.0119 kg/m<sup>2</sup>.

<sup>1</sup>NR = Not recognized.

<sup>2</sup>Insulation and roof-covering materials and methods of attachment are classified by UL LLC, and are recognized by a current ICC-ES evaluation report. Where foam plastic is used, it must be recognized in an ICC-ES evaluation report for the roof-covering system.

<sup>3</sup>Gypsum wallboard, complying with ASTM C36, must be 4 ft. wide and installed perpendicular to the flutes of the steel roof deck with end joints staggered 2 ft. in adjacent rows and occurring over crests of steel roof deck.

<sup>4</sup>A vapor barrier may be installed.

<sup>5</sup>When more than one layer of insulation is used, each layer must be offset in both directions from the layer below a minimum of 6 inches.

<sup>6</sup>BOND-SEAL adhesive must be applied to the steel deck surfaces before application of the sprayed fire-resistive materials.

<sup>7</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>8</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is 3<sup>7</sup>/<sub>8</sub> inch.

<sup>9</sup>Use of expanded metal lath or glass-fiber fabric (scrim mesh) is optional on steel joists. When used, the expanded metal lath must weigh minimum 1.7 lb/sq yd, and the glass fiber fabric must weigh approximately 4.3 oz per sq. yd., and must be fastened to the webs of the joists in an approved manner. When metal lath is attached to the joists, both sides of the lath must be completely coated with sprayed fire-resistive materials with no minimum thickness. Glass-fiber scrim mesh is not required to be covered with sprayed fire-resistive material.

<sup>10</sup>Bridging must be coated with the same thickness of sprayed fire-resistive material as the joist. Bridging must be welded to top and bottom chords of each joist at midspan.

<sup>11</sup>The design of the steel joists must comply with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable.

**TABLE 6—BLAZE-SHIELD TYPE DC/F, TYPE II AND TYPE HP SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO UNPROTECTED ROOF ASSEMBLIES WITH INSULATING CONCRETE**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
Item	Description	Fire-resistive Material Applied to:	3-Hour	2-Hour	1-Hour
			Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)		
1	<p>Roof Assembly<sup>2</sup>: Fluted steel deck, vented or nonvented units:</p> <ul style="list-style-type: none"> <li>• <sup>15</sup>/<sub>16</sub>-inch deep, minimum No. 24 gage (minimum 0.023-inch base-metal thickness), maximum clear span of 7 feet, 8 inches; or,</li> <li>• <sup>15</sup>/<sub>16</sub>-inch deep, minimum No. 26 gage (minimum 0.017-inch base-metal thickness), maximum clear span of 6 feet, 0 inch.</li> </ul> <p>Insulating Concrete<sup>3</sup>: Vermiculite or cellular concrete, <sup>1</sup>/<sub>8</sub>-inch-thick slurry coat<sup>4</sup> between top flutes of steel deck and foam plastic insulation boards.</p> <p>Insulation Type: Polystyrene foam-plastic insulation boards, maximum 8-inch thickness, nominal 1.0 pcf density. Each insulation board is 24" x 48", and must have six 3-inch diameter holes or six 3-inch wide slots.</p> <p>Insulating Concrete<sup>3,5</sup>: Vermiculite or cellular concrete, minimum 2-inch thick topping above foam-plastic insulation boards. Concrete must encapsulate 4x8-W12xW14 or 2x2-W14xW14 welded wire reinforcement (WWR) for 2-hour rated assemblies.</p> <p>Roof Covering<sup>6</sup>: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.</p>	No fire-resistive material is applied to the steel deck to achieve the 1-hour and 2-hour roof assembly ratings.	NR	0	0
2	Wide-flange Steel Beams <sup>7,8</sup>	Min. W6x16 (W/D $\geq$ 0.66)	2 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>8</sub>
		Min. W8x18 (0.57 $\leq$ W/D $\leq$ 0.65)	3 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>8</sub>
		Min. W8x10 (0.37 $\leq$ W/D $\leq$ 0.56)	3 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>
3	Steel Joist <sup>9,10</sup>	Min. 10K <sup>1</sup>	NR	2 <sup>3</sup> / <sub>8</sub>	1
		Joist Bridging: 1 <sup>1</sup> / <sub>4</sub> " x 1 <sup>1</sup> / <sub>4</sub> " x 1 <sup>1</sup> / <sub>8</sub> "	NR	1 <sup>3</sup> / <sub>4</sub>	1

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa; 1 lb/sq.yd. = 0.38 kP/m<sup>2</sup>; 1 oz = 1 oz/sq.yd. = 0.0119 kg/m<sup>2</sup>.

<sup>1</sup>NR = Not Recognized

<sup>2</sup>Insulation and roof-covering materials and methods of attachment are classified by UL LLC, and must be recognized in a current ICC-ES evaluation report.

<sup>3</sup>Vermiculite and cellular insulating concrete must be listed by UL LLC and recognized in a current ICC-ES evaluation report. Vermiculite concrete must consist of 6 cubic feet of UL-listed vermiculite aggregate, 94 pounds of Portland cement, and 0.06 to 0.5 pounds of air entraining agent. Cellular concrete must consist of UL-listed foam concentrate mixed with water and Portland cement per manufacturer's specifications, and must have a minimum 190 psi 28-day compressive strength as determined by ASTM C495.

<sup>4</sup>Two-hour rating for <sup>5</sup>/<sub>16</sub>-inch-deep deck with vermiculite concrete requires <sup>5</sup>/<sub>16</sub>-inch-thick slurry coat. The combined thickness of the cellular concrete slurry coat plus concrete topping is minimum 2<sup>3</sup>/<sub>8</sub> inches.

<sup>5</sup>The 4x8-W12xW14 or 2x2-W14xW14 smooth welded-wire reinforcement, complying with ASTM A185, is required for the 2-hour fire-resistance-rated roof assembly, and is optional for the 1-hour fire-resistance-rated assembly.

<sup>6</sup>Single-ply roof covering and method of attachment must comply with a current ICC-ES evaluation report.

<sup>7</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>8</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is <sup>3</sup>/<sub>8</sub> inch.

<sup>9</sup>The design of the steel joists must comply with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable.

<sup>10</sup>Use of expanded metal lath or glass-fiber fabric (scrim mesh) is optional on steel joists. When used, the expanded metal lath must weigh minimum 1.7 lb/sq yd, and the glass fiber fabric must weigh approximately 4.3 oz per sq. yd., and must be fastened to the webs of the joists in an approved manner. When metal lath is attached to the joists, both sides of the lath must be completely coated with sprayed fire-resistive materials with no minimum thickness. Glass-fiber scrim mesh is not required to be covered with sprayed fire-resistive material.

TABLE 7—CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB ORCAFCO 400, CAFCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO STEEL COLUMNS

CAFCO 400, CAFCO 400 AC AND CAFCO 400 ES							
STEEL COLUMN		W/D RATIO <sup>1</sup> RANGE	A/P RATIO <sup>2</sup>	FIRE-RESISTANCE RATING			
Structural Shape	Size			4-Hour	3-Hour	2-Hour	1-Hour
		Minimum Average Thickness of Sprayed Fire-resistive Materials (Inches)					
Wide-flange Steel Columns <sup>3,4</sup>	W14x730	W/D ≥ 6.68	—	1/2	3/8	1/4	1/4
	W14x233	2.49 ≤ W/D ≤ 6.67	—	1 1/4	7/8	1/2	1/4
	W12x106	1.46 ≤ W/D ≤ 2.48	—	3 3/4	1 1/4	7/8	3/8
	W10x49	0.83 ≤ W/D ≤ 1.45	—	2 1/8	1 5/8	1 1/8	5/8
	W8x28	0.67 ≤ W/D ≤ 0.82	—	2 3/8	1 7/8	1 1/4	5/8
	W6x16	0.57 ≤ W/D ≤ 0.66	—	2 3/8	1 7/8	1 3/8	3/4
	W8x10	0.33 ≤ W/D ≤ 0.56	—	2 3/4	2 1/8	1 5/8	1
Steel Hollow Structural Sections (HSS) <sup>5</sup>	HSS4x4x1/2	—	0.418	1 7/8	1 3/8	7/8	3/8
	HSS4x4x3/8	—	0.323	2 1/8	1 5/8	1	1/2
	HSS4x4x5/16	—	0.273	2 3/8	1 3/4	1 1/8	1/2
	HSS4x4x1/4	—	0.222	2 7/8	2 1/8	1 1/2	3/4
	HSS4x4x3/16	—	0.168	2 3/4	2 1/8	1 1/2	3/4
Steel Pipe: Standard Weight (Std.) <sup>5</sup>	4 × 0.237	—	0.22	2 3/4	2 1/8	1 3/8	3/4
CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES or CAFCO 300 SB							
STEEL COLUMN		W/D RATIO <sup>1</sup> RANGE	A/P RATIO <sup>2</sup>	FIRE-RESISTANCE RATING			
Structural Shape	Size			4-Hour	3-Hour	2-Hour	1-Hour
		Minimum Average Thickness of Sprayed Fire-resistive Materials (Inches)					
Wide-flange Steel Columns <sup>3,4</sup>	W14x730	W/D ≥ 6.68	—	1/2	3/8	1/4	1/4
	W14x233	2.49 ≤ W/D ≤ 6.67	—	1 1/8	7/8	1/2	1/4
	W12x106	1.46 ≤ W/D ≤ 2.48	—	3 3/4	1 1/4	7/8	1/4
	W10x49	0.83 ≤ W/D ≤ 1.45	—	2 1/8	1 5/8	1 1/8	1/2
	W8x28	0.67 ≤ W/D ≤ 0.82	—	2 3/8	1 7/8	1 1/4	5/8
	W6x16	0.57 ≤ W/D ≤ 0.66	—	2 3/8	1 7/8	1 3/8	5/8
	W8x10	0.33 ≤ W/D ≤ 0.56	—	2 3/4	2 1/8	1 5/8	1
Steel Hollow Structural Sections (HSS) <sup>5</sup>	HSS4x4x1/2	—	0.418	1 7/8	1 3/8	7/8	3/8
	HSS4x4x3/8	—	0.323	2 1/8	1 5/8	1	1/2
	HSS4x4x5/16	—	0.273	2 3/8	1 3/4	1 1/8	1/2
	HSS4x4x1/4	—	0.222	2 7/8	2 1/8	1 1/2	3/4
	HSS4x4x3/16	—	0.168	2 3/4	2 1/8	1 1/2	3/4
	ST20x20x1 3/4	—	1.60	3/4	1/2	3/8	1/4
	ST20x20x1 1/2	—	1.39	1/8	5/8	3/8	1/4
	ST32x32x1 1/4	—	1.20	1	3/4	1/2	1/4
	ST20x20x1	—	0.95	1 1/8	7/8	1/2	1/4
ST20x20x3/4	—	0.72	1 1/2	1 1/8	3/4	3/8	
Steel Pipe: Standard Weight (Std.) <sup>5</sup>	4 × 0.237	—	0.22	2 3/4	2 1/8	1 3/8	3/4

For SI: 1 inch = 25.4 mm; 1 lb/sq.yd. = 0.38 kg/m<sup>2</sup>.

<sup>1</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.1.1.3 of the 2012 IBC, Section 721.5.1.1.3 of the 2009 and 2006 IBC or Section 7.703.1 of UBC Standard 7-7, as applicable.

<sup>2</sup>A/P = Cross-sectional-area-to-heated-perimeter ratio, where A is the cross-sectional area of the structural steel column in square inches and P is the inside perimeter of the fire-resistive material in inches.

<sup>3</sup>Fire-resistive protection may be applied directly to the wide-flange steel column contour (contour profile) or column boxed with minimum 1.7 lbs. per sq. yd. metal lath (box profile).

<sup>4</sup>Thickness of sprayed fire-resistive material, T, applied to wide-flange steel columns may be calculated according to Section 722.5.1.3 of the 2012 IBC, Section 721.5.1.3 of the 2009 and 2006 IBC and Section 7.703.3 of UBC Standard 7-7, provided the columns have full protection at each flange tip:

(a) When 0.33 ≤ W/D ≤ 2.48, and T ≥ 1/4 inch, the material-dependent constants C<sub>1</sub> and C<sub>2</sub> are equal to 75 and 32, respectively.

(b) When 2.49 ≤ W/D ≤ 6.62, and T ≥ 1/4 inch, the material-dependent constants C<sub>1</sub> and C<sub>2</sub> are equal to 75 and 15, respectively.

<sup>5</sup>Thickness of sprayed fire-resistive material, T, applied to steel hollow section (HSS) columns and steel pipe columns may be calculated using the following equation, provided the minimum size tube column is an HSS4x4x3/16 and the minimum size pipe column is 4x0.237 (Std.), and the minimum sprayed fire-resistive material thickness is 1/4 inch:

$$T = \frac{R}{188(A/P) + 45}$$

where:

- T = Thickness of sprayed fire-resistive material: 0.25" ≤ T ≤ 4.25"
  - R = Fire resistance rating (minutes)
  - A = Cross-sectional area of the pipe or tubular column (square inches)
  - P = Heated perimeter of the pipe or tubular column (inches)
- Allowable A/P range: 0.18 ≤ A/P ≤ 0.49

**TABLE 8 —CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB OR CAFCO 400, CAFCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING <sup>1</sup>			
Item	Description	Fire-resistive Material Applied to:	4-Hour	3-Hour	2-Hour	1-Hour
			Minimum Average Thickness of Sprayed Fire-resistive Material (Inches)			
1	Floor Assembly: a. Minimum 1 1/2-inch-deep steel decking. <ul style="list-style-type: none"> <li>• Metal deck thickness, minimum gage: fluted No. 22 gage (minimum 0.028-inch base-metal thickness), cellular Nos. 20/20 gage (minimum 0.034-inch base-metal thickness).</li> <li>• Cellular units may be blended 1:1 with fluted units<sup>2</sup></li> <li>• CAFCO PRE-COAT Type PC must be applied to approximately 70% of the flat plate surface of cellular decking before the application of sprayed fire-resistive material.</li> </ul> b. Normal-weight or structural sand-lightweight concrete fill <sup>3</sup> . Minimum 2 1/2-inch thick concrete fill over the top of flutes	Fluted Deck (Top and Bottom Flutes)	NR	7/8	3/8	3/8
		Cellular Deck	NR	3/4	3/8	3/8
2	Steel Beams <sup>4,5,8</sup> or Joist <sup>7</sup> Supporting: a. Cellular or Blended Cellular/Fluted Steel Deck b. Normal-weight or Structural Sand-lightweight Concrete Fill, minimum 2 1/2-inch thick.	Min. W8x67 (W/D ≥ 1.60)	1 1/4	7/8	5/8	3/8
		Min. W10x60 (1.20 ≤ W/D ≤ 1.59)	1 1/2	1 1/8	3/4	3/8
		Min. W8x28 (0.80 ≤ W/D ≤ 1.19)	1 7/8	1 3/8	7/8	3/8
		Min. W8x10 (0.37 ≤ W/D ≤ 0.79)	2 5/8	2	1 1/4	1 1/2
		Joist (See footnotes 7, 8, 9)	NR	2 1/4	1 3/8	5/8 <sup>(9)</sup>
3	Steel Beams <sup>4,5,8</sup> or Joist <sup>7</sup> Supporting: a. All Fluted Steel Deck b. Normal-weight or Structural Sand-lightweight Concrete Fill, minimum 2 1/2-inch thick.	Min. W8x67 (W/D ≥ 1.60)	1	3/4	1 1/2	3/8
		Min. W10x60 (1.20 ≤ W/D ≤ 1.59)	1 1/4	7/8	5/8	3/8
		Min. W8x28 (0.80 ≤ W/D ≤ 1.19)	1 1/2	1 1/8	3/4	3/8
		Min. W8x10 (0.37 ≤ W/D ≤ 0.79)	2 1/4	1 5/8	1	1 1/2
		Joist (See footnotes 7, 8, 9)	NR	2 1/4	1 3/8	5/8 <sup>(9)</sup>
4a	Bottomless Trench Header <sup>10</sup> (Maximum 36-inch Width)	Top of Flute <sup>11</sup>	NR	2 1/4 <sup>(12)</sup>	1 3/4 <sup>(12)</sup>	1 3/4
		Bottom of Flute/Cellular <sup>11</sup>	NR	2 1/4 <sup>(12)</sup>	1 3/4 <sup>(12)</sup>	1 5/8 <sup>(13)</sup>
4b	Trench Header with Intermittent Bottom <sup>10</sup> (Maximum 36-inch Width)	Top of Flute <sup>11</sup>	NR	NR	1 3/4 <sup>(12,14)</sup>	1 3/4
		Bottom of Flute/Cellular <sup>11</sup>	NR	NR	1 3/4 <sup>(12,14)</sup>	1 5/8 <sup>(13)</sup>
5a	Electrical Inserts: Installed in Decks Supporting Normal-weight Concrete Fill	Floor Units with Inserts <sup>15</sup>	NR	NR	1 1/4	1 1/2
5b	Electrical Inserts: Installed in Decks Supporting Light-weight Concrete Fill	Floor Units with Inserts <sup>15</sup>	NR	NR	1 1/4	1 1/2

For SI: 1 inch = 25.4 mm, 1 Ksi = 6.89 MPa, 1 pcf = 16.018 kg/m<sup>3</sup>, 1 lbm/yd<sup>2</sup> = 542 g/m<sup>2</sup>, 1 oz/yd<sup>2</sup> = 33.9 g/m<sup>2</sup>.

