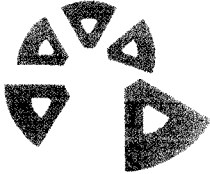




FOUR SEASONS SOLAR PRODUCTS

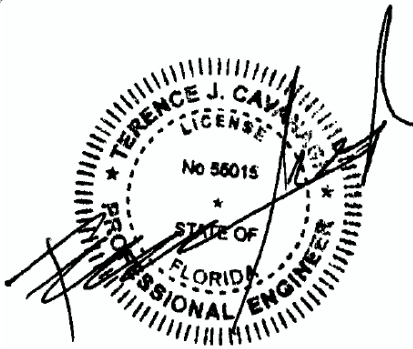
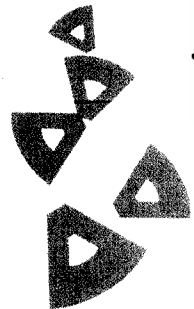
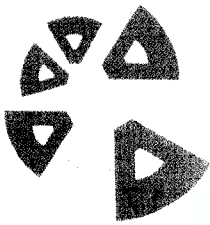


TAS 202 Tests Series 230 Sun & Shade

3 inch Solid Kick Panel Window with Vertical Utility H-Channels and Adjustable Eave

Report No. TT 507017-202

August 22, 2012
(REV 2.0)



Embossed Corporate Seal

Submitted by:

TERRAPIN TESTING
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RANCHO CORDOVA, CALIFORNIA 95742-6830
PHONE [916] 853-9658
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FLA TST2542

Signed: 
Terence Cavanagh

Title: Technical Manager

Signed: 
Michael Cavanagh

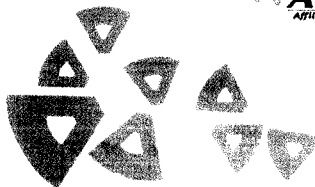
Title: Lab Manager

Dated: 8/22/12

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The results of testing in this report apply only to the samples supplied and under the stated conditions of testing.

The hard copy of this report is the final copy, and supersedes any electronic versions of the same, in case of disputes.



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Report No. TT **507017-202** Table of Contents

Main Report

Report Cover	1
Table of Contents	2
Introduction	3
Report Identification	3
Specimen Description	3
Results	5
Revision Page	6

Appendix

A—Uniform Static Air Pressure Test Report	7
B—Water Resistance Test Report	17
C—Air Infiltration Test Report	19
D—Detailed Product Information	21

Terrapin Testing		<i>Laminated Sandwich Panel Tests Patio Roof Panels</i>	
<i>Orig. Issue Date: 2008-07-11</i>	<i>Approval:</i>	<i>Report No. TT 507017-202</i>	<i>Page 2 of 30</i>
<i>Revision Date: 2012-08-22</i>	<i>RWC</i>		
<i>Revision #: 2.0</i>			



1.0 INTRODUCTION

Four Seasons Solar Products (FSSP) contracted with Terrapin Testing (Lab) to perform tests, in accordance with Florida Building Code **HVHZ TAS 202-94**, (**TAS 202**), Criteria For Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure. The criteria references ASTM E 283-04, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen (**ASTM E 283**).

The Lab performed **Uniform Static Air Pressure, Water Resistance, and Air Infiltration** tests at its facility in Rancho Cordova, California. Section 4.0 below describes the window configuration. This report summarizes the findings and conclusions of the aforementioned tests.

2.0 REPORT IDENTIFICATION

This report, titled "TAS 202 Tests," was prepared by the testing lab, Terrapin Testing, TL-159. The Lab is located at 3206 Luyung Drive, Rancho Cordova, California, 95742-6830. The Lab's unique job number, TT **507017-202** identifies this report.

This report was prepared at the request of **FSSP**. The proponent's corporate offices and manufacturing facilities are at **5005 Veterans Memorial Highway, Holbrook, NY 11741**.

This report is issued as of the date on the report cover. The tests covered by this report began on **March 1, 2008** and were completed on **March 15, 2008**.

Terence Cavanagh, a Florida Professional Engineer, prepared this report and supervised the tests. Terence Cavanagh is part of the Lab's permanent staff. Michael Cavanagh, Lab Manager, performed the tests. Their signatures are on the report cover.

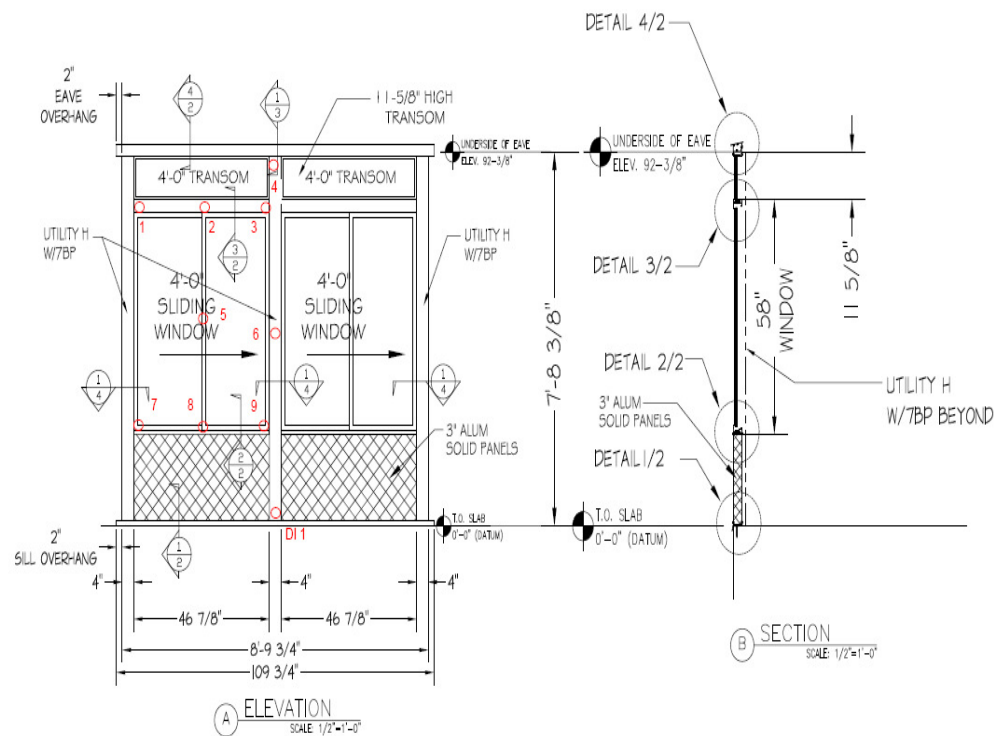
3.0 SPECIMEN DESCRIPTION

The products tested were Series 230 Sun & Shade window bays, **3 inches thick** and **48 inches wide**, assembled into **8-by-8-foot** specimens. Each bay consisted of a kick panel, a slider window, and a glass transom. The kick panel was **22¾ inches tall**, the slider window was **58 inches tall**, and the glass transom was **11 5/8 inches tall**, creating a **92 3/8-inch** wall to the top of the adjustable eave.

