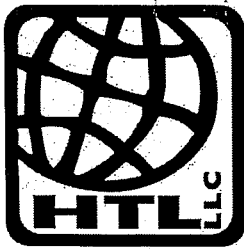


HURRICANE TEST LABORATORY, LLC  
*Testing & Evaluation Solutions*



Transparent Protection  
System, Inc.

Removable Hurricane Panels



**MANUFACTURER INFORMATION**

- 1.0 NAME OF APPLICANT:** Transparent Protection Systems, 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:**

TPS Specimen #	Report #	Specimen #	Panel Type	Test Date
1	0239-0107-05	25	Polyolefin with proprietary additive	2/10/05
1a		26		1/25/05
2		32		2/17/05
3		33		2/17/05
4		34		2/17/05
6		16		1/24/05
7		17		1/20/05
8		18		1/21-24/05
5 and 9		19		1/27-2/1/05
10		22		2/7/05
11		22a		2/7/05
12a		30		2/10-15/05
13		21		2/3/05
14		30a		2/14-15/05
15		13		1/25/05
16		14		1/27-28/05
17 and 12		15		1/31-2/1/05
20		20		2/1-3/05
18		23		2/9/05
19	24	2/7/05		
24	0239-0216-05	1	(Combo System)	2/15/05
23		2	Polycarbonate/ Polyolefin	2/28/05
21 and 22		3	with proprietary additive	2/21-28/05

**PRODUCT IDENTIFICATION**

- 6.0 Product Type:** Removable Hurricane Panels
- 7.0 Model Number:** Polyolefin with proprietary additive and Combo system
- 8.0 Performance Class and Overall Size:**

TPS Specimen #	Specimen #	Performance Class	Overall Size
15	13	+/-70 psf	41" x 45"
16	14		
17 and 12	15		

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TPS Specimen #	Specimen #	Performance Class	Overall Size
6	16	+/-100 psf	41" x 45"
7	17	+/-120 psf	
8	18	+120/-100 psf	
1	25	+/-90 psf	
1a	26	+/-90 psf	
5 and 9	19	+45/-40 psf	41" x 120"
10	22	+40/-40 psf	
11	22a	+40/-40 psf	
12a	30	+/-55 psf	41" x 57"
13	21	+43/-35 psf	41" x 70"
20	20	+/-26.5 psf	41" x 87"
14	30a	+25/-25 psf	
18	23	+25/-25 psf	
19	24	+25/-25 psf	
2	32	+/-65 psf	41" x 87"
3	33		
4	34		
24	1	+/-65 psf	
23	2		
21 and 22	3		

- 9.0 Configuration:** See Transparent Protection System, Inc. Drawing #05-TPS-0001, sheets 1 thru 3 for elevations of these units.
- 10.0 Drawing:** This test report is incomplete without the attached Transparent Protection System, Inc. Drawing #05-TPS-0001, 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 Panels:** Each sample tested as part of this test program consisted of three (3) Storm Panels that were interlocked together. There were two types of panels tested as described as follows:  
Polyolefin Panel (TPS #1-20): The polyolefin panel was fabricated from an extruded Thermoplastic Polymer Resin.  
Polycarbonate Panel (TPS #21-24): The polycarbonate panel was fabricated from an extruded Thermoplastic Polycarbonate Resin and was tested as the center panel in between two polyolefin panels.

The panels have overall cross sectional properties as listed in the following table:

Description	Item #	Overall Cross Section
Polyolefin Storm Panel	1	2.000" (h) x 15.250" (w) x 0.110" (t)
Polycarbonate Storm Panel	1a	2.000" (h) x 15.250" (w) x 0.070" (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

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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" (2" deep) x 0.067"	6063-T6
Super "H" Header	10a	5.000" x 2.000" x 0.125"	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	3	2.000" x 2.000" x 0.125"	6063-T6
Assembly	7	2.000" x 5.000" x 0.125"	6063-T6
"F" Track	6	1.675" x 0.380" x 0.095"	6063-T6
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	TPS 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.	13, 15
		5/8" x 1/2" wood bushings		16, 19
		1/4" x 2" ELCO Tapcon (1-1/4" min. embed.)		12, 12a
	CMU	1/4" x 2" ELCO Male Panelmate (1-1/4" min. embed.)		17, 20
		1/4" x 2" ELCO Tapcon (1-1/4" min. embed.)		14
Super "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.	18
2 x 2 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.	11 (trap), 15, 18
		1/4" x 2" ELCO Male Panelmate (1-1/4" min. embed.)		24 (trap)
		3/4" x 1/2" Solid Set lead anchors		1a, 7, 23
		3/4" x 1/2" Calk-in lead anchors		10
"F" Track	CMU	3/4" x 1/2" Solid Set lead anchors	2" from each end and 10" on center thereafter - 5 fasteners total.	16
		3/4" x 1/2" Calk-in lead anchors		19
	Wood	5/8" x 1/2" wood bushings		1a, 7, 10, 23

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Mounting Style	Substrate	Anchor Type	Anchor Schedule	TPS Specimen #
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.	1, 2, 3, 4, 5, 6, 9, 21, 22
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.	1, 2, 3, 4, 5, 6, 9, 21, 22
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.	8
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.	8, 11, 17, 20
	CMU	1/4" x 2" ELCO Tapcon (1-1/4" min. embed.)		12, 14, 12a, 24
		3/4" x 1/2" lead anchors		13

**TEST RESULTS**

**14.0 SUMMARY OF RESULTS:**

TEST METHOD	TEST CONDITIONS	SPECIMEN #
Static Load Test (ASTM E330 and TAS 202)	See Section 8.0	15, 19, 20, 21, 25, 26, 30, 32, 33, 34, 3
Large Missile Impact Test (ASTM E1886/1996)	--	13, 14, 15, 16, 17, 18, 19, 22, 22a, 23, 24, 30a, 1, 2, 3
Cyclic Load Test (ASTM E1886/1996)	See section 8.0	13, 14, 15, 16, 17, 18, 19, 22, 22a, 23, 24, 30a, 1, 2, 3

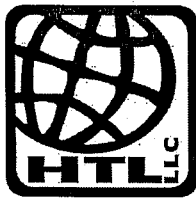
**15.0 TEST SEQUENCE:**

TEST SEQUENCE	SPECIMEN #
Uniform static load test at positive pre load Uniform static load test at positive design load Uniform static load test at positive over load Uniform static load test at negative pre load Uniform static load test at negative design load Uniform static load test at negative over load	15, 19, 20, 21, 25, 26, 30, 32, 33, 34, 3
Large Missile Impact Test Positive Cyclic Load Test Negative Cyclic Load Test	13, 14, 15, 16, 17, 18, 19, 22, 22a, 23, 24, 30a, 1, 2, 3

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**16.0 UNIFORM STATIC LOAD TEST RESULTS:**

**16.1 DEFLECTION DATA:**

Specimen #	Location	Load (psf)	Net Deflection (in.)	Permanent Set (in.)	Percent Recovery (%)
15 TPS #12	Geometric Center of Shutter	+52.5	0.875	0.000	100.00
		+70	1.000	0.063	93.80
		+105	1.250	0.125	90.00
		-52.5	1.000	0.000	100.00
		-70	1.625	0.125	92.30
		-105	1.750	0.250	85.70
19 TPS #5	Geometric Center of Shutter	+33.75	7.75	0.12	98.40
		+45	8.50	0.13	98.45
		+67.5	13.63	3.25	76.15
		-33.75	8.13	1.75	78.46
		-45	9.25	3.00	67.57
		-67.5	12.00	5.25	56.25
20 TPS #20	Geometric Center of Shutter	+19.87	2.00	0.00	100.00
		+26.5	2.88	0.25	91.30
		+39.75	4.25	0.50	88.24
		-19.87	3.00	0.25	91.67
		-26.5	5.00	0.75	85.00
		-39.75	6.50	1.00	84.62
21 TPS #13	Geometric Center of Shutter	+32.25	1.50	0.25	83.33
		+43	2.00	0.25	87.50
		+64.5	3.50	0.50	85.71
		-26.25	1.50	0.25	83.33
		-35	2.00	0.25	87.50
		-52.5	3.00	0.50	83.33
25 TPS #1	Geometric Center of Shutter	+67.5	0.91	0.16	82.71
		+90	1.18	0.24	79.46
		+135	1.92	0.33	82.72
		-67.5	0.73	0.07	90.29
		-90	0.91	0.18	80.50
		-135	1.52	0.25	83.53

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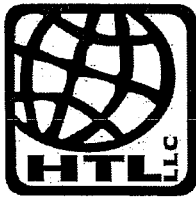


