

ACRO ALUMINUM INC.

TEST REPORT

TEST REPORT ISSUED TO

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

SPECIFICATION

ASTM E283-04(2012)
ASTM E547-00(2016)
ASTM E331-00(2016)
ASTM E330/E330M-14

PRODUCT SERIES & TYPE

Aluminum T451 Storefront 4-Lite Fixed Combination Window

REPORT NUMBER

105479267COQ-001C

TEST DATE(S)

07/14/21

ISSUE DATE

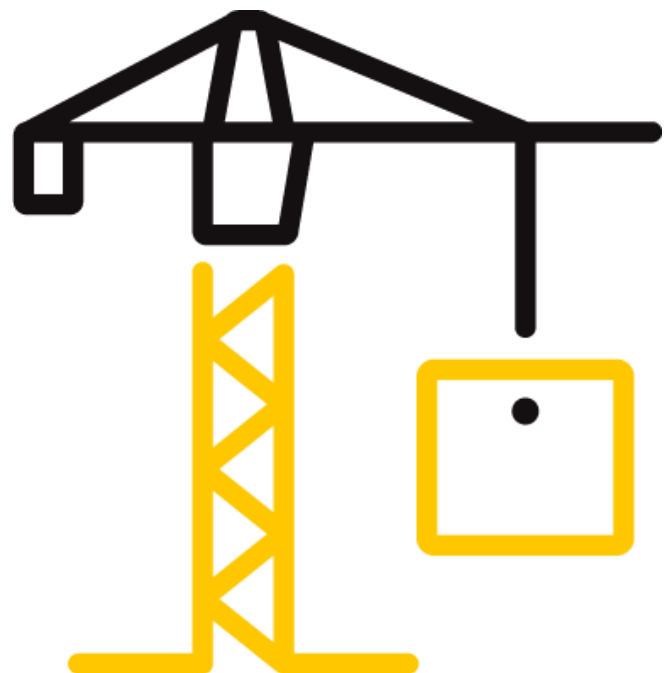
06/16/23

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DOCUMENT CONTROL NUMBER

GFT-OP-10c (09/29/20)
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TEST REPORT FOR ACRO ALUMINUM INC.

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SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Acro Aluminum Inc. to perform testing on a 2000 mm (78.7") x 2200 mm (86.6") Aluminum T451 Storefront 4-Lite Fixed Combination Window System in accordance with the following standard/specifications:

- ASTM E283-04(2012) – *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, 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 – *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 July 14, 2021 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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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	2160 Pa (45.1 psf)
Uniform Load – Structural	3240 Pa (67.7 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 E283-04(2012), *Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, 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, *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	10/26/21
60651	Water Spray Assembly	10/19/21
60652	Water Spray Assembly	10/19/21
D7817	20" Line Gauge	07/30/21
D7820	20" Line Gauge	07/30/21
D7821	20" Line Gauge	07/30/21

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SECTION 5

TEST PROCEDURE

AIR LEAKAGE RESISTANCE

The Air Leakage Resistance test was performed in accordance with ASTM E283-04(2012), *“Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, 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 *“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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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.

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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 T451 Storefront 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 52 mm (2") x 25 mm (1") x 3.5 mm (0.13"). The angle is secured to the test buck with 6x #12 x 2" pan head screws, and the angle is secured to the window still with 10x #10 x 1-1/2" pan head screws, approximately 305 mm (12") o.c.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 is full perimeter except for the bottoms of the jambs and vertical mullion.
Size	<ul style="list-style-type: none">Overall Size:<ul style="list-style-type: none">Width: 2000 mm (78.7")Height: 2200 mm (86.6")Fixed Size:<ul style="list-style-type: none">Width: 1000 mm (39.4")Height: 1100 mm (43.3")
Frame	<ul style="list-style-type: none">Material: Aluminum with thermal breakCorners: Butt joined and secured to the jambs with #12 x 2" pan head screws. The head was secured with 2x fasteners, the sill was secured with 3x fasteners.Reinforcement: None
Vertical Mullion	<ul style="list-style-type: none">One continuous vertical combination mullion<ul style="list-style-type: none">The mullion is a two-piece assembly, with each piece secured to the head and sill of the frame corner joints as described above.Reinforcement: None
Horizontal Mullion	<ul style="list-style-type: none">Two horizontal Integral mullions<ul style="list-style-type: none">Secured to the jambs and intersecting vertical mullion with 3x #12 x 2" pan head screws.Reinforcement: None

