



**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/MODEL:** 3M™ Safety Silver S20 Safety and Security Window Film

**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:** 14 pages  
**Test Facility:** 1 page  
**Pressure Time Plots:** 14 pages  
**Photographs:** 18 pages  
**Drawings:** 13 pages

**Report No.:** E1272.01-119-12  
**Test Completion Date:** 12/29/14  
**Report Date:** 02/27/15  
**Test Record Retention Date:** 12/29/18



### Summary of Results

Specimen No.	Film Type	Glass Type	Film Attachment Type	Average Peak Reflected Pressure	Average Positive Phase Impulse	Average Positive Phase Duration	GSA Performance Condition	ASTM F1642 Hazard Rating
1	Safety Silver S20	1/4" Tempered	IPA <sup>1</sup>	4.64 psi	32 psi-msec	12.26 msec	2	No Hazard
2		1/4" Annealed	IPA <sup>1</sup>	4.56 psi	32 psi-msec	12.27 msec	2	Minimal Hazard
3			IPA <sup>1</sup>	4.63 psi	32 psi-msec	12.86 msec	2	Minimal Hazard
4			IPA <sup>1</sup>	5.77 psi	38 psi-msec	12.90 msec	2	Minimal Hazard
5			IPP <sup>2</sup>	4.48 psi	32 psi-msec	11.93 msec	2	Minimal Hazard
6		1" IG Tempered	IPA <sup>1</sup>	4.84 psi	33 psi-msec	13.34 msec	1	No Break
7			IPA <sup>1</sup>	6.87 psi	44 psi-msec	13.32 msec	2	No Hazard

<sup>1</sup> IPA = 3M™ Impact Protection Adhesive

<sup>2</sup> IPP = 3M™ Impact Protection Profile

Reference must be made to Report No. E1272.01-119-12, 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 Report No.:** E1272.01-119-12

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

**3.3 Series/Model:** 3M™ Safety Silver S20 Safety and Security Window Film

**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:** 09/24/2014 - 12/29/2014

**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.

### 3.0 Project Summary: (Continued)

**3.9 Data Acquisition:** In accordance with ASTM F1642-12 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.

#### 3.10 List of Official Observers:

<u>Name</u>	<u>Company</u>
Travis A. Hoover	Intertek-ATI
Isaiah W. Gebhart	Intertek-ATI

### 4.0 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*

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

**5.1 Product Sizes:**

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

**5.2 Frame Construction:**

**Test Specimens #1 - #5:**

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

**5.0 Test Specimen Description:** (Continued)

**5.2 Frame Construction:** (Continued)

**Test Specimens #6 - #7:**

<b>Frame Member</b>	<b>Material</b>	<b>Description</b>
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

	<b>Joinery Type</b>	<b>Detail</b>
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.

**5.0 Test Specimen Description:** (Continued)

**5.3 Glazing:** All specimens utilized 1/4" thick clear glass with an 8 mil laminate safety and security film with metalized sun control film (3M Silver S20, 20% visible light transmission) adhered to the interior surface of the glass. 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 - #5:**

Test Specimen	Glass Type	Spacer Type	Glazing Bite
#1	1/4" tempered	Aluminum reinforced butyl	1/2"
#2 - #5	1/4" annealed		

**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 #6 - #7:**

Glass Type	Interior Lite	Exterior Lite	Spacer Type	Glazing Bite
1" IG	1/4" tempered	1/4" tempered	Aluminum reinforced butyl	1/2"

**Glazing Method:** The glass was exterior glazed against a kerf-mounted rubber gasket and secured with extruded aluminum pressure plate.

**5.4 Hardware:** No hardware was utilized.

**5.5 Reinforcement:**

Drawing Number	Location	Material
Tublelite 400 Series Curtain Wall Components, Detail PTB94	Head, sill and jambs (Test specimens #6 - #7 only)	1" wide by 3/4" deep aluminum "U" channel

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

**7.0 Test Results:** The results are tabulated as follows:

**Test Specimen #1:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	67°F
Glazing Temperature	66°F
<b>ASTM Hazard Rating</b>	<b>No Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	4.52psi
Right Pressure	4.86 psi
Shell Pressure	4.54 psi
<b>Average Pressure</b>	4.64 psi
Witness Chamber Pressure	0.64 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	13.50 msec
Right Duration	10.12 msec
Shell Duration	13.17 msec
<b>Average Duration</b>	12.26 msec

<b>Peak Positive Phase Impulse</b>	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	32 psi*msec
<b>Average Impulse</b>	32 psi*msec

<b>Glazing Response</b>	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

<b>Witness Chamber Results</b>
No debris was observed

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



**7.0 Test Results:** (Continued)

**Test Specimen #2:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	66°F
Glazing Temperature	65°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	4.21 psi
Right Pressure	4.98 psi
Shell Pressure	4.50 psi
<b>Average Pressure</b>	<b>4.56 psi</b>
Witness Chamber Pressure	0.20 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	12.08 msec
Right Duration	11.74 msec
Shell Duration	13.00 msec
<b>Average Duration</b>	<b>12.27 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	31 psi*msec
<b>Average Impulse</b>	<b>32 psi*msec</b>

<b>Glazing Response</b>	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1-1/4" at center

<b>Witness Chamber Results</b>
No debris was observed.

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

**7.0 Test Results:** (Continued)

**Test Specimen #3:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	67°F
Glazing Temperature	67°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	4.39 psi
Right Pressure	4.89 psi
Shell Pressure	4.62 psi
<b>Average Pressure</b>	<b>4.63 psi</b>
Witness Chamber Pressure	1.92 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	13.67 msec
Right Duration	11.84 msec
Shell Duration	13.08 msec
<b>Average Duration</b>	<b>12.86 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	32 psi*msec
<b>Average Impulse</b>	<b>32 psi*msec</b>

<b>Glazing Response</b>	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1" and 2" at head

<b>Witness Chamber Results</b>
No debris was observed.

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

**7.0 Test Results:** (Continued)

**Test Specimen #4:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	66°F
Glazing Temperature	65°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	6.28 psi
Right Pressure	5.67 psi
Shell Pressure	5.36 psi
<b>Average Pressure</b>	<b>5.77 psi</b>
Witness Chamber Pressure	0.26 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	13.09 msec
Right Duration	12.32 msec
Shell Duration	13.30 msec
<b>Average Duration</b>	<b>12.90 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	38 psi*msec
Right Impulse	38 psi*msec
Shell Impulse	38 psi*msec
<b>Average Impulse</b>	<b>38 psi*msec</b>

<b>Glazing Response</b>	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	3-3/4" tear in film

<b>Witness Chamber Results</b>
No debris was observed.

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

**7.0 Test Results:** (Continued)

**Test Specimen #5:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	71°F
Glazing Temperature	69°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	4.19 psi
Right Pressure	4.82 psi
Shell Pressure	4.42 psi
<b>Average Pressure</b>	<b>4.48 psi</b>
Witness Chamber Pressure	0.35 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	12.61 msec
Right Duration	10.04 msec
Shell Duration	13.14 msec
<b>Average Duration</b>	<b>11.93 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	32 psi*msec
Right Impulse	32 psi*msec
Shell Impulse	33 psi*msec
<b>Average Impulse</b>	<b>32 psi*msec</b>

<b>Glazing Response</b>	
Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	3/16" and 1/4" at sill corner

<b>Witness Chamber Results</b>
No debris was observed.

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

**7.0 Test Results:** (Continued)

**Test Specimen #6:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	69°F
Glazing Temperature	72°F
<b>ASTM Hazard Rating</b>	<b>No Break</b>
<b>GSA Performance Condition</b>	<b>1</b>

<b>Peak Positive Pressure</b>	
Top Pressure	4.85 psi
Right Pressure	5.07 psi
Shell Pressure	4.60 psi
<b>Average Pressure</b>	<b>4.84 psi</b>
Witness Chamber Pressure	0.14 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	13.64 msec
Right Duration	13.09 msec
Shell Duration	13.28 msec
<b>Average Duration</b>	<b>13.34 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	33 psi*msec
Right Impulse	33 psi*msec
Shell Impulse	33 psi*msec
<b>Average Impulse</b>	<b>33 psi*msec</b>

<b>Glazing Response</b>	
Exterior Lite	Unbroken
Interior Lite	Unbroken
Glazing Pullout Length and Location	None
Glazing Tearing	None

<b>Witness Chamber Results</b>	
No debris was observed.	

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

**7.0 Test Results:** (Continued)

**Test Specimen #7:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	69°F
Glazing Temperature	71°F
<b>ASTM Hazard Rating</b>	<b>No Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

<b>Peak Positive Pressure</b>	
Top Pressure	6.97 psi
Right Pressure	6.90 psi
Shell Pressure	6.75 psi
<b>Average Pressure</b>	<b>6.87 psi</b>
Witness Chamber Pressure	0.23 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	13.51 msec
Right Duration	13.37 msec
Shell Duration	13.10 msec
<b>Average Duration</b>	<b>13.32 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	44 psi*msec
Right Impulse	44 psi*msec
Shell Impulse	44 psi*msec
<b>Average Impulse</b>	<b>44 psi*msec</b>

<b>Glazing Response</b>	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	None

<b>Witness Chamber Results</b>	
No debris was observed.	

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

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:

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Emily C. Riley  
Project Manager

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

ECR:iwg/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 (14)
- Appendix C - Photographs (18)
- Appendix D - Drawings (13)

