



### MANUFACTURER INFORMATION

- 1.0 NAME OF APPLICANT:** Transparent Protection System, Inc.  
6643 42<sup>nd</sup> Terrace North  
West Palm Beach, FL 33407  
888.447.8320
- 2.0 CONTACT PERSON:** Scott Kuntz
- 3.0 HTL TEST NOTIFICATION #:** N/A
- 4.0 HTL LAB CERTIFICATION:** Miami-Dade County (03-0507.09); Florida Building Code (TST1527);  
AAMA; WDMA; Keystone Certifications
- 5.0 REPORT INFORMATION:**

Specimen #	Test Date
7	1/14-17/05
8	1/25/05
9	1/26/05
10	1/18/05
11	1/18/05
12	1/19/05

### PRODUCT IDENTIFICATION

- 6.0 Product Type:** Polycarbonate Hurricane Shutter Panels
- 7.0 Model Number:** Clear Guard Polycarbonate Storm Panels
- 8.0 Performance Class and Overall Size:**

Specimen #	Performance Class	Overall Size
7	+/-104 psf	41" x 45"
8		
9		
10	+/-120 psf	
11		
12		

- 9.0 Configuration:** See Transparent Protection System, Inc. Drawing #03-155-1343b, sheet 1 for an elevation of this unit.
- 10.0 Drawing:** This test report is incomplete without the attached Transparent Protection System, Inc. Drawing #03-155-1343b, sheets 1 thru 3 each bearing the raised seal of Hurricane Test Laboratory, LLC.
- 11.0 Source of Sample:** Sample provided by Transparent Protection System, Inc.

### PRODUCT DESCRIPTION

- 12.0 DETAILED DESCRIPTION:**
- 12.1 Panel:** Each sample tested as part of this test program consisted of three (3) Storm Panels that were interlocked together. Each panel was fabricated from an extruded Thermoplastic Polycarbonate Resin plastic sheet having overall cross sectional properties as listed in the following table:

ENGINEER OF RECORD

1/26/05  
Vinu J. Abraham, P.E.  
FL Reg. # 53820



Description	Item #	Overall Cross Section
Storm Panel	1	2.000" (h) x 15.250" (w) x 0.100" (t)

The following procedures (typical) were utilized when assembling the shutter sample:

Storm Panel Attachment: Each Storm Panel was either direct mounted to the opening as listed in the installation section of this test report or was in-directly mounted to the opening using some or all of the accessories listed in Section 12.2 of this report. Each Storm Panel is mechanically fastened to the mounting accessories using 1/4"-20 x 3/4" studs and a keyhole washer (Item #8) and a washered wingnut (Item #9) located in each valley of the shutter.

**12.2 Storm Panel Mounting Accessories:** Some or all of the following (typical) accessories were utilized in the testing of the Storm Panel samples:

Description	Item #	Overall Cross Section	Aluminum Alloy
"H" Header	10	3.813" x 2.250" x 0.067"	6063-T6
Stud Angle	3	2.000" x 2.000" x 0.125"	6063-T6
Build Out "F" Track	5	1.660" x 3.375" x 0.090"	6063-T6
Build Out Stud Angle Assembly	3	2.000" x 2.000" x 0.125"	6063-T6
	7	2.000" x 5.000" x 0.125"	6063-T6
"F" Track			
Reverse "F" Angle	4	2.000" x 2.000" x 0.092"	6063-T6

Mounting Accessory Attachment: See the installation section of this report for details.

## PRODUCT INSTALLATION

**13.0** The following section of this report details how each specimen was installed into the provided openings:

Mounting Style	Substrate	Anchor Type	Anchor Schedule	Specimen #
"H" Header	Wood	1/4" x 2-12" Lag Screw (2-3/32" min. embed.)	2" from each end and 10" on center thereafter – 5 fasteners total.	7
		____ x ____" wood bushings		8
	CMU	1/4" x 2" ELCO Male Panelmate (1-1/4" min. embed.)		9
Stud Angle	CMU	1/4" x 2" ELCO Tapcon (1-1/4" min. embed.)	2" from each end and 10" on center thereafter – 5 fasteners total.	7
	CMU	____ x ____" lead anchors		11
"F" Track	CMU	____ x ____" lead anchors	2" from each end and 10" on center thereafter – 5 fasteners total.	8
	Wood	____ x ____" wood bushings		11
Build Out "F" Track	Wood	1/4" x 2-1/2" Lag Screw (2-3/32" min. embed.)	2" from each end and 10" on center thereafter – 5 fasteners total.	10
Build Out Stud Angle Assembly	CMU	1/4" x 2" ELCO Tapcon (1-1/4" min. embed.)	2" from each end and 10" on center thereafter – 5 fasteners total.	10

