

**ASTM F1642-04 / GSA TS01 TEST REPORT**

**Rendered to:**

3M Company - St. Paul, Minnesota

**PRODUCT TYPE:**

Fragment Retention Film on 1/4" Single Pane Glass

**SERIES/MODEL:**

3M™ Scotchshield™ Ultra S600 Safety and Security Window Film with  
3M™ Impact Protection Profile Film Attachment System

**This report contains in its entirety:**

**Cover Page:** 1 page  
**Summary of Results:** 1 page  
**Report Body:** 14 pages  
**Test Facility:** 1 page  
**Pressure-Time Plots:** 14 pages  
**Photographs:** 18 pages  
**Drawings:** 6 pages

**Report No.:** D8962.01-119-12  
**Test Completion Date:** 07/22/14  
**Report Date:** 10/30/14  
**Test Record Retention Date:** 07/22/18

### Summary of Results

Specimen No.	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	1/4" Tempered	IPP <sup>1</sup>	7.16 psi	45 psi-msec	13.11 msec	4	Low Hazard
2		IPP <sup>1</sup>	6.65 psi	40 psi-msec	12.62 msec	3A	Minimal Hazard
3		IPP <sup>1</sup>	6.77 psi	43 psi-msec	12.26 msec	2	No Hazard
4		IPP <sup>1</sup>	7.39 psi	43 psi-msec	12.56 msec	2	No Hazard
5	1/4" Annealed	IPP <sup>1</sup>	6.82 psi	44 psi-msec	13.32 msec	3A	Minimal Hazard
6		IPP <sup>1</sup>	7.14 psi	43 psi-msec	13.25 msec	4	Low Hazard
7		IPP <sup>1</sup>	6.86 psi	41 psi-msec	12.37 msec	2	Minimal Hazard
8		IPP <sup>1</sup>	6.00 psi <sup>2</sup>	42 psi-msec <sup>2</sup>	14.00 msec <sup>2</sup>	2	No Hazard

<sup>1</sup> IPP = 3M™ Impact Protection Profile

<sup>2</sup> Data was not recorded due to equipment malfunction. Target blast load was 6 psi and 42 psi\*msec.

Reference must be made to Report No. D8962.01-119-12, dated 10/30/14 for complete test specimen description and detailed test results.

**1.0 Report Issued To:** 3M Renewable Energy Division  
3M Center, Building 235, E-330-3D-02  
St. Paul, Minnesota 55144

**2.0 Test Laboratory:** Architectural Testing, Inc.  
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

**3.2 Series /Model:** 3M™ Scotchshield™ Ultra S600 Safety and Security Window Film with 3M™ Impact Protection Profile Film Attachment System

**3.3 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 Architectural Testing, Inc.

**3.4 Test Dates:** 06/20/2014 - 07/22/2014

**3.5 Test Facility:** Architectural Testing, Inc.'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.

**3.6 Test Sample Source:** The test specimens were provided by the client. Representative samples of the test specimens will be retained by Architectural Testing for a minimum of four years from the test completion date.

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

**3.8 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.

**3.9 List of Official Observers:**

<u>Name</u>	<u>Company</u>
Josh Scott	Architectural Testing, Inc.
Steven A. Neff	Architectural Testing, Inc.
Travis A. Hoover	Architectural Testing, Inc.
Joseph A. Reed, P.E.	Architectural Testing, Inc.
Emily C. Riley	Architectural Testing, Inc.

**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	39-1/2	51-1/2
Fixed Day Lite Opening	36	48

**5.2 Frame Construction:**

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 (Reference Drawing 3M window test fixture with IPA drawing detail D, P/N 45-101)
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 screws

## 5.0 Test Specimen Description: (Continued)

**5.3 Glazing:** All specimens utilized 1/4" thick clear glass with a 6 mil micro-layered safety and security film adhered to the interior surface of the glass. The glass was channel glazed and secured at the exterior sill using extruded aluminum glazing stops. The glass was set against a kerf-mounted rubber gasket with a 1/2" glazing bite. The filmed glass was adhesively anchored to the interior side of the frame using 3M™ Impact Protection Profile (IPP), a flexible-mechanical rubber gasket type film attachment system (Reference Drawing Test-39.5 x 51.5-Ultra).

**Test Specimens #1 - #4:** Tempered Glass

**Test Specimens #5 - #8:** Annealed Glass

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

**5.5 Reinforcement:** No reinforcement was utilized.

**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:

Description	Results
Ambient Temperature	81°F
Glazing Temperature	83°F
<b>ASTM Hazard Rating</b>	<b>Low Hazard</b>
<b>GSA Performance Condition</b>	<b>4</b>

Peak Positive Pressure	
Top Pressure	7.33 psi
Right Pressure	7.60 psi
Shell Pressure	6.57 psi
<b>Average Pressure</b>	<b>7.16 psi</b>
Witness Chamber Pressure	0.38 psi

Peak Positive Phase Duration	
Top Duration	13.08 msec
Right Duration	13.17 msec
Shell Duration	13.08 msec
<b>Average Duration</b>	<b>13.11 msec</b>

Peak Positive Phase Impulse	
Top Impulse	45 psi*msec
Right Impulse	45 psi*msec
Shell Impulse	45 psi*msec
<b>Average Impulse</b>	<b>45 psi*msec</b>

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

Witness Chamber Results
Three fragments were located beyond 1m from the specimen on the witness chamber floor. One fragment indent was located at a height of 27-1/2" on the witness panel.

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:

Description	Results
Ambient Temperature	87°F
Glazing Temperature	88°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>3A</b>

Peak Positive Pressure	
Top Pressure	6.78 psi
Right Pressure	7.01 psi
Shell Pressure	6.15 psi
<b>Average Pressure</b>	<b>6.65 psi</b>
Witness Chamber Pressure	0.27 psi

Peak Positive Phase Duration	
Top Duration	12.71 msec
Right Duration	12.79 msec
Shell Duration	12.36 msec
<b>Average Duration</b>	<b>12.62 msec</b>

Peak Positive Phase Impulse	
Top Impulse	41 psi*msec
Right Impulse	40 psi*msec
Shell Impulse	40 psi*msec
<b>Average Impulse</b>	<b>40 psi*msec</b>

Glazing Response	
Exterior Lite	Fractured
Glazing Pullout Length and Location	1" at top left corner
Glazing Tearing	1" at top left corner

Witness Chamber Results	
A dusting of glass was deposited on the witness chamber floor.	

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	82°F
Glazing Temperature	83°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	7.06 psi
Right Pressure	7.03 psi
Shell Pressure	6.21 psi
<b>Average Pressure</b>	<b>6.77 psi</b>
Witness Chamber Pressure	0.42 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	12.76 msec
Right Duration	13.26 msec
Shell Duration	10.77 msec
<b>Average Duration</b>	<b>12.26 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	43 psi*msec
Right Impulse	43 psi*msec
Shell Impulse	43 psi*msec
<b>Average Impulse</b>	<b>43 psi*msec</b>

<b>Glazing Response</b>	
Exterior 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 #4:

Description	Results
Ambient Temperature	86°F
Glazing Temperature	88°F
<b>ASTM Hazard Rating</b>	<b>No Hazard</b>
<b>GSA Performance Condition</b>	<b>2</b>

Peak Positive Pressure	
Top Pressure	7.39 psi
Right Pressure	8.01 psi
Shell Pressure	6.76 psi
<b>Average Pressure</b>	<b>7.39 psi</b>
Witness Chamber Pressure	0.60 psi

Peak Positive Phase Duration	
Top Duration	12.24 msec
Right Duration	12.89 msec
Shell Duration	12.56 msec
<b>Average Duration</b>	<b>12.56 msec</b>

Peak Positive Phase Impulse	
Top Impulse	43 psi*msec
Right Impulse	43 psi*msec
Shell Impulse	43 psi*msec
<b>Average Impulse</b>	<b>43 psi*msec</b>

Glazing Response	
Exterior 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.

## 7.0 Test Results: (Continued)

### Test Specimen #5:

Description	Results
Ambient Temperature	81°F
Glazing Temperature	80°F
<b>ASTM Hazard Rating</b>	<b>Minimal Hazard</b>
<b>GSA Performance Condition</b>	<b>3A</b>

Peak Positive Pressure	
Top Pressure	6.82 psi
Right Pressure	7.18 psi
Shell Pressure	6.45 psi
<b>Average Pressure</b>	<b>6.82 psi</b>
Witness Chamber Pressure	0.27 psi

Peak Positive Phase Duration	
Top Duration	13.22 msec
Right Duration	13.68 msec
Shell Duration	13.32 msec
<b>Average Duration</b>	<b>13.40 msec</b>

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

Glazing Response	
Exterior Lite	Fractured
Glazing Pullout Length and Location	1-1/2" along head
Glazing Tearing	4" at center

Witness Chamber Results
One glazing fragment found on the floor near the sill. Dusting and glazing slivers were present on the floor back to the witness panel.

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:

Description	Results
Ambient Temperature	84°F
Glazing Temperature	84°F
<b>ASTM Hazard Rating</b>	<b>Low Hazard</b>
<b>GSA Performance Condition</b>	<b>4</b>

Peak Positive Pressure	
Top Pressure	7.24 psi
Right Pressure	7.54 psi
Shell Pressure	6.54 psi
<b>Average Pressure</b>	<b>7.14 psi</b>
Witness Chamber Pressure	0.31 psi

Peak Positive Phase Duration	
Top Duration	13.00 msec
Right Duration	13.70 msec
Shell Duration	13.07 msec
<b>Average Duration</b>	<b>13.25 msec</b>

Peak Positive Phase Impulse	
Top Impulse	43 psi*msec
Right Impulse	43 psi*msec
Shell Impulse	43 psi*msec
<b>Average Impulse</b>	<b>43 psi*msec</b>

Glazing Response	
Exterior Lite	Fractured
Glazing Pullout Length and Location	26" along sill, 10" along right jamb, 11" along left jamb
Glazing Tearing	1-3/4" upper right corner, 3" lower left corner

Witness Chamber Results
Several glazing fragments were located on the floor beyond 1m (<10" united). One fragment indent was located 3" 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.

**7.0 Test Results:** (Continued)

**Test Specimen #7:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	80°F
Glazing Temperature	83°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	7.09 psi
Right Pressure	7.07 psi
Shell Pressure	6.41 psi
<b>Average Pressure</b>	<b>6.86 psi</b>
Witness Chamber Pressure	0.58 psi

<b>Peak Positive Phase Duration</b>	
Top Duration	12.01 msec
Right Duration	12.71 msec
Shell Duration	12.40 msec
<b>Average Duration</b>	<b>12.37 msec</b>

<b>Peak Positive Phase Impulse</b>	
Top Impulse	42 psi*msec
Right Impulse	41 psi*msec
Shell Impulse	41 psi*msec
<b>Average Impulse</b>	<b>41 psi*msec</b>

<b>Glazing Response</b>	
Exterior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1/2" at the lower left corner, 1/2" at the lower right corner

<b>Witness Chamber Results</b>	
A dusting of glass was deposited on the witness chamber floor.	

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 #8:**

<b>Description</b>	<b>Results</b>
Ambient Temperature	84°F
Glazing Temperature	84°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	Data Not Recorded
Right Pressure	
Shell Pressure	
<b>Average Pressure</b>	
Witness Chamber Pressure	

<b>Peak Positive Phase Duration</b>	
Top Duration	Data Not Recorded
Right Duration	
Shell Duration	
<b>Average Duration</b>	

<b>Peak Positive Phase Impulse</b>	
Top Impulse	Data Not Recorded
Right Impulse	
Shell Impulse	
<b>Average Impulse</b>	

<b>Glazing Response</b>	
Exterior 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.

Architectural Testing 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 Architectural Testing, Inc. 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 Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

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Emily C. Riley - Project Manager  
Structural Systems Testing

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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 (14)
- Appendix C: Photographs (18)
- Appendix D: Drawings (6)

### Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	10/30/14	N/A	Original report issue