Specimen #	Location	Load (psf)	Net Deflection (in.)	Permanent Set (in.)	Percent Recovery (%)
26 TPS #1a	Geometric Center of Shutter	+67.5	0.32	0.00	99.38
		+90	0.48	0.01	98.96
		+135	1.31	0.04	96.73
		-67.5	0.64	0.07	89.39
		-90	0.78	0.05	93.24
		-135	1.19	0.07	94.36
30 TPS #12a	Geometric Center of Shutter	+41.25	1.25	0.00	100.00
		+55	1.75	0.00	100.00
		+82.5	2.25	0.75	66.67
		-41.25	1.25	0.13	90.00
		-55	1.75	0.25	85.71
		-82.5	2.75	0.00	100.00
32 TPS #2	Geometric Center of Shutter	+48.75	6.72	0.74	88.99
		+65	8.22	1.28	84.43
		+97.5	11.78	2.25	80.90
		-48.75	3.55	0.30	91.55
		-65	5.75	0.67	88.35
		-97.5	7.25	1.48	79.59
33 TPS #3	Geometric Center of Shutter	+48.75	8.97	0.93	89.63
		+65	9.95	1.74	82.51
		+97.5	12.34	2.94	76.18
		-48.75	3.86	0.00	100.00
		-65	4.84	0.05	98.97
		-97.5	5.70	0.64	88.77
34 TPS #4	Geometric Center of Shutter	+48.75	8.37	0.93	88.89
		+65	9.32	1.38	85.19
		+97.5	10.98	2.44	77.78
		-48.75	6.28	1.27	79.78
		-65	7.08	1.94	72.60
		-97.5	8.55	2.20	74.27

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Specimen #	Location	Load (psf)	Net Deflection (in.)	Permanent Set (in.)	Percent Recovery (%)
3 TPS #21	Geometric Center of Shutter	+48.75	8.11	0.28	96.52
		+65	9.71	0.30	96.91
		+97.5	11.11	1.50	86.50
		-48.75	4.90	2.62	46.53
		-65	5.70	2.82	50.53
		-97.5	6.95	2.95	57.55

**17.0 LARGE MISSILE IMPACT TEST:**

**17.1 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.)
13 TPS #15	1	49.48	20.50	21.50	5.00	1.00
	2	49.19	9.50	33.50	3.50	1.50
	3	49.63	32.50	14.00	4.50	1.00
14 TPS #16	1	49.86	20.00	20.50	5.75	0.75
	2	49.95	9.75	33.75	2.75	1.00
	3	49.75	30.75	11.50	5.25	0.88
15 TPS #17	1	49.73	19.00	19.00	7.50	2.50
	2	49.02	31.00	35.00	8.00	1.00
	3	49.12	7.00	6.00	7.50	2.50
16 TPS #6	1	50.92	21.50	22.25	5.50	3.25
	2	49.07	7.50	37.00	3.50	3.00
	3	49.16	36.38	7.50	3.00	2.50
17 TPS #7	1	50.35	22.00	23.00	5.00	3.13
	2	50.03	11.00	34.50	3.13	2.00
	3	49.02	34.00	13.00	3.25	2.13
18 TPS #8	1	49.46	20.50	32.00	4.00	2.50
	2	49.24	6.25	34.00	3.50	2.50
	3	49.04	32.50	11.50	4.50	2.13

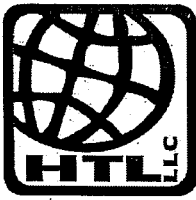
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Specimen #	Impact #	Velocity (ft/s)	X Coordinate (in.)	Y Coordinate (in.)	Instant Deflection (in.)	Permanent Deflection (in.)
<b>19</b> TPS #9	<b>1</b>	49.36	20.50	61.50	8.00	5.00
	<b>2</b>	49.02	33.00	16.50	10.50	2.50
	<b>3</b>	49.04	12.50	102.50	8.00	2.50
<b>30a</b> TPS #14	<b>1</b>	49.50	21.00	45.00	10.50	4.50
	<b>2</b>	49.46	32.00	12.50	10.50	2.50
	<b>3</b>	49.31	10.50	77.50	10.50	1.00
<b>22</b> TPS #10	<b>1</b>	49.14	21.00	60.00	6.39	5.50
	<b>2</b>	49.09	34.75	11.00	6.00	5.50
	<b>3</b>	49.00	11.00	107.00	8.00	3.00
<b>22a</b> TPS #11	<b>1</b>	49.58	21.25	58.75	6.51	4.60
	<b>2</b>	50.15	32.00	12.00	5.85	4.38
	<b>3</b>	49.63	10.25	104.75	7.08	2.85
<b>23</b> TPS #18	<b>1</b>	49.83	23.50	61.25	7.00	2.25
	<b>2</b>	49.35	34.50	12.00	6.75	4.50
	<b>3</b>	49.91	8.50	105.50	7.75	3.25
<b>24</b> TPS #19	<b>1</b>	48.95	23.75	44.00	7.00	1.00
	<b>2</b>	49.02	34.50	12.00	5.00	2.00
	<b>3</b>	49.02	8.88	74.50	7.00	1.00
<b>1</b> TPS #24	<b>1</b>	49.78	21.50	43.00	8.00	3.00
	<b>2</b>	49.55	34.00	6.00	7.50	3.00
	<b>3</b>	49.26	9.00	74.00	8.00	2.00
<b>2</b> TPS #23	<b>1</b>	49.12	21.50	43.50	6.00	5.00
	<b>2</b>	49.14	34.50	13.00	7.50	2.50
	<b>3</b>	49.14	8.25	72.50	8.00	3.00
<b>3</b> TPS #22	<b>1</b>	49.41	21.50	45.50	8.00	5.00
	<b>2</b>	49.50	34.38	10.50	9.00	3.00
	<b>3</b>	49.36	77.00	8.00	9.00	3.00

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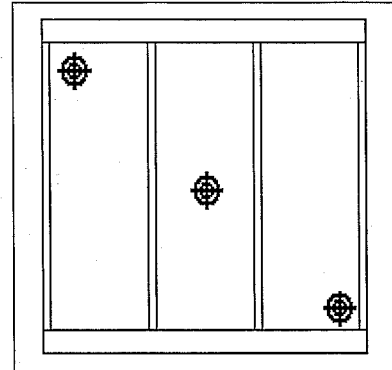
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**17.2 IMPACT LOCATIONS AND REMARKS:**

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.



**18.0 CYCLIC LOAD TEST:**

**18.1 CYCLIC TEST PRESSURE:**

Specimen #	CYCLIC TEST PRESSURE	
	$(P_d)_{in} = P_{max}$	$(P_d)_{out} = P_{max}$
13, 14, 15	70 psf	70 psf
16	100 psf	100 psf
17	120 psf	120 psf
18	120 psf	100 psf
19	45 psf	40 psf
22, 22a	40 psf	40 psf
23, 24, 30a	25 psf	25 psf
1, 2, 3	65 psf	65 psf

**18.2 CYCLIC LOAD SPECTRUM:**

**18.2.1 POSITIVE CYCLIC LOAD SPECTRUM:**

Specimen #	# OF INWARD ACTING CYCLES/STAGE			
	3500	300	600	100
13, 14, 15	14 – 35 (psf)	0 – 42 (psf)	35 – 56 (psf)	21 – 70 (psf)
16	20 – 50 (psf)	0 – 60 (psf)	50 – 80 (psf)	30 – 100 (psf)
17, 18	24 – 60 (psf)	0 – 72 (psf)	60 – 96 (psf)	36 – 120 (psf)
19	9 – 22.5 (psf)	0 – 27 (psf)	22.5 – 36 (psf)	13.5 – 45 (psf)
22, 22a	8 – 20 (psf)	0 – 24 (psf)	20 – 32 (psf)	12 – 40 (psf)
23, 24, 30a	5 – 12.5 (psf)	0 – 15 (psf)	12.5 – 20 (psf)	7.5 – 25 (psf)
1, 2, 3	13 – 32.5 (psf)	0 – 39 (psf)	32.5 – 52 (psf)	19.5 – 65 (psf)

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**18.2.2 NEGATIVE CYCLIC LOAD SPECTRUM:**

Specimen #	# OF OUTWARD ACTING CYCLES/STAGE			
	3500	300	600	100
13, 14, 15	21 – 70 (psf)	35 – 56 (psf)	0 – 42 (psf)	14 – 35 (psf)
16, 18	30 – 100 (psf)	50 – 80 (psf)	0 – 60 (psf)	20 – 50 (psf)
17	36 – 120 (psf)	60 – 96 (psf)	0 – 72 (psf)	24 – 60 (psf)
19, 22, 22a	12 – 40 (psf)	20 – 32 (psf)	0 – 24 (psf)	8 – 20 (psf)
23, 24, 30a	7.5 – 25 (psf)	12.5 – 20 (psf)	0 – 15 (psf)	5 – 12.5 (psf)
1, 2, 3	19.5 – 65 (psf)	32.5 – 52 (psf)	0 – 39 (psf)	13 – 32.5 (psf)

**18.3 DEFLECTION DATA:**

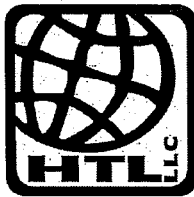
Specimen #	Location	Load (psf)	Net Deflection (in.)	Permanent Set (in.)	Percent Recovery (%)
<b>13</b> TPS #15	Geometric Center of Shutter	+70	0.88	0.13	85.71
		-70	1.00	0.00	100.00
<b>14</b> TPS #16	Geometric Center of Shutter	+70	4.25	1.50	64.71
		-70	2.50	0.25	90.00
<b>15</b> TPS #17	Geometric Center of Shutter	+70	1.06	0.25	76.47
		-70	1.13	0.38	66.67
<b>16</b> TPS #6	Geometric Center of Shutter	+100	1.50	0.50	66.67
		-100	2.00	0.13	93.75
<b>17</b> TPS #7	Geometric Center of Shutter	+120	2.00	0.88	56.25
		-120	2.75	0.50	81.82
<b>18</b> TPS #8	Geometric Center of Shutter	+120	0.88	0.06	92.86
		-100	1.00	0.00	100.00
<b>19</b> TPS #9	Geometric Center of Shutter	+45	9.63	5.00	48.05
		-40	9.13	4.00	56.16
<b>22</b> TPS #10	Geometric Center of Shutter	+40	7.25	4.50	37.93
		-40	10.38	8.00	22.89
<b>22a</b> TPS #11	Geometric Center of Shutter	+40	6.13	3.75	38.83
		-40	9.63	7.86	18.38

**ENGINEER OF RECORD**

9/7/05

Vinu J. Abraham, P.E.

