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ALUMIL SA
THERMAL PERFORMANCE TEST REPORT

SCOPE OF WORK
S77 DUAL ACTION WINDOW

REPORT NUMBER
J6342.01-116-46 R0

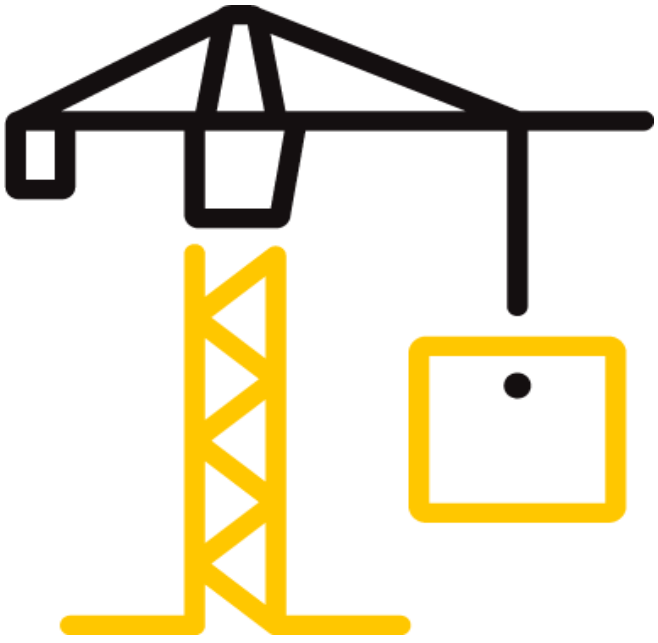
TEST DATE
07/30/19

ISSUE DATE
09/30/19

RECORD RETENTION END DATE
07/30/24

PAGES
20

DOCUMENT CONTROL NUMBER
RTTDS-R-AMER-Test-2822(a) (07/07/18)



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TEST REPORT FOR ALUMIL SA
Report No.: J6342.01-116-46 R0
Date: 09/30/19

REPORT ISSUED TO

ALUMIL SA
Iatrou Gogousi 8 GR 56429
Thessaloniki, GR 56429 (Greece)

SECTION 1

SCOPE

SERIES/MODEL: S77 Dual Action Window
TYPE: Dual-Action

Intertek Building & Construction (Intertek B&C) was contracted by Alumil SA 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 York, Pennsylvania. 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): 0.32 Btu/hr·ft^2·F (CTS Method)

For INTERTEK B&C:

COMPLETED BY	Ryan P. Moser	**REVIEWED BY**	Shon W. Einsig
TITLE	Senior Technician	**TITLE**	Technician Team Leader, IIRC
SIGNATURE	Digitally Signed by: Ryan P. Moser	**SIGNATURE**	Digitally Signed by: Shon W. Einsig
DATE	09/30/19	**DATE**	09/30/19

RPM:pan

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SECTION 3
TEST SPECIMEN SUMMARY

SERIES/MODEL	S77 Dual Action 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	Client

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 the client. 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 5 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
Ryan P. Moser	Intertek B&C
Shon W. Einsig	Intertek B&C

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SECTION 7
TEST SAMPLE DESCRIPTION

Frame

MATERIAL	AT (1.27"): Aluminum with Thermal Breaks - All Members		
SIZE	47-1/4" x 59" (Model Size)		
DAYLIGHT OPENING	N/A	**GLAZING METHOD**	N/A
EXTERIOR COLOR	White	**EXTERIOR FINISH**	Paint
INTERIOR COLOR	White	**INTERIOR FINISH**	Paint
CORNER JOINERY	Mitered / Keys & Stakes / Sealed		

Vent

MATERIAL	AT (1.27"): Aluminum with Thermal Breaks - All Members		
SIZE	45" x 56-3/4"		
DAYLIGHT OPENING	39-1/8" x 51"	**GLAZING METHOD**	Interior
EXTERIOR COLOR	White	**EXTERIOR FINISH**	Paint
INTERIOR COLOR	White	**INTERIOR FINISH**	Paint
CORNER JOINERY	Mitered / Keys & Stakes / Sealed		

Glazing Information

LAYER 1	1/4"	CL Extreme 60/28 II (e=0.026*, #2)	
GAP 1	0.56"	TP-D: Saint-Gobain Swisspacer	100% Air*
LAYER 2	1/4"	Clear	
GAS FILL METHOD	N/A*		

**Stated per Client/Manufacturer*
N/A Non-Applicable

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SECTION 7 (CONTINUED)

TEST SAMPLE DESCRIPTION (CONTINUED)

Weatherstripping

DESCRIPTION	QUANTITY	LOCATION
Flexible hollow bulb gasket	1 Row	Vent perimeter
Single-fin gasket	1 Row	Frame perimeter
Center gasket	1 Row	Frame perimeter
Glazing gasket	1 Row	Interior glazing perimeter
Glazing gasket	1 Row	Exterior glazing perimeter

