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EASTMAN PERFORMANCE FILMS, LLC

AIRBLAST LOADING TEST REPORT

SCOPE OF WORK
ASTM F1642/GSA TS01 TESTING ON *R20 SR PS9* SAFETY AND SECURITY PERFORMANCE FILM INSTALLED ON A FIXED WINDOW SYSTEM
(SINGLE PANE, ANNEALED, SILICONE GLAZING ATTACHMENT)

REPORT NUMBER
J3983.03-119-12 R0

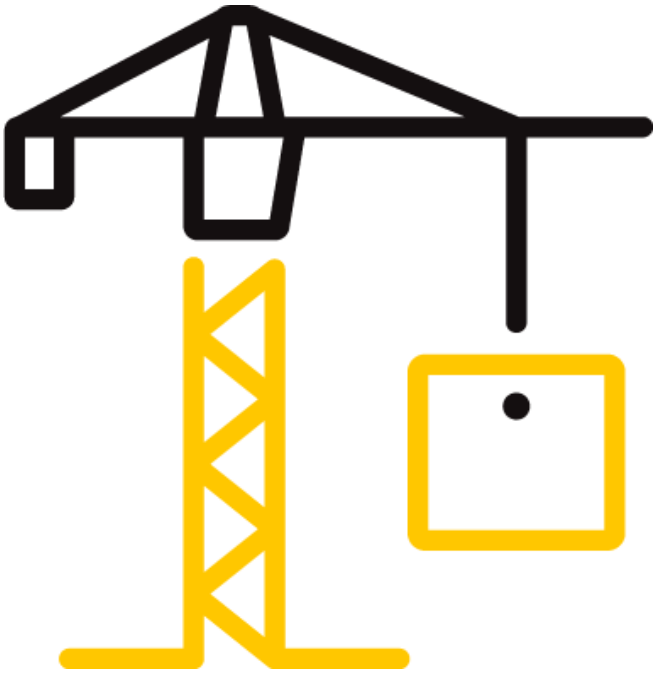
TEST DATE(S)
06/19/19

ISSUE DATE
09/27/19

RECORD RETENTION END DATE
06/19/23

PAGES
26

DOCUMENT CONTROL NUMBER
ATI 00368 (07/24/17)
RT-R-AMER-Test-2783



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TEST REPORT FOR EASTMAN PERFORMANCE FILMS, LLC
Report No.: J3983.03-119-12 R0
Date: 09/27/19

REPORT ISSUED TO

EASTMAN PERFORMANCE FILMS, LLC
4210 The Great Road
Fieldale, Virginia 24089

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Eastman Performance Films, LLC, Fieldale, Virginia to perform airblast loading tests in accordance with ASTM F1642 and GSA-TS01 on *R20 SR PS9* safety and security film installed on a fixed window system (single pane, annealed, silicone glazing attachment). Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at the Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2

SUMMARY OF TEST RESULTS

Product Type: Fixed Window (Single Pane, Annealed, Silicone Glazing Attachment)
Series/Model Number: *R20 SR PS9*

TITLE	SPECIMEN #1	SPECIMEN #2	SPECIMEN #3
ASTM Hazard Rating	Minimal Hazard	Minimal Hazard	Minimal Hazard
GSA Performance Condition	2	3a	3a
Average Peak Reflected Pressure	6.15 psi	6.11 psi	6.12 psi
Average Positive Phase Impulse	41 psi-msec	41 psi-msec	40 psi-msec
Average Positive Phase Duration	12.25 msec	11.99 msec	12.21 msec

For INTERTEK B&C:

COMPLETED BY:	Isaiah W. Gebhart	**REVIEWED BY:**	Virgal T. Mickley, Jr., P.E.
TITLE:	Ballistics Lead Technician	**TITLE:**	Senior Staff Engineer
SIGNATURE:	Digitally Signed by: Isaiah Gebhart	**SIGNATURE:**	Digitally Signed by: Virgal Thomas Mickley, Jr.
DATE:	09/27/19	**DATE:**	09/27/19

IWG:vtm:aas

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
VIRGAL THOMAS MICKLEY, JR.
ENGINEER
PE-078184

2019.10.01 08:11:35 -04'00'

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SECTION 3
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

ASTM F1642/F1642M-17, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading*

ASTM F2912-17, *Standard Specification for 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*

SECTION 4
TEST FACILITY

Intertek B&C's shock tube is housed in a 10,000 square foot state-of-the-art test facility located in York, Pennsylvania. A photograph of the shock tube is provided in Figure #1.

Figure #1
Shock Tube and Test Facility

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SECTION 5
TEST PROCEDURE

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.

SECTION 6
MATERIAL SOURCE/INSTALLATION

The test specimens were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of four years from the test completion date.

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

SECTION 7
EQUIPMENT

In accordance with ASTM F1642 and GSA TS01, four reflective pressure transducers were utilized for data acquisition at a 1MHz sample rate. Two reflective pressure transducers were located on the specimen holder at the top and right side (when viewed from the interior). A third pressure transducer was located on the shell to the exterior of the specimen, and a fourth was 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 is provided in Figure #2.