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Drainage	<ul style="list-style-type: none">• The hollow jamb and vertical mullion profiles are not sealed on the exterior side at the sill to allow for drainage.
Glazing (4x)	<ul style="list-style-type: none">• IGU specification:<ul style="list-style-type: none">• 6 mm / 6 mm clear tempered with a 13 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.• Interior glazing seal along the sides and top with the same glazing gasket as the exterior.• Glazing Blocks: 2x 102 mm (4") x 25 mm (1") x 12 mm (1/2") thick, neoprene setting blocks used to support the glass unit. 2x under the glass unit, approximately 127 mm (6") from either side.• Glazing Stops: 1 length of glazing stop used along the bottom of each window, with a glazing gasket profile, full length.
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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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	4.40 (47.36)	0.04 (0.01)	0.02 (0.00)	Pass (Fixed)
Overall Assembly @ 300 Pa		0.06 (0.01)	0.17 (0.03)	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

Fixed Combination Uniform Load Structural data:

Mullion span, L = 2150 mm (84.65")

Deflection limit, L/175 = N/A

Residual deflection limit, L*0.4% = 8.60 mm (0.34")

Test Pressure, Pa (psf)	Deflection Measurements, mm (in.)				Compliance
	Positive		Negative		
	Deflection	Residual	Deflection	Residual	
2160 (45.1)	6.69 (0.26)	0.10 (0.00)	7.44 (0.29)	0.05 (0.00)	Pass DP45
3240 (67.7)	n/a	0.15 (0.01)	n/a	0.20 (0.01)	

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 **2160 Pa (45.1 psf)** Uniform Load performance requirements under ASTM E330.

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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 T451 Storefront 4-Lite Fixed Combination Window - Interior



Photo No. 2

Aluminum T451 Storefront 4-Lite Fixed Combination Window - Exterior

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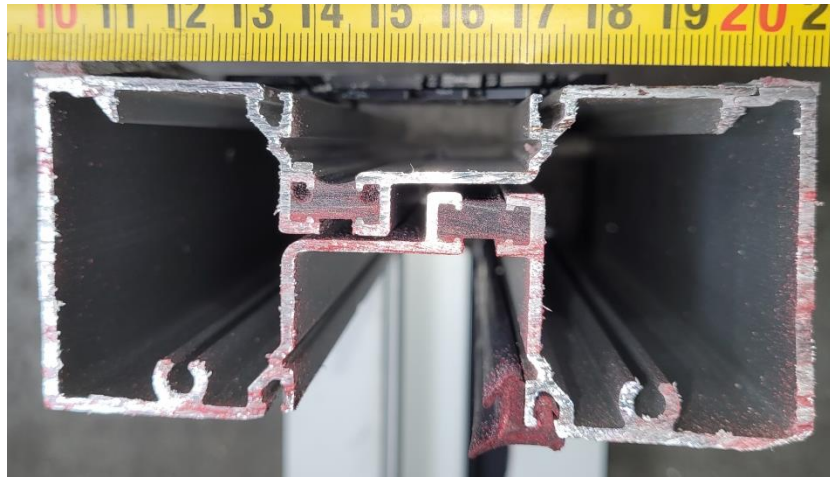


