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# APPROVAL REPORT

## APPROVAL OF LIQUID APPLIED ROOF COVERS IN VARIOUS SYSTEMS IN ACCORDANCE TO APPROVAL STANDARD 4470

**Prepared for:**

**National Coatings Corporation  
1201 Calle Suerte  
Camarillo, CA 93012**

**Project ID: 3036076**

**Class: 4470**

**Supersedes Report Dated: February 8, 2011**

**Date of Approval:** 10 FEBRUARY 2011

**Authorized by:**   
Richard P. Ferton, P.E. AVP, Group Manager

**APPROVAL OF LIQUID APPLIED ROOF COVERS IN VARIOUS  
SYSTEMS IN ACCORDANCE TO APPROVAL STANDARD 4470**

from

**NATIONAL COATINGS CORPORATION  
1201 CALLE SUERTE  
CAMARILLO, CA 93012**

**I INTRODUCTION**

- 1.1 National Coatings Corporation submitted various Liquid Applied Roof Covers to determine if they meet the approval requirements of the **Standard** listed below.
- 1.2 This report may be reproduced only in its entirety and without modification.
- 1.2.1 This Report was re-issued to clarify the manufacturing locations under section VI and VIII and to add optional ply sheet in paragraph 9.1.1 and 9.1.2 at customer request.
- 1.3 **Standard:**

<b>Title</b>	<b>Class Number</b>	<b>Date</b>
Approval Standard for Single-Ply Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction.	4470	April, 2010

- 1.4 Examination included external spread of flame tests, hail damage tests and leakage test. Project ID 3020235 was released by its sponsor for use in this program.
- 1.5 Tests show that National Coatings liquid applied roof covers, as tested, meet the Approval requirements of the **Standard** listed above.
- 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 AcryShield Basecoat is a water-based liquid applied roof cover.
- 2.2 LiquiSeal A200 Asphalt Emulsion is a non-fibered and asphaltic bentonite clay emulsion.
- 2.3 Polyester fabric weights 3 oz/sq. yd. (101 gr/m<sup>2</sup>)
- 2.4 All other products are as described in RoofNav. Proprietary formulations, specifications, and drawings are on file at FM Approvals.

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**III EXAMINATIONS AND TESTS**

3.1 Samples were submitted for examination and testing as follows:

3.1.1 Testing was conducted as required by the Standard listed in paragraph 1.3 above. Calorimeter testing was waived as no additional insulation is added to the assemblies. Wind uplift testing was waived as performance is dependent on the existing roof. Foot traffic test is waived due to previous testing completed under project ID#1B3A0.AM. Additional Approvals were granted in paragraph 9.3 due to Johns Manville written authorization of data from project ID #3020235.

3.1.2 All materials other than LiquiSeal A200 Asphalt Emulsion, Polyester Fabric and AcryShield Basecoat Liquid Applied Roof Cover are produced under the FM Approvals Surveillance Audit program as indicated by FM Approval labels.

3.1.3 All samples were considered to be representative of standard production and were examined and tested as indicated below.

3.1.4 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.

3.1.5 All data is on file at FM Approvals under Project ID 3036076 along with other documents and correspondence applicable to this program.

3.2 ASTM E 108-10 Spread of Flame Tests

3.2.1 The fire tests from above the liquid applied roof covers 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 Eight 3-1/3 by 8 ft. (1.0 by 2.4 m) test samples were constructed and tested. The components and sequence of installation were as follows:

Sample 1:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 L/m<sup>2</sup>).
- **Base Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

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Sample 2:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 L/m<sup>2</sup>).
- **Base Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

Sample 3:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 L/m<sup>2</sup>).
- **Ply Sheet:** One layer of polyester reinforcing fabric is embedded into wet LiquiSeal.
- **Base Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).

Sample 4:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 l/m<sup>2</sup>).
- **Ply Sheet:** One layer of polyester reinforcing fabric is embedded into wet LiquiSeal.
- **Base Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).

Sample 5:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 l/m<sup>2</sup>).
- **Base Coat:** One coat of AcryShield Basecoat applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

Sample 6:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 l/m<sup>2</sup>).
- **Base Coat:** One coat of AcryShield Basecoat applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

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Sample 7:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 l/m<sup>2</sup>).
- **Ply Sheet:** One layer of polyester reinforcing fabric is embedded into wet LiquiSeal.
- **Base Coat:** One coat of AcryShield Basecoat applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).

