MULTICOAT TEST DATA

LABORATORY EVALUATIONS and TEST DATA

MULTICOAT CORPORATION

I. SLATEX WALKING DECK AND ROOF SURFACING SYSTEMS

II. KRETE KOTE EXTERIOR WALKING DECK SYSTEM AND CONCRETE RESTORATION COATING

III. MULASTICOAT ELASTOMERIC WATERPROOFING MEMBRANE

Prepared by:
RAMTECH LABORATORIES
14104 Orange Ave.
Paramount, CA. 90723

Ronald A. Macey
Laboratory Director

EAST COAST: Multicoat Products Inc.
(800) 660-6729 • E-Mail: multiprods@aol.com
Website: www.multicoatproducts.com

WEST COAST: Multicoat Corporation
(877) MULTICO (685-8426) • E-Mail: multi5000@aol.com
Website: www.multicoat.com

MULTICOAT CORPORATION

Manufacturers & Distributors of Flexible Waterproofing Cement & Elastomerics

23061 Arroyo Vista • Rancho Santa Margarita • California 92688
Toll Free (877) 685-8426 • FAX (949) 888-2555
Website: www.multicoat.com

RAMTECH LABORATORIES, INC.
14104 Orange Ave.
Paramount, CA., 90723

(NERQA - 293)
I.C.B.O. E.S. Report No. 4871

PREPARED FOR:

MULTICOAT CORPORATION

Laboratory Number: 9340-91

EVALUATION OF

MULTICOAT SLATEX WALKING DECK AND ROOF SURFACING SYSTEMS

October 14, 1991

MULTICOAT CORPORATION
23061 Arroyo Vista
Rancho Santa Margarita, CA 92688
Toll Free (877) 685-8426
Fax (949) 888-2555
MULTIPURPOSE COATINGS AND DECK SYSTEMS

Laboratory Number: 9340-91

Subject: Testing of Multicoat Walking Deck and Roof Surfacing System (Slatex Systems)

Gentlemen:

A series of tests have been conducted on your Multicoat Walking Deck and Roof Surfacing Systems (Slatex Systems).. The tests were conducted to determine the performance of the material when evaluated to provisions specified in the Uniform Building Code (UBC) Standard Number 32-7; this test method is essentially identical to those test methods specified in (ASTM E108). (UL 790). and NFPA No. 256).

The tests conducted are shown in the contents which is detailed on the following page.

The results of our evaluation indicate that the Multicoat Walking Deck and Roof Surfacing System (Slatex System) comply with the requirements of the ICBO Evaluation service. Inc. standard for walking roof for the Class "B" Fire Resistance Rating. The Class "B" Multicoat System qualifies for a Class "A" rating when used over non-combustible substrates.

MULTICOAT CORPORATION
Laboratory No. 9340-91

TABLE OF CONTENTS

***NOTE:** Revision was made to the Report on March 31, 1993, to reflect the current testing. All other sections of the Report remain the same as when issued.

1. **Sampling**

All of the materials tested in this evaluation were randomly sampled at the Multicoat Corporation warehouse by Ramtech Laboratory Personnel. The materials were taken to Ramtech and held in storage until the day of the test deck fabrication by the licensed installer selected by Multicoat Corporation.

2. **Test Deck Fabrication**

The test decks were fabricated at Ramtech Laboratories, Inc. in accordance with Multicoat Corporation installation instructions on 5/8" AC plywood sheathing.

All of the fabrication procedures were witnessed by Ramtech personnel. The fabricated test decks were allowed to ambient cure for 14 days before the testing was started.

3. Weatherometer Tests

3.1 Procedure

(ASTM G23) 2000 Hours exposure - Atlas Twin Arc Weatherometer

Exposure Procedure

Device: Atlas Twin Arc Weatherometer, Type DH
Arc voltage: 120-145V AC
Arc Current: 15-17 Amps
Light Source: Twin Carbon Arcs 1/2" Diameter Electrodes
Spectral Transmission: 91 @ 2750 to 3700 Angstroms
Operating Black Panel Temperature: 145 °F ± 9 °F
Water Spray: 4.4 to 5.2 pints/min. @ 15 psi
Cycling Cam: 102 min. - 18 min.
Operating Relative Humidity: 50 ± 5%

Cycle Exposure Period	For a Period Of, Minutes
Light only 145 °F ± 9 °F. Black Panel Temperature.	102
Light with Water Spray at 60 °F ± 9 °F.	18
Total	120

3.2 Comments

So that some relationship to natural weathering can be made, it is generally accepted that 2000 Hours of accelerated weathering in the Atlas Weatherometer is approximately equivalent to 6 years of natural weathering or 350 hours per year.

3.3 Results of Visual Examination After 2000 Hours of Accelerated Weathering

After 2000 Hours of exposure the specimens showed no signs of chalking, crazing, cracking, blistering, delamination, or any other deleterious affects.

4. Aging Tests of Multicoat Walking Deck and Roof Surfacing System

4.1 Procedure

ASTM A756 - Procedure D and E. (25) consecutive cycles. Each cycle consists of:

24 Hours in Oven at 80 °C (176 °F) over water,followed by
24 Hours in Oven at 80 °C (176 °F)in the oven.
24 Hours in Oven at 80 °C (176 °F) and 70 to 75% relative humidity followed by.
24 Hours in Freezer at -40 °F
24 Hours in Oven at 80 °C (176 °F) in the oven.
24 Hours in Freezer at -40 °F

4.2 Visual Examination After Aging Tests

After (25) consecutive cycles the wood and concrete test specimens showed no sign of caulking. crazing.cracking. blistering. delamination. or any other deleterious effects.

5. Bond Strength Tests

5.1 Procedures

ASTM C297 Tension Tests in Flatwise Plane. Specimen Size Nominally 4" x 4".
A total of five specimens were tested. The specimens were ambient cured for five days before tension testing. The test consisted of subjecting the sandwich construction to tensile load normal to the plane of the sandwich.

5.2 Results:

The results for control samples of wood and concrete are presented in tabular form on the following page in Tables 1 and 2
The results for bond strength after accelerated aging on samples of wood and concrete are presented in tabular form on page 6 in Tables 3 and 4
The results for bond strength after Freeze Thaw on samples of wood and concrete are presented in tabular form on page 10 in Tables 9 and 10.

5.3 Before Aging (Wood Control Samples)

Table 1

Sample No	Area Sq in	Load lbs	PSI	Type of Failure
1	15.78	1325	84.0	Plywood
2	15.36	1480	96.0	Plywood
3	15.42	1430	93.0	Plywood
4	15.89	1525	96.0	Plywood
5	15.67	1375	88.0	Plywood
Average			91.0	

Note: All test failures resulted in a cohesive failure of the plywood.

5.4 Before Aging (Concrete Control Samples)

Table 2

Sample no	Area Sq in	Load lbs	PSI	Type of Failure
1	9.00	1635	182	Mulasticoat
2	9.00	1500	167	Mulasticoat
3	9.00	2225	247	Mulasticoat
4	9.00	1785	198	Mulasticoat
5	9.00	2275	253	Mulasticoat
Average			209	

Note: All test failures resulted in a bond failure between the concrete block and the water proof membrane.

5.5 After Aging (Wood) 25 cycles Procedure D&E ASTM D756

Table 3

Sample no	Area Sq in	Load lbs	PSI	Type of Failure
1	15.82	1200	76.0	Plywood
2	15.12	1220	81.0	Plywood
3	15.70	1585	101.0	Plywood
4	15.81	1225	77.0	Plywood
5	15.41	1720	112.0	Plywood
Average			89.0	

Note: All test failures resulted in a cohesive failure of the plywood.

5.6 After Aging (Concrete) 25 cycles Procedure D&E ASTM D756

Table 4

Sample no	Area Sq in	Load lbs	PSI	Type of Failure
1	9.00	2016	224	Mulasticoat
2	9.00	1782	198	Mulasticoat
3	9.00	2205	245	Mulasticoat
4	9.00	1863	207	Mulasticoat
5	9.00	1944	216	Mulasticoat
Average			218	

Note: All test failures resulted in a bond failure between the concrete block and the water proof membrane.

MULTICOAT CORP.
Laboratory No.9340-91

6. Abrasion Test (ASTM D1242)

6.1 Procedure

ASTM D1242 - Resistance to Abrasion, Method A
1000 revolutions
1000 gram load
No. 80 TP Aluminum Oxide Grit

6.2 Three specimens were measured for thickness before and after the abrasion cycle.

Table 5

Sample Number	Original Thickness Inches	Thickness After Abrasion 1000 Cycles Inches	Thickness Loss Inches
1	0.184	0.171	0.014
2	0.171	0.158	0.014
3	0.133	0.106	0.027
Average			0.018

Note: The maximum allowable abrasion loss is 0.040.

