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APPROVAL REPORT

APPROVAL OF WETSUIT LIQUID APPLIED ROOF COVER SYSTEM IN VARIOUS CLASS 1 ROOF ASSEMBLIES

Prepared for:

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Authorized by:

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FM APPROVALS
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from

NEPTUNE COATINGS CORPORATION
972 GOLDEN GATE TERRACE
GRASS VALLEY, CA 95945

I INTRODUCTION

1.1 Neptune Coatings Corporation submitted their WetSuit liquid applied roof cover system to determine if it meets the approval requirements of the **Standard** listed below for Class 1 roof covers when used in the constructions described in the Conclusions section of this report.

1.2 This report may be reproduced only in its entirety and without modification.

1.3 **Standard:**

Title	Class Number	Date
Class 1 Roof Covers	4470	April, 1986

1.4 Examination included simulated wind uplift pull tests, external spread of flame tests, hail damage tests, foot traffic tests and leakage tests.

1.5 Tests show that the Neptune Coatings Corporation WetSuit liquid applied roof cover, as tested, meets the Approval requirements of the **Standard** listed above for Class 1 roof covers.

1.6 **Listings:** The tested constructions meet the Approval criteria of FM Approvals when installed in as specified in the **CONCLUSIONS** of this report. The products will be listed in RoofNav.

II DESCRIPTIONS

2.1 WetSuit is a water-based, cold spray applied, two component liquid applied roof cover. WetSuit comes in 5 gal (22.73 L) or 55 gal (250.04 L) containers, the accelerator comes in 5 gal (22.73 L) plastic containers.

2.2 All other products are as described in RoofNav. Proprietary formulations, specifications, and drawings are on file at FM Approvals.

III EXAMINATIONS AND TESTS

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.

3.1.2 All components incorporated into the test sample were selected by FM Approvals personnel. The test samples were prepared by, or under the supervision of, FM Approvals personnel.

3.1.3 All data is on file at FM Approvals under Project ID 3030656 along with other documents and correspondence applicable to this program.

3.2 ASTM E 108-07 Spread of Flame Tests

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

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

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

3.2.1.3 Flame exposure: The flame was 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.

3.2.1.4 During and after the application of the flame, each panel was observed for the distance of maximum flame spread, glowing brands and other damage.

3.2.2 Four 3-1/3 by 8 ft. (1.0 by 2.4 m) test samples were prepared. The components and sequence of installation were as follows:

Samples 1-4:

- **Deck:** ½ in. (13 mm) thick plywood deck
- **Insulation:** Two layers of ½ in. (13 mm) thick wood fiber insulation, mechanically fastened
- **Cap Ply:** GAF Ruberoid Mop Granular cover adhered with hot asphalt at 25 lb/sq (1.2 kg/m^2).
- **Liquid Applied Roof Cover:** WetSuit liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

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

Sample No.	Slope	Max. Flame Spread	Rating
1	5 in 12	7 ft. 3 in. (2.21 m)	Class B
2*	5 in 12	8 ft. 0 in. (2.44 m)	Class C
3	2 in 12	4 ft. 0 in. (1.22 m)	Class A
4**	2 in 12	4 ft. 8 in. (1.42 m)	Class A

*confirming test of Class C rating for a 5 in 12 slope
**confirming test of Class A rating for a 2 in 12 slope

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

3.3 FM Approvals 2x2 ft (0.61x0.61 m) Simulated Wind Uplift Pull Test

3.3.1 Testing was conducted using the FM Approvals Uplift Pull 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.

3.3.1.1 The simulated wind uplift pull tests utilized a loading device supported by a steel frame to apply an uplift force to each test sample via a 2x2 ft (0.6x0.6 m) plywood form secured to the top of the test panel with an adhesive. The uplift force was applied perpendicular to the test panels and was monitored with a calibrated load cell.

3.3.1.2 A net uplift force equivalent to an uplift pressure of 30 psf (2.9 kPa) was applied to the test sample and maintained for 1 minute. The force was increased to the equivalent of 45 psf (4.3 kPa), then to the equivalent of 60 psf (5.7 kPa) and held for 1 minute at each increment. The force was increased in increments equivalent to 15 psf (0.7 kPa) every minute until failure occurred.

3.3.2 Two test samples were prepared and tested. The components, sequence of installation and test results were as follows:

Construction # 1:

- **Deck**: Concrete
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

Results #1: The sample failed on the incremental increase to the next pressure level. Failure was caused by the screws pulling out of the plywood. Meets Class 1-990.

