

SECTION 07810 CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.00 SCOPE

A. This specification covers labor, materials, equipment, and application necessary for, and incidental to, the complete and proper installation of cementitious fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents.

1. This specification shall be supplemented by the applicable requirements of building codes, insurance rating organizations and all other authorities having jurisdiction.

B. SECTION INCLUDES

1. Cementitious fire protection material.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract documents, including Conditions of Division 1 apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section shall include, but is not limited to:

1. Interior fireproofing, concealed from view and direct contact
2. Interior fireproofing, exposed to view and direct contact or abuse
3. Exterior fireproofing, exposed to the elements and contact and possible abuse.

1.03 RELATED WORK

A. Examine all of the contract documents for requirements which affect the work of this section. Other specification sections, which directly relate to the work of this section include, but are not limited to the following:

1. Fire Stopping	Division 07, Section 07 84 [__]
2. Thermal Insulation	Division 07, Section 07 [2_] [__]
3. Gypsum and Plaster	Division 09, Section 09 [2_] [__]
4. Structural Steel	Division 05, Section 05 [1_] [__]
5. Steel Joists	Division 05, Section 05 [2_] [__]
6. Metal Floor Decking	Division 05, Section 05 [3_] [__]
7. Metal Roof Decking	Division 05, Section 05 [3_] [__]
8. Mechanical – Re: Patching	Division 15 [or any new division designation]
9. Electrical – Re: Patching	Division 16 [or any new division designation]

1.04 QUALITY ASSURANCE

A. Installer: Contractor shall be approved by manufacturer, and be experienced in installing specified products, and is approved by the manufacturer of the fireproofing products. A manufacturer's willingness to sell products to an installer engaged by contractor, does not in itself confer qualification on the buyer.

B. Single Source: Obtain spray applied fireproofing products from a single source for each product required. Provide secondary materials, which are acceptable to the fireproofing manufacturer which, are included in the tested and/or listed designs.

C. Fire Resistance: Provide fireproofing materials that have been listed and classified by one or more of the following testing authorities: Underwriters Laboratories (UL), Underwriters Laboratories of Canada (ULC), ITS (formerly Warnock Hersey) or other testing and inspecting agency acceptable to the architect and authorities having jurisdiction.

D. Packaging: All products must be packaged with proper identifications and approval indications acceptable to the testing and/or listing agency.

E. Asbestos: Manufacturer shall provide Certification that products supplied are 100% asbestos free.

F. Steel Surfaces: **Structural steel and steel decking shall be unprimed.**

G. Painted Steel Surfaces: Steel surfaces requiring fireproofing that are painted and/or primed, shall meet UL requirements for application and adhesion characteristics. Provide certifications from fireproofing manufacturer of compatibility of fireproofing and painted systems. Restrictions published by UL shall apply.

H. Remedial Work: Steel surfaces with incompatible primers or paint shall be remedied by removal of the primer or paint, be lathed, or otherwise remedied within the requirements of UL, so that adequate and approved bonding can occur, acceptable to authorities having jurisdiction.

I. Field Quality Assurance: NFCA 200 – “Field Quality Assurance Procedures for Application of Spray-Applied Fire Resistive Materials” shall be followed to help ensure that material application meets design requirements for substrate surface conditions, water control, wet density and thickness.

J. Special inspections: Shall be conducted by an owner engaged ICC Certified Special Inspector for SFRM to perform code mandated inspections following SFRM application.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fireproofing material when ambient or substrate temperatures are 40 deg. F. (4 deg C) or lower, unless temporary heat and protection is provided to maintain temperatures at or above this level for 24 hours before, during and 24 hours after application of fireproofing.

B. Ventilation: Ventilate building spaces during and after application of fireproofing at a rate of four (4) air changes per hour until fireproofing is dry. If natural ventilation is insufficient, employ mechanical means as necessary.

C. Surfaces to be sprayed: Surfaces to be sprayed must be free of any substance that would impair proper adhesion.

D. Dedicated Pumping Station Area: The contractor shall make available to the fireproofing contractor suitable area(s) for permanent locations for mixing and pumping fireproofing. This site must be:

1. Convenient to the structure
2. Be able to accommodate delivery of product
3. Allow for space for truck storage and trailer parking, and for materials and equipment
4. Be well drained
5. Be near a suitable source of potable water of quantity required
6. Have a proper source of electrical power, if required.
7. Provide temporary heat and ventilation to comply with manufacturers recommendations

1.06 SEQUENCING

A. Sequence and coordinate application of sprayed fireproofing with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure for interior applications to prevent deterioration of applied materials exposed to unfavorable environmental conditions.