7 Percolation Tests

7.1 Procedures

2" Diameter Tube, 48" Water Column, 48 Hours
Room Temperature = 70 ± 2 °F.
Relative Humidity = 50 ± 5%

Table 6

Sample Number	Total Drop of 48" Water Column in 48 Hours	Drop of Water Column Due to Evaporation in 48 Hours	Waterhead Inches	Percent of Original Head
A	0.120	0.120	0.000	0.000
B	0.120	0.120	0.000	0.000
C	0.120	0.120	0.000	0.000
Average:			0.000	

Note: The specification allowed a maximum percolation of 1.0 percent of original head (48 inches)

8. Absorption Tests

8.1 Water Absorption (24 Hours Immersion in Distilled Water)

Table 7

Sample Number	Dry Weight	Weight After 24 Hours Immersion	Weight Percent of Water Absorption
1	12.3	13.3	8.1
2	11.9	12.8	7.6
3	11.0	12.0	9.1
4	9.2	10.0	8.7
5	9.9	10.6	7.1
Average			8.1

Note: The specification allows a maximum of 15.0 percent absorption by weight

MULTICOAT CORP.
Laboratory No. 9340-91

9. Chemical Resistance Tests Conducted on Multicoat Decking System

9.1 Procedure

ASTM D2299 Determining Relative Stain Resistance of Plastics (18 reagents) specimens immersed @ 122 F for 16 hours.

Table 8

Reagent	Non Abraded Surface	Abraded Surface
Heavy duty detergent solution	1	1
Ammonia solution - 5%	1	2
Prestone coolant	1	2
Kerosene	1	2
Soap solution - 1%	1	1
Diesel fuel	1	2
Transformer oil	1	1
Turpentine	1	2
Gasoline	1	1
Paint thinner	1	1
Lubricating oil	1	1
Sulfuric acid - concentrated	3	3
Sulfuric acid - 3%	2	3
Hydraulic fluids	3	3
Toluene	1	2
Salt Solution 20%	1	1
Muratic Acid - 10%	1	1
Chlorine Solution - 10%	2	2

NUMBER CODE: 1. Unaffected 2. Superficial Affect 3. Considerable Affect

Notes:

1. Of the 18 reagents used in the chemical resistance tests hydraulic fluids and concentrated sulfuric acid caused a deterioration of the decking. The softening which was observed was only on the seal coat membrane layer when subjected to concentrated sulfuric acid. However,slight softening of the cementitious membrane layer was noted when subjected to hydraulic fluids. The Chlorine Solution caused only slight bleaching. The wearing surface revealed no cracking, crazing, or delamination.

2. The test specimens which are coded (No. 3 considerable affect) could not be restored to their original surface condition by normal cleaning methods.

10. Freeze Thaw

10.1 Procedure

Freeze Thaw test were conducted in accordance with ASTM C-67 on five specimens. The test specimens were sealed on the back and all edges. The specimens were frozen with the decking material face down in water at a depth of 1/4 inch.

10.2 Bond Strength (Plywood)After 50 Cycles Freeze Thaw

Table 9

Sample No	Area Sq in	Load lbs	PSI	Type of Failure
1	15.32		79	Plywood
2	15.47	1480	64	Plywood
3	15.73	1430	81	Plywood
4	15.62	1525	94	Plywood
5	15.12	1375	88	Plywood
Average			81	

Note 1 All test failures resulted in a cohesive failure of the plywood.

Note 2 The average failure for the wood control samples was 91 PSI.

10.3 Bond Strength (Concrete)After 50 Cycles Freeze Thaw

Table 10

Sample No	Area Sq in	Load lbs	PSI	Type of Failure
1	9.00	1548	172	Mulasticoat
2	9.00	1683	187	Mulasticoat
3	9.00	2115	235	Mulasticoat
4	9.00	1728	192	Mulasticoat
5	9.00	2007	223	Mulasticoat
Average			202	

Note 1 All test failures resulted in a bond failure between the concrete and the waterproof membrane.

Note 2 The average failure for the concrete control samples was 209 PSI.

MULTICOAT CORP.
Laboratory No. 9340-91
Page 11

11. Concentrated Load Test

11.1 Procedure

Penetration load tests were conducted on five test samples. The test method standard specifies that a three inch diameter steel plate with rounded corners is to be centered on the specimens. A 500 pound load is imposed on the plate and the surface penetration is determined to the nearest hundredth of an inch. The superimposed load is reduced to zero and reloaded a minimum of four additional times with penetration and residual indentation readings taken each time without removing the plate. The specimen is to be inspected after each test and the condition at the steel interface noted. Noted tearing or cracking of the exterior protective coating causing exposure of the plastic, glass fibers, foam, or other compressible core materials, or excessive permanent deformation under applied load is unacceptable.

Results of the penetration load tests are presented in tabular form in Table 11. They indicate a final average loaded deflection of 0.031 inch and a final average residual indentation of 0.018 inch. No tearing or cracking of the exterior protective coating was observed upon examination during and after the loadings.

11.2 Penetration Load Test Results

Table 11

Specimen ID	Cycle 1			Cycle 2		Cycle 3		Cycle 4	
	Initial	500 lbs	Set	500 lbs	Set	500 lbs	Set	500 lbs	Set
1	0.00	.030	.016	.033	.019	.035	.020	.037	.021
2	0.00	.028	.013	.031	.016	.032	.018	.034	.020
3	0.00	.027	.014	.029	.017	.030	.019	.032	.020
4	0.00	.029	.015	.031	.018	.033	.020	.034	.021
5	0.00	.024	.013	.026	.015	.028	.017	.031	.018
Average		.028	.014	.030	.017	.032	.019	.034	.020

12. Fire Resistance Roof Test Series Class "B"

12.1 The tests were conducted in accordance with the provisions of UBC Standard Number 32-7. This test method is essentially the same as that specified in ASTM E108. UL 790 and N.F.P.A. No.. 256.

12.1.2 The class "B" test series contains three parts:

A. Intermittent Flame Exposure Test
B. Spread of Flame Test, and
C. Burning Brand Test; all three were conducted in this investigation.

The purpose of the investigation is to evaluate the performance of the Multicoat material when applied to a combustible plywood substrate, with blocking on the horizontal joints.

12.1.3 Description of Material Used:

Battens and Blocking:	Douglas Fir 2 x 4's
Plywood Sheathing:	5/8" Exterior Grade AC
Caulking:	Silicone Rubber
Reinforcing:	Fiberglass
Base Membrane:	Mulasticoat Elastomeric Waterproofing Membrane.
Surface Texture:	Krete Kote Latex Modified Cementitious Coating.
Surface Sealer	Color Seal/Clear Sealer.

12.2.1 Description of Roof Specimens

The decks were constructed in the laboratory following specification given in the Standard for Test Methods for Fire Resistance of Roof Covering Material for Class "B" rating. The plywood decking used was 5/8" exterior AC grade. The 1/8" horizontal joints of the decks were blocked with vertical 2 x 4's.

12.2.2 Step #1

All joints were filled with caulking compound per manufacturers specifications..

12.2.3 Step #1A

Mulasticoat elastomeric was rolled uniformly over the entire deck area with a 1-1/4" nap roller at a rate of 40-50 square feet per gallon.
A 24 hour cure period was allowed prior to the next step of the installation procedure.

12.2.4 Step #2

Fiberglass mesh.

12.2.5 Step #3 - First Coat

A cementitious paste composed of 1-3/4 bags of "Dry Mix" to 5 gallons of "Liquid Catalyst" were combined together at time of application and troweled onto the deck surface at a rate of 300-350 square feet per mixed unit of material.
A 24 hour cure period was allowed prior to the next step.

12.2.6 Step #3 - Second Coat

A cementitious paste composed of 1-1/2 bags of "Dry Mix" to 5 gallons of "Liquid Catalyst" were combined together at time of application and troweled onto the deck surface at a rate of 350-400 square feet per mixed unit.

12.2.7 Step #4

Colorseal/clearseal is a 6 mil (dry film thickness) acrylic paint and is an optional step in the latex waterproofing system, and was not applied to the test decks. This step has no effect on the fire performance and was not utilized in any part of this test series.

12.3.1 Fire Test Procedures and Results

Prior to testing, the frame for holding the test decks was adjusted to give a slope of 1/4" per horizontal foot. The velocity of the air current was adjusted and fixed at 12 mph more or less 0.5 mph and the burner flame was adjusted to a proper flame distribution of 1400 °F ± 50 °F temperature for the flame portion of the test.