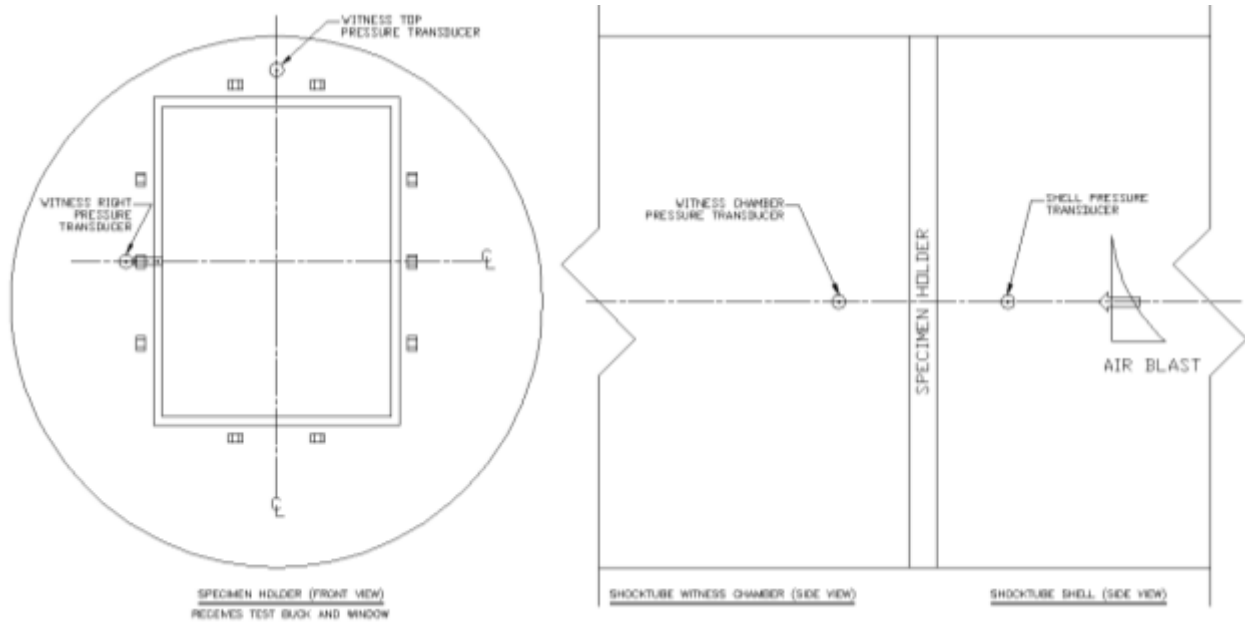


## **APPENDIX A**

### **Test Facility**



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

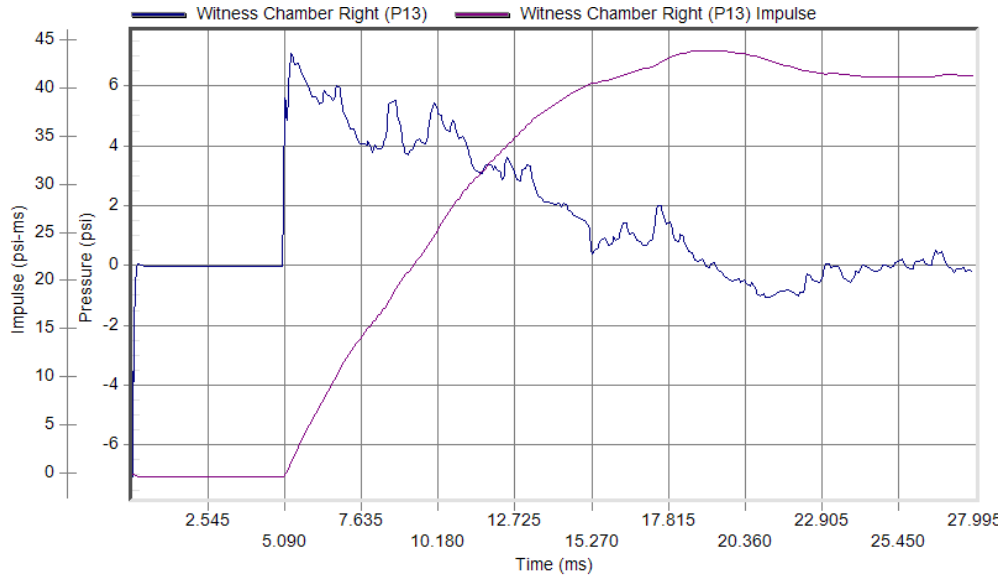


**Figure #2**  
**Pressure Sensor Locations**

## **APPENDIX B**

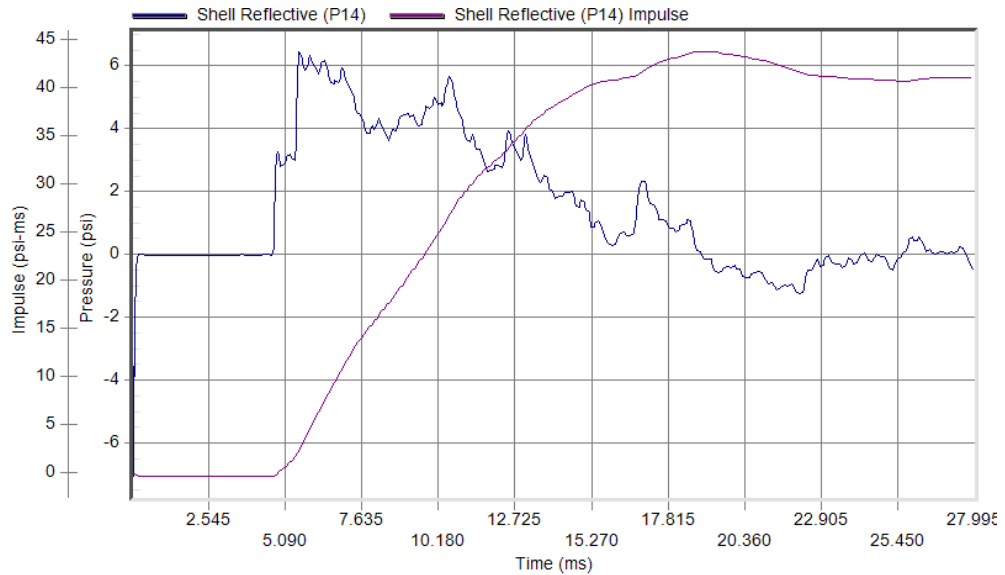
### **Pressure Time Plots**

### Specimen #1



Peak Pressure: 7.18 psi at 5.33 ms  
Duration: 13.68 ms

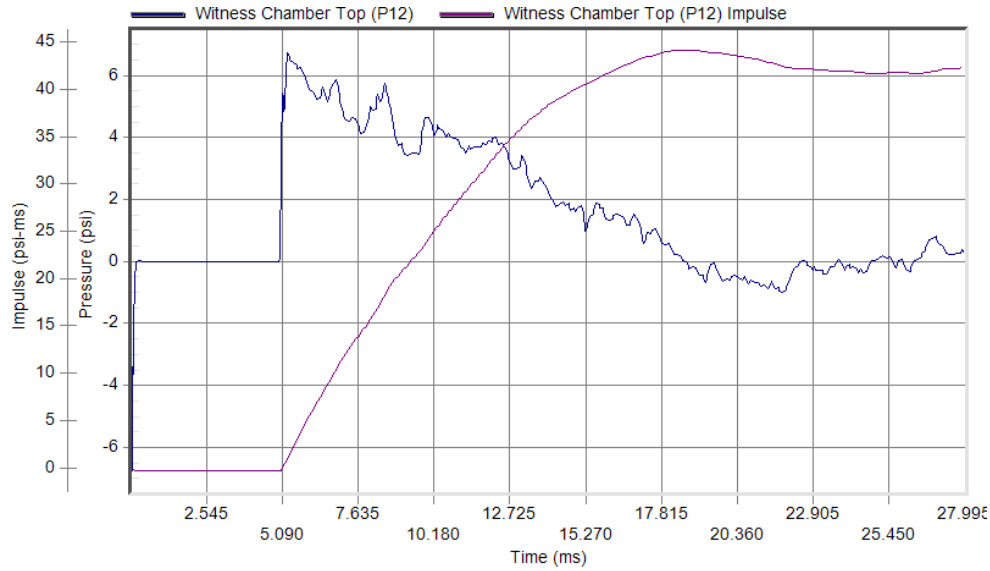
Test Date: 6/20/2014  
Test Time: 1:02 pm



Peak Pressure: 6.45 psi at 5.58 ms  
Duration: 13.32 ms

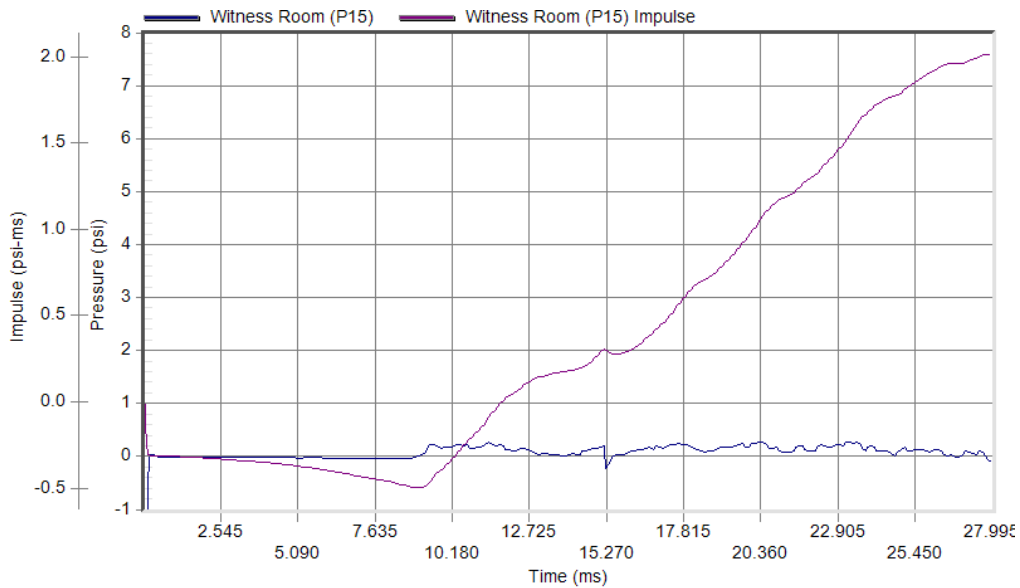
Test Date: 6/20/2014  
Test Time: 1:02 pm

### Specimen #1: (Continued)



Peak Pressure: 6.82 psi at 5.30 ms  
Duration: 13.22 ms

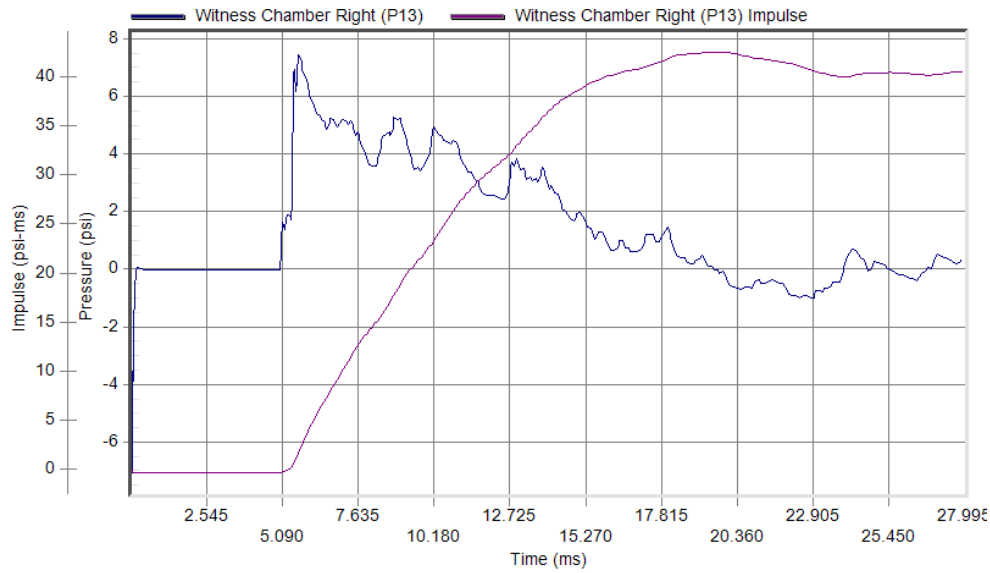
Test Date: 6/20/2014  
Test Time: 1:02 pm



Peak Pressure: 0.27 psi at 23.23 ms  
Duration: 3.45 ms

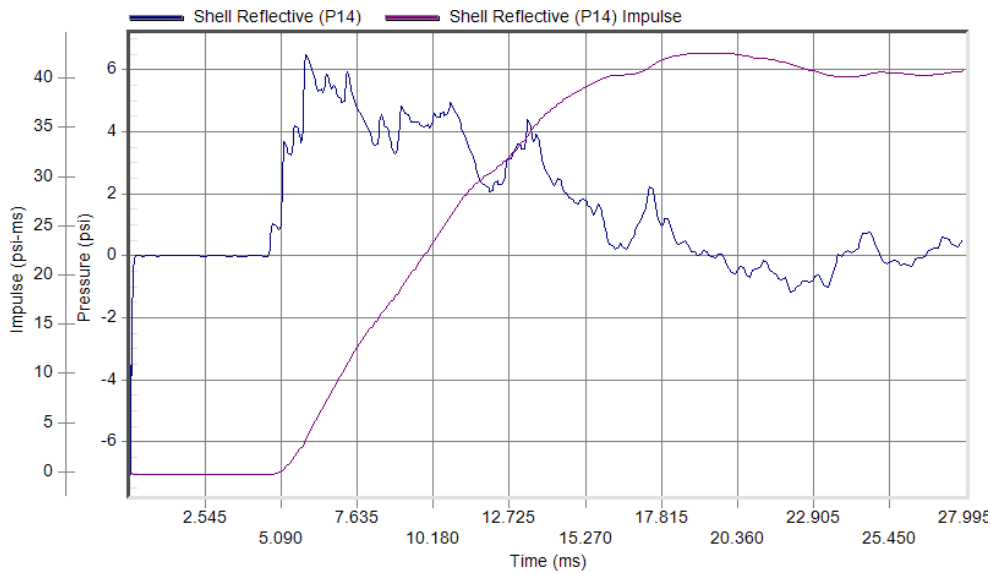
Test Date: 6/20/2014  
Test Time: 1:02 pm

### Specimen #2



Peak Pressure: 7.54 psi at 5.68 ms  
Duration: 13.70 ms

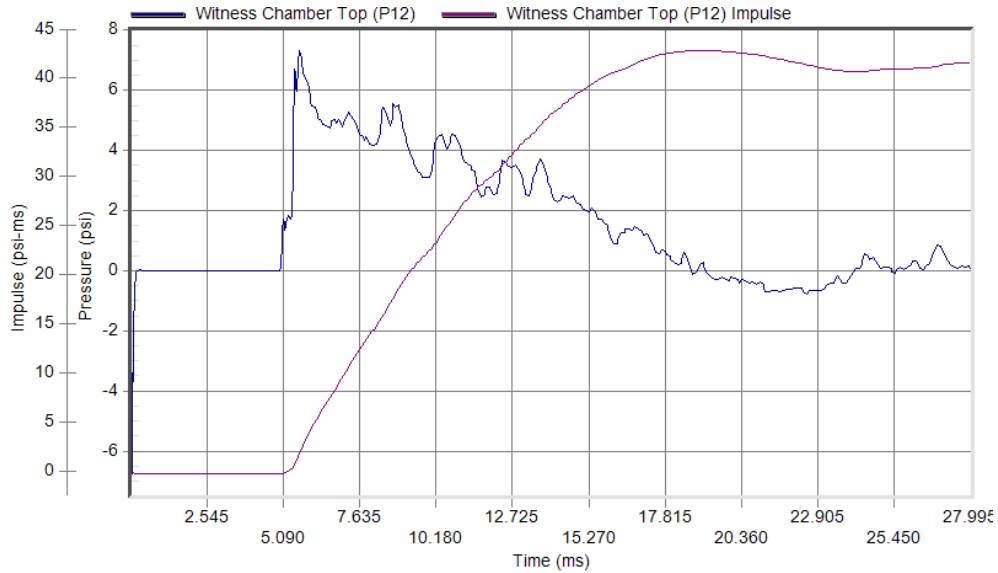
Test Date: 7/14/2014  
Test Time: 10:46 am



