Maine Wharf Portland, ME	Landry French 160 Pleasant Hill Road Scarborough, ME
Submittal Section: Spray Applied Fireproofing	8/6/2015

Contents:

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Application Guidelines to Spray Applied Cementitious Fireproofing

1. Spray applied fireproofing must be applied prior to the installation of duct work, piping or conduit, metal studs, and block walls.

2. Clips, short hangars (6"), support sleeves or items that penetrate the fireproofing may be installed, as practical, prior to fireproofing.

3. The floor area must be finished concrete and clear to roll mobile scaffolding along the area to be fireproofed.

4. Clutter, tools, debris and other items stored on the floor must be located where they will not interfere with the fireproofing. Protection of these items is not the responsibility of New England Fireproofing.

5. Prior to application of fireproofing to the underside of non-concrete roof decks, all roofing applications shall be completed. All roof traffic shall be prohibited upon commencement of fireproofing application and until the fireproofing material is fully cured and dried (30 days minimum). Areas to be sprayed must be weather tight.

6. Prior to application of fireproofing to the underside of concrete floor and roof decks, all decks must have slabs poured to avoid deflection and damage to fireproofing.

7. Requirements for winter application of spray applied fireproofing:
    a. Maintain temperature of 40° F for twenty-four (24) hours before, during and 24 hours after spraying. A minimum substrate temperature of 40° F is required prior to application.
    b. During extremely cold temperatures (0° - 15° F) it may be necessary to enclose the floor above the spray area in order to maintain a 40° F temperature on the steel in the spray area.
    c. Ventilation is as important as temperature in getting proper adhesion and surface hardness. Care must be taken to provide balance between heating and ventilation.

8. The scope of contract work for spray applied fireproofing typically EXCLUDES the following:
    a. Continuous water supply to the spraying area (by G.C.);
    b. Uninterrupted 240 volt, 50 amp electrical power to mixer station (by G.C.);
    c. Dumpster (by G.C.);
    d. Convenient area for storage of materials (by G.C.)
    e. Temporary lighting (by G.C.);
    f. Winter heat and ventilation – four air exchanges per hour (by G.C.);
    g. Weather protection (by G.C.);
    h. Cleaning or priming of steel;
    i. Masking;
    j. Sealer;
    k. Testing and inspections; and
    l. Patching of fireproofing due to damage by others.
    m. Mockups
9. If exterior walls are to be install prior to FP, must have 6" clearance

DATA SUBMITTAL

Monokote® MK-6®/HY®

Product Data and Application Instructions

Product Information/Description

Monokote® MK-6®/HY® is a single component, mill-mixed fireproofing plaster which requires only the addition of water on the job site to form a consistent, pumpable slurry. MK-6/HY is designed for use on structural steel columns, beams, joists, trusses and floor and roof decking.

Features/Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occupant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL tested and factory inspected
- Universal Building code compliance (ICBO, SBCCI, BOCA, NBCC, ICC)

Delivery and Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel and Concrete Surfaces

a. Prior to the application of Monokote MK-6/HY, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local Grace sales representative for details.

d. Prior to application of Monokote MK-6/HY, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-6/HY.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Performance Characteristics

Physical Properties	Values	Test Method
Dry density, minimum average	240 kg/m^3 (15 pcf)	ASTM E605 UBC STD 7-6
Bond strength	16.2 KPa (339 psf)	ASTM E736
Compression, 10% deformation	68.9 KPa (1,440 psf)	ASTM E761
Air erosion	0.000 g/m^2 (0.000 g/ft^2)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	ASTM E859 UMC STD 6-1
Corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	ASTM E1354
Impact penetration	3.3 cm^3	Developed by City of San Francisco
Abrasion resistance	8.3 cm^3	Developed by City of San Francisco

g. Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed and inspected.
h. Other trades shall install clips, hangers, support sleeves, and other attachments required to penetrate the fireproofing, prior to application of the fireproofing material.

Mixing

a. Monokote Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 640 - 720 kg/m^3 (40 - 45 pcf) of material.
b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 688 ± 16 kg/m^3 (43 ± 1 pcf) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately 13 mm (½ in.) or less, apply in one pass.
   2. For thicknesses of 16 mm (⅝ in.) or greater, apply subsequent passes after the first coat has set.
b. Spatterkote® SK-3 shall be applied to all flat plate cellular deck units and below all bottomless trench headers prior to application of MK-6/HY. Spatterkote shall be applied in accordance with the manufacturer's application instructions.
c. Spatterkote SK-3 shall be applied to roof decking where required prior to application of Monokote.
d. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.
e. Monokote shall have a minimum average dry, in-place density of 240 kg/m^3 (15 lbs/ft^3).
f. Monokote is formulated to be mixed with water at the job site.
g. Monokote Accelerator is to be used with Monokote MK-6/HY to enhance set characteristics and product yield. The Monokote Accelerator is injected into the Monokote MK-6/HY at the spray gun. Monokote Accelerator shall be mixed and used according to manufacturers recommendations.
h. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 38 kPa (20 psi), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due either to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature and Ventilation

a. An air and substrate temperature of 4.4°C (40°F) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.
b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the provisions of ASTM E605-93, "Standard Test Method for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members" or Uniform Building Code Standard No. 7-6 "Thickness and Density Determination for Spray Applied Fireproofing."
b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.
c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary SLIPPERY WHEN WET signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.
b. A Material Safety Data Sheet for Monokote MK-6/HY is available upon request by calling 866-333-3SBM (3726).

