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Element Materials Technology
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Report Number: ESP012965P-D
Report Date: December 16, 2013

STRUCTURAL PERFORMANCE TEST REPORT

Test Requested By: Deceuninck North America, LLC
351 North Garver Road
Monroe, Ohio 45050

Product Type and Series: Series 623.620 PD/ No Impact brackets Standard Vinyl Impact Sliding Glass Door
LC-PG 50-SD 4890 mm x 2413 mm (192.5" x 95")

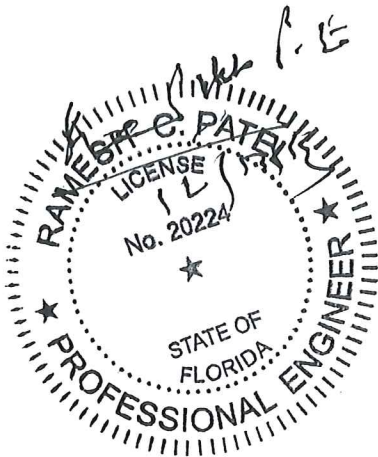
Test Specifications

Tests Conducted: TAS 201 (Large Missile), TAS 202, and TAS 203
Design Pressure: + 50.0 - 50.0
Overall Size: 4890 mm x 2413 mm (192.5" x 95")
Configuration: O/X/X/O Two (2) operable panels / Two (2) fixed panels
Frame and Sash Material: Extruded vinyl
Frame Construction: The extruded vinyl main equal leg frame measured 4890 mm wide x 2413 mm high (192.50" wide x .95" high). The frame corners utilized coped and butted corner construction, secured with three (3) # 8 x 76mm (2.5") Phillips PH fasteners. Head and jamb extrusions measured 127.2 mm 5.008" wide x 51mm (2.007") high (refer to drawing # 10001100_SH). The frame sill extrusion measured 127.2 mm (5.088") wide x 51mm(2.007") high (refer to drawing #10001101_SH).The frame sill had vinyl sill insert running full length of fixed panel that measured 46mm (1.800") wide x 26mm (1.020") high and secured to frame utilizing four (4) #8 x 32mm (1.250") Phillips CS self-drilling SMS (refer to drawing # 10001105_SH).

Panel Construction: The operable panels measured 1245 mm (49") wide x 2369mm(93.250") high overall. The fixed panels measured 1238mm (48.750") wide x 2369mm (93.250") high overall. The panels utilized mitered and welded corner construction. The vinyl sash stiles and rails measured 45mm (1.755") wide x 102 mm (4.000") high (refer to drawing # 10001102_SH).

The operable and fixed panel interlock stiles had an interlocking vinyl sash adapter measuring 51 mm (2.002") wide x 58 mm (2.279") high (refer to drawing # 10001117_SH Sash Adapter) secured through the stile with nine (9) #8 x 16mm (0.625") Phillips PH self-drilling SMS located 102 mm (4") from top and bottom of panel and a maximum of 305 mm (12") on center thereafter.

The fixed panels were secured to frame head/sill with an aluminum (L) shaped bracket measuring 46 mm (1.6") wide x 77 mm (3.031") high overall (refer to drawing # 011H027) and was secured to fixed panel interlock stile with two (2) #8 x 25mm (1.00") Phillips CS self-drilling SMS and to frame head/sill utilizing two (2) #8 x 19mm(0.750") Phillips CS self-drilling SMS and two (2) #8 x 64mm(2.500") Phillips CS fasteners per bracket.



Panel Construction continued:

The fixed panels each had three (3) aluminum snubbers each measuring 45mm (1.780") wide x 32mm (1.242") high x 762 mm (30") long. Two (2) were secured equal distance on the frame jamb at each fixed panel location with nine (9) #8 x 32 mm (1.250") Phillips F.H. self-tapping S.M.S. The third aluminum snubber was centered at the frame head fixed panel. This Frame head/Fixed panel snubber utilized no fasteners and was inserted between the frame head pocket and fixed panel sash top rail (*refer to drawing # 10300148*).

Two (2) aluminum T-Brackets were located at frame head of the operable panel track pocket c/l of the operable panel. The tracks/guides measured 47mm (1.845") wide x 29mm (1.145") high x 305mm (12.00") long. Each track/guide was secured to the frame head with eight (8) #8 x 64mm (2.500") Phillips F.H self-tapping S.M.S.