2. Avoid exposure of fireproofing to unnecessary damage or abrasion.
3. Do not apply fireproofing to metal roof decking until roofing is complete including installation of all air handling systems. Prohibit all roof traffic until application of fireproofing is completed and dry.
4. Do not apply fireproofing until all hangers, clips and other necessary supports are in place, requiring penetration of fireproofing if installed after the application of fireproofing.
5. Ducts, piping and other items that would interfere with the application of fireproofing shall not be installed, until application is completed.

1.07 APPLICATION PARAMETERS

A. The fireproofing contractor shall be allowed to move freely to apply products as necessary. Materials stored on the floor, shall be protected by the contractor, or relocated if these materials prevent the proper application of fireproofing.

B. Patching, repairing and cleaning of fireproofing, due to damage done by others, shall be performed by the fireproofing applicator.

C. After completion of fireproofing, the fireproofing applicator shall remove all equipment, and broom sweep all floor areas of overspray materials.

D. Application of fireproofing shall not commence until the project is at a stage to allow the applicator to apply product continuously and efficiently, without undue interference and delay by other trades.

E. Conference: Convene a pre-installation conference to establish a procedure to maintain optimum working conditions and to coordinate this work with related an/or adjacent work.

F. Spray Applied Fire Resistive Materials (SFRM) shall be installed in accordance with NFCA – 100, “Standard Practice For The Application of Spray-Applied Fire Resistive Materials.”

1.08 SUBMITTALS, REFERENCES AND APPLICABLE STANDARDS

A. Product Data: Submit manufacturer's product data, installation instructions, use and limitations for each material used, and applicable fire test designs, as listed by approved fire testing organization.

B. Performance Certification: Submit manufacturer's verification of performance criteria, fire performance and compliance with applicable standards.

C. Applicable Standards and Test Methods:

Products Submitted shall be tested in accordance with the following ASTM test methods:

1. **Fire Resistance:** ASTM E-119 Standard Test Method for Fire Tests of Building Construction and Materials
2. **Surface Burning:** ASTM E-84 Standard Test Method for Surface Burning Characteristics of Building Materials
3. **Non-combustibility:** ASTM E-136 Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
4. **Density:** ASTM E-605 Standard for Thickness and Density of Sprayed Fire Resistive Materials Applied to Structural Members
5. **Adhesion/Cohesion:** ASTM E-736, Standard for Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members
6. **Deflection:** ASTM E-759, Standard for Effect of Deflection of Sprayed Fire Resistive Materials Applied to Structural Members
7. **Impact:** ASTM E-760, Standard for Effect of Impact on Bonding of Sprayed Fire Resistive Materials Applied to Structural Members
8. **Compression:** ASTM E-761, Standard for Compressive Strength of Sprayed Fire Resistive Materials Applied to Structural Members
9. **Air Erosion:** ASTM E-859, Standard of Air Erosion of Sprayed Fire Resistive Materials Applied to Structural Members

10. **Steel Substrate Corrosion:** ASTM E-937, Standard for Corrosion of Steel By Sprayed Fire Resistive Materials Applied to Structural Members
11. **Mold & Mildew Growth:** ASTM G-21, Standard for Determining Resistance of Synthetic Polymeric Materials to Fungi

D. Testing Standards

1. AWCI Technical Manual 12-A "Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials", and the current UBC Standard on: "Thickness and Density Determination for Spray Applied Fire Protection"
2. NFCA – 100, "Standard Practice For The Application of Spray-Applied Fire Resistive Materials."
3. NFCA 200 – "Field Quality Assurance Procedures for Application of Spray-Applied Fire Resistive Materials"

1.09 WARRANTY

A. General Warranty: Submit a written warranty, executed by the contractor and cosigned by the installer, agreeing to repair or replace sprayed fireproofing materials that fall within the specified warranty period.

1. Failures include, but are not limited to cracking, flaking, eroding in excess of specified requirements, peeling and delaminating of sprayed fireproofing from substrates due to defective materials or installation.

2. Not covered in this warranty are failures due to damage by others, such as occupants and owner maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, excessive flexing of floor systems, and work on said roof systems, and other causes not reasonable foreseeable under conditions of normal use.

B. Warranty Period: 1 year, from date of substantial completion.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type, and other identifying data. Packaging shall bear the ULI or ITS labels and seals for fire resistance ratings.
- B. Store materials at a temperature above 40 degrees F (4 degrees C) in a dry location, protected from the weather.
- C. Damaged packages found unsuitable for use and any materials which have come into contact with contaminants prior to use shall be rejected and removed from the project.

PART 2 - PRODUCTS

A. General: All products shall be cementitious fireproofing materials. Physical properties shall be in accordance with below listed properties. Products shall be a mixture of gypsum and/or cement based materials, with lightweight aggregates to be mixed with water to form a slurry for conveyance and application. Mineral fiber based products not permitted.

2.01 **Standard Density Cementitious Fireproofing:** Standard density fireproofing meeting the below listed minimum physical properties, for use in locations not subject to physical contact or abuse.