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Report No. TT 507017-202 Page 3 of 30



The kick panel was a laminated sandwich panel with an interior and exterior aluminum skin. The foam core consisted of preformed expanded polystyrene. The slider window consisted of **two 24-inch** windows: one fixed and one slider. The slider window was closed during testing and locked to the fixed window. Both windows were dual paned. The glass transom window was dual paned, with the glass offset to the exterior side of the sill's centerline. Plastic film was used to seal against air leakage. Figure 1 depicts the specimen configuration.



O = LPT

**Figure 1
 Specimen Configuration**

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels	
Orig. Issue Date: 2008-07-11	Approval:	Report No. TT 507017-202	Page 4 of 30
Revision Date: 2012-08-22	RWC		
Revision #: 2.0			



Lab personnel did not witness the manufacture of the wall assembly components that were sent to the Lab by FSSP. The wall components were received in good condition at the Lab on **February 8, 2008**.

Lab personnel fabricated the test specimens from the components received, according to FSSP drawings. See Appendix D for additional detail regarding the specimens tested, including drawings depicting the assemblies.

4.0 RESULTS

TAS 202

Upon completion of all testing, the specimens meet the requirement of Section 1619 of the *Florida Building Code, Building* and TAS 202 for a DP 40 (+40 psf/-40 psf) rated window. Complete uniform static air pressure test results are within Appendix A.

TAS 202 requires uniform static air pressure in the positive and negative directions at Test Pressures; water penetration at 15% of design pressure and air leakage per ASTM E283.

Uniform Static Air Pressure Tests

No structural damage occurred when the window bays were subjected to the required static air pressures for design pressures of +48 psf and -62 psf.

The specimens passed the Uniform Static Air Pressure Tests.

Water Resistance Tests

No water leakage occurred when subjected to pressures associated with a DP 40 (+40 psf/-40 psf) window.

Water leakage occurred when subjected to pressures associated with a DP 50 (+50 psf/-50 psf) window.

The specimens passed the Water Resistance Tests for a DP40 (+40 psf/-40 psf) rated window.

Air Infiltration Tests

Average air leakage was: 0.07 of cfm/ft²

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests</i> <i>Patio Roof Panels</i>	
<i>Orig. Issue Date: 2008-07-11</i> <i>Revision Date: 2012-08-22</i> <i>Revision #: 2.0</i>	<i>Approval:</i> <i>RWC</i>	<i>Report No. TT 507017-202</i>	<i>Page 5 of 30</i>



Revisions Page

Revision Number Revision	Date
#2	August 22, 2012
To change reference of ASTM E283-91 to ASTM E283-04	
#1	May 5, 2009
To correct 20 HP at Page 7; To correct square feet calculations at Data Tables	
Revisions Page added	

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Report No. TT 507017-202 Page 6 of 30



Appendix A

Uniform Static Air Pressure Test Report

1.0 INTRODUCTION

Terrapin Testing performed uniform static air pressure tests on window bays for **Four Seasons Solar Products (FSSP)**. These are used primarily in patio rooms. The tests were performed to Design Pressure 40 (DP 40).

2.0 REPORT IDENTIFICATION

This Appendix is incorporated into the main report, number TT **507017-202**. Please see additional report identification information within Section 2.0 of the main report.

3.0 SAMPLE DESCRIPTION

The products tested were Series 230 Sun & Shade window bays, **3 inches thick and 48 inches wide, assembled into 8-by-8-foot specimens**, using the same configuration as proposed for use in the field. Please see sample description in Section 3.0 of the main report.

4.0 STANDARDS AND REFERENCE

The uniform static air pressure tests were performed in accordance with the provisions of Florida Building Code HVHZ TAS 202-94, (TAS 202), Criteria For Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.

5.0 TEST PROCEDURES AND EQUIPMENT

Apparatus

Apparatus used in these tests was **adequate to provide an essentially constant air-pressure difference for the required test period**. The equipment included an air chamber, specimen supports, digital manometer, pressure/vacuum system, film membrane, thermometer/hygrometer, laminar flow element and linear position transducers. Photos A1 - A4 display the test setup.

Terrapin Testing		Laminated Sandwich Panel Tests
Orig. Issue Date: 2008-07-11	Approval:	Patio Roof Panels
Revision Date: 2012-08-22	RWC	Report No. TT 507017-202
Revision #: 2.0		Page 7 of 30



- Air chamber, custom fabricated at the LAB. The wood chamber is wall-mounted and the seams of the chamber were sealed to the wood wall with backer rod.
- Digital pressure transducers with various ranges to accommodate pressure range. The transducers measure the test pressure difference within a tolerance of ± 0.25 percent.
- Pressure/vacuum system - a custom built pressure/vacuum wall system. A 20 HP variable speed blower is used to control the amount and rate of change of the differential air pressure within the chamber.
- A 2-mil polyethylene film membrane, is placed over the chamber and specimen. The polyethylene film seals the upper surface of the chamber. The edges of the polyethylene film were secured to the wood frame of the vacuum chamber using duct tape.
- Various temperature, barometer and hygrometer probes.
- Linear position transducers (LPT) were used to measure deflections within the system. Each LPT is capable of reading deflections of up to 10", in 0.0005-inch increments. Dial LPT's are placed at locations in the apparatus to measure the deflection of the support framing.

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests</i> <i>Patio Roof Panels</i>
<i>Orig. Issue Date: 2008-07-11</i> <i>Revision Date: 2012-08-22</i> <i>Revision #: 2.0</i>	<i>Approval:</i> <i>RWC</i>	<i>Report No. TT 507017-202</i> <i>Page 8 of 30</i>



Photo A1 - Test Set Up



Photo A2 - Test Set Up

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests Patio Roof Panels Report No. TT 507017-202</i>	
<i>Orig. Issue Date: 2008-07-11</i>	<i>Approval:</i>	<i>Page 9 of 30</i>	
<i>Revision Date: 2012-08-22</i>	<i>RWC</i>		
<i>Revision #: 2.0</i>			