The four (4) lite vinyl astragal measured 58mm (2.275") wide x 60mm (2.354") high (*refer to drawing # 10001116*). The four (4) lite vinyl astragal was secured to the panel with eight (8) #8 x 52mm (2.00") Phillips P.H.S.M.S. The fasteners were located at 127mm (5.00") from the each end of the vertical astragal and 305mm (12.000") on center thereafter.

Day lite opening:

Daylight opening for all panels measured 1038 mm (40.875") wide x 2162 mm (85.125") high.

Glazing:

1.000" overall insulated laminated glass consisting of the following: One (1) exterior piece of .1875" tempered glass / one (1) .375" Duraseal/Quanex spacer system / one (1) piece of .1875" annealed glass / 0.090" PVB interlayer (By Solutia/Saflex as stated by mfg.) / one (1) piece of .1875" annealed glass. Exterior glazed with silicone back bedding compound, .625" glass bite (*refer to drawing # 1*) The glazing utilized an extruded vinyl snap-in glazing bead measuring .283" wide x .977" high overall with (*refer to drawing # 1001111_SH Glazing Bead*)

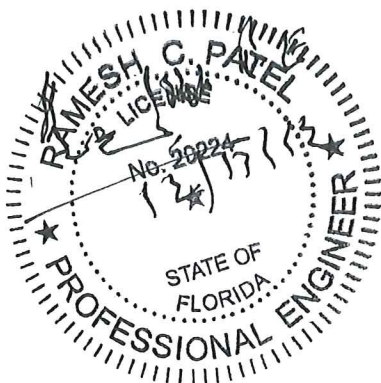
Reinforcement:

One (1) H shaped aluminum reinforcement measuring 50mm (1.971") wide x 39 mm (1.555") high x full length was located in each fixed panel interlock stile, operable panel interlock stile and operable panel astragal stile (*refer to drawing # 10300151*).

The fixed panel interlock reinforcement and the operable interlock reinforcement were secured through the interlock into stile with nine (9) #8 x 16mm (0.625") Phillips PH self-drilling SMS located 102 mm (4") from top and bottom of panel and a maximum of 305 mm (12") on center thereafter.

The operable panel astragal reinforcement was secured to the panel thru the astragal with eight (8) #8 x 52mm (2.00") Phillips P.H.S.M.S. The fasteners were located at 127mm (5.00") from the each end of the vertical astragal and 305mm (12.000") on center thereafter.

One (1) free floating aluminum reinforcement measuring 50 mm (1.965") wide x 39 mm (1.555") high x full length was located in each fixed panel jamb stile and operable panel lockstile (*refer to drawing # 10300150*).



Reinforcement continued: One (1) aluminum reinforcement in each operable panel bottom rail. Secured with two (2) #8 x .750” TEK screws (*refer to drawing # 10300152*)

One (1) 1.5” x 1.5” x 8’ x .125” aluminum angle. Located at frame sill interior, center mid-span. Secured to rough opening butted against interior frame sill attached to rough opening with eight (8) #10 x 2” SMS

Weep System: Four (4) weep notches that measured 25 mm (1.00”) wide x 6 mm (.250”) high were located as follows. One (1) at the corner of the exterior face of the frame sill and one (1) at the corner of the interior track leg of the frame sill. Each weep notch measured 76 mm (3.00”) c/l from the frame jamb/sill corner connection.

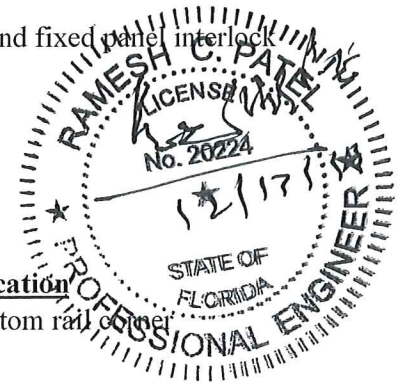
Weep System: Four (4) weep notches that measured 25mm (1.00”) wide x 6mm(.250”) high were located as follows. One (1) at the corner of the exterior face of the frame sill and one (1) at the corner of the interior track leg of the frame sill. Each weep notch measured 76mm (3.00”) c/l from the frame jamb/sill corner connection.

