

SECTION 07 81 16

CEMENTITIOUS FIREPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Fireproofing of interior structural steel.
- B. Related Sections
 - 1. [Section 05 10 00 - Structural Steel Framing.]
 - 2. Section 07 84 00 - Firestopping.

1.02 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
 - 3. ASTM E736 - Standard Test Method For Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
 - 4. ASTM E760 - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members.
 - 5. ASTM E761 - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.
- B. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistive Directory.

1.03 PERFORMANCE REQUIREMENTS

- A. [All sprayed applied fireproofing assemblies scheduled in this Section and approved by the authority having jurisdiction represent one accepted assembly. Contractor may propose alternate assemblies for the acceptance by University's Representative. Contractor will be responsible for obtaining the approval of the accepted assemblies by the authority having jurisdiction.

SPEC NOTE: *Delete the following Article if Rating Schedule is not included on Drawings.*

- B. [Rating Schedule: Comply with requirements indicated in "Fire Proofing Schedule" included on Drawings.]

SPEC NOTE: *Delete the following Article if Rating Schedule is included on Drawings or if Article 3.07 Spray Applied Fireproofing Schedule is include at end of this section.*

- C. [Sprayed-On Fireproofing Systems: Provide UL fire-rated assemblies to hourly ratings as follows:
 - 1. Interior Columns: [Three] hours.
 - 2. Interior Girders: [Three] hours.
 - 3. Interior Roof Deck: [Two] hours.

- D. Sprayed applied fireproofing shall form sound bond with steel.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. [Coordination:]

- B. Preinstallation Meeting:

1. Contractor shall arrange meeting to review spray applied fireproofing work prior to actual installation.
2. Meeting to be attended by University's Representative, University's Inspector of Record, Contractor, and Contractor's installer, agents of accepted manufacturers, and other installers whose work may be affected quality of spray applied fireproofing. Contractor to provide at least one week's advance notice of meeting date and time.
3. Participants shall have had at least one week's advance notice of meeting date and time.
4. Hold meeting at the job site.
5. The following major considerations shall be reviewed at the meeting:
 - a. Review in detail the Contract specifications, surface preparation, protection of adjacent surfaces, installation procedures, field quality control, and other related items.
 - b. Review in detail job conditions, schedule, construction sequence, application requirements, and quality of completed installation.
 - c. Review methods for storing and handling materials.
 - d. Review in detail the means of protecting completed work during remainder of construction period.
 - e. Record discussions of meeting and any conflict, incompatibility, or inadequacy, and furnish a copy of record to each participant.
6. Contractor shall produce meeting notes that will record discussions of meeting and any conflict, incompatibility, or inadequacy and they will indicate that the applicator of spray applied fireproofing has reviewed and accepted the substrates for spray applied fireproofing. Distribute meeting notes to all attendees prior to installation of spray applied fireproofing.

- C. Sequencing:

1. Prior to application of spray applied fireproofing, all other trades must have completed installation of all items such as hangers, clamps, and other attachments for work suspended from, attached to, or passing through construction required to receive spray applied fireproofing. Install the items such that they do not interfere with spray fireproofing applicators ability to access the work or contribute to unsafe working conditions for applications.
2. Apply spray applied fireproofing prior to installation of ducts, piping conduit, and other work preventing correct application.
3. Apply no fireproofing to underside of steel decking until completion of concrete work.
4. [Apply no fireproofing to underside of roof decking until completion of roofing application and until roof traffic has ceased.]
5. [Sequence work in conjunction with placement of ceiling hanger tabs.]

- D. Scheduling:

1. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.05 [SUSTAINABLE CHARACTERISTICS]

- A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:

1. [Recycled Content Materials: Furnish materials with maximum available recycled content including:

SPEC NOTE *List materials specified in this section required to have recycled content.*

- a. [_____.]
2. [Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.]

SPEC NOTE *List materials specified in this section required to be regional materials.*

- a. [_____.]

1.06 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures, for submittals procedures.
- B. Product Data, application instructions, ICBO Report and table showing thickness, density and UL Design Number for each fire-resistive rating for each different member to be fireproofed, including W/D ratios for beams and columns.
- C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, for:
 1. Bond Strength.
 2. Bond Impact.
 3. Compressive Strength.
 4. Fire tests using substrate materials similar those on project.
- D. Samples: As required by University's Testing Laboratory during normal application of material.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Certifications: Submit the following certifications indicating that:
 1. Sprayed-on fireproofing products meet or exceed requirements of contract documents.
 2. Application meets the requirements of Quality Assurance Article.

1.07 [SUSTAINABLE DESIGN SUBMITTALS]

- A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Regional products.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section, with minimum 3 years of documented experience.