12.3.2 Test Deck Moisture Readings (day of test)

The moisture content of the specimen test decks was within those minimum/maximum limits specified in (UL 790), "not less than 8 nor more than 12 percent moisture content".

12.3.3 Intermittent Flame Exposure Test

Two deck specimens, designated IF-1 and IF-2, were subjected to the eight cycle Intermittent Flame Exposure Test. Each test deck was exposed to eight 4-minute cycles comprised of 2 minutes of 1400 °F flame application followed by 2 minutes with the flame off. It should be noted that neither of the test decks, after the eight cycles of flame exposure, showed any evidence of displacement, sliding, spalling, or flaming on the underside of the decks. The two test decks met the requirements for the Class "B" Intermittent Flame Exposure Test.

12.3.4 Spread of Flame Test

Two deck specimens, designated SF-1 and SF-2, were subjected to the Spread of Flame Test. Each deck was exposed to a 10-minute application of 1400 °F flame as specified in (UL 790).

There was no sign of distress on the exposed surface of either specimen in the Spread of Flame Test. Test deck SF-1 had a heat affected area 16 inches wide with a maximum flame spread of 23 inches long. Test deck SF-2 had a heat affected area 13 inches wide with a maximum flame spread of 18 inches long. There was no lateral spread of flame on either test deck. The maximum allowable flame spread for Class "B" is 96 inches. The two test decks met the requirements for Class "B" and Class "A" Spread of Flame Test.

12.3.5 Burning Brand Test

Four deck specimens, designated BB-1, BB-2, BB-3 and BB-4 were subjected to the Burning Brand Method of Test, with one 6" x 6" Class "B" brand being placed on each one of the deck specimens. The "B" brands were ignited by exposing them to a gas flame for 4 minutes. The flaming brands were then placed on the test decks as specified (UL 790).

The heat affected areas were confined to the immediate area of brand placement and marginally above the brand. There was no displacement of the Multicoat material observed during or after the tests, nor was any distress noted on the underside of the decks throughout the exposure period.

12.4 Conclusions

The results of this Fire Retardant Roof Test Series Class "B" indicate that Multicoat Walking Deck and Roof Surfacing System will satisfactory withstand the three methods of test in (UBC Std. No. 32-7), (ASTM E 108), (UL 790), and (NFPA No. 256), when constructed and installed as described herein and tested for a Class "B" rating. The Class "B" Multicoat System qualifies for a Class "A" rating when used over non-combustible substrates.

MULTICOAT CORPORATION
Laboratory No. 9754-93
Page 2 of 2 Pages

DISCUSSION:

In order that the values shown in the table titled, coefficient of friction tests, may be more readily understood the following definitions are offered:

Coefficient of Friction: - the ratio of the frictional force to the force, usually gravitational, acting perpendicular to the two surfaces in contact. This coefficient is a measure of the relative difficulty with which the surface of one material will slide over an adjoining surface of itself, or of another material. The static or starting coefficient of friction is related to the force measured to begin movement of the surfaces relative to each other. The kinetic or sliding coefficient of friction is related to the force measured in sustaining this movement.

Friction. - the resisting force that arises when a surface of one substance slides. or tends to slide, over an adjoining surface of itself or another substance. Between surfaces of solids in contact there may be two kinds of friction: (1) the resistance opposing the force required to start to move one surface over another, and (2) the resistance opposing the force required to move one surface over another at a variable, fixed, or predetermined speed.

Slip: - a term denoting lubricity of two surfaces sliding in contact with each other. In a sense, it is the antithesis of friction in that high coefficient of friction denotes low slip and low coefficient of friction high slip.

It has been our experience and the experience of other e.g., The National Bureau of Standards (NBS) and the American Society for Testing and Materials (ASTM) that a static coefficient of friction of 0.50 may be perfectly satisfactory in that no slips and falls are likely to occur, when the nature of the traffic is orderly. On the other hand where traffic is of the hustling type, and direction of progress suddenly change, a higher coefficient of friction could be needed in order to minimize accidents.

MULTICOAT CORPORATION
Laboratory No. 9754-93

2. NON-SLIP PROPERTIES - RESULTS:

FACTORS OF FRICTION*

TEST METHOD, ASTM C1028

Sample Identification: Multicoat Walking Deck and Roof Surfacing System (Slatex System)

Date: 3-29-93

Contacting Surface	Factor of Static Friction		Factor of Sliding Friction	
Multicoat Decking System	Dry	Wet	Dry	Wet
Leather	0.87	0.75	0.52	0.67
Rubber	0.88	0.79	0.77	0.72

*NOTE:

(1) All results are an average of twelve readings.

(2) The ASTM C1028 details the measurement of static coefficient of friction of ceramic tiles or other surfaces under both wet and dry conditions while utilizing Neolite rubber heel material.

(3) The static and dynamic coefficient of friction of leather, and dynamic coefficient of friction of rubber are presented in this report for additional client information.

1-52 TEST PROCEDURE:

The test apparatus includes a 5 x 5 ft chamber that is dome-shaped and constructed of rigid acrylic plastic. Contoured structural ribs were placed under the plastic dome to provide sufficient strength to withstand the necessary negative pressure without collapsing. A neoprene gasket was installed to seal between the deck and the test chamber. The maximum deformation of the neoprene gasket when compressed under load of 20 inches of water column is 0.077 inches. Both the test chamber and test frame were of sufficient strength that instrumentation and test performance were not affected. A manometer tap was located at the center of the test chamber. Vacuum ports were provided at opposing ends of the chamber and so arranged that manometer readings were unaffected by air movement.
A Dwyer slant tube manometer was leveled and calibrated to indicate negative pressures in increments of 1 inch water column. The manometer was equipped with a flexible tube and connected to the tap on the chamber. A second U-Tube manometer was used above 52.0 psf.
The vacuum pump had sufficient capacity to create the indicated negative pressure for one minute at each increment.
A 4" dial indicator was placed at the center most location in the chamber and so positioned to indicate maximum deflection and ease of reading through the acrylic dome.

All dust and dirt were cleaned from the test area before the chamber was placed on the decking surface. The dome was secured with duct tape around the perimeter to facilitate sealing with the decking surface and allow a negative pressure to be drawn as required for the test. Two bypass valves are provided in the system. On start up both valves are full open to prevent shock loading and damage to the equipment and decking. One valve is slowly closed until desired load is achieved. A second valve is closed as necessary to attain higher loads in the latter stages of the test sequence. The load at each load sequence was held for one minute before recording deflection to stabilize the dial indicator. During the first load sequence the test deck was loaded in 1-inch water column (5.2 psf) increments up to 5 inches (26.0 psf). After reaching 5 inches of water column, the load was removed, and the rebound recorded. During the second load sequence the 1-inch load increments were increased to 2 inches water column after reaching 14 inches water column. The decking system was then loaded to maximum capacity of the test system. At this point, the load was released to zero and the set noted after 5 minutes recovery .

The test results are presented in tabular form in Table No.1

Table 1

Multicoat Corporation				Date Tested: 12-23-92
Laboratory No. 9573-93				Test Method : Factory Mutual 1 - 52
Page 3 of 4				
Uplift Load Psf	Wind Velocity MPH	Uplift Deflection in Inches First Run	Uplift Deflection in Inches Second Run	Comments
5.2	45.1	0.000	0.000	
10.4	67.3	0.026	0.026	
15.6	78.1	0.060	0.053	
20.8	90.1	0.099	0.088	
26	100.8	0.121	0.112	
5.2	45.1	0.003	0.004	Rebound Note 1 and 2
31.2	110.4		0.120	
36.4	119.2		0.139	
41.6	127.5		0.161	
46.8	135.2		0.182	
52	145.5		0.203	
57.2	149.5		0.220	
62.4	156.1		0.242	
72.8	168.6		0.287	
83.2	18.03		0.326	
93.6	191.2		0.363	
104	201.6		0.393	
114.4	211.4		0.434	
124.8	220.8		0.458	
135.2	229.8		0.495	Note 3
5.2	45.1		0.023	Rebound after five minutes recovery
Note 1	Test run number one has only 0.003" set after five minutes recovery.			
Note 2	Test run number two has only 0.004" set after five minutes recovery.			
Note 3	Maximum capacity of chamber 135.2 psf			
	At no time during the test did the deck show any signs of cracking , crazing , delamination			
	nor loss of bond from plywood substrate.			

