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# APPROVAL REPORT

## APPROVAL OF RHEPANOL fk MEMBRANE FOR USE IN CLASS 1 ROOF CONSTRUCTION

Prepared for:

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EISENBAHNSTRASSE 6-8  
D-68199 MANNHEIM  
GERMANY**

**Project ID: 3012156**

**Class: 4470**

**Date of Approval:**

May 26, 2005

**Authorized by:**



George A. Smith, Assistant Vice President

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**APPROVAL OF RHEPANOL fk MEMBRANE  
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from

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**I INTRODUCTION**

1.1 FDT FlachdachTechnologie GmbH & Co. KG submitted their Rhepanol fk membrane roof cover for evaluation to determine if it meets the Approval requirements of the **Standard** listed below for Class 1 roof constructions.

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1.3 **Standard:**

<b>Title</b>	<b>Class Number</b>	<b>Date</b>
Class 1 Roof Covers	4470	April 1986

1.4 Examination included combustibility testing for the potential for fire spread above the roof, simulated wind uplift testing, simulated hail resistance testing, leakage testing and foot traffic testing.

1.5 Testing shows that the Rhepanol fk membrane roof cover, as evaluated in this program, meets the Approval requirements of the **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 the FM Approval Guide.

**II DESCRIPTIONS**

2.1 Rhepanol fk membrane is a 0.098 in. (2.5 mm) Polyisobutylene (PIB) fleece back material which is mechanically fixed using the GripFix strip.

2.2 GripFix is a 5 in. (127 mm) wide woven polyester strip which uses hook and loop technology to secure the Rhepanol fk membrane.

2.3 OMG 2 in. Steel Seam Plate is a 2 in. (51 mm) diameter by 0.030 in. (0.76 mm) flat round seam plate manufactured from Galvalume AZ 55 steel.

2.4 All other materials are as described in the current edition of the FM Approval Guide. Proprietary formulations, specifications and drawings are on file at FM Approvals.

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### III EXAMINATION AND TESTING

- 3.1 Samples were submitted for examination and testing as follows:
- 3.1.1 Tests conducted were as required by the **Standard** listed in paragraph 1.3 above. FM Approvals corrosion resistance testing and Calorimeter testing was waived because of previous satisfactory performance in prior Approval programs.
- 3.1.2 All test materials used except the Rhepanol fk roofing membrane, GripFix strip and the OMG 2 in. Steel Seam Plate were produced under the FM Approvals Facilities and Procedures Audit program as indicated by FM Approvals labels. All samples were considered to be representative of standard production and were examined and tested as indicated below.
- 3.1.3 Roof covers, insulations, fasteners and plates incorporated into test samples were selected by FM Approvals personnel. Test samples were prepared by, or under the supervision of, FM Approvals personnel.
- 3.1.4 All test data is on file at FM Approvals under J.I. 3012156 along with other documents and correspondence applicable to this program.
- 3.2 FM Approvals 12x24 ft (3.7x7.3 m) 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 above deck components of the roofing system to resist a minimum simulated wind uplift pressure of 60 psf (2.9 kPa) without failure of the assembly.
- 3.2.1.1 The simulated wind uplift pressure test utilized a 24 ft. (7.3 m) long by 12 ft. (3.7 m) wide by 2 in. (51 mm) 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 30 psf (1.4 kPa) was applied to the test sample and maintained for 1 minute. The pressure was increased to 45 psf (2.2 kPa), then to 60 psf (2.9 kPa) and held for 1 minute at each increment. The pressure was increased in increments of 15 psf (0.7 kPa) every minute until failure occurred.
- 3.2.2 One 12 by 24 ft. (3.7 by 7.3 m) test sample was prepared and tested with the following sample construction and results:
- 22 ga., [0.0295 in. (0.75 mm) thick] type B, wide rib, ASTM A1008 SS Grade 80 steel deck was secured to supports spaced at 72 in. (1830 mm) o.c. using ITW Buildex Traxx/5 screws spaced at 6 in. (150 mm) o.c. and with side laps secured with ITW Buildex Traxx/1 screws spaced 24 in. (1220 mm) o.c.
  - 2 in. (51 mm) thick Atlas ACFoam-II insulation was presecured to the deck.
  - GripFix strips secured to the deck using OMG #12 Standard fasteners and OMG 2 in. Steel Seam Plates spaced 12 in. (305 mm) o.c. along the 5 in. (120 mm) wide GripFix strip which were placed perpendicular to the deck ribs and spaced 28 in. (711 mm) o.c.
  - One layer of Rhepanol fk membrane was mated to the GripFix strip and rolled. The membrane laps were sealed with 2 in. (51 mm) self welding overlap.

