



NATIONAL CERTIFIED TESTING LABORATORIES

FIVE LEIGH DRIVE • YORK, PENNSYLVANIA 17406 • TELEPHONE (717) 846-1200
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AAMA/WDMA/CSA 101/I.S.2/A440-11
AAMA/WDMA/CSA 101/I.S.2/A440-08
CSA A440S1-09

TEST REPORT SUMMARY

Rendered to:

REHAU CONSTRUCTION LLC.
1501 Edwards Ferry Road, NE
Leesburg, VA 20176

PRODUCT TYPE: Casement

SERIES/ MODEL: "1800"

Title	Summary of Results
Primary Product Designator AAMA/WDMA/CSA 101/I.S.2/A440-11 AAMA/WDMA/CSA 101/I.S.2/A440-08	Class CW-PG100: Size tested 813 x 1499 mm (~32 x 59 in) - Type C Class CW-PG100: Size tested 813 x 1499 mm (32 x 59 in) - Type C
Positive Design Pressure	+4800 Pa (+100.25 psf)
Negative Design Pressure	-4800 Pa (-100.25 psf)
Operating Force (in motion _{max})	<27 N (<6 lbf)
Air Infiltration	0.1 L/s/m ² (0.01 cfm/ft ²)
Canadian Air Infiltration/Exfiltration	A3 Level
Water Penetration Resistance Test Pressure	960 Pa (20.05 psf)
Uniform Load Structural Test Pressure	±7200 Pa (±150.38 psf)
Forced Entry Resistance	ASTM F588-07 - Grade 10 Pass

Test Completed: 12/12/16

Revision Date: 01/13/17

Reference must be made to Report No. NCTL-110-19011-2 dated 12/20/16 for complete test specimen description and data.

For National Certified Testing Laboratories


DIGITAL SIGNATURE

Justin L. Bupp
Laboratory Manager



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**AAMA/WDMA/CSA 101/I.S.2/A440-11
AAMA/WDMA/CSA 101/I.S.2/A440-08
CSA A440S1-09**

STRUCTURAL TEST REPORT

NCTL-110-19011-2

REPORT TO:
REHAU CONSTRUCTION LLC.
1501 EDWARDS FERRY ROAD, NE
LEESBURG, VA 20176

REPORT NUMBER: NCTL-110-19011-2
REPORT DATE: 12/20/16
REVISION DATE: 01/13/17

PRODUCT:
CASEMENT

SERIES/ MODEL:
"1800"



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Report Number	NCTL-110-19011-2
Report Date	12/20/16
Revision Date	01/13/17
Report To	REHAU Construction, LLC. 1501 Edwards Ferry Road, NE Leesburg, VA 20176
Test Start Date	03/02/16
Test Complete Date	12/12/16
Specification	AAMA/WDMA/CSA 101/I.S.2/A440-11 NAFS 2011 - North American Fenestration Standard/Specification for windows, doors, and skylights AAMA/WDMA/CSA 101/I.S.2/A440-08 NAFS North American Fenestration Standard/Specification for windows, doors, and skylights CSA A440S1-09 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights
Performance Results	<u>AAMA/WDMA/CSA 101/I.S.2/A440-11</u> Class CW-PG100: Size tested 813 x 1499 mm (~32 x 59 in)-Type C <u>AAMA/WDMA/CSA 101/I.S.2/A440-08</u> Class CW-PG100: Size tested 813 x 1499 mm (32 x 59 in)-Type C
<u>Description of Specimen Tested</u>	
Note: All dimensions are in the order (Width x Height x Thickness) unless otherwise noted.	
Model/ Series	"1800"
Configuration	Casement
Frame Size	<u>Overall</u> 800 mm x 1500 mm (31.5" x 59.0625")
Vent Size	762 mm x 1461 mm (30" x 57.5")
Viewing Area	629 mm x 1334 mm (24.75" x 52.5")
Frame & Vent Type	Extruded vinyl
Joint Construction	<u>Frame & Vent</u> Mitered, welded
Glazing Components	
Overall	25.78 mm (1.015") nominal
Glass Thickness	(2) Lites of 3 mm (0.120") nominal annealed glass
Spacer Type/Size	19.69 mm (0.775") Desiccant-filled stainless steel spacer (Type SS-D)
Glazing System	Interior glazed with a gasket back-bedding and a snap-in (2)-leaf dual durometer rigid vinyl glazing bead

