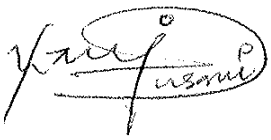
APPROVAL REPORT

Project No:	3046695 - Reissue
Class:	4470
Product Name:	Tritoflex
Approval Title:	Approval of Tritoflex as a Liquid Applied Roof Cover in FM Approved Class 1 Roof Assemblies
Name of Listing Company:	Triton Inc
Address of Listing Company:	250 33rd Street Drive SE Cedar Rapids IA 52403 United States
Customer ID:	141005-1
Customer website:	http://www.tritonwp.com/

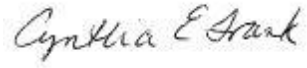
Prepared by



Olabanji Odusami
Engineer

Reviewed by

Leonard D'Angelo
Technical Team Manager



Cynthia Frank
Group Manager
Materials

6/7/2013
Date of Approval

FM Approvals
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062

1 INTRODUCTION

1.1 Triton Inc requested Approval of their Tritoflex liquid applied roof coating to determine if it meets the Approval requirements of the standard(s) listed in Section 1.3.

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

1.3 Standards

Title	Number	Issue Date
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	6/2012

1.4 Listing

The products and assemblies will be listed in RoofNav, an on-line resource of FM Approvals. Formulations, drawings and specifications are on file at FM Approvals.

2 DESCRIPTION

2.1 Tritoflex is described as follows:

2.1.1 Tritoflex is a water-based, fast-setting liquid rubber. It can be spray-applied to a thickness of 60 mils (1.5 mm) at a rate of 5 gal/sq. (2L/m^2)

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

3 EXAMINATIONS AND TESTS

3.1 All components, except the one on Section 2.1, were produced under the FM Approvals Surveillance 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. Components incorporated into test samples were selected by FM Approvals personnel. Test samples were prepared by, or under the supervision of, FM Approvals personnel. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

3.2 Several performance requirements and tests required by the Standard have been waived due to previous successful testing. See Table 1 below for details.

Table 1

FM Standard 4470 Performance Requirement	Waived or Included
Combustibility From Above the Roof Deck	Included
Combustibility From Below the Roof Deck	Waived[1]
Hail Damage Resistance Tests	Included
Water Leakage Resistance Tests	Included
Foot Traffic Resistance Tests	Included
Susceptibility to Heat Damage Tests	Waived[1]
Corrosion Resistance Tests	Waived[2]

Wind Uplift Resistance	Included

[1] Not required; insulation was not utilized in this program
[2] Not required; fasteners were not utilized in this program

3.3 Samples were submitted for examination and testing as follows:

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

3.3.2 All data is on file at FM Approvals under project identification number 3046695, along with other documents and correspondence applicable to this program.

3.4 Combustibility Above the Roof Deck (ASTM E108 Spread of Flame Tests)

3.4.1 Spread of Flame fire tests for combustibility from above the roof cover were conducted in accordance with ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings.

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

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

3.4.1.3 Flame exposure: The flame was adjusted to 1400±50°F (760±28°C). The flame temperature was measured by a thermocouple located 1 in. (25 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 the test panel for 10 minutes.

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

3.4.2 Four (4) 3-1/3 by 8 ft. (1.0 by 2.4 m) test samples were prepared. The components and sequence of installation was as follows:

Sample Nos. 1 – 4: 3/8 in. (9.5 mm) plywood deck;
Two (2) layers of ½ in. (13 mm) thick Structodek High Density Fiberboard cover board insulation mechanically fastened to the deck;
GAF Rubberoid Mop Granular adhered to the cover board insulation with Type III Hot Asphalt applied at a rate of 20-25 lb/sq (1.0-1.2 kg/m^2);
Tritoflex Coating spray applied over the GAF Rubberoid Mop Granular ply to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

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

Sample No.	Slope	Max. Flame Spread	Rating
1	5 in 12	94 in. (2388 mm)	Class B
2*	5 in 12	92 in. (2337 mm)	Class B
3	2 in 12	67 in. (1702 mm)	Class A
4□	2 in 12	69 in. (1778 mm)	Class A

*Confirming test for sample 1
□ Confirming test for sample 3

3.3.4 Sample ignition, deck exposure, flying brands and significant lateral flame spread was not observed during the tests.

3.5 Hail Damage Resistance Tests

3.5.1 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.

3.5.2 For the severe hail damage tests, a 51 mm (2 in.) diameter steel ball weighing 0.540 kg (1.19 lbs.) was dropped on the test sample from a 3.59 m (11 ft 9½ 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.

3.5.3 After each drop the sample is inspected and the roof panel shall not be punctured and the coating shall not show any signs of chipping, peeling, cracking or crazing.

3.4.2 Two (2) samples were prepared. The components and sequence of installation were as follows:

Sample No. 1: FM Approved Structural Concrete Deck;
½ in. (13 mm) thick Structodek High Density Fiberboard cover board adhered to the deck with Type III Hot Asphalt applied at a rate of 20-25 lb/sq (1.0-1.2 kg/m^2);
GAF Rubberoid Mop Granular adhered to the cover board insulation with Type III Hot Asphalt applied at a rate of 20-25 lb/sq (1.0-1.2 kg/m^2);
Tritoflex Coating spray applied over the GAF Rubberoid Mop Granular ply to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

Results: 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).