### Revision Log

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





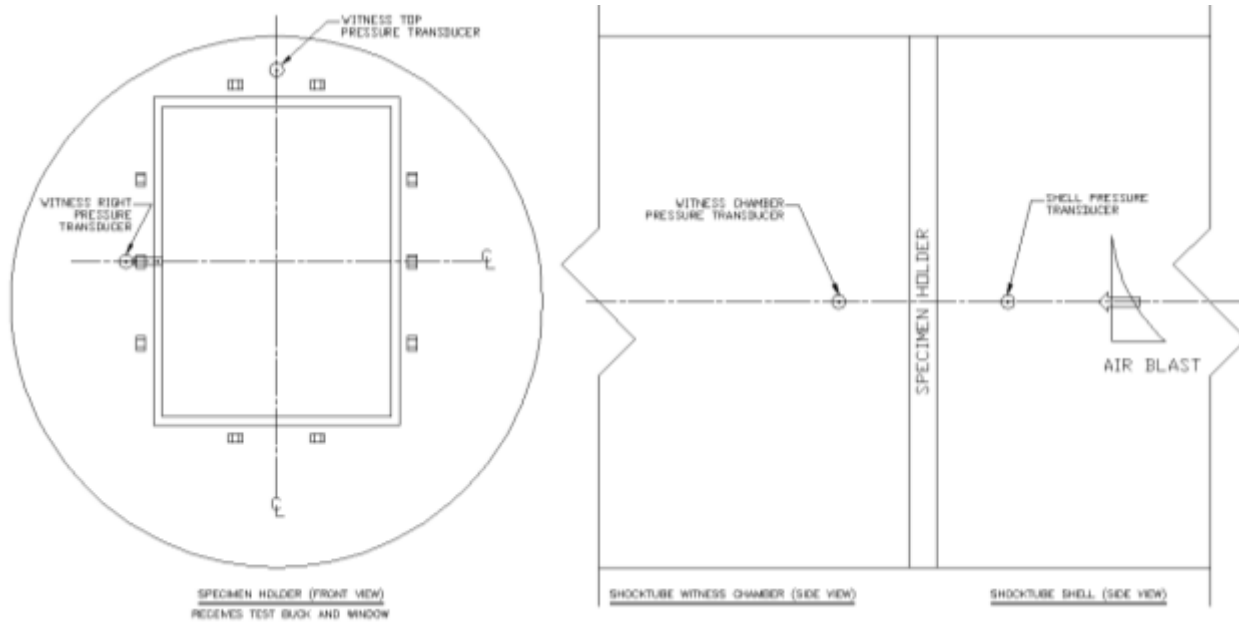
E1272.01-119-12

## **APPENDIX A**

### **Test Facility**



**Figure #1**  
**Shock Tube and Test Facility**



**Figure #2**  
**Pressure Sensor Locations**

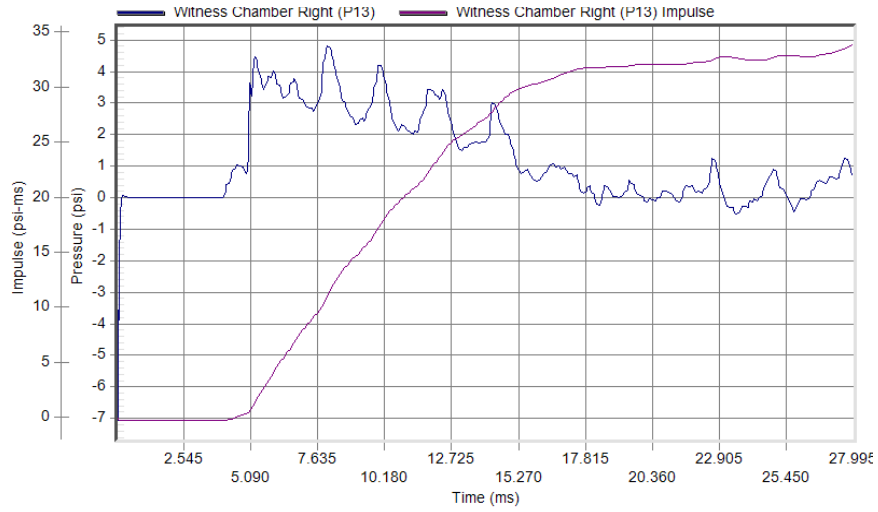


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## **APPENDIX B**

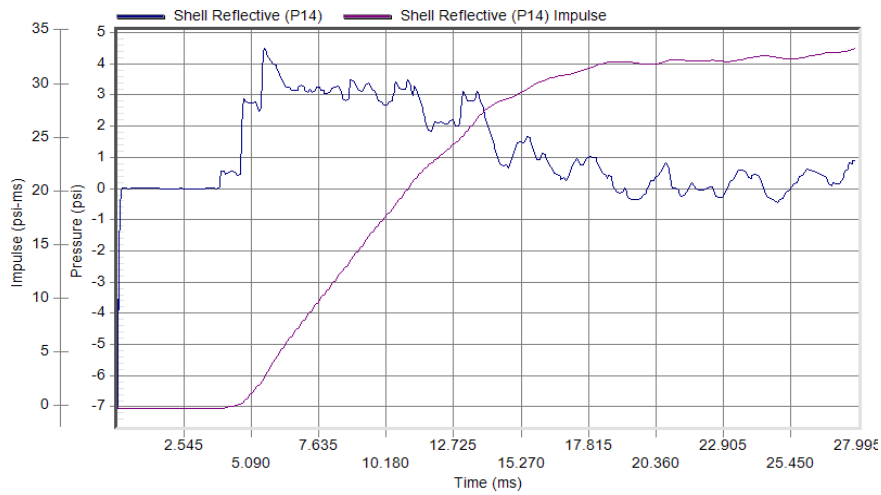
### **Pressure Time Plots**

## Specimen #1



Peak Pressure: 4.86 psi at 8.04 ms  
Duration: 10.12 ms

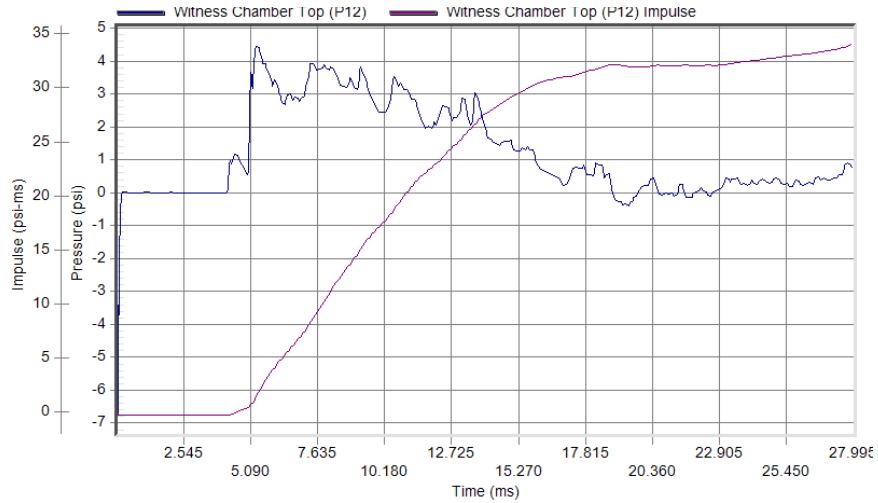
Test Date: 10/22/2014  
Test Time: 10:56 am



Peak Pressure: 4.54 psi at 5.60 ms  
Duration: 13.17 ms

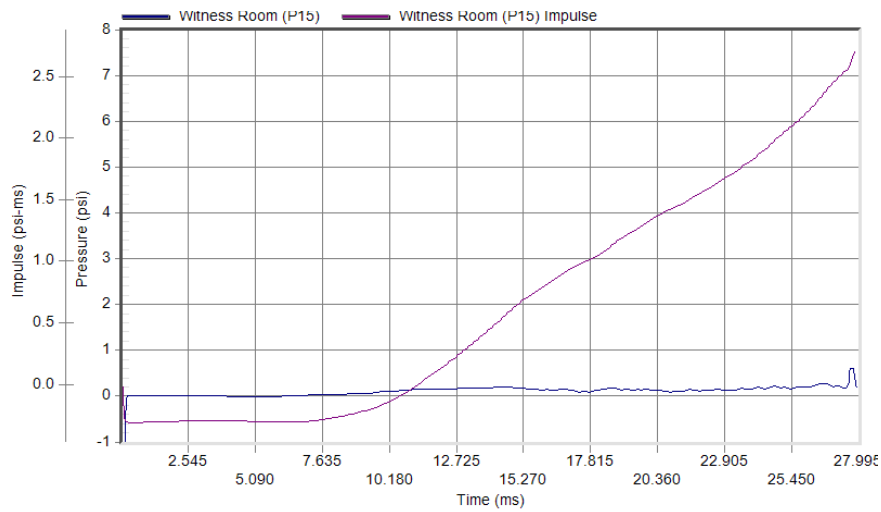
Test Date: 10/22/2014  
Test Time: 10:56 am

### Specimen #1: (Continued)



Peak Pressure: 4.52 psi at 5.35 ms  
Duration: 13.50 ms

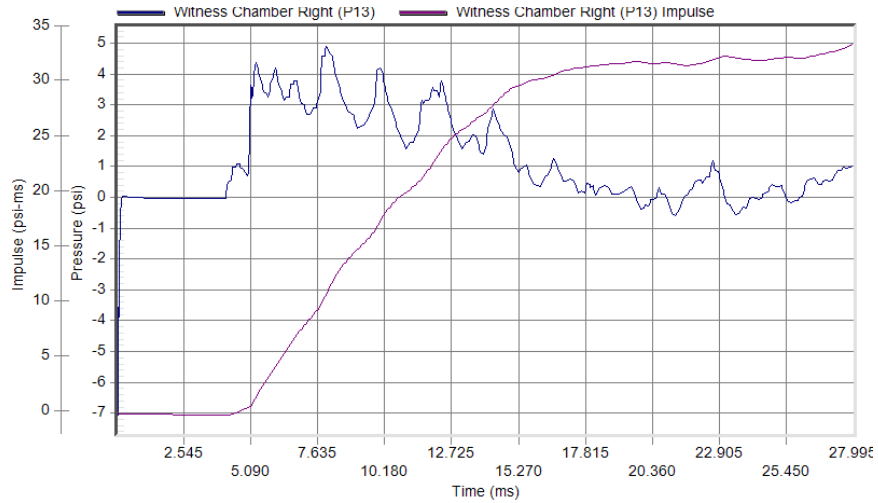
Test Date: 10/22/2014  
Test Time: 10:56 am



Peak Pressure: 0.64 psi at 27.74 ms  
Duration: 0.00 ms

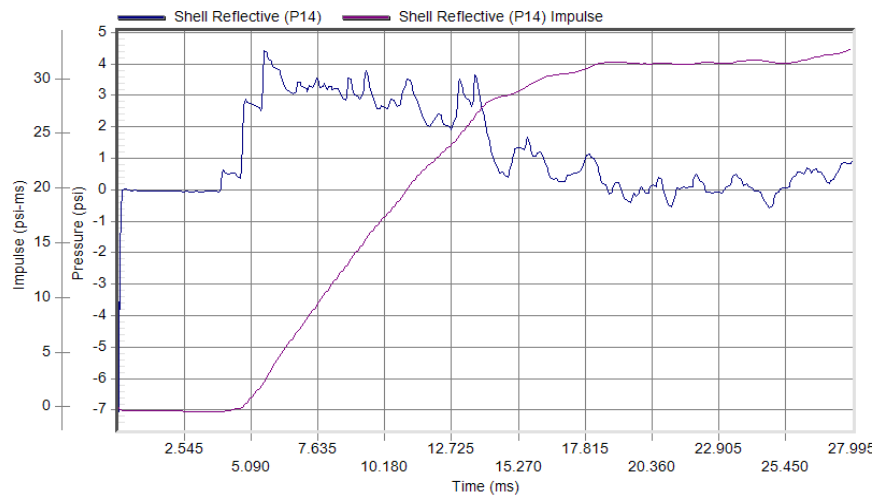
Test Date: 10/22/2014  
Test Time: 10:56 am

## Specimen #2



Peak Pressure: 4.98 psi at 7.98 ms  
Duration: 11.74 ms

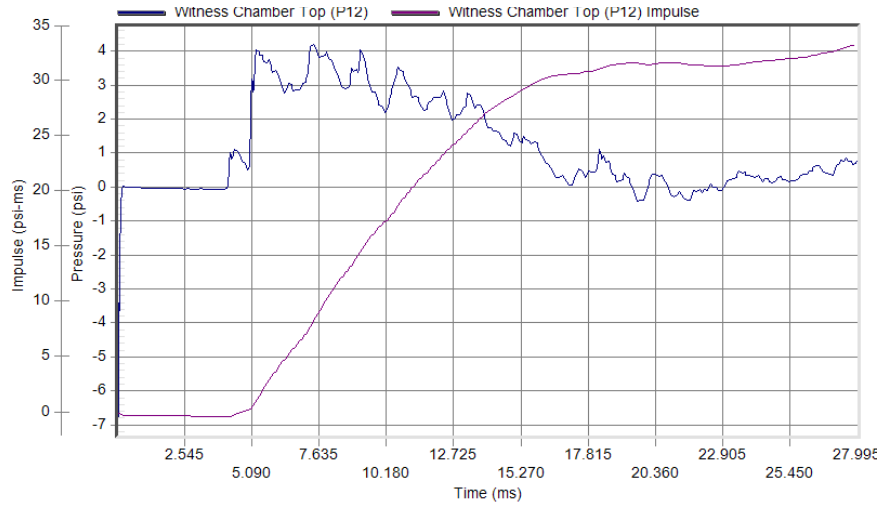
Test Date: 10/23/2014  
Test Time: 9:22 am



Peak Pressure: 4.50 psi at 5.64 ms  
Duration: 13.00 ms

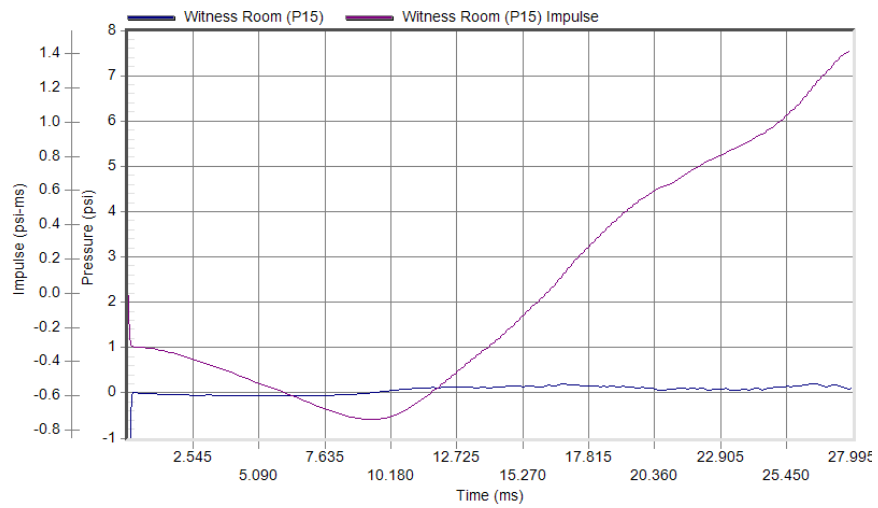
Test Date: 10/23/2014  
Test Time: 9:22 am

**Specimen #2: (Continued)**



Peak Pressure: 4.21 psi at 7.39 ms  
Duration: 12.08 ms

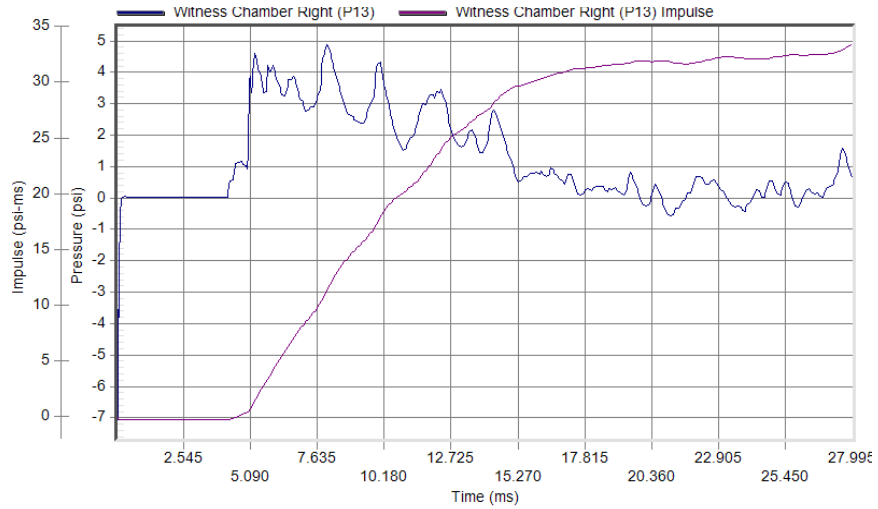
Test Date: 10/23/2014  
Test Time: 9:22 am