FL Reg. # 53820



Specimen #	Location	Load (psf)	Net Deflection (in.)	Permanent Set (in.)	Percent Recovery (%)
23 TPS #18	Geometric Center of Shutter	+25	3.00	0.50	83.33
		-25	4.75	3.00	36.84
24 TPS #19	Geometric Center of Shutter	+25	4.50	1.50	66.67
		-25	5.50	1.50	72.73
30a TPS #14	Geometric Center of Shutter	+25	7.13	2.50	64.91
		-25	6.75	2.50	62.96
1 TPS #24	Geometric Center of Shutter	+65	3.99	0.33	91.73
		-65	3.24	0.62	80.86
2 TPS #23	Geometric Center of Shutter	+65	2.70	0.06	97.78
		-65	3.87	0.51	86.82
3 TPS #22	Geometric Center of Shutter	+65	13.57	5.12	62.27
		-65	6.85	2.10	69.34

**18.4 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**

**19.0 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.

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

**ASTM E330-02** - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

**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.

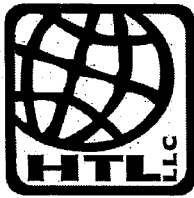
**ASTM E1996-02** - Standard Specification for Performance of Exterior Walls, Glazed Curtain Walls, Doors, and Storm Shutters Impacted by Windborne Debris in Hurricanes.

ENGINEER OF RECORD

9/7/05

Vinu J. Abraham, P.E.

FL Reg. # 53820



**HURRICANE TEST LABORATORY, LLC**  
**TESTING AND EVALUATION SOLUTIONS**  
**www.htltest.com**

**Report #: 0239-0107-05**  
**0239-0216-05**

**Specimen #: See Section 5.0**  
**Report Expiration Date: 9/7/10**  
**Page 12 of 12**

**Florida Building Code (HVHZ) Test Protocol TAS 202-94 – Criteria For Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.**

**21.0 LIST OF OFFICIAL OBSERVERS:**

Vinu J. Abraham – HTL, Professional Engineer  
Urmilla Jokhu-Sowell – HTL, Professional Engineer  
J.P. McDonald – HTL, Laboratory Operations Supervisor  
Fred Ciavola – HTL, Technician  
Scott Kuntz - Transparent Protection System, Inc.

**ENGINEER OF RECORD**

9/7/05

Vinu J. Abraham, P.E.

FL Reg. # 53820

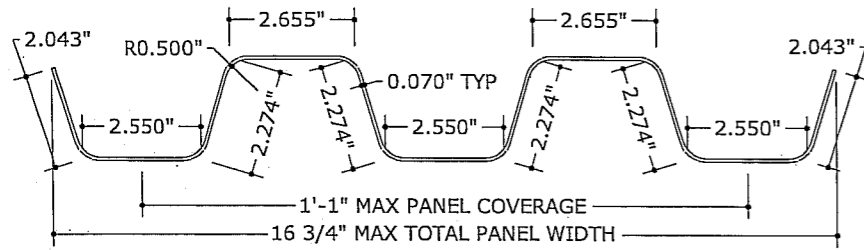


# POLYETHYLENE STORM PANELS (Non-HVHZ)

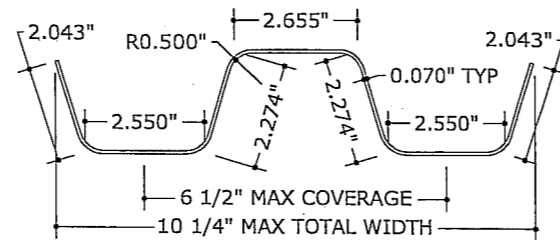
FRANK L. BENNARDO, P.E.  
# PE0046549

07/11/2005

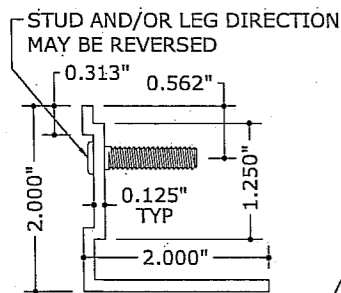
VALID FOR (1) JOB(S) ONLY  
VALID ONLY WITH RAISED ENGINEER SEAL



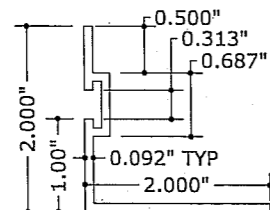
**1 FULL PANEL PROFILE**  
3" = 1'-0" (SEE GEN NOTE 7)



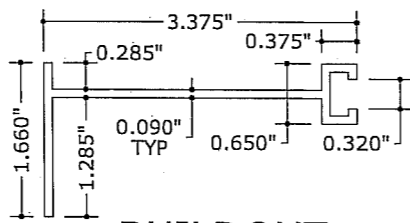
**2 HALF PANEL PROFILE**  
3" = 1'-0" (SEE GEN NOTE 7)



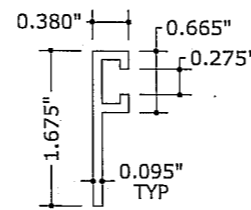
**3 STUD ANGLE**  
6" = 1'-0"



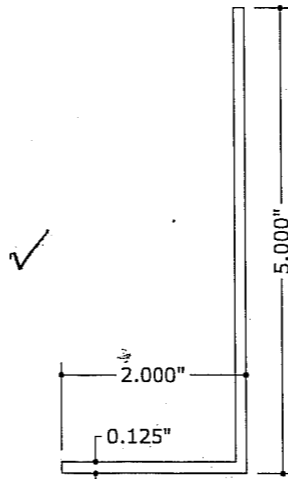
**4 REVERSE 'F' ANGLE**  
6" = 1'-0"



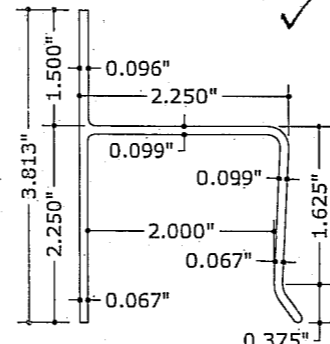
**5 BUILDOUT 'F' TRACK**  
6" = 1'-0"



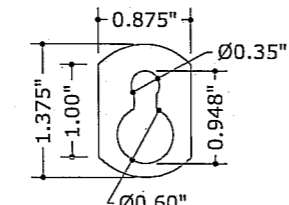
**6 'F' TRACK**  
6" = 1'-0"



**7 CLOSURE ANGLE**  
6" = 1'-0"



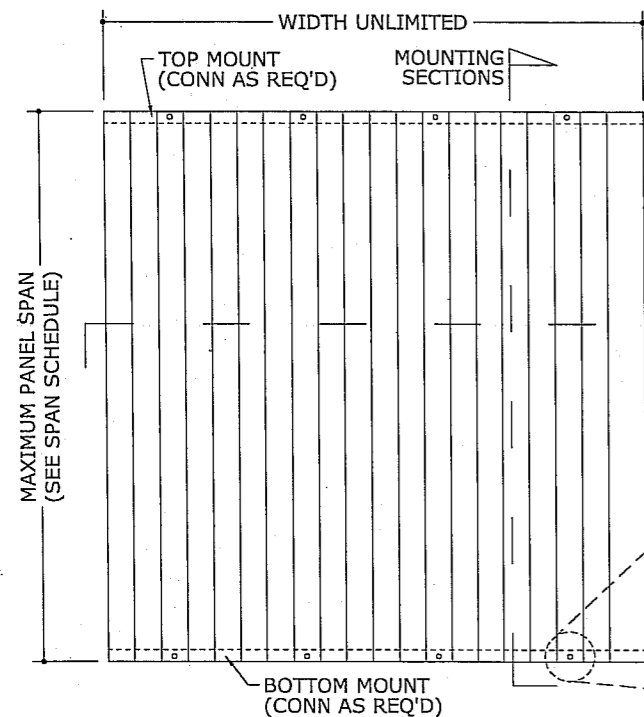
**10 'H' HEADER**  
6" = 1'-0"



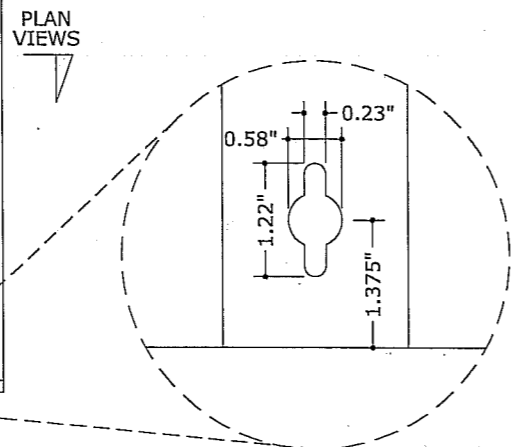
**8 KEYHOLE WASHER**  
6" = 1'-0"



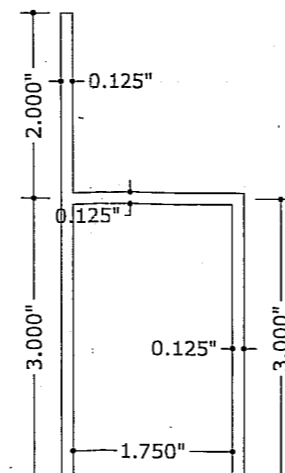
**9 WASHERED WINGNUT**  
6" = 1'-0"



**1 TYPICAL ELEVATION**  
1 N.T.S.



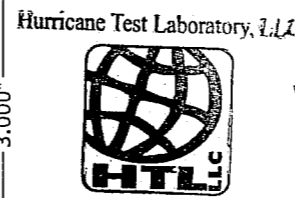
**2 KEYHOLE DETAIL**  
1 N.T.S.



