ASTM F1642-04 / GSA TS01 TEST REPORT

Report No.: D8934.02-119-12

Rendered to:

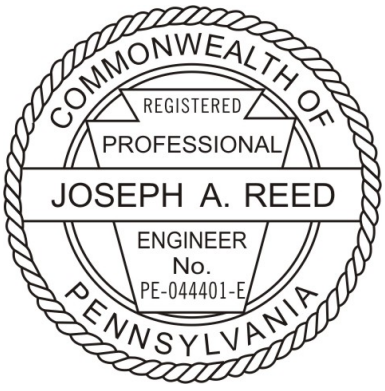
3M COMPANY
St. Paul, Minnesota

PRODUCT TYPE:
Fragment Retention Film on 1" Double Pane Glass with Film Attachment System

SERIES/MODEL:
3M™ Scotchshield™ Ultra S800 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



Digitally Signed by: Joseph A. Reed
2014.11.13 09:58:56 -05'00'

Test Completion Date:	08/27/14
Report Date:	11/13/14
Test Record Retention Date:	08/27/18

130 Derry Court
York, PA 17406

www.archtest.com . www.intertek.com/building

p. 717.764.7700
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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	8.81 psi	59 psi-msec	14.48 msec	3A	Minimal Hazard	Minimal Hazard (H2)
2		8.79 psi	58 psi-msec	14.66 msec	3A	Minimal Hazard	
3		9.03 psi	60 psi-msec	15.64 msec	2	No Hazard	
4		6.50 psi	40 psi-msec	12.62 msec	3A	Very Low Hazard	N/A
5		9.92 psi	84 psi-msec	-- [1]	5	High Hazard	
6	IPA	9.82 psi	78 psi-msec	16.18 msec	2	No Hazard	No Hazard (H1)
7		9.68 psi	80 psi-msec	19.49 msec	2	No Hazard	
8		10.43 psi	90 psi-msec	17.24 msec	4	Low Hazard	
9		10.74 psi	89 psi-msec	17.48 msec	2	No Hazard	
10		10.36 psi	78 psi-msec	-- [1]	2	Minimal Hazard	N/A

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

Reference must be made to Report No. D8934.02-119-12, 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 System

3.2 Series/Model: 3M™ Scotchshield™ Ultra S800 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: 07/23/2014 - 08/27/2014

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:

Name	Company
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 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	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 an 8 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), a 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	85°F
Glazing Temperature	85°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**3A**

Peak Positive Pressure	
Top Pressure	9.19 psi
Right Pressure	9.11 psi
Shell Pressure	8.14 psi
Average Pressure	8.81 psi
Witness Chamber Pressure	0.44 psi

Peak Positive Phase Duration	
Top Duration	16.16 msec
Right Duration	13.95 msec
Shell Duration	13.33 msec
Average Duration	14.48 msec

Peak Positive Phase Impulse	
Top Impulse	59 psi*msec
Right Impulse	60 psi*msec
Shell Impulse	59 psi*msec
Average Impulse	59 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	12-1/2" along head
Glazing Tearing	1" 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 #2:

Description	Results
Ambient Temperature	87°F
Glazing Temperature	88°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**3A**

Peak Positive Pressure	
Top Pressure	9.00 psi
Right Pressure	9.20 psi
Shell Pressure	8.17 psi
Average Pressure	8.79 psi
Witness Chamber Pressure	0.36 psi

Peak Positive Phase Duration	
Top Duration	14.98 msec
Right Duration	14.60 msec
Shell Duration	14.40 msec
Average Duration	14.66 msec

Peak Positive Phase Impulse	
Top Impulse	58 psi*msec
Right Impulse	58 psi*msec
Shell Impulse	58 psi*msec
Average Impulse	58 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	6" at lower left
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 #3:

Description	Results
Ambient Temperature	80°F
Glazing Temperature	79°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	9.41 psi
Right Pressure	9.31 psi
Shell Pressure	8.36 psi
Average Pressure	9.03 psi
Witness Chamber Pressure	1.02 psi

Peak Positive Phase Duration	
Top Duration	14.97 msec
Right Duration	16.83 msec
Shell Duration	15.13 msec
Average Duration	15.64 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	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 #4:

Description	Results
Ambient Temperature	81°F
Glazing Temperature	81°F
ASTM Hazard Rating	**Very Low Hazard**
GSA Performance Condition	**3A**

Peak Positive Pressure	
Top Pressure	6.46 psi
Right Pressure	6.98 psi
Shell Pressure	6.07 psi
Average Pressure	6.50 psi
Witness Chamber Pressure	0.36 psi

Peak Positive Phase Duration	
Top Duration	12.28 msec
Right Duration	13.69 msec
Shell Duration	12.88 msec
Average Duration	12.62 msec

Peak Positive Phase Impulse	
Top Impulse	40 psi*msec
Right Impulse	40 psi*msec
Shell Impulse	40 psi*msec
Average Impulse	40 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	24-1/2" along sill and 15" along head
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	89°F
Glazing Temperature	92°F
ASTM Hazard Rating	**High Hazard**
GSA Performance Condition	**5**

Peak Positive Pressure	
Top Pressure	10.01 psi
Right Pressure	10.12 psi
Shell Pressure	9.63 psi
Average Pressure	9.92 psi
Witness Chamber Pressure	0.66 psi

Peak Positive Phase Duration	
Top Duration	-- [1]
Right Duration	-- [1]
Shell Duration	-- [1]
Average Duration	-- [1]

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

Peak Positive Phase Impulse	
Top Impulse	84 psi*msec
Right Impulse	85 psi*msec
Shell Impulse	84 psi*msec
Average Impulse	84 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 at the panel. Glazing lite impacted panel and penetrated into the second layer of 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	81°F
Glazing Temperature	80°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	10.21 psi
Right Pressure	10.28 psi
Shell Pressure	8.97 psi
Average Pressure	9.82 psi
Witness Chamber Pressure	0.45 psi

Peak Positive Phase Duration	
Top Duration	-- [1]
Right Duration	16.33 msec
Shell Duration	16.07 msec
Average Duration	16.18 msec

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

Peak Positive Phase Impulse	
Top Impulse	78 psi*msec
Right Impulse	78 psi*msec
Shell Impulse	78 psi*msec
Average Impulse	78 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 #7:

Description	Results
Ambient Temperature	84°F
Glazing Temperature	83°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	10.01 psi
Right Pressure	10.18 psi
Shell Pressure	8.84 psi
Average Pressure	9.68 psi
Witness Chamber Pressure	0.43 psi

Peak Positive Phase Duration	
Top Duration	-- [1]
Right Duration	19.68 msec
Shell Duration	19.30 msec
Average Duration	19.49 msec

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

Peak Positive Phase Impulse	
Top Impulse	82 psi*msec
Right Impulse	79 psi*msec
Shell Impulse	79 psi*msec
Average Impulse	80 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 #8:

Description	Results
Ambient Temperature	86°F
Glazing Temperature	87°F
ASTM Hazard Rating	**Low Hazard**
GSA Performance Condition	**4**

Peak Positive Pressure	
Top Pressure	10.79 psi
Right Pressure	10.48 psi
Shell Pressure	10.01 psi
Average Pressure	10.43 psi
Witness Chamber Pressure	0.66 psi

Peak Positive Phase Duration	
Top Duration	19.11 msec
Right Duration	16.41 msec
Shell Duration	16.21 msec
Average Duration	17.24 msec

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

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	6" at upper right corner

Witness Chamber Results
Sum total united dimension of fragments on witness panel floor between 1m and 3m from the specimen was >10".

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	87°F
Glazing Temperature	88°F
ASTM Hazard Rating	**No Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	10.95 psi
Right Pressure	11.08 psi
Shell Pressure	10.18 psi
Average Pressure	10.74 psi
Witness Chamber Pressure	0.74 psi

Peak Positive Phase Duration	
Top Duration	16.42 msec
Right Duration	18.54 msec
Shell Duration	-- [1]
Average Duration	17.48 msec

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

Peak Positive Phase Impulse	
Top Impulse	89 psi*msec
Right Impulse	89 psi*msec
Shell Impulse	89 psi*msec
Average Impulse	89 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 #10:

Description	Results
Ambient Temperature	89°F
Glazing Temperature	90°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**2**

Peak Positive Pressure	
Top Pressure	10.57 psi
Right Pressure	10.64 psi
Shell Pressure	9.86 psi
Average Pressure	10.36 psi
Witness Chamber Pressure	0.42 psi

Peak Positive Phase Duration	
Top Duration	-- [1]
Right Duration	-- [1]
Shell Duration	-- [1]
Average Duration	-- [1]

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

Peak Positive Phase Impulse	
Top Impulse	78 psi*msec
Right Impulse	78 psi*msec
Shell Impulse	78 psi*msec
Average Impulse	78 psi*msec

Glazing Response	
Exterior Lite	Shattered
Interior Lite	Fractured
Glazing Pullout Length and Location	None
Glazing Tearing	3/4" long and 1" long

Witness Chamber Results
No debris was observed.

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

8.0 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.:

Digitally Signed by: Emily C. Riley

Emily C. Riley - Project Manager
Structural Systems Testing

Digitally Signed by: Joseph A. Reed

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

ECR/jar:jas

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

- Appendix A - Test Facility (1)
- Appendix B - Pressure Time Plots (20)
- Appendix C - Photographs (25)
- Appendix D - Drawings (9)

Revision Log

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

APPENDIX A

Test Facility

Figure #1
Shock Tube and Test Facility

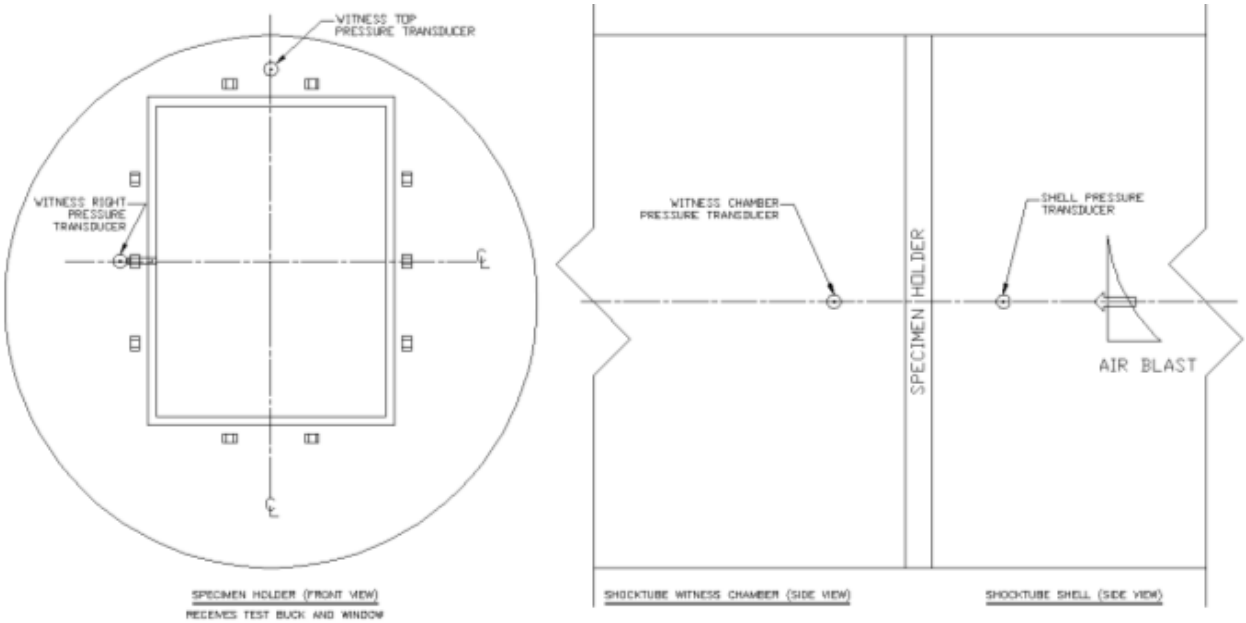
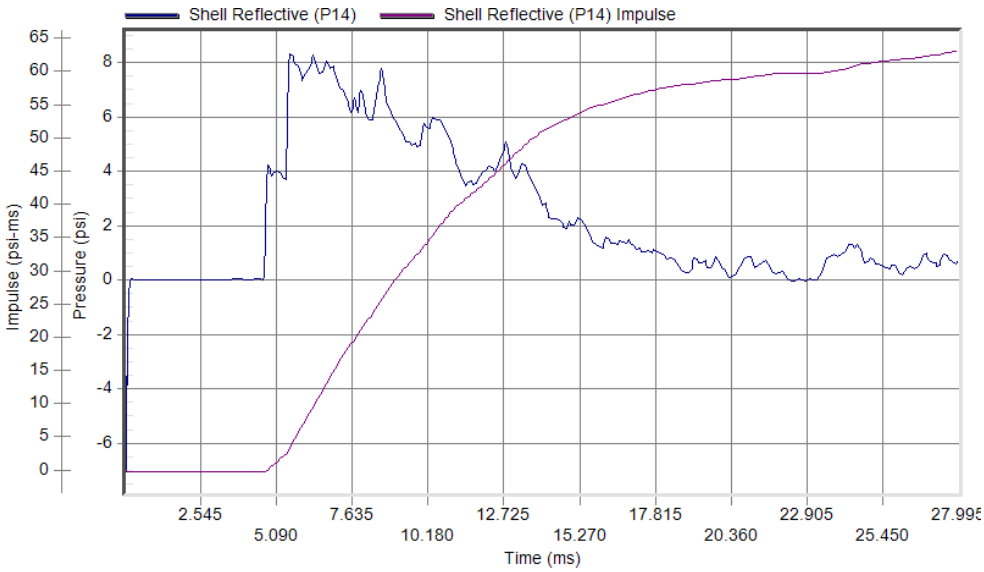


Figure #2
Pressure Sensor Locations

APPENDIX B

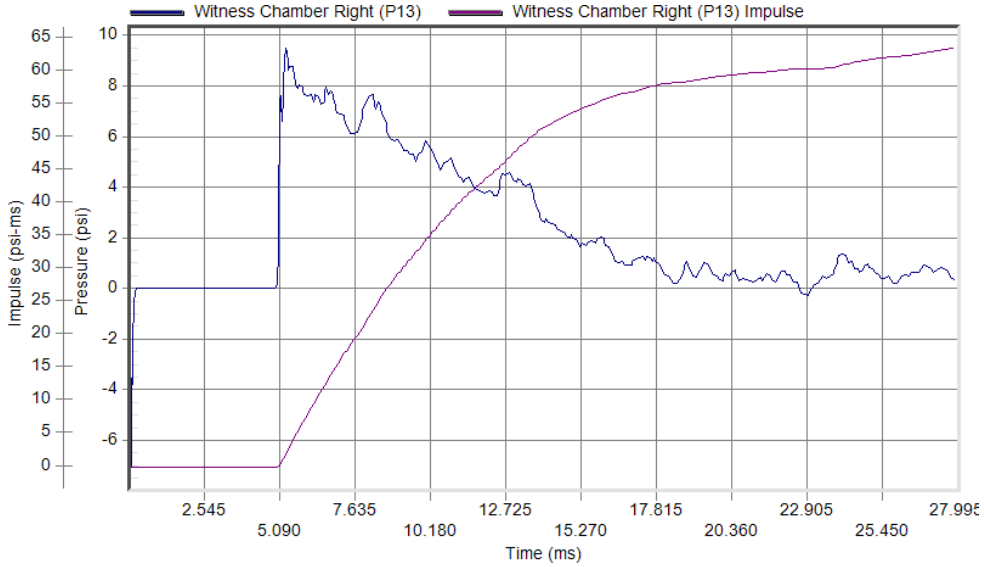
Pressure Time Plots

Specimen #1



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

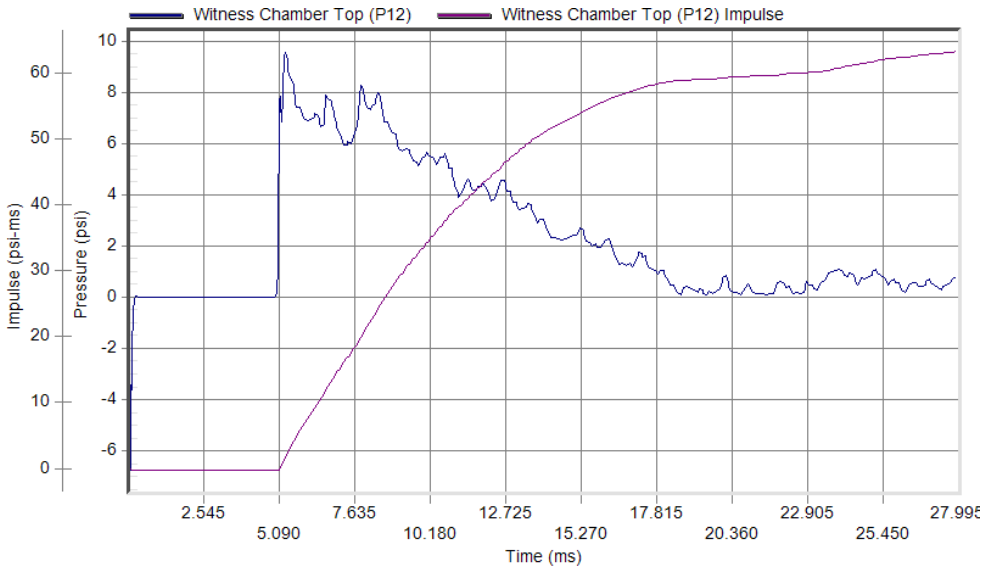
Test Date: 7/25/2014
Test Time: 9:05 am



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

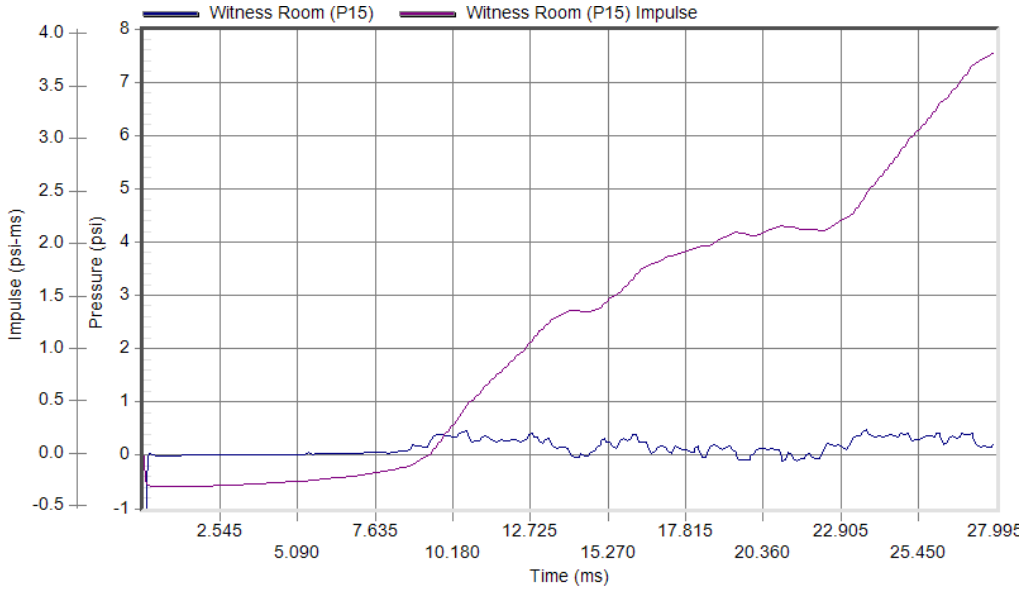
Test Date: 7/25/2014
Test Time: 9:05 am

Specimen #1: (Continued)



