

SECTION 07811

SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Exposed sprayed fire-resistive materials.
 - 2. Patching of in-place sprayed fire-resistive materials damaged or disturbed by installation of attachments and other construction during remainder of construction.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving sprayed fire-resistive materials.
 - 2. Division 5 Section "Steel Deck" for surface conditions required for metal decking receiving sprayed fire-resistive materials.
 - 3. Division 7 Section "Through-Penetration Firestop Systems" for fire-resistance-rated firestopping systems.
 - 4. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistance-rated joint systems.
 - 5. Division 9 Section "Gypsum Board Assemblies" for z-clips and accessories needing to be attached to structural framing prior to application of cementitious fireproofing.

1.03 DEFINITIONS

- A. Concealed Sprayed Fire-Resistive Materials: Applied to surfaces that are concealed from view behind other construction when the Work is completed.
- B. Exposed Sprayed Fire-Resistive Materials: Applied to surfaces that are exposed to view when the Work is completed.
- C. Cementitious Mixture: As identified by Underwriters Laboratories Inc. in the latest edition of the UL Fire Resistance Directory under category CHPX, Spray-Applied Fire Resistive Material.

1.04 SUBMITTALS

- A. General: Submit in accordance with Section 01300.
- B. Product Data: For each type of product indicated. Include manufacturer's instructions for proper application of cementitious fireproofing.
- C. Shop Drawings: Structural framing plans indicating the following:
 - 1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
 - 2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

3. Treatment of sprayed fire-resistive material after application.

D. Thickness Schedule: Indicating material to be used, building elements to be protected with spray-applied fireproofing, indication of restrained and unrestrained conditions, hourly rating and material thickness provided and appropriate references.

E. Product Certificates: For each type of sprayed fire-resistive material, signed by product manufacturer indicating products comply with requirements.

1. Submit evidence that fire-resistance testing was sponsored by the manufacturer and that material tested was produced at manufacturer's facility under supervision of UL personnel. Letters documenting classification status are not acceptable evidence of compliance with this Section.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified independent testing agency, for proposed sprayed fire-resistive materials.

H. Research/Evaluation Reports: For sprayed fire-resistive materials.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain sprayed fire-resistive materials through one source from a single manufacturer.

C. Sprayed Fire-Resistive Materials Testing: Owner may engage a qualified testing and inspecting agency to test for compliance with specified requirements for performance and test methods.

1. Sprayed fire-resistive materials shall be randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Testing shall be performed on specimens of sprayed fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.

3. Testing shall be performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Test reports shall include a full description of preparation and conditioning of laboratory test specimens.

D. Compatibility and Adhesion Testing: Owner may engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.

1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.

2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with sprayed fire-resistive material.

E. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing sprayed fire-resistive materials with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection tested per ASTM E 119.
 2. Surface-Burning Characteristics: ASTM E 84.
- F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to sprayed fire-resistive materials including, but not limited to, the following:
1. Meet with Architect, Owner, Installer, independent testing laboratory, representative of sprayed fire-resistive material manufacturer, and installers whose work interfaces with or affects sprayed fire-resistive materials.
 2. Review substrates for acceptability.
 3. Verify sequencing and coordination requirements, method of application, and applied thicknesses.
 4. Review inspection procedures.
 5. Review and finalize construction schedule.
 6. Record discussions and agreements and furnish copy to each participant.
 7. Provide not less than 72-hour advance notification to participants prior to convening preinstallation conference.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- C. Store materials inside, under cover, above ground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials or materials previously exposed to water.
 1. Replace discard materials at no additional expense to Owner.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat is provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve not less than 4 total air exchanges per hour until material is substantially dry. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.08 COORDINATION

- A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.01 EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

- A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.
 1. Cementitious Sprayed Fire-Resistive Material Products:
 - a. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6 or 6/HY.
 - b. Isolatek International Corp., Cafco Products; Cafco 300.
 - 1) Blaze Shield II, Isolatek International Corp. is not an acceptable substitution.
- B. Material Composition: As follows:
 1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders, mold inhibitors, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:
 1. Dry Density: 15 lb/cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater to attain fire-resistance ratings indicated, per ASTM E 605.
 2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:
 - a. Where the referenced fire-resistance design lists a thickness of 1 inch or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch.
 - b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch or 75 percent of the design thickness.
 - c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb./cu. ft..
 3. Bond Strength: Shall have a minimum average bond strength of 200 lbf/sq. ft. and minimum individual bond strength of 150 lbf/sq. ft. per ASTM E 736 under the following conditions:
 - a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
 - b. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch.
 4. Bond Impact: When subjected to impact tests in accordance with ASTM E 760, material shall not crack or delaminate from surface to which it is applied.
 5. Compressive Strength: 5.21 lbf/sq. in. as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch and minimum dry density shall be as specified, but not less than 15 lb./cu. ft.. Fireproofing shall not deform more than 10% when subjected to compressive forces of 1200 psf when tested in accordance with ASTM E 761.
 6. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
 7. Deflection: No cracking, spalling, or delamination per ASTM E 759.
 8. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.

9. Impact Penetration: Fireproofing material shall not show a loss of more than 6 cm³ when subjected to impact penetration tests in accordance with test methods developed by the City of San Francisco, Bureau of Building Inspection.
 10. Abrasion Resistance: No more than 15 cm³ shall be abraded or removed from fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
 11. Air Erosion: Maximum weight loss of 0.005 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch, maximum dry density is 15 lb./cu. ft., test specimens are not prepurged by mechanically induced air velocities, and total reported weight loss shall be total weight loss over a 24 hour period from beginning of test.
 - a. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 2500 ft/min (29 mph) when tested in accordance with UMC Standard 6-1 and ASTM E 859.
 12. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 0.
 13. Combustibility: Shall have a maximum total heat release of 20 MJ/m² and a maximum 125 kW/m² peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E 1354 at a radiant heat flux of 75 kW/m² with use of electric spark ignition. Sample shall be tested in the horizontal orientation.
 14. Fungal Resistance: No observed growth on specimens per ASTM G 21 for not less than 28 days for general use and not less than 60 days for use in plenums.
- D. Fire Resistance Classification: Material shall have been tested and reported by UL in accordance with ASTM E 119 and shall be listed in the Underwriters Laboratories Fire Resistance Directory.
- E. Mixing water shall be clean, fresh, and potable and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.

2.02 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
 3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and encapsulants.

3.03 INSTALLATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.
- D. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.
- E. Post appropriate cautionary "Slippery When Wet" signs in all areas in contact with wet fireproofing material. Erect appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixing areas and other areas exposed to wet fireproofing material.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of completed applications of sprayed fire-resistive material shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
 - 1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
 - 2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
 - 3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
 5. If testing finds applications of sprayed fire-resistive material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
- C. Remove and replace applications of sprayed fire-resistive material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.
 - D. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.
 - E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.05 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure exposed cementitious, sprayed fire proofing material in accordance to product manufacturer's written recommendations to prevent premature drying.
- C. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- D. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas.
- E. Repair or replace work that has not been successfully protected.

3.06 FIRE RATING SCHEDULE

- A. Locations: Protect all structural steel indicated to be protected in accordance with the following schedule:

Element	Hour	Reference
1. Beams and Floor Deck, Boiler Room 001	1	D703
2. Beams and Floor Deck, Oil Tank Room 023	3	D701

Unrestrained assembly rating for all elements.

END OF SECTION