<sup>1</sup>NR = Not recognized.

<sup>2</sup>Blended decks must consist of alternating one cellular unit to one or more fluted units. For use with trench headers, steel decks must be minimum Nos. 20/18 gages (minimum 0.034-inch/0.045-inch base-metal thickness) cellular and No. 20 gage (minimum 0.034-inch base-metal thickness) fluted. Burlap tape must be applied to steel deck joints with bituminous adhesive.

<sup>3</sup>Normal-weight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1], minimum unit weight of 147 pcf and utilizes either carbonate or siliceous aggregates. Structural sand-lightweight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1], a minimum unit weight of 109 pcf, 4 to 7 percent entrained air, and utilizes expanded shale clay or slate aggregate by rotary kiln method. Concrete must be vibrated. Concrete must encapsulate 6x6-W1.4xW1.4 welded-wire reinforcement, complying with ASTM A185, when steel beams are used and 6x6-W2.9xW2.9 welded-wire fabric when steel joists are used.

<sup>4</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>5</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC and Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is 3/8 inch.

<sup>6</sup>Sprayed fire-resistive material must be applied directly to either the beam contour or a boxed beam formed with minimum 3.4 lb/sq. yd. expanded steel lath attached in an approved manner.

<sup>7</sup>Steel Joist Description: Top chord must be two angles, minimum 1 1/2"x1 1/2"x 0.156"; bottom chord must be two round bars, minimum 0.675" diameter or two steel angles, minimum 1"x1"x0.125"; a second web member at each end must consist of 0.654" diameter round bar. All remaining web members, including the end web members, must consist of 0.774-inch diameter round bars. Bridging angles to be protected with same material thickness of fire protection as specified for the joist. Joists must be designed in accordance with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC for a maximum design stress of 30 ksi.

<sup>8</sup>The sprayed fire-resistive material must be applied to contour of the joist. Optional 1.7 lb./sq. yerd 3/8-inch diamond mesh steel lath or minimum 3/32-inch coated fiberglass fabric weighing 1.9 ounces per square yard may be attached to one side of each joist. When used, the method of attachment must be sufficient to hold the mesh or fabric and sprayed fire-resistive material in place during application and curing of the material. When used, the lath must be fully covered with fire-resistive material, but with no minimum thickness requirement. Glass fiber mesh is not required to be fully covered.

<sup>9</sup>When the steel joist's bottom chords consist of angles, the thickness of fire resistive material on the bottom chords only must be increased by 1/4 inch to achieve a 1-hour fire-resistive rating.

<sup>10</sup>Allowable loads of the steel deck must be based on noncomposite design when trench headers are used.

**TABLE 8 —CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB OR CAFCO 400, CAFCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED FLOOR ASSEMBLIES (continued)**

- <sup>11</sup>The thickness of the sprayed fire-resistive material required on the underside of the trench header must extend a minimum of 4 inches beyond each side of the trench header.
- <sup>12</sup>For two- end three-hour fire-resistive unrestrained assembly ratings, <sup>3</sup>/<sub>8</sub>-inch ribbed, expanded steel lath weighing 3.4 pounds per square yard must be fastened to the underside of the steel deck under the trench header in an approved manner. The width of the lath must extend a minimum of 2 inches on both sides of the trench header.
- <sup>13</sup>For one-hour fire-resistive unrestrained assembly rating, steel studs with discs must be applied to flat plates of cellular units under a trench header. Studs must consist of No. 12 gage galvanized smooth steel wire, 1<sup>1</sup>/<sub>4</sub>-inch long, with one end welded to 1<sup>1</sup>/<sub>2</sub>-inch diameter, No. 28 gage (minimum 0.014-inch base-metal thickness) galvanized steel disc. The total number of studs must average at least one stud per 250 sq in. The ends of the studs opposite the discs must be welded to the cellular units in rows parallel with the trench header. The distance between the outer rows of the studs and the edge of the trench header must not exceed 8<sup>1</sup>/<sub>2</sub> inches. The spacing between the rows must not exceed 9<sup>1</sup>/<sub>2</sub>-inches. The spacing between studs in each row must not exceed 12 inches.
- <sup>14</sup>Two-hour fire-resistive-rated assemblies with intermittent bottom trench headers must be limited to installations with normal-weight concrete.
- <sup>15</sup>Sprayed fire-resistive material must be applied the entire width and length of floor units between supports and must extend beyond the edge of inserts for a horizontal width of 12 inches.

**TABLE 9 —CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB or CAFCO 400, CAFCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO BEAMS IN UNPROTECTED FLOOR ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING			
			4-Hour	3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)			
1	Floor Assembly: a. Minimum 1 <sup>1</sup> / <sub>2</sub> -inch-deep steel fluted floor units only, minimum No. 22 gage (0.028-inch base-metal thickness). b. Normal-weight or Structural Sand-Lightweight Concrete Fill <sup>2</sup> . c. Beam protection requires minimum 2 <sup>1</sup> / <sub>2</sub> inches of concrete over the top flute. d. Minimum concrete fill thickness for the floor assembly rating is a separate consideration <sup>3</sup> .	No fire-resistive material applied to the deck soffit.	—	—	—	—
2	Steel Beams <sup>4,5,6,7</sup>	Min. W8×67 (W/D ≥1.60)	1	<sup>3</sup> / <sub>4</sub>	<sup>1</sup> / <sub>2</sub>	<sup>3</sup> / <sub>8</sub>
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1 <sup>1</sup> / <sub>4</sub>	<sup>7</sup> / <sub>8</sub>	<sup>5</sup> / <sub>8</sub>	<sup>3</sup> / <sub>8</sub>
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>8</sub>	<sup>3</sup> / <sub>4</sub>	<sup>3</sup> / <sub>8</sub>
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	2 <sup>1</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>8</sub>	1	<sup>1</sup> / <sub>2</sub>
3	Steel Joists <sup>7,8</sup>	Steel Joist (See footnotes 9,10)	NR	2 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	<sup>5</sup> / <sub>8</sub> (11)

For SI: 1 Inch = 25.4 mm, 1 psi = 6.89 kPa, 1 pcf = 16.018 kg/m<sup>3</sup>, 1 lbm/yd.<sup>2</sup> = 542 g/m<sup>2</sup>, 1 oz./yd.<sup>2</sup> = 33.9 g/m<sup>2</sup>.

- <sup>1</sup>NR = Not recognized.
- <sup>2</sup>Normal-weight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1], minimum unit weight of 150 pcf, and either carbonate or siliceous aggregates. Structural sand-lightweight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] and a minimum unit weight of 110 pcf. Concrete must encapsulate 6×6-W1.4×W1.4 welded-wire reinforcement, complying with ASTM A185.
- <sup>3</sup>Minimum concrete slab or fill thickness for the floor assembly and fire-resistive rating desired must comply with Sections 720 or 721.2.2.1 of the IBC, or Section 710.1 of the UBC or Section 7.708 of UBC Standard 7-7, as applicable, or with a current ICC-ES evaluation report.
- <sup>4</sup>Sprayed fire-resistive material must be applied directly either to exposed beam contour or a boxed beam formed with minimum 3.4 lb/sq. yd. expanded steel lath attached in an approved manner.
- <sup>5</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.
- <sup>6</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC and Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is <sup>3</sup>/<sub>8</sub> inch.
- <sup>7</sup>The fluted deck crest area above the beam or joist must be filled with the fire-resistive material.
- <sup>8</sup>Steel Joist Description: Top chord must be two angles, minimum 1<sup>1</sup>/<sub>2</sub>"×1<sup>1</sup>/<sub>2</sub>"×0.156"; bottom chord must be two round bars, minimum 0.675" diameter or two angles, minimum 1"×1"×0.125"; end reaction bearing plates must be two angles, minimum 2"×2"×0.192"; minimum 4<sup>15</sup>/<sub>16</sub>" long; and web members must be round bars, minimum 0.774" diameter, with a second web member at each end consisting of 0.654" diameter round bar. Design stress of joists must not exceed 30,000 psi. Bridging angles to be protected with same thickness of fire-protection material as specified for the joist.
- <sup>9</sup>Metal lath or fiberglass scrim attached to one side of the steel joist is optional. When used, the metal lath must be minimum 1.7 pounds per square yard, <sup>3</sup>/<sub>8</sub>-inch diamond mesh metal lath, and the fiberglass scrim mesh must be minimum <sup>3</sup>/<sub>32</sub>-inch coated fiberglass scrim mesh weighing 1.9 ounces per square yard. Both the lath or mesh must be attached to one side of steel joist in an approved manner.
- <sup>10</sup>Fire-protection material must be applied to joist following joist contour. If metal lath is used, lath is to be fully covered with fire-protection material with no minimum thickness requirement. If fiberglass mesh is used, mesh is not required to be fully covered.
- <sup>11</sup>When bottom chords consist of angles, the thickness of the sprayed fire-resistive material on the bottom chords only must be increased by <sup>1</sup>/<sub>4</sub> inch for the 1-hour fire-resistive-rated steel joist.

**TABLE 10 —CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB OR CAFCO 400, CAFCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
			3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (inches)		
<b>Roof Assembly A (Insulation Boards Applied over Gypsum Wallboard)</b>					
A1	Roof Assembly <sup>2</sup> : a. Minimum 1½-Inch-deep fluted steel roof deck units, Minimum No. 22 gage (0.034-Inch base-metal thickness). b. Vapor Retarder (Optional): Vinyl film or paper scrim vapor barrier, loose-laid or adhered to metal roof deck <sup>3</sup> . c. Cover Board <sup>4</sup> : Minimum 5/8-Inch-thick Type X gypsum wallboard placed under the Insulation board. d. Insulation Type <sup>5</sup> : • Polysocyanurate Board: Minimum size of 36 by 48 inches. Minimum 1-inch thickness. Unlimited maximum thickness. • Mineral and Fiber Board: Minimum 1-inch thick for 1-hour rating. Minimum 2-inch thick for 2-hour rating. Unlimited maximum thickness. • Polystyrene Board: Minimum 1-Inch thick. Unlimited maximum thickness. Maximum 2.5 pcf density. e. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>6</sup>	NR	1½	½
A2	Steel Beams <sup>7,8</sup>	Min. W8×28 (W/D ≥ 0.80)	1½	¾	½
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1¼	7/8	½
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	1⅝	1⅛	5/8
A3	Steel Joists <sup>8</sup>	Min. 10K1 Joist and Mid-span Bridging <sup>10</sup> (w/ or w/o scrim or lath) <sup>11</sup>	1⅝	1¼	¾
<b>Roof Assembly B (Insulation Boards Applied Directly Over Steel Deck)</b>					
B1	Roof Assembly <sup>2</sup> : a. Minimum 1½-Inch-deep fluted steel roof deck, minimum No. 22 gage (0.028-Inch base-metal thickness). b. Vapor Retarder (Optional): Vinyl film or paper scrim vapor barrier, loose-laid or adhered to metal roof deck <sup>3</sup> . c. Insulation Type <sup>5</sup> : • Fiberglass Board: Minimum ¾-Inch thick for 1-hour rating. Minimum 1¾-Inch thick for 2-hour rating. Maximum 4⅞-Inch thickness. • Mineral and Fiberboard: Minimum 2-Inch thickness when single-ply membrane is used. Minimum 1-inch thickness when bituminous roof covering is used. Unlimited maximum thickness. d. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>6</sup>	NR	1½	7/8
B2	Steel Beams <sup>7,8</sup>	Min. W8×28 (W/D ≥ 0.80)	NR	¾	½
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	NR	7/8	½
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	NR	1⅛	5/8
B3	Steel Joists <sup>8</sup>	Min. 10K1 Joist and Mid-span Bridging <sup>10</sup> (w/ or w/o scrim or lath) <sup>11</sup>	NR	1¼	¾

**TABLE 10 —CAFCC 300, CAFCC 300 AC, CAFCC 300 HS, CAFCC 300 ES, CAFCC 300 SB OR CAFCC 400, CAFCC 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO PROTECTED ROOF ASSEMBLIES (continued)**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
Item	Description	Fire-resistive Material Applied to:	3-Hour	2-Hour	1-Hour
<b>Roof Assembly C (Insulation Boards Applied Directly Over Steel Deck)</b>					
C1	Roof Assembly <sup>2</sup> : a. Minimum 1 1/2-inch-deep fluted steel roof deck, minimum No. 22 gage (0.028-inch base-metal thickness). b. Vapor Retarder (Optional): Vinyl film or paper scrim vapor barrier, loose-laid or adhered to metal roof deck <sup>3</sup> . c. Insulation Type <sup>5</sup> : Polyisocyanurate Board: Minimum size of 36 by 48 inches. Minimum 2-inch thickness. Unlimited maximum thickness. d. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.	Steel Deck <sup>8</sup>	1 7/8	1 7/8 1/2	7/8
C2	Steel Beams <sup>7,8</sup>	Min. W8x28 (W/D ≥ 0.80)	1 1/8	7/8	1/2
		Min. W6x16 (0.66 ≤ W/D ≤ 0.79)	1 1/4	7/8	1/2
		Min. W8x10 (0.37 ≤ W/D ≤ 0.65)	1 5/8	1 1/4	3/4
C3	Steel Joists <sup>9</sup>	Min. 10K1 Joist and Mid-span Bridging <sup>10</sup> (w/ or w/o scrim or lath) <sup>11</sup>	1 5/8	1 1/4	3/4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbm/ft.<sup>2</sup> = 4.882 kg/m<sup>2</sup>, 1 pcf = 16.018 kg/m<sup>3</sup>, 1 lb./yd.<sup>2</sup> = 0.38 kg/m<sup>2</sup>, 1 pound = 0.454 kg, 1 psf = 6.89 kPa.

<sup>1</sup>NR = Not recognized.

<sup>2</sup>Insulation and roof-covering materials and methods of attachment are classified by UL LLC, and are recognized by a current ICC-ES evaluation report. Where foam plastic is used, it must be recognized in an ICC-ES evaluation report for the roof-covering system. The attachment of the vapor retarder, gypsum wallboard, insulation, and roof covering to resist wind uplift must be in accordance with the evaluation report for the roof covering assembly. Use of adhesives, asphalt or coal tar pitch, or mechanical fasteners does not adversely affect the tabulated fire-resistance ratings, provided the following limitations are met:

- Optional adhesive may be applied between crests of steel roof deck and gypsum wallboard, between gypsum wallboard and vapor retarder, between vapor retarder and first layer of insulation, and between layers of insulation. Applied in 1/2-inch-wide ribbons, 6 inches on center at 0.4 gal./100 sq. feet.
- Optional asphalt or coal tar pitch may be used to attach first layer of roof insulation to vapor retarder and each additional layer of roof insulation, applied at a maximum rate of 25 lb./sq. ft.
- Optional mechanical screw-type fasteners with metal washers designed for the purpose may be used to attach one or more layers of insulation to steel roof deck.

