Intertek | Architectural Testing

ASTM F1642-12/GSA TS01 TEST REPORT

Rendered to:

3M COMPANY

PRODUCT: Fragment Retention Film on 1/4" Single Pane Glass and 1" Insulated Glass Units with Film Attachment System

SERIES: 3M™ Scotchshield™ Ultra Safety and Security Window Film
MODEL: Ultra Night Vision and Ultra Prestige

SPECIFICATIONS: ASTM F1642-12, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading*
AND
GSA-TS01-2003, *US General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings*

This report contains in its entirety:

Cover Page:	**1 page**
Report Body:	**21 pages**
Test Facility:	**1 page**
Pressure Time Plots:	**28 pages**
Photographs:	**21 pages**
Drawings:	**12 pages**

Joseph A. Reed
Digitally Signed by: Joseph A. Reed
2015.02.27 13:47:43 -05'00'

Report No.:	**E1272.01-119-12**
Test Completion Date:	**12/19/14**
Report Date:	**02/27/15**
Test Record Retention Date:	**12/19/18**

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Summary of Results

Specimen No.	Film Type	Glass Type	Film Attachment Type	Average Peak Reflected Pressure (psi)	Average Positive Phase Impulse (psi-msec)	Average Positive Phase Duration (msec)	ASTM Hazard Rating	GSA Performance Condition
1	Ultra Night Vision	1/4"Annealed	IPA [1]	6.76	43	11.83	No Hazard	2
2			IPP [2]	6.82	43	11.93	Low Hazard	5
3		1/4" Tempered	IPA [1]	6.79	45	11.62	No Hazard	2
4			IPP [2]	5.02	32	13.99	Minimal Hazard	3B
5		1” IG Annealed	IPA [1]	9.21	63	14.92	Low Hazard	4
6			IPP [2]	6.77	45	13.11	Very Low Hazard	4
7			IPP [2]	5.08	35	13.41	No Hazard	2
8		1" IG Tempered	IPA [1]	9.80	61	14.46	No Hazard	2
9	Ultra Prestige	1/4" Annealed	IPA [1]	6.90	45	10.41	Low Hazard	4
10			IPP [2]	4.99	32	13.21	Low Hazard	5
11		1/4" Tempered	IPA [1]	6.68	45	10.54	No Hazard	2
12			IPP [2]	5.10	33	13.16	Low Hazard	5
13		1" IG Annealed	IPP [2]	6.91	46	11.73	Low Hazard	5
14		1" IG Tempered	IPA [1]	9.18	61	14.97	No Hazard	2

[1] *IPA = 3M™ Impact Protection Adhesive*

[2] *IPP = 3M™ Impact Protection Profile*

Reference must be made to Report No. E1272.03-119-12, dated 02/27/15 for complete test specimen description and detailed test results.

1.0 Report Issued To: 3M Renewable Energy Division
3M Center, Building 235, 3D-02
St. Paul, Minnesota 55144

2.0 Test Laboratory: Intertek-Architectural Testing, Inc. (ATI)
130 Derry Court
York, Pennsylvania 17406
717-764-7700

3.0 Project Summary:

3.1 Product Type: Fragment Retention Film on 1/4" Single Pane Glass and 1" Insulated Glass Units with Film Attachment System

3.2 Series: 3M™ Scotchshield™ Ultra Safety and Security Window Film

3.3 Model: Ultra Night Vision and Ultra Prestige

3.4 Compliance Statement: Results obtained are tested values and were secured by using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

3.5 Test Dates: 12/15/2014 - 12/19/2014

3.6 Test Facility: Intertek-ATI's shock tube is housed in a 10,000 square foot state-of-the-art test facility located in York, Pennsylvania. Blast loadings are produced on the specimen to simulate the effects of a high explosive charge at a specified standoff distance. Shock waves are generated by the sudden rupturing of a thin aluminum membrane. The shock wave expands as it travels down the tube, and impacts the target with a specific positive pressure and impulse. A photograph of the shock tube is provided in Figure #1 of Appendix A.

3.7 Test Sample Source: The test specimens were provided by the client. Representative samples of the test specimens will be retained by Intertek-ATI for a minimum of four years from the test completion date.

3.8 Drawing Reference: The test specimen drawings have been reviewed by Intertek-ATI and are representative of the test specimens reported herein. Test specimen construction was verified by Intertek-ATI per the drawings located in Appendix D. Any deviations are documented herein or on the drawings.

4.0 Project Summary: (Continued)

4.1 Data Acquisition: In accordance with ASTM F1642-04 and GSA TS01, four reflective pressure transducers are utilized to record data at a 1MHz sample rate. Two reflective pressure transducers are located on the specimen holder at the top and right side (when viewed from the interior). A third pressure transducer is located on the shell to the exterior of the specimen, and a fourth is located in the witness chamber, directly to the interior of the specimen holder. A sketch of the specimen holder and corresponding reflective pressure sensor locations are provided in Figure #2 of Appendix A.

4.2 List of Official Observers:

Name	Company
Travis A Hoover	Intertek-ATI
Isaiah W. Gebhart	Intertek-ATI
Joseph A. Reed, P.E.	Intertek-ATI
Emily C. Riley	Intertek-ATI

5.0 Test Specifications:

ASTM F1642-04, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading*

GSA-TS01-2003, *US General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings*

6.0 Test Specimen Description: The following descriptions apply to all specimens.

6.1 Product Sizes:

Measured Dimensions	Width (inches)	Height (inches)
Overall size	48	66
Fixed Day Lite Opening	43-1/4	61-1/4

6.2 Frame Construction:

Test Specimens #1 - #4 and #9 - #12:

Frame Member	Material	Description
Head, sill and jambs	Aluminum	Extruded
Pressure plate	Aluminum	Extruded, secured to head sill, and jambs using #1/4 x 1" long hex head self-tapping screws located 2" from each end and spaced 4" on center
Face cap	Aluminum	Extruded, snaps into place on pressure plate

	Joinery Type	Detail
All corners	Square Cut	Butted and secured using extruded aluminum shear blocks
Jambs	N/A	The jambs were secured to each shear block at the head and sill ends using two #1/4 x 1" long hex head screws
Head/Sill	N/A	The shear blocks were secured to the head and sill ends using two #10 x 1-1/4" long Phillips pan head screws.

6.0 Test Specimen Description: (Continued)

6.2 Frame Construction: (Continued)

Test Specimens #5 - #8 and #13 - #14:

Frame Member	Material	Description
Head, sill and jambs	Aluminum	Extruded
Glass Stop	Aluminum	Extruded, snaps into place on sill frame member to secure the glazing

	Joinery Type	Detail
All corners	Square Cut	Butted and secured using extruded aluminum shear blocks
Jambs	N/A	The jambs were secured to each shear block at the sill end using four #10 x 2" long Phillips self-tapping pan head screws and were secured to each shear block at the head end using one #10 x 5/8" long Phillips flat head screw
Head	N/A	The head was secured to the shear blocks at each end using four #10 x 2" long Phillips self-tapping pan head screws
Sill	N/A	The sill was secured to the shear blocks at each end using one #10 x 5/8" Phillips flat head screw

6.0 Test Specimen Description: (Continued)

6.3 Glazing: All specimens utilized 1/4" thick clear glass with an 8 mil laminate safety and security film adhered to the interior surface of the glass. The film on Specimens #1 - #8 was utilized a dual-reflective sun control film (3M™ Scotchshield™ Ultra Night Vision S25, or "NV-S25" - 25% visible light transmission). The film on Specimens #9 - #14 was nano-layered and utilized a non-metalized sun control film (3M™ Scotchshield™ Ultra Prestige S50, or "PR-S50" - "PR-S50", 50% visible light transmission). The glass was secured in place using either a 3M™ Impact Protection Profile (IPP), flexible-mechanical rubber gasket type film attachment, or a continuous bead of 3M™ Impact Protection Adhesive (IPA) structural sealant.

Test Specimens #1 - #4 and #9 - #12 Glazing:

Test Specimen	Glass Type	Spacer Type	Glazing Bite
#1 - #2 and #9 - 10	1/4" annealed	Aluminum reinforced butyl	1/2"
#3 - #4 and #11 - #12	1/4" tempered		

Test Specimens #1 - #4 and #9 - #12 Glazing Method: The glass was channel glazed from the exterior against a kerf-mounted rubber gasket and secured at the sill using extruded aluminum glazing stops.

Test Specimens #5 - #8 and #13 - #14 Glazing:

Test Specimen	Glass Type	Interior Lite	Exterior Lite	Spacer Type	Glazing Bite
#5 - #7 and #13	1" IG	1/4" annealed	1/4" annealed	Aluminum reinforced butyl	1/2"
#8 and #14		1/4" tempered	1/4" tempered		

Test Specimens #5 - #8 and #13 - #14 Glazing Method: The glass was exterior glazed against a kerf-mounted rubber gasket and secured with extruded aluminum pressure plate.

6.4 Hardware: No hardware was utilized.

6.5 Reinforcement:

Drawing Number	Location	Material
Tublelite 400 Series Curtain Wall Components, Detail PTB94	Head, sill and jambs (Test specimens #5 - #8 and #13 - #14 only)	1" wide by 3/4" deep aluminum "U" channel

7.0 Installation: The specimens were placed directly into the shock tube test frame.

8.0 Test Results: The results are tabulated as follows

Test Specimen #1:

Description	Results
Ambient Temperature	68°F
Glazing Temperature	67°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	7.25psi
Right Pressure	6.61 psi
Shell Pressure	6.41 psi
Average Pressure	6.76 psi
Witness Chamber Pressure	0.77 psi

Peak Positive Phase Duration	
Top Duration	12.93 msec
Right Duration	12.27 msec
Shell Duration	10.30 msec
Average Duration	11.83 msec

Peak Positive Phase Impulse	
Top Impulse	43 psi*msec
Right Impulse	42 psi*msec
Shell Impulse	42 psi*msec
Average Impulse	42 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #2:

Description	Results
Ambient Temperature	67°F
Glazing Temperature	67°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**5**

Peak Positive Pressure	
Top Pressure	7.26 psi
Right Pressure	6.72 psi
Shell Pressure	6.47 psi
Average Pressure	6.82 psi
Witness Chamber Pressure	0.30 psi

Peak Positive Phase Duration	
Top Duration	12.87 msec
Right Duration	10.20 msec
Shell Duration	12.71 msec
Average Duration	11.93 msec

Peak Positive Phase Impulse	
Top Impulse	43 psi*msec
Right Impulse	43 psi*msec
Shell Impulse	42 psi*msec
Average Impulse	43 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	Entire lite deglazed
Glazing Tearing	N/A

Witness Chamber Results
Glass completely deglazed and landed on witness chamber floor near sill. Large quantities of fragments were on the witness chamber floor with 3 fragment indents and 1 sliver perforation on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #3:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	7.05 psi
Right Pressure	6.94 psi
Shell Pressure	6.37 psi
Average Pressure	6.79 psi
Witness Chamber Pressure	0.32 psi

Peak Positive Phase Duration	
Top Duration	13.48 msec
Right Duration	8.23 msec
Shell Duration	13.16 msec
Average Duration	11.62 msec

Peak Positive Phase Impulse	
Top Impulse	45 psi*msec
Right Impulse	44 psi*msec
Shell Impulse	45 psi*msec
Average Impulse	45 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #4:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**3B**

Peak Positive Pressure	
Top Pressure	5.20 psi
Right Pressure	5.13 psi
Shell Pressure	4.74 psi
Average Pressure	5.02 psi
Witness Chamber Pressure	0.24 psi

Peak Positive Phase Duration	
Top Duration	14.28 msec
Right Duration	-- msec [1]
Shell Duration	13.69 msec
Average Duration	13.99 msec

[1]*The pressure reading did not cross zero during the data capture.*

Peak Positive Phase Impulse	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	32 psi*msec
Average Impulse	32 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	30" at head
Glazing Tearing	None

Witness Chamber Results
Two fragments were located on the witness chamber floor beyond the 1m mark no fragment indents or perforations on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #5:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**4**

Peak Positive Pressure	
Top Pressure	9.99 psi
Right Pressure	8.93 psi
Shell Pressure	8.70 psi
Average Pressure	9.21 psi
Witness Chamber Pressure	3.09 psi

Peak Positive Phase Duration	
Top Duration	15.33 msec
Right Duration	15.00 msec
Shell Duration	14.43 msec
Average Duration	14.92 msec

Peak Positive Phase Impulse	
Top Impulse	62 psi*msec
Right Impulse	63 psi*msec
Shell Impulse	62 psi*msec
Average Impulse	63 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	37" at jamb
Glazing Tearing	17" at center, 5-9/16" at sill

Witness Chamber Results
Several fragments (sum total united dimensions >10") were located beyond 1m from the specimen with 1 fragment indent and 1 sliver perforation located less than 24"from the floor on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #6:

Description	Results
Ambient Temperature	66°F
Glazing Temperature	65°F
ASTM Hazard Rating	**Very Low Hazard**
GSA Performance Condition	**4**

Peak Positive Pressure	
Top Pressure	7.05 psi
Right Pressure	6.76 psi
Shell Pressure	6.50 psi
Average Pressure	6.77 psi
Witness Chamber Pressure	0.85 psi

Peak Positive Phase Duration	
Top Duration	13.16 msec
Right Duration	12.95 msec
Shell Duration	13.22 msec
Average Duration	13.11 msec

Peak Positive Phase Impulse	
Top Impulse	45 psi*msec
Right Impulse	45 psi*msec
Shell Impulse	45 psi*msec
Average Impulse	45 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	161-1/2" (81%) at sill and jambs
Glazing Tearing	None

Witness Chamber Results
Four fragments (sum total united dimensions <10") were located beyond 1m from the specimen with 1 sliver perforation located less than 24"from the floor on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #7:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	5.23 psi
Right Pressure	5.17 psi
Shell Pressure	4.84 psi
Average Pressure	5.08 psi
Witness Chamber Pressure	0.19 psi

Peak Positive Phase Duration	
Top Duration	13.70 msec
Right Duration	12.99 msec
Shell Duration	13.53 msec
Average Duration	13.41 msec

Peak Positive Phase Impulse	
Top Impulse	35 psi*msec
Right Impulse	34 psi*msec
Shell Impulse	35 psi*msec
Average Impulse	34 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #8:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	9.94 psi
Right Pressure	9.50 psi
Shell Pressure	9.96 psi
Average Pressure	9.80 psi
Witness Chamber Pressure	1.32 psi

Peak Positive Phase Duration	
Top Duration	13.85 msec
Right Duration	13.93 msec
Shell Duration	15.61 msec
Average Duration	14.46 msec

Peak Positive Phase Impulse	
Top Impulse	61 psi*msec
Right Impulse	60 psi*msec
Shell Impulse	62 psi*msec
Average Impulse	61 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #9:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**4**

Peak Positive Pressure	
Top Pressure	7.15 psi
Right Pressure	7.05 psi
Shell Pressure	6.51 psi
Average Pressure	6.90 psi
Witness Chamber Pressure	1.66 psi

Peak Positive Phase Duration	
Top Duration	9.73 msec
Right Duration	8.23 msec
Shell Duration	13.26 msec
Average Duration	10.41 msec

Peak Positive Phase Impulse	
Top Impulse	45 psi*msec
Right Impulse	44 psi*msec
Shell Impulse	45 psi*msec
Average Impulse	45 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	20" at jamb
Glazing Tearing	None

Witness Chamber Results
Two fragments were located beyond the 1m mark on the witness chamber floor with 9 fragment indents and 1 sliver perforation located within 20"of the floor on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #10:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	66°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**5**

Peak Positive Pressure	
Top Pressure	5.36 psi
Right Pressure	5.01 psi
Shell Pressure	4.61 psi
Average Pressure	4.99 psi
Witness Chamber Pressure	2.09 psi

Peak Positive Phase Duration	
Top Duration	0.17 msec [1]
Right Duration	12.62 msec
Shell Duration	13.80 msec
Average Duration	13.21 msec

[1] *Obvious spurious data, not used to determine average*.

Peak Positive Phase Impulse	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	32 psi*msec
Average Impulse	32 psi*msec

Glazing Response	
Interior Lite	Fractured
Glazing Pullout Length and Location	N/A
Glazing Tearing	N/A

Witness Chamber Results
Glass completely blew out and landed 1m from the specimen on the witness chamber floor. Eleven fragment indents and 5 sliver perforations were located within 20" of the floor on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #11:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	6.90 psi
Right Pressure	6.74 psi
Shell Pressure	6.40 psi
Average Pressure	6.68 psi
Witness Chamber Pressure	0.73 psi

Peak Positive Phase Duration	
Top Duration	12.97 msec
Right Duration	8.25 msec
Shell Duration	10.39 msec
Average Duration	10.54 msec

Peak Positive Phase Impulse	
Top Impulse	46 psi*msec
Right Impulse	45 psi*msec
Shell Impulse	45 psi*msec
Average Impulse	45 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #12:

Description	Results
Ambient Temperature	67°F
Glazing Temperature	67°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**5**

Peak Positive Pressure	
Top Pressure	5.32 psi
Right Pressure	5.11 psi
Shell Pressure	4.88 psi
Average Pressure	5.10 psi
Witness Chamber Pressure	0.28 psi

Peak Positive Phase Duration	
Top Duration	13.75 msec
Right Duration	12.67 msec
Shell Duration	13.05 msec
Average Duration	13.16 msec

Peak Positive Phase Impulse	
Top Impulse	33 psi*msec
Right Impulse	33 psi*msec
Shell Impulse	33 psi*msec
Average Impulse	33 psi*msec

Glazing Response	
Lite	Fractured
Glazing Pullout Length and Location	Entire lite deglazed
Glazing Tearing	N/A

Witness Chamber Results
Glass completely deglzed, landing on the witness chamber floor near the sill. Glazing fragments were found on the witness chamber floor as far as the witness panel. Three fragment indents and five sliver perforations were found on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #13:

Description	Results
Ambient Temperature	66°F
Glazing Temperature	65°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**5**

Peak Positive Pressure	
Top Pressure	7.31 psi
Right Pressure	6.89 psi
Shell Pressure	6.53 psi
Average Pressure	6.91 psi
Witness Chamber Pressure	2.67 psi

Peak Positive Phase Duration	
Top Duration	13.21 msec
Right Duration	8.95 msec
Shell Duration	13.04 msec
Average Duration	11.73 msec

Peak Positive Phase Impulse	
Top Impulse	46 psi*msec
Right Impulse	46 psi*msec
Shell Impulse	45 psi*msec
Average Impulse	46 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	Entire lite deglazed
Glazing Tearing	N/A

Witness Chamber Results
Glass completely deglazed, landing on the witness chamber floor near the sill. Glazing fragments were found on the witness chamber floor as far as the witness panel. Forty-seven fragment indents and six sliver perforations were found on the witness panel.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

8.0 Test Results: (Continued)

Test Specimen #14:

Description	Results
Ambient Temperature	65°F
Glazing Temperature	65°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	9.98 psi
Right Pressure	9.08 psi
Shell Pressure	8.49 psi
Average Pressure	9.18 psi
Witness Chamber Pressure	1.66 psi

Peak Positive Phase Duration	
Top Duration	15.03 msec
Right Duration	15.10 msec
Shell Duration	14.80 msec
Average Duration	14.97 msec

Peak Positive Phase Impulse	
Top Impulse	62 psi*msec
Right Impulse	61 psi*msec
Shell Impulse	61 psi*msec
Average Impulse	61 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

Witness Chamber Results
No debris was observed.

Pressure time plots are presented in Appendix B. Pre-test and post-test photographs are provided in Appendix C.

9.0 Closing Statement

Intertek-ATI will service this report for the entire test record retention period. Test records that are retained such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation will be retained by Intertek-ATI for the entire test record retention period.

Results obtained are tested values and were secured using the designated test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For Intertek-ATI:

Digitally Signed by: Emily C. Riley

Emily C. Riley
Project Manager

Digitally Signed by: Joseph A. Reed

Joseph A. Reed, P.E.
Director - Engineering

ECR:jar/jas

Attachments (pages): This report is complete only when all attachments listed are included.

- Appendix A - Test Facility (1)
- Appendix B - Pressure Time Plots (28)
- Appendix C - Photographs (21)
- Appendix D - Drawings (12)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	02/27/15	N/A	Original report issue

APPENDIX A

Test Facility

Figure #1
Shock Tube and Test Facility

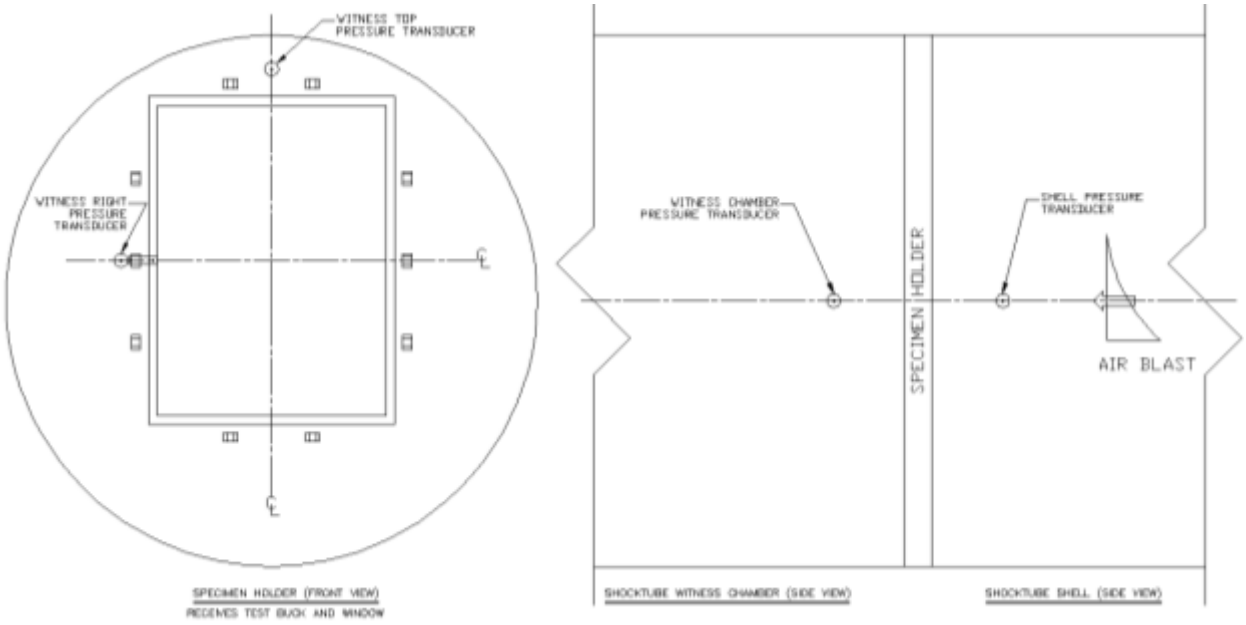
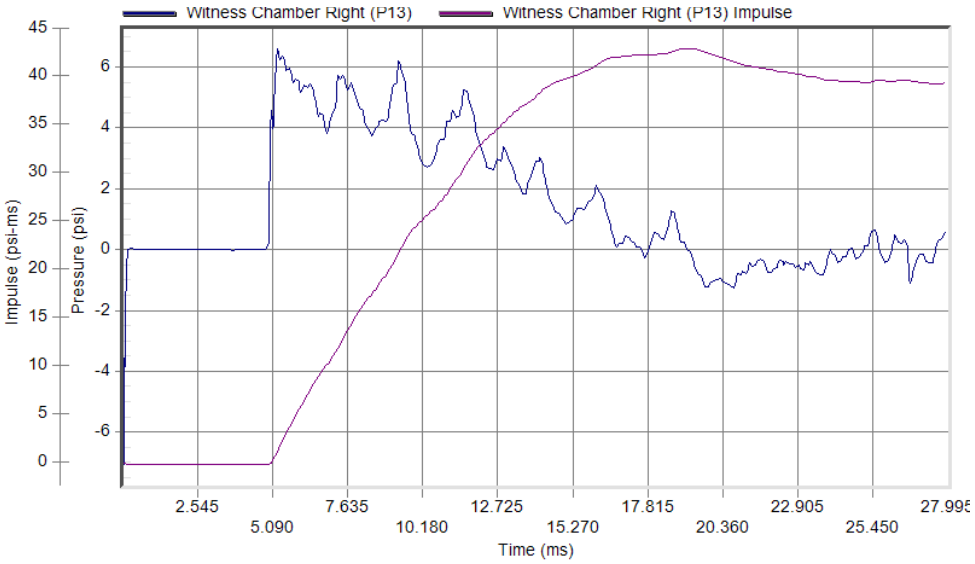


Figure #2
Pressure Sensor Locations

APPENDIX B

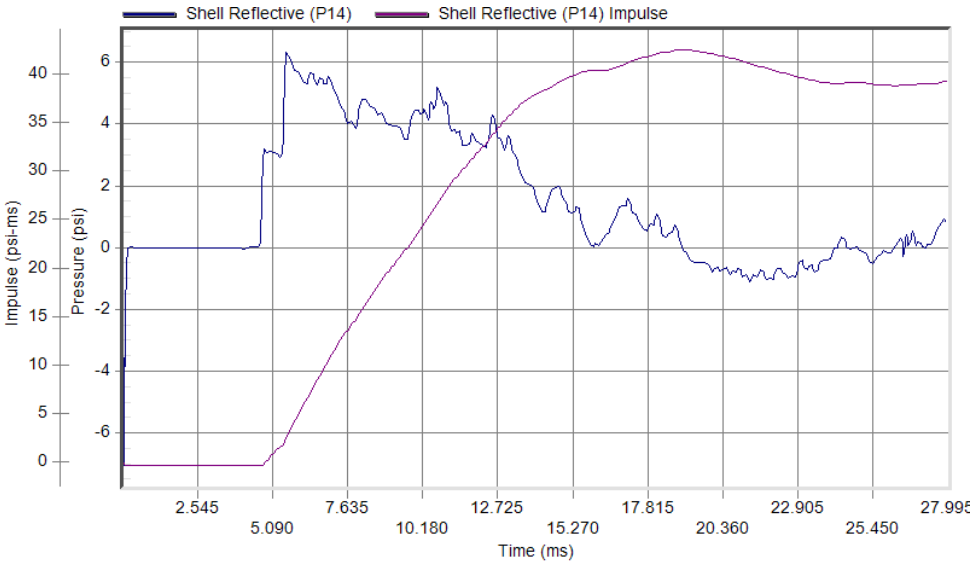
Pressure Time Plots

Specimen #1



Peak Pressure: 6.61 psi at 5.27 ms
Duration: 12.27 ms

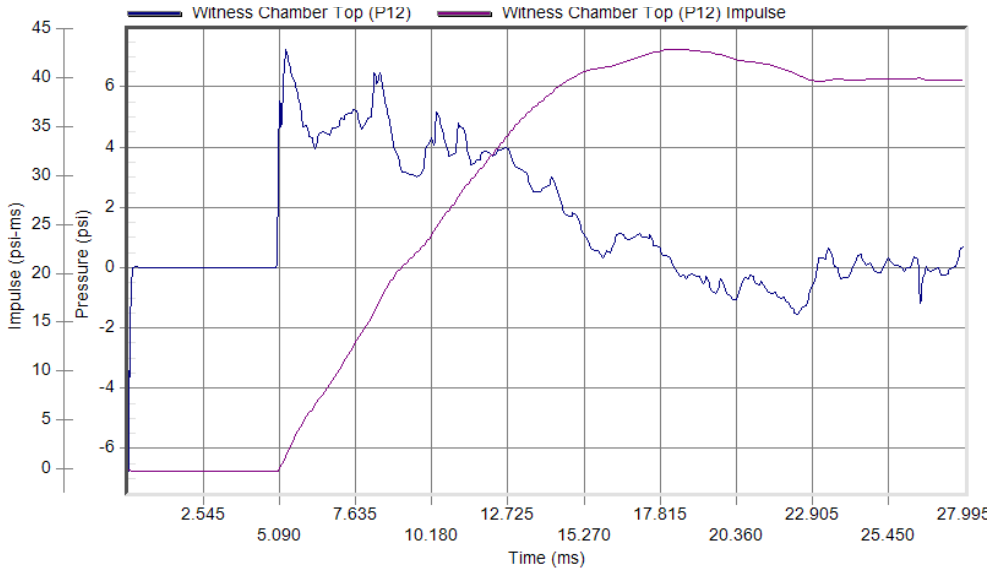
Test Date: 12/15/2014
Test Time: 3:31 pm



Peak Pressure: 6.41 psi at 5.59 ms
Duration: 10.30 ms

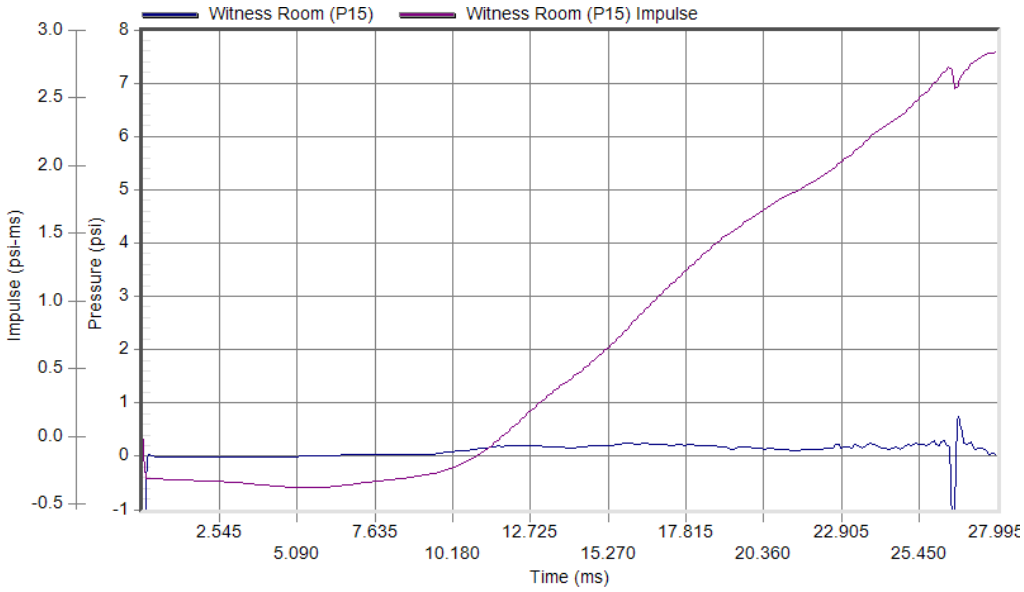
Test Date: 12/15/2014
Test Time: 3:31 pm

Specimen #1: (Continued)



