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APPROVAL REPORT

Project No: 3047177
Supplements Project No.: N/A
Class: 4470
Product Name: PF10-15 TPO, PF10-15 PVC Roof Covers, and CPC Panel
Name of Listing Company: Shenzhen Joaboa Technology Co Ltd
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7/9/2014

Date of Approval

1 INTRODUCTION

1.1 Shenzhen Joaboa Technology Co., Ltd. requested Approval of PF10-15 TPO and PF10-15 PVC roof membranes in addition to the CPC Panel to determine if they meet the Approval requirements of the Standard 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
American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures	4474	1/2011

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 The PF10-15 TPO, PF10-15 PVC, and CPC Panel are described as follows:

2.1.1 The PF10-15 TPO single-ply roof membrane is a polyester reinforced, thermoplastic polyolefin single-ply roofing membrane. It is manufactured in a thickness of 1.5 mm (0.060 in.) and is supplied in a width of 2000 mm (79 in.) The proprietary specifications and formulation are on file at FM Approvals.

2.1.2 The PF10-15 PVC single-ply roof membrane is a polyester reinforced, polyvinyl chloride single-ply roofing membrane. It is manufactured in a thickness of 1.5 mm (0.060 in.) and is supplied in a width of 2000 mm (79 in.) The proprietary specifications and formulation are on file at FM Approvals.

2.1.3 The CPC Panel insulation board is a rigid, closed cell, polyisocyanurate foam board laminated to 0.5 mm (0.020 in.) cement-based top and bottom facers. The board is available in thicknesses of 30 – 70 mm (1.2 – 2.8 in).

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 those in 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	Original Project ID
Combustibility From Above the Roof Deck	Included
Combustibility From Below the Roof Deck	Included, see 3033167 ¹ , 3049874 ²
Hail Damage Resistance Test	Included
Water Leakage Resistance Test	Included
Foot Traffic Resistance Test	Included
Susceptibility to Heat Damage Test	Included
Corrosion Resistance Test	Waived ³
Wind Uplift Resistance	Included

¹ Data released by test sponsor, Rockwool Firesafe Insulation (Guangzhou) Co. Ltd.

² Calorimeter test results performed under Approval examination Project ID 3049874 used as supporting evidence for maximum thickness CPC Panel insulation board.

³ All fasteners are Approved by the OEM, no new fasteners included.

3.3 Combustibility From Above the Roof Deck

- 3.3.1** Fire tests from above the roof cover were conducted in accordance with ASTM E-108 Spread of Flame Tests.

3.3.1.1 Sample size was 3-1/3 x 8 ft. (1.0 x 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 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.

3.3.1.4 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** Seven (7) 3-1/3 x 8 ft. (1.0 x 2.4 m) samples were tested. The components and sequence of installation were as follows:

Samples 1 & 2: 3/8 in. plywood deck
50 mm HardRock 80 (faced), mechanically fastened to the deck
1.5 mm PF10-15 PVC, mechanically fastened to the deck

Samples 3 & 4: 3/8 in. plywood deck
50 mm HardRock 80 (faced), mechanically fastened to the deck
1.5 mm PF10-15 TPO, mechanically fastened to the deck

Sample 5: 3/8 in. plywood deck
70 mm CPC Panel insulation board mechanically fastened to the deck
1.5 mm PF10-15 PVC, mechanically fastened to the deck

Samples 6 & 7: 3/8 in. plywood deck
70 mm CPC Panel insulation board mechanically fastened to the deck
1.5 mm PF10-15 TPO, mechanically fastened to the deck

3.3.3 The results of the ASTM E-108 Spread of Flame tests were as follows:

Sample No.	Slope	Max. Flame Spread	Rating
1	½ in 12	2 ft 5 in. (0.7 m)	Class A
2	½ in 12	2 ft 5 in. (0.7 m)	Class A
3	½ in 12	3 ft 1 in. (0.9 m)	Class A
4	½ in 12	3 ft 9 in. (1.1 m)	Class A
5	¼ in 12	2 ft 1 in. (0.6 m)	Class A
6	¼ in 12	2 ft 1.5 in. (0.6 m)	Class A
7	¼ in 12	2 ft 3 in. (0.7 m)	Class A

3.4 Combustibility From Below the Roof Deck

3.4.1 The fire tests from below the roof deck were 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 410 Btu/ft²/min (77.6 kW/m²) in any 3 minute time frame during the 30 minute fire exposure.