**10a SUPER 'H' HEADER**  
6" = 1'-0"

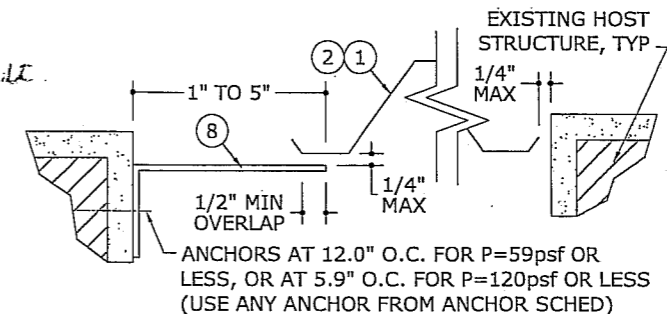
## GENERAL NOTES:

- THIS SYSTEM HAS BEEN TESTED AND EVALUATED AS A LARGE MISSILE IMPACT PROTECTIVE SYSTEM IN ACCORDANCE WITH THE REQUIREMENTS OF THE 2001 FLORIDA BUILDING CODE AND THE 2000 INTERNATIONAL BUILDING/RESIDENTIAL CODE PER ASTM STANDARDS E330, E1886, & E1996. PANELS ARE APPROVED FOR USE IN FLORIDA OUTSIDE THE HIGH VELOCITY HURRICANE ZONE, OR THROUGHOUT OTHER AREAS GOVERNED BY THE 2000 IBC/IRC.
- TESTING HAS BEEN PERFORMED IN ACCORDANCE WITH THE ASTM E1996-02 STANDARD FOR USE IN HIGH VELOCITY WIND ZONES (WIND ZONE 4) WHERE THE BASIC WIND SPEED IS GREATER THAN 140 MPH.
- NO 33-1/3% INCREASE IN ALLOWABLE STRESS HAS BEEN USED IN THE DESIGN OF THIS PRODUCT.
- POSITIVE AND NEGATIVE DESIGN PRESSURES TO BE USED WITH THESE DRAWINGS SHALL BE DETERMINED BY OTHERS FOR SPECIFIC JOBS IN ACCORDANCE WITH THE GOVERNING CODE. WHEN CALCULATING PRESSURES PER ASCE 7-98, USE OF DIRECTIONALITY FACTOR  $K_d=0.85$  IS ALLOWED.
- THE SYSTEM DETAILED HEREIN IS GENERIC AND DOES NOT PROVIDE INFORMATION FOR A SPECIFIC SITE. IF SITE CONDITIONS DEVIATE FROM THE CONDITIONS DETAILED HEREIN, A LICENSED ENGINEER OR REGISTERED ARCHITECT SHALL PREPARE SITE SPECIFIC DOCUMENTS TO BE USED IN CONJUNCTION WITH THIS DOCUMENT.
- PERMIT HOLDER SHALL VERIFY THE ADEQUACY OF THE EXISTING STRUCTURE TO WITHSTAND NEW SUPERIMPOSED LOADS.
- CLEAR POLYCARBONATE STORM PANELS (FULL AND HALF) MAY VARY IN "COVERAGE" WIDTH UP TO THE RESPECTIVE MAXIMA SHOWN HEREIN, PROVIDED THAT THE PANEL PROFILE HEIGHT BE MAINTAINED. HALF PANEL PROFILE IS ALSO KNOWN AS "MADEN DESIGN HALF PANEL".
- ALL POLYCARBONATE PANELS SHALL BE MANUFACTURED BY TRANSPARENT PROTECTION SYSTEMS, Inc.
- THIS PRODUCT APPROVAL IS FOR THE USE OF CLEAR POLYCARB PANELS ONLY. ALL POLYCARB PANELS SHALL BE EXTRUDED WITH THICKNESS  $t=0.100$ " ( $\pm 0.010$ ") AND SHALL BE FABRICATED FROM 100% G.E. SYNTHETIC THERMOPLASTIC POLYMER LEXAN RESIN #103-112 (UV STABILIZED) OR EQUIVALENT. THIS MATERIAL IS COMPARABLE TO G.E. LEXAN POLYMER SHEET #9034, AS APPROVED UNDER MIAMI-DADE COUNTY NOTICE OF ACCEPTANCE #03-0924.01. MINIMUM SYNTHETIC THERMOPLASTIC POLYMER TENSILE STRENGTH  $F_y=8.908$  KSI, FLEXURAL STRENGTH  $F_{by}=12.90$  KSI, & FLEXURAL MODULUS IS 328.7 KSI.
- ALL EXTRUSIONS SHALL BE 6063-T6 ALUMINUM ALLOY, U.N.O.
- PANELS SHALL BE PERMANENTLY LABELED WITH A MINIMUM OF ONE LABEL PER PANEL CONTAINING THE FOLLOWING:  
TRANSPARENT PROTECTION SYSTEMS, INC.  
WEST PALM BEACH, FLORIDA
- STORM PANELS HAVE BEEN DESIGNED AND TESTED TO THE MAXIMUM SPANS AND CORRESPONDING LOADS SHOWN HEREIN. REFERENCE CONSTRUCTION TESTING CORPORATION (CTC OF MIAMI, FL) TEST REPORTS #04-009-FE-ASTM & #04-009-LE-ASTM.
- TOP & BOTTOM MOUNTING SECTIONS MAY BE INTERCHANGED AS FIELD CONDITIONS DICTATE. PANELS MAY BE MOUNTED VERTICALLY OR HORIZONTALLY AS APPLICABLE.
- USE OF KEYHOLE WASHERS IS OPTIONAL IN CONJUNCTION WITH ANY MOUNTING CONDITION. WASHERED WINGNUTS SHALL HAVE 0.865" MINIMUM WASHER DIAMETER.
- ALL BOLTS & WASHERS SHALL BE ZINC COATED STEEL, GALVANIZED STEEL, OR STAINLESS STEEL WITH A MINIMUM TENSILE YIELD STRENGTH OF 60 KSI.



AS TESTED UNLESS OTHERWISE NOTED

Date: 9-7-05



**3 TRAP MOUNT CLOSURE**  
1 3" = 1'-0" PLAN VIEW

FRANK L. BENNARDO, P.E., INC.  
CONSULTING ENGINEERS  
4441 NORTH DIXIE HIGHWAY  
BOCA RATON, FL 33431  
(561) 391-2888 FAX: (561) 391-2862  
WWW.FLBENGINEERING.COM  
CERTIFICATE OF AUTHORIZATION: #9885

Transparent Protection Systems, Inc.  
6643 42nd Terrace North  
West Palm Beach, FL 33407  
POLYETHYLENE STORM PANELS  
TEST LAB DRAWINGS FOR  
FLORIDA STATEWIDE APPROVAL

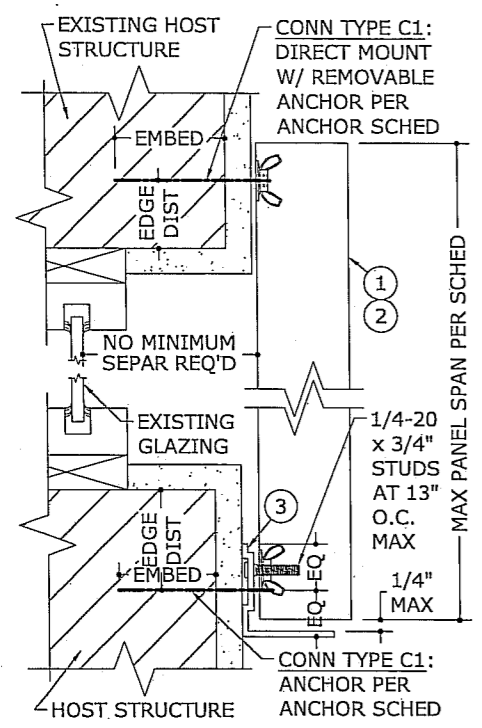
REMARKS	DRWN	CHKD	DATE
INIT ISSUE	CL		7/11/05