Sample No. 2: FM Approved Structural Concrete Deck;
Tritoflex Coating spray applied over the concrete deck to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

Results: 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).

3.6 Water Leakage Resistance Tests

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.

3.6.2 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 to197 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 test assembly 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.

3.6.3 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.

3.6.4 One (1) 18 in. (460 mm) diameter panel of the sample construction was prepared. The components and sequence of installation are as follows.

Sample No. 1: Polyethylene film acting as a substrate (removed after sample was fully cured)
Tritoflex Coating spray applied over the concrete deck to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

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

3.7 Foot Traffic Resistance Tests

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

3.7.2 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 board. 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 sample roof cover was inspected for damage after the last cycle at the steel plate interface.

3.7.3 One (1) sample was prepared. The components and sequence of installation were as follows:

Sample No. 1: ½ in. (13 mm) thick Structodek High Density Fiberboard cover board
GAF Rubberoid Mop Granular adhered to the cover board insulation with Type III Hot Asphalt applied at a rate of 20-25 lb/sq (1.0-1.2 kg/m^2);
Tritoflex Coating spray applied over the GAF Rubberoid Mop Granular ply to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

Results: There was no tearing or cracking of the roof cover causing exposure of the substrate.

3.8 FM Approvals Simulated Wind Uplift Pull Tests

3.8.1 The tests were 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 assemblies.

3.8.2 The simulated wind uplift pull tests utilized a threaded rod assembly supported by a steel frame to apply an uplift force to the test sample via a 2 by 2 ft. (0.6 by 0.6 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.

3.8.3 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.

3.8.4 Two (2) test samples were prepared. The component installation and test results were as follows:

Sample No. 1: FM Approved Structural Concrete Deck;
GAF Rubberoid Mop Granular adhered to the concrete deck with Type III Hot Asphalt applied at a rate of 20-25 lb/sq (1.0-1.2 kg/m^2);
Tritoflex Coating spray applied over the GAF Rubberoid Mop Granular ply to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

Result: The test sample maintained its integrity through an uplift force equivalent to 210 psf (10.04 kPa) uplift pressure. The construction failed upon increment to 225 psf (10.75 kPa) uplift pressure cycle. Failure was due to the roof cover delaminating from the deck. The test sample meets FM Approvals requirement for maximum **Class 1-210 psf** Windstorm Classification.

Sample No. 2: FM Approved Structural Concrete Deck;
Tritoflex Coating spray applied over the concrete deck to a thickness of 60 mils (1.5 mm), at a rate of 5 gal/sq. (2 L/m^2).

Result: The test sample maintained its integrity through an uplift force equivalent to the maximum allowable at 990 psf (47.3 kPa) uplift pressure. The construction did not fail. The test sample meets FM Approvals requirement for maximum **Class 1-990 psf** Windstorm Classification.

4 MARKING

4.1 The manufacturer shall mark each product and/or packaging with the manufacturer's name and product trade name. In addition, product and/or packaging 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 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.

5 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 roof perimeter flashing system Approved by FM Approvals. See RoofNav.

6 SURVEILLANCE AUDIT

The manufacturing facilities at the following location(s) shall be visited on a routine basis. The facility processes and quality control procedures in place have been determined to be satisfactory to manufacture products identical to that tested and Approved. A Form 797 shall be submitted to FM Approvals for requesting to manufacture products at any additional or alternate manufacturing facilities which are not listed below.

Audit Location(s)

250 33rd Street Drive SE
Cedar Rapids, IA 52403
United States

7 MANUFACTURER'S RESPONSIBILITIES

7.1 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. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FM Approvals.

7.2 To ensure compliance with his procedures in the field, the manufacturer shall supply to the installer such necessary instruction or assistance required to produce the desired performance achieved in the tests.

8 DOCUMENTATION

The following document describes the Tritoflex and is on file at FM Approvals.

Document Title	Issue Date
Surveillance Audit Manual	12 March, 2013

9 CONCLUSIONS

9.1 Test results from this program indicate that the submitted products as evaluated, meet the requirements of FM Approvals Standard(s) listed in section 1.3 when installed as follows:

Roof Cover:	Tritoflex
Application:	Mix Tritoflex and accelerator at a ratio of 10 to 1 and spray-applied at a rate of 5 gal./sq. (2 L/m^2) to a thickness of 60 mils (1.5 mm).
Deck:	Structural Concrete
Hail Rating:	Severe Hail (SH)
ASTM E-108 Rating:	Class A at slope of 2 in 12 and Class B at slope of 5 in 12

9.1.1 Deck: Structural Concrete (New). Tritoflex liquid-applied roof cover spray-applied at a rate of 5 gal./sq. (2 L/m^2) to a thickness of 60 mils (1.5 mm). Meets Class 1-990 windstorm classification.

9.1.2 Deck: Structural Concrete (Recover). Existing granular surface, asphalt-adhered modified bitumen or built-up roofs. Tritoflex liquid-applied roof cover spray-applied at a rate of 5 gal./sq. (2 L/m^2) to a thickness of 60 mils (1.5 mm). Meets Class 1-210 windstorm classification.

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

9.3 Since a duly signed Master Agreement is on file for this customer, 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.

PROJECT DATA RECORD: 3046695

ATTACHMENTS: None

ORIGINAL TEST DATA None