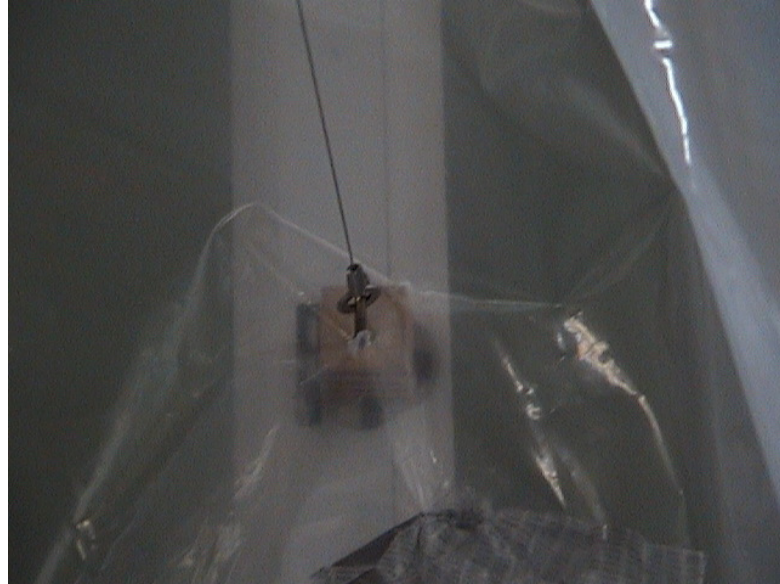


Photo A3- Test Set Up

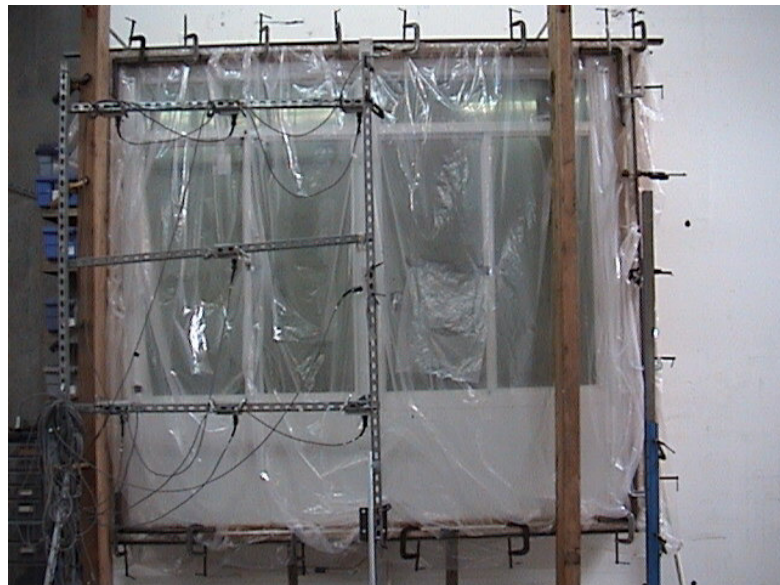


Photo A4 - Test Set Up

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests Patio Roof Panels Report No. TT 507017-202</i>
<i>Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0</i>	<i>Approval: RWC</i>	<i>Page 10 of 30</i>



Procedure

LAB personnel tested the window bay specimen in accordance with TAS 202, using the following steps:

1. Place the specimen into the testing apparatus, with the outside of the window bay facing the wall.
2. Place the polyethylene film over the specimen and vacuum chamber and secure with duct tape to the vacuum chamber test frame. Provide enough "slack" in the film to allow for movement of the specimen during testing.
3. Place LPT's as indicated in Figure 1.
4. Determine the test load, equal to 1.5 times the design pressure (positive and negative) as determined by Section 1619 of the *Florida Building Code, Building* for which the specimen is to be tested. For the purpose of these tests, the design pressure was assumed to be **+48 psf and -62 psf**.
5. Load the specimen in compliance with TAS 202 sub section 5.2.4 and 5.2.5.
 - a. Tare LPT's.
 - b. Apply **one half of the test load and hold for 30 seconds**.
 - c. Take deflection readings and record visual observations.
 - d. **Release the initial load**, and allow the specimen to **recover for 1-5 minutes**.
 - e. Take deflection readings.
 - f. Apply **one half the reverse test load and hold for 30 seconds**.
 - g. Take deflection readings.
 - h. **Release the reverse load**, and allow the specimen to **recover for 1-5 minutes**.
 - i. Take deflection readings and record visual observations.
 - j. Apply the **full test load and hold for 30 seconds**.
 - k. Take deflection readings and record visual observations.
 - l. **Release the test load** and allow the specimen to **recover for 1 to 5 minutes**.
 - m. Take deflection readings.
 - n. Apply the **full reverse test load and hold for 30 seconds**.
 - o. Take deflection readings.
 - p. **Release the reverse test load** and allow the specimen to **recover for 1 to 5 minutes**.
 - q. Take deflection readings.

LAB personnel performed both positive and negative uniform static air pressure on a window bay specimen using the above procedure.

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Report No. TT 507017-202 Page 11 of 30



5.0 CALCULATIONS

Not used.

6.0 RESULTS

Three specimens were subjected to static air pressure testing. Tables A1 through A3 present the results of the uniform static air pressure tests.

The testing had the following results, reported here as required by TAS 202:

- The average maximum deflection recorded was 1.452 inches at the center of the window, as recorded by the Linear Position Transducers. (TAS 10.6)
- Permanent deformation is provided in Tables A1 through A3. Locations of LPT's and DI's are documented at Figure 1. (TAS 10.7)
- Pressure differences exerted across the specimens (TAS 10.9) are tabulated on the spreadsheets and graphs following the test photos below.
- The maximum positive pressure used in the tests was 48 pounds per square inch (psi). The maximum negative pressure used in the tests was 62 pounds per square inch (psi). No visible failure of the specimen was noted during the testing. (TAS 10.10)
- After testing, with the exception of permanent deformation, especially at the exterior side of the sill plate, the condition of the test specimens was generally good. Only the exterior side of the sill plate was damaged. (TAS 10.11)
- These tests were conducted in accordance with TAS 202. (TAS 10.13)
- Upon completion of all testing, the specimens meet the requirement of Section 1619 of the *Florida Building Code, Building* and TAS 202 for a DP40 (+40 psf/-40 psf) window. (TAS 10.12 and 10.14)
- Film was used to seal against air leakage. In the judgment of the test engineer, the film did influence the results of the test.

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests Patio Roof Panels</i>
<i>Orig. Issue Date: 2008-07-11</i>	<i>Approval:</i>	<i>Report No. TT 507017-202</i>
<i>Revision Date: 2012-08-22</i>	<i>RWC</i>	<i>Page 12 of 30</i>
<i>Revision #: 2.0</i>		



As required by TAS 202, Section 9, the Lab notified Americo Segura seven working days before the test, and recorded the tests on video. Americo Segura did not observe the test. The video documentation is on file and available upon request.

The results of the above measurements, test specific failures, and other pertinent data (TAS 10.16) are tabulated within the spreadsheets.

<i>Terrapin Testing</i>		<i>Laminated Sandwich Panel Tests Patio Roof Panels</i>
<i>Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0</i>	<i>Approval: RWC</i>	<i>Report No. TT 507017-202</i> <i>Page 13 of 30</i>



Appendix B

Water Penetration Tests

1.0 INTRODUCTION

Terrapin Testing performed water resistance tests on window bays for **Four Seasons Solar Products (FSSP)**. These are used primarily in patio rooms. The tests were performed to DP 40 (40 psf).

2.0 REPORT IDENTIFICATION

This Appendix is incorporated into the main report, number TT **507017-202**. Please see additional report identification information within Section 2.0 of the main report.