<sup>3</sup>When used, the vapor retarder must be overlapped approximately 2 inches on adjacent sheets.

<sup>4</sup>Gypsum wallboard, complying with ASTM C36, must have a minimum weight of 2.2 psf, and must be installed perpendicular to steel roof deck with adhesive, hot asphalt, or laid loosely. End joints must be staggered 2 feet in adjacent rows and occurring over crests of steel roof deck. Wallboard may be 2- or 4-feet wide.

<sup>5</sup>When more than one layer of insulation is used, each layer must be offset in both directions from the layer below a minimum of 6 inches.

<sup>6</sup>BOND-SEAL adhesive must be applied to the steel deck surfaces before application of the sprayed fire-resistive materials.

<sup>7</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>8</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is 3/8 inch.

<sup>9</sup>The design of the steel joists must comply with Section 2206 of the IBC or Section 2221 of the UBC, as applicable. The 1-hour fire-resistance-rated steel joists described in Assembly A must be designed for a maximum tensile stress of 26,000 psi. All other steel joists must be designed for a maximum tensile stress of 30,000 psi. Bridging must consist of 1 1/4" x 1 1/4" x 1/8" (minimum) steel angles welded to top and bottom chords of each joist. The number and spacing of bridging angles must comply with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable.

<sup>10</sup>Bridging must be coated with the same thickness of sprayed fire-resistive material as the joist.

<sup>11</sup>Expanded metal lath or glass-fiber scrim (nonmetallic mesh) is optional. The fire-resistive material must be applied to joist contours. When metal lath or nonmetallic mesh is attached to the joists to catch overspray during application of the fire-resistive material to the steel joist contour, the metal lath must be covered with the fire-resistive material, but with no minimum thickness requirements. Glass-fiber scrim mesh is not required to be covered with sprayed fire-resistive material.

**TABLE 11 —CAFCCO 300, CAFCCO 300 AC, CAFCCO 300 HS, CAFCCO 300 ES, CAFCCO 300 SB OR CAFCCO 400, CAFCCO 400 AC AND 400 ES SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO UNPROTECTED ROOF ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
Item	Description	Fire-resistive Material Applied to:	3-Hour	2-Hour	1-Hour
			Minimum Average Thickness of Sprayed Fire-resistive Material <sup>1</sup> (Inches)		
1	<p>Roof Assembly<sup>2</sup>:</p> <p>a. Fluted steel deck units, vented or nonvented units:</p> <ul style="list-style-type: none"> <li>Minimum <math>1\frac{5}{16}</math>-inch deep, minimum No. 24 gage (0.023-inch base-metal thickness), maximum clear span of 7 feet, 8 inches; or,</li> <li>Minimum <math>1\frac{5}{16}</math>-inch deep, minimum No. 26 gage (0.017-inch base-metal thickness), maximum clear span of 6 feet, 0 inch.</li> </ul> <p>b. Vermiculite Concrete, Perlite Concrete, or Cellular Concrete<sup>3</sup>:</p> <ul style="list-style-type: none"> <li>Concrete slurry coat thickness must comply with footnote 4.</li> <li>Minimum 2-inch thick concrete topping above foam-plastic insulation boards.</li> <li>Combined thickness of cellular concrete slurry coat and topping must be minimum <math>2\frac{3}{8}</math> inches.</li> <li>Concrete must encapsulate 4×8–W12×W14 WWR or 2×2–W14×W14 smooth WWR (Welded Wire Reinforcement) for the 2-hour rated assembly.</li> </ul> <p>c. Insulation: Polystyrene foam-plastic insulation boards, maximum 8-inch thickness, nominal 1.0 pcf density for roof decks with perlite or cellular concrete, and nominal 2.5 pcf density for roof decks with vermiculite concrete. Each insulation board is 24" × 48", and must have six 3-inch diameter holes or slots symmetrically placed.</p> <p>d. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically attached Class A, B or C single-ply roof covering.</p>	No fire-resistive material is applied to the steel deck soffit to achieve the 1-hour and 2-hour roof assembly fire-resistance ratings.	NR	0	0
2	Steel Beams <sup>5,8</sup>	Min. W8×28 (W/D ≥ 0.80)	$1\frac{5}{8}$	1	$1\frac{1}{2}$
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	$1\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{1}{2}$
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	$2\frac{1}{4}$	$1\frac{1}{2}$	$5\frac{1}{8}$
3	Steel Joists <sup>7,8</sup>	Min. 10K1	NR	$1\frac{7}{8}$	$1\frac{1}{8}$
		Joist Bridging: $1\frac{1}{4}$ " × $1\frac{1}{4}$ " × $1\frac{1}{8}$ "	NR	$1\frac{1}{8}$	$1\frac{1}{8}$

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 MPa, 1 pcf = 16.018 kg/m<sup>3</sup>, 1 lb/yd<sup>2</sup> = 0.38 kg/m<sup>2</sup>, 1 oz./yd.<sup>2</sup> = 33.9 g/m<sup>2</sup>, 1 foot = 304.8 mm.

<sup>1</sup>NR = Not recognized

<sup>2</sup>Insulation and roof-covering materials and methods of attachment are classified by UL LLC, and must be recognized in a current ICC-ES evaluation report.

<sup>3</sup>Vermiculite, perlite and cellular insulating concrete must be recognized in a current ICC-ES evaluation report and listed by UL. Vermiculite concrete is mixed with 6 cubic feet of UL-listed vermiculite aggregate to 94 pounds of portland cement and 0.06 to 0.5 pounds of air-entraining agent. Perlite concrete consists of 6 cubic feet of UL-listed perlite aggregate mixed with 94 pounds of portland cement and  $1\frac{1}{2}$  pints of air-entraining agent. Cellular concrete is mixed per manufacturer's specifications in the evaluation report and has a minimum compressive strength of 190 psi.

<sup>4</sup>Concrete slurry coat thickness, which is measured from the top of the steel roof deck to bottom of foam plastic, must comply as follows:

- Vermiculite Concrete: Slurry coat thickness must be  $1\frac{1}{8}$  inch, except a slurry coat thickness of  $5\frac{1}{16}$  inch is required for two-hour fire-resistance-rated assemblies with  $1\frac{5}{16}$ -inch-deep steel decks.
- Perlite and Cellular Concrete: Slurry coat thickness must be  $1\frac{1}{8}$  inch.

<sup>5</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>8</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is  $3\frac{3}{8}$  inch.

<sup>7</sup>The design of the steel joists must comply with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable.

<sup>8</sup>Fire-resistive material must be applied to the steel joist following the joist contour. If metal lath is used, the lath must be fully covered with sprayed fire-resistive material with no minimum thickness requirement. If fiberglass mesh is used, mesh is not required to be fully covered. When used, the lath or mesh must be minimum  $3\frac{3}{8}$ -inch expanded steel lath or minimum  $3\frac{3}{32}$ -inch glass-fiber mesh weighing 1.7 lbs./sq. yd. and 1.9 oz./sq. yd., respectively. The lath or mesh is attached to one side of each joist web member.

**TABLE 12 — FENDOLITE® TYPE M-II SPRAYED FIRE-RESISTIVE MATERIAL APPLIED TO STEEL COLUMNS**

STEEL COLUMN		W/D RATIO <sup>1</sup> RANGE	A/P RATIO <sup>2</sup>	FIRE-RESISTANCE RATING				
				4-Hour	3-Hour	2-Hour	1-Hour	
Structural Shape	Size	Minimum Average Thickness of Sprayed Fire-resistive Materials (inches)						
		Wide-flange Steel Columns <sup>3</sup>		W14×730	W/D ≥ 6.68	—	1/2	1/2
W14×233	2.49 ≤ W/D ≤ 6.67			—	1 1/4	1	5/8	3/8
W12×106	1.46 ≤ W/D ≤ 2.48			—	1 7/8	1 3/8	1	1/2
W10×49	0.83 ≤ W/D ≤ 1.45			—	2	1 5/8	1 1/4	5/8
W8×28	0.67 ≤ W/D ≤ 0.82			—	2 3/8	1 7/8	1 3/8	3/4
W6×16	0.57 ≤ W/D ≤ 0.66			—	2 3/4	2 1/8	1 3/8	3/4
W6×12	0.43 ≤ W/D ≤ 0.56			—	2 7/8	2 1/4	1 1/2	7/8
W6×9	0.33 ≤ W/D ≤ 0.42			—	3 1/8	2 3/8	1 3/4	1
Steel Hollow Structural Sections (HSS)		HSS8×8×5/8	—	0.546	1 3/4	1 1/4	7/8	1/2
		HSS4×4×1/2	—	0.418	2 1/8	1 5/8	1	1/2
		HSS4×4×3/8	—	0.323	2 3/8	1 3/4	1 1/8	5/8
		HSS4×4×5/16	—	0.273	2 1/2	1 7/8	1 1/4	5/8
		HSS4×4×3/16	—	0.168	2 5/8	2 1/8	1 1/2	1
Steel Pipe	Standard Weight (Std.)	4 × 0.237	—	0.22	2 7/8	2 1/8	1 1/2	7/8
	Extra Strong (X-Strong)	6 × 0.432	—	0.40	2 7/8	1 5/8	1 1/8	1/2

For SI: 1 inch = 25.4 mm; 1 lb./sq. yd. = 0.38 kg/m<sup>2</sup>.

<sup>1</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.1.1.3 of the 2012 IBC, Section 721.5.1.1.3 of the 2009 and 2006 IBC or Section 7.703.1 of UBC Standard 7-7, as applicable.

<sup>2</sup>A/P = Cross-sectional-area-to-heated-perimeter ratio, where A is the cross-sectional area of the structural steel column in square inches and P is the inside perimeter of the fire-resistive material in inches.

<sup>3</sup>Fire-resistive protection may be applied directly to the wide-flange steel column contour (contour profile) or column boxed with minimum 1.7 lbs. per sq. yd. metal lath (box profile).

**TABLE 13 — FENDOLITE® TYPE M-II SPRAYED FIRE-RESISTIVE MATERIAL APPLIED TO PROTECTED FLOOR ASSEMBLIES**

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
Item	Description	Fire-resistive Material Applied to:	3-Hour	2-Hour	1-Hour
			Minimum Average Thickness of Sprayed Fire-resistive Material (Inches)		
1	Floor Assembly: a. All fluted, all cellular, or combination fluted/cellular steel decking: • 1 1/2-inch or 1 5/8-inch deep. • Fluted units: Minimum No. 22 gage (0.028-inch base-metal thickness), 24 inches wide. • Cellular units: Minimum Nos. 20/20 gage (0.034-inch base-metal thickness), 24 inches wide. b. Metal lath fastened to underside of steel decking <sup>1</sup> . c. Normal-weight concrete <sup>2</sup> fill, minimum 2 1/2-inch thick over top flutes of steel floor decking.	Metal Lath <sup>3</sup> (Fastened to Underside of Steel Decking)	5/8	5/8	5/8
2	Wide-flange Steel Beams <sup>4,5,6,7</sup>	Min. W10×60 (W/D ≥ 1.20)	3/4	5/8	3/8
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1	3/4	1/2
		Min. W6×16 (0.66 ≤ W/D ≤ 0.79)	1 1/8	3/4	1/2
		Min. W8×10 (0.37 ≤ W/D ≤ 0.65)	1 1/2	1	3/4

For SI: 1 inch = 25.4 mm, 1 lb./sq. yd. = 0.38 kg/m<sup>2</sup>; 1 psi = 6.89 Mpe; 1 pcf = 16.018 kg/m<sup>3</sup>.

<sup>1</sup>Three-eighths-inch expanded metal lath, weighing 2.5 lb./sq. yd., must be fastened to the underside of the floor decking units with No. 12 by 1-inch-long self-drilling tapping screws, with high-low threads and a flat head; or with approved powder-actuated steel fasteners, having a minimum length of 1 1/4 inches and a minimum shank diameter of 0.145 inch, and 1/16-inch thick by 1/2-inch diameter steel washers. Fasteners must be spaced 12 inches on center in both directions. Fasteners must be installed only to valley portion of the floor units and must not penetrate the cell areas of the cellular floor units. Adjacent pieces of lath must be overlapped 3 inches.

<sup>2</sup>Normal-weight concrete must have a minimum compressive strength of 4,000 psi and a minimum unit weight of 150 pcf, and contain carbonate or siliceous aggregate. Concrete must encase minimum 6×6-W1.4×W1.4 smooth welded-wire reinforcement complying with ASTM A185.

<sup>3</sup>Thickness of sprayed fire-resistive material beneath floor units must be measured to face of lath.

<sup>4</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>5</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the sprayed fire-resistive material is 3/8 inch.

<sup>6</sup>Sprayed fire-resistive material must be applied directly to either the beam contour or a boxed beam formed with minimum 2.5 lb./sq. yd. expanded steel lath etched in an approved manner.

<sup>7</sup>Voids above steel beams must be filled with fire-resistive material.

TABLE 14 — FENDOLITE TYPE M-II SPRAYED FIRE-RESISTIVE MATERIAL APPLIED TO UNPROTECTED FLOOR ASSEMBLIES

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING			
			4-Hour	3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material (inches)			
1	Floor Assembly: a. 1½-inch to 3-inch deep steel decking: • Fluted or corrugated floor units, minimum No. 22 gage (0.028-inch base-metal thickness). • Cellular floor units, minimum Nos. 20/20 gage (0.034-inch base-metal thickness). b. Normal-weight or lightweight concrete fill <sup>1</sup> c. Beam protection requires minimum 2½ inches of concrete over the top flute. d. Minimum concrete fill thickness for the floor assembly rating is a separate consideration <sup>2</sup> .	No fire-resistive material applied to the deck soffit.	—	—	—	—
2	Steel Beams <sup>3,4,5,8</sup> (Supporting fluted, cellular, or combination fluted/cellular steel decking)	Min. W8×67 (W/D ≥ 1.60)	1⅛	1	¾	¾
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1⅜	1¼	7/8	¾
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1¾	1½	1⅛	½
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	2⅝	2¼	1½	¾
3	Steel Beams <sup>3,4,5,6</sup> (Supporting fluted or corrugated steel decking)	Min. W8×67 (W/D ≥ 1.60)	1	7/8	5/8	¾
		Min. W10×60 (1.20 ≤ W/D ≤ 1.59)	1¼	1⅛	¾	¾
		Min. W8×28 (0.80 ≤ W/D ≤ 1.19)	1½	1⅜	1	¾
		Min. W8×10 (0.37 ≤ W/D ≤ 0.79)	2¼	2	1⅜	5/8

For SI: 1 inch = 25.4 mm. 1psi = 6.89 kPa; 1pcf = 16.018 Kg/m<sup>3</sup>; 1 lb/sq.yd. = 0.38 kg/m<sup>2</sup>.

<sup>1</sup>Normal-weight concrete must have a minimum compressive strength of 3,500 psi, unit weight of 147 pcf, and either carbonate or siliceous aggregates. Lightweight concrete must have a minimum compressive strength of 3,000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1] and a unit weight of 107 pcf. Concrete must encapsulate 6×6–W1.4×W1.4 smooth welded-wire reinforcement complying with ASTM A185.

<sup>2</sup>Minimum concrete slab or fill thickness for the floor assembly and fire-resistive rating desired must comply with Sections 721 and 722.2.2.1 of the 2012 IBC, Sections 720 or 721.2.2.1 of the 2009 and 2006 IBC, or Section 710.1 of the UBC or Section 7.708 of UBC Standard 7-7, as applicable, or with a current ICC-ES evaluation report.

<sup>3</sup>Sprayed fire-resistive material must be applied directly either to exposed beam contour or a boxed beam formed with minimum 3.4 lb/sq. yd. expanded steel lath attached in an approved manner.

<sup>4</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>5</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC or Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is ¾ inch.

<sup>6</sup>The deck crest area above the beam must be filled with the sprayed fire-resistive material.