C. Requirements of Regulatory Agencies:

1. Spray applied fireproofing shall meet requirements of UL system which satisfies minimum fire-resistive rating as scheduled in this Section for type of member to be fireproofed. Equal fireproofing systems may be proposed that meet requirements of this Section.
2. Spray applied fireproofing shall meet requirements of systems accepted by Designated Campus Fire Marshal.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged materials in original containers bearing manufacturer's name, brand number, batch number, UL label, and product information. Leave seals unbroken and labels intact until time of use. Remove from job site any rejected or damaged packages found unsuitable for use.
- B. Keep materials dry until ready for use by storing off ground, under watertight covers, and away from sweating walls and damp surfaces. Rotate stock of material and use prior to expiration date indicated on package. Remove from job site any bags of spray applied fireproofing materials that have been exposed to moisture or otherwise damaged or deteriorated before use and any bags with expired expiration date.

1.10 SITE CONDITIONS

- A. Environment: Do not apply spray applied fireproofing materials when substrate material is below 40 degrees Fahrenheit and ambient temperature is below 40 degrees Fahrenheit for 24 hours before, during, and after application. Relative humidity shall be low enough to assure proper drying of materials. If necessary for project to progress, provide enclosures with heat to maintain temperatures.
- B. Ventilation: Provide natural or mechanical ventilation in area to receive spray applied fireproofing, introducing fresh air and exhausting air continuously during, and 24 hours after, application to maintain nontoxic, unpolluted, safe working area. In areas lacking natural ventilation, provide forced air circulation to achieve a total air exchange rate of four per hour until fireproofing material is substantially dry.

1.11 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
 1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
 2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprayed-On Fireproofing:
 1. Grace Construction Products;
 2. Isolatek International Inc.;
 3. or equal.

2.02 FIREPROOFING

- A. Description:
 - 1. Type: Factory mix blend, cementitious fireproofing, free of asbestos and mineral wool, requiring only addition of water at the site for sprayed application.
 - 2. Surface Burning Characteristics: Material shall meet following requirements when tested in accordance with ASTM E84.
 - a. Flame Spread: Zero.
 - b. Smoke Developed: Zero.
 - 3. Physical Characteristic:
 - a. Bond Strength, ASTM E736: Minimum bond strength of 200 psf.
 - b. Compressive Strength, ASTM E761: Shall not deform more than 10 percent when subject to compressive forces of 1,000 psf.
 - c. Air Erosion, ASTM E859: Maximum allowable weight loss of 0.005 gm per square foot.
 - d. Dry Density, ASTM E605: Minimum average density shall be that listed in UL, ICBO Evaluation Report or as required by the authority having jurisdiction.
 - e. Mold Resistance, ASTM G21: Fireproofing material shall be formulated with a mold inhibitor and show resistance to mold growth for period of 69 days.
 - 4. Fire-Resistive Rating: Material shall have been tested for fire-resistive rating in accordance with ASTM E119.

- B. Product: W.R. Grace and Co., Construction Products Div.'s "Monokote Type MK-6"; Carboline Co.'s "Pyrolite 15"; Isolatek International's "Cafco 300"; Southwest Vermiculite Co. Inc.'s "Type 5"; or equal.

2.03 ACCESSORIES

- A. [Metal Lath: ASTM C847, diamond mesh weighing 3.4 pounds per square yard.]
- B. Related Materials: Bonding agent, [hard coats,] [sealers] and other materials for use with spray applied fireproofing material as recommended by manufacturer.
- C. Water: Clean and potable, free from impurities detrimental to spray applied fireproofing.

2.04 MIXING

- A. Mix spray applied fireproofing materials in accordance with manufacturer's directions in clean machine mixers free of remnants from previous batch.
- B. Do not use frozen, caked, lumpy, or partially set materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine receiving surfaces before application and verify that:
 - 1. Surfaces are ready to receive fireproofing.
 - 2. Surface conditions would not impair bonding or application of spray applied fireproofing.
 - 3. Substrate is clean of dirt, grease, loose paint/primers, oil, loose mill scale, and other extraneous substances which may affect bond strength of spray applied fireproofing.
 - 4. Hangers, inserts, clips, supports, sleeves, clamps or other attachments for work suspended from, attached to or passing through construction required to receive spray applied fireproofing are in place.
 - 5. Ducts, piping, equipment, or other items interfering with application of fireproofing have not been installed.

6. Means have been provided to prevent spray applied fireproofing from entering mechanical equipment and ductwork.
7. Projections have been removed where fireproofing will be exposed to view as a finish material.
8. Voids and cracks in substrate have been filled. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

