

GRANDVIEW EA BUILDING SYSTEMS TEST REPORT

TEST REPORT ISSUED TO

Grandview EA Building Systems
579-999 West Broadway
Vancouver, BC V5Z 1K5
Canada

SPECIFICATION

AAMA/WDMA/CSA 101/I.S.2/A440-11
AAMA/WDMA/CSA 101/I.S.2/A440-17
A440S1-17
A440S1-19

PRODUCT SERIES & TYPE

Enermax 150 Series Fixed Window

PRIMARY DESIGNATION

Class AW – PG40 – Size Tested 1502 x 2510 mm (59 x 99 in) – Type FW

SECONDARY DESIGNATION

Positive Design Pressure = 1920 Pa (40.1 psf)
Negative Design Pressure = 1920 Pa (40.1 psf)
Water Penetration Resistance = 720 Pa (15.0 psf)
Canadian Air Leakage Resistance = Fixed

REPORT NUMBER

104182880COQ-001A

ISSUE DATE

28-Jul-2020

PAGES

31

DOCUMENT CONTROL NUMBER

GFT-OP-10b (13-March-2017)
© 2017 INTERTEK



TEST REPORT FOR GRANDVIEW EA BUILDING SYSTEMS

Report No.: 104182880COQ-001A


Date: 28-Jul-2020

CONCLUSION

The Enermax 150 Series Fixed Window System, submitted by Grandview Building Systems, tested and described within this report, achieved the overall performance requirements of **Class AW – PG40** when tested in accordance with NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

For INTERTEK B&C:

COMPLETED BY:	Jason Komorski
TITLE:	Technician – Building & Construction
SIGNATURE:	
DATE:	28-Jul-2020

REVIEWED BY:	David Park
TITLE:	Reviewer – Building & Construction
SIGNATURE:	
DATE:	28-Jul-2020

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute Intertek's Reports and then only in their entirety, and the Client shall not use the Reports in a misleading manner. In the event any portion of this report becomes public, including but not limited to press releases, articles, and marketing material, without prior written consent from Intertek, Intertek may enforce the reproduction of the report in its entirety by making the full report public. Client further agrees and understands that reliance upon the Reports is limited to the representations made therein. In the event any portion of this report becomes public, including but not limited to press releases, articles, and marketing material, without prior written consent from Intertek, Intertek will enforce the reproduction of the report in its entirety by making the full report public. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. Should Customer use an Intertek Report, in whole or in part, in such a manner as to involve Intertek in legal controversy or to adversely affect Intertek's reputation, it shall be Intertek's right to utilize any and all Customer information, including, but not limited to, data, records, instructions, notations, samples or documents within Intertek's custody and control which relate to the customer for the purpose of offering any necessary defense or rebuttal to such circumstances. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Date: 28-Jul-2020

SECTION 1**SUMMARY OF RESULTS**

A summary of results for AAMA/WDMA/CSA 101/I.S.2/A440-11 *“Standard/Specification for windows, doors, and unit skylights”*, AAMA/WDMA/CSA 101/I.S.2/A440-17 *“Standard/Specification for windows, doors, and unit skylights”*, A440S1-17 *“Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights”*, and A440S1-19 *“Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights”*, 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	1920 Pa (40.1 psf)
Vent / Sash / Door Leaf Cycling	N/A
Locking Hardware Cycling	N/A
Misuse Test	N/A
Thermal Cycling	Pass
Air Leakage Resistance #2 @ 75 Pa (1.6 psf)	US – Pass; Can – Fixed
Air Leakage Resistance #2 @ 300 Pa (6.3 psf)	US – Pass; Can – Fixed
Water Penetration Resistance #2 (Static & Cyclic)	720 Pa (15.0 psf)
Uniform Load – Structural	2880 Pa (60.2 psf)
Forced Entry Resistance	Gr. 40
Thermoplastic Corner Weld Test	N/A

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

Primary and Secondary Designations are as indicated below:

Enermax 150 Series Fixed Window

Class AW – PG40 – Size Tested 1502 x 2510 mm (59 x 99 in) – Type FW

Secondary Designator

Positive Design Pressure = 1920 Pa (40.1 psf)

Negative Design Pressure = 1920 Pa (40.1 psf)

Water Penetration Resistance = 720 Pa (15.0 psf)

Canadian Air Leakage Resistance = Fixed

Date: 28-Jul-2020

SECTION 2**INDEX**

SECTION NAMES	PAGE
SUMMARY OF RESULTS.....	3
INDEX	4
OBJECTIVE.....	5
SAMPLE ASSEMBLY AND DESCRIPTION	5
TESTING AND EVALUATION METHODS.....	7
AIR LEAKAGE RESISTANCE	7
CYCLIC WATER PENETRATION RESISTANCE.....	7
STATIC WATER PENETRATION RESISTANCE	7
THERMAL CYCLING.....	7
UNIFORM LOAD DEFLECTION	8
AIR LEAKAGE RESISTANCE #2	8
CYCLIC WATER PENETRATION RESISTANCE #2	8
STATIC WATER PENETRATION RESISTANCE #2	8
UNIFORM LOAD STRUCTURAL.....	8
FORCED ENTRY RESISTANCE.....	8
DEVIATION FROM STANDARD METHOD	8
TEST EQUIPMENT	9
RESULTS AND OBSERVATIONS	10
AIR LEAKAGE RESISTANCE	10
WATER PENETRATION RESISTANCE	10
THERMAL CYCLING.....	10
AIR LEAKAGE RESISTANCE #2	11
WATER PENETRATION RESISTANCE #2	11
FORCED ENTRY RESISTANCE.....	12
CONCLUSION	13
APPENDIX A: DRAWINGS.....	14
APPENDIX B: PHOTOGRAPHS	24
APPENDIX C: REVISION TABLE	30