A. Cementitious Manufacturers:

1. Carbolite / Southwest Fireproofing Products, Type 5 GP™, P-15
2. or equal

B. Physical Properties: Minimum values unless otherwise indicated or higher values required to attain designated fire resistance ratings, measured per standard ASTM test methods referenced above in section 1.08, Part C.

1. E 84: Flame Spread 0, and Smoke Developed 0.
2. E 136: Passes, and is determined non-combustible
3. E 605: Density shall be a minimum of 15 pcf (240kg/m²),
4. E 736: Cohesion/Adhesion shall be 200 psf (9.5 kPa), with 150 psf (7.2 kPa) minimum acceptable level; if primed steel is used, comply with requirements published by ULI / ULC
5. E 759: No cracking, spalling or delamination
6. E 760: Impact: No delamination, cracking or spalling
7. E 761: Compression shall be 16.25 lbf/in² (112 kPa)
8. E 859: Erosion shall be 0.00 gr/sq.ft. maximum
9. E 937: Corrosion: No evidence of corrosion allowed
10. G 21: Mold Resistance: No evidence of growth

C. Structural members not meeting minimum size requirements specified in a design shall receive a thickness of fireproofing consistent with the member's W/D ratio.

2.02 **Medium Density Cementitious Fireproofing:** For exposed applications of sprayed fire-resistive materials, provide manufacturers standard products complying with requirements for materials and composition having the following minimum physical properties measured per ASTM standard test methods referenced above in Section 1.08, Part C.

A. Cementitious Manufacturers:

1. Carboline / Southwest Fireproofing Type 5 MD™ for regular conditioned areas; 7 GP™ for humidity conditions,
2. P-239 for fire protection and acoustical value
3. or equal

B. Exposed fire protection shall include, but are not limited to the following areas:

1. Stairwell columns and beams
2. Elevator shafts structural steel
3. Mechanical room columns
4. Areas where physical abuse may be encountered

C. Physical Properties:

1. E 84: Flame Spread 0, and Smoke Developed 0
2. E 136: Passes, and is determined to be non-combustible
3. E 605: Density shall be a minimum of 22 pcf (352kg/m²),
4. E 736: Cohesion/Adhesion shall be >1268 psf (>60.7 KPa)
5. E 759: No cracking or delamination
6. E 760: Impact: No delamination, cracking or spalling
7. E 761: Compression shall be a minimum 118 psi (813 kPa)
8. E 859: Erosion shall be 0.00 gr/sq.ft.
9. E 937: Corrosion: No evidence of corrosion allowed
10. G 21: Mold Resistance: No evidence of mold growth

2.03 **High Density Cementitious Fireproofing:** High density fire protection shall be defined as permanently exposed to weather, and shall be manufactured of cement based products, with light weight aggregate, with a minimum density of 40 pcf, and shall have the minimum ASTM values given above for the exposed fire protection in section 2.02 of this specification.

A. Cementitious Manufacturers:

1. Carboline Types Pyrocrete P40, P 240 and P 241
2. Type 7 HD™ high density interior applications
3. or equal

C. Physical Properties:

1. E 84: Flame Spread 0, and Smoke Developed 0
2. E 136: Passes, and is determined to be non-combustible
3. E 605: Density shall be a minimum of 40 pcf (640kg/m²),
4. E 736: Cohesion/Adhesion shall be >6000 psf (287 KPa)
5. E 759 No cracking or delamination
6. E 760 Impact: No delamination, cracking or spalling
7. E 761: Compression shall be 350 psi (2411 kPa)
8. E 859: Erosion shall be 0.00 gr/sq.ft.
9. E 937: Corrosion: No evidence of corrosion allowed
10. G 21: Mold Resistance: No evidence of mold growth

2.04 **Miscellaneous Materials:** Provide the following materials as standard with each of the fireproofing systems, as recommended by the manufacturer for each condition and substrate.

A. Primers: It is not recommended that any structural steel primers are used on any steel surfaces, unless tested and listed by ULI in designs proposed to be used. Compatible primers may be used, providing the fireproofing manufacturer can verify such compatibility in accordance with UL requirements.

B. Adhesives: Provide adhesives as necessary, to comply with manufacturer requirements for adhesion of fireproofing. Acceptable adhesives are:

1. TC-55 water based acrylic adhesive
2. Type DK Spatter Coat

C. Reinforcements: Provide fiberglass mesh or wire lath for areas where adhesion is not compatible and for application of fireproofing to steel joists.

D. Mold Inhibitor: Provide factory added mold inhibitor tested in accordance with ASTM G 21 for areas such as hospitals, testing laboratories, health facilities and other areas of hygienic requirements.