Peak Pressure: 0.20 psi at 26.46 ms  
Duration: 0.00 ms

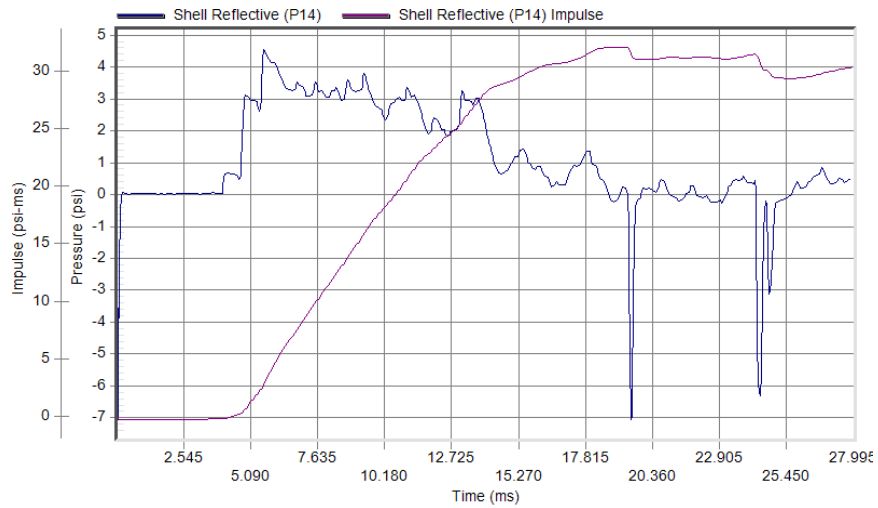
Test Date: 10/23/2014  
Test Time: 9:22 am

### Specimen #3



Peak Pressure: 4.89 psi at 8.05 ms  
Duration: 11.84 ms

Test Date: 10/22/2014  
Test Time: 2:48 pm

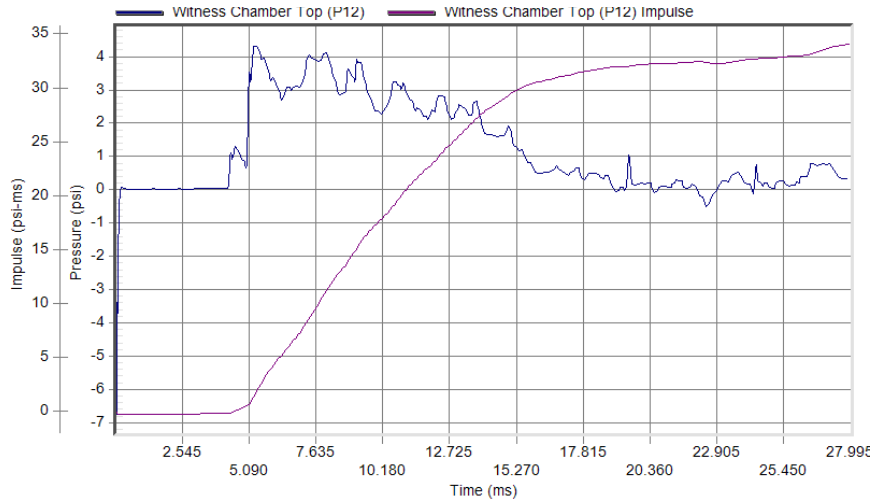


Peak Pressure: 4.62 psi at 5.62 ms  
Duration: 13.08 ms

Test Date: 10/22/2014  
Test Time: 2:48 pm

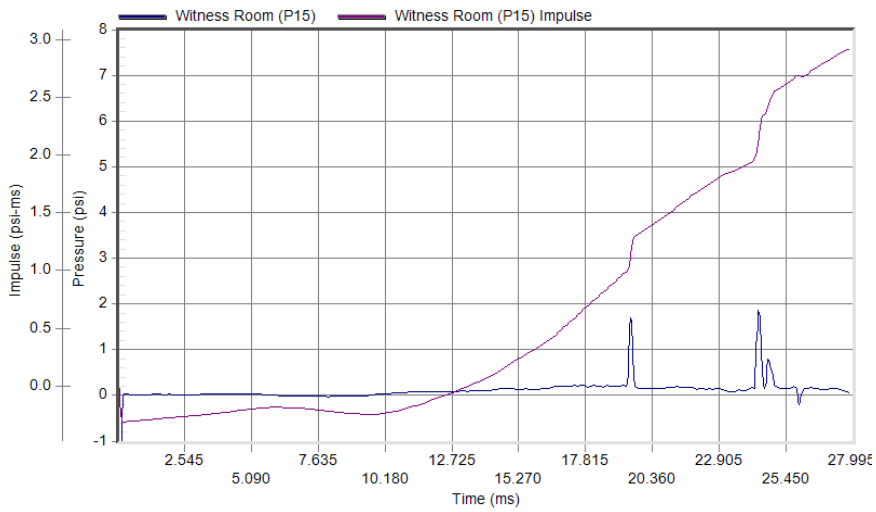


### Specimen #3: (Continued)



Peak Pressure: 4.39 psi at 5.32 ms  
Duration: 13.67 ms

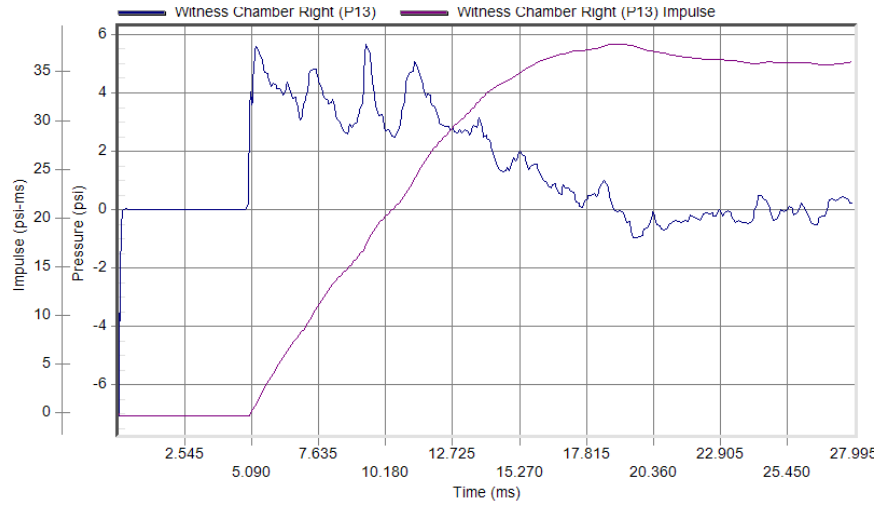
Test Date: 10/22/2014  
Test Time: 2:48 pm



Peak Pressure: 1.92 psi at 24.43 ms  
Duration: 1.48 ms

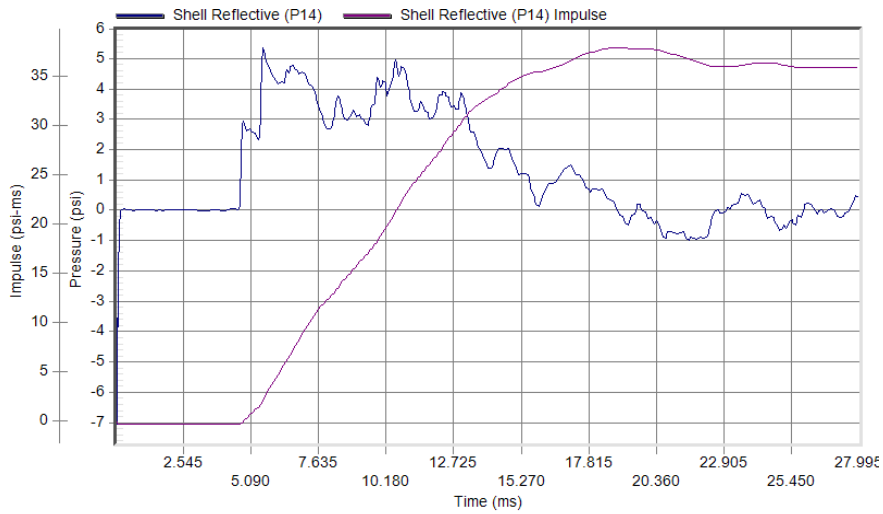
Test Date: 10/22/2014  
Test Time: 2:48 pm

### Specimen #4



Peak Pressure: 5.67 psi at 5.28 ms  
Duration: 12.32 ms

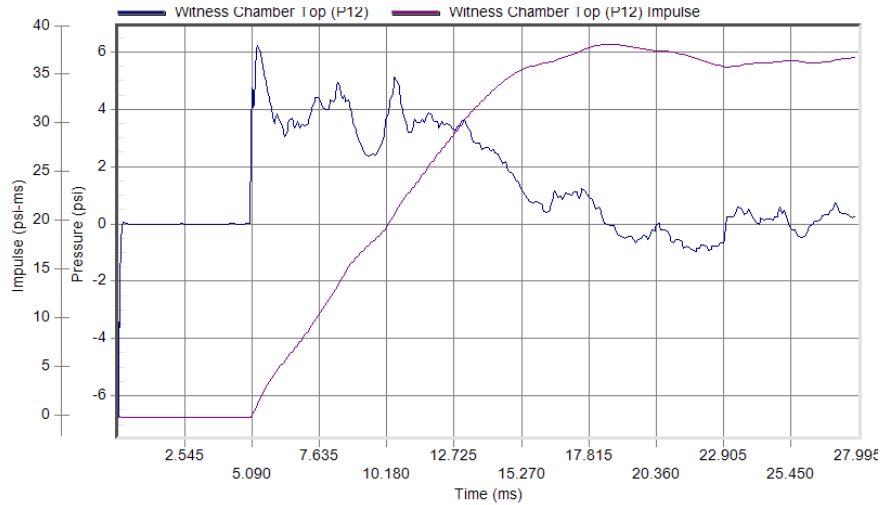
Test Date: 10/24/2014  
Test Time: 9:46 am



Peak Pressure: 5.36 psi at 5.57 ms  
Duration: 13.30 ms

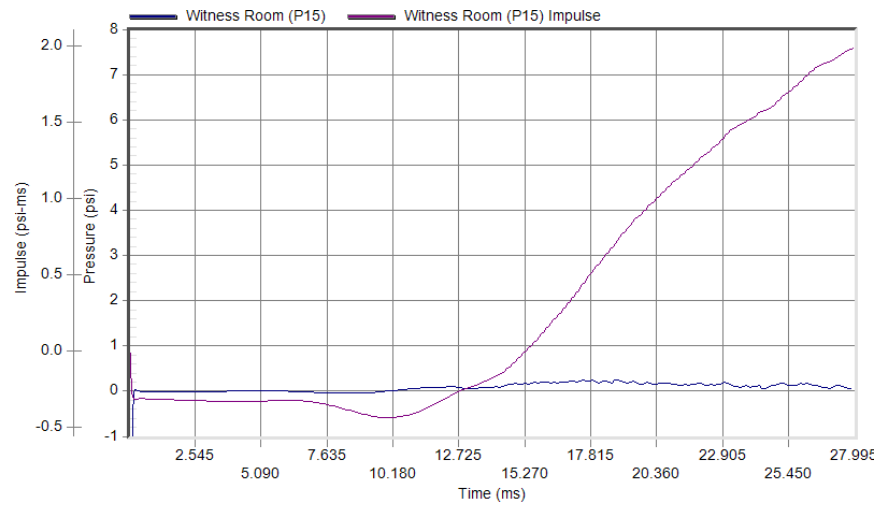
Test Date: 10/24/2014  
Test Time: 9:46 am

### Specimen #4: (Continued)



Peak Pressure: 6.28 psi at 5.31 ms  
Duration: 13.09 ms

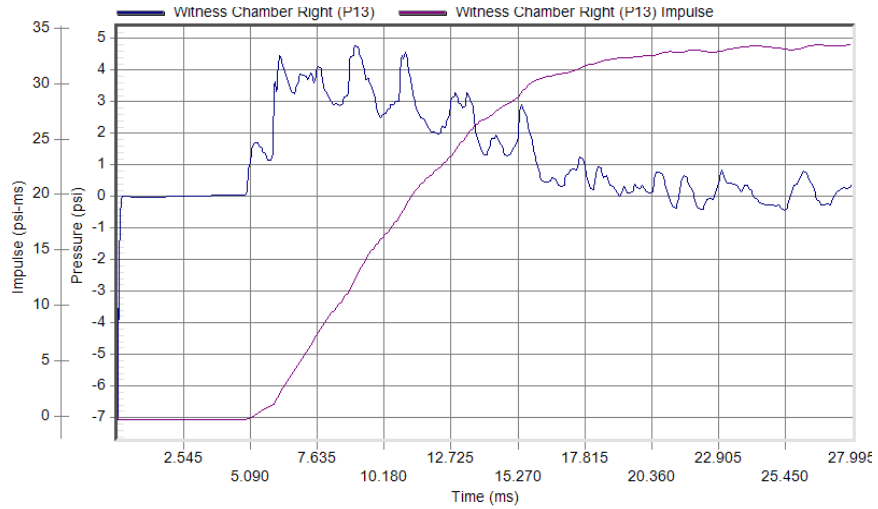
Test Date: 10/24/2014  
Test Time: 9:46 am