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62 Whittemore Avenue
Cambridge, MA 02140-1692
Tel.: (866) 333-3SBM (3726)
Fax: (617) 498-4311

W. R. Grace & Co.-Conn.
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For Technical Assistance call toll free at 866-333-3SBM (3726).

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GRACE
Construction Products

DATA SUBMITTAL

Monokote® Spatterkote® SK-3

PRODUCT INFORMATION

Description

Monokote® Spatterkote® SK-3 is a mill-mixed portland cement based cementitious spray applied fireproofing accessory product. It is designed to be used with Monokote MK-6® Fireproofing and Retro-Guard® RG Replacement Fireproofing on cellular steel decking with flat plate on the bottom and some roof-ceiling designs. Being cement based, Spatterkote bonds tenaciously to flexible galvanized flat plate steel surfaces used in many of today's most advanced structural steel deck designs. When used in conjunction with Monokote MK-6 and/or Retro-Guard Fireproofing, Spatterkote provides the most reliable fireproofing systems available to the spray fireproofing industry.

Uses

Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom before the application of Monokote MK-6 Fireproofing and/or Retro-Guard Replacement Fireproofing. Spatterkote is also required in some roof-ceiling and concrete floor-ceiling designs and is optional on other steel surfaces. The thickness of Spatterkote is included in the total final fireproofing thickness.

Materials

a. Material shall be Spatterkote, Underwriters' Laboratories designation "Type SK-3", as manufactured by Grace Construction Products, W. R. Grace & Co.-Conn. or its processing distributors.

b. Mixing water shall be clean, fresh and suitable for domestic consumption and free from such amounts of minerals or organic substances as would affect the set of the fireproofing.

c. Retarder material shall be Red Top Plaster Retarder as manufactured by United States Gypsum or approved equal.

Application

Application procedure shall conform to the material manufacturer's application instructions. Spatterkote shall be spray applied at the approximate rate of 1 kg/4.9 m^2 (1 lb/20 ft^2) [nominal 100 m^2/21 kg (960 ft^2/46 lb) bag]. Spatterkote should be sprayed as its name suggests. After application, the deck areas should look lightly textured and when viewed directly from below, 10-30% of the galvanized surface should remain exposed. A continuous coverage with no deck showing through is NOT acceptable.

Surface Preparation

All surfaces to receive Spatterkote shall be free of oil, grease, paints/primers, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate. Spatterkote is not intended for application over alkali sensitive primers.

JOB SET-UP, EQUIPMENT AND SPRAY INSTRUCTIONS

General

Spatterkote can be pumped through the main system directly from the main pump to a smaller pump on the floor or can be applied using a separate mixer/pump set up on the floor. The use of the main system only is considered most cost effective.

For simplest application start with Spatterkote first thing in the morning before application of Monokote has begun. Pumping will begin with Spatterkote and be immediately followed with retarded Monokote (see caution for "sandwich" Monokote-Spatterkote-Monokote alternate). Predetermine the number of bags of Spatterkote needed to spray the entire floor and place near the mixer. UL requires a minimum waiting period of 30 minutes after Spatterkote application before overspraying with Monokote or Retro-Guard. A single floor or several floors may be sprayed with Spatterkote at one time.

Job Set-Up

Set-up detailed below is based on pumping through the main Monokote system to an FM-9 (2L4 Rotor Stator) pump on the floor.

A large plaster pump, TM-30, A-3.75 or other (presently being used for Monokote application) is used to pump Spatterkote through main system to the hopper of a small pump (FM-9 or other 2L4 Rotor Stator Pump) placed on spray floor.

FM-9 is fitted with 30.5 m (100 ft) (max) of 31 mm (1¼ in.) plaster hose with 1.8 m (6 ft) pole gun. Pole gun to be 25 or 31 mm by 1.5 m (1 or 1¼ in. by 5 ft) aluminum pipe with hose swivel and nozzle fitted with 10 mm (⅜ in.) "tough boy" orifice. The 10 mm (⅜ in.) "tough boy" orifice is essential to obtain best pattern and throw to the steel surface, FM-9 to be fitted with front wheel to increase floor mobility. Monokote floor (main system) hose to be fitted with 50 mm (2 in.) KamLoc Brass (quick fit) fitting at the 50 mm x 38 mm (2 in. x 1½ in.) reducer. 50 mm (2 in.) hose to be disconnected and placed near hopper of FM-9. Large pump must be able to be shut off from spray floor, 38 L (10 gal) of water should be brought to the spray floor to allow for cleanout of the floor pump.

Mixing Procedures

Spatterkote is formulated to be mixed with water in a mechanical plaster mixer to form a cohesive, uniform slurry of 700 - 880 kg/m^3 (44 - 55 lb/ft^3). Water nominal 31.2 - 33.1 L (8¼ - 8¾ gal) per bag should be added to the mixer followed by addition of Spatterkote. Mixing should continue and water adjusted to create a wet, creamy mix with the consistency of medium thick tomato/rice soup. Mixing a wet mix at 35 rpm for a period of 1½ - 3 minutes will produce proper consistency. Mix will be significantly wetter than Monokote.