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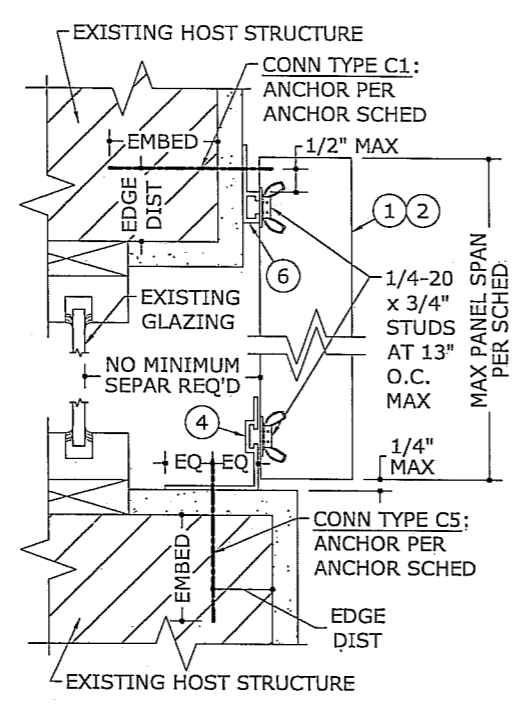
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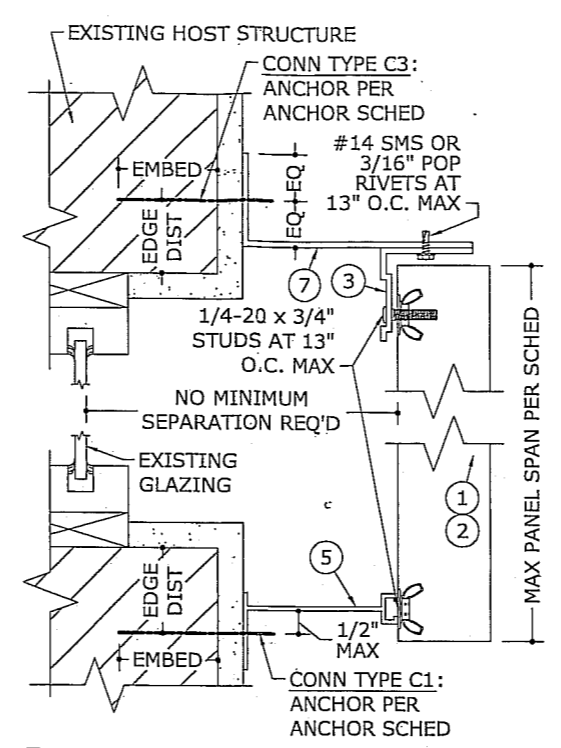
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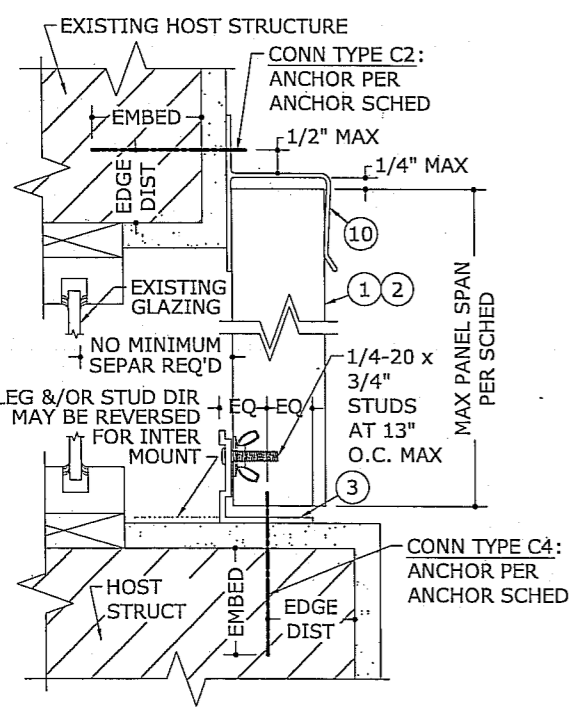
**1 MOUNTING SECTION**  
 2 3" = 1'-0" VERT SECTION



**2 MOUNTING SECTION**  
 2 3" = 1'-0" VERT SECTION



**3 MOUNTING SECTION**  
 2 3" = 1'-0" VERT SECTION



**4 MOUNTING SECTION**  
 2 3" = 1'-0" VERT SECTION

**MAXIMUM PANEL SPAN SCHEDULE (POSITIVE CONN.)**

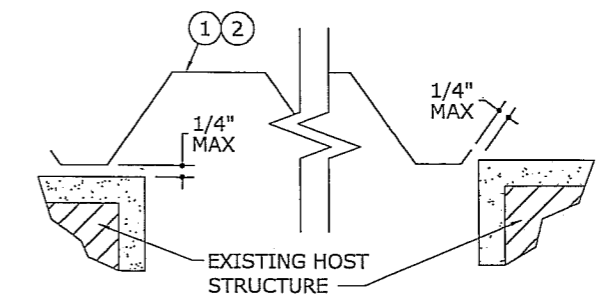
LOAD (psf)	MAX SPAN (ft)
25	11'-4"
30	10'-4"
35	9'-7"
40	8'-11"
45	8'-5"
50	8'-0"
55	7'-7"
60	7'-4"
65	7'-0"
70	6'-7"
75	6'-1"
80	5'-9"
90	5'-1"
100	4'-7"
110	4'-2"
120	3'-8"

**MAXIMUM PANEL SPAN SCHEDULE (W/ "H" HEADER)**

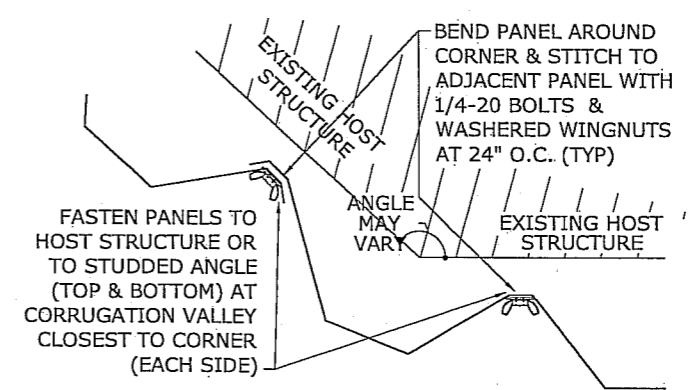
LOAD (psf)	MAX SPAN (ft)
17.3	8'-7"
24.2	7'-9"
34.6	7'-0"
41.6	6'-0"
55.4	5'-0"
104	4'-0"

**MAXIMUM SPAN SCHEDULE NOTES:**

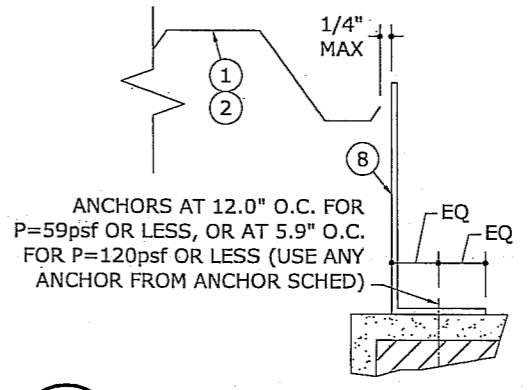
1. SPANS SHOWN IN "MAX PANEL SPAN SCHEDULE" ABOVE ARE MAXIMUM ALLOWABLE SPANS AT EACH RESPECTIVE DESIGN PRESSURE.
2. THIS SCHEDULE MAY BE USED TO DETERMINE MAXIMUM ALLOWABLE SPANS FOR PANELS INSTALLED USING ANY COMBINATION OF MOUNTING EXTRUSIONS INVOLVING A POSITIVE CONNECTION - I.E. ALL INSTALLATIONS WHICH DO NOT INCLUDE AN "H" HEADER.
3. TABLE ABOVE IS VALID FOR PANELS MOUNTED HORIZONTALLY OR VERTICALLY. SPAN DIRECTION IS ALWAYS PERPENDICULAR TO LINE OF ANCHORAGE.



**5 WALL MOUNT CLOSURE**  
 2 3" = 1'-0" PLAN VIEW



**6 CORNER CLOSURE**  
 2 N.T.S. PLAN VIEW



**7 BUILD-OUT CLOSURE**  
 2 3" = 1'-0" PLAN VIEW

Hurricane Test Laboratory, I.I.I.