TABLE 15 —FENDOLITE® TYPE M-II SPRAYED FIRE-RESISTIVE MATERIAL APPLIED TO PROTECTED ROOF ASSEMBLIES

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING	
Item	Description	Fire-resistive Material Applied to:	2-Hour	1-Hour
1	Roof Assembly <sup>2</sup> : a. Minimum 1 1/2-inch-deep fluted steel roof deck; Minimum No. 22 gage (0.028-inch base-metal thickness), with 2.5 lb/sq yd metal lath etched to the underside of the steel deck <sup>3</sup> . b. Cover Board <sup>4</sup> (optional): When required, minimum 5/8-inch-thick Type X gypsum wallboard, adhered or fastened to the roof deck, placed under insulation board. c. Insulation Type <sup>5,8</sup> : Polyisocyanurate foam-plestic Insulation board. Required minimum thickness as indicated in this table. No limit on maximum overall thickness. d. Roof Covering: Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or ballasted, adhered or mechanically etched Class A, B or C single-ply roof covering.	Metal Lath attached to Steel Deck <sup>7</sup> (min. 2-inch thick insulation w/ gyp. board)	1 1/4	5/8
		Metal Lath etched to Steel Deck <sup>7</sup> (min. 1-inch thick insulation w/ gyp. board)	1 3/8	5/8
		Metal Lath attached to Steel Deck <sup>7</sup> (min. 0-inch thick insulation w/ gyp. board)	1 5/8	3/4
		Metal Lath attached to Steel Deck <sup>7</sup> (min. 3-inch thick insulation w/ or w/o gyp. board)	2 1/8	7/8
		Metal Lath attached to Steel Deck <sup>7</sup> (min. 2-inch thick insulation w/ or w/o gyp. board)	2 3/8	1
		Metal Lath attached to Steel Deck <sup>7</sup> (min. 1-inch thick insulation w/ or w/o gyp. board)	3 1/4	1 1/4
		Metal Lath attached to Steel Deck <sup>7</sup> (min. 0-inch thick insulation w/ or w/o gyp. board)	3 1/4	2 1/8
2	Wide-flange Steel Beams <sup>8,9</sup> (with or without gypsum wallboard on steel roof deck)	Min. W8x28 (W/D ≥ 0.80)	1	5/8
		Min. W6x16 (0.66 ≤ W/D ≤ 0.79)	1	3/4
		Min. W8x10 (0.37 ≤ W/D ≤ 0.65)	1 3/8	1
3	Steel Joists <sup>10,11,12</sup> (with or without gypsum wallboard on steel roof deck)	Min. 10K1 and mid-span bridging	1 3/4	NR
		Min. 12K3 and mid-span bridging	1 3/4	1 1/8

For SI: 1 inch = 25.4 mm, 1 lb./sq. yd. = 0.38 kg/m<sup>2</sup>; 1 gal/100 sq.ft = 0.41 liter/m<sup>2</sup>; 1 oz./sq.yd. = 0.0119kg/m<sup>2</sup>; 1 lb/100 sqft = 0.05 kg/m<sup>2</sup>.

<sup>1</sup>NR = Not recognized.

<sup>2</sup>Insulation and roof-covering materials and methods of attachment are classified by UL LLC, and are recognized by a current ICC-ES evaluation report. Where foam plastic is used, it must be recognized in an ICC-ES evaluation report for the roof-covering system. The attachment of the vapor retarder, gypsum wallboard, insulation, and roof covering to resist wind uplift must be in accordance with the evaluation report for the roof covering assembly. Use of adhesives, asphalt or coal tar pitch, or mechanical fasteners does not adversely affect the tabulated fire-resistance ratings, provided the following limitations are met:

- Optional adhesive may be applied between crests of steel roof deck and gypsum wallboard, between gypsum wallboard and vapor retarder, between vapor retarder and first layer of insulation, and between layers of insulation. Applied in 1/2-inch-wide ribbons, 6 inches on center at 0.4 gal./100 sq. feet.
- Optional asphalt or coal tar pitch may be used to attach the vapor retarder or the first layer of roof insulation to the steel crest surfaces at a maximum rate of 15 lbs/100 sq ft. Also, optional asphalt or coal tar pitch may be used to attach the first layer of insulation to the vapor retarder and each additional layer of roof insulation, applied at a maximum rate of 25 lbs/100 sq ft.
- Optional mechanical screw-type fasteners with metal washers designed for the purpose may be used to attach one or more layers of insulation to steel roof deck.

<sup>3</sup>Three-eighths-inch expanded metal lath, weighing 2.5 lb./sq. yd., must be fastened to the underside of the steel decking units with No. 12 by 1-inch-long self-drilling tapping screws, with high-low threads, a flat head, and 1/2-inch diameter steel washers; or with approved powder-actuated steel fasteners, having a minimum length of 1 1/4 inches and a minimum shank diameter of 0.145 inch, and 1/16-inch thick by 1/2-inch diameter steel washers. Fasteners must be spaced 12 inches on center in both directions. Lath edges must overlap approximately 3 inches.

<sup>4</sup>Gypsum wallboard must have a minimum weight of 2.2 psf, and must be minimum 4 ft. wide and installed perpendicular to the flutes of the steel roof deck with end joints staggered 2 ft. in adjacent rows and occurring over crests of steel roof deck.

<sup>5</sup>A vapor barrier may be installed.

<sup>6</sup>Minimum insulation board size is 36 inches by 48 inches. When more than one layer of insulation is used, each layer must be offset in both directions from the layer below a minimum of 6 inches.

<sup>7</sup>Thickness of sprayed fire-resistive material beneath floor units must be measured to face of lath.

<sup>8</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>9</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC and Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is 3/8 inch.

<sup>10</sup>Use of expanded metal lath or glass-fiber fabric (scrim mesh) is optional on steel joists. When used, the expanded metal lath must weigh minimum 1.7 lb/sq yd, and the glass fiber fabric must weigh approximately 1.9 oz per sq. yd., and must be fastened to the webs of the joists in an approved manner. When metal lath is attached to the joists, both sides of the lath must be completely coated with sprayed fire-resistive materials with no minimum thickness. Glass-fiber scrim mesh is not required to be covered with sprayed fire-resistive material.

<sup>11</sup>Bridging must be coated with the same thickness of sprayed fire-resistive material as the joist. Bridging must be welded to top and bottom chords of each joist at midspan.

<sup>12</sup>The design of the steel joists must comply with Section 2207 of the 2012 IBC, Section 2206 of the 2009 and 2006 IBC or Section 2221 of the UBC, as applicable.

TABLE 16 —FENDOLITE® TYPE M-II SPRAYED FIRE-RESISTIVE MATERIAL APPLIED TO UNPROTECTED ROOF ASSEMBLIES

ASSEMBLY ELEMENT			FIRE-RESISTANCE RATING		
			3-Hour	2-Hour	1-Hour
Item	Description	Fire-resistive Material Applied to:	Minimum Average Thickness of Sprayed Fire-resistive Material (Inches)		
1	Roof Assembly: a. Corrugated or fluted steel deck units; $\frac{9}{16}$ -, $\frac{15}{16}$ -, $1\frac{5}{16}$ - or $1\frac{1}{2}$ -inch-deep galvanized vented or nonvented units. b. Vermiculite Concrete, Perlite Concrete, or Cellular Concrete <sup>1</sup> : • Vermiculite Concrete: Beam protection requires minimum $2\frac{1}{4}$ -inch-thick concrete topping above crests of steel deck units. • Perlite or Cellular Concrete: Beam protection requires minimum $2\frac{3}{4}$ -inch-thick concrete topping above crests of steel deck units. • Concrete must encapsulate 4x8-W12xW14 or 2x2-W14xW14 smooth welded wire reinforcement <sup>2</sup> . c. Minimum concrete fill thickness for fire-resistance rating of unrestrained roof assemblies is a separate consideration <sup>3</sup> , except as noted in footnote 3. d. Roof Covering <sup>4</sup> : Hot-mopped or cold-applied Class A, B or C bituminous roof covering; or belleted, adhered or mechanically attached Class A, B or C single-ply roof covering.	No fire-resistive material is applied to the steel deck.	—	— <sup>(3)</sup>	— <sup>(3)</sup>
2	Steel Beams <sup>5,6</sup>	Min. W8x28 (W/D ≥ 0.80)	$2\frac{3}{8}$	$1\frac{1}{4}$	$\frac{5}{8}$
		Min. W6x16 (0.66 ≤ W/D ≤ 0.79)	$2\frac{5}{8}$	$1\frac{1}{2}$	$\frac{5}{8}$
		Min. W8x10 (0.37 ≤ W/D ≤ 0.65)	$3\frac{3}{8}$	$1\frac{7}{8}$	$\frac{7}{8}$

For SI: 1 Inch = 25.4 mm, 1 foot = 305 mm, 1ft<sup>3</sup> = 0.0283m<sup>3</sup>, 1 lb = 0.45kg.

<sup>1</sup>Vermiculite, perlite and cellular insulating concrete must be recognized in a current ICC-ES evaluation report and listed by UL. Vermiculite concrete is mixed with 6 cubic feet of UL-listed vermiculite aggregate to 94 pounds of portland cement and 0.06 to 0.5 pounds of air-entraining agent. Perlite concrete consists of 6 cubic feet of UL-listed perlite aggregate mixed with 94 pounds of portland cement and 1½ pints of air-entraining agent. Cellular concrete is mixed per manufacturer's specifications in the ICC-ES evaluation report and has a minimum compressive strength of 190 psi.

<sup>2</sup>The smooth welded wire reinforcement, complying with ASTM A185, may be omitted for the 1-hour fire-resistance rated roof assemblies when the flexural design stress of the steel decking is limited to 75 percent of its bending capacity.

<sup>3</sup>No sprayed fire-resistive material is required on the underside of the steel deck for an unrestrained roof assembly fire-resistance rating of 2 or 1 hours, provided the following conditions are met:

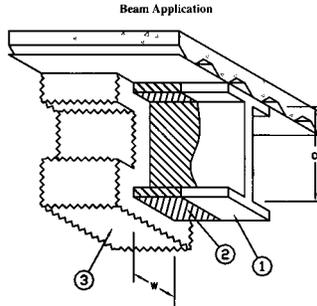
- Minimum  $1\frac{5}{16}$ -inch deep corrugated or fluted steel decking is used, having a minimum thickness of No. 24 gage (minimum 0.023-inch base-metal thickness), and
- Minimum concrete thickness complies with item 1b in the table, and
- Maximum clear span of the steel deck units is 7 feet, 7 inches.

<sup>4</sup>Roof-covering materials and methods of attachment are classified by UL LLC, and must be recognized in a current ICC-ES evaluation report. Where foam plastic is used, it must comply with the requirements set forth in the ICC-ES evaluation report for the roof covering material.

<sup>5</sup>W/D = Weight-to-heated-perimeter ratio according to Section 722.5.2.1.1 of the 2012 IBC, Section 721.5.2.1.1 of the 2009 and 2006 IBC or Section 7.704.1.1 of UBC Standard 7-7, as applicable.

<sup>6</sup>Thickness of sprayed fire-resistive material applied to wide-flange steel beams may be calculated according to Section 722.5.2.2 of the 2012 IBC, Section 721.5.2.2 of the 2009 and 2006 IBC and Section 7.704.1.2 of UBC Standard 7-7, provided the minimum W/D ratio is 0.37 and the minimum thickness of the fire-resistive material is  $\frac{3}{8}$  inch.

density of 19.5 pcf. Thickness of SFRM is in accordance with the specific referenced design.



1. **Steel Beam** — See the individual D Series design for the minimum size. The maximum depth (d) is 24 in. and the maximum width (w) is 12 in.
  2. **Primers for Structural Steel\*** —  
TNEMEC CO INC —Series 394 PerimePrime Primer applied in accordance with the manufacturers application recommendations accompanying the product.
  3. **Spray-applied Fire Resistive Materials\*** — Any UL Classified spray-applied fire resistive materials having a maximum average density of 19.5 pcf. Thickness of SFRM is in accordance with the specific referenced design.
- \* Bearing the UL Classification Mark

## SPRAY-APPLIED FIRE-RESISTIVE MATERIALS (CHPX)

### GENERAL

This category covers spray-applied fire-resistive materials (SFRM) investigated for use in fire-resistance designs as detailed in Fire-resistance Ratings - ANSI/UL 263 (BXUV). SFRMs typically consist of one or more binders, aggregates and fibers. The materials are either mixed with water to form a slurry and conveyed through a hose to a nozzle where compressed air is typically used to disperse the material into a spray pattern, or are conveyed by low-pressure air through a hose to a nozzle where the material is mixed with atomized water and sprayed. The mixing and application instructions are printed on each bag of SFRMs.

Surfaces on which the SFRMs are applied should be free of dirt, oil and loose scale. The minimum thickness and density information specified in the design text must be followed to obtain the specified rating. The test method used to investigate the SFRMs is specified in the design text.

Regulations governing the application and use of the SFRMs have been promulgated by various governmental agencies. Authorities Having Jurisdiction should be consulted to determine local requirements.

Unless specified in the design text as being suitable for exterior-use application, SFRMs investigated to ANSI/UL 263, "Fire Tests of Building Construction and Materials," and ANSI/UL 2079, "Tests for Fire Resistance of Building Joint Systems," are intended for interior-use application only.

For SFRMs investigated to ANSI/UL 1709, "Rapid Rise Fire Tests of Protection Materials for Structural Steel," the SFRMs are investigated for exposure to the following standardized environments: aging, high humidity, salt spray, carbon dioxide and sulfur dioxide air mixture, and wet-freeze-dry cycling. SFRMs investigated to ANSI/UL 1709 can be used in optional environments when indicated in the individual certifications.

In addition to investigations in accordance with ANSI/UL 1709, where indicated in the individual certifications, SFRMs have been tested in accordance with "Jet-Fire Resistance Test of Passive Fire Protection Materials" (1996), published by the Health and Safety Executive of the United Kingdom. These SFRMs have demonstrated an ability to limit the time for the identified structural shape to reach 900°F during a jet-fire exposure for the specified time duration.

To investigate the influence of the environments, the system, including the SFRMs, is applied to either steel plates or structural steel shapes and a selected number of samples are subjected to the environments. After the environmental exposures, samples are subjected to the fire exposure defined in either ANSI/UL 263 or ANSI/UL 1709, depending on the scope of the investigation. The ability of the system to retain its fire-resistive properties is determined on the basis of a comparative analysis of the fire test data obtained from (1) fire tests on exposed samples and (2) fire tests on samples that were not exposed to the simulated environments.

### RELATED PRODUCTS

For information on related products, see Fire-resistance Ratings - ANSI/UL 263 (BXUV).

### ADDITIONAL INFORMATION

For additional information, see Fire-resistance Ratings (BXRH).

### REQUIREMENTS

The basic standards used to investigate products in this category are ANSI/UL 263, "Fire Tests of Building Construction and Materials," ANSI/UL 2079, "Tests for Fire Resistance of Building Joint Systems," and ANSI/UL 1709, "Rapid Rise Fire Tests of Protection Materials for Structural Steel."

### UL MARK

The Classification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Classification and Follow-Up Service. The Classification Mark for these products includes the UL symbol, the word "CLASSIFIED" above the UL symbol (as illustrated in the Introduction of this Directory), and the following additional information:

For SFRMs investigated to ANSI/UL 263 or ANSI/UL 2079, the Classification Mark reads:

**SPRAY-APPLIED FIRE RESISTIVE MATERIAL**  
**FIRE RESISTANCE CLASSIFICATION**  
**DESIGN NO(S). \_\_\_\_\_**  
**SEE UL FIRE RESISTANCE DIRECTORY**  
**Issue No.**

or

**SPRAY-APPLIED FIRE RESISTIVE MATERIAL**  
**FIRE RESISTANCE CLASSIFICATION**  
**SEE UL FIRE RESISTANCE DIRECTORY**  
**Issue No.**

For SFRMs investigated to ANSI/UL 1709, the Classification Mark reads:

SPRAY-APPLIED FIRE RESISTIVE MATERIAL  
FIRE RESISTANCE CLASSIFICATION  
RAPID TEMPERATURE RISE FIRE EXPOSURE  
DESIGN NO(S). \_\_\_\_\_  
SEE UL FIRE RESISTANCE DIRECTORY  
Issue No.

or

SPRAY-APPLIED FIRE RESISTIVE MATERIAL  
FIRE RESISTANCE CLASSIFICATION  
RAPID TEMPERATURE RISE FIRE EXPOSURE  
SEE UL FIRE RESISTANCE DIRECTORY  
Issue No.