Pumping

a. Large plaster pump (TM-30, A3.75 or equal) and hoses should be primed with a small amount of water. Pump should be placed in a low gear and when the hopper is empty the mixer can be dumped and Spatterkote pumping begun. When all the Spatterkote has been mixed and dumped into the pump hopper, the mixer must be dumped and allowed to empty completely. The first 3 bag batch of Monokote MK-6 can then be mixed with the addition of 74 mL (2.5 oz) [one half of a 148 mL (5 oz) dixie cup] of plaster retarder. Retarder must be added or fast setting will occur. When all the Spatterkote has been pumped and the hopper is empty, the retarded Monokote can be dumped and regular Monokote mixing/pumping can continue.

b. On the spray floor the 50 mm (2 in.) hose (open mouth with quick fit) should be held in the hopper of the FM-9 and the Spatterkote allowed to flow into the hopper. The FM-9 (soap the night before, see section c, which follows) should be placed in third gear. When the hopper of the FM-9 is approximately ½ full, start the pump and immediately begin Spatterkote application. Experience will dictate the proper speed of the large main pump to match the output of the FM-9 floor pump.

c. When Monokote appears at the mouth of the 50 mm (2 in.) hose, the main pump can be shut off and the 38 mm (1½ in.) Monokote floor hose attached with the quick fit and laid aside until completion of Spatterkote application. When all the Spatterkote has been pumped, 19 L (5 gal) of water can be used to wash down the pump and clean the hoses. When this is complete, an additional 19 L (5 gal) of water pumped through the system will complete the cleanout. When the system is clean, a small amount of liquid dish soap can be "dribbled" over the end of the turning stator tube in hopper. This will lubricate the stator and prevent sticking of the tube and rotor during start up at a later date.

CAUTIONS

1. If Spatterkote is sandwiched between Monokote MK-6 or Retro-Guard (i.e., Monokote pumping-change to Spatterkote-change back to Monokote) the Monokote batches in front of and following Spatterkote MUST BE RETARDED. One half of a 148 mL (5 oz) dixie cup of plaster retarder added to the mixing water of a 3 bag batch of Monokote MK-6 or Retro-Guard is sufficient.
2. Whenever changing products the pump hopper should be allowed to completely empty and the sides scraped clean. Where mixing blades do not clean the mixer, a small amount of water should be added to the mixer and dumped into the full pump hopper to help empty the mixer completely.
3. Caution: Spatterkote is cement-based. It will stain aluminum curtain walls, car finishes, and other surfaces which are attacked by alkali (lime).
4. Always review the information on the bag and in the MSDS before using the product. This product is manufactured for professional use only.

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

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W. R. Grace & Co.-Conn. 62 Whittemore Avenue Cambridge, MA 02140

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GRACE Construction Products

Grace Construction Products

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Paul E. Korenberg
Grace Technical Services
Fire Protection Products

21 February 2008

To our valued customers and friends.

As part of the bidding process and occasionally after our products are installed we are asked to supply letters detailing the specific tests and results regarding the asbestos content of or sprayed fireproofing products. In response to these requests we can confirm as follows:

The Monokote® brand fireproofing products listed below, manufactured by Grace Construction Products were analyzed for fibrous asbestos content by an independent testing laboratory. Production bag samples were randomly selected from each manufacturing plant and shipped to the RJ Lee Group, Inc. for analysis. The RJ Lee Group is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos fiber analysis (PLM) and airborne asbestos fiber analysis (TEM) and by the American Industrial Hygiene Association (AIHA).

The Polarized Light Microscopy (PLM) method, as outlined in EPA /600/ R-23/116, Method for Determination in Bulk Building Materials was utilized to analyze the bulk material samples. There was no asbestos detected in the Monokote fire protection materials.

Transmission Electron Microscopy (TEM) was used to analyze composite samples. TEM is universally recognized as the most state-of-the-art asbestos detection method available today. There was no asbestos detected in the Monokote fire protection materials using this very precise test method. The test results are summarized in Table 1.

Table 1. Monokote Fireproofing Test Results

MONOKOTE PRODUCT	ASBESTOS CONTENT *
MK-6/HY	None detected
MK-6s	None detected
Retroguard	None detected
Z-106/HY	None detected
Z-146	None detected
Z-156PC	None detected

* Detection limit 0.0000002%
Note: EPA asbestos reporting level is 1%.
OSHA carcinogen warning and labeling requirement level is 0.1%.

The test reports are available upon request.

If you have any questions concerning this issue, please feel free to contact me.

Sincerely,

Paul E. Korenberg

Grace Technical Services
Fire Protection Products

GRACE

Grace Construction Products

W. R. Grace & Co.
30 East Street
Sudbury, MA 01776

(978) 440-8454 Office
(978) 440-8464 Fax

FAX TO: Paul Roy

FROM: George M. Guanci

DATE: 01/14/00

SUBJECT: Certification of Organic Compound Content of Fire Protection Products

PAGES: 01

Paul:

This letter serves to certify that Fire Protection Products manufactured by Grace Construction Products do not contain reactive volatile organic compounds (VOC) believed to contribute to the formation of ozone, at concentrations currently regulated by federal, state and local agencies for the prevention of ozone generation. This also applies to the accelerator for MK-6HY.

If you require any additional information, please feel free to contact Mr. Jay Burrill, Department of Environment, Health & Safety, Grace Construction Products, Cambridge, Massachusetts, at 617-876-1400.

Regards

George M Guanci

George M. Guanci
Specialty Fireproofing Consultant

GRACE

Grace Construction Products
Fire Protection Products

W.R. Grace & Co.-Conn.

January 14, 2000

To Whom It May Concern:

RE: Grace Fireproofing

W. R. Grace & Co. does not license our fireproofing applicators. Also, there is no formal approved applicator program at W. R. Grace & Co.-Conn.

This letter is to verify that New England Fireproofing is very experienced in the application of our fireproofing products. New England has applied our products in many projects, and of varying size and complexity. Their work has been highly efficient and effective.

New England's crews are extremely knowledable in application practices, and they are very profficient in their work

If I can be of any further assistance concerning this matter please give me a call.

