

SECTION 07810  
SPRAY-APPLIED FIREPROOFING

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes the following:
1. Low density sprayed-on cementitious fireproofing.
  2. High density sprayed-on cementitious fireproofing.
- B. Related Work Specified in Other Sections:
1. No primers/compatible primers on structural steel: Section 05120.
  2. Through-penetration firestop systems: Section 07840, "Firestopping"
  3. Fire-rated gypsum-board assemblies and enclosures: Section 09250

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
1. ASTM E 84, "Test Method for Surface Burning Characteristics of Building Materials."
  2. ASTM E 119, "Test Methods for Fire Tests of Building Construction and Materials."
  3. ASTM E 605, "Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members."
  4. ASTM E 736, "Test Method for Cohesion/Adhesion of Sprayed fire-Resistive Materials Applied to Structural Members"
  5. ASTM E 759, "Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members"
  6. ASTM E 760, "Test Method for Effect of Impact on Sprayed Fire-Resistive Material Applied to Structural Members"
  7. ASTM E 761, "Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members"
  8. ASTM E 859, "Test Method for Air Erosion of Sprayed Fire-Resistive Material Applied to Structural Members"
  9. ASTM E 937, "Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members"
  19. ASTM C665, "Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing."
  11. ASTM G 21, "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi"

1.04 DEFINITIONS

- A. "Cementitious Fireproofing": Spray-applied fire-resistive material (SFRM) consisting of one or more binders, aggregates and fibers which are mixed with water to form a slurry and conveyed through a hose to a nozzle where compressed air is used to disperse the material into a spray pattern.

1.05 SUBMITTALS

- A. Product data for each sprayed-on fireproofing product indicated, including technical specifications, material composition, installation instructions, and test data for standard products substantiating compliance with the performance requirements.
  - 1. Certification by manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Shop Drawings: Structural framing plans indicating the following:
  - 1. Locations and types of surface preparation required before fireproofing is applied.
  - 2. Extent of sprayed-on fireproofing for each construction and fire-resistance rating including the following:
    - a. Applicable fire-resistive design designations of a qualified inspecting and testing agency acceptable to authorities having jurisdiction.
    - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
    - c. Designation of restrained and unrestrained conditions based on definitions in the Quality Assurance Article.
- C. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Compatibility and Adhesion Test Reports: For primers and other coatings applied to structural steel. Provide reports from a qualified independent testing and inspecting agency engaged by Contractor. Confirm that primers and coatings proposed for application in shop or field are compatible with fire-resistive material. Instruct laboratory to determine compatibility according to requirements specified in "Quality Assurance" Article.
- G. Research/Evaluation Reports: Evidence of sprayed fire-resistive material's compliance with building code in effect for Project, from Building Officials and Code Administrators.

## 1.06 QUALITY ASSURANCE

- A. Design for "unrestrained" assembly and beam ratings at building perimeter, edges of floors, framing members adjacent to a building expansion joint, and around openings through floor or roof. Design for "restrained" assembly ratings, at other locations.
- B. Fire-Test-Response Characteristics: Provide sprayed-on fireproofing materials and assemblies identical to those tested, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify packages (bags) containing fireproofing with appropriate classification markings of applicable testing and inspecting agency.
  - 1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL "Fire Resistance Directory," or in the comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, tested per ASTM E 119.
  - 2. Surface-Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84.
- C. Installer Qualifications: Engage an experienced Installer certified, licensed, or otherwise qualified by the sprayed-on fireproofing manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its sprayed-on fireproofing products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Sprayed Fire-Resistive Materials Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.
  - 1. Sprayed fire-resistive materials are 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 is 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 is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
- F. Testing for Compatibility and Adhesion: When primers or coatings are present on the steel, or will be applied to the steel under this Contract, engage a qualified testing and inspecting agency

to prepare compatibility and adhesion test reports required in "Submittals" Article based on testing that complies with the following requirements:

1. Testing for bond per ASTM E 736 and requirements specified in UL's "Fire Resistance Directory" about coating materials.
  2. Verify that manufacturer of fire-resistive material has not found primers or coatings to be incompatible with fire-resistive material based on its own laboratory testing or field experience.
- G. Source Limitations: Obtain each type of sprayed-on fireproofing material from one source and from a single manufacturer.
- H. Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.
- I. Resistance to Mold: Fireproofing materials shall not support growth of mold, mildew or fungi. Test fire-proofing materials in dry and finished state according to one of the test methods listed below, as appropriate to the composition of the fireproofing and approved by the Architect:
1. Fireproofing materials containing synthetic polymers: ASTM G-21 using aspergillus niger and mixed spore cultures.
  2. Fireproofing materials containing mineral fibers: No growth of mold or fungi when tested in accordance with ASTM C655 for fungi resistance.
  3. Fire proofing materials may incorporate mold inhibitor in the mix at the time of manufacture if necessary to provide resistance to growth of mold, provided that fire response characteristics have been tested with the mold inhibitor in the mix.

#### 1.07 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 any materials whose shelf life has expired.
- C. Store materials inside, under cover, above ground, so they are kept dry until ready for use. Remove from Project site and discard any materials that have deteriorated.

#### 1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F (4.4 deg C) and falling, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after applying sprayed-on fireproofing.

- B. Ventilation: Provide ventilation in areas to receive fireproofing during application and for at least 24 hours following application, until fireproofing dries thoroughly. If natural ventilation is inadequate, General Contractor shall provide forced-air circulation.

#### 1.09 SEQUENCING

- A. Sequence and coordinate application of sprayed-on fireproofing with other related work specified in other Sections to comply with the following requirements:
  1. Provide temporary enclosures to prevent deterioration of sprayed-on fireproofing for interior applications due to exposure to unfavorable environmental conditions.
  2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.
  3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
  4. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
  5. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until fireproofing is installed.
  6. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, tested, and corrections have been made to any defective fireproofing.

#### 1.10 WARRANTY

- A. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed-on fireproofing that has failed within the specified warranty period. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements, peeling, and delaminating of sprayed-on fireproofing.
  1. Warranty Period: 2 years from date of Substantial Completion.
- B. General: The warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under the Contract Documents.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Cementitious Fireproofing: Furnish complying product by one of the following manufacturers:
  1. Carbolite Fireproofing Products Div., Carbolite Co.
  2. Construction Products Div., W.R. Grace & Co.
  3. Isolatek International Corp.

4. Southwest Vermiculite Co., Inc.;

2.02 LOW-DENSITY CEMENTITIOUS FIREPROOFING

- A. Material Composition: Manufacturer's standard low-density cementitious fireproofing consisting of factory-mixed, dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry for conveyance and application.
- B. Physical Properties: Minimum values, unless higher values are required to attain designated fire-resistance ratings:
1. Dry Density: 15 pcf for average and individual densities, regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, as determined per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A.
  2. Bond Strength: 150 lbf per sq. ft. as determined per ASTM E 736 under the following conditions:
    - a. Field test sprayed-on fireproofing that is applied to flanges of wide-flange structural steel members on surfaces matching those that will exist for remainder of steel receiving fireproofing.
    - b. If surfaces of structural steel receiving sprayed-on fireproofing are primed or otherwise painted, perform series of bond tests specified in UL "Fire Resistance Directory" for coating materials.
    - c. Minimum sprayed-on fireproofing thickness tested in laboratory shall be 0.75 inch.
  3. Impact Resistance: No cracking, spalling, or delamination when tested per ASTM E 760.
  4. Corrosion Resistance: No evidence of corrosion as determined per ASTM E 937.
  5. Deflection: No cracking, spalling, or delamination as determined per ASTM E 759.
  6. Air Erosion: Maximum weight loss of 0.005 gram per sq. ft. (0.05 gms/square meter) in when tested in accordance with ASTM E 859. (Sample surface shall be "as applied," not pre-purged, and the reported weight loss shall be the total weight loss over a 24 hour period from the beginning of the test.)
  7. Surface-Burning Characteristics: Maximum flame-spread value of 10, smoke-developed 0.
  8. Mold Resistance: Fire-resistant materials shall not support mold growth when tested by one of the following methods, as applicable to the constituent materials. Add mold inhibitor to product at the time of manufacture if necessary to achieve this performance.
    - a. Mix containing synthetic polymer: Test in accordance with ASTM G-21.
    - b. Mix containing mineral-fibers: Test in accordance with ASTM C665.
- D. Products: Subject to compliance with requirements, furnish one of the following products:
1. Pyrolite 1, Carbolite Fireproofing Products Div., Carbolite Co.
  2. Monokote Type MK-6, Construction Products Div., W.R. Grace & Co.--Conn.

