

**ASTM F1642-04/GSA TS01/UFC 4-010-01
TEST REPORT**

Report No.: C4837.03-801-12

Rendered to:

UNITED STATES ALUMINUM
A division of CR Laurence Co., Inc.
Vernon, CA

PRODUCT TYPE: Horizontal Sliding Window
SERIES/MODEL: 8200

SPECIFICATION: ASTM F 1642-04, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.*

AND

GSA-TS01-2003, *US General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.*

AND

UFC 04-010-01, DoD Minimum Antiterrorism Standards for Buildings

Title	Summary of Results
ASTM Hazard Rating	Very Low
GSA Performance Condition	3b
UFC Level of Protection	Low

Test Completion Date: 6/27/2013

Reference must be made to Report No. C4837.03-801-12, dated 6/30/13 for complete test specimen description and detailed test results.



1.0 Report Issued To: United States Aluminum
A Division of C.R. Laurence Co., Inc.
2100 E. 38th Street
Vernon, CA 90058

2.0 Test Laboratory: Architectural Testing, Inc.
1098 US Highway 380
Tahoka, TX 79373
806-797-2208

3.0 Project Summary:

3.1 Product Type: Horizontal Sliding Window

3.2 Series/Model: 8200

3.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). 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 Date: 6/27/2013

3.5 Test Facility: Architectural Testing, Inc.'s shock tube construction consists of a 90 foot long steel tube reinforced with wide flange steel beams, steel tubes, and steel skin. ATI also placed a 48 inches long, 30 inch diameter steel pipe at the standoff calibrated to achieve the desired pressures. The specimen opening dimensions of the shock tube are 92 inches wide and 102 inches. An exterior platform houses the occupied space and witness panels. The sealed surfaces of the reaction buck and shock tube prevent air blast pressure from wrapping around the test specimen, so the blast pressure loads only one side of the test specimen.

3.6 Test Sample Source: The test specimens were provided by the client. Representative samples of the test specimen(s) 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 specimen(s) reported herein. Test specimen construction was verified by Architectural Testing per the drawings located in Appendix C. Any deviations are documented herein or on the drawings.

3.8 Data Acquisition: In accordance with ASTM F 1642-04 and GSA TS01, four reflective pressure transducers are utilized to record data at a 100 kHz sample rate. Three reflective pressure transducers are located on the reaction chamber at the horizontal and vertical midpoints. A fourth pressure transducer is located in the witness area, to the interior of the reaction chamber face. A sketch of the reaction chamber and corresponding reflective pressure sensor locations are provided in Figure #2 of Appendix A.

3.9 Explosive Charge:

Standoff	Charge Weight	Explosive
72 ft	600 grams.	C-4 (Composition 4)

3.10 List of Official Observers:

<u>Name</u>	<u>Company</u>
Bart Masters	Architectural Testing, Inc.
Daniel Simmons, E.I.T.	Architectural Testing, Inc.

4.0 Test Specification(s):

ASTM F 1642-04, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.*

GSA-TS01-2003, *US General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.*

UFC 4-010-1, *DoD Minimum Antiterrorism Standards for Buildings*

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

5.1 Product Sizes:

Measured Dimensions	Width (inches)	Height (inches)
Overall size	71	60
Fixed Day Light Opening	31-1/2	51
Vent Day Light Opening	31-1/2	51

**5.2 Frame Construction:**

Frame Member	Material	Description
HS801	6063-T6 Aluminum	Frame Fin Head
HS803	6063-T6 Aluminum	Frame Fin Sill
HS805	6063-T6 Aluminum	Frame Fin Jamb
SH866	6063-T6 Aluminum	Mullion
SH865	6063-T6 Aluminum	Glazing Bead (Blast)
HS804	6063-T6 Aluminum	Sill Insert
PW803	6063-T5 Aluminum	Jamb Cover

	Joinery Type	Detail
Sill Insert	Snap-Fit	The sill insert was square cut and snap-fit into the sill.
Glazing Bead	Snap-Fit	The glazing bead was square cut and snap fit into the sill insert.
Sill corners	Square Cut and Butted	The sill and sill insert was mechanically fastened to the jamb using five (5) #8 x 1" Phil Hex Washer HD SMS Type AB SS screws.
Head corners	Square Cut and Butted	The sill was mechanically fastened to the jamb using three (3) #8 x 1" Phil Hex Washer HD SMS Type AB SS screws.
Mullion	Square Cut and Butted	The mullion was mechanically fastened to the head and sill using four (4) #8 x 1-1/4" Phil Hex Washer HD SMS A SS screws.
Jamb Insert	Snap-Fit	The Jamb insert was square cut and snap fit into the fixed lite jamb.

5.3 Sash Construction:

Vent Member	Material	Description
HS854	6063-T6 Aluminum	Interlock
HS813	6063-T6 Aluminum	Bottom Rail
HS815	6063-T6 Aluminum	Vent Stile
SH865	6063-T6 Aluminum	Glazing Bead (Blast)
HS811	6063-T6 Aluminum	Top Rail

	Joinery Type	Detail
All corners	Square Cut and Butted	The vertical ran through while the horizontal was square cut and butted then mechanically fastened using one (1) #8 x 1" Phil Hex Washer HD SMS Type AB SS screws.

5.4 Glazing:

Glass Type	Interior Lite (Nominal)	Interlayer Material	Interlayer Thickness	Exterior Lite (Nominal)	Glazing Bite
1" IG	1/4" Lam. (2) 1/8 " AN	PVB	0.030"	1/4" HS	1"

Spacer: Aluminum; desiccant filled; 1/2" air space.

Glazing Method: The lites were exterior glazed. Tremco glazing gasket (Part# NP881) was applied to the interior of the glazing. Tremco glazing gasket (Part# TR-14677E) was applied to the exterior of the glazing.

5.5 Hardware:

Description	Quantity	Location
Latch Housing	2	Vent Stile
Sash Release Lever	2	Vent Stile
Lock Assembly	1	Interlock

5.6 Reinforcement: No reinforcement was utilized.

6.0 Installation:

The specimen was installed into a steel C-channel buck. The specimen was anchored to the surrounding steel buck using 1/4-20 x 1-1/8" TEK screws. See Drawing MU2012-021-00 in Appendix C for anchor spacing and location.

7.0 Test Results: The results are tabulated as follows

Test Specimen #1:

Description	Results
Ambient Temperature	95°F
Glazing Temperature	98°F
ASTM Hazard Rating	Very Low
GSA Performance Condition	3b
UFC Level of Protection	Low

Peak Positive Pressure	
Top Pressure	7.127 psi
Right Pressure	8.758 psi
Shell Pressure	6.744 psi
Average Pressure	7.543 psi
Witness Chamber Pressure	0.279 psi

Peak Positive Phase Duration	
Top Duration	14.81 msec
Right Duration	13.14 msec
Shell Duration	11.99 msec

Peak Positive Phase Impulse	
Top Impulse	46.83 psi*msec
Right Impulse	42.24 psi*msec
Shell Impulse	39.63 psi*msec
Average Impulse	42.90 psi*msec

Glazing Response		
Lite	Fixed	Operable
Exterior Lite	Fractured	Fractured
Interior Lite	Fractured	Fractured
Glazing Pullout Length and Location	79"	None
Glazing Tearing	1.75" at center	None

Witness Chamber Results
A dusting of glass was deposited on the witness chamber floor. The glazing generally fell between zero and 40" of the inside face of the glazing. One (1) fragment was located at 112". Two (2) glazing sliver perforations were located below 20" on the vertical witness panel.

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

Test Specimen #2:

Description	Results
Ambient Temperature	95°F
Glazing Temperature	105°F
ASTM Hazard Rating	Very Low
GSA Performance Condition	3b
UFC Level of Protection	Low

Peak Positive Pressure	
Top Pressure	7.897 psi
Right Pressure	6.809 psi
Shell Pressure	7.178 psi
Average Pressure	7.295 psi
Witness Chamber Pressure	0.375 psi

Peak Positive Phase Duration	
Top Duration	13.89 msec
Right Duration	14.25 msec
Shell Duration	12.85 msec

Peak Positive Phase Impulse	
Top Impulse	36.51 psi*msec
Right Impulse	38.69 psi*msec
Shell Impulse	39.87 psi*msec
Average Impulse	38.35 psi*msec

Glazing Response		
Lite	Fixed	Operable
Exterior Lite	Fractured	Fractured
Interior Lite	Fractured	Fractured
Glazing Pullout Length and Location	51"	None
Glazing Tearing	None	None

Witness Chamber Results
A dusting of glass was deposited on the witness chamber floor. The glazing generally fell between zero and 40" of the inside face of the glazing. One (1) fragment was located at 58". Zero (0) perforations or indents were located on the vertical witness panel.

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

Test Specimen #3:

Description	Results
Ambient Temperature	87°F
Glazing Temperature	101°F
ASTM Hazard Rating	Very Low
GSA Performance Condition	3b
UFC Level of Protection	Low

Peak Positive Pressure	
Top Pressure	7.873 psi
Right Pressure	6.770 psi
Shell Pressure	7.194 psi
Average Pressure	6.869 psi
Witness Chamber Pressure	0.387 psi

Peak Positive Phase Duration	
Top Duration	13.90 msec
Right Duration	14.33 msec
Shell Duration	14.01 msec

Peak Positive Phase Impulse	
Top Impulse	36.01 psi*msec
Right Impulse	39.94 psi*msec
Shell Impulse	33.98 psi*msec
Average Impulse	40.49 psi*msec

Glazing Response		
Lite	Fixed	Operable
Exterior Lite	Fractured	Fractured
Interior Lite	Fractured	Fractured
Glazing Pullout Length and Location	45"	44"
Glazing Tearing	None	None

Witness Chamber Results
A dusting of glass was deposited on the witness chamber floor. The glazing generally fell between zero and 40" of the inside face of the glazing. One (1) fragment was located at 51-3/8". Zero (0) perforations or indents were located on the vertical witness panel.