Sincerely

George Guanci
Specialty Fireproofing Consultant

IMPACT PENETRATION TEST

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

IMPACT PENETRATION

ABSTRACT

Significance: This test determines the effect of impact on the surface of sprayed fire-resistive material. The test was conducted in accordance with ASTM proposed method for testing " Sprayed Fire-Resistive Material applied to Structural Members", published in 1978.

Results: The average amount of Monokote Type MK-6 HY lost through impact by this test was 3.3 cubic centimeters.

REPORT DETAILS

Date of Test: January 7, 1991

Identification of Specimen: Bags were selected at random of Monokote Type MK-6 HY as produced by the Construction Products Division, W. R. Grace, & Company. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag, to produce a cohesive uniform slurry having a mixer density of 43.7 p.c.f. and a nozzle density of 32.1 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

(1) Apparatus

(a) Impact Penetration Apparatus described in the ASTM proposed method for testing, "Spray Fire Resistive Material Applied to Structural Members".

(b) Ottawa Sand

(c) Graduated Cylinder, 50-cm^3 capacity

(2) Test Specimen: Two, 12 x 18 inch (305 by 460mm) test specimens consisting of sprayed fire resistive Monokote Type MK-6 HY applied to a rigid 11 gauge cold rolled steel substrate. The specimens were allowed to dry to a constant weight at laboratory atmospheric conditions. Thickness measurements which did not vary by more than 3/16 inch (5mm) from the average were taken in nine equally spaced points on the specimen. These specimens were also used to test "Abrasion".

(3) Procedure: A test specimen was place into the test apparatus, and all adjustable stops were placed tight against the specimen and locked. The impact device was attached to the apparatus and adjusted such that the low point of the swing of the impact device was at a point 1/2 inch (12mm) into the specimen. The impact device was rotated to the horizontal to one side of the support structure and allowed to free fall on to the specimen.

Three impacts on each side of the impact device support structure were made in the above manner. The impactor at no time encroached upon tracks in the test specimen made during the above referenced "Abrasion" test.

Upon its removal from the apparatus, each specimen was turned over and loose material was removed by lightly shaking and then tapping the specimen. Tapping on the back of the inverted specimen was made with 16 ounce (454g) rod, 8 inch (200mm) long, held at one end at 2 inch (50mm) along the rod. The rod was held 3 inches above the specimen in a horizontal position and the long end of the rod was allowed to drop onto the back of the specimen by pivoting about the 2 inch point. The rod was so dropped four times over each of the impacted areas.

Sand was then placed in the $50cm^3$ graduate to its maximum mark. The graduate was tapped with a glass stirring rod twenty (20) times to achieve uniform compaction. Any reduction in volume was made up with sand again to the $50cm^3$ mark and the tapping procedure was repeated. Sand was placed slowly into the gouged impact area, filling the gouged area level with the adjacent original surface. The amount of sand used was recorded after the graduate was again tapped. The procedure was repeated for the second impact-gouged area on the specimen and on the second specimen for both gouged areas. In addition, provisions were made to determine the thickness and density of the test specimens in accordance to ASTM E 605-77.

(4) **Results:**

First Specimen:

Volume of sand first gouged area	$4.0cm^3$
Volume of sand second gouged area	$3.0cm^3$
Thickness of Monokote Type MK-6 HY	.968 inches

Second Specimen:

Volume of sand first gouged area	3.0cm^3
Volume of sand second gouged area	3.0cm^3
Thickness of Monokote Type MK-6 HY	.922 inches

Average:

Volume of sand	3.3cm^3
Thickness	1.05 inches
Density of Monokote Type MK-6 HY	16.10 p.c.f.

Official Observers:

Rick Grubbs - Froehling & Robertson, Inc.

Gerald L. Stewart - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis

James P. Willis, C.W.I.
Technical Services

WDH/cwm

HIGH VELOCITY AIR EROSION TEST

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

AIR EROSION TEST

ABSTRACT

Significance: This test measures the effect of an air stream upon fire-resistive materials in plenums during normal service conditions, and evaluates the resistance to dusting, flaking, spalling, and delamination of the fire-resistive material.

The test was conducted in accordance with ASTM E-859 "Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members."

Results: Monokote Type MK-6 HY when subjected to tangential air stream of a velocity of 2575 feet per minute (29.3 m.p.h.) resulted in a weight loss of 0.006 grams at one hour, 0.000 grams at six hours, and no weight loss between six and twenty-four hours. The total weight loss at 24 hours was 0.006 grams per square foot of material tested.

REPORT DETAILS

Date of Test: December 18, 1990

Identification of Specimen: Bags of Monokote Type MK-6 HY were selected at random as produced by the Construction Products Division, W. R. Grace, & Company. Each bag contained the label of Underwriters' Laboratories, Inc. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag, to produce a cohesive uniform slurry having a mixer density of 43.7 p.c.f. and a nozzle density of 34.0 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

I. Apparatus

A. Application Base - 16 gauge galvanized steel sheet 14.5" by 67.5".

B. Duct System - A duct made of 12 gauge galvanized steel 8 feet, 8 inches long, rectangular in cross section, with a 10.5" by 63.5" opening in the top to accept the test sample (4.63 feet square exposed area).

C. Blower - capable of moving air through the entire cross section of the duct at a velocity of 2575 feet per minute (29.3 m.p.h.).

D. Pilot Tube - used in conjunction with a manometer to measure air velocity in the duct.

E. Filters - (2) one at the intake end of the duct (blower end), and a collecting filter at the exhaust end of the duct. Filter fabric was 30 denier nylon constructed, 94 ends per inch and 82 picks per inch.