Sample 8:

- **Deck:** ½ in. (13 mm) thick plywood deck.
- **Insulation:** 2.0 in. (51 mm) thick AC Foam-II.
- **Plies:** 4 plies of JM Type IV glass felt adhered with hot asphalt at 25 lb/sq (1.2 kg/m<sup>2</sup>) with a flood coat of hot asphalt.
- **Coat:** One coat of LiquiSeal A200 Asphalt Emulsion applied at 8.0 gal/sq (3.4 l/m<sup>2</sup>).
- **Ply Sheet:** One layer of polyester reinforcing fabric is embedded into wet LiquiSeal.
- **Base Coat:** One coat of AcryShield Basecoat applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 3.0 gal/sq (1.2 L/m<sup>2</sup>).

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

Sample	Slope	Flame Spread		Rating
		in.	mm	
1	1.5 in 12	36	914	A
2	1.5 in 12	37	940	A*
3	1.5 in 12	49	1245	A
4	1.5 in 12	31	787	A*
5	1.5 in 12	50	1270	A
6	1.5 in 12	52	1321	A*
7	1.5 in 12	42	1067	A
8	1.5 in 12	51	1295	A*

\*confirming test of Class A rating for a 1.5 in 12 slope

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

3.3 FM Approvals Simulated Hail Damage Tests

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

3.3.1.1 For the severe hail damage tests, a 2 in. (51 mm) diameter steel ball weighing 1.19 lbs. (540 g) was dropped on the test sample from a height of 141.5 in. (3595 mm) onto the sample. This procedure generates an impact energy of approximately 14 ft lb (19 J) over the impact area of the 2 in. (51 mm) diameter ball. 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.

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- 3.3.1.2 After each drop, the sample is inspected and there must be no evidence of splitting, delamination or rupture of the roof cover.
- 3.3.2 Two 2x4 ft. (0.6x1.2 m) samples were prepared. The components and sequence of installation were as follows:

Sample 1:

- **Substrate:** FM Approved Pro Chain Standing Seam Roof System.
- **Base Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

Sample 2:

- **Substrate:** FM Approved UNA-CLAD UC-6 Roof Panel.
- **Base Coat:** One coat of AcryShield Basecoat applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).
- **Top Coat:** One coat of AcryShield applied at 2.0 gal/sq (0.8 L/m<sup>2</sup>).

Test Results: No damage to the Liquid Applied Roof Covers as described in 3.3.2 above were observed after each drop of the simulated hail impactor before and after conditioning (weathering).

3.4 FM Approvals Susceptibility to Leakage Test

- 3.4.1 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.
- 3.4.1.1 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.
- 3.4.1.2 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.
- 3.4.1.3 There must be no signs of water leakage during the 7 day period or during or after the pressure cycles following the exposure.
- 3.4.2 One 18 in. (460 mm) diameter panel of AcryShield Liquid Applied Roof Cover was prepared. The components and sequence of installation are as follows.

Sample 1:

- **Substrate:** Polyethylene film (removed after sample was allowed to cure).
- **Base Coat:** One coat of AcryShield Basecoat applied at a rate of 2.0 gal/sq (0.8 L/m<sup>2</sup>).

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- **Top Coat:** One coat of AcryShield applied at a rate of 2.0 gal/sq (0.8 L/m<sup>2</sup>).

Test Results: 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 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 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 covers must be installed using an FM Approved roof perimeter flashing system. See RoofNav for details.

**VI SURVEILLANCE AUDITS**

National Coatings Corporation manufacturing locations in Camarillo, CA, Long Beach, CA and Spartanburg, SC 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 FM Approved. The surveillance audits 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 3036076.

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Document	Issue or Revision	Description
Surveillance Audit for National Coating @ Camarillo, CA	January, 2011	FPA Manual
Surveillance Audit for National Coating @ Long Beach, CA	January, 2011	FPA Manual
Surveillance Audit for National Coating @ Spartanburg, SC	January, 2011	FPA Manual

**IX CONCLUSIONS**

9.1 Test results from this and previous programs sponsored by National Coatings Corporation indicate that the various Liquid Applied Roof Covers meet the FM Approvals Standard 4470 (2010) Approval requirements when installed as follows:

9.1.1	Liquid Applied Roof Cover:	<p><u>System #1:</u></p> <p><u>Top Coat:</u> AcryShield, AcryShield A400FR, AcryShield A405, AcryShield A500, AcryShield A520, AcryShield A530, AcryShield A540, AcryShield A550, AcryShield A600, DuraTuff or White Armor applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allow to dry per manufacturing specification.</p> <p><u>Ply Sheet (Optional):</u> Polyester fabric weights 3 oz/sq. yd. (101 gr/m<sup>2</sup>) and is embedded in wet base coat when ply sheet is used.</p> <p><u>Base Coat:</u> AcryShield Basecoat or AcryShield applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>System #2:</u></p> <p><u>Top Coat:</u> AcryShield, AcryShield A400FR, AcryShield A405, AcryShield A500, AcryShield A520, AcryShield A530, AcryShield A540, AcryShield A550, AcryShield A600, DuraTuff or White Armor applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>Base Coat:</u> AcryShield Basecoat or AcryShield applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>Ply Sheet:</u> Polyester fabric weights 3 oz/sq. yd. (101 gr/m<sup>2</sup>) and is embedded in wet LiquiSeal A200 Asphalt Emulsion.</p> <p><u>Coat:</u> LiquiSeal A200 Asphalt Emulsion is applied at 5-8.0 gal/sq (2.1-3.4 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p>
	Deck:	Existing Roof
	Existing Cover:	FM Approved Steel Roof Panels, FM Approved BUR
	Hail:	SH
	ASTM E108:	Class A at 1.5 in 12
	Windstorm:	Per existing roof



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9.1.2

Maintenance Coating:	<p><u>System #1:</u></p> <p><u>Top Coat:</u> AcryShield, AcryShield A400FR, AcryShield A405, AcryShield A500, AcryShield A520, AcryShield A530, AcryShield A540, AcryShield A550, AcryShield A600, DuraTuff or White Armor applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allow to dry per manufacturing specification.</p> <p><u>Ply Sheet (Optional):</u> Polyester fabric weights 3 oz/sq. yd. (101 gr/m<sup>2</sup>) and is embedded in wet base coat when ply sheet is used.</p> <p><u>Base Coat:</u> AcryShield Basecoat or AcryShield applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>System #2:</u></p> <p><u>Top Coat:</u> AcryShield, AcryShield A400FR, AcryShield A405, AcryShield A500, AcryShield A520, AcryShield A530, AcryShield A540, AcryShield A550, AcryShield A600, DuraTuff or White Armor applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>Base Coat:</u> AcryShield Basecoat or AcryShield applied at 2.0-3.0 gal/sq (0.8-1.2 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p> <p><u>Ply Sheet:</u> Polyester fabric weights 3 oz/sq. yd. (101 gr/m<sup>2</sup>) and is embedded in wet LiquiSeal A200 Asphalt Emulsion.</p> <p><u>Coat:</u> LiquiSeal A200 Asphalt Emulsion is applied at 5-8.0 gal/sq (2.1-3.4 L/m<sup>2</sup>) and allowed to dry per manufacturing specification.</p>
Approval:	Approved as an optional coating to existing FM Approved metal panels and FM Approved BUR.
ASTM E108:	Meets ASTM E108 classification of the existing roof to a maximum of Class A at 1.5 in 12

9.1.3 DuraTuff, White Armor, AcryShield, AcryShield A400FR, AcryShield A405, AcryShield A500, AcryShield A520, AcryShield A530, AcryShield A540, AcryShield A550 or AcryShield A600 is applied to PermaPly No. 28 cap sheet in 2 coats of 1.5 gal/sq/coat (0.6L/m<sup>2</sup>/coat). The combination of PermaPly No.28 and the liquid applied roof cover from above are Approved as an alternate to GlasKap cap sheet when applied in Johns Manville Approved 4-5 ply asphaltic built up roof constructions. Meets Class A at a slope of 1 in 12.

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.

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

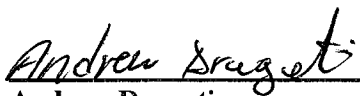
**TESTING SUPERVISED BY:** Jeffrey S. Barr

**PROJECT DATA RECORD:** 3036076

**ORIGINAL TEST DATA:** 3020235 and 1B3A0.AM

**ATTACHMENTS:** None

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

  
\_\_\_\_\_  
Andrew Dragoti  
Associate Engineer - Materials Group

  
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