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SHANDONG SAINTY ALUMINIUM LIMITED

THERMAL PERFORMANCE TEST REPORT

SCOPE OF WORK
SERIES 70 THERMALLY-BROKEN ALUMINUM WINDOW

REPORT NUMBER
K5497.01-901-46

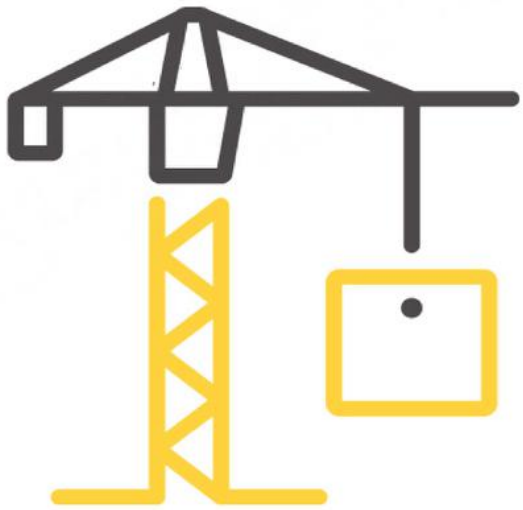
TEST DATE
12/15/19

ISSUE DATE
02/12/20

RECORD RETENTION END DATE
12/15/24

PAGES
30

DOCUMENT CONTROL NUMBER
RTTDS-R-AMER-Test-2822(a) (05/23/19)



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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·ft^2·F (CTS Method)

For INTERTEK B&C:

COMPLETED BY	Che Rodriguez	**REVIEWED BY**	Brian L. Rasmussen
TITLE	Technician	**TITLE**	Lab Manager, IIRC
SIGNATURE	Che Rodriguez	**SIGNATURE**	
DATE	02/12/20	**DATE**	02/12/20

CR:ss

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Report No.: K5497.01-901-46
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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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TEST REPORT FOR SAINTY ALUMINIUM LIMITED
Report No.: K5497.01-901-46
Date: 02/12/20

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_2O

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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TEST REPORT FOR SAINTY ALUMINIUM LIMITED
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Date: 02/12/20

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 $Btu/hr \cdot ft^2 \cdot F$
14.	Measured Cold Side Surface Conductance (hc)	5.72 $Btu/hr \cdot ft^2 \cdot F$
15.	Test Specimen Thermal Conductance (Cs)	0.30 $Btu/hr \cdot ft^2 \cdot F$
16.	Convection Coefficient (Kc)	0.29 $Btu/(hr \cdot ft^2 \cdot F^{1.25})$
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 $Btu/hr \cdot ft^2 \cdot F$
20.	Convective Heat Flux of Test Specimen (qc1)	7.04 $Btu/hr \cdot ft^2 \cdot F$
21.	Standardized Warm Side Surface Conductance (hsth)	1.20 $Btu/hr \cdot ft^2 \cdot F$
22.	Standardized Cold Side Surface Conductance (hstc)	5.28 $Btu/hr \cdot ft^2 \cdot F$
23.	Standardized Thermal Transmittance (Ust)	0.23 $Btu/hr \cdot ft^2 \cdot F$

**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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TEST REPORT FOR SAINTY ALUMINIUM LIMITED
Report No.: K5497.01-901-46
Date: 02/12/20

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	$Btu/hr \cdot ft^2 \cdot F$
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	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
9.	Measured Cold Side Surface Conductance (hc)	5.72	$Btu/hr \cdot ft^2 \cdot F$
10.	Measured Thermal Transmittance	0.30	$Btu/hr \cdot ft^2 \cdot F$

