

ACRO ALUMINUM INC.

TEST REPORT

TEST REPORT ISSUED TO

Acro Aluminum Inc.
5430 - 275th St
Langley, BC V4W 3X7
Canada

SPECIFICATION

ASTM E283M-19
ASTM E547-00(2016)
ASTM E331-00(2016)
ASTM E330/E330M-14 (2021)

PRODUCT SERIES & TYPE

Aluminum 2000 Series 4-Lite Fixed Combination Window

REPORT NUMBER

105479267COQ-001A

TEST DATE(S)

11/02/22

ISSUE DATE

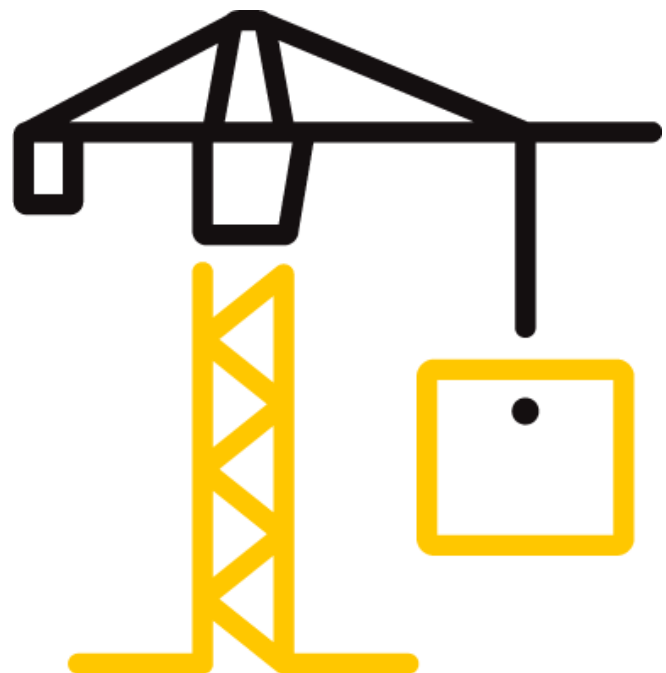
06/16/23

PAGES

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TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

SECTION 1 SCOPE

Intertek Building & Construction (B&C) was contracted by Acro Aluminum Inc. to perform testing on a 2058 mm (81.0") x 2210 mm (86.6") Aluminum 2000 Series 4-Lite Fixed Combination Window System in accordance with the following standard/specifications:

- ASTM E283M-19– *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*
- ASTM E547-00(2016) – *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference*
- ASTM E331-00(2016) – *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- ASTM E330/E330M-14(2021) – *Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference*

Testing was conducted at the Intertek test facility in Coquitlam, BC. This evaluation was started on November 2, 2022 and completed on the same day.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule also called "Shared Risk approach," of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

For INTERTEK B&C:

COMPLETED BY:	Jason Komorski	REVIEWED BY:	David Park
TITLE:	Technician – Building Products	TITLE:	Reviewer – Building Products
SIGNATURE:		SIGNATURE:	
DATE:	06/16/23	DATE:	06/16/23

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TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

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SECTION 2

SUMMARY OF TEST RESULTS

A summary of results are as indicated in the table below:

Evaluation Property	Results
Air Leakage Resistance @ 75 Pa (1.6 psf)	US – Pass; Can – Fixed
Air Leakage Resistance @ 300 Pa (6.3 psf)	US – Pass; Can – Fixed
Water Penetration Resistance (Static & Cyclic)	720 Pa (15.0 psf)
Uniform Load – Deflection	3600 Pa (75.1 psf)
Uniform Load – Structural	5400 Pa (112.8 psf)

Details of the tested results can be found in Section 7 of this report.

SECTION 3

TEST METHOD(S)

The specimen was tested and evaluated in accordance with the following:

ASTM E283M-19, *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*

ASTM E547-00(2016), *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference*

ASTM E331-00(2016), *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*

ASTM E330/E330M-14(2021), *Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference*

SECTION 4

EQUIPMENT

ASSET #	DESCRIPTION	CAL DUE DATE
60650	Fenestration Control Unit	11/03/22
60651	Water Spray Assembly	11/03/22
60652	Water Spray Assembly	11/03/22
D7813	20" Line Gauge	01/27/23
D7814	20" Line Gauge	01/27/23
D7815	20" Line Gauge	01/27/23
D7816	20" Line Gauge	01/27/23
D7817	20" Line Gauge	01/27/23
64923	20" Line Gauge	01/27/23

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SECTION 5

TEST PROCEDURE

AIR LEAKAGE RESISTANCE

The Air Leakage Resistance test was performed in accordance with ASTM E283M-19, *“Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen”*. Air infiltration and exfiltration tests were performed using test pressures of 75 Pa (1.57 psf) and 300 Pa (6.27 psf). The maximum air leakage rate was calculated and compared to the allowable air leakage.

CYCLIC WATER PENETRATION RESISTANCE

A four-cycle Water Penetration Resistance test was performed in accordance with ASTM E547-00(2016) *“Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference”* (ASTM E547). The test was performed using the specified pressure differential and a water spray rate of at least 204 L/m² per hour (5.0 U.S. gal/ft² per hour). Each cycle consisted of five minutes with the pressure applied and one minute with the pressure released, during which the water spray was continuously applied.

STATIC WATER PENETRATION RESISTANCE

The Static Water Penetration Resistance Test was performed in accordance with ASTM E331-00(2016) *“Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference”* (ASTM E331). The test was performed using the specified pressure differential and a water spray rate of at least 204 L/m² per hour (5.0 U.S. gal/ft² per hour). Duration of the test was 15 minutes, during which the water spray and air pressure was continuously applied.

UNIFORM LOAD DEFLECTION

The Uniform Load Deflection tests were conducted in accordance with ASTM E330/E330M-14(2021) *“Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference”* (ASTM E330), Procedure A. The tests were performed in both the positive and negative directions. After a 10 second preload (50% of the test load), followed by 1 minute with the pressure released, the tests were conducted at the specified test pressure for a period of 10 seconds. Deflections were measured at the mid-span and at the ends. The end deflections were averaged and subtracted from the mid-span deflection (to eliminate deflections caused by movement at the ends of the structural supporting members). Polyethylene film was used during the positive wind pressure sequences.

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Report No.: 105479267COQ-001A

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UNIFORM LOAD STRUCTURAL

The Uniform Load Structural tests were conducted in accordance with ASTM E330/E330M-14 *“Standard Test Method for Structural Performance of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference”* (ASTM E330), Procedure A. After a 10 second preload (50% of test load), followed by 1 minute with the pressure released, the sample was subjected to a Uniform Load Structural test using a specified test pressure for a time of 10 seconds. The test was performed in both the positive and negative directions. After the test loads were released, the permanent deflections were recorded and the specimen was inspected for failure or permanent deformation of any part of the system that would cause any operational malfunction. Polyethylene film was used during the positive wind pressure sequences.

