

APPROVAL REPORT

RESITRIX MB ROOF COVER FOR USE MECHANICALLY ATTACHED IN CLASS 1 ROOF CONSTRUCTION

Prepared for:

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Project ID: 3036376

Class: 4470

Date of Approval: 7 December 2010

Authorized by:


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**RESITRIX MB ROOF COVER
FOR USE MECHANICALLY ATTACHED
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from

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I INTRODUCTION

- 1.1 Phoenix Dichtungstechnik GmbH submitted their Resitrix MB roof cover for evaluation to determine if it would meet the Approval requirements of FM Standard 4470.
- 1.2 This Report may be reproduced only in its entirety and without modification.
- 1.3 **FM Standard 4470:**

Title	Class	Date
Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Systems for use in Class 1 and Noncombustible Roof Construction	4470	April 2010

- 1.4 Examination included Construction Materials Calorimeter testing for interior fire exposure, ASTM E108 fire testing for exterior fire exposure, wind uplift testing, hail damage testing, leakage testing and foot traffic testing.
- 1.5 Testing shows that the Phoenix Dichtungstechnik GmbH Resitrix MB roof cover, as evaluated in this program, meets the Approval requirements of the **FM Standard** listed above.
- 1.6 **Listings:** The evaluated constructions meet the FM Approvals criteria when installed as specified in the **CONCLUSIONS** of this report. The products and FM Approved constructions will be listed in RoofNav.

II DESCRIPTIONS

- 2.1 Resitrix MB is a composite waterproofing sheet consisting of an EPDM top layer, glass reinforcement coated with TPE (Thermoplastic elastomer) and a SBS modified bitumen bottom layer with a polyethylene separating film on the bottom side. It is 3.1 mm (0.122 in.) thick by 1000 mm (39.37 in.) wide and supplied in 10 m (32.8 ft) long rolls.
- 2.2 Alutrix FR is a self adhesive water vapor control layer consisting of composite layer PET-ALU-PET (PET is a Polyester-Foil) and glass reinforcement coated with a polymer modified self adhesive bitumen. It has a PET layer on the top side and release film on the bottom side.
- 2.3 Formulations are on file at FM Approvals. All other products were as described in RoofNav.

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III EXAMINATION AND TESTING

3.1 Samples were submitted for examination and testing as follows:

3.1.1 Corrosion testing was waived based on successful testing by the fastener manufacturer in prior test programs.

3.1.2 The deck, insulation and fasteners were produced under the FM Approvals Surveillance Audit program as indicated by FM Approval labels. All samples were considered to be representative of standard production and were examined and tested as indicated below.

3.1.3 All test data is on file at FM Approvals under 3036376 along with other documents and correspondence applicable to this program.

3.2 FM Approvals 3.7x7.3 m (12x24 ft) Simulated Wind Uplift Pressure Test

3.2.1 Testing was conducted using the FM Approvals Uplift Pressure Test Apparatus to evaluate the ability of the roof assembly to resist a minimum simulated wind uplift pressure of 2.9 kPa (60 psf) without failure of the assembly.

3.2.1.1 The simulated wind uplift pressure test utilized a 7.3 m (24 ft.) long by 3.7 m (12 ft.) wide by 51 mm (2 in.) deep steel pressure vessel arranged to apply air pressure at pre-established standard rates to the underside of the test sample which formed the top of the pressure vessel. The vessel was pressurized with compressed air.

3.2.1.2 A net pressure of 1.4 kPa (30 psf) was applied to the test sample and maintained for 1 minute. The pressure was increased to 2.2 kPa (45 psf), then to 2.9 kPa (60 psf) and held for 1 minute at each increment. The pressure was increased in increments of 0.7 kPa (15 psf) every minute until failure occurred.

3.2.2 One 3.7 by 7.3 m (12 by 24 ft.) test sample was prepared. The components, sequence of installation and test results follow:

- 0.75 mm (22 ga., 0.0295 in.) thick type B, wide rib steel deck meeting the requirements of ASTM A653, Grade 33 was secured to 6.4 mm (0.25 in.) thick structural supports spaced at 1830 mm (72 in.) o.c. using Teks 5 screws spaced at 152 mm (6 in.) o.c. and with side laps secured with Stitch Teks 1 screws spaced at 610 mm (24 in.) o.c.
- 50 mm (2 in.) thick Thermarroof TR26 FM insulation loose laid.
- 1000 mm (39.4 in.) wide Resitrix MB was mechanically attached with isofast IR 2-4.8 x 70 screws and IR-82x40 stress plates spaced 305 mm (12 in.) o.c. and placed within the 100 mm (4 in.) wide laps which were spaced at 900 mm (35.4 in.) o.c. and sealed with a 80 mm (3.2 in.) wide heat weld.