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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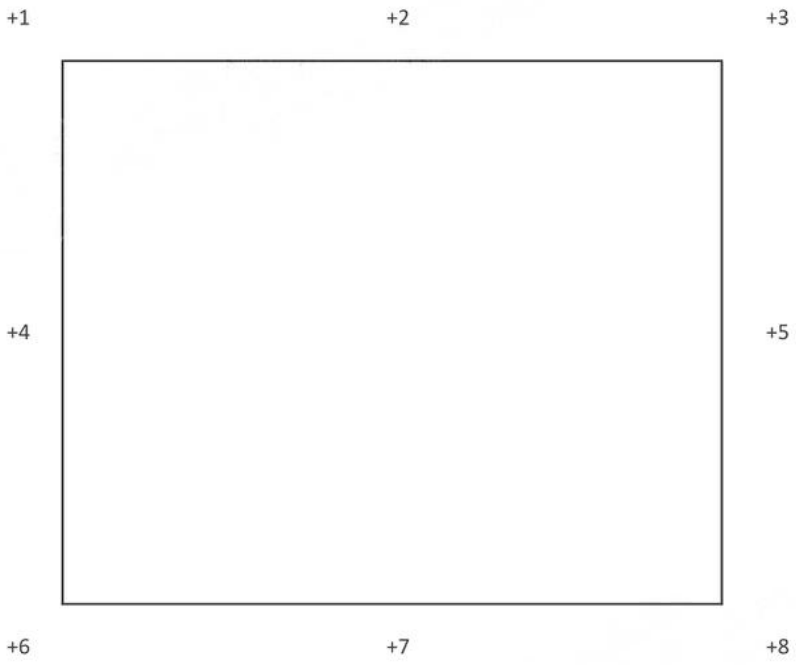
SECTION 13
SURROUND PANEL WIRING DIAGRAM



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SECTION 14
BAFFLE WIRING DIAGRAM

+1	+2	+3	+4	+5	+6
+7	+8	+9	+10	+11	+12
+13	+14	+15	+16	+17	+18
+19	+20	+21	+22	+23	+24
+25	+26	+27	+28	+29	+30

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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

Submittal Form for Test Samples

For use by Manufacturers, Lineal Suppliers and Fabricators

National Fenestration Rating Council®

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 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: Che Rodriguez
4. Modifications made: ~

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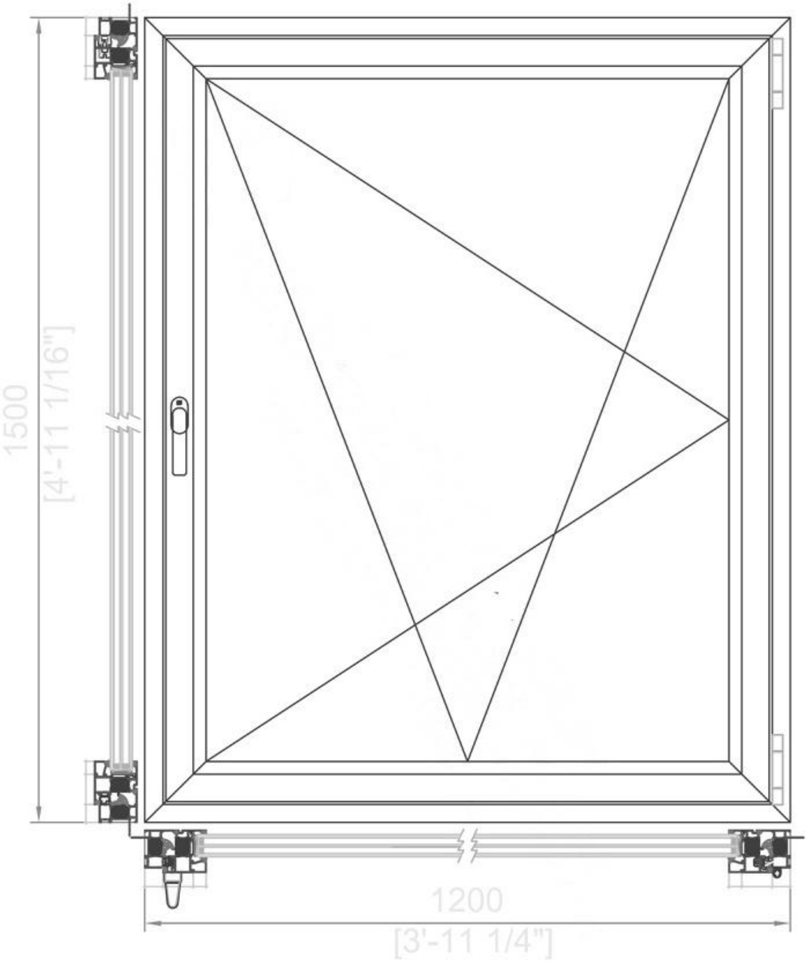
Report #: K5497.01
Date: 02/05/2020
Verified by:

Company Name: Sainty Group

Series/Model: Thermally Broken Aluminum Tilt Turn Window

Part #	Part Description	Material	Finish
Part #1	-	Aluminum	Anodized and Painted
Part #2	-	Aluminum	Anodized and Painted
Part #3	-	Aluminum	Anodized and Painted
Part #4	-	Aluminum	Anodized and Painted
Part #5	-	Aluminum	Anodized and Painted
Part #6	-	Polyamide	-
Part #7	-	Polyamide	-
Part #8	-	EPDM	-
Part #9	-	EPDM	-
Part #10	-	EPDM	-
Part #11	-	EPDM	-
Part #12	-	EPDM	-
Part #13	-	Aluminum	Anodized and Painted



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Report #:	K5497.01
Date:	02/05/2020
Verified by:	[signature]

Note		
Diagram	Name	Descriptions
	Frame	6063-T5 Extruded Aluminum Profiles
	Frame	6063-T5 Extruded Aluminum Profiles
	Sash Frame	6063-T5 Extruded Aluminum Profiles
	Sash Frame	6063-T5 Extruded Aluminum Profiles
	Glazing Bead	6063-T5 Extruded Aluminum Profiles
	Glass Unit	[illegible]
	[illegible] Nylon	65% PA66 + 25% Fiberglass
	[illegible] Nylon	65% PA66 + 25% Fiberglass
	[illegible] Nylon	65% PA66 + 25% Fiberglass
	Sash Corner Connector	Extruded Aluminum Corner Connector
	Sash Corner Connector	Extruded Aluminum Corner Connector
	Frame Corner Connector	Extruded Aluminum Corner Connector
	Frame Corner Connector	Extruded Aluminum Corner Connector
	Frame Corner Connection Steel Piece	Stainless Steel
	Sash Corner Connection Steel Piece	Stainless Steel

Note		
Diagram	Name	Descriptions
	German [illegible] Handle	Aluminum Handle From German Brand [illegible]
	Hinge	Hardware Zinc Alloy
	Actuator	Hardware Zinc Alloy
	Latch Segment	Hardware Zinc Alloy
	Center Corner Gasket	EPDM Rubber Sealant
	Center Gasket	EPDM Rubber Sealant
	Interior Glazing Gasket	EPDM Rubber Sealant
	External Glazing Gasket	EPDM Rubber Sealant
	Interior Sash Gasket	EPDM Rubber Sealant
	Exterior Frame Gasket	EPDM Rubber Sealant
	[illegible] Cover	Polyvinyl Chloride
	Glass Block	Polyvinyl Chloride
	Glass Gasket	Polyvinyl Chloride
	[illegible] Cover	Polypropylene

DOORWIN GROUP

1. THIS DRAWING IS PROPERTY AND COPYRIGHT OF [illegible] SHALL NOT BE COPIED OR USED IN ANY WAY WITHOUT THEIR EXPRESS WRITTEN PERMISSION.

2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE OTHER RELEVANT ARCHITECTURAL, STRUCTURAL AND OTHER CONSULTANTS DRAWINGS. IT SHALL BE DEEMED THE RESPONSIBILITY OF THE CONTRACTOR/FABRICATOR TO BRING TO THE NOTICE OF THE ARCHITECTS, PRIOR TO ANY CONSTRUCTION OR FABRICATION ANY DISCREPANCY WITHIN OR BETWEEN THE AFOREMENTIONED DRAWINGS.

	DATE	REVISION	PURPOSE

DISTRIBUTION OF PRINTS

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North America Europe Australia Standards Wood & Aluminum Windows and Doors

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doorwingroup.en.alibaba.com
doorwin.en.made-in-china.com

Project Consultant: Vincent
Whatsapp/M: +86-186 000 26127
E: vincent@doorwingroup.com