Weather-stripping:

| <u>Quantity</u> | <u>Description</u> | <u>Location</u> |
|-----------------|---|---|
| Two (2) strips | Fin seal 9mm (.270”) wide x 6 mm (.250”) high | one (1) operable panel track and one (1) fixed panel track frame head |
| One (1) strip | Fin seal 9mm (.270”) wide x 6 mm (.250”) high | one (1) operable panel track frame sill |
| Two (2) strips | Fin seal 9mm (.270”) wide x 6 mm (.250”) high | One (1) each frame jamb. |
| Four (4) strip | Fin seal 9mm (.270”) wide x 6mm (.250”) high | One each operable and fixed panel interlock |
| Two (2) strips | Fin seal 9mm (.270”) wide x 6mm (.250”) high | Astragal |

Hardware:

| <u>Quantity</u> | <u>Description</u> | <u>Location</u> |
|-----------------|---|---|
| Four (4) | Steel front adjustable tandem roller, 42mm (1.66”) OD wheels, each secured with two (2) # 8 x 25mm(1.00”) Phillips PH SMS | Each operable panel bottom rail corner |
| Two (2) | Inside/Outside Pull Handle | Located at lock stile of the operable panel |
| One (1) | Gemini II Lock with 2450 Trimplate, secured with four (4) # 10 x 32mm (1.250”) Phillips flat head screws. | Lock stile of the operable panel located 972mm (38.250”) c/l measuring from bottom of panel. |
| One (1) | Steel keeper (Gemini 1”) secured with four (4) #8 x 76mm (3.00”) Phillips P.H. screws. | Latch stile of the operable panel located 972mm (38.250”) c/l measuring from bottom of panel. |



Installation: The specimen was secured to the (2" x 12") wood test buck utilizing forty-six (46) #8 x (1.500") Phillips PH SMS. Seven (7) in each frame jamb located at (6.00"), (20.00"), (34.00"), (48.00"), (62.00"), (76.00") and (84.00") measuring from frame sill to frame head. Sixteen (16) in the frame head and frame sill located at (6.00"), (18.00"), (30.00"), (42.00"), (54.00") (66.00"), (78.00"), (90.00"), (102.00"), (114.00"), (124.00"), (136.00"), (148.00"), (160.00"), (172.00"), (184.00") and (196.00") measuring from left frame jamb to right frame jamb.

Sealant: Silicone caulking as needed to seal the test units to the wood bucks.

Screen: Roll formed aluminum screen with fiberglass mesh and vinyl spline.

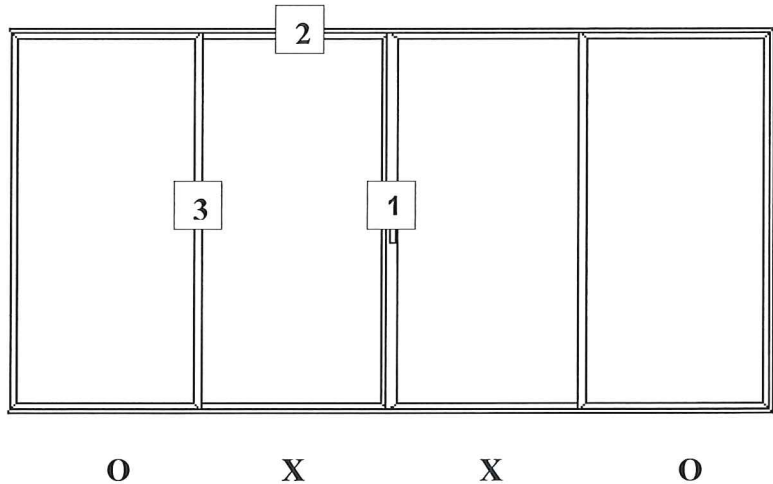
Surface Finish: White vinyl

Performance Test Results

Specimen 1

Test Sequence TAS 202-94

1. Air Infiltration
2. ½ Test Pressure Positive
3. ½ Test Pressure Negative
4. Design Pressure Positive
5. Design Pressure Negative
6. Water Infiltration
7. Full Test pressure Positive
8. Full Test Pressure Negative
9. Forced Entry Resistance



Location (1) - Center mid-span astragal
 Location (2) - Between installation anchors, frame head
 Location (3) - Center mid-span of the interlock

Deflection / Permanent Set were measured with three (3) dial indicators Element control #'s A066, A068 & A070.