Peak Pressure: 7.25 psi at 5.33 ms
Duration: 12.93 ms

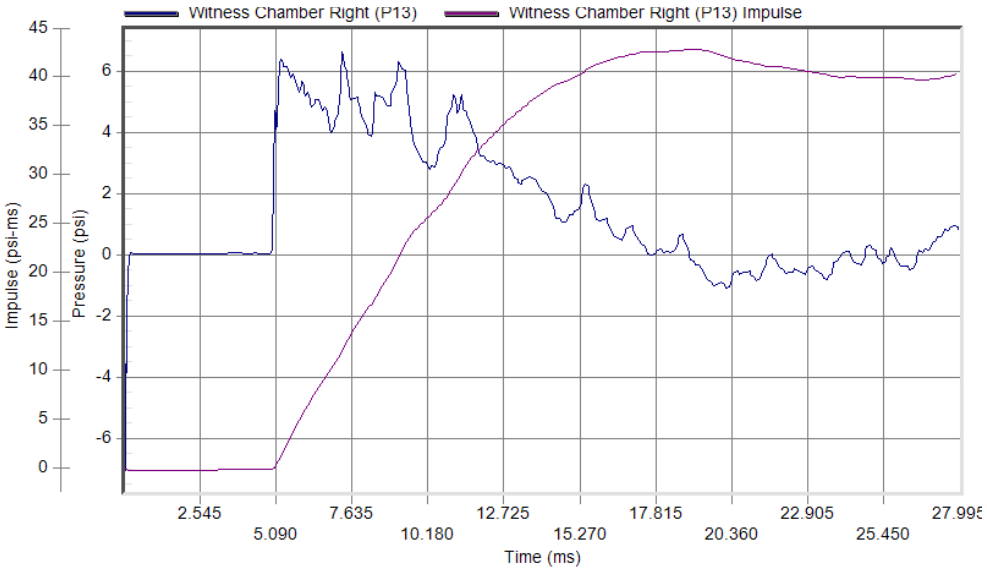
Test Date: 12/15/2014
Test Time: 3:31 pm



Peak Pressure: 0.77 psi at 26.73 ms
Duration: 1.26 ms

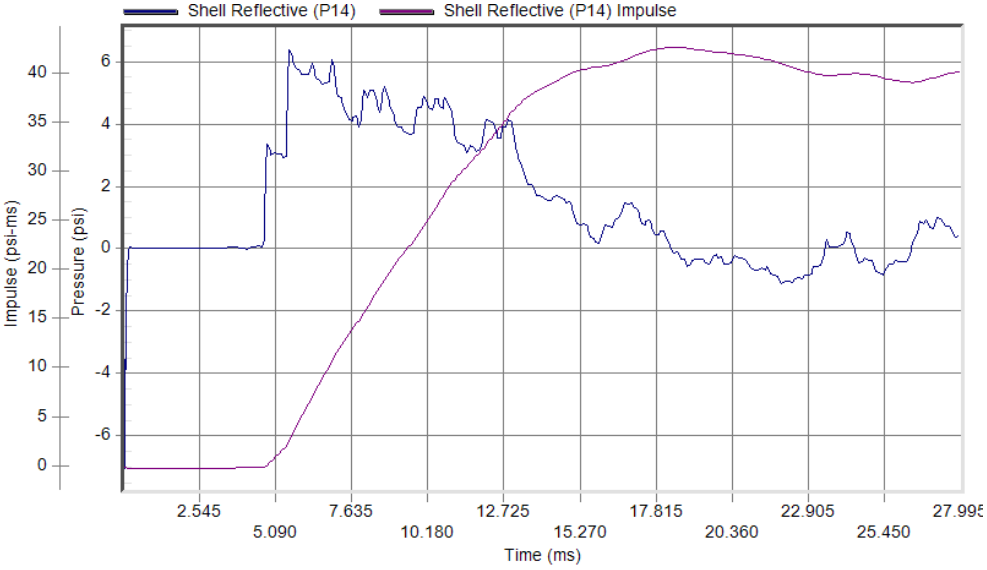
Test Date: 12/15/2014
Test Time: 3:31 pm

Specimen #2



Peak Pressure: 6.72 psi at 7.33 ms
Duration: 10.20 ms

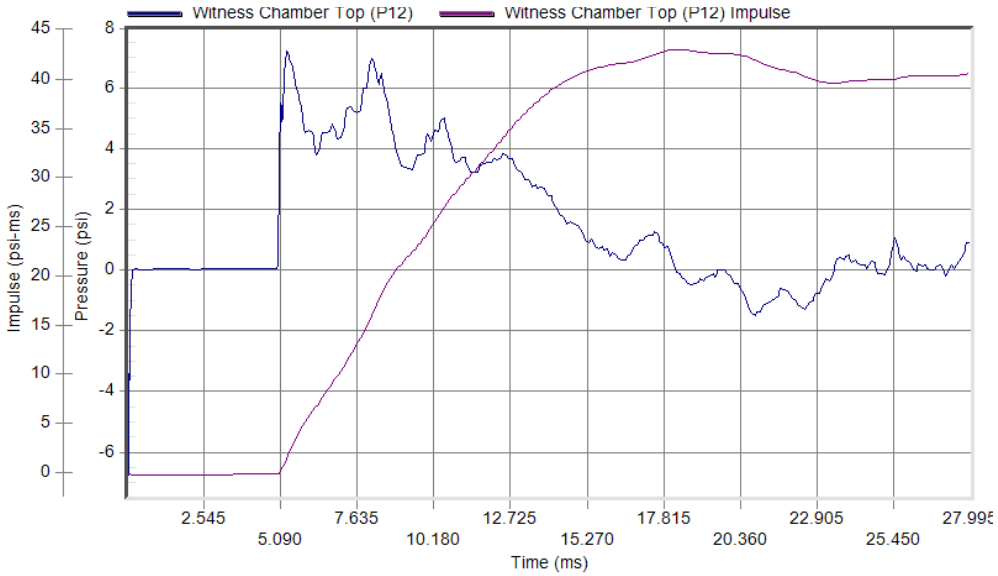
Test Date: 12/15/2014
Test Time: 10:59 am



Peak Pressure: 6.47 psi at 5.59 ms
Duration: 12.71 ms

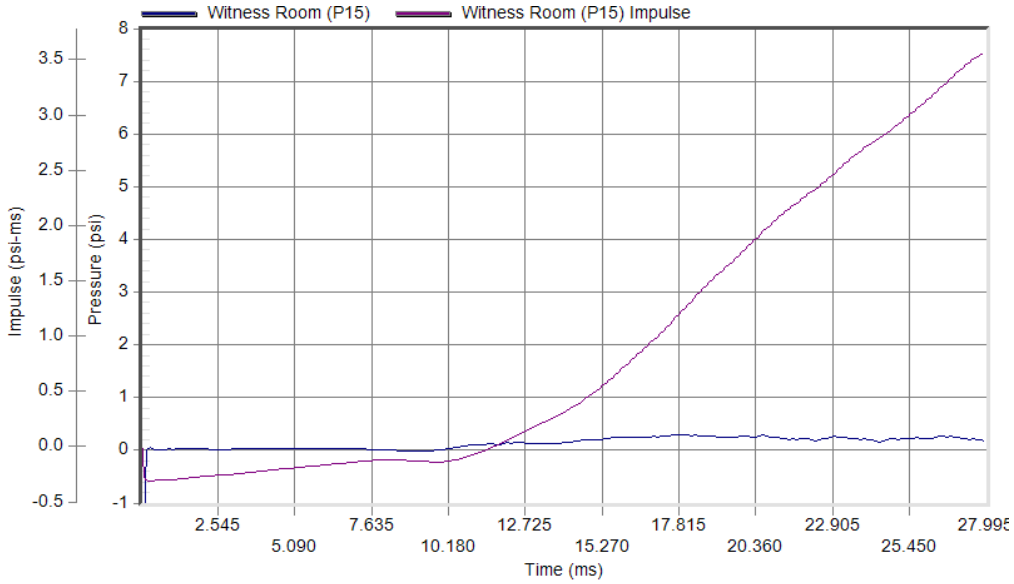
Test Date: 12/15/2014
Test Time: 10:59 am

Specimen #2: (Continued)



Peak Pressure: 7.26 psi at 5.33 ms
Duration: 12.87 ms

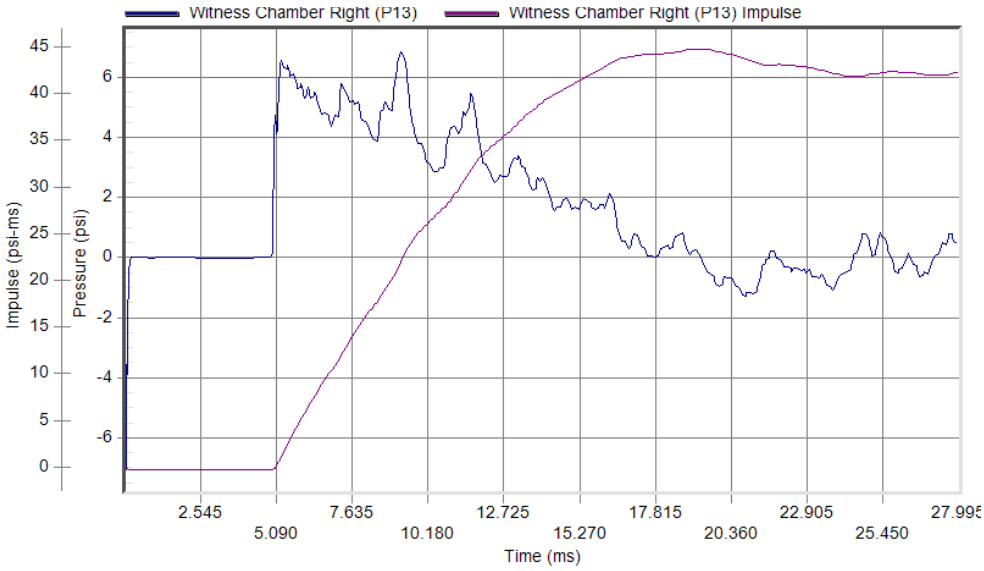
Test Date: 12/15/2014
Test Time: 10:59 am



Peak Pressure: 0.30 psi at 17.91 ms
Duration: 0.00 ms

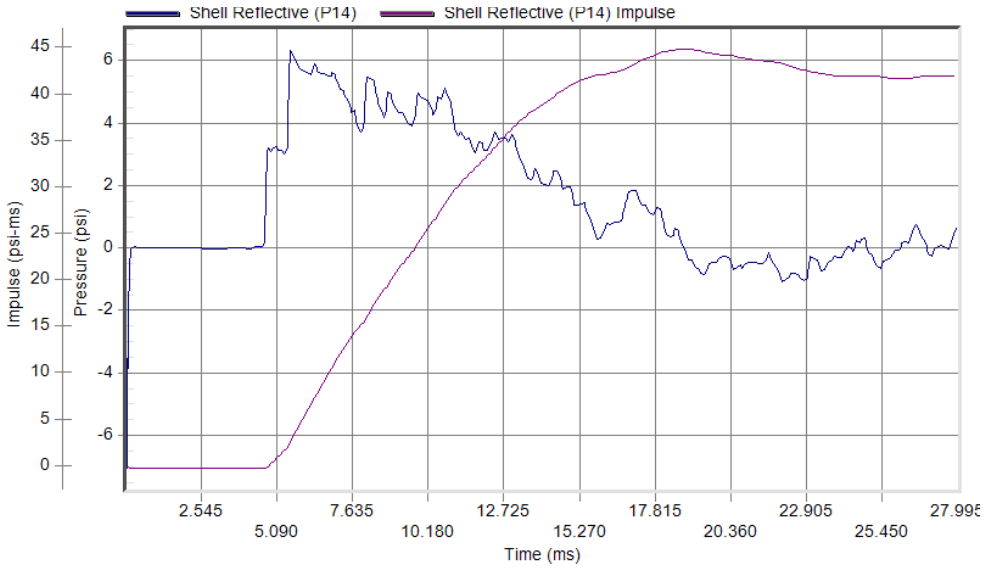
Test Date: 12/15/2014
Test Time: 10:59 am

Specimen #3



Peak Pressure: 6.94 psi at 9.30 ms
Duration: 8.23 ms

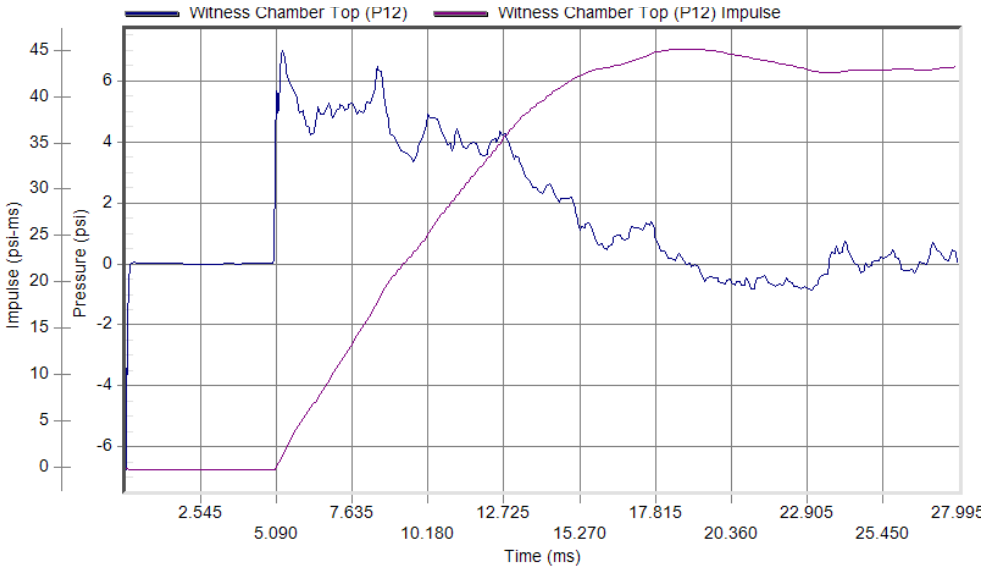
Test Date: 12/16/2014
Test Time: 11:21 am



Peak Pressure: 6.37 psi at 5.59 ms
Duration: 13.16 ms

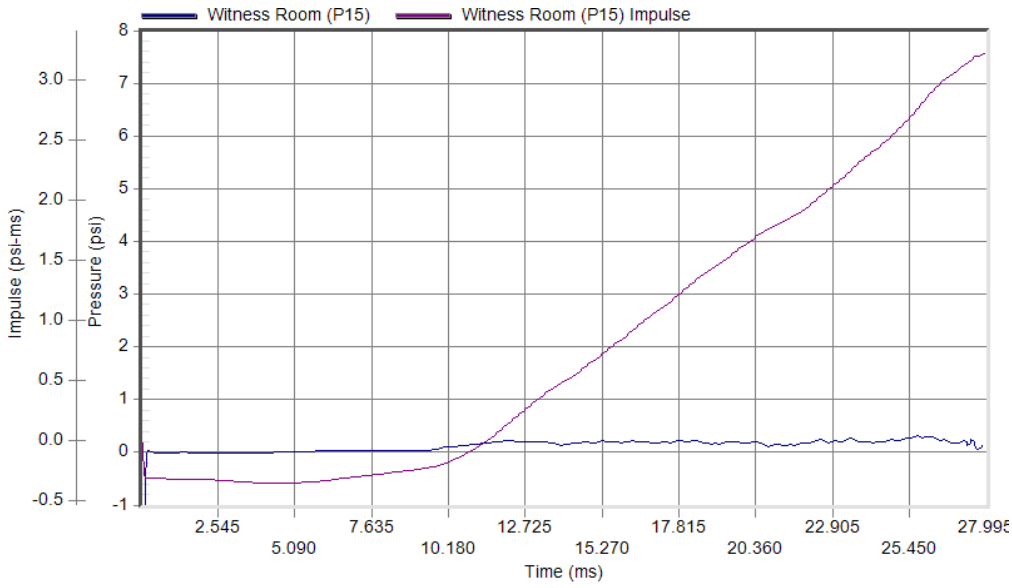
Test Date: 12/16/2014
Test Time: 11:21 am

Specimen #3: (Continued)



Peak Pressure: 7.05 psi at 5.32 ms
Duration: 13.48 ms

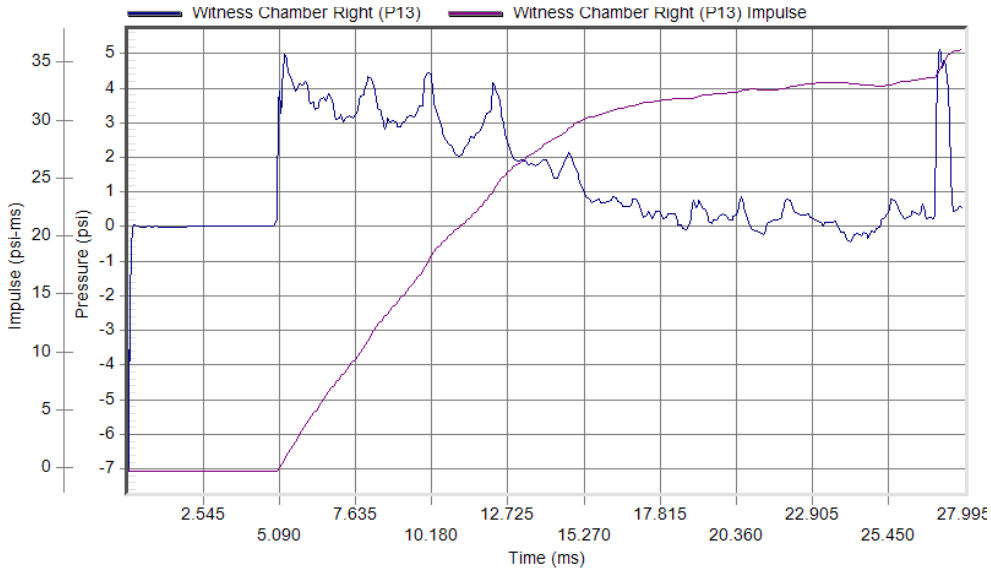
Test Date: 12/16/2014
Test Time: 11:21 am



Peak Pressure: 0.32 psi at 25.72 ms
Duration: 1.48 ms

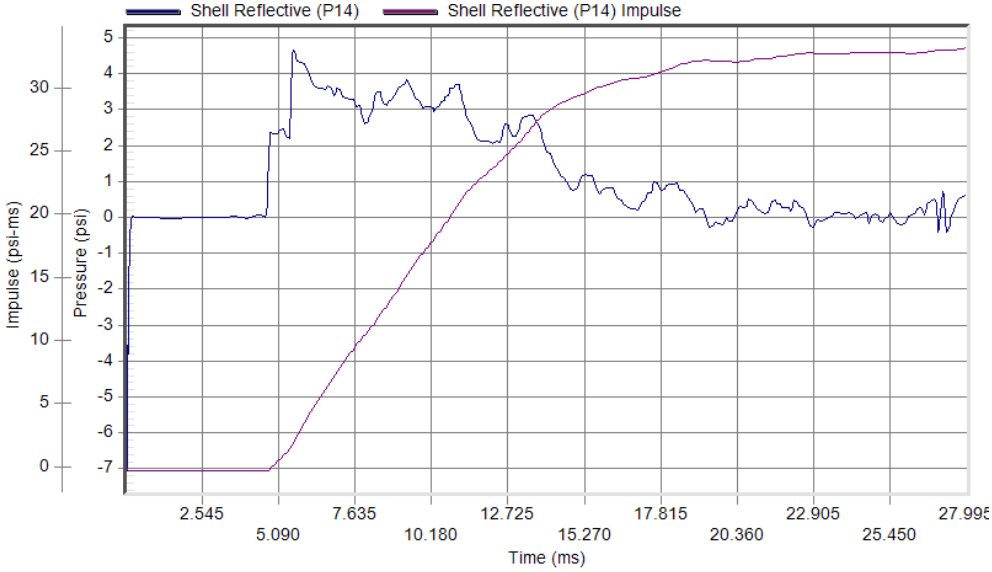
Test Date: 12/16/2014
Test Time: 11:21 am

Specimen #4



Peak Pressure: 5.13 psi at 27.16 ms
Duration: 0.00 ms

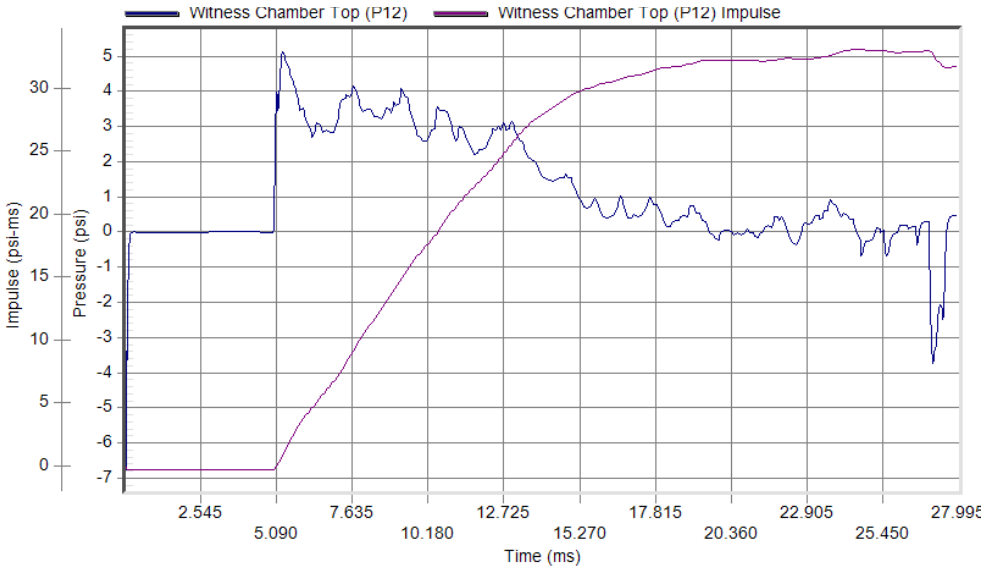
Test Date: 12/18/2014
Test Time: 8:29 am



Peak Pressure: 4.74 psi at 5.60 ms
Duration: 13.69 ms

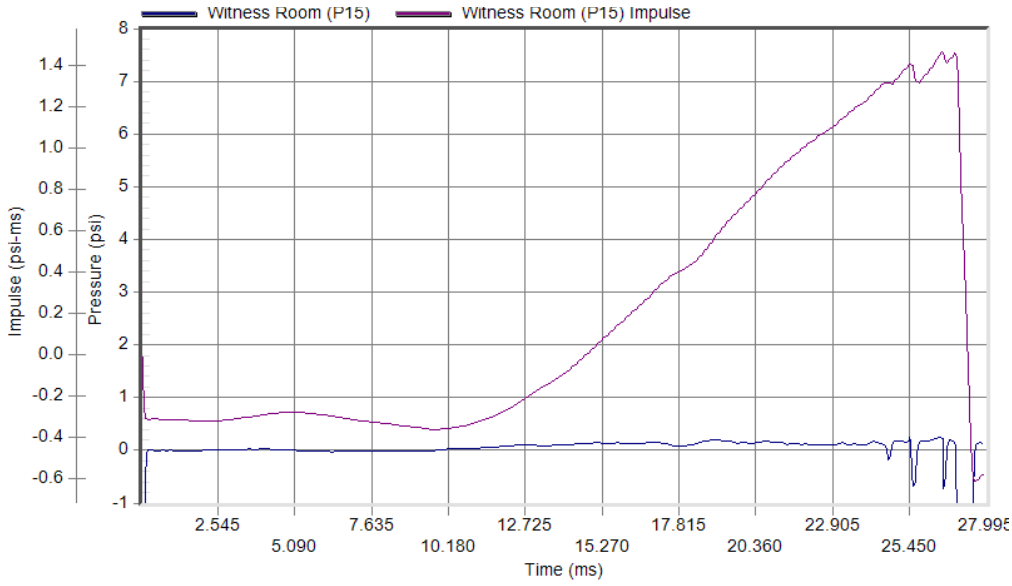
Test Date: 12/18/2014
Test Time: 8:29 am

Specimen #4: (Continued)



Peak Pressure: 5.20 psi at 5.32 ms
Duration: 14.28 ms

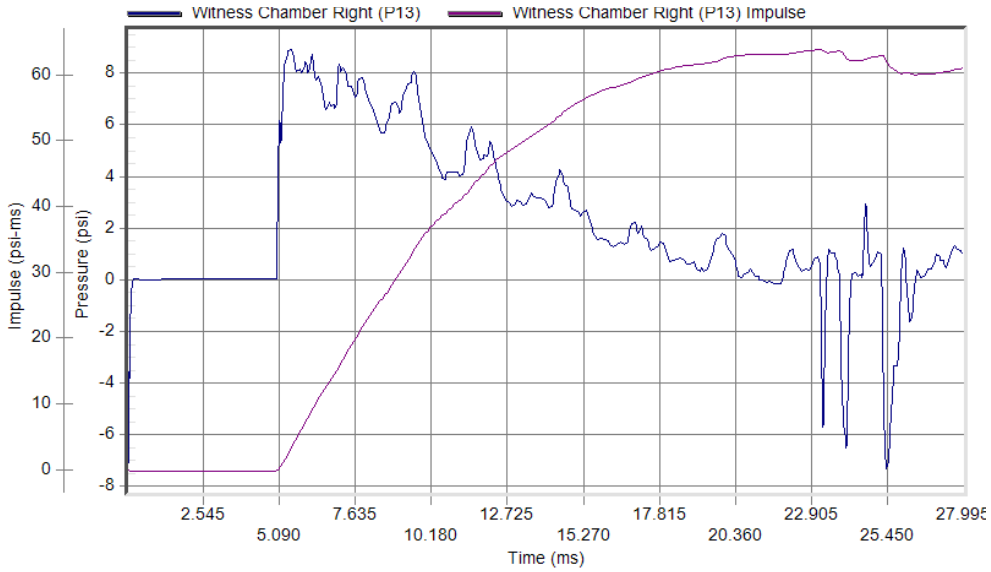
Test Date: 12/18/2014
Test Time: 8:29 am



Peak Pressure: 0.24 psi at 26.52 ms
Duration: 0.04 ms

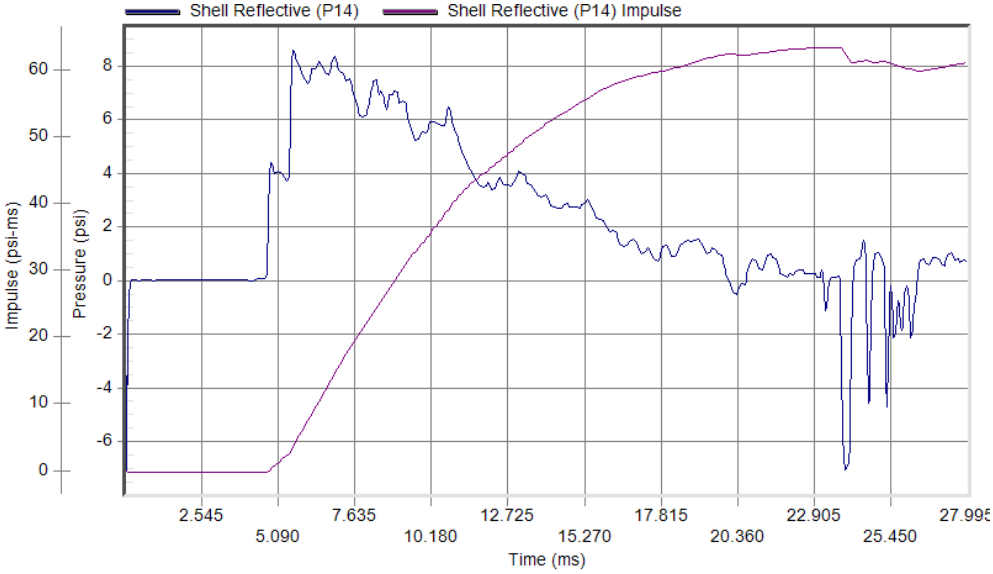
Test Date: 12/18/2014
Test Time: 8:29 am

Specimen #5



Peak Pressure: 8.93 psi at 5.49 ms
Duration: 15.00 ms

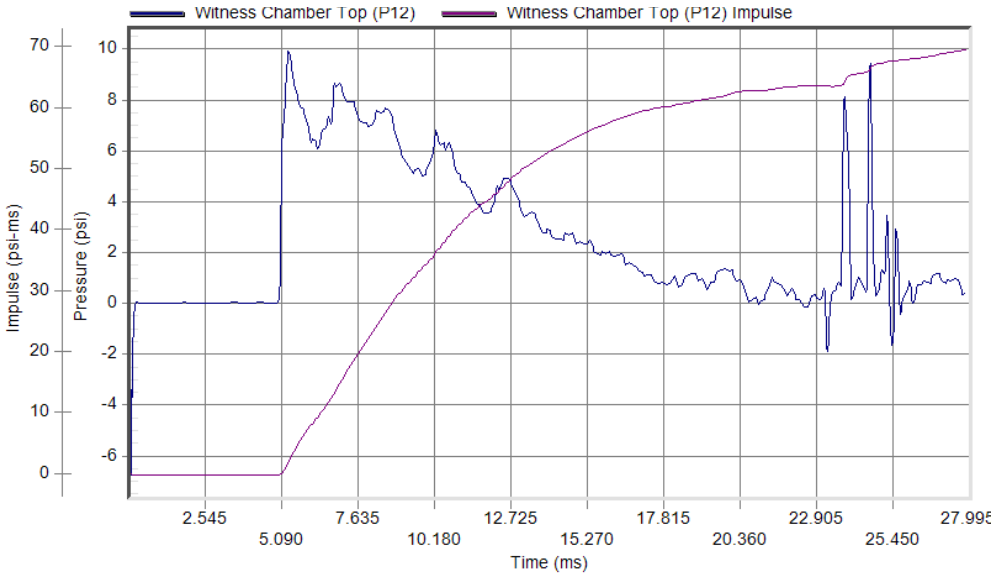
Test Date: 12/18/2014
Test Time: 4:11 pm



Peak Pressure: 8.70 psi at 5.61 ms
Duration: 14.43 ms

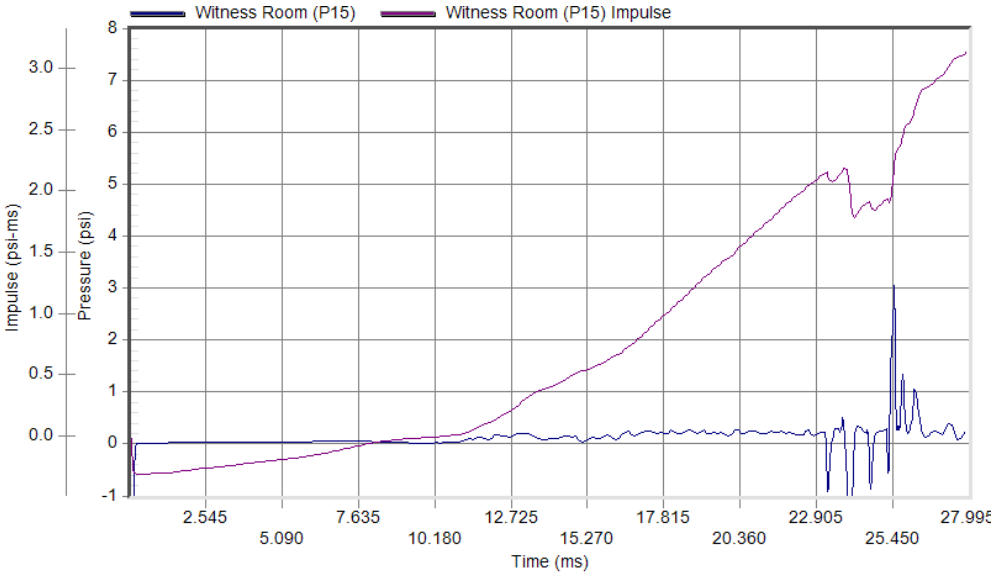
Test Date: 12/18/2014
Test Time: 4:11 pm