Peak Pressure: 0.26 psi at 18.80 ms  
Duration: 0.00 ms

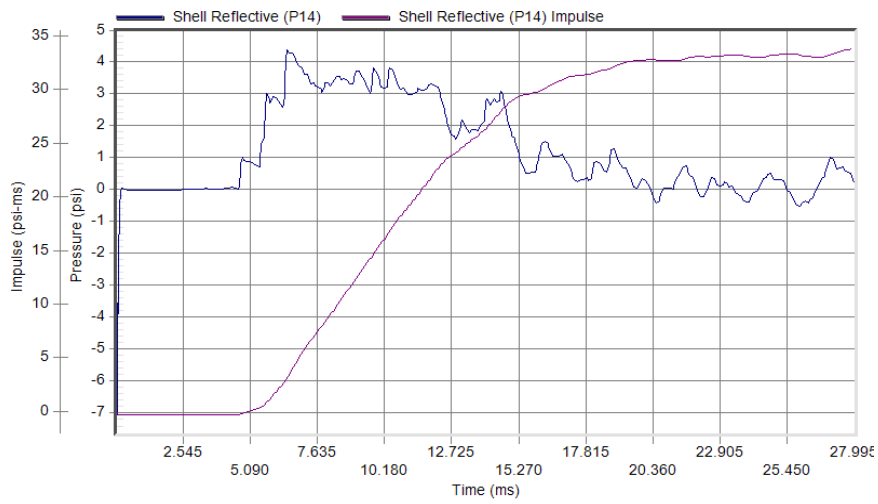
Test Date: 10/24/2014  
Test Time: 9:46 am

### Specimen #5



Peak Pressure: 4.82 psi at 9.09 ms  
Duration: 10.04 ms

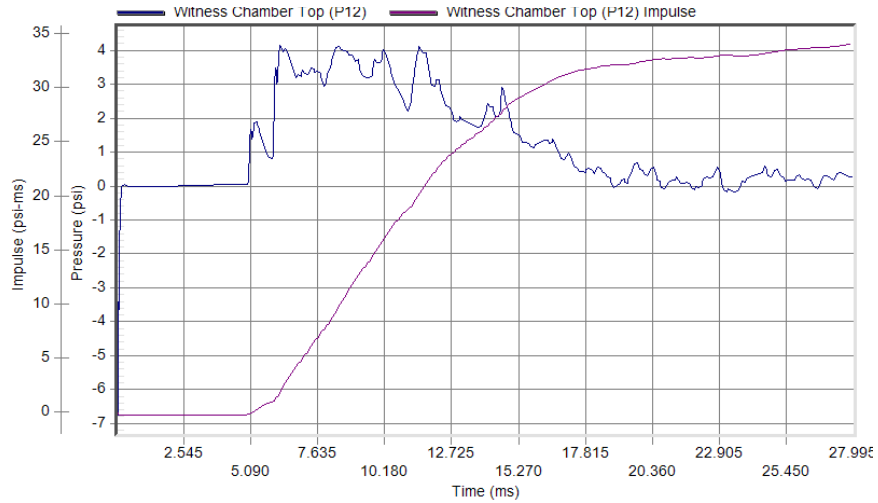
Test Date: 9/24/2014  
Test Time: 10:25 am



Peak Pressure: 4.42 psi at 6.51 ms  
Duration: 13.14 ms

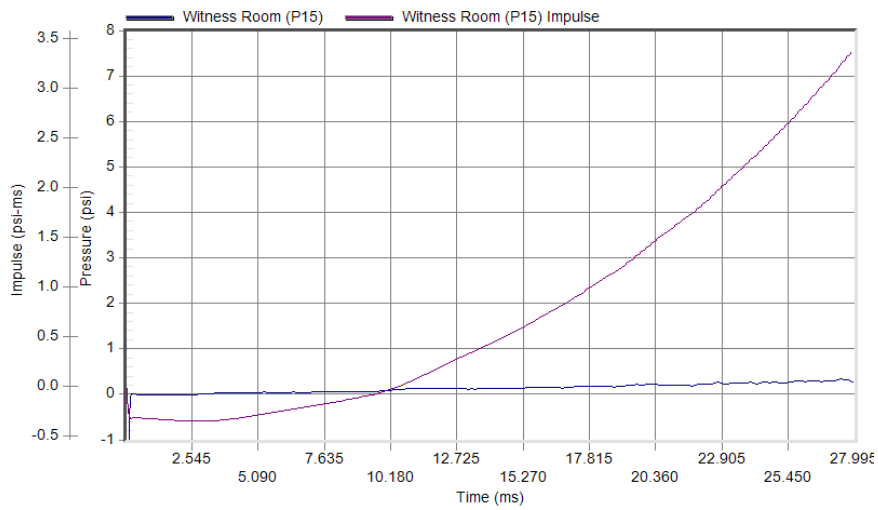
Test Date: 9/24/2014  
Test Time: 10:25 am

### Specimen #5: (Continued)



Peak Pressure: 4.19 psi at 6.22 ms  
Duration: 12.61 ms

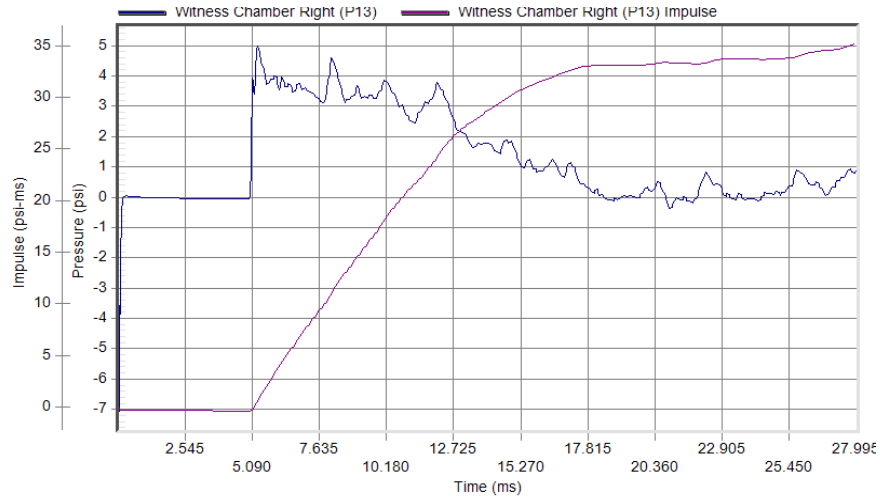
Test Date: 9/24/2014  
Test Time: 10:25 am



Peak Pressure: 0.35 psi at 27.43 ms  
Duration: 0.00 ms

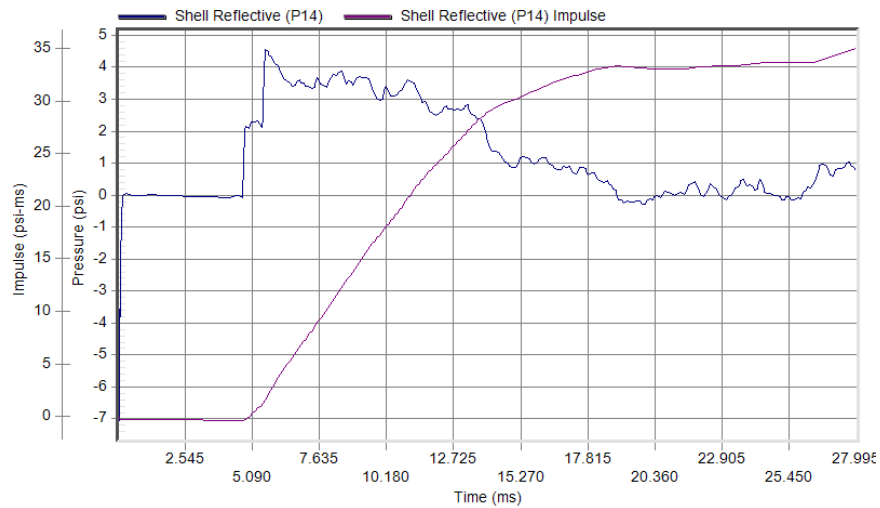
Test Date: 9/24/2014  
Test Time: 10:25 am

## Specimen #6



Peak Pressure: 5.07 psi at 5.32 ms  
Duration: 13.09 ms

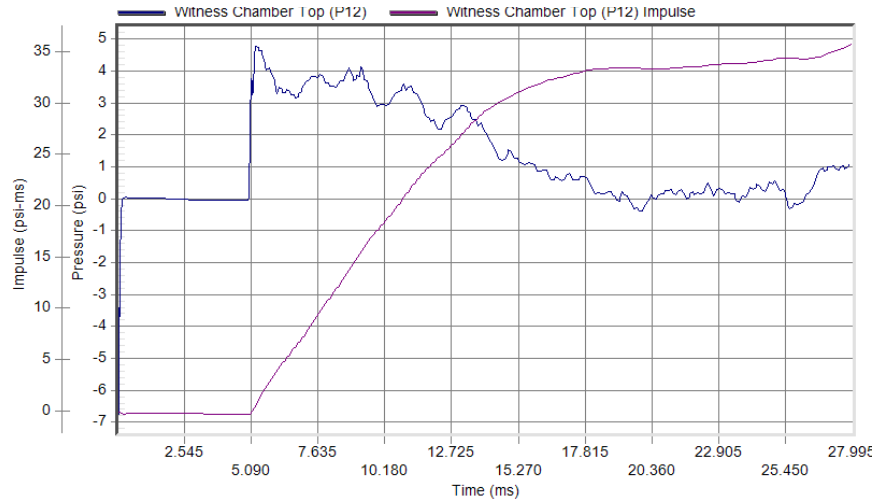
Test Date: 12/29/2014  
Test Time: 12:13 pm



Peak Pressure: 4.60 psi at 5.64 ms  
Duration: 13.28 ms

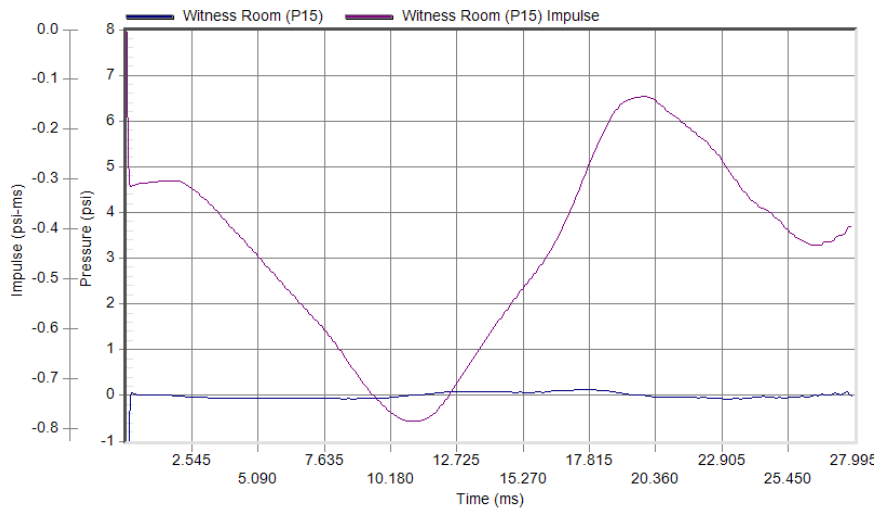
Test Date: 12/29/2014  
Test Time: 12:13 pm

### Specimen #6: (Continued)



Peak Pressure: 4.85 psi at 5.31 ms  
Duration: 13.64 ms

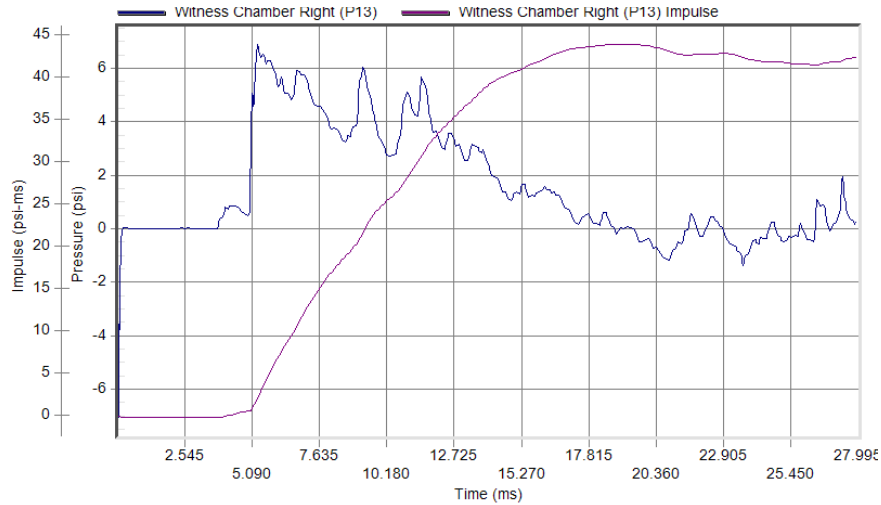
Test Date: 12/29/2014  
Test Time: 12:13 pm