Air Infiltration Test: Specimen 1

Air Infiltration Tests were conducted in accordance with DCBCCD TAS 202-94

| | | |
|-----------|--------------------------|--------------------------|
| | <u>Actual</u> | <u>Allowable</u> |
| @ 1.57psf | 0.23 cfm/ft ² | 0.34 cfm/ft ² |

Water Infiltration Test: Specimen 1

Water Infiltration Test was conducted in accordance with DCBCCD TAS 202-94

WTP=9.75 psf

No water penetration was observed 15 min. duration Result: Passed

The specimen was tested with and without an insect screen installed.

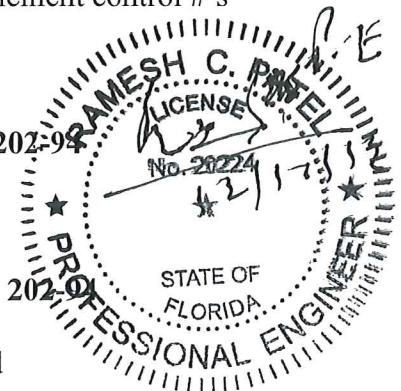
Forced Entry Resistance Test: Specimen 1

Forced Entry Resistance Test was conducted in accordance with DCBCCD TAS 202-94

ASTM F842 Passed

Type "C" Window Assembly

The test specimen meets the performance Grade 20.



Uniform Structural Load Test

Static Tests were conducted in accordance with DCBCCD TAS 202-94

Specimen 1

Design Pressure of +50.0psf

| Range of test | Time | Actual Load | Deflection | Perm. Set | Allowable |
|-----------------------|-----------|-------------|-----------------------|-----------|-------------|
| Positive loads | (seconds) | psf | | | |
| ½ Test load | 30 | 37.5 | | | |
| Design Load | 30 | 50.0 | Loc. 1 (1.501") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 1 (0.147") | | (.373") |
| Design Load | 30 | 50.0 | Loc. 2 (.021") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 2 (0.004") | | (.048") |
| Design Load | 30 | 50.0 | Loc. 3 (1.129") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 3 (0.082") | | (.373") |

Negative loads

| | | | | | |
|-------------|----|------|-----------------------|--|-------------|
| ½ Test load | 30 | 37.5 | | | |
| Design Load | 30 | 50.0 | Loc. 1 (1.660") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 1 (0.075") | | (.373") |
| Design Load | 30 | 50.0 | Loc. 2 (.013") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 2 (0.008") | | (.048") |
| Design Load | 30 | 50.0 | Loc. 3 (1.320") Gross | | Record only |
| Test load | 30 | 75.0 | Loc. 3 (0.130") | | (.373") |

Location (1) -Center mid-span astragal .004 of 93.25" span = .373" allowable permanent set

Location (2) -Between installation anchors, frame head .004 of 12" span = .048"

Allowable permanent set

Location (3) -Center mid-span of the interlock .004 of 93.25" span = .373" allowable permanent set

Impact Test: Large Missile

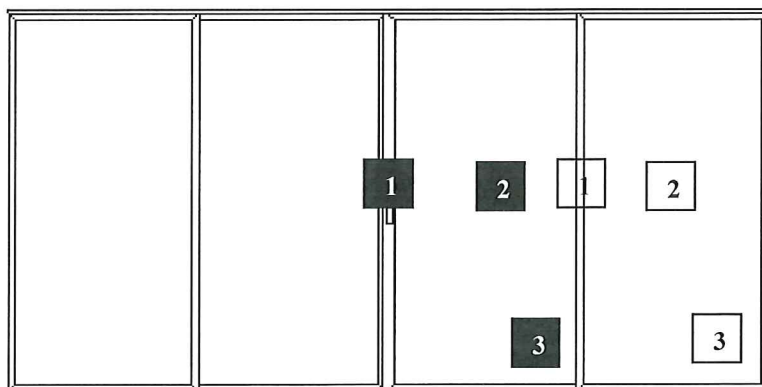
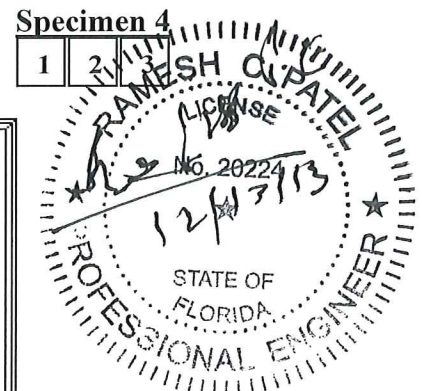
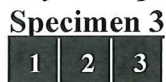
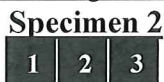
Impact tests were conducted in accordance with DCBCCD TAS 201-94