3.0 SAMPLE DESCRIPTION

The products tested were Series 230 Sun & Shade window bays, **3 inches thick and 48 inches wide, assembled into 8-by-8-foot specimens**, using the same configuration as proposed for use in the field. Please see sample description in Section 3.0 of the main report.

4.0 STANDARDS AND REFERENCE

The water resistance tests were performed in accordance with the provisions of **Florida Building Code HVHZ TAS 202-94 (TAS 202)**, Criteria For Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.

5.0 TEST PROCEDURES AND EQUIPMENT

Water is sprayed on the specimen at a rate of +5 gph while pressure is maintained for 15 minutes.

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Report No. TT 507017-202 Page 17 of 30



6.0 RESULTS

Three specimens were subjected to water resistance testing. Leakage was observed when tested at DP50. The specimens were dried and subjected to water resistance testing at DP40, where no leakage was observed. The results were:

Water Penetration Resistance (ASTM E 547)

	Results	Allowed
DP 40: 300 Pa (6 psf):	No Leakage	No Leakage
DP 50: 375 Pa (7.5 psf):	Leakage	No Leakage

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels Report No. TT 507017-202
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Page 18 of 30



Appendix C

Air Infiltration Tests

1.0 INTRODUCTION

Terrapin Testing performed air filtration tests on window bays for **Four Seasons Solar Products (FSSP)**. These are used primarily in patio rooms.

2.0 REPORT IDENTIFICATION

This Appendix is incorporated into the main report, number TT **507017-202**. Please see additional report identification information within Section 2.0 of the main report.

3.0 SAMPLE DESCRIPTION

The products tested were Series 230 Sun & Shade window bays, **3 inches thick and 48 inches wide, assembled into 8-by-8-foot specimens**, using the same configuration as proposed for use in the field. Please see sample description in Section 3.0 of the main report.

4.0 STANDARDS AND REFERENCE

The air filtration tests were performed in accordance with the provisions of **Florida Building Code HVHZ TAS 202-94 (TAS 202)**, Criteria For Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure, which references ASTM E 283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen (ASTM E 283).

5.0 TEST PROCEDURES

A positive (infiltration) air pressure of 1.57 psf is applied and the amount of air flow is measured twice. Once while all operable cracks are covered and again when all operable cracks are uncovered. The difference in air flow is the "air leakage". Maximum allowed value is from AAMA 101 as ASTM E283 does not list a maximum.

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Report No. TT 507017-202 Page 19 of 30



6.0 RESULTS

Three specimens were subjected to air infiltration testing. Air leakage results were:

Table C1 - Total Air Leakage

Test #	Air Pressure	Results	Allowed
1	75 Pa (1.57 psf)	1.29 L/s (2.56 cfm)	n/a
2	75 Pa (1.57 psf)	2.95 L/s (6.26 cfm)	n/a
3	75 Pa (1.57 psf)	2.03 L/s (4.30 cfm)	n/a

Table C2 - Air Leakage Over Operable Crack Perimeter

Test #	Air Pressure	Results	Allowed
1	75 Pa (1.57 psf)	0.15 L/s/m (0.10 cfm/ft)	n/a
2	75 Pa (1.57 psf)	0.37 L/s/m (0.24 cfm/ft)	n/a
3	75 Pa (1.57 psf)	0.22 L/s/m (0.14 cfm/ft)	n/a

Table C3 - Air Leakage Over Window Area (Outside Frame Dimension)

Test #	Air Pressure	Results	Allowed
1	75 Pa (1.57 psf)	0.20 L/s/m ² (0.04 cfm/ft ²)	1.5 L/s/m ² (0.3 cfm/ft ²)
2	75 Pa (1.57 psf)	0.51 L/s/m ² (0.10 cfm/ft ²)	1.5 L/s/m ² (0.3 cfm/ft ²)
3	75 Pa (1.57 psf)	0.36 L/s/m ² (0.07 cfm/ft ²)	1.5 L/s/m ² (0.3 cfm/ft ²)

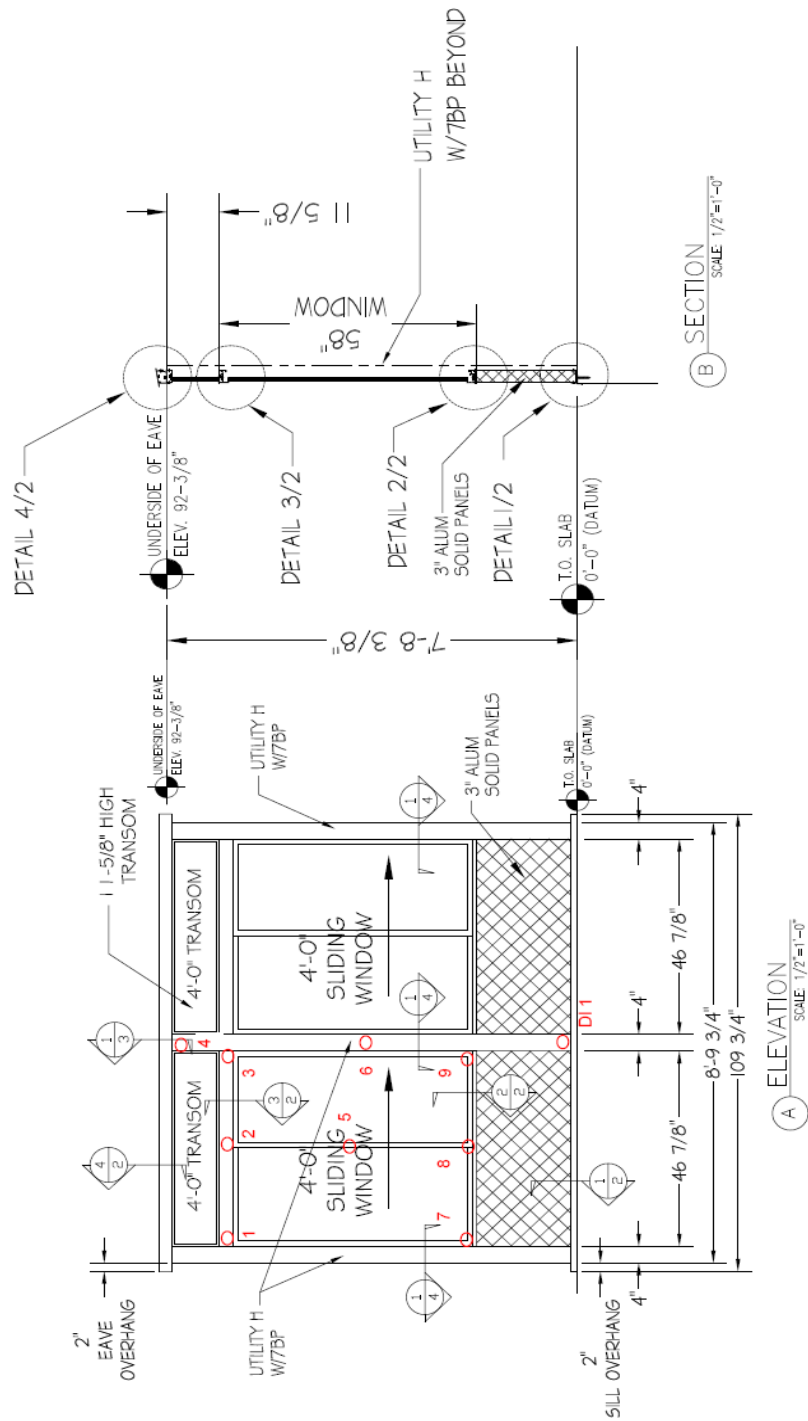
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<i>Orig. Issue Date: 2008-07-11</i>		<i>Patio Roof Panels</i>	
<i>Revision Date: 2012-08-22</i>		<i>Report No. TT 507017-202</i>	
<i>Revision #: 2.0</i>		<i>Approval:</i> RWC	<i>Page 20 of 30</i>