Photo No. 3
Jamb assembly



Photo No. 4
Head assembly

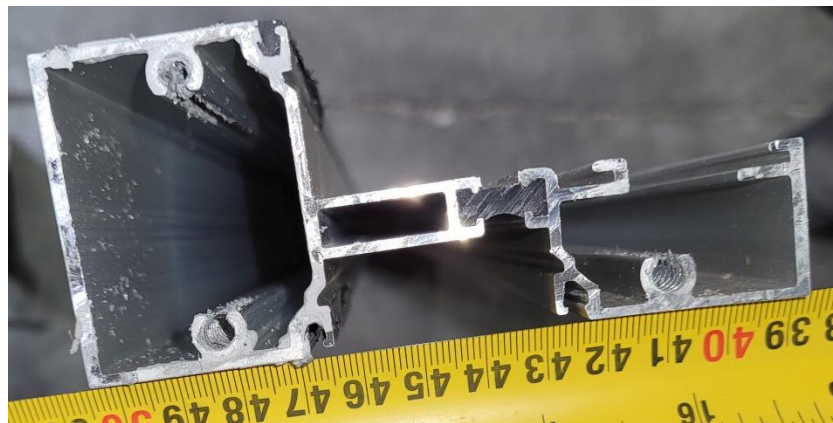


Photo No. 5
Sill and Horizontal Mullion assembly

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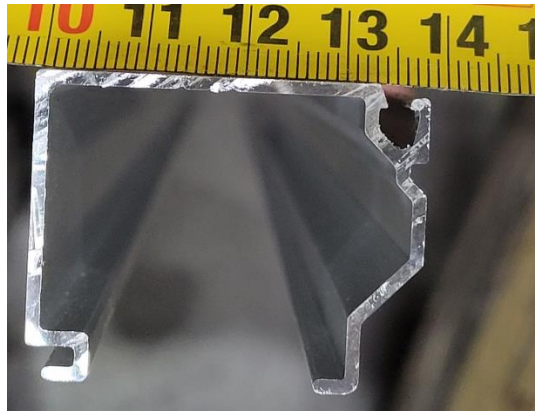


Photo No. 6
Glazing stop profile



Photo No. 7
Corner joint fasteners for one side of vertical mullion



Photo No. 8
Corner joint fasteners for head and vertical mullion

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Photo No. 9

Corner joint fasteners for horizontal mullion and sill



Photo No. 10

Glazing gasket with silicone at corners



Photo No. 11

Glazing gasket – Interior and exterior side

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Photo No. 12
Head track Gasket

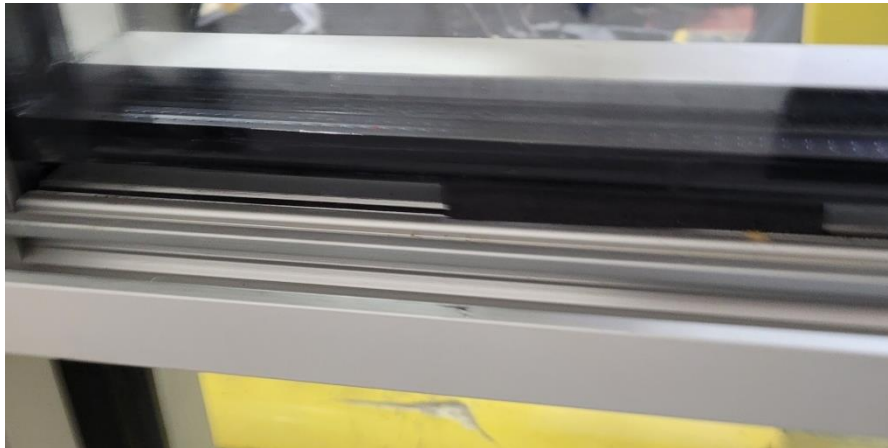


Photo No. 13
Setting block location



Photo No. 14
Setting block profile

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SECTION 10 DRAWINGS

The drawings for the Aluminum T451 Storefront 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.