F. Scale - balance having a capacity of 100 grams with sensitivity of ± 0.001 gram.

II. Test Specimen: A 16 gauge galvanized steel sheet 14.5" by 67.5" square onto which the Monokote Type MK-6 HY was spray applied at 0.910 inch thickness. The specimens were allowed to dry to constant weight at laboratory conditions.

III. Procedure:

A. The collecting filter was dried for one hour at 120 degrees Fahrenheit and placed in the apparatus.

B. The specimen was placed into the duct opening so the face of the specimen and the inside face of the duct opening were flush on in the same plane. The edges overlapped the duct opening by two (2) inches.

C. The pilot tube was positioned four (4) inches from the upstream edge of the specimen at the center line of the duct, and two (2) inches below the top.

D. With both filters in place, the blower was maintained at an average velocity of 2575 feet per minute. (29.3 miles per hours).

E. The blower was stopped at intervals of 1, 6, and 24 hours, the collecting filter removed, dried and reweighed.

IV. **TEST DATA:**

A. Density = 16.27 p.c.f.

B. Thickness tested = 0.910 inches

C. Exposed Area = 4.63 feet square

Filter weight (grams) at:	1 hour	6 hours	24 hours
Ending	3.293	3.246	3.263
Starting	3.287	3.246	3.263
Weight loss by sample	0.006	0.000	0.000

Total weight loss (24 hours) = 0.006 grams
Total weight loss per square foot (24 hours) = 0.001 grams

Official Observers:

W. Donald Holliday - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis,
Technical Services

JPW/cwm

SINCE F&R 1881

COHESION/ADHESION

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY-CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

COHESION/ADHESION

ABSTRACT

Significance: This test measures the adhesive force required to separate the material from the base, or the cohesive force within the material and is an indication of the ability of sprayed fire-resistive material to remain in place and resist separation during anticipated service conditions.

The test was conducted in accordance with ASTM E-736 "Cohesion/Adhesion of Sprayed Fire-Resistive Material Applied to Structural Members".

Results: The average cohesive strength of Monokote Type MK-6 HY on galvanized steel was 339 lbs. per square foot.

REPORT DETAILS

Date of Test: November 23, 1988

Identification of Specimen: Bags were selected at random of Monokote Type MK-6 HY as produced by Construction Products Division, W. R. Grace & Company. Each bag contained the label of Underwriters Laboratory, Inc. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on the bag to produce a uniform slurry, having a mixer density of 38.8 p.c.f. and a nozzle density of 29.4 p.c.f. The procedures represented typical field construction practices and complied with instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

(1) Apparatus
- (a) Metal screw cap 3.81 inches in diameter and 0.5 inches deep (11.4 sq. in. area), with a hook attached at the center.
- (b) Two component urethane resin system.
- (c) Scale accurate to 1/4 lb. and a capacity of 50 lbs.
- (d) Steel substrate 11.5" x 12.5" x 16 gage, to which Monokote Type MK-6 HY was spray applied and allowed to dry in laboratory conditions (72° F $\pm$ 3° F).

(2) Test Specimen:
- (a) Galvanized steel sheet (2 tests)

(3) Procedure: The two component urethane resin was mixed in the metal dish and placed against the surface of the Monokote Type MK-6 HY and the urethane allowed to set and cure.

The test specimen was suspended by it's edges facing down, with a clear span of 11.5 inches. The scale with a hook was engaged to the dish, and step wise force was applied at approximately 7.5 lbs. per minute perpendicular to the surface. The test was continued to failure or until the capacity of the scale was reached.

(4) Calculations: The cohesive/adhesive force is:

$$CA = F/A$$

Where:

CA = Cohesive/adhesive force, (lbs./ft^2)
F = Recorded force, (lb.)
A = Area of the wood cap, (ft.^{2})

TEST DATA:
(Average of 2)

		Nature of Failure	F(lbs.)	C/A(lbs/ft^3)
(a)	Galv. Steel (Sample 1)	Cohesive	32.87	415
(b)	Galv. Steel (Sample 2)	Cohesive/ Adhesive	20.87	264
			Average	339

Thickness Tested - 0.861"
Monokote Type MK-6 HY Density - 14.43 p.c.f.

Official Observers:
Rick Grubbs - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,
FROEHLING & ROBERTSON, INC.

James P. Willis

James P. Willis, C.W.I.
Technical Services

INDENTATION HARDNESS

MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS DIVISION

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

INDENTATION HARDNESS
ABSTRACT

Significance: This test measures the force required to indent a sprayed fire-resistive material. The hardness of such a material is measured in order to judge a product's resistance to physical damage during the initial construction of a building as well as for the life of the structure.

The test was conducted in accordance with ASTM C-569 "Indentation Hardness of Performed Thermal Insulations".

Results: The average depth of indentation of MK-6 HY applied to steel was .123 inches.

REPORT DETAILS

Date of Test: December 14, 1989

Identification of Specimen: Bags were selected at random of MK-6 HY as produced by Construction Products Division, W.R. Grace and Company. Each bag contained the label of Underwriters' Laboratory, Inc. Each bag of the MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on the bag to produce a uniform slurry having a mixer density of 30.7 p.c.f. and a nozzle density of 35.7 p.c.f. The procedures represented typical field construction practices and complied with the instructions printed on the MK-6 HY bags.

Description of Test:

I. Apparatus

A. The test jig was equipped with a 1 inch diameter spherical-ended indentor, weighing 2 lbs. with a 10 lb. weight which may be lowered onto the indentor. This jig had a .001 inch dial gauge to read the penetration of the indentor.

