

SHANDONG SAINTY ALUMINIUM LIMITED THERMAL PERFORMANCE TEST REPORT

SCOPE OF WORK

SERIES 70 THERMALLY-BROKEN ALUMINUM WINDOW

REPORT NUMBER

K5497.01-901-46

TEST DATE

12/15/19

ISSUE DATE

02/12/20

RECORD RETENTION END DATE

12/15/24

PAGES

30

DOCUMENT CONTROL NUMBER

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TEST REPORT FOR SAINTY ALUMINIUM LIMITED

Report No.: K5497.01-901-46

Date: 02/12/20

REPORT ISSUED TO

SAINTY ALUMINIUM LIMITED

No. 322 Yubei Rd, Dongcheng Industry Park,
Linqu , Weifang 262600, China

SECTION 1

SCOPE

SERIES/MODEL: Series 70 Thermally-broken Aluminum Window

TYPE: Dual-Action

Intertek Building & Construction (Intertek B&C) was contracted by Shandong Sainty Aluminium Limited to evaluate the thermal performance per NFRC 102-2017. The purpose of this testing was to evaluate the U-Factor performance. Results obtained are tested values and were secured by using the designated test method. Testing was conducted at Intertek B&C test facility in Kent, Washington. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

SECTION 2

SUMMARY OF TEST RESULTS

Standardized U-factor (Ust): 0.23 Btu/hr-ft²·F (CTS Method)

For INTERTEK B&C:

COMPLETED BY Che Rodriguez

TITLE Technician

SIGNATURE

DATE 02/12/20

CR:ss

REVIEWED BY Brian L. Rasmussen

TITLE Lab Manager, IIRC

SIGNATURE

DATE 02/12/20

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TEST REPORT FOR SAINTY ALUMINIUM LIMITED

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Date: 02/12/20

SECTION 3

TEST SPECIMEN SUMMARY

SERIES/MODEL	Series 70 Thermally-broken Aluminum Window
TYPE	Dual-Action
OVERALL SIZE	47-1/4" x 59" (1200 mm x 1499 mm) (Model Size)
NFRC STANDARD SIZE	47.2" x 59.1" (1200 mm wide x 1500 mm high)
TEST SAMPLE SUBMITTED BY	Shandong Sainty Aluminium Limited - Wei fang City, Shandong Province , China
TEST SAMPLE SUBMITTED FOR	Validation for Recertification (Production Line Unit) & Plant Qualification

SECTION 4

TEST METHOD

The specimens were evaluated in accordance with the following:

NFRC 102-2017, Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems

SECTION 5

MATERIAL SOURCE/INSTALLATION

The test specimen was provided by Shandong Sainty Aluminium Limited - Wei fang City, Shandong Province , China. Representative samples of the test specimen will be retained by Intertek B&C for a minimum of two and half years from the submittal date to the Inspection Agency and no more than five years from the test date.

Test Chamber Installation

The test sample was installed in a vertical orientation, the exterior of the specimen was exposed to the cold side.

SECTION 6

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Che Rodriguez	Intertek B&C

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SECTION 7

TEST SAMPLE DESCRIPTION

Frame

MATERIAL	AT (1"): Aluminum with Thermal Breaks and Foam Filling - All Members		
SIZE	47-1/4" x 59" (Model Size)		
DAYLIGHT OPENING	N/A	GLAZING METHOD	N/A
EXTERIOR COLOR	Black	EXTERIOR FINISH	Paint
INTERIOR COLOR	Black	INTERIOR FINISH	Paint
CORNER JOINERY	Mitered / Corner Keys/Screws / Sealed		

Vent

MATERIAL	AT (1"): Aluminum with Thermal Breaks and Foam Filling - All Members		
SIZE	44-5/8" x 56-5/8"		
DAYLIGHT OPENING	38-1/8" x 50"	GLAZING METHOD	Interior
EXTERIOR COLOR	Black	EXTERIOR FINISH	Paint
INTERIOR COLOR	Black	INTERIOR FINISH	Paint
CORNER JOINERY	Mitered / Corner Key/Screws / Sealed		

Glazing Information

LAYER 1	1/4"	Beijing Wuhuatianbao Glass SDF178 (e=0.052*, #2)	
GAP 1	0.53"	TS-D: Thermo-Plastic with Stainless Steel Substrate Spacer	90% Argon*
LAYER 2	3/16"	Beijing Wuhuatianbao Glass Glass WT1.16 (e=0.064*, #4)	
GAP 2	0.47"	TS-D: Thermo-Plastic with Stainless Steel Substrate Spacer	90% Argon*
LAYER 3	1/4"	Clear	
GAS FILL METHOD	Dual-Probe Method*		