Peak Pressure: 0.14 psi at 17.39 ms  
Duration: 2.47 ms

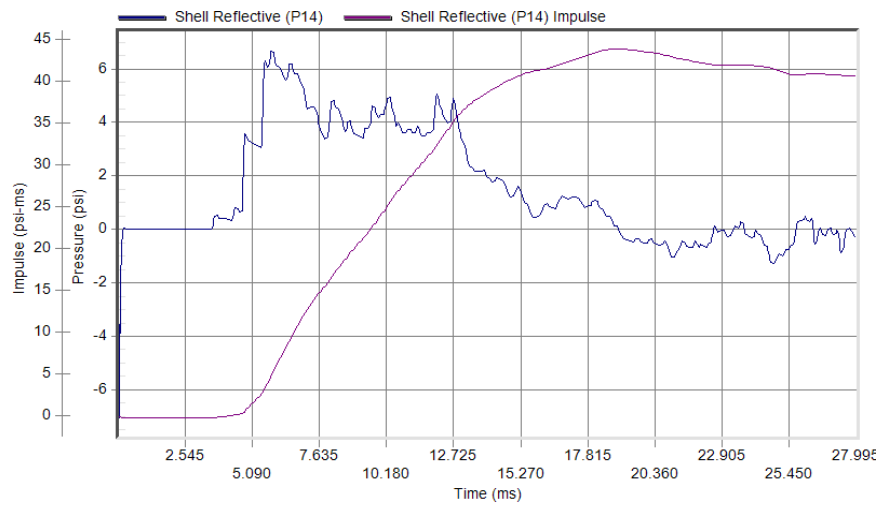
Test Date: 12/29/2014  
Test Time: 12:13 pm

## Specimen #7



Peak Pressure: 6.90 psi at 5.31 ms  
Duration: 13.37 ms

Test Date: 12/29/2014  
Test Time: 2:22 pm

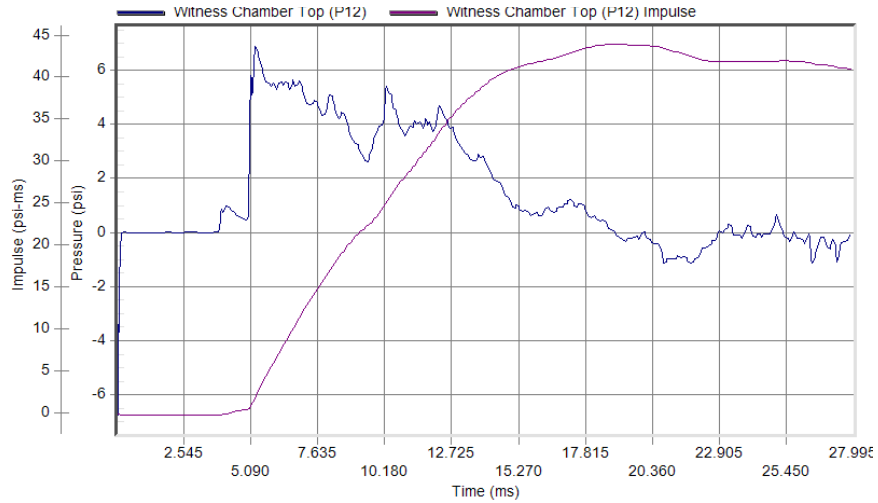


Peak Pressure: 6.75 psi at 5.85 ms  
Duration: 13.10 ms

Test Date: 12/29/2014  
Test Time: 2:22 pm

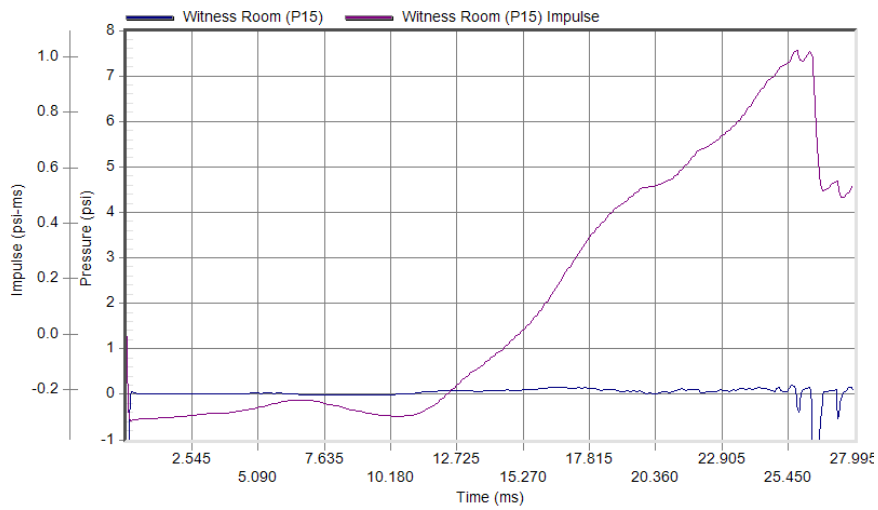


## Specimen #7: (Continued)



Peak Pressure: 6.97 psi at 5.31 ms  
Duration: 13.51 ms

Test Date: 12/29/2014  
Test Time: 2:22 pm



Peak Pressure: 0.23 psi at 25.73 ms  
Duration: 0.03 ms

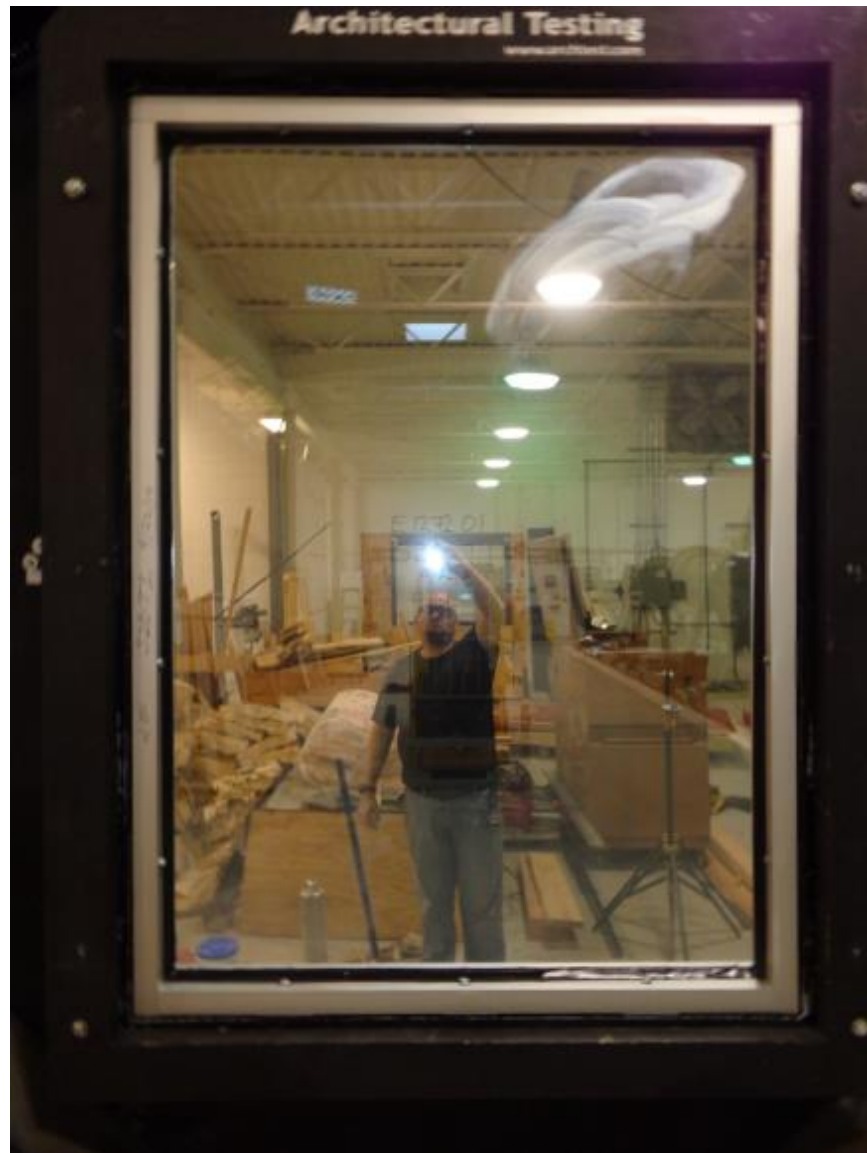
Test Date: 12/29/2014  
Test Time: 2:22 pm



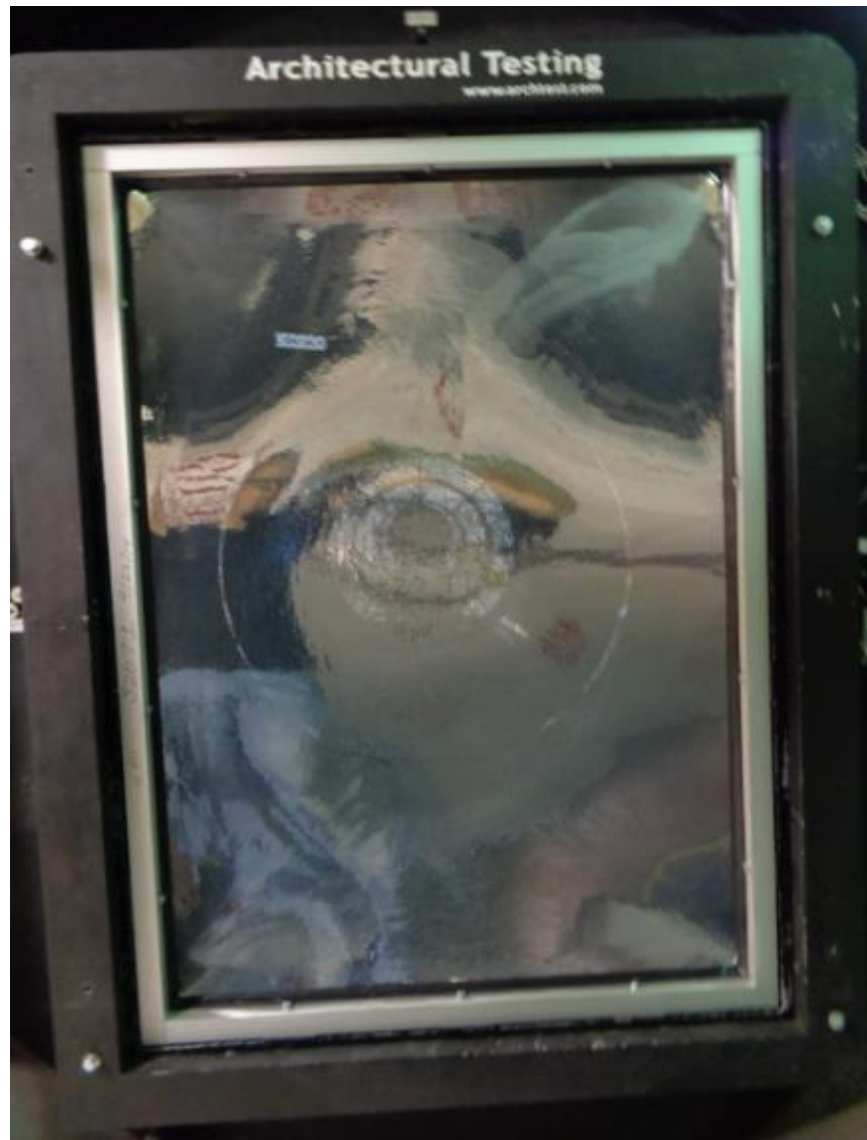
E1272.01-119-12

## **APPENDIX C**

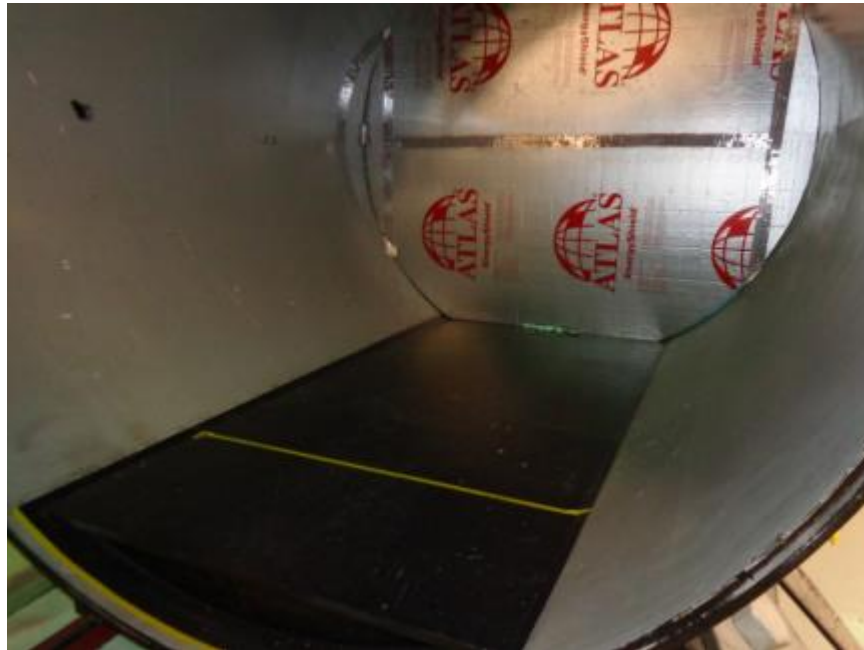
### **Photographs**



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



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



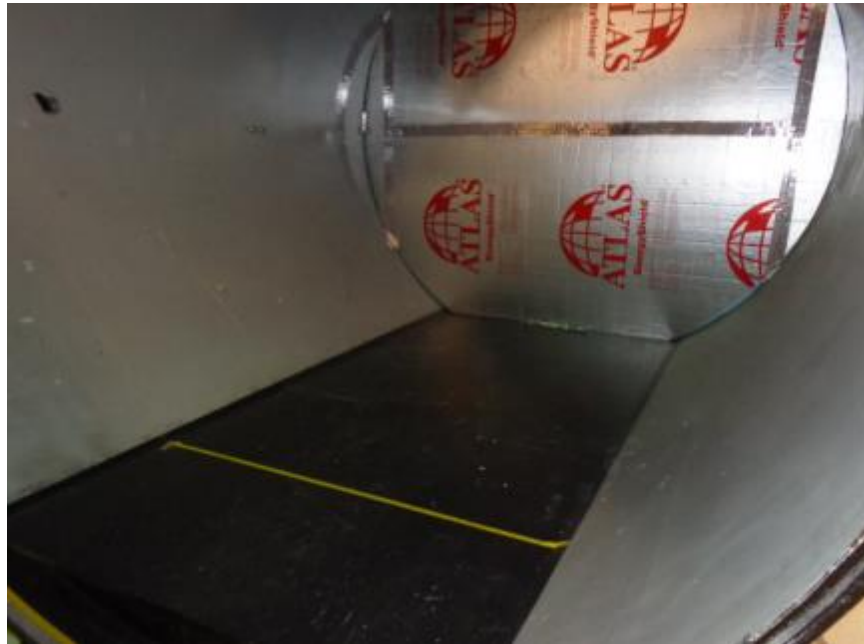
**Photo No. 3**  
**Post-test Specimen #1, Witness Chamber**