DEVIATION FROM STANDARD METHOD

There were no noted deviations from the test standards used in the evaluation reported herein.

TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

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SECTION 6

TEST SPECIMEN DESCRIPTION

Manufacturer Information	Acro Aluminum Inc. 5430 275 th St. Langley, BC V4W 3X7 Canada
Model Name	<ul style="list-style-type: none">Aluminum 2000 Series 4-Lite Fixed Combination Window
Installation	<ul style="list-style-type: none">Test Buck: 2x6, #2 & better spf, box w/ 2x12, #2 & better spf, cladding, butt joints secured with 2x #8 x 3" deck screws. The 2x12 clad was also butt jointed together with 4x #8 x 3" deck screws and secured to the 2x6 with #8 x 3" flat head screws at least at every 305 mm (12"). The buck was lined with a peel & stick membrane.<ul style="list-style-type: none">Specimen to Buck: An aluminum installation angle is used to install the interior side of the sill to the 2x6 portion of the test buck, approximately 76 mm (3") x 25 mm (1") x 3.5 mm (0.13"). The angle is secured to the test buck with #12 x 3" flat head screws, spaced approximately 406 mm (16") o.c. , and the angle is secured to the window sill with #8 x 3/4" flat head self-tapping screws, approximately 406 mm (16") o.c.The vertical mullion was supported at the head with the use of T shaped bracket, approximately 203 mm (8") wide, 102 mm (4") tall, inserted into the hollow cavity of the vertical profile, and secured to the head of the buck with 4x #12 x 3" flat head screws.Silicone was used to seal all joints of the test buck as well as the rough opening of the buck, full perimeter around the interior side. The exterior side has silicone along the jambs and head, and the peel & stick membrane is used to seal the exterior side of the installation angle along the sill.
Size	<ul style="list-style-type: none">Overall Size:<ul style="list-style-type: none">Width: 2058 mm (81.0")Height: 2210 mm (86.6")Fixed Size:<ul style="list-style-type: none">Width: 1028 mm (40.5")Height: 1105 mm (43.5")
Frame	<ul style="list-style-type: none">Material: AluminumCorners: Butt joined and secured with the use of an aluminum corner block. The corner block is secured to the vertical jambs with 2x #8 x 1" hex head self-tapping screws. The joining horizontal profile slides over the corner block and then is secured in place with 2x #8 x 1-1/2" flat head screws. A plastic spacer block is used on the exterior side of each corner joint, and the joint is sealed with silicone.An aluminum drip cap profile was used along the sill of the assembly, secured to either side of the assembly with 1x #8 x 3/4" flat head self-tapping screw.Reinforcement: None

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Report No.: 105479267COQ-001A

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Vertical Mullion	<ul style="list-style-type: none">• One continuous vertical mullion• Corners: Butt joined and secured with the use of an aluminum corner block. The corner block is secured to the vertical profiles of the butt joint with 2x #8 x 1" hex head self-tapping screws. The joining horizontal head or sill profile slides over the corner block and then is secured in place with 2x #8 x 1-1/2" flat head screws. A plastic spacer block is used on the exterior side of each corner joint, and the joint is sealed with silicone.• Reinforcement: None
Horizontal Mullion	<ul style="list-style-type: none">• Two horizontal Integral mullions• Corners: Butt joined and secured to the jambs or intersecting vertical mullion with the use of an aluminum corner block. The corner block is secured to the vertical profiles of the butt joint with 2x #8 x 1" hex head self-tapping screws. The joining horizontal mullion profile slides over the corner block and then is secured in place with 2x #8 x 1-1/2" flat head screws. A plastic spacer block is used on the exterior side of each corner joint, and the joint is sealed with silicone.<ul style="list-style-type: none">• Reinforcement: None
Drainage	<ul style="list-style-type: none">• Each horizontal pressure plate has 2x drain slots, approximately 38 mm (1.5") x 5mm (0.20") centered approximately 89 mm (3-1/2") from either end.• Each horizontal beauty cap has 2x 7 mm (1/4") diameter drain holes through the bottom edge, approximately 191 mm (7-1/2") from either end of the profile.
Glazing (4x)	<ul style="list-style-type: none">• IGU specification:<ul style="list-style-type: none">• 6 mm / 6 mm clear tempered with a 12 mm spacerbar.• Overall thickness, 25 mm (~1")• Laid-in, exterior glazed on top of a full perimeter glazing gasket, applied to the frame profile as 4 strips, one per length of frame profile. Silicone is used at each corner of the glazing gasket.• Exterior glazing gasket inserted into kerf of the pressure plate profile, with silicone at each joint.• Glazing Blocks: 2x 63 mm (2-1/2") x 25 mm (1") x 7 mm (1/4") thick, neoprene setting blocks used to support the glass unit. 2x under the glass unit, approximately 127 mm (6") from either side.• Pressure Plates: Aluminum pressure plates are secured to the frame profile with 1/4" x 1" hex head bolts. 6x horizontal profiles are used, butted against the 3x full height vertical profiles and sealed along the joint with silicone. Horizontal profiles have 6x fasteners used, height vertical profiles have 11x fasteners used along the jambs and 12x along the vertical mullion. Pressure plates include 2x glazing gaskets as noted above, and a centre gasket. An aluminum beauty cap profile is snapped over each corresponding length of pressure plate.
Drawings	<ul style="list-style-type: none">• A copy of the drawing package supplied by Acro Aluminum Inc. is included in Section 10 of this report.