Specimen #5: (Continued)



Peak Pressure: 9.99 psi at 5.32 ms
Duration: 15.33 ms

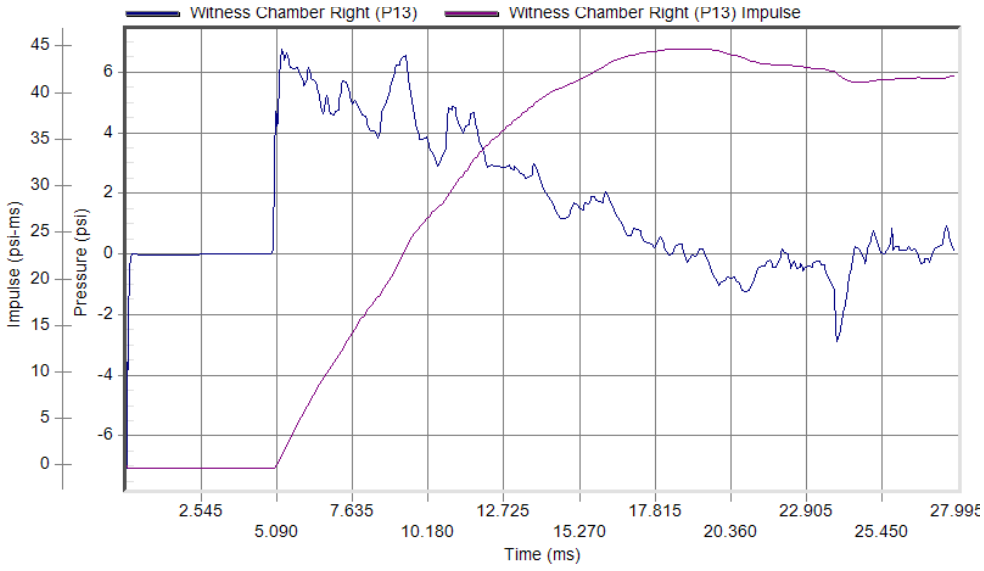
Test Date: 12/18/2014
Test Time: 4:11 pm



Peak Pressure: 3.09 psi at 25.51 ms
Duration: 0.02 ms

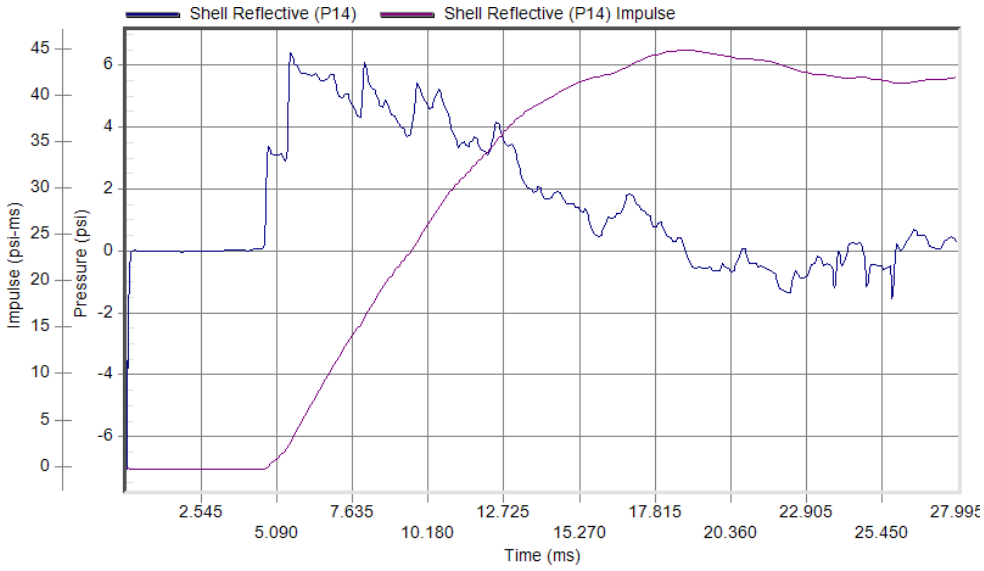
Test Date: 12/18/2014
Test Time: 4:11 pm

Specimen #6



Peak Pressure: 6.76 psi at 5.27 ms
Duration: 12.95 ms

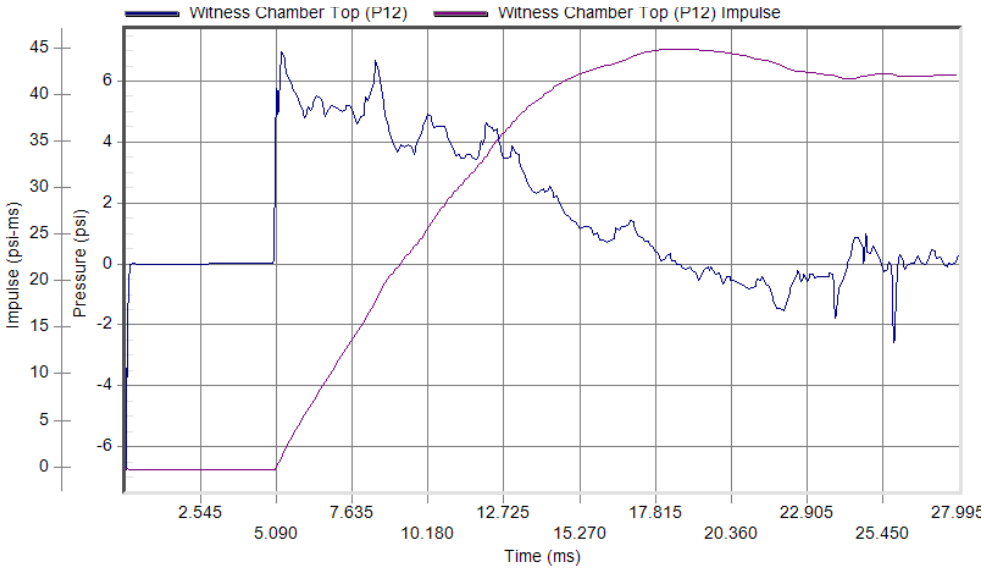
Test Date: 12/17/2014
Test Time: 10:34 am



Peak Pressure: 6.50 psi at 5.58 ms
Duration: 13.22 ms

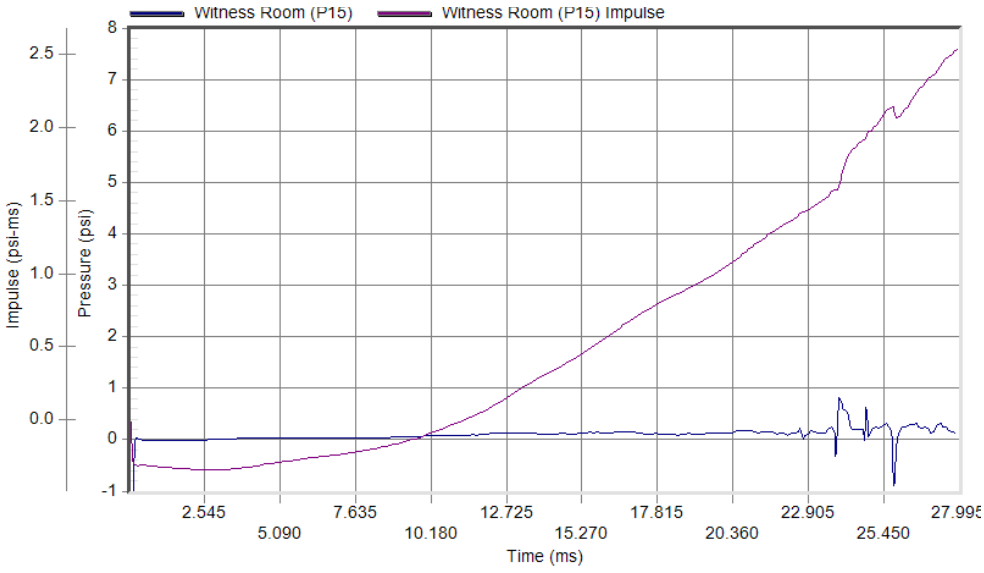
Test Date: 12/17/2014
Test Time: 10:34 am

Specimen #6: (Continued)



Peak Pressure: 7.05 psi at 5.32 ms
Duration: 13.16 ms

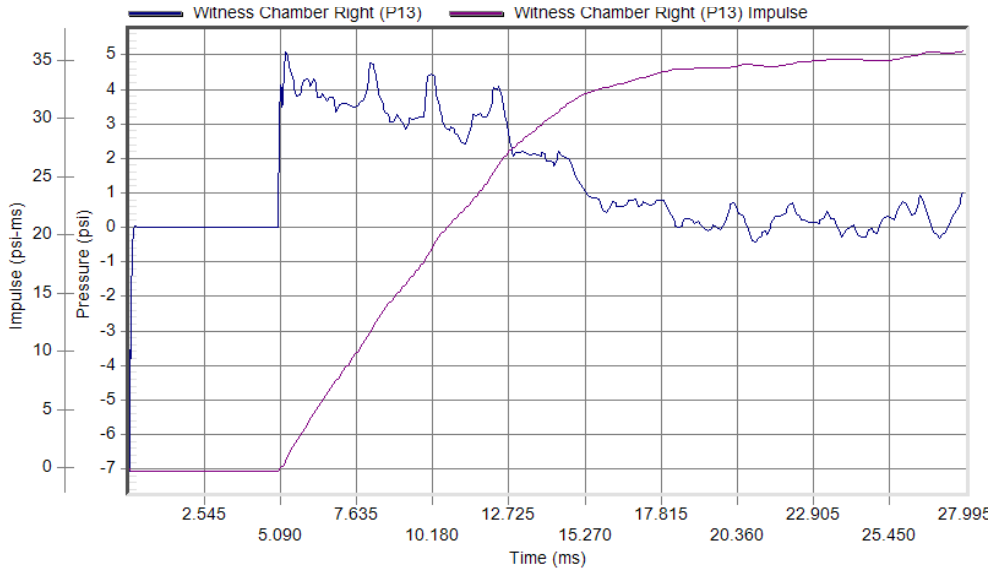
Test Date: 12/17/2014
Test Time: 10:34 am



Peak Pressure: 0.85 psi at 23.98 ms
Duration: 0.82 ms

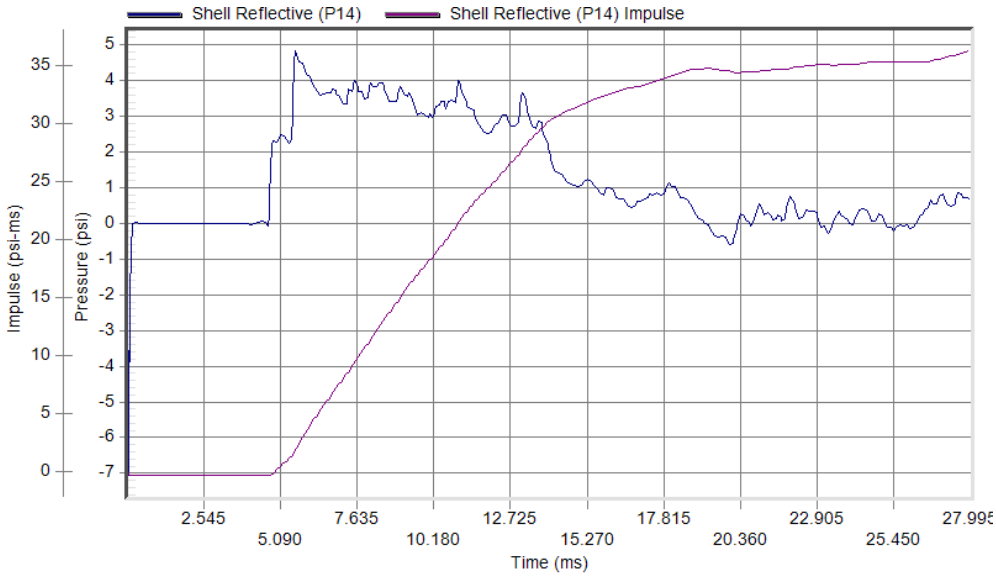
Test Date: 12/17/2014
Test Time: 10:34 am

Specimen #7



Peak Pressure: 5.17 psi at 5.30 ms
Duration: 12.99 ms

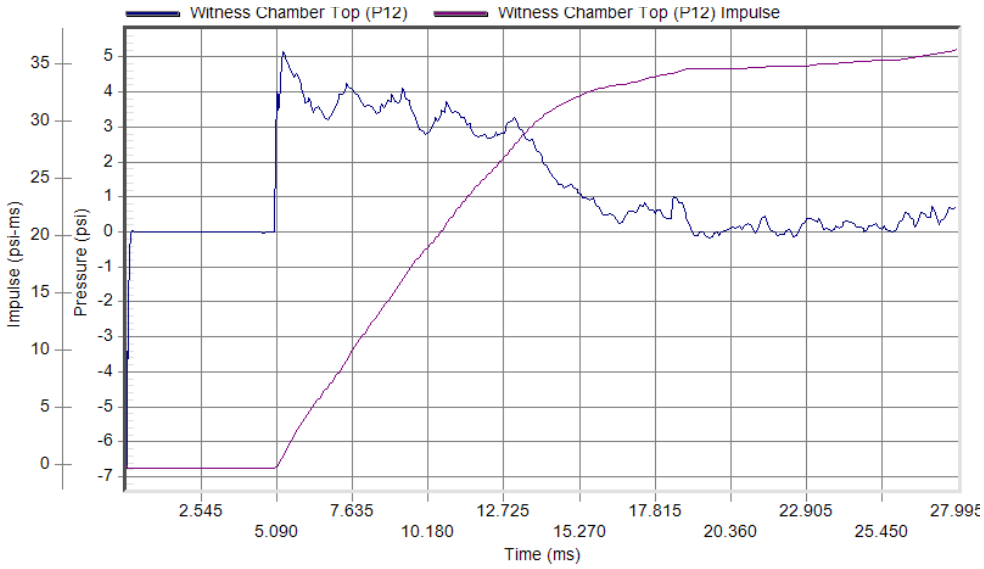
Test Date: 12/19/2014
Test Time: 3:12 pm



Peak Pressure: 4.84 psi at 5.61 ms
Duration: 13.53 ms

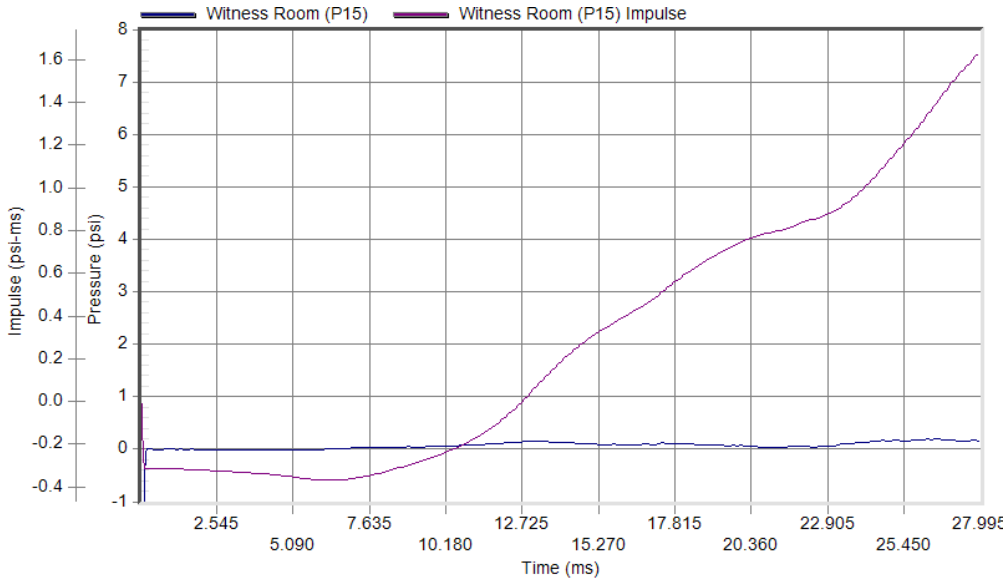
Test Date: 12/19/2014
Test Time: 3:12 pm

Specimen #7: (Continued)



Peak Pressure: 5.23 psi at 5.33 ms
Duration: 13.70 ms

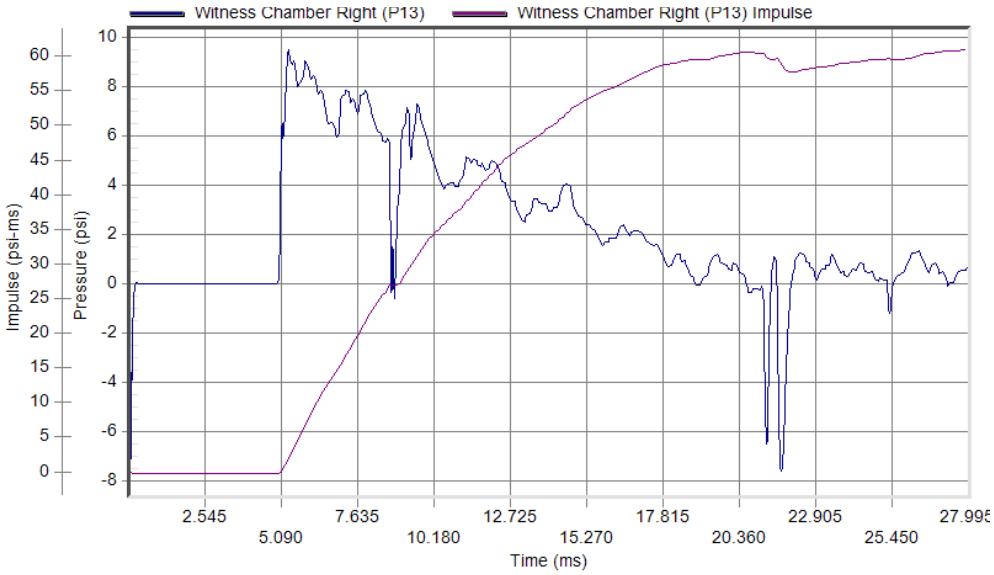
Test Date: 12/19/2014
Test Time: 3:12 pm



Peak Pressure: 0.19 psi at 26.57 ms
Duration: 0.00 ms

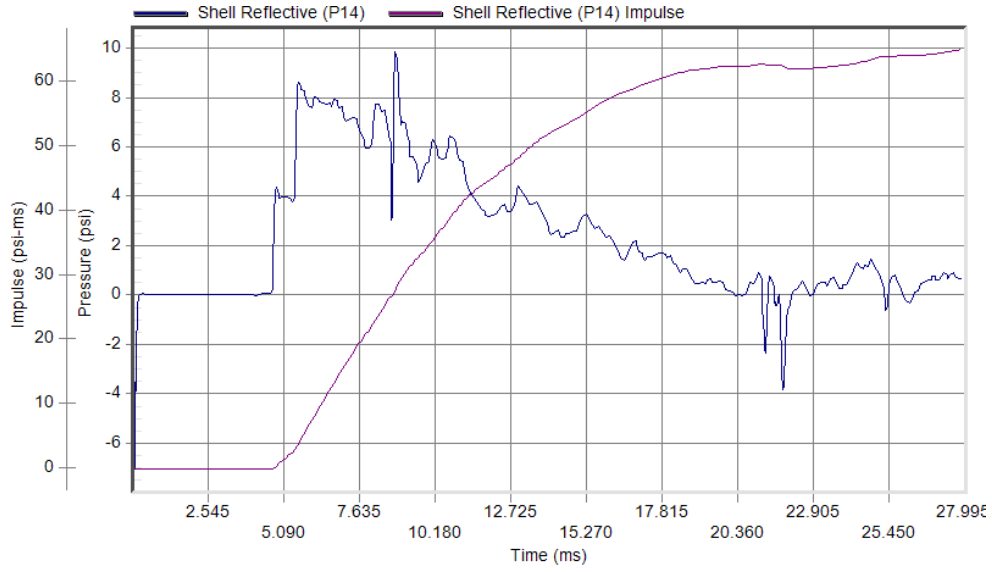
Test Date: 12/19/2014
Test Time: 3:12 pm

Specimen #8



Peak Pressure: 9.50 psi at 5.32 ms
Duration: 3.42 ms

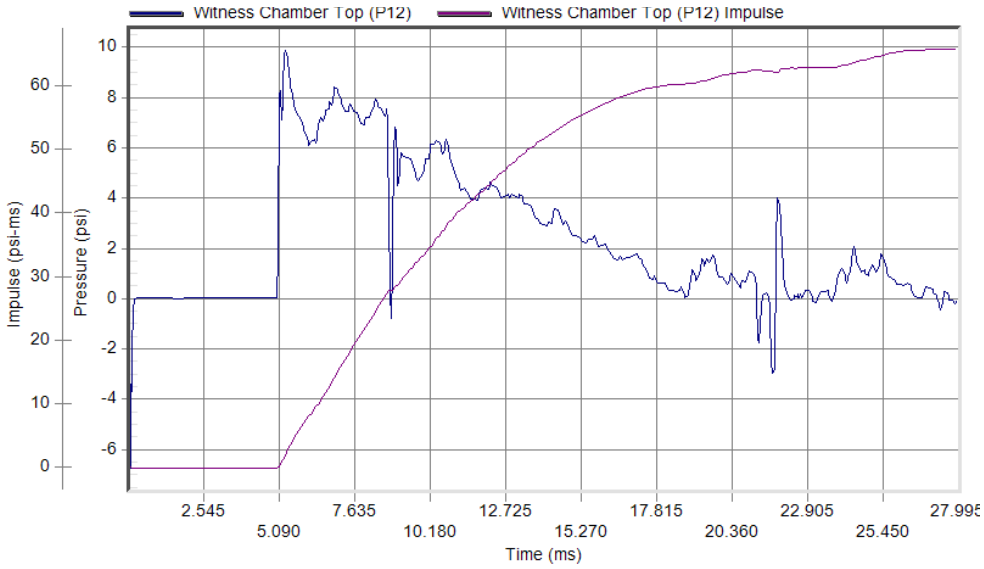
Test Date: 12/19/2014
Test Time: 10:15 am



Peak Pressure: 9.96 psi at 8.85 ms
Duration: 11.38 ms

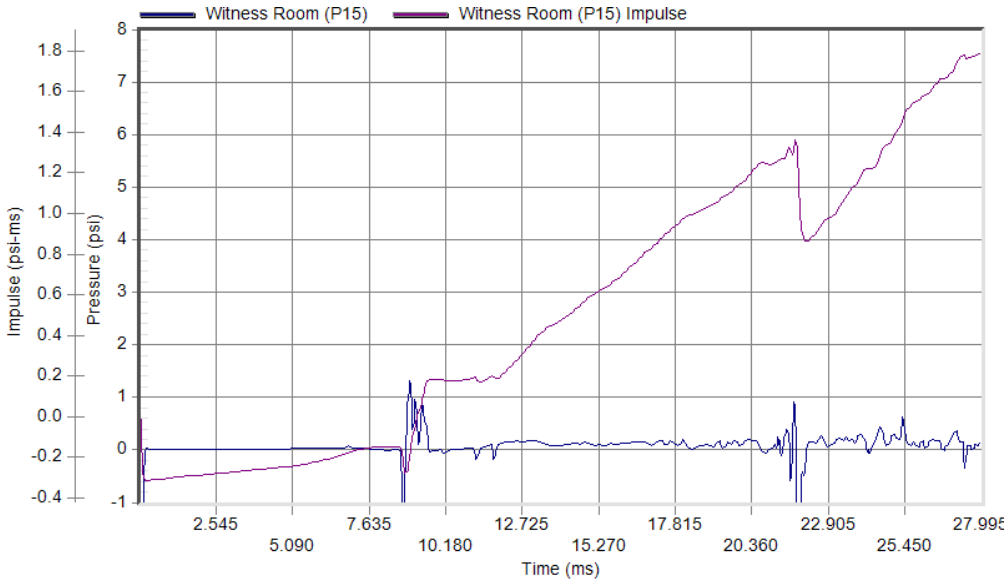
Test Date: 12/19/2014
Test Time: 10:15 am

Specimen #8: (Continued)



Peak Pressure: 9.94 psi at 5.30 ms
Duration: 3.53 ms

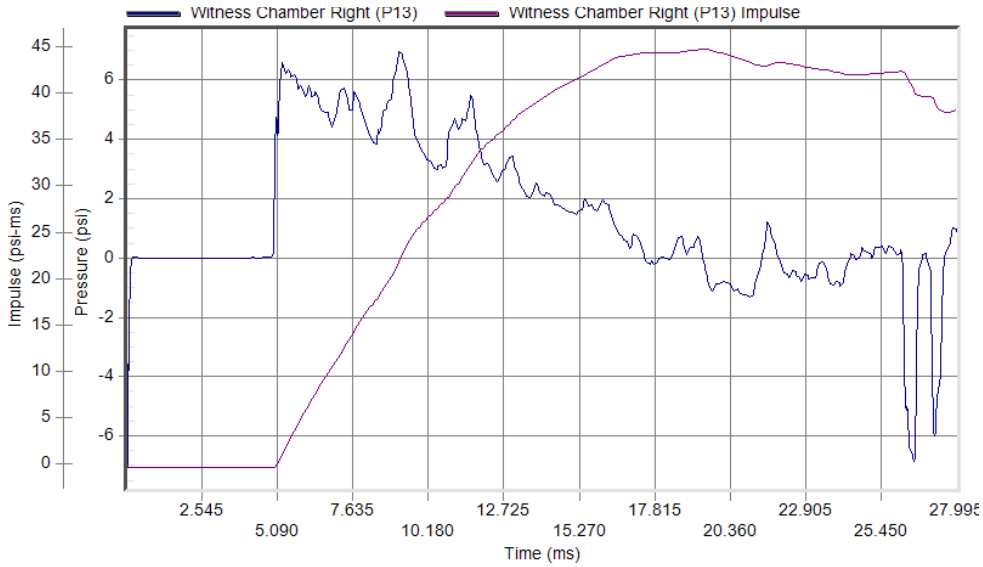
Test Date: 12/19/2014
Test Time: 10:15 am



Peak Pressure: 1.32 psi at 9.00 ms
Duration: 0.62 ms

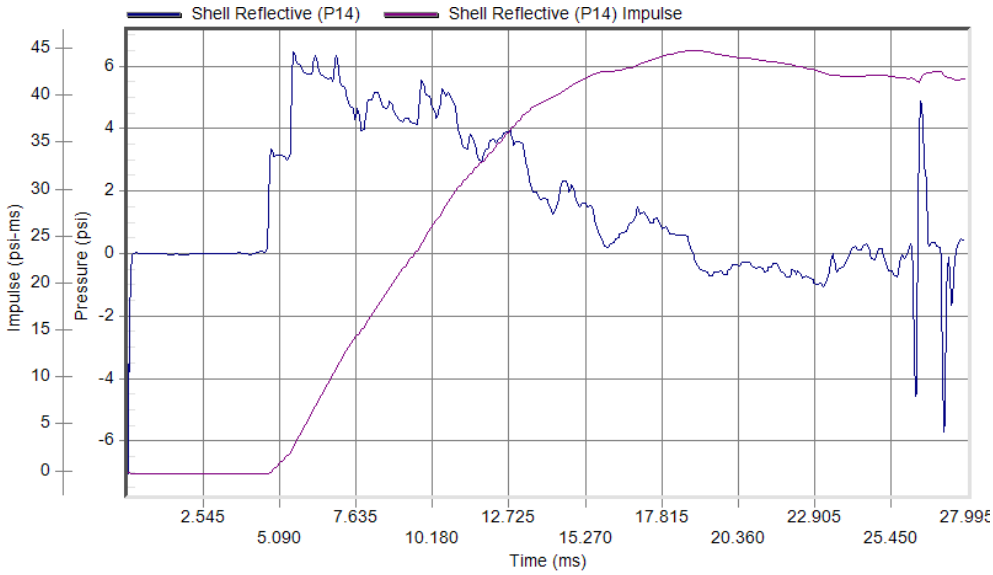
Test Date: 12/19/2014
Test Time: 10:15 am

Specimen #9



Peak Pressure: 7.05 psi at 9.23 ms
Duration: 8.23 ms

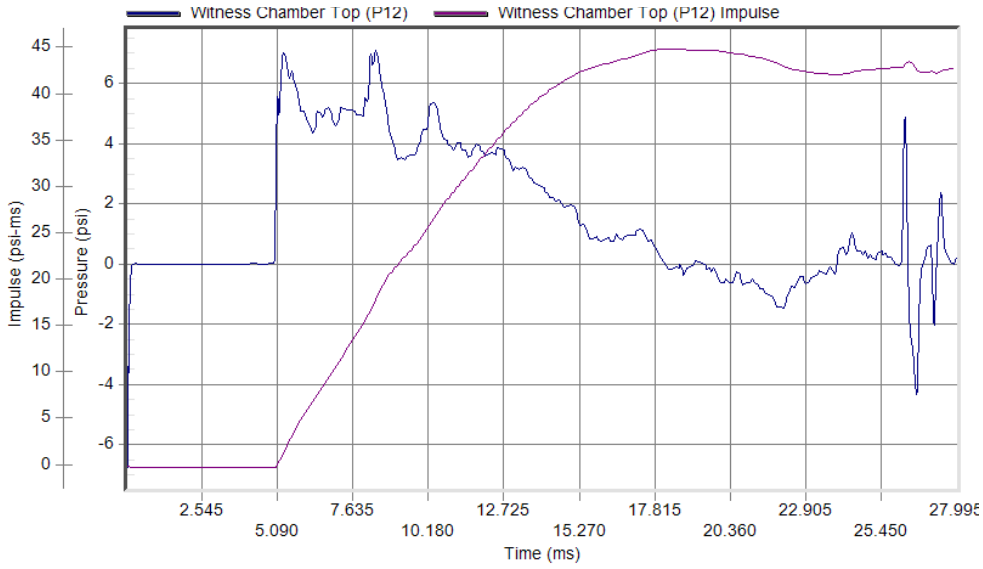
Test Date: 12/16/2014
Test Time: 9:02 am



