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ABSTRACT:

What binder, density, and bond strength are required for sprayed fire-resistive materials? New building code requirements include additional considerations for bond strength in buildings greater than 75 feet high. Careful choices must be made when specifying SFRM to ensure comparable products and fair competitive bidding.

FILING:

UniFormat™
B1010 - Floor Construction
B1020 - Roof Construction

MasterFormat®
07 81 00 - Applied Fireproofing

KEYWORDS:

SFRM, Fireproofing

REFERENCES:

ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E859 - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members

International Building Code, 2009 edition.

SFRM Types and Applications

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Background

Must medium density spray fire-resistive materials (SFRM), or spray fireproofing, be specified to meet the new building code high rise building requirements?

Not necessarily.

Most medium density SFRM products do exceed the new code high-rise requirements. However, there is a cost associated with selecting medium density SFRM products compared to low density SFRM products to protect the building's steel frame. Let's take a look at the requirements and the options.

The Code

The IBC 2009 edition introduced a new requirement for SFRM used in high-rise buildings in section 403.2.4. Now the following bond strength requirements apply depending on building height.

- Up to 75 feet high (non high-rise) 150 psf
- 75 feet to 420 feet (high-rise) 430 psf
- 420 feet and greater (high-rise) 1000 psf

The rationale for the new requirement is that, above all else, the SFRM must remain bonded to the steel to be effective. If the bond is compromised, the SFRM may fail during a fire event and the steel may not be capable of support the loads for the intended time to ensure safe evacuation of the building occupants. The IBC requires field testing by special inspections specified in

section 1704.12. Three physical properties of SFRM must be measured by specific ASTM teststo ensure code compliance.

- Application thickness, ASTM E605
- Density, ASTM E605
- Bond strength, ASTM E736

Unlike bond strength, the minimum thickness and density are not set by the code. The minimum thickness and density are determined by the approved fire resistance design selected for each application.

Visual inspections are required to examine the condition of the substrate before SFRM is applied to ensure proper bond and the condition of the finished application to ensure complete coverage.

One other performance aspect is particularly important when the fireproofing is used in a return air plenum. The velocity of the return air can loosen the surface of the SFRM product and cause particles to be transported by the return air stream. Air erosion resistance is the ability of the SFRM to remain in place rather than being scoured by the return air. Most SFRM products are unaffected by return air streams at the ASTM E859 test velocity of 1200 fpm, reporting zero material loss. Refer to ICC-ES for current SFRM product Evaluation Reports

The Types

Spray-on fireproofing materials are available in two basic types based on the binder. The binders are gypsum cement and portland cement. The other distinction is the means by

which water is added to the bagged SFRM. Most products are combined with water in a mixer before the product is applied. Only CAFCO® BLAZE-SHIELD® products from Isolatek are mixed at the spray nozzle as the SFRM is applied. ASTM SFRM test standards refer to the first as cementitious material and the second as fibrous material even though both contain cement binders.

Gypsum binders should not be used for exterior applications because moisture exposure will degrade the cement.

The available products are usually identified by minimum dry density:

Low density, 15 pcf

Medium density, 22 pcf

High density, 40 pcf

Low and medium density products are available with both gypsum cement and portland cement binders. High density products are available with portland cement binders only.

The greater the density the more durable the product will be. Low density products are used only where the SFRM will be concealed in completed construction. Low density SFRM is usually concealed by gypsum board at column locations and acoustic ceiling panels above suspended ceilings.

Medium density products are often selected where the product may be exposed to physical abuse in an interior application or where exposed to exterior environmental conditions without direct exposure to the elements. SFRM is often exposed in mechanical rooms and other utility type spaces. At covered loading docks SFRM may be exposed to high humidity and physical abuse, but protected from weather. Both applications may warrant medium density products.

High density products can withstand physical abuse and direct exposure to

exterior elements without additional protection. For buildings, applications may include open exterior loading docks, intake air plenums, and parking garages. Refer to 4Specs.com for a list of [current SFRM manufacturers](#).

Material Options

Traditional low density SFRM products develop bond strengths of 200-400 psf, not enough for the new high-rise requirements. Medium density products have bond strengths of 2000 psf or greater, far in excess of the high-rise requirements.

The only way to achieve the required bond strength for high-rise construction has been to specify at least a medium density product. New low density materials are being introduced to the market that will achieve the required high-rise bond strengths.

These new materials provide a cost advantage compared to the medium density products because they have greater coverage rates. Therefore application is faster. Since labor rates are the majority of the application cost, the installed cost of the new products can offer significant advantages.

Specifications

AIA's MasterSpec® includes all fireproofing types and densities in a single article — all but these new products. Edit the section carefully to ensure the specified products are consistent with the specified performance.

Conclusion

For competitive bidding, select SFRM products with the same binder, mixing method, and density. Consider

allowing the newer low density products with improved bond strength to meet the code requirements without the cost of a medium density product, especially when the SFRM is concealed in the finished construction. The latest products meeting high-rise bond strengths are not found on manufacturers' websites yet. Contact your preferred SFRM manufacturer for additional information. Be sure to request data showing tested fire resistance designs for each project application.

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