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

Sample 1: 18 gauge steel deck Approved by FM Approvals
30 mm CPC Panel insulation board mechanically fastened to the deck
1.5 mm PF10-15 TPO, mechanically fastened to the deck

Sample 2: 18 gauge steel deck Approved by FM Approvals
30 mm CPC Panel insulation board mechanically fastened to the deck
1.5 mm PF10-15 PVC, mechanically fastened to the deck

Sample 3*: 18 gauge steel deck Approved by FM Approvals
30 mm TPO WiCi waterproofing insulation integration panel mechanically fastened to the deck

Sample 4*: 18 gauge steel deck Approved by FM Approvals
70 mm TPO WiCi waterproofing insulation integration panel mechanically fastened to the deck

* Calorimeter tests performed under Approval examination Project ID 3049874. Results used as supporting evidence for maximum thickness CPC Panel Board.

3.4.3 The calorimeter tests showed the test panels to have fuel contribution rates below the maximum permissible rates for Class 1 construction. The rates and the Class 1 limits are noted on the following page:

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

Time Interval	3 min	5 min	10 min	Average
Class 1 Standard	410 (77.6)	390 (73.8)	360 (68.1)	285 (54.0)
Sample No. 1	83 (15.7)	82 (15.5)	82 (15.5)	70 (13.2)
Sample No. 2	97 (18.4)	96 (18.2)	96 (18.2)	88 (16.6)
Sample No. 3	105 (19.9)	105 (19.9)	104 (19.7)	98 (18.5)
Sample No. 4	149 (28.2)	148 (28.0)	137 (25.9)	114 (21.6)

3.5 Hail Damage Resistance Test

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.

3.5.1.1 For the severe hail damage test, the test apparatus consists of a section of tubing supported above the sample. A 2 in. (51 mm) diameter steel ball weighing 1.19 lb (540 g) was dropped from a height of 141.5 in. (3595 mm) onto the sample. This procedure generated 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 the 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.

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

3.5.1.1.2. Four (4) 2 x 4 ft. (0.6 x 1.2 m) samples were prepared. The components and sequence of installation were as follows:

Sample No. 1: 50 mm HardRock 80 (faced)
1.5 mm PF10-15 PVC membrane (heat welded lap seam incorporated into sample)

Sample No. 2: 50 mm HardRock 80 (faced)
1.5 mm PF10-15 TPO membrane (heat welded lap seam incorporated into sample)

Sample No. 3: 70 mm CPC Panel
1.5 mm PF10-15 PVC membrane (heat welded lap seam incorporated into sample)

Sample No. 4: 70 mm CPC Panel
1.5 mm PF10-15 TPO membrane (heat welded lap seam incorporated into sample)

3.5.2 No damage to the roof cover on the test panels, described in 3.5.1.1.2 above, was observed after each drop of the simulated hail impactor before or after conditioning (weathering).

3.6 Water Leakage Resistance Test

3.6.1 A test was conducted in accordance with ASTM D7281, Standard Method for Determining Water Migration Resistance Through Roof Membranes, to evaluate the ability of the roof cover to resist leakage of water under the conditions of the test.

3.6.2 Two (2) 18 in. (460 mm) diameter samples were prepared. The components and sequence were as follows:

Sample No. 1: 1.5 mm PF10-15 PVC membrane (heat welded lap seam incorporated into sample)

Sample No. 2: 1.5 mm PF10-15 TPO membrane (heat welded lap seam incorporated into sample)

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

3.7 Foot Traffic Resistance Test

3.7.1 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.

3.7.1.1 A 3 in. (76 mm) square steel plate with rounded corners was centered on the centerline of each 12 in. (305 mm) square horizontal test panel and positioned along the butt edge and the side joint of the boards. 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.

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

3.7.2 Three (3) samples were prepared. The components and sequence of installation were as follows:

Sample No. 1: 50 mm HardRock 80 (faced)
1.5 mm PF10-15 PVC membrane (heat welded lap seam incorporated into sample)

Sample No. 2: 50 mm HardRock 80 (faced)
1.5 mm PF10-15 TPO membrane (heat welded lap seam incorporated into sample)

Sample No. 3: 30 mm CPC Panel insulation board placed over rib opening of FM Approved Type B wide rib steel deck

3.7.3 No damage to the roof cover (Samples 1 and 2) or roof insulation (Sample 3) was observed after the tests.

3.8 Susceptibility to Heat Damage Test

3.8.1 Tests to evaluate the susceptibility of a foam insulation to heat damage from a fire in an adjacent area were performed using the FM Approvals Heat Susceptibility Oven which subjects the sample installed on top of the oven over a steel plate to a 20 minute long radiant heat exposure that starts at ambient and rises to 425°F (218°C) after 5 minutes, 475°F (246°C) after 10 minutes, 500°F (260°C) after 15 minutes and remains at 500°F (260°C) until the end of the test.