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Report No.: 105479267COQ-001A

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SECTION 7

TEST RESULTS

AIR LEAKAGE RESISTANCE

Air test data is indicated in the following table:

Property	Area m ² (ft ²)	Infiltration Rate L/s*m ² (cfm/ft ²)	Exfiltration Rate L/s*m ² (cfm/ft ²)	Compliance US (CAN)
Overall Assembly @ 75 Pa	4.54 (48.91)	0.04 (0.01)	0.03 (0.01)	Pass (Fixed)
Overall Assembly @ 300 Pa		0.12 (0.02)	0.07 (0.01)	Pass (Fixed)
Allowable Leakage Rates				
Maximum allowable air leakage rate (US):			1.5 L/s*m ² , 0.3 cfm/ft ²	
Maximum allowable air leakage rate (CAN – Fixed):			0.2 L/s*m ² , 0.04 cfm/ft ²	

The overall system **met** the US and Canadian performance requirements as reported above when evaluated under ASTM E283

CYCLIC WATER PENETRATION RESISTANCE

During the 24-minute test period, using a pressure differential of 720 Pa (15.0 psf), there was no water leakage observed. The system met the **720 Pa (15.0 psf)** Water Penetration Resistance performance requirements under ASTM E547

STATIC WATER PENETRATION RESISTANCE

During the 15-minute test period, using a pressure differential of 720 Pa (15.0 psf), there was no water leakage observed. The system met the **720 Pa (15.0 psf)** Water Penetration Resistance performance requirements under ASTM E331

UNIFORM LOAD – DEFLECTION & STRUCTURAL

Vertical Mullion Uniform Load Structural data:

Mullion span, L = 2210 mm (87.01")

Deflection limit, L/175 = 12.63 (0.50")

Residual deflection limit, L*0.3% = 6.63 mm (0.26")

Test Pressure, Pa (psf)	Deflection Measurements, mm (in.)				Compliance
	Positive		Negative		
	Deflection	Residual	Deflection	Residual	
2160 (45.1)	6.31 (0.25)	0.13 (0.00)	6.39 (0.25)	0.28 (0.01)	Pass DP75
3240 (67.7)	n/a	0.18 (0.01)	n/a	0.40 (0.02)	

After the test loads were released, the specimen was inspected and there was found to be no failure or permanent deformation of any part of the window system that would cause any operational malfunction. The system met the overall **3600 Pa (75.1 psf)** Uniform Load performance requirements under ASTM E330.

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Date: 06/16/23

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SECTION 8

CONCLUSION

The test specimen met the specified performance requirements as described in Section 7.

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**SECTION 9
PHOTOGRAPHS**



Photo No. 1

Aluminum 2000 Series 4-Lite Fixed Combination Window - Interior

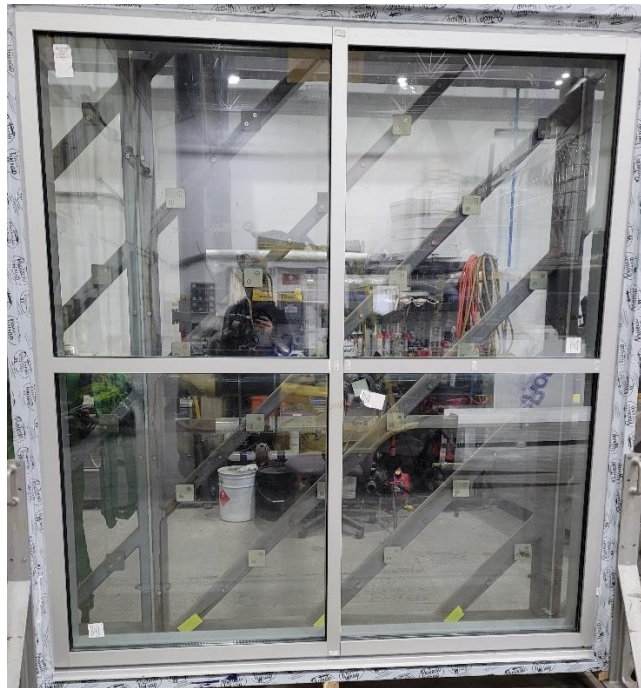


Photo No. 2

Aluminum 2000 Series 4-Lite Fixed Combination Window – Exterior

TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

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Photo No. 3
Sill assembly

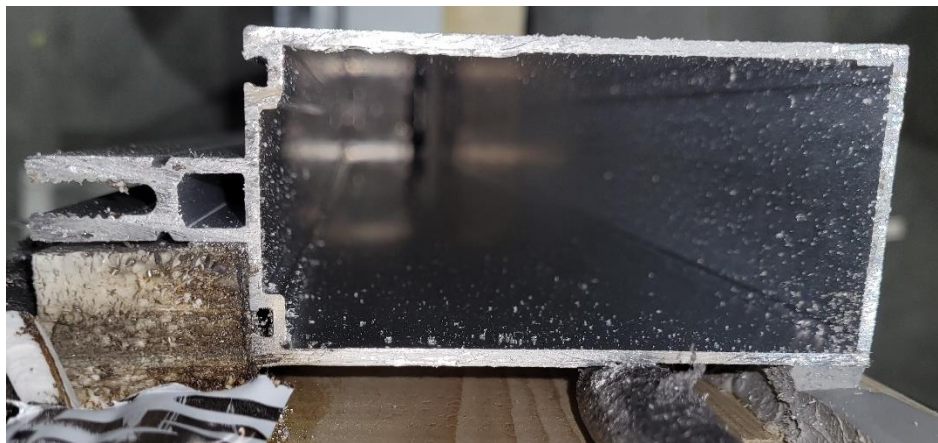


Photo No. 4
Jamb assembly

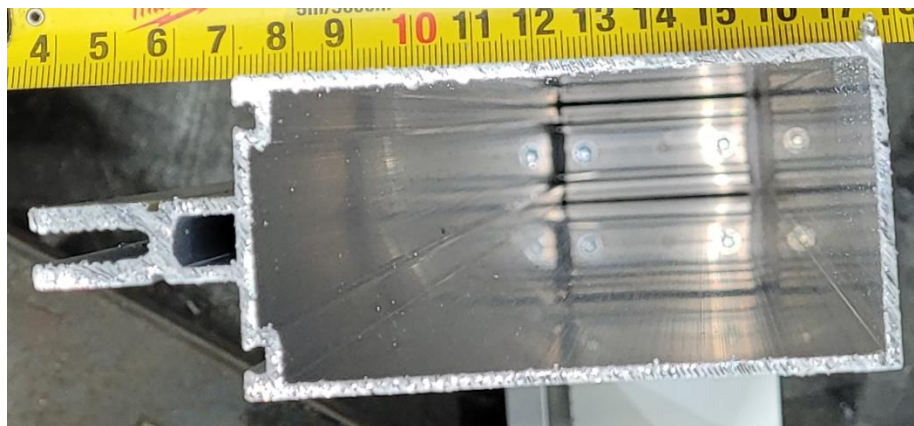


Photo No. 5
Mullion and frame profile

TEST REPORT FOR ACRO ALUMINUM INC.