II. Test Specimen

A. The material was applied to a 6 in. x 12 in. steel plate at a thickness of .75 inches. The specimen was then conditioned according to the ASTM C-569 test procedure.

III. Procedure

A. The 2 lb. indentor head was applied perpendicular to the top surface of the specimen. An initial dial gauge reading was taken, then a load of 10lbs. was applied to the indentor. Dial gauge readings were then taken at 30 seconds.

IV. TEST DATA

Depth of Indentation

#1	.121
#2	.129
#3	.118
Average	.123

Thickness Tested - .854 in.

Mk-6 HY Density - 15.66 p.c.f.

Official Observers:

Rick Grubbs - Froehling & Robertson, Inc.

Gerald L. Stewart - W.R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis
Technical Services

JPW/cm

DEFLECTION TEST (1/60)

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W.R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

DEFLECTION

ABSTRACT

Significance: The deflection test measures the behavior of sprayed fire-resistive materials when subjected to deflection and evaluates such phenomena as spalling and delamination under bending stress. It is an indication of the ability of the sprayed fire-resistive material to remain in place and resist removal during anticipated service conditions.

The test was conducted in accordance with ASTM E-759 "Effect of Deflection on Sprayed Fire-Resistive Materials Applied to Structural Members."

Results: MK-6 HY did not crack, spall, or delaminate and remained unchanged in every aspect when the backing to which it was applied was subjected to deflection of twice the required 1/120th of the span (2 inches instead of the required 1 inch). Test density was 15.75 p.c.f.

REPORT DETAILS

Date of Test: November 9, 1992

Identification of Specimen: Randomly selected bags of MK-6 HY as produced by the Construction Products Division, W.R. Grace, & Company were used. Each bag contained the label of Underwriters' Laboratories, Inc. Each bag of the MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag, to produce a cohesive uniform slurry having a mixer density of 36.1 p.c.f. and a nozzle density of 31.8 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the MK-6 HY bags.

Description of Test:

I Apparatus

A. Supports - A rigid base to provide four (4) inch bearing and a clear span between supports of 10 feet.

B. Load - Pre-weighed bars of iron.

C. Deflection Gauge - A dial micrometer graduated to 0.001 inch.

II **Test Specimen:** The test specimen consisted of cellular steel deck of non-composite type, nominal 1.5 inches, 24 inches wide by 12 feet long, consisting of an 18 gauge galvanized steel fluted top section and an 20 gauge galvanized steel flat bottom section welded together to form four cells 6 inches on center. MK-6 HY fire-resistive material was spray-applied to the underside of the steel deck to a 3/4 inch thickness. The dry in-place density was 15.75 p.c.f. The MK-6 HY was not applied to an area 12 inches in from each end of the specimen in order to permit the steel deck to bear directly on the supports of the test fixture. The prepared specimen was allowed to condition at room temperature and atmospheric conditions. The test was conducted thirty-one (31) days after the completed application of the sprayed fire-resistive material.

III **Procedure:** The test specimen was placed on the fixtures supports to simulate the field condition of a floor construction with the MK-6 HY sprayed fire-resistive material as the lower surface. The specimen had a clear span between supports of 10 feet. A vertical load was applied to the upper face of the specimen to develop a deflection of one-one-hundred twentieth (1/120) of the clear span, that is 2.0 inch instead of 1.0 inch. To measure the deflection the initial reading of the dial micrometer was recorded prior to the application of the load and deformation monitored as the load was applied.

IV **Results:** The test specimen was examined upon completion of the test and there was no evidence of cracking, spalling, delamination, loss of bond, or any other change in the MK-6 HY after being subjected to the above described deflection test procedure.

Official Observers:

Heather Crawford - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis, C.W.I.
Technical Services

JPW/ cwm

BOND IMPACT TEST

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W.R. GRACE & COMPANY

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

BOND IMPACT

ABSTRACT

Significance: The Bond Impact Test measures the behavior of sprayed fire resistive material when the floor construction to which it is applied is subjected to the impact of shock loading and evaluates adhesion and resistance to spalling, cracking and delamination. It is an indication of the ability of the sprayed fire-resistance material to remain in place and resist removal during anticipated service conditions.

The test was conducted in accordance with ASTM E-760 "Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members."

Results: Monokote Type MK-6 HY did not crack, spall, or delaminate and remained unchanged in every aspect when the floor construction to which it was applied was subjected to an impact shock loading of 240 feet pounds (60 pounds dropped from 4.0 feet). Test density was 14.13 p.c.f.

REPORT DETAILS

Date of Test: November 9, 1992

Identification of Specimen: Randomly selected bags of Monokote Type MK-6 HY as produced by the Construction Products, W. R. Grace, & Company. Each bag contained the label of Underwriters' Laboratories, Inc. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag of material to produce a cohesive uniform slurry having an average mixer density of 36.7 p.c.f. and a nozzle density of 30.4 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

I. Apparatus

A. Supports - A rigid base to provide four inch bearing and a clear span between supports of 10 feet.

B. Sandbag - The sandbag used was as described in the proposed test method for sprayed fire-resistive material Rev. 7/1/76.

C. Measuring Stick - was used to measure accurately the height of drop.

II. **Test Specimen:** The test specimen consisted of a complete deck assembly consisting of a cellular steel deck and a concrete topping. The cellular steel deck was of the non-composite type, nominal 1.5 inches, 24 inches wide by 12 feet long, consisting of an 18 gauge galvanized steel fluted top section and an 20 gauge steel flat bottom section welded together to form four cells 6 inches on center. The concrete was nominal 3000 psi, 2.5 inches deep as measured to the top plane of the steel decking. The fire-resistive material was then spray applied to the underside the steel deck to a 3/4 inch thickness. The dry in-place density of the actually tested Monokote Type MK-6 HY was 14.13 p.c.f. The Monokote Type MK-6 HY was not applied to an area 12 inches in from each end of the specimen, in order to permit the steel deck to bear directly on the supports of the test fixture. The prepared specimen was allowed to condition at atmospheric conditions for 28 days.