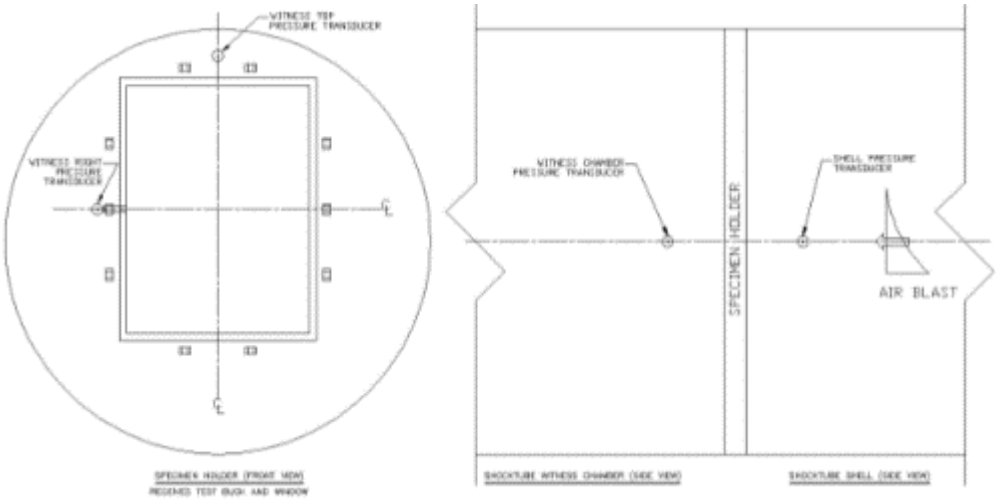

Figure #2
Pressure Sensor Locations

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SECTION 8
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Steve DeBusk	Eastman Chemical Company
Charles Adiasor	Eastman Chemical Company
Isaiah W. Gebhart	Intertek B&C
Cory E. Straub	Intertek B&C
Emily C. Riley	Intertek B&C
Travis A. Hoover	Intertek B&C

SECTION 9
TEST SPECIMEN DESCRIPTION

The following descriptions apply to all specimens.

Product Type: Fixed Window (Single Pane, Annealed, Silicone Glazing Attachment)
Series/Model Number: *R20 SR PS9*

Product Sizes

MEASURED DIMENSIONS	WIDTH (inches)	HEIGHT (inches)
Overall Size	48	66
Fixed Day Lite Opening	44-1/2	62-1/2

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

LOCATION	JOINERY TYPE	DETAIL
All Corners	Square cut and butted	Secured using two #12 x 1 in long pan head screws

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Glazing

GLASS TYPE	GLAZING BITE
1/4" Annealed	1/4"

Glazing Method: The glass was channel glazed from the exterior and was secured in place with snap-fit extruded aluminum glazing stop at the sill and a flexible rubber gasket around the glazing perimeter. A 9 mil thick safety and security film was adhered to the interior lite and a bead of silicone was applied around the perimeter of the frame at the glazing edge.

Hardware: No hardware was utilized.

Reinforcement: No reinforcement was utilized.

SECTION 10
TEST RESULTS

Test Dates: 06/19/19
Ambient Temperature: 82±2°F
Relative Humidity: 64-73%

The results are tabulated as follows. Pressure time plots are presented for each specimen. Pre-test and post-test photographs are provided in Section 12.

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Date: 09/27/19

Test Specimen #1

DESCRIPTION	RESULTS
Ambient Temperature	80°F
Glazing Temperature	81°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**2**
PEAK POSITIVE PRESSURE	
Top Pressure	6.27 psi
Right Pressure	6.09 psi
Shell Pressure	6.08 psi
Average Pressure	**6.15 psi**
Witness Chamber Pressure	0.28 psi
PEAK POSITIVE PHASE DURATION	
Top Duration	12.51 msec
Right Duration	12.23 msec
Shell Duration	12.02 msec
Average Duration	**12.25 msec**
PEAK POSITIVE PHASE IMPULSE	
Top Impulse	41 psi*msec
Right Impulse	41 psi*msec
Shell Impulse	40 psi*msec
Average Impulse	**41 psi*msec**
GLAZING RESPONSE	
Exterior Lite	Fractured
Interior Lite	N/A
Glazing Pullout	None
Film Tearing	3-3/4" tear bottom left interior; 3-1/2 in tear bottom right interior
WITNESS CHAMBER RESULTS	
Glazing cracked but remained fully retained. Dust and small fragments were deposited on the witness chamber floor near sill. No damage observed to the witness panel.	

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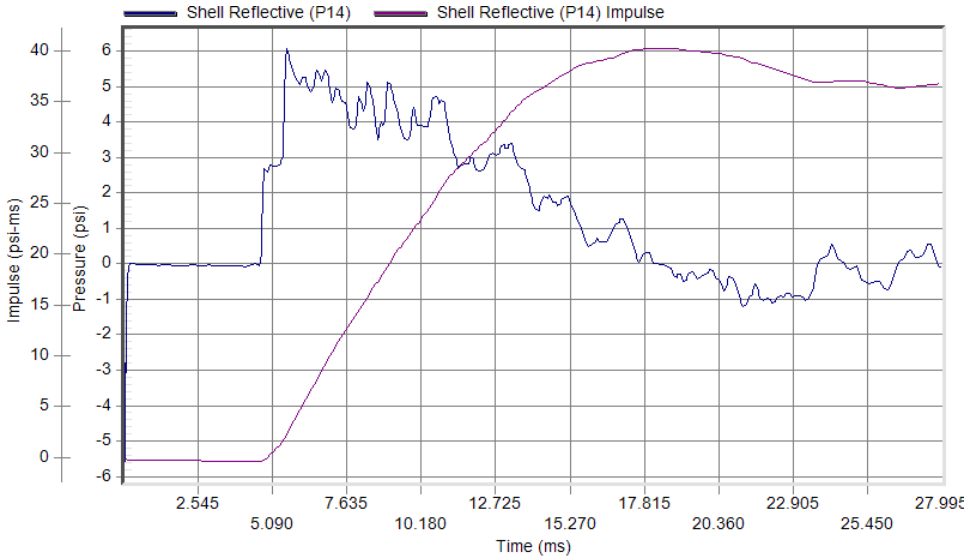
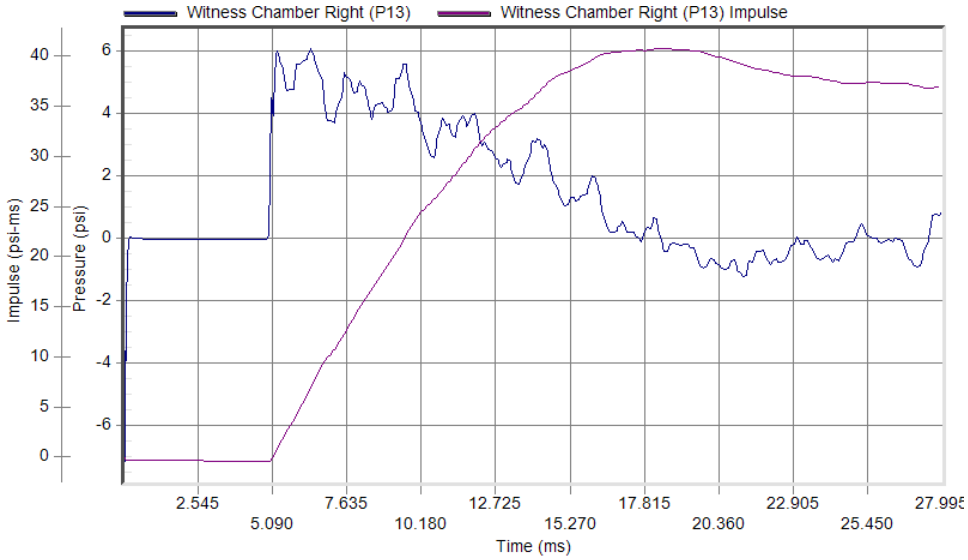
Test Specimen #1 - Pressure Time Plots