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Date: 06/16/23

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Photo No. 6
Pressure plate profile

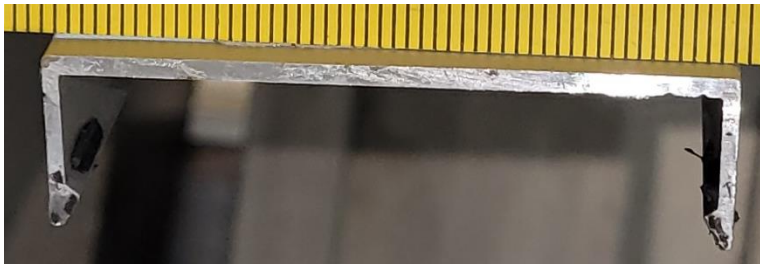


Photo No. 7
Beauty cap profile



Photo No. 8
Pressure plate gasket profiles

TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

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Photo No. 9
Interior glazing gasket



Photo No. 10
Interior glazing gasket with silicone at corners



Photo No. 11
Pressure plate fasteners and drain slot

TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

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Photo No. 12
Pressure plate fastener

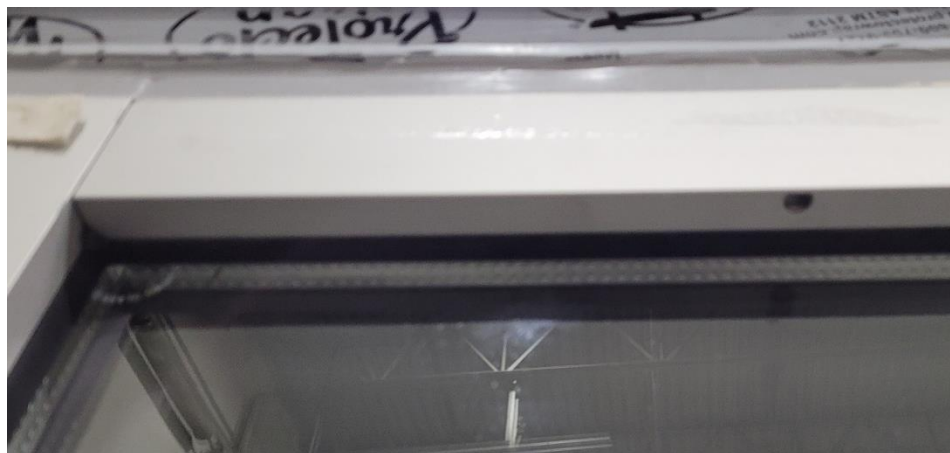


Photo No. 13
Drain hole for beauty cap profile



Photo No. 14
Mullion joint

TEST REPORT FOR ACRO ALUMINUM INC.

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Date: 06/16/23

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Photo No. 15
Aluminum corner block

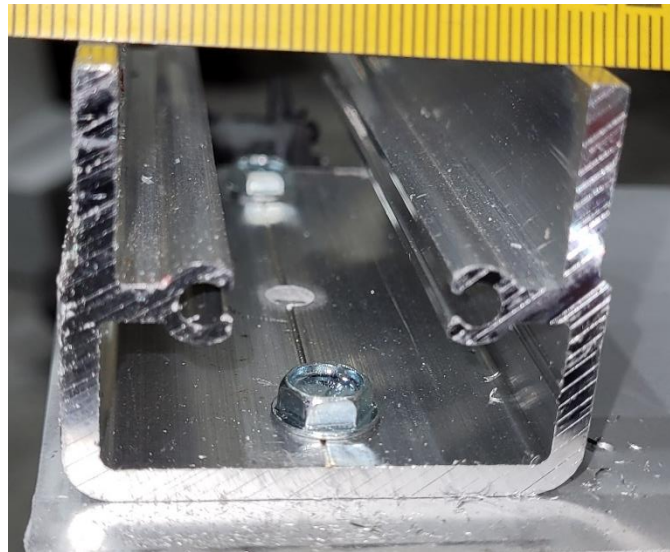


Photo No. 16
Aluminum corner block profile

TEST REPORT FOR ACRO ALUMINUM INC.

Report No.: 105479267COQ-001A

Date: 06/16/23

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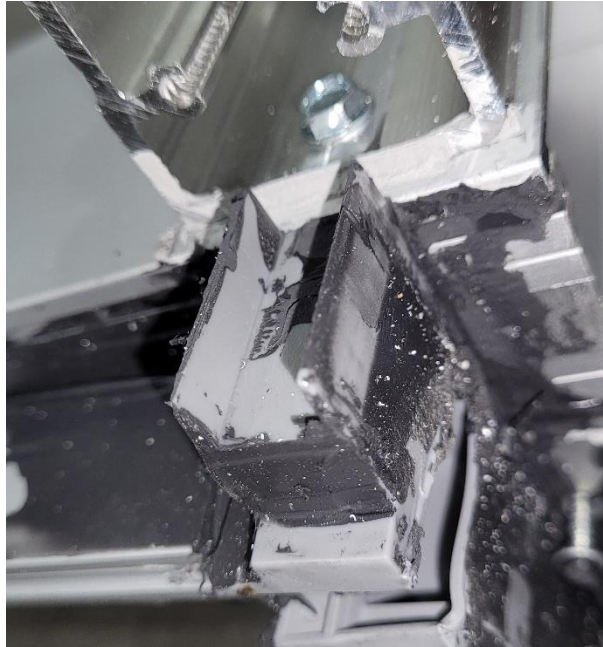


Photo No. 17
Plastic spacer block at corner joints

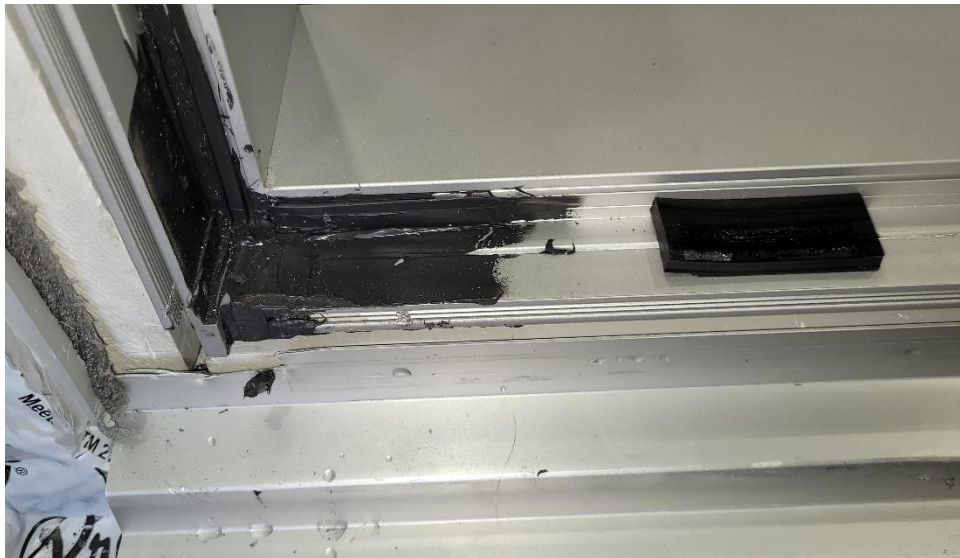


Photo No. 18
Setting block

TEST REPORT FOR ACRO ALUMINUM INC.