Hardware

DESCRIPTION	QUANTITY	LOCATION
Multi-point lock assembly	1	Lock stile
Metal keeper	9	Four per lock jamb, two per hinge jamb and sill, one per head
Dual-action hinge	2	Hinge jamb/stile
Single-arm hinge	1	Head/top rail
Metal vent ramp	1	Sill

Drainage

DRAINAGE METHOD	SIZE	QUANTITY	LOCATION
No visible weeps			

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SECTION 8
THERMAL TRANSMITTANCE (U-FACTOR): MEASURED TEST DATA

Heat Flows

1.	Total Measured Input into Metering Box (Qtotal)	494.11	Btu/hr
2.	Surround Panel Heat Flow (Qsp)	33.84	Btu/hr
3.	Surround Panel Thickness	6.00	inches
4.	Surround Panel Conductance	0.0303	$Btu/hr \cdot ft^2 \cdot F$
5.	Metering Box Wall Heat Flow (Qmb)	3.96	Btu/hr
6.	EMF vs Heat Flow Equation (equivalent information)	0.0117*EMF + 0.001	
7.	Flanking Loss Heat Flow (Qfl)	8.47	Btu/hr
8.	Net Specimen Heat Loss (Qs)	447.86	Btu/hr

Areas

1.	Test Specimen Projected Area (As)	19.36	ft^2
2.	Test Specimen Interior Total (3-D) Surface Area (Ah)	22.04	ft^2
3.	Test Specimen Exterior Total (3-D) Surface Area (Ac)	20.64	ft^2
4.	Metering Box Opening Area (Amb)	36.11	ft^2
5.	Metering Box Baffle Area (Ab1)	33.94	ft^2
6.	Surround Panel Interior Exposed Area (Asp)	16.75	ft^2

Test Conditions

1.	Average Metering Room Air Temperature (th)	69.80	F
2.	Average Cold Side Air Temperature (tc)	-0.38	F
3.	Average Guard/Environmental Air Temperature	71.26	F
4.	Metering Room Average Relative Humidity	7.63	%
5.	Metering Room Maximum Relative Humidity	7.67	%
6.	Metering Room Minimum Relative Humidity	7.57	%
7.	Measured Cold Side Wind Velocity (Perpendicular Flow)	12.66	mph
8.	Measured Warm Side Wind Velocity (Parallel Flow)	N/A	mph
9.	Measured Static Pressure Difference Across Test Specimen	0.00" ± 0.04"	H_2O

Average Surface Temperatures

1.	Metering Room Surround Panel	66.78	F
2.	Cold Side Surround Panel	0.04	F

Results

1.	Thermal Transmittance of Test Specimen (Us)	0.33	$Btu/hr \cdot ft^2 \cdot F$
2.	Standardized Thermal Transmittance of Test Specimen (Ust)	0.32	$Btu/hr \cdot ft^2 \cdot F$

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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)	N/A	
9.	Equivalent Warm Side Surface Temperature (t1)	53.47	F
10.	Equivalent Cold Side Surface Temperature (t2)	4.00	F
11.	Warm Side Baffle Surface Temperature	68.63	F
12.	Cold Side Baffle Surface Temperature	N/A	F
13.	Measured Warm Side Surface Conductance (hh)	1.42	$Btu/hr \cdot ft^2 \cdot F$
14.	Measured Cold Side Surface Conductance (hc)	5.29	$Btu/hr \cdot ft^2 \cdot F$
15.	Test Specimen Thermal Conductance (Cs)	0.47	$Btu/hr \cdot ft^2 \cdot F$
16.	Convection Coefficient (Kc)	0.36	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
17.	Radiative Test Specimen Heat Flow (Qr1)	222.12	Btu/hr
18.	Conductive Test Specimen Heat Flow (Qc1)	225.73	Btu/hr
19.	Radiative Heat Flux of Test Specimen (qr1)	11.47	$Btu/hr \cdot ft^2 \cdot F$
20.	Convective Heat Flux of Test Specimen (qc1)	11.66	$Btu/hr \cdot ft^2 \cdot F$
21.	Standardized Warm Side Surface Conductance (hsth)	1.22	$Btu/hr \cdot ft^2 \cdot F$
22.	Standardized Cold Side Surface Conductance (hstc)	5.28	$Btu/hr \cdot ft^2 \cdot F$
23.	Standardized Thermal Transmittance (Ust)	0.32	$Btu/hr \cdot ft^2 \cdot F$

**Stated per NFRC 101*

SECTION 10
TEST DURATION

1. The environmental systems were started at 13:00 hours, 07/29/19.
2. The test parameters were considered stable for two consecutive four hour test periods from 22:06 hours, 07/29/19 to 06:06 hours, 07/30/19.
3. The thermal performance test results were derived from 02:06 hours, 07/30/19 to 06:06 hours, 07/30/19.

