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# EDITING NOTE

All bracketed blanks, words, phrases, sentences, and paragraphs in this specification require the editor to either include or delete the bracketed section, or provide required information.

# SPRAYED FIRE-RESISTANT MATERIALS - SECTION 078100

PART 1 - GENERAL

* 1. RELATED DOCUMENTS
		1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
		2. Related Sections include the following:
			1. Section 051200 – Structural Steel Framing
			2. Section – 078413 Penetration Firestopping
	2. SUMMARY
		1. This Section includes the following:
			1. Concealed and exposed sprayed fire-resistive materials for structural steel, as required.
	3. ALLOWANCES

[List Allowances, if included as part of the contract. Confirm with OSHEM and COTR]

* 1. UNIT PRICES

[List Unit Prices, if included as part of the contract. Confirm with OSHEM and COTR]

* 1. DEFINITIONS
		1. COTR: Contracting Officer Technical Representative
		2. FM: FM Global (Factory Mutual)
		3. FPE: Fire Protection Engineer
		4. Furnish: To supply the stated equipment or materials
		5. Install: To set in position and connect or adjust for use
		6. NFPA: National Fire Protection Association
		7. NICET: National Institute for Certification in Engineering Technologies
		8. OSHEM: Office of Safety Health and Environmental Management
		9. Provide: To furnish and install the stated equipment or materials
		10. UL: Underwriters Laboratories
		11. Concealed Sprayed Fire-Resistive Materials: Applied to surfaces that are concealed from view behind other construction when the Work is completed.
	2. SYSTEM DESCRIPTION
		1. Cementitious and/or sprayed fiber fire resistive materials applied to structural steel and/or floor decking to provide the required hourly – rating.
	3. PERFORMANCE REQUIREMENTS
		1. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch (9 mm), per ASTM E 605:
			1. No more than ten percent (10%) of the thickness measurements of sprayed fire resistive materials shall be less than the thickness required by the approved design.
			2. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
			3. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm), the minimum allowable individual thickness of sprayed fire-resistive material shall be the design thickness minus 25 percent.
			4. 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. (240 kg/cu. m).
		2. Bond Strength: 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736 under the following conditions:
			1. 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.
			2. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
			3. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
			4. The impact of ambient conditions (temperature, humidity, space conditions, etc.) shall be considered in the selection of fireproofing products to prevent loss of required bonding strength.
		3. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).
		4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
		5. Deflection: No cracking, spalling, or delamination per ASTM E 759.
		6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
		7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
		8. 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:
			1. Flame-Spread Index: 10 or less.
			2. Smoke-Developed Index: 0.

I. Fungal Resistance: No observed growth on specimens per ASTM G 21.

* 1. SUBMITTALS
		1. Product Data: For each type of product indicated.
		2. 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:
				1. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
				2. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
				3. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified professional engineer.
			3. Treatment of sprayed fire-resistive material after application.
		3. Product Certificates: For each type of sprayed fire-resistive material, signed by product manufacturer.
		4. Qualification Data: For manufacturer and testing agency.
		5. Compatibility and Adhesion Test Reports: From sprayed fire-resistive material manufacturer indicating the following:
			1. Materials have been tested for bond with substrates.
			2. Materials have been verified by sprayed fire-resistive material manufacturer to be compatible with substrate primers and coatings.
			3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
		6. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed sprayed fire-resistive materials.
		7. Research/Evaluation Reports: For sprayed fire-resistive materials.
		8. Warranties: Special warranties specified in this Section.
	2. QUALITY ASSURANCE
		1. 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.
			1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.
		2. 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.
		3. Source Limitations: Obtain sprayed fire-resistive materials through one source from a single manufacturer.
		4. 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.
		5. Compatibility and Adhesion Testing: 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.
		6. 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.
		7. 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."
		8. Mockups: Apply mockups to verify qualities of materials and execution and set the quality standard for fabrication and installation.
			1. Locations of Mockups: As determined by COTR.
			2. Extent of Mockups: As determined by COTR
			3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
		9. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to sprayed fire-resistive materials including, but not limited to, the following:
			1. Review and finalize construction schedule and verify sequencing and coordination requirements.
	3. DELIVERY, STORAGE, AND HANDLING
		1. Deliver products to project site in original, unopened packages with intact and legible manufacturers’ labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
		2. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.
	4. PROJECT CONDITIONS

[List any special project conditions and/or environmental limitations on system installation, such as temperature, humidity, ventilation, etc.]

* 1. COORDINATION
		1. 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.
	2. WARRANTY
		1. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
			1. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistive materials from substrates.
			2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
		2. Warranty Period: 5 years from date of Substantial Completion.
	3. SERVICE AGREEMENT

[List requirements, if part of the contract. Confirm with OSHEM and COTR].

* 1. EXTRA MATERIALS

[List special requirements for spare parts, if part of the contract. Confirm with OSHEM and COTR].

PART 2 - PRODUCTS

* 1. MANUFACTURERS
		1. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
			1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
	2. SPRAYED FIRE-RESISTIVE MATERIALS
		1. General: For concealed 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.
		2. Available Products:
			1. Cementitious Sprayed Fire-Resistive Material:
				1. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
				2. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6/HY.
				3. Isolatek International Corp., Cafco Products; Cafco 300.
				4. Southwest Vermiculite Co., Inc.; 5GP.
				5. Grace, W. R. & Co.--Conn., Construction Products Div.; Retro-Gard.
				6. Approved equal.
			2. Sprayed-Fiber Fire-Resistive Material:
				1. Isolatek International Corp., Cafco Products; Cafco Blaze-Shield II.
				2. Isolatek International Corp., Cafco Products; Type JN-HD.
				3. Approved equal.
		3. Material Composition: Either of the following:
			1. Cementitious sprayed fire-resistive material 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 or mortar for conveyance and application.
			2. Sprayed-fiber fire-resistive material consisting of factory-mixed, dry formulation of inorganic binders, mineral fibers, fillers, and additives conveyed in a dry state by pneumatic equipment and mixed with water at spray nozzle to form a damp, as-applied product.
		4. 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. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire- resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."

PART 3 - EXECUTION

* 1. EXAMINATION
		1. 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.
		2. 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.
		3. Proceed with installation only after unsatisfactory conditions have been corrected.
	2. PREPARATION
		1. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
		2. 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. Prime substrates where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive sprayed fire-resistive material.
		4. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.
	3. INSTALLATION, GENERAL
		1. 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.
		2. 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.
		3. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely

attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

* + 1. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire- resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.
		2. 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.
		3. 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.
		4. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply sprayed fire-resistive material that differs in color from that of encapsulant over which it is applied.
		5. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire- resistive material over which they are applied.
	1. INSTALLATION, CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS
		1. Apply concealed sprayed fire-resistive material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed Sprayed Fire-Resistive Materials" Article.
		2. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating.
	2. FIELD QUALITY CONTROL
		1. Testing Agency: The Contractor shall hire an Owner-approved 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.
		2. 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. (93-sq. m) area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. (0.093-sq. m) sample area, with sample width of not less than 6 inches (152 mm) 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.

* + - 1. 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."
			2. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. (929 sq. m) 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.
			3. 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.
		1. 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.
		2. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.
		3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
	1. CLEANING, PROTECTING, AND REPAIR
		1. 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.
		2. 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.
		3. 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.
		4. Repair or replace work that has not been successfully protected.

END OF SECTION 078100