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R13348

Type DC/F, HP or II (investigated for exterior use) Spray-Applied Fire Resistive Materials for application with or without Type EBS or Type X adhesive/sealer in Design Nos. A811, A815, D814, D816, D822, D824, D825, D826, D827, D829, D830, D831, D832, D833, D835, D836, D837, D840, D847, D858, D859, D860, D861, D862, D865, D867, D868, D871, D902, D904, D908, D913, D914, D919, D921, D924, D926, D942, D947, D971, D974, G801, G802, G805, J801, J803, J804, J805, J809, J957, N803, N804, N805, N814, N815, N816, N820, N823, N824, N825, N826, N830, N831, P801, P807, P810, P811, P812, P815, P819, P822, P825, P826, P901, P902, P907, P908, P920, P922, P923, S801, S802, S805, S806, U357, U401, U431, U450, U804, X525, X827, X829, X835, X840, X841.

Type 280 Spray-Applied Fire Resistive Materials for use in Design Nos.: D755, D902, D974, D976, D977, J708, N735, N743, N759, N761, P713, P901, P902, P907, P908, P920, P922, P923, S729, X790.

Type 800 Spray-Applied Fire Resistive Materials (investigated for exterior use) for use in Design Nos. D744, D902, D974, N742, N760, P819, P908, S720, Y714.

Type 300, Type 300AC, Type 300ES, Type 300HS, Type 300N, Type 400 or Type SB Spray-Applied Fire Resistive Materials for application with or without Type EBS or Type X adhesive/sealer in Design Nos: D759, D859, D860, D902, D904, D921, D942, D947, D974, D976, D977, G705, J708, J710, J804, J805, J809, J957, N735, N759, N761, N831, N846, P675, P676, P901, P902, P907, P908, P920, P922, P923, S721, S729, X790.

Type 300, Type 300AC, Type 300ES, Type 300HS, Type 300N, Type 400 or Type SB Spray-Applied Fire Resistive Materials for application with Type EBS or Type X adhesive sealer for use in Design Nos. P719, P723, P752, P744 and P826.

Type 300, Type 300AC, Type 300ES, Type 300HS, Type 300N, or Type SB Spray-Applied Fire Resistive Materials for application with or without Type EBS or Type X adhesive/sealer in Design Nos: D797, N792, Y729.

Types 300, 400, or SB may be trowel-applied provided the materials are first mixed and pumped through standard application equipment as outlined in the manufacturer's application instructions.

Type P-20 for use in Design Nos. D764, D922, G709, J711, N765, N767, P722, P726, P731, P925, S727, S730, X798, X799, Y705.

Type M-II (investigated for exterior use) for use in Design Nos. D744, D781, D902, D922, D974, D976, D977, J809, N742, N755, N760, P720, P721, P819, P826, P908, P922, S720, S723, X764, X768, XR704, XR723.

Type M-II may be trowel applied provided the Type M-II is first mixed with and pumped through standard application equipment as outlined in the manufacturer's application instructions. The minimum thickness and minimum in-place density of the Type M-II stated in the individual designs shall be maintained.

Type TG (investigated for exterior use) for use in Design Nos. D744, D781, D902, D922, D974, D976, D977, J809, N742, N755, N760, P720, P721, P819, P826, P908, P922, S720, S723, X764, X768, XR704, XR723.

Type CP-2 for use in Design Nos. D764, D922, G709, J711, N765, N767, P722, P726, P731, P925, S727, S730, X798, X799, Y705.

Type PC pre-coat for use in Design Nos. D759, D860, G705, J708, J710, J804, J805, J809.

Types 304 and 404 for use in Design Nos. D796, G716, J725, U706.

Type M-II/P for use in Design No. XR725.

For information on Type EBS or Type X adhesive/sealer refer to Adhesives category (BYWR), Isolatek International.

### Other Conditions of Use

The following conditions of use apply only to the conditions described and apply only to the UL Classified Isolatek International spray-applied fire-resistive materials (SFRM) listed. For further technical assistance regarding field issues, contact the technical service staff of Isolatek International. Authorities Having Jurisdiction should be consulted as to the particular requirements covering the installation and use of UL Listed or Classified products, equipment, systems, devices and materials.

#### 1. Patching

Types 280, 300, 300AC, 300ES, 300HS, 300N, SB, 304, 404, 400, 800 and M-II may be hand patched in all designs, in areas up to 144 sq. in., following the guidelines listed below:

- A.) The material used for patching is of the same Type designation as the material being patched.
- B.) The material may be hand mixed and trowel applied as required for patching and repair surfaces where the area of the patch will not exceed 144 square inches.
- C.) All areas to be patched must be cleaned, down to the substrate, of loose, poorly adhered material including dirt and any other foreign material.
- D.) The material is keyed into the material surrounding the patch. It should be understood that the integrity of the surrounding material shall not have been impaired and must be pre-wetted prior to applying the patching material.
- E.) All manufacturer's application instructions of the Spray-Applied Fire Resistive Material being used to patch the area must be followed.
- F.) If Type EBS or Type X adhesive/sealer is required in the fire resistance design, it must be applied to the substrate prior to the patching material. Type EBS adhesive is required on fluted steel deck that does not contain concrete and on all cellular decks.
- G.) The minimum in-place density and minimum thickness of the material, as specified in the fire resistance design, must be maintained.
- H.) The bond strength of the material maintains the minimum value established by the manufacturer along with the requirements for Spray Applied Fire Resistive Materials in the front of the UL Fire Resistance Directory.
  - I.) Any clips or hangers being patched around are totally encased in material at the point of attachment to the structural member at a thickness equal to or greater than that being applied to the structural member.
  - J.) Where applications will exceed 144 square inches, the materials may be trowel-applied provided they are first mixed and pumped through standard application equipment as outlined in the manufacturer's application instructions.
- K.) Type P may be used to hand patch Types DC/F, II or HP in all designs, limited to a maximum area of 432 sq. in., or in all designs protected with Types 280, 300, 300AC, 300ES, 300HS, 300N, SB or 400, limited to a maximum area of 144 sq. in. following the guidelines B through G listed above and the additional guideline H listed below. The minimum average density of Type P shall be 17.5 pcf.

**2. Surface Coatings**

Surface coatings such as water-based latex, vinyl acrylic, urethane or chlorinated rubber coatings may be used as overspray on Types D-C/F, II, HP, 300, 300AC, 300ES, 300HS, 300N, 400 and M-II. If used, the coatings are intended for surface coloring only. Their application must be controlled so that the coatings do not saturate the Spray-Applied Fire Resistive Material (SFRM) and thus influence the bond between the SFRM and the steel substrate. Unless specifically indicated above, these systems have not been investigated for exterior use. The flame spread index of the surface coating shall be less than 200 as determined by the test method in ANSI/UL 723 (ASTM E84 and NFPA 255). Surface Burning Classifications are contained in the Building Materials Directory.

**3. Top-Coat Materials**

Gypsum plaster, gypsum cement or Types M-II, TG or 400 may be used as a top-coat over Types 300, 300AC, 300ES, 300HS, 300N, SB, 400, DC/F, II or HP. If used, the coating is intended as a smooth surface coating only. Their application must be controlled to a maximum 1/4 in. thickness so that the coating does not affect the Spray-Applied Fire Resistive Material (SFRM) and thus influence the bond between the SFRM and the steel substrate. The minimum thickness and density for the SFRM being top-coated shall be as specified in the individual Design.

**4. Using Type CB Batts and Blankets and Spray-Applied Fire Resistive Material on the Same Structural Member**

One face of a wide flange steel beam or column may be protected with Type CB Batts and Blankets in accordance with Design Nos. N308, N309 or X314 using CAFCLIP fasteners when Types DC/F, II, HP, 300, 300AC, 300ES, 300HS, 300N, 400 or M-II Spray-Applied Fire Resistive Material (SFRM) is applied to the remainder of the beam or column, in accordance with the individual Design. The unused portion of the CAFCLIP fastener may be removed. The SFRM shall be oversprayed on the Type CB Batts and Blankets at the edges for the entire width of the Type CB Batts and Blankets. The minimum thickness and density for the SFRM and the minimum thickness of the Type CB Batts and Blankets shall be as specified in the individual Design.

**5. Spanning Gaps Between a Wide Flange Steel Beam and a Rated Concrete Block Wall**

When the wide flange steel beam in a floor-or-roof ceiling assembly is in close proximity and parallel to a rated concrete block wall, preventing the entire perimeter of the beam from being properly protected with Spray-Applied Fire Resistive Material (SFRM), the following method may be used to maintain the fire resistance rating of the floor-or-roof ceiling assembly. Minimum 3.4 lb/sq yd galvanized or painted expanded steel lath shall be used to bridge the gap between the beam and the masonry wall. The lath shall be mechanically attached by welds, screws or powder-actuated fasteners to the lower flange of the beam and the masonry façade. The SFRM shall be applied to the entire metal lath surface at the thickness specified for the steel beam in the chosen design for the desired rating. The steel beam, lath and masonry wall shall be clean and free of dirt, loose scale and oil. The gap may not be greater than 18 in. The concrete block wall must have an hourly rating equal to or greater than the restrained assembly rating. The steel floor units between the beam and masonry wall need not be sprayed due to the protection provided by the box enclosure formed by the metal lath and the SFRM.

**6. Spanning Gaps Between a Vertical Column and a Rated Concrete Block Wall**

Where a vertical column is in close proximity to a rated concrete block wall, preventing the entire perimeter of the column from being properly protected with Spray-Applied Fire Resistive Material (SFRM), one of the following methods may be used to maintain the fire resistance rating of the column assembly, depending on the depth of the gap. The protection on the remaining sides of the column shall be in accordance with the requirements in the specified column design. The concrete block wall must have an hourly rating equal to or greater than the column rating. a) For gaps greater than 2 in. and up to 18 in., minimum 3.4 lb/sq yd galvanized or painted expanded steel lath shall be used to bridge the gap between the column and the masonry wall. The lath shall be mechanically attached by welds, screws or powder-actuated fasteners to both flanges of the column and the masonry façade. The SFRM shall be applied to the entire metal lath surface at the thickness specified for the column in the chosen design for the desired rating. The column, lath and masonry wall shall be clean and free of dirt, loose scale and oil. b) For gaps 2 in. or less, no metal lath is required to bridge the gap. The gap shall be completely filled with the SFRM. If Type 300 is used, prior to its application Type PC Pre-coat shall be applied to the masonry wall in the area where the SFRM will be applied. The thickness of Type PC Pre-coat is included in the total thickness of protection material.

See Volume 1 of UL Fire Resistance Directory for illustrations of designs and fire resistance ratings.

See UL Fire Resistance Directory for illustrations of designs and fire resistance ratings.

**GYPSUM BOARD (CKNX)****GENERAL**

This category covers gypsum board investigated for use in fire-resistance designs as detailed in Fire-resistance Ratings – ANSI/UL 263 (BXUV).

Gypsum board represents a family of products that includes gypsum board ceiling board, water-resistant gypsum backing board, gypsum backing board, gypsum coreboard, gypsum shaft-liner board, predecorated gypsum board, gypsum sheathing, exterior gypsum soffit board, gypsum base for veneer plaster, gypsum lath, and gypsum formboard.

Gypsum board consists of a gypsum core reinforced with mineral fibers and surfaced on both sides with paper or similar material bonded to the core. It can be applied to steel or wood framing, or to furring attached to steel or wood framing or concrete building components to form walls, ceilings or soffits. Gypsum board can also be applied to columns or beams as specified in the individual designs.

**RELATED PRODUCTS**

For information on related products, see Fire-resistance Ratings – ANSI/UL 263 (BXUV).

For information on surface-burning characteristics, see Gypsum Board (BWFR).

**ADDITIONAL INFORMATION**

For additional information, see Fire-resistance Ratings (BXRH).

**REQUIREMENTS**

The basic standard used to investigate products in this category is ANSI/UL 263, "Fire Tests of Building Construction and Materials."

**UL MARK**

The Classification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Classification and Follow-Up Service. The Classification Mark for these products includes the UL symbol, the word "CLASSIFIED" above the UL symbol (as illustrated in the Introduction of this Directory), and the following additional information:

**GYPSUM BOARD****FIRE RESISTANCE CLASSIFICATION****DESIGN NO(S). \_\_\_\_****SEE UL FIRE RESISTANCE DIRECTORY****Issue No.****or****GYPSUM BOARD****FIRE RESISTANCE CLASSIFICATION****SEE UL FIRE RESISTANCE DIRECTORY****Issue No.**

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# ISOLATEK® QWIK-SET®

Set Accelerating Material

ISOLATEK QWIK-SET is an Underwriters Laboratories (UL) approved gypsum accelerator that is specifically manufactured for utilization with CAFCO® 300, CAFCO® 300 AC, CAFCO® 300 HS, CAFCO® 300 ES and CAFCO® 300 SB, and CAFCO® 304 Spray-Applied Fire Resistive Materials (SFRMs). When used, ISOLATEK QWIK-SET will reduce set times and increase yields. Using ISOLATEK QWIK-SET allows the CAFCO 300 products to be applied in multiple passes per day allowing for a more time and cost effective application.

ISOLATEK QWIK-SET is not required to be used with CAFCO 300, CAFCO 304 and CAFCO 300 SB, however due to its labor saving benefits and ease of use during the application process, it has become the preferred method of application.

ISOLATEK QWIK-SET is simply mixed with water and is applied with a standard chemical metering pump which conveys the solution through a hose to the nozzle or in-line where it is then mixed with the CAFCO SFRM slurry.

## MAJOR SPECIFICATIONS

ISOLATEK QWIK-SET when used in conjunction with CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES and CAFCO 300 SB, and CAFCO 304 complies with the requirements of the following specifications:

- General Services Administration (GSA): AIA/SC/GSA:07811
- Department of the Navy NAVFACENGCOM Guide Specification NFGS 07810, Sprayed-On Fireproofing
- Veterans Administration (VA): H-08-1
- U.S. ARMY Corps of Engineers CEGS-07811
- U.S. Environmental Protection Agency (EPA): Regulation 40
- Construction Specification Canada (CSC) TEK-AID

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## Benefits:

- Increased Yield
  - Multiple Passes Per Day
  - Faster Application
  - Reduced Labor Costs
- 
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ISOLATEK INTERNATIONAL is registered with the AIA Continuing Education System (AIA/CES)



## For Further Information

CAFCO Technical and Sales Representatives are always available to lend assistance. Additional printed materials, including Material Safety Data Sheets, and other product literature, are available upon request. For more information about our CAFCO line of sprayed fire protection, thermal and acoustical treatments, Intumescent Coatings, thermal barriers and CAFCO-BOARD® or for the name of the Sales Representative in your area, please contact:

**In the United States:** Isolatek International, Stanhope, New Jersey Tel: 800.631.9600 Fax: 973.347.9170  
**In Europe:** Isolatek International (Europe) Ltd, UK Tel: +44.1623.726242 Fax: +44.1623.729346  
**In Mexico:** Cafco Mexico S.A. de C.V., Mexico D.F. Tel: 525.254.6683 Fax: 525.531.7826  
**In Canada:** Cafco Industries, Toronto (Ontario) Tel: 888.873.0003 Fax: 416.679.2933  
**In Asia/Pacific:** Tel: 60.3.5121.3886 Fax: 60.3.5121.4886

For more detailed product information, visit our website at [www.isolatek.com](http://www.isolatek.com) or contact us at [technical@isolatek.com](mailto:technical@isolatek.com)



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Total Passive Fire Protection



## SHORT FORM APPLICATION GUIDE ISOLATEK® QWIK-SET



*ISOLATEK QWIK-SET is a gypsum accelerator that is used in conjunction with CAFCO® 300, CAFCO 300 AC™, CAFCO 300 HS™, CAFCO 300 ES, CAFCO 300 SB, CAFCO 304, CAFCO 400 AC, and CAFCO 400 ES to reduce the set time and increase yield. ISOLATEK QWIK-SET is applied by using a chemical metering pump which conveys the solution through a hose to the nozzle or in-line where it is mixed with the slurry.*

*The applicator shall completely and fully read and understand the Long Form Application & Installation Manuals for the specific CAFCO® Spray-Applied Fire Resistive Materials (SFRMs) being used in conjunction with ISOLATEK QWIK-SET prior to application.*

### **EQUIPMENT REQUIREMENTS:**

ISOLATEK QWIK-SET requires an adjustable type chemical metering pump, a plastic 50 gallon (190 L) reservoir tank and an agitator mixer. ISOLATEK QWIK-SET is pumped through a pressure rated 1/4 in. (6 mm) I.D. hose to a standard injection cartridge where it is introduced at the nozzle or in-line.