Peak Pressure: 6.51 psi at 5.58 ms
Duration: 13.26 ms

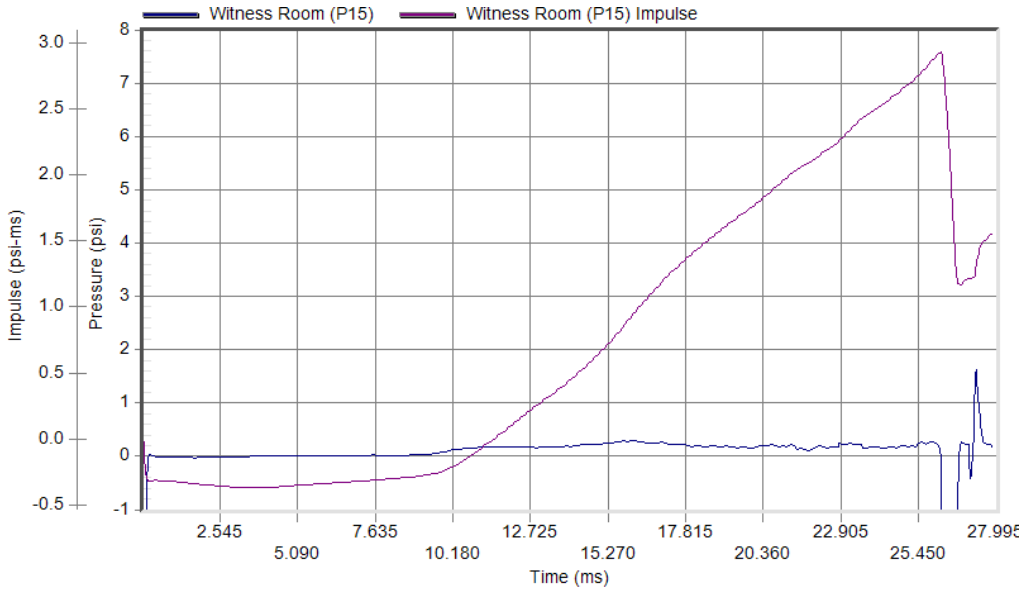
Test Date: 12/16/2014
Test Time: 9:02 am

Specimen #9: (Continued)



Peak Pressure: 7.15 psi at 8.42 ms
Duration: 9.73 ms

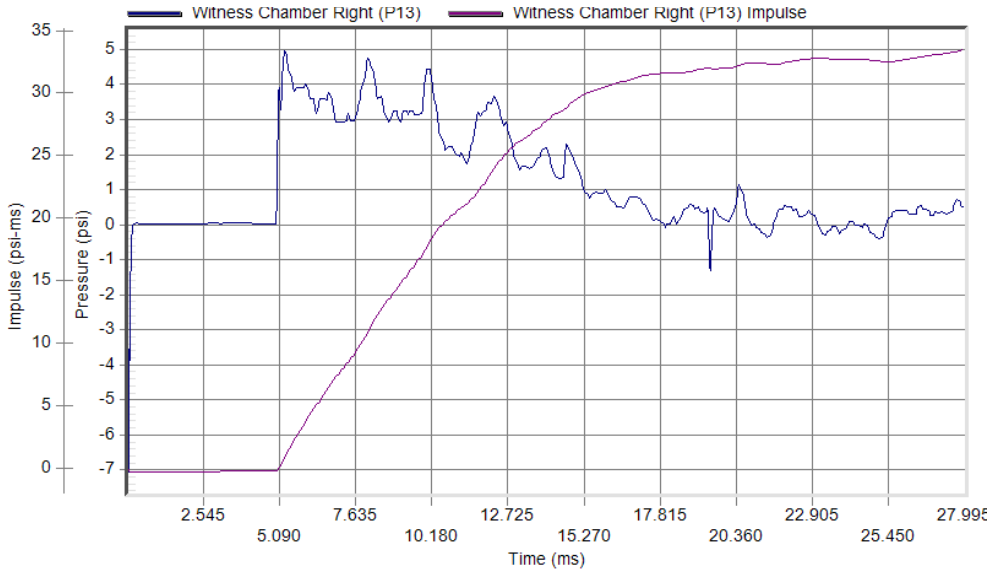
Test Date: 12/16/2014
Test Time: 9:02 am



Peak Pressure: 1.66 psi at 27.35 ms
Duration: 0.10 ms

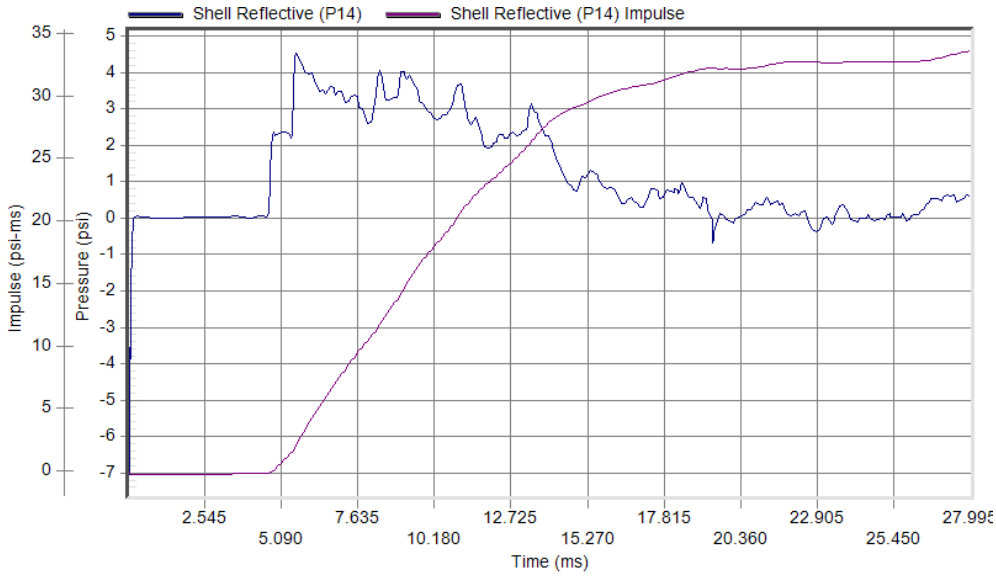
Test Date: 12/16/2014
Test Time: 9:02 am

Specimen #10



Peak Pressure: 5.01 psi at 5.29 ms
Duration: 12.62 ms

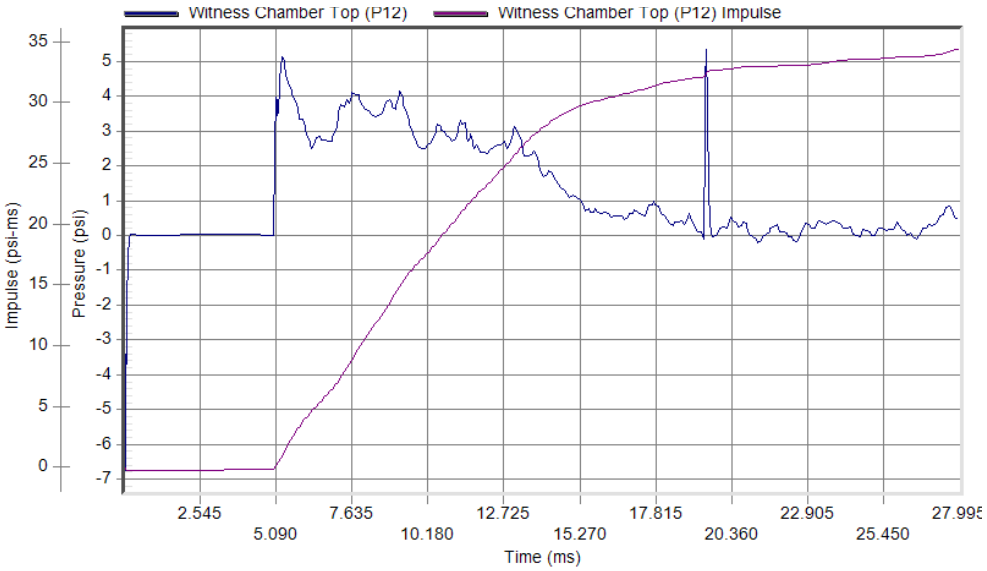
Test Date: 12/18/2014
Test Time: 10:57 am



Peak Pressure: 4.61 psi at 5.60 ms
Duration: 13.80 ms

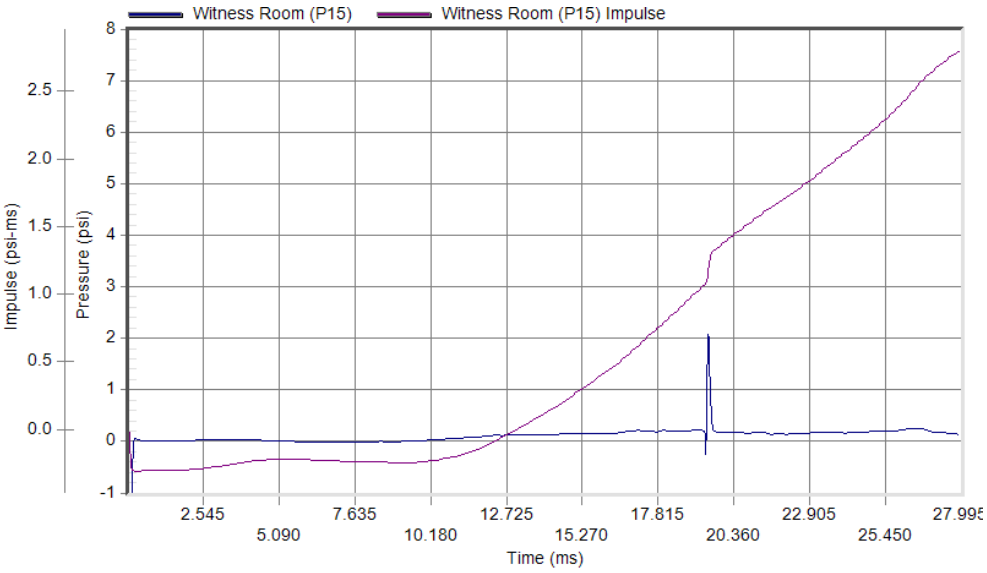
Test Date: 12/18/2014
Test Time: 10:57 am

Specimen #10: (Continued)



Peak Pressure: 5.36 psi at 19.50 ms
Duration: 0.17 ms

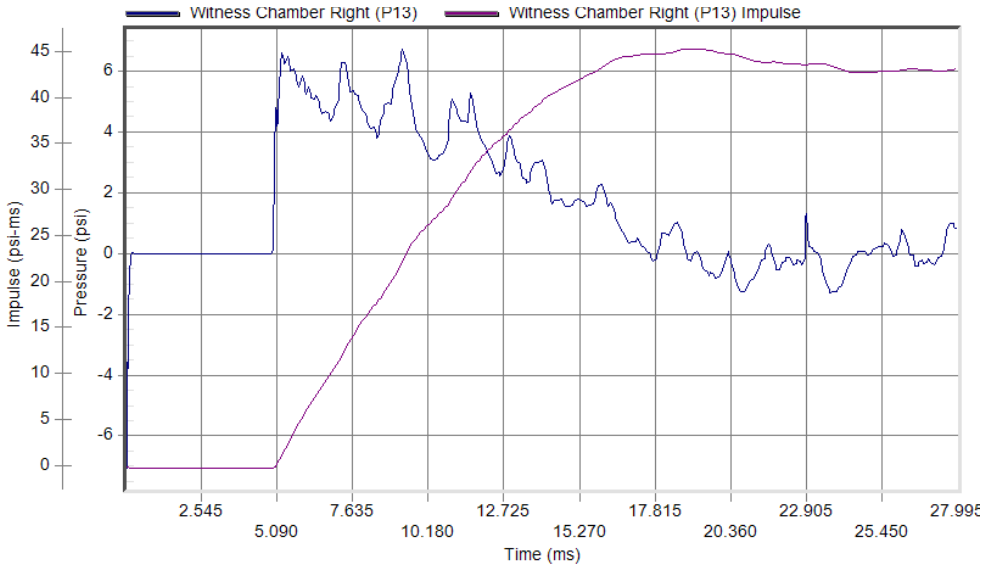
Test Date: 12/18/2014
Test Time: 10:57 am



Peak Pressure: 2.09 psi at 19.50 ms
Duration: 0.00 ms

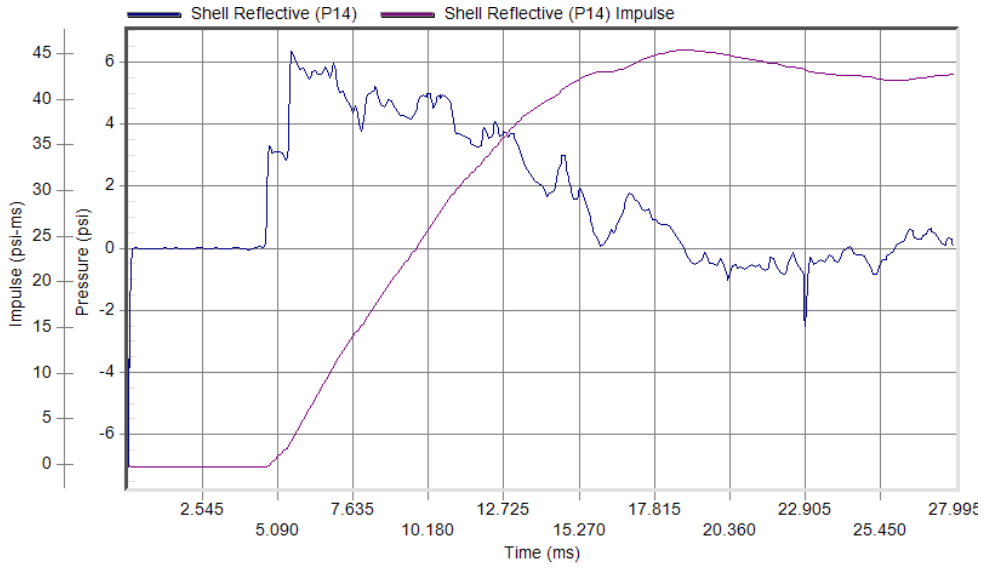
Test Date: 12/18/2014
Test Time: 10:57 am

Specimen #11



Peak Pressure: 6.74 psi at 9.32 ms
Duration: 8.25 ms

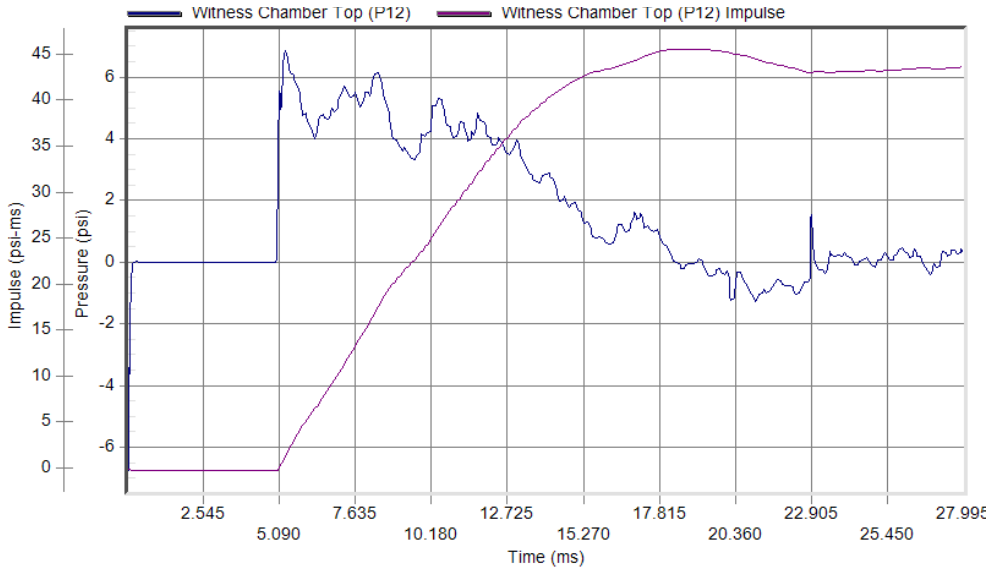
Test Date: 12/16/2014
Test Time: 1:42 pm



Peak Pressure: 6.40 psi at 5.59 ms
Duration: 10.39 ms

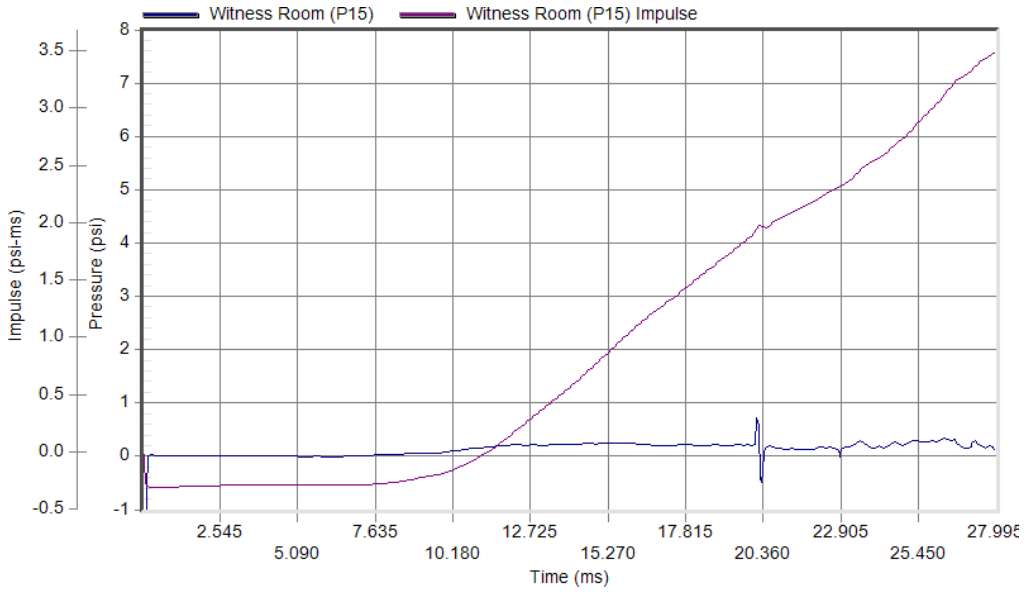
Test Date: 12/16/2014
Test Time: 1:42 pm

Specimen #11: (Continued)



Peak Pressure: 6.90 psi at 5.32 ms
Duration: 12.97 ms

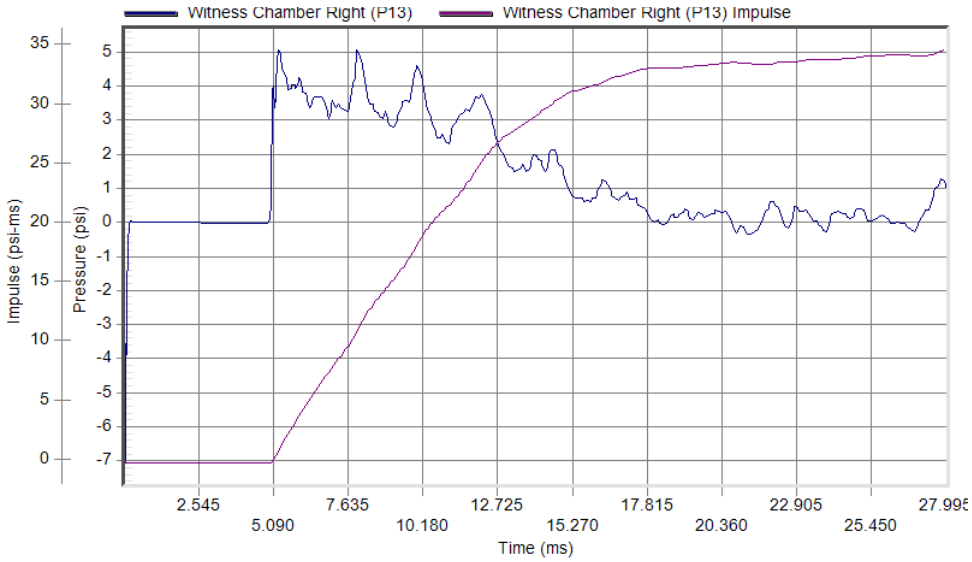
Test Date: 12/16/2014
Test Time: 1:42 pm



Peak Pressure: 0.73 psi at 20.16 ms
Duration: 0.09 ms

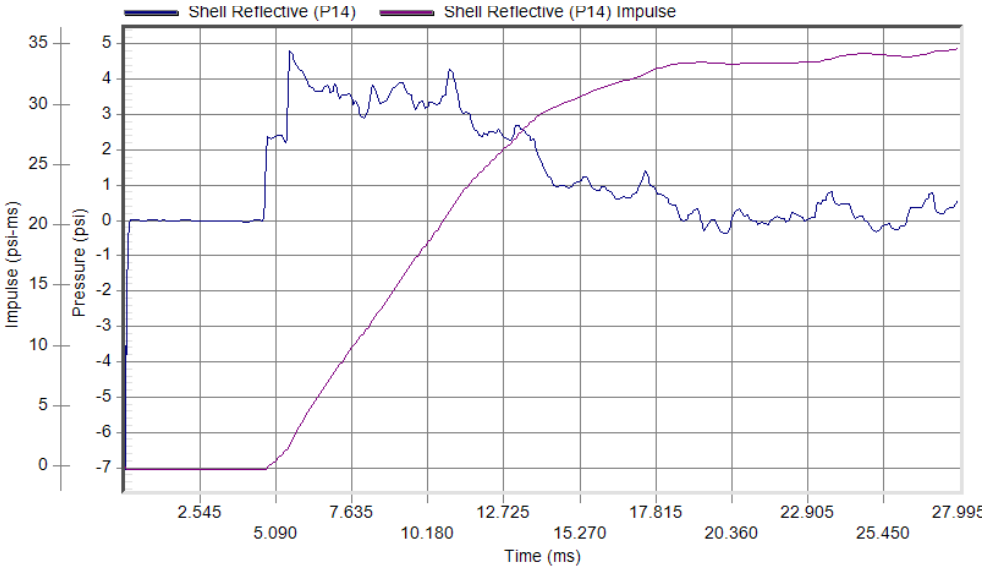
Test Date: 12/16/2014
Test Time: 1:42 pm

Specimen #12



Peak Pressure: 5.11 psi at 5.29 ms
Duration: 12.67 ms

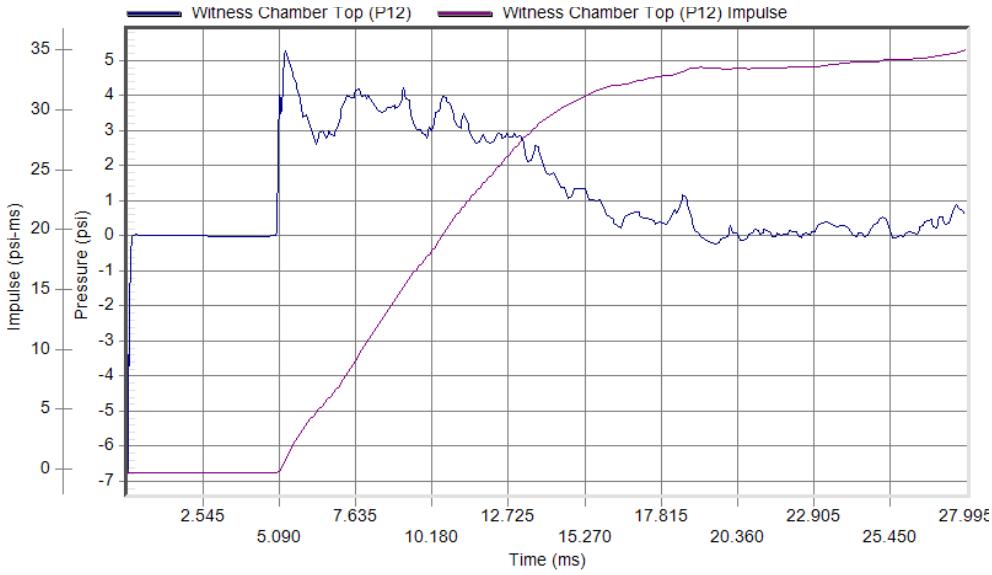
Test Date: 12/17/2014
Test Time: 2:43 pm



Peak Pressure: 4.88 psi at 5.60 ms
Duration: 13.05 ms

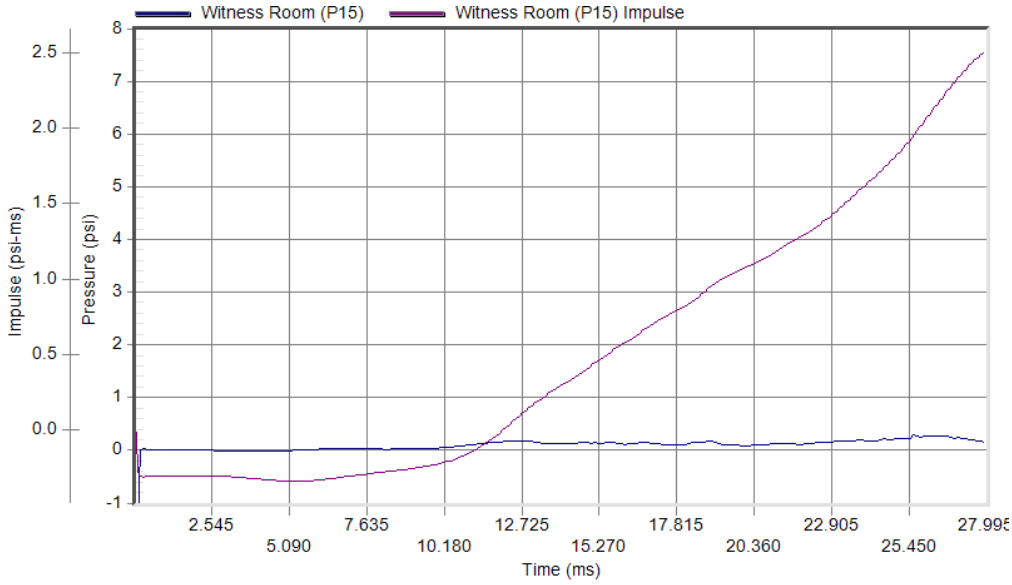
Test Date: 12/17/2014
Test Time: 2:43 pm

Specimen #12: (Continued)



Peak Pressure: 5.32 psi at 5.31 ms
Duration: 13.75 ms

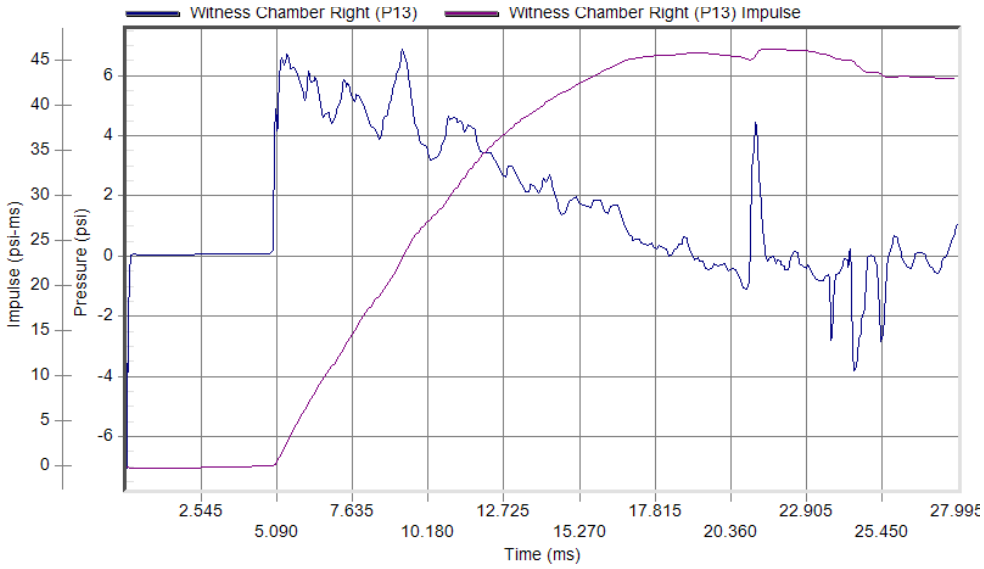
Test Date: 12/17/2014
Test Time: 2:43 pm



Peak Pressure: 0.28 psi at 25.60 ms
Duration: 0.00 ms

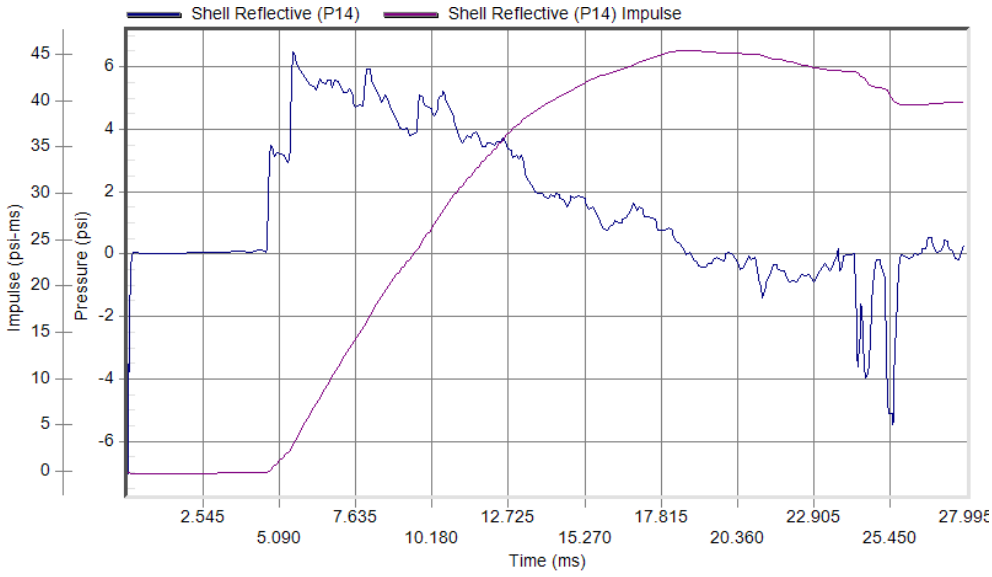
Test Date: 12/17/2014
Test Time: 2:43 pm