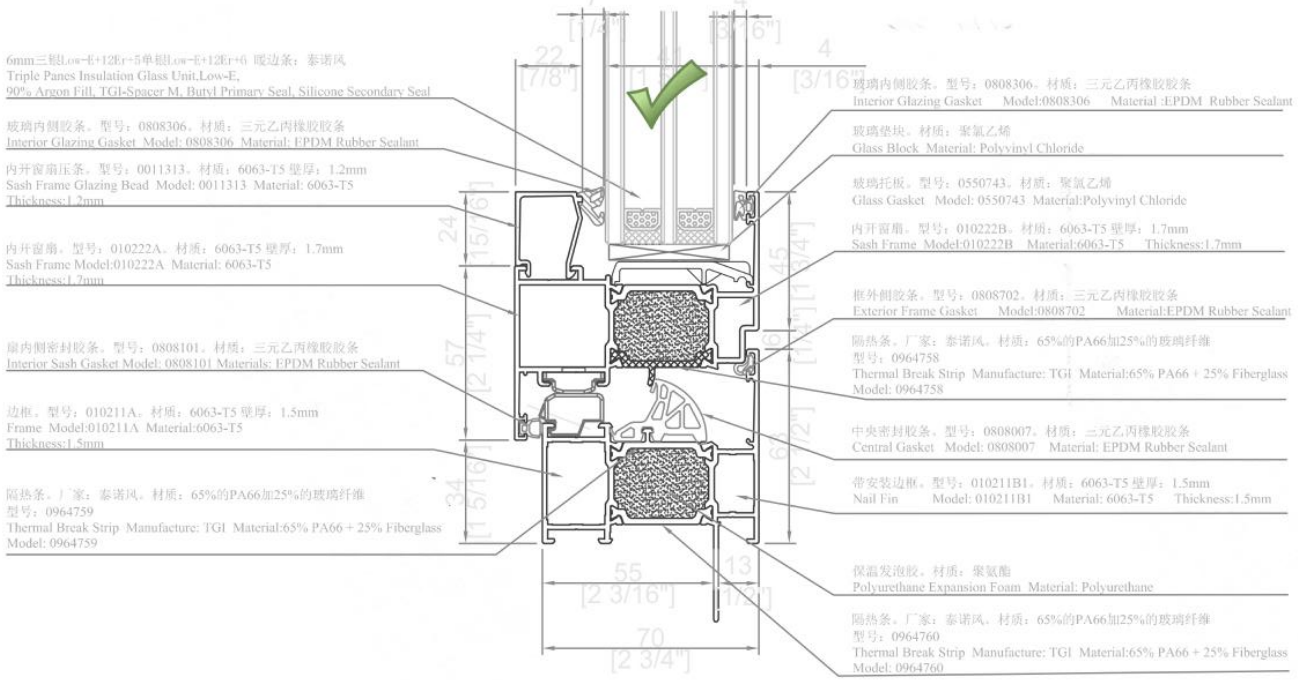
CLIENT :

DRAWING TITLE :

Shop Drawing

SCALE: As Per Drawing	
DRAWN BY: Sandy You	CHECKED BY: Vincent Hui
SCALE:	DATE: [illegible]
DWG NO: DW-20190122	REVISION: 0

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



NO.	DATE	DESIGN	PURPOSE
1			
2			
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DISTRIBUTION OR PRINTS

CLIENT :

DRAWING TITLE :
Shop Drawing

SCALE:
As Per Drawing

DRAWN BY:	CHECKED BY:
Sandy You	Vincent Hsu
SCALE:	DATE: 22nd February,2020
DWG. NO. DW-20190122	REVISION: 0

Part #1

6063-T5 铝型材
6063-T5 Extruded Aluminum Profiles

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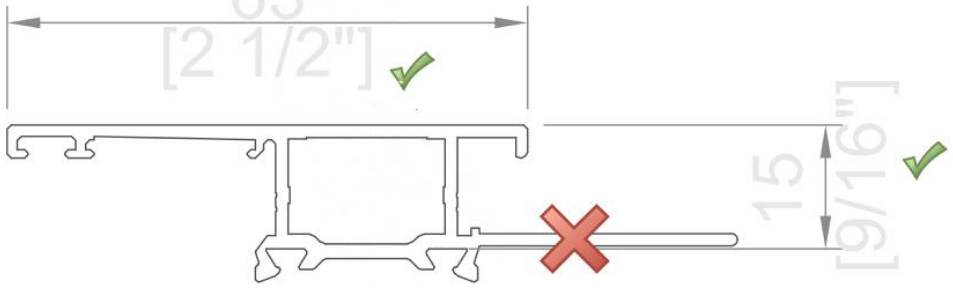

Part #2

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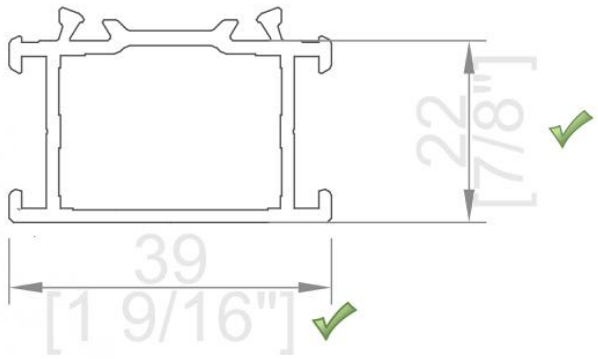
Report #: K5497.01
Date: 02/05/2020
Verified by:

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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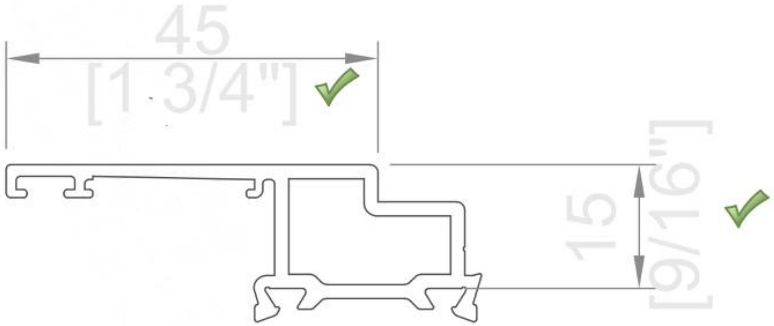

Part #4

6063-T5 铝型材
6063-T5 Extruded Aluminum Profiles

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Report #:	K5497.01
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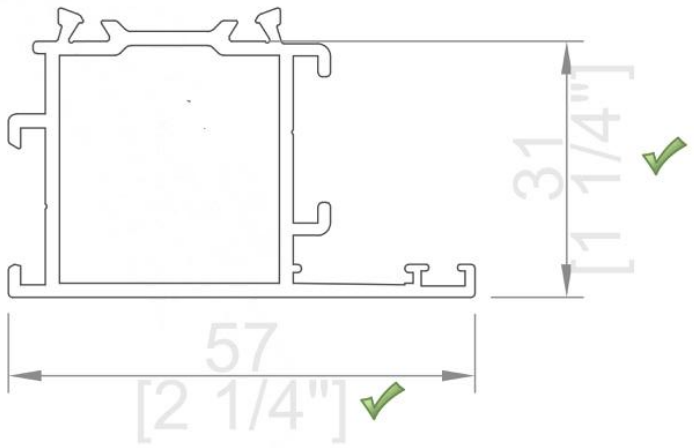
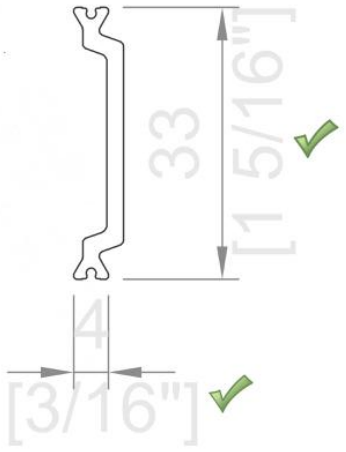


Part #6

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

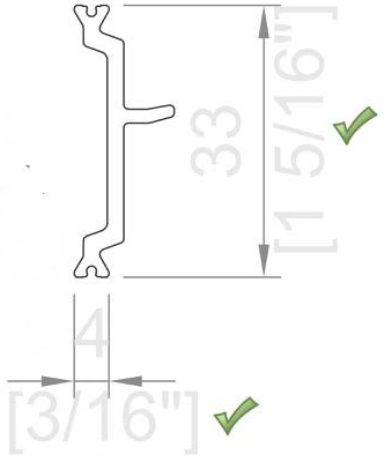


intertek
Total Quality. Assured.

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

Part #7

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



intertek
Total Quality. Assured.

Report #:	K5497.01
Date:	02/05/2020
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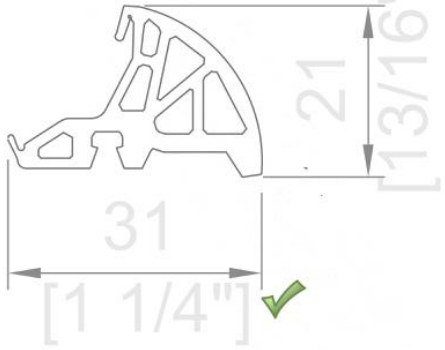
Part #8

intertek
Total Quality. Assured.