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SECTION 11
GLAZING DEFLECTION

	VENT
EDGE GAP WIDTH	0.56"
ESTIMATED CENTER GAP WIDTH upon receipt of specimen in laboratory (after stabilization)	0.53"
CENTER GAP WIDTH at laboratory ambient conditions on day of testing	0.53"
CENTER GAP WIDTH at test conditions	0.38"

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 000001) in York, Pennsylvania were last conducted in May 2019 in accordance with Intertek B&C calibration procedure. A CTS Calibration verification was performed August 2018. A Metering Box Wall Transducer and Surround Panel Flanking Loss Characterization was performed August 2018.

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	05/03/17	
2.	CTS Size	21.53	ft^2
3.	CTS Glass/Core Conductance	0.42	$Btu/hr \cdot ft^2 \cdot F$
4.	Warm Side Air Temperature	69.80	F
5.	Cold Side Air Temperature	-0.41	F
6.	Warm Side Average Surface Temperature	54.41	F
7.	Cold Side Average Surface Temperature	3.67	F
8.	Convection Coefficient (Kc)	0.36	$Btu/(hr \cdot ft^2 \cdot F^{1.25})$
9.	Measured Cold Side Surface Conductance (hc)	5.29	$Btu/hr \cdot ft^2 \cdot F$
10.	Measured Thermal Transmittance	0.31	$Btu/hr \cdot ft^2 \cdot F$

ANSI/NCSL Z540-2-1997 type B uncertainty for this test was 1.71%.

"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 values identified on a valid Certification Authorization Report (CAR) 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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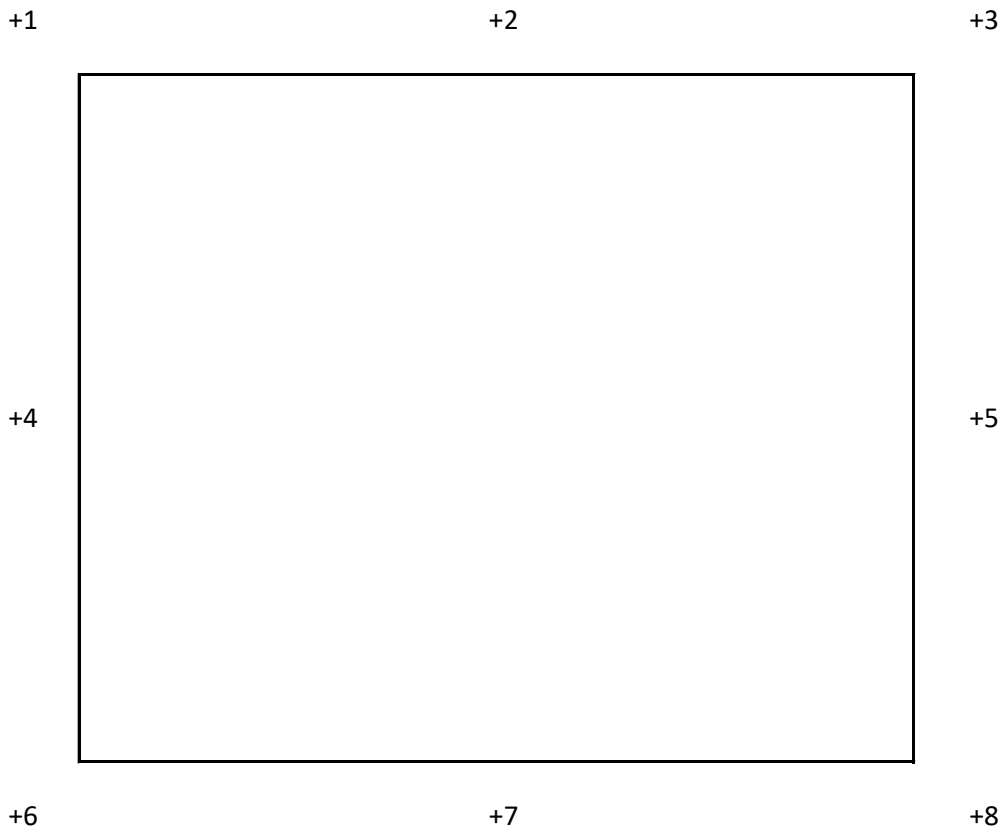
SECTION 13
SURROUND PANEL WIRING DIAGRAM