Weatherstrip

Type	(2) Strip dual durometer bulb-vinyl
Location	Vent perimeter
Type	(1) Strip single-leaf dual durometer
Location	Exterior vent perimeter

Operating Hardware

Locks	
Type	Single handle (5)-point integrated lock system
Location	241 mm (9.5") From the bottom of the lock jamb

Keeper	
Type	Plastic
Location	Lock stile at the lock locations

Roto-Operator	
Type	Crank-type
Location	229 mm (9") From the hinge stile on the sill

Hinge Hardware	
Type	(3)-Bar
Location	Head/ top rail

Auxiliary

Type	Metal snubbers
Location	495 mm (19.5") From each end of the hinge jamb with corresponding hinges on the hinge stile

Reinforcement

Type	C-shaped steel
Thickness	2.54 mm (0.100")
Location	Largest vent hollow and fastened with (1) # 8 x 19.05 mm (0.75") flat head tek screw located 64 mm (2.5") from each end of all members and midspan of the stiles

Weep Description

Size	19.05 mm (0.75") wide by 3.18 mm (0.125") high
Location	25.4 mm (1") From each end of the bottom rail glazing channel
Size	19.05 mm (0.75") wide by 3.18 mm (0.125") high
Location	Each end of the exterior vertical face of the bottom rail

Interior/ Exterior Surface Finish

White vinyl (PVC)

Sealant

No apparent sealant applied

Insect Screen

No screen employed

Installation Method

The window was installed in a 51 mm x 203 mm (2" x 8") spruce-pine-fir lumber test buck and was fastened through the nail fin with (1) #10 x 12.7 mm (0.5") pan head screw located 25.4 mm (1") from each end and 76 mm (3") on center thereafter at the frame perimeter. The exterior perimeter was sealed with silicone sealant.

Test Results - AAMA/WDMA/CSA 101/I.S.2/A440-2011 & 2008

Paragraph Test
 5.3.1/ 9.3.1 Operating Force and Force to Latch - Method B (Force Gauge)
 ASTM E2068-00(08)

Initiate Motion	=	36 N	(7 lbf)
Allowed (Normal Use _{11/08})	=	60 N	(13.49 lbf)
Maintain Motion - Opening	=	<27 N	(<6 lbf)
Maintain Motion - Closing	=	<27 N	(<6 lbf)
Allowed (CW Rating _{08/11})	=	30 N	(6.74 lbf)
Latches	=	<31 N	(<7 lbf)
Allowed	=	100 N	(22.5 lbf)

NOTE: The results above represent the maximum force among all sash tested.

Paragraph Test
 5.3.2.1/ 9.3.2 Air Leakage Resistance
 ASTM E283-04(12)

The tested specimen meets or exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440-2011 and 2008 for air infiltration at 75 Pa (1.6 psf).

Maximum Allowable	=	1.5 L/s/m ²	(0.3 cfm/ft ²)
Extraneous Air Leakage	=	0.38 L/s	(0.80 cfm)
Total Air Leakage	=	0.04 L/s	(0.09 cfm)
Air Infiltration Rate	=	0.1 L/s/m ²	(0.01 cfm/ft ²)

Paragraph Test
 5.3.3/ 9.3.3 Water Penetration Resistance
 ASTM E532-00(09)

3.4 L / (min • m²) (5.0 gph/ft²)

No Leakage after 4 cycles of 5 minutes at 960 Pa (20.05 psf)

NOTE: Tested without insect screen

Paragraph Test
 5.3.4.2/ 9.3.4.2 Uniform Load Deflection at Design Pressure
 ASTM E330-14

No damage after positive	4800 Pa (100.25 psf) held for 10 seconds
No damage after negative	4800 Pa (100.25 psf) held for 10 seconds
Measured Deflection _{Positive}	= 1.14 mm (0.045 inches)
Measured Deflection _{Negative}	= 0.58 mm (0.023 inches)
Maximum Allowed (_{L/175})	= 4.37 mm (0.172 inches)