3. Cafco 300, Isolatek International Corp.

## 2.03 HIGH DENSITY CEMENTITIOUS FIREPROOFING

- A. Material Composition: Manufacturer's standard, factory-mixed, formulation of portland cement, additives, and inorganic aggregates, chloride free, mixed with water at Project site to form a slurry for conveyance and application; containing no asbestos or mineral fibers.
- B. Physical Properties: Minimum values, unless higher values are required to attain designated fire-resistance ratings:
  1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, as determined per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWCI Technical Manual 12-A, but with an average density of not less than 39 pcf.
  2. Deflection: Material shall not crack or delaminate from the surface to which it is applied, when tested in accordance with ASTM E 759.
  3. Bond Impact: Shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E 760.
  4. Bond Strength: 10,000 lb. per sq. ft. (478 kN/m<sup>2</sup>) average, with minimum individual bond strength of 8,000 psi, as determined per ASTM E 736.
  5. Air Erosion: Maximum weight loss of 0.005 gram per sq. ft. as determined per ASTM E 859.
  6. Compressive Strength: 550 lbf per sq. inch as determined per ASTM E 761.
  7. Corrosion Resistance: No evidence of corrosion as determined per ASTM E 937.
  8. Surface-Burning Characteristics: Maximum flame-spread 0 and smoke-developed 0.
  9. Durometer Hardness: ASTM D2240; 35 minimum.
  10. Mold Resistance: Fire-resistant materials shall not support mold growth when tested by one of the following methods, as applicable to the constituent materials. Add mold inhibitor to product at the time of manufacture if necessary to achieve this performance.
    - a. Mix containing synthetic polymer: Test in accordance with ASTM G-21.
    - b. Mix containing mineral-fibers: Test in accordance with ASTM C665.
- C. Products: Subject to compliance with requirements, provide one of the following products:
  1. Pyrocrete 240, Carbolite Company.
  2. Monokote Type Z146, Construction Products Div., W.R. Grace & Co.--Conn.
  3. Fendolite M-II, Mandoval Vermiculite Products Div., Isolatek International Corp.,
  4. Southwest Vermiculite Co., Inc.; 1XR.

## 2.04 AUXILIARY FIREPROOFING 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.
- B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
  - 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory," for coating materials based on a series of bond tests per ASTM E 736.
  - 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Adhesive for Bonding Fire-Resistive Material: If required to promote adhesion of sprayed-on fireproofing to metal deck, furnish adhesive product approved by manufacturer of sprayed fire-resistive material.
- D. Reinforcing Fabric: Glass-fiber fabric or metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance designs indicated. Include attachment devices.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates with Installer present to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:
  - 1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
  - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying the fireproofing.
- B. Conduct tests according to sprayed-on fireproofing manufacturer's recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond where there is any doubt as to their presence.
- C. Do not install fireproofing until unsatisfactory conditions have been corrected.



### 3.02 PREPARATION

- A. Clean substrates to remove substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
- B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- C. For exposed sprayed-on fireproofing applications, repair substrates to remove surface irregularities that could affect uniformity of texture and thickness in finished fireproofing surface. Remove minor projections and fill voids that would telegraph through fireproofing after application.
- D. Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.
- E. In Area C (as defined in the fireproofing schedule at the end of this Section), mask underside of floor and roof deck to prevent overspray from adhering to the deck.

### 3.03 INSTALLATION, GENERAL

- A. Comply with fireproofing manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply sprayed-on fireproofing that is identical to products tested as specified in Part 1 under "Test Reports" in "Submittals" article, with respect to rate of application, use of sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Install reinforcing fabric or reinforcing mesh as required to comply with fire-resistance ratings, or if recommended by the fireproofing manufacturer to facilitate spray application of fireproofing to surfaces such as beam webs and permitted by the U. L. design. Attach the reinforcing fabric or mesh by means which are sufficient to hold the reinforcing and the spray-applied fire-resistive material in place during application and until the fireproofing has cured.
- D. Coat metal deck substrates with adhesive prior to applying fireproofing where required to achieve fire-resistance rating or as recommended by fireproofing manufacturer for material and application indicated.
- E. Extend fireproofing in full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.
- F. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended by manufacturer.