3.8.1.1 The insulation sample was examined for any curling or bowing after the radiant heat exposure and then cut in half and examined for decomposition, excessive discoloration, charring or other damage beyond a depth of 1/8 in. (3 mm) from the surface that was exposed.

3.8.2 One (1) 16 by 16 in. (405 by 405 mm) sample was prepared. The components and sequence of installation were as follows:

Sample No. 1: 30 mm CPC Panel insulation board placed over 20 gauge [0.0356 in. (0.9 mm) thick] steel sheet

3.8.3 Upon examination after the test, the test sample was not charred, decomposed, excessively discolored or otherwise damaged beyond a depth of 1/8 in. (3 mm). The sample did not curl or bow during the tests.

3.9 FM Approvals 12 x 24 ft (3.7 x 7.3 m) Simulated Wind Uplift Pressure Tests

3.9.1 Tests were 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 assemblies.

3.9.1.1 The simulated wind uplift pressure tests utilized a 24 ft. (7.3 m) long x 12 ft. (3.7 m) wide x 2 in. (51 mm) deep 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.

3.9.1.2 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.

3.9.2 Six (6) 12 by 24 ft. (3.7 x 7.3 m) test samples were prepared. The components, sequence of installation and test results were as follows:

Sample 1: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 6.4 mm (1/4 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Tekes 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 TPO membrane laid perpendicular to steel deck ribs
Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 150 mm (6.0 in.) on center within the roof cover 120 mm (4.7 in.) side laps
The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 90 psf (4.3 kPa) minimum FM Approvals requirements for Class 1-90 windstorm classification. The construction failed after maintaining a load equivalent to an uplift pressure of 105 psf (5.0 kPa) for 13 seconds due to separation of the heat welded side laps of adjacent sections of roof cover. Windstorm classification limited to Class 1-75 for Grade 33 steel deck due to limitations of steel deck stress for mechanically attached roof cover assemblies. Class 1-90 for Grade 80 steel deck.

Sample 2: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 6.4 mm (1/4 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Tekes 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 TPO membrane laid perpendicular to steel deck ribs
Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 150 mm (6.0 in.) on center within the roof cover 120 mm (4.7 in.) side laps
Intermediate rows of OMG XHD fasteners and OMG Eyehook Seam Plates were applied centered between the fastener rows applied within the roof cover side laps; fasteners within intermediate rows were applied 150 mm (6.0 in.) on center
A strip of PF10-15 TPO membrane 140 mm (5.5 in.) wide was centered over each intermediate fastener row and the 40 mm (1.6 in.) wide outer

edges of the strips were heat welded to the roof cover
The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 210 psf (10.1 kPa) minimum FM Approvals requirements for Class 1-210 windstorm classification. The construction failed during the incremental increase to a load equivalent to an uplift pressure of 225 psf (10.8 kPa) due to fasteners pulling out of the deck. Windstorm classification limited to Class 1-135 for Grade 33 steel deck due to limitations of steel deck stress for mechanically attached roof cover assemblies. Class 1-210 for Grade 80 steel deck.

Sample 3: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 6.4 mm (1/4 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Teks 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 TPO membrane laid perpendicular to steel deck ribs
Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 300 mm (12 in.) on center within the roof cover 120 mm (4.7 in.) side laps
The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 75 psf (3.6 kPa) minimum FM Approvals requirements for Class 1-75 windstorm classification. The construction failed during the incremental increase to a load equivalent to an uplift pressure of 90 psf (4.3 kPa) due to fasteners pulling out of the deck. Meets Class 1-75.

Sample 4: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 2.0 mm (0.079 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Teks 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 PVC membrane laid perpendicular to steel deck ribs
Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD

fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 300 mm (12 in.) on center within the roof cover 120 mm (4.7 in.) side laps

The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 75 psf (3.6 kPa) minimum FM Approvals requirements for Class 1-75 windstorm classification. The construction failed after maintaining a load equivalent to an uplift pressure of 90 psf (4.3 kPa) for 5 seconds due to separation of the heat welded side laps of adjacent sections of roof cover. Meets Class 1-75.