Paragraph Test
 5.3.4.3/ 9.3.4.3 Uniform Load Structural Test
 ASTM E330-14

No damage after positive	7200 Pa (150.38 psf) held for 10 seconds
No damage after negative	7200 Pa (150.38 psf) held for 10 seconds
Measured Permanent Set _{Positive}	= 0.56 mm (0.022 inches)
Measured Permanent Set _{Negative}	= 1.04 mm (0.041 inches)
Maximum Allowed (0.3%)	= 2.34 mm (0.092 inches)

NOTE: Deflection and Permanent Set measurements taken on the top rail over a 764 mm (30.0625") span.

Paragraph
5.3.5/ 9.3.5

Test
Forced Entry Resistance
ASTM F588-07

Type B Window Assembly/ Grade 10: = Pass

Test

Disassembly	= No Entry
Lock Manipulation	= No Entry
Sash Manipulation	= No Entry
Test B1	= No Entry
Test B2	= No Entry
Test B3	= No Entry
Hardware Manipulation Test	= No Entry
Sash Manipulation Test	= No Entry

NOTE: 1. T1 = 5 minutes, L1 = 667 N (150 lbf), L2 = 333 N (75 lbf), L3 = 111 N (25 lbf)
2. Loads were held for 60 seconds.

Paragraph
5.3.6.2/ 9.3.6.2

Test
Thermoplastic Corner Weld Test (PVC products only) = Pass

Paragraph
9.3.6.4.2/
5.3.6.4.3

Test
Sash Vertical Deflection Test

Vertical load applied 270 N (60.70 lbf) held for 60 seconds

Vertical Deflection Limit = 15.24 mm (0.6 inches)

Measured Deflection = 12.95 mm (0.51 inches)

NOTE: Load was held for 60 seconds; at the conclusion of the test the specimen properly closed and operated and there was no glass breakage.

Paragraph
5.3.6.6.2/
9.3.6.5.2

Test
Sash and Hardware Load Test (Distributed Load Test)

Load applied 300 Pa (6.2 psf) held for 10 seconds
= No Damage

NOTE: 1. Required load 334 N (75.11 lbf)
2. Sash weight 227 N (51 lbf)
3. Distributed center load added to sash 107.2 N (24.1 lbf)
4. At the conclusion of testing the sash properly and fully closed and there was no failure of screws, track, hinge or permanent deformation of the support arms.

Test Results - CSA A440S1-09

Paragraph Test
 5.2 Operating Force and Force to Latch - Method B (Force Gauge)
 ASTM E2068-00(08)

Initiate Motion	=	36 N	(7 lbf)
Allowed (Normal Use _{11/08})	=	60 N	(13.49 lbf)
Maintain Motion - Opening	=	<27 N	(<6 lbf)
Maintain Motion - Closing	=	<27 N	(<6 lbf)
Allowed (CW Rating _{08/11})	=	30 N	(6.74 lbf)
Latches	=	<31 N	(<7 lbf)
Allowed	=	100 N	(22.5 lbf)

NOTE: The results above represent the maximum force among all sash tested.

Paragraph Test
 5.3 Canadian Air Infiltration/Exfiltration
 ASTM E283-04(12)

The tested specimen meets or exceeds the performance levels specified in CSA A440S1-09 for air infiltration at 75 Pa (1.57 psf)

A3 Level Maximum Allowable = 0.5 L/s/m² (0.1 cfm/ft²)

Infiltration

Extraneous Air Leakage	=	0.38 L/s (0.80 cfm)
Total Air Leakage	=	0.04 L/s (0.09 cfm)
Air Infiltration Rate	=	0.1 L/s/m ² (0.01 cfm/ft ²)

Exfiltration

Extraneous Air Leakage	=	0.38 L/s (0.80 cfm)
Total Air Leakage	=	0.33 L/s (0.13 cfm)
Air Exfiltration Rate	=	0.1 L/(s•m ²) (0.01 cfm/ft ²)

Paragraph Test
 5.4 Water Penetration Resistance
 ASTM E532-00(09)

No Leakage after 4 cycles of 5 minutes at 960 Pa (20.05 psf)