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Test Result: The test sample met the 135 psf (6.46 kPa) FM Approvals requirements for Class 1-135 windstorm classification. The test failed upon reaching the 150 psf (7.2 kPa) pressure level due to the GripFix strip ripping out from under the 2 in. (51 mm) plate. Meets Class 1-135.

3.3 ASTM E108-04 Spread of Flame Tests

3.3.1 The fire tests from above the roof cover were conducted in accordance with ASTM E108-04 Spread of Flame Tests.

3.3.1.1 Sample size was 3-1/3 by 8 ft. (1.0 by 2.4 m).

3.3.1.2 The wind velocity over the top of the standard panel was adjusted to 12±0.5 mph (5.3±0.2 m/s).

3.3.1.3 Flame exposure: The flame is adjusted to 1400±50°F (760±28°C) for Class A tests. The flame temperature was measured by a thermocouple located 1 in. (25.4 mm) above the surface of the standard panel and 1/2 in. (13 mm) 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 Two 3-1/3 by 8 ft. (1.0 by 2.4 m) test samples were prepared over a plywood deck. The above deck components and sequence of installation were as follows:

Sample No. 1:

- ½ in. (13 mm) thick plywood deck
- 4 in (103 mm) thick Raylite insulation
- ½ in.(13 mm) thick Dens-deck
- GripFix strips, mechanically secured
- Rhepanol fk roof cover with seam joint

Sample No. 2:

- ½ in. (13 mm) thick plywood deck
- 4 in (103 mm) thick Raylite insulation
- ½ in.(13 mm) thick Dens-deck
- GripFix strips, mechanically secured
- Rhepanol fk roof cover with seam joint

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 in. (mm)</u>	<u>Rating</u>
1	1 in 12	42.5 (1079.5)	Class A
2	1 in 12	44 (1117.6)	Class A

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

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### 3.4 FM Approvals Simulated Hail Damage Test

3.4.1 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.

3.4.1.1 For the moderate hail damage tests, a 2 in. (51 mm) diameter steel ball weighing 1.625 lbs. (0.737 kg) was dropped on the test sample from a 5 ft (1.52 m) height through a length of steel tube with a 2-1/4 in. (57 mm) inside diameter. 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.

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

3.4.2 One 2 by 4 ft. (0.6 by 1.2 m) sample was prepared. The components and sequence of installation were as follows:

- 2 in. (51 mm) thick Atlas ACFoam-II
- 1/2 in. (13 mm) thick Dens Deck
- Rhepanol fk roof cover, loose laid

3.4.3 No damage to the roof cover on the test panel described in 3.4.2 above was observed after each drop of the simulated hail impactor before or after conditioning (weathering).

### 3.5 FM Approvals Susceptibility to Leakage Test

3.5.1 A test 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 9-1/4 in. (235 mm) diameter cap cemented to 7-3/4 in. (197 mm) clear acrylic pipe. An 11-5/8 in. (295 mm) 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 1/2 in. (13 mm) 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 10 in. (254 mm) 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 6 in. (152 mm) 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 1 psi (6.3 kpa) and cycled 25 times from 1 psi (6.3 kpa) to ambient.

