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USACE / NAVFAC / AFCEC / NASA **UFGS-07 81 00 (February 2011)**

Preparing Activity: USACE **Superseding**
UFGS-07 81 00 (November 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 81 00

SPRAY-APPLIED FIREPROOFING

02/11

PART 1 GENERAL

1.1 REFERENCES
1.2 SYSTEM DESCRIPTION
1.2.1 General Requirements
1.2.2 Fire Resistance Rating
1.2.3 Evaluation Reports - ICC-ES Reports
1.3 SUBMITTALS
1.4 QUALITY ASSURANCE
1.4.1 Installer Qualifications
1.4.2 Pre-Installation Meeting
1.5 DELIVERY, STORAGE, AND HANDLING
1.6 PROJECT/SITE CONDITIONS
1.6.1 Temperature
1.6.2 Ventilation

PART 2 PRODUCTS

2.1 SPRAY-APPLIED FIREPROOFING
2.1.1 Dry Density and Cohesion/Adhesion
2.1.1.1 Concealed Structural Components
2.1.1.2 Exposed Structural Components
2.1.1.3 Mechanical Rooms and Storage Areas
2.1.2 Deflection
2.1.3 Bond-Impact
2.1.4 Compressive Strength
2.1.5 Corrosion
2.1.6 Air Erosion
2.2 SEALER
2.3 WATER
2.4 SPRAY-APPLIED INTUMESCENT EPOXY COATING SYSTEM
2.4.1 Percent Solids by Weight
2.4.2 In Service Temperature Restrictions
2.4.3 Application Method
2.4.4 Drying Time
2.4.5 Shelf Life

2.4.6 Pot Life
2.4.7 Flash Point

PART 3 EXECUTION

3.1 SURFACE PREPARATION
3.2 PROTECTION
3.3 FIREPROOFING MATERIAL
3.4 APPLICATION
3.4.1 Sequence
3.4.2 Application Technique
3.4.3 Sealer Application
3.4.4 Applied Thickness
3.4.5 Application of Spray-Applied Intumescent Epoxy Coating System
3.5 MANUFACTURER'S SERVICES
3.5.1 General
3.5.2 Manufacturer's Inspection
3.6 FIELD TESTS
3.6.1 Structural Components
3.6.2 Repair
3.6.3 Visual Inspections
3.6.4 Patching
3.7 CLEANUP

-- End of Section Table of Contents --

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SECTION 07 81 00

SPRAY-APPLIED FIREPROOFING
02/11

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NOTE: This guide specification covers the requirements for spray-applied fire protection.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

****

PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASSOCIATION OF THE WALL AND CEILING INDUSTRY (AWCI)

AWCI TM 12-A	(1997; 3rd Ed) Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; An Annotated Guide

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E605/E605M	(1993; R 2015; E 2015) Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E759/E759M	(1992; R 2020) Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E760/E760M	(1992; R 2020) Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E761/E761M	(1992; R 2020) Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E859/E859M	(1993; R 2020) Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
ASTM E937/E937M	(1993; R 2020) Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to

	Structural Members
ASTM E1042	(2002; R 2014) Acoustically Absorptive Materials Applied by Trowel or Spray
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC23	(2012; R 2016) Acceptance Criteria for Sprayed Fire-resistant Materials (SFRMs), Intumescent Fire-resistant Coatings and Mastic Fire-resistant Coatings Used to Protect Structural Steel Members

UNDERWRITERS LABORATORIES (UL)

UL 263	(2011; Reprint Sep 2020) UL Standard for Safety Fire Tests of Building Construction and Materials
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

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NOTE: Specify, or indicate on the drawings, each structural member, and floor and deck underside to be fireproofed. Indicate structural members that do not require fireproofing, such as exterior structural peripheral members.

The following information will be shown on the project drawings or detailed in this section:

1. The extent and location of sprayed fire protection.

2. Fire resistance rating of each structural component to receive fireproofing, and whether the component is restrained or unrestrained as specified in UL Fire Resistance.