Peak Pressure: 6.54 psi at 5.93 ms  
Duration: 13.07 ms

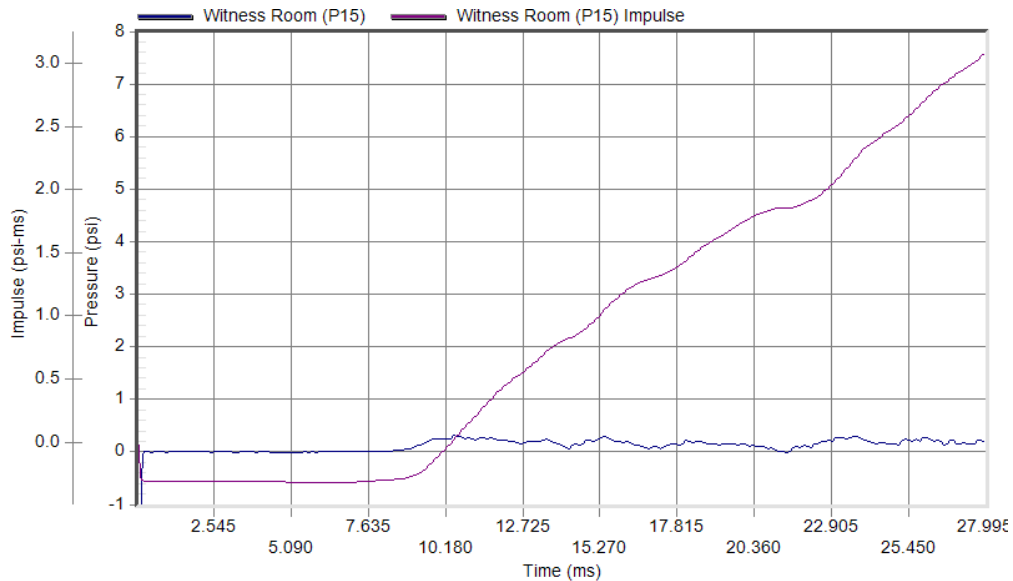
Test Date: 7/14/2014  
Test Time: 10:46 am

### Specimen #2: (Continued)



Peak Pressure: 7.34 psi at 5.66 ms  
Duration: 13.00 ms

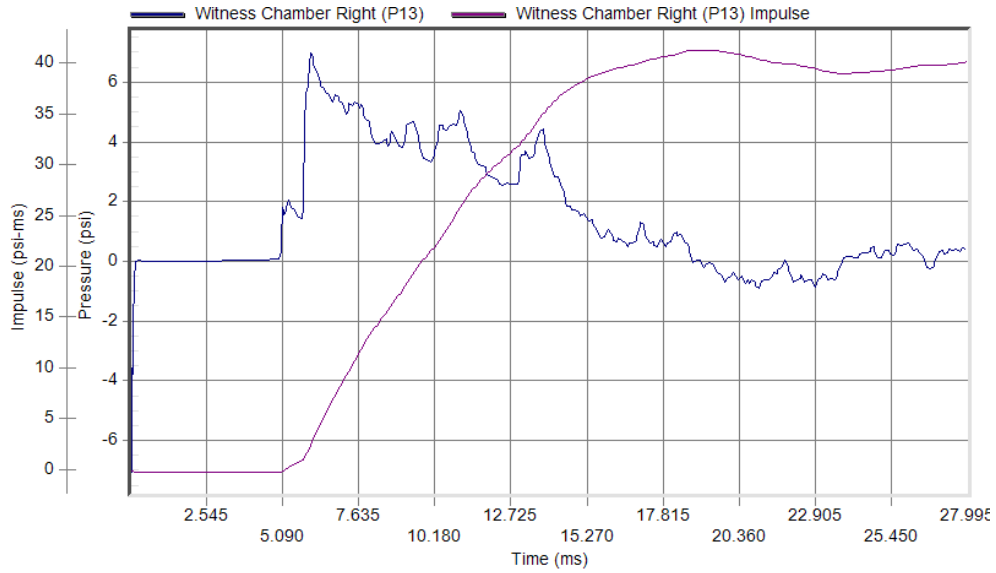
Test Date: 7/14/2014  
Test Time: 10:46 am



Peak Pressure: 0.31 psi at 10.47 ms  
Duration: 10.67 ms

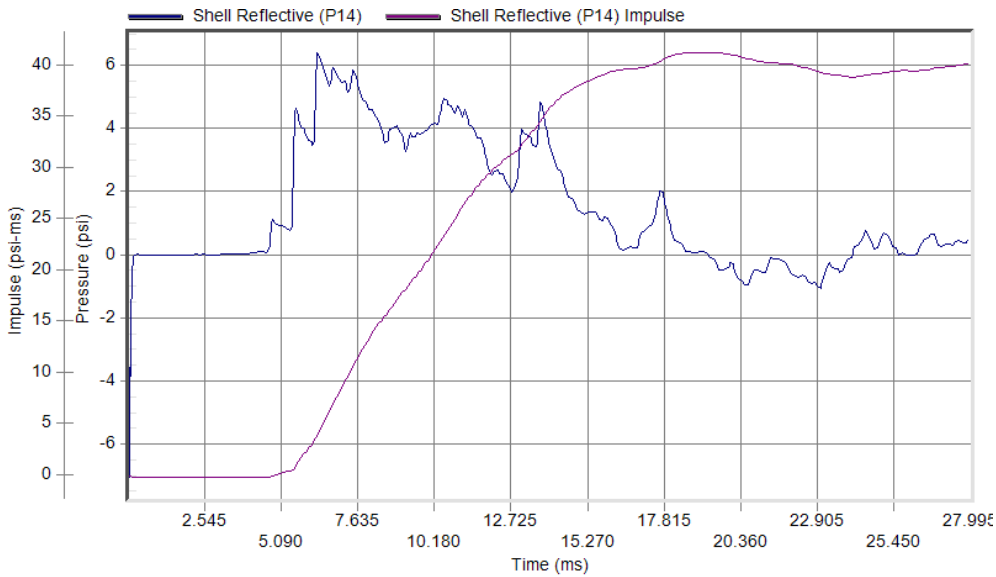
Test Date: 7/14/2014  
Test Time: 10:46 am

### Specimen #3



Peak Pressure: 7.07 psi at 6.07 ms  
Duration: 12.71 ms

Test Date: 7/18/2014  
Test Time: 2:49 pm

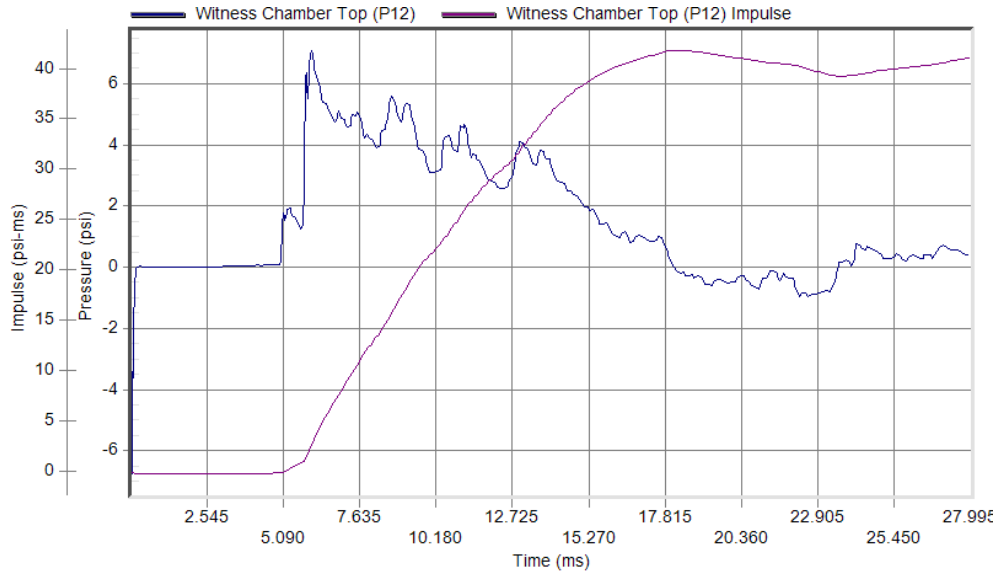


Peak Pressure: 6.41 psi at 6.32 ms  
Duration: 12.40 ms

Test Date: 7/18/2014  
Test Time: 2:49 pm

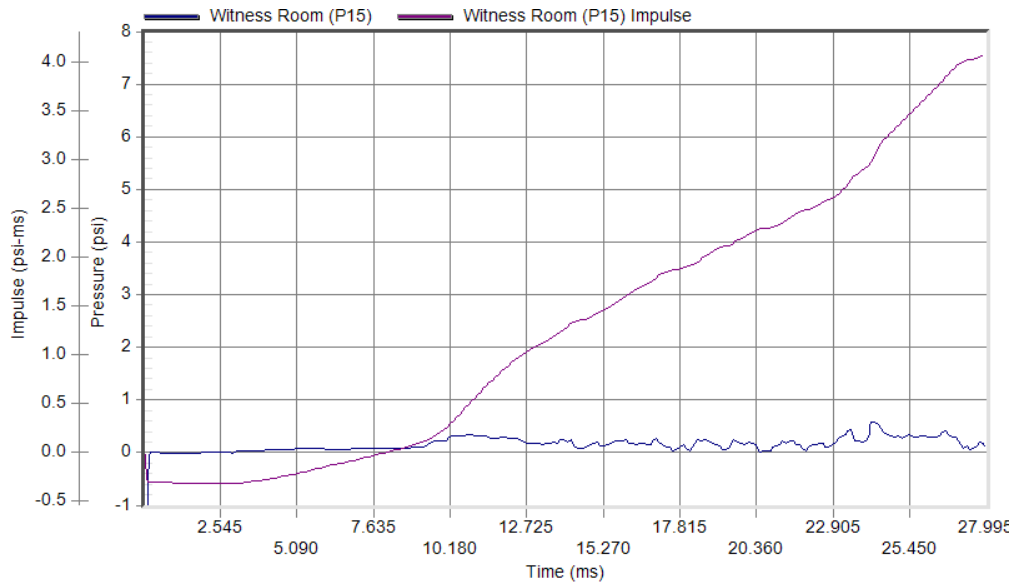


### Specimen #3: (Continued)



Peak Pressure: 7.09 psi at 6.04 ms  
Duration: 12.01 ms

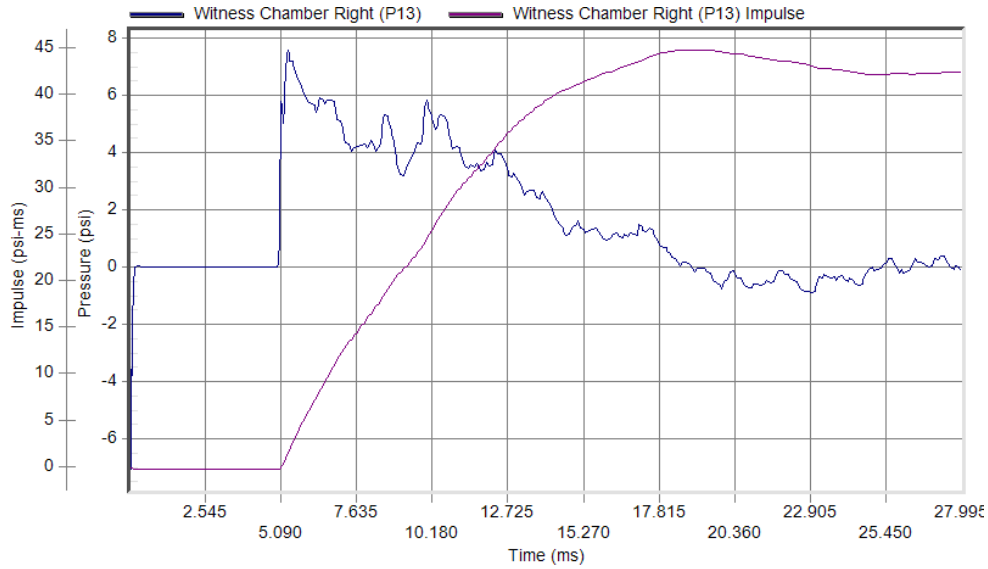
Test Date: 7/18/2014  
Test Time: 2:49 pm



