

ASTM F1642-04 / GSA TS01 TEST REPORT

Report No.: D8934.01-119-12

Rendered to:

3M COMPANY
St. Paul, Minnesota

PRODUCT TYPE:

Fragment Retention Film on 1" Double Pane Glass with Film Attachment Systems

SERIES/MODEL:

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

This report contains in its entirety:

Cover Page: 1 page
Summary of Results: 1 page
Report Body: 16 pages
Test Facility: 1 page
Pressure-Time Plots: 20 pages
Photographs: 25 pages
Drawings: 9 pages

Test Completion Date: 08/29/14
Report Date: 11/13/14
Test Record Retention Date: 08/29/18

Summary of Results

Specimen No.	Film Attachment Type	Average Peak Reflected Pressure	Average Positive Phase Impulse	Average Positive Phase Duration	GSA Performance Condition	ASTM F1642-04 Hazard Rating	ASTM F2912-11 System Rating
1	IPP	9.18 psi	60 psi-msec	15.74 msec	2	No Hazard	Minimal Hazard (H2)
2		8.55 psi	60 psi-msec	15.32 msec	2	No Hazard	
3		8.90 psi	60 psi-msec	15.70 msec	2	Minimal Hazard	
4		6.95 psi	44 psi-msec	12.68 msec	2	No Hazard	N/A
5		9.62 psi	80 psi-msec	17.36 msec	5	High Hazard	
6	IPA	9.28 psi	64 psi-msec	16.54 msec	2	Minimal Hazard	Minimal Hazard (H2)
7		9.30 psi	64 psi-msec	16.35 msec	2	Minimal Hazard	
8		9.46 psi	62 psi-msec	15.96 msec	2	Minimal Hazard	
9		10.52 psi	90 psi-msec	18.20 msec	5	Low Hazard	N/A
10		9.40 psi	74 psi-msec	17.65 msec	2	Minimal Hazard	

Reference must be made to Report No. D8934.01-119-12, dated 11/13/14 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" Double Pane Glass with Film Attachment Systems

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

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: 07/24/2014 - 08/29/2014

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.

3.0 Project Summary: (Continued)

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.
Isaiah W. Gebhart	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*

ASTM F2912-11, *Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings*

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	40-1/2	48-1/2
Fixed Day Lite Opening	35-1/4	43-1/4

5.2 Frame Construction:

Frame Member	Material	Description
Head, sill and jambs	Aluminum	Extruded
Pressure plate	Aluminum	Extruded, secured to head sill, and jambs using #1/4 x 1-1/2" 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 (Reference Drawings ASSY-DOUBLE-39.4x47.3_ULTRA-IPP, Details C and D; and ASSY-DOUBLE-39.4x47.3_ULTRA, Details C and D)
Jambs	N/A	The jambs were secured to each shear block at the head and sill ends using four #1/4 x 1-1/2" long hex head screws
Head/Sill	N/A	The shear blocks utilized a leg that was fitted to a channel in the head and sill. 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:

Glass Type	Interior Lite	Exterior Lite	Glazing Bite
1" IG	1/4" annealed	1/4" annealed	1/2"

Spacer: Aluminum reinforced butyl

Glazing Method: All specimens utilized a 6 mil micro-layered safety and security film adhered to the interior surface of the glass. The glass was exterior glazed against a kerf-mounted rubber gasket and secured with extruded aluminum pressure plate. The glass was secured in place from the interior using either a 3M™ Impact Protection Profile (IPP), flexible-mechanical rubber gasket type film attachment (Reference Drawing ASSY-DOUBLE-39.4x47.3_ULTRA-IPP, Details C, D, and E), or a continuous bead of 3M™ Impact Protection Adhesive (IPA) structural sealant (Reference ASSY-DOUBLE-39.4x47.3_ULTRA, Details C, D, and E).

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	79°F
Glazing Temperature	77°F
ASTM Hazard Rating	No Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.61 psi
Right Pressure	9.50 psi
Shell Pressure	8.42 psi
Average Pressure	9.18 psi
Witness Chamber Pressure	0.49 psi

Peak Positive Phase Duration	
Top Duration	13.24 msec
Right Duration	17.34 msec
Shell Duration	16.63 msec
Average Duration	15.74 msec

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

7.0 Test Results: (Continued)

Test Specimen #2:

Description	Results
Ambient Temperature	81°F
Glazing Temperature	81°F
ASTM Hazard Rating	No Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	8.64 psi
Right Pressure	8.80 psi
Shell Pressure	8.21 psi
Average Pressure	8.55 psi
Witness Chamber Pressure	0.48 psi

Peak Positive Phase Duration	
Top Duration	14.08 msec
Right Duration	16.56 msec
Shell Duration	15.32 msec
Average Duration	15.32 msec

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

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

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:

Description	Results
Ambient Temperature	80°F
Glazing Temperature	80°F
ASTM Hazard Rating	Minimal Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.15 psi
Right Pressure	9.29 psi
Shell Pressure	8.25 psi
Average Pressure	8.90 psi
Witness Chamber Pressure	0.49 psi

Peak Positive Phase Duration	
Top Duration	15.21 msec
Right Duration	16.24 msec
Shell Duration	15.67 msec
Average Duration	15.70 msec

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

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1-1/4" at lower 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 #4:

Description	Results
Ambient Temperature	83°F
Glazing Temperature	82°F
ASTM Hazard Rating	No Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	7.10 psi
Right Pressure	7.38 psi
Shell Pressure	6.37 psi
Average Pressure	6.95 psi
Witness Chamber Pressure	0.35 psi

Peak Positive Phase Duration	
Top Duration	12.41 msec
Right Duration	13.28 msec
Shell Duration	12.35 msec
Average Duration	12.68 msec

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

7.0 Test Results: (Continued)

Test Specimen #5:

Description	Results
Ambient Temperature	80°F
Glazing Temperature	79°F
ASTM Hazard Rating	High Hazard
GSA Performance Condition	5

Peak Positive Pressure	
Top Pressure	9.88 psi
Right Pressure	10.00 psi
Shell Pressure	8.97 psi
Average Pressure	9.62 psi
Witness Chamber Pressure	0.78 psi

Peak Positive Phase Duration	
Top Duration	16.21 msec
Right Duration	19.27 msec
Shell Duration	16.60 msec
Average Duration	17.36 msec

Peak Positive Phase Impulse	
Top Impulse	80 psi*msec
Right Impulse	80 psi*msec
Shell Impulse	80 psi*msec
Average Impulse	80 psi*msec

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

Witness Chamber Results
The interior lite landed on the witness chamber floor, 18" past the 1m mark. Several glazing fragments penetrated into the second layer of 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	87°F
Glazing Temperature	89°F
ASTM Hazard Rating	Minimal Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.68 psi
Right Pressure	9.53 psi
Shell Pressure	8.62 psi
Average Pressure	9.28 psi
Witness Chamber Pressure	0.64 psi

Peak Positive Phase Duration	
Top Duration	15.82 msec
Right Duration	16.14 msec
Shell Duration	17.66 msec
Average Duration	16.54 msec

Peak Positive Phase Impulse	
Top Impulse	65 psi*msec
Right Impulse	64 psi*msec
Shell Impulse	64 psi*msec
Average Impulse	64 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1/2" at each end of sill

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 #7:

Description	Results
Ambient Temperature	78°F
Glazing Temperature	79°F
ASTM Hazard Rating	Minimal Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.98 psi
Right Pressure	9.39 psi
Shell Pressure	8.51 psi
Average Pressure	9.30 psi
Witness Chamber Pressure	0.46 psi

Peak Positive Phase Duration	
Top Duration	17.65 msec
Right Duration	14.95 msec
Shell Duration	16.46 msec
Average Duration	16.35 msec

Peak Positive Phase Impulse	
Top Impulse	64 psi*msec
Right Impulse	64 psi*msec
Shell Impulse	64 psi*msec
Average Impulse	64 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	3/4" at upper right 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 #8:

Description	Results
Ambient Temperature	82°F
Glazing Temperature	83°F
ASTM Hazard Rating	Minimal Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.80 psi
Right Pressure	9.64 psi
Shell Pressure	8.94 psi
Average Pressure	9.46 psi
Witness Chamber Pressure	0.39 psi

Peak Positive Phase Duration	
Top Duration	-- ¹
Right Duration	16.72 msec
Shell Duration	15.20 msec
Average Duration	15.96 msec

¹ Readings at pressure sensors did not cross zero during the data capture.

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

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	1/4" at lower 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 #9:

Description	Results
Ambient Temperature	83°F
Glazing Temperature	82°F
ASTM Hazard Rating	Low Hazard
GSA Performance Condition	5

Peak Positive Pressure	
Top Pressure	10.85 psi
Right Pressure	10.78 psi
Shell Pressure	9.94 psi
Average Pressure	10.52 psi
Witness Chamber Pressure	0.52 psi

Peak Positive Phase Duration	
Top Duration	19.83 msec
Right Duration	16.56 msec
Shell Duration	-- ¹
Average Duration	18.20 msec

¹ Readings at pressure sensors did not cross zero during the data capture.

Peak Positive Phase Impulse	
Top Impulse	90 psi*msec
Right Impulse	92 psi*msec
Shell Impulse	89 psi*msec
Average Impulse	90 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	18" along right jamb
Glazing Tearing	Tore at several locations

Witness Chamber Results
34 Fragment indents were found on witness panel up to a height of 46" from the floor. One sliver perforation was found on the witness panel, 34" from the 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 #10:

Description	Results
Ambient Temperature	78°F
Glazing Temperature	78°F
ASTM Hazard Rating	Minimal Hazard
GSA Performance Condition	2

Peak Positive Pressure	
Top Pressure	9.79 psi
Right Pressure	9.76 psi
Shell Pressure	8.64 psi
Average Pressure	9.40 psi
Witness Chamber Pressure	0.37 psi

Peak Positive Phase Duration	
Top Duration	18.46 msec
Right Duration	17.19 msec
Shell Duration	17.31 msec
Average Duration	17.65 msec

Peak Positive Phase Impulse	
Top Impulse	74 psi*msec
Right Impulse	74 psi*msec
Shell Impulse	74 psi*msec
Average Impulse	74 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	Five tears; 3/4" to 2-1/2" long

Witness Chamber Results
Glazing fragments and dust were found on witness chamber floor (<10" sum united dimensions).

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

8.0 Closing Statement

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.:

Emily C. Riley - Project Manager
Structural Systems Testing

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 (20)
- Appendix C - Photographs (25)
- Appendix D - Drawings (9)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	11/13/14	N/A	Original report issue

APPENDIX A

Test Facility



Figure #1
Shock Tube and Test Facility

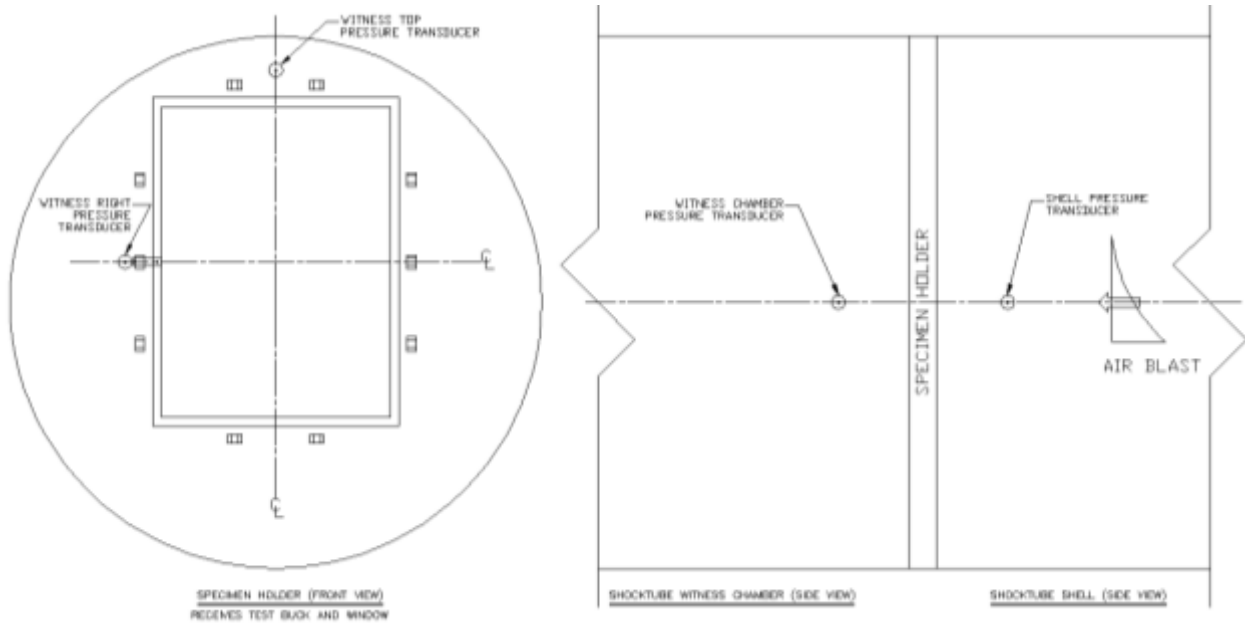
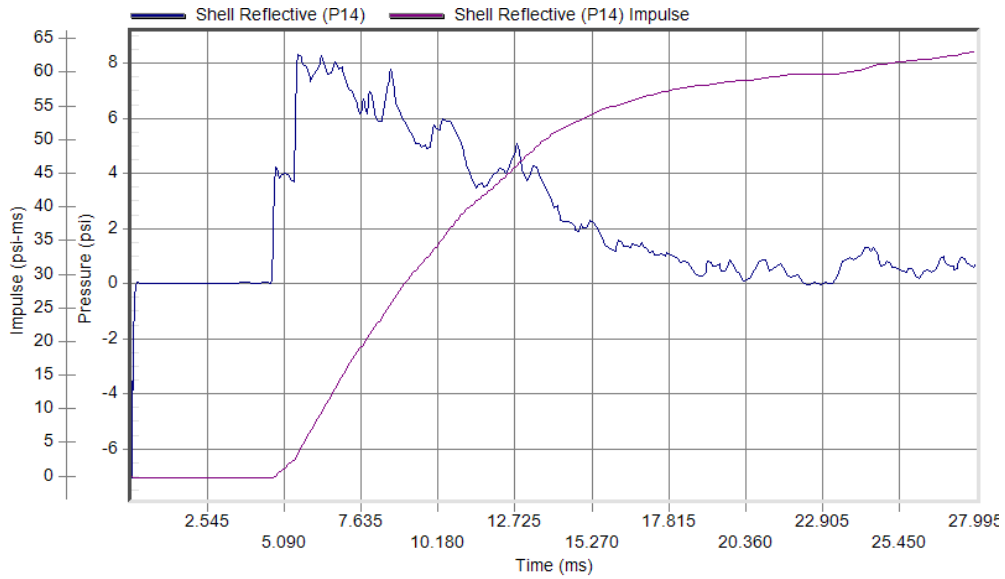