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



The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

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 specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, Inc.

Daniel Simmons, E.I.T.
Project Manager

John Waskow, P.E.
Director – Regional Operations

DS:hd

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

- Appendix-A: Test Facility (1)
- Appendix-B: Pressure Time Plots (3)
- Appendix-C: Photographs (4)
- Appendix-D: Drawings (10)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	6/30/13	N/A	Original report issue

This report produced from controlled document template ATI 00368, issued 06/08/12.



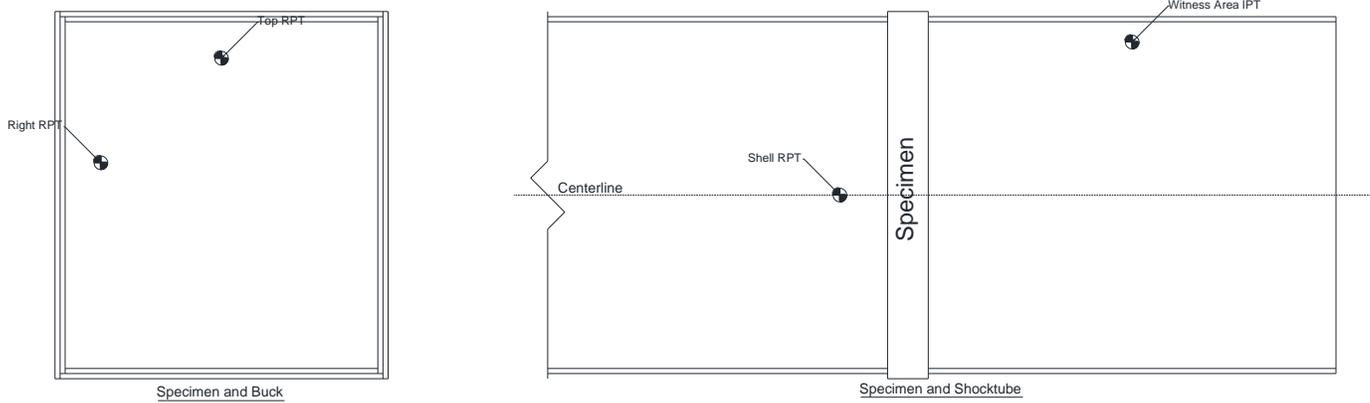
Architectural Testing

Test Report No.: C4837.01-801-12
Report Date: 6/30/13
Test Record Retention End Date: 6/30/17

Appendix A

Test Facility

Figure #1
Pressure Sensor Locations



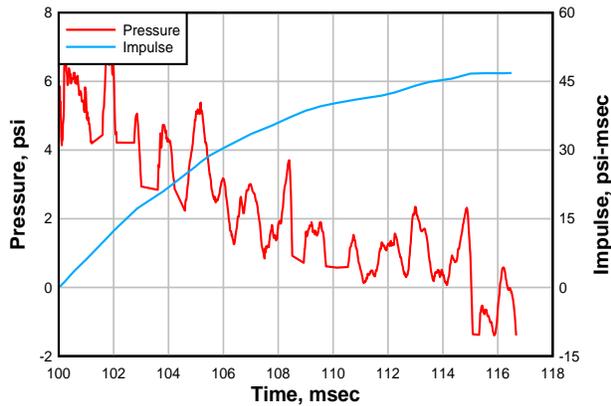


Test Report No.: C4837.03-801-12
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Appendix B
Pressure Time Plots