AS TESTED OTHERWISE!  
 Date 9-7-05  
 Job# 239-0107-05

FRANK L. BENNARDO, P.E.  
 # PE0046549

07/11/2005

VALID FOR (1) JOB(S) ONLY  
 VALID ONLY WITH RAISED ENGINEER SEAL

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 CONSULTING ENGINEERS  
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 BOCA RATON, FL 33431  
 (561) 391-2888 FAX: (561) 391-2862  
 WWW.FLBENGINEERING.COM  
 CERTIFICATE OF AUTHORIZATION: #9885

Transparent Protection Systems, Inc.  
 6643 42nd Terrace North  
 West Palm Beach, FL 33407  
 POLYETHYLENE STORM PANELS  
 TEST LAB DRAWINGS FOR  
 FLORIDA STATEWIDE APPROVAL

REMARKS	DATE
INIT ISSUE	7/11/05
DRWN CHKD	
CL	

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05-TPS-0001

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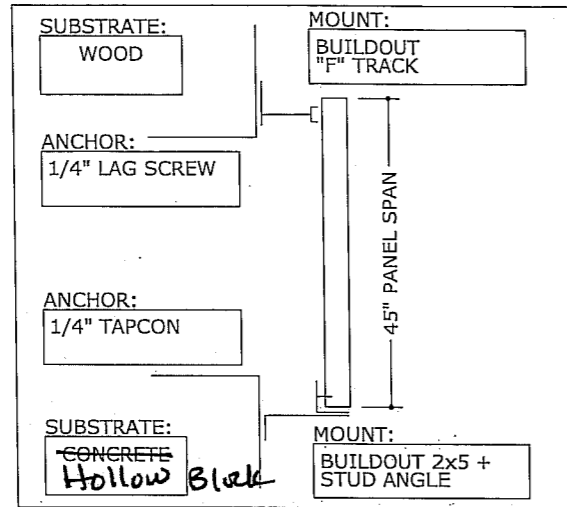


# TEST PROGRAM

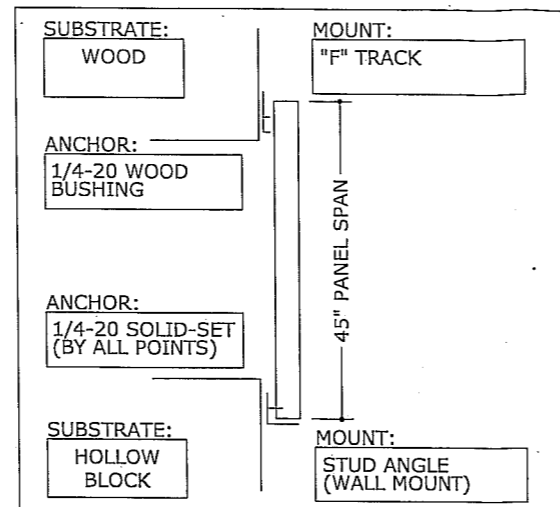
## POLYETHYLENE STORM PANELS (FIXED END)

### STATIC LOAD TEST SAMPLES

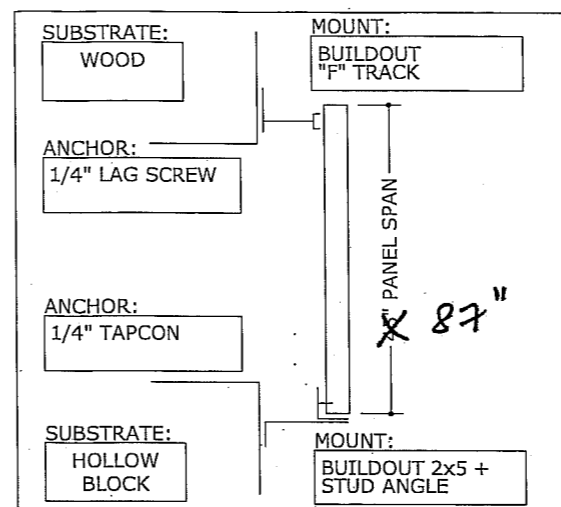
PER ASTM E330-84, -97, or -02



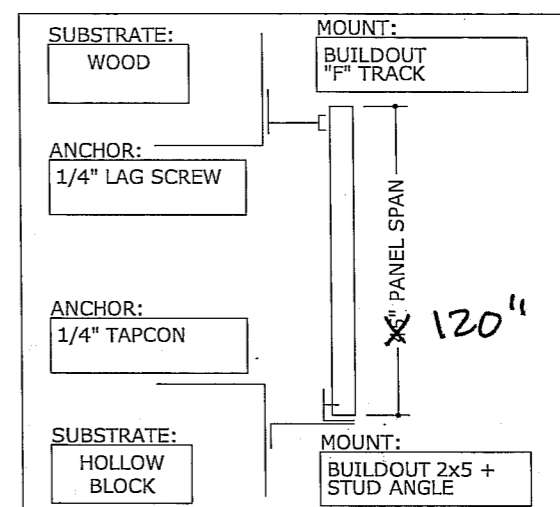
**SAMPLE #1**  
LOAD TO FAILURE (90) PSF



**SAMPLE #1a**  
LOAD TO FAILURE (90) PSF



**SAMPLE #2, #3, #4**  
LOAD TO FAILURE (65) PSF



**SAMPLE #5**  
LOAD TO FAILURE (45) PSF

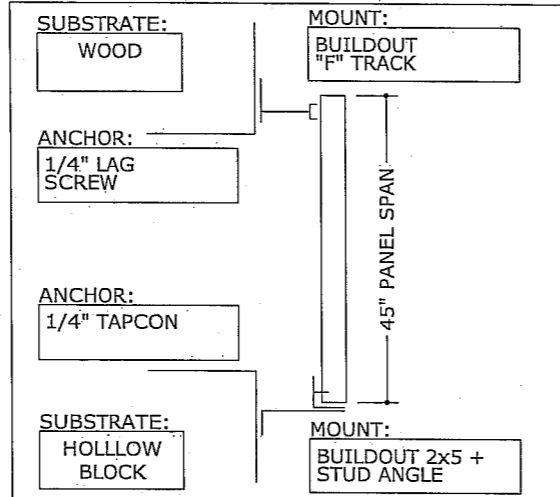
### IMPACT & CYCLIC LOAD TEST SAMPLES

PER ASTM E1886-97 & E1996-99

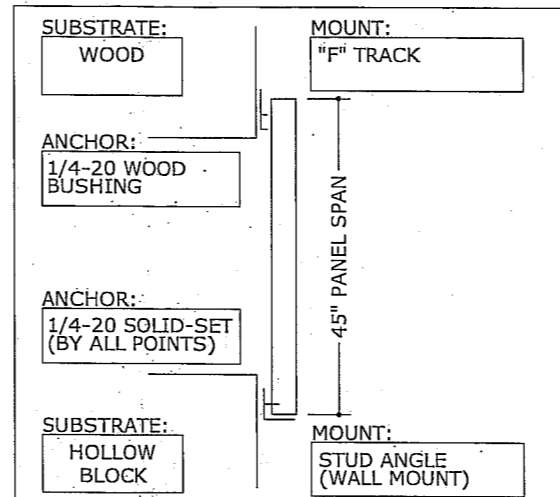
Hurricane Test Laboratory, LLC



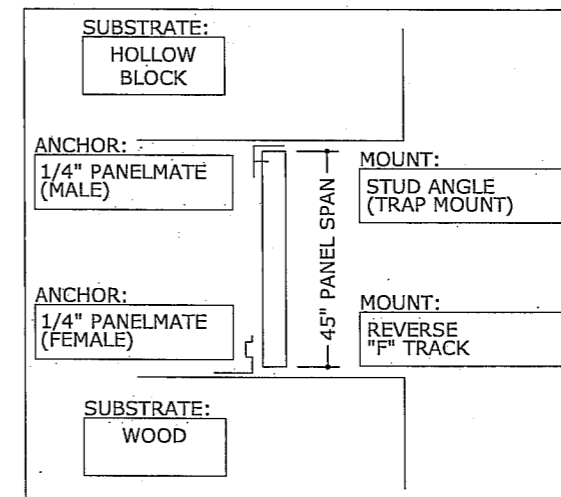
AS TESTED UNLESS OTHERWISE NOTED  
Date: 9-7-05  
Job#: 239-0107-05



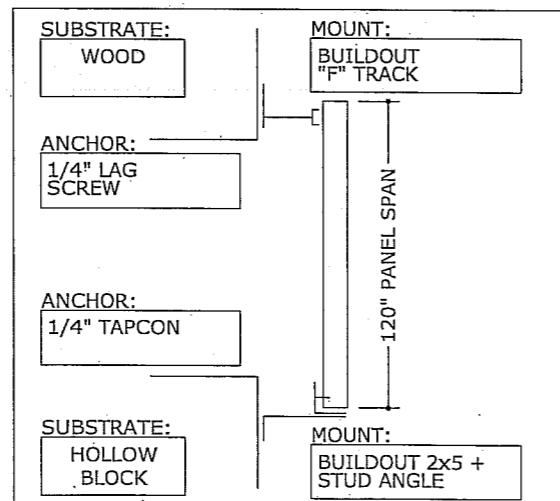
**SAMPLE #6**  
CYCLIC DESIGN PRESSURE: 100 PSF



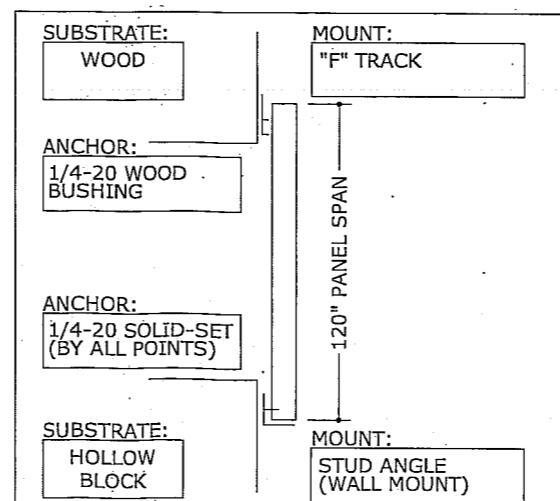
**SAMPLE #7**  
CYCLIC DESIGN PRESSURE: 100 PSF