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

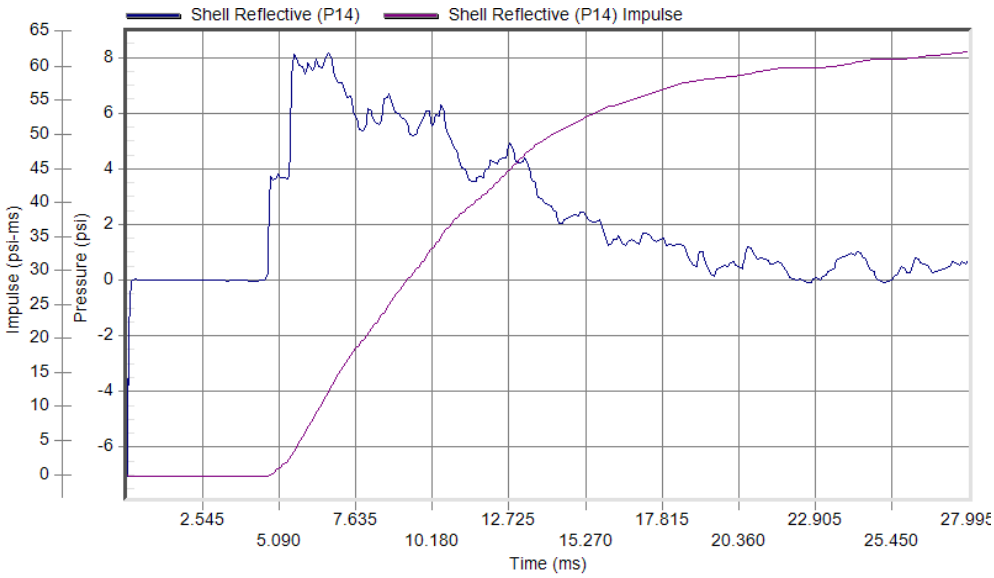
Test Date: 7/25/2014
Test Time: 9:05 am



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

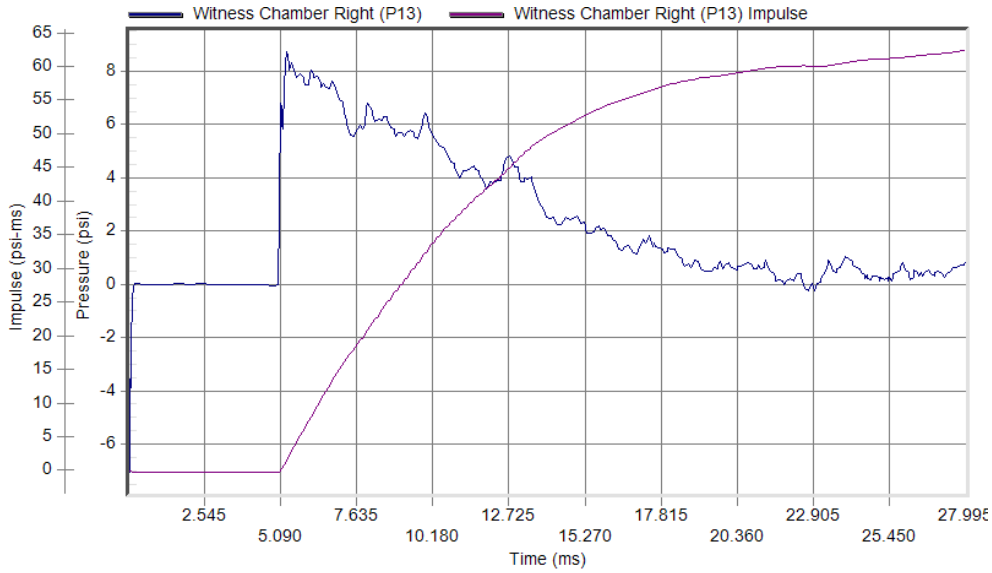
Test Date: 7/25/2014
Test Time: 9:05 am

Specimen #2



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

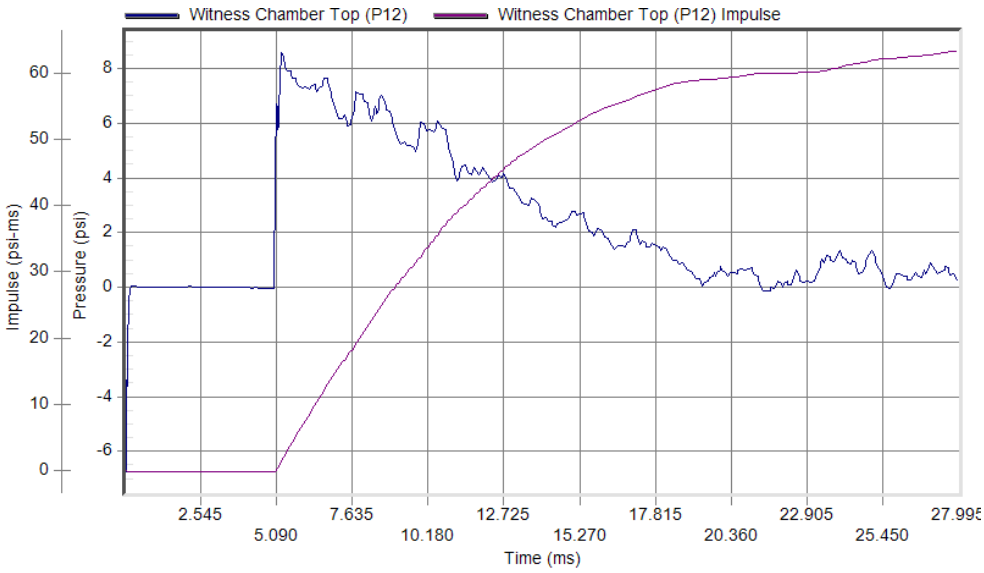
Test Date: 8/4/2014
Test Time: 2:58 pm



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

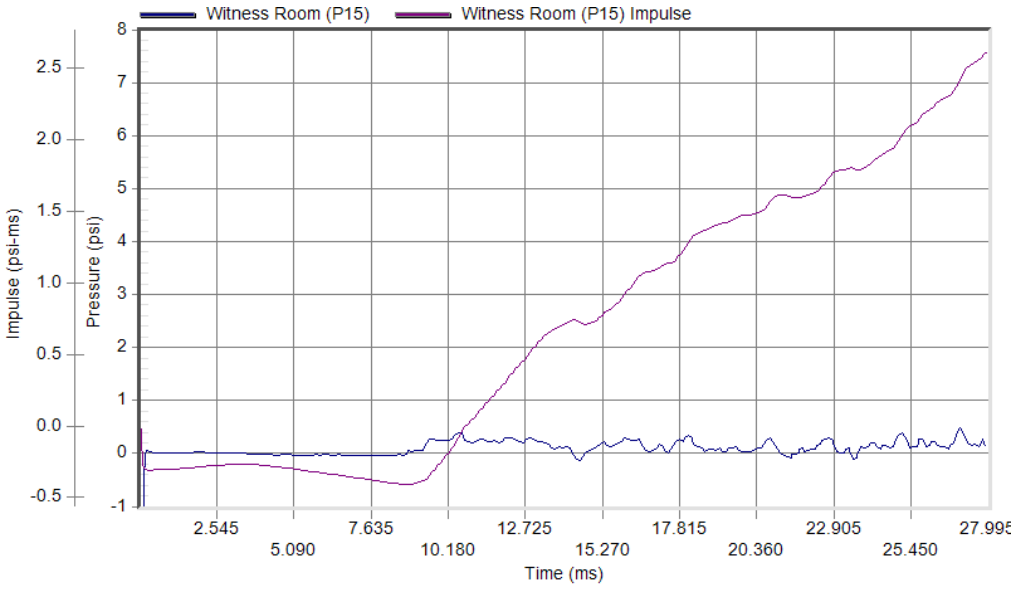
Test Date: 8/4/2014
Test Time: 2:58 pm

Specimen #2: (Continued)



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

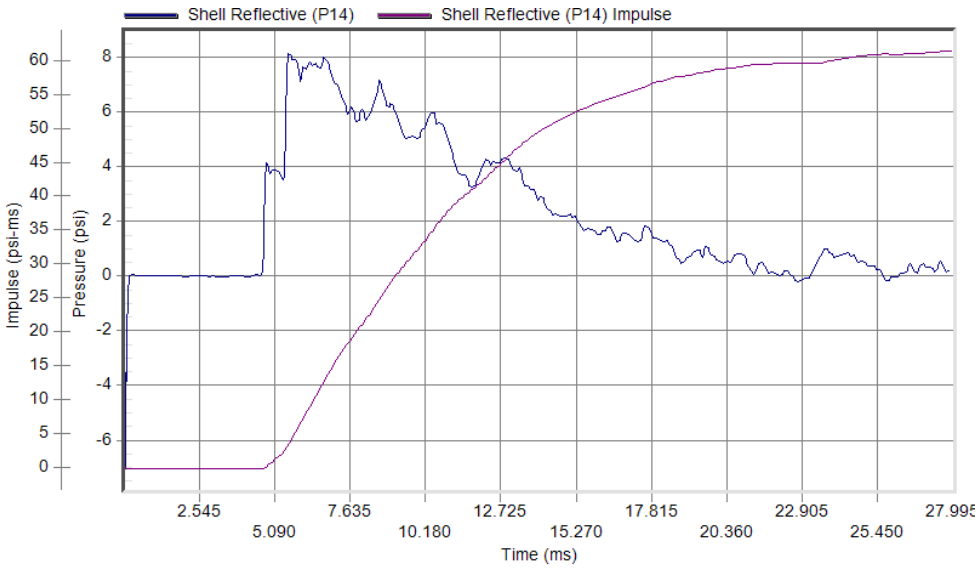
Test Date: 8/4/2014
Test Time: 2:58 pm



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

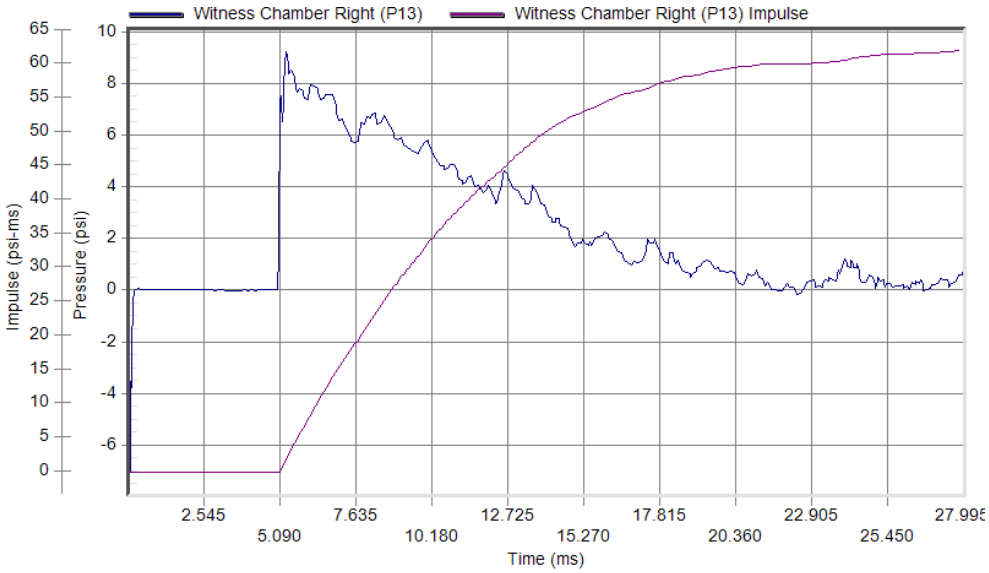
Test Date: 8/4/2014
Test Time: 2:58 pm

Specimen #3



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

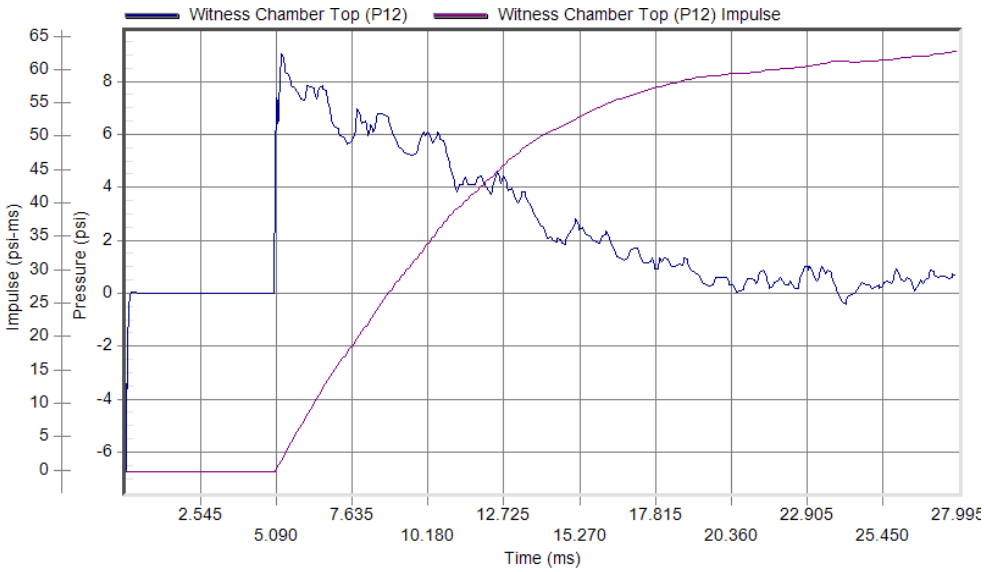
Test Date: 8/4/2014
Test Time: 11:57 am



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

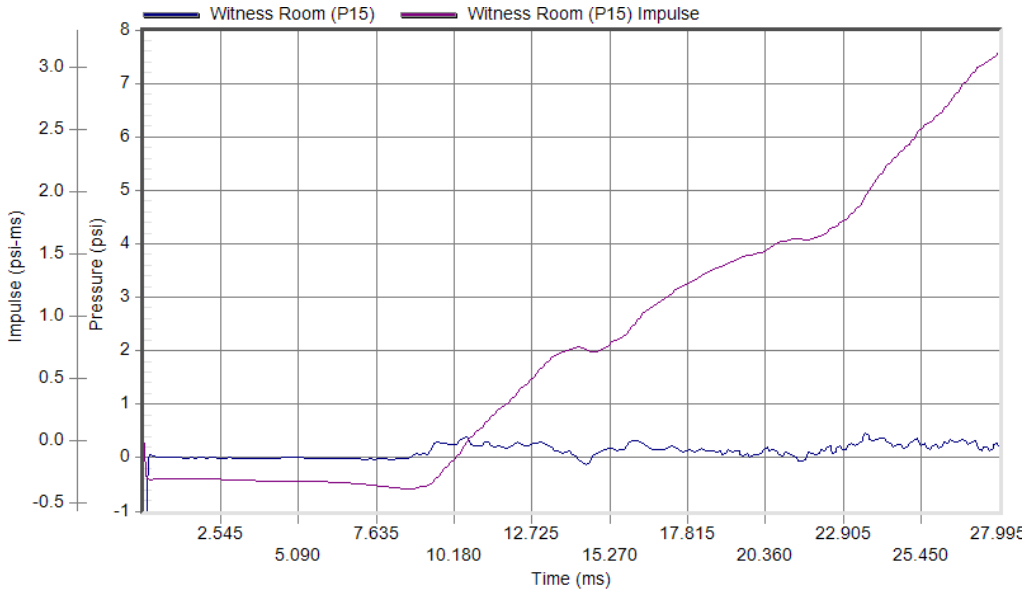
Test Date: 8/4/2014
Test Time: 11:57 am

Specimen #3: (Continued)