NOTE: Tested without insect screen

This test report was prepared by National Certified Testing Laboratory (NCTL), for the exclusive use of the above named client and it does not constitute certification of this product. The results are for the particular specimen tested and do not imply the quality of similar or identical products manufactured or installed from specifications identical to the tested product. The test specimen was supplied to NCTL by the above named client. No conclusions of any kind regarding the adequacy or inadequacy of the glass in the test specimen are to be drawn from the ASTM E330 test. Forced entry resistance test equipment used is in compliance with Section 7 of the ASTM F588-07 test method. Foam tape is mounted to the perimeter of the test buck prior to clamping to the test wall. It is the assertion of this laboratory that any film employed during testing does not affect measurement values. NCTL is a testing lab and assumes that all information provided by the client is accurate and does not guarantee or warranty any product tested or installed. The results in this report are actual tested values and are applicable to the specimen tested only, using the components and construction methods described herein.

Detailed drawings were available for laboratory records and compared to the test specimen at the time of this report. Component drawings were reviewed for product verification. The bill of materials contains details with any deviations noted. Ambient conditions during the referenced testing are available upon request. A copy of this report along with representative sections of the test specimen will be retained per applicable requirements by NCTL. This report does not constitute certification or approval of the product, which may only be granted by a certification program validator or recognized approval entity. All tests were conducted in full compliance with the referenced specifications and/or test methods. Tests were performed in the order set forth by the applicable standard or specification. This report is the joint property of National Certified Testing Laboratories Inc. and the Client to whom it is issued. Permission to reproduce this report by anyone other than National Certified Testing Laboratories Inc and the Client must be granted in writing by both of the above parties. This report may not be reproduced, except its entirety, without the written consent of NCTL.

National Certified Testing Laboratories

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Justin L. Bupp
Laboratory Manager



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SIGNATURE

Robert H. Zeiders, P.E.
Vice-President Engineering & Quality

JLB/ dro

Attachments

Appendix A – Revision Summary

Appendix B – Drawings

Appendix A

Revision Log

<u>Identification</u>	<u>Date</u>	<u>Page & Revision</u>
Original Issue	12/20/16	Not Applicable
Revision 01	01/13/17	Corrected drawings

Appendix B

Drawings

Component Drawings, with Applicable Part Numbers, Manufacturing and Modeling Details, were reviewed (as submitted) for Product Verification. Detailed assembly drawings showing wall thicknesses of all members, corner construction and hardware application are on file and have been compared to the test sample submitted.

(Reference: NCTL-110-19011-2)

See Attached Documentation;
any deviations noted.

Note: The above referenced component drawings (if applicable) along with representative sections of the test specimen will be retained by NCTL per applicable retention requirements. This testing facility assumes that all information provided by the client is accurate.

BILL OF MATERIALS



Product: 1800 - Casement

Article / Part No.	Description
560321	Glazing Stop for 1" Glass
659011	Frame
659005	Sash
659213	Reinforcement - Sash
Notes: Quantity estimate based on rough estimate	

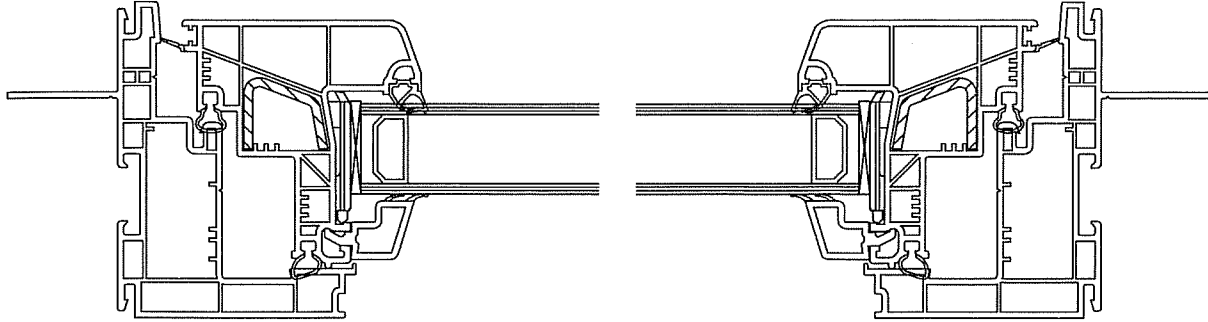
TEST SPECIMEN COMPLIES
WITH THESE DETAILS.