Peak Pressure: 6.08 psi at 5.61 ms
Duration: 12.02 ms

Test Date: 6/19/2019
Test Time: 10:28 am



Peak Pressure: 6.09 psi at 5.27 ms
Duration: 12.23 ms

Test Date: 6/19/2019
Test Time: 10:28 am

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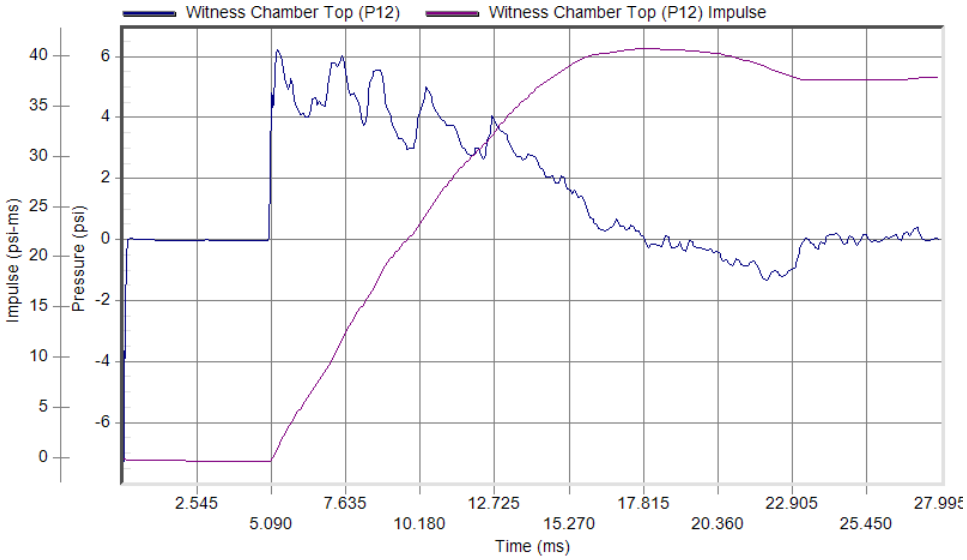
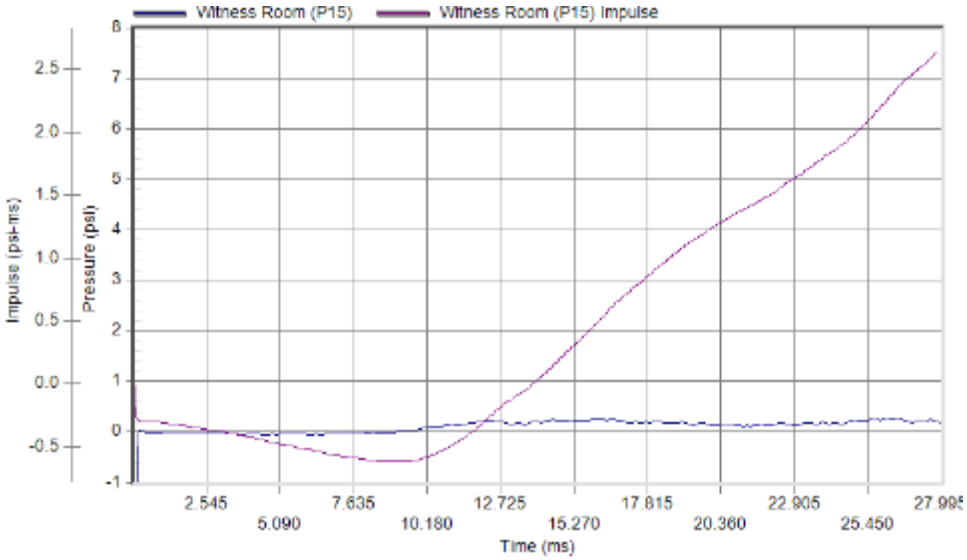
Test Specimen #1 - Pressure Time Plots (continued)