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

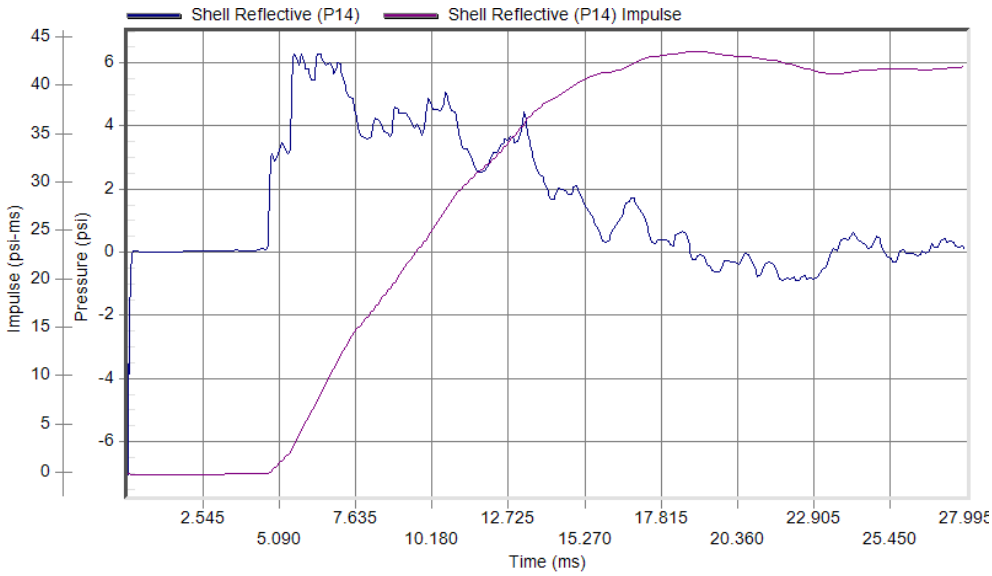
Test Date: 8/4/2014
Test Time: 11:57 am



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

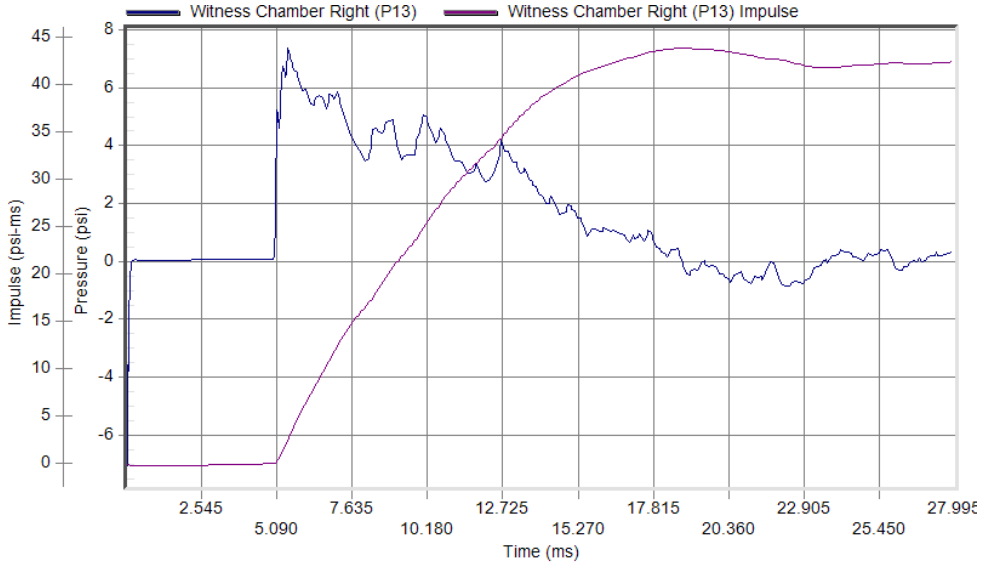
Test Date: 8/4/2014
Test Time: 11:57 am

Specimen #4



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

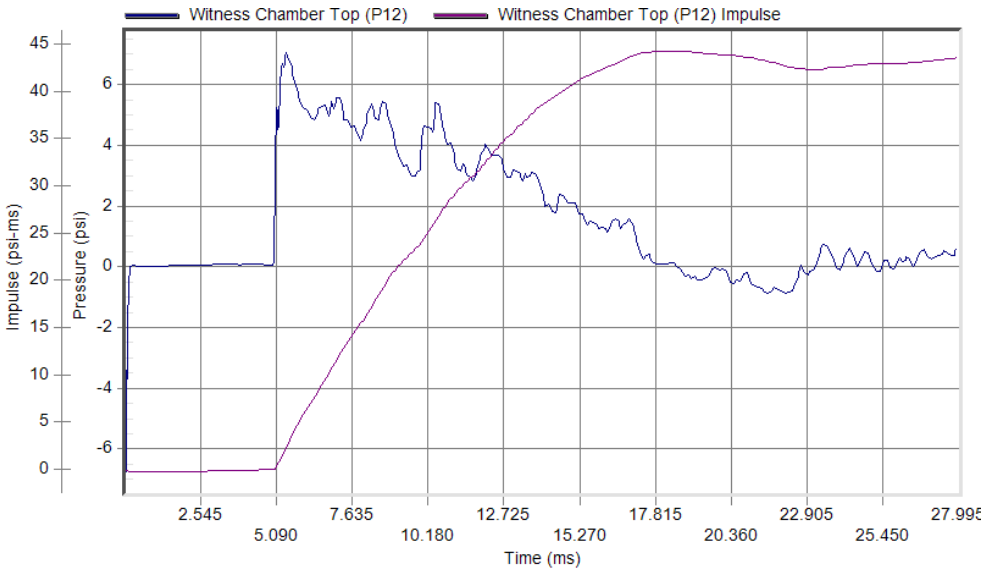
Test Date: 7/24/2014
Test Time: 2:32 pm



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

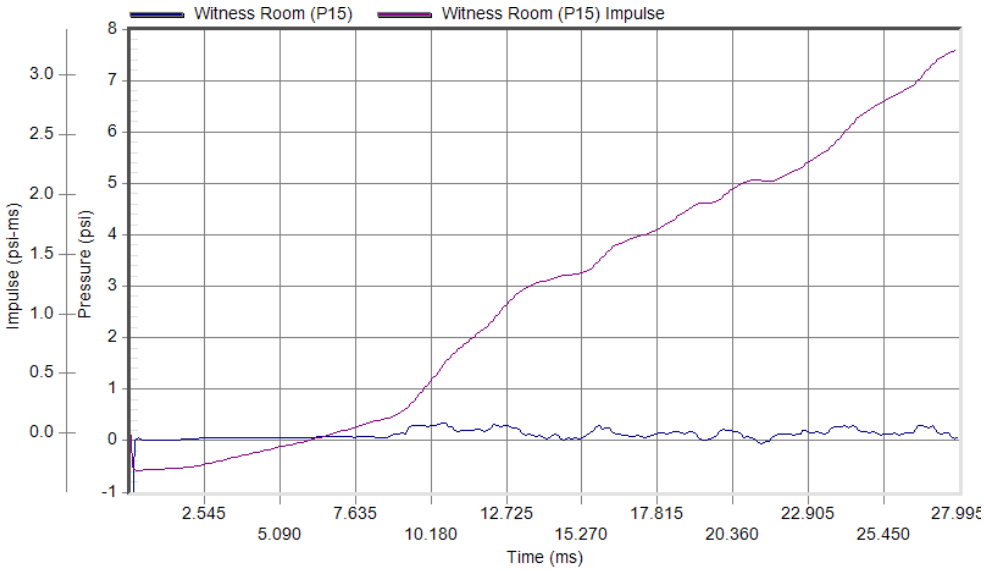
Test Date: 7/24/2014
Test Time: 2:32 pm

Specimen #4: (Continued)



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

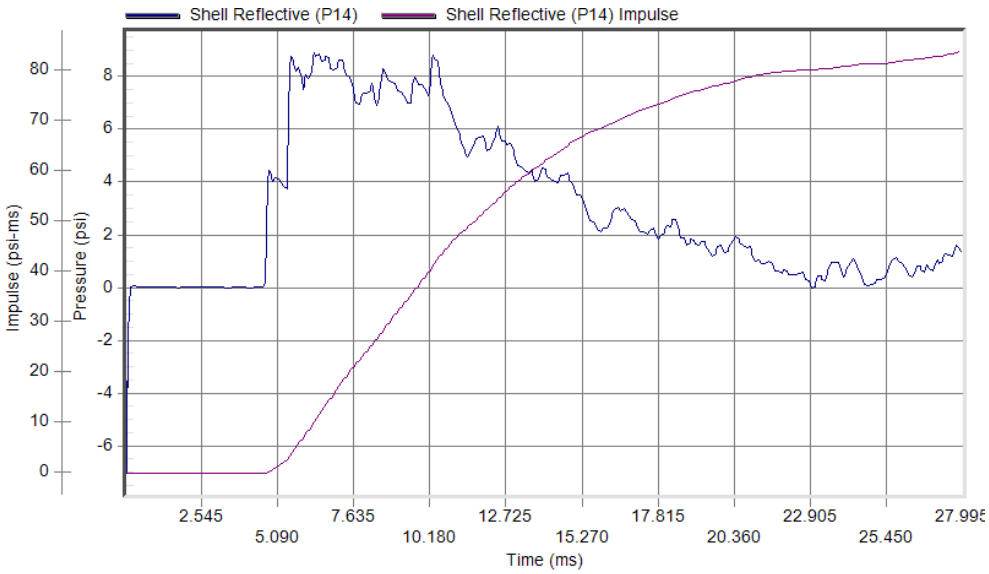
Test Date: 7/24/2014
Test Time: 2:32 pm



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

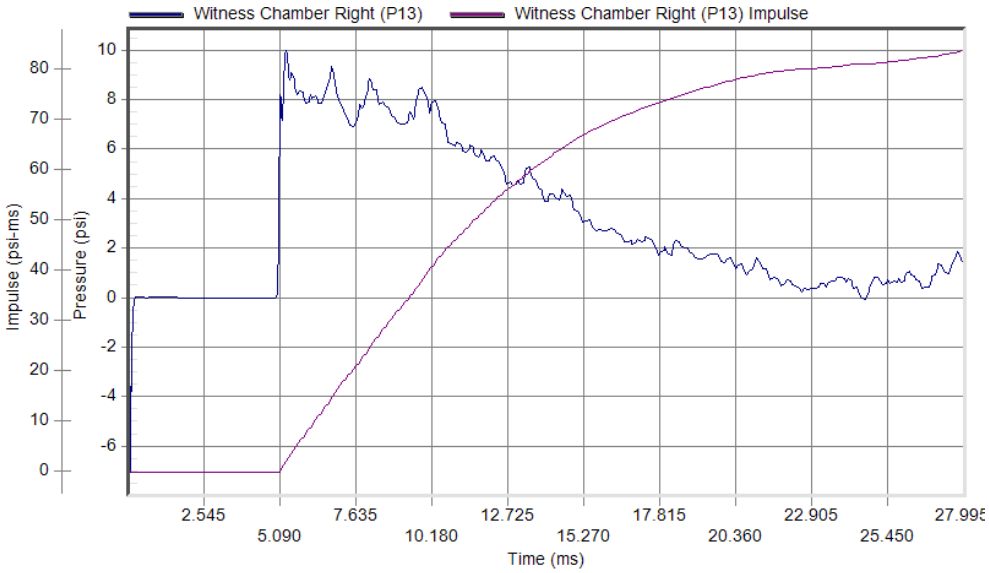
Test Date: 7/24/2014
Test Time: 2:32 pm

Specimen #5



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

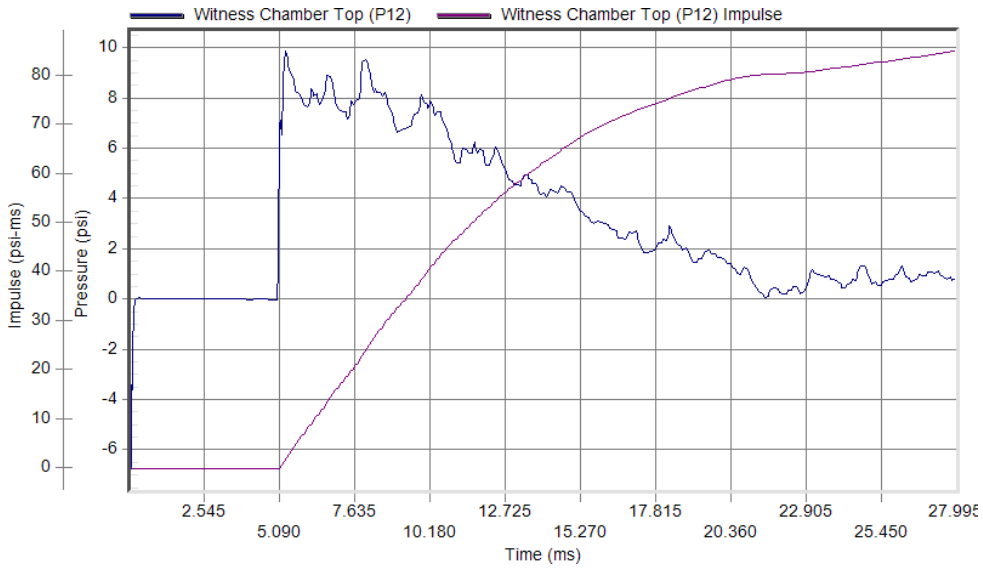
Test Date: 8/6/2014
Test Time: 10:15 am



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

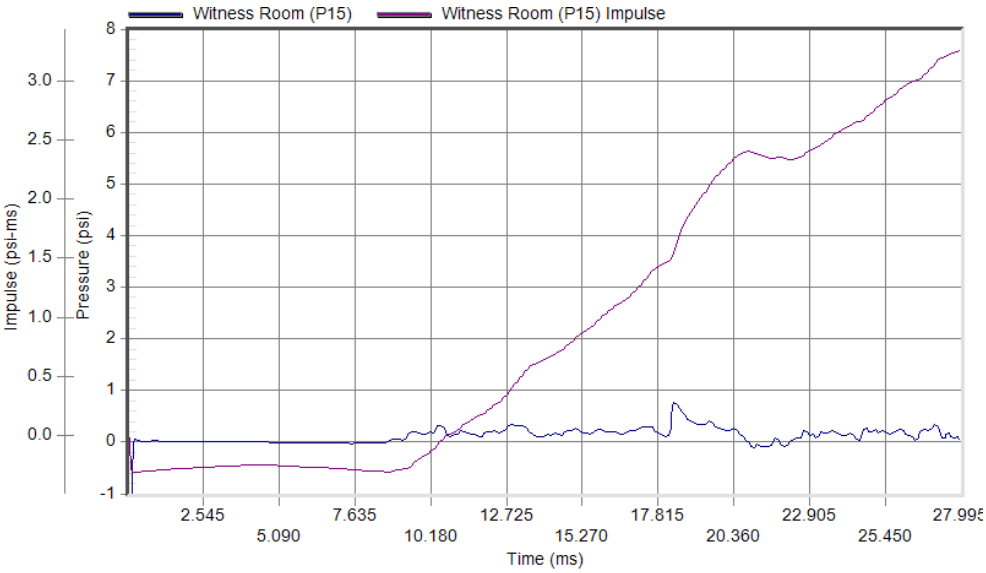
Test Date: 8/6/2014
Test Time: 10:15 am

Specimen #5: (Continued)



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

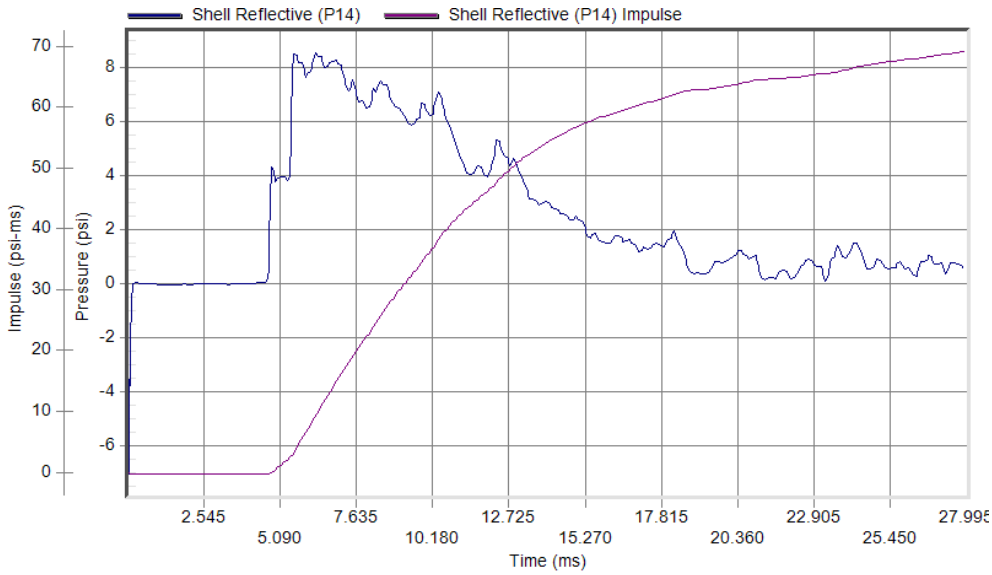
Test Date: 8/6/2014
Test Time: 10:15 am



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

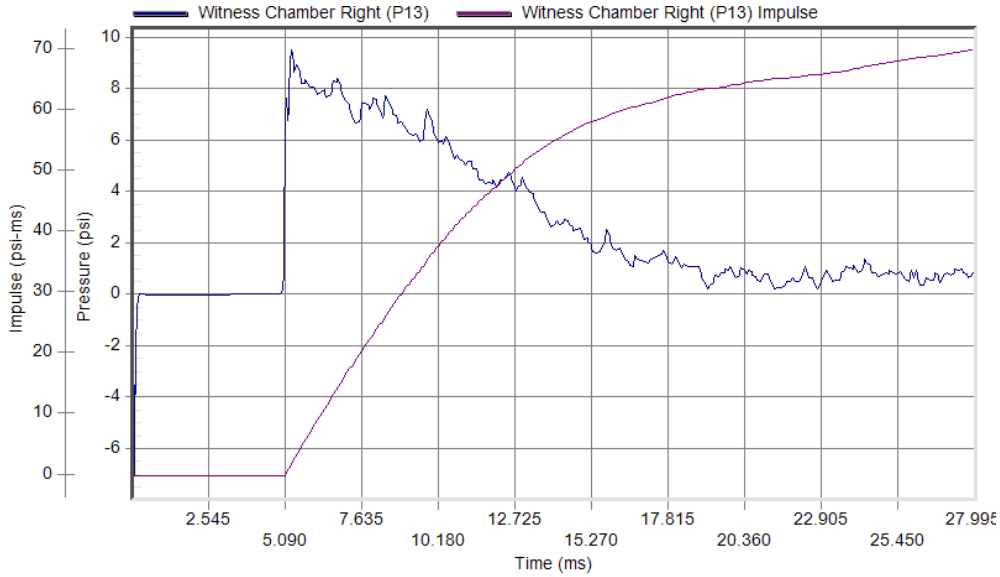
Test Date: 8/6/2014
Test Time: 10:15 am

Specimen #6



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

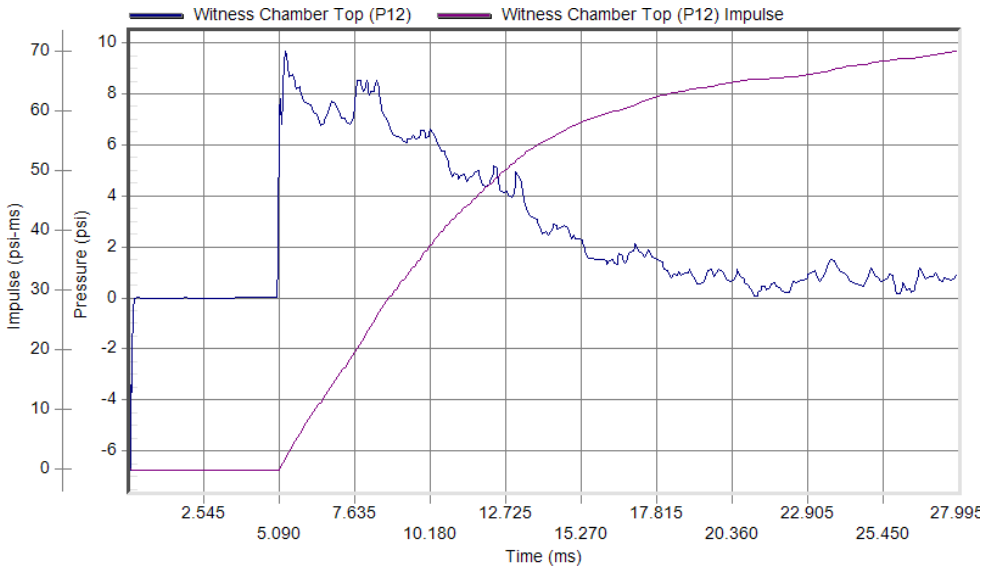
Test Date: 8/27/2014
Test Time: 2:43 pm



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

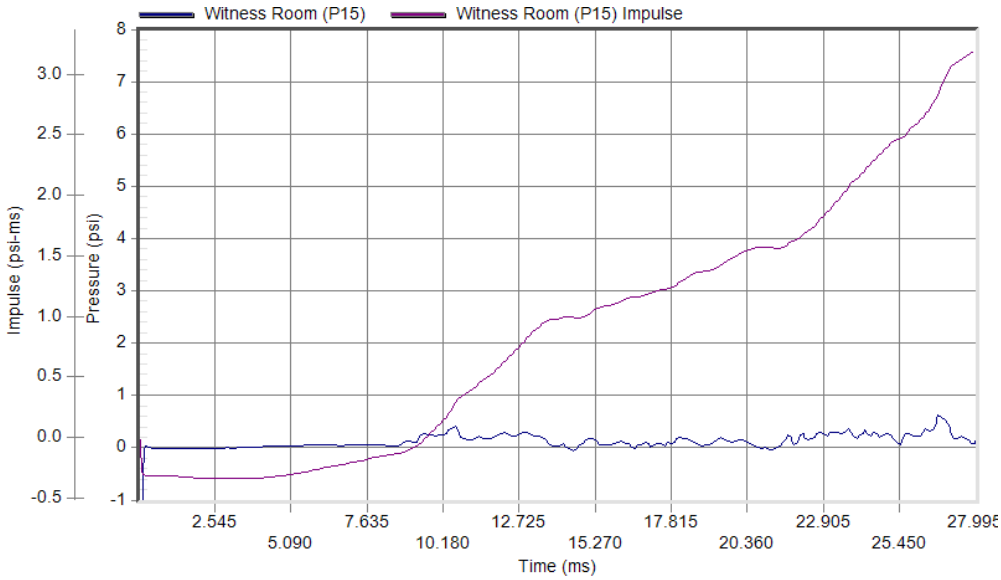
Test Date: 8/27/2014
Test Time: 2:43 pm

Specimen #6: (Continued)