Sample 5: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 2.0 mm (0.079 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Teks 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 PVC membrane laid perpendicular to steel deck ribs
Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 150 mm (6 in.) on center within the roof cover 120 mm (4.7 in.) side laps
The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 75 psf (3.6 kPa) minimum FM Approvals requirements for Class 1-75 windstorm classification. The construction failed after maintaining a load equivalent to an uplift pressure of 90 psf (4.3 kPa) for 53 seconds due to separation of the heat welded side laps of adjacent sections of roof cover. Meets Class 1-75.

Sample 6: 3.7 m (12 ft 3 in.) sections of FM Approved ASTM A653 SS Grade 33, 22 gauge, Type B steel deck installed parallel to the 7.3 m (24 ft) test frame dimension and secured to 2.0 mm (0.079 in.) thick steel structural supports spaced 1830 mm (6 ft) on center
Steel deck secured to structural supports with one (1) ITW Buildex Corp. #12 HWH Teks 5 spaced 152 mm (6.0 in.) on center at each bearing point
50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) placed on the deck
Insulation was preliminarily fastened using OMG #12 Standard Roofgrip fasteners and OMG 3 in. Ribbed Galvalume Plate
New 1.5 mm (0.059 in.) 2000 mm (79 in.) wide PF10-15 PVC membrane laid perpendicular to steel deck ribs

Roof membrane is mechanically fastened minimum 35 mm (1.4 in.) from the membrane edge on one side to the steel deck using OMG XHD fasteners and OMG Eyehook Seam Plates applied in rows 1880 mm (74 in.) apart and 300 mm (12 in.) on center within the roof cover 120 mm (4.7 in.) side laps

Intermediate rows of OMG XHD fasteners and OMG Eyehook Seam Plates were applied centered between the fastener rows applied within the roof cover side laps; fasteners within intermediate rows were applied 300 mm (12.0 in.) on center

A strip of PF10-15 PVC membrane 140 mm (5.5 in.) wide was centered over each intermediate fastener row and the 40 mm (1.6 in.) wide outer edges of the strips were heat welded to the roof cover

The 40 mm (1.6 in.) outer free edge of the roof cover side laps was heat welded to the mechanically fastened side of adjacent roof covers

Test Result: The test sample met the 135 psf (6.5 kPa) minimum FM Approvals requirements for Class 1-135 windstorm classification. The construction failed during the incremental increase to a load equivalent to an uplift pressure of 150 psf (7.2 kPa) due to simultaneous tearing of roof cover over fasteners as well as fasteners pulling out of the deck. Meets Class 1-135.

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 be 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 locations 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 Locations

Audited Product	Manufacturer
TPO raw material	Da He Bao Li – Issopoly Material Technology (Suzhou) Co. Ltd. 699 Xinzhen Road Kunshan City Suzhou, China
CPC Panel	Hubei Joaboa Building Energy Conservation Technology Co., Ltd Jinyang Road, Yangluo economic Development District Wuhan, China
PVC raw material	Shanghai Yu Cheng Can Xing Plastic Materials Co. Ltd. No. 62 Yifu Road Songjiang District Shanghai, China
PF10-15 TPO, PF10-15 PVC	Suzhou Joaboa Technology Co Ltd North of Double Tower Bridge Road Qidou Town Wujiang City Suzhou, China

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.
- 7.3 In accordance with the Master Agreement, the manufacturer shall make full and immediate disclosure to FM Approvals of all information concerning any defect in, or potential hazard of, the product or service manufactured or provided by the Customer which is Approved by, or being examined by, FM Approvals. The manufacturer shall make all necessary arrangements for the investigation of complaints / anomalies applicable to this approval and shall keep records of all complaints / anomalies including actions taken.

8 DOCUMENTATION

The following documents describes the PF10-15 TPO and PF10-15 PVC single-ply roof covers and CPC Panel insulation board and is on file at FM Approvals.

Document Title	Issue Date
141863Shenzhen Joaboa_at_Dahe Baoli_20131017_4470	October 2013
141863Shenzhen Joaboa_at_Hubei Joaboa_20131018_4470	October 2013
141863Shenzhen Joaboa_at_Suzhou Joaboa_20131017_4470	October 2013

9 CONCLUSIONS

- 9.1** Test results from this program indicate that the PF10-15 TPO and PF10-15 PVC roof covers and CPC Panel evaluated in this program, meet the requirements of the FM Approvals Standard listed in section 1.3 when installed as follows:
- 9.1.1** Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), minimum Grade 80 steel deck. Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 150 mm (6 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Meets Class 1-90.
- 9.1.1.1** Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), steel deck is secured to minimum 2.0 mm (0.079 in.) thick steel structural supports spaced a maximum 1.8 m (6 ft.) on center with ITW Buildex Corp. #12 HWH Tekes 5 spaced at maximum 152 mm (6.0 in.) on center at the supports (one fastener installed at each bearing attachment point). Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 150 mm (6 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Meets Class 1-75.
- 9.1.1.2** Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), steel deck. Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 150 mm (6 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Meets Class 1-75.
- 9.1.2** Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), steel deck. Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening

requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 300 mm (12.0 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Meets Class 1-75.