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



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

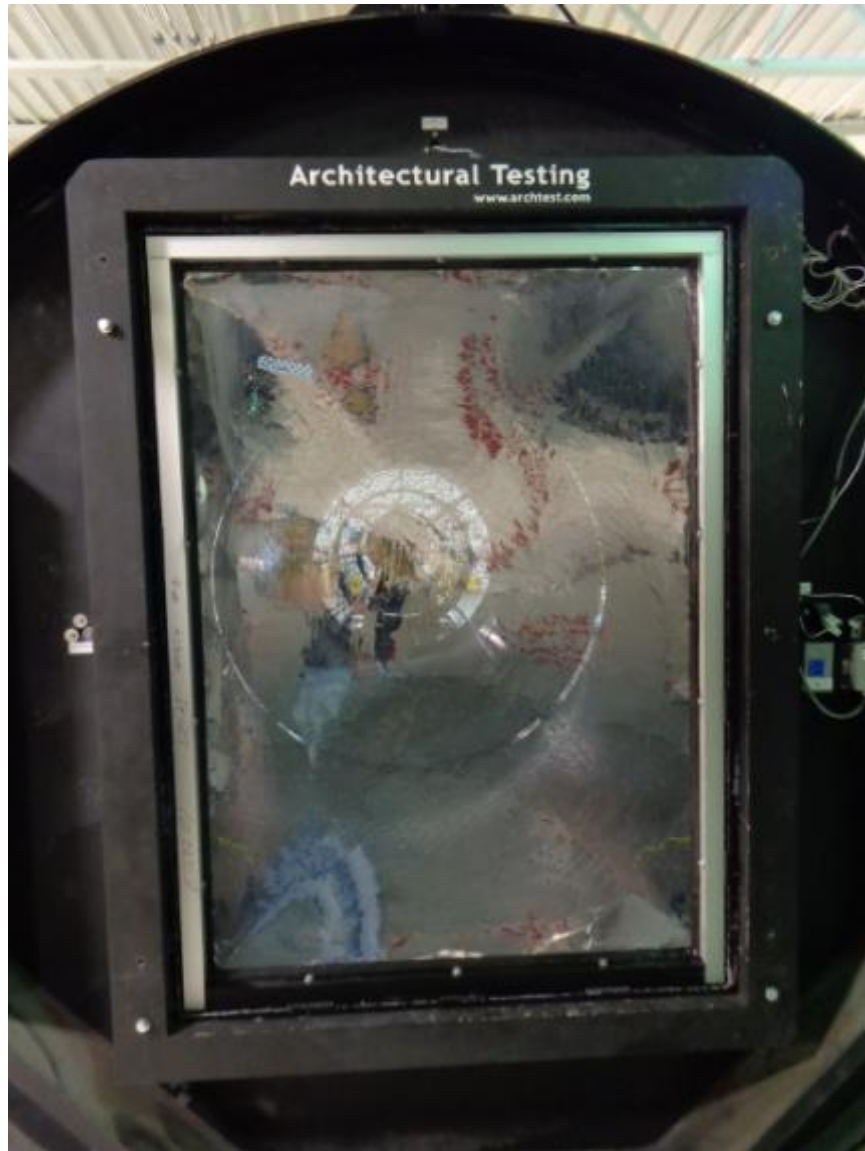


**Photo No. 6**  
**Post-test Specimen #2, Witness Chamber**

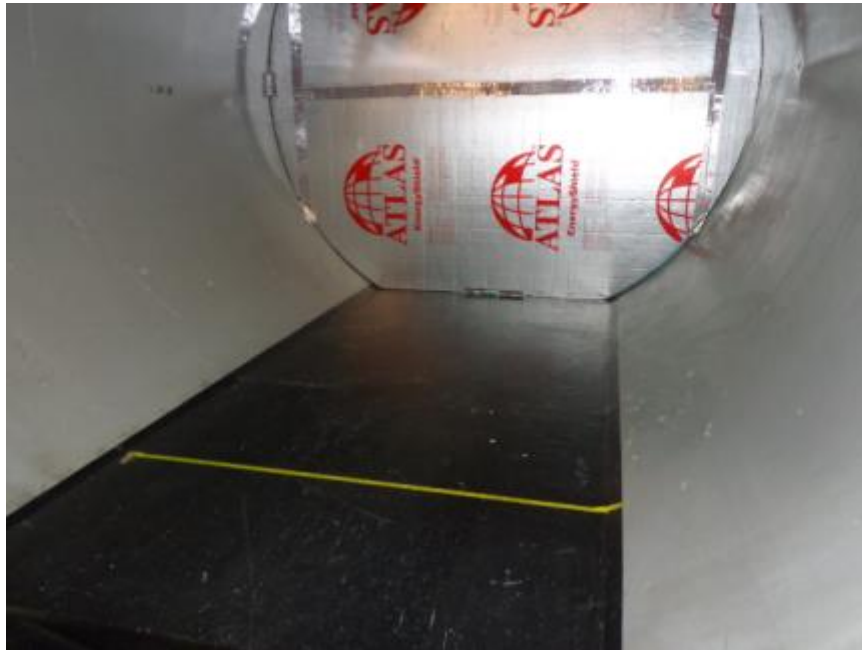




**Photo No. 7**  
**Pre-test Specimen #3, Interior**



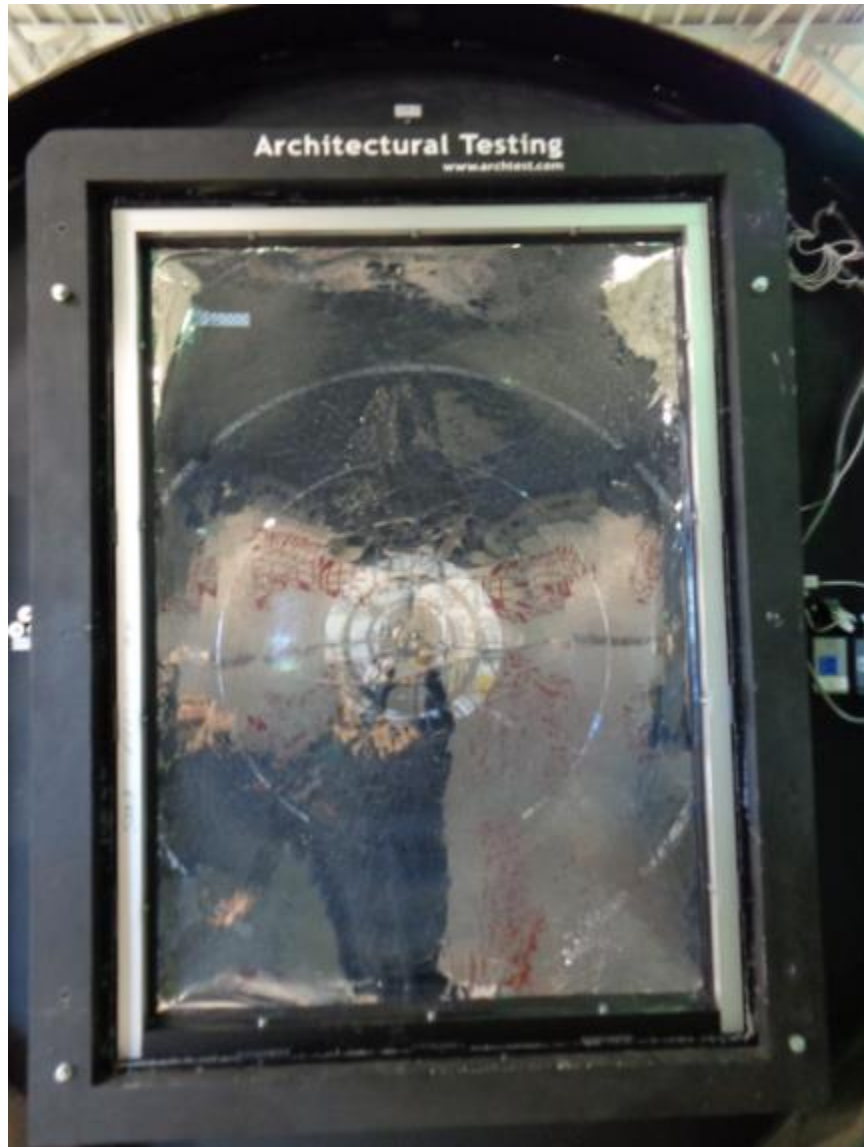
**Photo No. 8**  
**Post-test Specimen #3, Interior**



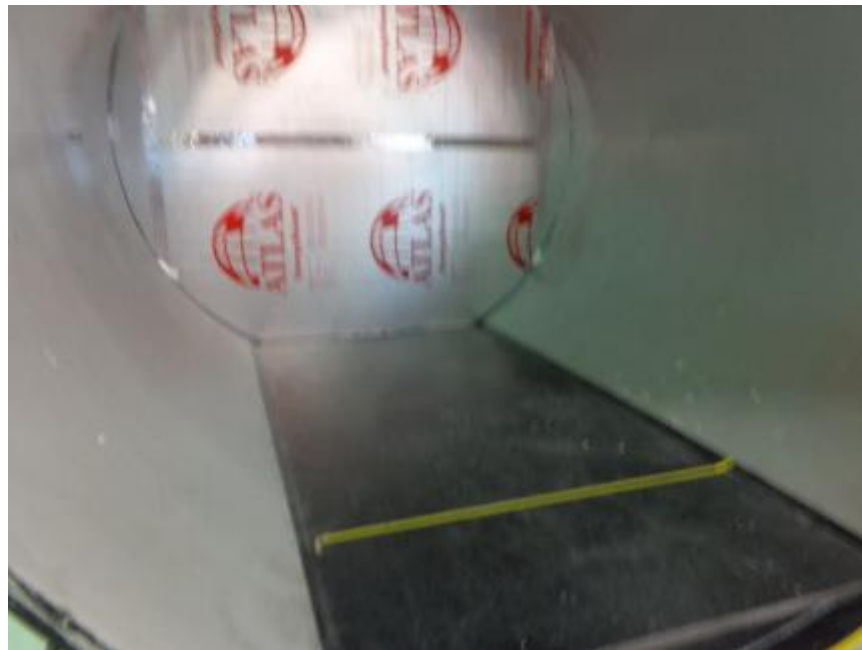
**Photo No. 9**  
**Post-test Specimen #3, Witness Chamber**



