DATA SUBMITTAL

Monokote® MK-6®/HY®

Comparison of Physical Properties with CAFCO® D-C/F

Spray applied fireproofing is the most effective and economical means to protect structural steel from the effects of fire. To perform its critical function, fireproofing must remain in-place. Any material which is too soft and friable (damageable) to remain on the steel after application has little fire protection value.

Tests are now available which measure significant characteristics of spray applied fireproofing materials. From these tests it is possible to establish reasonable levels of in-place performance – a critical element in achieving quality fireproofing. These tests should be used to determine the quality of all fireproofing materials for your specifications.

Grace Construction Products has conducted a series of tests on Monokote® (cementitious) and Cafco (sprayed fiber) fireproofing. Samples of each product, at various densities, were subjected to each of the performance tests. The results show the superior in-place performance of Monokote.

Comparative Test Results

Characteristic	Performance Standard	Test Results: Monokote MK-6®/HY® Cementitious		Test Results: CAFCO Type D-C/F Sprayed Fiber		Test Reference
Impact Penetration	6 cm^3 (Maximum)***	Density (pcf)	Volume Removed, (cm^3)	Density (pcf)	Volume Removed, (cm^3)	City of San Francisco
		16.1	3.3	19.0 15.6 13.7 13.5	5.75 17.0 66.0 **	
Abrasion Resistance	15 cm^3 (Maximum)***	Density (pcf)	Volume Removed, (cm^3)	Density (pcf)	Volume Removed, (cm^3)	City of San Francisco
		16.0	8.3	19.0 15.6 13.5	13.0 26.5 158.3	
Compression	1200 psf (Minimum)	Density (pcf)	Load at 10% Deformation (psf)	Density (pcf)	Load at 10% Deformation (psf)	ASTM E761
		16.1 14.1	1820 1440	19.0 14.0 12.5	518.0 62.9 59.0	
Bond Strength (Cohesion/ Adhesion)	200 psf (Minimum)	Density (pcf)	Bond Strength (psf)	Density (pcf)	Bond Strength (psf)	ASTM E736
		14.4	339	19.4 15.7 14.0 12.3	204.0 38.6 30.0 15.8	
Air Erosion 15 mph	.005 gms/ft^2 (Maximum)	Density (pcf)	Weight Loss at 24 hours (gm/ft^2)	Density (pcf)	Weight Loss at 24 hours (gm/ft^2)	ASTM E859/GSA
		14.3	.000	20.2 15.0 14.2 12.1	.132 .171 .183 .339	
Air Erosion 29 mph	No continued erosion after 4 hr	Density (pcf)	Weight Loss between 4 hr and 24 hr (gm/ft^2)			Uniform Mechanical Code/ASTM E859
		16.3	.000	No Data Available		

**Impact Loss Exceeds Limitation Of This Test

***Grace-Recommended Standard

Air Erosion Test (ASTM E859/GSA)

This test is designed to measure the amount of fireproofing material eroded by air movement across its surface. Dusting and sifting of the material will lead to loss of fire-resistive properties.

Samples are inserted into openings of a tunnel-like apparatus with the fireproofing exposed to the interior. A blower, forcing air down the tunnel at a velocity of 1200 ft/min, is activated for 24 hours. A filter at the end opposite the blower collects material which has been eroded from the samples. The filter is weighed at 1, 6 and 24 hour intervals to determine weight loss. If the material is still dusting after 24 hours, the procedure is continued until weight loss stops.

Additionally, the Uniform Mechanical Code requires that products used in air handling plenum areas must be tested with airflows of minimum 2500 ft/min or 28 mph (Standard 6-1, Uniform Mechanical Code). Results for this airflow requirement are also included. Performance criteria states that "at the end of the test period, there is to be no evidence of continued erosion, and interior surfaces of the sample are not to show evidence of cracking, flaking, peeling or delamination. For the purpose of this requirement, continued erosion is considered to be either a constant or an increasing rate of erosion".

The test results are reported as the amount of weight loss in g/ft^2 of sample area. Excessive air erosion of a fireproofing means premature loss of its ability to perform as intended.

Impact Penetration Test (Developed by City of San Francisco)

This test is designed to measure the resistance of a fireproofing material to penetration or removal due to impact forces. Low resistance to these forces means excessive damage to the material and loss of fire protection.

A sample, measuring 305 mm x 457 mm (12 in. x 18 in.), is subjected to a swinging pendulum. The pendulum length is set so that the low point of the swing is at a point 13 mm (½ in.) into the specimen. The impact device is then held horizontally and allowed to free-fall onto the fireproofing surface.

This procedure is followed three times on two samples. The amount of material dislodged is measured by filling the voids with sand and then weighing the sand used. If the pendulum swings past the vertical, dislodging material to the opposite side, the sample has exceeded the limitations of the test (it has failed).

An average volume of the sand from all six samples tested is determined and reported as the volume of material removed by impact forces.

Abrasion Test (Developed by City of San Francisco)

This test is designed to measure the amount of material removed by abrasion forces moving across the surface of the fireproofing material. Low resistance to these forces means an excessive amount of material may be removed after installation by normal construction activity.

The test allows a rake-like device to pass over the surface of a 305 mm x 457 mm (12 in. x 18 in.) sample. Multiple passes are made on each of two samples. All abraded fireproofing material is removed and the tracks made by the abrading instrument are filled with sand.

An average volume of sand used to fill the tracks caused by the rake moving over the samples is reported as the volume of material removed.

Compression Test (ASTM E761)

This test is designed to measure the deformation resistance of a fireproofing material. With low compressive strengths a fireproofing material is easily deformed. These easily compressible materials cannot resist removal from the steel.

A 152 mm x 610 mm (6 in. x 24 in.) sample of fireproofing, applied to a steel sheet, is subjected to compression loads through a 152 mm (6 in.) square bearing surface. After application of an initial load and measurement of the thickness, the sample is then compressed to ultimate load or 10% deformation, whichever occurs first.

The test results are reported as the amount of compressive force (in lb/ft^2) required to produce a 10% deformation of the material (or ultimate load).

Bond Strength Test (ASTM E736)

This test measures the force required to cause the fireproofing material to separate from itself (cohesion) or remove it from the substrate (adhesion). This test indicates how well the material will remain on the steel after installation.

The test is conducted by adhering a metal dish to the surface of the fireproofing. By using a two-component urethane foam, the metal cap is tightly bonded to the fireproofing surface.

Uniform perpendicular forces are exerted to pull the dish from the fireproofing. The force required to separate the fireproofing from the substrate or itself is measured.

Results are reported as the force (in lb/ft^2) required to cause cohesive or adhesive failure. The higher the bond strength, the more resistant the fireproofing is to accidental removal and damage.

SERVICE CENTERS

Grace maintains sales offices in every major metropolitan area. To locate your local Grace Fireproofing representative, or to obtain additional product information, contact your local service center by dialing **866-333-3SBM (3726).**

For Technical Assistance call toll free at 866-333-3SBM (3726).

Visit our web site at www.graceconstruction.com

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