Test Result: The test sample met the 2.9 kPa (60 psf) minimum requirement for Class 1-60 windstorm classification. The sample failed upon reaching the 3.6 kPa (75 psf) pressure level as a result of the roof membrane tearing over the stress plates.

3.3 ASTM E108 Spread of Flame Tests

3.3.1 The fire tests from above the roof cover were conducted in accordance with ASTM E108-10a Spread of Flame Tests.

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- 3.3.1.1 Sample size was 1.0 by 2.4 m (3-1/3 by 8 ft.).
- 3.3.1.2 The wind velocity over the top of the standard panel was adjusted to 5.3±0.2 m/s (12±0.5 mph).
- 3.3.1.3 Flame exposure: The flame was adjusted to 760±28°C (1400±50°F) for Class A tests. The flame temperature was measured by a thermocouple located 25.4 mm (1 in.) above the surface of the standard panel and 13 mm (1/2 in.) toward the flame source from the lower edge of the standard panel. The flame was applied to each test panel for 10 minutes.
- 3.3.1.4 During and after the application of the flame, each panel was observed for the distance of maximum flame spread, glowing brands and other damage.
- 3.3.2 Five 1.0 by 2.4 m (3-1/3 by 8 ft.) test samples were prepared over a plywood deck. The components and sequence of installation were as follows:

Sample No.'s 1 & 2:

130 mm (5.1 in.) thick Taurox D (bitumen faced) loose laid
3.1 mm (0.122 in.) thick Resitrix MB (100 mm wide) mechanically attached

Sample No.'s 3 & 4:

140 mm (3.6 in.) thick Powerdeck
3.1 mm (0.122 in.) thick Resitrix MB (100 mm wide) mechanically attached

Sample No. 5:

160 mm (6.3 in.) thick Durock, no facer
3.1 mm (0.122 in.) thick Resitrix MB (100 mm wide) mechanically attached

- 3.3.3 The results of the ASTM E108 Spread of Flame tests were as follows:

<u>Sample No.</u>	<u>Slope</u>	<u>Max. Flame Spread mm (in.)</u>	<u>Rating</u>
1	1.5 in 12	1473 (58)	Class A
2	1.5 in 12	1321 (52)	Class A
3	1.5 in 12	1829 (72)	Class A
4	1.5 in 12	2083 (82)	Class B
5	1.5 in 12	2007 (79)	Class B

Deck exposure, flying brands and significant lateral flame spread were not observed during the tests.

3.4 FM Approvals Calorimeter Fire Test

- 3.4.1 The fire test from below the roof deck was conducted using the FM Approvals Construction Materials Calorimeter which measures the maximum rate of fuel contribution by the sample roof, also expressed as maximum heat release rate (HRR); e.g, for a Class 1 rating, the assembly must exhibit a HRR no greater than 77.6 kW/m² (410 Btu/ft²/min) in any 3 minute time frame during the 30 minute fire exposure.

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3.4.2 One 1.4 by 1.5 m (4-1/2 by 5 ft.) sample was prepared. The components and sequence of installation were as follows:

- 1.2 mm [0.474 in. (18 ga.) thick] steel deck
- Phoenix Alutrix (FR) self adhered with 40 mm (1.5 in) wide laps
- 140 mm (5.5 in.) thick Powerdeck mechanically fixed
- Resitrix MB mechanically fixed

3.4.3 The calorimeter test showed the test panel to have fuel contribution rates below the maximum permissible rates for Class 1 construction. These rates and the Class 1 limits are:

Fuel Contribution Rate for Various Time Intervals
kW/m² (Btu/ft²/min)

Time Interval	3 min	5 min	10 min	Average
Class 1 Standard	77.6 (410)	73.8 (390)	68.1 (360)	53.9 (285)
Test Sample	56.6 (299)	54.5 (288)	50.7 (268)	35.2 (186)

3.5 FM Approvals Susceptibility to Leakage Test

3.5.1 Leakage testing was conducted in accordance with the FM Approvals Susceptibility to Leakage Test Procedure to evaluate the ability of the roof cover to resist leakage of water under the conditions of the test.