Date: 28-Jul-2020

SECTION 3

OBJECTIVE

Intertek Testing Services NA Ltd. (Intertek) has conducted testing for **Grandview Building Systems** (Grandview) on a 1502 mm (59.1") x 2510 mm (98.8") Enermax 150 Series Fixed Window System. Testing was conducted in accordance with following standard / specification:

- AAMA/WDMA/CSA 101/I.S.2/ A440-11 *"Standard/Specification for windows, doors, and unit skylights"* (NAFS-11)
- A440S1-17 *"Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights"* (A440S1-17)
- AAMA/WDMA/CSA 101/I.S.2/ A440-17 *"Standard/Specification for windows, doors, and unit skylights"* (NAFS-17)
- A440S1-19 *"Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights"* (A440S1-19)

This evaluation was started on June 18, 2020 and completed on July 8, 2020.

SECTION 4

SAMPLE ASSEMBLY AND DESCRIPTION

Manufacturer Information	Grandview Building Systems 579–999 West Broadway Vancouver, BC V5Z 1K5 Canada
Model Name	<ul style="list-style-type: none"> • Enermax 150 Series Fixed Window
Installation	<ul style="list-style-type: none"> • Test Buck: 2x8 #2 & better spf, box w/ 2x12, #2 & better spf, cladding, butt joints secured with 2x #8 x 3" flat head screws. The 2x12 clad was also butt jointed together with 4x #8 x 3" flat head screws and secured to the 2x8 with #8 x 3" flat head screws at least at every 305 mm (12"). An aluminum skin membrane was used over the entire test buck. <ul style="list-style-type: none"> • The sill is secured with a length of aluminum angle, approximately 2" x 1", 0.125" thick. The angle is secured to the test buck with 6x #10 x 1-1/2" wafer head self-tapping screws. The angle is secured to the window sill with 9x #10 x 3/4" wafer head self-tapping screws. The head track was secured with the use of 6x #12 x 1-1/2" flat-head. The jambs were not secured to the test buck with fasteners. • Backer rod and silicone were used to seal the rough opening of the buck on the interior and exterior full perimeter.

Date: 28-Jul-2020

Size	<ul style="list-style-type: none"> Overall Size: <ul style="list-style-type: none"> Width: 1502 mm (59.1") Height: 2510 mm (98.8")
Frame	<ul style="list-style-type: none"> Material: Aluminum with thermal struts Jamb profile is snapped on to a jamb track profile, with a gasket used on each the exterior and interior side between the profiles. The profiles are secured together with #8 x 1" self-tapping screws, approximately 48" o.c. The exterior cavity and the 2x thermal break cavities are filled with roxul insulation. Head profile is secured in to a two-piece head track, with a gasket used on each the exterior and interior side between the profiles. The exterior cavity and the thermal break cavity are filled with roxul insulation. Corners: Butt joined and secured with 4x #8 x 1" screws. Silicone is used around all seams of the frame joint. Reinforcement: None
Drainage	<ul style="list-style-type: none"> None
Glazing	<ul style="list-style-type: none"> IGU specification: <ul style="list-style-type: none"> 6 mm / 6 mm clear annealed glass with a 12 mm (1/2") spacer bar, sealed using polyisobutylene. Overall thickness, 24 mm (~1") Laid-in, interior dry glazed on top of a perimeter of a glazing gasket, applied as 4x lengths. A full bead of silicone was used around the full perimeter of the glass unit, in the setting block cavity. Glazing Blocks: Black neoprene setting blocks, approximately 102 mm (4") x 25 mm (1") x 5 mm (0.20"). 2x under the glass unit, 343 mm (13-1/2") from the corners of the glass unit. Glazing Stops: Vinyl
Drawings	<ul style="list-style-type: none"> Copy of drawings supplied by Grandview Building Systems included in Appendix A.

Date: 28-Jul-2020

SECTION 5

TESTING AND EVALUATION METHODS

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). The maximum air leakage rate was calculated and compared to the allowable air leakage.

CYCLIC WATER PENETRATION RESISTANCE

The Cyclic 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.

THERMAL CYCLING

The Thermal Cycling Test was performed in general accordance with AAMA 501.5 *“Test Method for Thermal Cycling of Exterior Walls”* following the cycle and temperature requirements in Section 3.7 of AAMA 910. The test consisted of six cycles of hot, 82°C (180°F) and cold, -18°C (0°F).

Date: 28-Jul-2020

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.

AIR LEAKAGE RESISTANCE #2

The Air Leakage Resistance test was repeated.

CYCLIC WATER PENETRATION RESISTANCE #2

The Cyclic Water Penetration Resistance test was repeated.

STATIC WATER PENETRATION RESISTANCE #2

The Static Water Penetration Resistance test was repeated.

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.

FORCED ENTRY RESISTANCE

The Forced-entry Resistance Test was conducted in accordance with ASTM F588-14 *“Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact”*. This included the Disassembly, Sash Manipulation, Lock Hardware Manipulation, and Assembly Tests.