III. **Procedure:** The test specimen was placed on the test fixture supports to simulate the field condition of a floor construction with sprayed Monokote Type MK-6 HY fire-resistive material as the lower surface and the concrete as the upper surface. The specimen had a clear span between supports of 10 feet. An impact load was applied once to the middle of the upper face to the specimen by dropping the sandbag from a height of 4 feet. The height of the bag was measured from the upper face of the specimen prior to release.

IV. **Results:** The test specimen was examined upon completion of the test and there was no evidence of cracking, spalling, delamination, loss of bond or any other change in the Monokote Type MK-6 HY after being subjected to the above described test procedure.

Official Observers:

Heather Crawford - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis, C.W.I.
Technical Services

JPW/cwm

SINCE F&R 1831

COMPRESSIVE STRENGTH

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

COMPRESSIVE STRENGTH ABSTRACT

Significance: This test measures the compressive strength of sprayed fire-resistive materials and is a measure of the resistance to deformation under a compressive load.

The test was conducted in accordance with ASTM E-761 "Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members."

Results: Monokote Type MK-6 HY required a uniform compressive load of 12.6 p.s.i. (1,820 p.s.f.) to compress it to 10 percent deformation.

REPORT DETAILS

Date of Test: December 28, 1988

Identification of Specimen: Bags of Monokote Type MK-6 HY were selected at random as produced by the Construction Products Division, W. R. Grace, & Company. (Each bag contained the label of Underwriters' Laboratories, Inc.) Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag, to produce a cohesive uniform slurry having a mixer density of 38.3 p.c.f. and a nozzle density of 31.1 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

I. Apparatus

A. A standard hydraulic compression machine.

B. Spherical bearing block assembly having a plane bearing surface of 6 inches by 6 inches square.

C. Load Cell - 1,000 pound capacity.

II. Test Specimen:

A. Substrate - 7 inch by 24 inch by 16 gauge galvanized steel sheet.

B. Monokote Type MK-6 HY was spray-applied at 0.765 inch thickness. The specimen was allowed to dry to constant weight at laboratory conditions.

C. Surface - was capped level and parallel to the steel backing sheet.

III. Procedure:

A. Two compression tests were made on the test specimen. The remaining area was used for density measurement.

B. The load was applied perpendicular to the face of the test specimen, with the bearing block on top of the specimen. The initial thickness for the deformation calculation was measured between the bearing surfaces and the steel substrate after the initial load of 0.1 p.s.i. had been applied.

C. The crosshead speed of the testing machine was 0.05 inches per minute during compression to 10 percent deformation.

IV. **TEST DATA:**

A. Density = 16.14 p.c.f.

B. Thickness tested = 0.765 inches

Official Observers:

Rick Grubbs - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis, C.W.I.
Technical Services

JPW/cwm

CORROSION TEST

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

CORROSION

ABSTRACT

Significance: This test evaluates the corrosion to steel induced by sprayed fire-resistive materials and determines whether the presence of these materials increases, decreases, or had no effect on the corrosion characteristics of steel. The test was conducted in accordance with ASTM E-937 "Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members".

Results: Monokote Type MK-6 HY did not contribute to corrosion of steel when exposed to higher temperature and humidity.

REPORT DETAILS

Date of Test: October 31, 1988

Identification of Specimen: Bags were selected at random from Monokote Type MK-6 HY as produced by Construction Products Division, W. R. Grace & Company. Each bag contained the label of Underwriters Laboratory, Inc. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on the bag to produce a uniform slurry, having a mixer density of 37.6 p.c.f. and a nozzle density of 28.6 p.c.f. The procedures represented typical field construction practices and complied with instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

(1) Apparatus
- (a) A temperature humidity cabinet equipped to maintain the temperature at 90° ± 3° F and a relative humidity of 70 ± 3%. The cabinet was constructed of clear plastic.
- (b) Scale with a capacity of 2200 Kg and a sensitivity of 0.1 g
- (c) Wire brush described as "cement mold brush" with brass wire bristles.

(2) Test Specimen: Duplicate sets of 8" x 8" x 12 gage sheets of each of galvanized, bare, and shop-coated steel, to which Monokote Type MK-6 HY fire-resistive material was spray applied. The sheets were cleaned with trichlorethylene to remove any oil or grease. For the purpose of sample identification, each plate was marked Ia (control) or IIa (exposed to 90° and 70% R.H.).

RESULTS:

Weight loss of control sprayed with Monokote Type MK-6 HY (Ia - Ib)

Bare Steel = 0.4 grams

Shop Coated = 0.0 grams

Galvanized = 0.0 grams

Weight loss of conditioned specimens: (IIa - IIb)

Bare Steel = 0.4 grams

Shop Coated = 0.0 grams

Galvanized = 0.0 grams

Difference in weight loss:

Bare Steel = None

Shop Coated = None

Galvanized = None

Official Observers:

Rick Grubbs - Froehling & Robertson, Inc.

Walter Payment - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis, C.W.I.
Technical Services

JPW/cwm

ABRASION

MONOKOTE TYPE MK-6 HY

FIRE RESISTIVE MATERIAL

MADE FOR

GRACE CONSTRUCTION PRODUCTS

W. R. GRACE & COMPANY - CONNECTICUT

TRAVELERS REST, SOUTH CAROLINA

MADE BY

FROEHLING & ROBERTSON, INC.