*Stated per Client/Manufacturer

N/A Non-Applicable

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SECTION 7 (CONTINUED)

TEST SAMPLE DESCRIPTION (CONTINUED)

Weatherstripping

DESCRIPTION	QUANTITY	LOCATION
Rubber gasket (EPDM)	2 Rows	Frame full perimeter
Rubber gasket (EPDM)	3 Rows	Vent full perimeter

Hardware

DESCRIPTION	QUANTITY	LOCATION
Lever lock handle	1	Vent - stile approx 30" from the sill
Multi-point lock assembly	6	Vent - rails/stiles
Metal keeper	6	Frame - head/sill/jambs
Hinges	2	Frame/vent - at the corners

Drainage

DRAINAGE METHOD	SIZE	QUANTITY	LOCATION
Weepslot with cover	1-5/16" x 5/16"	2	Frame - sill approx. 3-1/2" from the jambs
Weephole	3/4" x 1/4"	2	Vent - bottom rail - approx. 3-3/4" from the stiles (through two walls)

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SECTION 8

THERMAL TRANSMITTANCE (U-FACTOR): MEASURED TEST DATA

Heat Flows

1. Total Measured Input into Metering Box (Qtotal)	550.29 Btu/hr
2. Surround Panel Heat Flow (Qsp)	200.23 Btu/hr
3. Surround Panel Thickness	4.00 inches
4. Surround Panel Conductance	0.0537 Btu/hr-ft ² -F
5. Metering Box Wall Heat Flow (Qmb)	-2.41 Btu/hr
6. EMF vs Heat Flow Equation (equivalent information)	0.0117*EMF + 0.000
7. Flanking Loss Heat Flow (Qfl)	32.72 Btu/hr
8. Net Specimen Heat Loss (Qs)	319.74 Btu/hr

Areas

1. Test Specimen Projected Area (As)	19.36 ft ²
2. Test Specimen Interior Total (3-D) Surface Area (Ah)	20.13 ft ²
3. Test Specimen Exterior Total (3-D) Surface Area (Ac)	19.54 ft ²
4. Metering Box Opening Area (Amb)	75.11 ft ²
5. Metering Box Baffle Area (Ab1)	69.33 ft ²
6. Surround Panel Interior Exposed Area (Asp)	55.75 ft ²

Test Conditions

1. Average Metering Room Air Temperature (th)	69.80 F
2. Average Cold Side Air Temperature (tc)	-0.43 F
3. Average Guard/Environmental Air Temperature	70.70 F
4. Metering Room Average Relative Humidity	0.27 %
5. Metering Room Maximum Relative Humidity	0.27 %
6. Metering Room Minimum Relative Humidity	0.27 %
7. Measured Cold Side Wind Velocity (Perpendicular Flow)	3.30 mph
8. Measured Warm Side Wind Velocity (Parallel Flow)	0.36 mph
9. Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04" H ₂ O

Average Surface Temperatures

1. Metering Room Surround Panel	67.99 F
2. Cold Side Surround Panel	1.10 F

Results

1. Thermal Transmittance of Test Specimen (Us)	0.24 Btu/hr-ft ² -F
2. Standardized Thermal Transmittance of Test Specimen (Ust)	0.23 Btu/hr-ft ² -F