DEVIATION FROM STANDARD METHOD

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

Date: 28-Jul-2020

SECTION 6**TEST EQUIPMENT**

Equipment used during testing is listed as follows:

Test	Equipment	Intertek ID#
Air Leakage Resistance, Water Penetration Resistance, and Uniform Load Deflection / Structural	Fenestration Testing Control Unit	60650
	Water spray assembly	60651
		60652
		60653
	20" Line Gauge	60673
		64928
		64926

Date: 28-Jul-2020

SECTION 7**RESULTS AND OBSERVATIONS****AIR LEAKAGE RESISTANCE**

Air test data is indicated in the following table:

Property	Test Pressure Pa (psf)	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 (1.6)	3.77 (40.58)	0.02 (0.00)	0.02 (0.00)	Pass (Fixed)
Overall Assembly	300 (6.3)	3.77 (40.58)	0.06 (0.01)	0.03 (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 NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

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 **(CAN) PG100** Water Penetration Resistance performance requirements under NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

THERMAL CYCLING

No. of Cycles	Exterior Conditions		Interior Conditions
	Hot Temperature	Cold Temperature	
6	82°C (180°F)	-18°C (0°F)	24°C (74°F)

Upon completion of the thermal cycling, there was found to be no failure or permanent deformation due to the expansion and contraction of the system that would cause any operational malfunction. The system **met** the Thermal Cycling performance requirements of AAMA 910.

Date: 28-Jul-2020

UNIFORM LOAD – DEFLECTIONUniform Load Deflection data:

Jamb span, L = 2440 mm (96.06")

Deflection limit, L/175 = 13.94 mm (0.55")

Test Pressure, Pa (psf)	Deflection Measurements, mm (in.)				Compliance
	Positive		Negative		
	Deflection	Residual	Deflection	Residual	
1920 (40.1)	1.56 (0.08)	0.08 (0.00)	1.16 (0.05)	0.08 (0.00)	Pass DP40

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 deflection requirements for **DP40** Uniform Load performance requirements under NAFS-11 and NAFS-17.

AIR LEAKAGE RESISTANCE #2

Air test data is indicated in the following table:

Property	Test Pressure Pa (psf)	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 (1.6)	3.77 (40.58)	0.06 (0.01)	0.06 (0.01)	Pass (Fixed)
Overall Assembly	300 (6.3)	3.77 (40.58)	0.12 (0.02)	0.08 (0.02)	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 NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

WATER PENETRATION RESISTANCE #2

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 **(CAN) PG100** Water Penetration Resistance performance requirements under NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

Date: 28-Jul-2020

UNIFORM LOAD – STRUCTURALUniform Load Structural data:

Jamb span, L = 3000 mm (118.11")

Residual deflection limit, $L \times 0.2\% = 6.00 \text{ mm (0.24")}$

Test Pressure, Pa (psf)	Deflection Measurements, mm (in.)		Compliance
	Positive	Negative	
	Residual	Residual	
2880 (60.1)	0.15 (0.01)	0.05 (0.00)	Pass DP40

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 structural requirements for **DP40** Uniform Load performance requirements under NAFS-11 and NAFS-17.

FORCED ENTRY RESISTANCE

Attempts to gain entry by opening the glazing panel, in accordance with the Disassembly and Sash Manipulation tests for a Type D assembly, were unsuccessful. The system met the **Grade 40** Forced-entry Resistance performance requirements of NAFS-11 and NAFS-17.

Date: 28-Jul-2020

SECTION 8

CONCLUSION

The Enermax 150 Series Fixed Window System, submitted by Grandview Building Systems, tested and described within this report, achieved the overall performance requirements of **Class AW – PG40** when tested in accordance with NAFS-11, NAFS-17, A440S1-17 and A440S1-19.