Figure #2
Pressure Sensor Locations

APPENDIX B

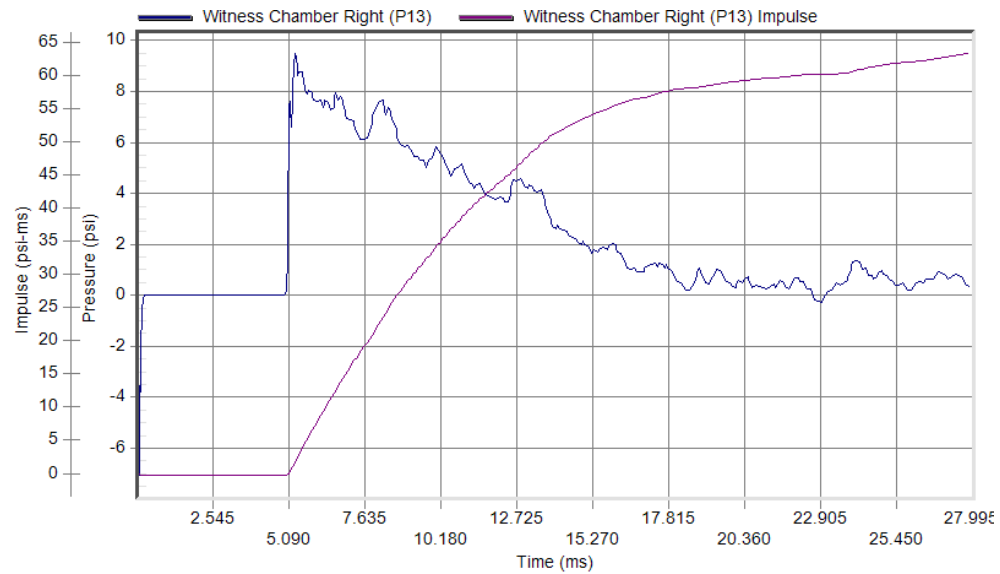
Pressure Time Plots

Specimen #1



Peak Pressure: 8.42 psi at 5.60 ms
Duration: 16.63 ms

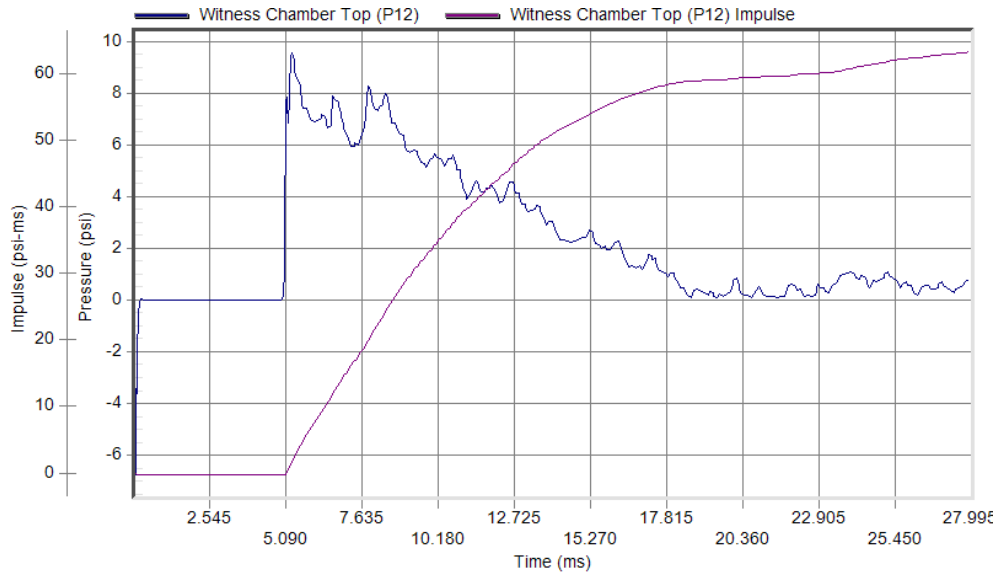
Test Date: 7/25/2014
Test Time: 9:05 am



Peak Pressure: 9.50 psi at 5.30 ms
Duration: 17.34 ms

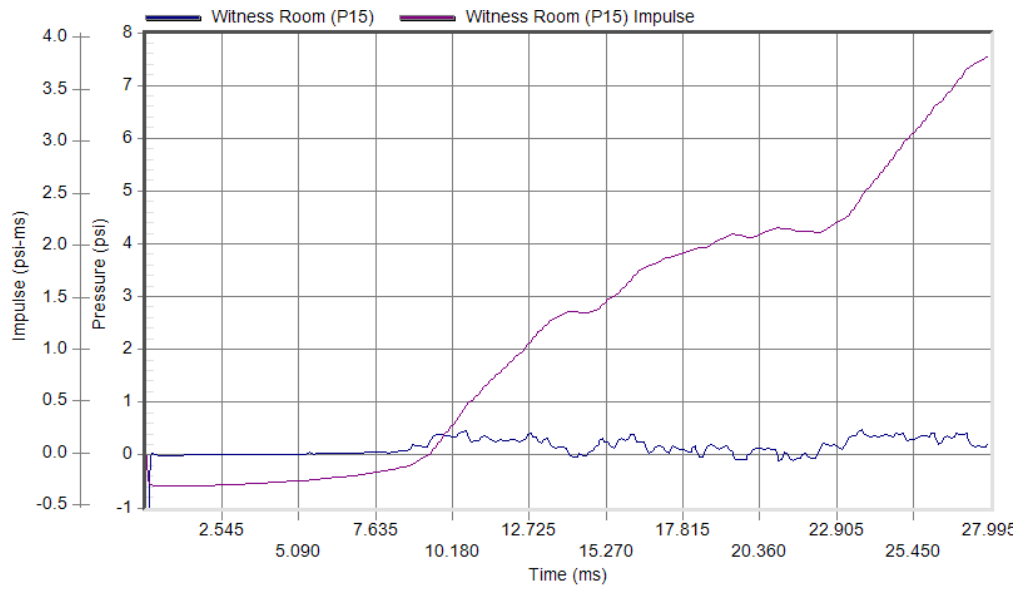
Test Date: 7/25/2014
Test Time: 9:05 am

Specimen #1: (Continued)



Peak Pressure: 9.61 psi at 5.30 ms
Duration: 13.24 ms

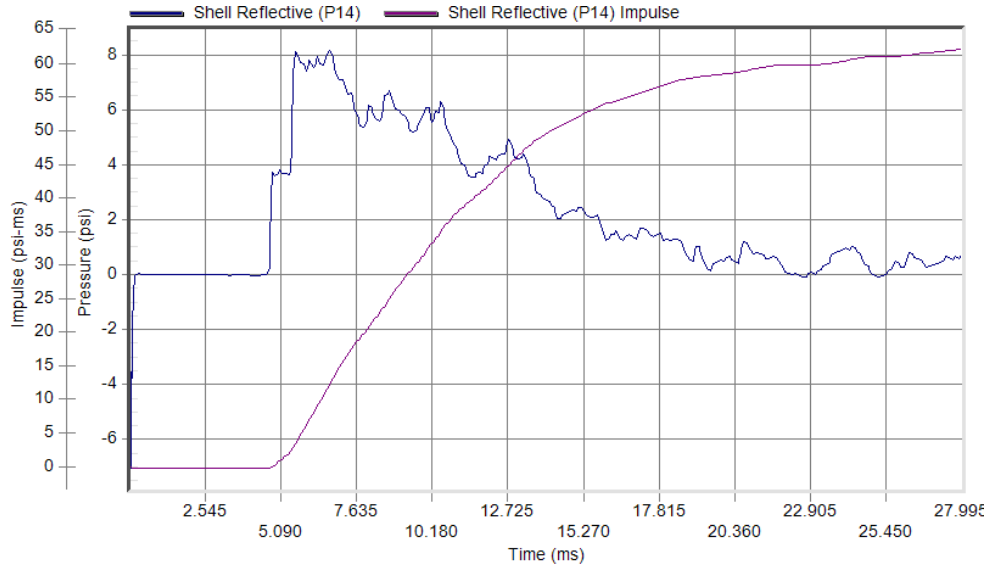
Test Date: 7/25/2014
Test Time: 9:05 am



Peak Pressure: 0.49 psi at 23.72 ms
Duration: 1.35 ms

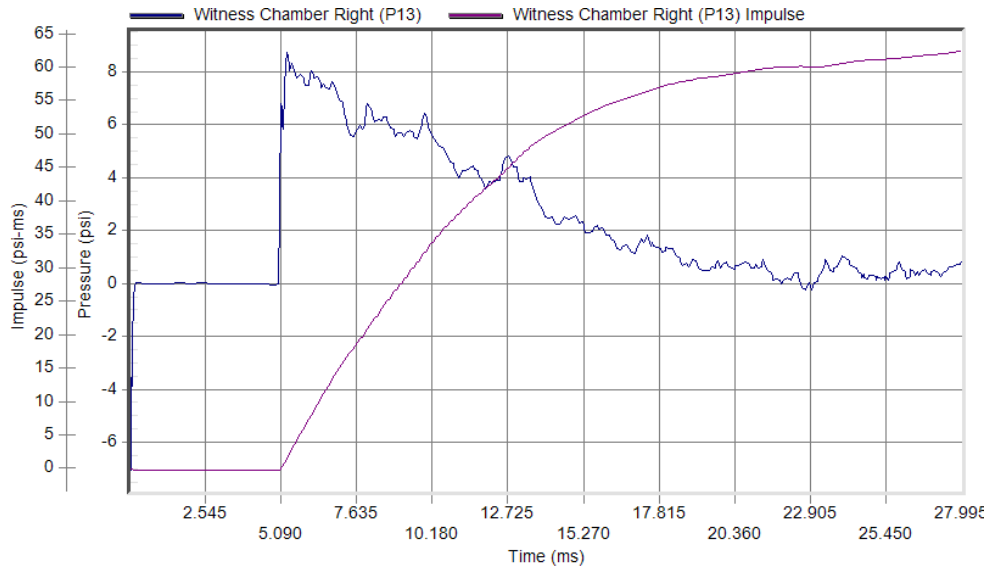
Test Date: 7/25/2014
Test Time: 9:05 am

Specimen #2



Peak Pressure: 8.21 psi at 6.77 ms
Duration: 15.32 ms

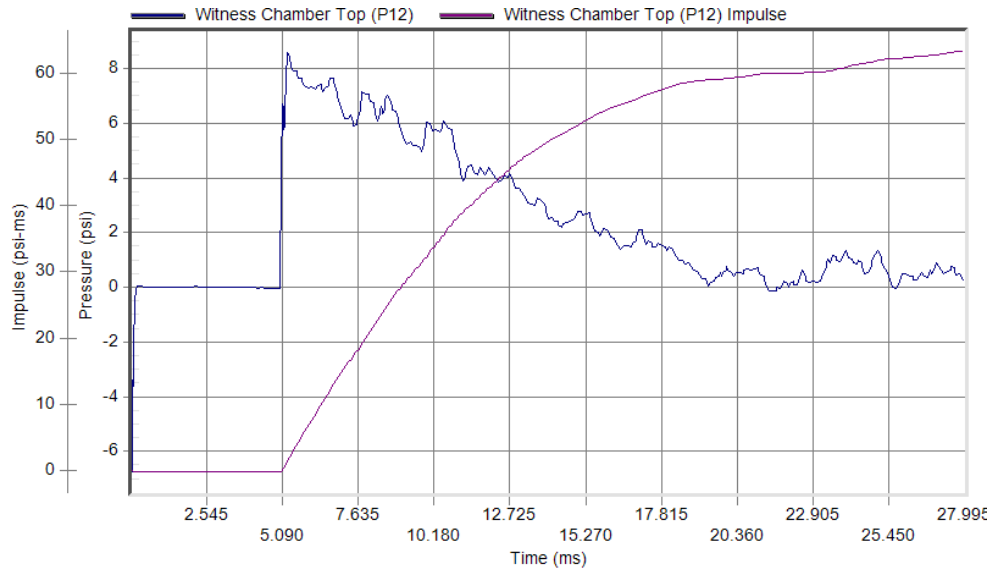
Test Date: 8/4/2014
Test Time: 2:58 pm



Peak Pressure: 8.80 psi at 5.32 ms
Duration: 16.56 ms

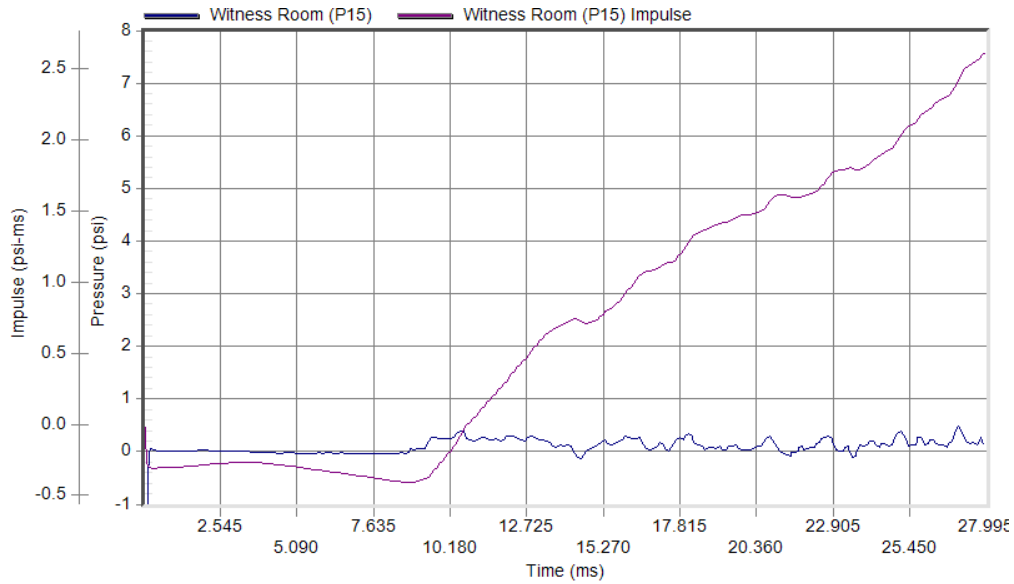
Test Date: 8/4/2014
Test Time: 2:58 pm

Specimen #2: (Continued)