3.5.1.1 The test apparatus consists of top and bottom sections which are bolted or clamped together with the specimen being evaluated placed as a diaphragm between the sections. The top and bottom sections consist of 235 mm (9-1/4 in.) diameter cap cemented to 197 mm (7-3/4 in.) clear acrylic pipe. A 295 mm (11-5/8 in.) diameter pipe flange is cemented to the other end of each pipe section. Both top and bottom sections are bolted or clamped together at the flanges with the cover being evaluated placed between them. The apparatus is fabricated to allow both a standing head of water above and additional air pressure below the test sample. Each section is fabricated with two 13 mm (1/2 in.) diameter pipe outlets to allow connection of an air pressure source and a pressure gauge.

3.5.1.2 After conditioning (weathering) for 1000 hours in the FM Approvals Ultraviolet Weatherometer a 254 mm (10 in.) diameter specimen was cut from the sample and bolted or clamped in place between the flanges of the test apparatus. Water was placed over the sample to a depth of 152 mm (6 in.) and maintained for a period of 7 days. At the end of the 7 day period, air was introduced below the sample at a pressure of 6.3 kPa (1 psi) and cycled 25 times from 6.3 kPa (1 psi) to ambient.

3.5.1.3 There must be no signs of water leakage during the 7 day period or during or after the pressure cycles following the exposure.

3.5.2 One test sample was prepared. The components, sequence of installation and test results were:

- Resitrix MB 3.1 mm (0.122 in.) thick with a 100 mm (4 in.) wide lap sealed with an 80 mm (3.1 in.) wide heat weld.

3.5.3 No signs of water leakage through the test panel was observed during the 7 day exposure to a head of water or during or after the pressure cycles following the exposure.

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3.6 FM Approvals Resistance to Foot Traffic Test

3.6.1 Testing was conducted using the FM Approvals Resistance to Foot Traffic Test Apparatus to evaluate the ability of the roof cover/insulation combination to resist simulated foot traffic without damage.

3.6.1.1 A 76 mm (3 in.) square steel plate with rounded corners was centered on the centerline of each 305 mm (12 in.) square horizontal test panel and positioned along the butt edge and the side joint of the insulation boards. A 91 kg (200 lb.) load was imposed on the plate and then removed. This cycle was repeated four additional times. Penetration and residual readings were taken after each cycle without removing the plate. The roof cover was inspected for damage after the last cycle at the steel plate interface.

3.6.1.2 There must be no tearing or cracking of the roof cover causing exposure of plastic, glass fiber, foam or other compressible core materials.

3.6.2 One sample was prepared. The components and sequence of installation were:

- Roof Cover: 3.1 mm (0.122 mm) thick Resitrix MB, loose laid
- Insulation: 130 mm (5.1 in.) thick Rockwool Rhinox (tissue faced)

3.6.3 No damage to the roof cover was observed after the test.

3.7 FM Approvals Simulated Hail Damage Tests

3.7.1 Tests were conducted using the FM Approvals Simulated Hail Damage Test Apparatus to evaluate the ability of the roof covers to withstand a hailstorm without damage to the membrane.

3.7.1.1 For the severe hail damage tests, a 51 mm (2 in.) diameter steel ball weighing (540 g) 1.19 lb was dropped on the test sample from a 3595 mm (141.5 in.) height. This procedure was repeated several times on various sections of the sample. After each drop the sample was inspected for damage to the weatherproof membrane. Following initial testing, the sample was conditioned (weathered) for 1000 hours in the FM Approvals Ultraviolet Weatherometer. The initial procedure was then repeated on the conditioned sample.

3.7.1.2 After each drop, the sample is inspected and there must be no evidence of splitting, delamination or rupture of the roof cover.

3.7.2 Two 0.6 by 1.2 m (2 by 4 ft.) samples were prepared. The components and sequence of installation were:

Sample No. 1:

- Roof Cover: 3.1 mm (0.122 mm) thick Resitrix MB, loose laid
- Insulation: 130 mm (5.1 in.) thick Rockwool Rhinox (tissue faced)

Sample No. 2:

- Roof Cover: 3.1 mm (0.122 mm) thick Resitrix MB, loose laid
- Insulation: 160 mm (6.3 in.) thick ThermoRoof TR26 FM (ThermoRoof TR26 FM was subsequently dropped from the test program)

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- 3.7.3 No damage to the roof cover on either test panel described in 3.7.2 above was observed after each drop of the simulated hail impactor before or after conditioning (weathering).