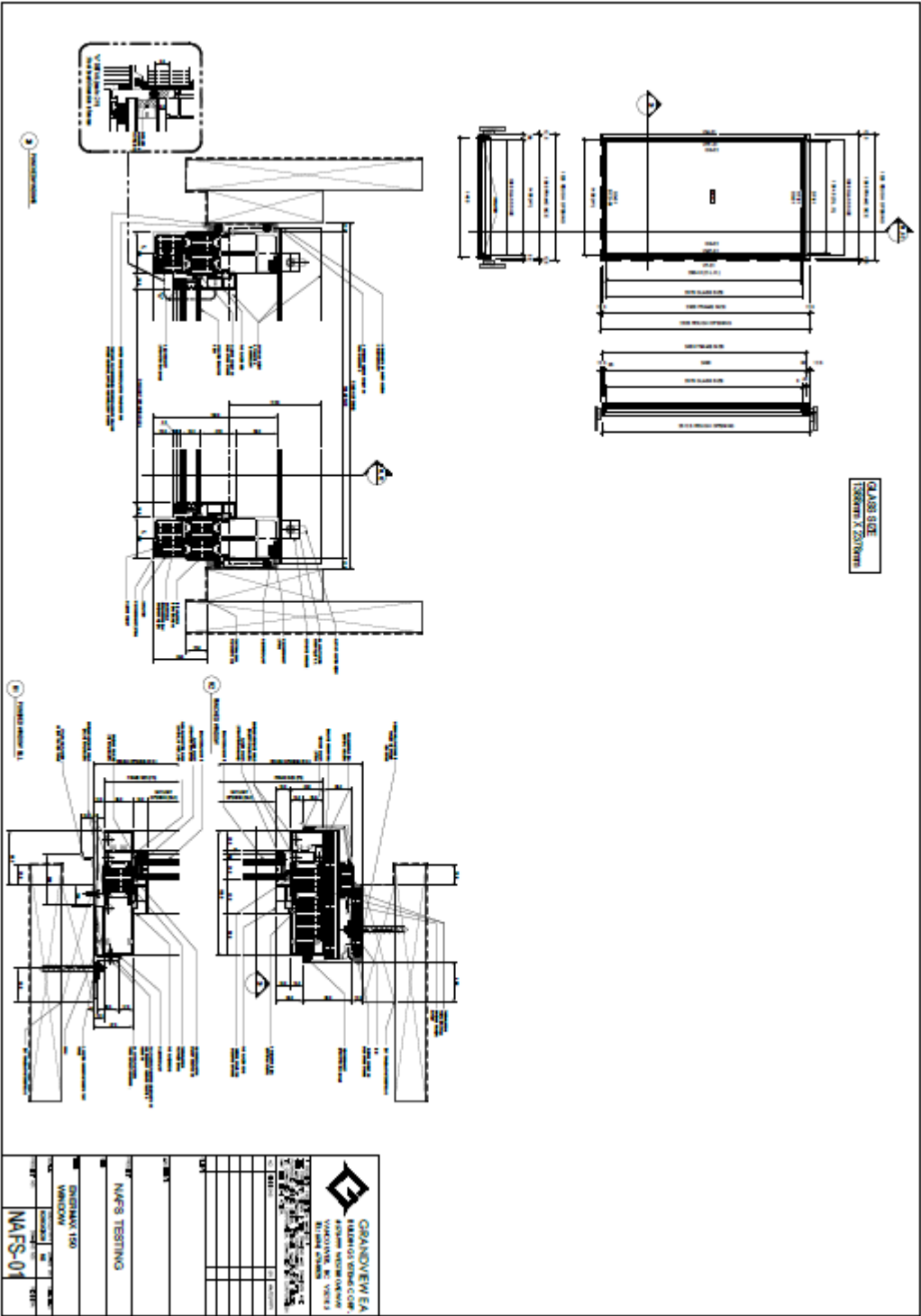
Date: 28-Jul-2020

SECTION 9

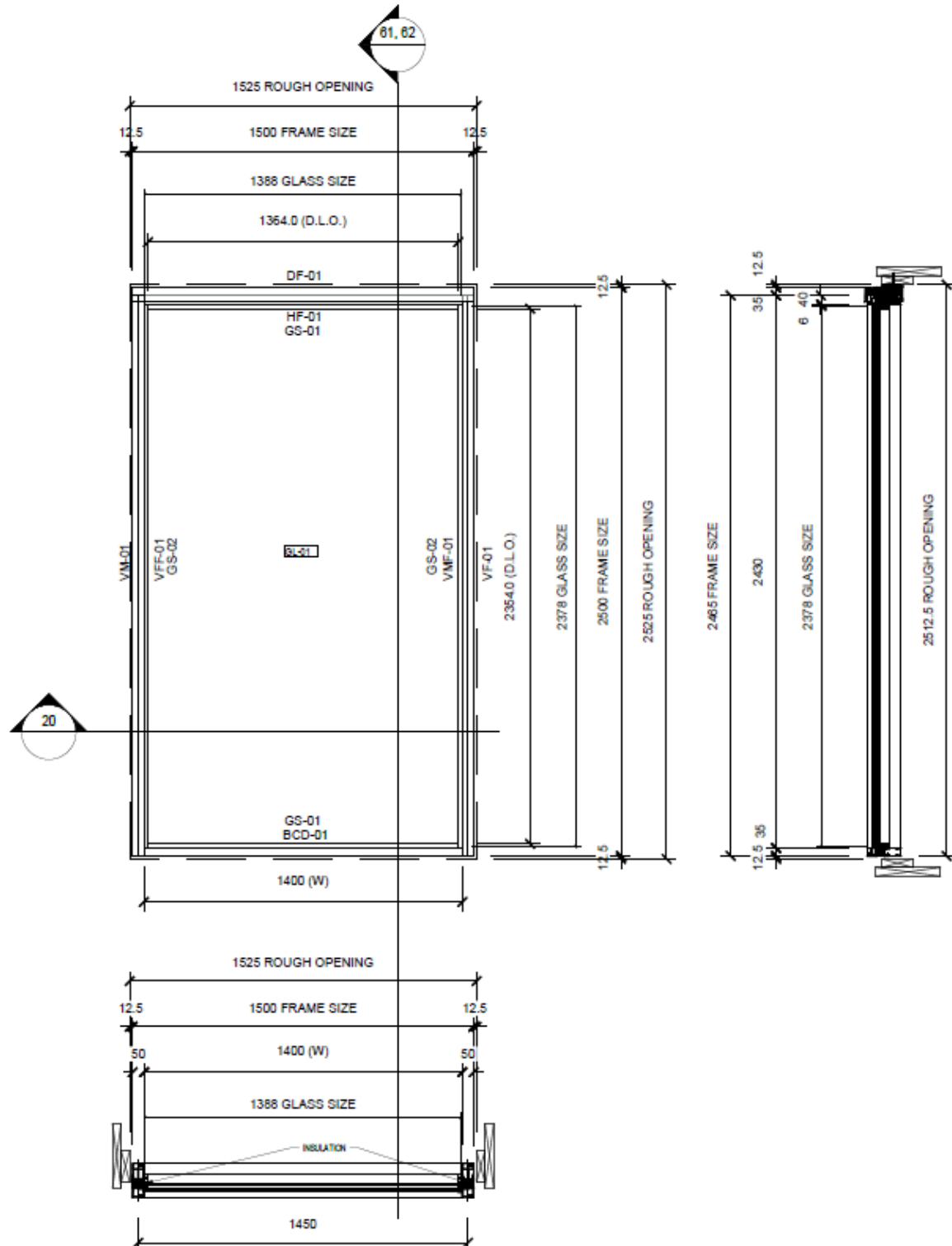
APPENDIX A: DRAWINGS

(9 Pages)