Peak Pressure: 8.64 psi at 5.31 ms
Duration: 14.08 ms

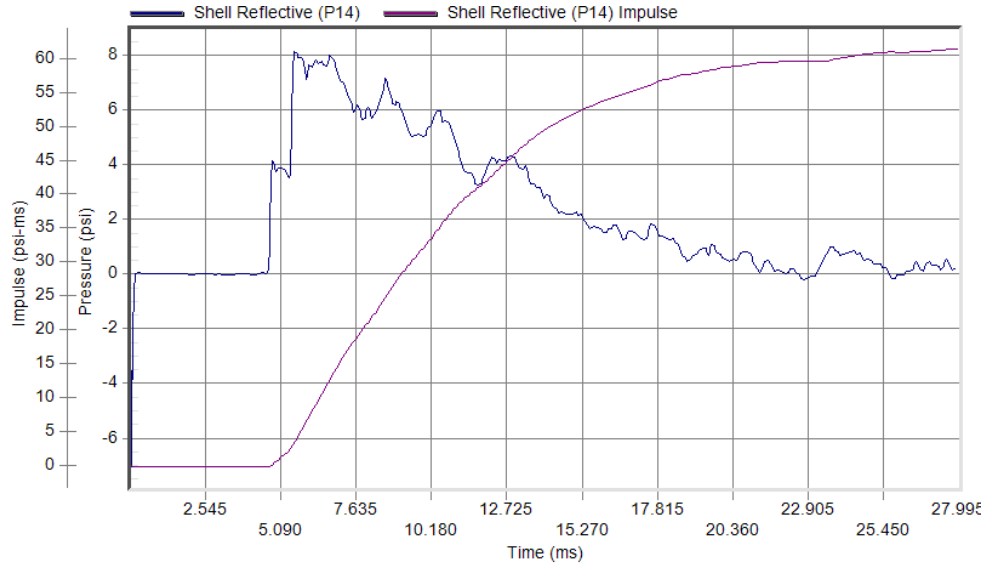
Test Date: 8/4/2014
Test Time: 2:58 pm



Peak Pressure: 0.48 psi at 27.09 ms
Duration: 0.00 ms

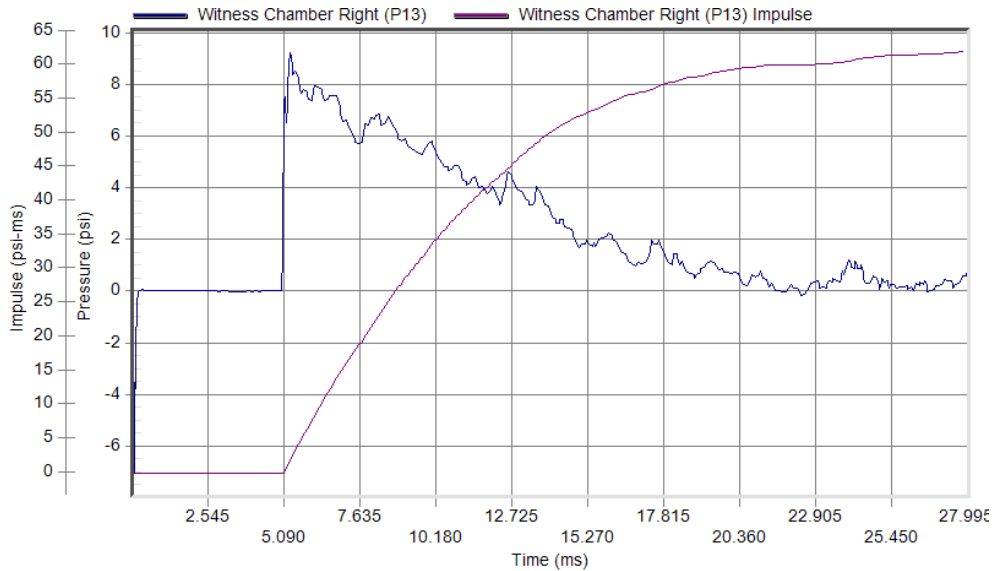
Test Date: 8/4/2014
Test Time: 2:58 pm

Specimen #3



Peak Pressure: 8.25 psi at 5.60 ms
Duration: 15.67 ms

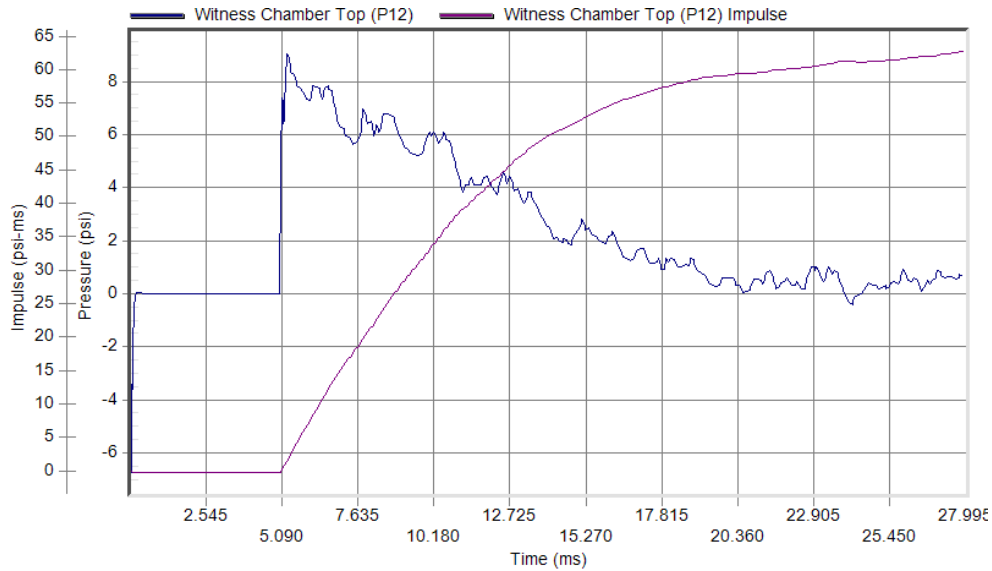
Test Date: 8/4/2014
Test Time: 11:57 am



Peak Pressure: 9.29 psi at 5.30 ms
Duration: 16.24 ms

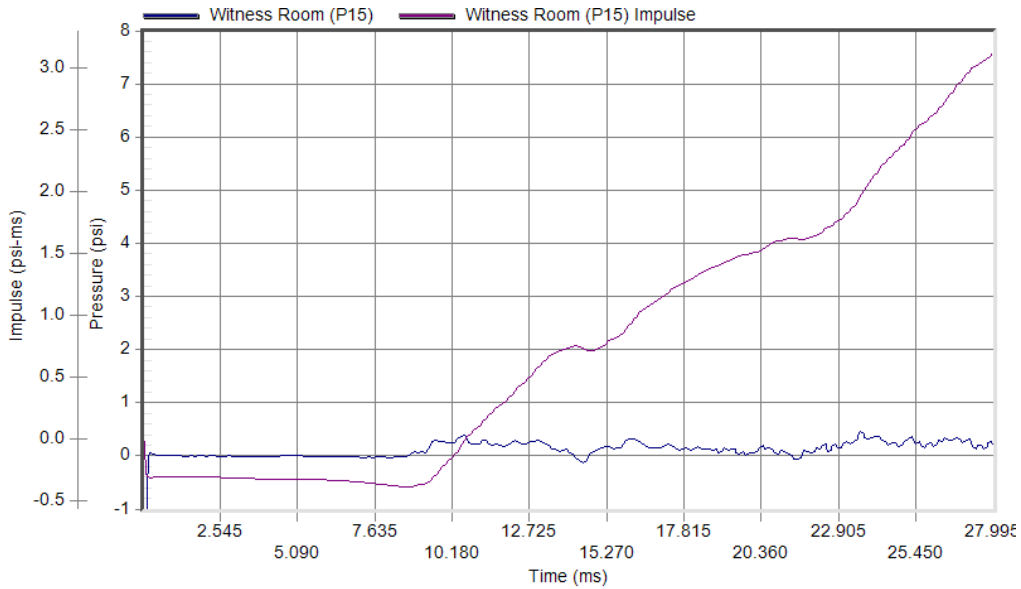
Test Date: 8/4/2014
Test Time: 11:57 am

Specimen #3: (Continued)



Peak Pressure: 9.15 psi at 5.31 ms
Duration: 15.21 ms

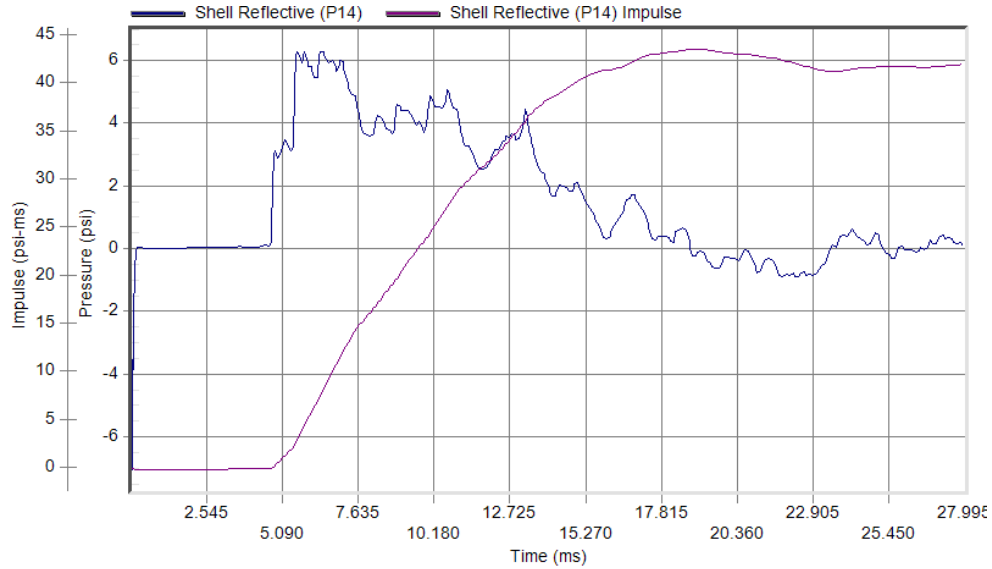
Test Date: 8/4/2014
Test Time: 11:57 am



Peak Pressure: 0.49 psi at 23.65 ms
Duration: 4.06 ms

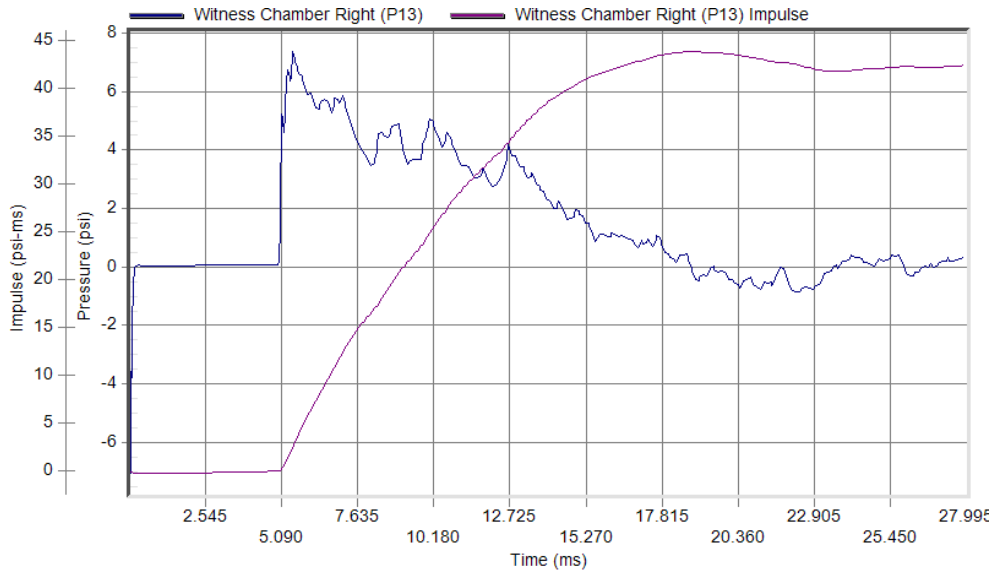
Test Date: 8/4/2014
Test Time: 11:57 am

Specimen #4



Peak Pressure: 6.37 psi at 6.43 ms
Duration: 12.35 ms

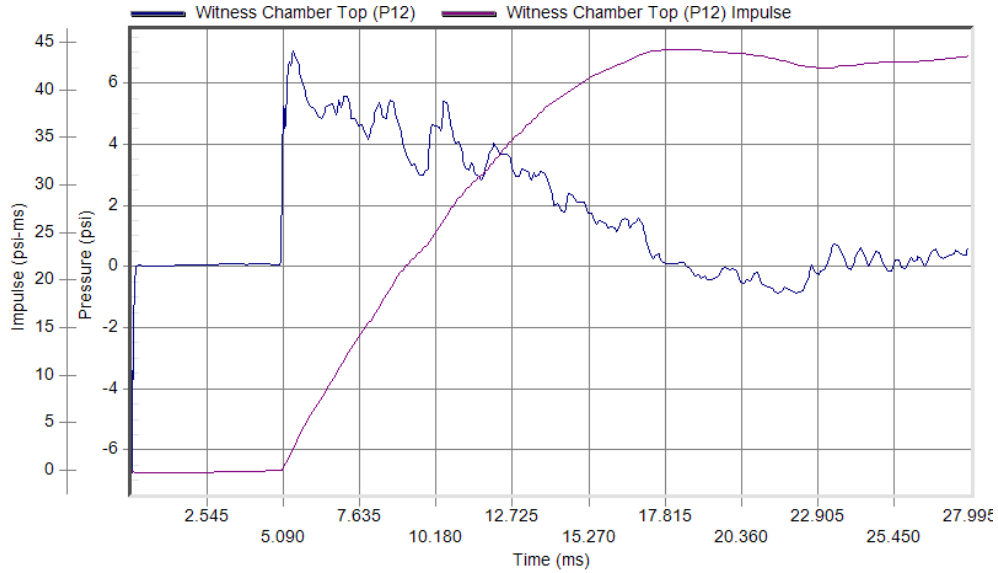
Test Date: 7/24/2014
Test Time: 2:32 pm



Peak Pressure: 7.38 psi at 5.50 ms
Duration: 13.28 ms

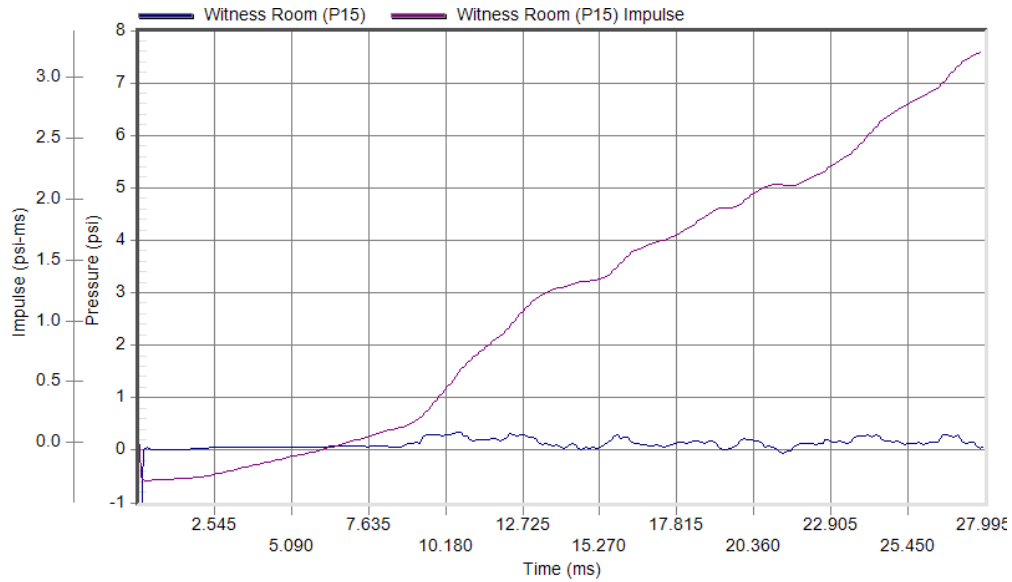
Test Date: 7/24/2014
Test Time: 2:32 pm

Specimen #4: (Continued)