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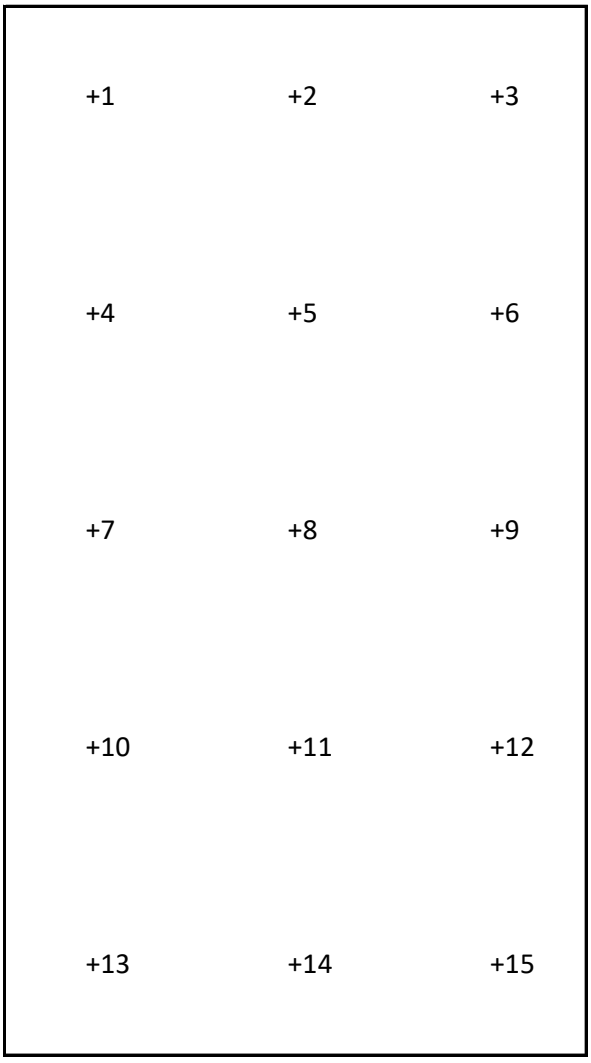
SECTION 14
BAFFLE WIRING DIAGRAM



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SECTION 15
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.

Revised Final Version

Report #:	J6342-116-46
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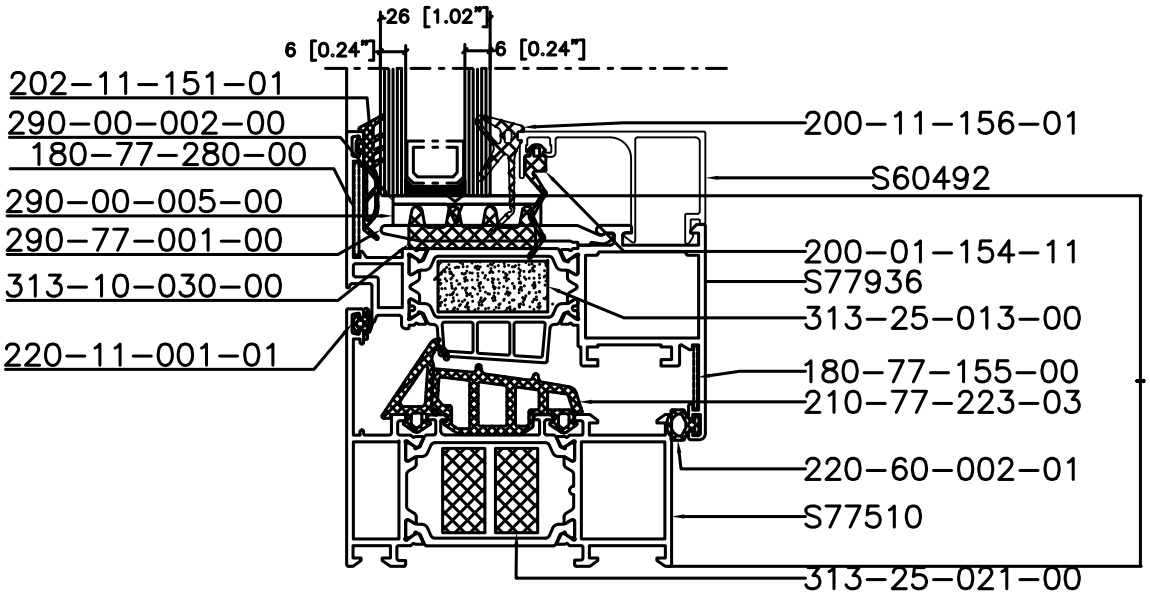
Verified by:	Ryan P. Moser



S77510 Frame width	2 pieces
S77510 Frame height	2 pieces
S77936 Sash width	2 pieces
S77936 Sash height	2 pieces
S60433 Glazing bead width	2 pieces
S60492 Glazing bead height	2 pieces

210-77-223-03		Central gasket
255-77-223-03		Vulcanized corner
220-60-002-01		Sash gasket
220-11-001-01		Frame gasket
202-11-151-01		External glass gasket
200-11-156-01		Internal glass gasket
200-01-154-11		Gasket for glazing bead
220-11-449-12		Gasket for glazing bead
290-00-005-00		5mm Shim
290-00-002-00		2mm Shim
290-77-001-00		Glazing bridge
313-10-030-00		Glazing foam 30x10 mm
313-25-013-00		NRG bar 25x13
313-25-036-00		NRG bar 25x36
180-77-155-00		Alignment corner
180-77-280-00		Alignment corner
140-58-530-00		Die cast corner cleat
140-58-290-00		Die cast corner cleat
165-77-116-00		Cast spring cleat
140-58-320-00		Die cast corner cleat