$$\frac{135.2\ psf}{\text{Safety Factor of 3}} = 45\ psf$$

$$\text{Qualifying Wind Velocity} = \sqrt{\frac{45}{0.00256}} = 132\ \text{MPH}$$

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE, PARAMOUNT, CALIFORNIA 90723 • TELEPHONE (310) 633-4824

Date:	MANUFACTURER:	Audit:
Inspector: Steven Berggren	Multicoat Corporation	Other: Fabrication Witnessing
Listing:	Person Name: Norman	Time In:
ICBO/ES	Address: 1565 Sunflower Avenue	Time Out:
Person Contacted:	City: Costa Mesa	Travel Hours:
Ramtech Lab. No.: 9753-93	State: CA Zip Code: 92626	Lab. Hours:
	Telephone No.: (714) 754-1212	Total Hours:

11/2/92	
8:00 A.M.	Start construction on 7' x 7' deck using 2"x4" @ 12" o.c. and covering with 1/2 CDX Plywood All edges
	to be blocked and nailed with 8d Green Vinyl Sinkers at 6"-12" o.c.
2:30 P.M.	Apply Mulasticoat to plywood deck with 9" roller one gallon to cover 49 sq.ft./gallon.
4:00 P.M.	Apply second coat of Mulasticoat to plywood one gallon to cover 49 sq.ft./gallon and allow to dry
	minimum 24 hours.
11/4/92	
11:30 A.M.	Arrived at Ramtech "Norman".
11:50 A.M.	Mix Liquid Catalist at with bag of Krete Kote 1-3/4 bags to 5 gal using a drill motor with mixing blade
	Mixing time 5 minutes.
11:55 A.M.	Apply mixture to surface using a steel trowel covering enough area to apply fiberglass mesh 39" wide
	over mixture. *First coat can be either troweled or rolled per Norman.
12:00 P.M.	Apply mixture to surface second area 39" wide over lapping first area by 1" - 2"
12:04 P.M.	Apply fiberglass mesh to second area over lapping first area by 1" - 2" and trowel down the fiberglass
	mesh into the mixture.
12:10 P.M.	Allow surface to dry - "To Touch" approx. 1-4 hour
	*Note. Per Norman fiberglass can be laid parallel to the joist or perpendicular depending on
	convenience.
	*Note: Liquid Catalyst #920717-A (5 gal)
	Bag of Krete Kote #161223 (65 lbs) + # 232123
1:50 P.M.	Return to Ramtech "Norman" mix Liquid Catalyst with bag of Krete Kote (same liquid & bag as above).
1:55 P.M.	Apply mixture to surface using steel trowel (second coat).
2:00 P.M	Complete second coat.
11/9/92	
9:50 A.M.	Arrived at Ramtech "Norman"
9:55 A.M.	Mix Liquid Catalyst (same sample as above) with bag of Krete Kote (same)
10:00 A.M.	Apply 3rd coat with steel trowel 5 minutes application start to completion on sample 7' x 7'

MULTICOAT CORPORATION

Manufacturers & Distributors of Flexible Waterproofing Cement & Elastomerics

23061 Arroyo Vista • Rancho Santa Margarita • California 92688
Toll Free (877) 685-8426 • FAX (949) 888-2555
Website: www.multicoat.com

RAMTECH LABORATORIES, INC.
14104 Orange Ave.
Paramount, CA., 90723

(NERQA - 293)

PREPARED FOR:

MULTICOAT CORPORATION

Laboratory Number : 8454A-88

EVALUATION OF KRETE KOTE EXTERIOR WALKING DECK SYSTEM and CONCRETE RESTORATION COATING

Prepared by:
Ronald A. Macey, P.E.
Laboratory Director

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE. PARAMOUNT. CALIFORNIA 90723 • TELEPHONE (213) 633-4824

April 24, 1989

MULTICOAT CORPORATION
23061 Arroyo Vista
Rancho Santa Margarita, CA 92688
Toll Free (877) 685-8426
Fax (949) 888-2555
MULTIPURPOSE COATINGS AND DECK SYSTEMS

Laboratory Number: 8454A-88

Gentlemen:

A series of tests have been conducted on your "Krete Kote" Exterior Walking Deck System. The tests were conducted to determine the performance of the material when evaluated to Nationally Recognized Test Standards. The tests that were conducted are shown in the contents which is detailed on the following page.

Respectfully submitted,

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P.E.
Laboratory Director

RAM/dob

Multicoat Corp.
Lab. No. 8454A-88

CONTENTS

*NOTE: Revision was made to the Report on March 31, 1993 to reflect the current testing. All other sections of the Report remain the same as when issued.

1. Sampling

All of the materials tested in this evaluation were randomly sampled at the Multicoat Corp. warehouse by Ramtech Laboratory personnel. The materials were mixed and applied by Multicoat personnel on the same day as the sampling and the day following for the second coat.

2. Test Deck Fabrication

The test decks were fabricated at Multicoat Corp. in accordance with the Krete-Kote installation instructions (see attached copy) on plywood sheathing, concrete and on galvanized sheet steel.

All of the fabrication procedures were witnessed by Ramtech personnel. The fabricated test samples were allowed to ambient cure for 45 days before the testing was started, with an exception being the early age compression tests at 7 and 28 days.

One half of each test specimen was sealed with a sealer coat which was applied at the rate of 200 sq. ft./gal. The sealer coat was applied several days after the decks were fabricated.

RAMTECH LABORATORIES, INC.

TEST PROCEDURES AND RESULTS

3. Weatherometer Tests:

Procedure:

(ASTM G23) 2000 hour exposure - Atlas Twin Arc Weatherometer

Exposure Procedure:

Device: Atlas Twin Arc Weatherometer, Type DH

Light Source: Twin Carbon Arcs 1/2" Diameter Electrodes

Spectral Transmission: 91% @ 2750 to 3700 Angstroms

Operating Black Panel Temperature: 145°F. ± 9°F.

Water Spray: 4.4 to 5.2 pints/min. @ 15 psi

Cycling Cam: 102 min. - 18 min.

Operating Relative Humidity: 50 ± 5%

	For a Period of, Minutes
Light only @ 145°F. ± 9°F. Black Panel Temperature	102
Light with Water Spray at 55°F. ± 9° F.	18
Total: 11 Periods of (per day)	120

Comment:

So that some relationship to natural weathering can be made, it is generally accepted that 2000 hours of accelerated weathering in the Atlas Weatherometer is approximately equivalent to 6 years of natural weathering or 350 hrs./year.

Results of Visual Examination After 2000 Hours of Accelerated Weathering:

There is a slight color change on the surface of the Krete-Kote and the Krete-Kote Sealer but no evidence of cracking, blistering, flaking, chalking, loss of bond or any other deleterious affects.

. Compression Tests:

The 2"x2" cast compression cubes were ambient air cured prior to testing. The casting and testing procedures were conducted in accordance with ASTM C109 test methods.

Age Tested:	Compression Strength, psi 7 Day	28 Day	45 Day
1.	1275	2145	2595
2.	1250	2095	2610
3.	1255	2140	2580
Average:	1260	2127	2595

5. Tensile Strength:

The tensile briquettes were cast and ambient air cured for 45 days prior to testing. The casting and testing procedures were conducted in accordance with ASTM C190 test method.

Sample Mark	Tensile Strength psi
1	465
2	460
3	446
Average:	457

Bond Strength: (Flatwise Tension)

The Krete-Kote was applied to a hardened concrete substrate and was ambient air cured 45 days prior to testing in flatwise tension. The tension tests were conducted in accordance with ASTM C297.

Sample Mark	Size in Inches	Area in Sq. In.	Total Load Pounds	Flatwise Tension Bond Strength psi
1	3.0x3.0	9.0	1782	198
2	3.0x3.0	9.0	1737	193
3	3.0x3.0	9.0	1665	185
		Average:	1728	192

Salt Spray: (300 Hour Exposure)

The Krete-Kote was applied to a 20 gage galvanized section of sheet steel 8"x12" in size. The specimen was allowed to cure for 45 days and was then cut and X-scribed to bare metal prior to the continuous 300 hr. salt spray exposure in accordance with ASTM B117 test methods.

Results:

The visual examination after the 300 hr. exposure revealed no undercutting corrosion at X-scribed mark nor any loss of bond from the galvanized steel substrate.

8. 50 Cycle Freeze-Thaw:

The Krete-Kote was applied to 12"x12" sections of hardened concrete. The specimens were allowed to ambient air cure for 45 days and were then subjected to 50 cycles of freezing and thawing in accordance with ASTM C67.