GREENVILLE, SOUTH CAROLINA

FROM NEW ENGLAND FIREPROOFING
Tel: 207-872-0804 Fax: 207-872-2535

ABRASION

ABSTRACT

Significance: This test measures the amount of material removed from sprayed fire-resistive material when subjected to abrading forces. The test was conducted in accordance with ASTM proposed method for testing "Sprayed Fire-Resistive Material applied to Structural Members", published in 1978.

Results: The average amount of Monokote Type MK-6 HY abraded by this test was 8.3 cubic centimeters.

REPORT DETAILS

Date of Test: January 7, 1991

Identification of Specimen: Bags were selected at random of Monokote Type MK-6 HY as produced by the Construction Products Division, W. R. Grace, & Company. Each bag contained the label of Underwriters' Laboratories, Inc. Each bag of the Monokote Type MK-6 HY was mixed with water in a mechanical mixer in accordance with the instructions on each bag, to produce a cohesive uniform slurry having a mixer density of 43.7 p.c.f. and a nozzle density of 32.1 p.c.f. The procedures truly represented typical field construction practices and complied with the instructions printed on the Monokote Type MK-6 HY bags.

Description of Test:

(1) Apparatus
- (a) Abrasion Test apparatus described in the ASTM proposed method for testing, "Spray Fire Resistive Material Applied to Structural Members".
- (b) Ruler, 12 inches (305 mm).
- (c) Ottawa Sand, 100% passing 30-mesh sieve.
- (d) Graduated cylinder, 50 cm^3 capacity.
- (e) Steel-pointed strips of varying widths.
- (f) Rigid substrate, 1/8" steel plate 12 by 18 in. (305mm by 460mm).
- (g) Rod, 8 in. (200mm) long, 1 lb. (454g) in weight.

(2) Test Specimen: Two, 12 x 18 inch (305 by 460mm) test specimens consisting of sprayed fire-resistive Monokote Type MK-6 HY applied to a 11 gauge cold rolled steel substrate. The specimens were allowed to dry to a constant weight at laboratory atmospheric conditions. Thickness measurements which did not vary by more than 3/16 inch (5mm) from the average were taken in nine equally spaced points on the specimen.

(3) Procedure: A test specimen was placed into the abrasion test apparatus, and all adjustable stops were placed tight against the specimen and locked. The test vehicle guide was placed over the specimen so that the guide centerline was 3 in. (75mm) from one edge of the specimen and adjusted to permit transfer of the test vehicle to the sample without dropping. The guide was adjusted at each end and locked. The test vehicle was placed in the guide with the restraining trigger in place. The pulling cable was then attached to the test vehicle and passed over the pulley at the end of the guide. The weights were fastened to the cable. The trigger was then removed and the test vehicle made a complete pass over the test specimen being drawn by he falling weights. There was a drop of not more than 0.1 in. (2.5mm) of the test vehicle to reach the specimen.

Three such complete passes were made, with adjustments to the guide such that the 0.1 in. (2.5mm) drop to the specimen was not exceeded. Each pass of the test vehicle exceeded 12 in. (300mm) in length on the specimen and spanned its centerline. The guide was then repositioned such that the guide centerline was 3in. (75mm) from the other edge of the specimen and three more turns of the test vehicle were made in the same manner as the first test series. The test was repeated for the second specimen as described above.

Upon its removal from the apparatus, each specimen was turned over and loose material was removed by lightly shaking and then tapping the specimen. Tapping on the back of the inverted specimen was made with 16 ounce (454g) rod, 8 inch (200mm) long, held at one end at 2 inch (50mm) along the rod. The rod was held 3 inch above the specimen in a horizontal position and the long end of the rod was allowed to drop onto the back of the specimen by pivoting about the 2 inch point. The rod was so dropped at four equal distant points along the test track and parallel to the line of the track.

Before removal of the test specimen from the test apparatus, a centerline on the surface perpendicular to the travel of the test vehicle was scribed. The 6 in. (150mm) measuring length was then used for the determination of abrasion.

Thin steel strips were used to mark the 6 in. (150mm) length and confine the sand used for measurement. Sand was first placed in the 50 cm^3 mark and the tapping procedure was repeated. Sand was placed slowly into the grooves made by the test vehicle, filling them level to the surface of the original surrounding area. The graduate was again tapped and the amount of sand used to fill the groove was recorded. The second track was measured in the same manner and the measurement procedure was repeated for the second specimen. All measurements were recorded. In addition, provisions were made to determine the thickness and density of the test specimens.

(4) **Results**

First Specimen:

Volume of sand first pass	9.0cm³
Volume of sand second pass	7.0cm³
Thickness of Monokote Type MK-6 HY	.968 inches

Second Specimen:

Volume of sand first pass	10.0cm³
Volume of sand second pass	7.0cm³
Thickness of Monokote Type MK-6 HY	.922 inches

Average;

Volume of sand	8.3cm³
Thickness of Monokote Type MK-6 HY	1.05 inches
Density of Monokote Type MK-6 HY	16.01 p.c.f.

Official Observers:

Rick Grubbs - Froehling & Robertson, Inc.

Gerald L. Stewart - W. R. Grace & Co.

The data included in this report constitutes all the tests that were witnessed.

Respectfully submitted,

FROEHLING & ROBERTSON, INC.

James P. Willis

James P. Willis, C.W.I.
Technical Services

JPW/cwm