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SECTION 10 **DRAWINGS**

The drawings for the Aluminum 2000 Series 4-Lite Fixed Combination Window, as provided by the client, have been reviewed by Intertek B&C and are representative of the sample reported herein. Sample construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

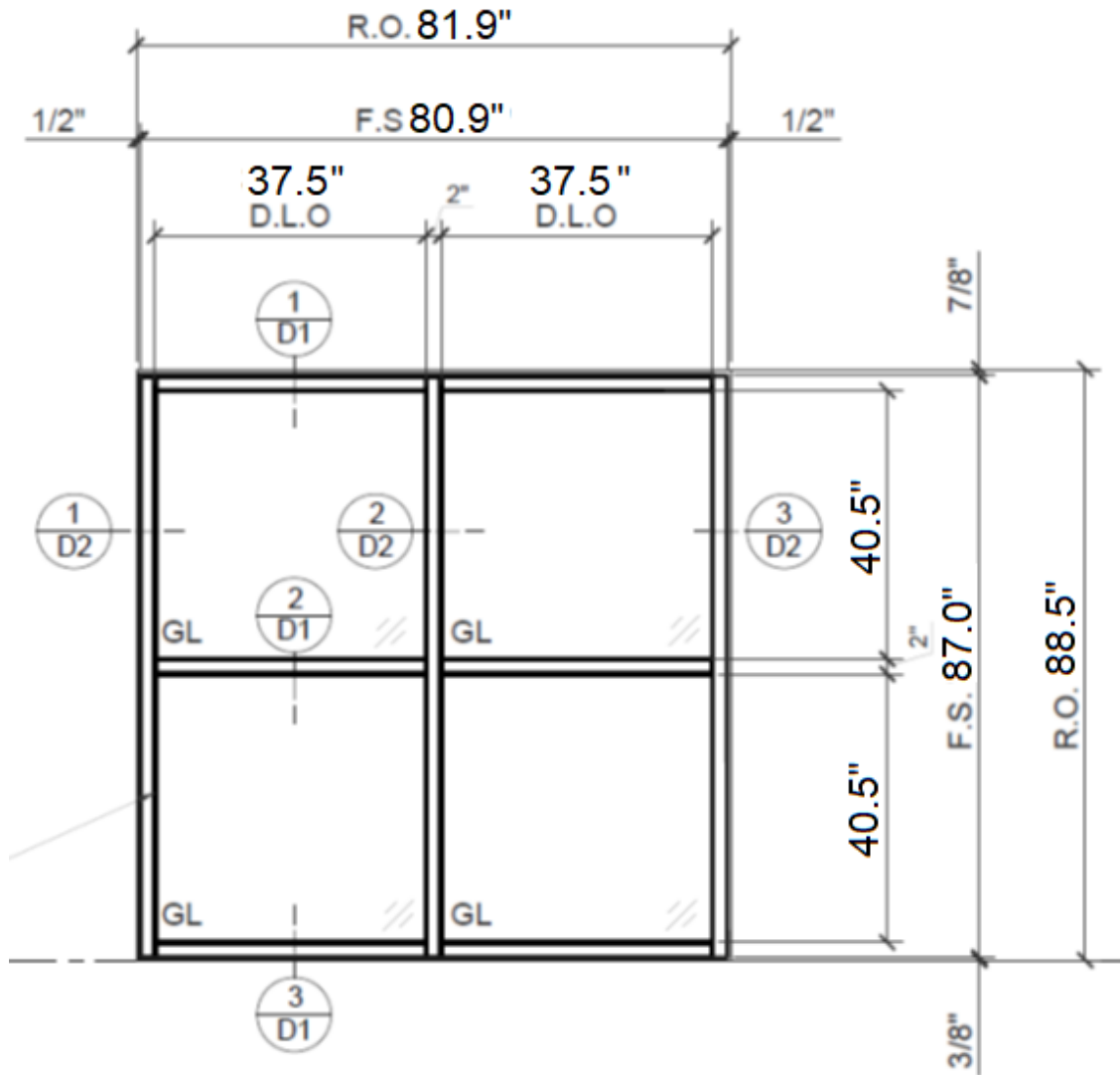
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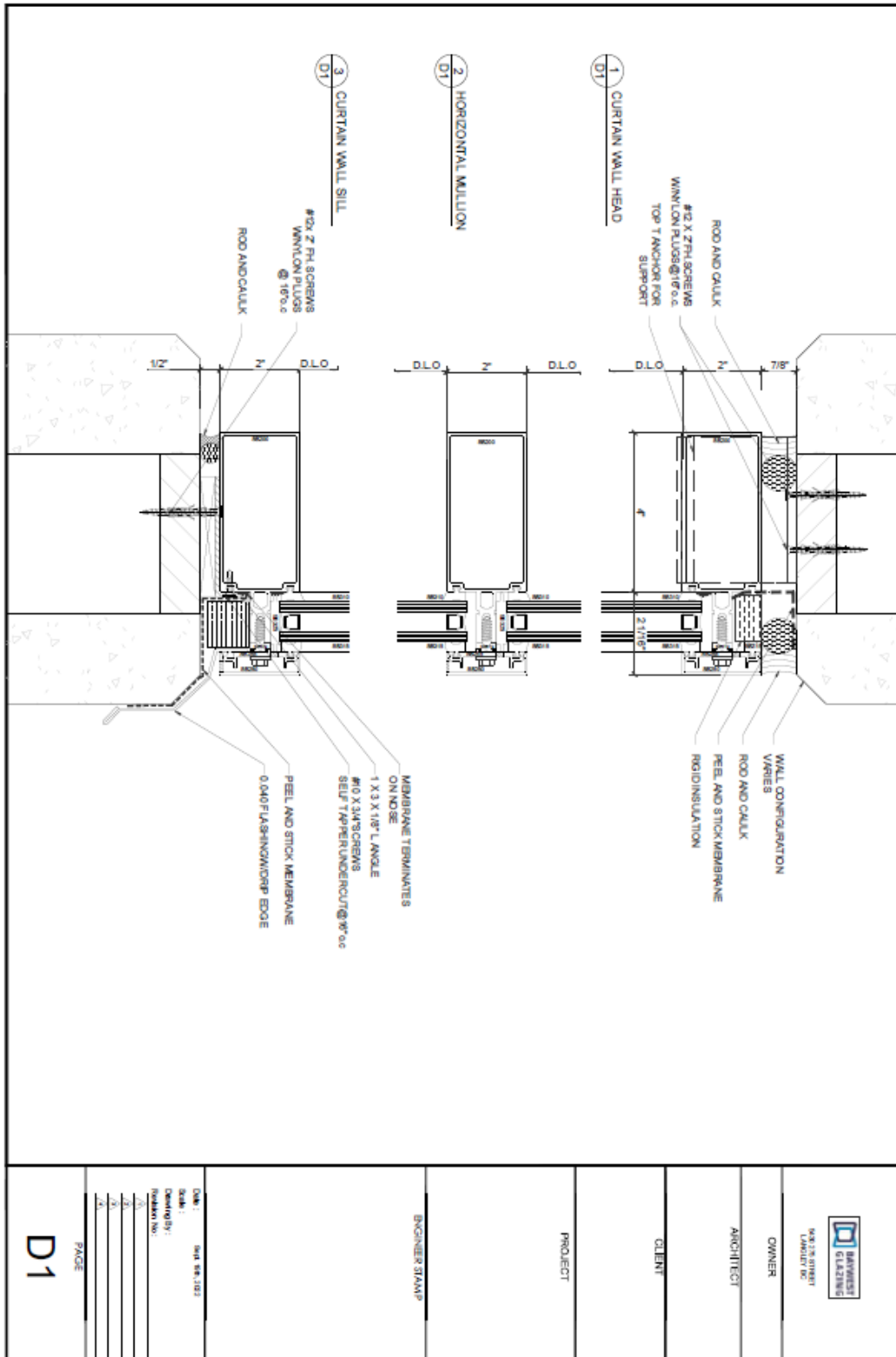
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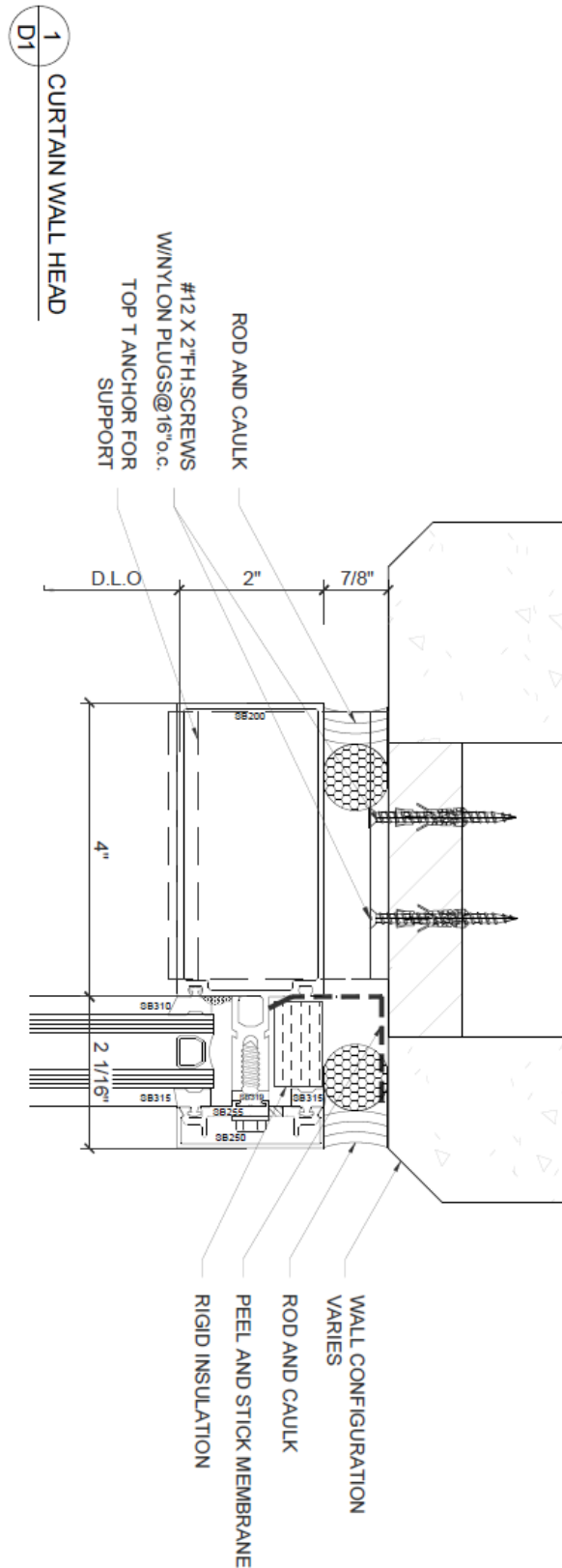
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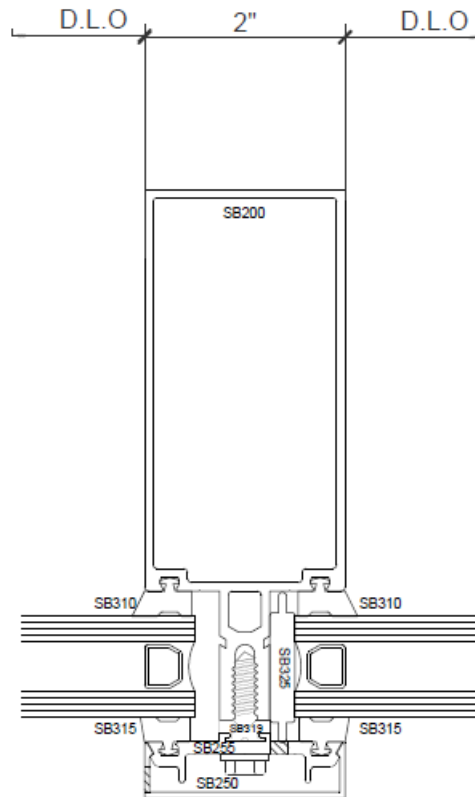