Appendix D

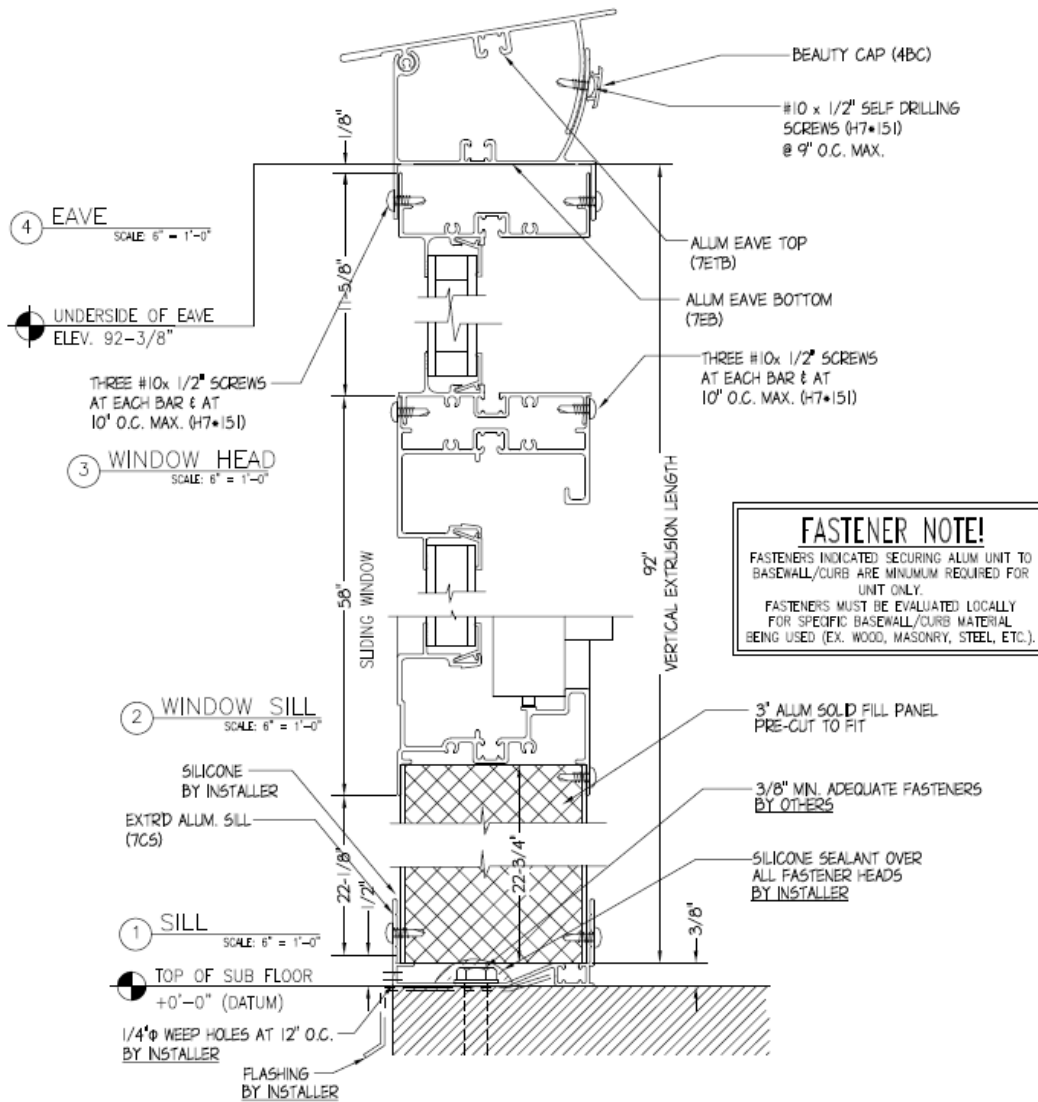
Detailed Product Information

Terrapin Testing		Laminated Sandwich Panel Tests Patio Roof Panels Report No. TT 507017-202
Orig. Issue Date: 2008-07-11 Revision Date: 2012-08-22 Revision #: 2.0	Approval: <i>RWC</i>	Page 21 of 30



O = LPT

Terrapin Testing		Laminated Sandwich Panel Tests	
Orig. Issue Date: 2008-07-11		Patio Roof Panels	
Revision Date: 2012-08-22		Report No. TT 507017-202	
Revision #: 2.0		Approval: RWC	Page 22 of 30



Terrapin Testing

Orig. Issue Date: **2008-07-11**
 Revision Date: **2012-08-22**
 Revision #: **2.0**