ANY DEVIATION IS NOTED.

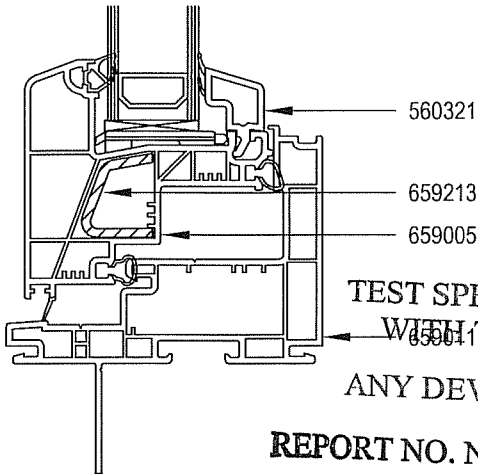
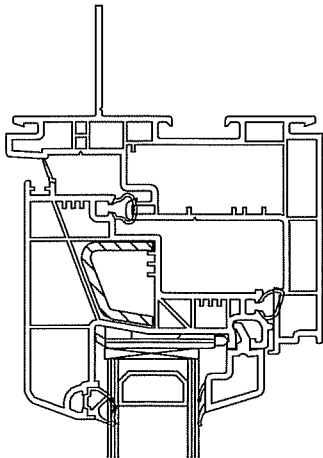
REPORT NO. NCTL-110- 19011-2

TEST DATE: 12-12-16

Section B - B



Section A - A

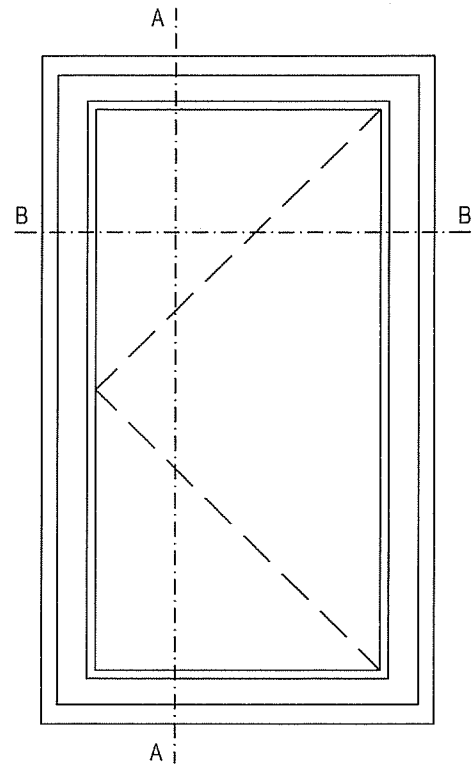


TEST SPECIMEN COMPLIES
WITH THESE DETAILS.

ANY DEVIATION IS NOTED.