E. Top Coats: Use as required and recommended by fireproofing manufacturer or compatible products.

PART 3 – EXECUTION

3.01 Pre-Installation Examination: The applicator and the contractor shall examine surfaces to be fire protected, and determined if the surfaces are satisfactory. Substrate conditions must comply with the following:

A. Substrates must be free of grease, oil, rolling compounds, incompatible primers, loose mill scale, dirt or any other foreign matter which would prevent proper bonding of fireproofing. Structural steel shall be unprimed. Steel roof and floor decking shall be galvanized only.

B. Any objects such as hangers, piping attachments, and other suspended retainer devices shall be properly secured.

C. Ducts, piping, and other equipment shall not be placed or suspended until the fire protection materials are in place.

3.02 Preparation:

A. Clean any substrate not ready to receive fireproofing. Consult with manufacturer if conditions exist that are not easily remedied.

B. Apply adhesives as necessary.

C. Cover all work subject to oversprays during application. Provide temporary enclosure when necessary to temporarily confine fireproofing and protect the environment.

D. Assure maintenance of ambient temperatures, and/or heat and ventilation when required.

3.03 Mock Up

- A. Before proceeding with the work, the applicator shall apply the fire protection material to a section as a mock up. This section shall be witnessed by the architect or owner's representative and shall be subject to their approval to be used as a guide for texture, and thickness of the finish work.

3.04 Installation, General

A. Comply with manufacturers written application instructions and procedures for mixing, conveying and applying products, in accordance with the types of recommended equipment, admixtures and specific procedures regarding special conditions.

B. Coat substrates with adhesives if necessary.

C. Extend fireproofing materials in full thickness per approved design, to be protected. Unless otherwise recommended, install fireproofing complete in each area, prior to another.

D. Provide a uniform surface matching UL requirements for designs approved. Apply products at the minimum densities required, or greater.

E. Cure fireproofing to prevent premature drying; protect from freezing as listed in Section 1.05 of this specification.

F. Exposed to View Applications: Where exposed to view, provide appearance of fire protection as follows:

1. Provide a troweled surface of appearance previously determined prior to installation
2. Surfaces shall be within tolerances of 1/16 inch
3. Mask edges of termination's so as to achieve neat and sharp edges.

3.05 Field Quality Control:

A. Testing Agency: The owner shall engage as ICC certified special inspector as the independent testing agency to perform field quality inspections of applied fireproofing, and prepare reports.

1. Testing shall be done in accordance with the building code following procedure in AWC "Technical Manual 12 - A, Standard Practice for the Testing and Inspecting of Field Applied Sprayed Fire - Resistive Materials" and ASTM E 605.
2. Tests shall be done to determine thickness, density and adhesion.
3. Variances shall be corrected with the testing agency present and when the applicator is performing work in the same area to allow for expedient corrections.
4. A schedule of tests to be performed shall be agreed upon by applicator, contractor and testing agency.

3.06 Cleaning and Repair:

A. After completion of each day's work, the applicator shall broom clean the area fireproofed. Areas not to receive fireproofing and that are finished surfaces shall be masked.

B. All patching of damaged fireproofing shall be completed by applicator.

3.07 Schedule:

A. Fire resistance ratings shall be in hours as listed below

STRUCTURAL COMPONENT	HOURS REQUIRED	UL DESIGN
FLOOR ASSEMBLY	_____	
ROOF ASSEMBLY	_____	
COLUMNS, SPANDREL	_____	
COLUMNS, INTERIOR	_____	
PRIMARY BEAMS	_____	
SECONDARY BEAMS	_____	
TRUSSES	_____	
ROOF DECK, BEAMS, JOISTS	_____	

B. List below other provisions not covered above: _____

3.08 Restrained and Unrestrained Classifications

Guidance information for determining conditions of thermal restraint in buildings is available in the introductory section of ULI's Fire Resistance Directory – Volume 1 and in the Appendix of the test standards ASTM E119 and ANSI/UL 263

The 2006 International Building Code states: **703.2.3 Restrained classification.** *Fire-resistance-rated assemblies tested under ASTM E 119 shall not be considered to be restrained unless evidence satisfactory to the building official is furnished by the registered design professional showing that the construction qualifies for a restrained classification in accordance with ASTM E 119. Restrained construction shall be identified on the plans"*

Definition

Thermal Restraint in Buildings: *"Floor ceiling and roof-ceiling assemblies and individual beams in buildings shall be considered restrained when surrounding or supported structure is capable of resisting substantial thermal expansion throughout the range of anticipated elevated temperatures. Constructions not complying with this definition are assumed to be free to rotate and expand and shall be therefore considered as unrestrained."* ANSI/UL263, Appendix C

References

NFCA 100 Standard Practice For The Application of Spray-Applied Fire Resistive Materials
NFCA 200 Quality Assurance Procedures for Application of Spray-Applied Fire Resistive Materials