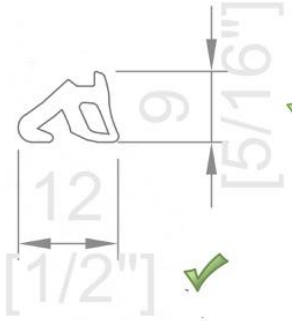
Report #: K5497.01
Date: 02/05/2020
Verified by:

三元乙丙橡胶胶条
EPDM Rubber Sealant



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

Part #9



三元乙丙橡胶胶条
EPDM Rubber Sealant

Report #:	K5497.01
Date:	02/05/2020
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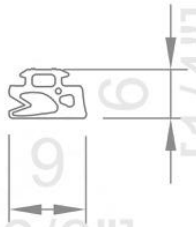
Part #10

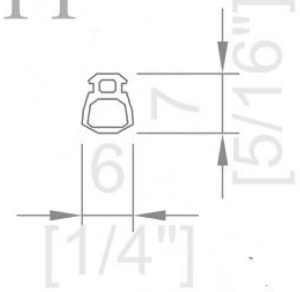


三元乙丙橡胶胶条

EPDM Rubber Sealant

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

Part #11

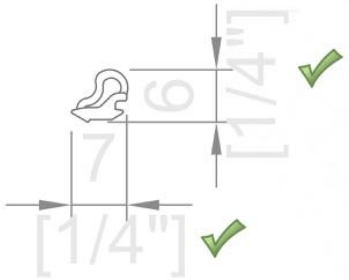


三元乙丙橡胶胶条

EPDM Rubber Sealant

intertek "Total Quality. Assured."	Report #:	K5497.01
	Date:	02/05/2020
	Verified by:	

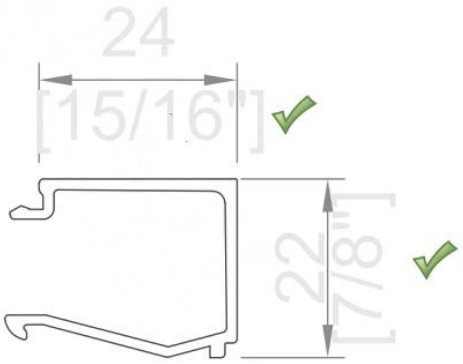
Part #12



三元乙丙橡胶胶条
EPDM Rubber Sealant

Part #5

6063-T5 铝型材
6063-T5 Extruded Aluminum Profiles



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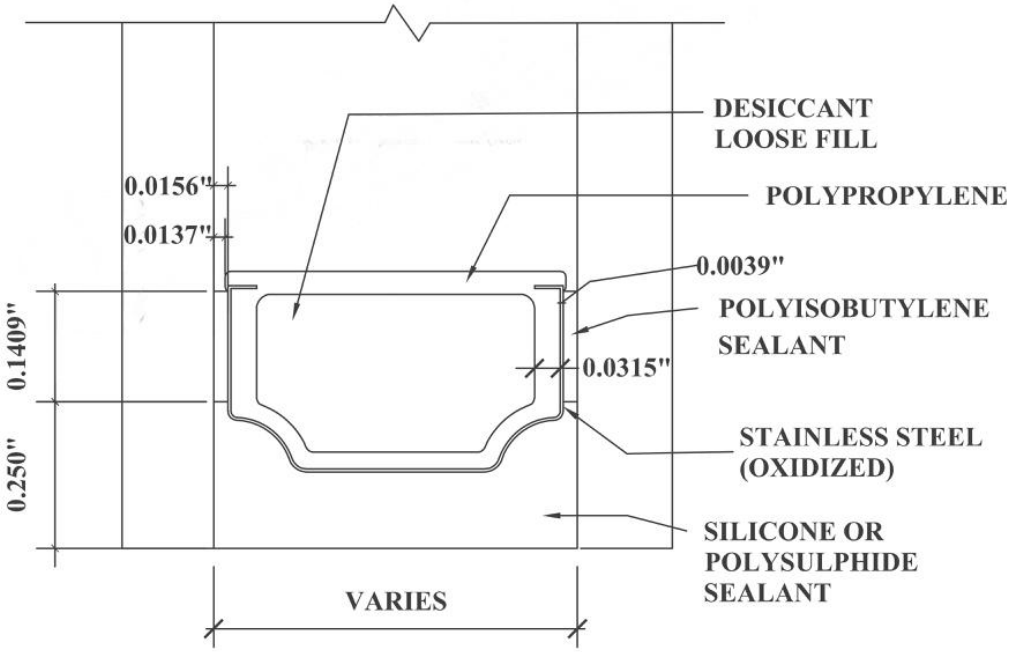

DETAIL FOR THERMAL MODELING OF
TECHNOFORM TGI SPACER - M (TS-D)

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SECTION 16
REVISION LOG

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