Test Cycle:

4 hrs. in water @ 75° F ± 5° F
20 hrs. in freezer @ -20°F ± 5°F
24 hrs. one cycle repeated 50 times

The specimen were dried to a constant weight and weighed before and after the 50 cycle exposure.

Results:

None of the five test specimens lost more than 1/2% of their weight after the 50 cycle exposure, and there was no bond loss to the concrete substrate whatsoever.

Note: A weight loss of less than 1/2% is considered to qualify for severe weathering conditions.

9. Water Vapor Transmission:

The Krete-Kote material was applied to a porous polyester scrim fabric in order to determine the WVT of the Krete-Kote without any substrate variations.

The test were conducted in accordance with ASTM E96 Method A, (dry cup).

Specimen Mark	Water Vapor Transmission Grams/Hr./m^2	Conversion to Perms
1	1.4	Permeance = WVT/S (R_1-R_2) WVT = 1.87 grains/(hr. x $ft.^2$)
2	1.2	= WVT (1.378 x 0.49) = 1.87 (1.378 x 0.49)
3	1.3	Perms = 1.26
Average:	1.3	S = Saturation vapor pressure, in. Hg. R_1 = 49% RH R_2 = 0% RH

10. Abrasion: (ASTM D1242)

The Krete-Kote material was applied to a hardened concrete substrate and was ambient air cured for 45 days prior to conducting the abrasion test in accordance with ASTM D1242 Method A Loose abrasive method. (1,000 Cycles - 1,000 gram load).

Specimen Mark	Loss in Thickness Mils = 0.001"
1	42.0
2	44.5
3	44.0
Average:	43.5

11. Flexural Strength: (ASTM D790)

The Krete-Kote material was applied to a plywood substrate and was ambient air cured for 45 days prior to conducting the flexural tests.

The plywood was cut away from the specimens prior to testing.

Specimen Mark	Maximum Deflection In Inches at Fracture	Modulus of Rupture psi
1	0.696	785
2	0.672	760
3	0.678	765
Average:	0.682	770

Note: The specimens were tested with a span length to depth ratio of 32 to 1.

12. Impact Resistance: (Mil-D-3134F)

The Krete-Kote material was applied to a hardened concrete substrate and was ambient air cured for 45 days prior to conducting the falling steel ball impact test in accordance with Military Specification for decking materials Mil-D-3134F.

2 Pound Steel Ball Dropped From an 8" Height

Specimen Mark	Indentation Crater Depth In Inches	Remarks
1	0.024	No cracking, chipping, spalling nor loss of bond from the concrete substrate
2	0.029	
3	0.021	
Average:	0.025	

13. Flame Spread: (ASTM E84)

The Krete-Kote was applied to a type X gypsum board substrate and was allowed to ambient air cure for 45 days prior to subjecting it to the ASTM E84 Flame Spread Test.

Test Flame: 1400°F.; for 10 minutes.

Note: The flame spread test was conducted on samples which had been seal coated. This was done intentionally to evaluate the worst case condition.

Results:

Flame Spread Index	Smoke Generation
10	5

Note: The Krete-Kote with the finish sealer on the surface, passes a Class "A" Flame Spread Index which is 0 to 25. A smoke generation of 5 is considered very low smoke.

Comment:

The primary contributor to the flame spread and the smoke generation was the Acrylic Sealer Coating. The cementatious Krete-Kote showed no progressive thermal degradation whatsoever.

EVALUATION OF "KRETE KOTE"

Ramtech Laboratories, Inc.

Laboratory Number 8454A-88

SUPPLEMENTARY COMMENTS

TESTS: (Note: Tests start with ppg 3 on Ramtech Report)

3. Weatherometer Test

   Note: NO failure with or without sealer coat

4. Compression Tests

   Medium Strength Concrete is about 2000 psi. In thin coats, as KRETE KOTE is applied, the strength would be minimum of 50-100% higher. Probably much higher since "test failure" is always in shear.

5. Tensile Strength

   Concrete usually 250-300 psi - KRETE KOTE 457 psi average.

6. Bond Strength

   ICBO requires 10 psi. KRETE KOTE approximately 19 times higher (192 psi average)

7. Salt Spray

   Self- explanatory.

8. Freeze Thaw

   Note that test qualifies KRETE KOTE for "severe weathering conditions".

9. Water Vapor Transmission

   Indicates Excellent water resistance with "breathing characteristics."

10. Abrasion

    Note: Navy specs allows 150 mil loss @1500 cycles.
    Equates to about 100 mil loss @ 1000 cycles.
    KRETE KOTE test 43.5 mil loss @ 1000 cycles.

11. Flexural Strength

Concrete specifications will vary from about 300-750 psi depending on requirements for specific use. High modulus specified only for high impact applications such as airport runways. Note KRETE KOTE @ 770 psi. Much higher than most concrete used for structural work.

12. Impact Resistance

Military test - Specs allow up to .06" indentation.
Note: KRETE KOTE only .025".

13. Flame Spread

Krete Kote well within Class "A" even with sealer. See Ramtech comment.

Note: Without sealer, Krete Kote would be expected to have a Flame Spread of under 5 and no smoke generation.

MULTICOAT CORPORATION
Laboratory No. 9754-93
Page 2 of 2 Pages

DISCUSSION

In order that the values shown in the table titled, coefficient of friction tests, may be more readily understood the following definitions are offered

Coefficient of Friction - the ratio of the frictional force to the force, usually gravitational, acting perpendicular to the two surfaces in contact. This coefficient is a measure of the relative difficulty with which the surface of one material will slide over an adjoining surface of itself, or of another material. The static or starting coefficient of friction is related to the force measured to begin movement of the surfaces relative to each other. The kinetic or sliding coefficient of friction is related to the force measured in sustaining this movement.

Friction - the resisting force that arises when a surface of one substance slides, or tends to slide, over an adjoining surface of itself or another substance. Between surfaces of solids in contact there may be two kinds of friction: (1) the resistance opposing the force required to start to move one surface over another, and (2) the resistance opposing the force required to move one surface over another at a variable, fixed, or predetermined speed.

Slip - a term denoting lubricity of two surfaces sliding in contact with each other. In a sense, it is the antithesis of friction in that high coefficient of friction denotes low slip and low coefficient of friction high slip.

It has been our experience and the experience of other e.g., The National Bureau of Standards (NBS) and the American Society for Testing and Materials (ASTM) that a static coefficient of friction of 0.50 may be perfectly satisfactory in that no slips and falls are likely to occur, when the nature of the traffic is orderly. On the other hand where traffic is of the hustling type, and direction of progress suddenly change, a higher coefficient of friction could be needed in order to minimize accidents.

MULTICOAT CORPORATION
Laboratory No. 9754-93

2. NON-SLIP PROPERTIES - RESULTS

FACTORS OF FRICTION*

TEST METHOD, ASTM C1028

Sample Identification: Multicoat Walking Deck and Roof Surfacing System (Slatex System)

Date: 3-29-93

Contacting Surface	Factor of Static Friction		Factor of Sliding Friction	
Multicoat Decking System	Dry	Wet	Dry	Wet
Leather	0.87	0.75	0.52	0.67
Rubber	0.88	0.79	0.77	0.72

*NOTE:

(1) All results are an average of twelve readings.

(2) The ASTM C1028 details the measurement of static coefficient of friction of ceramic tiles or other surfaces under both wet and dry conditions while utilizing Neolite rubber heel material.

(3) The static and dynamic coefficient of friction of leather, and dynamic coefficient of friction of rubber are presented in this report for additional client information.

LAB EVALUATION TEST DATA

Supplementary Information

The following Ramtech Laboratories Inc. test report supercedes some of the results set forth in prior reports. The data reflects minor changes in physical characteristics due to formula modifications.

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE, PARAMOUNT, CALIFORNIA 90723 • TELEPHONE NO. (562) 633-4824 • FAX NO. (562) 633-4128

Mr. Herb Fuente
MULTICOAT CORPORATION
1565 Sunflower Avenue
Costa Mesa, CA 92626

April 15th , 1997

Re.: Testing of Modified "Krete-Kote" Formulation.

Laboratory No. 10760A-96

Dear Mr. Fuente:

In accordance with your request, the following tests were conducted on your sampled "Krete-Kote" material:

- Accelerated Aging - ASTM D756 (Procedure D & E).
- Water Absorption - ICBO AC39.
- Impact Resistance - Mil-D-3134F.
- Bond Strength - ASTM C297.
- Abrasion - ASTM D-1242, Method "A".

A summary of the test results is presented below. Sample preparation and individual test data is presented on the following pages.

