
USACE / NAVFAC / AFCEA / NASA UFGS-07 81 00 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-07810 (August 2002)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 1 April 2006

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SECTION 07 81 00

SPRAY-APPLIED FIREPROOFING 04/06

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

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

1.1 REFERENCES

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 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.**

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 INDUSTRIES - INTERNATIONAL
(AWCI)

AWCI TM 12-A (1997) Testing and Inspection of Field
Applied Sprayed Fire-Resistive Materials;
An Annotated Guide

ASTM INTERNATIONAL (ASTM)

ASTM E 1042 (2002) Acoustically Absorptive Materials
Applied by Trowel or Spray

ASTM E 119 (2000a) Fire Tests of Building
Construction and Materials

ASTM E 605 (1993; R 2000) Thickness and Density of
Sprayed Fire-Resistive Material (SFRM)
Applied to Structural Members

ASTM E 736 (2000) Cohesion/Adhesion of Sprayed
Fire-Resistive Materials Applied to
Structural Members

ASTM E 759 (1992; R 2000) Effect of Deflection on
Sprayed Fire-Resistive Material Applied to
Structural Members

ASTM E 760 (1992; R 2000) Effect of Impact on Bonding
of Sprayed Fire-Resistive Material Applied
to Structural Members

ASTM E 761 (1992; R 2000) Compressive Strength of
Sprayed Fire-Resistive Material Applied to
Structural Members

ASTM E 84 (2005) Surface Burning Characteristics of
Building Materials

ASTM E 859 (1993; R 2000) Air Erosion of Sprayed
Fire-Resistive Materials (SFRMS) Applied
to Structural Members

ASTM E 937 (1993; R 2000) Corrosion of Steel by
Sprayed Fire-Resistive Material (SFRM)
Applied to Structural Members

ASTM G 21 (1996; R 2002) Determining Resistance of
Synthetic Polymeric Materials to Fungi

UNDERWRITERS LABORATORIES (UL)

UL 263 (2003) Fire Tests of Building Construction and Materials

UL Fire Resist Dir (2006) Fire Resistance Directory

1.2 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

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" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.][information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fireproofing Material; G, [_____] [[_____] Division,] [EFA ____] Naval Facilities Engineering Command Fire Protection Engineer]

Data identifying performance characteristics of fireproofing material. Data shall include recommended application requirements and indicate thickness of fireproofing that must be applied to achieve each required fire rating.

SD-04 Samples

Spray-Applied Fireproofing; G, [_____] [[_____] Division,] [EFA ____]
Naval Facilities Engineering Command Fire Protection Engineer]

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 meters 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.

SD-06 Test Reports

Fire Resistance Rating; G, [_____] [[_____] Division,] [EFA ____]
Naval Facilities Engineering Command Fire Protection Engineer]

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.

Field Tests[; G][; G, [_____]]

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.

SD-07 Certificates

Installer Qualifications[; G][; G, [_____]]

Manufacturer's certification that each listed installer is qualified and trained to install the specified fireproofing. Evidence that each fireproofing installer has had a minimum of 3 years experience in installing the specified type of fireproofing.

Surface Preparation Report; G, [_____] [[_____] Division,] [EFA ____]
Naval Facilities Engineering Command Fire Protection Engineer]

Manufacturer's certification that surfaces to be protected have been inspected and are acceptable to receive spray-applied fireproofing. The statement shall list the structural members and the areas that have been inspected and certified.

Manufacturer's Inspection Report; G, [_____] [[_____] Division,] [EFA ____]
Naval Facilities Engineering Command Fire Protection Engineer]

Manufacturer's certification that the spray-applied fireproofing in the entire project complies with the manufacturer's criteria and recommendations.

1.3 DELIVERY AND STORAGE

Packaged material shall be delivered in the original unopened containers, marked to show the brand name, the manufacturer, and the UL markings. Fireproofing material shall be kept dry until ready to be used, and shall be stored off the ground, under cover and away from damp surfaces. Damaged or opened containers will be rejected. Material with shelf-life shall be applied prior to expiration of the shelf-life.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Substrate and ambient air temperatures shall be maintained above 4 degrees C 40 degrees F during application and for 24 hours before and after application. Relative humidity shall be maintained within the limits recommended by the fireproofing manufacturer.

1.4.2 Ventilation

Adequate ventilation shall be provided to properly dry the fireproofing after application. In enclosed areas, a minimum of 4 air exchanges per hour shall be provided by forced air circulation.

1.5 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. 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.

1.6 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.

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.

1.7 FIRE RESISTANCE RATING

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 floor decks and 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.