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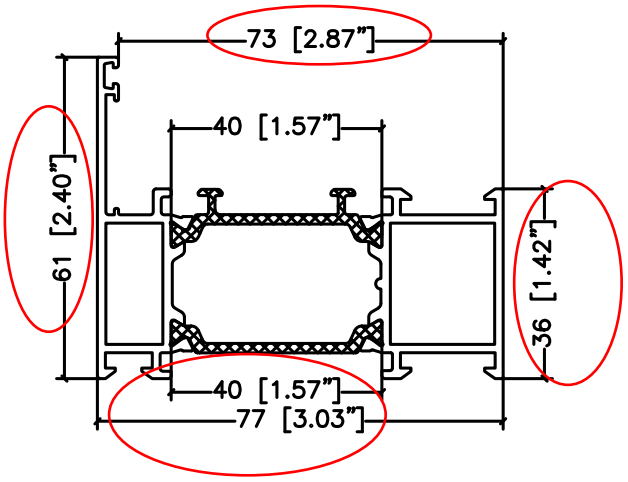
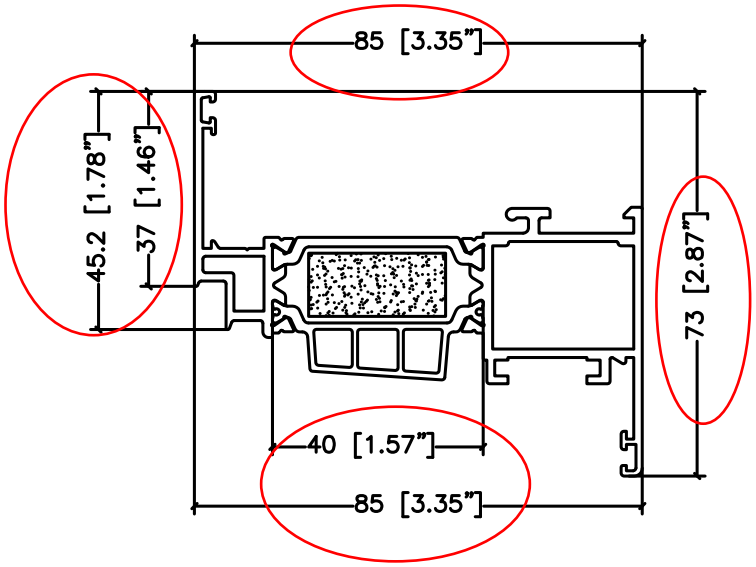
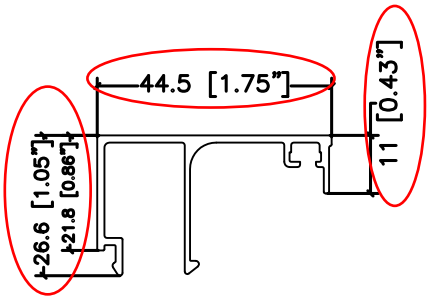
S77510



S77936



S60492



Κατ. 004, Ποσότητα: 1
Έργο:S77-US INTERTEK
Σειρά: Alumil S77 & SD77 Τετράγωνα (Vertical Passing) High
Εσωτερική Όψη 62 kg