9.1.2.1 Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), steel deck is secured to minimum 2.0 mm (0.079 in.) thick steel structural supports spaced a maximum 1.8 m (6 ft.) on center with ITW Buildex Corp. #12 HWH Tekes 5 spaced at maximum 152 mm (6.0 in.) on center at the supports (one fastener installed at each bearing attachment point). Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 300 mm (12 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Meets Class 1-75.

9.1.3 Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), minimum Grade 80 steel deck is secured to minimum 6.4 mm (0.25 in.) thick steel structural supports spaced a maximum 1.8 m (6 ft.) on center with ITW Buildex Corp. #12 HWH Tekes 5 spaced at maximum 152 mm (6.0 in.) on center at the supports (one fastener installed at each bearing attachment point). Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 150 mm (6.0 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Intermediate rows of OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 150 mm (6.0 in.) on center are applied parallel and centered between the fastener rows within the roof cover laps. A respective strip of PF10-15 TPO or PF10-15 PVC membrane 140 mm (5.5 in.) wide is centered over each intermediate fastener row and the 40 mm (1.6 in.) wide outer edges of the strips heat welded to the roof cover. Meets Class 1-210.

9.1.4 Steel Deck – New: FM Approved, minimum 22 gauge (0.0295 in. [.75 mm]), steel deck is secured to minimum 2.0 mm (0.079 in.) thick steel structural supports spaced a maximum 1.8 m (6 ft.) on center with ITW Buildex Corp. #12 HWH Tekes 5 spaced at maximum 152 mm (6.0 in.) on center at the supports (one fastener installed at each bearing attachment point). Minimum 50 mm (2.0 in.) thick Rockwool Firesafe Insulation (Guangzhou) Co., Ltd. HardRock 80 (unfaced) or minimum 30 mm (1.2 in.) to maximum 70 mm (2.8 in.) CPC Panel is placed on the deck and fastened per FM Approvals preliminary fastening requirements. 1.5 mm (0.059 in.) thick, 2000 mm (79 in.) wide

PF10-15 TPO or PF10-15 PVC roof membrane is placed over the insulation perpendicular to steel deck ribs and mechanically fastened on one side minimum 35 mm (1.4 in.) from the membrane edge to the steel deck with OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 300 mm (12 in.) on center along the roof cover 120 mm (4.7 in.) wide laps spaced maximum 1880 mm (74 in.) on center. The outside 40 mm (1.6 in.) of the outer free edge of the roof membrane is heat welded to the mechanically fastened side of the adjacent roof membrane. Intermediate rows of OMG XHD fasteners and OMG Eyehook Seam Plates spaced at 300 mm (12 in.) on center are applied parallel and centered between the fastener rows within the roof cover laps. A respective strip of PF10-15 TPO or PF10-15 PVC membrane 140 mm (5.5 in.) wide is centered over each intermediate fastener row and the 40 mm (1.6 in.) wide outer edges of the strips heat welded to the roof cover. Meets Class 1-135.

- 9.2 ASTM E-108 Ratings for mechanically fastened PF10-15 TPO and PF10-15 PVC roof covers are as follows:

Roof Cover	Substrate	Rating	Max Slope
PF10-15 TPO or PF10-15 PVC	HardRock 80 (faced)	Class A	½ in 12
PF10-15 TPO or PF10-15 PVC	CPC Panel	Class A	¼ in 12

- 9.3 The Hail Damage rating for all roof cover and substrate combinations referenced in this report is SH.
- 9.4 Tests show that the tested roof constructions in and of themselves would not create a need for automatic sprinklers.
- 9.5 Since a duly signed Master Agreement is on file for this customer, Approval is effective as of the date of this report.
- 9.6 Continued Approval will depend upon satisfactory field experience and periodic Facilities and Procedures Audits.

PROJECT DATA RECORD: 3047177
ATTACHMENTS: N/A
ORIGINAL TEST DATA See PDRs for project in Table 1