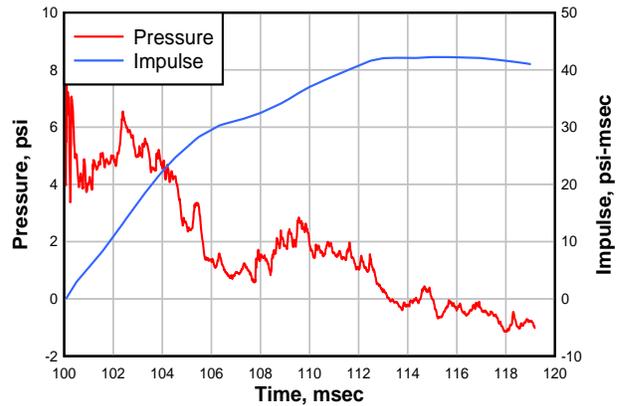
Specimen #1

**Reflected Air Blast Pressure
RPT #1**



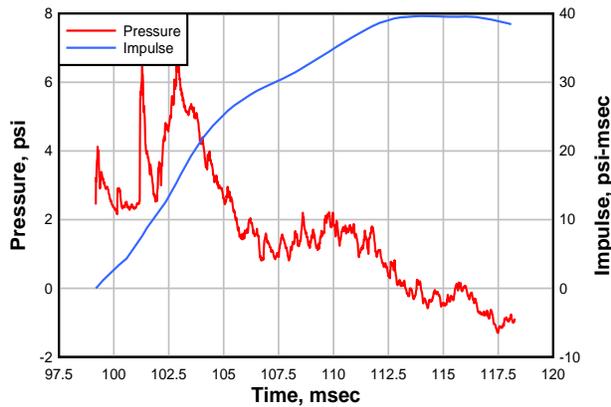
Top RPT

**Reflected Air Blast Pressure
RPT #2**



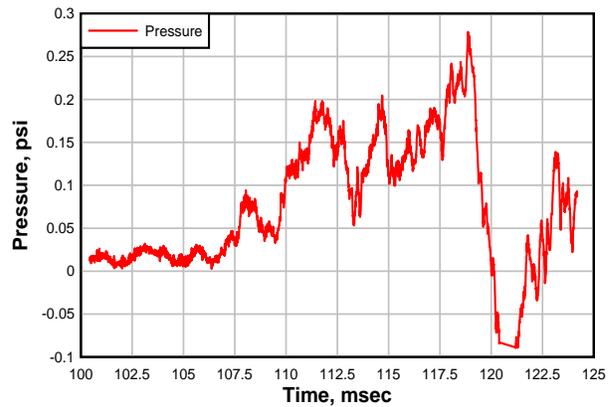
Right RPT

**Reflected Air Blast Pressure
RPT #3**



Shell RPT

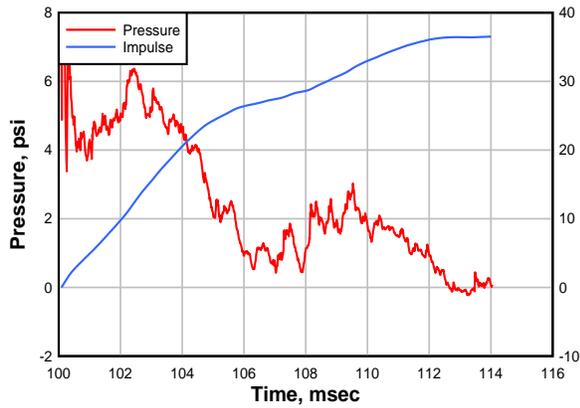
**Internal Air Blast Pressure
IPT #1**



Witness Chamber RPT

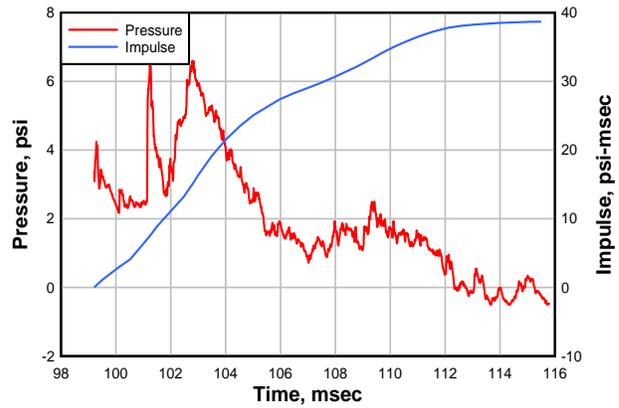
Specimen #2

Reflected Air Blast Pressure
RPT #1



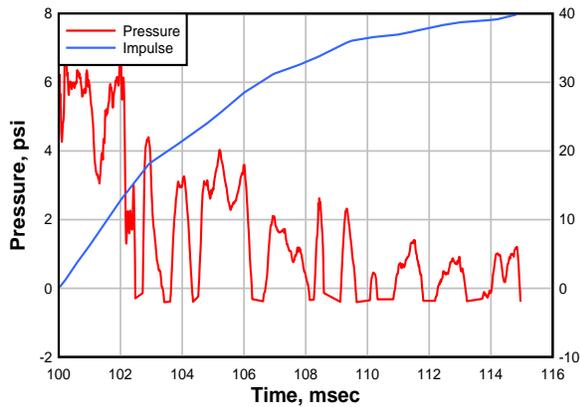
Top RPT

Reflected Air Blast Pressure
RPT #2



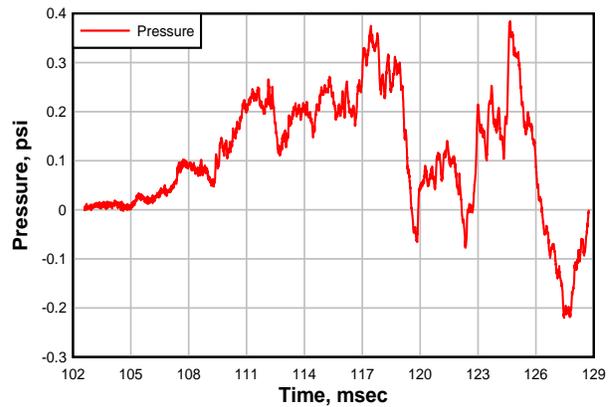
Right RPT

Reflected Air Blast Pressure
RPT #3



Shell RPT

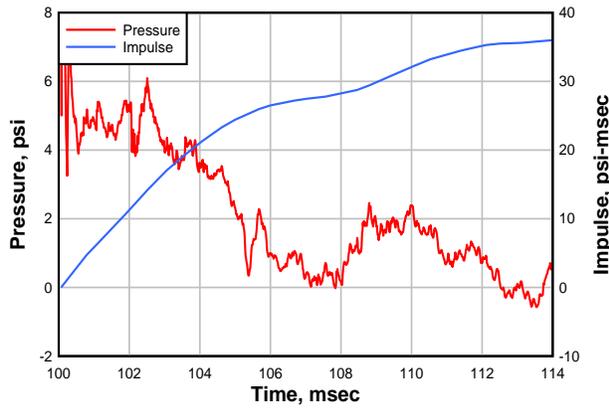
Internal Air Blast Pressure
IPT #1



Witness Chamber RPT

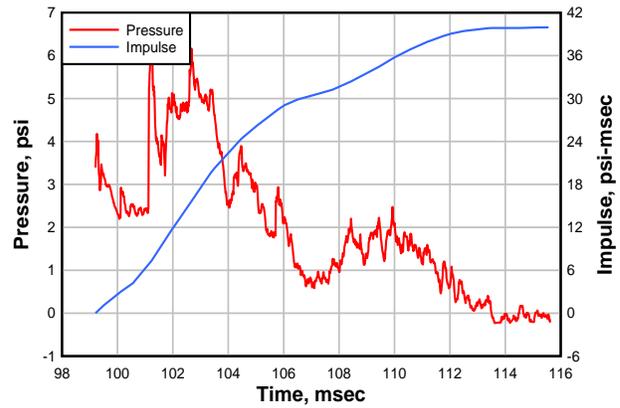
Specimen #3

Reflected Air Blast Pressure
RPT #1



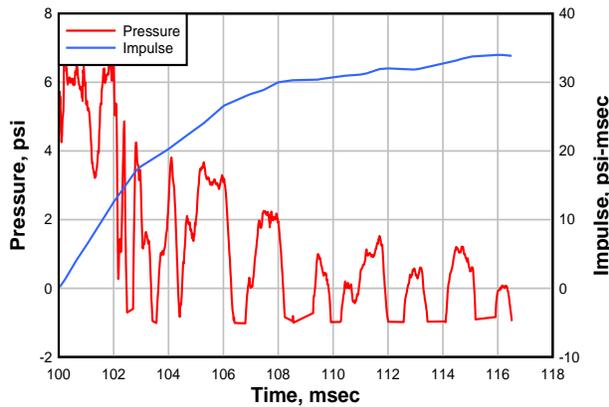
Top RPT

Reflected Air Blast Pressure
RPT #2



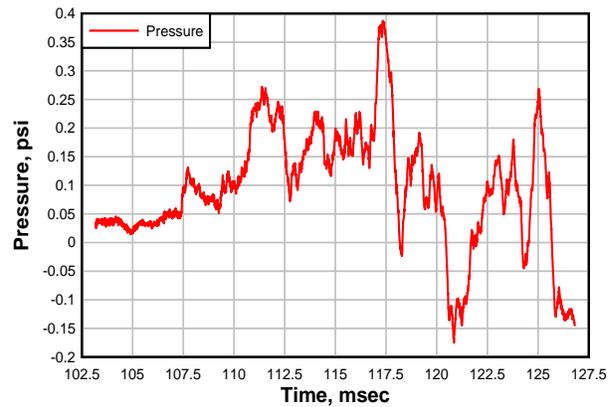
Right RPT

Reflected Air Blast Pressure
RPT #3



Shell RPT

Internal Air Blast Pressure
IPT #1



Witness Chamber RPT



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Appendix C

Photographs



Specimen 1



Photo No. 1
Pre-test, Interior



Photo No. 2
Pre-test, Exterior



Photo No. 3
Post-test, Interior



Photo No. 4
Post-test, Exterior



Photo No. 5
Post-test, Fragment



Photo No. 6
Post-test, Witness Panel Impact



Photo No. 7
Post-test, Witness Panel Impact



Photo No. 8
Post-test, Glazing Tear



Specimen #2



Photo No. 1
Pre-test, Interior



Photo No. 2
Pre-test, Exterior



Photo No. 3
Post-test, Interior



Photo No. 4
Post-test, Exterior

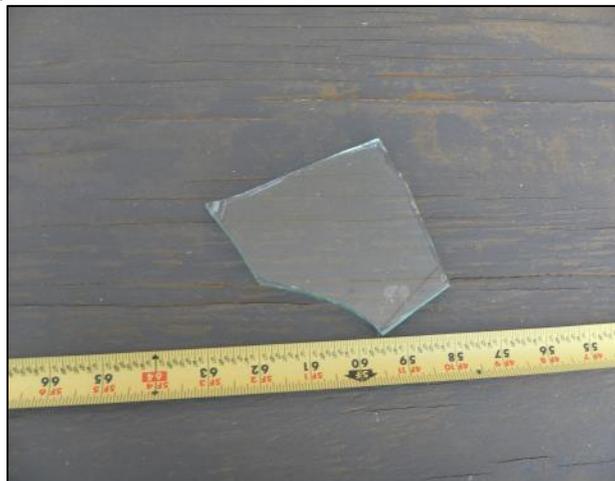


Photo No. 5
Post-test, Fragment



Specimen #3



Photo No. 1
Pre-test, Interior