- B. Do not apply spray applied fireproofing until:
1. Receiving surfaces in accordance with recommendations of fireproofing manufacturer.
 2. Unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protection:
1. Tarp or otherwise protect concrete surfaces that will be exposed in the completed building from damage by over spray, fall-out, and dusting-off of spray applied fireproofing materials.
 2. Tarp or otherwise protect concrete wall that will be exposed or only scheduled to receive painted finish in completed building from damage by over spray, fall-out, and dusting-off of spray applied fireproofing materials.
 3. Tarp or otherwise protect installation from rain, wind, and other weather related factors that could affect quality spray applied fireproofing or schedule.
 4. Tarp or otherwise protect adjacent equipment from damage by over spray, fall-out, and dusting-off of spray applied fireproofing materials.
 5. Provide temporary enclosures to prevent spray fireproofing from contaminating air.
 6. Provide temporary enclosures to prevent spray applied fireproofing from over spraying beyond building perimeter.
 7. Provide means to prevent spray applied fireproofing from entering mechanical equipment and duct work.
 8. Close off and seal duct work in areas where fireproofing is being applied.
- B. Perform tests as recommended by fireproofing manufacturer in situations where adhesion of fireproofing to substrate is in question.
- C. Remove incompatible materials that could affect bond by scraping, brushing, scrubbing, or sandblasting.
- D. Clean substrate of dirt, grease, loose paint/primers, oil, loose mill scale, and other extraneous substances which may affect bond strength of spray applied fireproofing.
- E. Otherwise, prepare receiving surfaces in accordance with recommendations of fireproofing manufacturer.
- F. [Metal Lath: Install metal as recommended by spray applied fireproofing manufacturer. As a minimum tie metal lath at 6 inches on center with a 2 inch lap.]
- G. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

3.03 APPLICATION

- A. Apply spray applied fireproofing in accordance with recommendations of fireproofing manufacturer and fire test report information unless otherwise noted.
- B. Apply spray applied fireproofing to structural steel not encased in concrete unless otherwise noted. Hand application allowable up to area of 12 square inches.

- C. Build spray applied fireproofing in sufficient thickness to achieve indicated fire rating with as many passes or stages as necessary to cover substrate with monolithic blanket of uniform density and texture.
- D. Utilize probes or other approved means to determine thickness during application.
- E. [After application trowel surface spray applied fireproofing to provide a skip trowel finish.]

3.04 FIELD QUALITY CONTROL

- A. University's Testing Laboratory will test sample specimens for required thickness and density in accordance with ASTM E605 at least once for every day's application.
- B. Contractor shall:
 - 1. Inspect the installed fireproofing after application and curing for integrity, prior to its concealment
 - 2. In event specimen indicates defective work by failure to meet required minimum:
 - a. Pay costs of additional tests required to determine extent of defective work requiring replacement.
 - b. Pay costs of additional tests required to establish quality required of replaced fireproofing.
 - 3. Patch areas from which testing samples have been removed to satisfy fire-resistive rating requirements.
 - 4. Re-inspect the installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

- A. See Section 01 74 00 - Cleaning.
- B. Remove application equipment from receiving areas and clean deposits and over sprays of spray applied fireproofing materials. Leave clean all finish surfaces adjacent to spray applied fireproofing areas including sweeping the floors when spray applied fireproofing operation has been completed.

3.06 DEFECTIVE WORK

- A. Repair spalling attributable to vibration of structure after application or resulting from unsatisfactory cleaning of surfaces.
- B. Patch and repair damage to this work before spray applied fireproofing is covered up, or if exposed, before final inspection.
- C. Remove spray applied fireproofing in areas deemed defective and replace with new meeting requirements of this Section.
- D. Restore to original condition work of other sections damaged in repair or replacement of defective work.
- E. Remove and replace work damaged by weather.

SPEC NOTE: *Delete the following Article if Rating Schedule is included on Drawings or if performance requirements are included the Article 1.03 Performance Requirements.*

The following schedule is an example of how a schedule could be developed. The schedule needs be reviewed against Project requirements, current code and UL Design Numbers.

3.07 SPRAY APPLIED FIREPROOFING SCHEDULE

BUILDING ELEMENTS	CBC TABLE 6A CLASSIFICATION OF STRUCTURAL MEMBER (consistent with type I construction)	RATING	UL DESIGN	COMMENTS
COLUMNS	Structural frame	3 hours	X772	For all wide flange columns exceeding W 6x9
PRIMARY BEAMS				Primary beams = all beams directly connected to or supported by columns.
- AT FLOORS	Structural frame	3 hours	N708	For all beams exceeding W 8x28
- AT ROOF	Structural frame	3 hours	N708	For all beams exceeding W 8x28
SECONDARY BEAMS				
- AT FLOORS	Floor construction	2 hours	N708	For all beams exceeding W 8x28
- AT ROOF	Roof construction	2 hours	N708	For all beams exceeding W 8x28 Penthouse roof is not rated - see note 3 below.
FLOOR SLAB (4 1/2" concrete topping over 2" metal deck)	Floor	2 hours	D925	Typical;
FLOOR SLAB (2 1/2" minimum concrete topping over 2' metal deck"	Floor	2-hour	D775	Reduced slab at location shown on Edge of Slab Drawings, AE Series
ROOF SLAB (4 1/2" concrete topping over 2" metal deck)	Roof	2 hours	D925	Penthouse roof is not rated - see note 3 below.
MISCELLANEOUS Tube steel at Interstitial deck	Floor construction	2 hours	X771	For maximum 3" in dia or 3" square tubes with minimum 3/16" thick walls.
Fireproofing Schedule Notes: 1. Fireproofing by formula may be used per 1998 Edition of UL Directory page 8, "Adjustment of Sprayed Protection Material". 2. All fireproofing UL design numbers are for unrestrained construction. 3. Fireproofing of Penthouse structure is not required based on CBC 1511.4 exception 3.				

END OF SECTION