IV MARKING

- 4.1 The manufacturer shall mark each roll or packing container with the manufacturer's name and product trade name. In addition, the roll or container must be marked with the Approval Mark of FM Approvals.
- 4.2 Markings denoting Approval by FM Approvals shall be applied by the manufacturer only within and on the premises of manufacturing locations under the FM Approvals Surveillance Audit program.
- 4.3 The manufacturer agrees that use of the FM Approvals name or Approval Mark is subject to the conditions and limitations of the Approval by FM Approvals. Such conditions and limitations must be included in all references to Approval by FM Approvals.

V REMARKS

- 5.1 The securement of the roof system must be enhanced at the building corners and perimeter as outlined in FM Global Property Loss Prevention Data Sheet 1-29.
- 5.2 The roof covers must be installed using a FM Approved roof perimeter flashing system. See RoofNav.

VI SURVEILLANCE AUDITS

The Phoenix Dichtungstechnik GmbH manufacturing locations in Waltershausen and Hamburg, Germany are subject to periodic audit inspections to determine that the quality and uniformity of the materials have been maintained and will provide the same level of performance as originally Approved. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

VII MANUFACTURER'S RESPONSIBILITIES

- 7.1 To assure compliance with his procedures in the field, the manufacturer shall supply to the roofer such necessary instruction or assistance required to produce the desired performance achieved in the tests.
- 7.2 The manufacturer shall notify FM Approvals of any planned change in the Approved product, prior to general sale or distribution, using Form 797, Approved Product Revision Report.

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VIII DOCUMENTATION

The following documents describe the roof cover components and are filed under 3036376.

Document	Issue	Description
Surveillance Audit Manual Hamburg, Germany	08/02/10	Compounding @ Phoenix Compounding Technology Calendaring @ Phoenix Dichtungstechnik
Surveillance Audit Manual Waltershausen, Germany	08/02/10	Resitrix MB and Alutrix FR finished products @ Phoenix Dichtungstechnik

IX CONCLUSIONS

9.1 The test results from this test program indicate that the Phoenix Dichtungstechnik GmbH Resitrix MB roof cover and Alutrix FR vapor retarder meet the FM Standard 4470 Approval requirements when installed as described.

9.2

Roof Cover:	Resitrix MB
Roof Cover Securement:	Mechanically attached with isofast IR 2-4.8 screws and IR-82x40 stress plates spaced maximum 305 mm (12 in.) o.c. and placed within minimum 100 mm (4 in.) wide side laps which are spaced maximum 900 mm (35.4 in.) o.c. and sealed with a minimum 80 mm (3.2 in.) wide heat weld.
Insulation:	DuoRock (Torch-On Bitumen faced): 160 – 180 mm (6.3 – 4.6 in.) Recticel NV Powerdeck: 140 mm (5.5 in.) Taurox D (bitumen faced): 130 mm (5.1 in.) Rockwool Rhinox (unfaced): 130 – 140 mm (5.1 – 5.5 in.)
Insulation Securement:	Mechanically attached with one FM Approved stress plate and fastener applied at with a maximum contributory area of 1 per 2 ft ² (1 per 0.19 m ²).
Vapor Retarder:	Alutrix FR self adhered with 40 mm (1.5 in) wide laps
Deck:	Steel deck (new)
Hail:	Class 1-SH
ASTM E108:	Maximum roof slope of 7.1% (1.5 in 12) Class A - Taurox D (bitumen faced) Class B - Powerdeck and Durock

9.3 Tests show that the tested roof constructions in and of themselves would not create a need for automatic sprinklers.

9.4 Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective as of the date of this report.

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9.5 Continued Approval will depend upon satisfactory field experience and periodic Surveillance Audits.

TESTING SUPERVISED BY: John P. Cauley

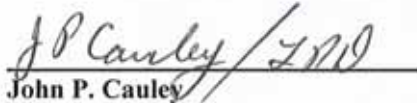
PROJECT DATA RECORD: 3036376

ORIGINAL TEST DATA: none

ATTACHMENTS: None

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