Peak Pressure: 6.27 psi at 5.32 ms
Duration: 12.51 ms

Test Date: 6/19/2019
Test Time: 10:28 am



Peak Pressure: 0.26 psi at 26.42 ms
Duration: 0.00 ms

Test Date: 6/19/2019
Test Time: 10:28 am

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Test Specimen #2

DESCRIPTION	**RESULTS**
Ambient Temperature	82°F
Glazing Temperature	83°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**3a**
PEAK POSITIVE PRESSURE	
Top Pressure	6.14 psi
Right Pressure	6.36 psi
Shell Pressure	5.84 psi
Average Pressure	**6.11 psi**
Witness Chamber Pressure	0.33 psi
PEAK POSITIVE PHASE DURATION	
Top Duration	12.42 msec
Right Duration	10.40 msec
Shell Duration	13.16 msec
Average Duration	**11.99 msec**
PEAK POSITIVE PHASE IMPULSE	
Top Impulse	41 psi*msec
Right Impulse	42 psi*msec
Shell Impulse	41 psi*msec
Average Impulse	**41 psi*msec**
GLAZING RESPONSE	
Exterior Lite	Fractured
Interior Lite	N/A
Glazing Pullout	None
Film Tearing	10" tear bottom right corner interior; 13" tear top right corner; 2" tear top left corner
WITNESS CHAMBER RESULTS	
Glass was deposited on the witness chamber floor. Two fragments were located before the 1M mark. No damage observed to the witness panel.	

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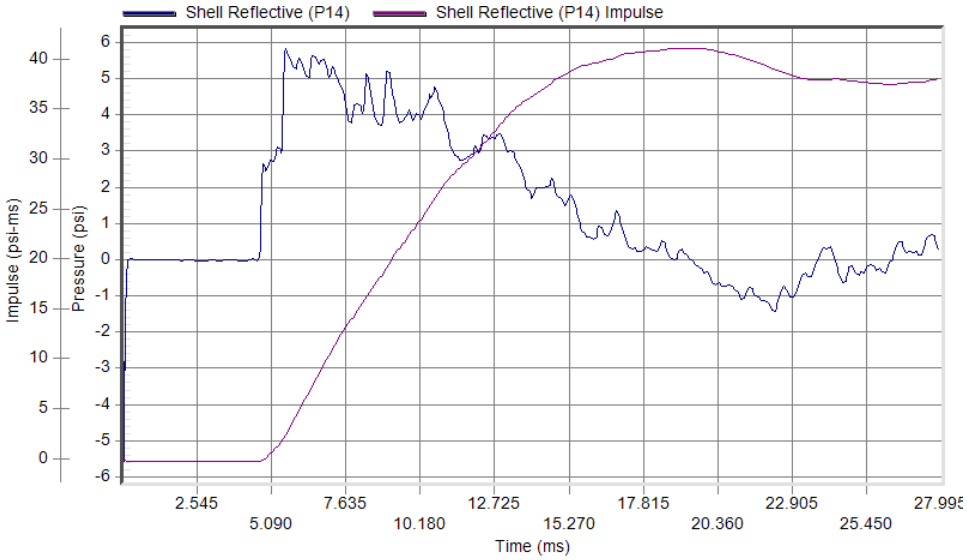
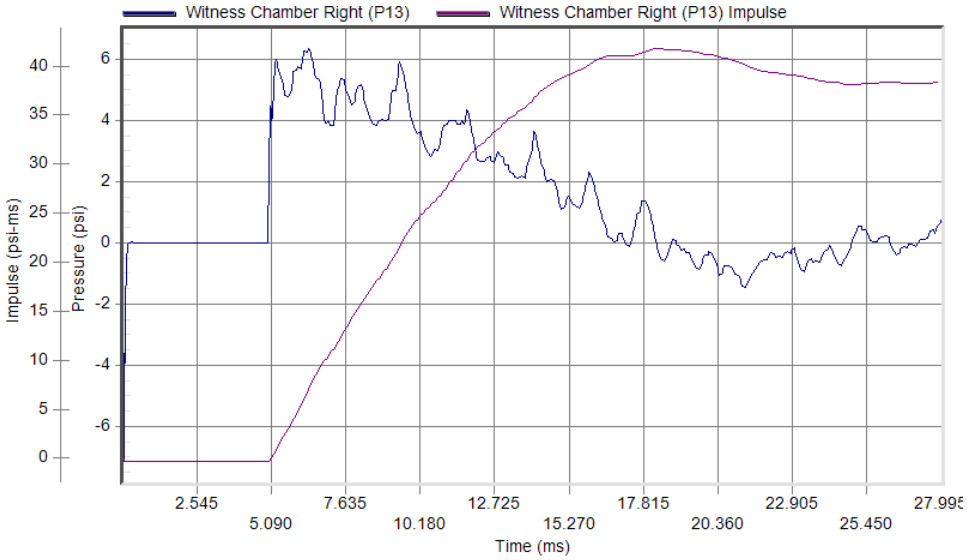
Test Specimen #2 - Pressure Time Plots