Peak Pressure: 0.58 psi at 24.30 ms  
Duration: 3.86 ms

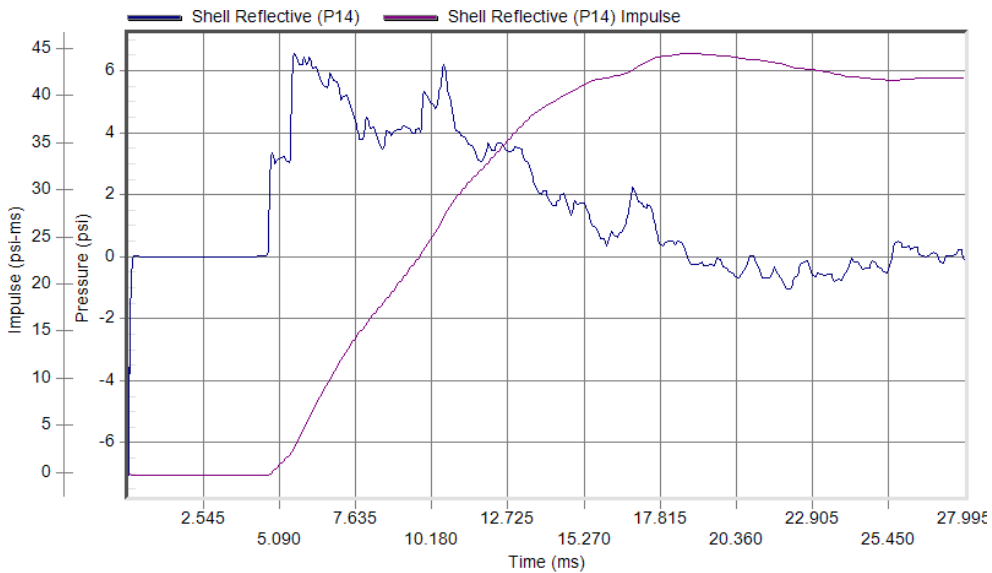
Test Date: 7/18/2014  
Test Time: 2:49 pm

### Specimen #4:



Peak Pressure: 7.60 psi at 5.34 ms  
Duration: 13.17 ms

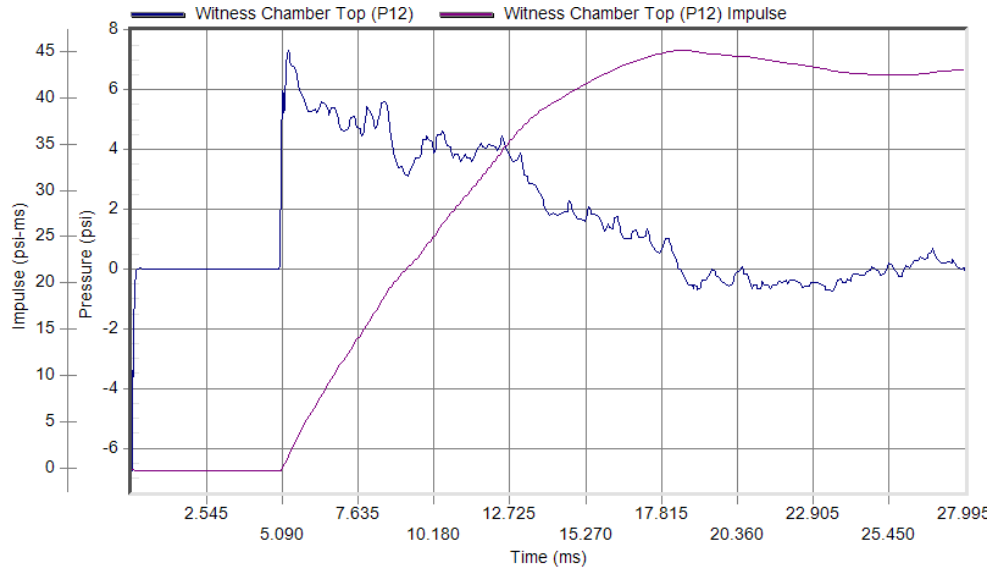
Test Date: 6/20/2014  
Test Time: 3:18 pm



Peak Pressure: 6.57 psi at 5.62 ms  
Duration: 13.08 ms

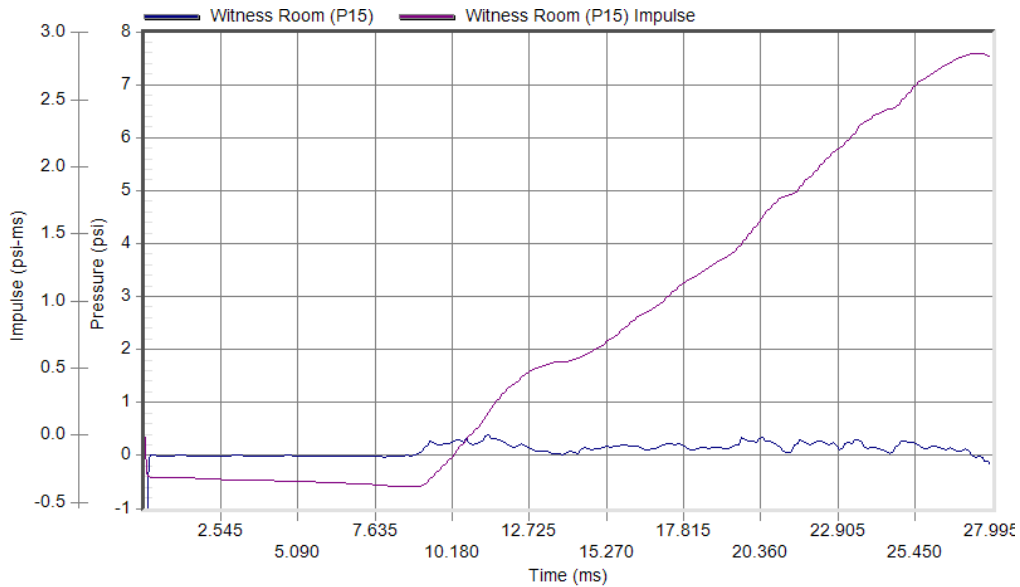
Test Date: 6/20/2014  
Test Time: 3:18 pm

### Specimen #4: (Continued)



Peak Pressure: 7.33 psi at 5.30 ms  
Duration: 13.08 ms

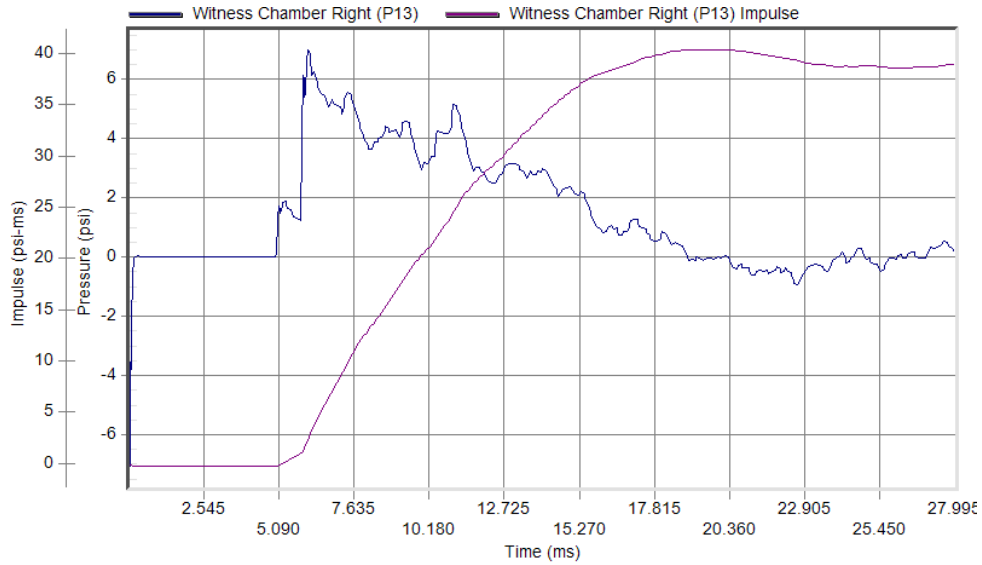
Test Date: 6/20/2014  
Test Time: 3:18 pm



Peak Pressure: 0.38 psi at 11.37 ms  
Duration: 15.96 ms

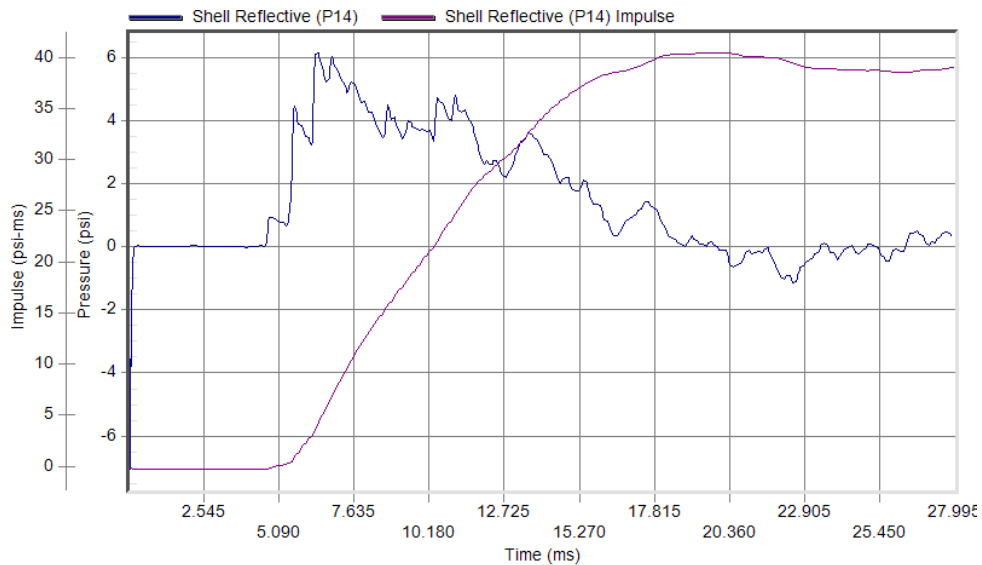
Test Date: 6/20/2014  
Test Time: 3:18 pm

### Specimen #5:



Peak Pressure: 7.01 psi at 6.11 ms  
Duration: 12.79 ms

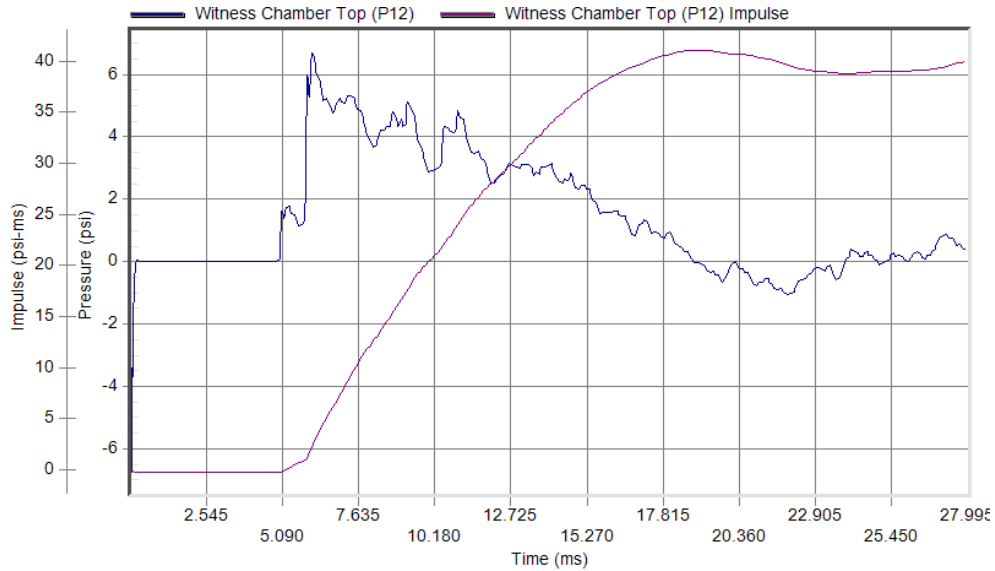
Test Date: 7/14/2014  
Test Time: 2:04 pm



Peak Pressure: 6.15 psi at 6.41 ms  
Duration: 12.36 ms

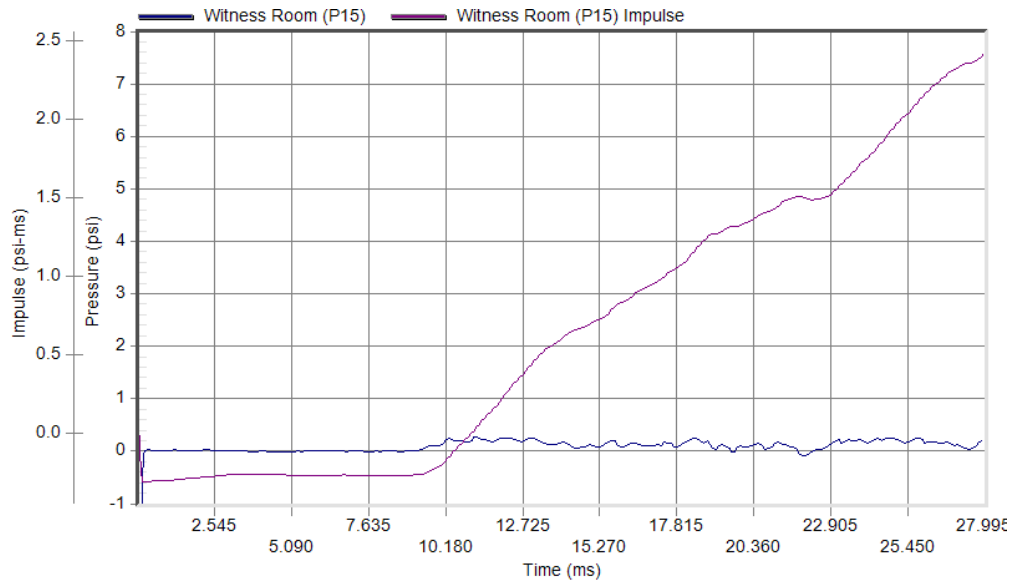
Test Date: 7/14/2014  
Test Time: 2:04 pm