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

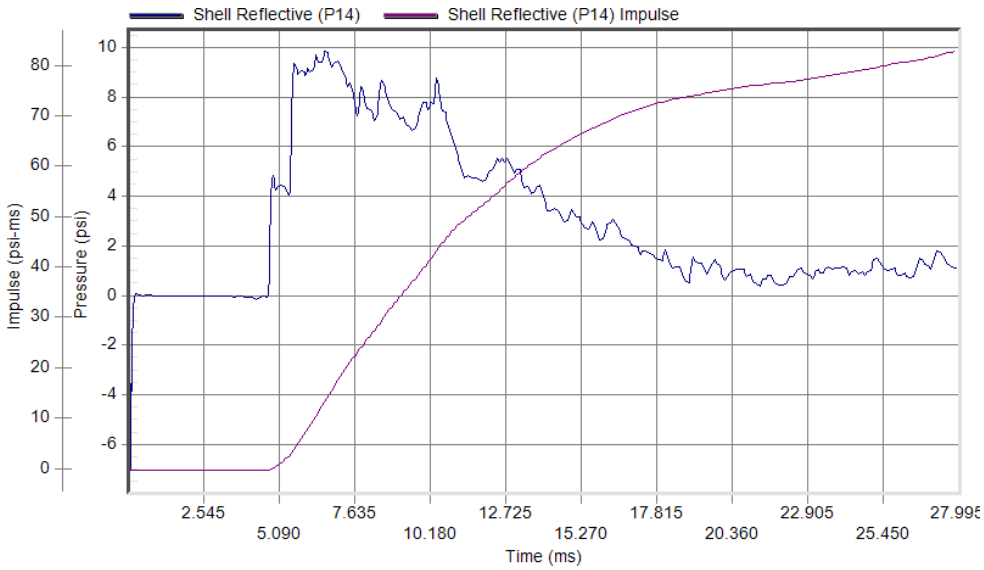
Test Date: 8/27/2014
Test Time: 2:43 pm



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

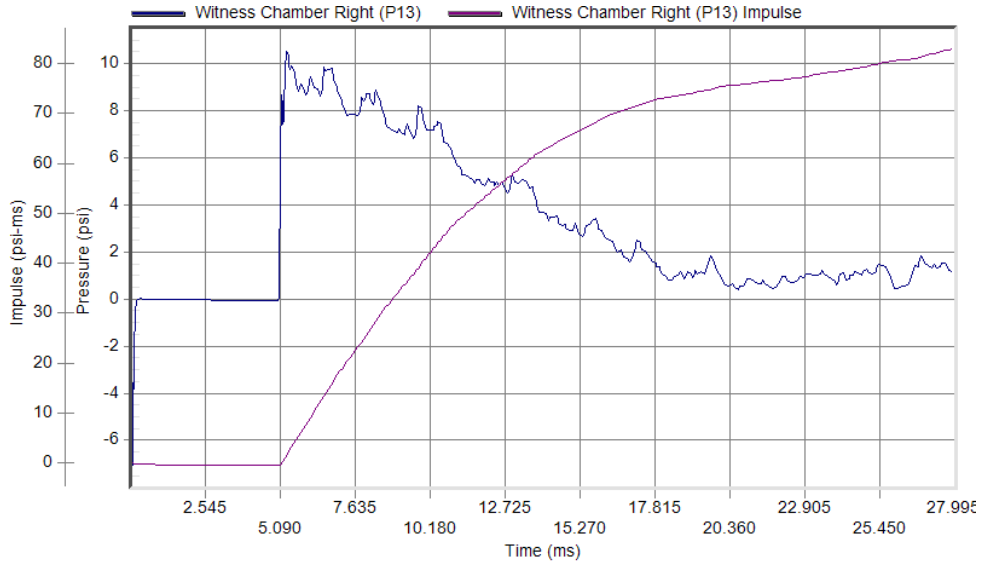
Test Date: 8/27/2014
Test Time: 2:43 pm

Specimen #7



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

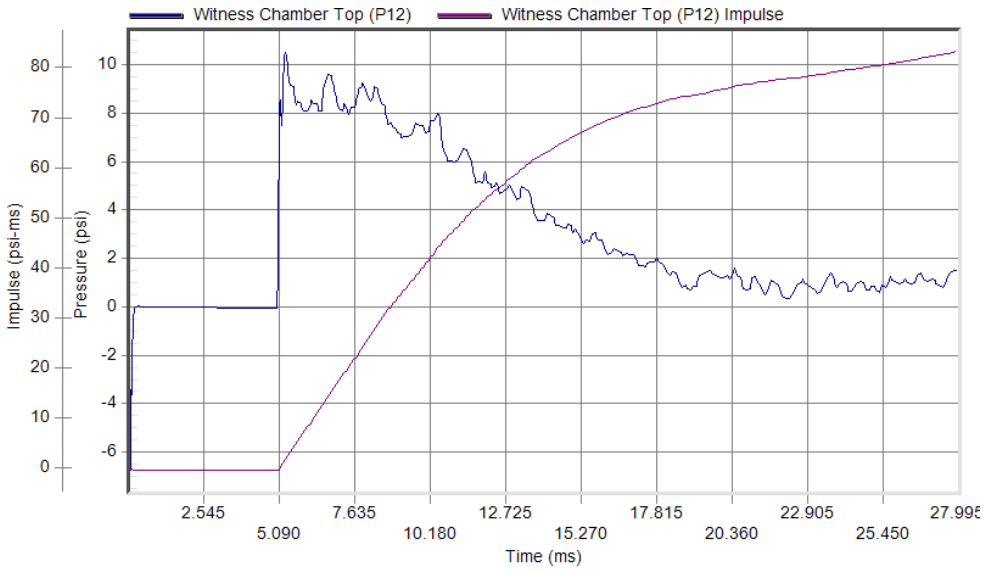
Test Date: 8/27/2014
Test Time: 4:17 pm



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

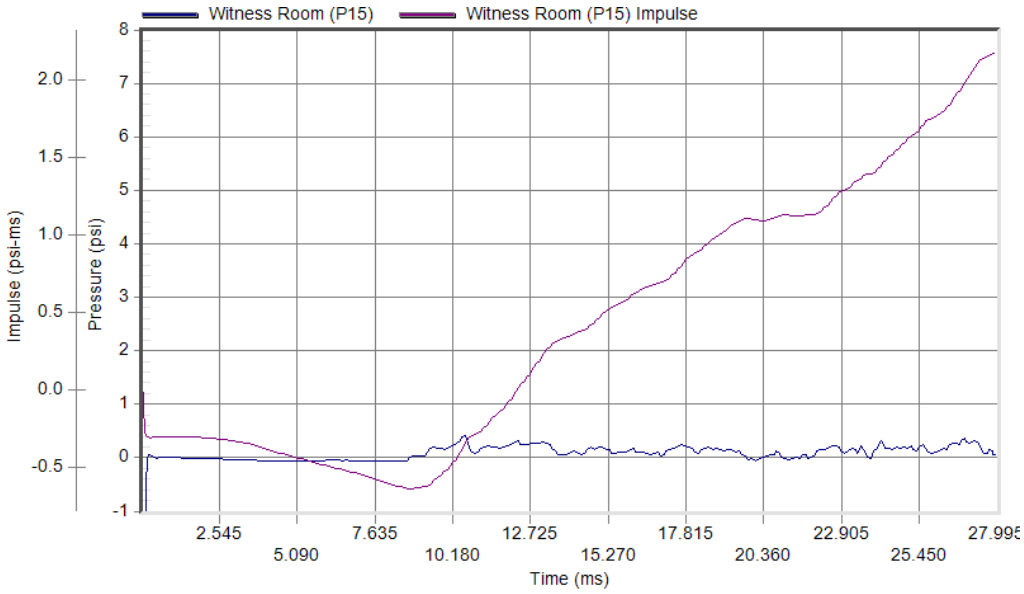
Test Date: 8/27/2014
Test Time: 4:17 pm

Specimen #7: (Continued)



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

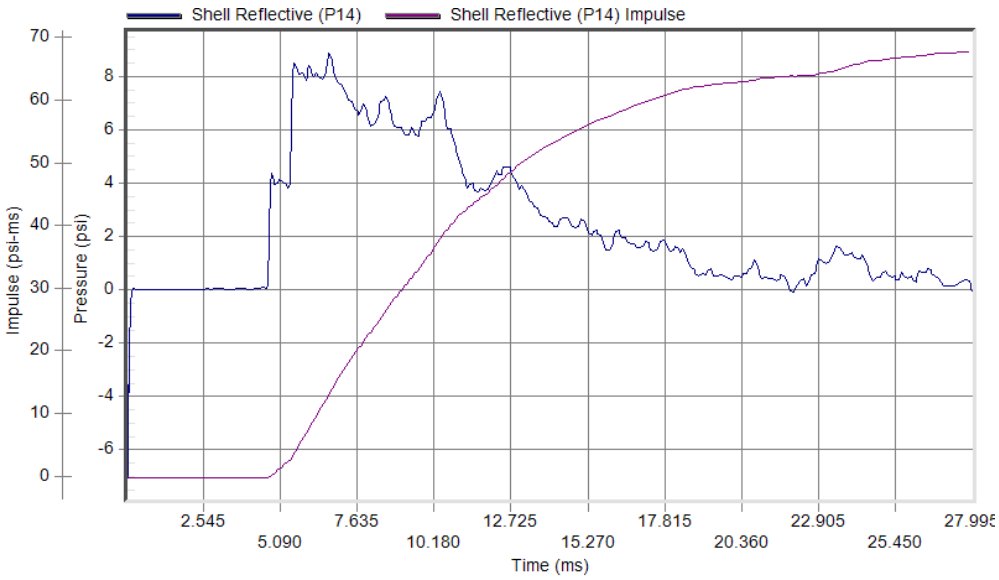
Test Date: 8/27/2014
Test Time: 4:17 pm



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

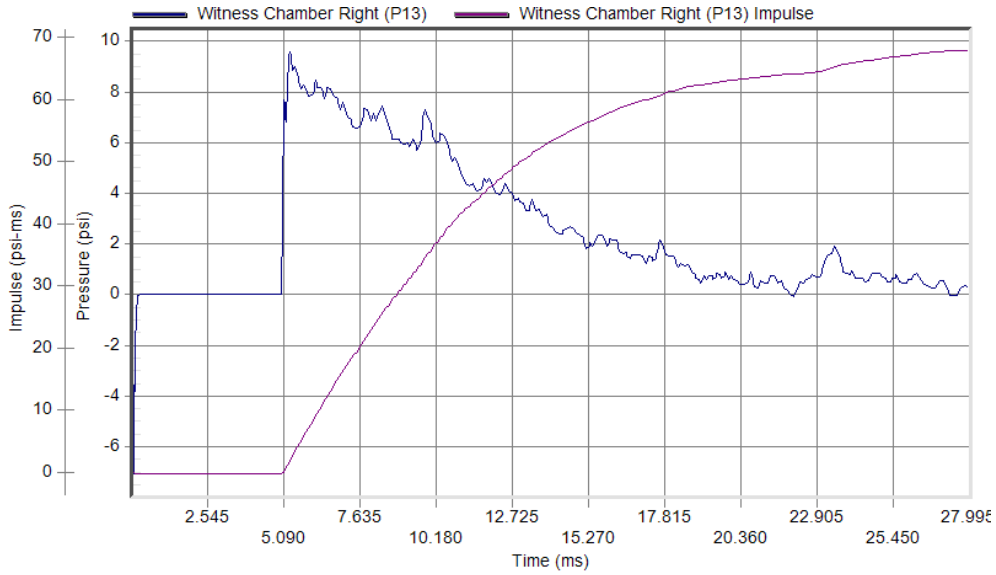
Test Date: 8/27/2014
Test Time: 4:17 pm

Specimen #8



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

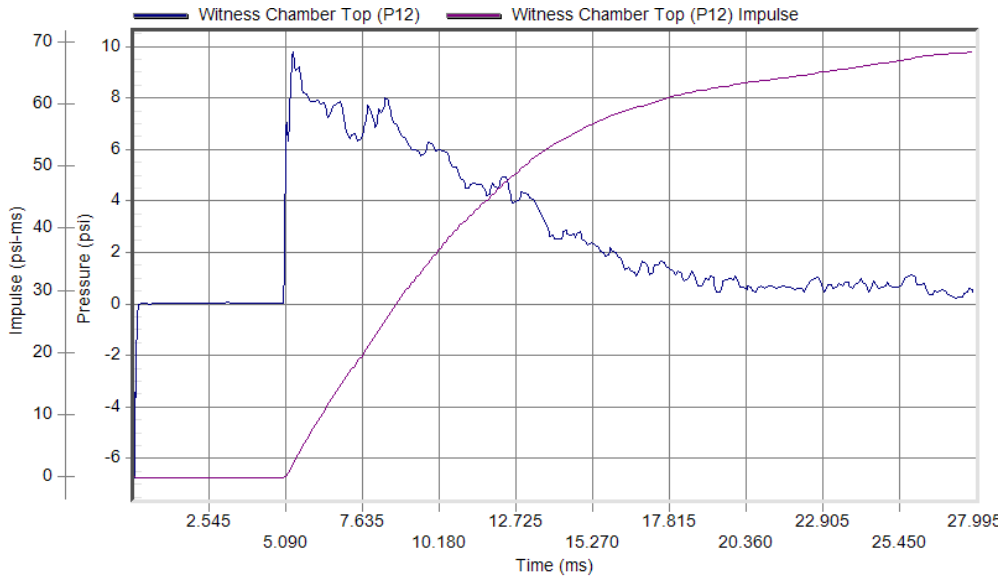
Test Date: 8/28/2014
Test Time: 2:59 pm



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

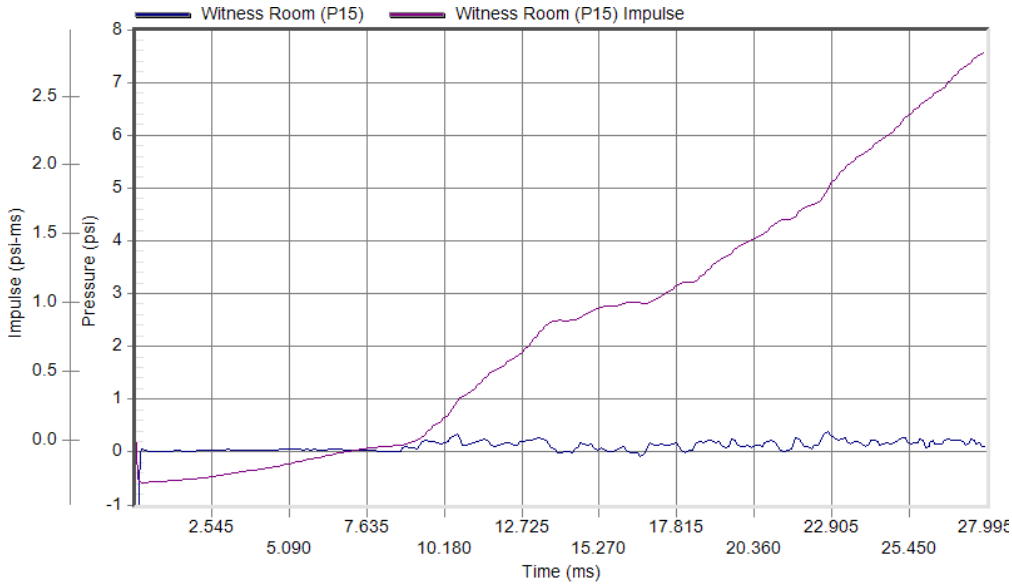
Test Date: 8/28/2014
Test Time: 2:59 pm

Specimen #8: (Continued)