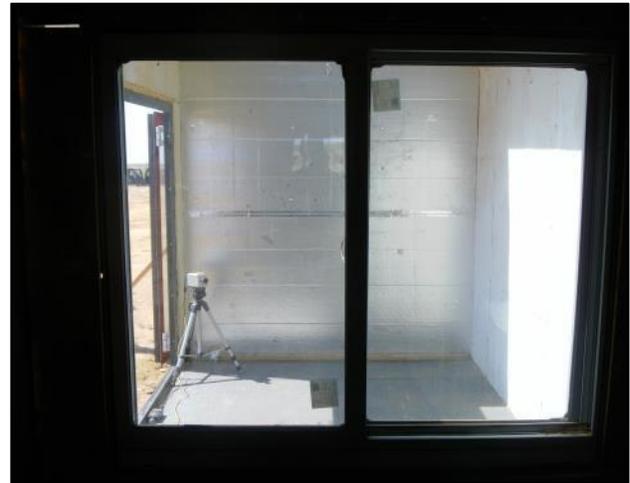


Photo No. 2
Pre-test, Exterior



Photo No. 3
Post-test, Interior



Photo No. 4
Post-test, Witness Chamber



Photo No. 5
Post-test, Exterior

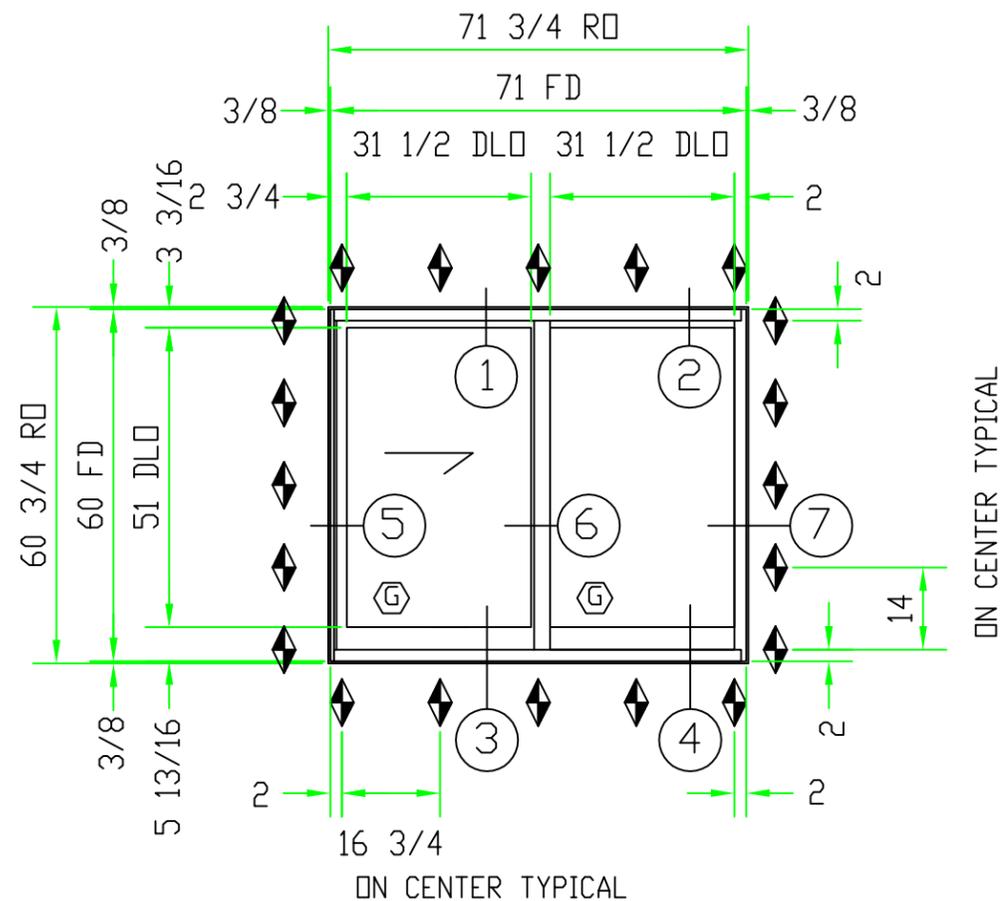


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Appendix D

Drawings



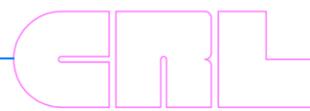
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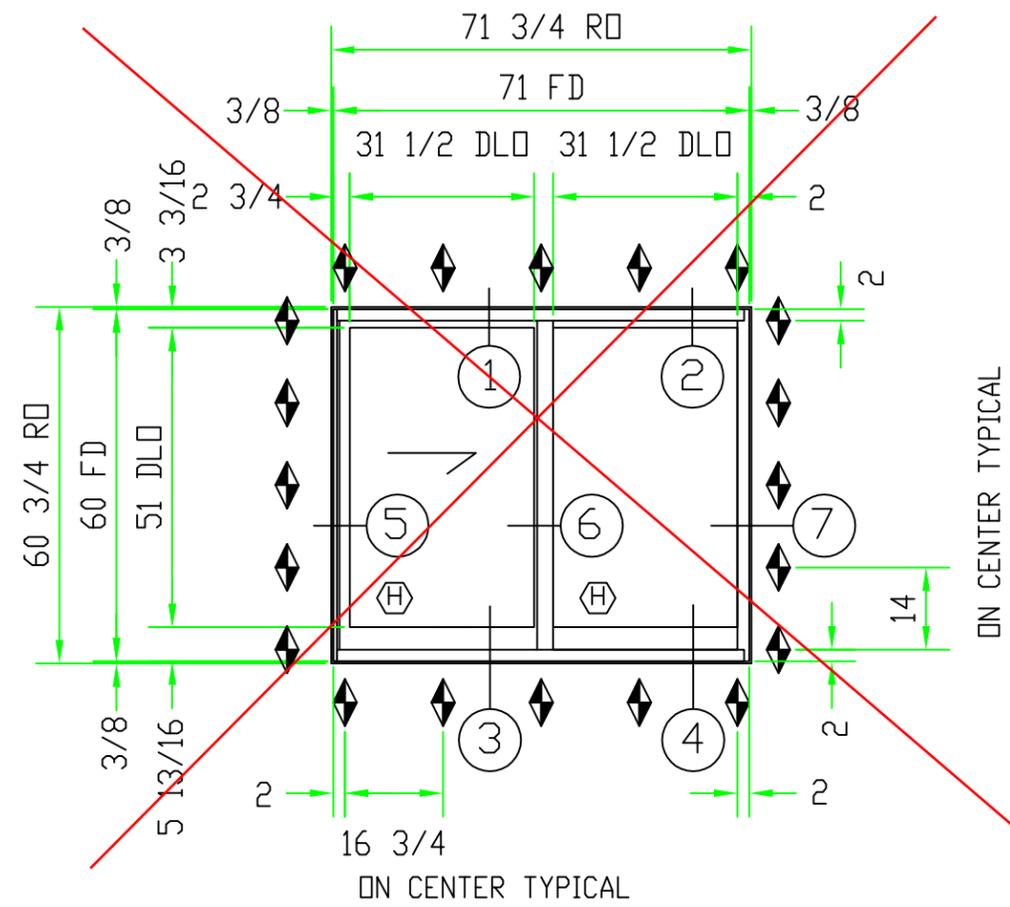


Architectural Testing, Inc
Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

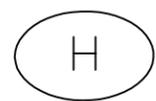
Report #: C4837.03-801-12
Date: 06/30/13 By: DS

SYMBOL KEY			
SYMBOL	DESCRIPTION	QTY	COMMENTS
G	33.500 X 53.000	2	1' INS = 1/4' CLR, 1/2' AIR, LAMI 1/8"HS,030,1/8"HS BUT/PVB
◆	ANCHOR POINT		

				 2100 E. 38TH STREET PHONE: (323) 588-1281 VERNON, CA 90058 FAX: (323) 232-2523		
						DIVISION UNITED STATES ALUMINUM
				DRWN BY: DCW	SHOCK_TUBE_TESTING	DWG NO. MU2012-021-00
REV	REV_DESCRIPTION	DATE	XXX	DATE: 11.28.12	1 PSI - 4 PSI - 6 PSI	
SYM	REVISION	DATE	BY	SCALE: 3/8"=1"	SERIES_8200_HORIZONTAL_SLIDER	



NOT USED



QTY = 1

SYMBOL KEY			
SYMBOL	DESCRIPTION	QTY	COMMENTS
(H)	33.500 X 53.000	2	1.034" INS = 1/4" CLR, 1/2" AIR, LAMI 1/8"HS,060,1/8"HS BUT/PVB
◆	ANCHOR POINT		

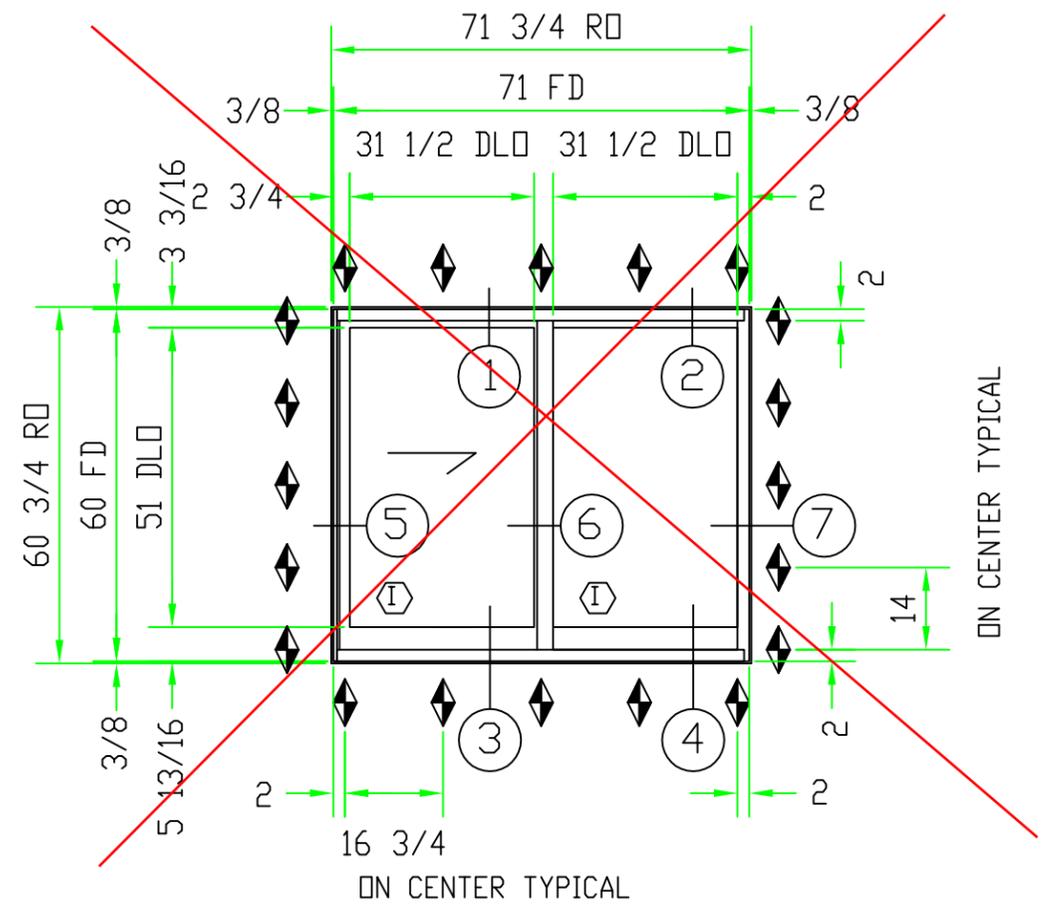
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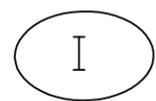
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DRWN BY: DCW	SHOCK_TUBE_TESTING	DWG NO.
DATE: 11.28.12	1 PSI - 4 PSI - 6 PSI	MU2012-021-01
SCALE: 3/8"=1"	SERIES_8200_HORIZONTAL_SLIDER	



NOT USED



QTY = 1

SYMBOL KEY			
SYMBOL	DESCRIPTION	QTY	COMMENTS
⊕	33.500 X 53.000	2	1.054" INS - 1/4" CLR, 3/8" AIR, LAMI 3/16"HS,090,3/16"HS SGP
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REV	REV_DESCRIPTION	DATE	XXX
SYM	REVISION	DATE	BY