SUMMARY OF TEST RESULTS

Tests	Control	Aged
Water Absorption	3.7%	N/A
Impact	0.051 deep	N/A
Bond Strength to Concrete	161 psi	225 psi
Bond Strength to Steel	114 psi	120 psi
Abrasion	0.039" Loss	N/A

Report Prepared By:

RAMTECH LABORATORIES, INC.

Steve Berggren
Laboratory Supervisor/QC
RAM/SB/meza.

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

1.0 SAMPLE PREPARATION:

Sample preparation was conducted by Multicoat's personnel and witnessed by Ramtech's personnel on the following substrates:

A. Concrete.
B. Galvanized Sheet Metal.

The "Krete-Kote" used in these tests was sampled by Ramtech's personnel on October 18, 1996 and identified by Ramtech's personnel as having a modified formulation.

The "Krete-Kote" was applied in one coat to a dry film thickness of 0.035 to 0.042 inches for the following tests:

- Water Absorption
- Impact
- Bond Strength

For sample preparation for the abrasion test, see Section 6.0 of this report.

2.0 ACCELERATED AGING TEST:

An accelerated aging test was conducted on the modified formulation of "Krete-Kote" as detailed in ASTM D756, Procedures "D" and "E" using the following cycles on the three substrates described in Section 1.0.

24 Hours over water at 176 °F ± 1.8 °F.
24 Hours at 70 °F to 75% RH and 176 °F ± 1.8 °F.
24 Hours at -40 °F ± 1.8 °F.
24 Hours at -40 °F ± 3.6 °F.

3.0 WATER ABSORPTION TEST:

A water absorption test was conducted on the modified formulation of "Krete-Kote" as detailed in ASTM D570.

3.1 RESULTS:

The results of the water absorption test presented in Table No. 1 indicate the modified formulation of "Krete-Kote" had an average absorption rate of 3.7% .

WATER ABSORPTION TEST

Table No. 1

Sample Number	Dry Weight (Grams)	Weight After 24 Hours Immersion (Grams)	Weight of Water Absorption (Percent)
1.	35.3	36.7	4.0
2.	36.3	37.5	3.3
3.	36.3	37.5	3.3
4.	37.3	38.8	4.0
5.	33.2	34.5	3.9
		Average:	**3.7**

NOTE:

The specification allows a maximum of 15.0 percent absorption by weight.

4.0 IMPACT RESISTANCE TEST:

A impact resistance test was conducted on the modified formulation of "Krete-Kote" as detailed in Mil-D-3134F. In this test, the following condition were met:

A. 2 lb. Steel ball.

B. Drop weight = 8 feet.

C. Substrate = 0.025 galvanized sheet metal.

4.1 RESULTS:

The results of this impact test presented in Table No. 2, indicate the modified formulation of "Krete-Kote" had an average indentation crater depth of 0.051 with no cracking, chipping, spalling or loss of bond to the sheet metal substrate.

IMPACT TEST

Table No. 2

Sample Identification	Drop Height **(Feet)**	Indentation Crater Depth **(Inches)**
1.	8	0.050
2.	8	0.051
3.	8	0.051
	Average:	**0.051**

5.0 BOND STRENGTH TEST:

A bond strength test was conducted on the modified formulation of "Krete-Kote" as detailed in ASTM C297. In this test, five samples on each substrate described in Section 1.0 of this report were subjected to the accelerated aging test described in Section 2.0 of this report. Along with the aged samples five samples of each substrate were tested as a control after 14 days of ambient air cure.

5.1 RESULTS:

The results of the bond strength test is presented in Tables 3 through 6 on the following substrates.

- Concrete - Control - Table No. 3 = 161 psi.
- Concrete - Aged - Table No. 4 = 225 psi.
- Sheet Metal - Control - Table No. 5 = 114 psi.
- Sheet Metal - Aged - Table No. 6 = 120 psi.

BOND STRENGTH

CONCRETE CONTROL SAMPLE

Table No. 3

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Control 1	2 x 2	4	650	163	Cohesive within the "Krete-Kote".
Control 2	2 x 2	4	578	145	Cohesive within the "Krete-Kote".
Control 3	2 x 2	4	700	175	Cohesive within the "Krete-Kote".
Control 4	2 x 2	4	685	171	Cohesive within the "Krete-Kote".
Control 5	2 x 2	4	600	150	Cohesive within the "Krete-Kote".
			Average:	**161**	

BOND STRENGTH

CONCRETE AGED SAMPLE

Table No. 4

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Aged 1	2 x 2	4	885	221	Cohesive within the Concrete Block.
Aged 2	2 x 2	4	960	240	Cohesive within the Concrete Block.
Aged 3	2 x 2	4	890	223	Cohesive within the Concrete Block.
Aged 4	2 x 2	4	900	225	Cohesive within the Concrete Block.
Aged 5	2 x 2	4	860	215	Cohesive within the Concrete Block.
			Average:	**225**	

5.1 RESULTS: (Cont.)

BOND STRENGTH

SHEET METAL CONTROL SAMPLE

Table No. 5

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Aged 1	2 x 2	4	432	108	Cohesive failure within "Krete-Kote".
Aged 2	2 x 2	4	429	107	Cohesive failure within "Krete-Kote".
Aged 3	2 x 2	4	437	109	Cohesive failure within "Krete-Kote".
Aged 4	2 x 2	4	513	128	Cohesive failure within "Krete-Kote".
Aged 5	2 x 2	4	461	115	Cohesive failure within "Krete-Kote".
Aged 6	2 x 2	4	462	116	Cohesive failure within "Krete-Kote".
			Average:	**114**	

BOND STRENGTH

SHEET METAL AGED SAMPLE

Table No. 6

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Control 1	2 x 2	4	460	115	Cohesive failure within "Krete-Kote".
Control 2	2 x 2	4	533	133	Cohesive failure within "Krete-Kote".
Control 3	2 x 2	4	524	131	Cohesive failure within "Krete-Kote".
Control 4	2 x 2	4	419	105	Cohesive failure within "Krete-Kote".
Control 5	2 x 2	4	451	113	Cohesive failure within "Krete-Kote".
Control 6	2 x 2	4	478	120	Cohesive failure within "Krete-Kote".
			Average:	**120**	

6.0 ABRASION TEST:

An abrasion test was conducted on the modified formulation of "Krete-Kote" as described in ASTM D-1242, Method "A".

6.1 SAMPLE PREPARATION:

In this abrasion test, the modified formulation of "Krete-Kote" was applied as a multi-layer, fiberglass reinforced, latex, modified cementitious top coating over an elastomeric waterproofing membrane on a 3/4 inch plywood substrate.

6.2 PROCEDURE:

ASTM D-1242 - Resistance to Abrasion, Method "A".
1000 Revolutions.
1000 Gram Load.
No. 80 TP Aluminum Oxide Grit.

6.3 RESULTS:

The results of this abrasion test, presented in Table No. 7, indicate an average loss in thickness of 0.039 inches.

ABRASION TEST

Table No. 7

Sample Identification	Original Thickness **(Inches)**	Final Thickness **(Inches)**	Loss **(Inches)**
1.	0.220	0.183	0.037
2.	0.220	0.178	0.042
3.	0.220	0.220	0.038
		Average:	**0.039**

RAMTECH LABORATORIES, INC.
14104 ORANGE AVENUE, PARAMOUNT, CALIFORNIA 90723-2019 • TELEPHONE (562) 633-4824 • FAX (562) 633-4128

September 10, 1998

Mr. Herb Fuente
MULTICOAT CORPORATION
23061 Arroyo Vista
Rancho Santa Margarita, CA 92688

Laboratory No. 11154-98

Dear Mr. Fuente:

In accordance with your request, Ramtech Laboratories, Inc. conducted a Water Vapor Transmission Test on your "Krete-Kote" System, in accordance with ASTM E 96, Section 11.0, Desiccant Method.

This testing was conducted on samples prepared by Multicoat personnel and witnessed by Ramtech Laboratories on July 23, 1998. All of the materials used in the preparation of the test specimens were received by Ramtech Laboratories in unopened containers. A summary of the test results are presented below along with detailed description of sample preparation, test procedures and individual test results presented on the following pages.

SUMMARY OF TEST RESULTS

A. Painted Surface = 3.9 perms

B. Unpainted Surface = 8.5 perms

Report Prepared By:

RAMTECH LABORATORIES, INC.

Steve Berggren
Laboratory Supervisor/QCI
RAM/SB/meza.