### Specimen #5: (Continued)



Peak Pressure: 6.78 psi at 6.12 ms  
Duration: 12.71 ms

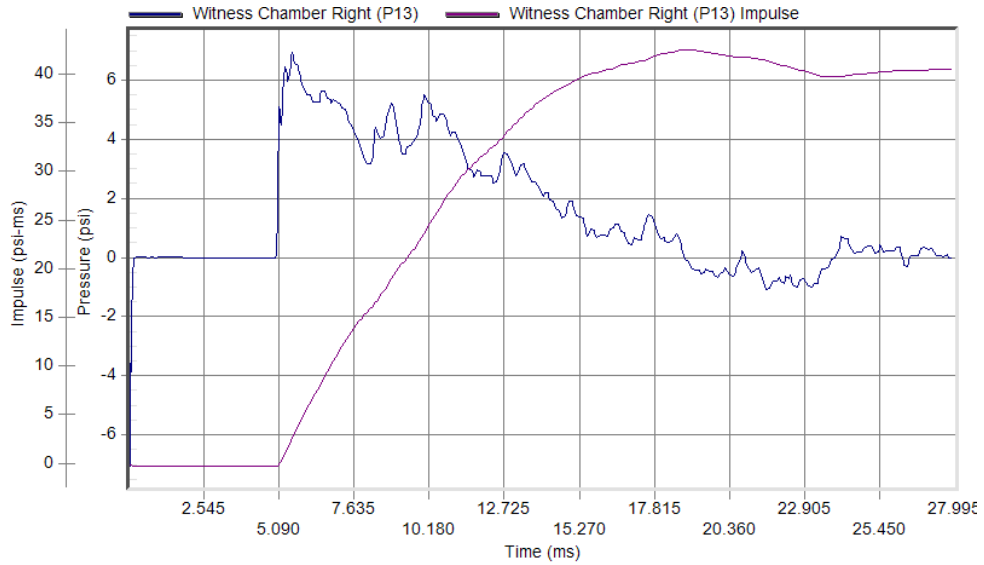
Test Date: 7/14/2014  
Test Time: 2:04 pm



Peak Pressure: 0.27 psi at 24.74 ms  
Duration: 0.73 ms

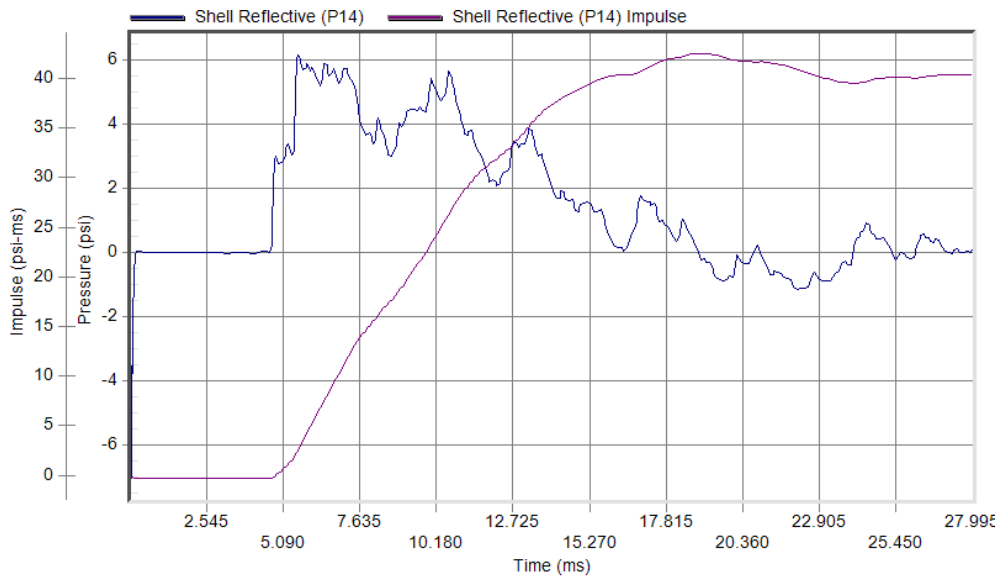
Test Date: 7/14/2014  
Test Time: 2:04 pm

### Specimen #6:



Peak Pressure: 7.03 psi at 5.56 ms  
Duration: 13.26 ms

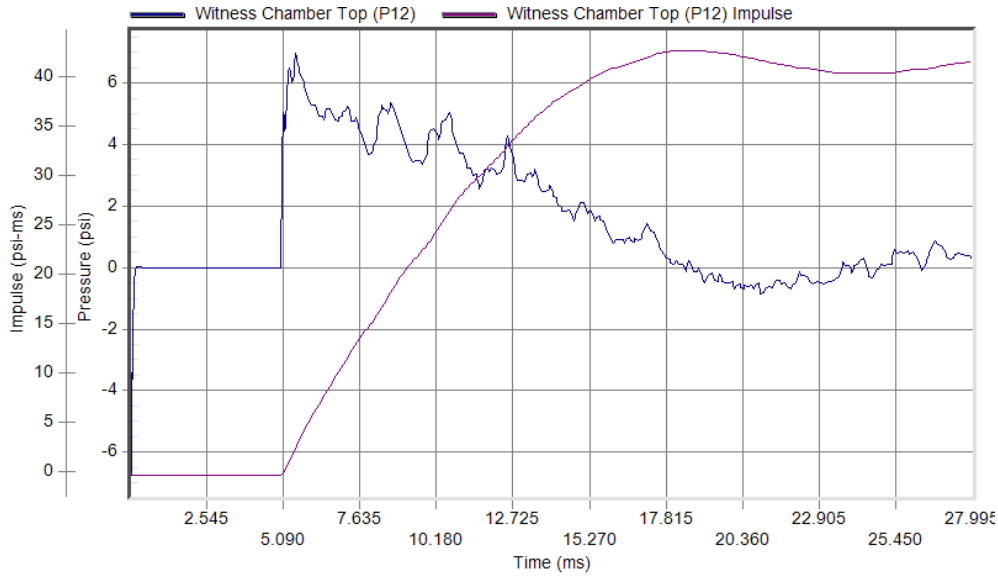
Test Date: 7/18/2014  
Test Time: 1:47 pm



Peak Pressure: 6.21 psi at 5.62 ms  
Duration: 10.77 ms

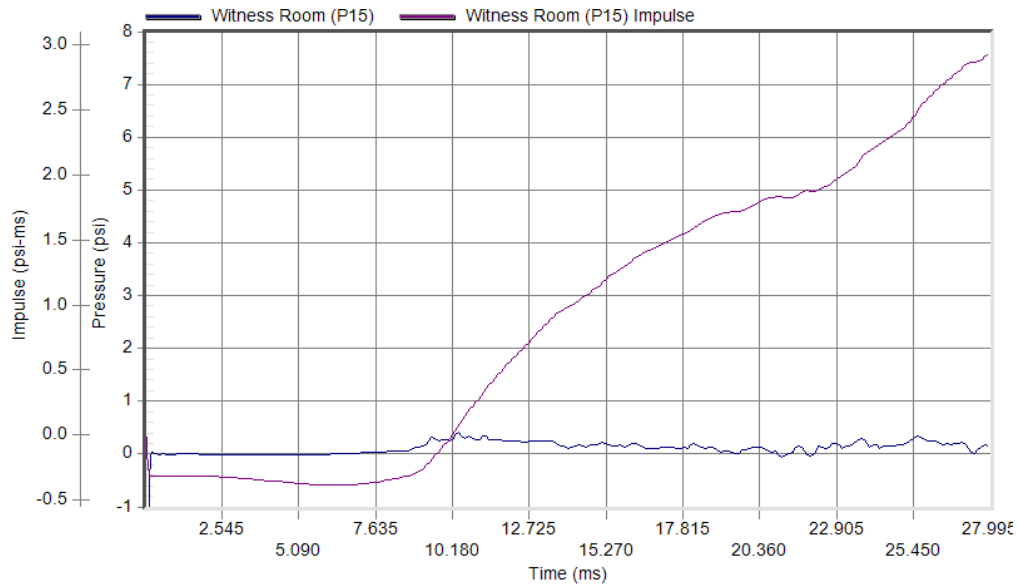
Test Date: 7/18/2014  
Test Time: 1:47 pm

### Specimen #6: (Continued)



Peak Pressure: 7.06 psi at 5.52 ms  
Duration: 12.76 ms

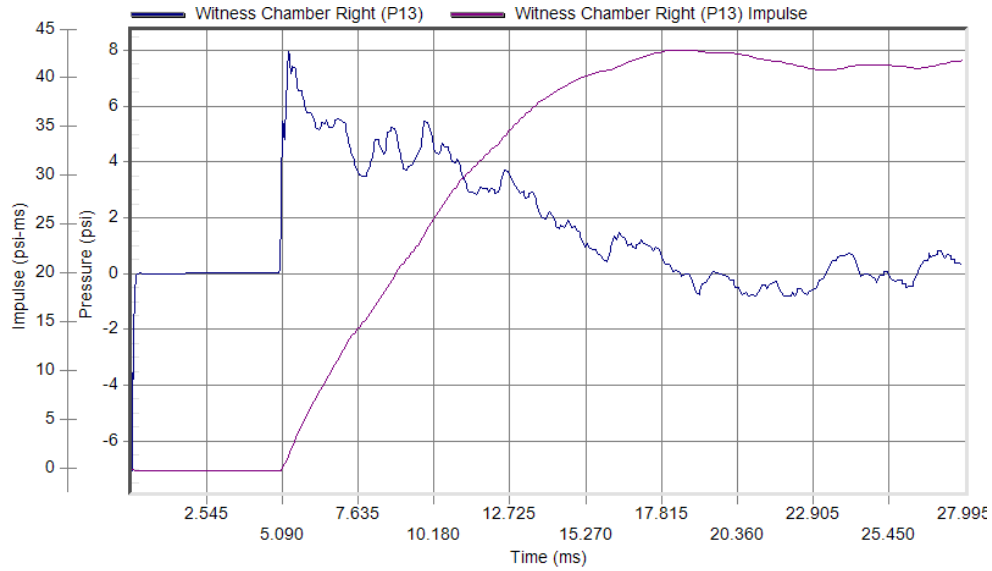
Test Date: 7/18/2014  
Test Time: 1:47 pm



Peak Pressure: 0.42 psi at 10.37 ms  
Duration: 10.59 ms

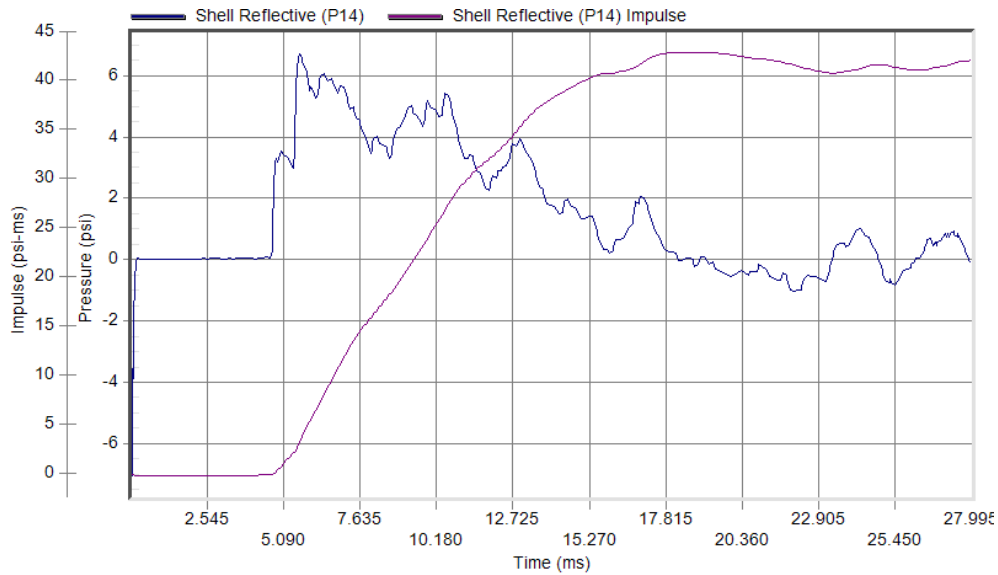
Test Date: 7/18/2014  
Test Time: 1:47 pm