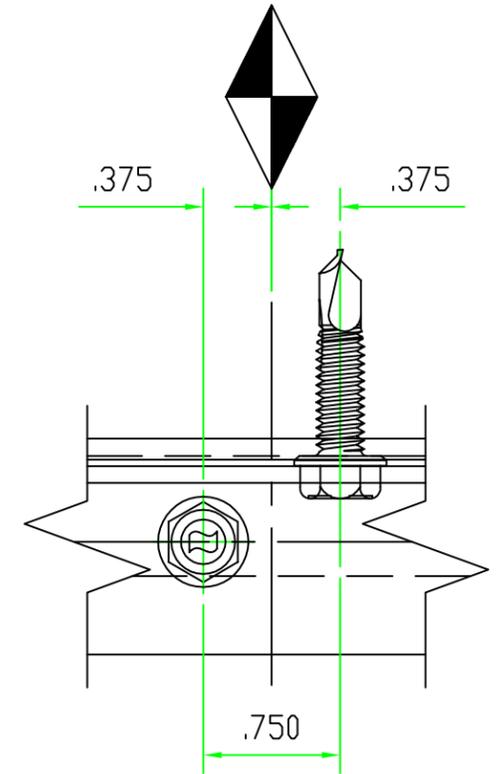
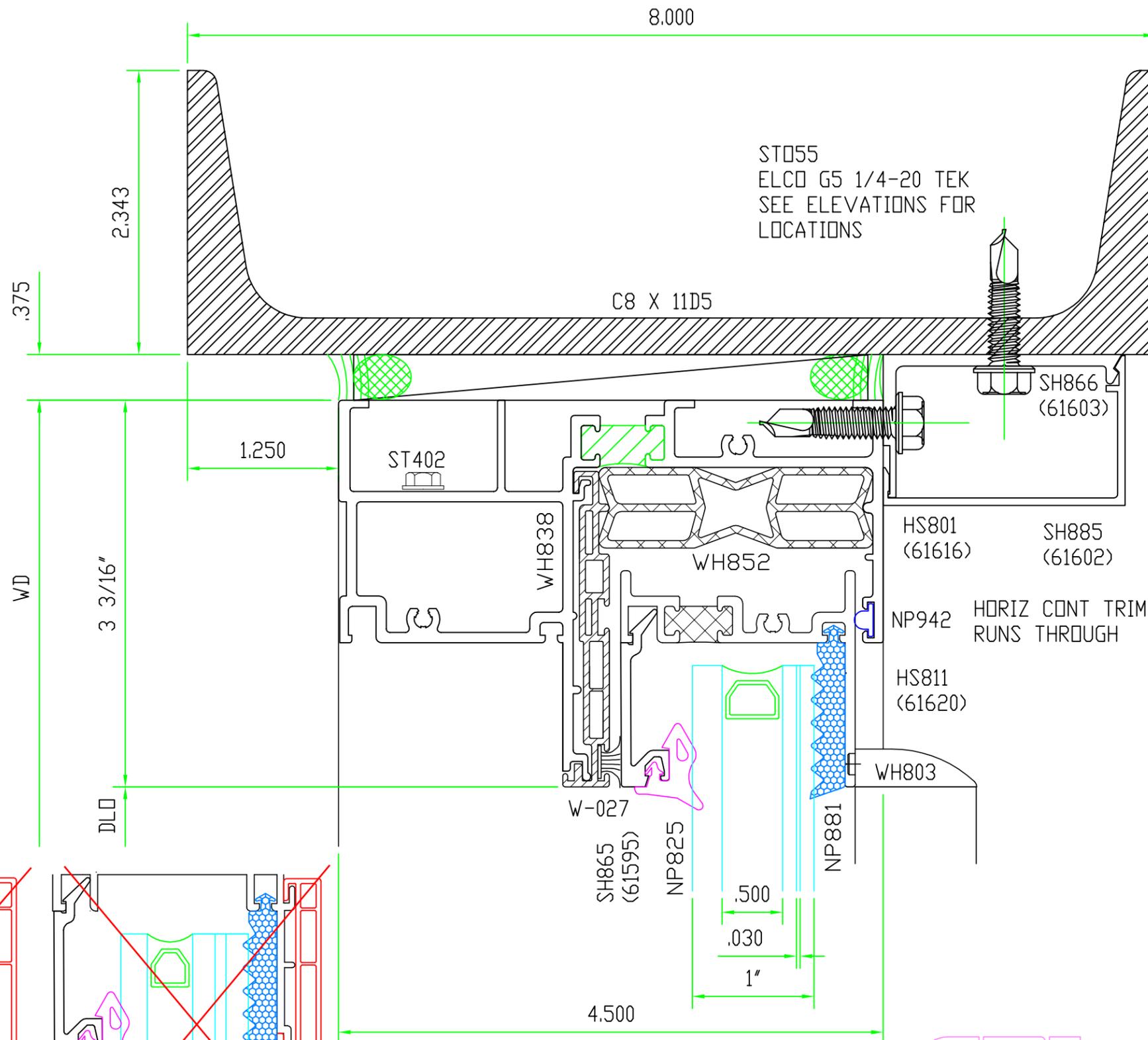


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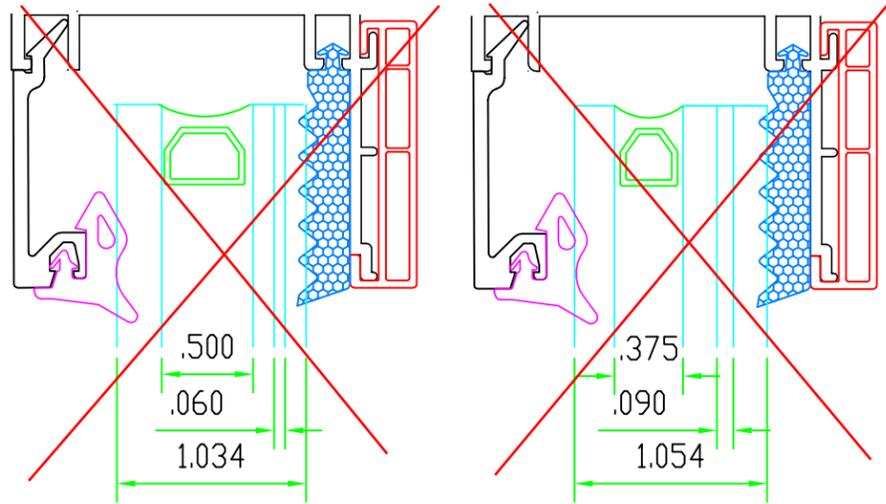
DIVISION UNITED STATES ALUMINUM

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DATE: 11.28.12	10 PSI	MU2012-021-10
SCALE: 3/8"=1"	SERIES_8200_HORIZONTAL_SLIDER	

1



TYPICAL FASTENER OFFSET FOR INSTALLATION



Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

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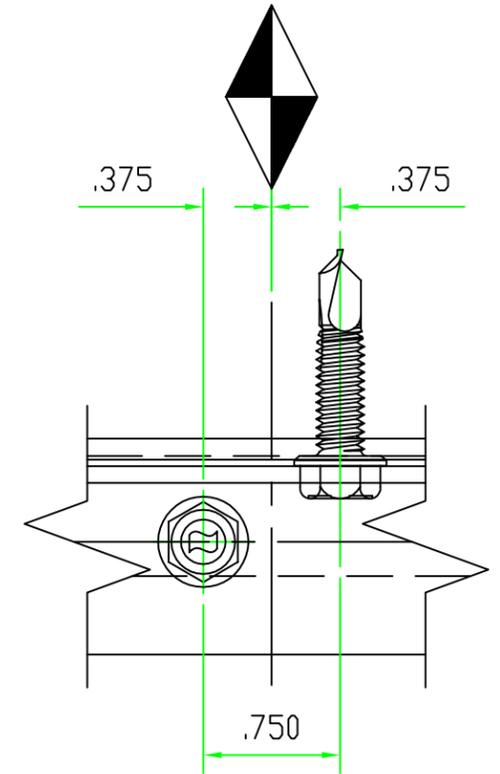
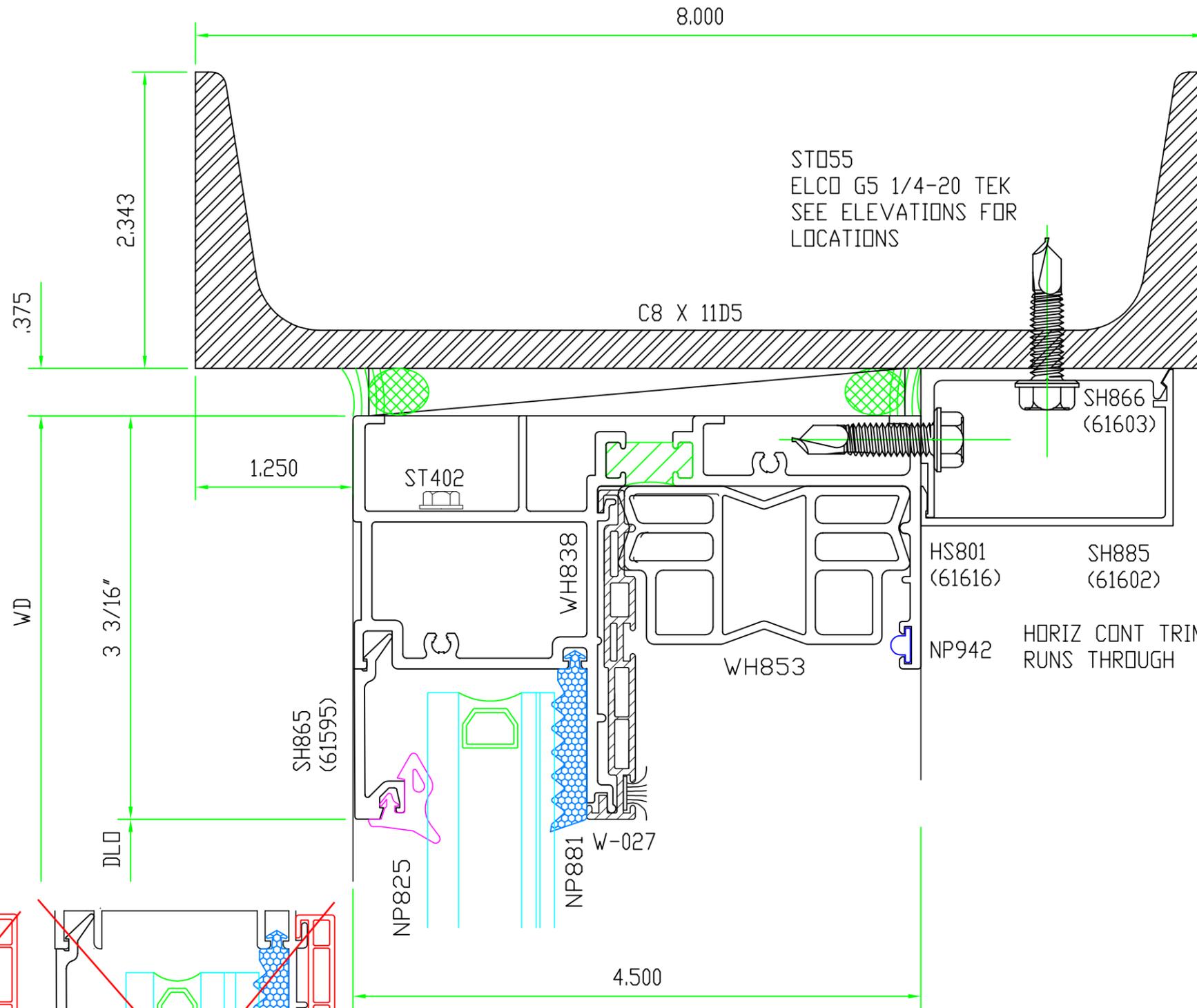