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SECTION 9

THERMAL TRANSMITTANCE (U-FACTOR): CALCULATED TEST DATA

CTS Method Results

1. Warm Side Emittance of Glass (e1)	0.84
2. Cold Side Emittance of Glass	0.84
3. Warm Side Frame Emittance*	0.90
4. Cold Side Frame Emittance*	0.90
5. Warm Side Sash/Panel/Vent Emittance*	0.90
6. Cold Side Sash/Panel/Vent Emittance*	0.90
7. Warm Side Baffle Emittance (eb1)	0.92
8. Cold Side Baffle Emittance (eb2)	0.92
9. Equivalent Warm Side Surface Temperature (t1)	57.15 F
10. Equivalent Cold Side Surface Temperature (t2)	2.46 F
11. Warm Side Baffle Surface Temperature	69.50 F
12. Cold Side Baffle Surface Temperature	0.65 F
13. Measured Warm Side Surface Conductance (hh)	1.31 Btu/hr-ft ² -F
14. Measured Cold Side Surface Conductance (hc)	5.72 Btu/hr-ft ² -F
15. Test Specimen Thermal Conductance (Cs)	0.30 Btu/hr-ft ² -F
16. Convection Coefficient (Kc)	0.29 Btu/(hr-ft ² -F ^{1.25})
17. Radiative Test Specimen Heat Flow (Qr1)	183.36 Btu/hr
18. Conductive Test Specimen Heat Flow (Qc1)	136.38 Btu/hr
19. Radiative Heat Flux of Test Specimen (qr1)	9.47 Btu/hr-ft ² -F
20. Convective Heat Flux of Test Specimen (qc1)	7.04 Btu/hr-ft ² -F
21. Standardized Warm Side Surface Conductance (hsth)	1.20 Btu/hr-ft ² -F
22. Standardized Cold Side Surface Conductance (hstc)	5.28 Btu/hr-ft ² -F
23. Standardized Thermal Transmittance (Ust)	0.23 Btu/hr-ft ² -F

*Stated per NFRC 101

SECTION 10

TEST DURATION

1. The environmental systems were started at 19:48 hours, 12/14/19.
2. The test parameters were considered stable for two consecutive four hour test periods from 00:03 hours, 12/15/19 to 08:03 hours, 12/15/19.
3. The thermal performance test results were derived from 04:03 hours, 12/15/19 to 08:03 hours, 12/15/19.

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**SECTION 11
GLAZING DEFLECTION**

	Gap 1	Gap 2
EDGE GAP WIDTH	0.53"	0.47"
ESTIMATED CENTER GAP WIDTH upon receipt of specimen in laboratory (after stabilization)	0.50"	0.45"
CENTER GAP WIDTH at laboratory ambient conditions on day of testing	0.50"	0.45"
CENTER GAP WIDTH at test conditions	0.32"	0.33"

Glass collapse determined using a digital glass and air space meter

The sample was inspected for the formation of frost or condensation, which may influence the surface temperature measurements. The sample showed no evidence of condensation/frost at the conclusion of the test.

“This test method does not include procedures to determine the heat flow due to either air movement through the specimen or solar radiation effects. As a consequence, the thermal transmittance results obtained do not reflect performances which are expected from field installations due to not accounting for solar radiation, air leakage effects, and the thermal bridge effects that have the potential to occur due to the specific design and construction of the fenestration system opening. The latter can only be determined by in-situ measurements. Therefore, it is important to recognize that the thermal transmittance results obtained from this test method are for ideal laboratory conditions and should only be used for fenestration product comparisons and as input to thermal performance analyses which also include solar, air leakage and thermal bridge effects.”

Required annual calibrations for the Intertek B&C, 'thermal test chamber' (ICN 63449) in Kent, Washington were last conducted in January 2019 in accordance with Intertek B&C calibration procedure. A CTS Calibration verification was performed May 2019. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed June 2019.

The reported Standardized Thermal Transmittance (Ust) was determined using CTS Method, per Section 9.2(A) of NFRC 102.

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SECTION 12

CTS CALIBRATION DATA

1. CTS Test Date	05/15/19
2. CTS Size	19.38 ft ²
3. CTS Glass/Core Conductance	0.40 Btu/hr·ft ² ·F
4. Warm Side Air Temperature	69.80 F
5. Cold Side Air Temperature	-0.40 F
6. Warm Side Average Surface Temperature	54.38 F
7. Cold Side Average Surface Temperature	3.17 F
8. Convection Coefficient (Kc)	0.29 Btu/(hr·ft ² ·F ^{1.25})
9. Measured Cold Side Surface Conductance (hc)	5.72 Btu/hr·ft ² ·F
10. Measured Thermal Transmittance	0.30 Btu/hr·ft ² ·F

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 6.69%.

"Ratings included in this report are for submittal to an NFRC licensed IA for certification purposes and are not meant to be used for labeling purposes. Only those options identified on a valid Certificate of Authorization (CA) are to be used for labeling purposes."

The direction of heat transfer was from the interior (warm side) to the exterior (cold side) of the specimen. The ratings were rounded in accordance to NFRC 601, NFRC Unit and Measurement Policy. The data acquisition frequency is 5 minutes.