3. Fire protection other than that specified in this section for equivalent masonry, concrete or plaster fire protection on outside surfaces of exterior structural peripheral members.

4. Bearing members which do not require fire protection including structural steel and underside of steel decks in elevator machine rooms, and steel bearing members in elevator hoistways.

****

1.2.1 General Requirements

Protect all structural steel, undersides of steel floors (if required) and

steel roof decks (if required) with spray-applied fireproofing to a fire resistance hour-rating as indicated below, unless otherwise indicated.

1.2.2 Fire Resistance Rating

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NOTE: Fire ratings will be determined in accordance with the nationally-recognized building code used for the project, i.e. Uniform Building Code, published by the International Conference of Building Officials, or the International Building Code published by the International Code Council.

Thickness and rating must be specified for each fireproofing application not covered by a specified UL Design Number. However, the UL Design number is for a specific product; therefore, is indirectly being proprietary and would require justification for sole source.

The roof deck designs should utilize systems that do not require the underside of the decking to receive spray-applied fireproofing. This may require specifying a thicker deck or a different system. Due to flexing of the deck, spray-applied fireproofing will eventually become loose and be of no value.

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Fire resistance ratings shall be in accordance with the fire rated assemblies listed in UL Fire Resistance. Proposed materials not listed in UL Fire Resistance shall have fire resistance ratings at least equal to the UL Fire Resistance ratings as determined by an approved independent testing laboratory, based on tests specified in UL 263 or ASTM E119. Submit reports and test records, attesting that the fireproofing material conforms to the specified requirements. Each test report shall conform to the report requirements specified by the test method. For the underside of the decking use metal lath installed prior to the fireproofing material or Rigid Board Fireproofing Material as outlined in the UL Fire Resistance Directory Volume 1. Apply fireproofing to structural steel members, with the following hourly fire resistance rating and in accordance with the following UL design or approved equivalent. Use unrestrained fire resistance ratings, unless the architect/engineer has specified that the degree of thermal restraint of the construction meets or exceeds the degree of thermal restraint of the tested assembly. Performance tests shall be in accordance with ASTM E119.

Fire Rating Schedule		
Element	Hourly Rating	UL Design Reference
Columns supporting one floor	[_____]	[_____]
Columns supporting more than one floor	[_____]	[_____]

Fire Rating Schedule		
Element	Hourly Rating	UL Design Reference
Columns supporting roof	[_____]	[_____]
Floor decks	[_____]	[_____]
Floor supports	[_____]	[_____]
Roof decks	[_____]	[_____]
Roof supports	[_____]	[_____]

1.2.3 Evaluation Reports - ICC-ES Reports

Materials shall be evaluated in accordance with ICC-ES AC23. ICC-ES Reports shall be included as part of the Submittals below. The reports will identify the product as code compliant and having met the physical performance requirements outlined in paragraphs "Dry Density and Cohesion/Adhesion" through "Air Erosion".

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fireproofing Material[; G][; G, [NVFAC]]

SD-04 Samples

Spray-Applied Fireproofing[; G][; G, [NVFAC]]

SD-06 Test Reports

Fire Resistance Rating[; G][; G, [NVFAC]]
Field Tests; G[, [_____]]
Evaluation Reports; G[, [_____]]

SD-07 Certificates

Installer Qualifications; G[, [_____]]
Surface Preparation Report[; G][; G, [NVFAC]]
Manufacturer's Inspection Report[; G][; G, [NVFAC]]

1.4 QUALITY ASSURANCE

1.4.1 Installer Qualifications

Engage an experienced installer that is certified, licensed, or otherwise qualified by the spray-on fireproofing manufacturer as having the necessary experience, staff, and training to install the manufacturer's products in accordance with specified requirements. Submit manufacturer's certification that each listed installer is qualified and trained to install the specified fireproofing. Show evidence that each fireproofing installer has had a minimum of 3 years experience in installing the specified type of fireproofing. Each installer of fireproofing material shall be trained, have a minimum of 3 years experience and a minimum of three installations using fireproofing of the type specified. A manufacturer's willingness to sell its products to the Contractor or installer does not infer qualification of the buyer.