Peak Pressure: 5.84 psi at 5.59 ms
Duration: 13.16 ms

Test Date: 6/19/2019
Test Time: 11:57 am



Peak Pressure: 6.36 psi at 6.39 ms
Duration: 10.40 ms

Test Date: 6/19/2019
Test Time: 11:57 am

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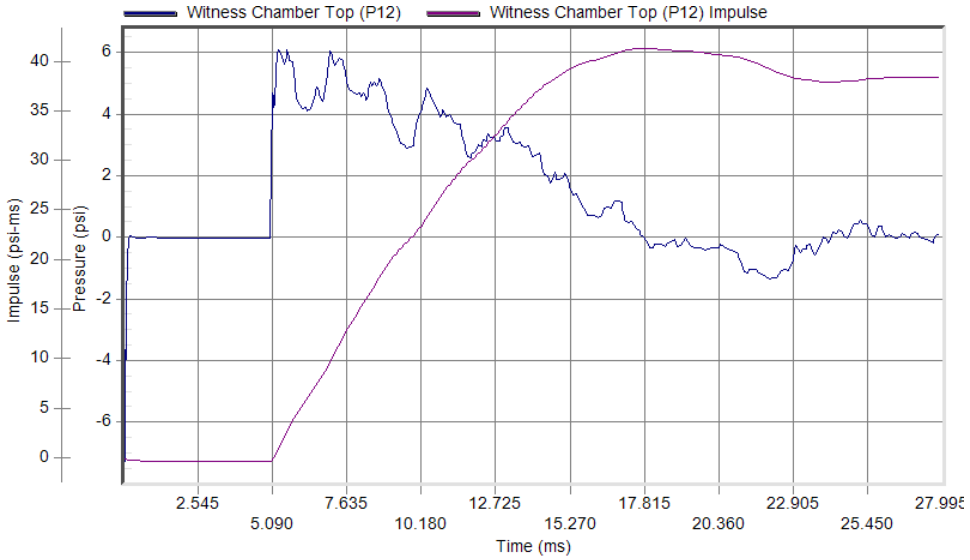
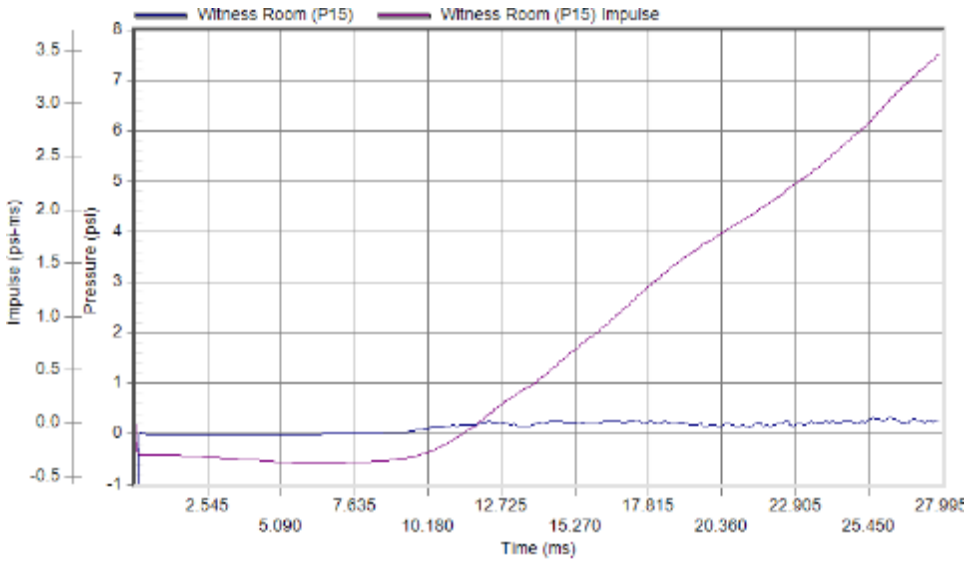
Test Specimen #2 - Pressure Time Plots (continued)



Peak Pressure: 6.14 psi at 5.32 ms
Duration: 12.42 ms

Test Date: 6/19/2019
Test Time: 11:57 am



Peak Pressure: 0.33 psi at 26.12 ms
Duration: 0.00 ms

Test Date: 6/19/2019
Test Time: 11:57 am

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Test Specimen #3

DESCRIPTION	RESULTS
Ambient Temperature	84°F
Glazing Temperature	86°F
ASTM Hazard Rating	**Minimal Hazard**
GSA Performance Condition	**3a**
PEAK POSITIVE PRESSURE	
Top Pressure	6.22 psi
Right Pressure	6.12 psi
Shell Pressure	6.01 psi
Average Pressure	**6.12 psi**
Witness Chamber Pressure	0.26 psi
PEAK POSITIVE PHASE DURATION	
Top Duration	12.99 msec
Right Duration	10.79 msec
Shell Duration	12.85 msec
Average Duration	**12.21 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	Fractured
Interior Lite	N/A
Glazing Pullout	None
Film Tearing	7" tear bottom right; 14-1/4" tear top right corner; 4" tear upper left corner
WITNESS CHAMBER RESULTS	
Glass was deposited on the witness chamber floor. One fragment was located before the 1M mark. The weight of the fragment was 2.68g. No damage observed to the witness panel.	