Construction # 2:

- **Deck**: Concrete
- **Cap Ply:** GAF Ruberoid Mop Granule cover adhered with hot asphalt at 25 lb/sq (1.2 kg/m^2).
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

Results #2: The sample failed after 10 seconds in the next pressure level. Failure was caused by delamination of the asphalt between the concrete and the cap sheet. Meets Class 1-420.

3.4 FM Approvals Simulated Hail Damage Tests

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 severe hail damage tests, a 1¾ in. (49 mm) diameter steel ball weighing 0.79 lbs. (0.359 kg) was dropped on the test sample from a 17 ft 9½ in. (5.42 m) height through a 33¾ in. (0.86 m) length of PVC pipe with a 2 in. (51 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 Two 2x4 ft. (0.6x1.2 m) samples were prepared. The components and sequence of installation were as follows:

Construction # 1:

- **Deck:** Concrete
- **Insulation:** 1/2 in (13 mm) thick wood fiber insulation
- **Cap Ply:** GAF Ruberoid Mop Granule cover adhered with hot asphalt at 25 lb/sq (1.2 kg/m^2)
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

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

Construction # 2:

- **Deck:** Concrete
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

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

3.5 FM Approvals Resistance to Foot Traffic Tests

3.5.1 Tests were conducted using the FM Approvals Resistance to Foot Traffic Test Apparatus to evaluate the ability of the roof cover/insulation combinations to resist simulated foot traffic without damage.

3.5.1.1 A 3 in. (76 mm) square steel plate with rounded corners was centered on the centerline of a 12 in. (305 mm) square horizontal test panel. A 200 lb. (91 kg) 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 covers were inspected for damage after the last cycle at the steel plate interface.

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

3.5.2 One sample was prepared. The components and sequence of installation were as follows:

Construction #1:

- **Insulation:** 1/2 in (13 mm) thick wood fiber insulation
- **Plies:** One plies of GAFGLAS Ply IV adhered with hot asphalt at 25 lb/sq (1.2 kg/m^2)
- **Cap Ply:** GAF Ruberoid Mop Granule cover adhered with hot asphalt at 25 lb/sq(1.2 kg/m^2)
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

No damage to the roof cover test sample described above was observed after the tests.

3.6 FM Approvals Susceptibility to Leakage Test

3.6.1 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.

3.6.1.1 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.

3.6.1.2 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.

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

3.6.2 One 18 in. (460 mm) diameter panel of MS2200 liquid applied roof cover was prepared. The components and sequence of installation are as follows.

Construction #1:

- **Substrate:** Polyethylene film (removed after sample was allowed to cure).
- **Cover:** WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].

No signs of water leakage through the roof cover test sample described above was observed during the 7 day exposure to a head of water during or after the pressure cycles following the exposure.

IV MARKING

4.1 The manufacturer shall mark each bucket, drum or packing container with the manufacturer's name and product trade name. In addition, the bucket, drum or container must be marked with the Approval Mark of FM Approvals.

4.2 Markings denoting Approval by FM Approvals shall by 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 covers must be installed using an FM Approved roof perimeter flashing system. See RoofNav for details.

VI FACILITIES AND PROCEDURES AUDITS

Neptune Coating Corporation manufacturing location in South San Francisco, CA is 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 FM 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 FM Approved products, prior to general sale or distribution, using Form 797, FM Approved Product Revision Report.

VIII DOCUMENTATION

The following documents describe the products and are filed under Project ID 3030656.

Document	Issue or Revision	Description
Facilities and Procedures Audit Manual	April, 2008	FPA Manual

IX CONCLUSIONS

9.1 Test results from this program indicate that the Neptune Coatings Corporation WetSuit liquid applied roof cover meets the Standard 4470 Approval requirements for Class 1 Roof Covers when installed in the following constructions:

Roof Cover:	WetSuit Liquid Applied Roof Cover
Application:	Mix WetSuit and Accelerator at a rate of 10 to 1 and spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)].
Decks:	Concrete

Hail:	SH
ASTM E108:	Class A at 2 in 12 Class C at 5 in 12

9.1.1 Deck: Structural Concrete (New). Roof Cover: WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)]. Meets Class 1-990.

9.1.2 Deck: Structural Concrete (Recover). Recover existing granular surfaced, asphalt adhered modified bitumen or built up roof. WetSuit Liquid applied roof cover spray applied to a thickness of 60 mils. (1.5 mm) [a rate of 5 gal/sq (2 L/m^2)]. Meets wind uplift rating of existing roof to a maximum of Class 1-420.

9.2 Consult Roofnav for details of all assemblies.

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 customer, Approval is effective as of the date of this report.

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

TESTING SUPERVISED BY: **Joanna M. Blaney**

PROJECT DATA RECORD: **3030656**

ORIGINAL TEST DATA: **None**

ATTACHMENTS: **None**

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