Specimen #13



Peak Pressure: 6.89 psi at 9.31 ms
Duration: 8.95 ms

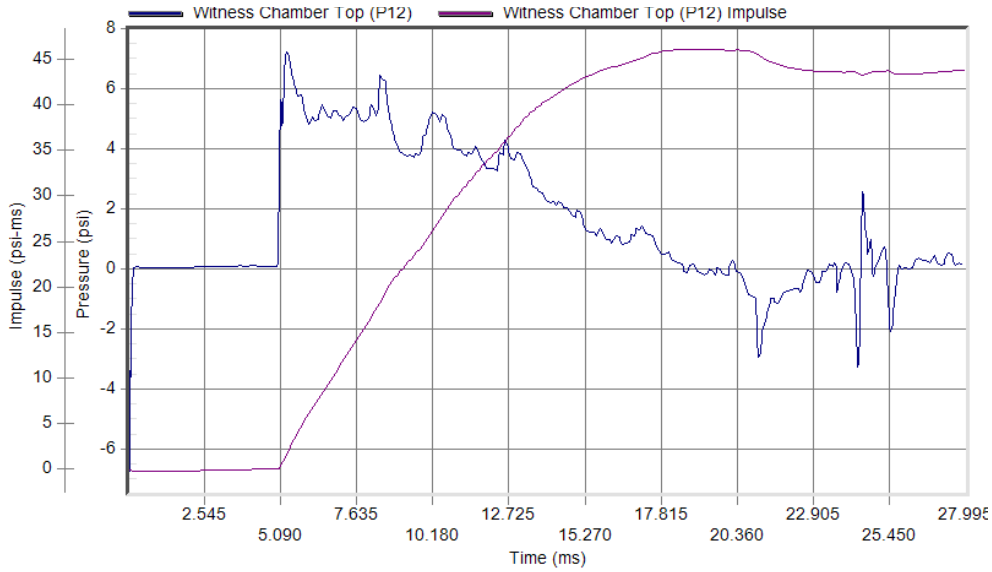
Test Date: 12/16/2014
Test Time: 4:57 pm



Peak Pressure: 6.53 psi at 5.58 ms
Duration: 13.04 ms

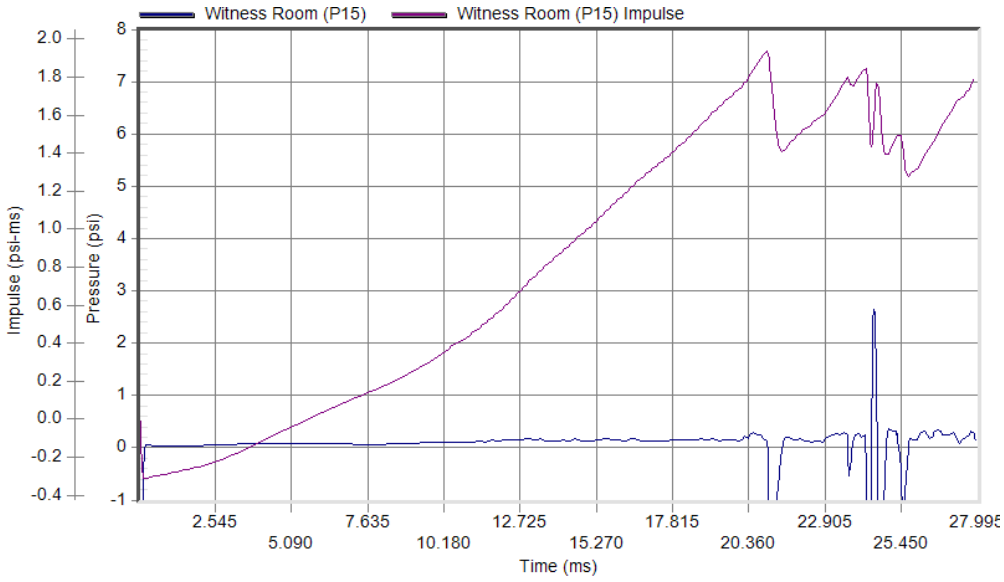
Test Date: 12/16/2014
Test Time: 4:57 pm

Specimen #13: (Continued)



Peak Pressure: 7.31 psi at 5.33 ms
Duration: 13.21 ms

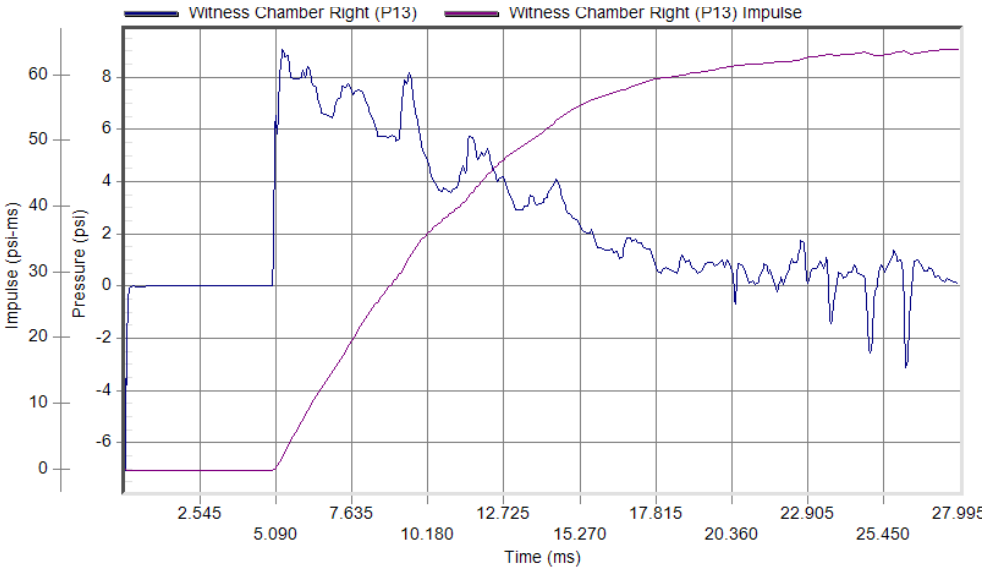
Test Date: 12/16/2014
Test Time: 4:57 pm



Peak Pressure: 2.67 psi at 24.55 ms
Duration: 0.10 ms

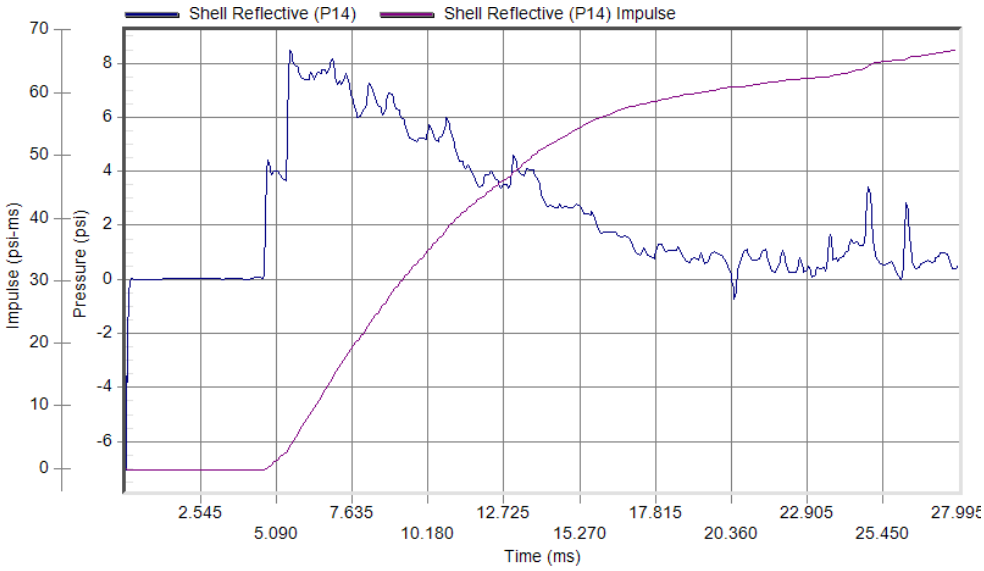
Test Date: 12/16/2014
Test Time: 4:57 pm

Specimen #14



Peak Pressure: 9.08 psi at 5.33 ms
Duration: 15.10 ms

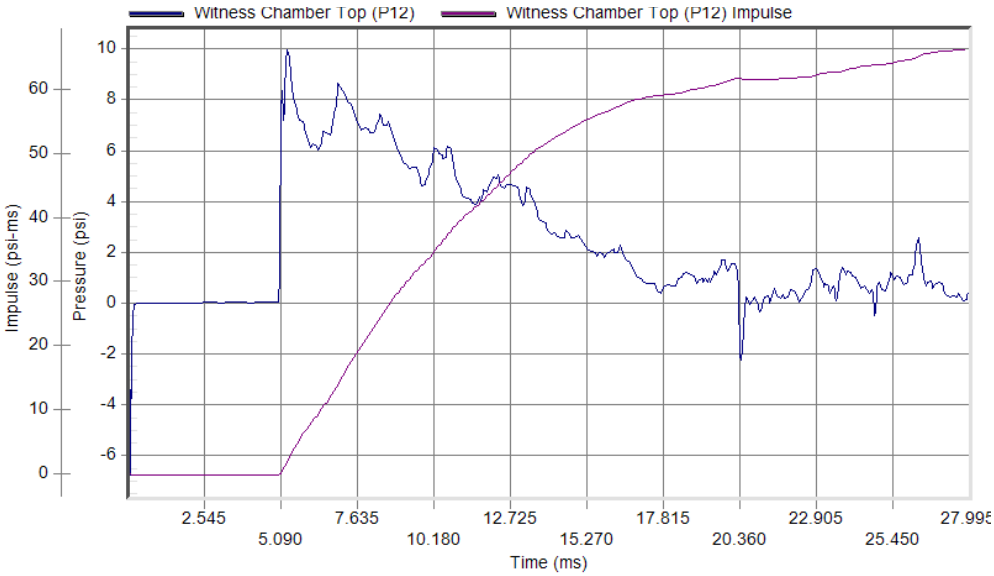
Test Date: 12/18/2014
Test Time: 2:28 pm



Peak Pressure: 8.49 psi at 5.57 ms
Duration: 14.80 ms

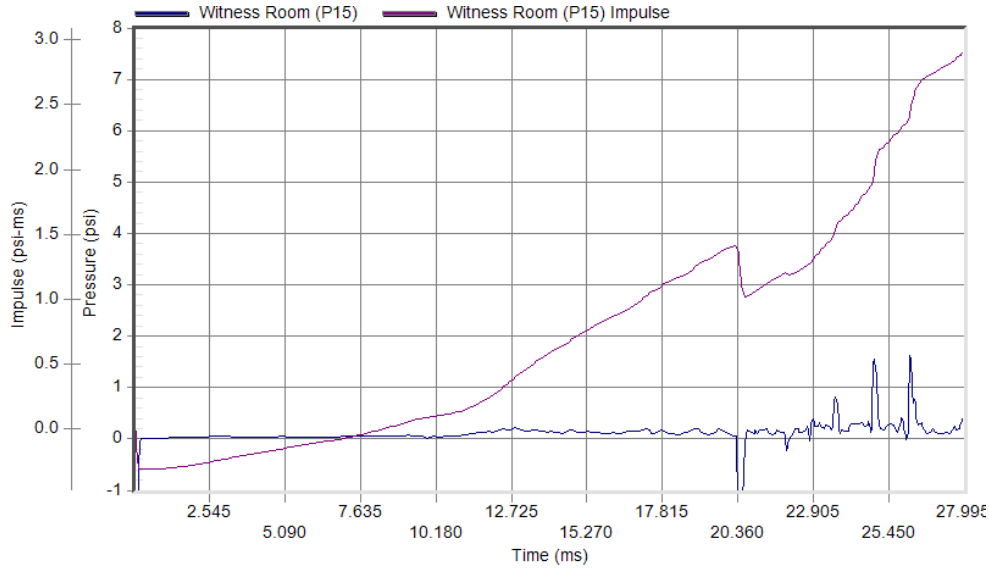
Test Date: 12/18/2014
Test Time: 2:28 pm

Specimen #14: (Continued)