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

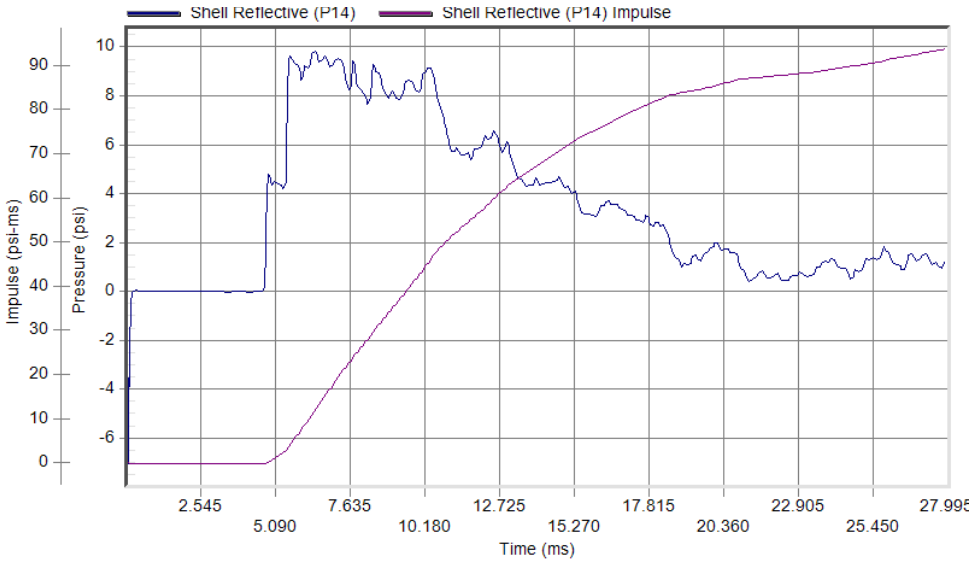
Test Date: 8/28/2014
Test Time: 2:59 pm



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

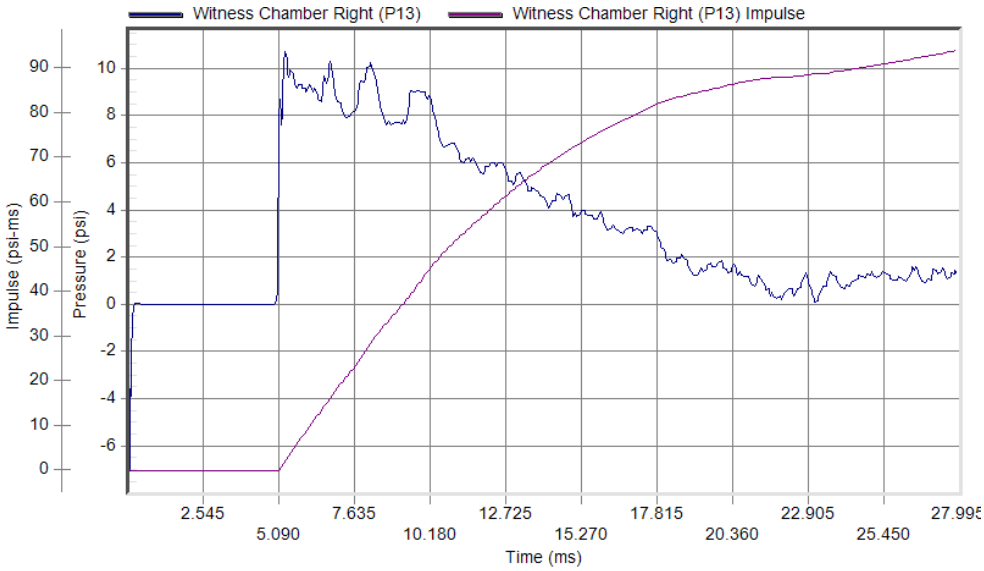
Test Date: 8/28/2014
Test Time: 2:59 pm

Specimen #9



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

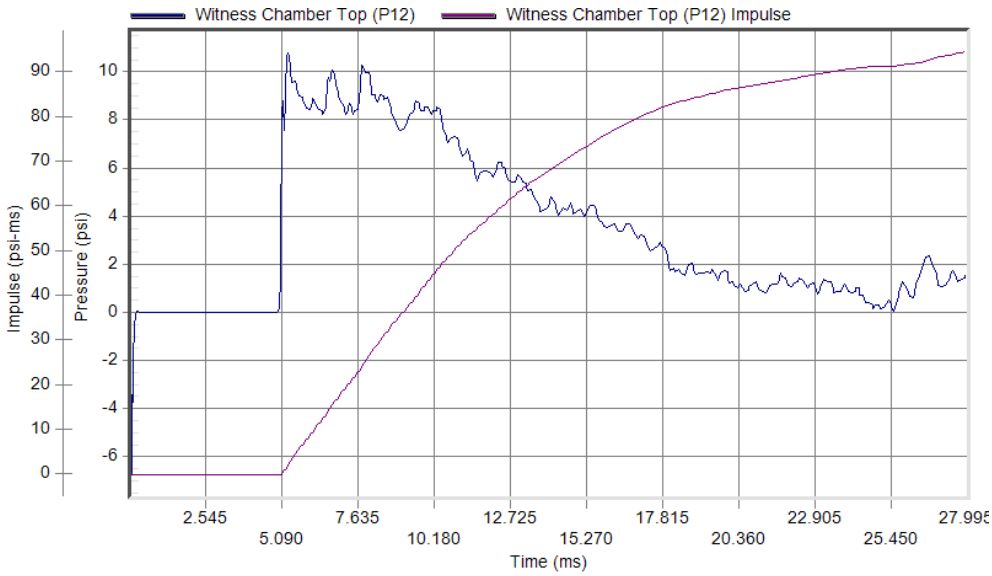
Test Date: 8/26/2014
Test Time: 12:09 pm



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

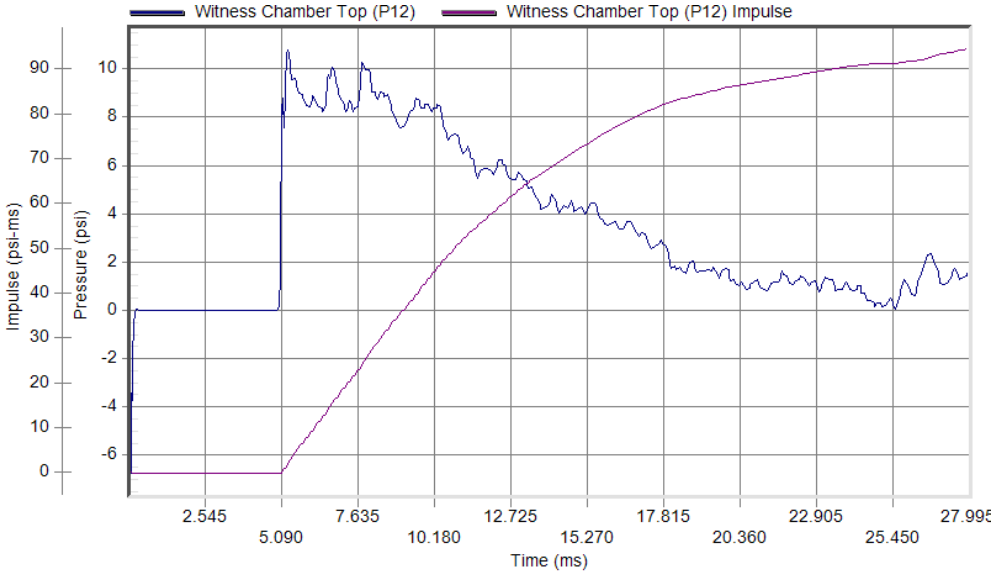
Test Date: 8/26/2014
Test Time: 12:09 pm

Specimen #9: (Continued)



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

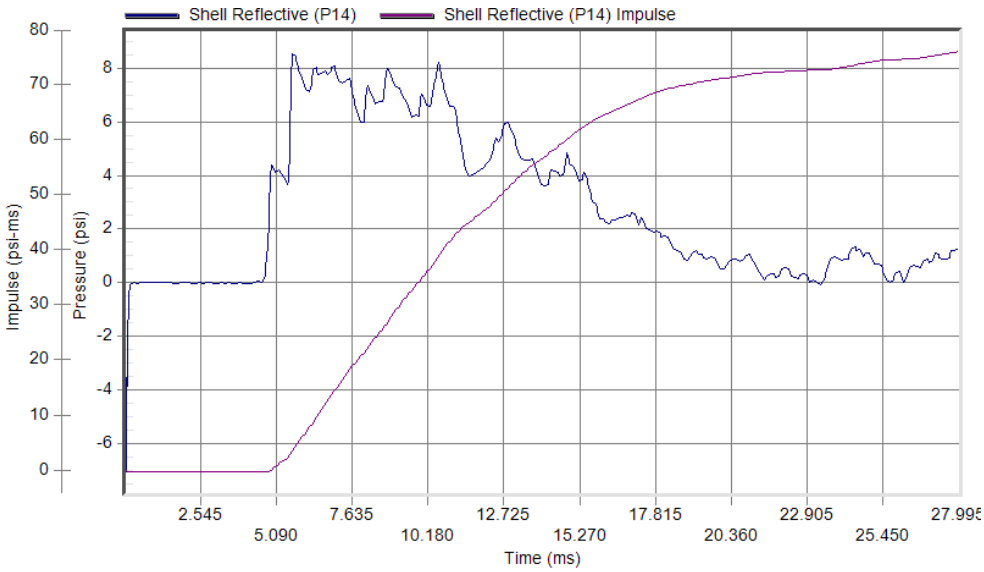
Test Date: 8/26/2014
Test Time: 12:09 pm



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

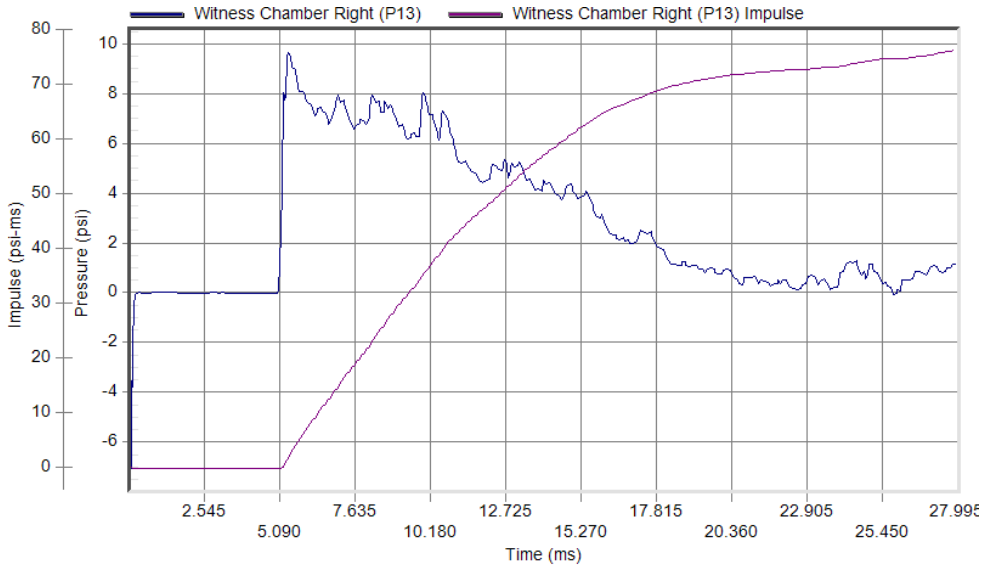
Test Date: 8/26/2014
Test Time: 12:09 pm