**ENGINEER OF RECORD**

1/26/05  
**Vinu J. Abraham, P.E.**  
 FL Reg. # 53820



Mounting Style	Substrate	Anchor Type	Anchor Schedule	Specimen #
Direct	CMU	1/4" x 2" ELCO Male Panelmate (1-1/4" min. embed.)	1" from each end and 6-1/2" on center thereafter – 7 fasteners total.	12
Reverse "F" Track	Wood	1/4" x 2" ELCO Female Panelmate (1-1/4" min. embed.)	2" from each end and 10" on center thereafter – 5 fasteners total.	9 and 12

**TEST RESULTS**

**14.0 SUMMARY OF RESULTS:**

Test Method	Test Conditions	Specimen #
Large Missile Impact Test (ASTM E1886/1996)	--	7, 8, 9, 10, 11 and 12
Cyclic Load Test (ASTM E1886/1996)	See section 8.0	7, 8, 9, 10, 11 and 12

**15.0 TEST SEQUENCE:**

TEST SEQUENCE	Specimen #
Large Missile Impact Test. Positive Cyclic Load Test Negative Cyclic Load Test.	7, 8, 9, 10, 11 and 12

**16.0 Specimen #7-#12 - LARGE MISSILE IMPACT TEST:**

**16.1 IMPACT DATA:**

**Missile Weight:** 9 lb.

**Missile Length:** 96 in.

Specimen #	Impact #	Velocity (ft/s)	X Coordinate (in.)	Y Coordinate (in.)	Instant Deflection (in.)	Permanent Deflection (in.)
7	1	49.53	20.50	21.50	7.50	0.63
	2	49.73	11.00	36.50	3.00	0.50
	3	49.93	32.00	7.75	7.00	0.75
8	1	49.60	19.50	20.25	7.50	1.50
	2	49.86	8.50	33.50	6.00	4.50
	3	50.03	28.00	6.00	1.50	0.00
9	1	50.00	20.50	20.00	6.00	5.00
	2	50.10	9.50	34.00	2.00	0.50
	3	50.23	29.00	7.50	2.00	0.75

**ENGINEER OF RECORD**



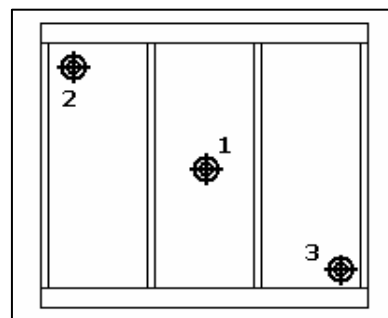
Specimen #	Impact #	Velocity (ft/s)	X Coordinate (in.)	Y Coordinate (in.)	Instant Deflection (in.)	Permanent Deflection (in.)
10	1	49.68	21.00	20.50	5.50	2.00
	2	49.24	10.00	34.00	2.00	0.75
	3	49.60	34.00	10.00	5.00	1.50
11	1	49.60	22.00	20.00	9.50	6.50
	2	49.86	7.00	34.50	1.50	1.00
	3	49.36	32.25	8.50	4.00	3.00
12	1	49.86	20.50	21.50	6.00	4.00
	2	49.41	10.50	34.00	3.50	3.00
	3	49.98	31.75	8.00	3.50	2.00

**16.2 IMPACT LOCATIONS AND REMARKS:**

Each impact test conducted on this specimen was performed in accordance with the requirements of ASTM E1886/1996.

All of the impacts hit their intended targets resulting in the recorded measurements.

Upon completion of the missile impact test, this sample subsequently underwent the cyclic load test as specified by ASTM E1886/E1996.