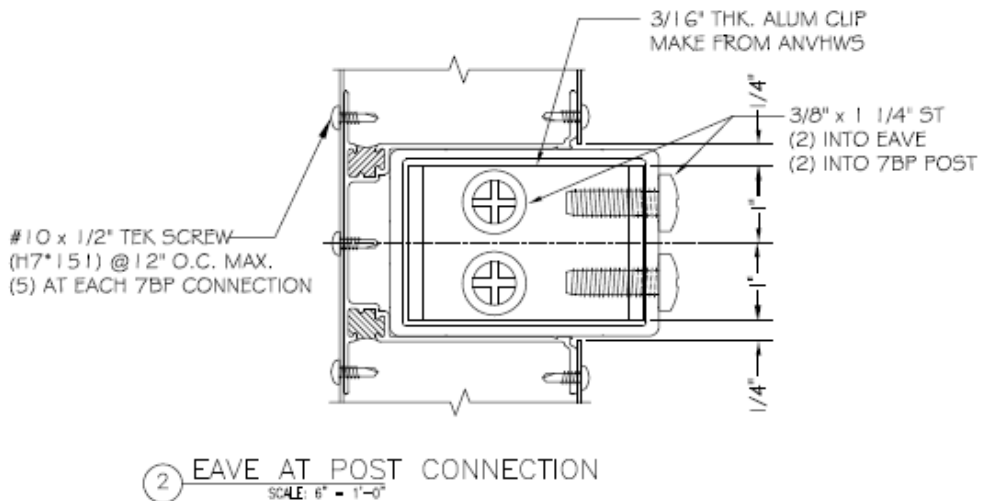
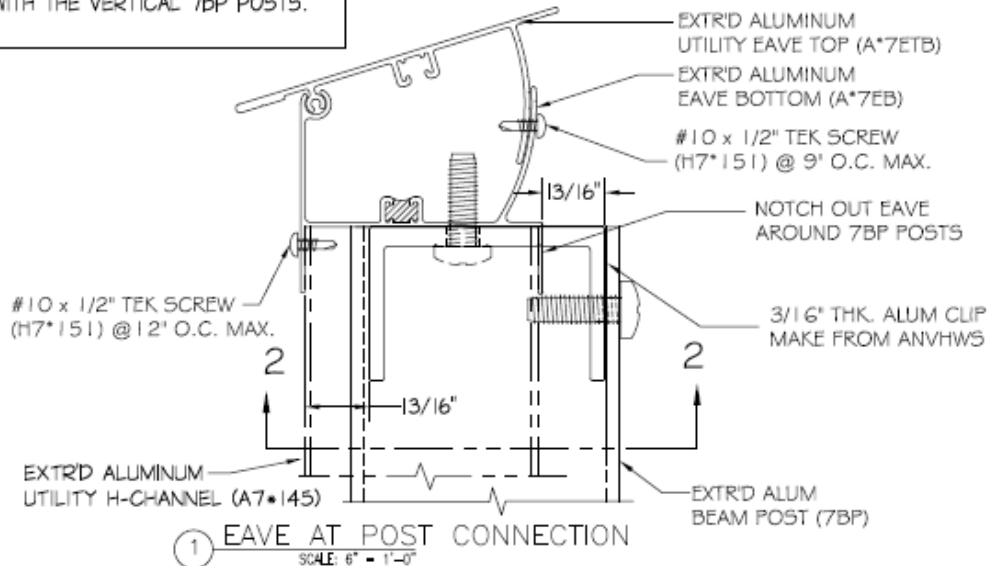
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Laminated Sandwich Panel Tests
Patio Roof Panels

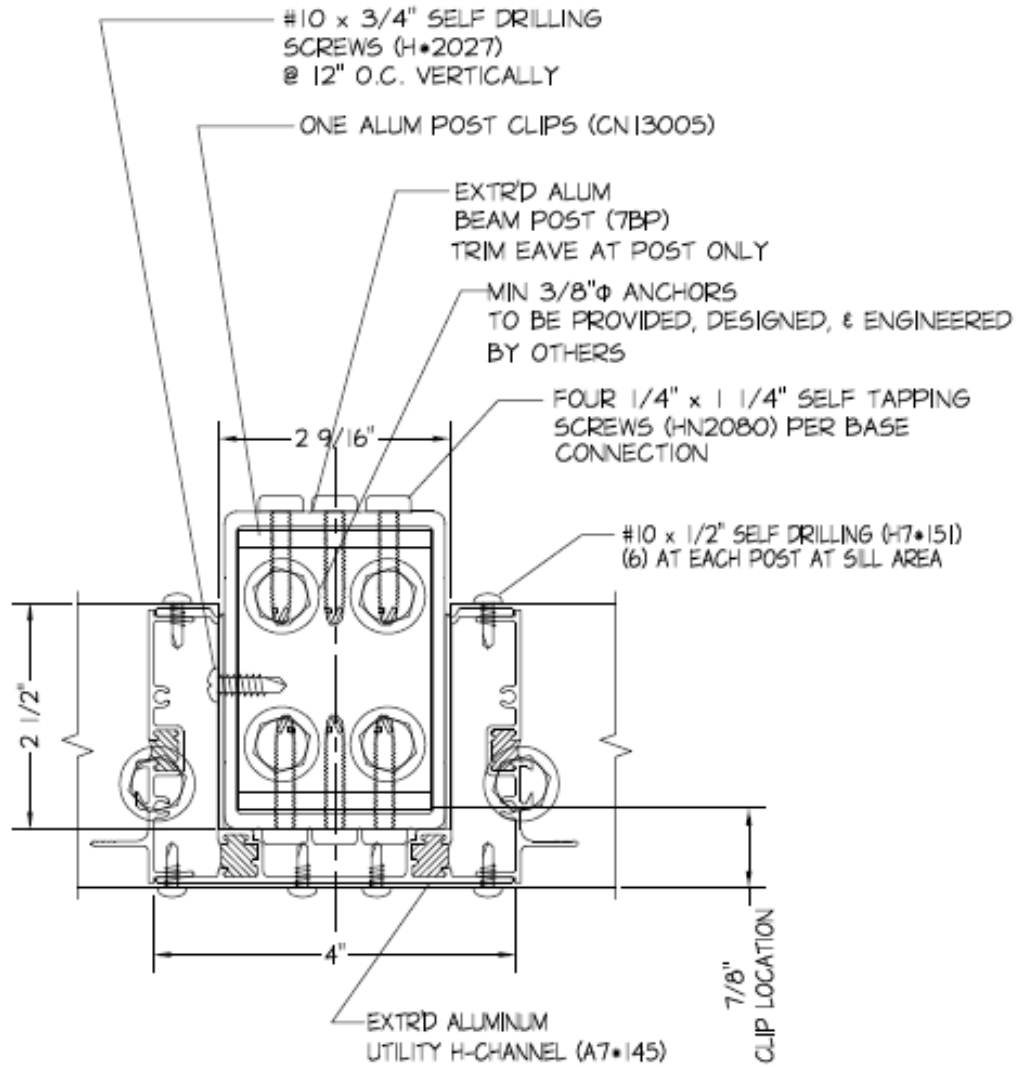
Report No. **TT 507017-202**



NOTE:
 BEFORE INSTALLING "U" CLIPS
 INTO THE EAVE, CHECK LOCATIONS
 WITH THE VERTICAL 7BP POSTS.