Peak Pressure: 9.98 psi at 5.30 ms
Duration: 15.03 ms

Test Date: 12/18/2014
Test Time: 2:28 pm



Peak Pressure: 1.66 psi at 26.19 ms
Duration: 0.13 ms

Test Date: 12/18/2014
Test Time: 2:28 pm

APPENDIX C

Photographs

Photo No. 1
Pre-test Specimen #1, Interior

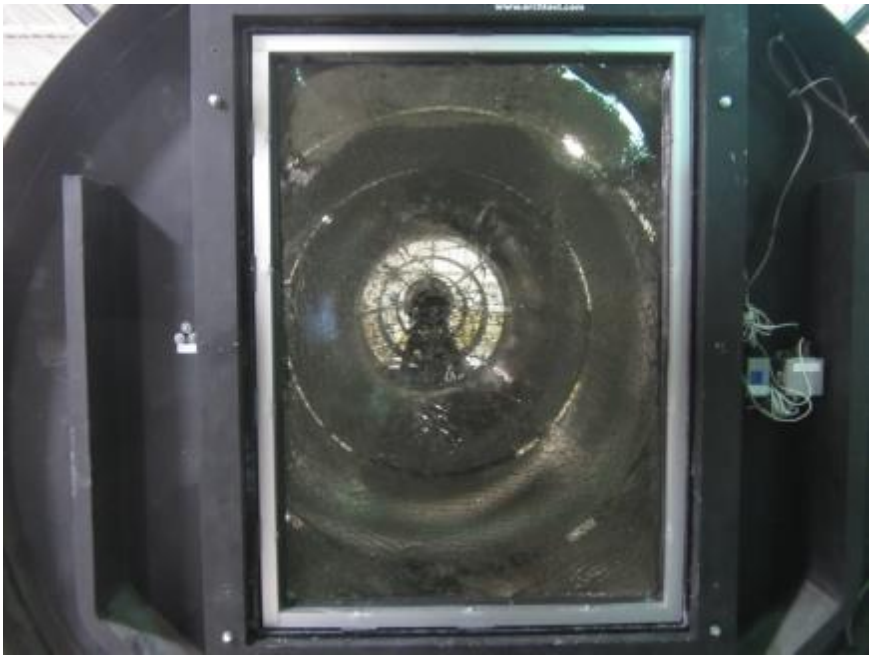


Photo No. 2
Post-test Specimen #1, Interior

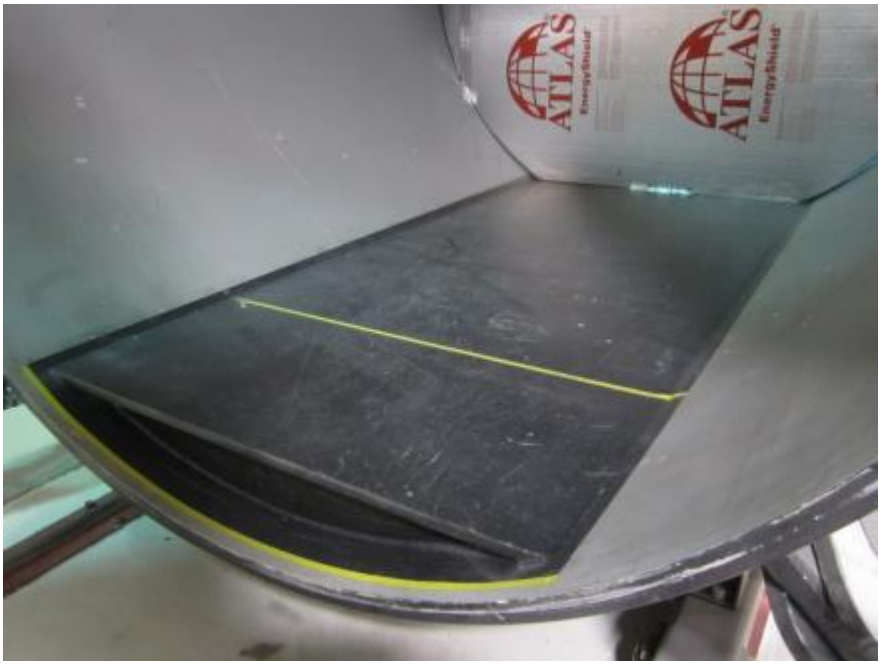


Photo No. 3
Post-test Specimen #1, Witness Chamber

Photo No. 4
Pre-test Specimen #2, Interior

Photo No. 5
Post-test Specimen #2, Interior

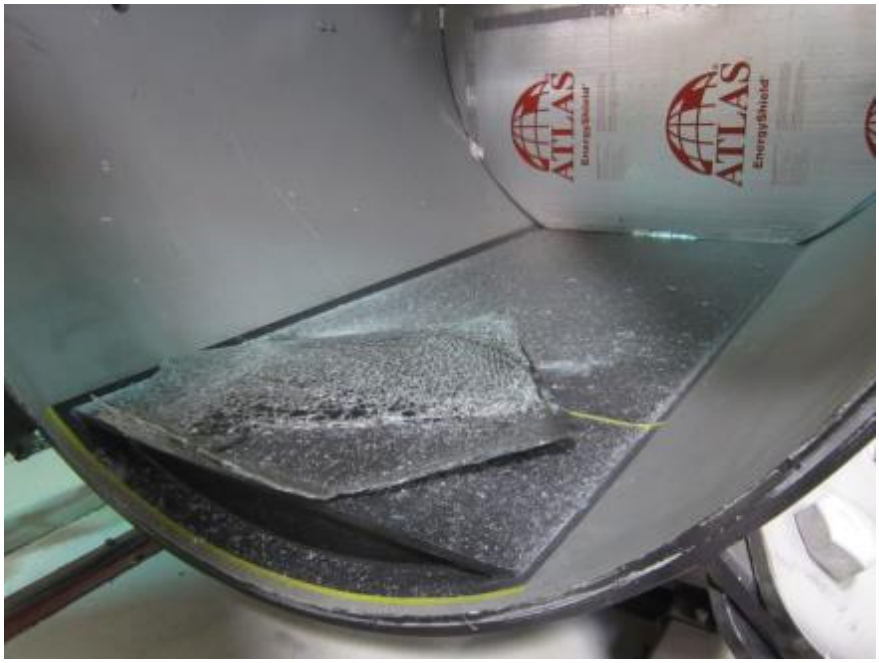


Photo No. 6
Post-test Specimen #2, Witness Chamber

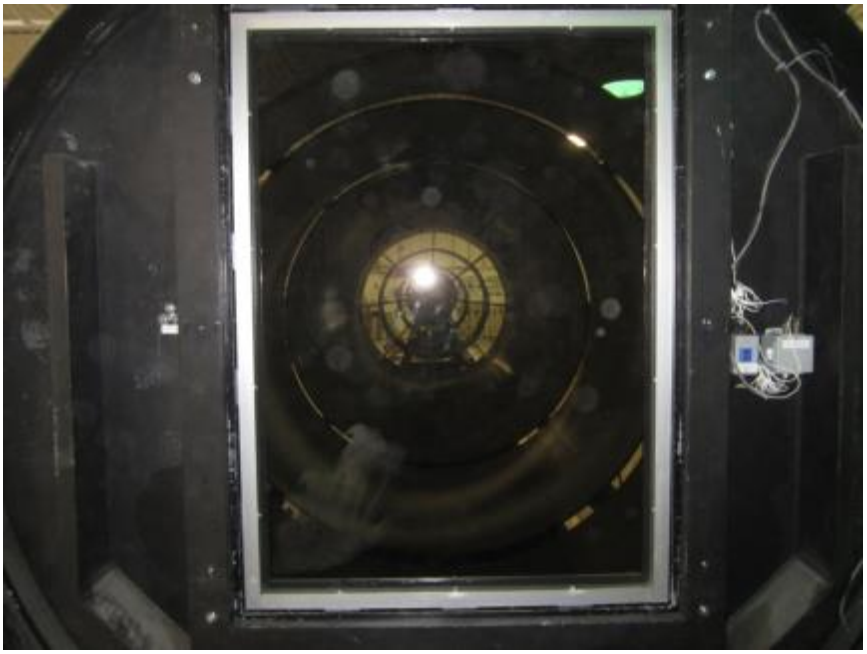


Photo No. 7
Pre-test Specimen #3, Interior

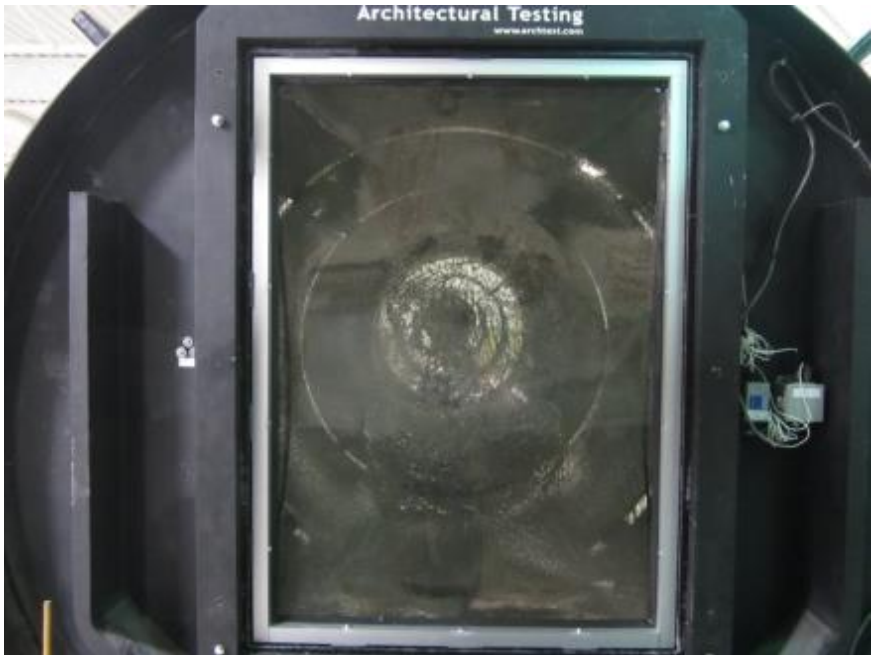


Photo No. 8
Post-test Specimen #3, Interior

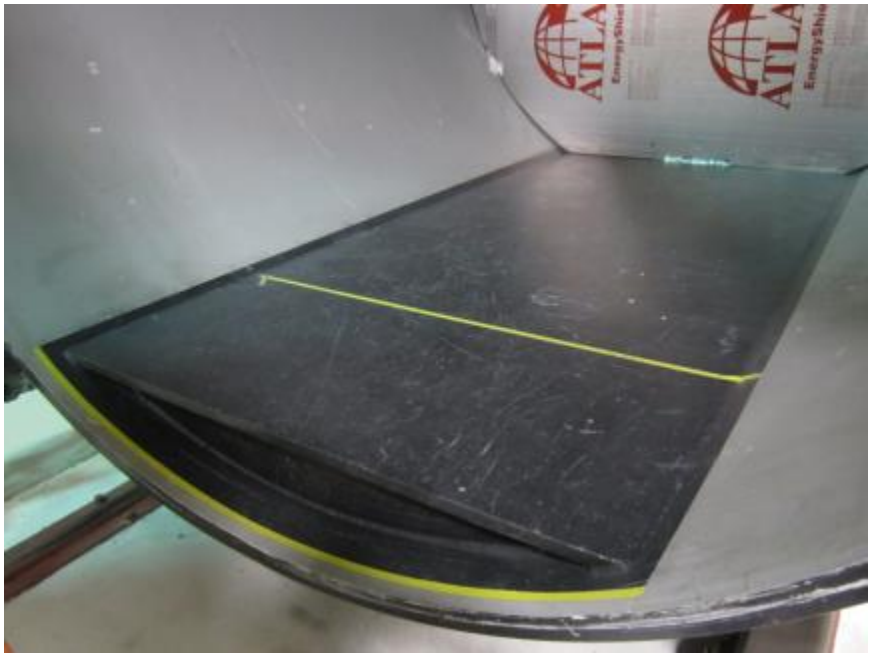


Photo No. 9
Post-test Specimen #3, Witness Chamber

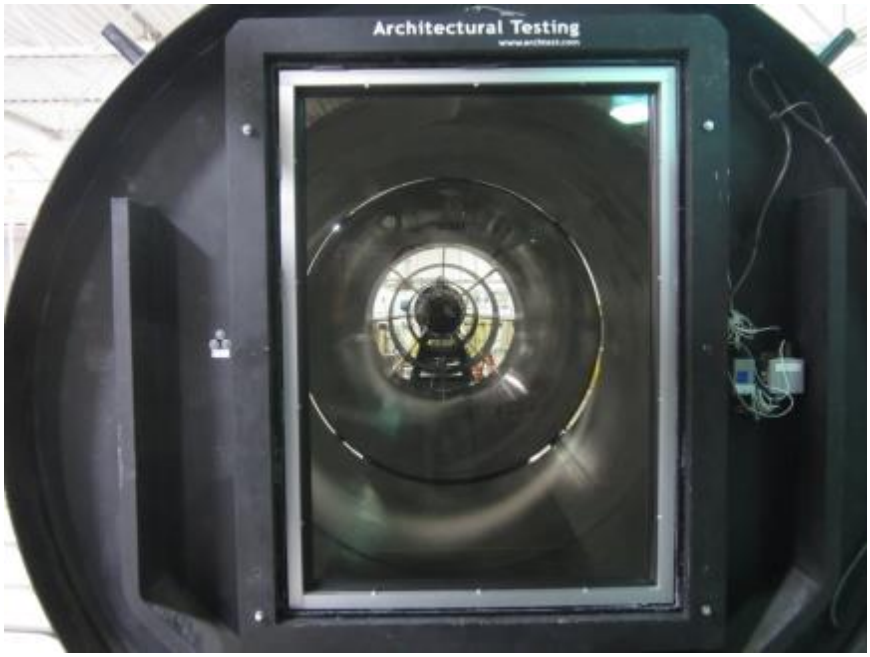


Photo No. 10
Pre-test Specimen #4, Interior

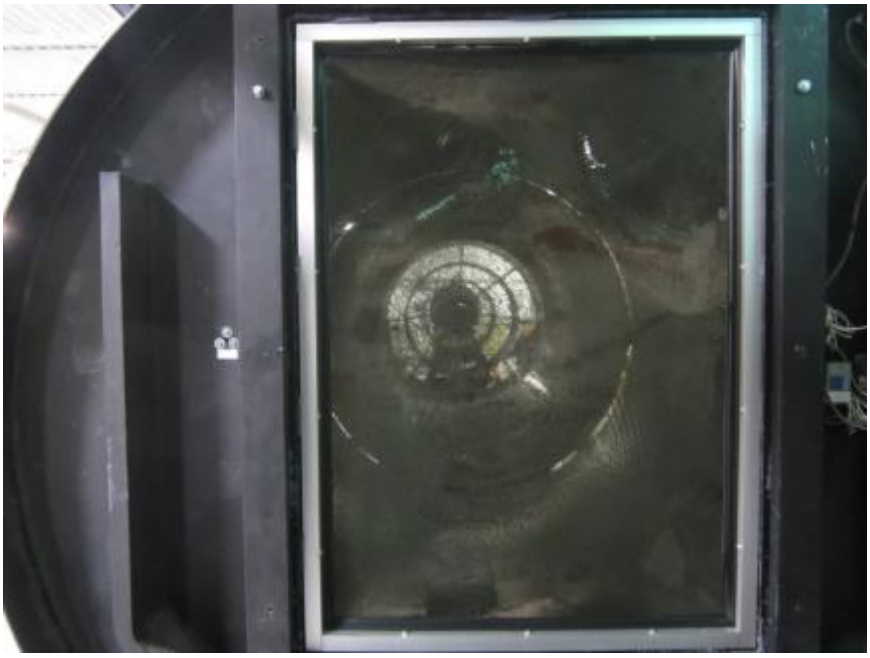


Photo No. 11
Post-test Specimen #4, Interior

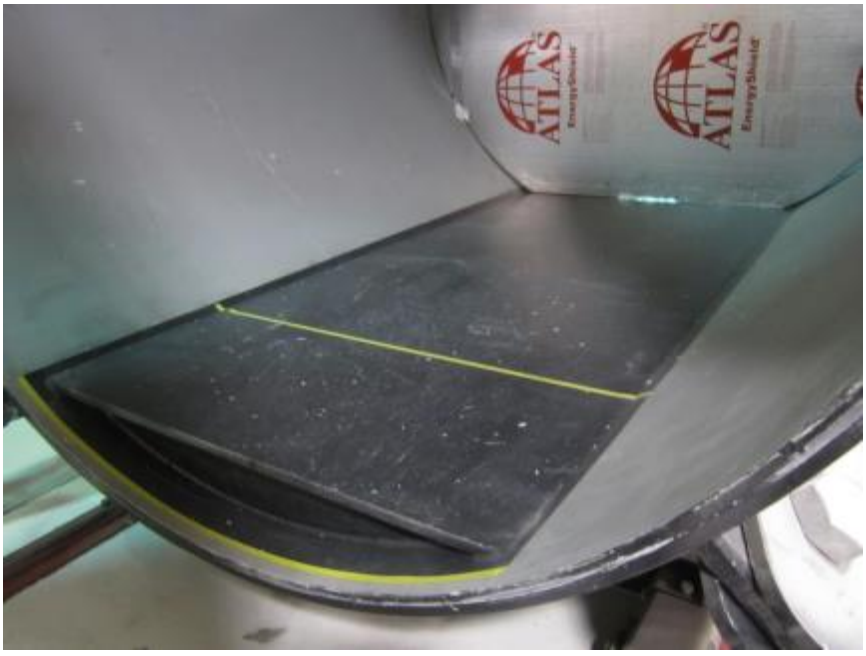


Photo No. 12
Post-test Specimen #4, Witness Chamber

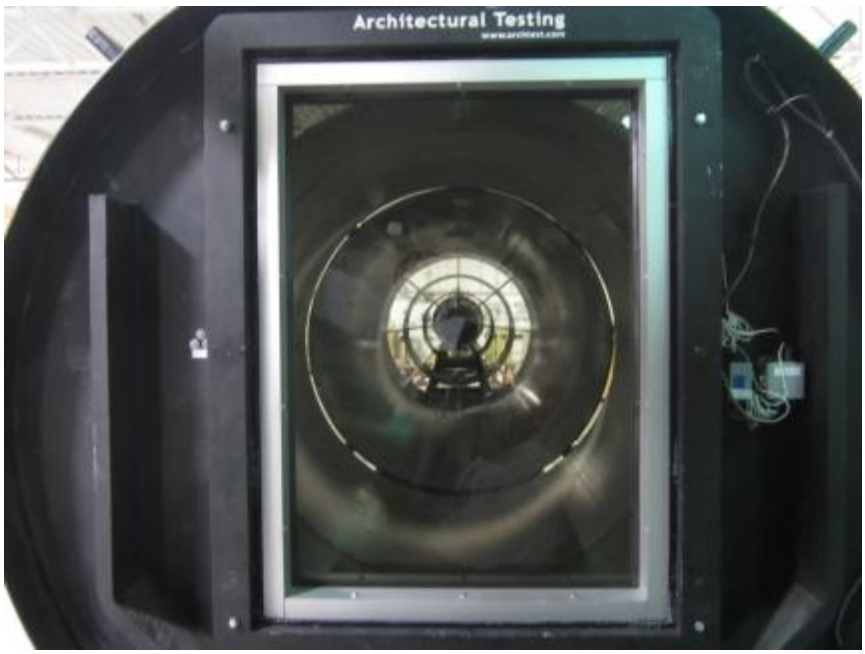


Photo No. 13
Pre-test Specimen #5, Interior

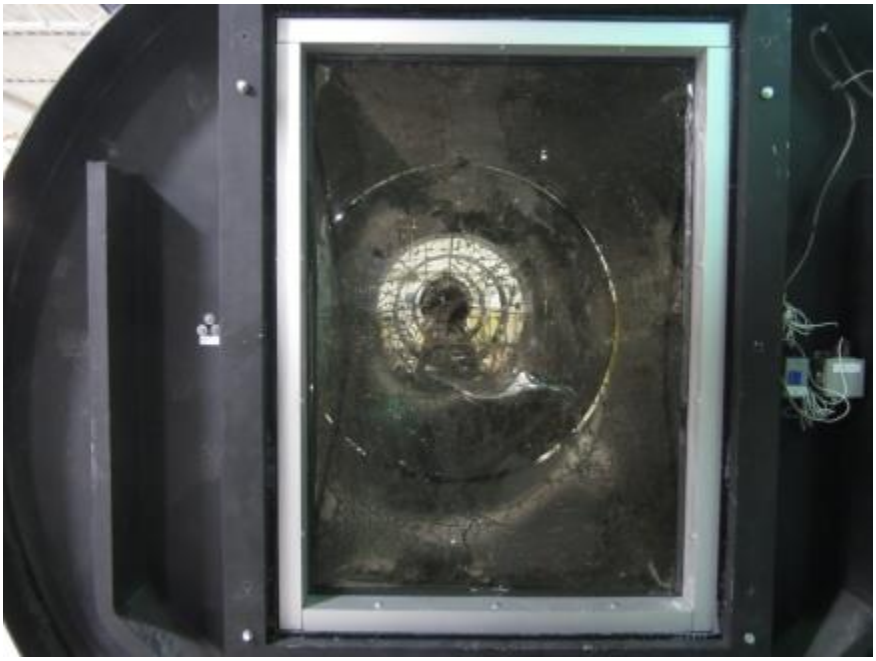


Photo No. 14
Post-test Specimen #5, Interior

Photo No. 15
Post-test Specimen #5, Witness Chamber

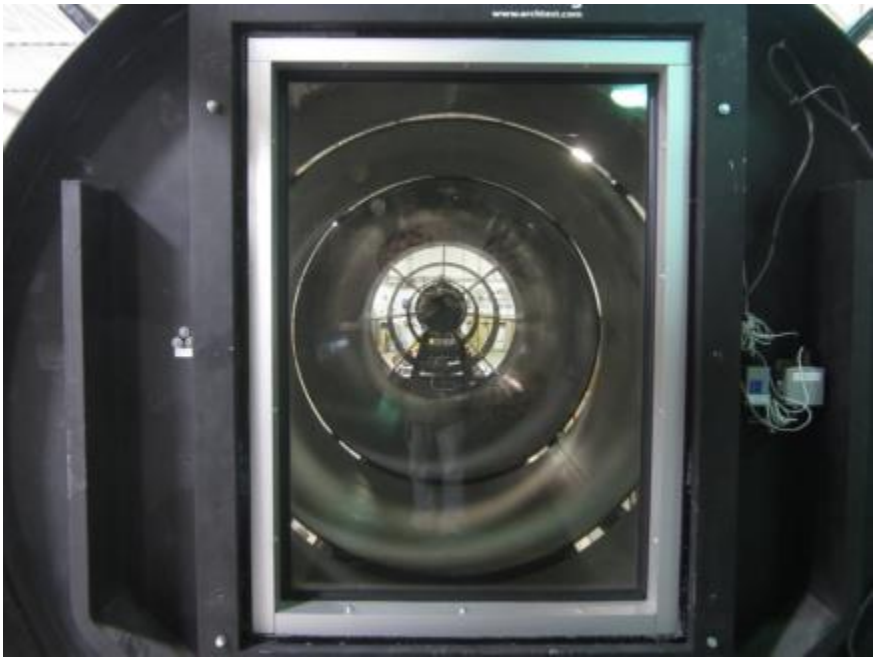


Photo No. 16
Pre-test Specimen #6, Interior

Photo No. 17
Post-test Specimen #6, Interior

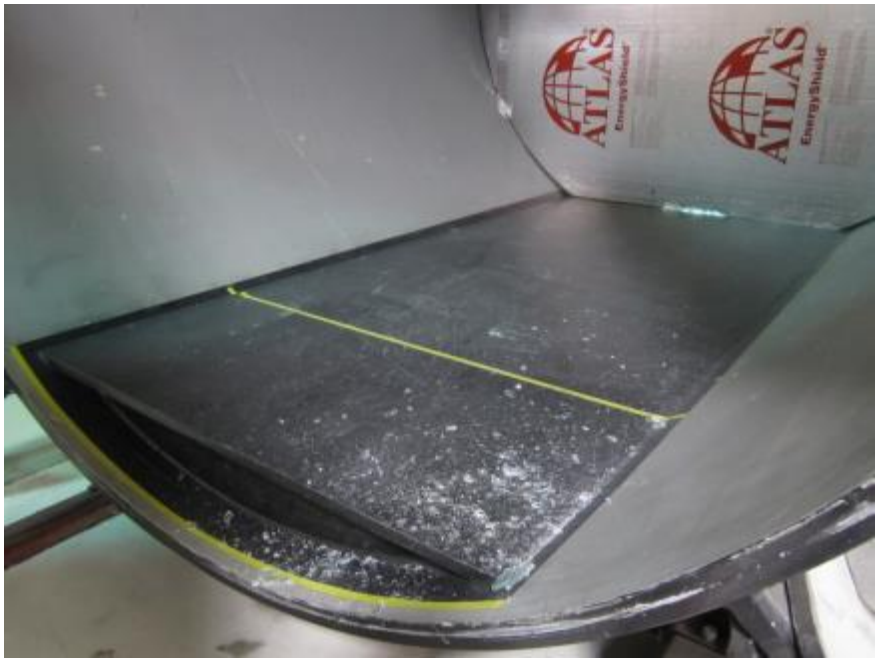


Photo No. 18
Post-test Specimen #6, Witness Chamber

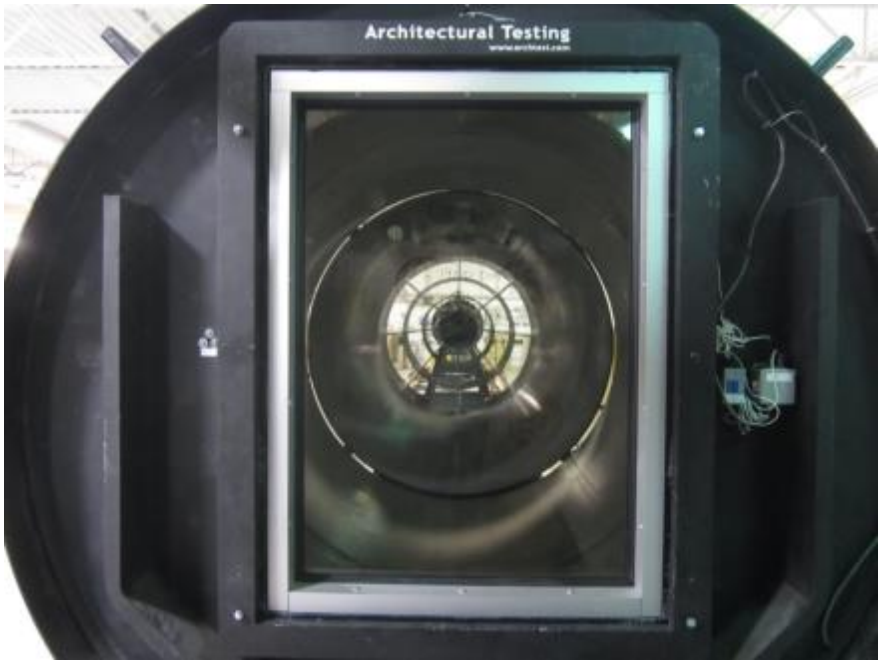


Photo No. 19
Pre-test Specimen #7, Interior

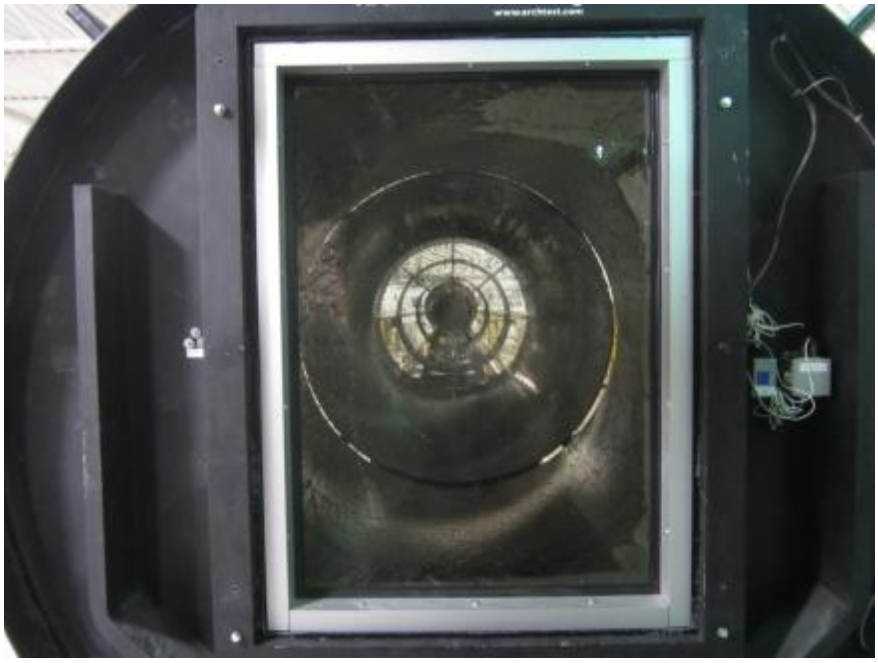


Photo No. 20
Post-test Specimen #7, Interior

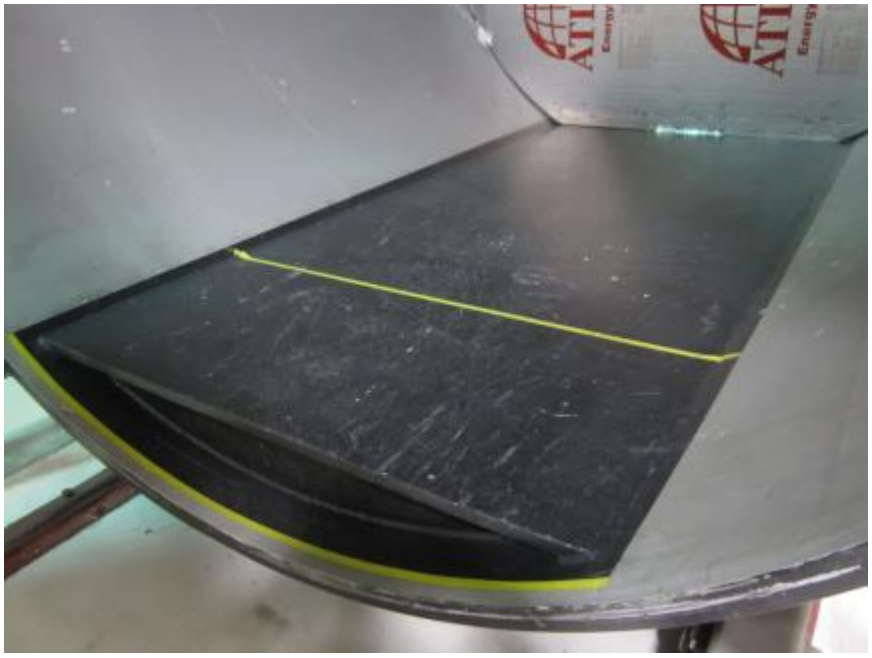


Photo No. 21
Post-test Specimen #7, Witness Chamber

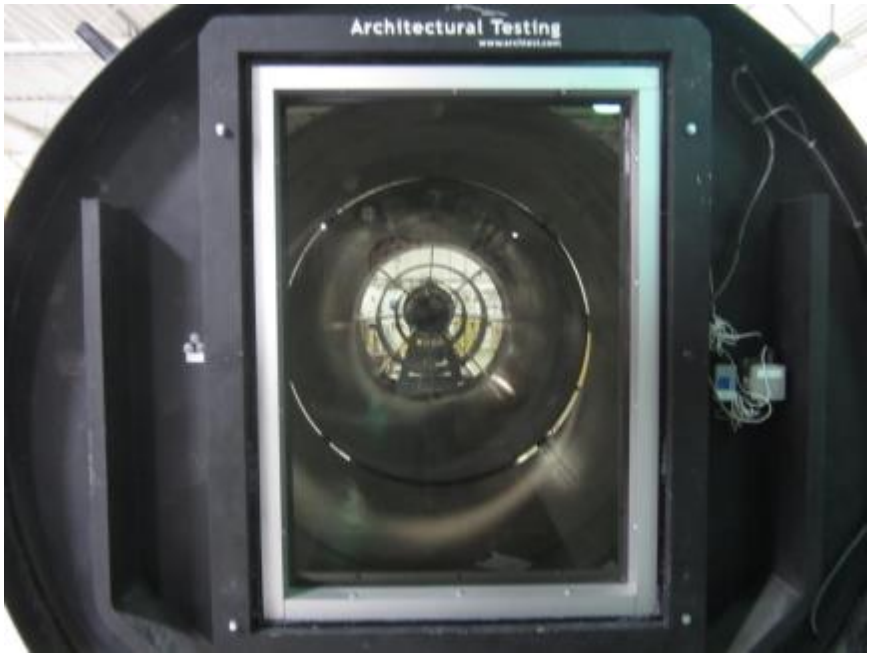


Photo No. 22
Pre-test Specimen #8, Interior

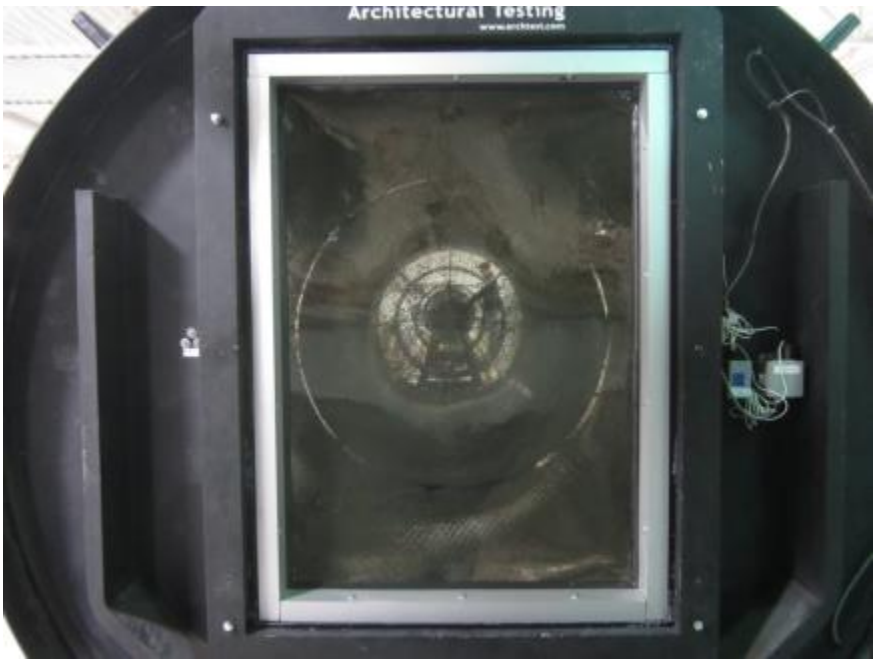


Photo No. 23
Post-test Specimen #8, Interior

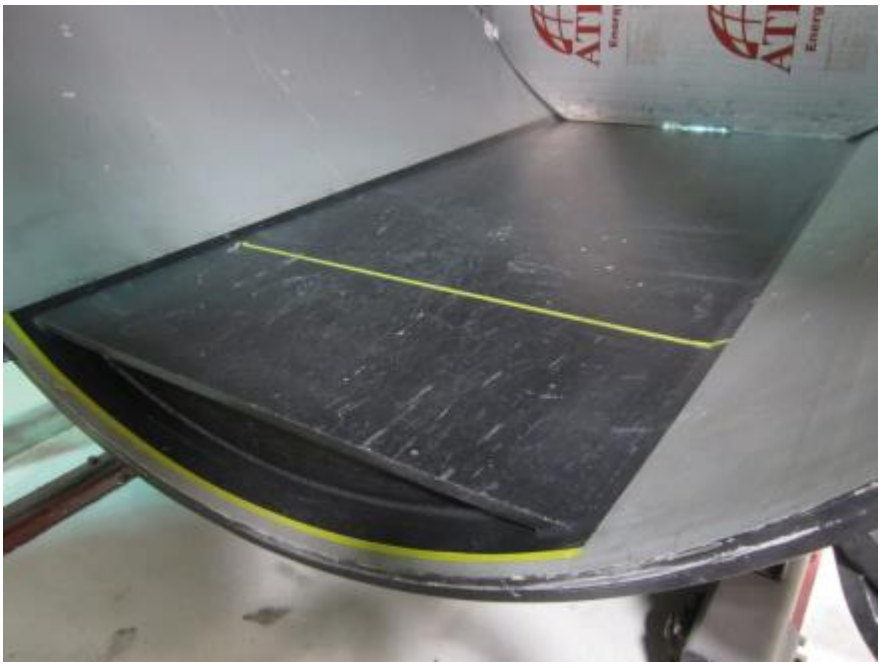


Photo No. 24
Post-test Specimen #8, Witness Chamber

Photo No. 25
Pre-test Specimen #9, Interior

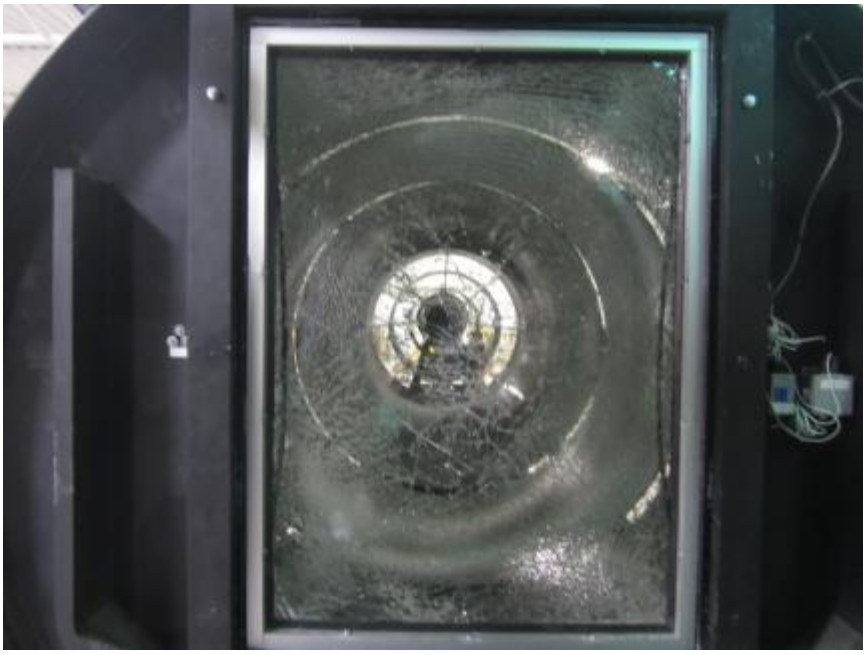


Photo No. 26
Post-test Specimen #9, Interior

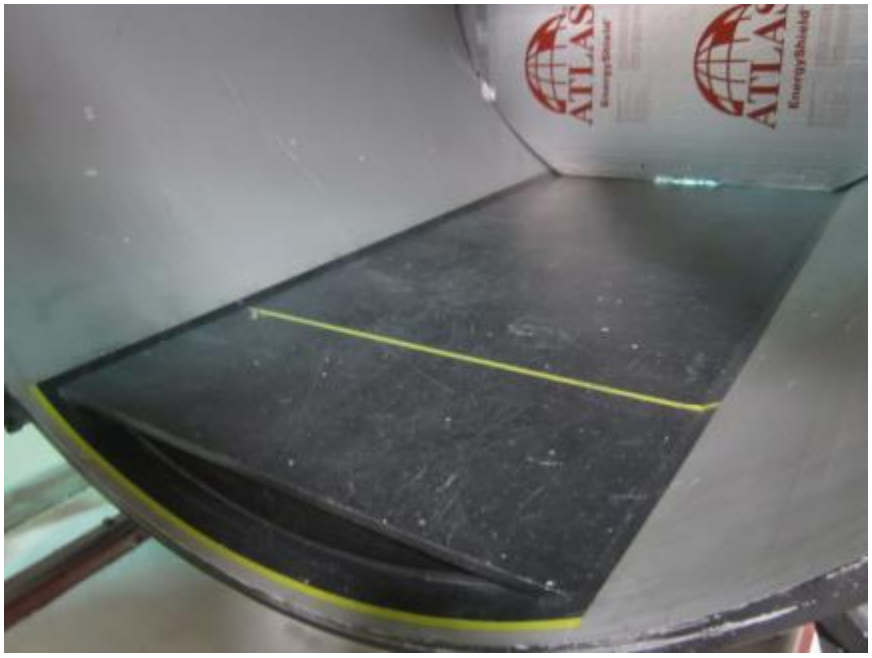


Photo No. 27
Post-test Specimen #9, Witness Chamber

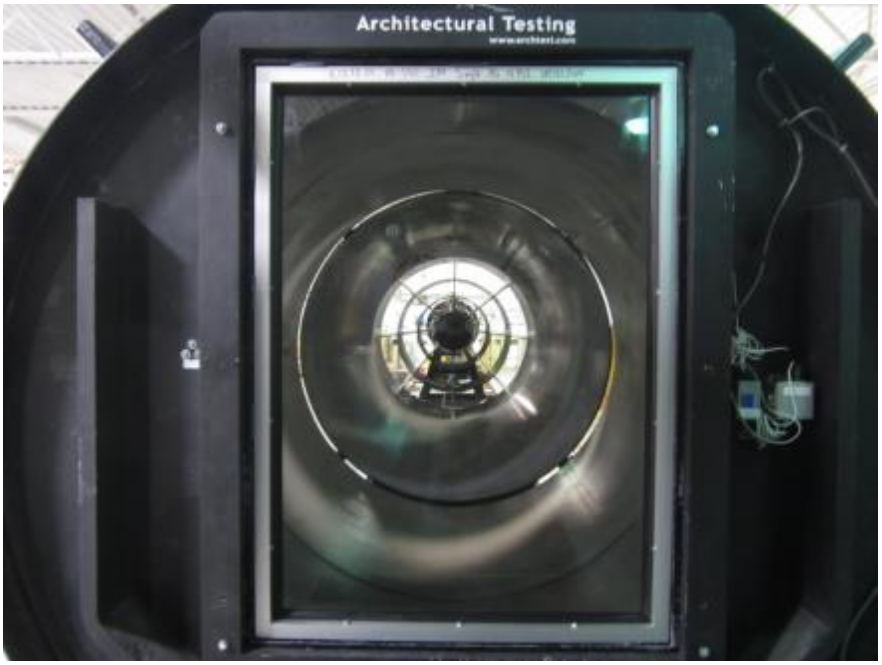


Photo No. 28
Pre-test Specimen #10, Interior

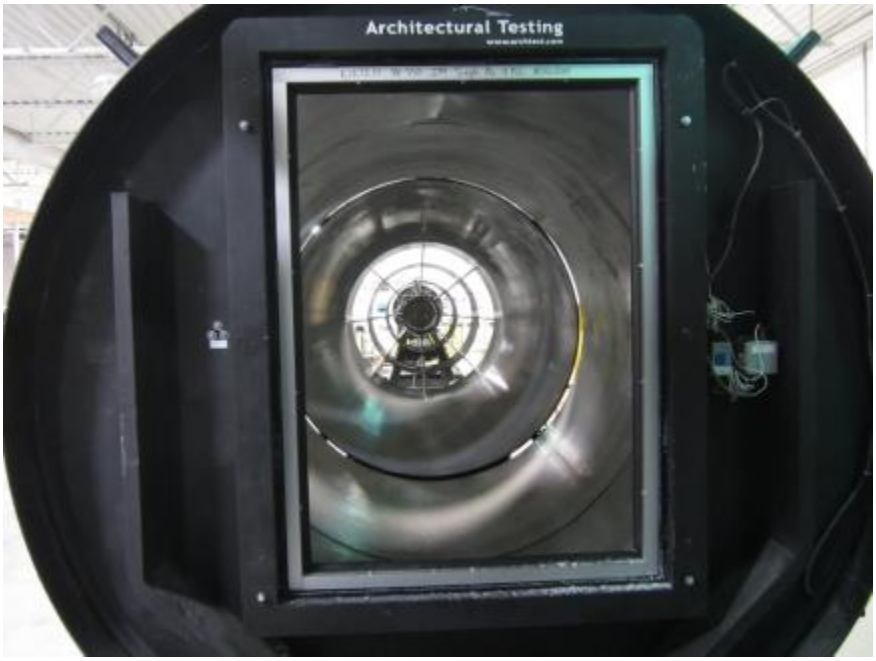


Photo No. 29
Post-test Specimen #10, Interior

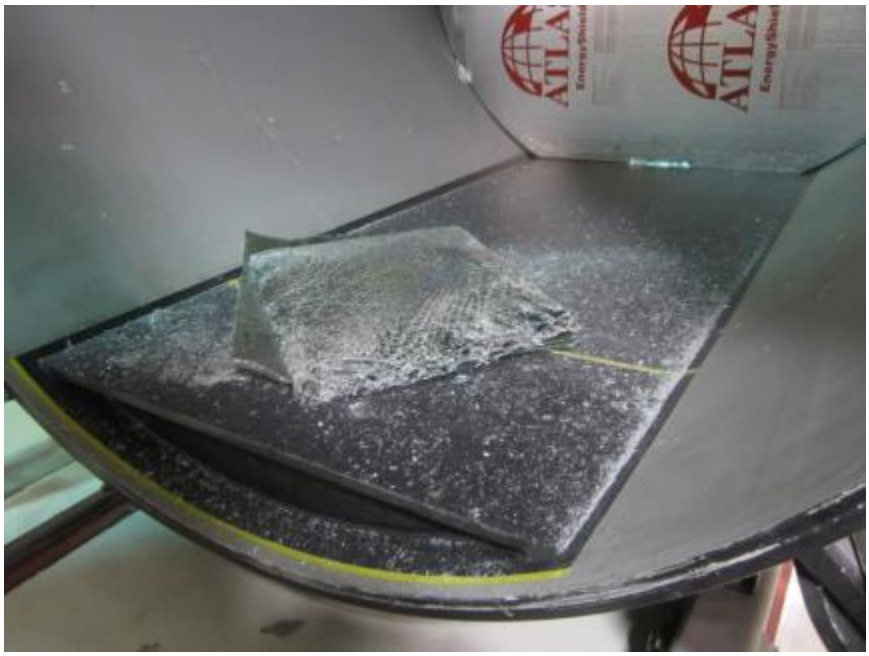


Photo No. 30
Post-test Specimen #10, Witness Chamber

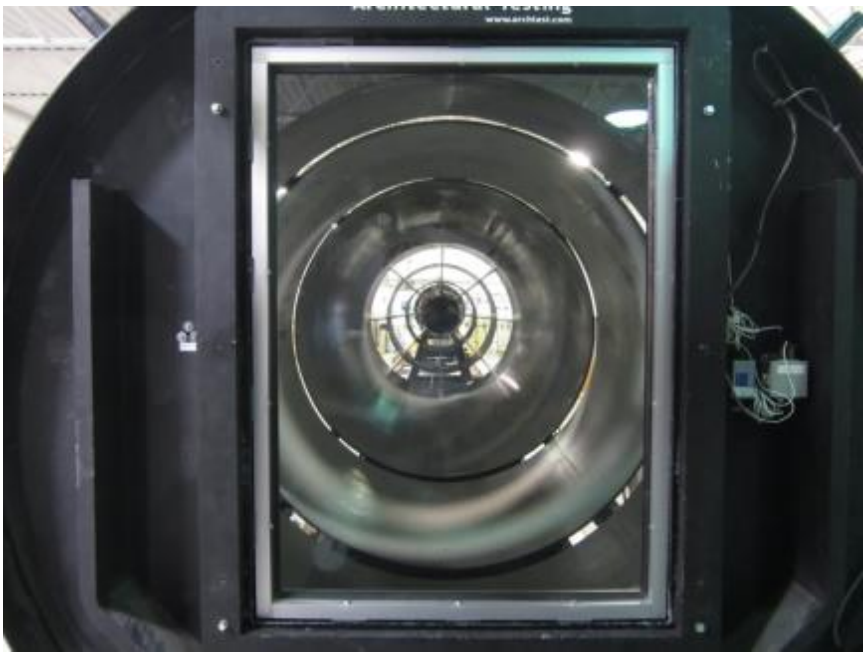


Photo No. 31
Pre-test Specimen #11, Interior

Photo No. 32
Post-test Specimen #11, Interior

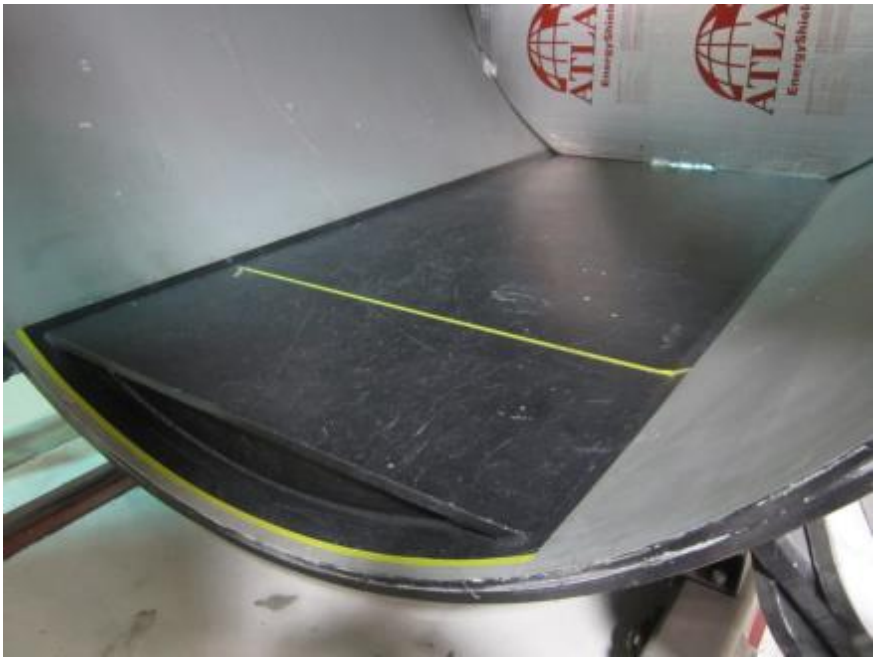


Photo No. 33
Post-test Specimen #11, Witness Chamber

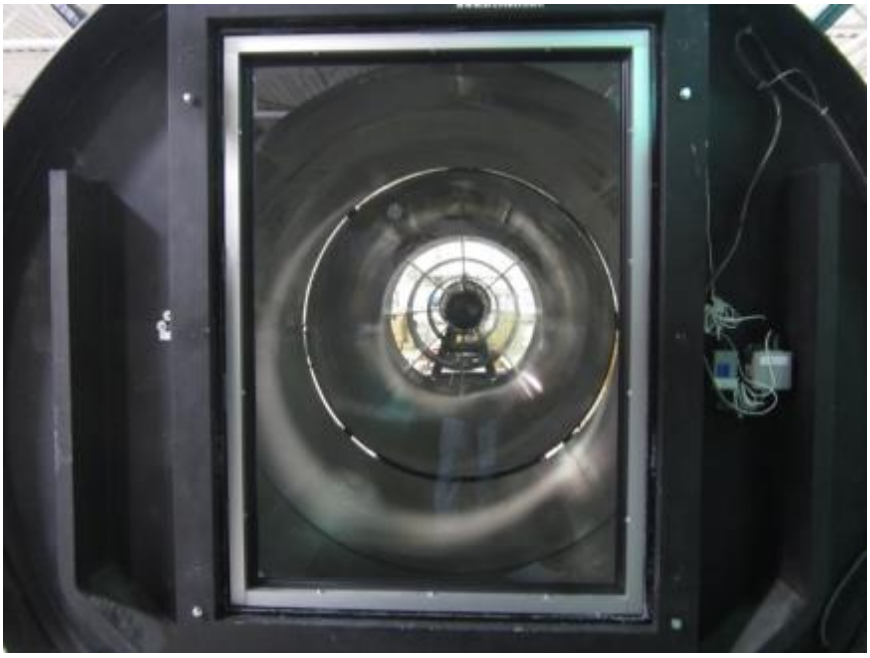


Photo No. 34
Pre-test Specimen #12, Interior

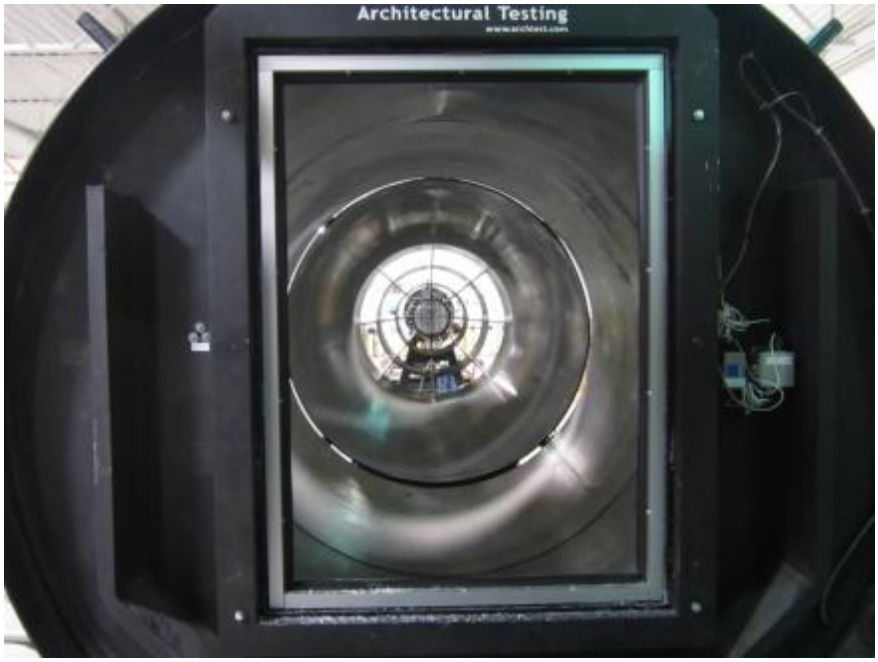


Photo No. 35
Post-test Specimen #12, Interior

Photo No. 36
Post-test Specimen #12, Witness Chamber

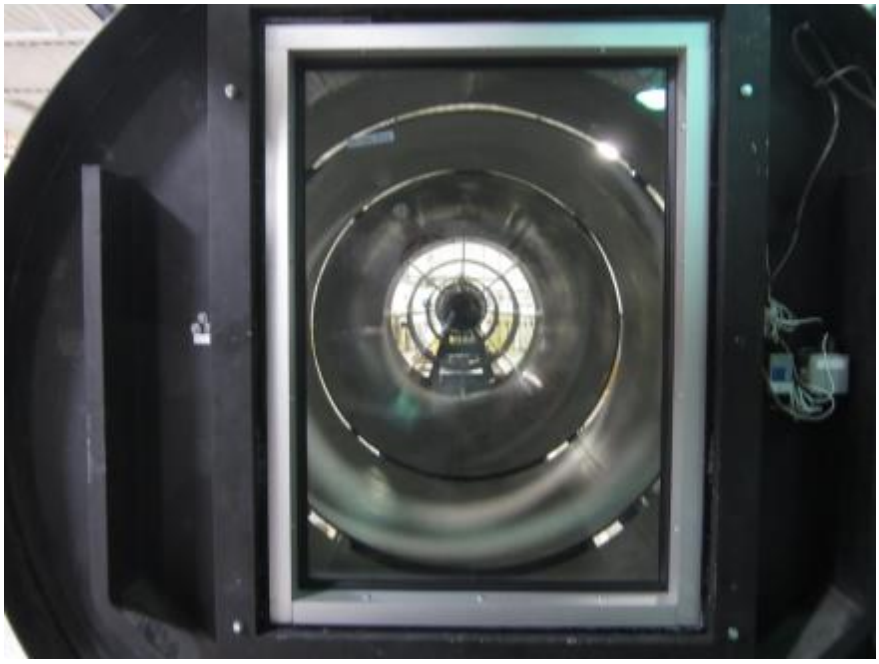


Photo No. 37
Pre-test Specimen #13, Interior

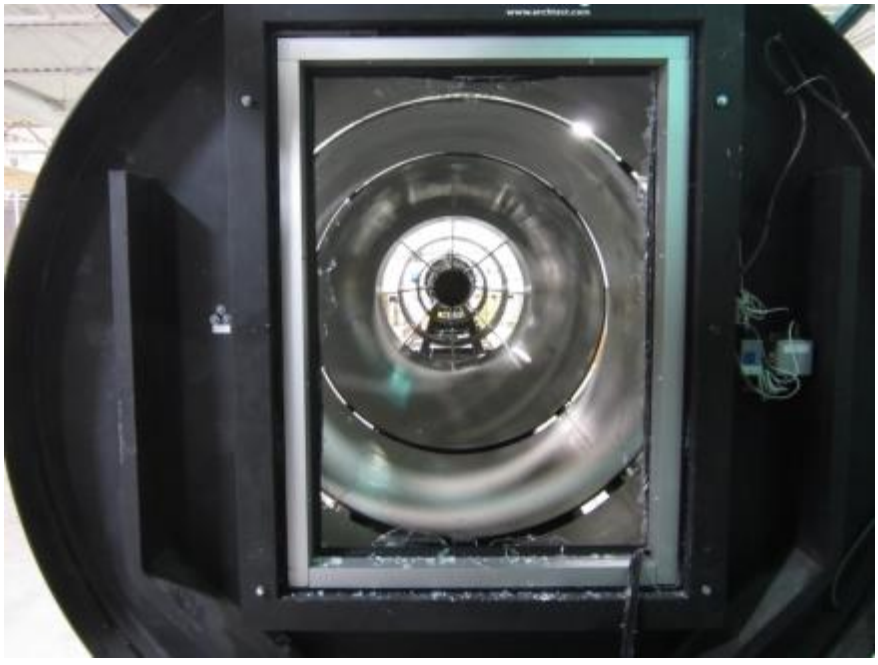


Photo No. 38
Post-test Specimen #13, Interior

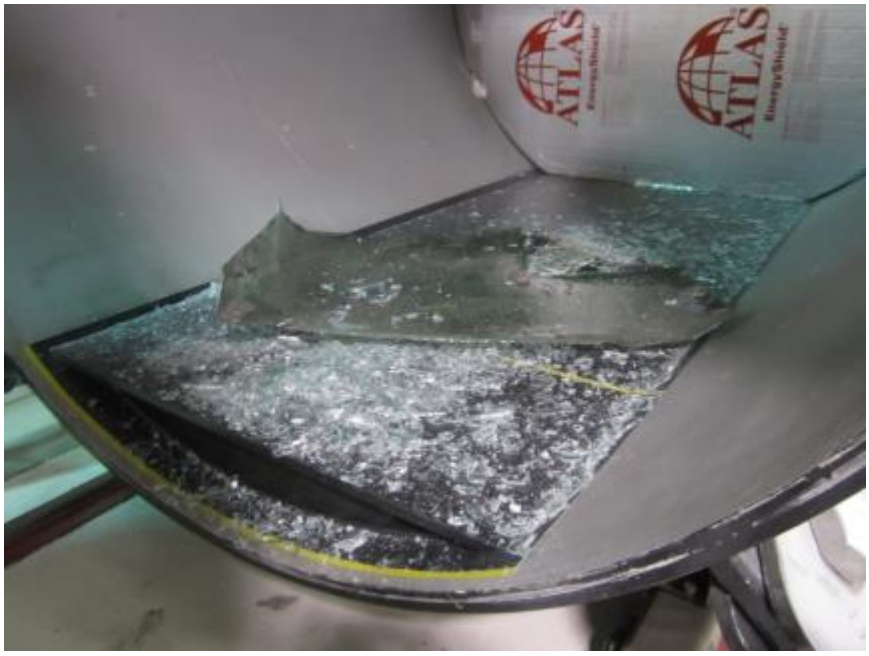


Photo No. 39
Post-test Specimen #13, Witness Chamber

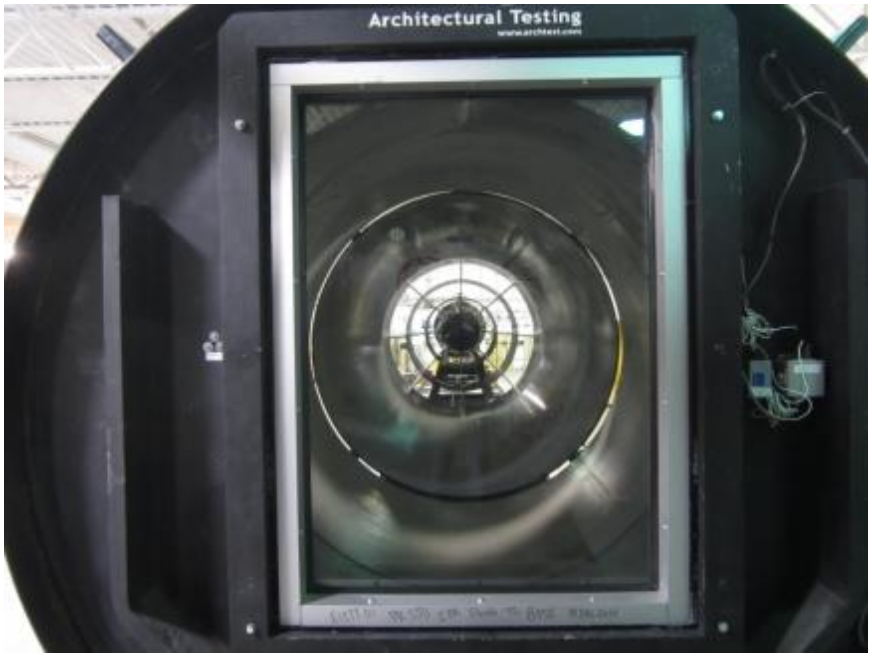


Photo No. 40
Pre-test Specimen #14, Interior

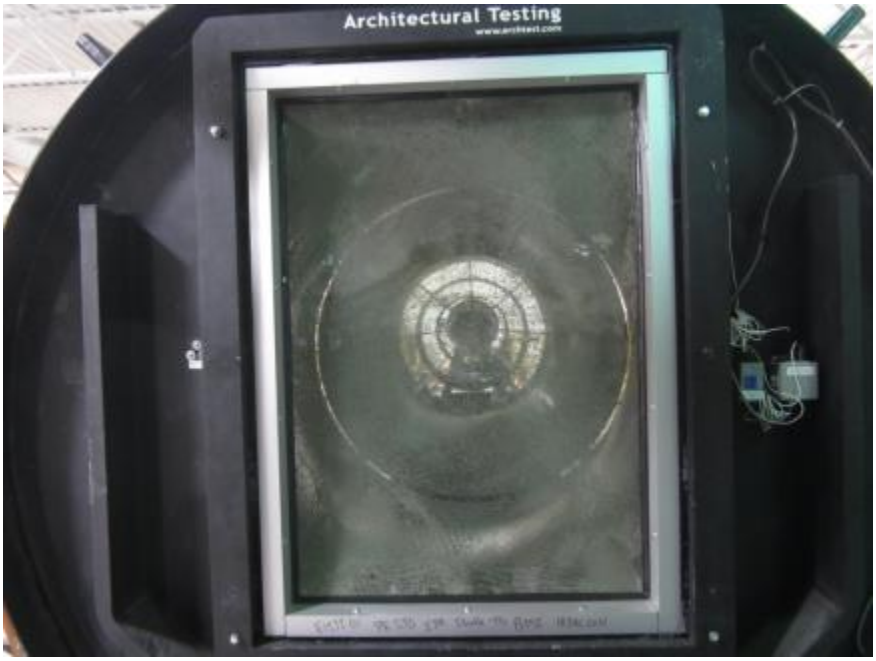


Photo No. 41
Post-test Specimen #14, Interior

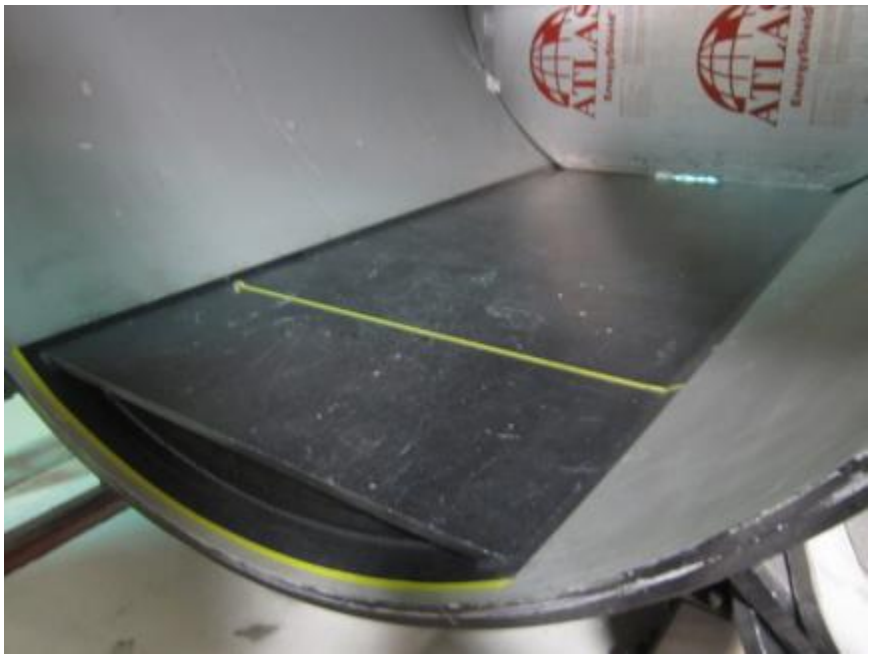
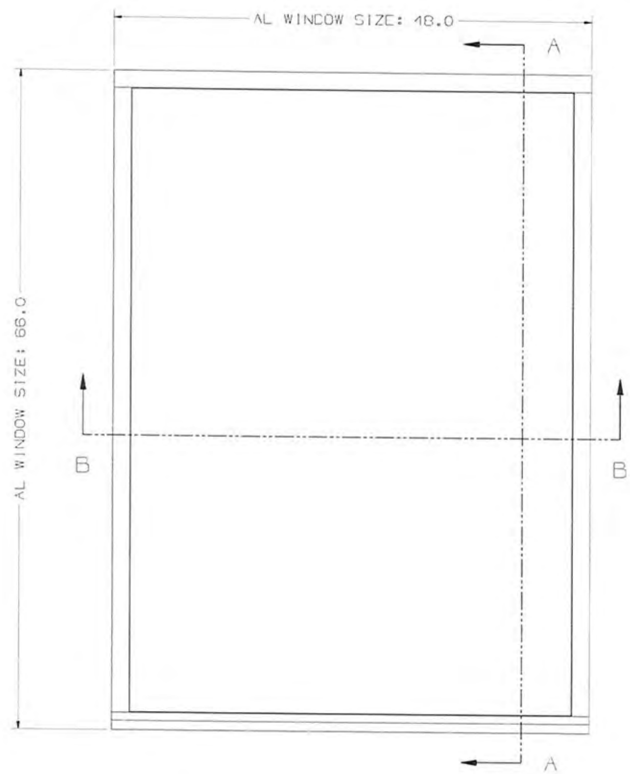