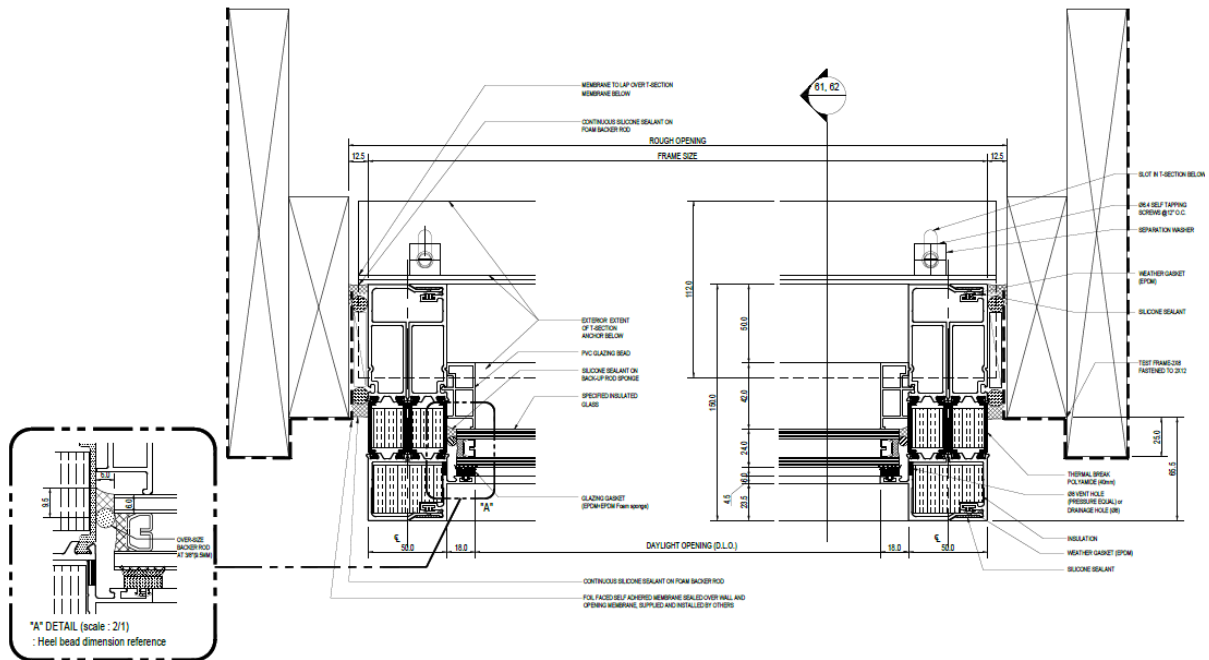
Date: 28-Jul-2020



Date: 28-Jul-2020

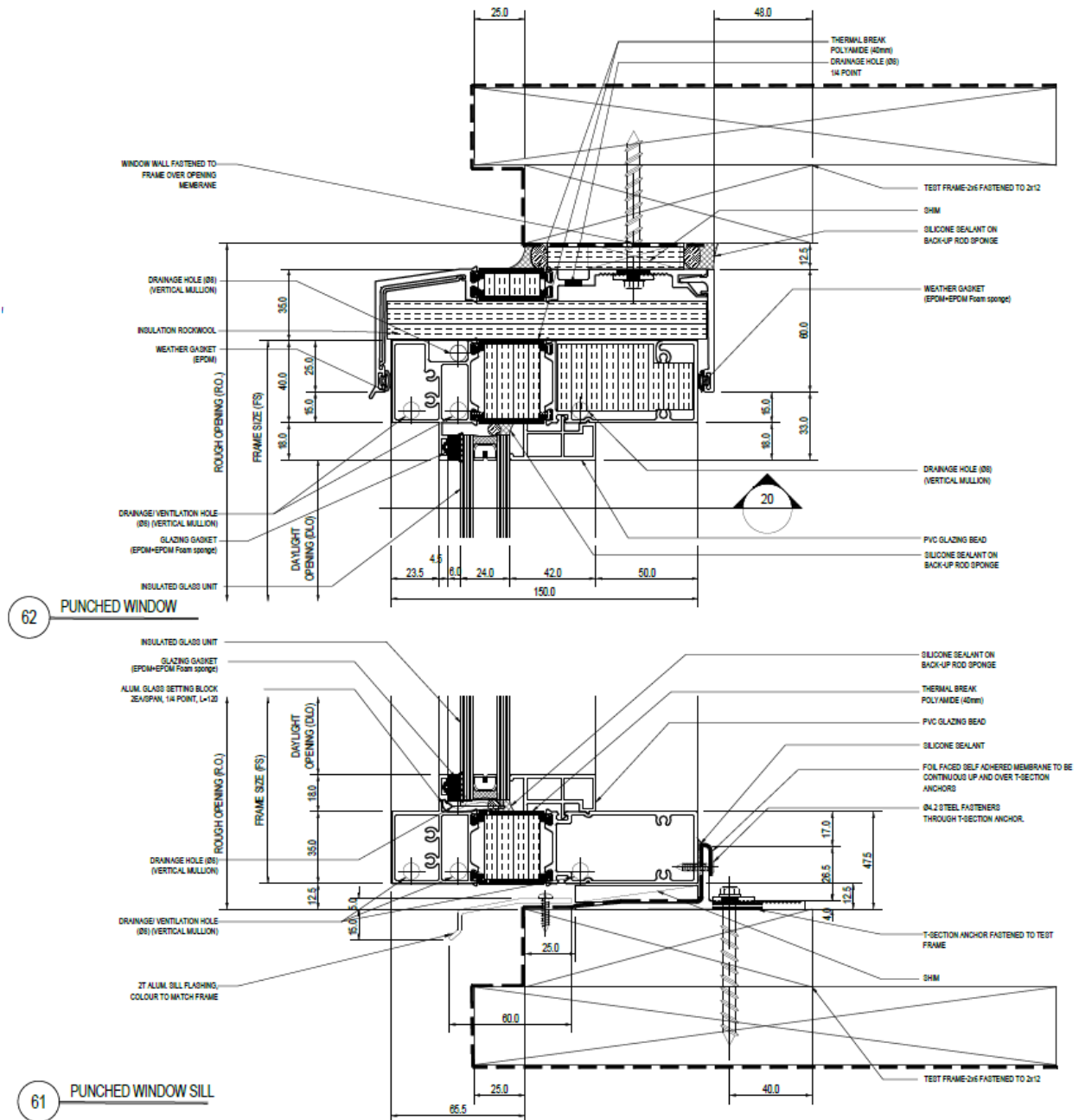


Date: 28-Jul-2020



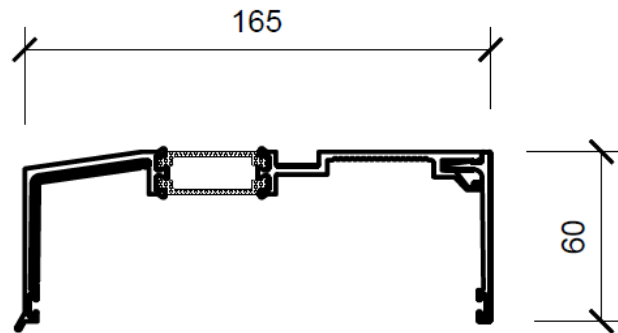
20 PUNCHED WINDOWS