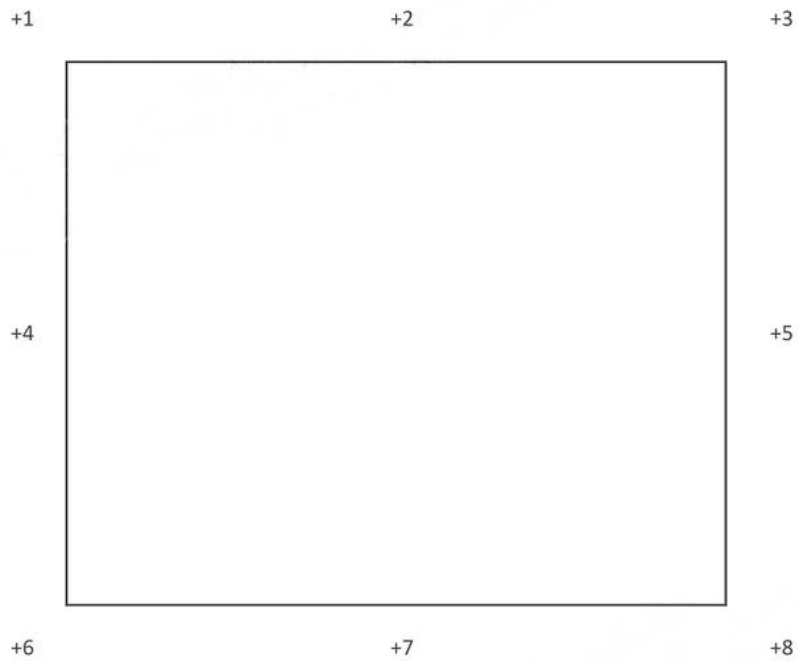
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Date: 02/12/20

SECTION 13

SURROUND PANEL WIRING DIAGRAM

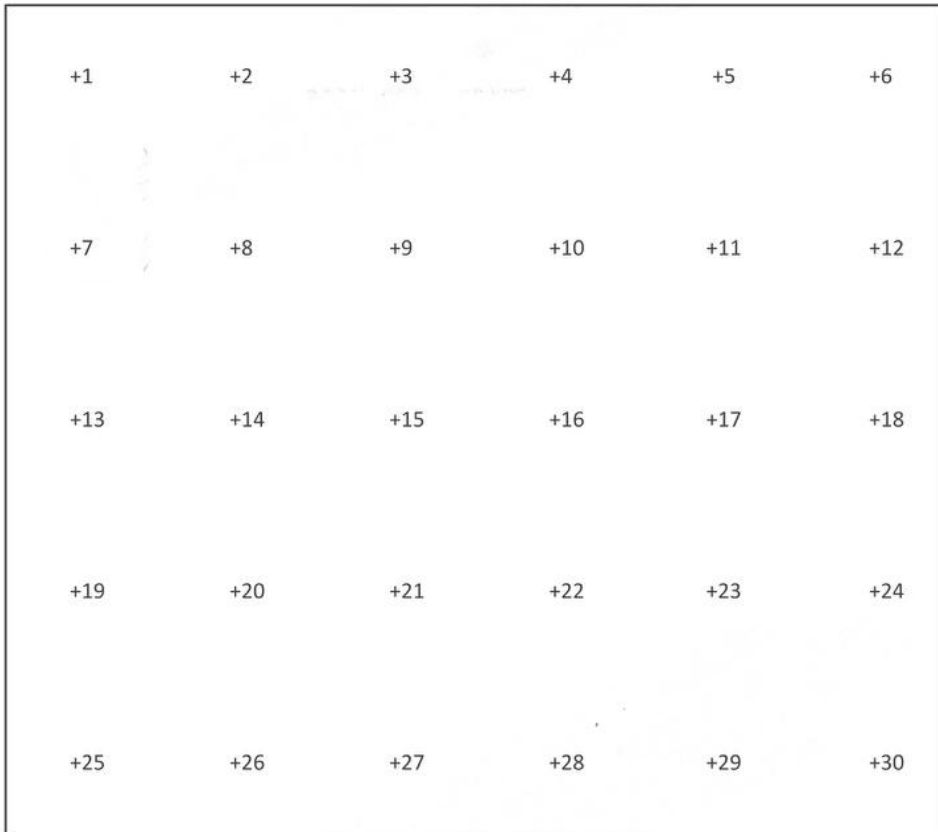


TEST REPORT FOR SAINTY ALUMINIUM LIMITED

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Date: 02/12/20

SECTION 14
BAFFLE WIRING DIAGRAM





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SECTION 15

SUBMITTAL FORM AND DRAWINGS

The test specimen drawings which follow have been reviewed by Intertek B&C and are representative of the test specimen(s) reported herein. Test specimen construction was verified by Intertek B&C per the drawings included in this report. Any deviations are documented herein or on the drawings.