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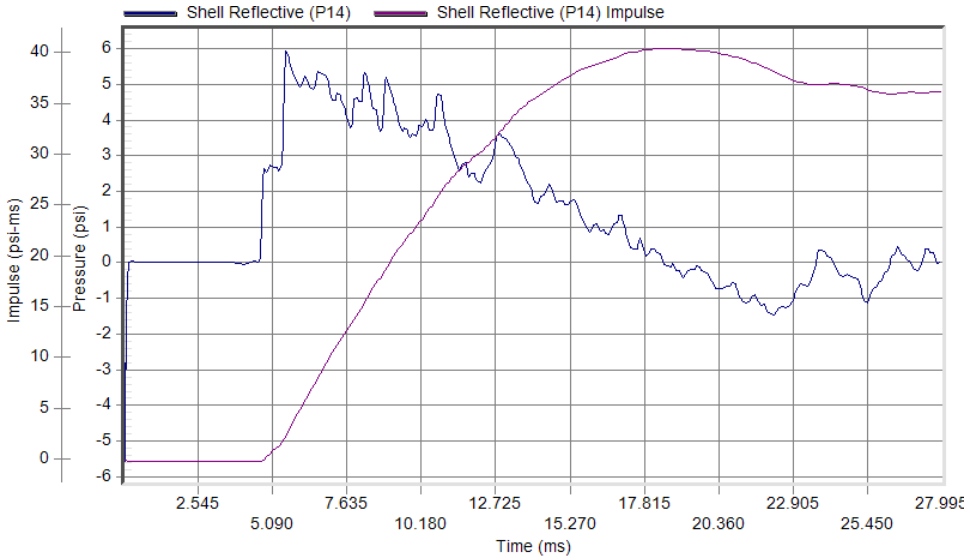
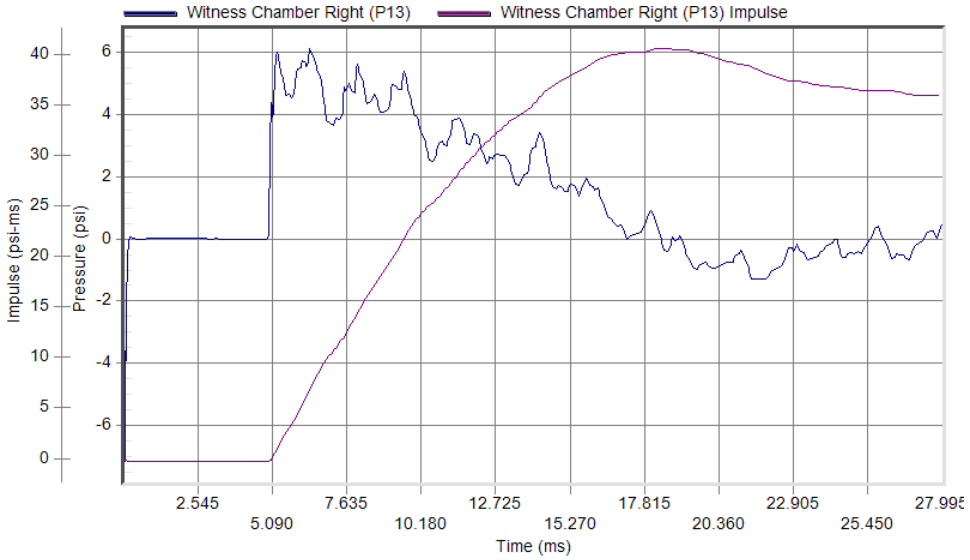
Test Specimen #3 - Pressure Time Plots



Peak Pressure: 6.01 psi at 5.60 ms
Duration: 12.85 ms

Test Date: 6/19/2019
Test Time: 2:48 pm



Peak Pressure: 6.12 psi at 6.39 ms
Duration: 10.79 ms

Test Date: 6/19/2019
Test Time: 2:48 pm

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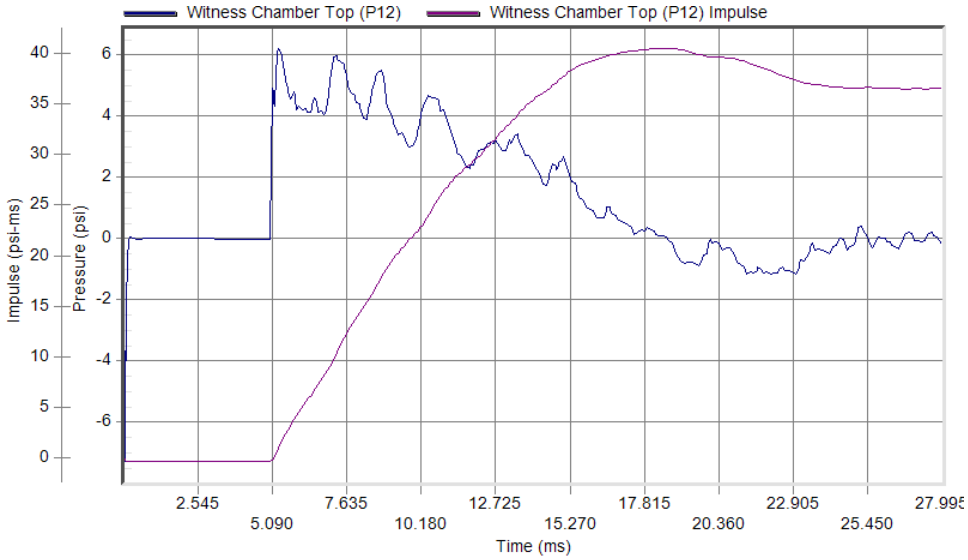
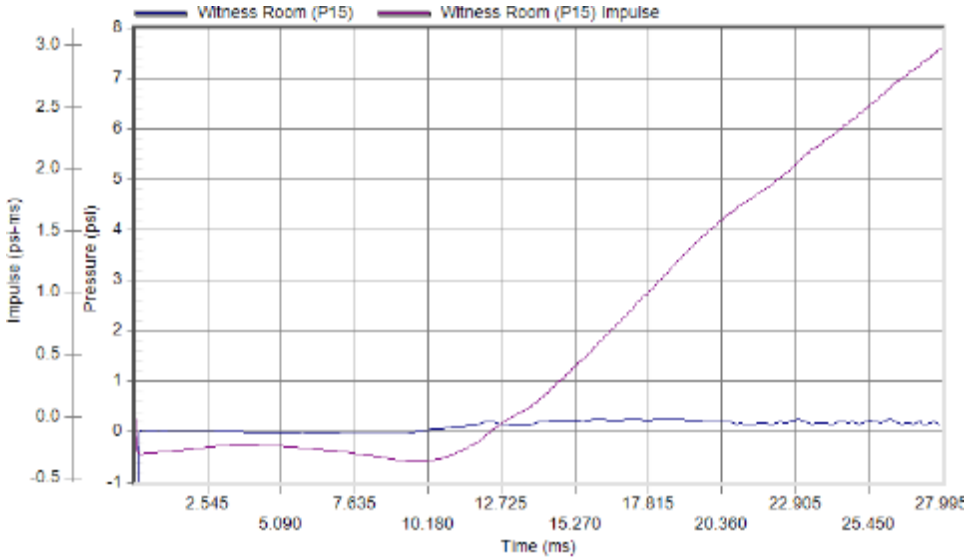
Test Specimen #3 - Pressure Time Plots (continued)