**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**

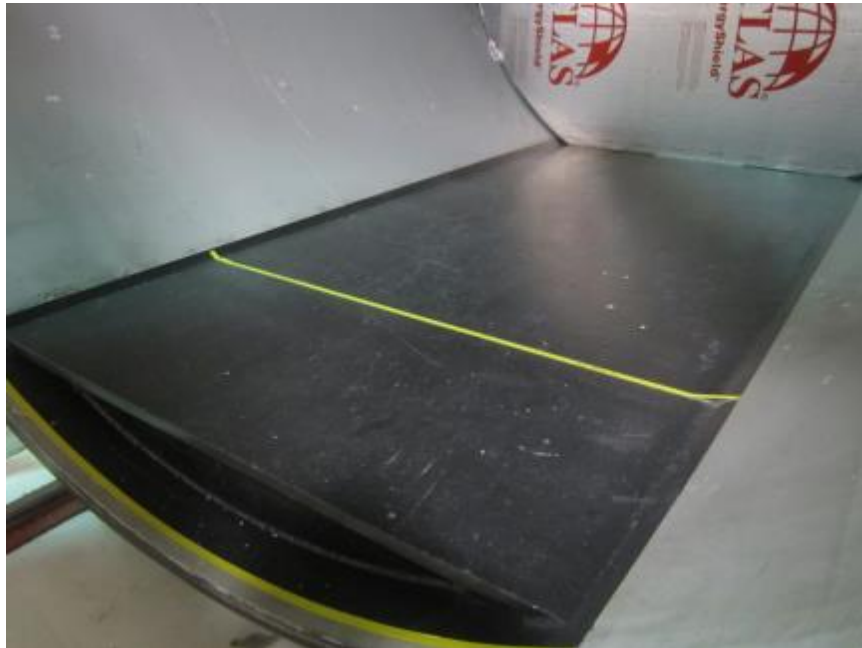




**Photo No. 13**  
**Pre-test Specimen #5, Interior**

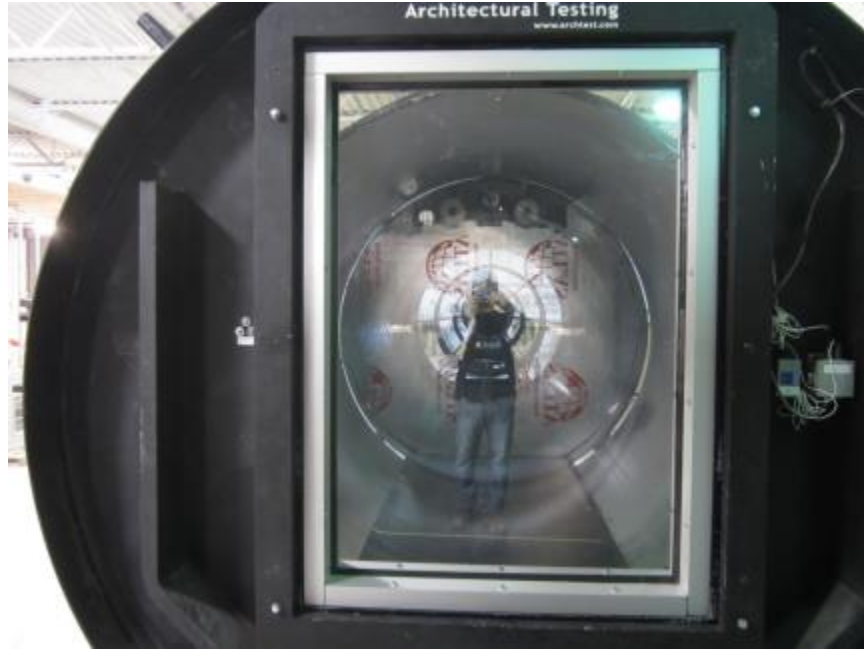


**Photo No. 14**  
**Post-test Specimen #5, Interior**

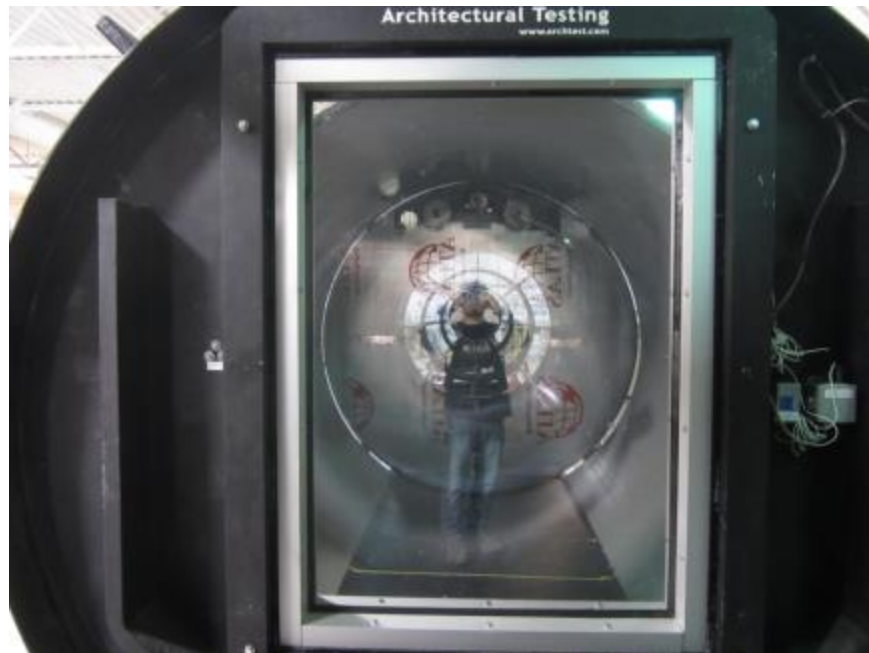


**Photo No. 15**  
**Post-test Specimen #5, Witness Chamber**

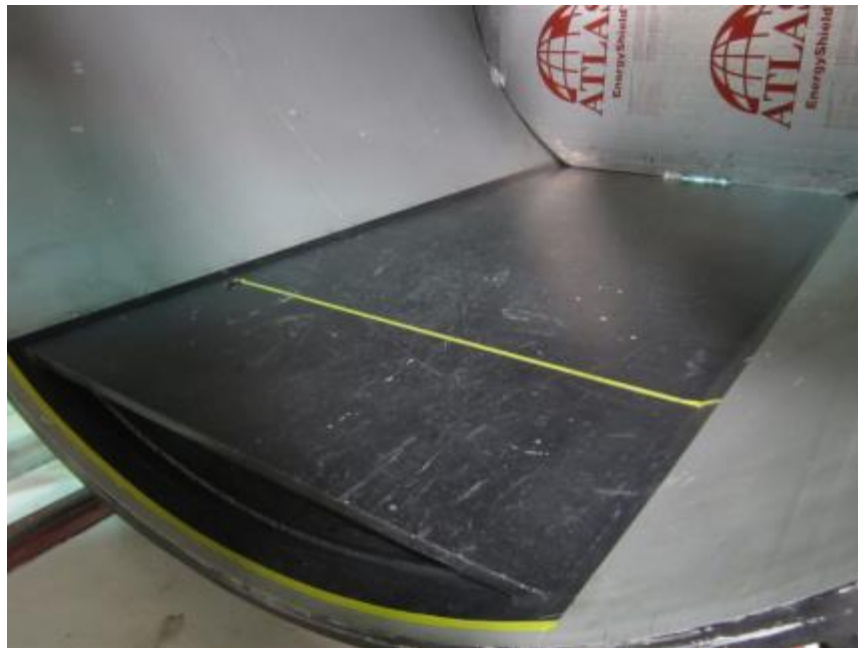




**Photo No. 16**  
**Pre-test Specimen #6, Interior**



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



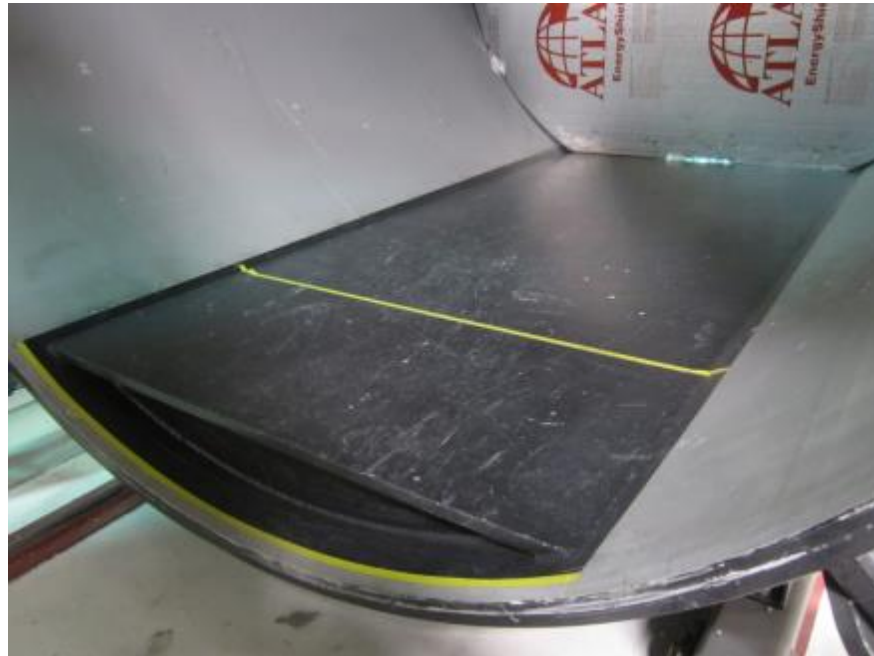
**Photo No. 18**  
**Post-test Specimen #6, Witness Chamber**



**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**



E1272.01-119-12

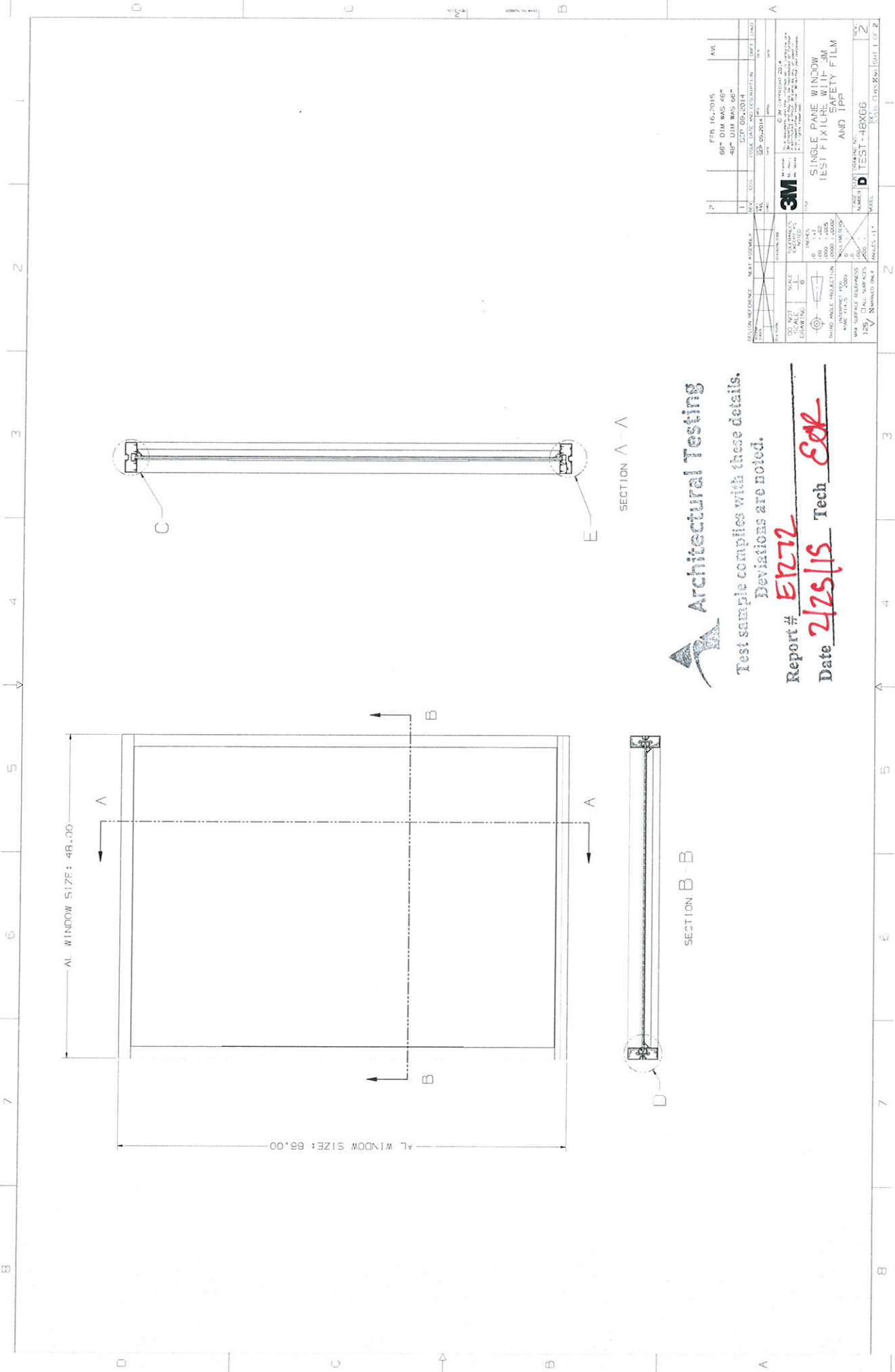
## **APPENDIX D**

### **Drawings**









AL WINDOW SIZE: 48.00

AL WINDOW SIZE: 66.00

SECTION A - A

SECTION B - B



Test sample complies with these details.  
Deviations are noted.