1.4.2 Pre-Installation Meeting

Hold a meeting with the installer, field testing agency, the manufacturer, subcontractors (whose employees come into contact with the fireproofing), and the Contracting Officer prior to the installation of any fireproofing material to review the substrates for acceptability, method of application, applied thickness, patching, repair, inspection and testing procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver packaged material in the original unopened containers, marked to show the brand name, the manufacturer, and the UL markings. Keep fireproofing material dry until ready to be used, and store off the ground, under cover and away from damp surfaces. Damaged or opened containers will be rejected. Apply material with shelf-life prior to expiration of the shelf-life.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Temperature

Maintain substrate and ambient air temperatures above 4 degrees C 40 degrees F during application and for 24 hours before and after application. Maintain relative humidity within the limits recommended by the fireproofing manufacturer.

1.6.2 Ventilation

Provide adequate ventilation to properly dry the fireproofing after application. In enclosed areas, provide a minimum of 4 air exchanges per hour by forced air circulation.

PART 2 PRODUCTS

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NOTE: Select the SPRAY-APPLIED FIREPROOFING tailoring option to implement spray-applied fireproofing conforming to ASTM E1042. Select the SPRAY-APPLIED INTUMESCENT EPOXY COATING tailoring option to implement an intumescent epoxy coating system. Include a requirement for a topcoat over the fire protective layer for exterior surfaces exposed to the weather.

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2.1 SPRAY-APPLIED FIREPROOFING

Provide spray-applied fireproofing material, including sealer, conforming to ASTM E1042, Class (a), Category A, either Type I or Type II, except that the dust removed shall not exceed 0.027 gram per square meter 0.0025 gram per square foot of fireproofing material applied as specified in the project. Only products that have been evaluated at UL and bear and "investigated for exterior use" approval are allowed in waterfront areas where the fireproofing may be directly exposed to a natural body of water. Material shall be asbestos free, and shall resist fungus for a period of 28 days when tested in accordance with ASTM G21. Material shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Submit one sample panel, 450 mm 18 inches square, for each specified type of fireproofing. Also, a designated sample area of not less than 9 square m 100 square feet shall be prepared. Sample area shall be representative of typical installation of fireproofing including metal decks, beams, columns and attachments. Equipment, materials and procedures used in the sample area shall be the same as, or representative of, that to be used in the work. The sample area shall be approved prior to proceeding with fireproofing work in any other area. The approved sample area shall be used as a reference standard for applied fireproofing material. Sample area shall remain in

place and open to observation until all spray-applied fireproofing is completed and accepted, at which time it may become part of the work.

2.1.1 Dry Density and Cohesion/Adhesion

****
NOTE: For Navy projects use the table in NAVFAC's guide specification, since the numbers in the table were provided by the manufacturer's when the spec was developed. Otherwise, include the same numbers into these paragraphs. The wording in the definitions contained in NAVFAC's guide specification should be included in these paragraphs, to avoid misinterpretations.
****

Fireproofing shall have a minimum ASTM E605/E605M dry density and ASTM E736 cohesion/adhesion properties as follows:

2.1.1.1 Concealed Structural Components

Fireproofing for structural components concealed above the ceiling, or within a wall, chase, or furred space, shall have a [minimum] [average] applied dry density of 240 kg per cubic meter 15 pounds per cubic foot and a cohesion/adhesion strength of 9.57 kPa 200 psf.