Peak Pressure: 6.22 psi at 5.32 ms
Duration: 12.99 ms

Test Date: 6/19/2019
Test Time: 2:48 pm



Peak Pressure: 0.26 psi at 17.36 ms
Duration: 0.00 ms

Test Date: 6/19/2019
Test Time: 2:48 pm

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SECTION 11
CONCLUSION

The test specimen(s) achieved the following ratings:

TITLE	SPECIMEN #1	SPECIMEN #2	SPECIMEN #3
ASTM Hazard Rating	Minimal Hazard	Minimal Hazard	Minimal Hazard
GSA Performance Condition	2	3a	3a

SECTION 12
PHOTOGRAPHS

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

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

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

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

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

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

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

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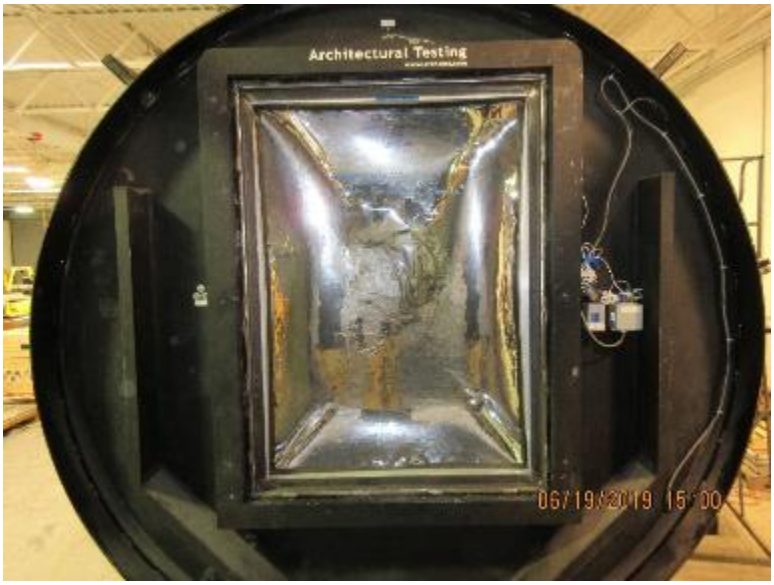

Photo No. 8
Post-test Specimen #3, Interior

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

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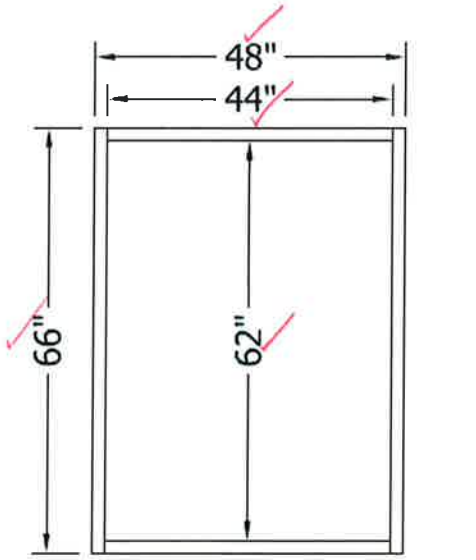
SECTION 13
DRAWINGS

The test specimen drawings which follow have been reviewed by Intertek B&C and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

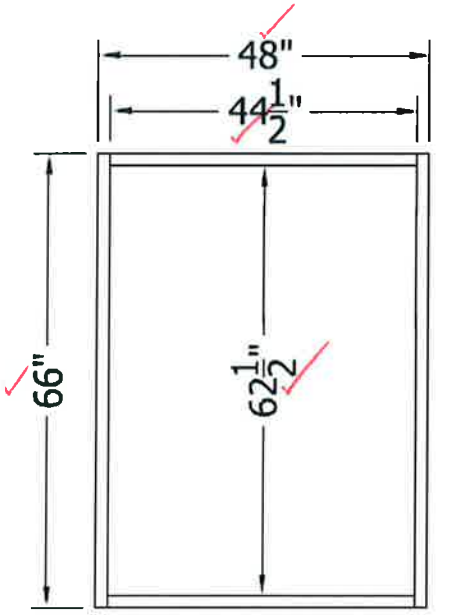
Eastman Performance Films, LLC
Intertek Quote 210169R3
Shock Tube Test Sample Details