### Specimen #7:



Peak Pressure: 8.01 psi at 5.32 ms  
Duration: 12.89 ms

Test Date: 7/22/2014  
Test Time: 3:28 pm

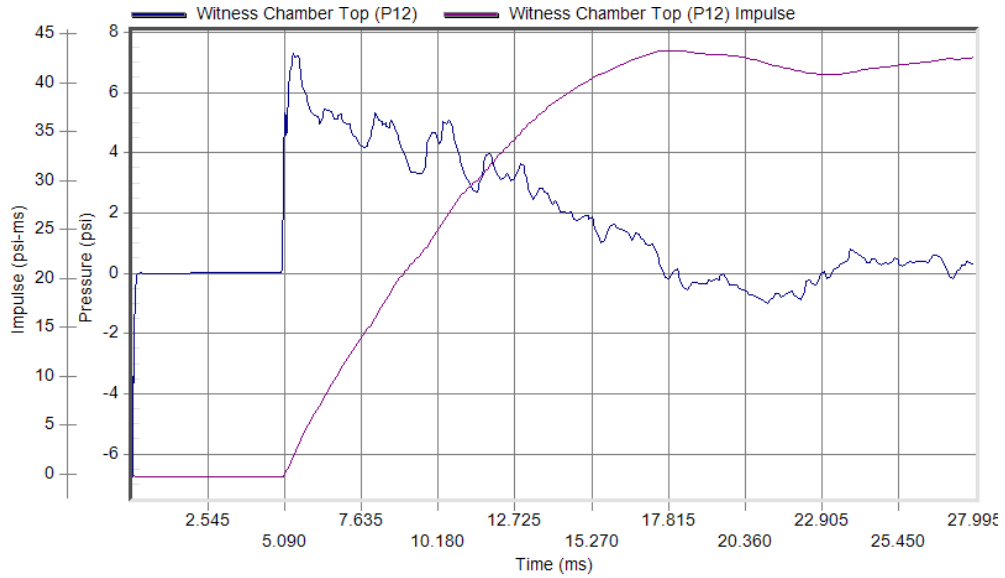


Peak Pressure: 6.76 psi at 5.64 ms  
Duration: 12.56 ms

Test Date: 7/22/2014  
Test Time: 3:28 pm

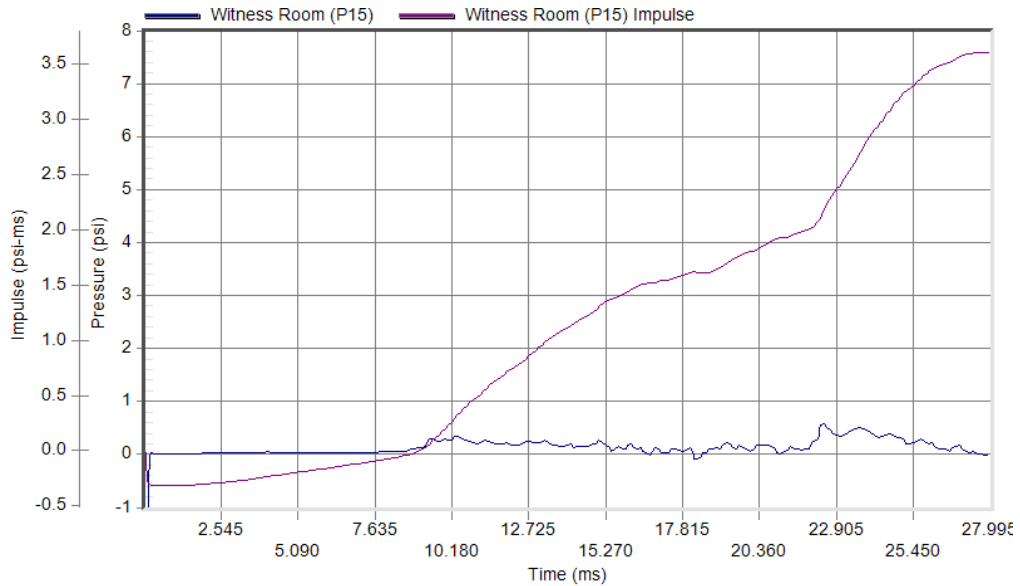


### Specimen #7: (Continued)



Peak Pressure: 7.39 psi at 5.40 ms  
Duration: 12.24 ms

Test Date: 7/22/2014  
Test Time: 3:28 pm



Peak Pressure: 0.60 psi at 22.43 ms  
Duration: 5.13 ms

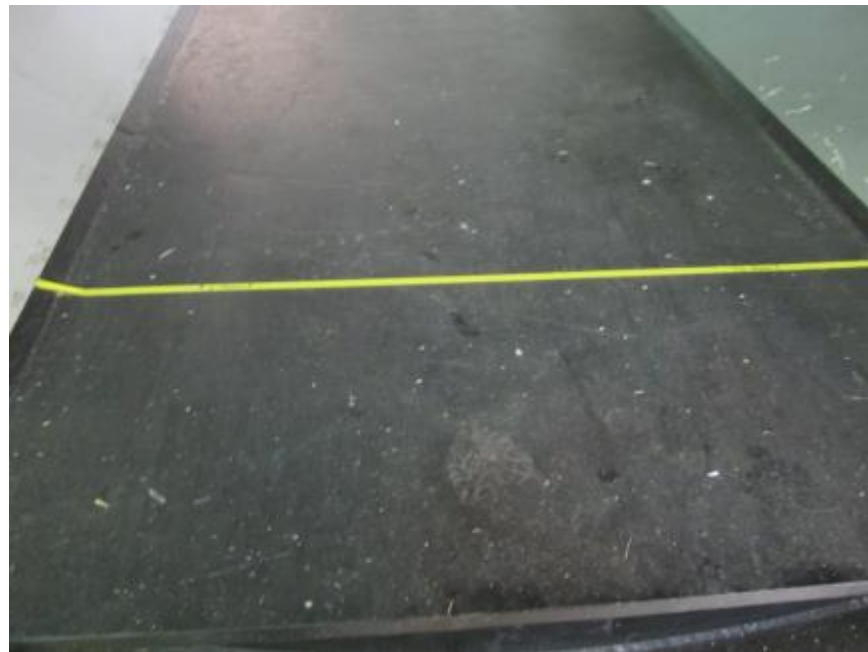
Test Date: 7/22/2014  
Test Time: 3:28 pm

## **APPENDIX C**

### **Photographs**



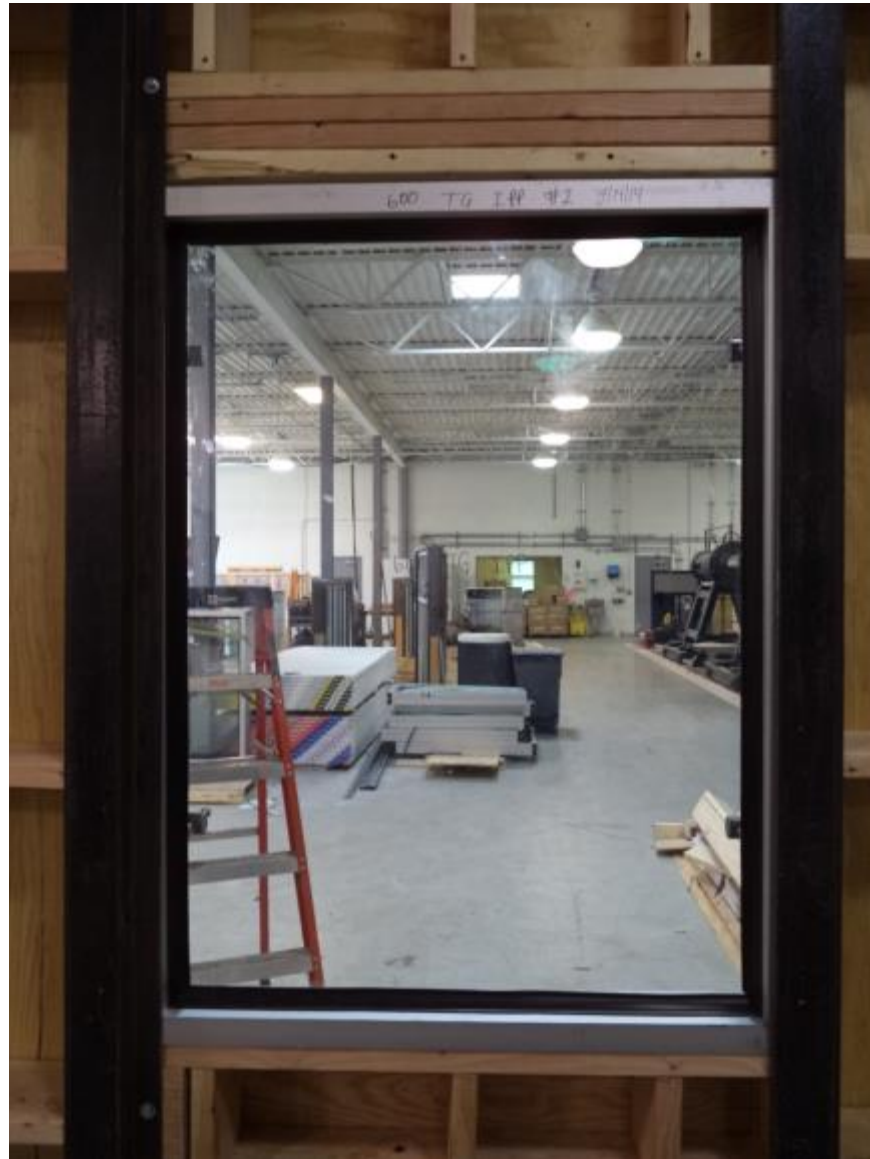
**Photo No. 1**  
**Pre-test Specimen #1, Interior**



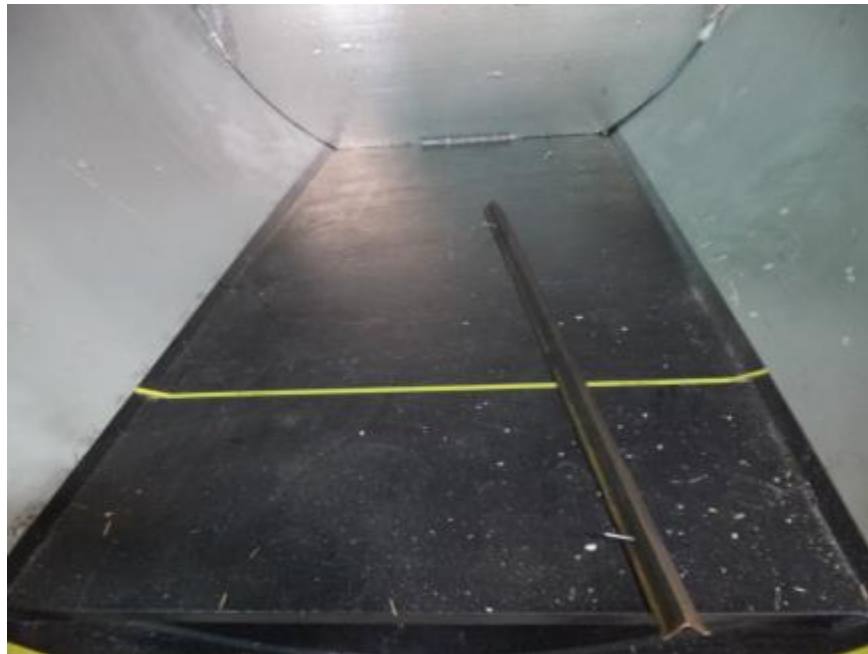
**Photo No. 2**  
**Post-test Specimen #1, Witness Chamber**



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



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

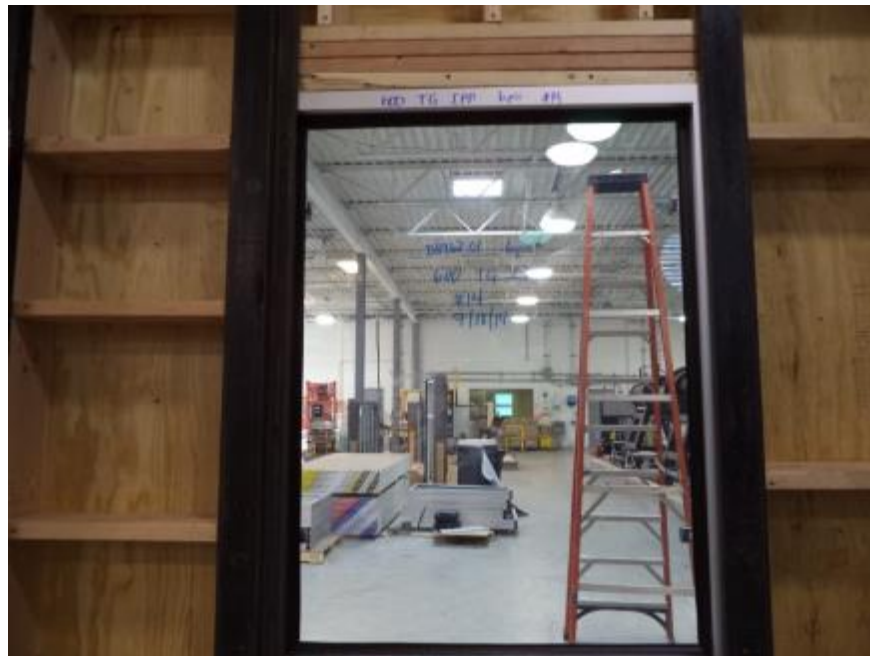


**Photo No. 5**  
**Post-test Specimen #2, Witness Chamber**



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





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



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





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



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



**Photo No. 11**  
**Post-test Specimen #4, Witness Chamber**



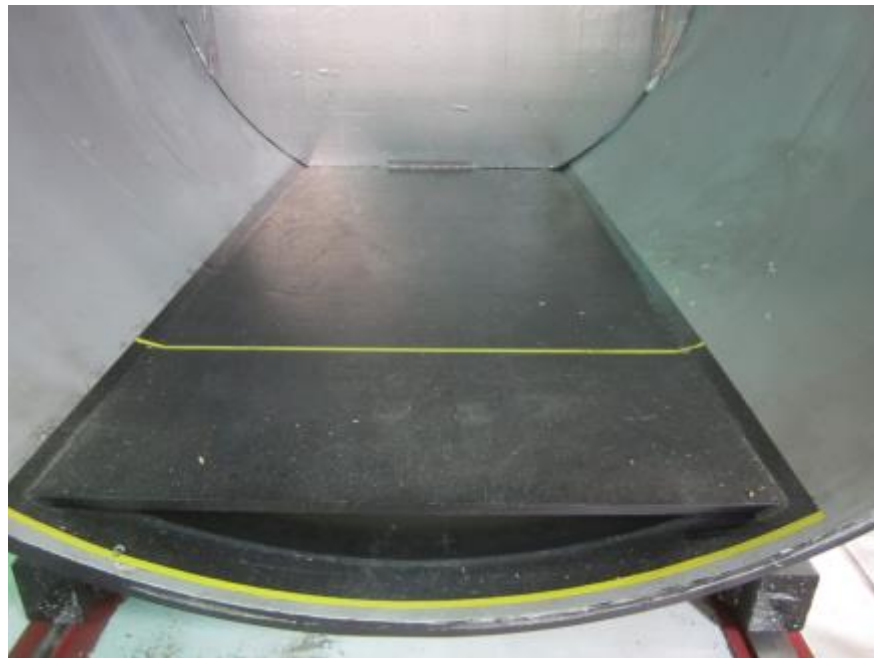
**Photo No. 12**  
**Post-test Specimen #4, Interior**