2.1.1.2 Exposed Structural Components

Fireproofing for exposed structural components, except where otherwise specified or indicated, shall have a minimum applied dry density of 350 kg per cubic meter 22 pounds per cubic foot and a cohesion/adhesion strength of 20.83 kPa 434 psf.

2.1.1.3 Mechanical Rooms and Storage Areas

Fireproofing for structural components located in mechanical rooms and storage areas shall have a minimum applied dry density of 640 kg per cubic meter 40 pcf and a cohesion/adhesion strength of [350] [_____] kPa [1,000] [_____] psf.

2.1.2 Deflection

Spray-applied fireproofing shall not crack, spall, or delaminate when backing to which it is applied is subject to downward deflection 1/120 of 3 m 10 foot clear span, when tested in accordance with ASTM E759/E759M.

2.1.3 Bond-Impact

Spray-applied fireproofing material shall not crack, spall or delaminate when tested in accordance with ASTM E760/E760M.

2.1.4 Compressive Strength

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NOTE: For Navy projects use the table in NAVFAC's guide specification, since the numbers in the table were provided by the manufacturer's when the spec was developed. Otherwise, include the same numbers into these paragraphs. The wording in the

definitions contained in NAVFAC's guide specification should be included in these paragraphs, to avoid misinterpretations.
****

The minimum compressive strength shall be 48 kPa 1000 psf when tested in accordance with ASTM E761/E761M.

2.1.5 Corrosion

Spray-applied fireproofing material shall not contribute to corrosion of test panels when tested as specified in ASTM E937/E937M.

2.1.6 Air Erosion

Dust removal shall not exceed 0.25 gram per square meter 0.025 gram per square foot when tested in accordance with ASTM E859/E859M.

2.2 SEALER

****
NOTE: Specify color contrasting with the fireproofing to facilitate inspection.
****

Sealer shall be the type approved by the manufacturer of the fireproofing material, shall be fungus resistant, shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, and shall be [white] [_____] [or] [green] color.

2.3 WATER

Water used for material mixing and surface preparation shall be potable.

2.4 SPRAY-APPLIED INTUMESCENT EPOXY COATING SYSTEM

Provide a two-component epoxy based intumescent fire protective coating that meets the following requirements.

a. On curing it forms a flexible and tough epoxy barrier which transforms into a ceramic-like, insulating char to provide thermal protection of the substrate in the event of a fire.

b. The coating system includes the manufacturer's required surface preparation, primer, and fire protective layer, and topcoat.

c. The coating system protects the substrate from corrosion and retain its fire protection properties under aggressive chemical environments.

d. Resistant to solvents, acids, alkalis, salts and abrasion while retaining its fire protective properties.

Provide a system that exhibits the following properties:

2.4.1 Percent Solids by Weight

100 percent

2.4.2 In Service Temperature Restrictions

Up to 65 degrees C 150 degrees F

2.4.3 Application Method

Air spray or specialized plural component airless equipment approved by the manufacture. Troweling can be used for small areas or touch-up work.

2.4.4 Drying Time

Approximately 24 hours to achieve a Shore D hardness of 25.

2.4.5 Shelf Life

Minimum shelf life under proper storage condition is 1 Year from date of manufacture.

2.4.6 Pot Life

Approximately 40 minutes at 25 degrees C 77 degrees F and 50 percent relative humidity. Pot life is not a factor when using specialized plural component airless spray equipment.

2.4.7 Flash Point

Greater than 100 degrees C 212 degrees F Pensky-Martens for each component.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

****

NOTE: Surfaces to receive sprayed fire protection may be primed only as permitted by UL Fire Resistance. Surfaces to be galvanized and/or left unpainted must be coordinated with other sections. Metal deck to receive fireproofing will be galvanized and not primed or painted; coordinate with Section 05 30 00 STEEL DECKS.

Most applications of spray-applied fireproofing are for unprimed and unpainted surfaces. Structural members to receive fireproofing will not be painted because the paint may weaken the cohesion or adhesion of the fireproofing.