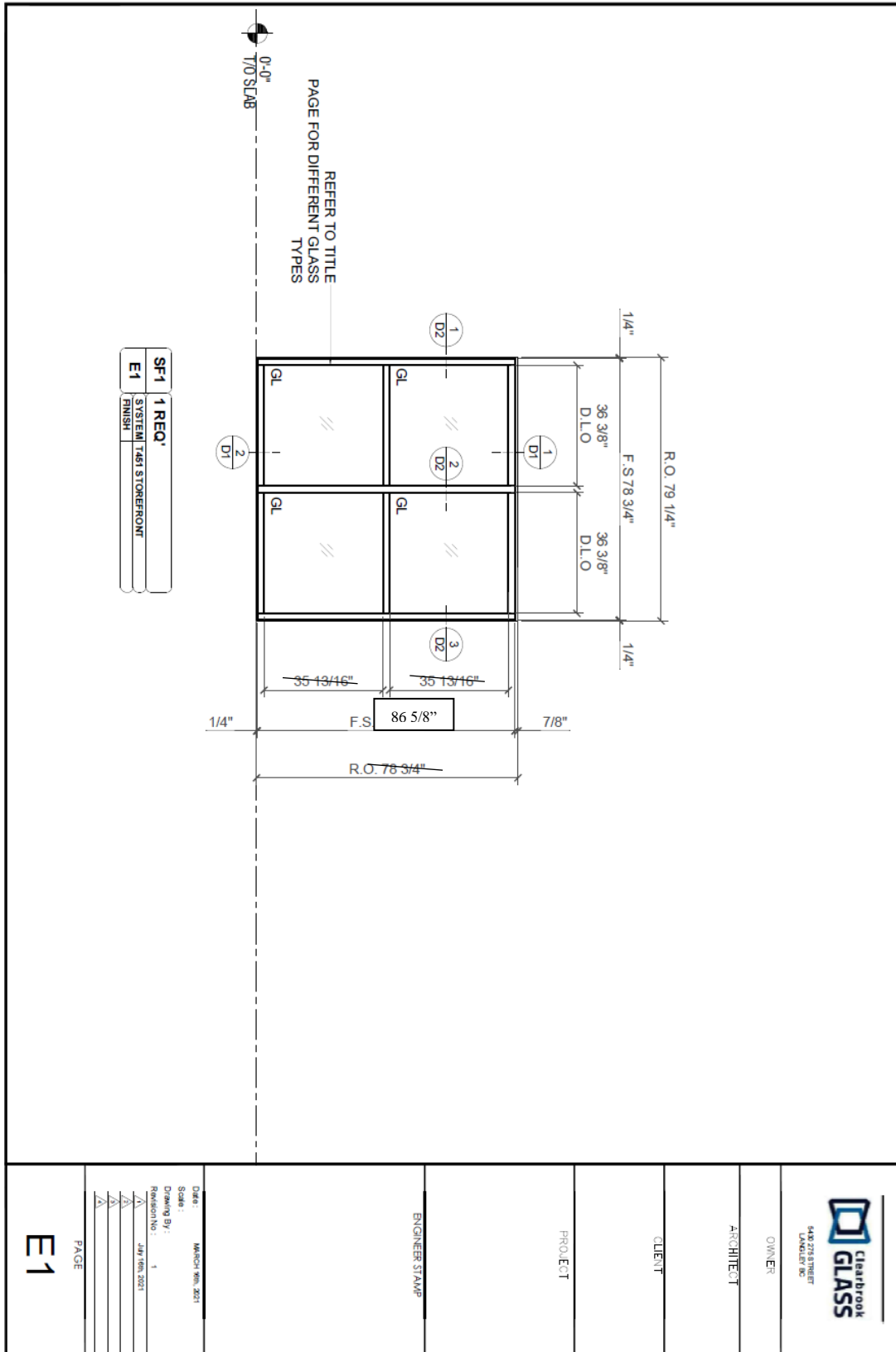
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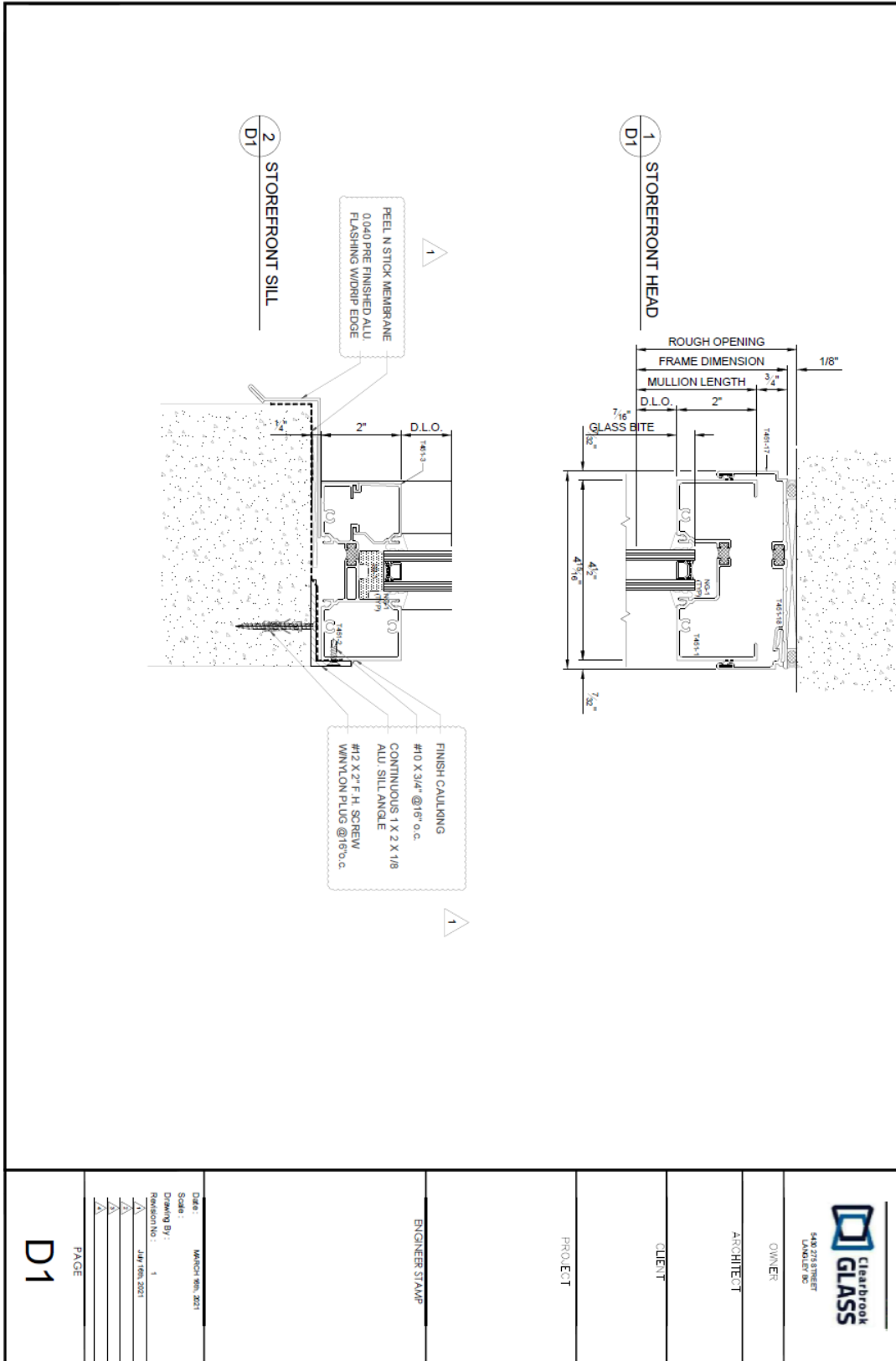
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