**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**

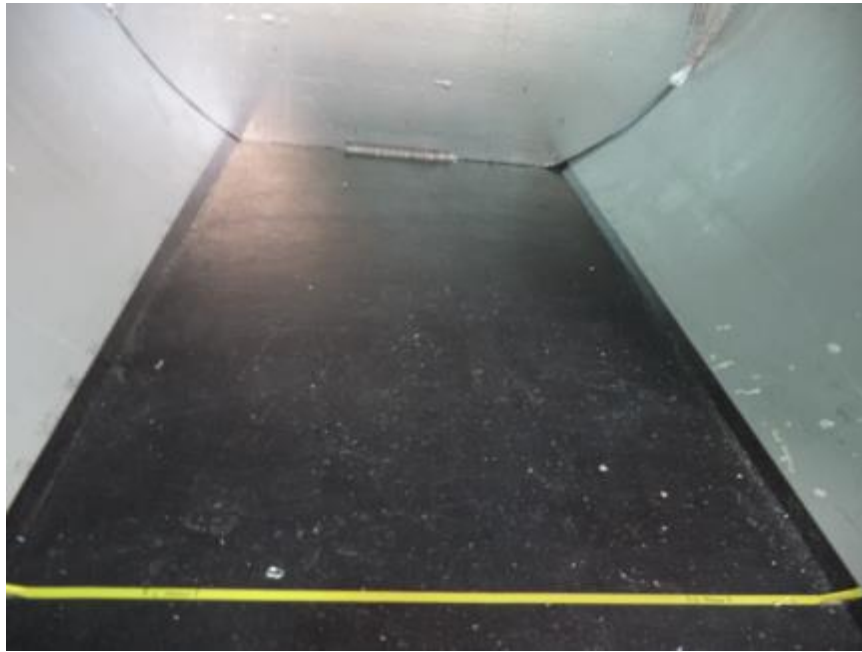




**Photo No. 16**  
**Pre-test Specimen #6, Interior**



**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**



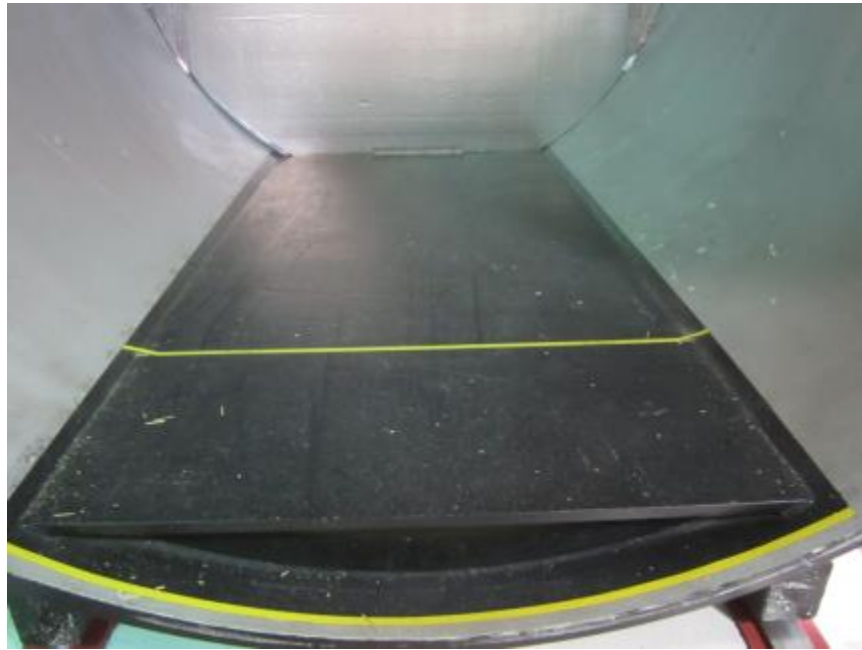
**Photo No. 20**  
**Post-test Specimen #7, Interior**



**Photo No. 21**  
**Pre-test Specimen #8, Interior**



**Photo No. 22**  
**Post-test Specimen #8, Interior**

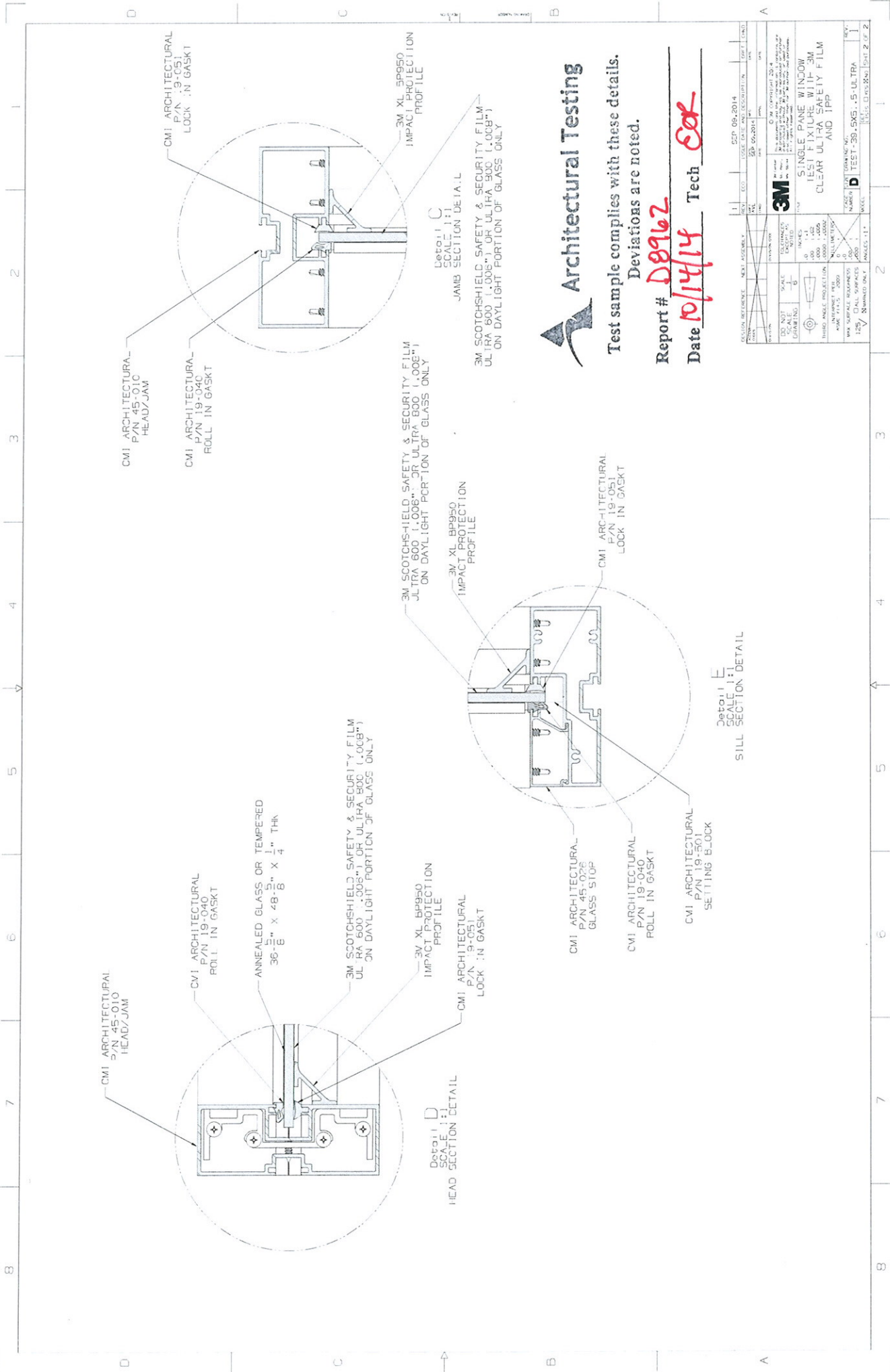


**Photo No. 24**  
**Post-test Specimen #8, Witness Chamber**

## **APPENDIX D**

### **Drawings**



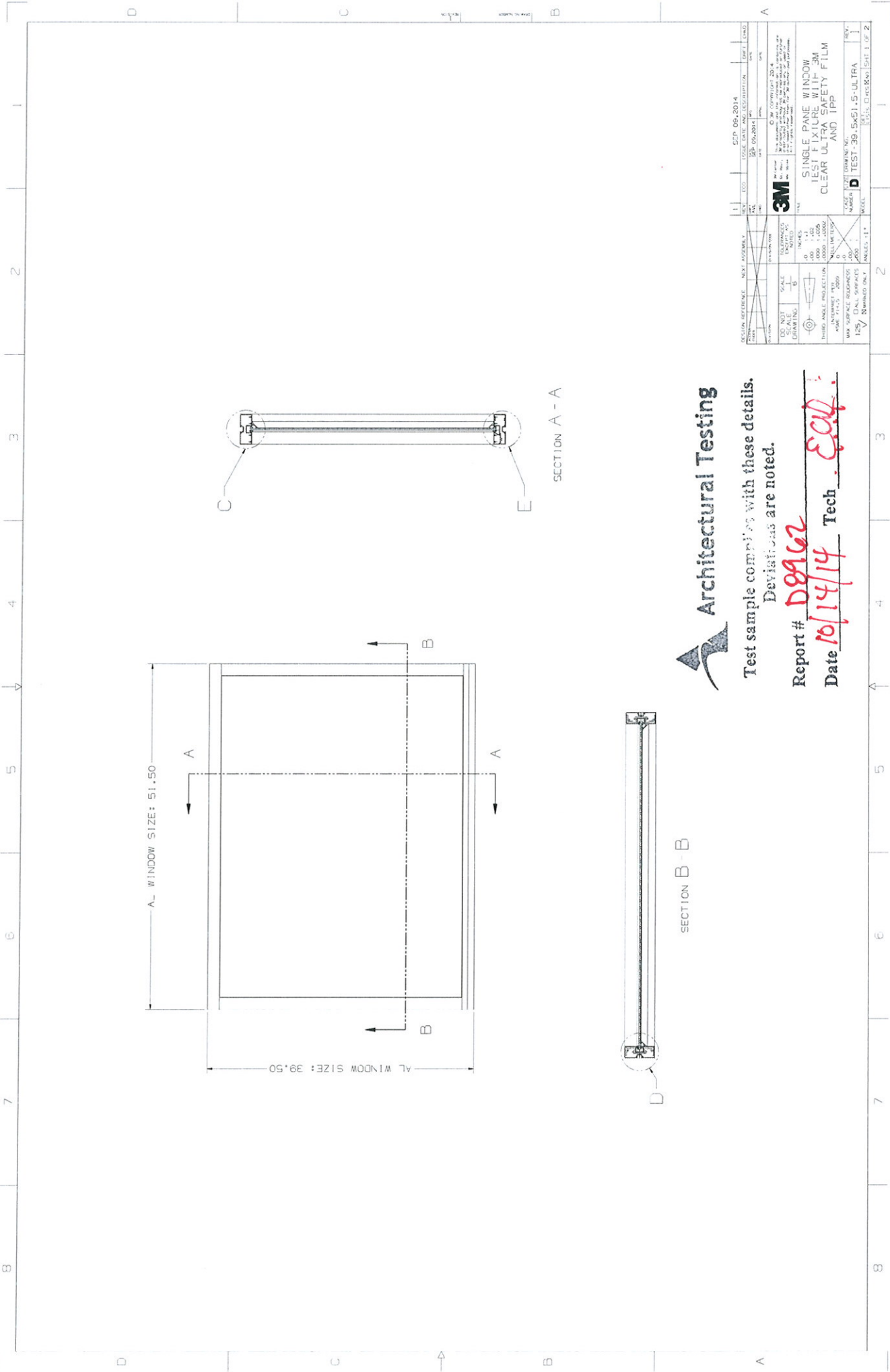


Test sample complies with these details.  
Deviations are noted.

Report # **D8962**  
Date **10/14/14** Tech **Ear**

Detail E  
SILL SECTION DETAIL

TEST REFERENCE	TEST ASSEMBLY	TEST DATE	TEST TYPE	TEST RESULT
1	1	SEP 08, 2014	1	1
2	2		2	2
3	3		3	3
4	4		4	4
5	5		5	5
6	6		6	6
7	7		7	7
8	8		8	8
9	9		9	9
10	10		10	10
11	11		11	11
12	12		12	12
13	13		13	13
14	14		14	14
15	15		15	15
16	16		16	16
17	17		17	17
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93	93		93	93
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96	96		96	96
97	97		97	97
98	98		98	98
99	99		99	99
100	100		100	100



A WINDOW SIZE: 51.50

AL WINDOW SIZE: 39.50

SECTION A - A

SECTION B - B



Architectural Testing

Test sample compares with these details.  
 Deviations are noted.