Each specimen was impacted with an 8 ft., 9 lb. Southern yellow pine (2" x 4") at the following locations:

X measurement from left edge of specimen.

Y measurement from top edge of test specimen

Type and weight of missile: #2 Southern yellow pine 2 x 4, length approx. 96" & 9 lb.



| <u>Specimen</u> | <u>Impact Loc.</u> | <u>Speed Ft/Sec</u> | <u>X Meas.</u> | <u>Y Meas.</u> |
|-----------------|--------------------|---------------------|----------------|----------------|
| No. 2 | Loc: 1. | 49.9 | 98.25" | 47.50" |
| | Loc: 2. | 50.1 | 122.00" | 47.50" |
| | Loc: 3. | 50.1 | 137.00" | 87.00" |

| <u>Specimen</u> | <u>Impact Loc.</u> | <u>Speed Ft/Sec</u> | <u>X Meas.</u> | <u>Y Meas.</u> |
|-----------------|--------------------|---------------------|----------------|----------------|
| No. 3 | Loc: 1. | 49.6 | 98.00" | 47.50" |
| | Loc: 2. | 50.2 | 123.00" | 47.00" |
| | Loc: 3. | 50.1 | 137.00" | 88.50" |

| <u>Specimen</u> | <u>Impact Loc.</u> | <u>Speed Ft/Sec</u> | <u>X Meas.</u> | <u>Y Meas.</u> |
|-----------------|--------------------|---------------------|----------------|----------------|
| No. 4 | Loc: 1. | 50.5 | 147.00" | 47.00" |
| | Loc: 2. | 50.2 | 171.50" | 47.50" |
| | Loc: 3. | 50.1 | 187.00" | 87.00" |

Results: All specimens tested resisted the large missile impact, without penetration of the inner plane of the glazing. With no tear forming longer than 5" and wider than 1/16" thru which air can pass, or no opening through which a 3" diameter solid sphere could freely pass.

Fatigue Loading Test TAS 203

Specimens 2, 3, and 4:

Cycle tests were conducted in accordance with DCBCCD TAS 203-94

Specimen 2

Design Load + 50.0 psf, -50.0 psf
+ Positive loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .2 - .5 | 10.0 | 25.0 | 3500 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 300 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 600 | 55 |
| + .3 - 1.0 | 15.0 | 50.0 | 100 | 55 |

Deflection taken at center mid-span

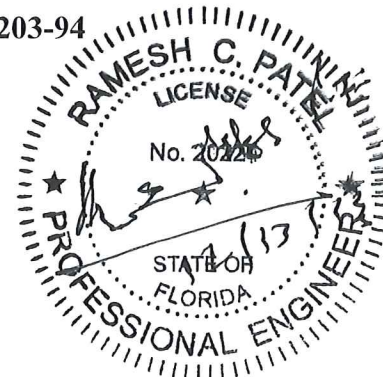
-Negative Loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .3 - 1.0 | 15.0 | 50.0 | 50 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 1050 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 50 | 55 |
| + .2 - .5 | 10.0 | 25.0 | 3350 | 55 |

Deflection taken at center mid-span

9000 cycles completed

Specimen showed no resultant failure after cycle test.