NFRC PRODUCT CERTIFICATION PROGRAM
Submission Form for Test Samples



For use by Manufacturers, Lineal Suppliers and Fabricators

1. Information on Production of the Test Sample (complete **ALL** fields):

Manufacturer: Shandong Sainty Aluminium Limited Date of sample manufacture: September 19, 2019
Plant Address where manufactured: No. 322 Yubei Rd, Dongcheng Industry Park, Linqu , Weifang 262600, China
City: _____ State: _____ Zip Code: _____
Name of IA: NAMI Phone: 804.684.5124 Fax: 804.684.5122

2. Product Information (complete **APPLICABLE** fields):

Existing Product Line ID (CPD) No.: DRN 3104 Product/Operator Type (Table 4-3 of NFRC 100): Tilt-Turn
Series/Model: Series 70 Thermally-broken Aluminum Window

3. Test sample is being submitted for (select **ONE**):

- a. Validation for Initial Certification (prototype only) no plant qualification
- b. Validation for Initial Certification or Recertification (production line unit) & plant qualification
- c. Plant Qualification Only (production line unit)
- d. Test Only Alternative (production line unit) & plant qualification

I, YILIN WU, as the designated agent for Shandong Doorwin Construction Co. Ltd do hereby attest that the foregoing information is true to the best of my information, knowledge, and belief. Further, if the unit is identified in Section 3 as a production line unit, I hereby authorize the NFRC-accredited testing laboratory to send a copy of the test report to the IA identified above for plant qualification purposes pursuant to the NFRC Product Certification Program.

Signature: Yilin Wu Digitally signed by Yilin Wu, DN: cn=Yilin Wu, email=yilinwu@doorwin.com.cn, c=CN Date: January 12, 2020

For Laboratory Use Only

1. Laboratory: Intertek, Kent WA
2. Date Sample Received: 11/22/19 Test Report #: K5497
3. Date Sample Tested: 12/15/19 By: Ché Rodriguez
4. Modifications made: _____

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Report #: K5497.01
Date: 02/05/2020
Verified by: *Cher Rodriguez*

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NO.	REVISION	DATE	BY	DESCRIPTION

1500
[4'-11 1/16"]



Diagram		Note	
Diagram	Descriptions	Diagram	Descriptions
	W101 WINDOW PANE		W101 WINDOW PANE
	W102 WINDOW FRAME		W102 WINDOW FRAME
	W103 WINDOW HANDLE		W103 WINDOW HANDLE
	W104 WINDOW SEAL		W104 WINDOW SEAL
	W105 WINDOW SILL		W105 WINDOW SILL
	W106 WINDOW LINTEL		W106 WINDOW LINTEL
	W107 WINDOW JAMB		W107 WINDOW JAMB
	W108 WINDOW STOP		W108 WINDOW STOP
	W109 WINDOW WEATHERSTRIPPING		W109 WINDOW WEATHERSTRIPPING
	W110 WINDOW DRAINAGE CHANNEL		W110 WINDOW DRAINAGE CHANNEL
	W111 WINDOW ANCHOR BOLT		W111 WINDOW ANCHOR BOLT
	W112 WINDOW FASTENER		W112 WINDOW FASTENER
	W113 WINDOW GASKET		W113 WINDOW GASKET
	W114 WINDOW SPACER		W114 WINDOW SPACER
	W115 WINDOW REINFORCEMENT		W115 WINDOW REINFORCEMENT
	W116 WINDOW INSULATION		W116 WINDOW INSULATION
	W117 WINDOW TRIM		W117 WINDOW TRIM
	W118 WINDOW HARDWARE		W118 WINDOW HARDWARE
	W119 WINDOW ACCESSORIES		W119 WINDOW ACCESSORIES
	W120 WINDOW COMPONENTS		W120 WINDOW COMPONENTS

CLIENT:

DRAWING TITLE:
Shop Drawing

PROJECT:
As Per Drawing

DESIGNER:
Sung-Hyun Vincent Hsu

CHECKER:
Cher Rodriguez

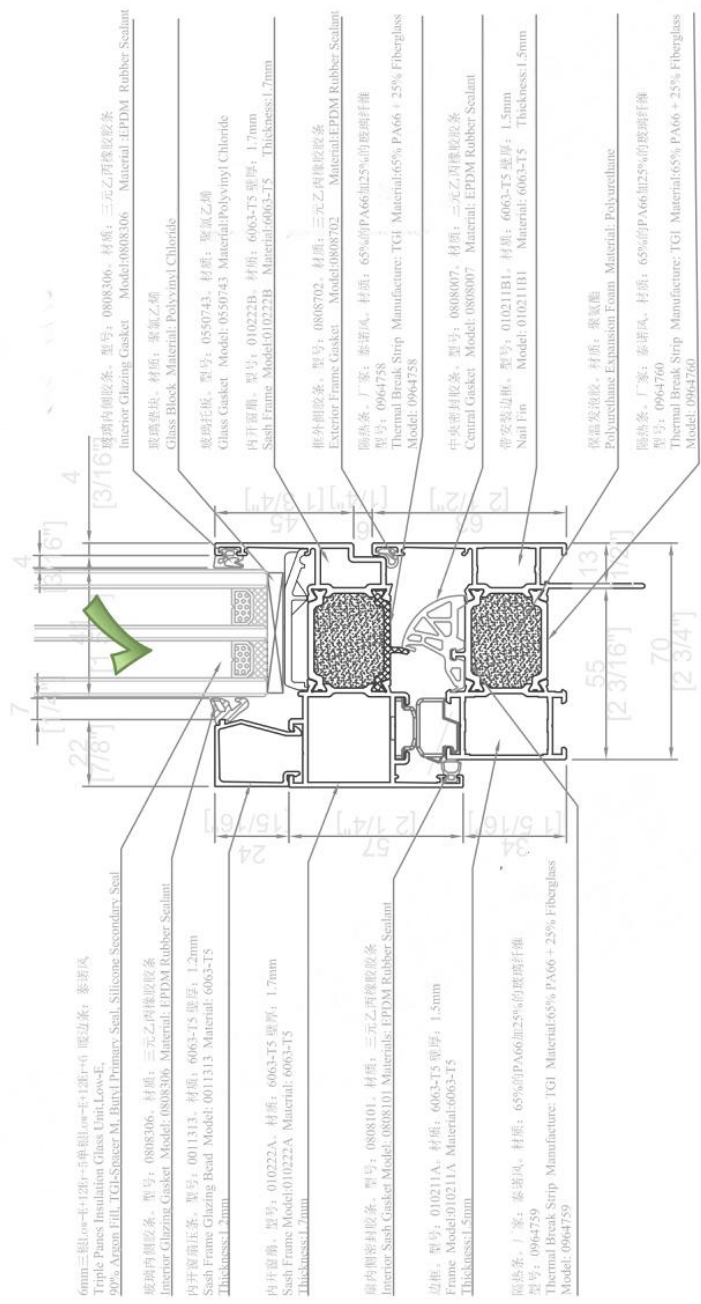
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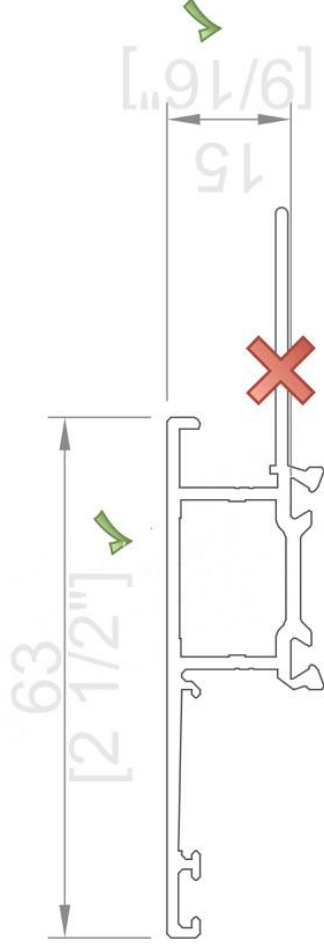
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Shop Drawing

Part #1

6063-T5 铝型材

6063-T5 Extruded Aluminum Profiles

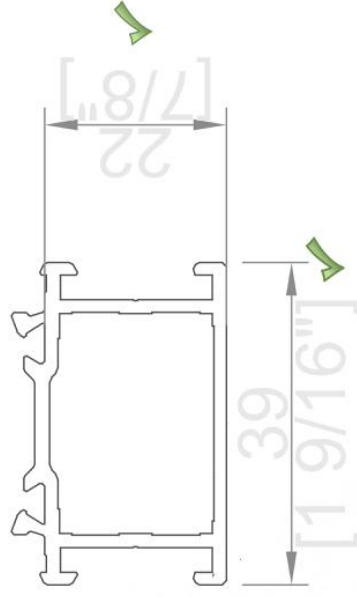
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Part #2