Dual-pane unit frames
Kawneer 451 Aluminum Framing



B (12 THUS) 451T

Single-pane unit frames
Kawneer 450 Aluminum Framing



A (20 THUS) 450

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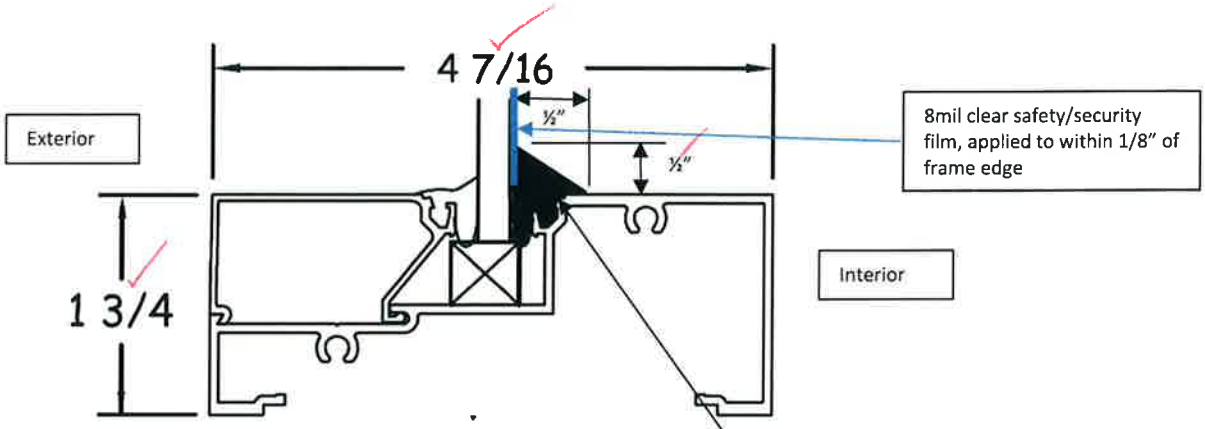
Test sample complies with these details.
Deviations are noted.

Report # J3983 -119-12

Date 8/30/19 Tech TWG

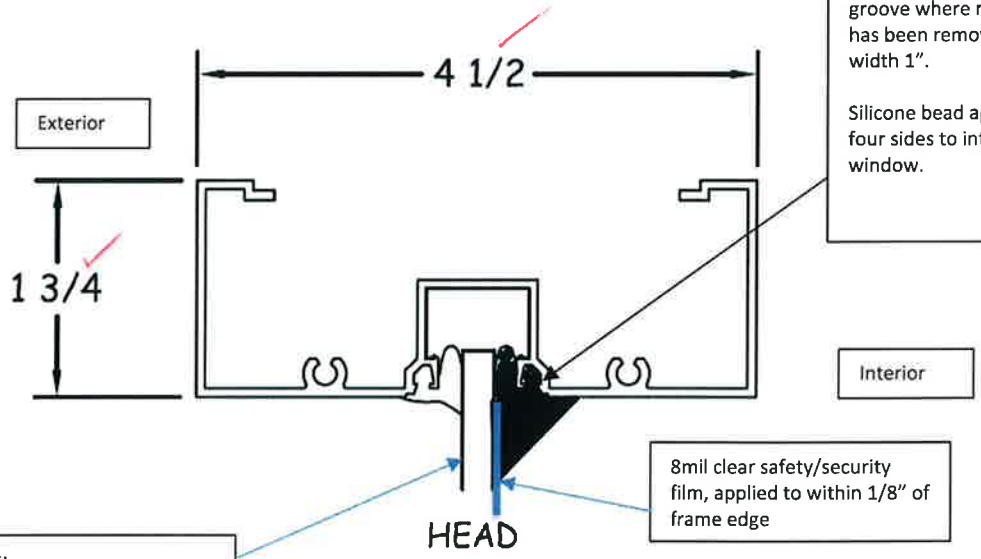


SILL

DETAIL F9

Tremco Proglaze SSG or Dow Corning 995 Structural Silicone Caulking, 3/4" onto film, 3/4" onto frame and into framing groove where rubber gasket has been removed. Bead width 1".

Silicone bead applied on all four sides to interior of window.



8mil clear safety/security film, applied to within 1/8" of frame edge

Glass:
single-pane or dual-pane
(single-pane shown)

HEAD

DETAIL F12

intertek

Test sample complies with these details.
Deviations are noted.

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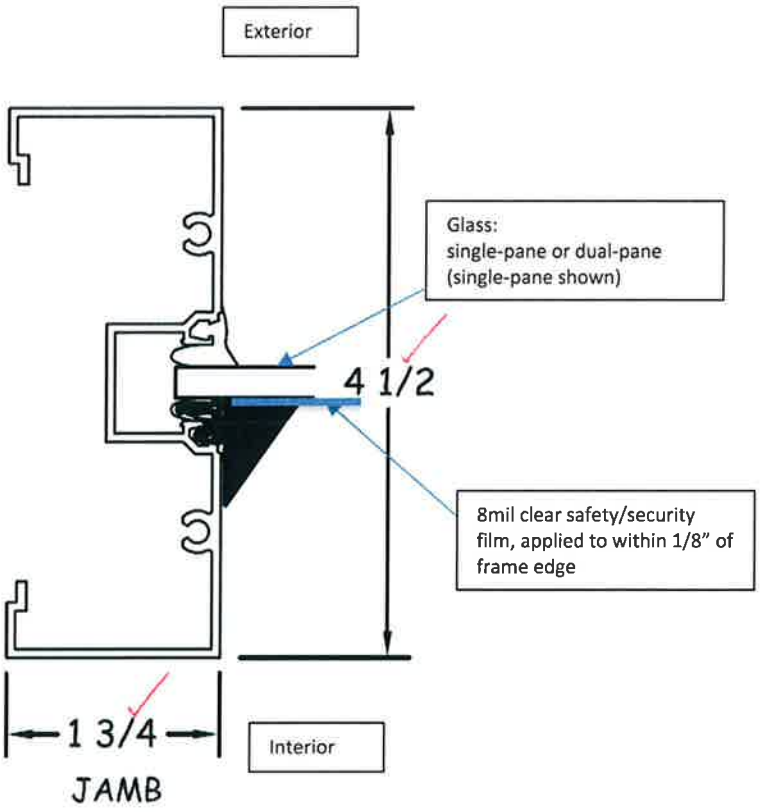

DETAIL F10

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intertek

Test sample complies with these details.
Deviations are noted.

Report # J3983 -119-12

Date 8/30/19 Tech ING

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SECTION 14
REVISION LOG

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