Report # **E1772**

Date **2/25/15** Tech **ESK**

DATE	1/16/2015	REV	1
DESCRIPTION	66" DIM WAS 48"	REV	2
DATE	02/05/2014	REV	3
DESCRIPTION	48" DIM WAS 66"	REV	4
DATE	02/05/2014	REV	5
DESCRIPTION	52" DIM WAS 66"	REV	6
DATE	02/05/2014	REV	7
DESCRIPTION	52" DIM WAS 66"	REV	8
DATE	02/05/2014	REV	9
DESCRIPTION	52" DIM WAS 66"	REV	10
DATE	02/05/2014	REV	11
DESCRIPTION	52" DIM WAS 66"	REV	12
DATE	02/05/2014	REV	13
DESCRIPTION	52" DIM WAS 66"	REV	14
DATE	02/05/2014	REV	15
DESCRIPTION	52" DIM WAS 66"	REV	16
DATE	02/05/2014	REV	17
DESCRIPTION	52" DIM WAS 66"	REV	18
DATE	02/05/2014	REV	19
DESCRIPTION	52" DIM WAS 66"	REV	20
DATE	02/05/2014	REV	21
DESCRIPTION	52" DIM WAS 66"	REV	22
DATE	02/05/2014	REV	23
DESCRIPTION	52" DIM WAS 66"	REV	24
DATE	02/05/2014	REV	25
DESCRIPTION	52" DIM WAS 66"	REV	26
DATE	02/05/2014	REV	27
DESCRIPTION	52" DIM WAS 66"	REV	28
DATE	02/05/2014	REV	29
DESCRIPTION	52" DIM WAS 66"	REV	30
DATE	02/05/2014	REV	31
DESCRIPTION	52" DIM WAS 66"	REV	32
DATE	02/05/2014	REV	33
DESCRIPTION	52" DIM WAS 66"	REV	34
DATE	02/05/2014	REV	35
DESCRIPTION	52" DIM WAS 66"	REV	36
DATE	02/05/2014	REV	37
DESCRIPTION	52" DIM WAS 66"	REV	38
DATE	02/05/2014	REV	39
DESCRIPTION	52" DIM WAS 66"	REV	40
DATE	02/05/2014	REV	41
DESCRIPTION	52" DIM WAS 66"	REV	42
DATE	02/05/2014	REV	43
DESCRIPTION	52" DIM WAS 66"	REV	44
DATE	02/05/2014	REV	45
DESCRIPTION	52" DIM WAS 66"	REV	46
DATE	02/05/2014	REV	47
DESCRIPTION	52" DIM WAS 66"	REV	48
DATE	02/05/2014	REV	49
DESCRIPTION	52" DIM WAS 66"	REV	50
DATE	02/05/2014	REV	51
DESCRIPTION	52" DIM WAS 66"	REV	52
DATE	02/05/2014	REV	53
DESCRIPTION	52" DIM WAS 66"	REV	54
DATE	02/05/2014	REV	55
DESCRIPTION	52" DIM WAS 66"	REV	56
DATE	02/05/2014	REV	57
DESCRIPTION	52" DIM WAS 66"	REV	58
DATE	02/05/2014	REV	59
DESCRIPTION	52" DIM WAS 66"	REV	60
DATE	02/05/2014	REV	61
DESCRIPTION	52" DIM WAS 66"	REV	62
DATE	02/05/2014	REV	63
DESCRIPTION	52" DIM WAS 66"	REV	64
DATE	02/05/2014	REV	65
DESCRIPTION	52" DIM WAS 66"	REV	66
DATE	02/05/2014	REV	67
DESCRIPTION	52" DIM WAS 66"	REV	68
DATE	02/05/2014	REV	69
DESCRIPTION	52" DIM WAS 66"	REV	70
DATE	02/05/2014	REV	71
DESCRIPTION	52" DIM WAS 66"	REV	72
DATE	02/05/2014	REV	73
DESCRIPTION	52" DIM WAS 66"	REV	74
DATE	02/05/2014	REV	75
DESCRIPTION	52" DIM WAS 66"	REV	76
DATE	02/05/2014	REV	77
DESCRIPTION	52" DIM WAS 66"	REV	78
DATE	02/05/2014	REV	79
DESCRIPTION	52" DIM WAS 66"	REV	80
DATE	02/05/2014	REV	81
DESCRIPTION	52" DIM WAS 66"	REV	82
DATE	02/05/2014	REV	83
DESCRIPTION	52" DIM WAS 66"	REV	84
DATE	02/05/2014	REV	85
DESCRIPTION	52" DIM WAS 66"	REV	86
DATE	02/05/2014	REV	87
DESCRIPTION	52" DIM WAS 66"	REV	88
DATE	02/05/2014	REV	89
DESCRIPTION	52" DIM WAS 66"	REV	90
DATE	02/05/2014	REV	91
DESCRIPTION	52" DIM WAS 66"	REV	92
DATE	02/05/2014	REV	93
DESCRIPTION	52" DIM WAS 66"	REV	94
DATE	02/05/2014	REV	95
DESCRIPTION	52" DIM WAS 66"	REV	96
DATE	02/05/2014	REV	97
DESCRIPTION	52" DIM WAS 66"	REV	98
DATE	02/05/2014	REV	99
DESCRIPTION	52" DIM WAS 66"	REV	100

**3M**

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

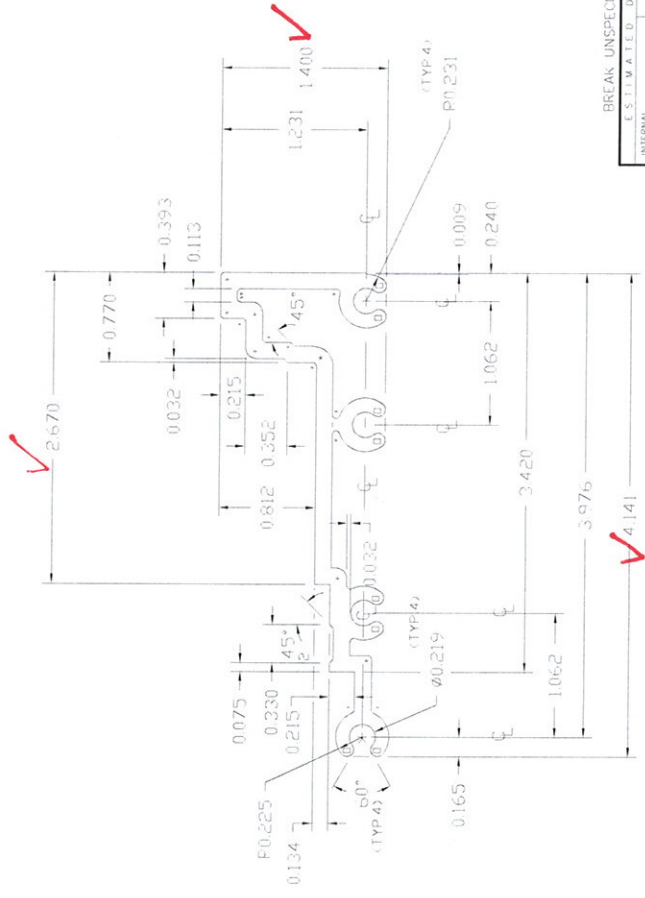
TESTING NO. **D**  
TEST - 48X66

DATE 02/05/2014  
SHEET 1 OF 2



PRINT REVISIONS	DATE

CRM-63
REV. A
DELHI <input type="checkbox"/> IFTON <input type="checkbox"/> BOTH <input type="checkbox"/>



**Architectural Testing**  
 Test sample complies with these details.  
 Deviations are noted.  
 Report # **E1272**  
 Date **2/25/15** Tech **EAR**

NOTE:  
 NO EXPOSED CURFAFE

BREAK UNSPECIFIED CORNERS		0.010	P	0.140	TYPICAL WALL UNLESS SPECIFIED OTHERWISE
ESTIMATED	D.T.E.	D.A.T.A.			
INTERNAL USE	AREA	1.182	W/FI	1.418	6063-T5
	PERIMETER	17.816	CIRCLE SIZE	4 - 5	
	SOLID PERIMETER		FACTOR	12	
	DIAGONAL PERIMETER				
	ADJUSTED CREW	BOTS	M.B.	P-13-20	

LEGEND	DATE
• = 0.31 R	
◦ = 0.62 R	
× = 1.25 R	
⊙ = 250 R	
± =	

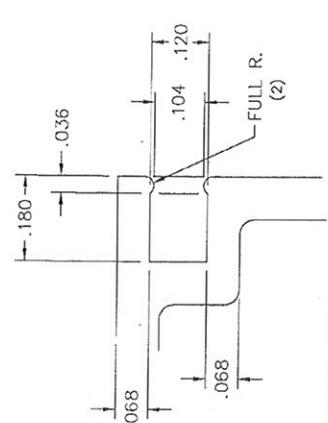
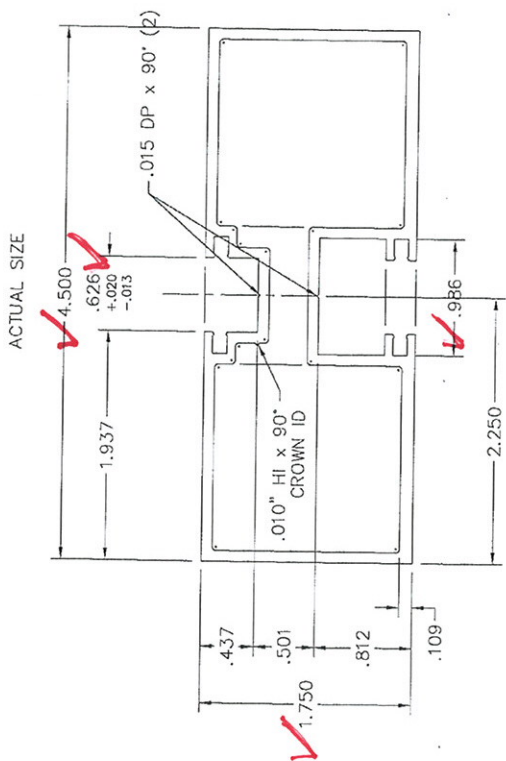
SCALE	ACTUAL
DATE	12-3-88
LAST REVISION	
BROWN	M. COPIES
JOB	
CUSTOMER NUMBER	A-6613

Customer: **sapa: Sapa Extrusions, Inc.**  
 DELHI, LA 71232  
 CUSTOMER: **CRONSTROMS**  
 MINNEAPOLIS, MINN.  
 APPLICATION: **SILL CLIP**



PRINT REVISIONS	DATE

12580
Die Number
45-010
Customer Number



**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

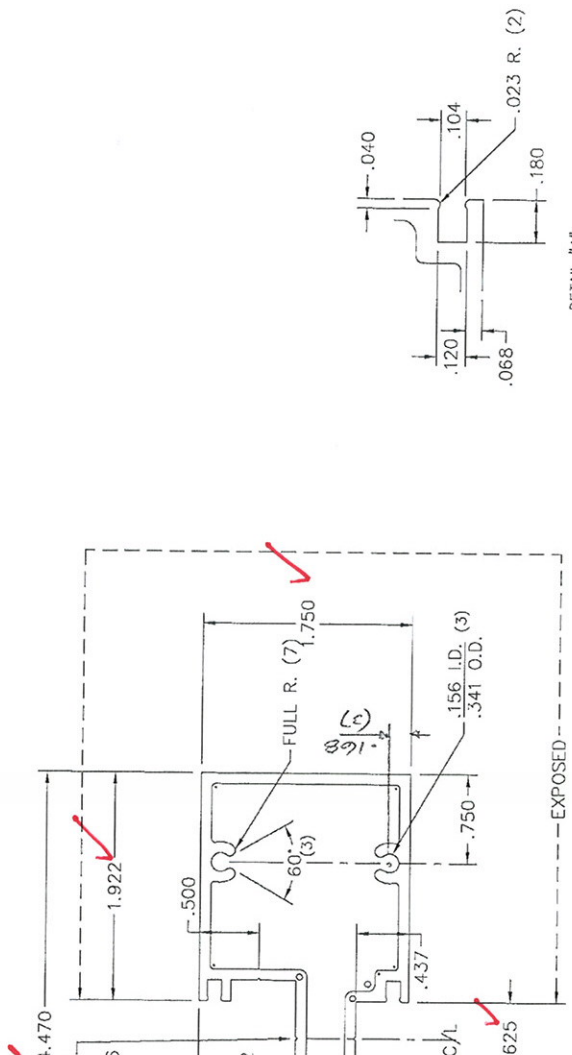
Report # E1212  
Date 2/13/15 Tech EAR

03-24-11 added .625 tolerance  
TYPICAL WALL UNLESS OTHERWISE NOTED: .090

<b>Crown Extrusions, Inc.</b> <b>122 Columbia Court N.</b> <b>Chaska, MN 55318</b> 952-446-8338 Fax: 952-446-8326		DIE # 12580
<b>CMI Architectural</b> <b>CMI Architectural Products, Inc.</b> 20621 SD Highway 25 DeSmet, SD 57231-5827 605-854-3326 Fax: 605-854-3920		SCALE FULL & NOTED
CUSTOMER <b>MULLION</b>		DATE 12-11-08
PART NAME MULLION		LAST REVISION 03-24-11
ESTIMATED DIE DATA ALLOY/TEMPER: 6063-T5 AREA: 1.445 WT/FT: 1.733 PERIMETER: 31.168 ORLE SIZE: 4-5 OUTSIDE PERIMETER: 17.197 FACTOR: 18 EXPOSED PERIMETER: 17.197 HOLLOW		DRAWN TCC
LEGEND * = .031 R. o = .062 R. x = .125 R. ⊗ = .250 R. * =		CUSTOMER NUMBER 45-010
STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED		

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

CRM-44  
 REV.  DELHI  TIFTON  BOYH



DETAIL "A"  
2 x SIZE

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

<b>sapa:</b>		CARD #
sapa Extrusions, Inc.		CRM-44 350
DETAIL 14-7122		SCALE
CUSTOMER		FULL & NOTED
CMI ARCHITECTURAL PRODUCTS		DATE
2800 FREEWAY BOULEVARD		7-29-98
SUITE 205		LAST REVISION
MINNEAPOLIS, MN 55430		DRAWN
APPLICATION		Michael Bryson
F.C. SILL 1/4"		JOB
CUSTOMER NUMBER		45-018

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

LEGEND	DATE
• = .031 R.	
o = .062 R.	
x = .125 R.	
⊗ = .250 R.	
* =	



Test sample complies with these details.  
Deviations are noted.

Report # E1272

Date 2/13/15 Tech SER