Peak Pressure: 7.10 psi at 5.43 ms
 Duration: 12.41 ms

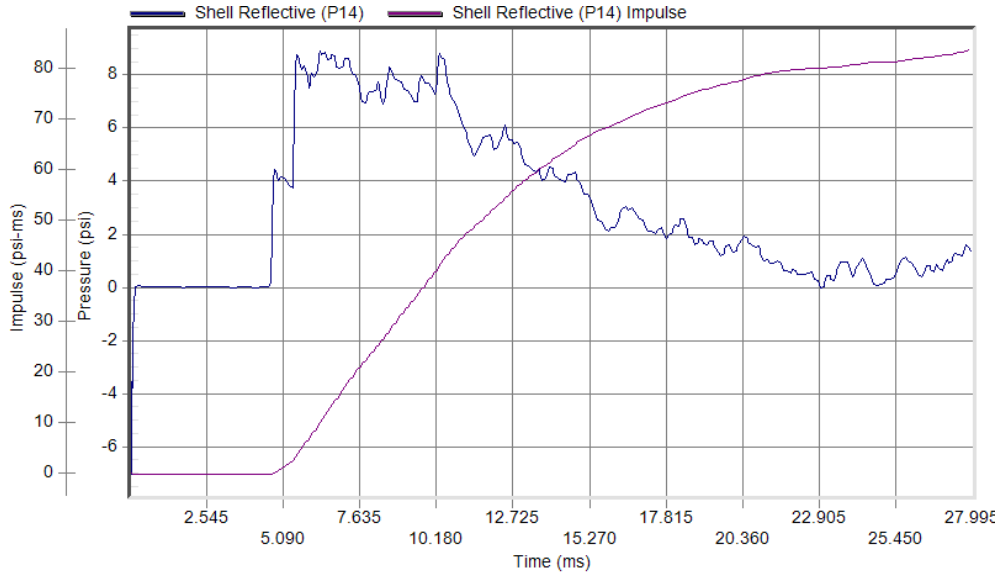
Test Date: 7/24/2014
 Test Time: 2:32 pm



Peak Pressure: 0.35 psi at 10.64 ms
 Duration: 4.02 ms

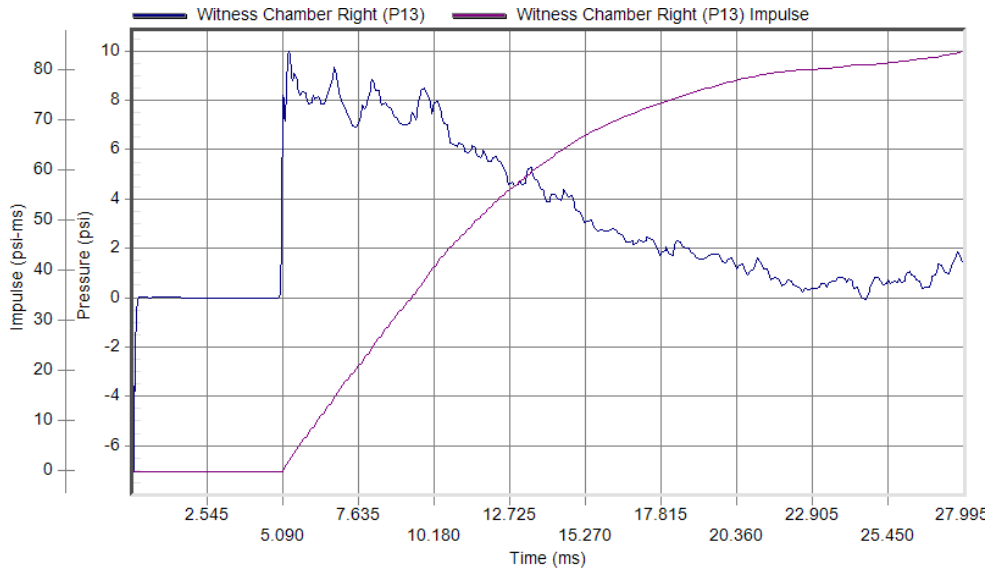
Test Date: 7/24/2014
 Test Time: 2:32 pm

Specimen #5



Peak Pressure: 8.97 psi at 6.33 ms
Duration: 16.60 ms

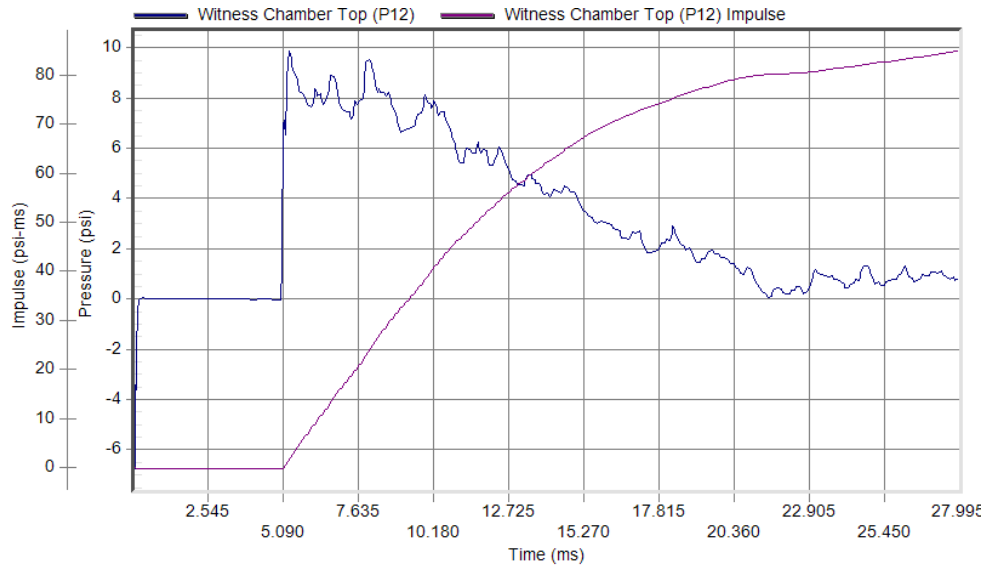
Test Date: 8/6/2014
Test Time: 10:15 am



Peak Pressure: 10.00 psi at 5.29 ms
Duration: 19.27 ms

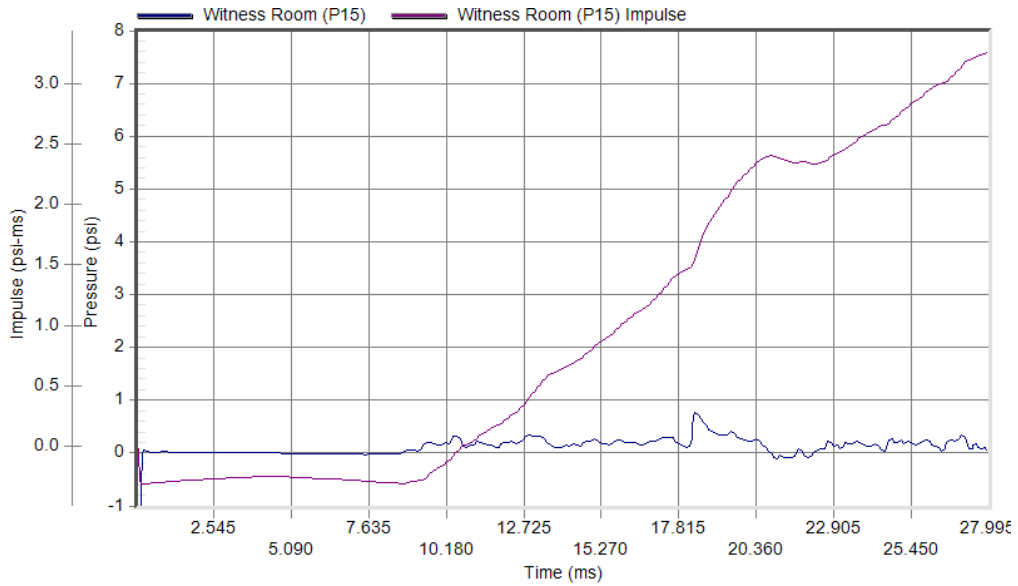
Test Date: 8/6/2014
Test Time: 10:15 am

Specimen #5: (Continued)



Peak Pressure: 9.88 psi at 5.31 ms
Duration: 16.21 ms

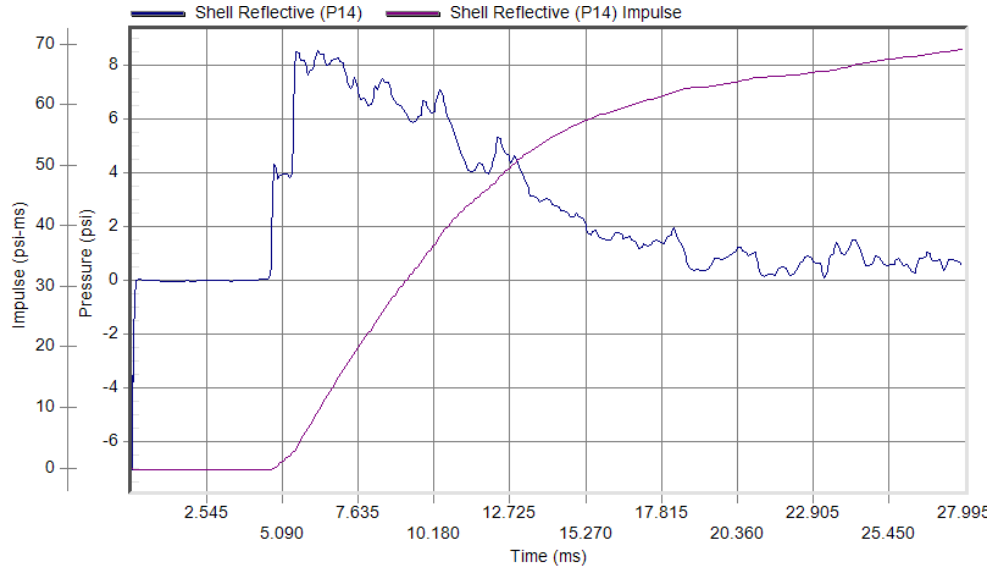
Test Date: 8/6/2014
Test Time: 10:15 am



Peak Pressure: 0.78 psi at 18.35 ms
Duration: 2.49 ms

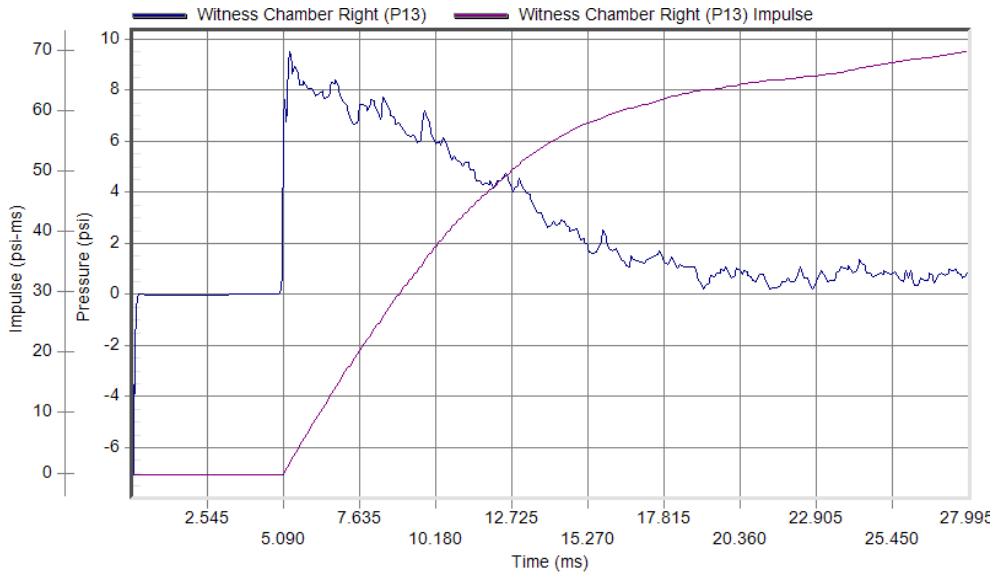
Test Date: 8/6/2014
Test Time: 10:15 am

Specimen #6



Peak Pressure: 8.62 psi at 5.60 ms
Duration: 17.66 ms

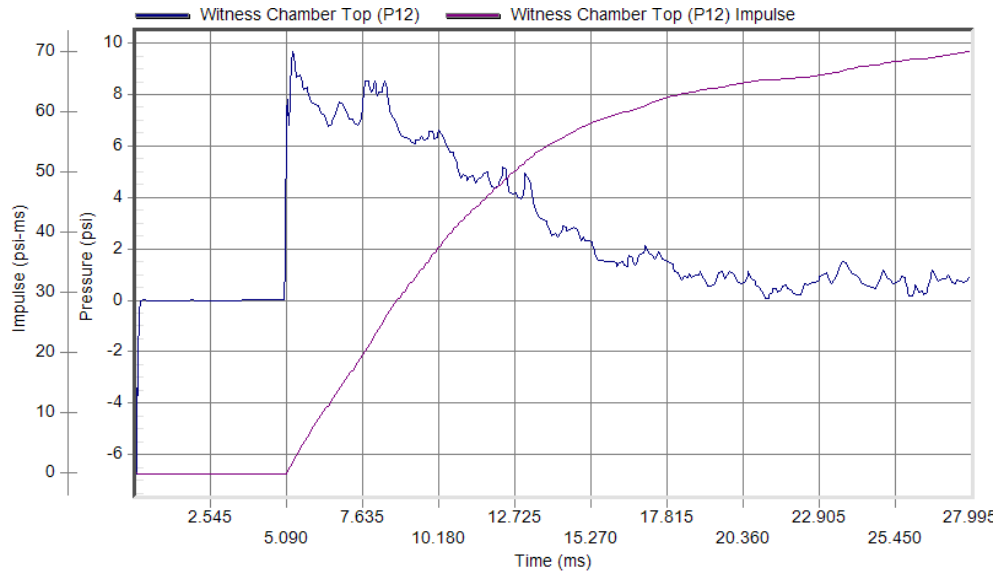
Test Date: 8/27/2014
Test Time: 2:43 pm



Peak Pressure: 9.53 psi at 5.31 ms
Duration: 16.14 ms

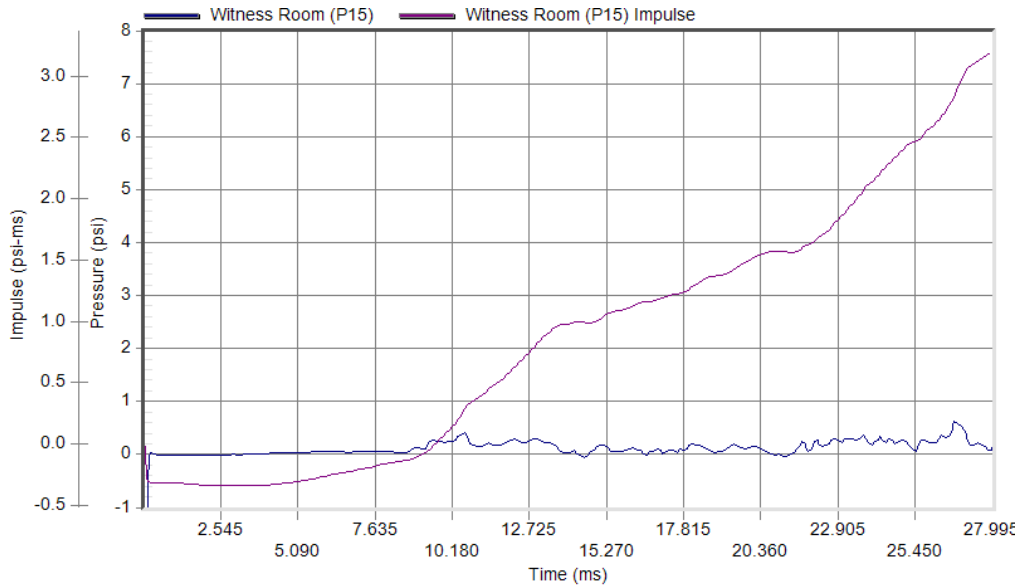
Test Date: 8/27/2014
Test Time: 2:43 pm

Specimen #6: (Continued)