Ducts, piping, and conduit will not be installed until fire protection materials have been applied to all ceiling areas to be treated (avoiding underside of the floor and roof decks) and application has been approved; coordinate with mechanical and electrical requirements.

If it is determined that surfaces to receive fire proofing should not be painted, omission of painting should be coordinated with Section 09 90 00 PAINTS AND COATINGS.

****

Thoroughly clean surfaces to be fireproofed of dirt, grease, oil, paint, primers, loose rust, rolling lubricant, mill scale or other contaminants that will interfere with the proper bonding of the sprayed fireproofing to the substrate. Test painted/primed steel substrates in accordance with ASTM E736, with specified sprayed fireproofing material, to provide the required fire-resistance rating; painted or primed steel surfaces may require a fireproofing bond test to determine if the paint formulation will impair proper adhesion. Certify the acceptability of surfaces to receive sprayed-applied fireproofing by inspection and submit a Surface Preparation Report accordingly. The statement shall list the structural members and the areas that have been inspected and certified. Overhead areas to be fireproofed shall be cleared of all obstructions interfering with the uniform application of the spray-applied fireproofing. Hardware such as support sleeves, inserts, clips, hanger attachment devices and the like shall be installed prior to the application of the fireproofing. Condition of the surfaces shall be acceptable to the manufacturer prior to application of spray-applied fireproofing. Applications listed for use on primed surfaces shall be in accordance with the manufacturer's recommendations and standards, and detailed in submittal item SD-03 Product Data.

3.2 PROTECTION

Cover surfaces not to receive spray-applied fireproofing to prevent contamination by splatter, rebound and overspray. Cover exterior openings in areas to receive spray-applied fireproofing prior to and during application of fireproofing with tarpaulins or other approved material. Clean surfaces not to receive fireproofing of fireproofing and sealer.

3.3 FIREPROOFING MATERIAL

Mix fireproofing material in accordance with the manufacturer's recommendations. Submit data identifying performance characteristics of fireproofing material. Data includes recommended application requirements and indicate thickness of fireproofing to be applied to achieve each required fire rating.

3.4 APPLICATION

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NOTE: For renovation projects, spray-applied fireproofing must be compatible with encapsulant of remaining residual asbestos.

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3.4.1 Sequence

Prior to application of fireproofing on each floor, the manufacturer shall inspect and approve application equipment, water supply and pressure, and the application procedures. If fireproofing is required to be applied to underside of steel roof deck and steel floor assemblies, it shall be done only after respective roof or floor construction is complete. No roof or floor traffic shall be allowed during application. Fireproofing material shall be applied prior to the installation of ductwork, piping and conduits which would interfere with uniform application of the fireproofing.

3.4.2 Application Technique

Maintain water pressure and volume to manufacturer's recommendations throughout the fireproofing application. Apply fireproofing material to the thickness and density established for the specified fire resistance rating, in accordance with the procedure recommended by the manufacturer, and to a uniform density and texture. Do not tamp fireproofing material to achieve the desired density.

3.4.3 Sealer Application

If sealer is required by the product used, apply it after field testing has been conducted and after corrective measures and repairs, if required, have been completed.

3.4.4 Applied Thickness

The minimum average thickness shall be no less than 9.525 mm 0.375 inches. Thicknesses shall not be less than required to achieve designated fire resistance ratings. If the specified thickness is greater than or equal to 25 mm 1 inch, any individual measurement shall not be less than the specified thickness minus 6 mm 0.25 inches. If the specified thickness is less than 25 mm 1 inch, any individual measurement shall not be less than the specified thickness minus 25 percent.

3.4.5 Application of Spray-Applied Intumescent Epoxy Coating System

Prepare surfaces and apply the spray-applied Intumescent epoxy coating system in accordance with the manufacturer's written recommendations.