**Note:** Since the ISOLATEK QWIK-SET solution is mildly acidic, all pumps and fittings must be resistant to this type of solution.

### **APPLICATION:**

For CAFCO 300 family of products, each bag of ISOLATEK QWIK-SET requires 12.5 gallons (48 L) of potable water. For CAFCO 400 AC or CAFCO 400 ES, each bag of ISOLATEK QWIK-SET requires 30 gallons (114 L) of potable water.

When mixing multiple bags, add each bag slowly to ensure that the previous bag is fully dissolved before adding additional bags. Typical mix time to fully dissolve 1 bag of ISOLATEK QWIK-SET is 5 minutes. Continually mix the ISOLATEK QWIK-SET solution during use.

### **HOSE SET-UP:**

Following mixing, place a 1036cc cup on a 2000 gram capacity scale and slowly fill the cup with the ISOLATEK QWIK-SET solution. When ISOLATEK QWIK-SET is properly mixed, the 1036cc cup must weigh between 1180 to 1240 grams when using 12.5 gallons (48 L) of water per bag of QWIK-SET for the CAFCO 300 family of products and 1090 to 1130 grams when using 30 gallons (114 L) of water per bag of QWIK-SET for CAFCO 400 AC & ES.

Use 1/4 in. (6 mm) I.D. high pressure hose. Lengths dependent on material hose set-up.

### **APPLICATION:**

To achieve a desired density and yield follow the steps below:

1. Weigh an empty 1036cc cup and "zero" the scale with the cup on it.
2. While the pump and atomizing air are running, place the nozzle head inside the cup and slowly pull back as the cup fills.
3. Level the product with the top of cup, being careful not to compress the product. Leveling must be repeated until the material stops swelling in cup. When leveling the product, angle the spatula so that it is cutting the excess product as opposed to troweling/compressing it.
4. Weigh the filled cup in grams.
5. Match the cup weight with the appropriate Isolatek short form application guide density chart for the product you are using. Adjust the ISOLATEK QWIK-SET flow rate and repeat the steps above until the desired density and yield are achieved.

### **INTRODUCTION OF ISOLATEK QWIK-SET:**

ISOLATEK QWIK-SET is typically introduced in-line. When using a 1 in. (25 mm) whip hose, the ISOLATEK QWIK-SET must be introduced a maximum of 25 ft. (8 m) back; when using a 3/4 in. (19 mm) whip hose, the ISOLATEK QWIK-SET should be introduced a maximum of 17 ft. (5 m) back. As an alternative, ISOLATEK QWIK-SET can be introduced at the nozzle. **Depending on the product being used, maximum 5% ISOLATEK QWIK-SET can be utilized.**

## **USAGE:**

One bag of ISOLATEK QWIK-SET will set approximately 19 bags of CAFCO 300, CAFCO 300 SB, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, and CAFCO 304 materials when the product is applied at an average 15 pcf (240 kg/m<sup>3</sup>) density.

One bag of ISOLATEK QWIK-SET will set approximately 30 bags of CAFCO 300, CAFCO 300 SB, CAFCO 300 ES, CAFCO 300 HS, and CAFCO 304 materials when the product is applied at an average 17.5 pcf (280 kg/m<sup>3</sup>) density.

One bag of ISOLATEK QWIK-SET will set approximately 35 bags of CAFCO 400 AC and CAFCO 400 ES materials when the product is applied at an average 22 pcf (352 kg/m<sup>3</sup>) density.

**Note: Exceeding the above guidelines will result in average densities below UL Design or Assessment minimum guidelines.**

## **YIELD CHARTS:**

In order to determine mixer and cup weights, refer to CAFCO 300, CAFCO 300 AC, CAFCO 300 HS, CAFCO 300 ES, CAFCO 300 SB, CAFCO 304, CAFCO 400 AC, or CAFCO 400 ES Short Form and/or Long Form Application Manuals.

## **PRECAUTIONS:**

1. In-line injecting beyond the maximum distance shown above may re-temper the material. This will result in poor physical performance properties and cracking.
2. Do not add ISOLATEK QWIK-SET solution to the product while the product is in the mixer or pump. This will result in a premature set and will cause blockages in the equipment and/or material lines.
3. The water ratio and ISOLATEK QWIK-SET rate must be adjusted to achieve the desired density and yield. Do not apply product below the recommended cup weights.
4. ISOLATEK QWIK-SET is slippery when mixed with water. Do not allow material to remain on scaffolds, ladder rungs or floors. Walking on wet product may result in slips or falls.
5. During use, this product may cause local skin irritation. Protect skin by wearing loose clothing and gloves. Wash work clothes separately from other garments.
6. To prevent irritation to eyes and respiratory tract from product which may become airborne during use, wear NIOSH approved or equivalent dust masks and goggles or safety glasses.
7. ISOLATEK QWIK-SET may stain or discolor aluminum or metal doors and window frames, window glass or other surfaces. Provide masking, drop cloths or other suitable coverings to protect surfaces.
8. ISOLATEK QWIK-SET may stain or discolor floor slabs and may inhibit or reduce the ability of tile or carpet to adhere to the slab. Protect floor slabs from leaks or spills especially in the vicinity of the ISOLATEK QWIK-SET equipment and hoses.
9. After use, tank, pump and hose must be thoroughly flushed clean with water.

**For additional information, please contact the Technical Service Department.**



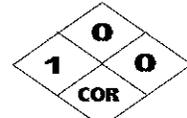
41 Furnace Street, Stanhope, NJ 07874 Tel: (800) 631-9600 Fax: (973) 347-6730  
Visit us at [www.isolatek.com](http://www.isolatek.com) or contact us at [technical@isolatek.com](mailto:technical@isolatek.com)

**WE SAVE LIVES®**

Health Hazard	1
Fire Hazard	0
Physical Hazard	0
Personal Protection	E

**HMIS RATING**

**MATERIAL SAFETY DATA SHEET  
(OSHA 29 CFR 1910.1200)**



**NFPA RATING**

Effective Date: September 3, 2009  
Supersedes: May 10, 2005

**SECTION I – PRODUCT INFORMATION**

- MANUFACTURER'S NAME AND ADDRESS:**  
United States Mineral Products Company  
dba Isolatek International/CAFECO INDUSTRIES  
41 Furnace Street  
Stanhope, NJ 07874
- EMERGENCY TELEPHONE NUMBER:**  
973-347-1200
- CHEMICAL NAME AND SYNONYMS**  
Aluminum Sulfate Hydrate - Alum
- CHEMICAL FAMILY:**  
Inorganic Acid Salt
- FORMULA:**  
Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> Hydrate
- TRADE NAMES AND SYNONYMS:**  
CAFECO QWIK-SET®

**SECTION II – HAZARDOUS INGREDIENTS/IDENTITY INFORMATION**

INGREDIENT	CAS NUMBER	OSHA PEL	ACGIH TLV – TWA
Aluminum Sulfate	1043-01-3 (Anhydrous)	2mg/m <sup>3</sup>	2mg/m <sup>3</sup>

**SECTION III – PHYSICAL/CHEMICAL CHARACTERISTICS**

- Boiling Point (°F): N/Ap
- Vapor Density (Air=1): N/Ap
- Solubility in Water: 50% by Wt.
- Specific Gravity (H<sub>2</sub>O=1): 1.6
- Evaporation Rate: N/Ap
- Appearance and Odor: White or buff granules or powder. No odor.
- Physical State: Solid
- Percent Volatile by Volume (%): N/Ap
- Vapor Pressure (mm Hg): Negligible

**SECTION IV - FIRE AND EXPLOSION HAZARD DATA**

- Flash Point (Method used): Non-flammable
- Flammable Limits: N/Ap
- Extinguishing Media: N/Ap
- Special Fire Fighting Procedures: Wear self-contained breathing apparatus.
- Unusual Fire and Explosion Hazards: Thermal decomposition produces toxic fumes.

**SECTION V - REACTIVITY DATA**

- Stability: Stable  
Conditions to Avoid: Temperatures above 760°C (1400°F)
- Incompatibility (Materials to Avoid): Alkalis and water sensitive materials.
- Hazardous Decomposition Products: Will release SO<sub>2</sub> and SO<sub>3</sub> at temperatures cited above.
- Hazardous Polymerization: Will not occur  
Conditions to Avoid: N/Ap

N/Ap = Not Applicable

## SECTION VI - HEALTH HAZARD DATA

Primary Routes of Entry: Inhalation, Skin and Eye Contact.

Acute: Dust or mist inhalation at levels above the TLV levels listed herein may irritate respiratory tract. May cause irritation to eyes and skin.

Chronic: Inhalation over long periods of high amounts of any dust may overload lung clearance mechanisms and may make the lungs more vulnerable to disease.

Carcinogenicity: NTP - NO IARC - NO OSHA - NO

Medical Conditions Aggravated by Exposure: Any condition which may be aggravated by mechanical irritants.

Emergency and First Aid Procedures:

- Eye Contact: \*Flush with water. If irritation persists, seek medical attention.
- Skin Contact: \*Wash with water. Launder clothing separate from other garments.
- Inhalation: \*Remove to fresh air.
- Ingestion: \*If conscious, drink large amounts of water.

\*Seek medical attention for all cases of overexposure.

**USE NORMAL PERSONAL HYGIENE AFTER CONTACT TO REMOVE ANY MATERIAL CONTAMINANTS.**

### California Proposition 65

This product **does not contain** substances known to the State of California to cause cancer, birth defects, or other reproductive harm.

## SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

1. Steps to be taken in case material is released or spilled:  
Dry material may be shoveled into containers for later use or disposal.
2. Waste Disposal Method: In accordance with local, state, and federal regulations.
3. Precautions to be taken in handling and storing:  
Avoid inhalation of dust during use. Avoid skin and eye contact. Use normal personal hygiene to remove material contaminants.

## SECTION VIII - CONTROL MEASURES

1. Respiratory Protection: Use NIOSH approved dust mask or equivalent for nuisance dust.
2. Ventilation: Maintain dust levels below TLV.
3. Protective Gloves: Wear Neoprene, PVC or equivalent gloves.
4. Eye Protection: Wear proper eye protection.
5. Other Protective Equipment: Wear loose fitting long sleeve shirt and pants.

## SECTION IX- PREPARATION INFORMATION

Prepared By: Research Department, U.S.A.

Telephone: (973) 347-1200

Effective Date: September 3, 2009

Supersedes: May 10, 2005

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof. **VENDOR SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** In no event shall the vendor be liable for special, indirect or consequential damages.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in this data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes all risks in his use of the material.

## ISOLATEK<sup>®</sup> QWIK-SET INSTRUCTIONS

1. **For CAFCO<sup>®</sup> 300/300AC and CAFCO 300HS:** Mix one bag of ISOLATEK QWIK-SET with 12.5 gallons of potable water. A properly mixed solution should weigh between 1220 and 1255 grams when using an Isolatek supplied density cup.
2. **For CAFCO 400AC:** Mix one bag of ISOLATEK QWIK-SET with 30 gallons of potable water. A properly mixed solution should weigh between 1120 and 1150 grams when using an Isolatek supplied density cup.
3. **For CAFCO 3000:** Mix one bag of ISOLATEK QWIK-SET with 10 gallons of potable water. A properly mixed solution should weight between 1260 and 1285 grams when using an Isolatek supplied density cup.

When mixing multiple bags, add each bag slowly to ensure that the previous bag is fully dissolved before adding additional bags. Typical mix time to fully dissolve 1 bag of ISOLATEK QWIK-SET is 5 minutes. Continually mix the ISOLATEK QWIK-SET solution during use.

09/15



# COATINGS & SEALANTS

From exterior industrial environments, to open air parking garages, mechanical rooms and elevator shafts, you can be sure there is a CAFCO coating or sealant which meets your needs.

Only ISOLATEK offers such a wide variety of surface coatings and sealants for Spray-Applied Fire Resistive Materials (SFRMs) as well as sprayed Thermal and Acoustical materials.

ISOLATEK has several products which provide multiple degrees of enhanced surface integrity. Each has been specifically engineered to provide tough, reliable performance and protection.

## SEALANTS

### CAFCO® BOND-SEAL (Type EBS)

*Water based sealer designed to provide a firmer surface texture. Inexpensive, quick, and easy to apply.*

Ideal for elevator shafts, mechanical rooms, areas next to air shafts, or anywhere high velocity air flow or vibration occurs. Is also used as an adhesive for CAFCO SFRMs and Insulation Products.

#### SPECIFICATIONS:

- UL classified. Will not adversely affect fire resistive performance when used in accordance with UL guidelines.
- Clear drying. May be tinted to meet specification requirements.
- Easily applied by airless spray equipment.
- Can be applied over SFRMs, Thermal Insulation and Acoustical Materials.
- Inorganic/Mold resistant.
- Locks down loose particulates which may result from abuse.

### CAFCO BOND-SEAL TYPE X

*Green tinted, water based surface encapsulant used as a lock down after abatement. Also can be applied as a surface sealer over SFRMs to identify areas of abatement or respray.*

#### SPECIFICATIONS:

- UL classified.
- Inorganic/Mold resistant.
- Water soluble.
- Dries to a green tint which allows for easy identification after use.
- Easily applied with airless spray equipment.
- For application with all CAFCO SFRMs.
- Encapsulates loose particulates which may result from abatement work.

## COATINGS

### CAFCO TOP-COTE™

*Water based, permeable surface coating designed to provide multiple degrees of flexibility and abrasion resistance, TOP-COTE™ forms a tough, yet aesthetically pleasing and bright appearance.*

Ideal for indirect weather exposures and high wear applications such as covered parking garages, elevator shafts, mechanical rooms, work centers, or anywhere an attractive, abrasion resistant, and resilient surface coating is required.

#### SPECIFICATIONS:

- Will not adversely affect fire resistive performance when used in accordance with UL guidelines.
- Dries to white color and has high light reflective properties.
- Easy to apply by brush, roller, or airless spray equipment.
- Can be applied over SFRMs, Thermal Insulation and Acoustical Materials.
- Bridging encapsulant binds together loose particulates which may result from abuse.

#### APPLICATION/COVERAGE

CAFCO TOP-COTE offers the design flexibility of various levels of protection and appearance. Simply by applying the material at different coverage rates, a number of textures and abrasion resistant levels can be achieved. By rolling or tamping flat the surface of the base material prior to applying CAFCO TOP-COTE, a smooth and pleasing appearance can be created.

For a tight surface texture which must stand up to high velocity air flow, apply CAFCO TOP-COTE at 120 ft<sup>2</sup>/U.S. gal (2.9m<sup>2</sup>/liter). This coverage ensures that the surface is bound together to form a tight, durable texture.

A tougher coating that stands up to wear and tear in work areas, can be obtained by applying CAFCO TOP-COTE at a 60 ft<sup>2</sup>/U.S. gal (1.5m<sup>2</sup>/liter) rate. Yielding a tougher, abrasion resistant coat, this coverage rate also provides a whiter and brighter appearance. Such a resilient finish is ideal for mechanical rooms, generator rooms, automotive bays, and anywhere occasional physical contact with the SFRMs or insulation material may occur.

When an extreme wear and abrasion resistant surface is called for, apply CAFCO TOP-COTE at 30 ft<sup>2</sup>/U.S. gal (0.74m<sup>2</sup>/liter). This application rate provides almost continuous, solid coverage. Clean in appearance and extremely abrasion resistant, this coating rate is also permeable and offers a high level of light reflectance. It is ideal for use in correctional facilities and prevents whip antenna damage in parking garages.