Peak Pressure: 9.68 psi at 5.30 ms
Duration: 15.82 ms

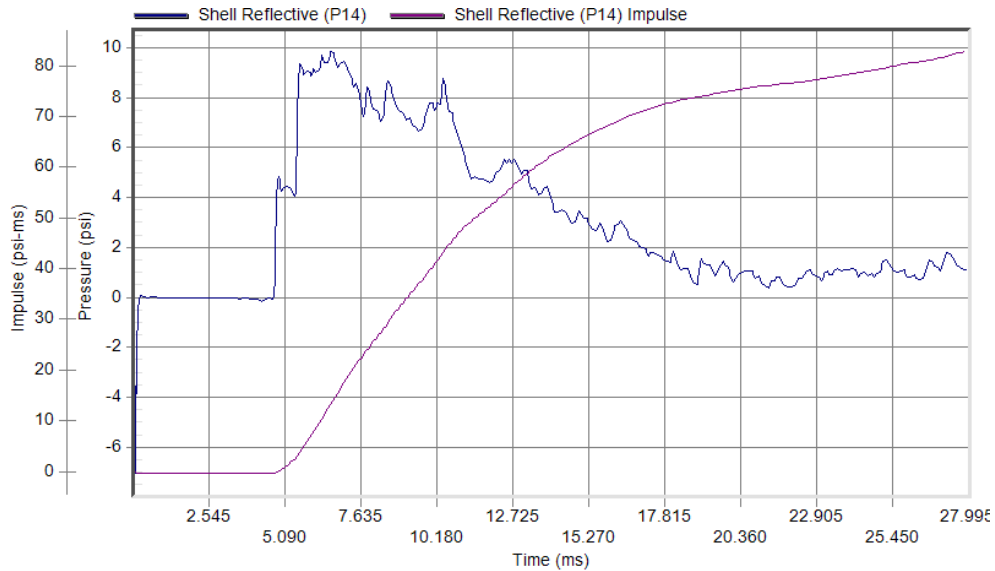
Test Date: 8/27/2014
Test Time: 2:43 pm



Peak Pressure: 0.64 psi at 26.77 ms
Duration: 0.00 ms

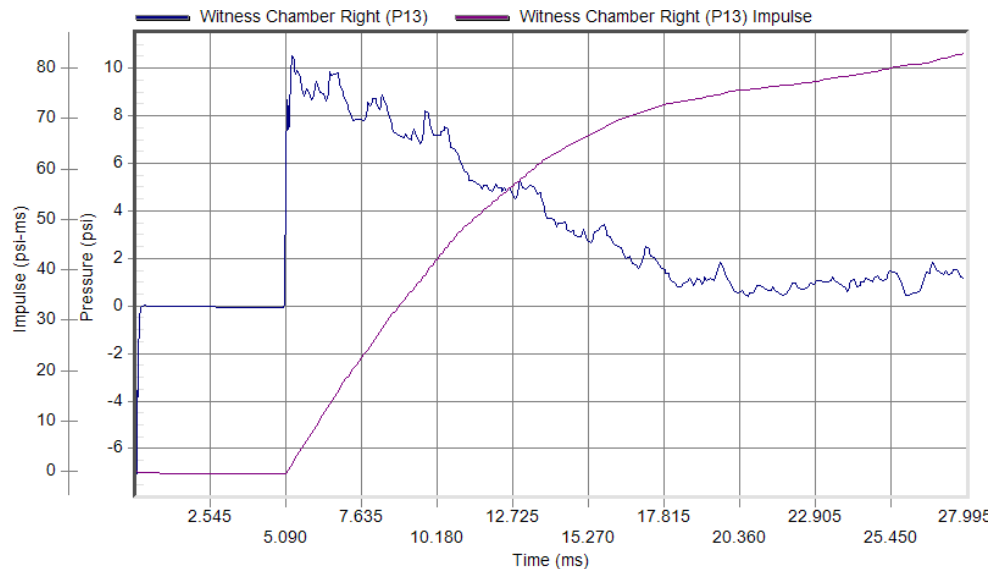
Test Date: 8/27/2014
Test Time: 2:43 pm

Specimen #7



Peak Pressure: 9.86 psi at 6.64 ms
Duration: 0.00 ms

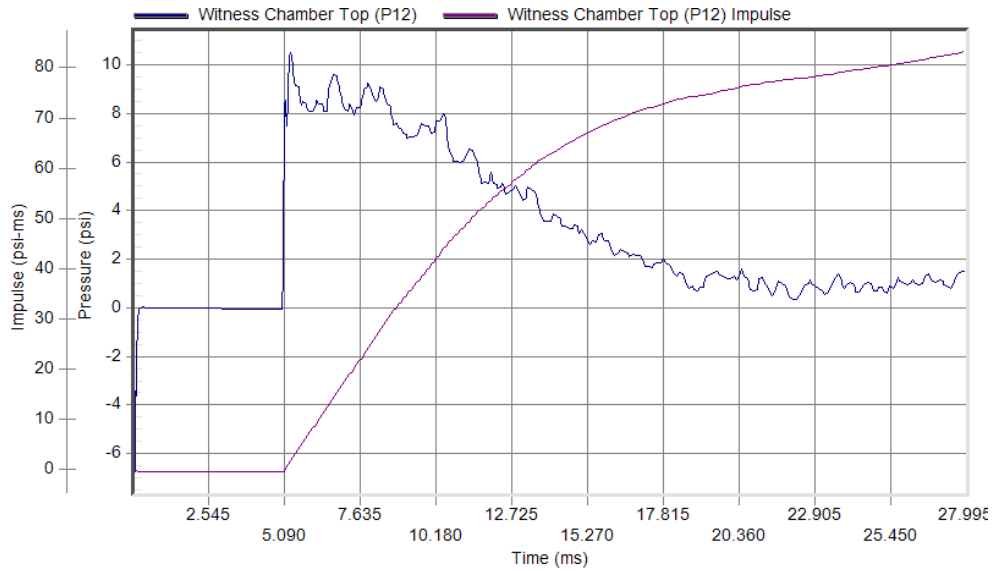
Test Date: 8/27/2014
Test Time: 4:17 pm



Peak Pressure: 10.64 psi at 5.32 ms
Duration: 0.00 ms

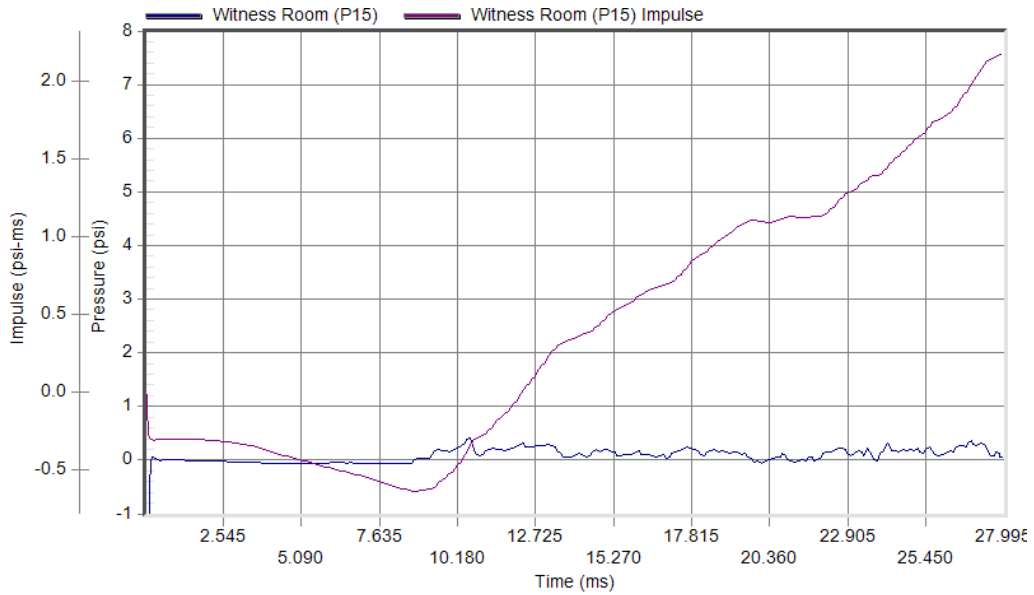
Test Date: 8/27/2014
Test Time: 4:17 pm

Specimen #7: (Continued)



Peak Pressure: 10.57 psi at 5.30 ms
Duration: 0.00 ms

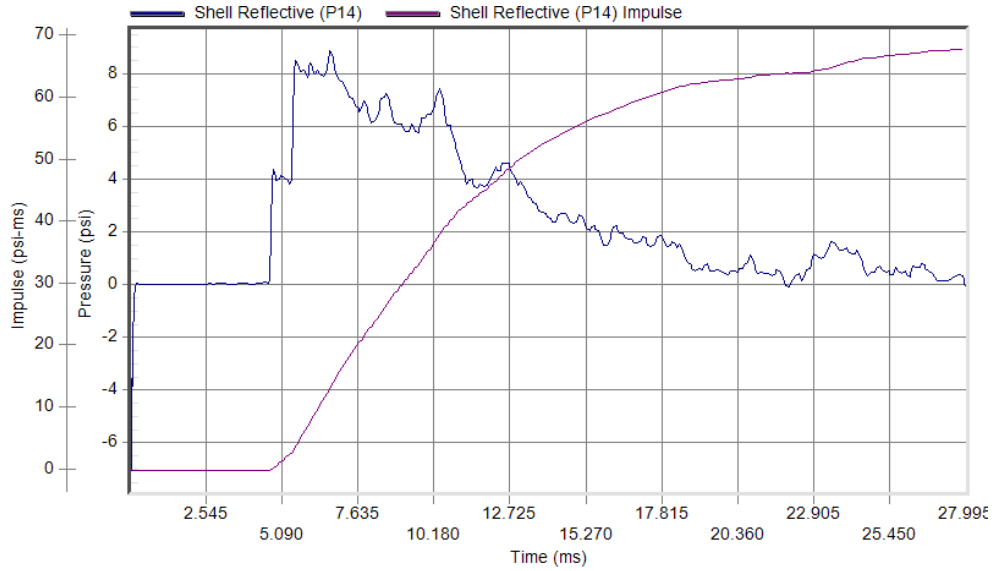
Test Date: 8/27/2014
Test Time: 4:17 pm



Peak Pressure: 0.42 psi at 10.57 ms
Duration: 9.24 ms

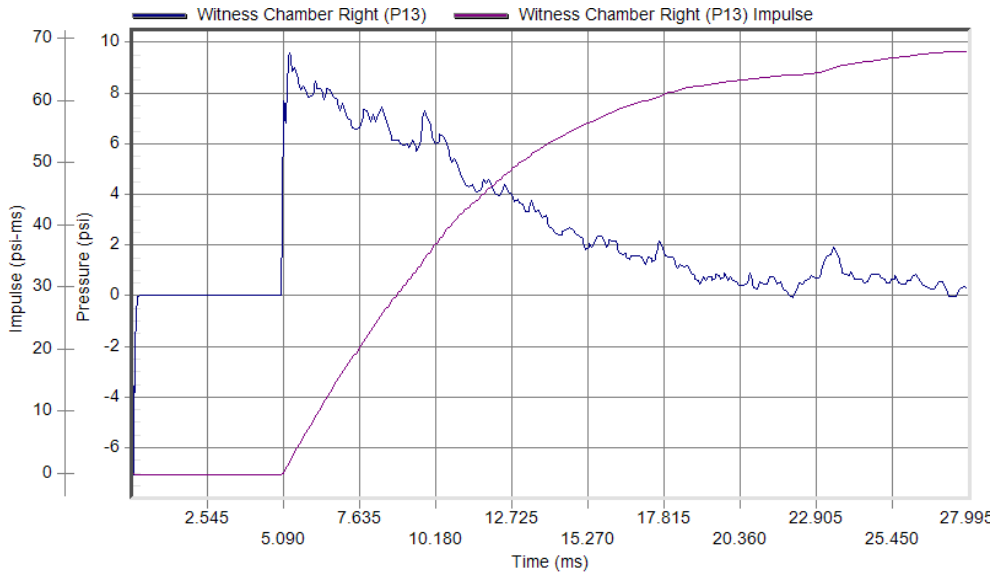
Test Date: 8/27/2014
Test Time: 4:17 pm

Specimen #8



Peak Pressure: 8.94 psi at 6.73 ms
Duration: 15.20 ms

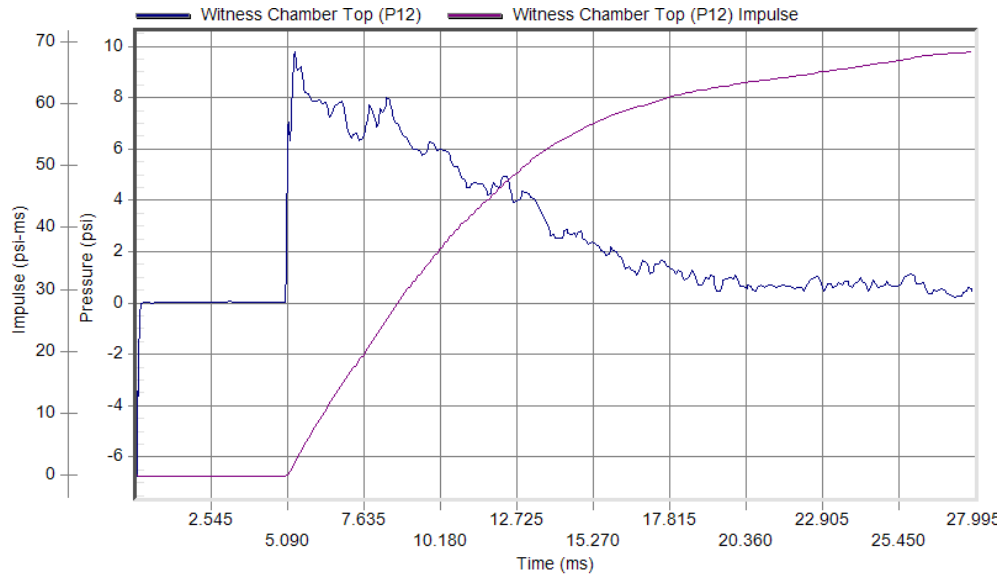
Test Date: 8/28/2014
Test Time: 2:59 pm



Peak Pressure: 9.64 psi at 5.29 ms
Duration: 16.72 ms

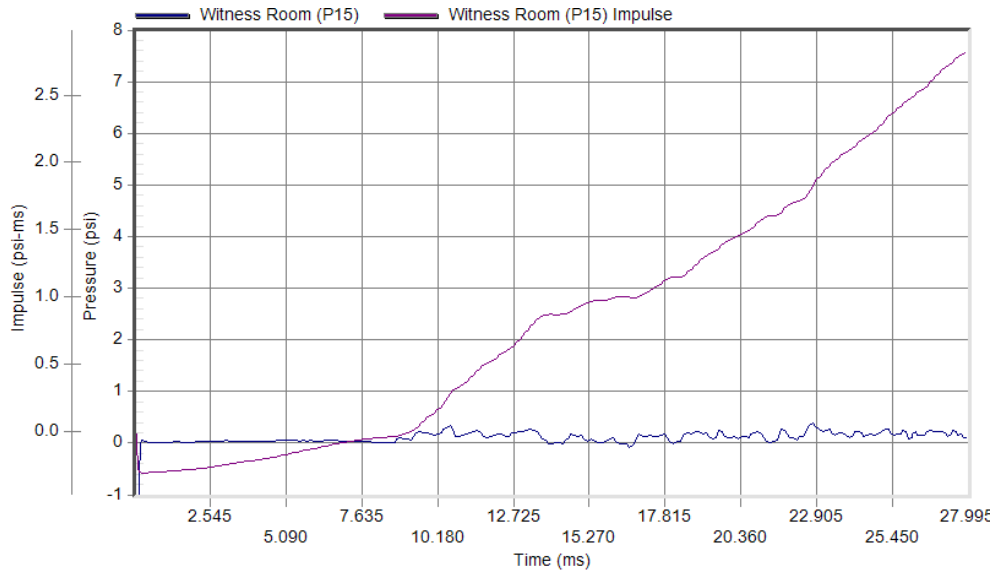
Test Date: 8/28/2014
Test Time: 2:59 pm

Specimen #8: (Continued)