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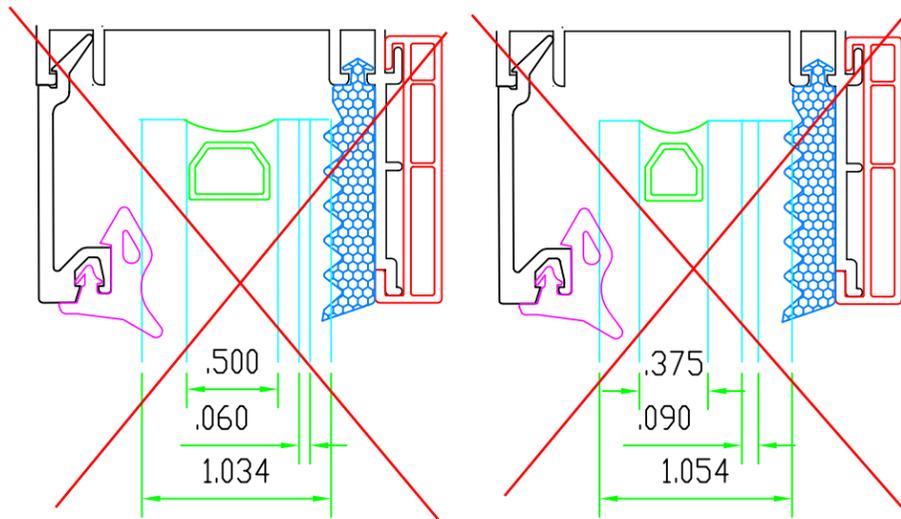
DIVISION UNITED STATES ALUMINUM

REV	REV_DESCRIPTION	DATE	XXX
SYM	REVISION	DATE	BY

DRWN BY: DCW	SHOCK_TUBE_TESTING	DWG NO.
DATE: 11.29.12	SERIES_8200_HORIZONTAL_SLIDER	MU2012-021-20
SCALE: FULL		



TYPICAL FASTENER OFFSET FOR INSTALLATION



Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

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DIVISION UNITED STATES ALUMINUM

REV	REV_DESCRIPTION	DATE	XXX	DRWN BY: DCW	SHOCK_TUBE_TESTING	DWG NO.
SYM	REVISION	DATE	BY	DATE: 11.29.12		
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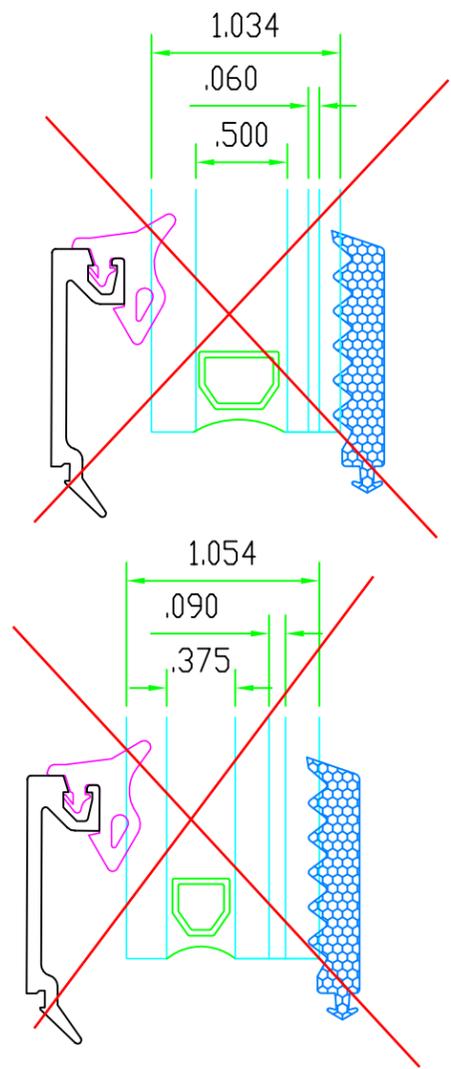
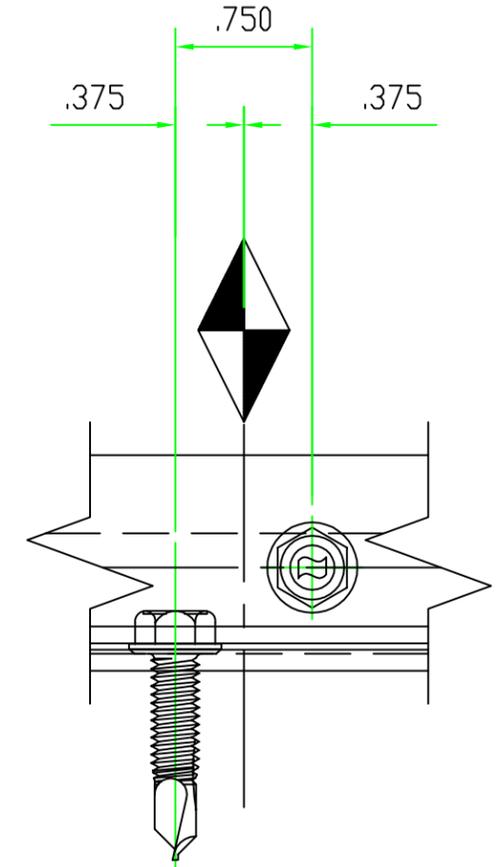


Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

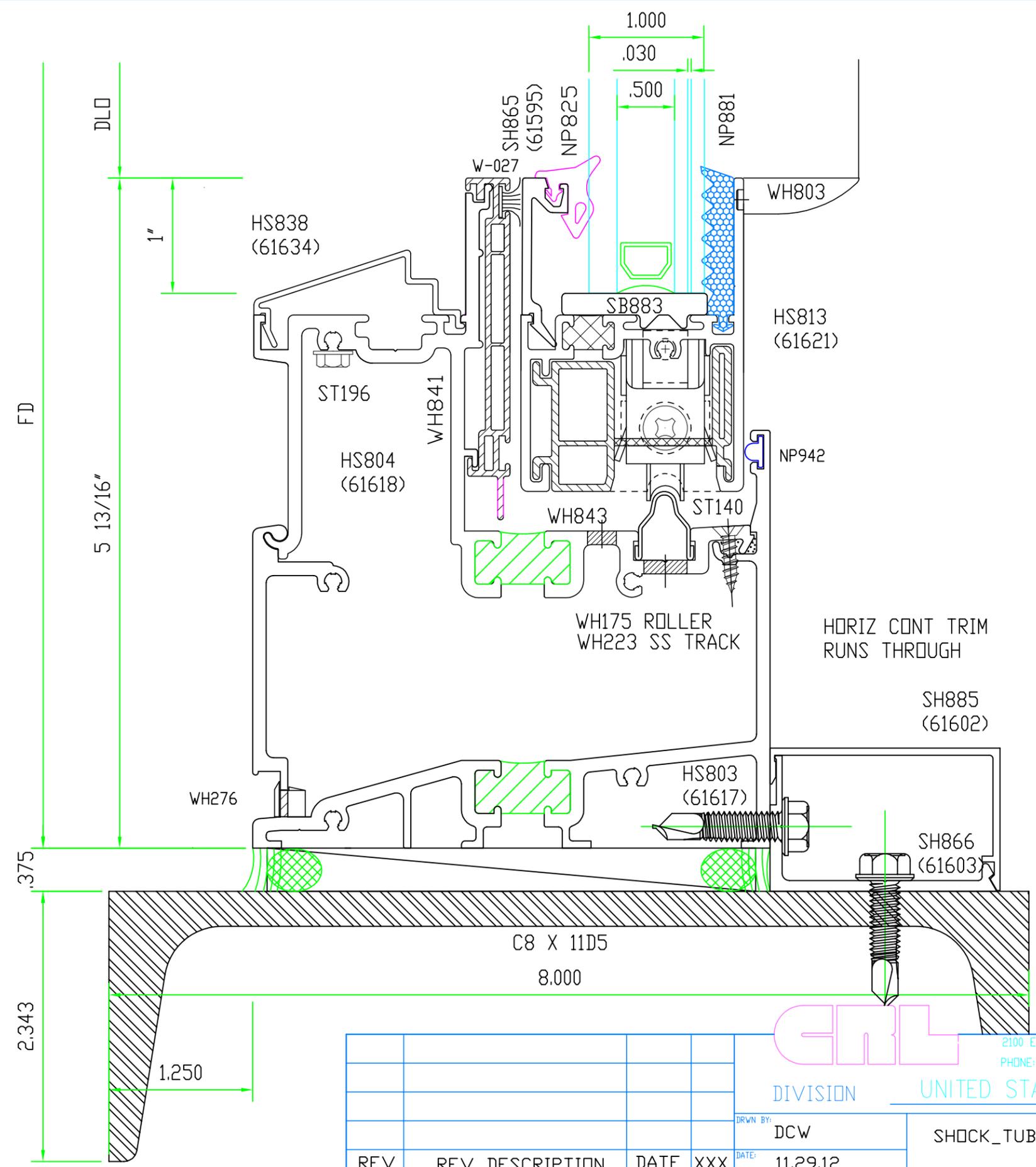
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 Date: 06/30/13 By: DS

ST055
 ELCD G5 1/4-20 TEK
 SEE ELEVATIONS FOR LOCATIONS

TYPICAL FASTENER OFFSET FOR INSTALLATION



3



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 PHONE: (323) 588-1281 FAX: (323) 232-2523

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				DRWN BY: DCW		SHOCK_TUBE_TESTING		DWG NO.	
				DATE: 11.29.12		SERIES_8200_HORIZONTAL_SLIDER		MU2012-021-40	
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SYM	REVISION	DATE	BY	FULL					