Specimen #10



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

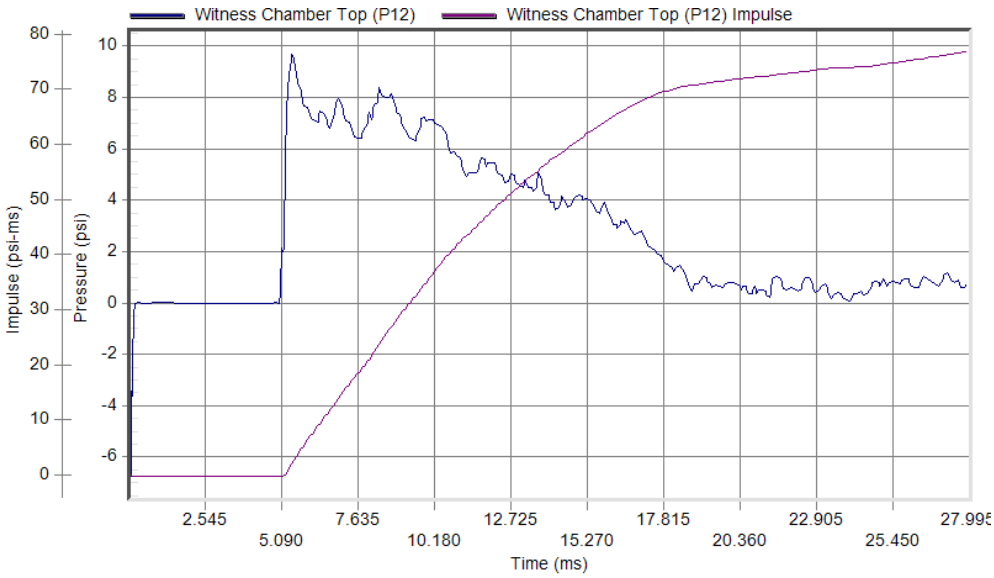
Test Date: 8/29/2014
Test Time: 9:16 am



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

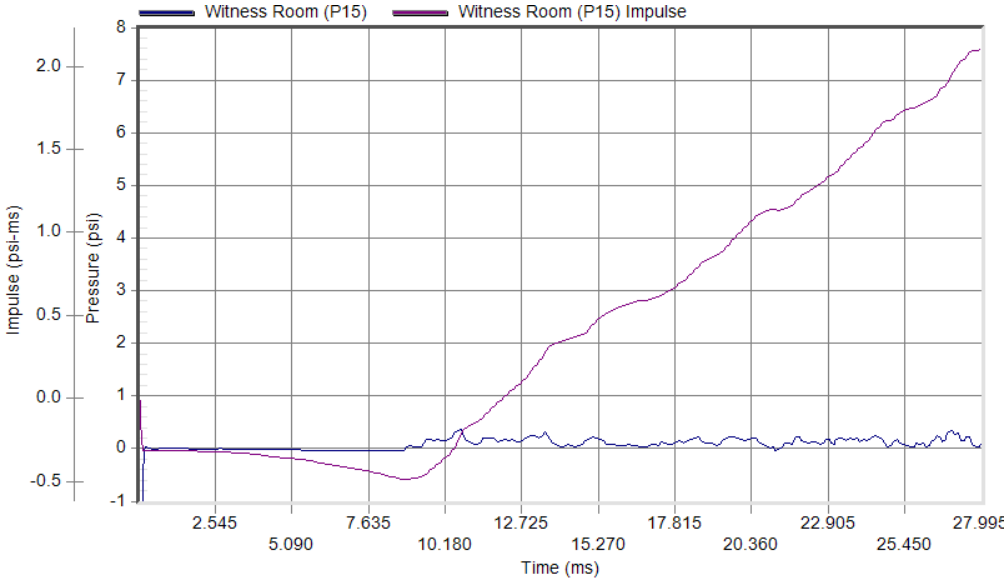
Test Date: 8/29/2014
Test Time: 9:16 am

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

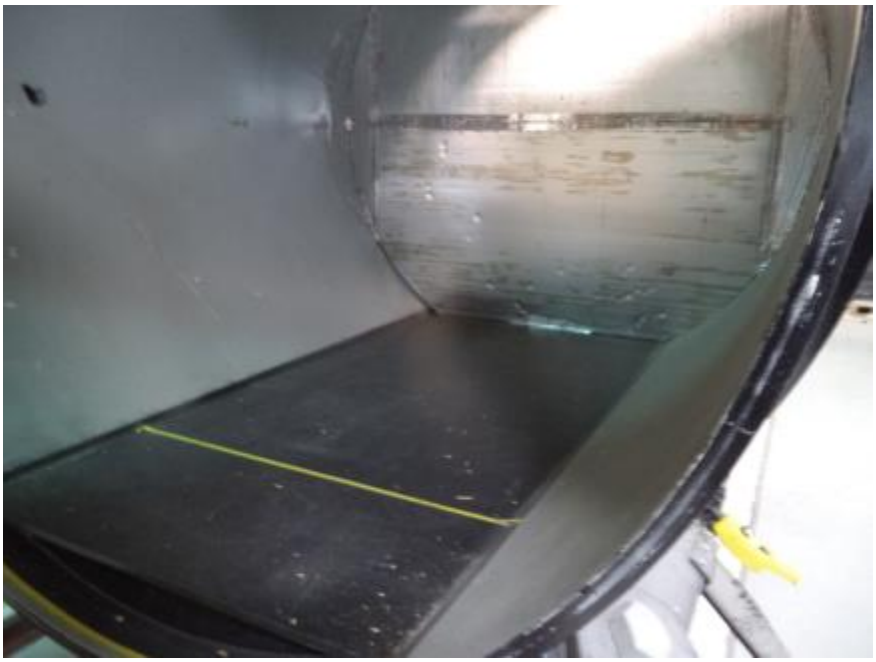


Photo No. 3
Post-test Specimen #1, Witness Chamber

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

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

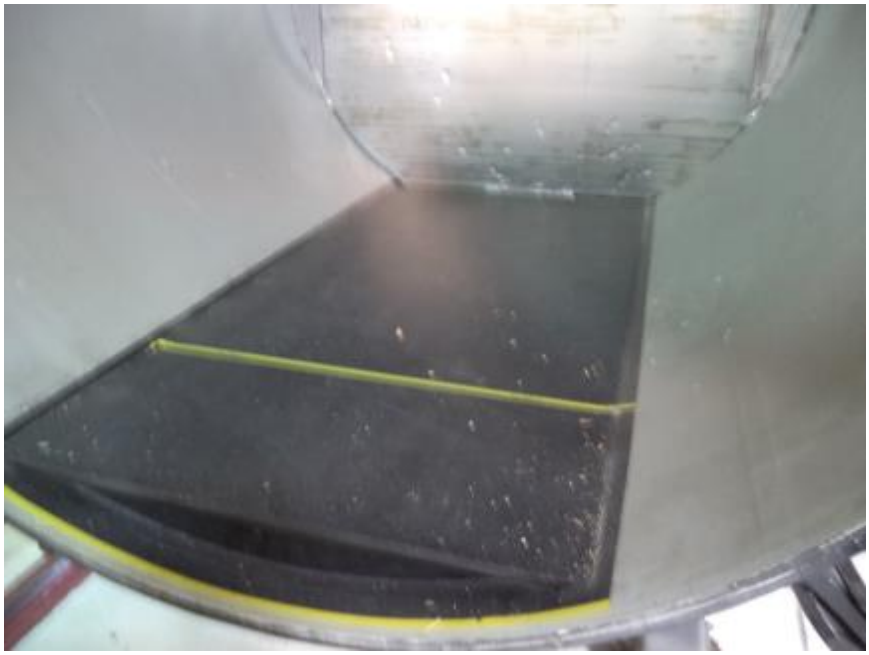


Photo No. 6
Post-test Specimen #2, Witness Chamber

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

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

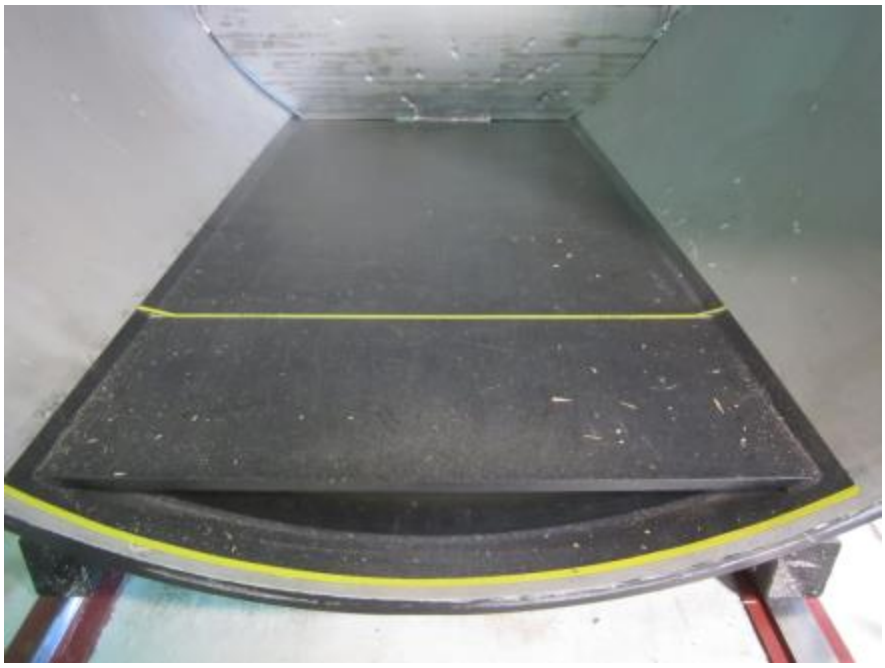


Photo No. 9
Post-test Specimen #3, Witness Chamber

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

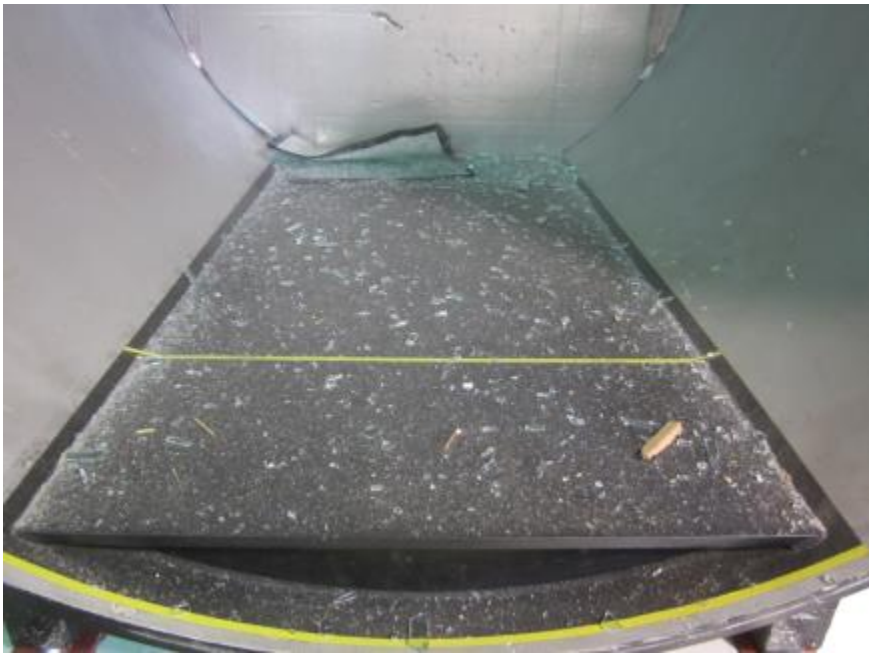


Photo No. 15
Post-test Specimen #5, Witness Chamber

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

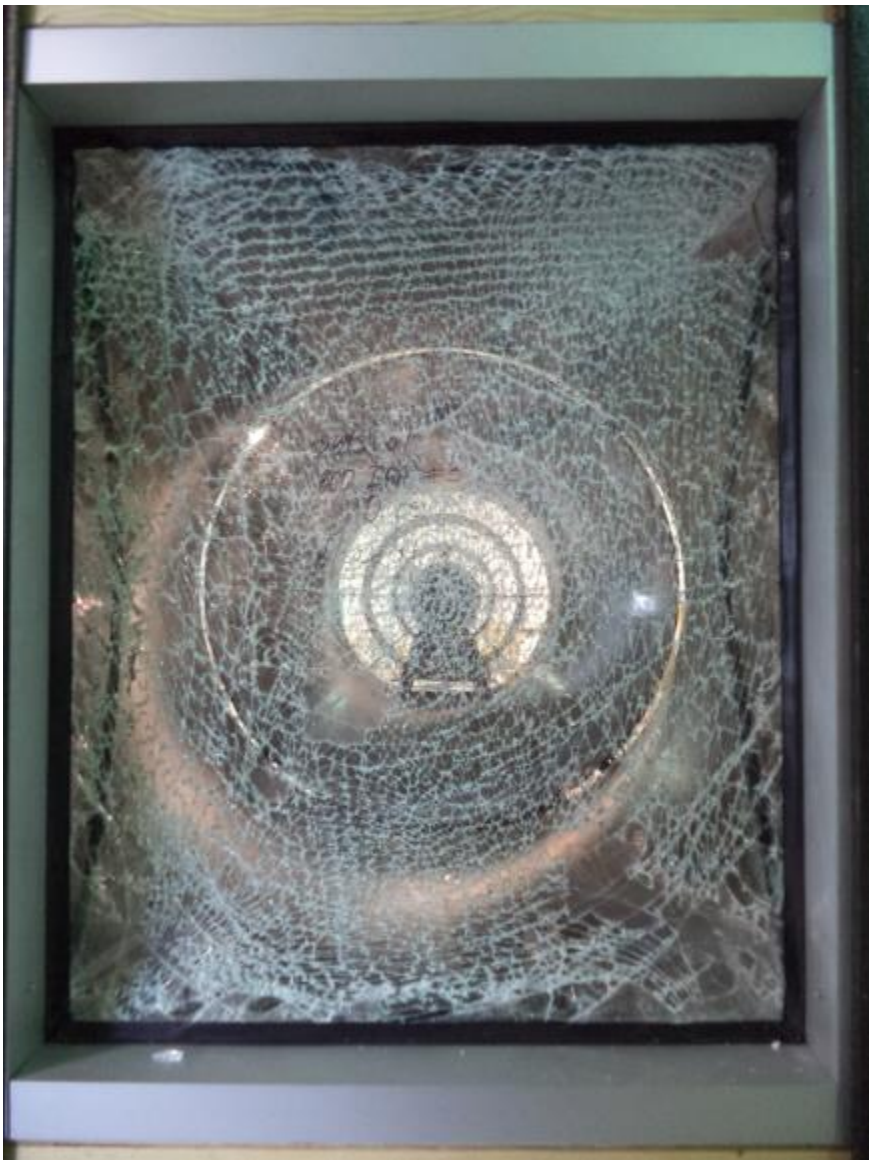


Photo No. 23
Post-test Specimen #8, Interior

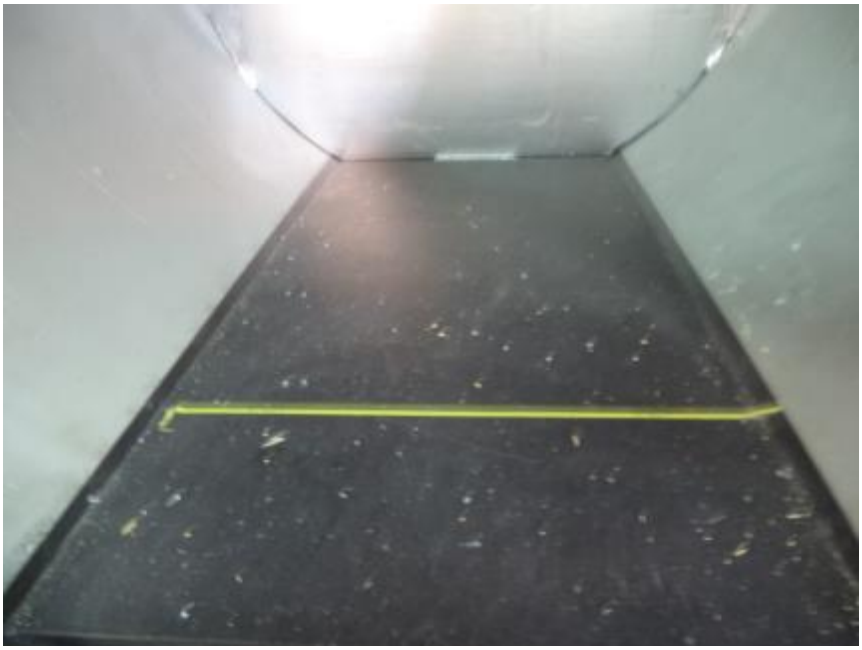


Photo No. 24
Post-test Specimen #8, Witness Chamber

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

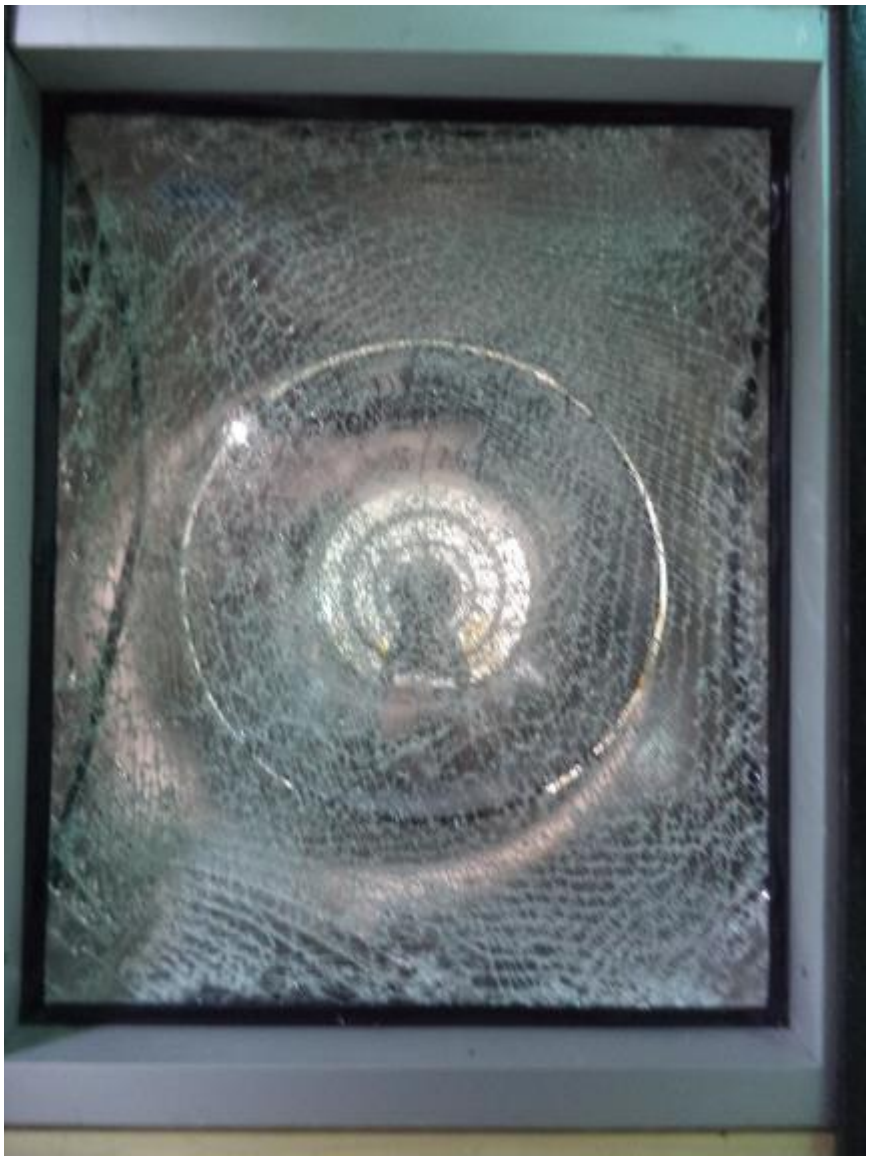


Photo No. 26
Post-test Specimen #9, Interior

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

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

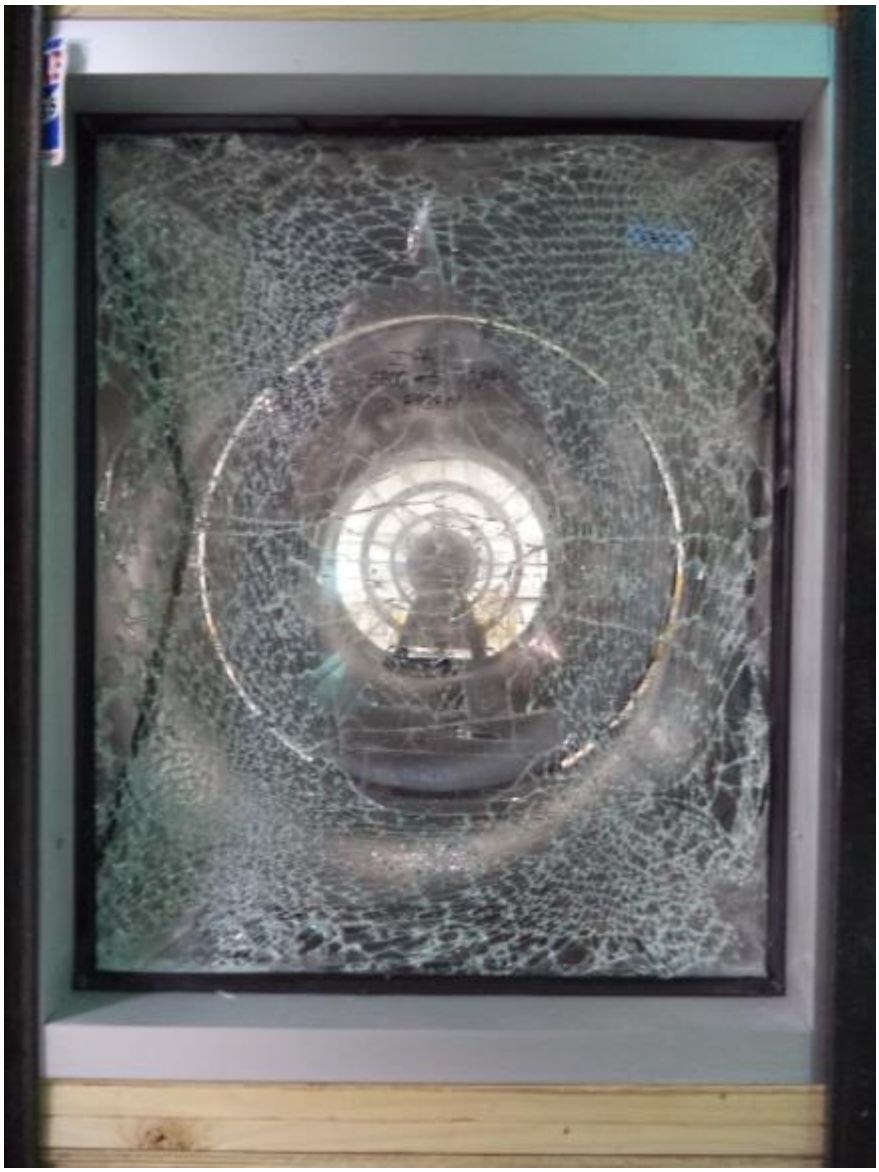


Photo No. 29
Post-test Specimen #10, Interior

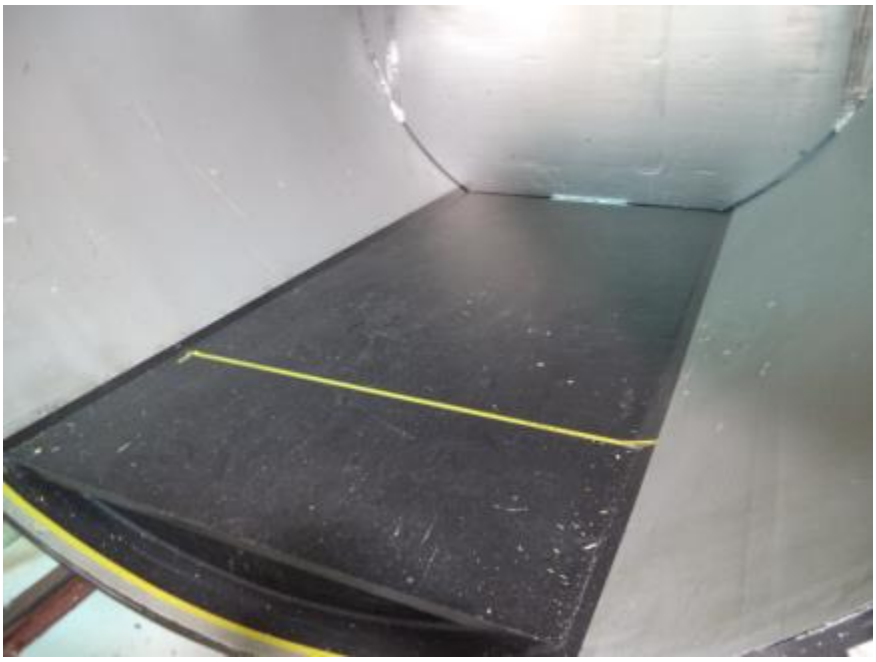
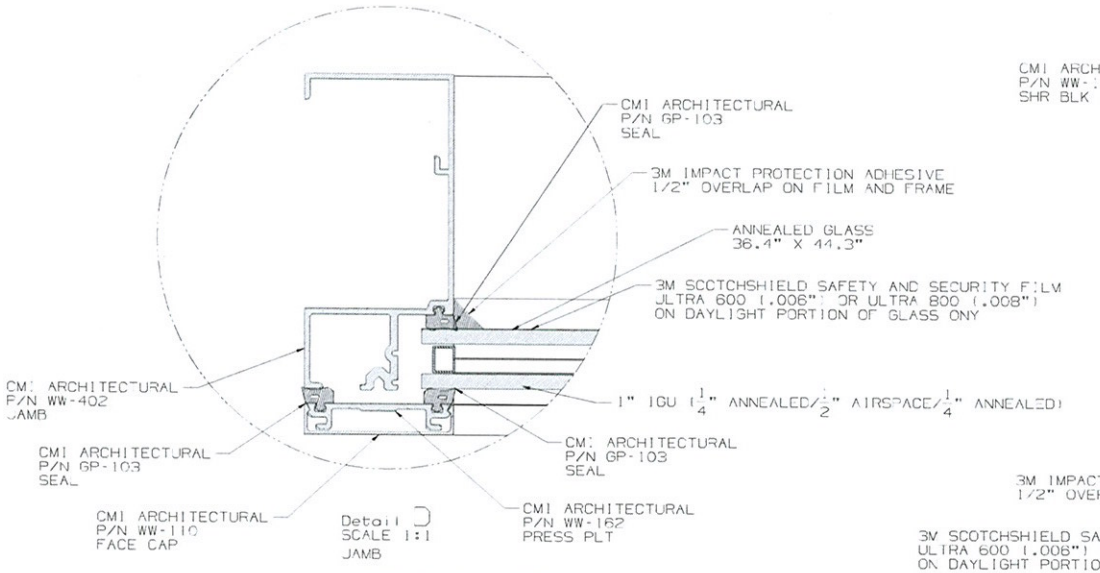
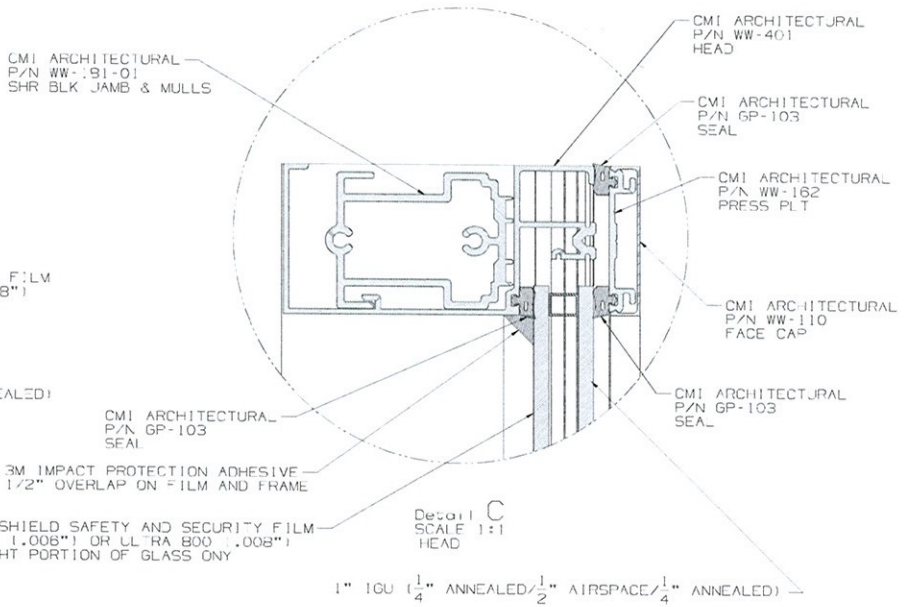