Peak Pressure: 9.80 psi at 5.32 ms
Duration: 0.00 ms

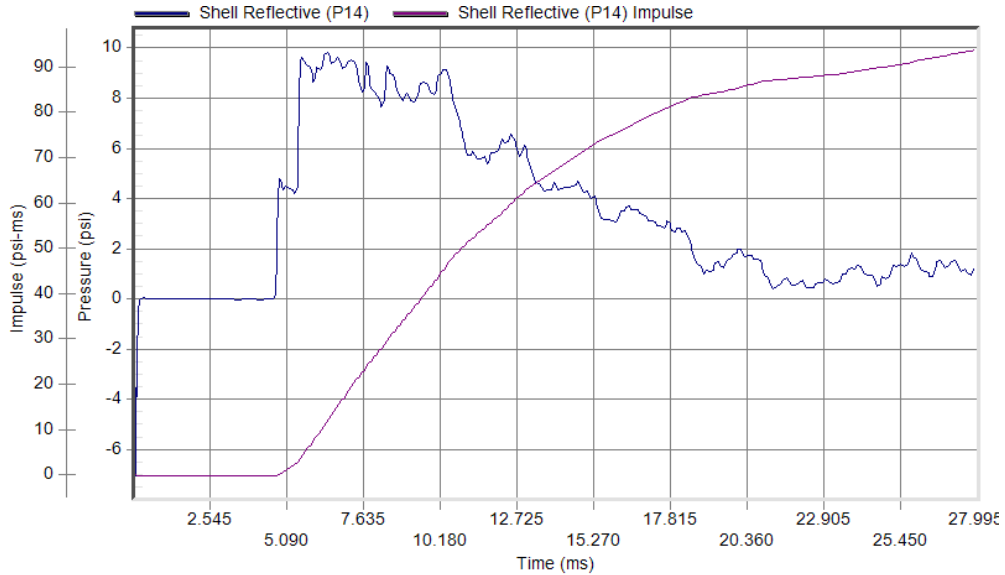
Test Date: 8/28/2014
Test Time: 2:59 pm



Peak Pressure: 0.39 psi at 22.76 ms
Duration: 0.00 ms

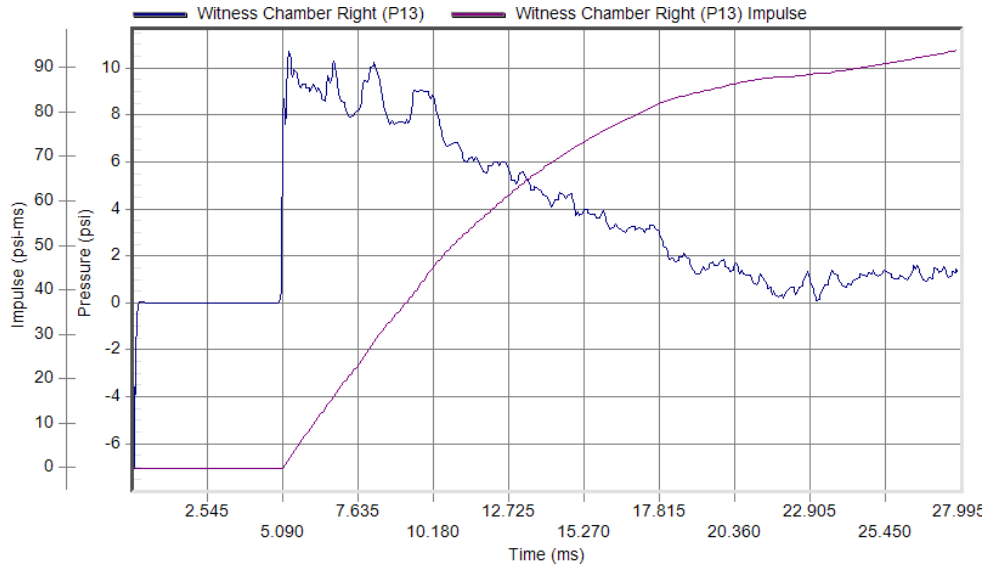
Test Date: 8/28/2014
Test Time: 2:59 pm

Specimen #9



Peak Pressure: 9.94 psi at 6.45 ms
Duration: 0.00 ms

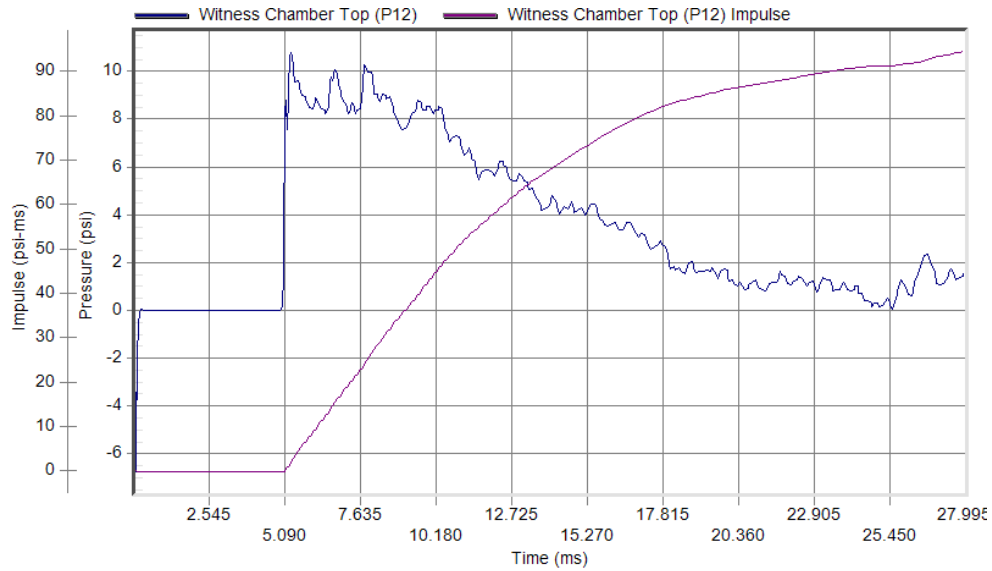
Test Date: 8/26/2014
Test Time: 12:09 pm



Peak Pressure: 10.78 psi at 5.31 ms
Duration: 16.56 ms

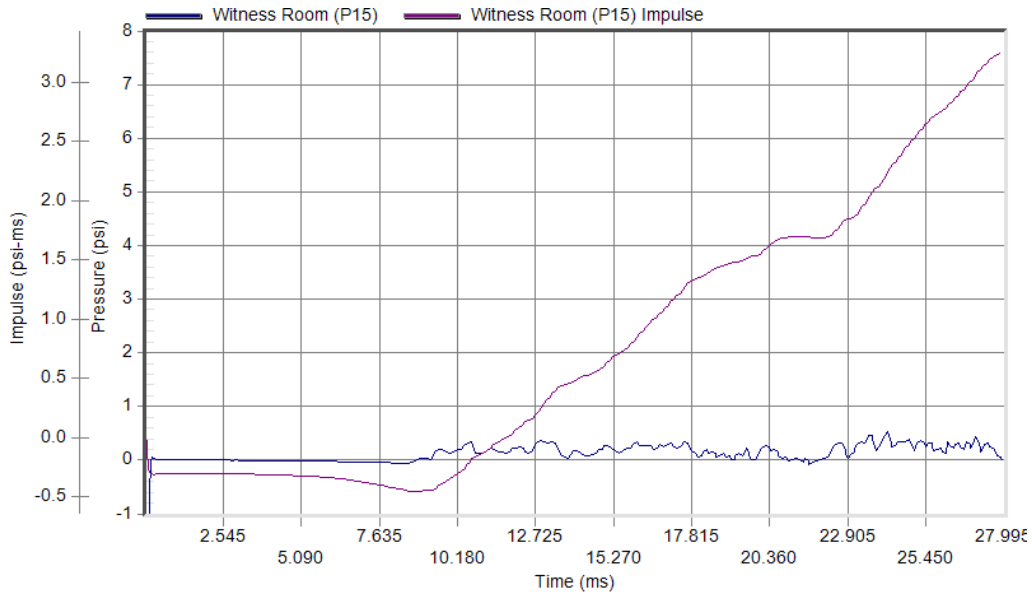
Test Date: 8/26/2014
Test Time: 12:09 pm

Specimen #9: (Continued)



Peak Pressure: 10.85 psi at 5.30 ms
Duration: 19.83 ms

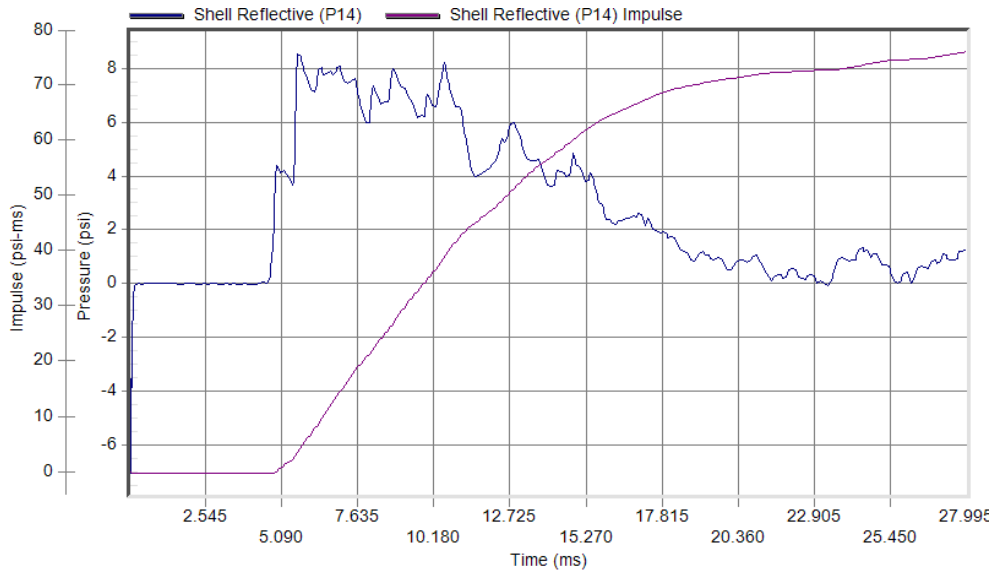
Test Date: 8/26/2014
Test Time: 12:09 pm



Peak Pressure: 0.52 psi at 24.21 ms
Duration: 3.71 ms

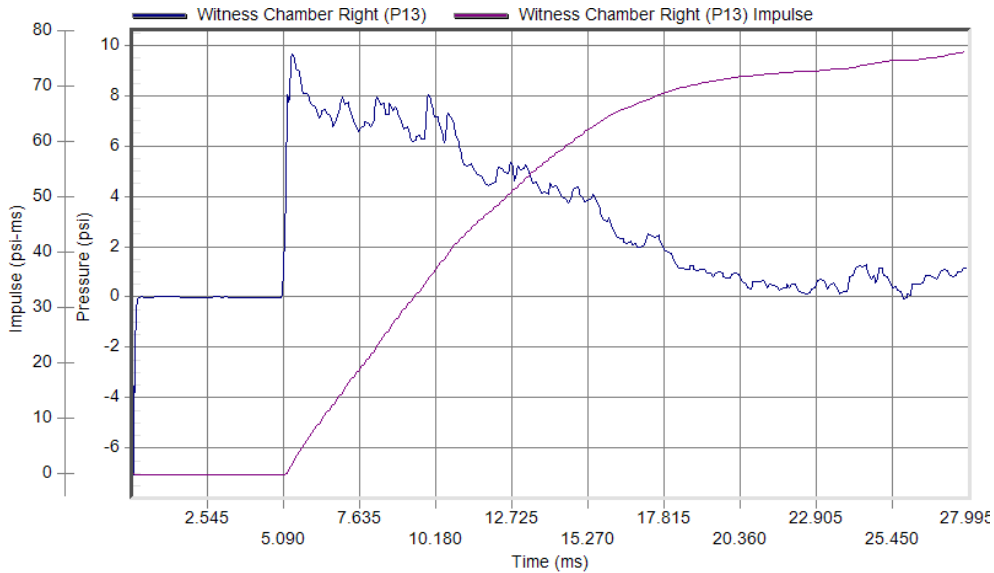
Test Date: 8/26/2014
Test Time: 12:09 pm