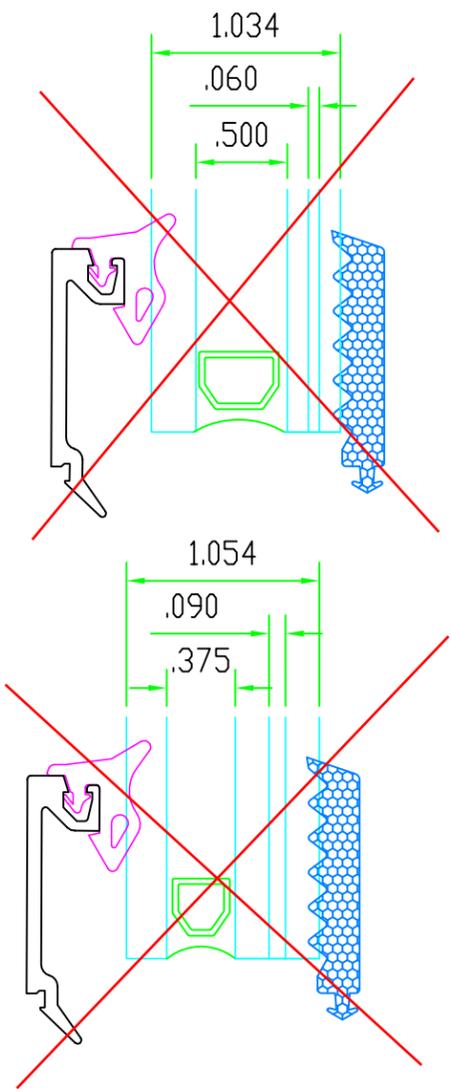


Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

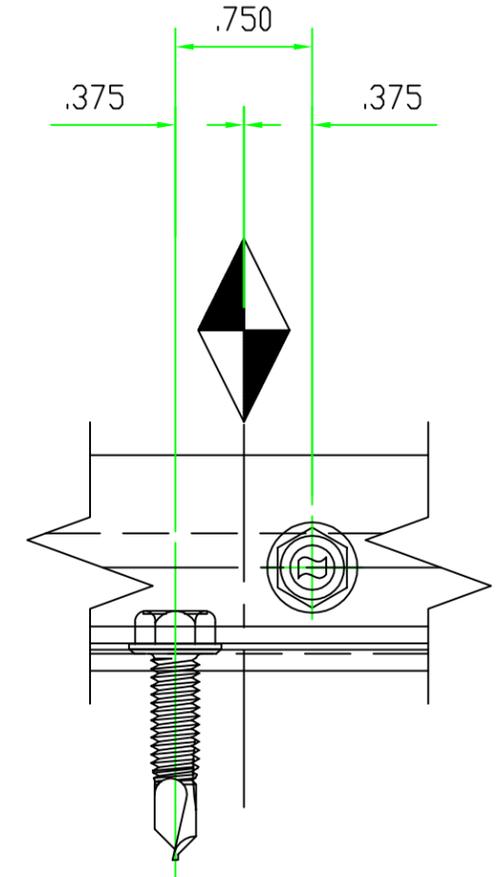
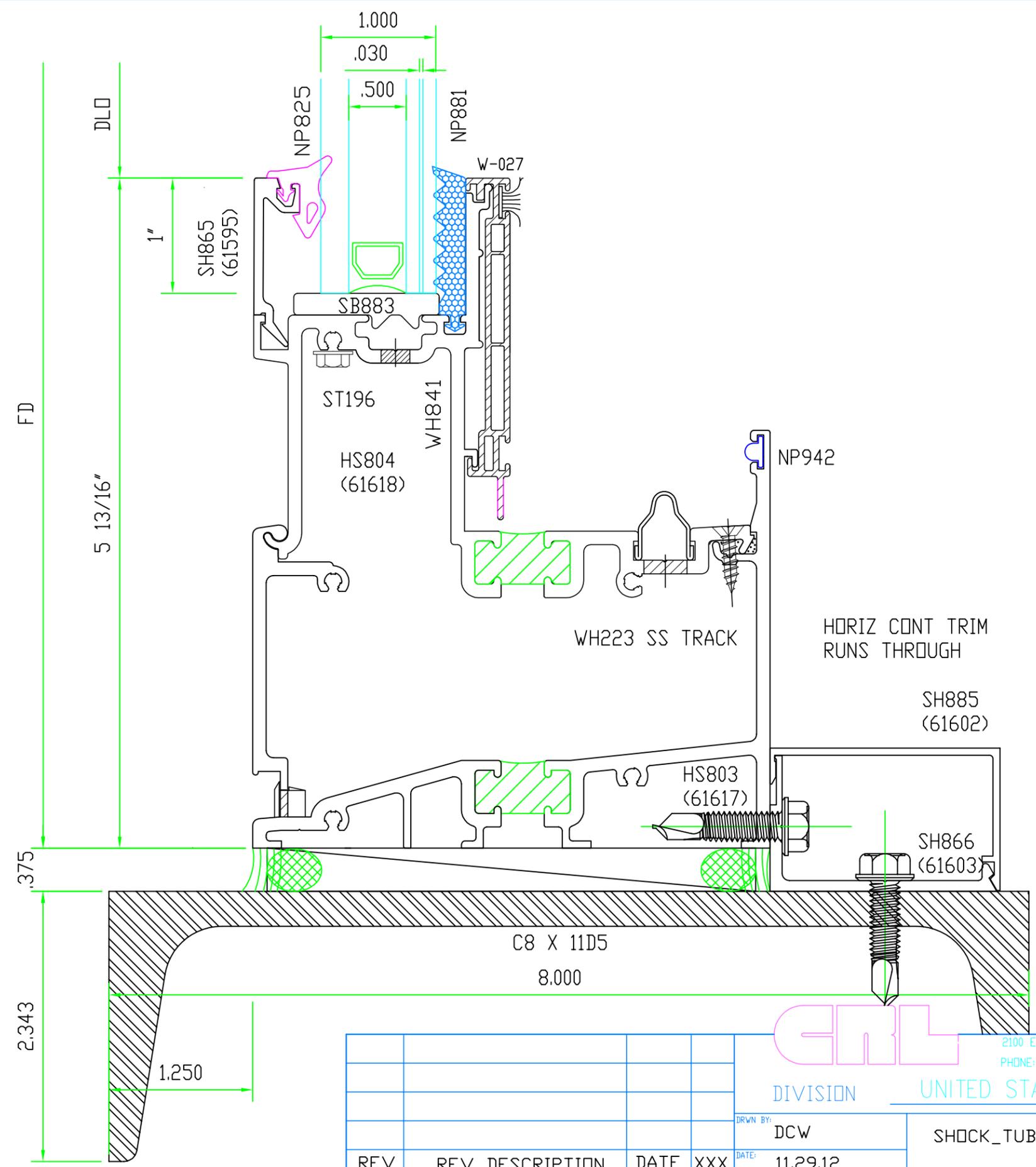
Report #: C4837.03-801-12
 Date: 06/30/13 By: DS

ST055
 ELCD G5 1/4-20 TEK
 SEE ELEVATIONS FOR
 LOCATIONS

TYPICAL FASTENER OFFSET
 FOR INSTALLATION



4



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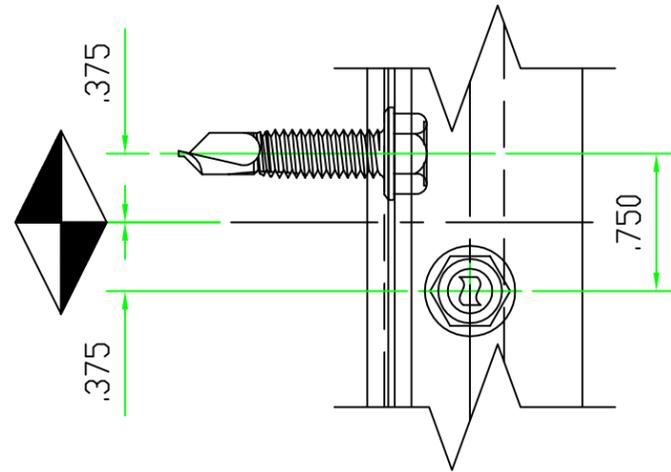
DIVISION UNITED STATES ALUMINUM

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				DATE: 11.29.12		SERIES_8200_HORIZONTAL_SLIDER		MU2012-021-50	
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SYM	REVISION	DATE	BY	FULL					