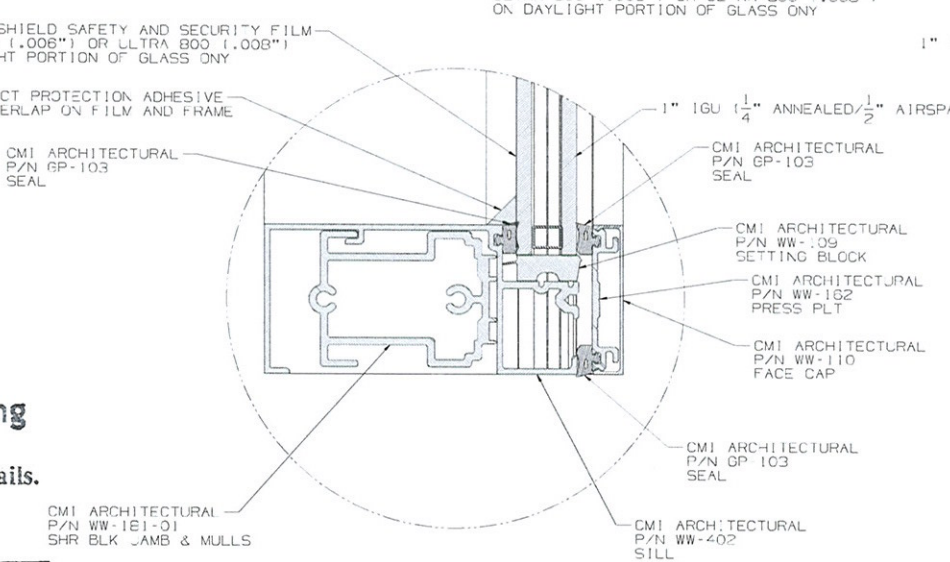
Photo No. 30
Post-test Specimen #10, Witness Chamber

APPENDIX D

Drawings







Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 **Tech** EOR

1	SEP 18,2014		
REV.	ECO	ISSUE DATE AND DESCRIPTION	DRFT CHKD

DESIGN REFERENCE | NEXT ASSEMBLY | DIVISION | DIVISION CODE

DO NOT SCALE DRAWING | SCALE 1/4 | THIRD ANGLE PROJECTION | INTERPRET PER ASME Y14.5 -2009 | MAX SURFACE ROUGHNESS 125 ALL SURFACES MARKED ONLY

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

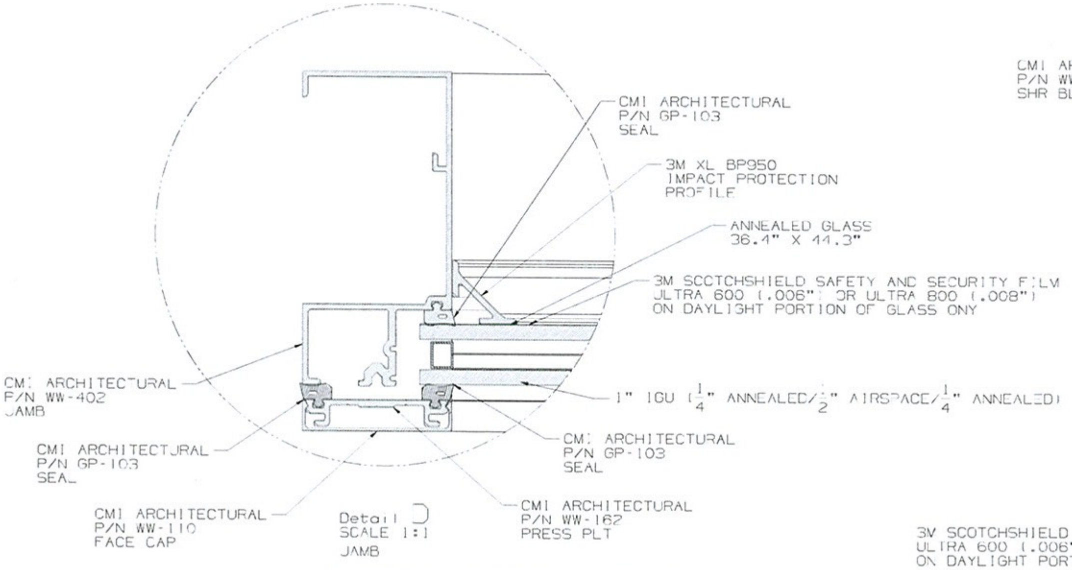
3M | © 3M COPYRIGHT 2014

TITLE: DOUBLE PANE WINDOW TEST FIXTURE WITH 3M CLEAR ULTRA SAFETY FILM AND IPA

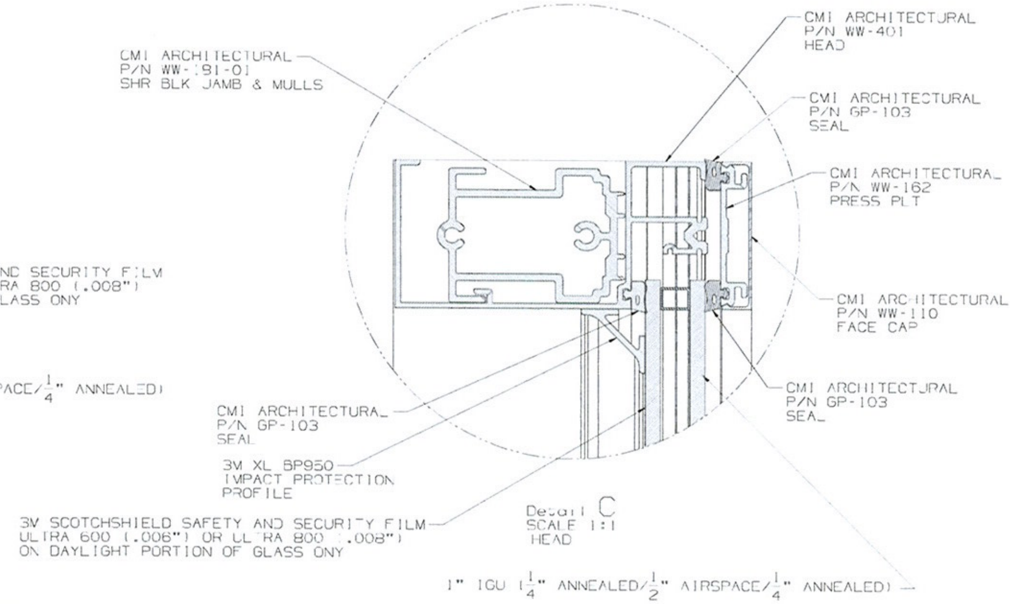
CAGE NUMBER | SIZE D | DRAWING NO. ASSY-DOUBLE-30X47.3_ULTRA | REV. 1

MODEL | DET. LISTS ☐ YES ☒ NO | SHT 2 OF 2

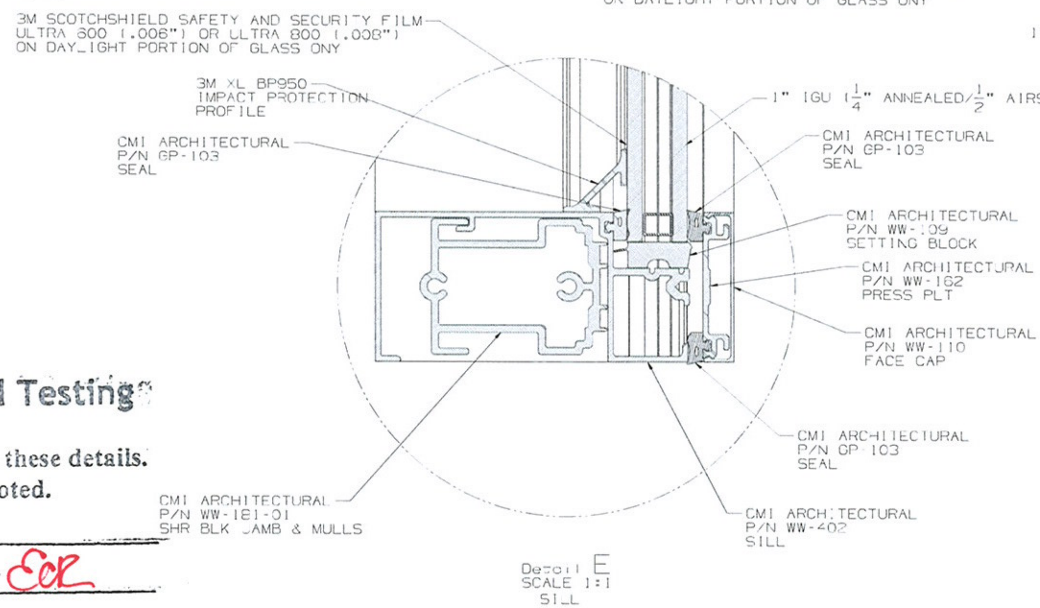
ASSY-DOUBLE-39



Detail D
SCALE 1:1
JAMB



Detail C
SCALE 1:1
HEAD



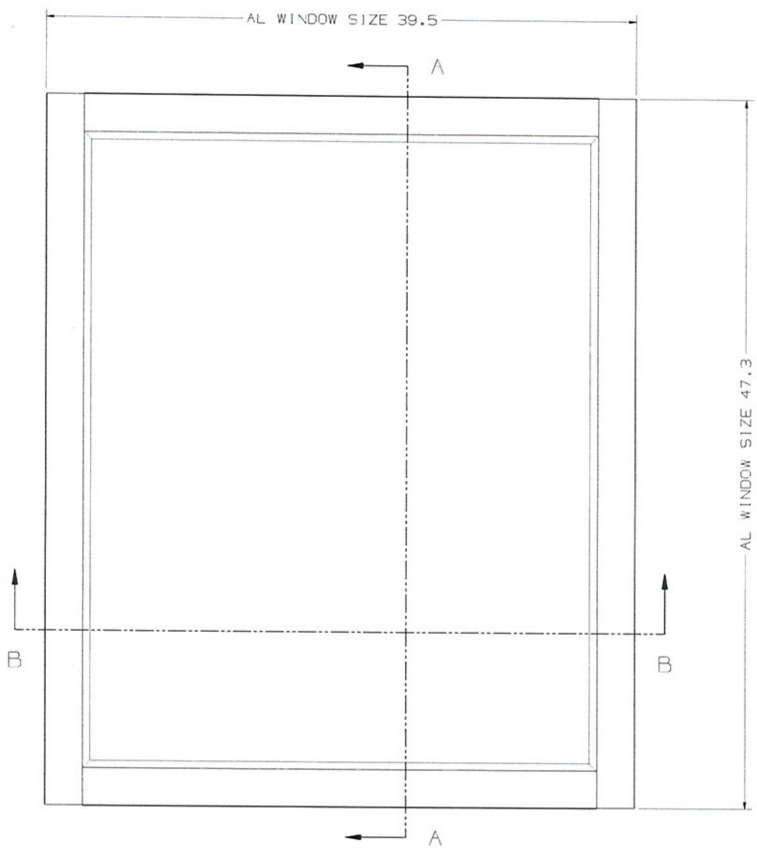
Detail E
SCALE 1:1
SILL

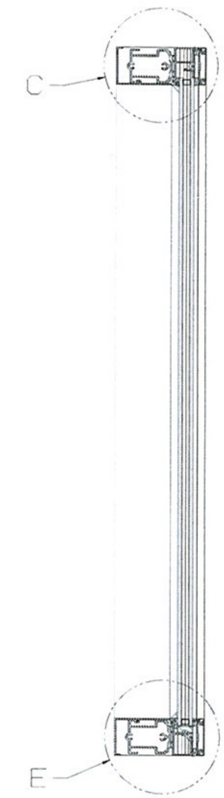
Architectural Testing

Test sample complies with these details.
Deviations are noted.

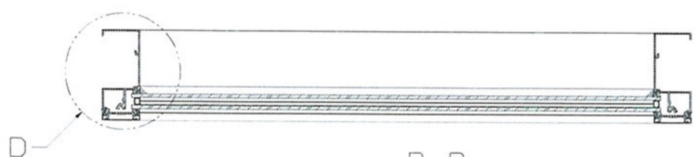
Report # D8934
Date 11/12/14 Tech EOR

REV	1
ISSUE DATE AND DESCRIPTION	SEP 16,2014
DRFT	AVL
DATE	SEP 16,2014
DO NOT SCALE DRAWING	SCALE 1/4
TOLERANCES EXCEPT AS NOTED	INCHES .0 ±.1, .00 ±.02, .000 ±.005, .0000 ±.0002
THIRD ANGLE PROJECTION	INTERPRET PER ASME Y14.5 2009
MAX SURFACE ROUGHNESS	125 ☐ ALL SURFACES ☒ MARKED ONLY
ANGLES	±1°
TITLE	DOUBLE PANE WINDOW TEST FIXTURE WITH 3M CLEAR ULTRA SAFETY FILM AND IPP
SIZE	D
DRAWING NO.	ASSY-DOUBLE-39X47.3_ULTRA-IPP
REV.	1
SHT	2 OF 2