Specimen #10



Peak Pressure: 8.64 psi at 5.67 ms
Duration: 17.31 ms

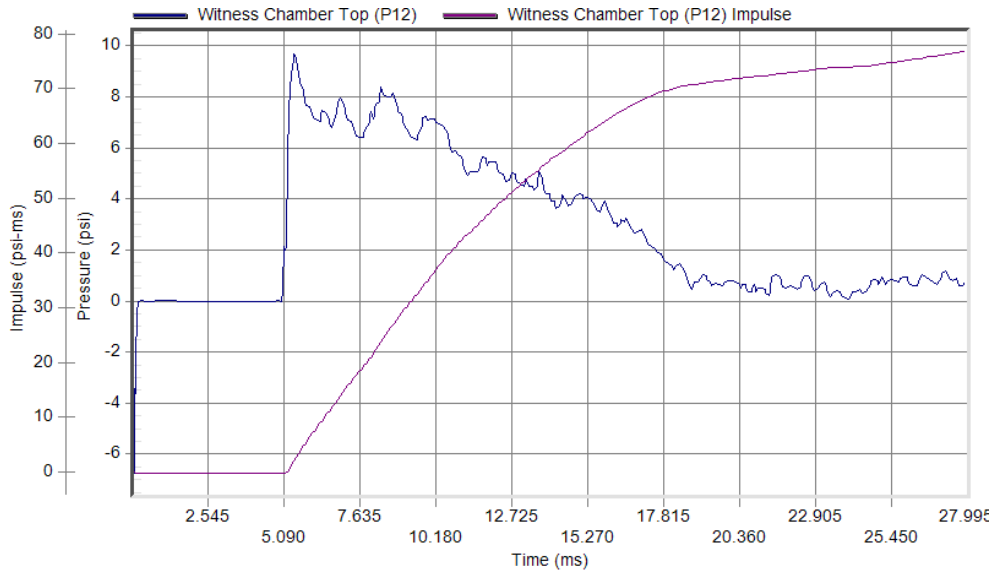
Test Date: 8/29/2014
Test Time: 9:16 am



Peak Pressure: 9.76 psi at 5.41 ms
Duration: 17.19 ms

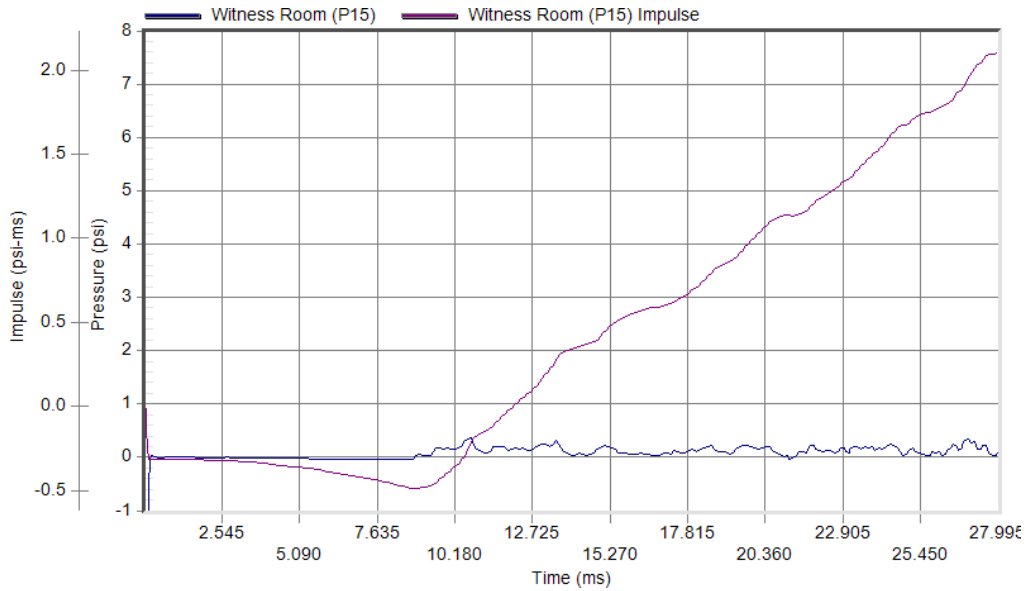
Test Date: 8/29/2014
Test Time: 9:16 am

Specimen #10: (Continued)



Peak Pressure: 9.79 psi at 5.44 ms
Duration: 18.46 ms

Test Date: 8/29/2014
Test Time: 9:16 am



Peak Pressure: 0.37 psi at 10.69 ms
Duration: 6.01 ms

Test Date: 8/29/2014
Test Time: 9:16 am

APPENDIX C

Photographs



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



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

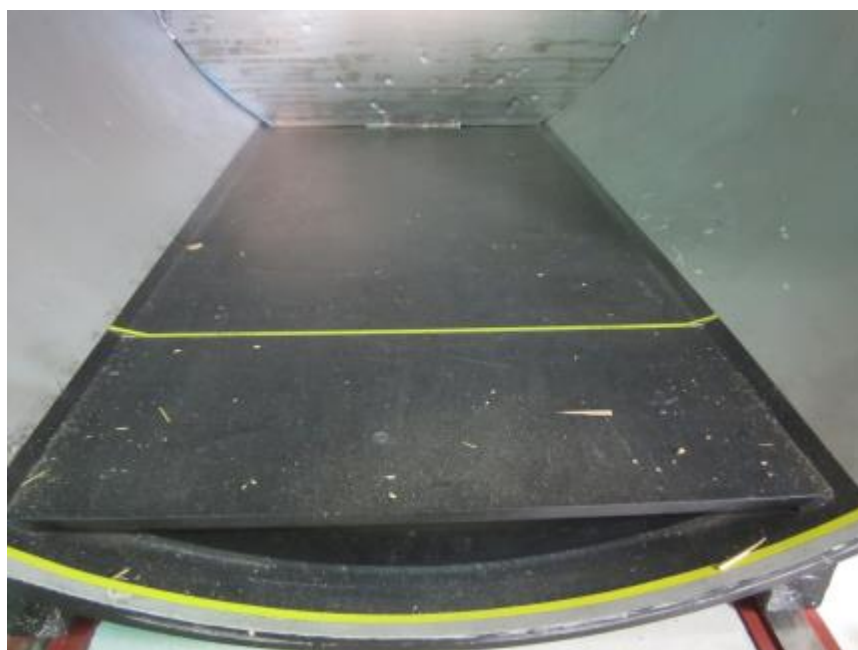


Photo No. 3
Post-test Specimen #1, Witness Chamber



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



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

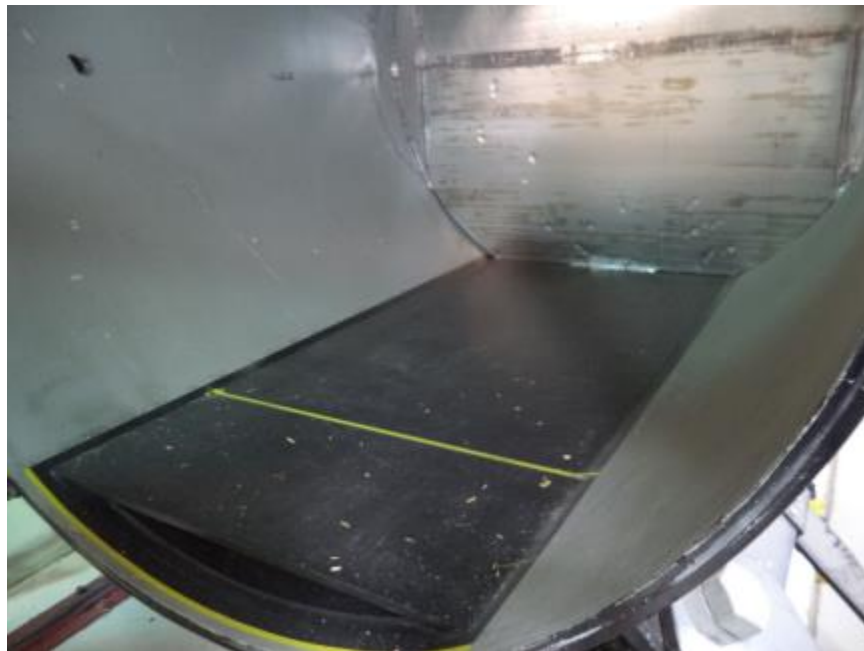


Photo No. 6
Post-test Specimen #2, Witness Chamber



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

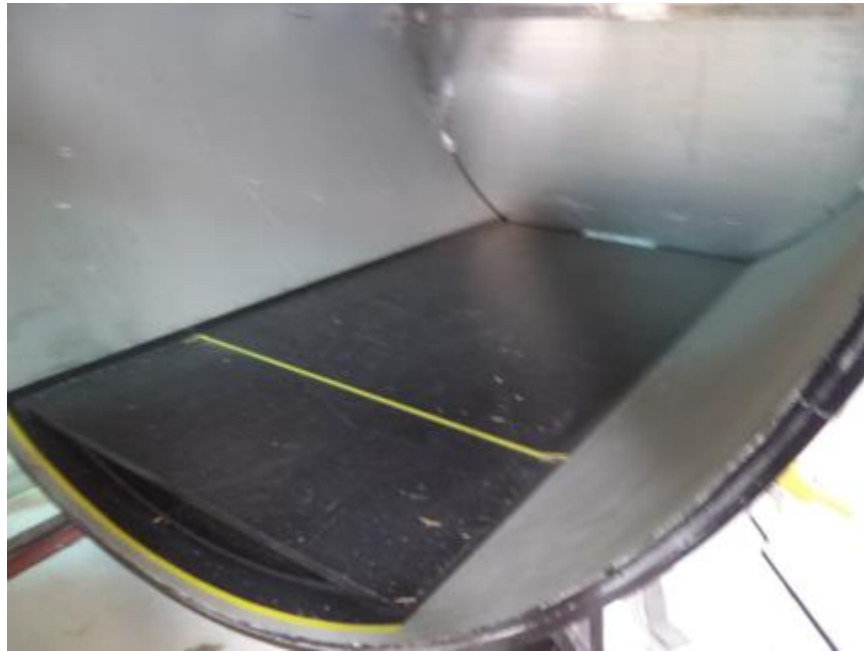


Photo No. 21
Post-test Specimen #7, Witness Chamber



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



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

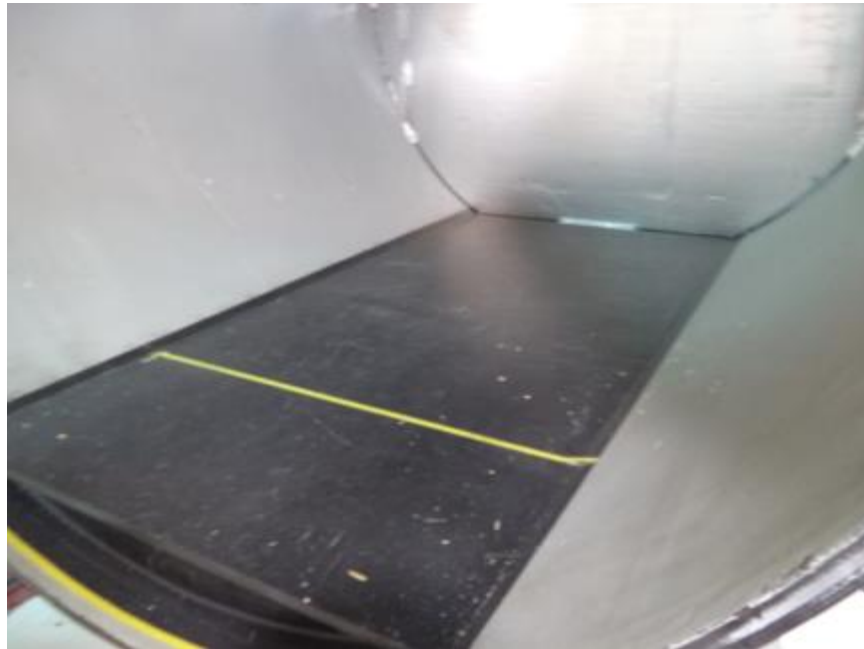


Photo No. 24
Post-test Specimen #8, Witness Chamber



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



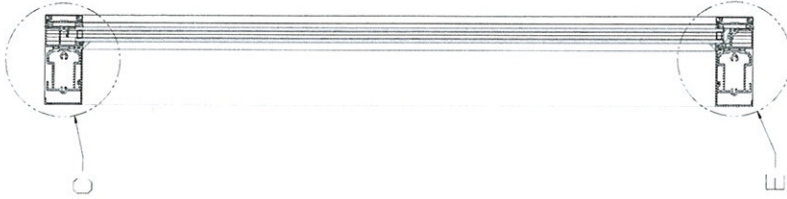
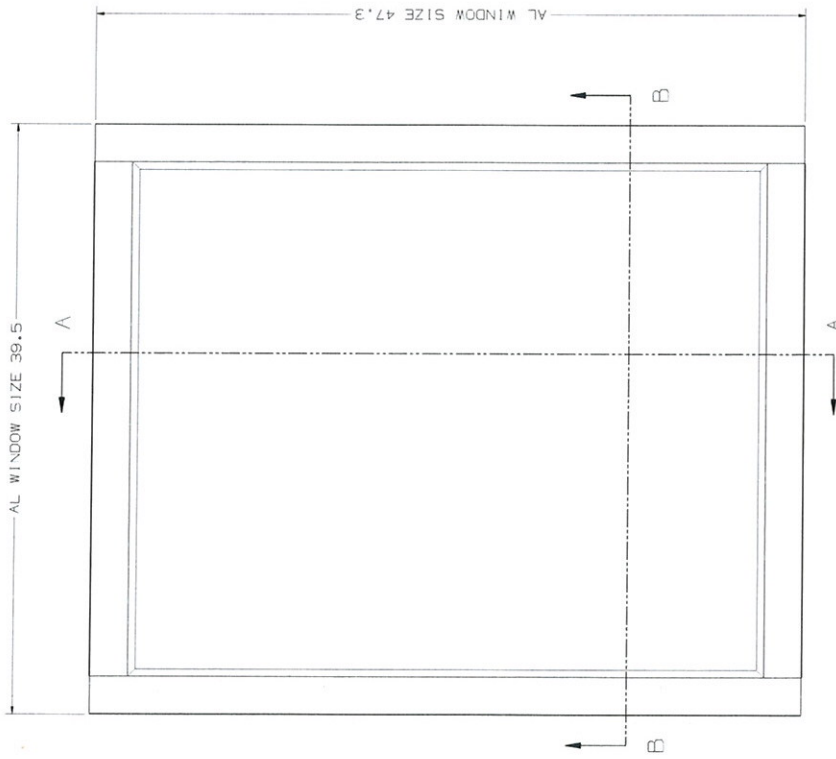
Photo No. 29
Post-test Specimen #10, Interior



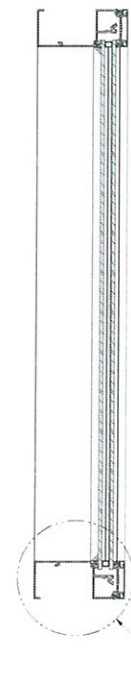
Photo No. 30
Post-test Specimen #10, Witness Chamber

APPENDIX D

Drawings



SECTION A - A



SECTION B - B

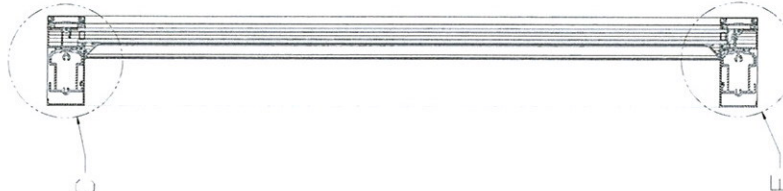
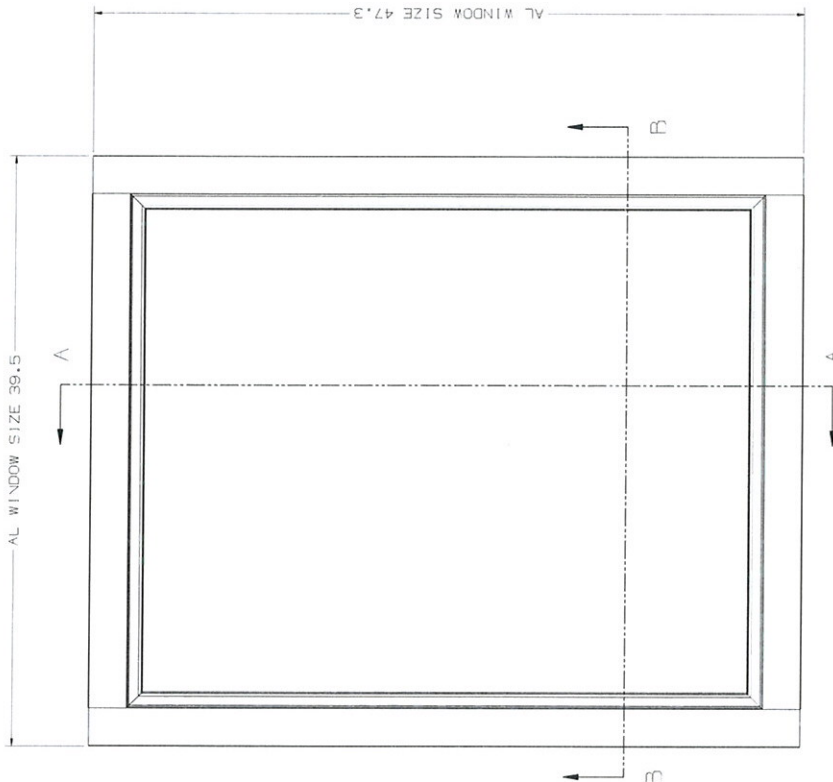


Test sample complies with these details.
Deviations are noted.