Other application rates can be used to obtain desired coverage and surface characteristics; however, CAFCO TOP-COTE is not recommended for coverage rates beyond 15 ft<sup>2</sup>/U.S. gal (0.37m<sup>2</sup>/liter) applied to a tamped flat surface material.

# COATINGS

## CAFCO® FENDOLITE® M-II

High density, portland cement based Spray-Applied Fire Resistive Material used alternately as a coating. Provides highest degree of damage and abrasion resistance of all ISOLATEK coatings or sealants offered. Ideal for indirect weather exposures, or anywhere a rigid, tough, cement-like finish is desired.

### SPECIFICATIONS:

- UL classified. Will not adversely affect fire resistive performance when used in accordance with UL guidelines.
- Easy to apply with standard wet-mix application equipment or by trowel using TG .
- UL approved to be applied directly over Commercial & Medium density SFRMs at a maximum 1/4" thickness.
- Excellent abrasion and erosion resistant properties.
- Locks down loose particulates which may result from abuse.
- May be used as a stand-alone fire resistive material.

### Quick-Reference Selection Chart

<b>Product Characteristics</b>	<b>CAFCO BOND-SEAL</b>	<b>CAFCO BOND-SEAL TYPE X</b>	<b>CAFCO FENDOLITE M-II</b>	<b>CAFCO TOP-COTE</b>
Drying Color	Clear	Green Tint	Light Gray	White
Enhancement Type	Water based surface sealer. Enhances the surface texture.	Water based surface encapsulant. Locks down particulates during abatement.	High density, cement based coating. Forms a rigid, weather resistant surface.	Water based, permeable surface coating. Forms flexible, abrasion resistant finish.
UL Classified	✓	✓	✓	*
Suitable Over Wet Mix Products	✓	✓	✓	✓
Suitable Over Dry Mix Products	✓	✓	✓	✓
<b>Sample Applications</b>				
Abated Surfaces		▲		
Automotive Bays	●	●	●	▲
Correctional Facilities	●	●	●	▲
Elevator Shafts	▲	●	●	●
Generator Rooms	●	●	●	▲
Indirect Weather Exposures			▲	●
Loading Docks	●	●	▲	●
Locker Rooms	●	●	●	▲
Machine Shops	●	●	●	▲
Mechanical Rooms	●	●	●	▲
Open Air Parking Decks	●	●	▲	●
Parking Garages	●	●	●	▲
Warehouses	▲	●	●	●
* Acceptable for use over CAFCO Spray-Applied Fire Resistive Materials.      ▲ Primary Recommendation      ● Secondary Selection				

In the United States: Isolatek International, Stanhope, New Jersey Tel: 800.631.9600 Fax: 973.347.9170

In Mexico & Central America: Cafco Mexico S.A. de C.V., Mexico D.F. Tel: 525.254.6683 Fax: 525.531.7826

In Canada: Cafco Industries, Toronto (Ontario) Tel: 888.873.0003 Fax: 416.679.2933

In Asia/Pacific: Tel: 60.3.5121.3886 Fax: 60.3.5121.4886

For more detailed product information, visit our website at [www.cafco.com](http://www.cafco.com) or contact us at [technical@isolatek.com](mailto:technical@isolatek.com)



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The performance data herein reflect our expectations based on tests conducted in accordance with recognized standard methods under controlled conditions. The applicator, general contractor, property owner and/or user MUST read, understand and follow the directions, specifications and/or recommendations set forth in Isolatek International's publications concerning use and application of these products, and should not rely merely on the information contained in this product data sheet. Isolatek International is not responsible for property damage, bodily injuries, consequential damages, or losses of any kind that arise from are related to the applicator's, general contractor's, or property owner's failure to follow the recommendations set forth in Isolatek International's publications. The sale of these products shall be subject to the Terms and Conditions of Sale set forth in the Company's invoices.



Total Passive Fire Protection 7/12



HMIS CODES:  
0 = NONE 4 = EXTREME  
HEALTH: 1  
FIRE: 0  
REACTIVITY: 0

## MATERIAL SAFETY DATA SHEET

PERSONAL PROTECTION: B

### SECTION I – CHEMICAL PRODUCT / COMPANY INFORMATION

**Product Name:** CAFCO® BOND-SEAL  
CAFCO® BOND-SEAL TYPE X  
ISOLATEK® TYPE EBS or TYPE X

**Effective Date:** August 6, 2012

**Supersedes:** 9/3/09, 7/27/09

**Manufacturer:** United States Mineral Products Company  
dba Isolatek International  
41 Furnace Street  
Stanhope, NJ 07874 USA  
973-347-1200

**Preparer:** R&D Department

**CHEMTREC Transportation  
Emergency Phone #:** 800-424-9300 / 703-527-3887 (Intl.)

### SECTION II – HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

REPORTABLE COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP	WEIGHT PERCENT
Acetic Acid Ethenyl Polymer W/ Ethenol	25213-24-5	N/A	1.0 to 5.0

SARA 313: No toxic chemical(s) subject to the reporting requirements of section 313 of Title III and of 40 CFR 372 are present.

### SECTION III – PHYSICAL/CHEMICAL CHARACTERISTICS

1. Boiling Point (°F):	>212
2. Vapor Density (Air=1):	Lighter than air
3. Solubility in Water:	Miscible
4. Specific Gravity (H <sub>2</sub> O=1):	1.09
5. VOC:	0
6. Evaporation Rate:	Faster than n-butyl acetate
7. Appearance and Odor:	White liquid (BOND-SEAL Type X is green), mild odor.
8. Physical State:	Liquid
9. Percent Solid by Weight (%)	50

### SECTION IV - FIRE AND EXPLOSION HAZARD DATA

OSHA FLAMMABILITY CLASS: Not regulated, Class III B

1. Flash Point:	>200°F Method Used: No data
2. Flammable Limits In Air by Volume:	Lower (LEL): No Data Upper (UEL): No Data
3. Extinguishing Media:	Water, Foam, Carbon Dioxide or Dry Chemical
4. Special Fire Fighting Procedures:	Wear positive pressure self-contained NOISH approved breathing equipment
5. Unusual Fire and Explosion Hazards:	Sealed pails may rupture. Keep cool with water.

### SECTION V - REACTIVITY DATA

1. Stability:	Stable
2. Conditions to Avoid:	Mixture with or exposure to incompatible materials (see below)
3. Incompatibility (Materials to Avoid):	Strong oxidizing agents
4. Hazardous Decomposition by Products:	CO, CO <sub>2</sub>
5. Hazardous Polymerization:	Will not occur

## SECTION VI - HEALTH HAZARD DATA

Primary Routes of Entry: Inhalation, Skin and Eye Contact.

Acute: May cause skin or eye irritation. Inhalation may cause dizziness and irritation to nose, throat and lungs

Chronic: None known.

Carcinogenicity: NTP - NO IARC - NO OSHA - NO

Emergency and First Aid Procedures:

Eye Contact: Flush eyes with clean water for at least 15 minutes. If irritation persists, seek medical attention.  
Skin Contact: Wash affected area with soap and water for at least 15 minutes. If irritation persists, seek medical attention.  
Inhalation: If adverse effects occur, remove to fresh air. If irritation persists, seek medical attention.  
Ingestion: If swallowed, do not induce vomiting. If irritation persists, seek medical attention.

### California Proposition 65

This product **does not contain** substances known to the State of California to cause cancer, birth defects, or other reproductive harm.

## SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

1. Steps to be taken in case material is released or spilled:  
Ventilate area. Spill area will be slippery. Contain spill. Mop up or absorb on inert material and place in container.
2. Waste Disposal Method: In accordance with local, state, and federal regulations.
3. Precautions to be taken in handling and storing:  
Avoid extreme temperatures – do not allow to freeze. Avoid excess skin and eye contact.

## SECTION VIII – PERSONAL PROTECTION RECOMMENDATIONS

1. Respiratory Protection: A dust mask should be used in cases where individuals are exposed to airborne mists of the material.
2. Ventilation: Provide ventilation to ensure compliance with applicable exposure limits.
3. Glove Recommendations: Wear cloth, rubber or latex type gloves.
4. Eyes/Face: Wear splash resistant safety goggles.
5. Protective Clothing: Wear typical long sleeve work clothing or a "TYVEK®" type suit.

## SECTION IX- PREPARATION INFORMATION

Prepared By: Research Department, U.S.A.

Telephone: (973) 347-1200

Effective Date: 8/6/12

Supersedes: 9/3/09, 7/27/09

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[Date]

Mr. Devin Yedo  
Anning-Johnson Company  
14700 NE 95<sup>th</sup> St. Ste. 201  
Redmond, WA 98502

RE: [Project Name, Project Address]

Dear Mr. Yedo:

This is to certify that Anning-Johnson Company, located in Redmond, WA is a recognized applicator of Isolatek International and is authorized to purchase and install CAFCO® products for sprayed fire protection, thermal insulation and acoustical control. Anning-Johnson Company has over 10 years experience applying our products.

We trust this information is of assistance. Should you have any questions, please feel free to contact the undersigned at 973-347-1200.

Sincerely,



Matthew Martinez  
Applications Engineer  
CAFCO® Fire Protection Products

MLM  
Cc: T. Wildeboer – Isolatek International



**Leadership in Energy and Environmental Design  
LEED 2009 Green Building Rating System™**





# Isolatek Contributions to LEED 2009

As the world’s leading manufacturer of structural steel fire protection products, Isolatek International recognizes the value of designing buildings to meet the standards of the Leadership in Energy and Environmental Design (LEED) Program.

Attached you will find a detailed breakdown of how Isolatek products help contribute to certain LEED credits and the corresponding points. There is no such thing as a LEED certified product. The intent of the LEED program is to apply products to the outlined criteria for the various LEED credits.

The following are the areas of the LEED 2009 for New Construction and Major Renovations, where Isolatek products will contribute toward the credit(s):

Credit - Section	Page
➤ EA – Energy and Atmosphere	
◆ Prerequisite 2.....	1
◆ Credit 1(Optimize Energy Performance).....	1
➤ MR – Materials and Resources	
◆ Credit 1.1 (Building Re-use, 75% of Existing Walls, Roofs and Floors).....	2
◆ Credit 2 (Construction Waste, Divert 50%-75% from Disposal).....	2
◆ Credit 4 (Recycled Content, 10%-20% Post-Consumer + ½ Pre-Consumer).....	3
◆ Credit 5 (Regional Materials, 10%-20% Extracted, Processed, & Manufactured Regionally).....	4
◆ Manufacturing Map.....	5
➤ EQ – Indoor Environmental Quality	
◆ Credit 4.1 (Low-Emitting Materials, Adhesives and Sealants).....	6
◆ Credit 4.2 (Low-Emitting Materials, Paints and Coatings).....	6

The contents of this informational package should be used as a guide only. Please contact our Technical Services Department at 973-347-1200 (Option 1) with any questions concerning this package.



# Isolatek International - ISOLATEK® Fire Protection Products

## Contributions to LEED 2009 New Construction & Major Renovations



### Energy and Atmosphere

#### Prerequisite 2

**Intent:** Establish the minimum level of energy efficiency for the proposed building system

**Requirements:** Utilize one of the three options outlined in the LEED 2009 New Construction and Major Renovations guide.

**Potential Technologies & Strategies:** Design the building envelope and systems to meet the baseline requirements utilizing a computer simulation model.

**How ISOLATEK Contributes:** Both Wet-Mix and Dry-Mix materials provide thermal resistance and NRC (Noise Reduction Coefficient) values. This will reduce the amount of energy needed for climate control, and reduce any added materials needed for soundproofing. This credit only applies to materials when used within the building envelope.

**Products that Contribute:**

CAFECO® 300/300AC/300SB/304, CAFECO® 400  
 CAFECO® BLAZE-SHIELD® II, CAFECO® BLAZE-SHIELD® HP  
 CAFECO-BOARD®, SOUND-SHIELD® 40' HEAT-SHIELD®  
 CAFECO® FENDOLITE M-II/TG

#### EA Credit 1: Optimize Energy Performance 1-19 Points

**Intent:** Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

**Requirements:** Select one of three compliance path options described in the LEED-NC Version 2.2 page 35

**How ISOLATEK Contributes:** Both Wet-Mix and Dry-Mix materials provide thermal resistance and NRC (Noise Reduction Coefficient) values. This will reduce the amount of energy needed to for climate control, and reduce any added materials needed for soundproofing. This credit only applies to materials when applied within the building envelope.

**Products that Contribute:**

CAFECO 300/300AC/300SB/304, CAFECO 400  
 CAFECO BLAZE-SHIELD II, CAFECO BLAZE-SHIELD HP  
 CAFECO-BOARD, SOUND-SHIELD 40, HEAT-SHIELD  
 CAFECO FENDOLITE M-II/TG





**MR Credit 1.1: Building Reuse: Maintain of Existing Walls, Roofs & Floor**

Building Reuse	Points
55%	1
75%	2
95%	3

**Intent:** Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transportation.

**Requirements:** Maintain at 55% - 95% (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, exclude window assemblies and non-structural roofing material)

**Potential Technologies & Strategies:** Remove elements that pose contamination risk to the building occupants and upgrade components that would improve energy and water efficiency.

**How ISOLATEK Contributes:** Wet-Mix and Dry-Mix products are utilized for retrofit/rehab construction. They will provide fire resistance ratings to unprotected structural members which will bring the existing building up to code. This will eliminate the need to replace the structural elements, that were not code compliant. An example would be wood floors Remember that this credit only applies when at least 55% of the surface area of the building is reused.

**Products that Contribute:**

CAFCO 300/300AC/300SB/304, CAFCO 400  
CAFCO BLAZE-SHIELD II, CAFCO BLAZE-SHIELD HP  
CAFCO FENDOLITE M-II/TG, CAFCO-BOARD

**MR Credit 2: Construction Waste Management: Divert 50% - 75% from Disposal**

Recycled/Salvaged	Points
50%	1
75%	2

**Intent:** Divert construction, demolition and land clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to the appropriate sites.

**Requirements:** Recycle and/or salvage at 50%-75% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or commingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

**Potential Technologies & Strategies:** Establish goals for diversion from disposals in landfills and incinerators and adopt a construction waste management plan to achieve these goals. Consider recycling construction materials.

**How ISOLATEK Contributes:** Our products are supplied in either plastic or kraft paper bags that are able to be recycled. The pallets our products are shipped on can also be recycled. Our pailed products are supplied in 5 gallon plastic containers which are able to be sent to a recycling site. None of our products are hazardous materials.

**Products that Contribute:**

CAFCO 300/300AC/300SB/304, CAFCO 400  
CAFCO BLAZE-SHIELD II, CAFCO BLAZE-SHIELD HP  
CAFCO® SPRAYFILM® WB 3/WB 4/WB 5, BOND-SEAL  
CAFCO FENDOLITE M-II/TG, CAFCO-BOARD





**MR Credit 4: Recycled Content:**

Recycled Content	Points
10%	1
20%	2

**Intent:** Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

**Requirements:** Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes 10%-20% (based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of the assembly to determine the recycled content.

Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer materials is defined as material diverted from a waste stream during the manufacturing process. Excluded is the reutilization of materials such as rework, regrind, or scrap generated in a process and capable of reclaimed within the same process that generated it.

**Potential Technologies & Strategies:** Establish a project goal for recycled content and identify material suppliers that can achieve this goal. During construction ensure that the specified recycled content materials are installed.



**How ISOLATEK Contributes:** Our various products are manufactured with recycled materials. See the breakdown listed below, which identifies the recycled content percentage.

**Products that Contribute:**

- CAFECO BLAZE-SHIELD II - 67% Pre-consumer  
- **Total Recycled content for this credit is 33.5%**
- CAFECO BLAZE-SHIELD HP - 56% Pre-consumer  
- **Total Recycled content for this credit is 28%**
- CAFECO 300/300AC/300SB/304 - 10% Post-consumer  
- **Total Recycled content for this credit is 10%**
- CAFECO 400 - 10% Post-consumer  
- **Total Recycled content for this credit is 10%**
- CAFECO-BOARD - >75% Pre-consumer  
- **Total Recycled content for this credit is 45%**
- CAFECO HEAT-SHIELD - 90% Pre-consumer  
- **Total Recycled content for this credit is 45%**



**MR Credit 5: Regional Materials:**

Recycled Content	Points
10%	1
20%	2

**Intent:** Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

**Requirements:** Use building materials that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally then only that percentage (by weight) shall contribute to the regional value.