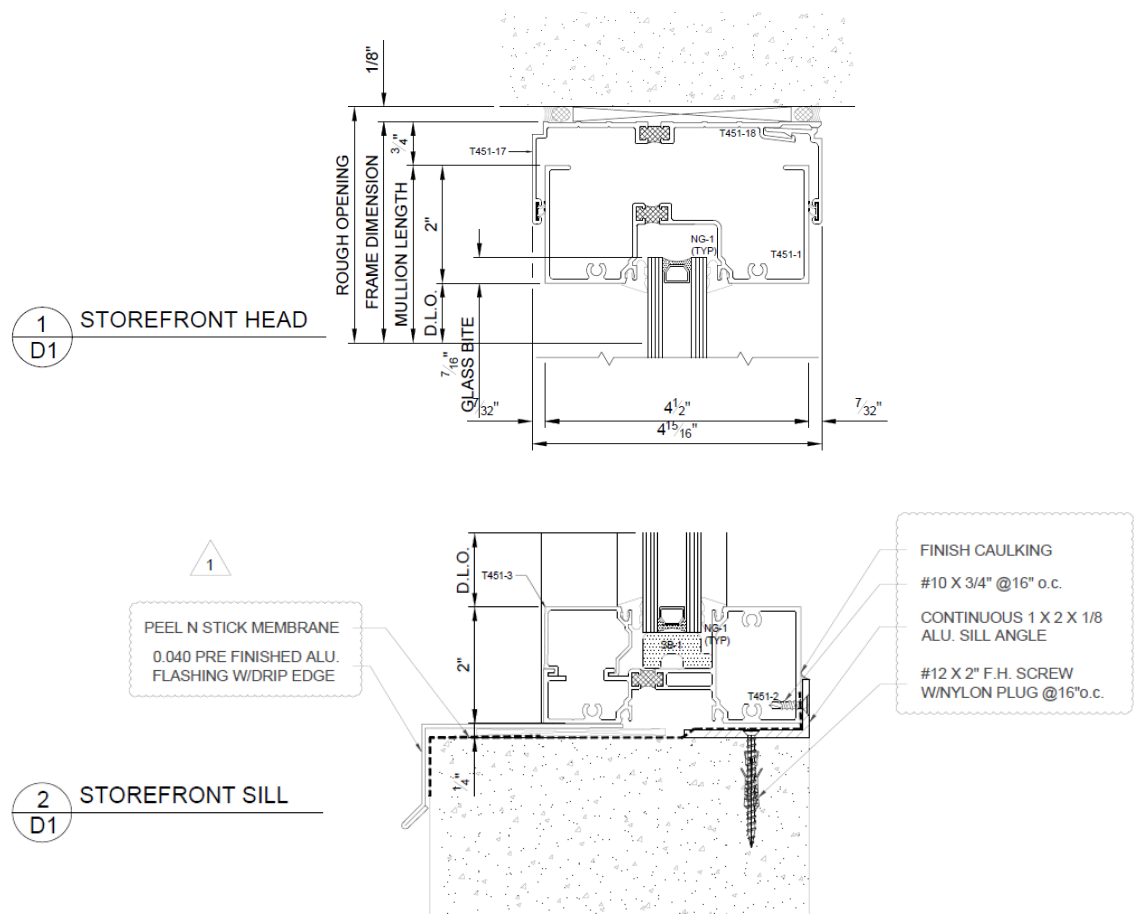
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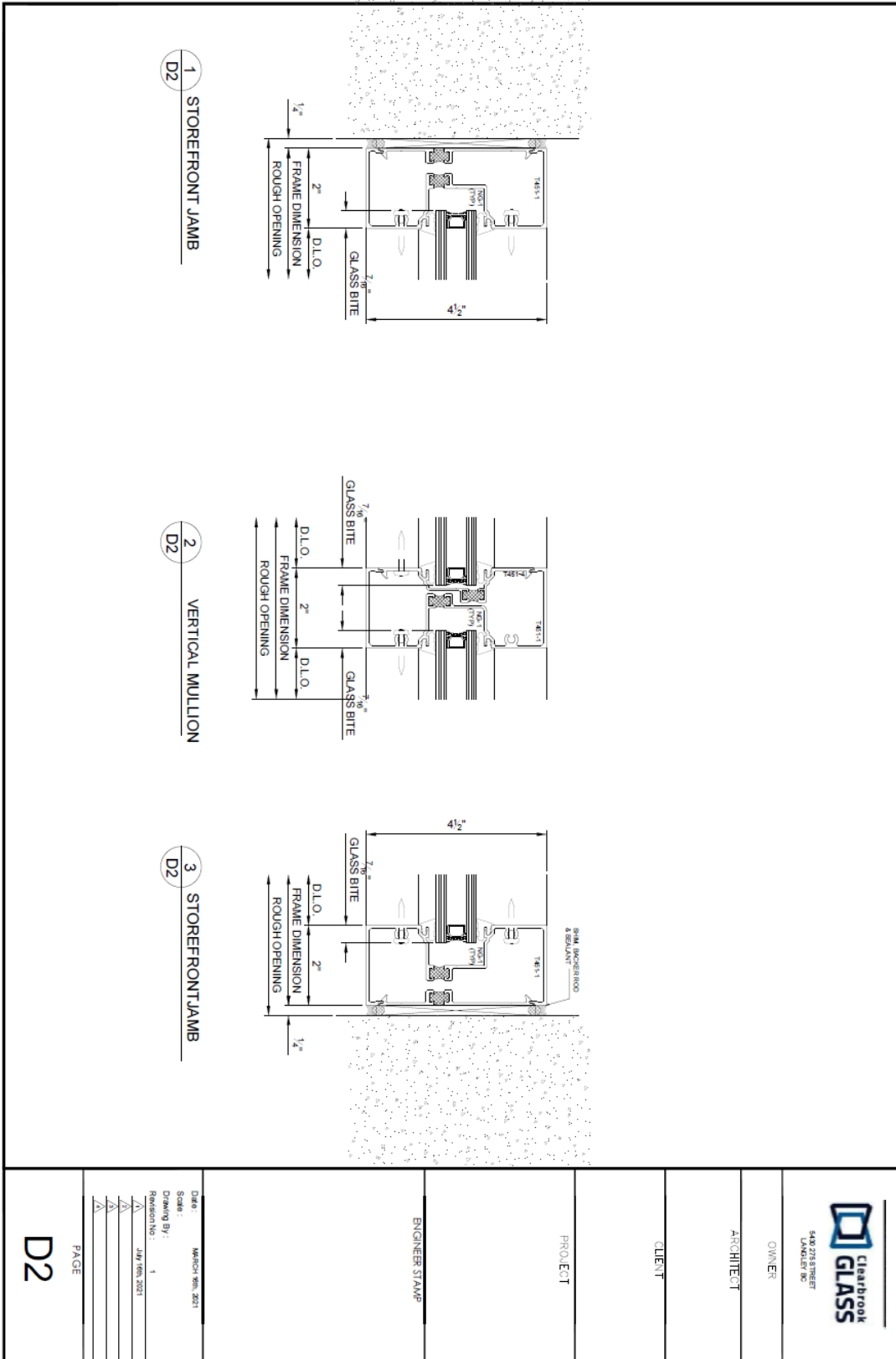
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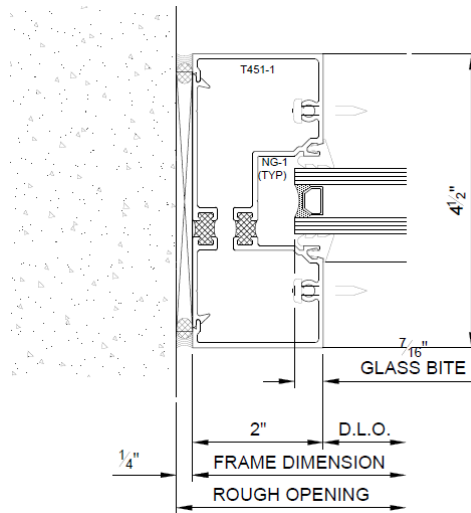
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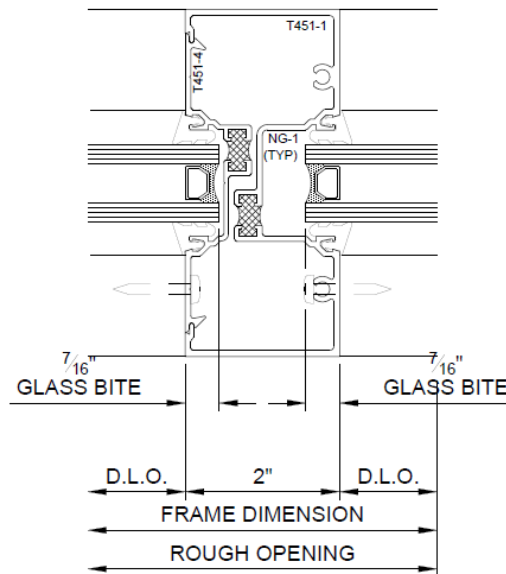
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1 STOREFRONT JAMB
D2



2 VERTICAL MULLION
D2

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SECTION 11

REVISION LOG

REVISION #	DATE	SECTION	REVISION
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