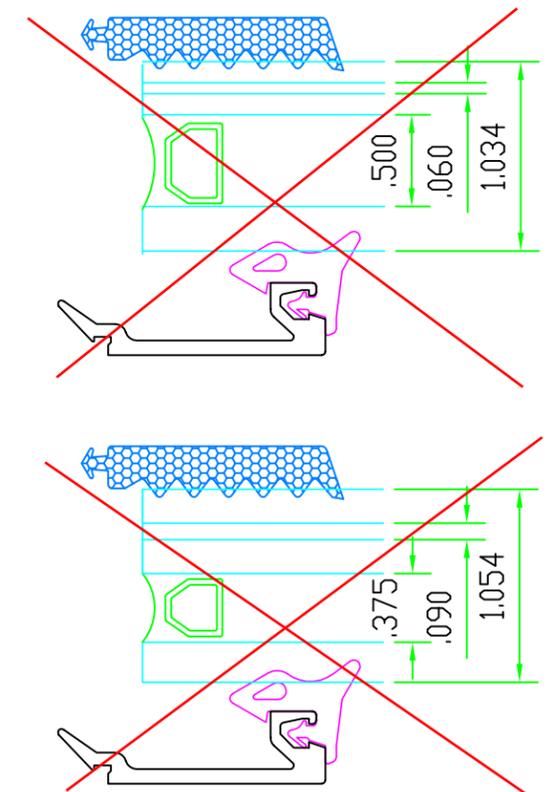
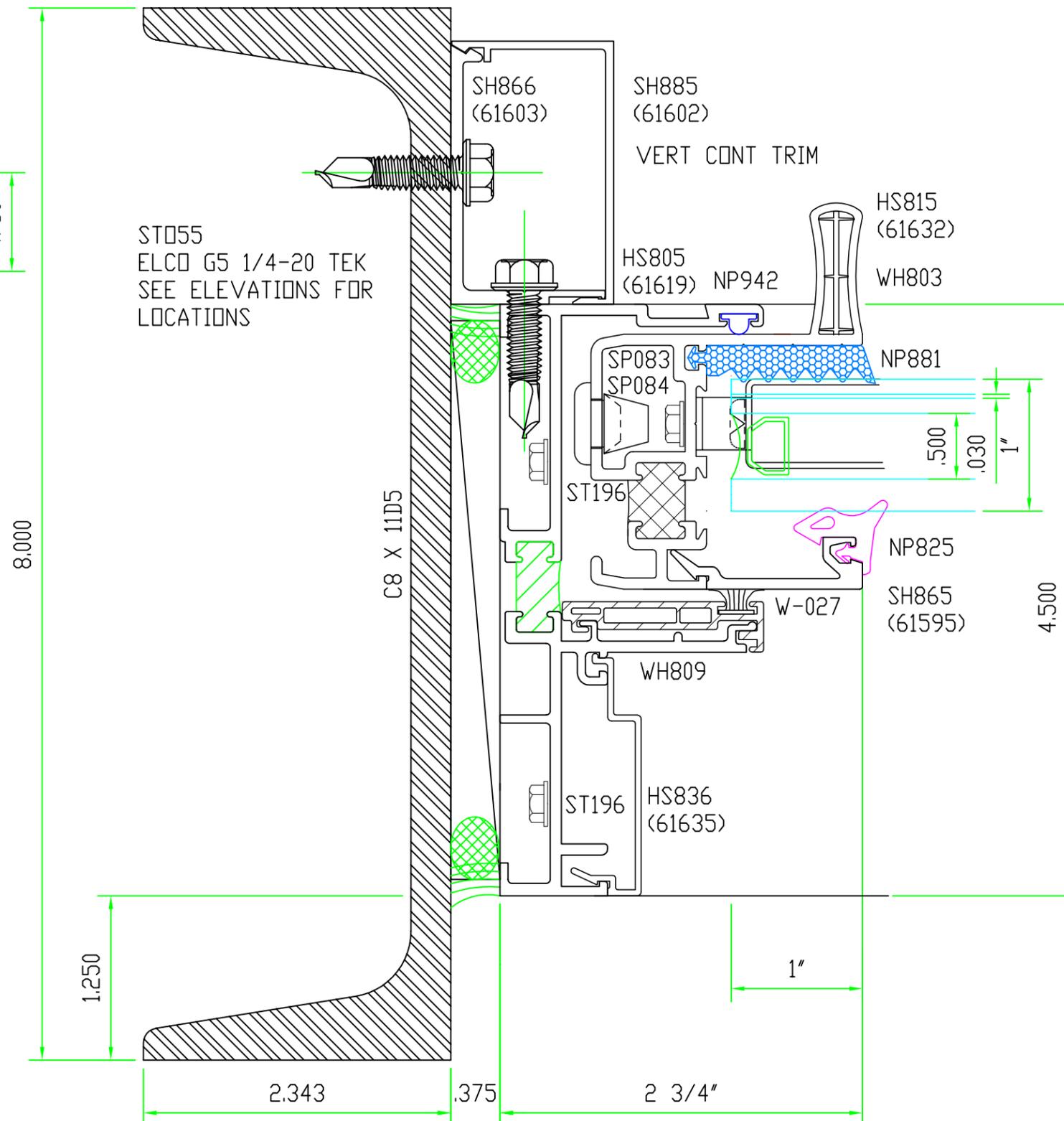
Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

Report #: C4837.03-801-12
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TYPICAL FASTENER OFFSET FOR INSTALLATION

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DIVISION UNITED STATES ALUMINUM

REV	REV_DESCRIPTION	DATE	XXX
SYM	REVISION	DATE	BY

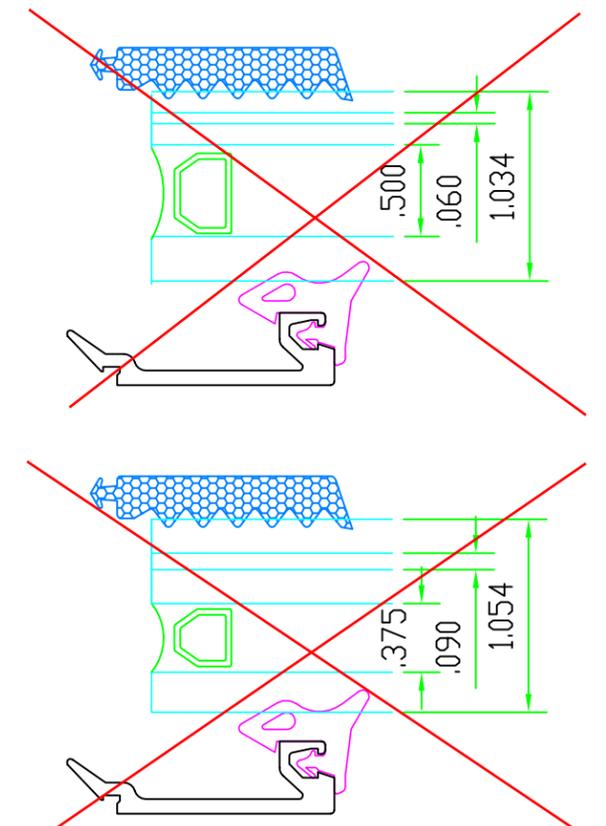
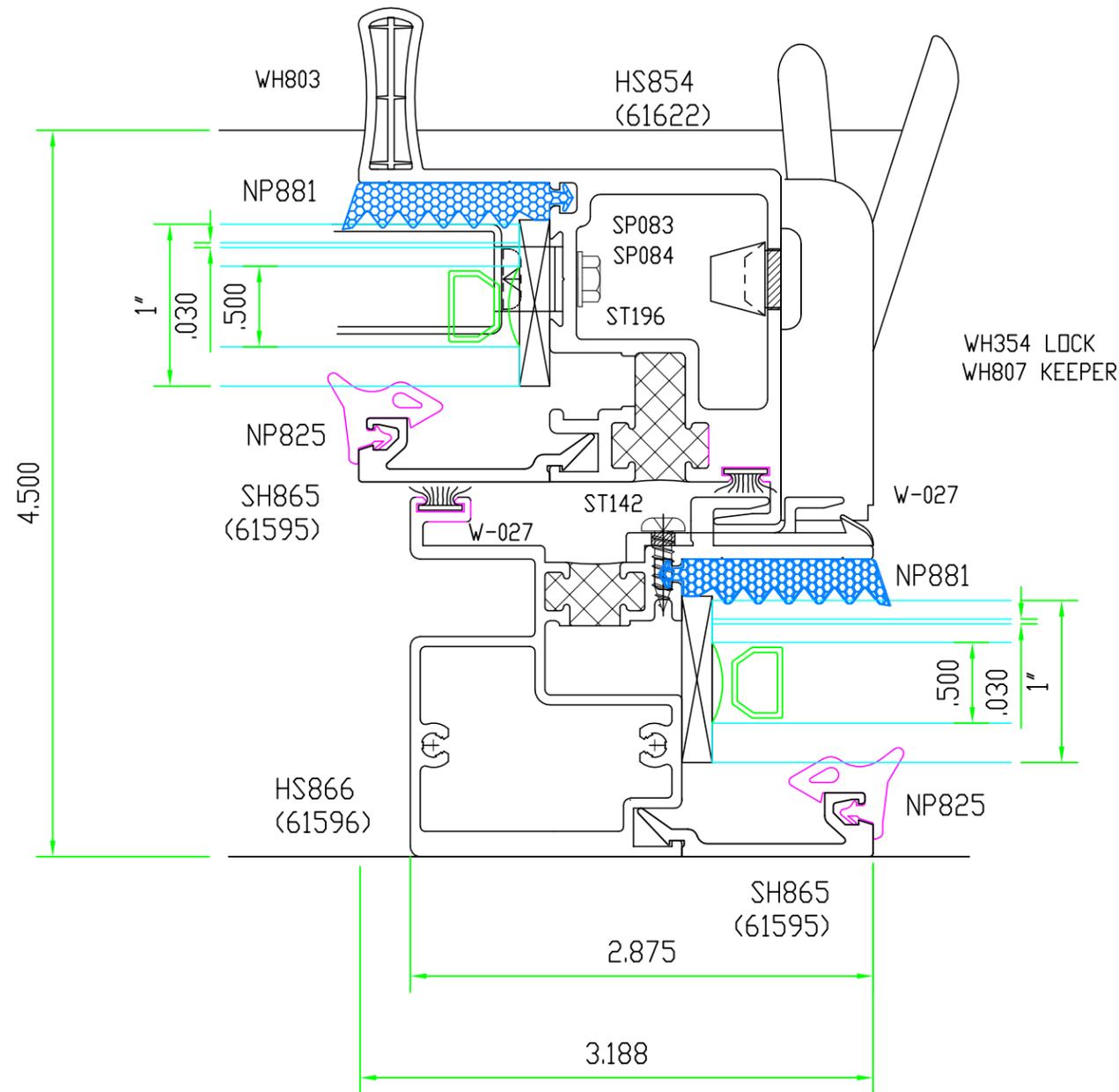
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DATE: 11.29.12	SERIES_8200_HORIZONTAL_SLIDER	MU2012-021-60
SCALE: FULL		



Architectural Testing, Inc
 Test sample complies with details shown herein. Any deviations are noted in the test report or drawings.

Report #: C4837.03-801-12
 Date: 06/30/13 By: DS

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DIVISION UNITED STATES ALUMINUM

REV	REV_DESCRIPTION	DATE	XXX	DRWN BY: DCW	SHOCK_TUBE_TESTING	DWG NO.
SYM	REVISION	DATE	BY	DATE: 11.29.12		
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