Report # **D8934**

Date **11/12/14** Tech **CAF**

DESIGN REVISIONS	NEXT ASSEMBLY	DATE	BY	APP'D	DATE	BY	APP'D
		SEP 16, 2014			SEP 16, 2014		
DO NOT SCALE DRAWING	SCALE	TOLERANCES UNLESS SHOWN	UNITS	ANGLE UNLESS SHOWN	PROJECTION	STANDARD	UNIT
	4	0.005, 0.010, 0.020, 0.050, 0.100, 0.200, 0.500, 1.000, 2.000, 5.000, 10.000	INCHES	DEGREES	1ST ANGLE	ANSI	IN
THIRD ANGLE PROJECTION	INTERPRET PER ASME Y14.5	NULL UNLESS SHOWN	UNLESS SHOWN	UNLESS SHOWN	UNLESS SHOWN	UNLESS SHOWN	UNLESS SHOWN
DATE TESTED	TESTING LOCATION	TESTING METHOD	TESTING EQUIPMENT	TESTING PERSONNEL	TESTING RESULTS	TESTING COMMENTS	TESTING CONCLUSION
11/12/14	ARCHITECTURAL TESTING	3M	3M	3M	3M	3M	3M
DOUBLE PANE WINDOW TEST FRAME SAFETY FILM CLEAR UL AND IPA							1 OF 2 SHEET 1 OF 2

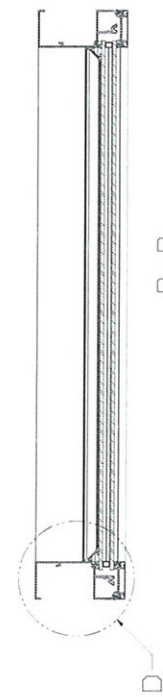


Architectural Testing

Test sample complies with these details.
Deviations are noted.

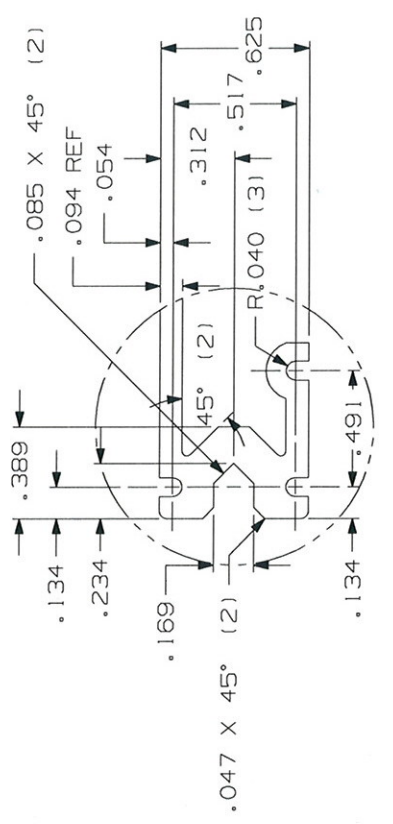
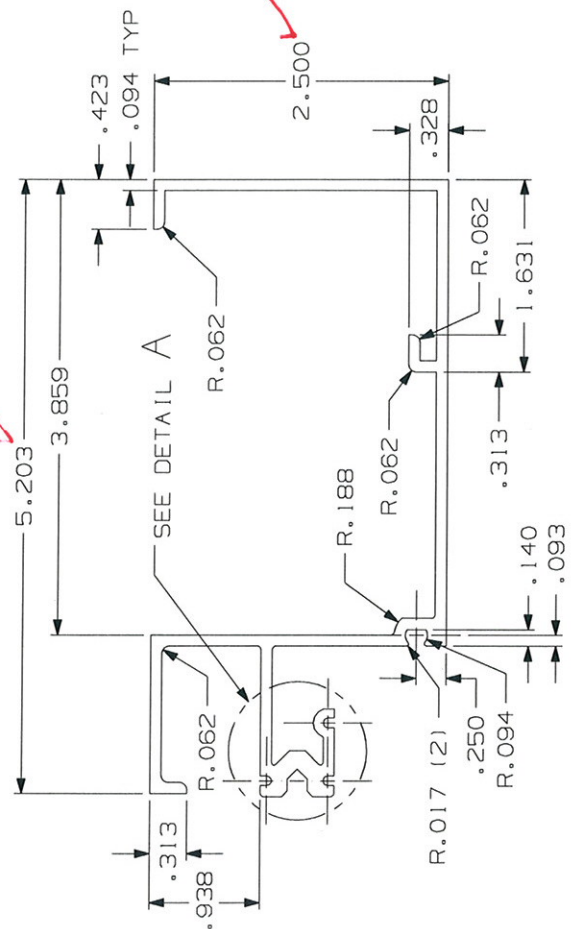
Report # **D8934**

Date **11/12/14** Tech **CR**



REV.	DATE	DESCRIPTION	BY	CHKD.
1	SEP 16, 2014			
2	SEP 18, 2014			

DO NOT SCALE DRAWING	SCALE: 1/4" = 1'-0"	UNITS: INCHES	TOLERANCES: UNLESS OTHERWISE SPECIFIED
THIRD ANGLE PROJECTION	INTERPRET PER ASME Y14.5-2009	NULL MULTIPLY	0.000, 0.005, 0.010, 0.020, 0.050, 0.100, 0.150, 0.250, 0.500, 1.000, 2.000, 5.000, 10.000
DATE: 11/12/14	PROJECT: 394-14177-3 ULTRA-1PP	NO. OF SHEETS: 1	SHEET NO.: 1 OF 2
DESIGNER: [Redacted]	CHECKED: [Redacted]	DATE: 11/12/14	BY: [Redacted]
<p>3M DOUBLE PANE WINDOW UNIT WITH 3M CLEAR ULTRA-1PP FILM</p>			
<p>MODEL: D ASSY DOUBLE 394-14177-3 ULTRA-1PP</p>			



- NOTES:
1. REFERENCE DRAWING ONLY.
 2. PART NUMBER: WW-401.
 3. PART SUPPLIER: OLD CASTLE BUILDING ENVELOPE.
WWW.OLDCASTLE.COM.



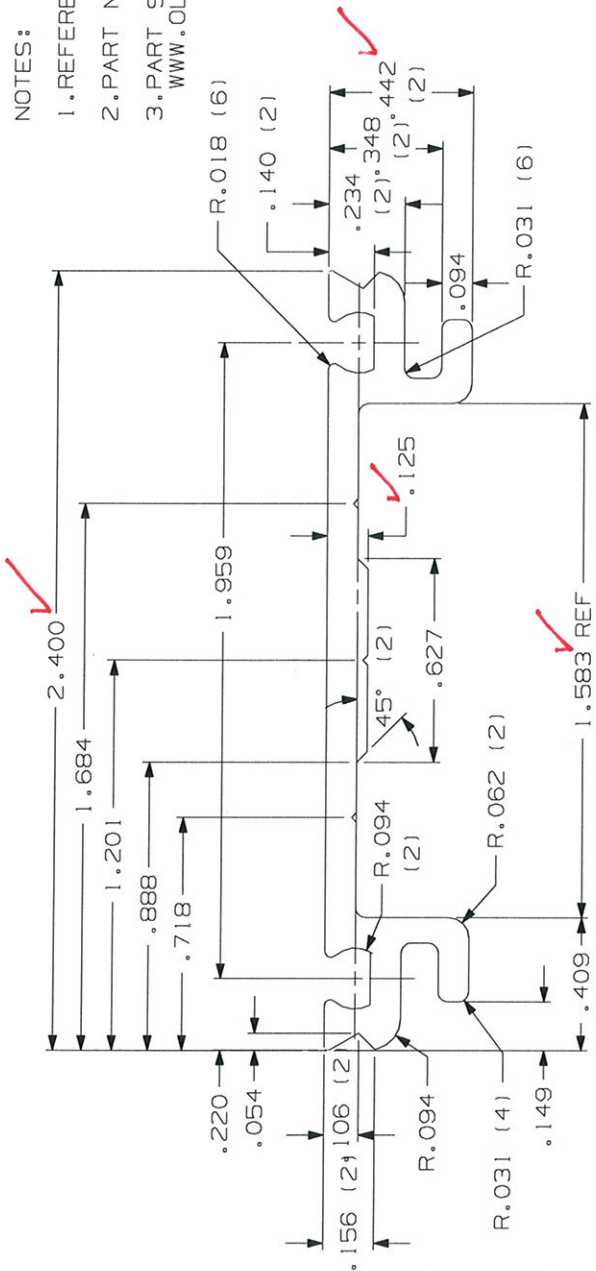
Test sample complies with these details.
Deviations are noted.

Report # **08934**
Date **11/2/14** Tech **CR**

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		OCT 16, 2014		
DRFT	L.SCHLEIF	DATE	DATE	
CHKD		OCT 16, 2014	DATE	
		DATE	DATE	
		APPL		
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3M Center St. Paul, MN 55144				
TITLE: HEAD - WW - 401				
DESIGN REFERENCE NEXT ASSEMBLY				
ACCESS CODES				
DIVISION				
DO NOT SCALE DRAWING				
SCALE				
THIRD ANGLE PROJECTION				
INTERPRET PER ASME Y14.5 - 2009				
MAX SURFACE ROUGHNESS				
<input type="checkbox"/> ALL SURFACES				
<input checked="" type="checkbox"/> MARKED ONLY				
TOLERANCES EXCEPT AS NOTED				
INCHES				
MILLIMETERS				
ANGLES : 0.1°				
CASE SIZE DRAWING NO.				
NUMBER B				
MODEL				
DET. LISTS <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO SHT 1 OF 1				

NOTES:

1. REFERENCE DRAWING ONLY.
2. PART NUMBER: WW-162.
3. PART SUPPLIER: OLD CASTLE BUILDING ENVELOPE.
WWW.OLDCASTLE.COM.

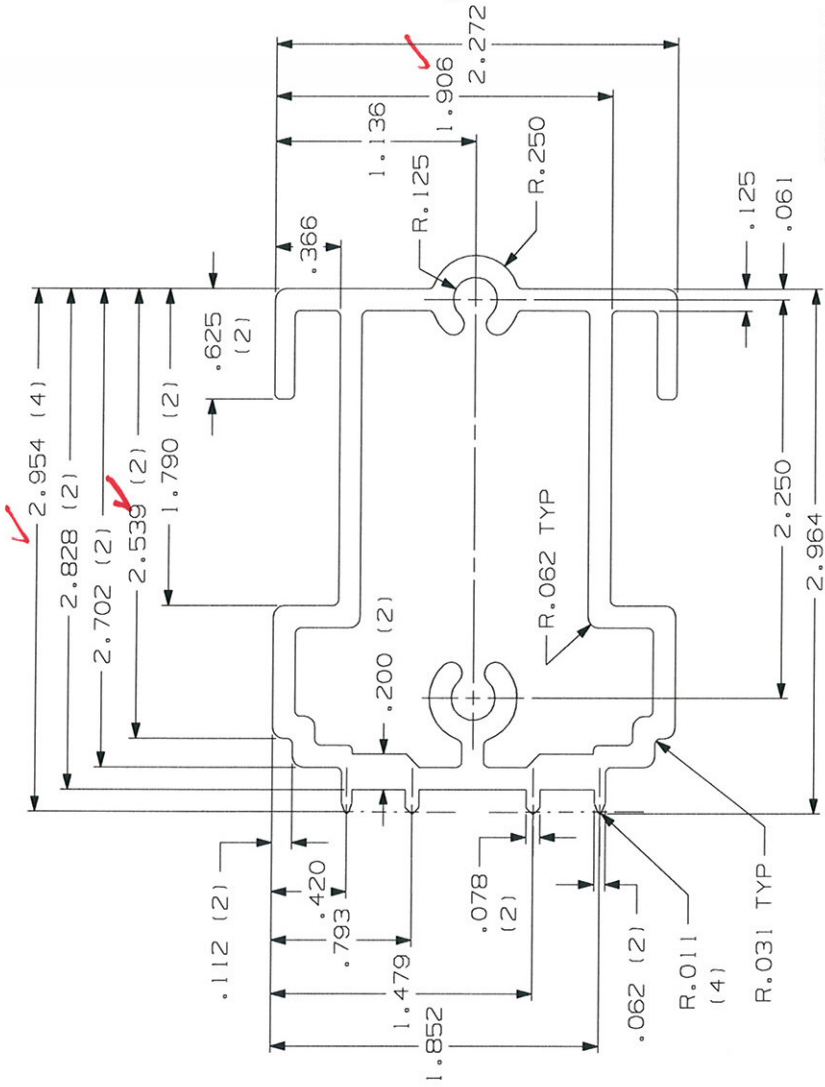


Test sample complies with these details.
Deviations are noted.

Report # D8934
Date 11/2/14 Tech Car

DESIGN REFERENCE	NEXT ASSEMBLY	REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD	
ADDRESS CODES		DATE	DATE	DATE	DATE	DATE	
DIVISION	DIVISION CODE	3M	3M Center	3M	3M	3M	
DO NOT SCALE DRAWING	SCALE	3M Center		3M		3M	
	1/2	St. Paul, MN 55144		This document and the information it contains are the property of 3M. It is not to be distributed, copied, or used for other than the authorized purposes. All rights reserved.		© 3M COPYRIGHT 2014	
THIRD ANGLE PROJECTION	INTERPRET PER ASME Y14.5 - 2009	TITLE		PRESS PLT WW-162			
MAX SURFACE ROUGHNESS 10	<input checked="" type="checkbox"/> ALL SURFACES MARKED ONLY	CAGE NUMBER	SIZE	DRAWING NO.	REV.		
		B			I		
		MODEL	LISTS	YES	NO	SHT	1 OF 1

- NOTES:
1. REFERENCE DRAWING ONLY.
 2. PART NUMBER: WW-181-01.
 3. PART SUPPLIER: OLD CASTLE BUILDING ENVELOPE.
WWW.OLDCASTLE.COM.



Test sample complies with these details.
Deviations are noted.

Report # **D8934-01**

Date **11/12/14** Tech **CB**

DESIGN REFERENCE	NEXT ASSEMBLY	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
ACCESS CODES		L.SCHLEIF	DATE OCT 16, 2014	DATE	
DIVISION	DIVISION CODE	CHKD	DATE	DATE	
DO NOT SCALE DRAWING	SCALE	© 3M COPYRIGHT 2014 This document and the information it contains are the property of 3M Intellectual Property. No other information may be disclosed without 3M permission for use or distribution other than for 3M authorized purposes. All rights reserved.			
THIRD ANGLE PROJECTION	INTERPRET PER ASME Y14.5 - 2009	3M Center St. Paul, MN 55144			
MAX SURFACE ROUGHNESS	10	TITLE SHR BLK JAM & MULLS-WW-181-01			
<input checked="" type="checkbox"/> ALL SURFACES MARKED ONLY	ANGLES : 0.1°	CAGE NUMBER	SIZE	DRAWING NO.	REV.
		B			I
		MODEL	DET. LISTS	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	SHT 1 OF 1