Date: 28-Jul-2020

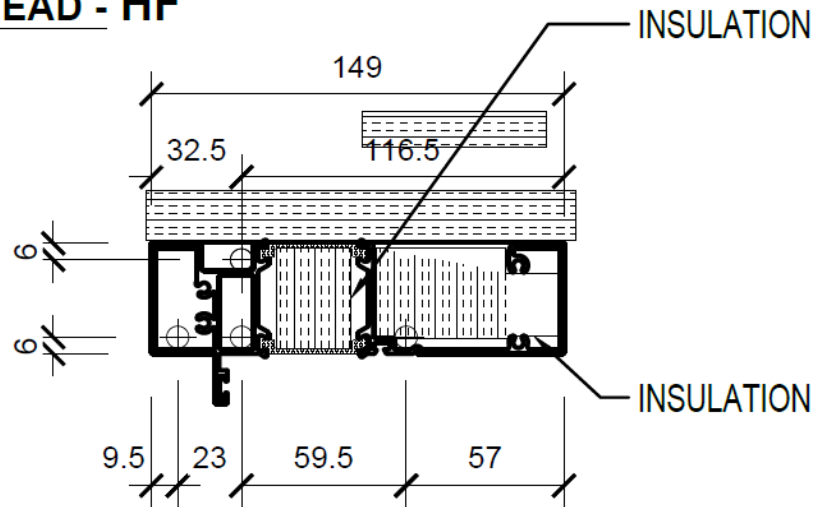


Date: 28-Jul-2020

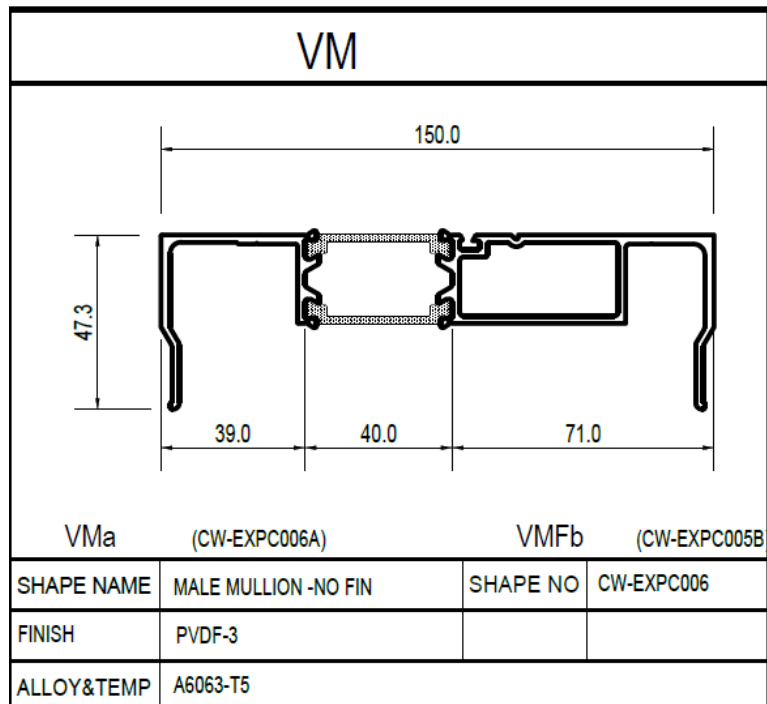
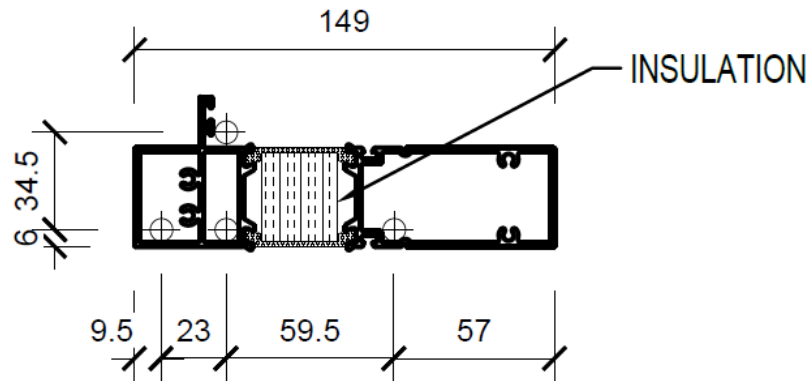
DEFLECTION HEAD - DF