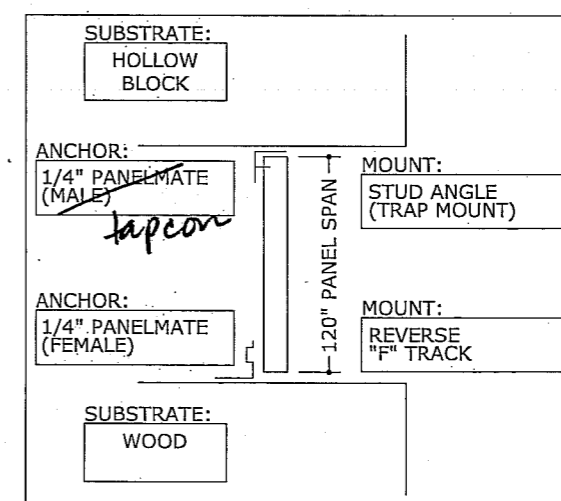
**SAMPLE #8**  
CYCLIC DESIGN PRESSURE: 100 PSF



**SAMPLE #9**  
CYCLIC DESIGN PRESSURE: 40 PSF



**SAMPLE #10**  
CYCLIC DESIGN PRESSURE: 40 PSF



**SAMPLE #11**  
CYCLIC DESIGN PRESSURE: 40 PSF

02/16/2005

FRANK L. BENNARDO, P.E., INC.  
CONSULTING ENGINEERS  
4441 NORTH DIXIE HIGHWAY  
BOCA RATON, FL 33431  
(561) 391-2888 FAX: (561) 391-2862  
WWW.FLBENGINEERING.COM  
CERTIFICATE OF AUTHORIZATION: #9885

TRANSPARENT PROTECTION SYSTEMS, Inc.  
6643 42nd TERRACE NORTH  
WEST PALM BEACH, FL 33407  
CLEAR POLYETHYLENE STORM PANELS  
TEST PROGRAM FOR  
FLORIDA STATEWIDE APPROVAL

REMARKS	DRWN	CHKD	DATE
INIT ISSUE	CL	FLB	1/27/05
REVISED PER TESTING	CL	FLB	2/16/05

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**05-TPS-0001**  
PAGE SCALE: N.T.S.  
DESCRIPTION:  
TEST PROGRAM SETUP & MOUNTING CONDITIONS

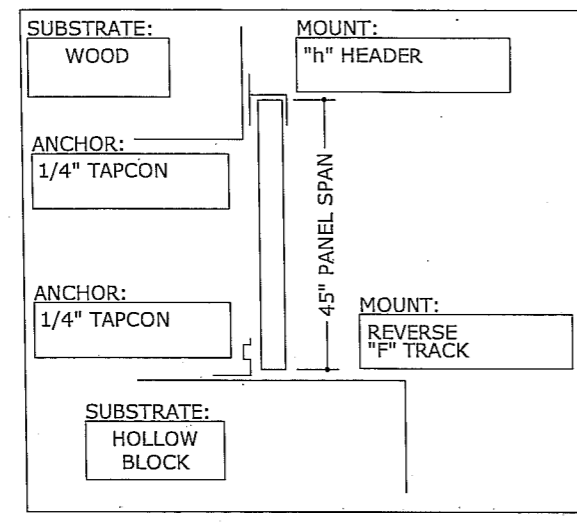
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# TEST PROGRAM

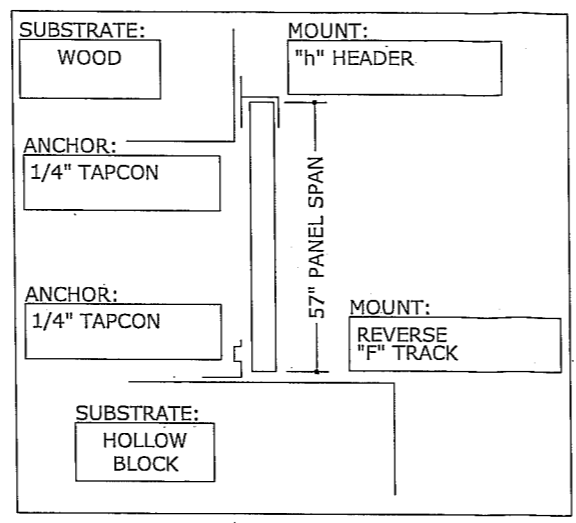
## POLYETHYLENE STORM PANELS (LOOSE END)

### STATIC LOAD TEST SAMPLES

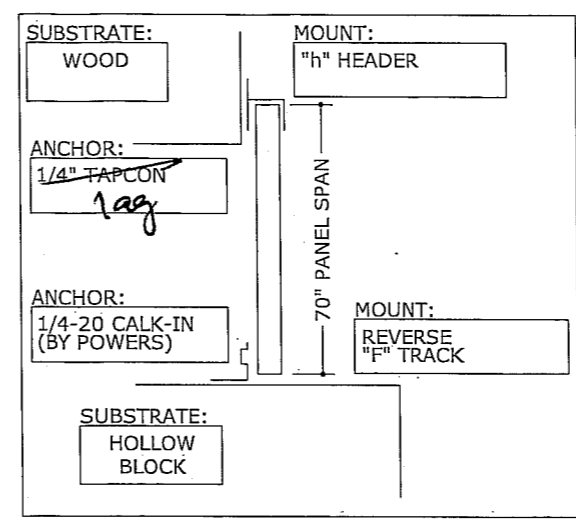
PER ASTM E330-84, -97, or -02.



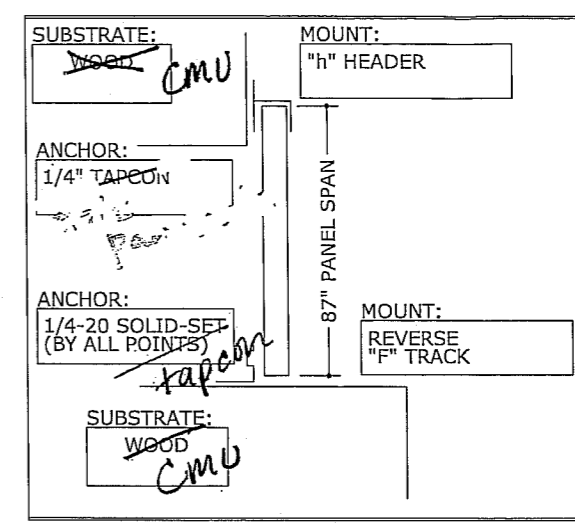
**SAMPLE #12** ✓  
LOAD TO FAILURE ( 70 ) PSF