SECTION A - A



SECTION B - B

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 Tech EOR

3M

DOUBLE PANE WINDOW TEST FIXTURE WITH 3M CLEAR ULTRA SAFETY FILM AND IPA

SEP 16,2014

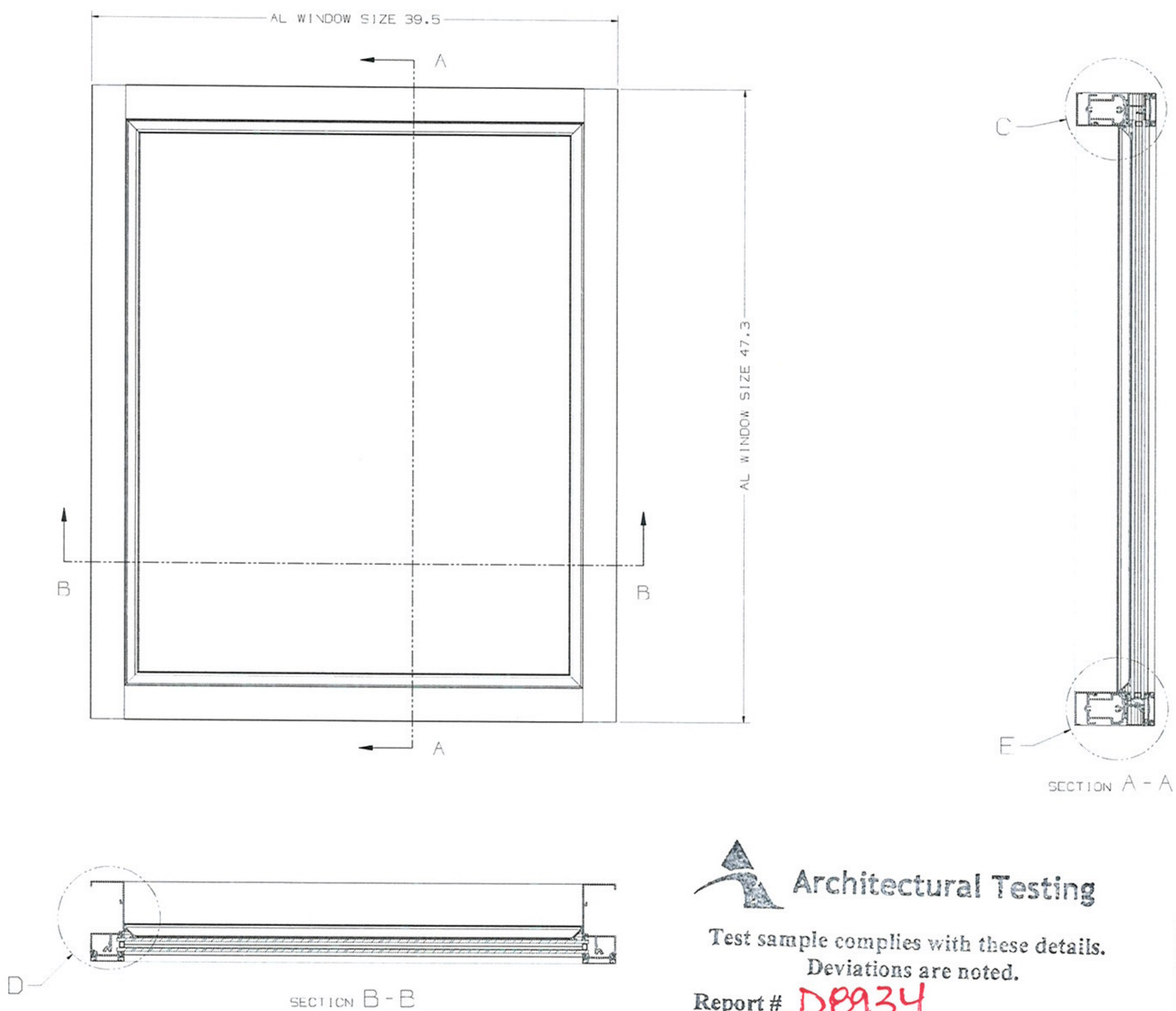
DO NOT SCALE DRAWING

SIZE D

DRAWING NO. ASSY-DOUBLE-39.4X47.3_ULTRA

REV. 1

SHT 1 OF 2



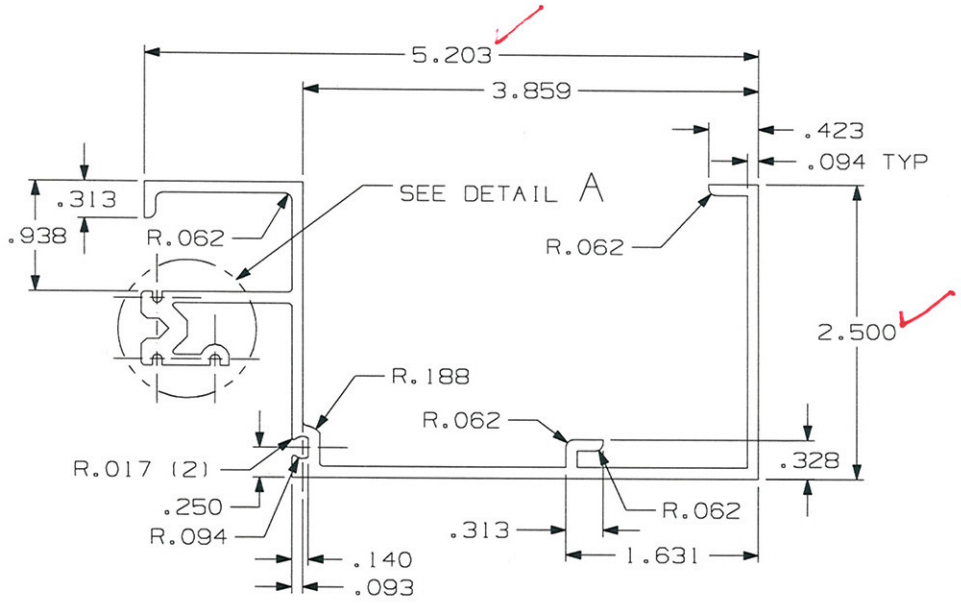
Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

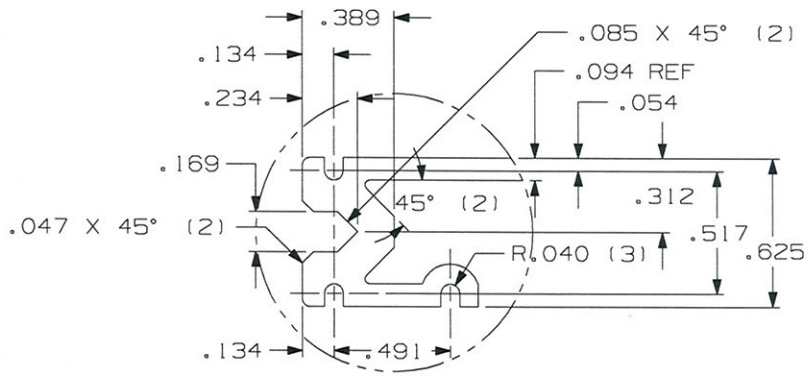
Date 11/12/14 Tech CCR

Title	DOUBLE PANE WINDOW TEST FIXTURE WITH 3M CLEAR ULTRA SAFETY FILM AND IPP
Rev. / Issue Date	1 — SEP 16,2014
Drawn	AVL, SEP 16,2014
Size	D
Drawing No.	ASSY-DOUBLE-39.4X47.3_ULTRA-IPP
Rev.	1
Sheet	SHT 1 OF 2
Scale	1/4
	DO NOT SCALE DRAWING
	THIRD ANGLE PROJECTION
	INTERPRET PER ASME Y14.5 2009



NOTES:

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



SEE DETAIL A
SCALE 2:1

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 Tech SAR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		OCT 16, 2014		

DESIGN REFERENCE | NEXT ASSEMBLY

ACCESS CODES

DRFT L.SCHLEIF | DATE OCT 16, 2014 | MFG | DATE

CHKD | DATE | APPVL | DATE

DIVISION | DIVISION CODE

DO NOT SCALE DRAWING | SCALE 1/1

TOLERANCES EXCEPT AS NOTED

INCHES
.0 ±
.00 ±.02
.000 ±.005
.0000 ±

MILLIMETERS
0 ±
.0 ±
.00 ±
.000 ±

ANGLES ±0.1°

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 - 2009

MAX SURFACE ROUGHNESS
10 √ ☐ ALL SURFACES ☒ MARKED ONLY

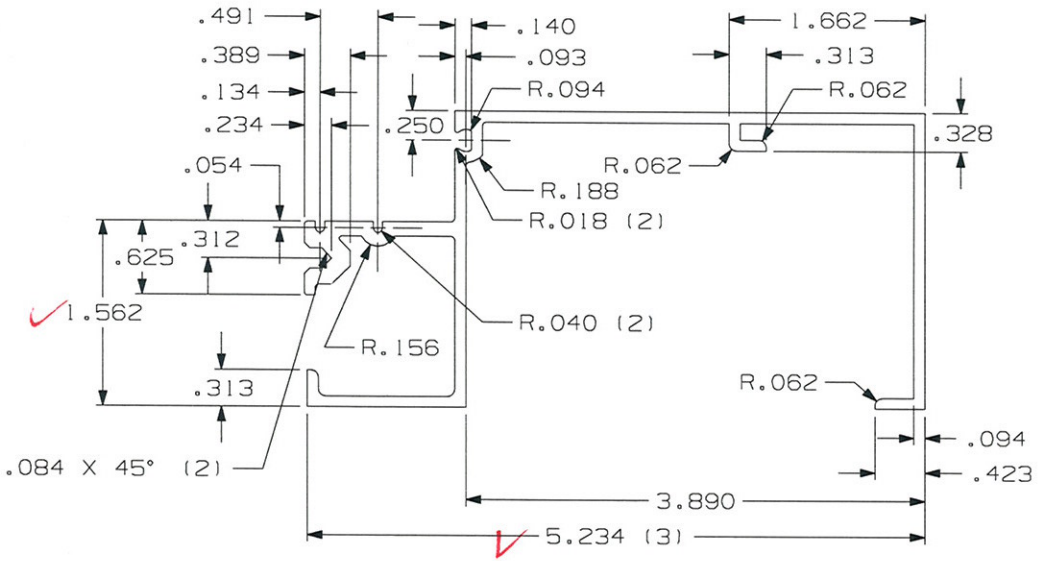
3M Center, St. Paul, MN 55144

TITLE

HEAD - WW - 401

CAGE NUMBER | SIZE B | DRAWING NO. | REV. 1

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



NOTES:

1. REFERENCE DRAWING ONLY.
2. PART NUMBER: WW-402.
3. PART SUPPLIER: OLD CASTLE BUILDING ENVELOPE. WWW.OLDCASTLE.COM.

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 Tech CDR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		OCT 16,2014		

DESIGN REFERENCE | NEXT ASSEMBLY

ACCESS CODES

DRFT L.SCHLEIF | DATE OCT 16,2014 | MFG | DATE

CHKD | DATE | APPVL | DATE

DIVISION | DIVISION CODE

DO NOT SCALE DRAWING | SCALE 1/1

TOLERANCES EXCEPT AS NOTED

INCHES
.0 ±
.00 ±.02
.000 ±.005
.0000 ±

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 - 2009

MILLIMETERS
0 ±
.0 ±
.00 ±
.000 ±

MAX SURFACE ROUGHNESS 10 √ ☐ ALL SURFACES ☒ MARKED ONLY

ANGLES ±0.1°

3M 3M Center St. Paul, MN 55144

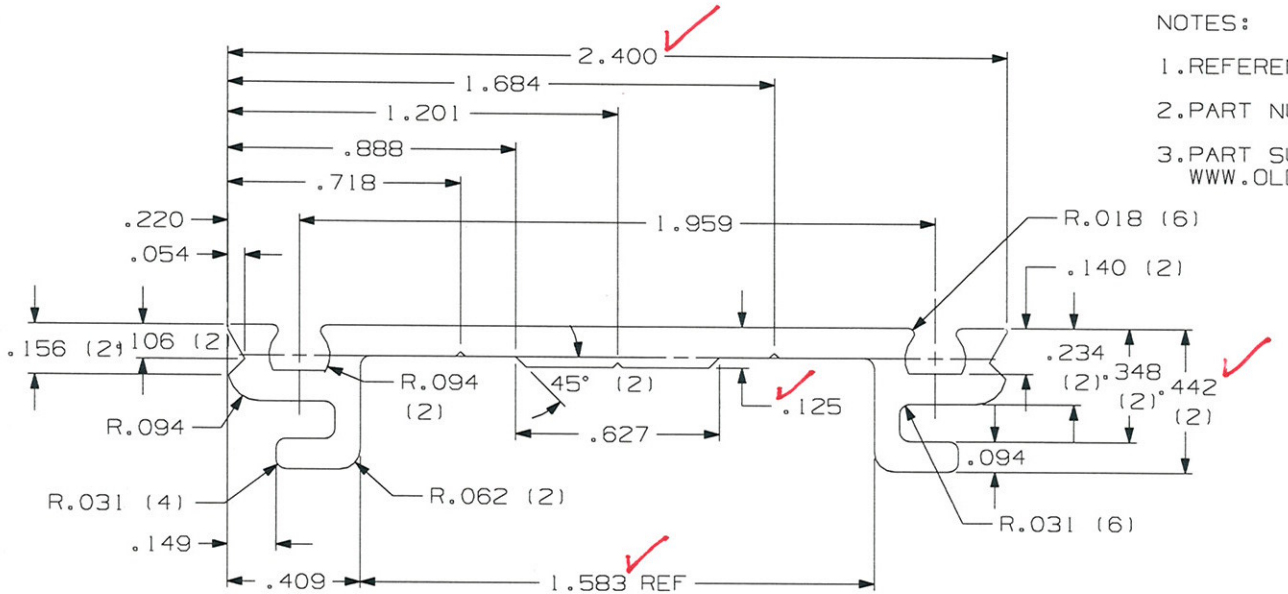
TITLE

JAMB & SILL WW-402

CAGE NUMBER | SIZE B | DRAWING NO. | REV. 1

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

REV. 1 | DRAWING NUMBER



NOTES:

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

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 Tech EOR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		OCT 16, 2014		

DESIGN REFERENCE | NEXT ASSEMBLY | ACCESS CODES | DIVISION | DIVISION CODE

DRFT: L.SCHLEIF | DATE: OCT 16, 2014 | MFG | DATE

CHKD | DATE | APPVL | DATE

DO NOT SCALE DRAWING | SCALE 1/2

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 - 2009

MAX SURFACE ROUGHNESS 10 √ ☐ ALL SURFACES ☒ MARKED ONLY

TOLERANCES EXCEPT AS NOTED

INCHES
.0 ±
.00 ±.02
.000 ±.005
.0000 ±

MILLIMETERS
0 ±
.0 ±
.00 ±
.000 ±

ANGLES ±0.1°

3M 3M Center St. Paul, MN 55144

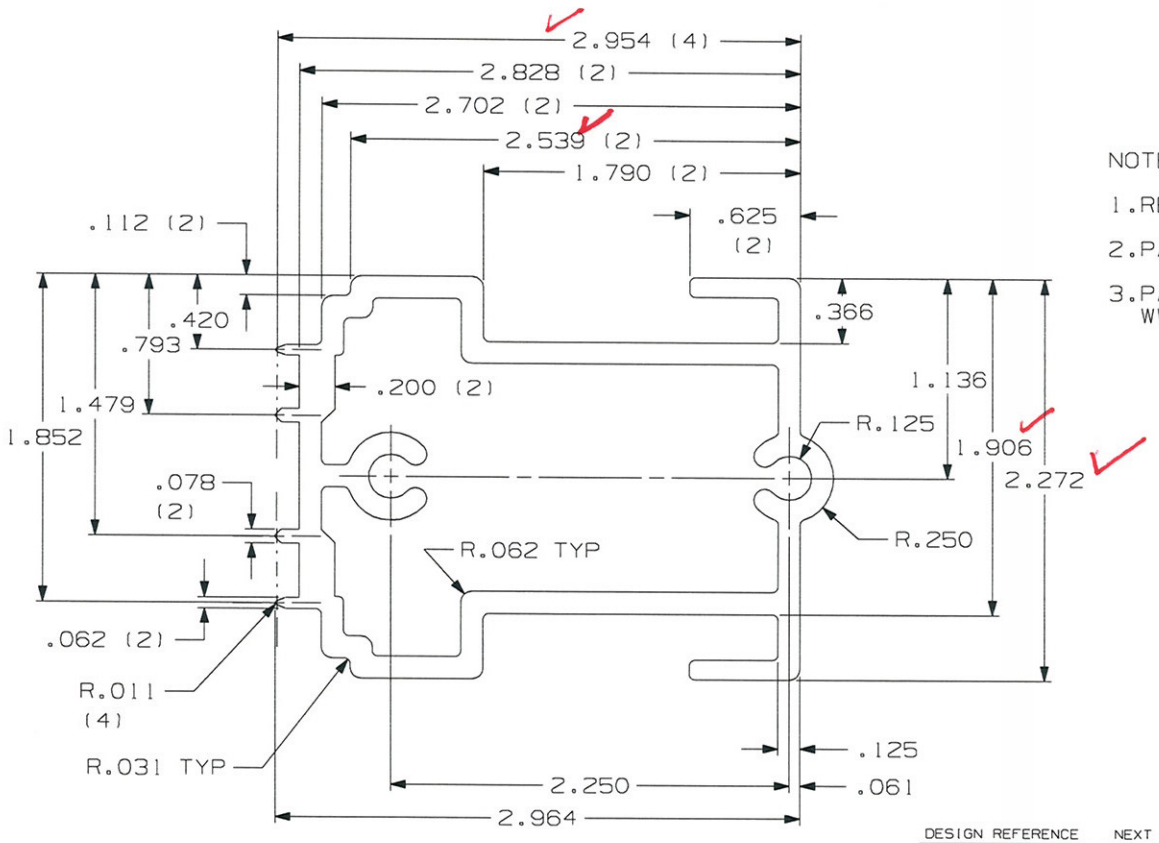
TITLE

PRESS PLT WW-162

CAGE NUMBER	SIZE	DRAWING NO.	REV.
	B		1

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

REV. | DRAWING NUMBER



NOTES:

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

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934.01

Date 11/12/14 Tech EOR

REV	ECO	ISSUE DATE AND DESCRIPTION	DRFT	CHKD
1		OCT 16,2014		

DESIGN REFERENCE | NEXT ASSEMBLY

ACCESS CODES

DRFT L.SCHLEIF | DATE OCT 16,2014 | MFG | DATE

CHKD | DATE | APPVL | DATE

DIVISION | DIVISION CODE

DO NOT SCALE DRAWING | SCALE 1/1

TOLERANCES EXCEPT AS NOTED

INCHES
.0 ±
.00 ±.02
.000 ±.005
.0000 ±

MILLIMETERS
0 ±
.0 ±
.00 ±
.000 ±

ANGLES ±0.1°

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 - 2009

MAX SURFACE ROUGHNESS 10 √ ☐ ALL SURFACES ☒ MARKED ONLY

3M 3M Center St. Paul, MN 55144

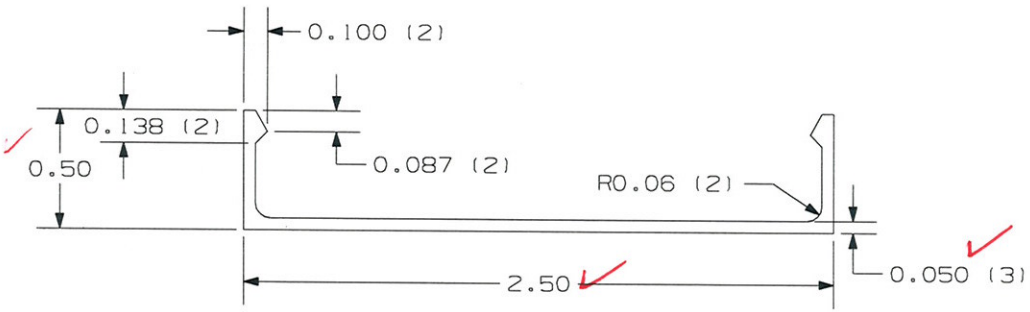
TITLE

SHR BLK JAM & MULLS-WW-181-01

CAGE NUMBER | SIZE B | DRAWING NO. | REV. 1

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

REV. | DRAWING NUMBER



NOTES:

1. REFERENCE DRAWING ONLY.
2. PART NUMBER: WW-110.
3. PART SUPPLIER: OLD CASTLE BUILDING ENVELOPE. WWW.OLDCASTLE.COM.

Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # D8934

Date 11/12/14 Tech EdR

1		OCT 16,2014			
REV	ECO	ISSUE DATE AND DESCRIPTION		DRFT	CHKD

DESIGN REFERENCE | NEXT ASSEMBLY

ACCESS CODES

DRFT L.SCHLEIF | DATE OCT 16,2014 | MFG | DATE

CHKD | DATE | APPVL | DATE

DIVISION | DIVISION CODE

DO NOT SCALE DRAWING | SCALE 1/2

TOLERANCES EXCEPT AS NOTED

INCHES
.0 ±
.00 ±.02
.000 ±.005
.0000 ±

THIRD ANGLE PROJECTION

INTERPRET PER ASME Y14.5 - 2009

MILLIMETERS
0 ±
.0 ±
.00 ±
.000 ±

MAX SURFACE ROUGHNESS
10 √
☐ ALL SURFACES
☒ MARKED ONLY

ANGLES ±0.1°

3M 3M Center St. Paul, MN 55144

TITLE

FACE CAP WW-110

CAGE NUMBER	SIZE	DRAWING NO.	REV.
	B		1

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

REV. | DRAWING NUMBER