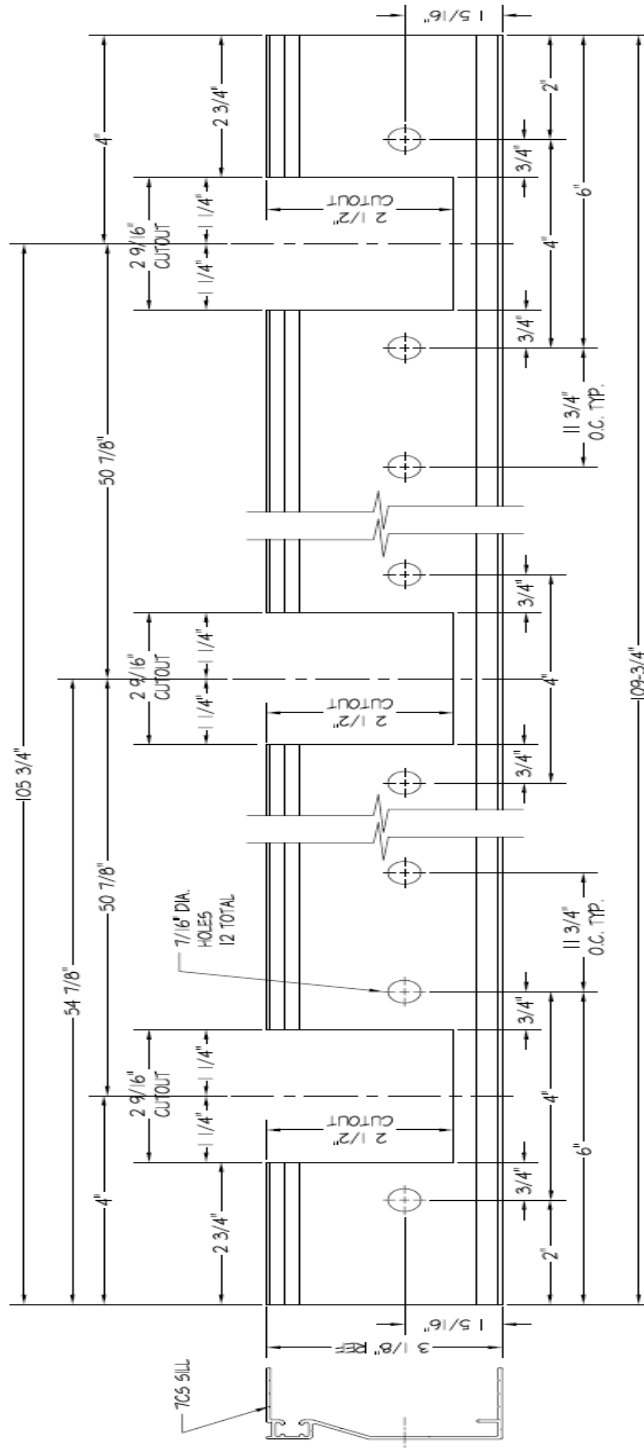


Terrapin Testing		Laminated Sandwich Panel Tests	
Orig. Issue Date: 2008-07-11		Patio Roof Panels	
Revision Date: 2012-08-22		Report No. TT 507017-202	
Revision #: 2.0		Approval: RWC	Page 24 of 30



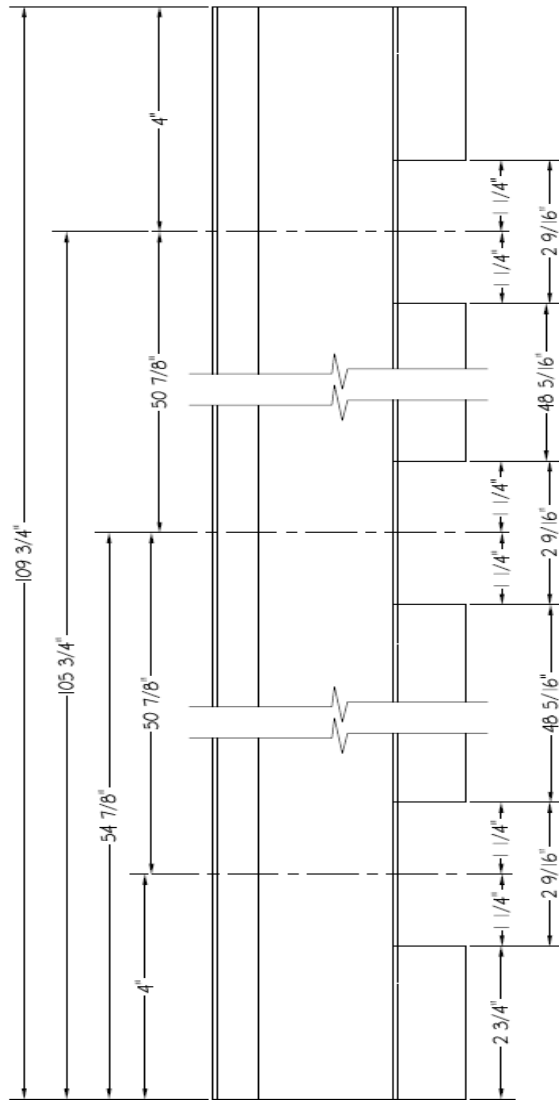
① PLAN UTILITY POST/7BP
 SCALE: 6"=1'-0"

Terrapin Testing		Laminated Sandwich Panel Tests	
<i>Orig. Issue Date: 2008-07-11</i>		<i>Patio Roof Panels</i>	
<i>Revision Date: 2012-08-22</i>		<i>Report No. TT 507017-202</i>	
<i>Revision #: 2.0</i>		<i>Approval:</i> RWC	<i>Page 25 of 30</i>

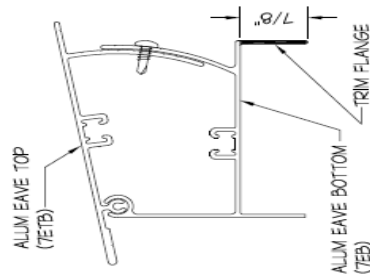


TCS SILL
 COLOR WHITE
 QTY 1

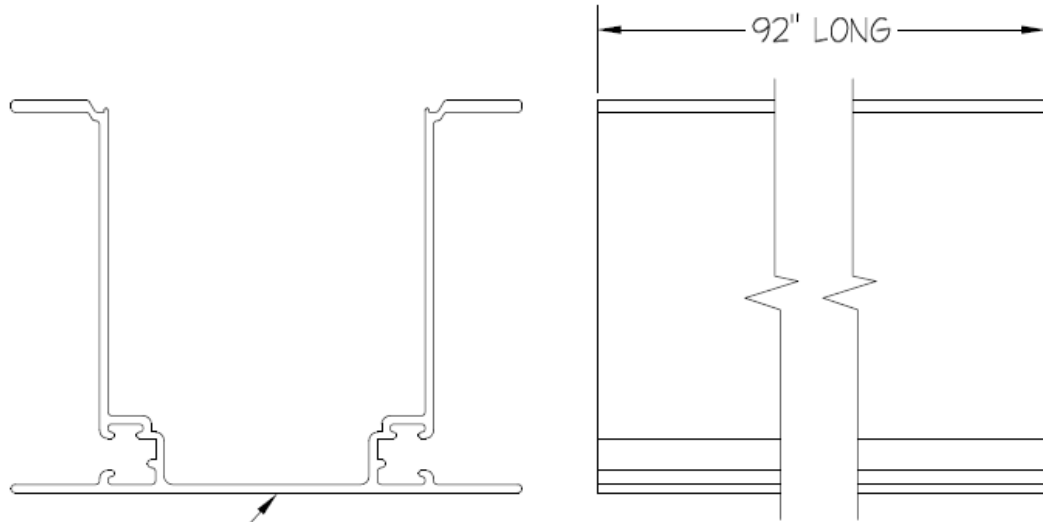
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Orig. Issue Date: 2008-07-11		Patio Roof Panels	
Revision Date: 2012-08-22		Report No. TT 507017-202	
Revision #: 2.0		Approval: RWC	Page 26 of 30