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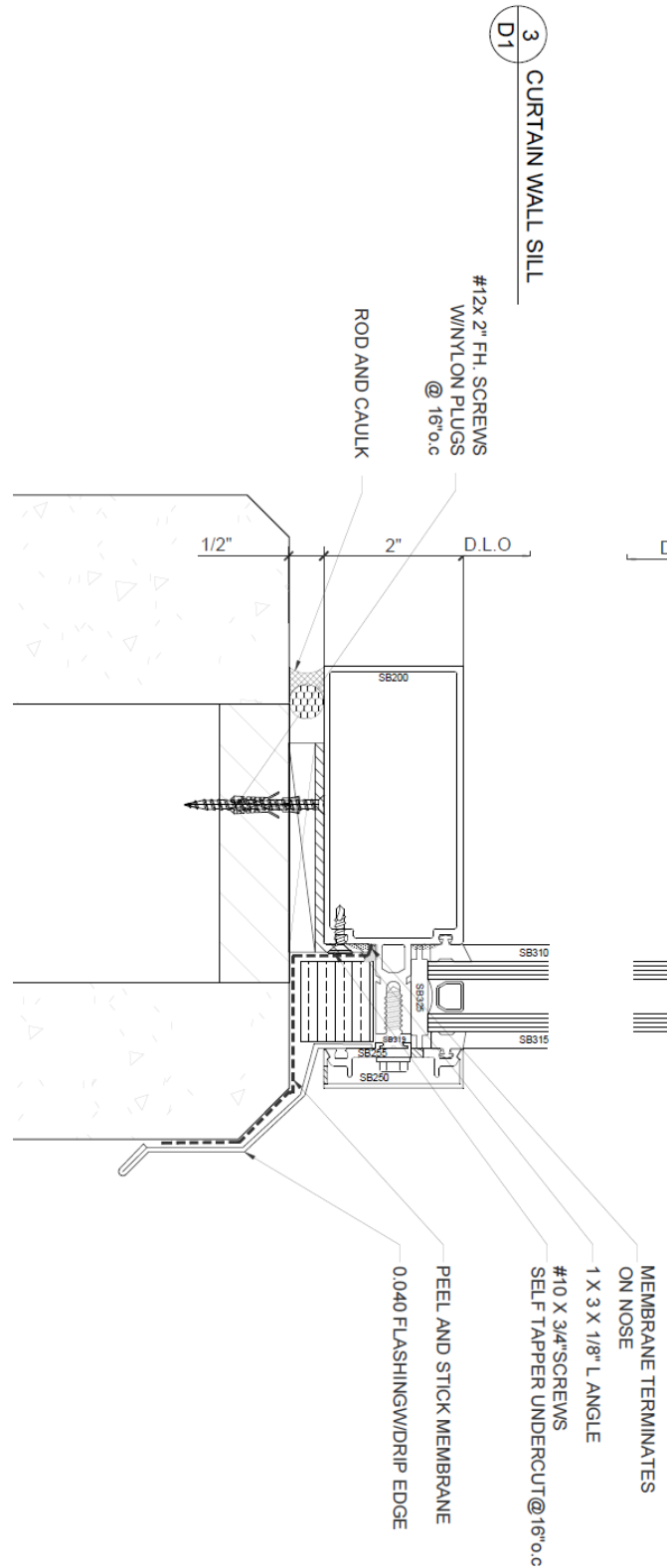
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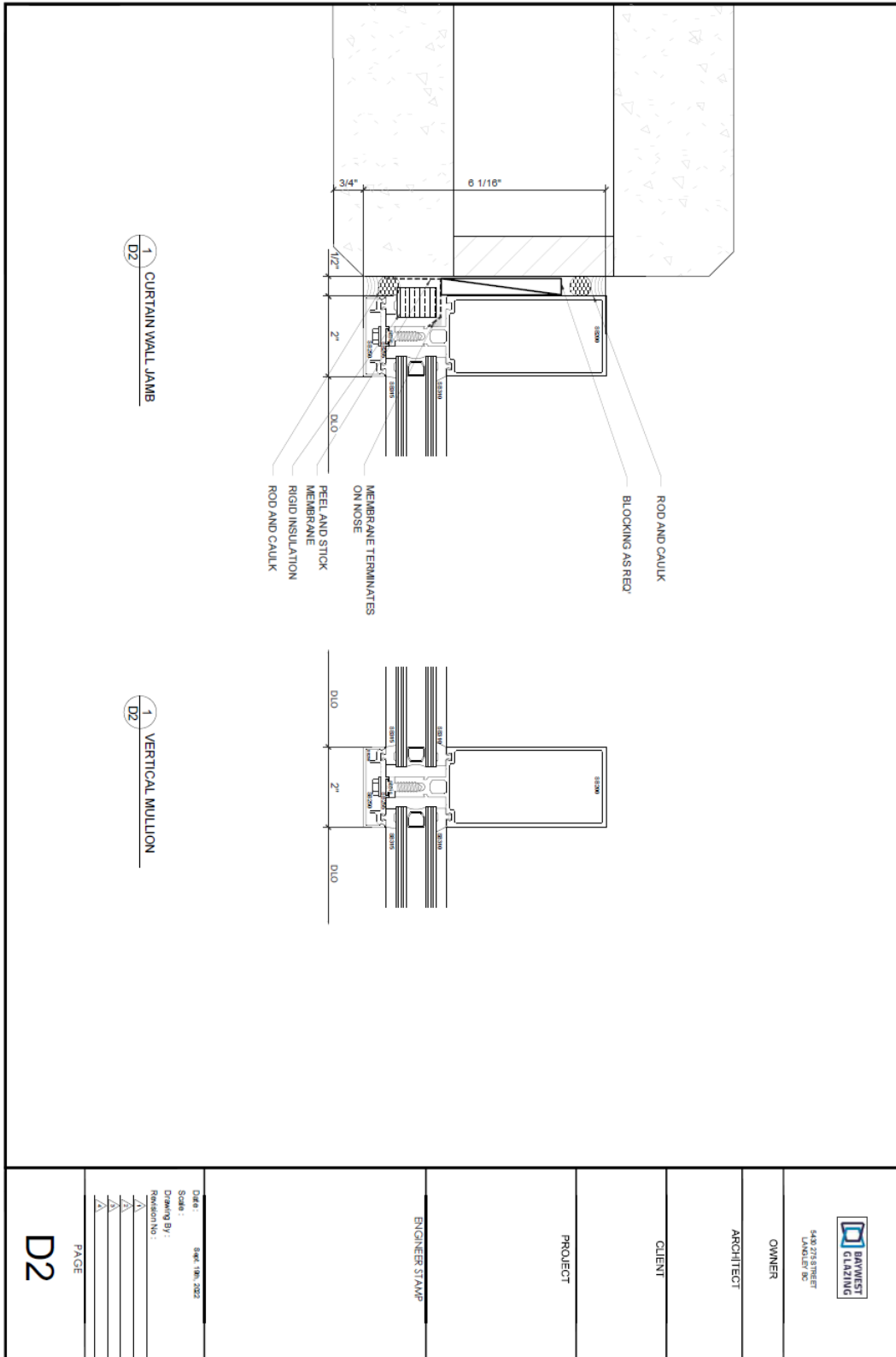
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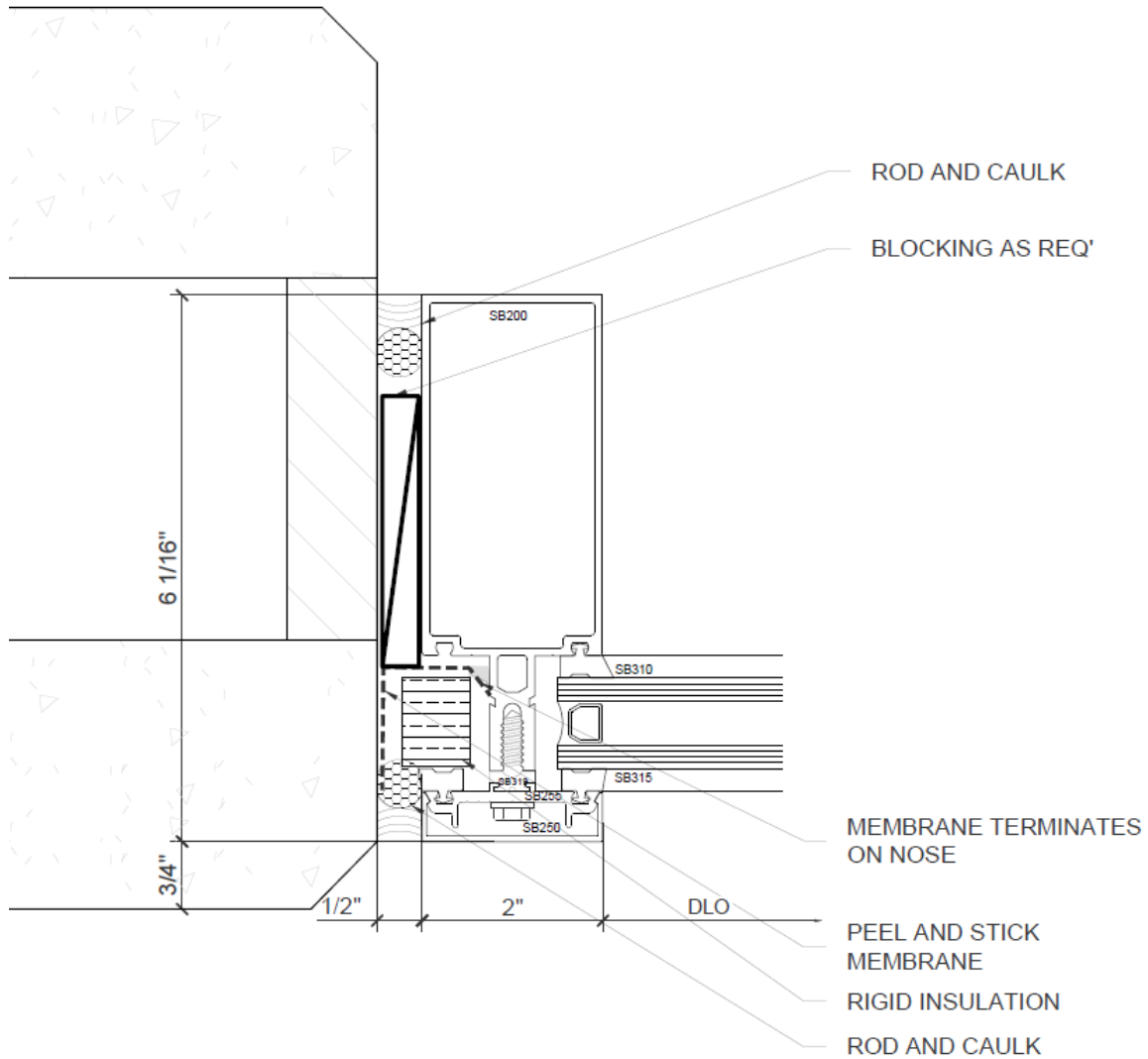
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1 CURTAIN WALL JAMB
D2