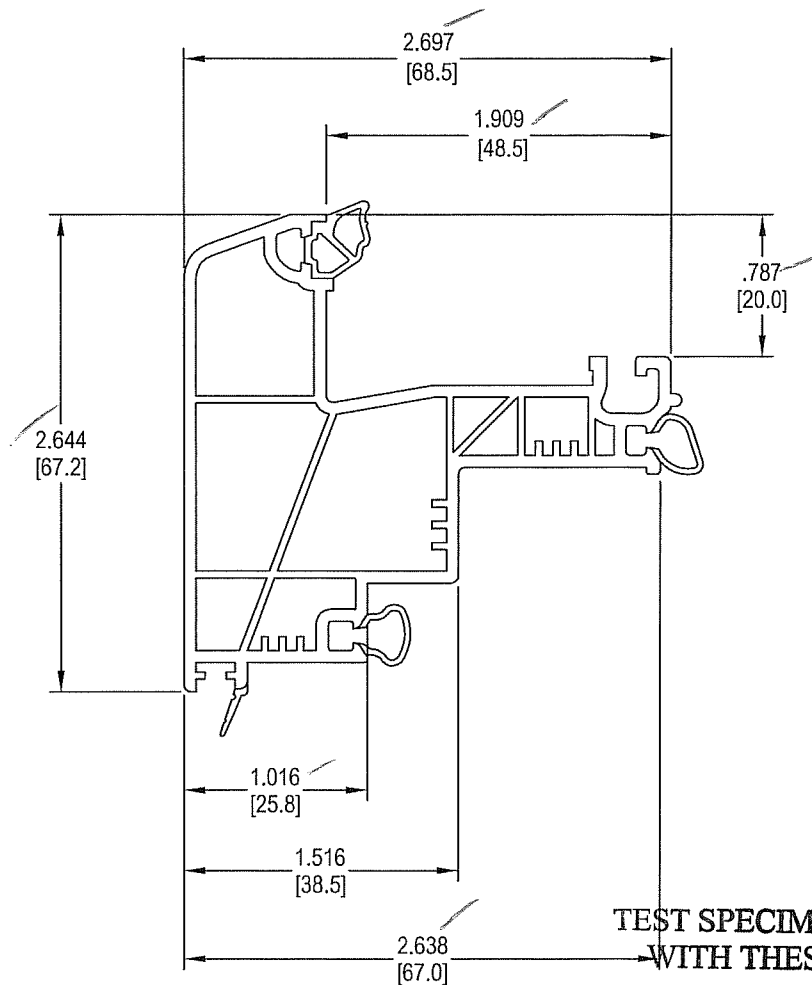
REPORT NO. NCTL-110- 19611-2

TEST DATE: 12-12-16



			System: 1800			
			Title: Casement			
		REHAU Construction LLC 1501 Edwards Ferry Road, NE Leesburg, Virginia 20176 Tel: (703) 777-5255	Date: 07/27/2016	Scale: 1:2	Drawn by: JWB	
-	-			Drawing No.: 2412-16-049	Rev.:	
Rev #	Revision Description & Date			© 2016 REHAU. Do not disclose without written permission		

Art. 659005
Sash



**TEST SPECIMEN COMPLIES
WITH THESE DETAILS.**

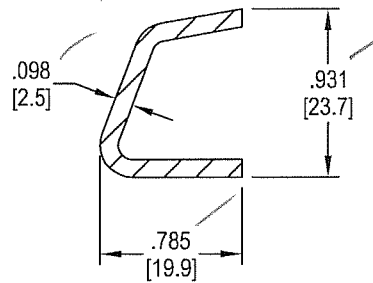
ANY DEVIATION IS NOTED.

REPORT NO. NCTL-110- 19611-2

TEST DATE: 12-12-16

			System: 1800			
			Title: Sash (Art. 659005)			
		REHAU Construction LLC 1501 Edwards Ferry Road, NE Leesburg, Virginia 20176 Tel: (703) 777-5255	Date: 04/10/2015	Scale: 1:1	Drawn by: JWB	
-	-			Drawing No.: TDS_659005	Rev.:	
Rev #	Revision Description & Date			© 2015 REHAU. Do not disclose without written permission		

Art. 659213
Sash Reinforcement



**TEST SPECIMEN COMPLIES
WITH THESE DETAILS.**

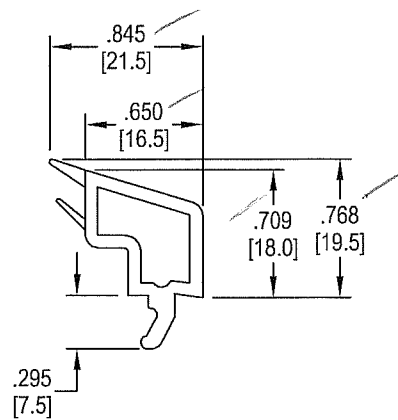
ANY DEVIATION IS NOTED.