TEB EAVE BOTTOM
 TETB EAVE TOP
 COLOR WHITE
 QTY 1



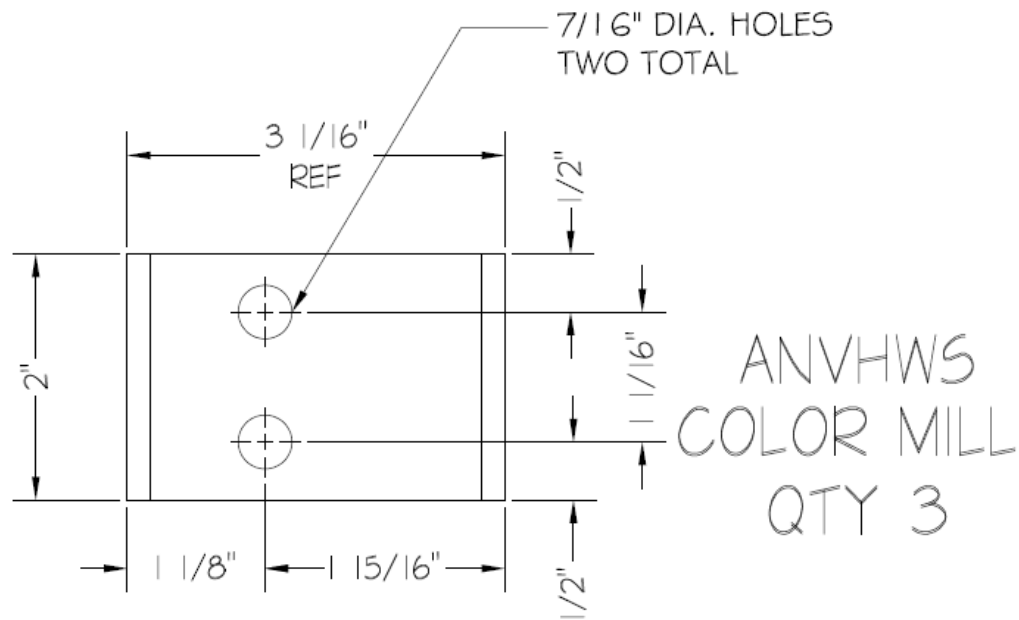
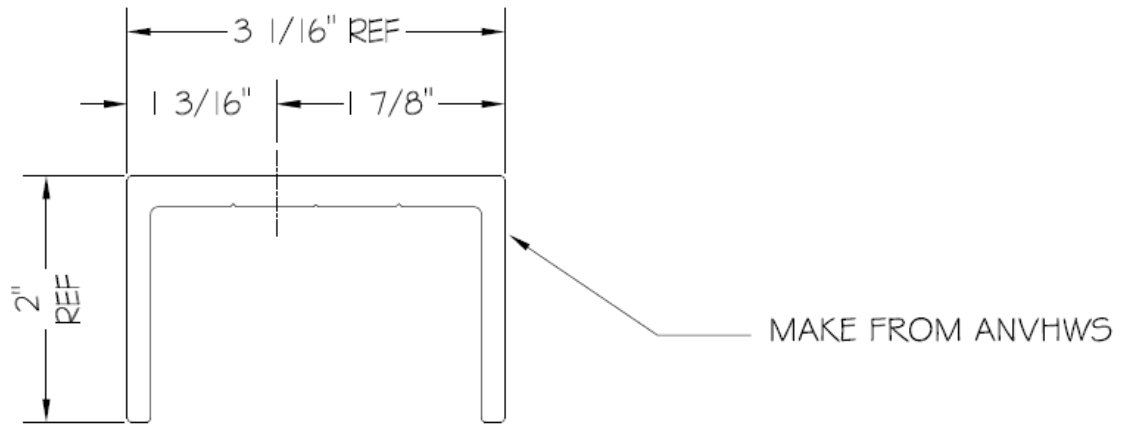
Terrapin Testing		Laminated Sandwich Panel Tests	
Patio Roof Panels		Patio Roof Panels	
Orig. Issue Date: 2008-07-11	Approval:	Report No. TT 507017-202	Page 27 of 30
Revision Date: 2012-08-22	RWC		
Revision #: 2.0			



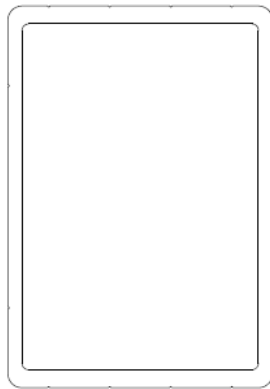
EXTR'D ALUMINUM
UTILITY H-CHANNEL (A7*145)

A7W145
COLOR WHITE
QTY 3

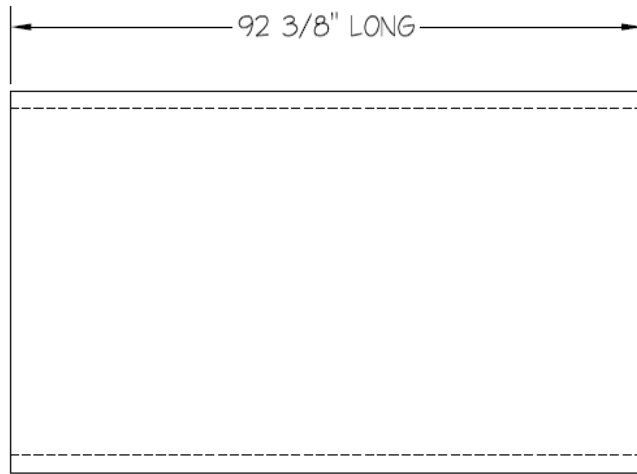
Terrapin Testing		Laminated Sandwich Panel Tests	
Orig. Issue Date: 2008-07-11		Patio Roof Panels	
Revision Date: 2012-08-22		Report No. TT 507017-202	
Revision #: 2.0		Approval: RWC	Page 28 of 30



Terrapin Testing		Laminated Sandwich Panel Tests	
<i>Patio Roof Panels</i>		<i>Patio Roof Panels</i>	
Orig. Issue Date: 2008-07-11	Approval: RWC	Report No. TT 507017-202	Page 29 of 30
Revision Date: 2012-08-22			
Revision #: 2.0			



EXTRD ALUMINUM
BEAM POST (7BP)



AN7BP
COLOR WHITE
QTY 3

Terrapin Testing		Laminated Sandwich Panel Tests	
Orig. Issue Date: 2008-07-11		Patio Roof Panels	
Revision Date: 2012-08-22		Report No. TT 507017-202	
Revision #: 2.0		Approval: RWC	Page 30 of 30