Fire resistance ratings shall be in accordance with the fire rated assemblies listed in [UL Fire Resist Dir](#). Proposed materials not listed in [UL Fire Resist Dir](#) shall have fire resistance ratings at least equal to the [UL Fire Resist Dir](#) ratings as determined by an approved independent testing laboratory, based on tests specified in [UL 263](#) or [ASTM E 119](#). Fireproofing shall be applied 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 E 119](#).

<u>Element</u>	<u>Fire Rating Schedule</u>	
	<u>Hourly Rating</u>	<u>UL Design Reference</u>
Columns supporting one floor	[_____]	[_____]
Columns supporting more than one floor	[_____]	[_____]
Columns supporting roof	[_____]	[_____]
Floor decks	[_____]	[_____]
Floor supports	[_____]	[_____]
Roof decks	[_____]	[_____]
Roof supports	[_____]	[_____]

1.8 EXTENT OF FIREPROOFING

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 Resist Dir.
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.

All structural steel, and undersides of steel floors (if required) and steel roof decks (if required) shall be protected with spray-applied fireproofing to a fire resistance hour-rating as indicated in the preceding paragraph, unless otherwise indicated.

1.9 PRE-INSTALLATION CONFERENCE

The Contractor shall 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.

PART 2 PRODUCTS

2.1 SPRAY-APPLIED FIREPROOFING

Spray-applied fireproofing material, including sealer, shall conform to [ASTM E 1042](#), 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 Type I fireproofing is 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 G 21](#). 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 E 84](#).

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 E 605** dry density and **ASTM E 736** 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** **[7,000] [_____] 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 E 759**.

2.1.3 Bond-Impact

Spray-applied fireproofing material shall not crack, spall or delaminate when tested in accordance with **ASTM E 760**.

2.1.4 Compressive Strength

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 E 761.

2.1.5 Corrosion

Spray-applied fireproofing material shall not contribute to corrosion of test panels when tested as specified in ASTM E 937.

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 E 859.

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 E 84, and shall be [white] [_____] [or] [green] color.

2.3 WATER

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

PART 3 EXECUTION

3.1 SURFACE PREPARATION

NOTE: Surfaces to receive sprayed fire protection may be primed only as permitted by UL Fire Resist Dir. 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.

Surfaces to be fireproofed shall be thoroughly cleaned 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. Painted/primed steel substrates shall be tested in accordance with [ASTM E 736](#), 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. The Contractor shall certify the acceptability of surfaces to receive sprayed-applied fireproofing and submit a [Surface Preparation Report](#) accordingly. 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

Surfaces not to receive spray-applied fireproofing shall be covered to prevent contamination by splatter, rebound and overspray. Exterior openings in areas to receive spray-applied fireproofing shall be covered prior to and during application of fireproofing with tarpaulins or other approved material. Surfaces not to receive fireproofing shall be cleaned of fireproofing and sealer.

3.3 MIXING

[Fireproofing material](#) shall be mixed in accordance with the manufacturer's recommendations.

3.4 APPLICATION

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

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 and during a 7-day minimum curing period. 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

Water pressure and volume shall be maintained to manufacturer's recommendations throughout the fireproofing application. Fireproofing

material shall be applied 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. Fireproofing material shall not be tamped to achieve the desired density.

3.4.3 Sealer Application

If sealer is required by the product used, it shall be applied 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.

3.5 FIELD TESTS

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. The tests shall be performed in approved locations: for density in accordance with ASTM E 736, cohesion/adhesion in accordance with ASTM E 736, and for thickness in accordance with ASTM E 605. Determine densities in accordance with ASTM E 605 or Appendix A, "Alternate Method for Density Determination" of AWC 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.

3.5.1 Structural Components

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

3.5.2 Repair

Additional fireproofing material may be added to provide proper thickness. Rejected areas of fireproofing shall be corrected to meet specified requirements by adding fireproofing material to provide the proper thickness, or by removing defects and respraying with new fireproofing material. Repairs shall use same type of fireproofing material as originally applied or patching materials recommended by the manufacturer. Repaired areas shall be retested and reinspected. Fireproofing material shall be applied to voids or damaged areas by hand-trowel, or by respraying.

3.5.3 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.

3.5.4 Manufacturer's Inspection

**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. The Contractor shall obtain and submit the [Manufacturer's Inspection Report](#) and certifications of approval.

3.5.5 Patching

Patching and repairing of damaged fireproofing is the responsibility of the Contractor. The patching material shall be the same as that specified for that area.

3.6 CLEANUP

Surfaces not indicated to receive fireproofing shall be thoroughly cleaned of sprayed material within a 24 hour period after application.

-- End of Section --