6063-T5 铝型材

6063-T5 Extruded Aluminum Profiles

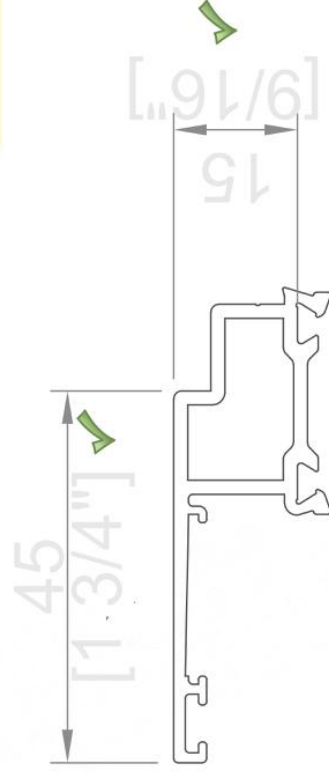


Part #3

6063-T5 铝型材

6063-T5 Extruded Aluminum Profiles

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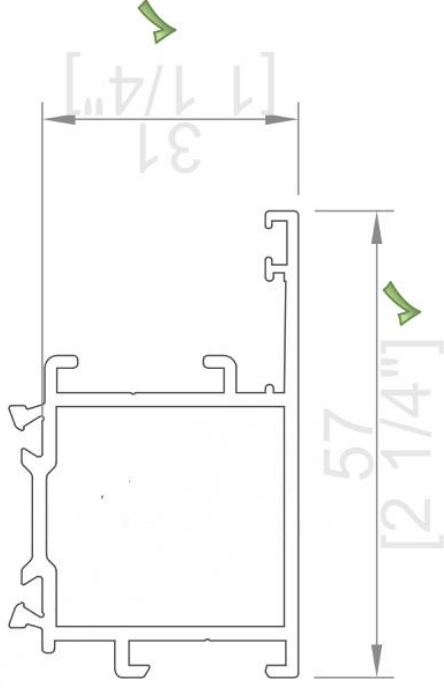
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6063-T5 铝型材

6063-T5 Extruded Aluminum Profiles

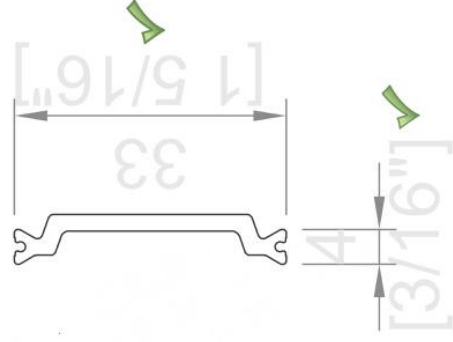
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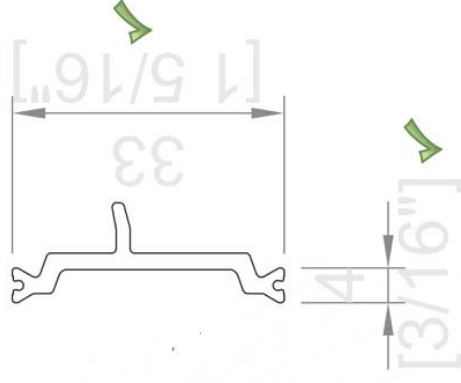
Part #6

65%的PA66加25%的玻璃纤维
65% PA66 + 25% Fiberglass



Part #7

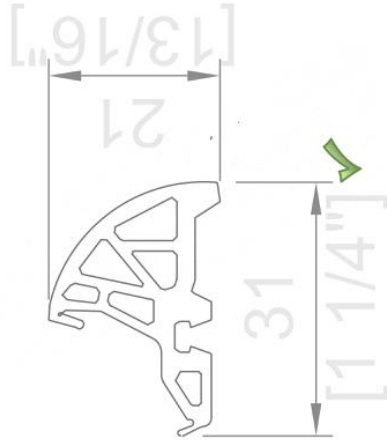
65%的PA66加25%的玻璃纤维
65% PA66 + 25% Fiberglass



Part #8

intertek <small>Total Quality Assurance</small>	Report #:	K5497.01
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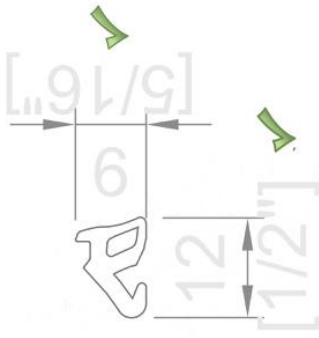
三元乙丙橡胶胶条 EPDM Rubber Sealant