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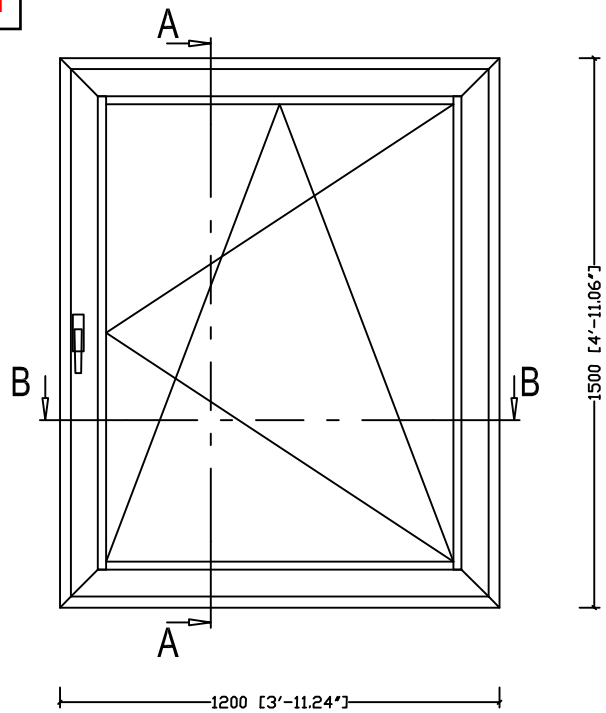
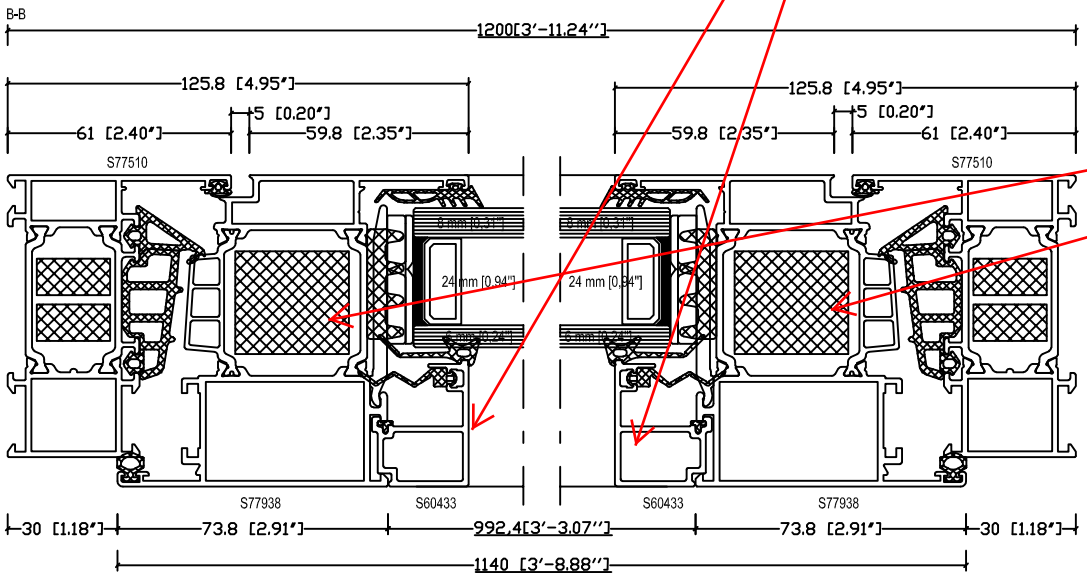
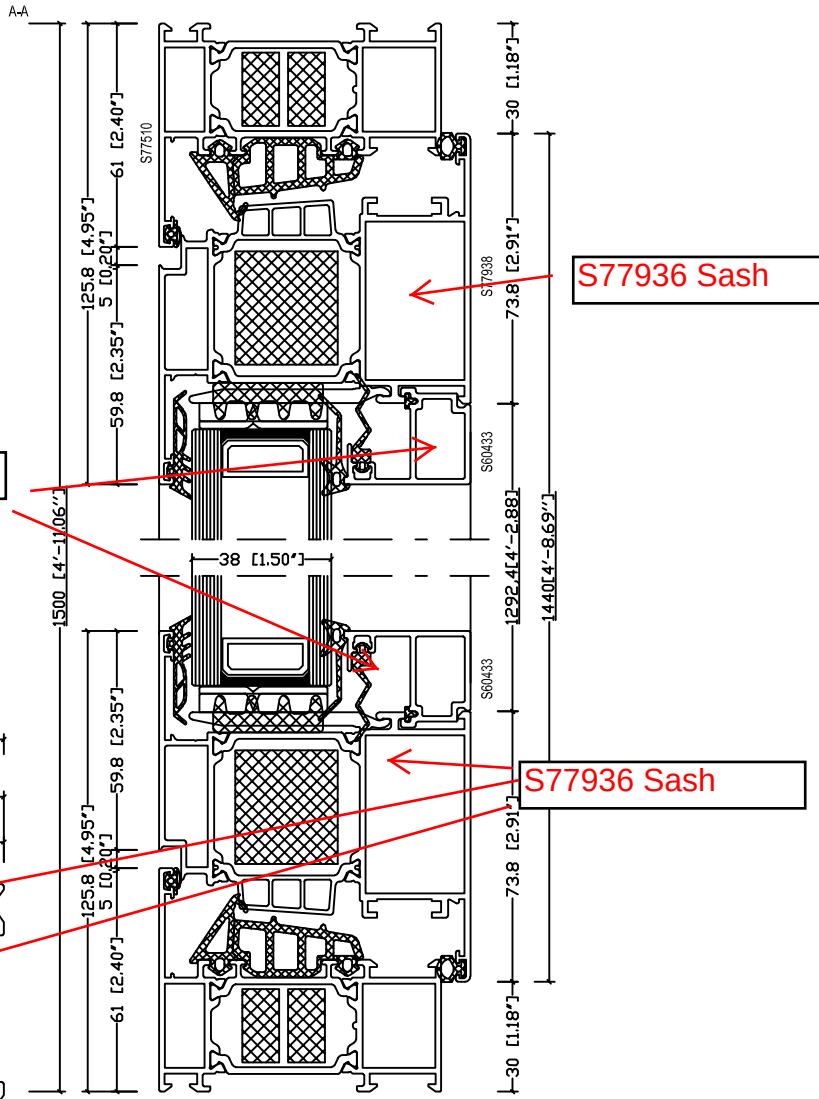
High Configuration