### 3.04 INSTALLING LOW-DENSITY FIREPROOFING

- A. Apply low-density fireproofing in thicknesses and densities indicated, but no less than that required to achieve fire-resistance ratings designated for each condition, and no less than the minimum thickness specified below.
- B. Minimum Thickness: Provide minimum average thickness required for fire-resistive design indicated according to the following criteria, but not less than 0.375 inch, as determined per ASTM E 605.
  - 1. Where the referenced fire-resistive design lists a thickness of 1.0 inch or greater, the minimum allowable individual sprayed-on fireproofing thickness is the design thickness minus 0.25 inch.
  - 2. Where the referenced fire-resistive design lists a thickness of less than one inch but more than 0.375 inch, the minimum allowable individual sprayed-on fireproofing thickness is the greater of 0.375 inch or 75 percent of the design thickness.
  - 3. No reduction in average thickness is permitted for those fire-resistive designs whose fire resistance ratings were established at densities of less than 15 pcf.

### 3.05 INSTALLING HIGH DENSITY FIREPROOFING

- A. Apply high density fireproofing in thicknesses and densities required to achieve fire-resistance ratings designated for each condition.
- B. Provide a uniform finish complying with description indicated for each type of material and matching Architect's sample or, if none, finish approved for field-erected mockup.
- C. Finish: Smooth trowelled.
- D. In Area C (as defined in the fireproofing schedule at the end of this Section), take care to prevent fireproofing overspray from adhering to metal deck. Promptly remove overspray and clean deck to restore it to its original condition. This area will be exposed to view when the project is built-out in the future.

### 3.06 FIELD QUALITY CONTROL

- A. Testing Agency: A qualified independent testing agency employed and paid by Owner will perform field quality-control testing.
- B. Sprayed-On Fireproofing: Completed fireproofing will be tested as application on each floor level is completed. Do not proceed with fireproofing of next area until test results for previously completed fireproofing show compliance with requirements.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace fireproofing where test results indicate that it does not comply with specified requirements for cohesion and adhesion or for density or both.

- E. Apply additional fireproofing per manufacturer's directions where test results indicate that the thickness does not comply with specified requirements.
- F. Additional Testing: Where fireproofing is removed and replaced or repaired, additional testing will be performed to determine compliance with specified requirements.

3.07 CLEANING, REPAIR, AND PROTECTION

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.
- C. Protect fireproofing from damage until Substantial Completion.
- D. If, despite precautions, fireproofing is disturbed subsequent to installation, patch to restore fire-resistance rating, thickness, and uniform surface texture.

3.08 SCHEDULE OF FIREPROOFING

- A. For purposes of designating hourly ratings and fireproofing densities the floor plan is divided into areas as follows:
  1. Area A: Columns and beams generally west of the boundary line described below.
  2. Area B: Columns and beams on the boundary line delineated as follows: Starting from column grid point B.6-5, thence easterly along grid line B to grid line 3, thence northerly along grid line 3 to grid line D, thence westerly along grid line D to a beam framing the shaft opening approximately 6.5 feet from grid line 4, thence northerly along said beam to the south wall of stair #6, thence easterly to grid line 3.6, thence northerly to grid line G.
  3. Area C: Columns and beams generally east of the boundary line described above.
- B. Fireproof columns and beams according to the schedule below. Apply fireproofing to underside of roof deck at top of Stair No. 6, to achieve a 2 hour rating; use low density fireproofing.

SCHEDULE OF FIREPROOFING

Area	Structural member	Rating	Density
Area A	Beams	2 Hours	Low
	Columns	2 Hours	Low
Area B	Beams	2 Hours	Low
	Columns below 12' above finish floor	2 Hours	High
	Columns above 12' above finish floor	2 Hours	Low

Area C	Beams	1.5 Hours	High
	Columns below 12' above finish floor	2 Hours	High
	Columns above 12' above finish floor	2 Hours	Low

Note: At Contractor's option, Contractor may substitute high density for low density at any location, at no additional cost to Owner.

END OF SECTION 07810