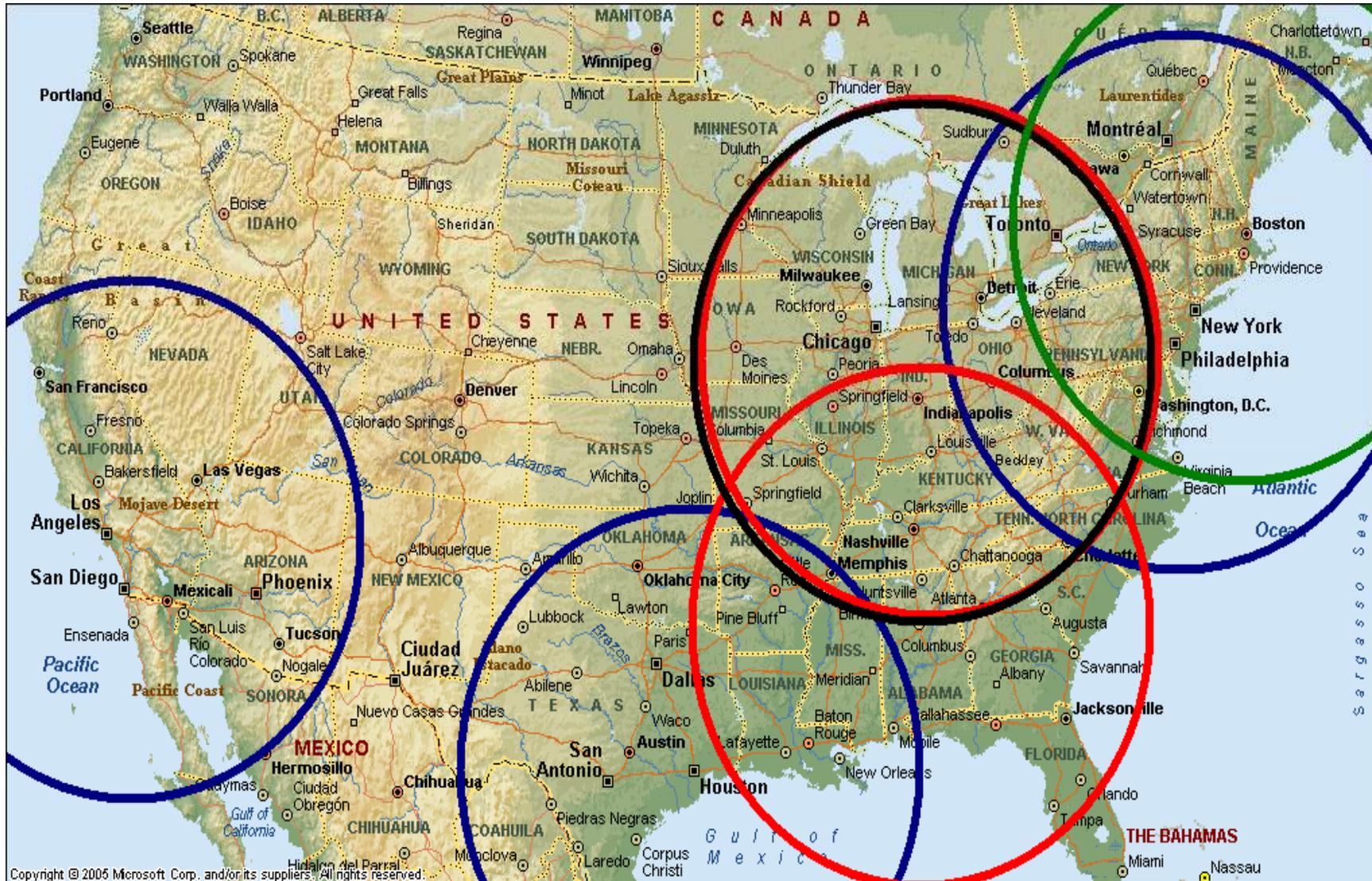
**Potential Technologies & Strategies:** Establish a project goal for locally sourced materials, and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local are installed and quantify the total percentage of local materials installed.



**How ISOLATEK Contributes:** In the Americas, Isolatek has strategically placed manufacturing facilities located in key areas. A map has been supplied to show manufacturing facilities and the required 500 mile radius to earn this credit.

**Products that Contribute:**

CAFECO BLAZE-SHIELD II - <b>Manufactured in Huntington, IN and Birmingham, AL</b>
CAFECO BLAZE-SHIELD HP - <b>Manufactured in Huntington, IN</b>
CAFECO HEAT-SHIELD - <b>Manufactured in Huntington, IN</b>
CAFECO 300/300AC/300SB/304 - <b>Manufactured in Stanhope, NJ, Houston, TX and San Bernardino, CA</b>
CAFECO 400 - <b>Manufactured in Stanhope, NJ and Houston, TX San Bernardino, CA</b>
FENDOLITE M-II/TG & SOUND-SHIELD 40 - <b>Manufactured in Stanhope, NJ and Houston, TX San Bernardino, CA</b>
SPRAYFILM WB 3/WB 4/WB 5 & BOND-SEAL - <b>Manufactured in Lawrence, MA</b>
CAFECO-BOARD - <b>Manufactured in Warren, IN</b>





**IEQ Credit 4.1: Low-Emitting Materials: Adhesives and Sealants**  
**1 Point**

**Intent:** Reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of installers and occupants.

**Requirements:** All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the South Coast Air Quality Management District (SCAQMD) Rule #1168

**Potential Technologies & Strategies:** Specify low VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section of the specification where adhesives and sealants are addressed.

**How ISOLATEK Contributes:** CAFCO BOND-SEAL, BOND-SEAL X and TOP-COTE are all VOC Compliant and meet the standards set forth by South Coast Air Quality Management District Rule #1168.

**Products that Contribute:**  
 CAFCO BOND-SEAL  
 CAFCO BOND-SEAL X  
 CAFCO TOP-COAT

**EQ Credit 4.2: Low-Emitting Materials: Paints and Coatings**  
**1 Point**

**Intent:** Reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of installers and occupants.

**Requirements:** Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

**Architectural paints,** coatings and primers applied to interior walls and ceilings: Do not exceed the VOC limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993:

- \* Flats : 50 g/L
- \* Non-Flats: 150 g/L

**Potential Technologies & Strategies:** Specify low VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section of the specification where paints and coatings are addressed.

**How ISOLATEK Contributes:** CAFCO SPRAYFILM products and CAFCO TOPSEAL all meet the required VOC limits as outlined in this credit.

**Products that Contribute:**

Material	VOC Content*
CAFCO SPRAYFILM WB 3	0.0 g/L
CAFCO SPRAYFILM WB 4	0.0 g/L
CAFCO SPRAYFILM WB 5	0.0 g/L
CAFCO SPRAYFILM TOPSEAL™	0.20 lb/gal
CAFCO BLAZE-SHIELD II**	0.0 lb/gal
CAFCO BLAZE-SHIELD HP**	0.0 lb/gal
CAFCO 300/300AC/300SB**	0.0 lb/gal
CAFCO 400**	0.0 lb/gal
CAFCO FENDOLITE M-II/TG**	0.0 lb/gal

\* In accordance Federal Reference Method 24.

\*\* These materials may not be considered coatings and may not apply to this credit.

Conversion: (1 lb/gal = 119.8 g/L) or (1 g/L = 0.0083 lbs/gal)



ISOLATEK INTERNATIONAL PRESENTS

# Isolutions

Information & Solutions For Design & Construction Professionals

October 1996

Re-released February 2003

Number 2

## Construction Roof Traffic

*In order to maintain the required hourly fire resistance rating of a roof assembly, the bond of the Spray-Applied Fire Resistive Material (SFRM) must not be weakened during or after application. Unfortunately, there are too many cases where this does occur. By far, the predominant reason for delamination of SFRMs is **Construction Roof Traffic**; typically resulting from condensed or out of sequence work schedules.*

“Construction Roof Traffic” refers to the activity of walking, installing, or working with equipment on the roof of a building. Roof traffic above areas where the SFRM has already been applied, especially to **steel roof deck**, is a major concern for manufacturers and Building Team Members. Impact forces and deflection often compromise the adhesion between the material and substrate, which may cause the SFRM to delaminate or “bridge”.

Bridged SFRM refers to material essentially separated from the substrate but held in place cohesively by adjacent material. Bridged SFRM may fall off weeks, months, or even

years after the initial damage, resulting in an unsafe condition. Delamination or bridging not only jeopardizes the hourly fire resistance ratings required to meet governing building codes, but can also delay the construction work schedule, increase overall costs, and present a hazard to building occupants.

As the world’s leading manufacturer of SFRMs, Isolatek International recognizes this industry concern and offers several precautionary measures to help prevent delamination and the resulting consequences. Using terminology similar to that used by others in the fire protection industry, we clearly state on the back of our product data sheets under Section 3.2.5 of the Guide Specification: “*The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roofing is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and after construction roof traffic has ceased*”. Therefore, **all** roof work, including work on the perimeter and the installation of the roofing membrane and ballast, should be

completed prior to the SFRM application.

In addition to proper sequencing and coordination between trades, the following additional guidelines will help minimize the problem:

1. The design specifications for roof deck gauge and spans should be in accordance with the Steel Deck Institute recommendations for construction and maintenance loading.
2. Roof assemblies consisting of gypsum wallboard and insulation (mineral fiberboard, polyisocyanurate, polystyrene, etc.) above the metal deck is preferred instead of insulation only. The layer of wallboard (5/8") provides a more rigid roof system and helps distribute loads more effectively.
3. The SFRM manufacturer's recommended adhesive or bonding agent must be applied to all steel roof decking (without concrete topping) prior to the application of the SFRM. Bonding agents enhance the ability of the SFRM to adhere to the substrate.
4. When roof traffic is anticipated, as in the

case of periodic maintenance, roofing pavers should be installed as a walkway to distribute loads.

5. Although several painted roof decks are classified in certain UL roof designs, galvanized roof deck is a better substrate for bonding of SFRMs. Painted roof decks increase the risk of delaminations.

Rigid Board Fire Resistive Materials can be utilized on roof deck areas where construction roof traffic is unavoidable. Rigid Board Fire Resistive Materials are mechanically fastened to structural steel decking, as well as beams and columns, and is the reason why these materials are unaffected by construction roof traffic. Such a system should be considered carefully when determining the overall construction schedule.

*Following these guidelines will help to minimize the problems associated with SFRM delamination due to construction roof traffic. However, proper construction scheduling and coordination between trades cannot be overemphasized.*

## *Project Sequencing/Scheduling*

The proper application and performance of Spray-Applied Fire Resistive Materials (SFRMs) is dependent upon many variables associated with project sequencing/scheduling.

**Isolatek International, the world leader in passive fire protection, recognizes this industry concern and recommends the following scheduling practices which will result in a cost-effective, efficient SFRM installation.**

The coordination and scheduling of fire protection work with other trades on any project is a key factor in avoiding delays in job progress. *Clips, hangers, supports, sleeves and other attachments to the substrates to receive fire protection are to be placed by other trades prior to the application of*

*SFRMs.* This is critical since the patching and/or repairs of SFRMs typically results from non-compliance with this practice. Reducing the need for SFRM patching following its installation helps minimize the effect on the overall project schedule.

*The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of the SFRM is complete in that area.* Mechanical equipment that is fastened prior to the SFRM installation can make the application extremely labor intensive and inefficient. The installation is hindered since the applicator cannot clearly spray to those substrates requiring SFRMs. Additionally, the mechanical equipment must be completely covered to

avoid SFRM overspray onto these surfaces.

*SFRMs shall not be applied to steel floor decks prior to the completion of concrete work on that deck.* The installation of SFRMs to floor decking before the completion of concrete work can result in unacceptable adhesion of the SFRM to the substrate or even delamination of the SFRM. If such conditions exist, the SFRM must be reapplied to the affected areas in order to maintain the hourly fire rating requirements. This reinstallation often leads to valuable time lost in the construction schedule while also affecting the other trades to follow.

*The application of SFRMs to the underside of roof deck shall not commence until the roofing is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and after roof traffic has ceased.* Unlike

floor decking, roof decks are more susceptible to deflection caused by impact forces. These impact forces are typically the result of “Construction Roof Traffic” - the activity of walking, installing or working with equipment on the roof of a building. All too often, roof traffic compromises the adhesion of the SFRM resulting in “bridged” material and/or product delamination from the substrate. Please refer to “ISOLUTIONS #2 – Construction Roof Traffic” for details. The SFRM must be reapplied to the areas affected by roof traffic, again resulting in a less efficient installation process.

*Isolatek International strongly recommends following these key guidelines to provide the building team members and owners with an efficient, cost-effective SFRM installation. The coordination and scheduling of the SFRM application with other trades will help to avoid any delays in the project’s development and completion.*

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## *SFRM Temperature Guidelines*

The temperatures at which Spray-Applied Fire Resistive Materials (SFRMs) can be installed are critical to its long-term fire and physical performance characteristics.

*Isolatek International and other industry manufacturers state; "When the prevailing outdoor temperature at the building is less than 40° F (4° C), a minimum substrate and ambient temperature of 40° F (4° C) shall be maintained prior to, during, and a minimum of 24 hours after application of the Spray-Applied Fire Resistive Material.*

Traditional SFRMs require the use of water either at time of mixing or at the nozzle prior to application onto the steel substrate. Once the SFRM has been applied to the substrate, it must cure properly in order to exhibit acceptable physical performance characteristics. When SFRMs are subjected to temperatures below 40° F (4° C) after initial application to the steel, the

binders are not allowed sufficient time to hydrate. This can result in poor adhesion qualities of the SFRM to the substrate and adversely affect the overall fire performance.

It is critical that the substrate and ambient temperatures are equal to or exceed 40° F (4° C) prior to, during, and a minimum of 24 hours after application. Sufficient heat must be provided so that these temperature requirements are met. Coordination between the SFRM Applicator and the General Contractor is necessary so that the heating process is not compromised during the initial 24-hour time period.

Coupled with maintaining proper temperature is the need for sufficient air exchanges to fully dry the SFRM. The introduction of any moisture into areas containing SFRMs can present adverse conditions and result in unacceptable performance. The types and use of heaters is important. Both propane and kerosene heaters often introduce large

amounts of moisture into the area being heated. When utilizing heaters, it is imperative that proper ventilation practices be exercised. In addition, when utilizing heaters to achieve minimum substrate and ambient temperatures, tarp enclosures are recommended to contain the heat within areas where SFRMs are being installed.

Freezing temperatures can contribute to frequent delays in the SFRM scheduling. Aside from traditional SFRMs, another type of fire protection product exists that does not require the use of water during application.

Rigid Board Fire Resistive Materials are primarily composed of mineral wool and can provide equivalent fire resistance ratings as those achieved through the use of traditional SFRMs. By not requiring water during installation, Rigid Board Fire Resistive Materials can be installed

at any time throughout the building construction cycle. It is mechanically held in place utilizing a variety of attachment systems and does not rely on the steel alone for its adhesion qualities.

Rigid Board Fire Resistive Materials can also be used in conjunction with compatible SFRMs to form a "composite system". These systems often prove valuable in keeping the building construction cycle on or ahead of schedule. One of the most widely used "composite systems" allows for the installation of Rigid-Board Fire Resistive Materials to the perimeter steel during freezing temperatures. The exterior sheathing of the building is then installed, allowing for the heating of the internal structural steel. Once the inside ambient and substrate temperature of the internal steel has reached a minimum 40° F (4° C), the application of SFRMs may begin.

***Strict adherence to the specified temperature guidelines is a critical factor when applying SFRMs and directly relates to proper in-place performance.***

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**For Further Information** CAFCO® Technical and Sales Representatives are always available to lend assistance. Additional printed materials, including Material Safety Data Sheets, and other product literature, are available upon request. For more information about our CAFCO® line of sprayed fire protection, thermal and acoustical treatments, CAFCO-BOARD®, and SprayFilm™ Intumescent Coatings, or for the name of the Sales Representative in your area, please contact:

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