S60492 Bead

S77936 Sash

S77936 Sash

Advanced Configuration

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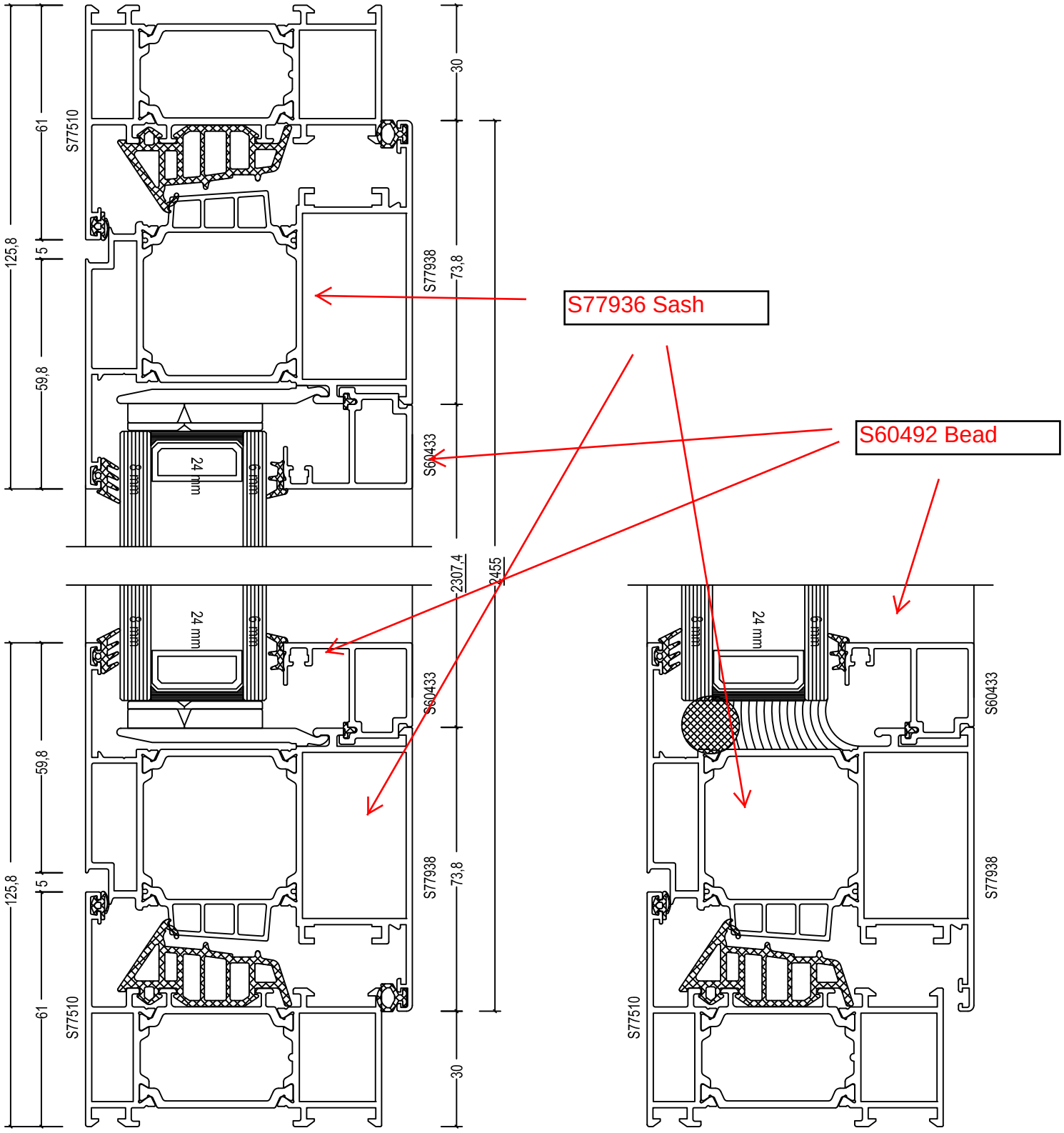
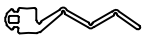
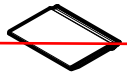
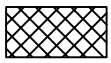
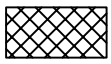


S77510 Frame width	2 pieces
S77510 Frame height	2 pieces
S77936 Sash width	2 pieces
S77936 Sash height	2 pieces
S60433 Glazing bead width	2 pieces
S60433 Glazing bead height	2 pieces