Report # **D8962**

Date **10/14/14** Tech **SCW**

REV.	DATE	BY	DESCRIPTION
1	06-2014	SCW	ISSUE DATE AND REVISIONS
2			ISSUE DATE AND REVISIONS
3			ISSUE DATE AND REVISIONS
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97			ISSUE DATE AND REVISIONS
98			ISSUE DATE AND REVISIONS
99			ISSUE DATE AND REVISIONS
100			ISSUE DATE AND REVISIONS

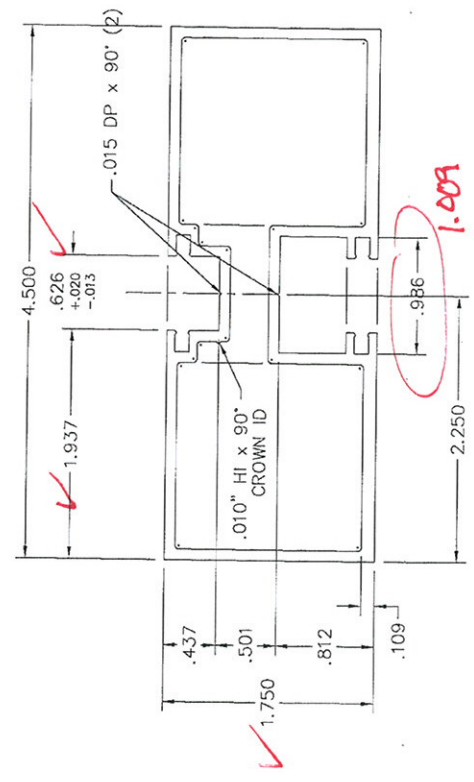
3M  
 SINGLE PANE WINDOW  
 TEST FIXTURE WITH 3M  
 CLEAR ULTRA SAFETY FILM  
 AND IPP

TEST: 39-5451-5-ULTRA  
 DRAWING NO: 1  
 SHEET: 1 OF 2

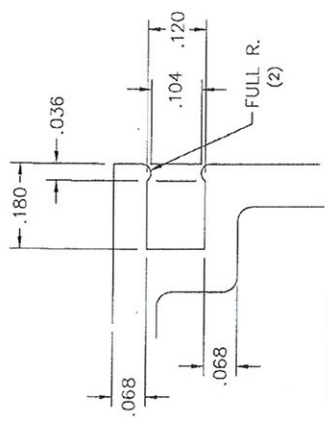
PRINT REVISIONS	DATE

12580
Die Number
45-010
Customer Number

ACTUAL SIZE



ENTIRE OUTSIDE SURFACE EXPOSED



DETAIL "A"  
4 x SIZE



Test sample complies with these details.  
Deviations are noted.

Report # D8962

Date 10/14/14 Tech EGK

STANDARD TOLERANCES APPLY UNLESS OTHERWISE NOTED

BREAK UNSPECIFIED CORNER: .010 R.  
TYPICAL WALL UNLESS OTHERWISE NOTED: .090

03-24-11 added .625 tolerance

ESTIMATED DIE DATA	
ALLOY/TEMPER	6063-15
AREA	1.445 WT/FT
PERMETER	31.168
OUTSIDE PERMETER	17.197
EXPOSED PERMETER	17.197
SCALE	1:1
DICTIONARY	4 - 5
DICTIONARY	18
DICTIONARY	HOLLOW
DICTIONARY	DATE

CROWN EXTRUSIONS	CUSTOMER
<b>Crown Extrusions, Inc.</b> 122 Columbia Court N. Chaska, MN 55318 924-46-5833 Fax: 924-46-5828	CMI Architectural CMI Architectural Products, Inc. 20621 SD Highway 25 DeSmet, SD 57231-5827 605-864-3828 Fax: 605-864-3820
DIE #	12580
SCALE	FULL & NOTED
DATE	12-11-08
LAST REVISION	03-24-11
DRAWN	TCG
CUSTOMER NUMBER	45-010

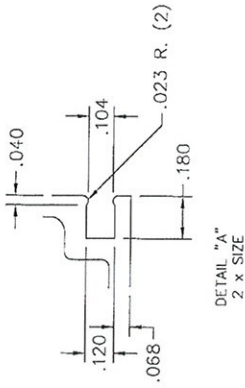
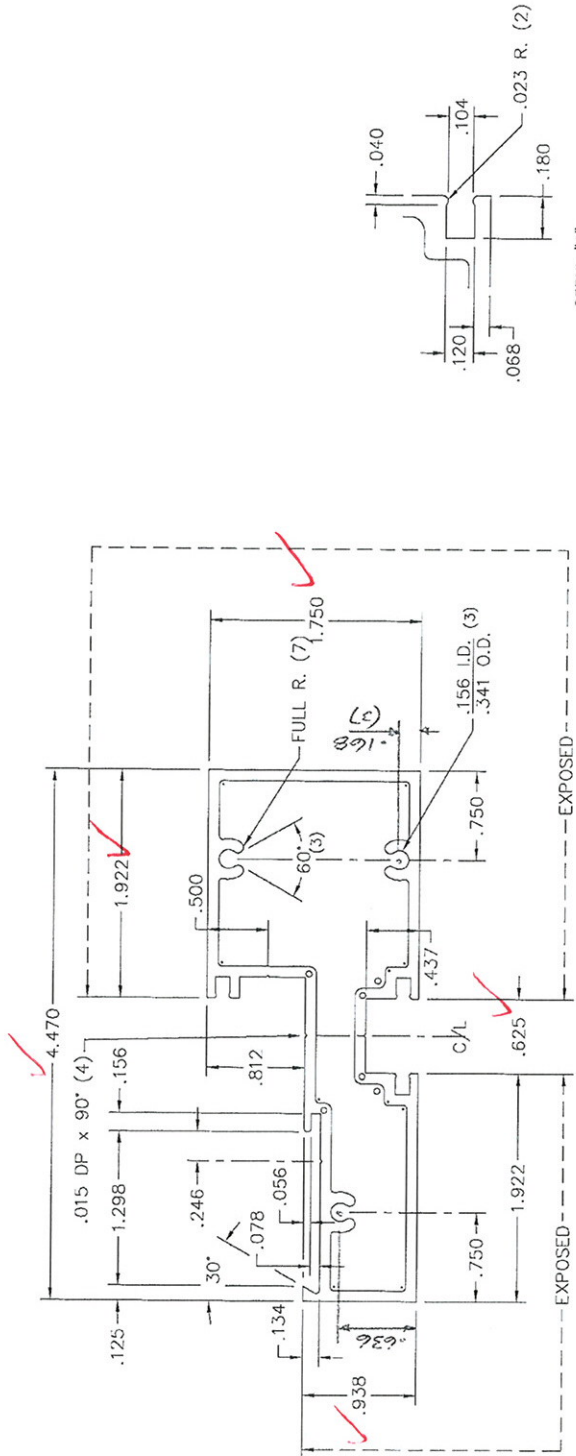
LEGEND	DATE
• = .031 R.	
◦ = .062 R.	
× = .125 R.	
⊗ = .250 R.	
*	

PART NAME: MULLION



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

CRM-44	
REV.	
DELHI TIFTON BOTH	
<input checked="" type="checkbox"/>	<input type="checkbox"/>



Test sample complies with these details.  
Deviations are noted.

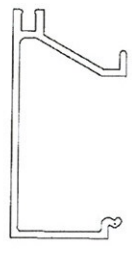
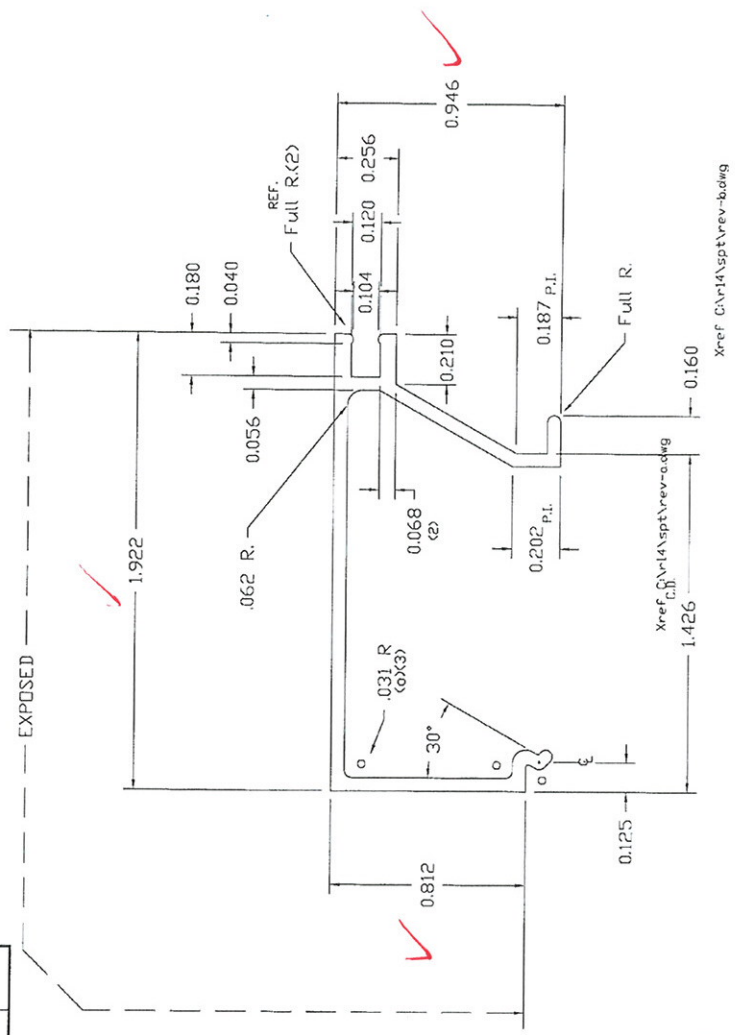
Report # **D8962**

Date **10/14/14** Tech **EA**

BREAK UNSPECIFIED CORNERS .010 R.		.090 TYPICAL WALL UNLESS SPECIFIED OTHERWISE.	
ESTIMATED DIE DATA	6063-T5	<b>sapa:</b>	Sapa Extrusions, Inc. DEUILA 7122
INTERNAL USE		CUSTOMER	CMI ARCHITECTURAL PRODUCTS 2800 FREEWAY BOULEVARD SUITE 205 MINNEAPOLIS, MN 55430
AREA	1.354	WT/FT	1.624
PERIMETER	29.721	CIRCLE SIZE	4 - 5
DIAMETER	15.421	FACTOR	18
EXPOSED PERIMETER		DIE REVISIONS	HOLLOW II
PROCESS SIZE		DATE	
LEGEND			
•	.031 R.		
o	.062 R.		
x	.125 R.		
⊗	.250 R.		
*			
CAD #	CRM-44	350	
SCALE	FULL & NOTED		
DATE	7-29-98		
LAST REVISION			
DRAWN BY	Michael Bryson		
JOB			
CUSTOMER NUMBER	45-018		
APPLICATION	F.G. SILL 1/4"		

CRM-49. B  
REV.  DELHI  TIFTON  BOTH

PRINT REVISIONS	DATE



ACTUAL SIZE

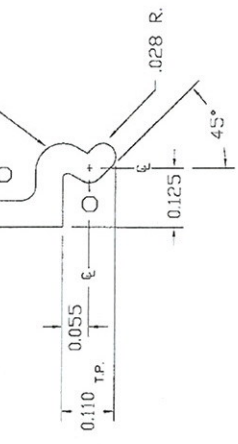


**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report # **D8962**

Date **10/14/14** Tech **EAR**



LEGEND	DIE REVISIONS	DATE
• = .031 R.	A   REF. DESIGNED	1-5-88
o = .062 R.	B   SHORTENED LEG	2-12-89
x = .125 R.		
⊗ = .250 R.		
* =		

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

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

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

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

**sapa:** Sapa Extrusions, Inc.  
DELU, LA 71232

CUSTOMER: CRONSTROMS

MINNEAPOLIS, MN

DATE: 10-31-88

SCALE: 2 x & Noted

JOB: J. ALBEREZ

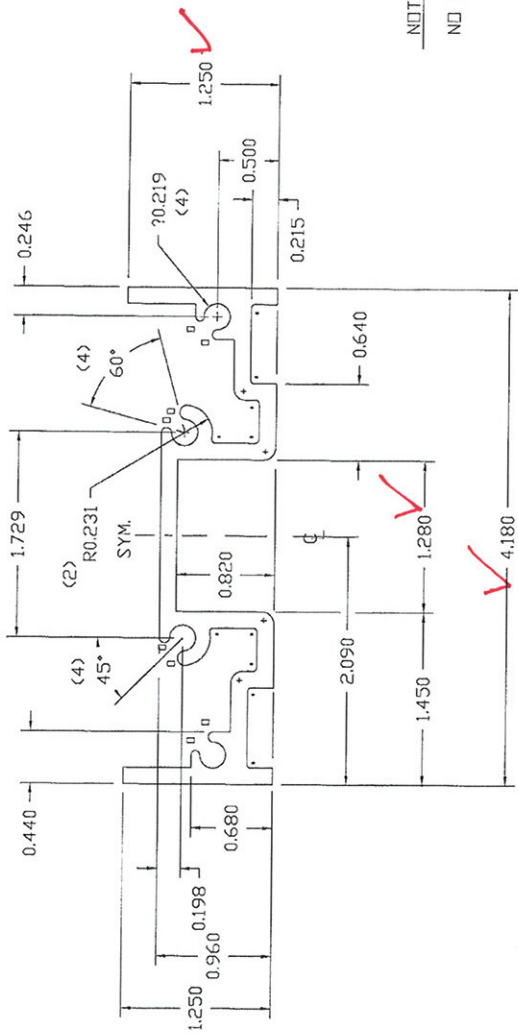
APPLICATION: SILL STOP 1/4" TO 1"

CUSTOMER NUMBER: 45-026

CRM-62

REV.	DATE

DELHI TIFTON BOTH



Architectural Testing

Test sample complies with these details.  
 Deviations are noted.

Report # 089167

Date 10/14/14 Tech EAR

NOTE:

NO EXPOSED SURFACE

LEGEND:

- \* = 0.031 R. (10)
- + = 0.100 R. (4)
- u = 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
PERIMETER	23.555
OUTSIDE PERIMETER	1.667
PERIMETER FACTOR	4-5
CIRCLE SIZE	12

DIE DIMENSIONS	
DATE	

LEGEND	
* = 0.031 R.	
+ = 0.100 R.	
u = FULL R.	

DIE DIMENSIONS	
DATE	

APPLICATION	
MULL. CLIP	

CUSTOMER	
Sapa Extrusions, Inc.	
DELHI, LA 71232	

CUSTOMER	
CRONSTROMS	
MINNEAPOLIS, MINN.	

SCALE	
ACTUAL	

DATE	
12-3-88	

LAST REVISION	

DRAWN	
M. COPE	

JOB	

CUSTOMER NUMBER	
32-003	

CARD #	
MRC-10	010