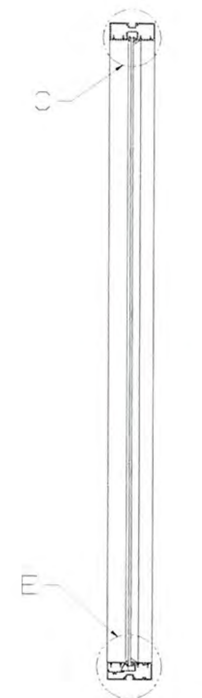


Photo No. 42
Post-test Specimen #14, Witness Chamber

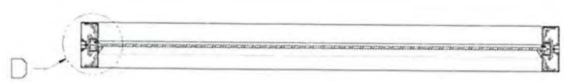
APPENDIX D

Drawings





SECTION A - A



SECTION B - B

Architectural Testing

Test sample complies with these details. Deviations are noted.

Report # E1212

Date 2/25/15 Tech EOR

REV	ECO	ISSUE DATE AND DESCRIPTION		DRFT	CHKD
2		FEB 16, 2015 48" DIM WAS 66" 66" DIM WAS 48"		AVI	
1		SEP 09, 2014			

3M

© 3M COPYRIGHT 2014

SINGLE PANE WINDOW TEST FIXTURE WITH 3M SAFETY FILM AND IPA

SIZE: D

DRAWING NO. ASSY_WINDOW_48X66

REV. 2

SHT 1 OF 2

DO NOT SCALE DRAWING

THIRD ANGLE PROJECTION

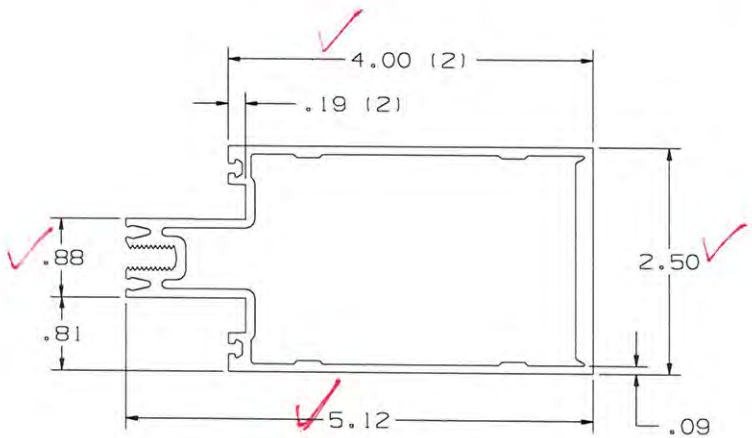
INTERPRET PER ASME Y14.5 2009

TOLERANCES EXCEPT AS NOTED

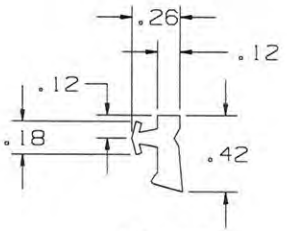
INCHES: .0 ±.1, .00 ±.02, .000 ±.005, .0000 ±.0002

ANGLES ±1°

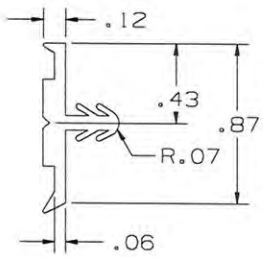
MAX SURFACE ROUGHNESS 125



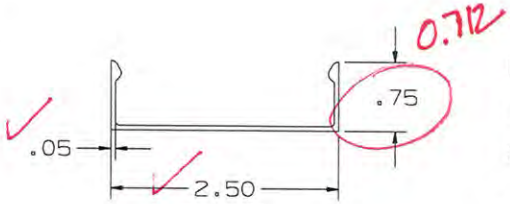
E4TB223



PTB28



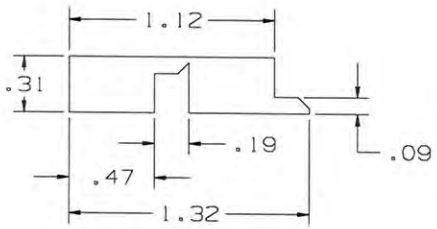
PTB94



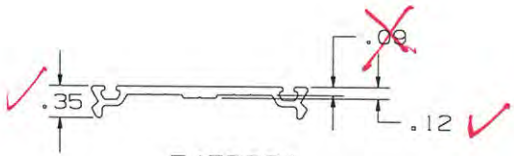
E4TB64

NOTES:

1. REFERENCE DRAWING ONLY.
2. PART NUMBERS OF COMPONENTS ARE SHOWN IN EACH VIEW.
3. PART SUPPLIER : TUBELITE INC.
   WWW.TUBELITEINC.COM



P946



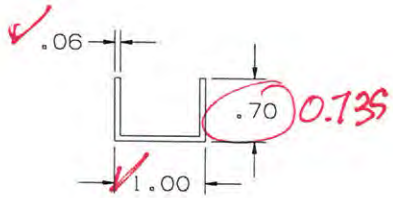
E4TB224

Architectural Testing

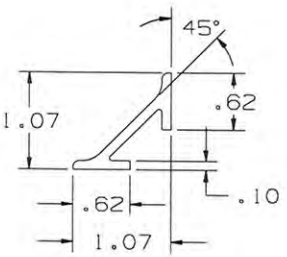
Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech SCR

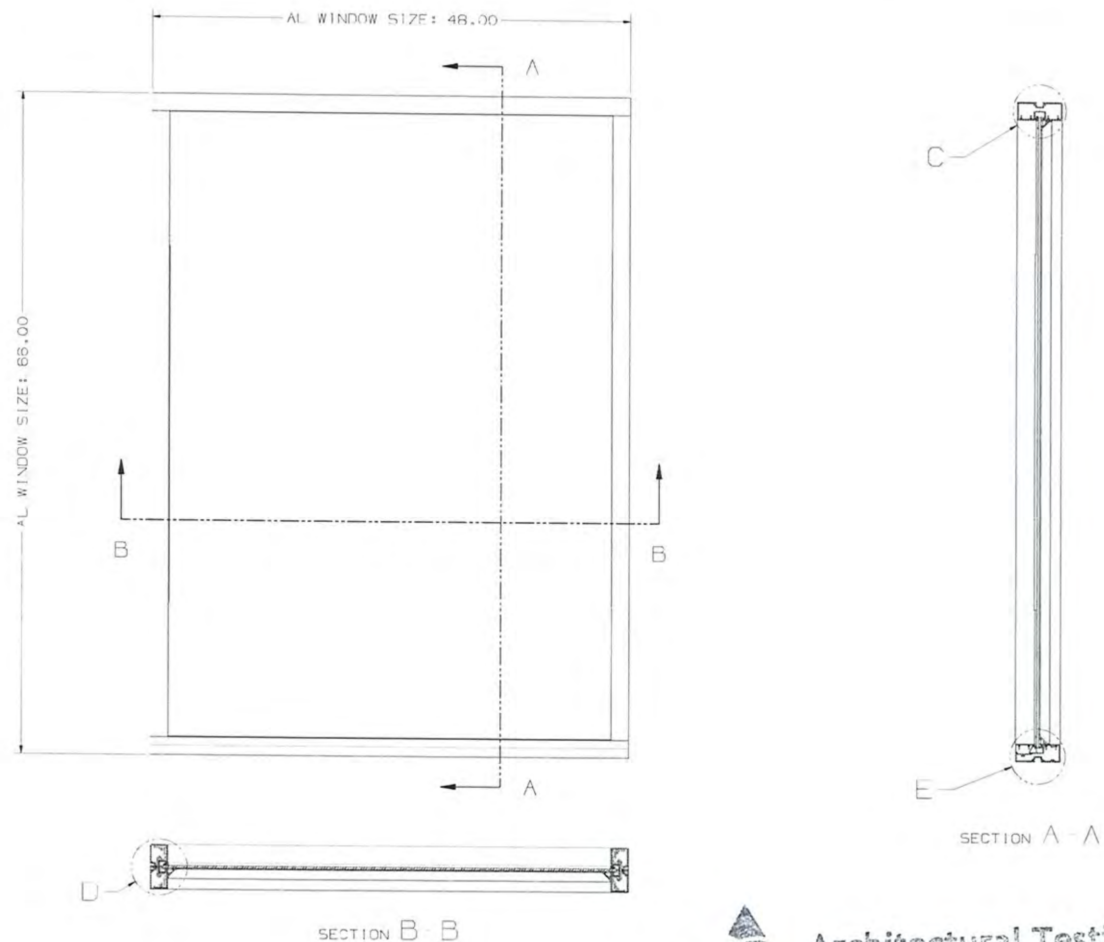


PTB94
C-CHANNEL SPACER
(BY MIDLAND GLASS CO.)



BP950
IMPACT PROTECTION PROFILE

DESIGN REFERENCE	NEXT ASSEMBLY	01	FEB 02, 2015
ACCESS CODES		REV	ECO / ISSUE DATE AND DESCRIPTION / DRFT / CHKD
DIVISION	DIVISION CODE	DRFT L.SCHLEIF	DATE FEB 02, 2015
DO NOT SCALE DRAWING	SCALE 1/1	CHKD	DATE
TOLERANCES EXCEPT AS NOTED	INCHES .0 : .00 : .02 .000 : .005 .0000 :	MFG	DATE
THIRD ANGLE PROJECTION	MILLIMETERS 0 : .0 : .00 : .000 :	APPVL	DATE
INTERPRET PER ASME Y14.5 - 2009	ANGLES :0.1°	3M Center St. Paul, MN 55144	© 3M COPYRIGHT 2015 This document and the information it contains are 3M property and may not be reproduced or further distributed without 3M permission, or used or disclosed other than for 3M authorized purposes. All rights reserved.
MAX SURFACE ROUGHNESS ☐ ALL SURFACES ☐ MARKED ONLY		TITLE	TUBELITE 400 SERIES CURTAIN WALL COMPONENTS
		CAGE NUMBER	SIZE C / DRAWING NO. / REV. 01
		MODEL	DET. LISTS ☐ YES ☒ NO / SHT 1 OF 1



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/25/15 Tech EOR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
2		FEB 16, 2015 66" DIM WAS 48" 48" DIM WAS 66"	AVL	
1		SEP 09, 2014		

DRFT: AVL — DATE: SEP 09, 2014

DO NOT SCALE DRAWING — SCALE 1/6

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 2009

MAX SURFACE ROUGHNESS 125 ☐ ALL SURFACES ☒ MARKED ONLY

TOLERANCES EXCEPT AS NOTED — INCHES: .0 ±.1; .00 ±.02; .000 ±.005; .0000 ±.0002 — ANGLES ±1°

TITLE: SINGLE PANE WINDOW TEST FIXTURE WITH 3M SAFETY FILM AND IPP

SIZE: D — DRAWING NO.: TEST-48X66 — REV.: 2

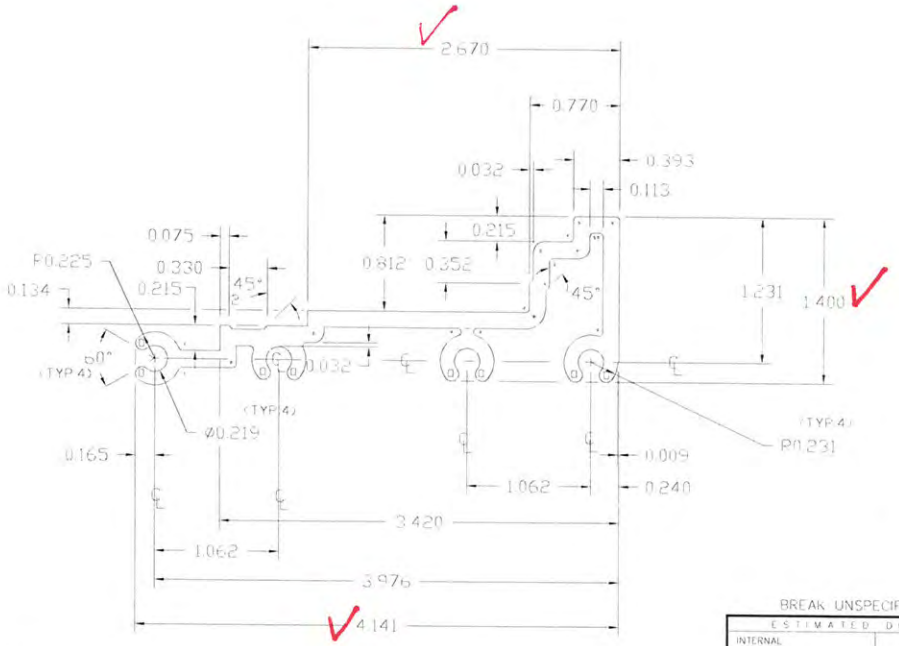
DET LISTS ☐ YES ☒ NO — SHT 1 OF 2

PRINT REVISIONS	DATE

CRM-63

REV. A

DELHI	TIFTON	BOTH
☐	☐	☐



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/25/15 Tech EOR

NOTE

NO EXPOSED SURFACE

LEGEND

- = 0.031 R. (13)
- = 0.093 R. (3)
- = 0.170 R. (1)
- = FULL R. (6)

BREAK UNSPECIFIED CORNERS 0.010 R. 0.140 TYPICAL WALL UNLESS SPECIFIED OTHERWISE

ESTIMATED DIE DATA			
INTERNAL USE		6063-T5	
AREA	1.182	WT./FT.	1.418
PERIMETER	17.816	CIRCLE SIZE	4 - 5
OUTSIDE PERIMETER		FACTOR	12
EXPOSED PERIMETER			

PRESS SIZE	

LEGEND
• = .031 R.
o = .062 R.
× = .125 R.
ⓧ = .250 R.
+ =

DIE REVISIONS		DATE
A	ADDED SCREW BOSS M.B.	2-13-89

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER
CRONSTROMS
MINNEAPOLIS, MINN.