210-77-223-03		Central gasket
255-77-223-03		Vulcanized corner
220-60-002-01		Sash gasket
220-11-001-01		Frame gasket
202-11-151-01		External glass gasket
200-11-156-01		Internal glass gasket
200-01-154-11		Gasket for glazing bead
220-11-449-12		Gasket for glazing bead
~~290-00-005-00~~		~~5mm~~ Shim
~~290-00-002-00~~		~~2mm~~ Shim
~~290-77-001-00~~		Glazing bridge
313-10-030-00		Glazing foam 30x10 mm
313-25-021-00		NRG bar 25x21
313-25-036-00		NRG bar 25x36
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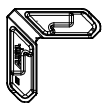
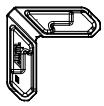
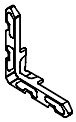
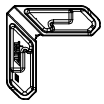
180-77-280-00		Alignment corner
140-58-530-00		Die cast corner cleat
140-58-290-00		Die cast corner cleat
165-77-116-00		Cast spring cleat
140-58-310-00		Die cast corner cleat

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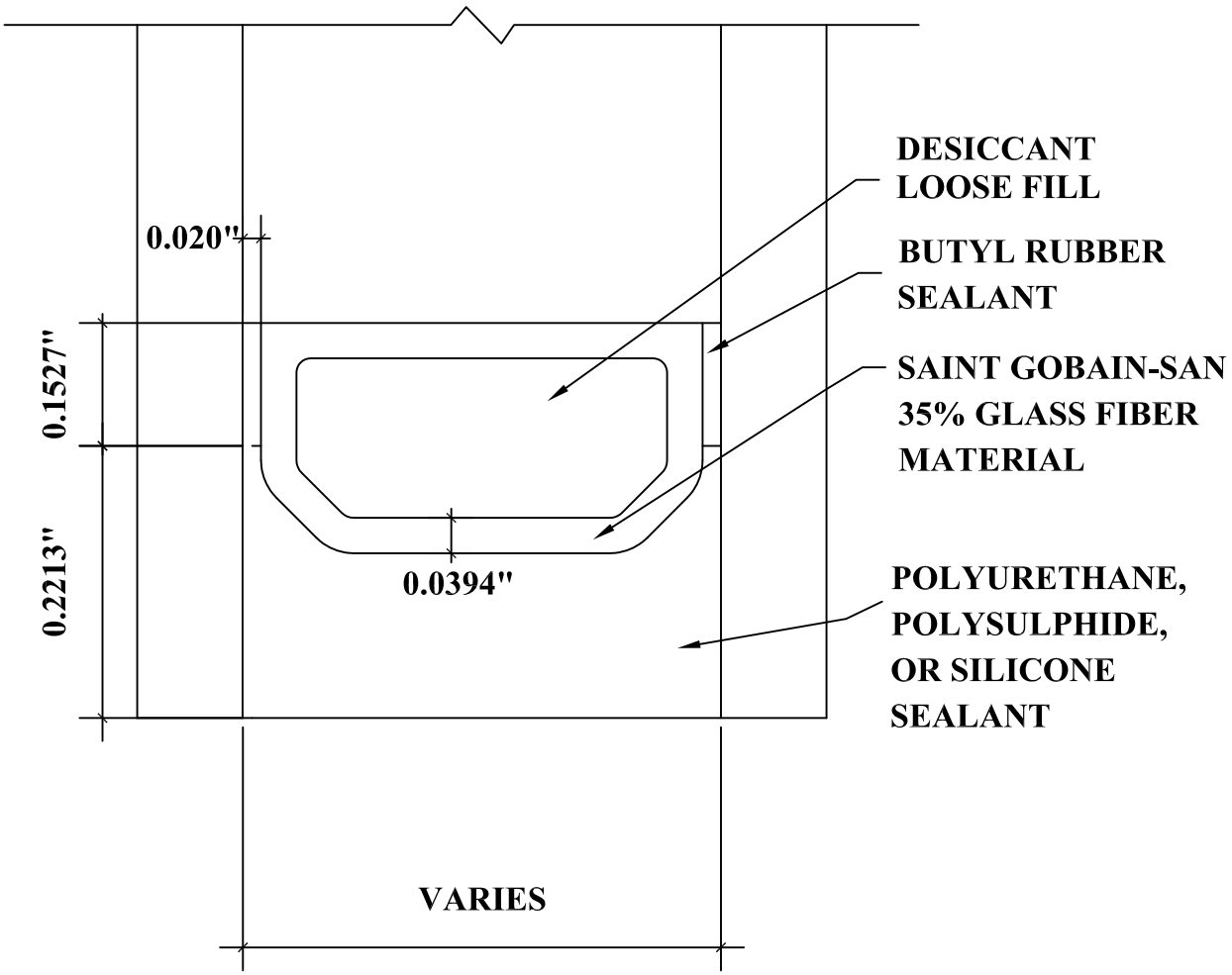
200-06-860-01		External glazing gasket
200-08-004-01		Internal glazing gasket



DETAIL FOR THERMAL MODELING OF
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SECTION 16
REVISION LOG

REVISION #	DATE	PAGES	REVISION
.01 R0	09/30/19	N/A	Original Report Issue