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

MULTICOAT CORPORATION

Manufacturers & Distributors of Flexible Waterproofing Cement & Elastomerics

23061 Arroyo Vista • Rancho Santa Margarita • California 92688
Toll Free (877) 685-8426 • FAX (949) 888-2555
Website: www.multicoat.com

RAMTECH LABORATORIES, INC.
14104 Orange Ave.
Paramount, CA., 90723

(NERQA - 293)

PREPARED FOR:

MULTICOAT CORPORATION

Laboratory Number: 9097A-90

EVALUATION OF

MULASTICOAT
ELASTOMERIC WATERPROOFING MEMBRANE

Prepared by:
Ronald A. Macey, P.E.
Laboratory Director

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE. PARAMOUNT. CALIFORNIA 90723 • TELEPHONE (213) 633-4824

MULTICOAT CORPORATION
23061 Arroyo Vista
Rancho Santa Margarita, CA 92688
Toll Free (877) 685-8426
Fax (949) 888-2555
MULTIPURPOSE COATINGS AND DECK SYSTEMS

Laboratory Number: 9097A-90

Gentlemen:

In accordance with your request a series of tests have been conducted on your Mulasticoat II Sealer.

The material was sampled from your warehouse stocks by Ramtech Laboratories personnel.

One application was necessary to produce a dry film thickness of 16 mils. Upon completion, the resulting membrane was allowed to ambient cure for a period of 7 days.

To determine the physical characteristics of the Mulasticoat II membrane the following tests were conducted.

1. Test Methods for Rubber Properties in Tension ASTM D412-83. (Before and After Aging Exposure)
2. Test Methods of Flat Sandwich Construction in Flatwise Plane - ASTM C297-61 (Bond Test Concrete and Wood).
3. Percent Solids
4. Low Temperature Flexibility
5. Cracking Resistance (crack bridging) LA City Method
6. Percolation Test (48 in. Water Head)
7. Accelerated Aging (ASTM D756)
8. Water Vapor Transmission ASTM E96 (Procedure BW)

The tests procedures and results are detailed on the following pages.

Respectfully submitted,
RAMTECH LABORATORIES, INC.

Ronald A. Macey, P.E.
Laboratory Director

MULTICOAT CORPORATION
Laboratory No. 9754-93

2. NON-SLIP PROPERTIES - RESULTS

FACTORS OF FRICTION*

TEST METHOD, ASTM C1028

Sample Identification: Multicoat Walking Deck and Roof Surfacing System (Slatex System)

Date 3-29-93

Contacting Surface	Factor of Static Friction		Factor of Sliding Friction	
Multicoat Decking System	Dry	Wet	Dry	Wet
Leather	0.87	0.75	0.52	0.67
Rubber	0.88	0.79	0.77	0.72

*NOTE

(1) All results are an average of twelve readings.

(2) The ASTM C1028 details the measurement of static coefficient of friction of ceramic tiles or other surfaces under both wet and dry conditions while utilizing Neolite rubber heel material.

(3) The static and dynamic coefficient of friction of leather, and dynamic coefficient of friction of rubber are presented in this report for additional client information.

Tensile Strength & Elongation:

Tensile specimens were cut from the cured membrane as per ASTM D412-83. Each specimen was measured and tested individually in the Tinus Olsen Electromatic testing machine at a rate of 2" per minute until failure.

Results:
Tensile Strength & Elongation Before Aging Exposure (Control)

Sample Number	Area	Load	PSI	Elongation Percent
1	.0043	3.50	814	300
2	.0040	3.85	963	280
3	.0050	4.20	840	315
4	.0045	4.00	889	265
5	.0040	4.25	1063	285
		Average:	914	289

Tensile Strength & Elongation After Aging Exposure

Sample Number	Area	Load	PSI	Elongation Percent
1	.0047	4.50	947	190
2	.0035	2.87	821	180
3	.0045	3.62	805	170
4	.0032	2.50	769	160
5	.0035	3.62	1035	190
		Average:	875	178
		Percent Loss:	4.26	38.4

RAMTECH LABORATORIES, INC.

Bond Strength - ASTM C-297:

The Mulasticoat was applied to a hardened concrete block and wood, then allowed to ambient air cure for 14 days prior to testing in flatwise tension. The tension tests were conducted in accordance with ASTM C-297.

Results:

Sample Number	Area	Ultimate Bond Strength to Concrete Load, Lbs.	PSI	Remarks
1	9.00	1635	182.0	All samples had
2	9.00	1500	167.0	bond failure between
3	9.00	2225	247.0	concrete block
4	9.00	1785	198.0	and water proof
5	9.00	2275	253.0	membrane.
		Average:	209.4	

Sample Number	Area	Ultimate Bond Strength to Wood Load, Lbs.	PSI	Remarks
1	12.25	1650	135.0	All samples had
2	12.25	1925	157.0	bond failure between
3	12.25	1610	131.0	wood block and
4	12.25	1450	118.0	water proof
5	12.25	1860	152.0	membrane.
		Average:	138.6	

Percent Solids:

The percent solids for the Mulasticoat is 50.40%. 84 grams of material were oven dried at 150°F. for 14 days and net dry weight was 42.35 grams.

Low Temperature Flexibility:

Data obtained by testing a 16 mil thick free film of Mulasticoat elastomeric membrane by bending the sample over a 1" radius at reduced temperatures resulted in a 50% failure rate at temperatures below -5°F. therefore the material is considered to have a low temperature flexibility of -5°F.

Crack Bridging:

Five 2"x 8" specimens were fabricated from 5/8" plywood with a 1/8" joint cut across the center. The joint was filled with liquid mulasticoat to a dry thickness of 30 mils above the plywood substrate, the resulting membrane was allowed to ambient cure for 14 days.

Sample Number	Beginning of Cohesive Separation %Elongation	Total Elongation%	Mode of Failure
1	80.0	160	Tension failure
2	80.0	144	of membrane @
3	80.0	160	deck joint, on
4	80.0	152	all samples.
5	80.0	160	
	Average:	155	

Percolation Tests:
Procedure:

2" Diameter Tube, 48" Water Head, 48 Hours
Room Temperature = 70 ± 2° F
Relative Humidity = 50 ± 5%

Sample Number	Total Drop Of 48" Water Column In 48 Hours	Drop Of Water Column Due To Evaporation In 48 Hours	Percolation Overhead Of Water Inches	Percolation Percent Of Original Head
A	0.113	0.113	0.000	0.000
B	0.113	0.113	0.000	0.000
C	0.113	0.113	0.000	0.000

Note: The specification allows a maximum percolation of 1.0 percent of original head (48 inches).

Accelerated Aging Tests:
Procedure:

ASTM A756 - Procedure D and E, (25) consecutive cycles. Each cycle consists of:

12 Hours in Freezer at -40°C
12 Hours in Oven at 80°C
12 Hours in Freezer at -40°C
12 Hours in oven at 80°C and 75% Relative Humidity
2 Days

Results: After 25 consecutive cycles there were no signs of cracking, crazing, chalking, delamination or any other deleterious effects.

Water Vapor Transmission: ASTM E96 (Procedure BW)
Results:

Sample Mark	WVT Grams/Hour/ Meter²	WVT Grains/Hour/ Foot²
1	0.0031	0.0044
2	0.0027	0.0039
3	0.0034	0.0049
	0.00307	0.0044

LAB EVALUATION TEST DATA

Supplementary Information

The following Ramtech Laboratories Inc. test report supercedes some of the results set forth in prior reports. The data reflects minor changes in physical characteristics due to formula modifications.

RAMTECH LABORATORIES, INC.

14104 ORANGE AVENUE, PARAMOUNT, CALIFORNIA 90723 • TELEPHONE NO. (562) 633-4824 • FAX NO. (562) 633-4128

Mr. Herb Fuente
MULTICOAT CORPORATION
1565 Sunflower Avenue
Costa Mesa, CA 92626

February 18, 1997

Re.: Testing of Modified Mulasticoat Formulation.

Laboratory No. 10759-96

Dear Mr. Fuente:

In accordance with your request, the following tests were conducted on your sampled "Mulasticoat" material:

- Accelerated Aging - ASTM D756 (Procedure D & E).
- Tensile and Elongation - ASTM D412.
- Percolation - ICBO AC39.
- Bond Strength - ASTM C297.

A summary of the test results is presented below. Sample preparation and individual test data is presented on the following pages.

SUMMARY OF TEST RESULTS

Tests	Control	Aged
Tensile and Elongation	446 psi, 477%	717 psi, 392%
Percolation	0.001 inch	N/A
Bond Strength to Concrete	163 psi	192 psi
Bond Strength to Plywood	175 psi	191 psi
Bond Strength to Steel	514 psi	504 psi

Report Prepared By:

RAMTECH LABORATORIES, INC.