**SAMPLE #12a**  
LOAD TO FAILURE (55) PSF



**SAMPLE #13**  
LOAD TO FAILURE ( 35 ) PSF



**SAMPLE #14**  
LOAD TO FAILURE ( 25 ) PSF

### IMPACT & CYCLIC LOAD TEST SAMPLES

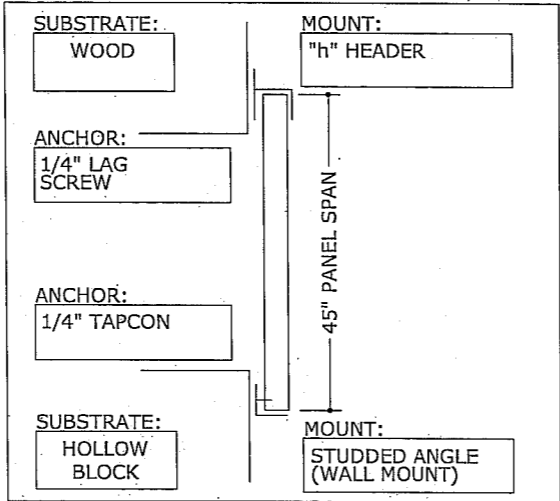
PER ASTM E1886-97 & E1996-99

Hurricane Test Laboratory, LLC

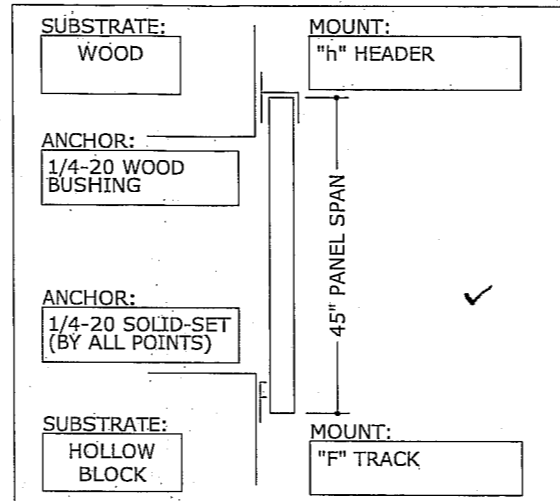


AS TESTED UNLESS OTHERWISE NOTED

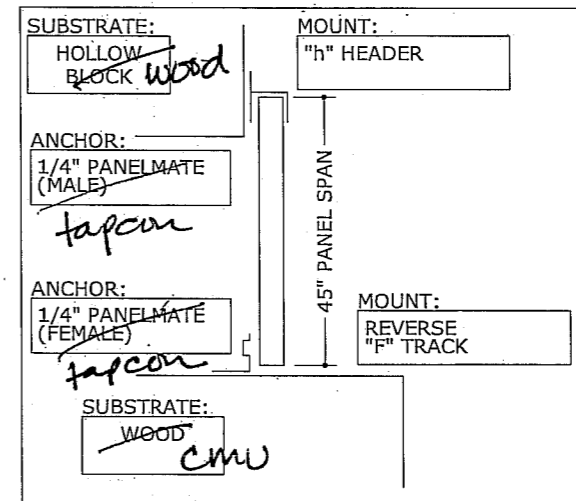
Date 9-7-05  
Job# 239-0107-05



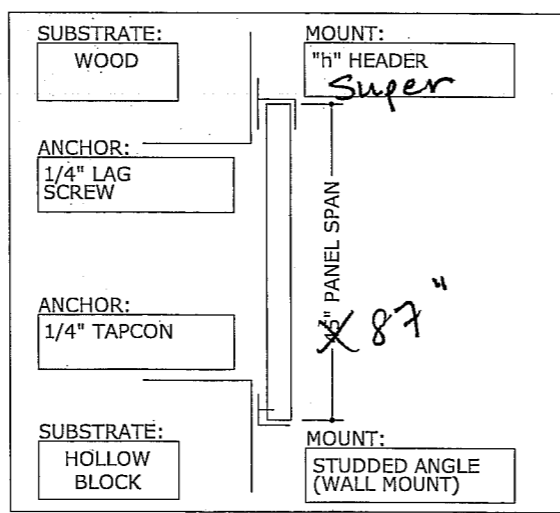
**SAMPLE #15** ✓  
CYCLIC DESIGN PRESSURE: 70 PSF



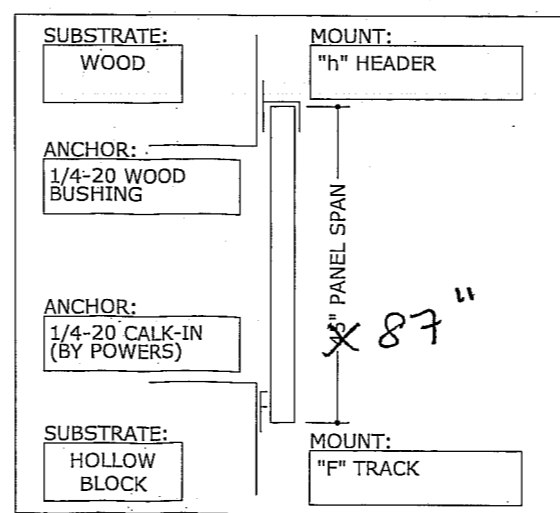
**SAMPLE #16**  
CYCLIC DESIGN PRESSURE: 70 PSF



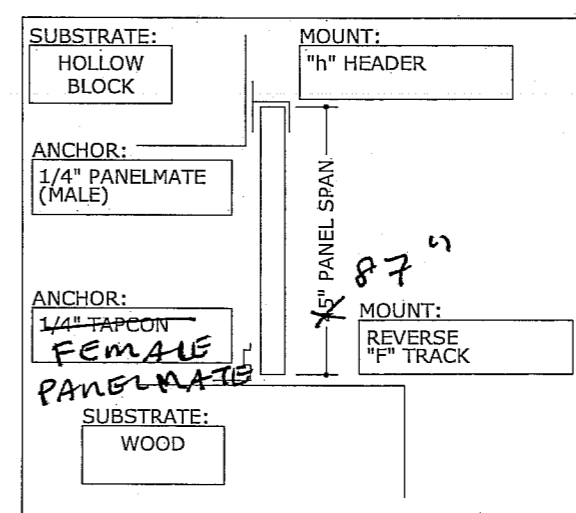
**SAMPLE #17**  
CYCLIC DESIGN PRESSURE: 70 PSF



**SAMPLE #18**  
CYCLIC DESIGN PRESSURE: 25 PSF



**SAMPLE #19**  
CYCLIC DESIGN PRESSURE: 25 PSF



**SAMPLE #20**  
CYCLIC DESIGN PRESSURE: 25 PSF

02/16/2005

FRANK L. BENNARDO, P.E., INC.  
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CERTIFICATE OF AUTHORIZATION: #9885

TRANSPARENT PROTECTION SYSTEMS, Inc.  
6643 42nd TERRACE NORTH  
WEST PALM BEACH, FL 33407  
CLEAR POLYETHYLENE STORM PANELS  
TEST PROGRAM FOR  
FLORIDA STATEWIDE APPROVAL

REMARKS	DRWN	CHKD	DATE
INIT ISSUE	CL	FLB	1/27/05
REVNS PER TESTING	CL	FLB	2/16/05

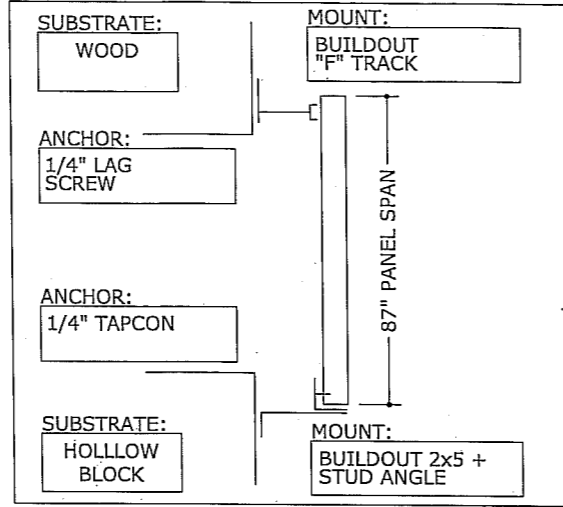
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TEST PROGRAM SETUP & MOUNTING CONDOTOINS

# TEST PROGRAM

COMBO POLYETHYLENE & POLYCARBONATE STORM PANELS (FIXED END)

STATIC LOAD TEST SAMPLES  
PER ASTM E330-84, -97, or -02



SAMPLE #21  
LOAD TO FAILURE (65) PSF

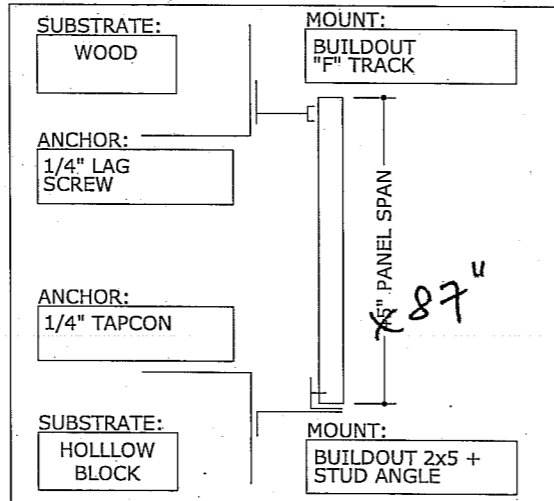
IMPACT & CYCLIC LOAD TEST SAMPLES  
PER ASTM E1886-97 & E1996-99

Hurricane Test Laboratory, LLC

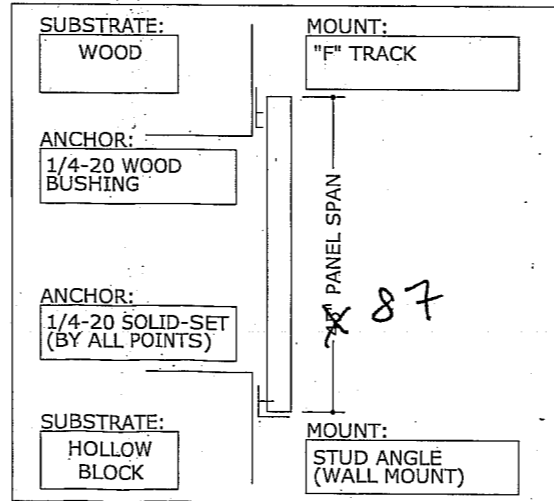


AS TESTED UNLESS OTHERWISE NOTED

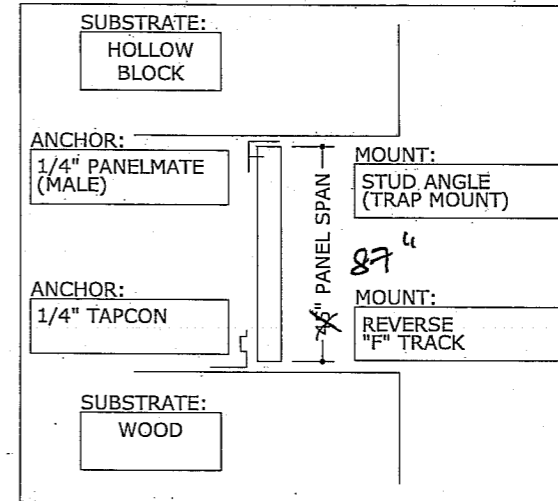
Date: 9-7-05  
Job#: 0239-0107-05



SAMPLE #22  
CYCLIC DESIGN PRESSURE: 65 PSF



SAMPLE #23  
CYCLIC DESIGN PRESSURE: 65 PSF



SAMPLE #24  
CYCLIC DESIGN PRESSURE: 65 PSF

02/16/2005

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TEST PROGRAM FOR  
FLORIDA STATEWIDE APPROVAL

REMARKS	DRWN	CHKD	DATE
INIT ISSUE	CL	FLB	1/27/05
REVNS PER TESTING	CL	FLB	2/16/05

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TEST PROGRAM SETUP &

MOUNTING CONDITIONS