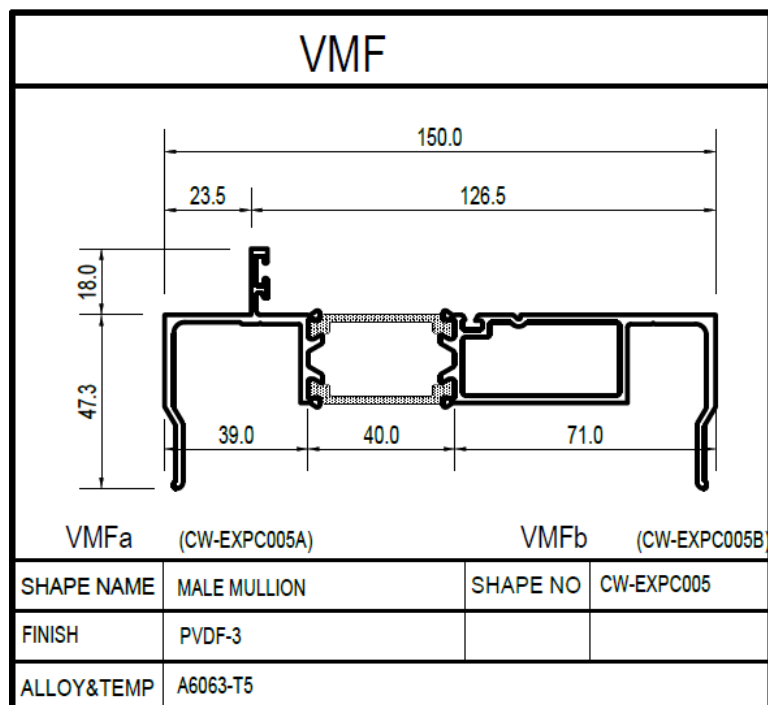
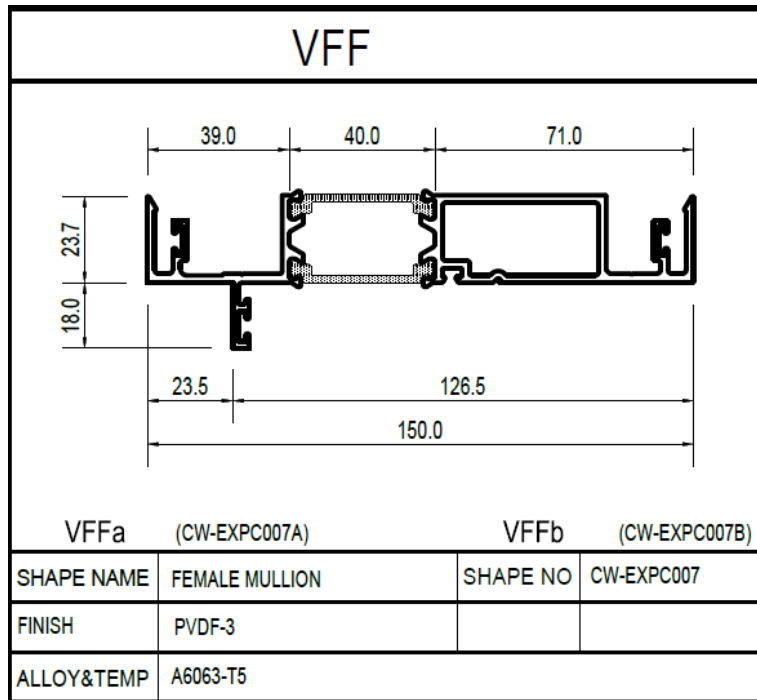
HEAD - HF



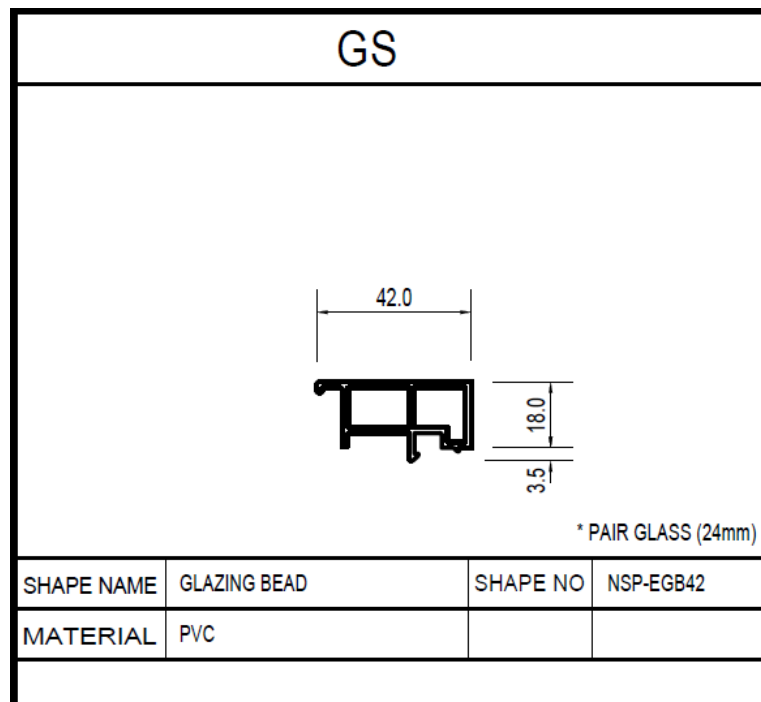
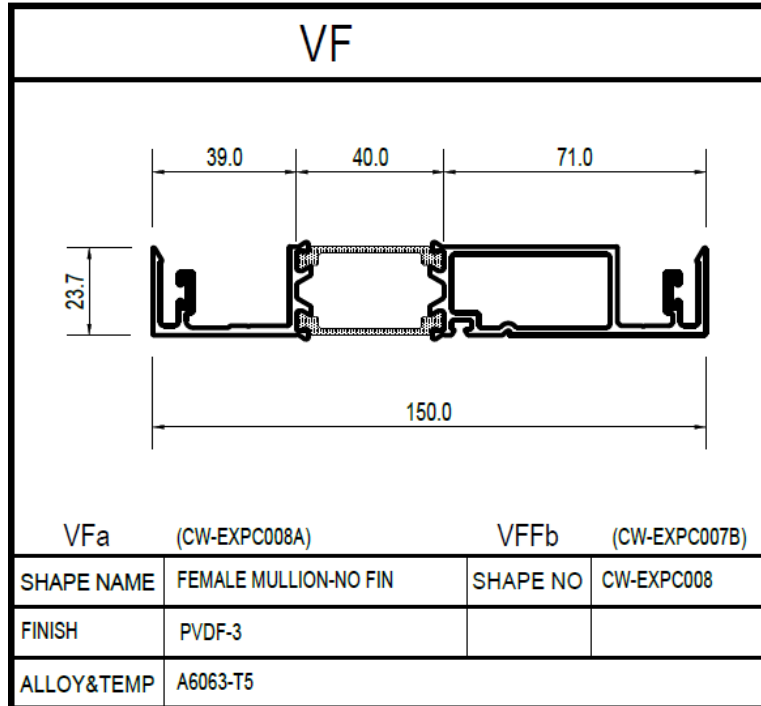
Date: 28-Jul-2020