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- 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 18 in. (460 mm) diameter panel of roof cover with center seam was prepared.
- 3.5.3 No sign 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.

### **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 and the words "Subject to the conditions of Approval as a roof cover (adhesive or fastener, as appropriate) when installed as described in the current edition of the FM Approval Guide".
- 4.2 Markings denoting Approval by FM Approvals shall be applied by the manufacturer only within and on the premises of manufacturing locations that are under the FM Approvals Facilities and Procedures 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 cover must be installed using a FM Approved roof perimeter flashing system. See the current edition of the FM Approval Guide.

### **VI FACILITIES AND PROCEDURES AUDITS**

The FlachdachTechnologie GmbH & Co. manufacturing location in Hemsbach, Germany and the OMG facility located in Agawan, MA 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.

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**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 products, prior to general sale or distribution, using Form 797, Approved Product Revision Report.

**VIII DOCUMENTATION**

The following documents describe the roof cover and GripFix system and are filed under J.I. 3012156.

Document	Issue or Revision	Description
Product Formulation	Jan 2005	Rhepanol fk & GripFix system
Process Description	May 2004	Rhepanol fk
OMG Quality Control Information	May 2004	2 in. Steel Seam Plate

**IX CONCLUSIONS**

- 9.1 The test results indicate that the Rhepanol fk roof membrane cover meets the FM Approvals Standard 4470 Approval requirements as described below.
  - 9.1.1 Steel Deck. Minimum 22 ga., [0.0295 in. (0.75 mm) thick] ASTM designation A1008/A100M-01a or A653/A653M-01a SS grade 80 steel roof deck is secured to min. ¼ in. (6.4 mm) thick steel structural supports spaced maximum 72 in.. (1829 mm) o.c. with ITW Buildex TRAXX 5 fasteners spaced max. 6 in. (152 mm) o.c. at the supports. Deck side laps are secured max. 24 in. (610 mm) o.c. with ITW Buildex TRAXX 1 fasteners. Thermal barrier of min 1.0 in. (25 mm) thick ConPerl, GAFTEMP Permalite or Fesco Board is loose laid to the steel deck. A layer of 1-8 in. (25-203 mm) thick 1.0 lb/ft<sup>3</sup> (16 kg/m<sup>3</sup>) or 1-8 in. (25-203 mm) thick 1.25 lb/ft<sup>3</sup> (20 kg/m<sup>3</sup>) FM Approved BASF Styropor insulation is laid loose to the thermal barrier, G-P Gypsum Dens Deck, minimum ½ in. (13 mm) thick is applied and secured per FM Approvals preliminary fastening requirements. Five inch (120 mm) wide GripFix strips are placed 28 in. (711 mm) oc perpendicular to the deck ribs and secured to the metal deck with OMG #12 Standard fasteners and OMG 2 in. Steel Seam Plates spaced 12 in. (305 mm) oc along the length of the GripFix strip. Rhepanol fk roofing membrane is secured to the GripFix strips and rolled in for positive securement. Laps joints are sealed with 2 in. (50 mm) wide self welding overlap. Meets Class 1-135.
  - 9.1.2 The above roof assemblies meet Class 1-MH Hail Damage requirements and ASTM E108 Class A, noncombustible deck requirements when constructed at a maximum 1 in 12 roof slope.
- 9.2 Tests show that the tested roof constructions in and of themselves would not create a need for automatic sprinklers.

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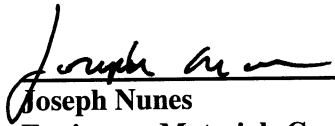
- 9.3 Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective as of the date of this report.
- 9.4 Continued Approval will depend upon satisfactory field experience and periodic Facilities and Procedures Audits.

**TESTING SUPERVISED BY:** Joseph Nunes

**PROJECT DATA RECORD:** 3012156

**ATTACHMENTS:** None

**REPORT BY:** **REPORT REVIEWED BY:**

  
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