REPORT NO. NCTL-110- 19411-2

TEST DATE: 12-12-16

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			Date: 11/18/2015	Scale: 1:1	Drawn by: JWB
				Drawing No.: TDS_659213	Rev.:
Rev #	Revision Description & Date	REHAU Construction LLC 1501 Edwards Ferry Road, NE Leesburg, Virginia 20176 Tel: (703) 777-5255	© 2015 REHAU. Do not disclose without written permission		

Art. 560321
Glazing Stop 16.5 mm



**TEST SPECIMEN COMPLIES
WITH THESE DETAILS.**

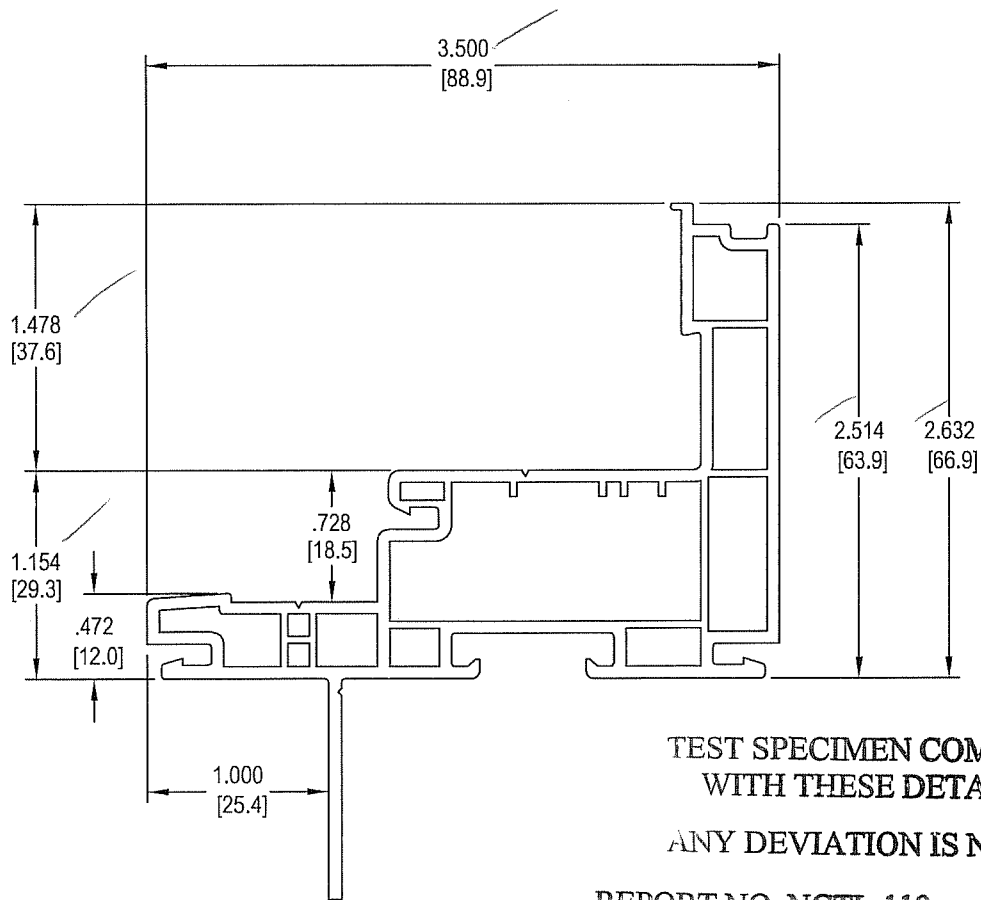
ANY DEVIATION IS NOTED.

REPORT NO. NCTL-110- 19611-2

TEST DATE: 12-12-16

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			Date: 04/10/2015	Scale: 1:1	Drawn by: JWB
				Drawing No.: TDS_560321	Rev.:
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Rev #	Revision Description & Date	REHAU Construction LLC 1501 Edwards Ferry Road, NE Leesburg, Virginia 20176 Tel: (703) 777-5255			

Art. 659011
Frame Standard Plus
with Nailing Fin



**TEST SPECIMEN COMPLIES
WITH THESE DETAILS.**

ANY DEVIATION IS NOTED.

REPORT NO. NCTL-110- 15011-2

TEST DATE: 12-12-16

			System: 1800		
			Title: Frame Standard Plus with Nailing Fin (Art. 659011)		
			Date: 06/17/2015	Scale: 1:1	Drawn by: JWB
-	-		Drawing No.: TDS_659011		Rev.:
Rev #	Revision Description & Date		© 2015 REHAU. Do not disclose without written permission		
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