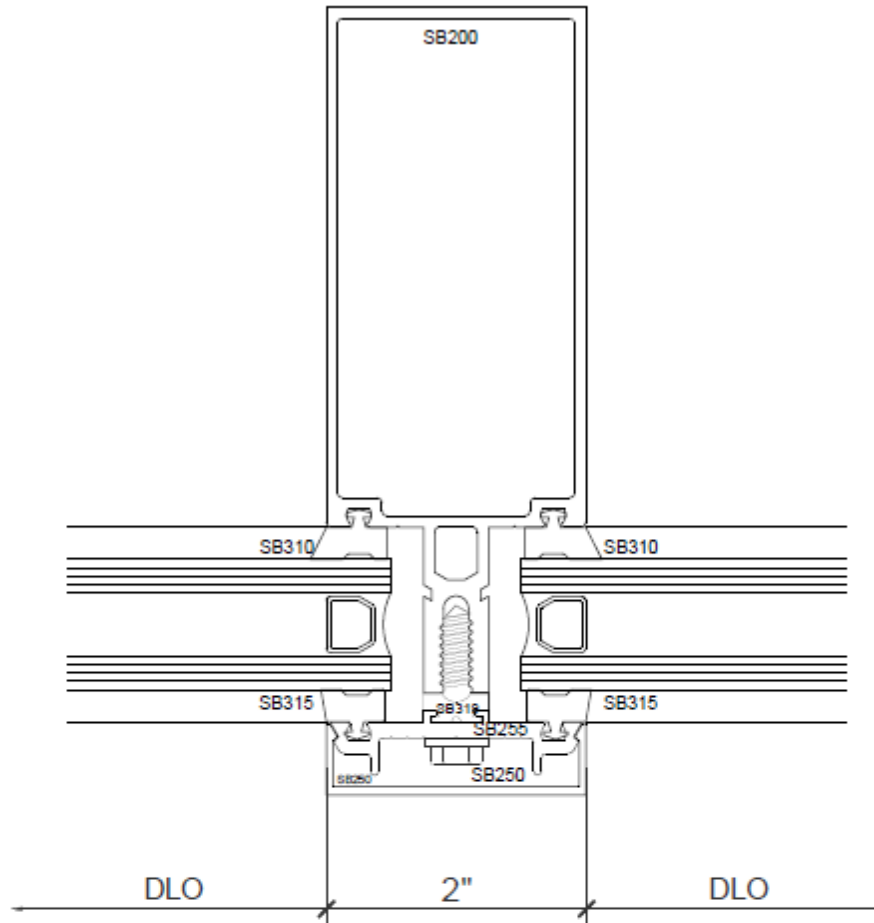
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Report No.: 105479267COQ-001A

Date: 06/16/23

1500 Brigantine Drive
Coquitlam, BC, V3K 7C1

Telephone: 604-520-3321
604-524-9186
www.intertek.com/building



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SECTION 11
REVISION LOG

REVISION #	DATE	SECTION	REVISION
0	06/16/23	N/A	Original Report Issue