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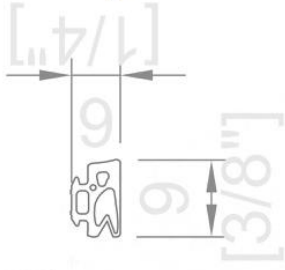
Part #9



三元乙丙橡胶胶条 EPDM Rubber Sealant



Part #10



三元乙丙橡胶胶条

EPDM Rubber Sealant



Part #11



7

6

[1/4"]

三元乙丙橡胶胶条

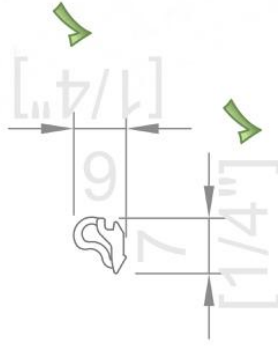


EPDM Rubber Sealant

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Part #12

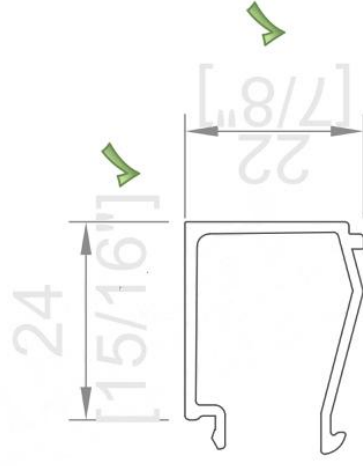


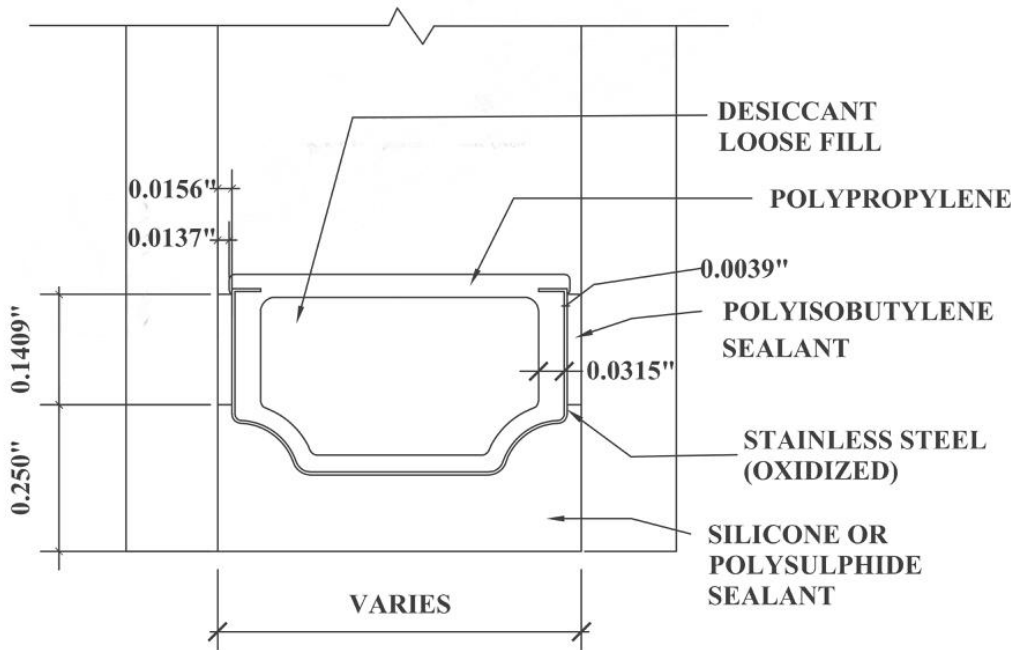
三元乙丙橡胶胶条
EPDM Rubber Sealant

Part #5

6063-T5 铝型材

6063-T5 Extruded Aluminum Profiles





DETAIL FOR THERMAL MODELING OF
TECHNOFORM TGI SPACER - M (TS-D)



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TEST REPORT FOR SAINTY ALUMINIUM LIMITED

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**SECTION 16
REVISION LOG**

REVISION #	DATE	PAGES	REVISION
.01 R0	02/12/20	N/A	Original Report Issue