APPLICATION
SILL CLIP

CADD #

SCALE: ACTUAL

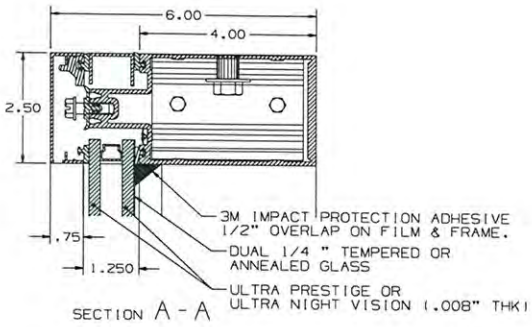
DATE: 12-3-88

LAST REVISION

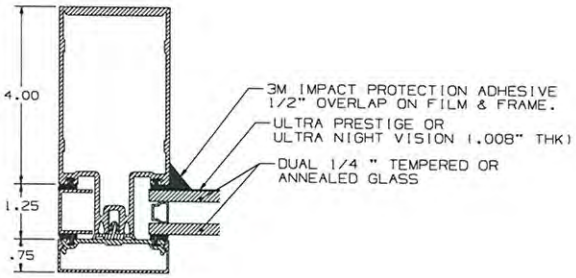
DRAWN: M. COPES

JOB

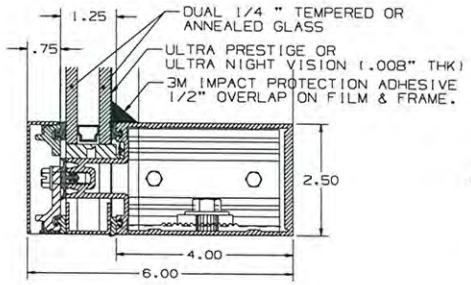
CUSTOMER NUMBER: A-6613



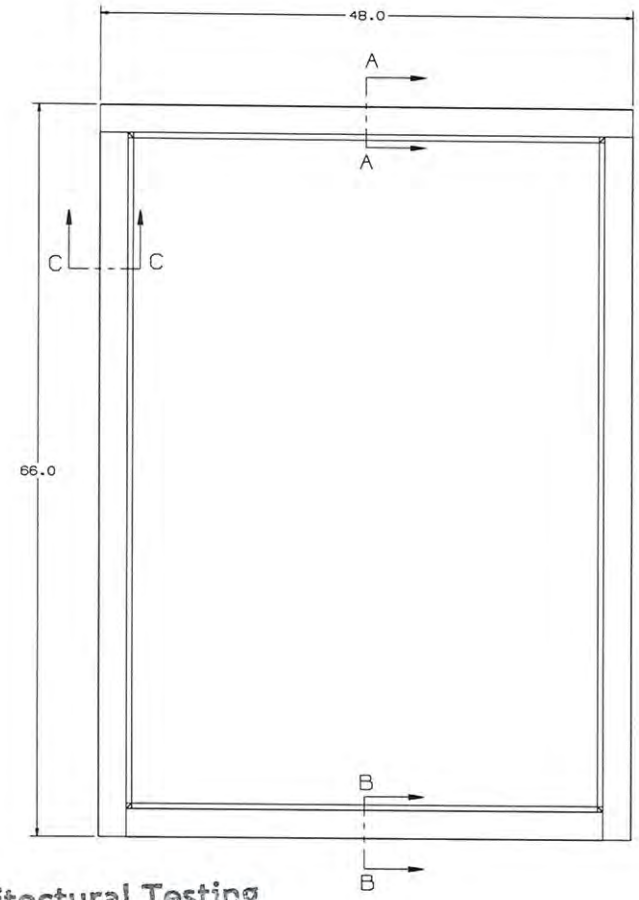
SECTION A - A

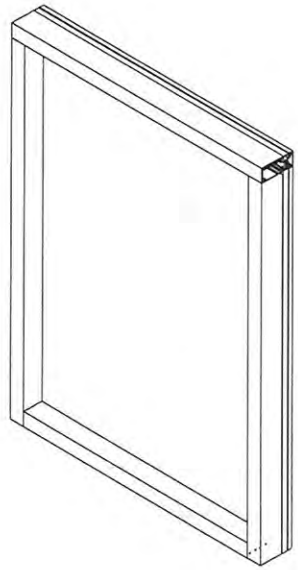


SECTION C - C



SECTION B - B





Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272.

Date 2/13/15 Tech EOR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
01		JAN 20,2015 PRE-RELEASE	LAS	

DESIGN REFERENCE | NEXT ASSEMBLY

DO NOT SCALE DRAWING | SCALE

TOLERANCES EXCEPT AS NOTED
INCHES: .0 ± .03; .00 ± .010; .0000 ±
MILLIMETERS: 0 ± 1; .0 ± .3; .00 ± .25; .000 ± .010
ANGLES ±1°

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 2009

SURFACE ROUGHNESS: SURFACES / MARKED ONLY

© 3M COPYRIGHT 2015

TITLE: ASSEMBLY - SCOTCHSHIELD ULTRA TINTED IPA DOUBLE PANE

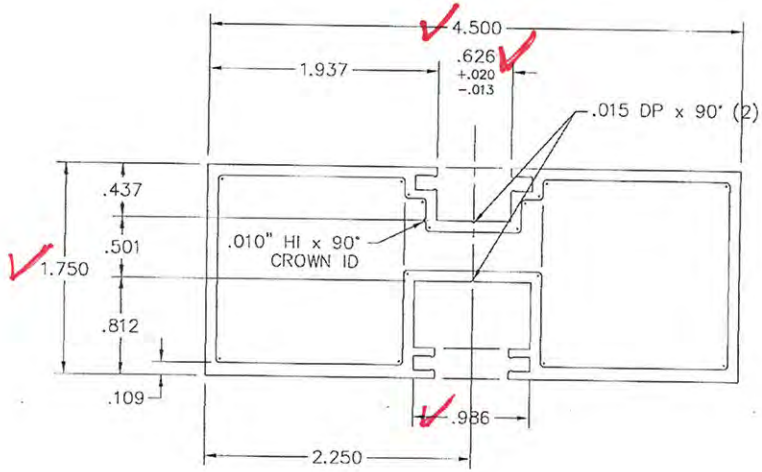
CAGE NUMBER | SIZE D | DRAWING NO. | REV 01

MODEL | DET. LISTS ☐ YES ☒ NO | SHT 1 OF 1

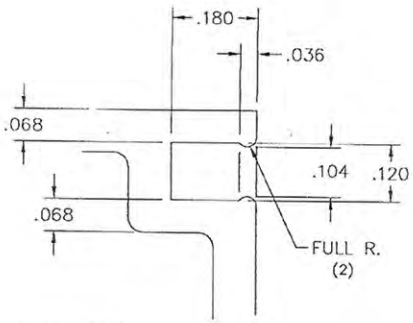
PRINT REVISIONS	DATE

12580
Die Number
45–010
Customer Number

ACTUAL SIZE



ENTIRE OUTSIDE
SURFACE EXPOSED



DETAIL "A"
4 x SIZE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech EOR

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

03–24–11 added .625 tolerance

BREAK UNSPECIFIED CORNER: .010 R.

TYPICAL WALL UNLESS OTHERWISE NOTED: .090

ESTIMATED DIE DATA			
ALLOY/TEMPER:	6063–15		
AREA	1.445	WT/FT	1.733
PERIMETER	31.168	CIRCLE SIZE	4 – 5
OUTSIDE PERIMETER	17.197	FACTOR	18
EXPOSED PERIMETER	17.197	HOLLOW	

PRESS SIZE
LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
* =

DIE REVISIONS	DATE

CROWN EXTRUSIONS

Crown Extrusions, Inc.
122 Columbia Court N.
Chaska, MN 55318
952-448-3533 Fax: 952-448-5328

CUSTOMER

CMI Architectural
CMI Architectural Products,Inc.
20621 SD Highway 25
DeSmet, SD 57231-5827
605-854-3326 Fax: 605-854-3620

PART NAME: MULLION

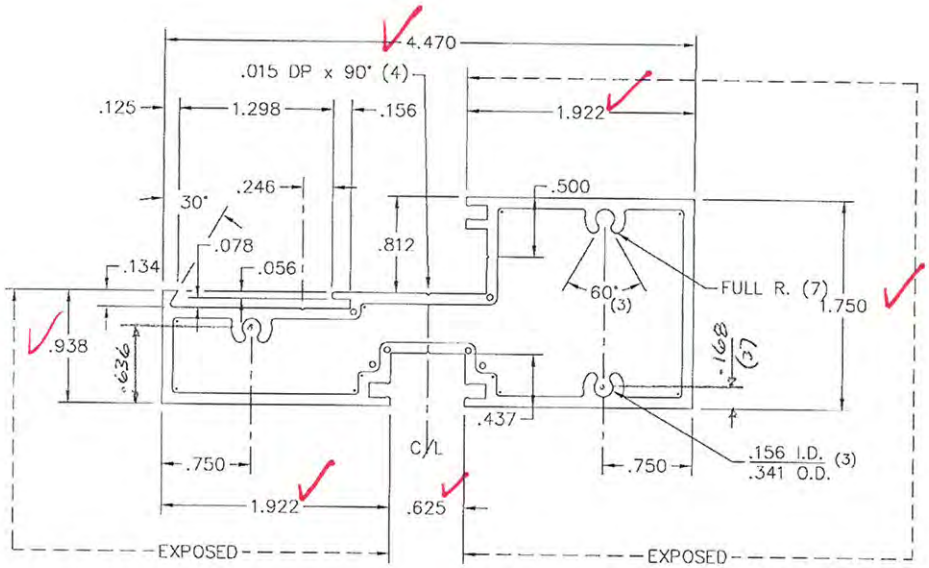
DIE #	12580
SCALE	FULL & NOTED
DATE	12–11–08
LAST REVISION	03–24–11
DRAWN	TCG
CUSTOMER NUMBER	45–010

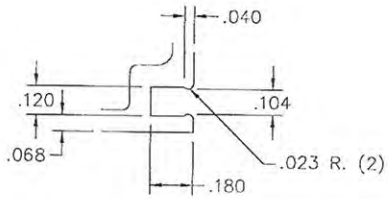
PRINT REVISIONS		DATE
1	REDRAWN ON CAD MB	7-30-98

CRM-44

REV.

DELHI ☒ TIFTON ☐ BOTH ☐





DETAIL "A"
2 x SIZE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech SCR

BREAK UNSPECIFIED CORNERS .010 R. .090 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.

ESTIMATED DIE DATA			
INTERNAL USE		6063-T5	
AREA	1.354	WT/FT	1.624
PERIMETER	29.721	CIRCLE SIZE	4 - 5
OUTSIDE PERIMETER	15.421	FACTOR	18
EXPOSED PERIMETER		HOLLOW II	

PRESS SIZE	
LEGEND	
• = .031 R.	
○ = .062 R.	
× = .125 R.	
⊗ = .250 R.	
✳ =	

DIE REVISIONS	DATE

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER
CMI ARCHITECTURAL PRODUCTS
2800 FREEWAY BOULEVARD
SUITE 205
MINNEAPOLIS, MN 55430

APPLICATION
F.G. SILL 1/4"

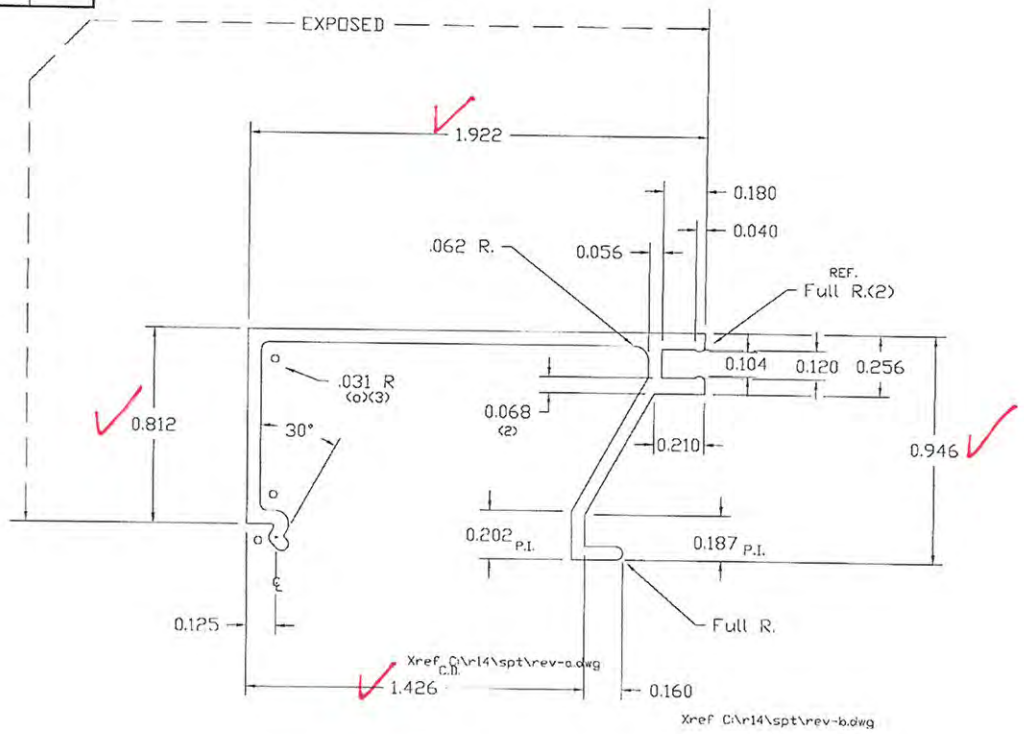
CADD # CRM-44 350
SCALE FULL & NOTED
DATE 7-29-98
LAST REVISION
DRAWN Michael Bryan
JOB
CUSTOMER NUMBER 45-018

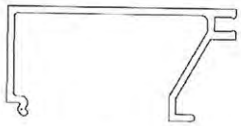
PRINT REVISIONS	DATE

CRM-49 B

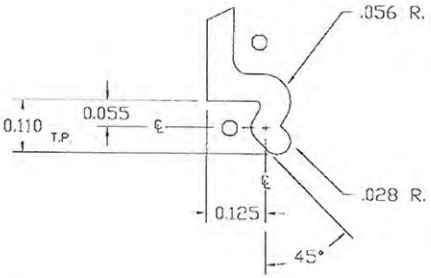
REV.

DELHI ☐ TIFTON ☐ BOTH ☐





ACTUAL SIZE



DETAIL

4 x Size

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech SQR

BREAK UNSPECIFIED CORNERS .010 R. .056 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.

ESTIMATED DIE DATA			
INTERNAL USE		6063-T5	
AREA	.243	WT/FT	.291
PERIMETER	8.478	CIRCLE SIZE	2-3
OUTSIDE PERIMETER		FACTOR	29
EXPOSED PERIMETER	2.734		

PRESS SIZE	
LEGEND	
• = .031 R.	
o = .062 R.	
× = .125 R	
⊗ = .250 R.	
* =	

DIE REVISIONS		DATE
A	RE-DESIGNED	1-5-88
B	SHORTENED LEG	2-13-89

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER: CRONSTROMS
MINNEAPOLIS, MN

APPLICATION: SILL STOP 1/4" TO 1"

CADD #

SCALE: 2 x & Noted

DATE: 10-31-88

LAST REVISION

DRAWN: J. ALBEREZ

JOB

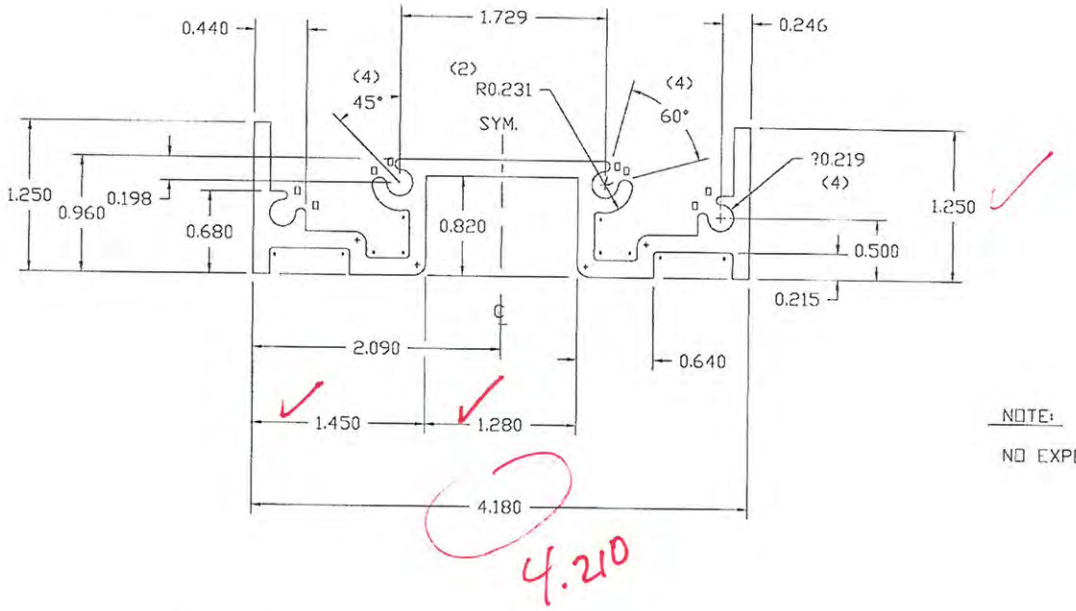
CUSTOMER NUMBER: 45-026

PRINT REVISIONS	DATE

CRM-62

REV.

DELHI ☐ TIFTON ☐ BOTH ☐



NOTE:

NO EXPOSED SURFACE

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech BDR

LEGEND:

• = 0.031 R. (10)
+ = 0.100 R. (4)
□ = FULL R. (8)

BREAK UNSPECIFIED CORNERS 0.010 R. 0.140 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.

ESTIMATED DIE DATA			
INTERNAL USE		6063-T5	
AREA	1.389	WT/FT	1.667
PERIMETER	23.555	CIRCLE SIZE	4-5
OUTSIDE PERIMETER		FACTOR	12
EXPOSED PERIMETER			

PRESS SIZE

LEGEND
• = .031 R.
○ = .062 R.
× = .125 R.
⊗ = .250 R.
* =

DIE REVISIONS	DATE

sapa: Sapa Extrusions, Inc.
DELHI, LA 71232

CUSTOMER
CRONSTROMS
MINNEAPOLIS , MINN.

APPLICATION
MULL. CLIP

CADD # MRC---10 010

SCALE ACTUAL

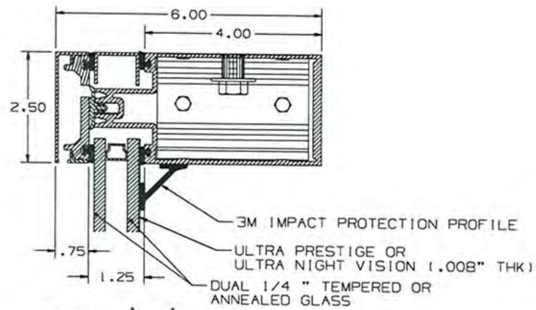
DATE 12-3-88

LAST REVISION

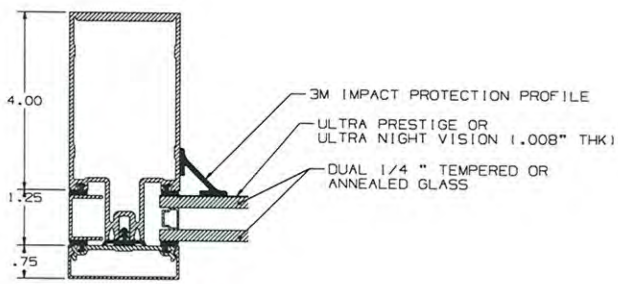
DRAWN M. COPES

JOB

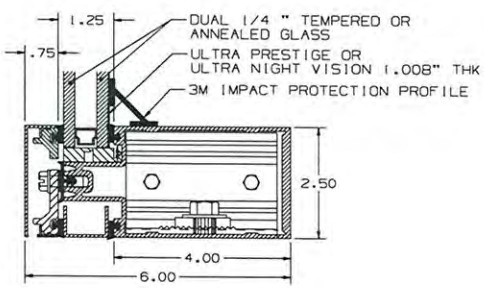
CUSTOMER NUMBER 32-003



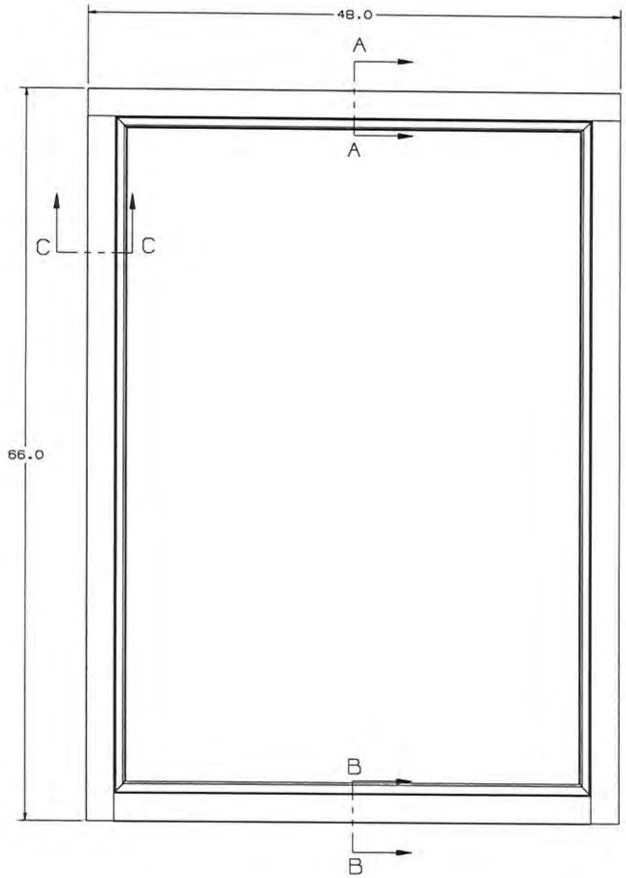
SECTION A - A

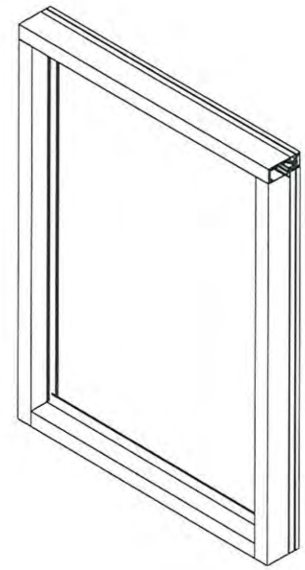


SECTION C - C



SECTION B - B





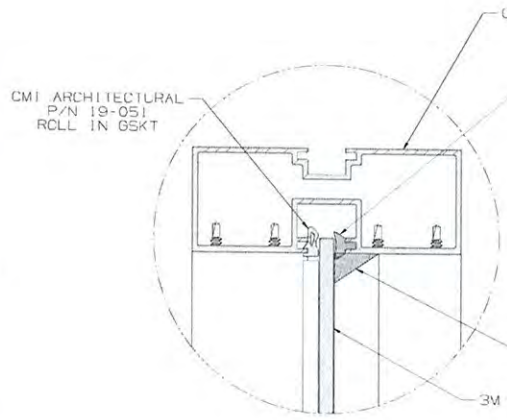
Architectural Testing

Test sample complies with these details.
Deviations are noted.

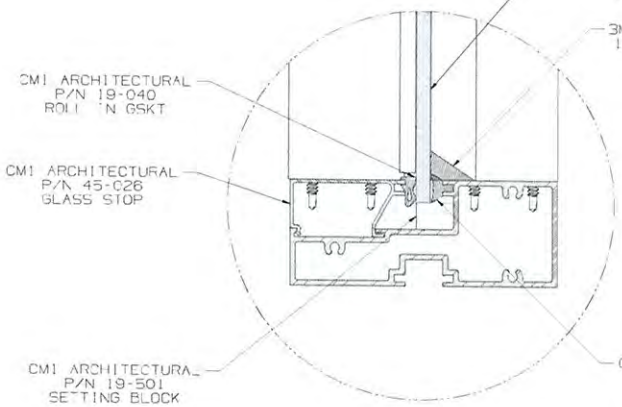
Report # E1272

Date 2/13/15 Tech [signature]

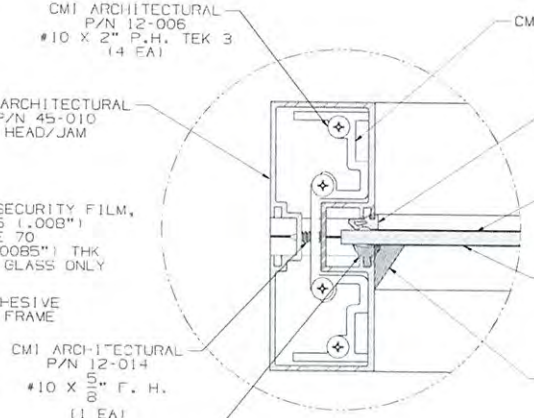
REV	01
ISSUE DATE AND DESCRIPTION	JAN 20, 2015 PRE-RELEASE
DRFT	LAS
DRFT	C. SCHLEIF
DATE	JAN 20, 2015
DO NOT SCALE DRAWING	SCALE
TOLERANCES EXCEPT AS NOTED	INCHES .0 ± .00 ±.03 .000 ±.010 .0000 ±
THIRD ANGLE PROJECTION	
INTERPRET PER ASME Y14.5 - 2009	MILLIMETERS
ANGLES	±1°
TITLE	ASSEMBLY-SCOTCHSHIELD ULTRA TINTED IPP DOUBLE PANE
SIZE	D
REV.	01
SHT	1 OF 1



Detail C
SCALE 1:1
HEAD SECTION DETAIL



Detail E
SCALE 1:1
SILL SECTION DETAIL



Detail D
SCALE 1:1
JAMB SECTION DETAIL

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech EOR

REV.	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		SEP 09,2014		

DESIGN REFERENCE / NEXT ASSEMBLY

DO NOT SCALE DRAWING | SCALE 1/6

TOLERANCES EXCEPT AS NOTED
INCHES: .0 ±.1, .00 ±.02, .000 ±.005, .0000 ±.0050
MILLIMETERS: .0 ±., .00 ±., .000 ±.
ANGLES ±1°

THIRD ANGLE PROJECTION

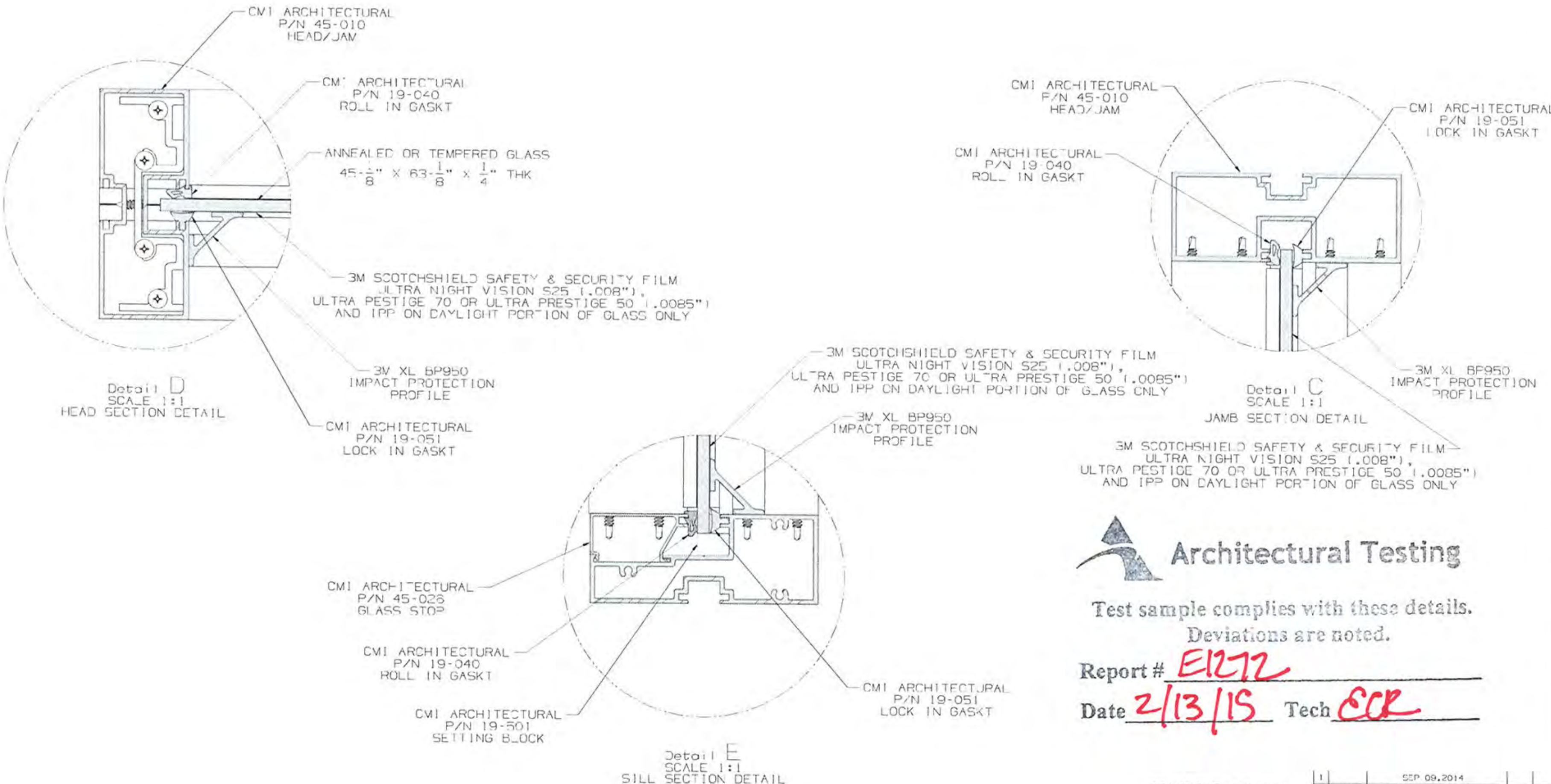
INTERPRET PER ASME Y14.5 2009

MAX SURFACE ROUGHNESS 125 √ ALL SURFACES / MARKED ONLY

TITLE: SINGLE PANE WINDOW TEST FIXTURE WITH 3M TINTED ULTRA SAFETY FILM AND IPA

CAGE NUMBER | SIZE D | DRAWING NO. ASSY_WINDOW_48X66_UNV | REV. 1

MODEL | SHT 2 OF 2



Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # E1272

Date 2/13/15 Tech ECR

REV 1	SEP 09,2014	
DRFT AVL	SEP 09,2014	
DO NOT SCALE DRAWING	SCALE 1/6	3M
THIRD ANGLE PROJECTION	TOLERANCES EXCEPT AS NOTED	© 3M COPYRIGHT 2014
MAX SURFACE ROUGHNESS 125		SINGLE PANE WINDOW TEST FIXTURE WITH 3M TINTED ULTRA SAFETY FILM AND IPP
	SIZE D	DRAWING NO. TEST-48X66-ULTRA REV 1 SHT 2 OF 2