**17.0 CYCLIC LOAD TEST**

**17.1 CYCLIC TEST PRESSURE:**

Specimen #	CYCLIC TEST PRESSURE	
	$(P_d)_{in} = P_{max}$	$(P_d)_{out} = P_{max}$
7, 8 and 9	104 psf	104 psf
10, 11 and 12	120 psf	120 psf

**17.2 CYCLIC LOAD SPECTRUM:**

**17.2.1 POSITIVE CYCLIC LOAD SPECTRUM:**

Specimen #	# OF INWARD ACTING CYCLES/STAGE			
	3500	300	600	100
7, 8 and 9	20.8 – 52 (psf)	0 – 62.4 (psf)	20.8 – 83.2 (psf)	21.2 – 104 (psf)
10, 11 and 12	24 – 60 (psf)	0 – 72 (psf)	60 – 96 (psf)	36 – 120 (psf)

ENGINEER OF RECORD

1/26/05  
 Vinu J. Abraham, P.E.  
 FL Reg. # 53820



**17.2.2 NEGATIVE CYCLIC LOAD SPECTRUM:**

Specimen #	# OF OUTWARD ACTING CYCLES/STAGE			
	3500	300	600	100
<b>7, 8 and 9</b>	21.2 – 104 (psf)	20.8 – 83.2 (psf)	0 – 62.4 (psf)	20.8 – 52 (psf)
<b>10, 11 and 12</b>	36 – 120 (psf)	60 – 96 (psf)	0 – 72 (psf)	24 – 60 (psf)

**17.3 DEFLECTION DATA:**

SPECIMEN #	Location	POSITIVE LOAD		NEGATIVE LOAD	
		Measured % Recovery	Allowable % Recovery	Measured % Recovery	Allowable % Recovery
<b>7</b>	Geometric Center of Panel	90.00	80.00	100.00	80.00
<b>8</b>		85.71	80.00	85.29	80.00
<b>9</b>		100.00	80.00	82.14	80.00
<b>10</b>		92.31	80.00	90.00	80.00
<b>11</b>		88.89	80.00	93.33	80.00
<b>12</b>		87.50	80.00	88.88	80.00

**17.4 REMARKS:**

This sample was inspected carefully upon completion of the cyclic test for failures. None were found. As such, this specimen was found to satisfy the cyclic test requirements of ASTM E1886-97/1996-02.

**MISCELLANEOUS INFORMATION**

**18.0 CERTIFICATION & DISCLAIMER STATEMENT:**

All tests performed on this test specimen were conducted in accordance with the specifications of the applicable codes, standards & test methods listed below by the Hurricane Test Laboratory, LLC located at 6655 Garden Road, Riviera Beach, FL 33404. HTL does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested at HTL. HTL is not owned, operated or controlled by any company manufacturing or distributing products it tests. This report is only intended for the use of the entity named in section 1.0 of this report. Detailed assembly drawings showing wall thickness of all members, corner construction and hardware applications are on file and have been compared to the test specimen submitted. A copy of this test report along with representative sections of the test specimen will be retained at HTL for a period of three (3) years. All results obtained apply only to the specimen tested and they do indicate compliance with the performance requirements of the test methods and specifications listed in the following section.

**19.0 APPLICABLE CODES, STANDARDS & TEST METHODS:**

**ASTM E1886-97** – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.

**ASTM E1996-02** – Standard Specification for Performance of Exterior Walls, Glazed Curtain Walls, Doors, and Storm Shutters Impacted by Windborne Debris in Hurricanes.

**ENGINEER OF RECORD**

1/26/05  
**Vinu J. Abraham, P.E.**  
 FL Reg. # 53820



**HURRICANE TEST LABORATORY, LLC**  
**TESTING AND EVALUATION SOLUTIONS**  
[www.htltest.com](http://www.htltest.com)

**Report #: 0239-0107-05**  
**Specimen #: See Section 5.0**  
**Report Expiration Date: 1/26/10**  
**Page 6 of 6**

**20.0 LIST OF OFFICIAL OBSERVERS:**

Vinu J. Abraham – HTL, Professional Engineer  
Urmilla Jokhu-Sowell – HTL, Professional Engineer  
Dylan O'Berry – HTL, Technician  
Fred Ciavola – HTL, Technician  
Scott Kuntz - Transparent Protection System, Inc

**ENGINEER OF RECORD**

1/26/05  
Vinu J. Abraham, P.E.  
FL Reg. # 53820