Deflection/ Set
 1.250" 0.250"

Deflection/ Set
 1.750" 0.375"

Specimen 3
Design Load + 50.0 psf, -50.0 psf
+ Positive loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .2 - .5 | 10.0 | 25.0 | 3500 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 300 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 600 | 55 |
| + .3 - 1.0 | 15.0 | 50.0 | 100 | 55 |

Deflection taken at center mid-span

-Negative Loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .3 - 1.0 | 15.0 | 50.0 | 50 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 1050 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 50 | 55 |
| + .2 - .5 | 10.0 | 25.0 | 3350 | 55 |

Deflection taken at center mid-span

9000 cycles completed

Specimen showed no resultant failure after cycle test.

Deflection/ Set

1.250" 0.250"

Deflection/ Set

1.750" 0.375"

Specimen 4
Design Load + 50.0 psf, -50.0 psf
+ Positive loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .2 - .5 | 10.0 | 25.0 | 3500 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 300 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 600 | 55 |
| + .3 - 1.0 | 15.0 | 50.0 | 100 | 55 |

Deflection taken at center mid-span

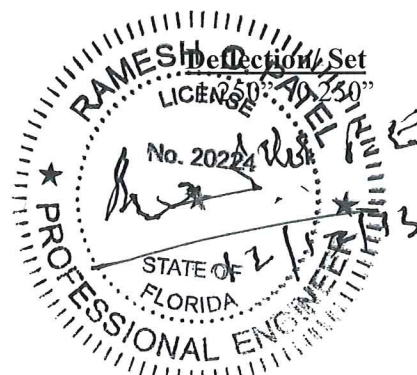
-Negative Loads

| <u>Range of test</u> | <u>Actual load PSF</u> | | <u># of cycles</u> | <u>Cycles/min</u> |
|----------------------|------------------------|------|--------------------|-------------------|
| + .3 - 1.0 | 15.0 | 50.0 | 50 | 55 |
| + .5 - .8 | 25.0 | 40.0 | 1050 | 55 |
| + .0 - .6 | 0.00 | 30.0 | 50 | 55 |
| + .2 - .5 | 10.0 | 25.0 | 3350 | 55 |

Specimen showed no resultant failure after cycle test.

9000 cycles completed

Specimen showed no resultant failure after cycle test.

Note: The doors were operable at the end of cycle test.

Deflection/ Set

1.250" 0.250"

Deflection/ Set

1.750" 0.375"

Results: All specimens tested resisted the Fatigue Loading test. With no tear forming longer than 5" long x 1/16" wide thru which air could pass.

Comment: Nominal 2-mil polyethylene film was used to seal against air leakage during structural loads. The film was used in a manner that did not influence the test results.

Test Dates: June 19th 2013 thru November 19th 2013

Remarks: Detailed drawings were available for laboratory records and comparison to the test specimen at the time of this report. A copy of this report along with representative sections of the test specimen will be retained by Element Materials Technology for a period of ten (10) years. The results obtained apply only to the specimen tested.

This test report does not constitute certification of this product, but only the above test results were obtained using the designated test methods and they indicate compliance with the performance requirements (paragraphs as listed) of the above referenced specifications.

Element Materials Technology assumes that all information provided by the client is accurate and that the physical and chemical properties of the components are as stated by the manufacturer. This report shall not be reproduced, except in full, without the written approval of the laboratory.

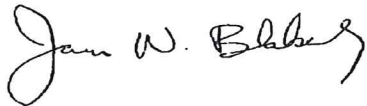
Element Materials Technology

Testing Performed/Witnessed By:

Mike Miller Element Materials Technology
Washington Romero Element Materials Technology
Ramesh Patel P.E.

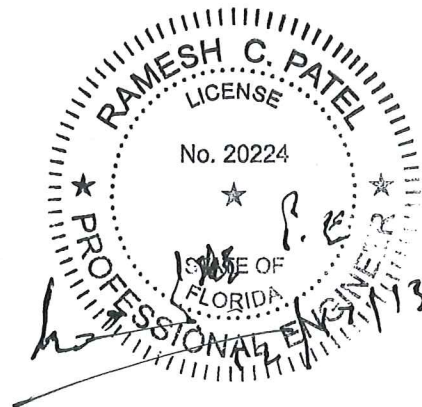
Client Present:

Dennis Cox Deceuninck NA



James Blakely
Operations Manager
Element Materials Technology

cc: Deceuninck NA (2)
 Ramesh Patel P.E. (1)
 File (1)



Ramesh Patel, P.E.
Florida Reg. # 20224
Structural Engineer