3.5 MANUFACTURER'S SERVICES

****

NOTE: The requirement to have a manufacturer's representative onsite, for small jobs and in remote locations, must be based on an economical analysis.and the importance of the project.

For Navy projects, consult with EFD/A Fire Protection Engineer to determine if the manufacturer's representative is required for the project.

****

3.5.1 General

The manufacturer, or its representative, shall be onsite prior to, periodically during, and at completion of the application, to provide the specified inspections and certifications; and to ensure that preparations are adequate and that the material is applied according to manufacturer's recommendations and the contract requirements.

3.5.2 Manufacturer's Inspection

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NOTE: Delete requirement for manufacturer's inspection for small jobs and remote sites where such support is not economical.

****

The manufacturer shall inspect the fireproofing work after the work is completed on each floor or area, including testing, repair and clean-up, and shall certify that the work complies with the manufacturer's criteria and recommendations. Before the sprayed material is covered, and after all of the fireproofing work is completed, including repair, testing, and clean-up; and after mechanical, electrical and other work in contact with fireproofing material has been completed, the manufacturer shall re-inspect the work and certify that the entire project complies with the manufacturer's criteria and recommendations. Obtain and submit the Manufacturer's Inspection Report and certifications of approval stating that the spray-applied fireproofing in the entire project complies with the manufacturer's criteria and recommendations.

3.6 FIELD TESTS

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NOTE: This paragraph applies to the spray-applied fireproofing meeting the requirements of ASTM E1042. Delete the paragraph in its entirety if the spray-applied intumescent epoxy coating system is being implemented
****

The applied fireproofing shall be tested by an approved independent testing laboratory to be selected by the A/E and paid for by the Contractor. Submit test reports documenting results of tests on the applied material in the project. Report shall include defects identified, repair procedures, and results of the retests when required. Perform the tests in approved locations: for density in accordance with ASTM E736, cohesion/adhesion in accordance with ASTM E736, and for thickness in accordance with ASTM E605/E605M. Determine densities in accordance with ASTM E605/E605M or Appendix A, "Alternate Method for Density Determination" of AWCI TM 12-A. Take density determinations at the flat portion of deck, beam bottom flange, beam web, column, and an equivalent area from the top of the lower beam flange. Areas showing a density less than specified will be rejected. A test sample shall be located every 920 square meters 10,000 square feet of floor area or two for each floor, whichever produces the greatest number of test areas. Any area showing less than minimum requirements shall be corrected. Proposed corrective measures, in writing, shall be approved before starting the corrective action. Corrected work shall be retested.

3.6.1 Structural Components

Test each structural component type at floor and roof decks, beams, columns, joists, and trusses. Minimum average thickness shall be as [indicated] [or] [required by UL Fire Resistance]. Density and cohesion/adhesion shall be as specified.

3.6.2 Repair

Additional fireproofing material may be added to provide proper thickness. Correct rejected areas of fireproofing to meet specified requirements by adding fireproofing material to provide the proper thickness, or by removing defects and respraying with new fireproofing material. Use same type of fireproofing material for repairs as originally applied or use patching materials recommended by the manufacturer. Retest and reinspect repaired areas. Apply fireproofing

material to voids or damaged areas by hand-trowel, or by respraying.

3.6.3 Visual Inspections

Inspections shall be made by the certified independent laboratory prior to closure of concealed areas. These inspections may be phased, but shall not occur less than 5 working days prior to the enclosure of the fireproofing. Sprayed areas shall receive a final inspection. Fireproofed surfaces shall be inspected after mechanical, electrical, and other work in contact with fireproofing material has been completed and before sprayed material is covered. Any locations missing fireproofing shall be patched in accordance with the manufacturer's requirements.

3.6.4 Patching

Patch and repair damaged fireproofing. The patching material shall be the same as that specified for that area.

3.7 CLEANUP

Thoroughly clean surfaces not indicated to receive fireproofing of sprayed material within a 24 hour period after application.

-- End of Section --