Steve Berggren
Laboratory Supervisor/QCI
RAM/SB/meza.

Report Approved By:

RAMTECH LABORATORIES, INC.

Ronald A. Macey, P. E.
Laboratory Director

1.0 SAMPLE PREPARATION:

Sample preparation was conducted by Multicoat's personnel and witnessed by Ramtech's personnel on the following substrates:

A. Concrete.
B. 5/8 inch A-C Plywood.
C. Galvanized Sheet Metal.

The "Mulasticoat" used in these tests were sampled by Ramtech's personnel on October 18, 1996 and identified by Ramtech's personnel as having a modified formulation.

The "Mulasticoat" was applied in two thin coats with a coverage rate of 40-50 sq. ft. per gallon to a dry film thickness of 0.020 to 0.030 inches.

2.0 ACCELERATED AGING TEST:

An accelerated aging test was conducted on the modified formulation of "Mulasticoat" as detailed in ASTM D756, Procedures "D" and "E" using the following cycles on the three substrates described in Section 1.0.

24 Hours over water at 176 °F ± 1.8 °F.
24 Hours at 70 °F to 75% RH and 176 °F ± 1.8 °F.
24 Hours at -40 °F ± 1.8 °F.
24 Hours at -40 °F ± 3.6 °F.

3.0 TENSILE AND ELONGATION TEST:

A tensile and elongation test was conducted on the modified formulation of "Mulasticoat" as detailed in ASTM D412. In this test, nine samples were subjected to the accelerated aging test described in Section 2.0 of this report and five samples were tested as a control.

3.1 RESULTS:

The results of the tensile and elongation tests presented in Table Nos. 1 and 2 indicate the modified formulation of "Mulasticoat" had an average tensile strength of 446 psi for the control with an elongation of 477 percent. The results of these tests after the accelerated aging test indicate the modified formulation of "Mulasticoat" had an average tensile strength of 717 psi with an elongation o f 392 percent.

3.1 RESULTS: (Cont.)

TENSILE AND ELONGATION TESTS

CONTROL

Table No. 1

Sample Identification	Area (Inch^2)	Load (Lbs.)	PSI	Elongation (Percent)
1. Control	0.053	2.35	443	478
2. Control	0.058	2.78	478	502
3. Control	0.058	1.95	336	429
4. Control	0.053	2.40	453	443
5. Control	0.058	3.03	522	532
			446	**477**

TENSILE AND ELONGATION TESTS

AFTER ACCELERATED AGING

Table No. 2

Sample Identification	Area (Inch^2)	Load (Lbs.)	PSI	Elongation (Percent)
1. Aged	0.058	5.05	878	422
2. Aged	0.050	4.60	836	447
3. Aged	0.058	4.48	778	403
4. Aged	0.060	4.40	733	400
5. Aged	0.058	3.93	683	391
6. Aged	0.058	3.28	570	353
7. Aged	0.053	3.20	610	355
8. Aged	0.063	5.15	824	413
9. Aged	0.055	3.00	545	342
			717	**392**

4.0 PERCOLATION TEST:

A percolation test was conducted on the modified formulation of "Mulasticoat" as detailed in ICBO AC39. In this test, the following condition were met:

A. 2 inch diameter tube with 48 inches of water head for 48 hours.

B. Room temperature = 75 ± 5 °F.

C. Relative humidity = 50 ± 5%.

4.1 CONDITION OF ACCEPTANCE:

A maximum water percolation equivalent to a 0.5-inch column height.

4.2 RESULTS:

The results of this percolation test presented in Table No. 3, indicate the modified formulation of "Mulasticoat" passed the minimum requirement for the percolation test with an average water percolation test with an average water percolation of 0.001-inch column height.

PERCOLATION TEST

Table No. 3

Sample Identification	Percolation **(Inches)**	Evaporation **(Inches)**	Total Percolation **(Inches)**
1.	0.113	0.114	0.001
2.	0.113	0.114	0.001
3.	0.113	0.114	0.001
		Average:	**0.001**

5.0 BOND STRENGTH TEST:

A bond strength test was conducted on the modified formulation of "Mulasticoat" as detailed in ASTM C297. In this test, six samples on each substrate described in Section 1.0 of this report were subjected to the accelerated aging test described in Section 2.0 of this report. Along with the aged samples, six samples of each substrate were tested as a control after 14 days of ambient air cure.

5.1 RESULTS:

The results of the bond strength test is presented in Tables 4 through 9 on the following substrates.

- Concrete - Control - Table No. 4 = 163 psi.
- Concrete - Aged - Table No. 5 = 192 psi.
- Plywood - Control - Table No. 6 = 175 psi.
- Plywood - Aged - Table No. 7 = 191 psi.
- Sheet Metal - Control - Table No. 8 = 514 psi.
- Sheet Metal - Aged - Table No. 9 = 504 psi.

BOND STRENGTH

CONCRETE CONTROL SAMPLE

Table No. 4

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Control 1	2 x 2	4	614	154	Bond Failure Between "Mulasticoat" and Concrete
Control 2	2 x 2	4	648	162	Bond Failure Between "Mulasticoat" and Concrete
Control 3	2 x 2	4	660	165	Bond Failure Between "Mulasticoat" and Concrete
Control 4	2 x 2	4	658	165	Bond Failure Between "Mulasticoat" and Concrete
Control 5	2 x 2	4	689	172	Bond Failure Between "Mulasticoat" and Concrete
			Average:	**163**	

BOND STRENGTH

CONCRETE AGED SAMPLE

Table No. 5

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Aged 1	2 x 2	4	736	184	Cohesive within the Concrete Block.
Aged 2	2 x 2	4	752	188	Cohesive within the Concrete Block.
Aged 3	2 x 2	4	677	169	Cohesive within the Concrete Block.
Aged 4	2 x 2	4	770	193	Cohesive within the Concrete Block.
Aged 5	2 x 2	4	892	223	Cohesive within the Concrete Block.
Aged 6	2 x 2	4	776	194	Cohesive within the Concrete Block.
			Average:	**192**	

5.1 RESULTS: (Cont.)

BOND STRENGTH

PLYWOOD CONTROL SAMPLE

Table No. 6

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Control 1	2 x 2	4	802	201	Cohesive within the Plywood.
Control 2	2 x 2	4	512	128	Cohesive within the Plywood.
Control 3	2 x 2	4	671	168	Cohesive within the Plywood.
Control 4	2 x 2	4	725	181	Cohesive within the Plywood.
Control 5	2 x 2	4	707	177	Cohesive within the Plywood.
Control 6	2 x 2	4	770	193	Cohesive within the Plywood.
			Average:	**174**	

BOND STRENGTH

PLYWOOD AGED SAMPLE

Table No. 7

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Aged 1	2 x 2	4	861	215	Cohesive within the Plywood.
Aged 2	2 x 2	4	762	191	Cohesive within the Plywood.
Aged 3	2 x 2	4	659	165	Cohesive within the Plywood.
Aged 4	2 x 2	4	642	161	Cohesive within the Plywood.
Aged 5	2 x 2	4	804	201	Cohesive within the Plywood.
Aged 6	2 x 2	4	850	213	Cohesive within the Plywood.
			Average:	**191**	

5.1 RESULTS:

BOND STRENGTH

SHEET METAL CONTROL SAMPLE

Table No. 8

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Control 1	2 x 2	4	1810	453	Bond Failure to Sheet Metal
Control 2	2 x 2	4	2125	531	Bond Failure to Sheet Metal
Control 3	2 x 2	4	2395	599	Bond Failure to Sheet Metal
Control 4	2 x 2	4	2200	550	Bond Failure to Sheet Metal
Control 5	2 x 2	4	1910	478	Bond Failure to Sheet Metal
Control 6	2 x 2	4	1890	473	Bond Failure to Sheet Metal
			Average:	**514**	

BOND STRENGTH

SHEET METAL AGED SAMPLE

Table No. 9

Specimen ID	Dimensions	Area (Sq. In.)	Load (Pounds)	PSI	Mode of Failure
Aged 1	2 x 2	4	1950	488	Bond Failure to Sheet Metal
Aged 2	2 x 2	4	1890	473	Bond Failure to Sheet Metal
Aged 3	2 x 2	4	2180	545	Bond Failure to Sheet Metal
Aged 4	2 x 2	4	2140	535	Bond Failure to Sheet Metal
Aged 5	2 x 2	4	1920	480	Bond Failure to Sheet Metal
Aged 6	2 x 2	4	2020	505	Bond Failure to Sheet Metal
			Average:	**504**	