INTERMEDIATE HORIZONTAL - IHF

Date: 28-Jul-2020



Date: 28-Jul-2020



Date: 28-Jul-2020

Enermax 150 Series Fixed Window – Parts List	
Glazing silicone	Dow Corning - CWS
Glazing gasket	Hankook – CHUO-G02

Date: 28-Jul-2020

SECTION 10

APPENDIX B: PHOTOGRAPHS

(5 Pages)

Date: 28-Jul-2020



Enermax 150 Series Fixed Window – Interior & Exterior

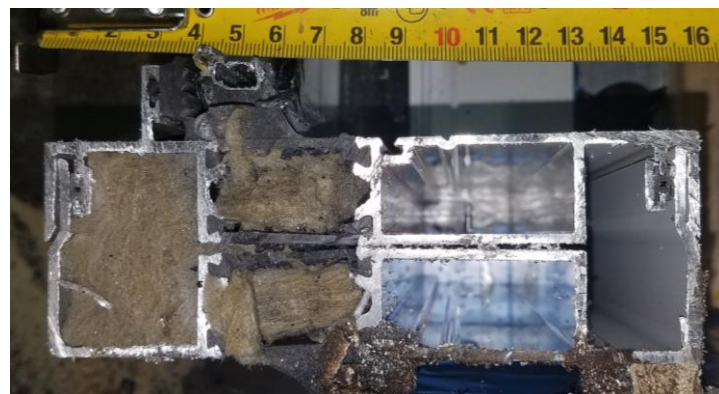
Date: 28-Jul-2020



Sill assembly

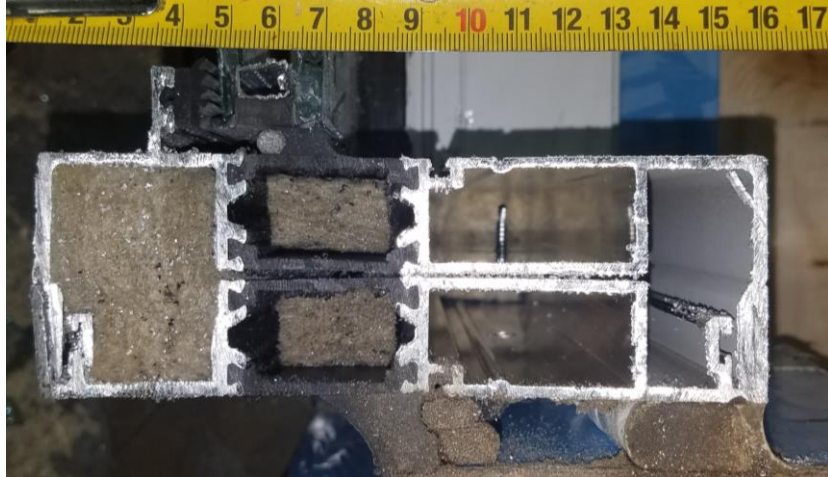


Head assembly



Left jamb assembly

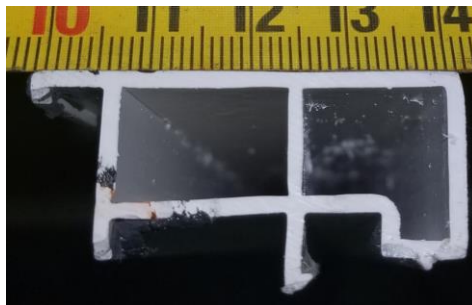
Date: 28-Jul-2020



Right jamb assembly



Frame corner joint



Glazing stop profile

Date: 28-Jul-2020



Glazing gasket and backer rod with silicone



Glazing gasket corner

Date: 28-Jul-2020



Silicone around entire IGU



Setting block

Date: 28-Jul-2020

SECTION 11

APPENDIX C: REVISION TABLE

(1 Page)

Date: 28-Jul-2020

Revision Table				
Date	Section	Description	Technician	Reviewer
28-Jul-2020	---	Original Issue Date	---	---