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ENGINEERING JUDGEMENT

ABOUT

ADLUX HARMONY ROOF WINDOW

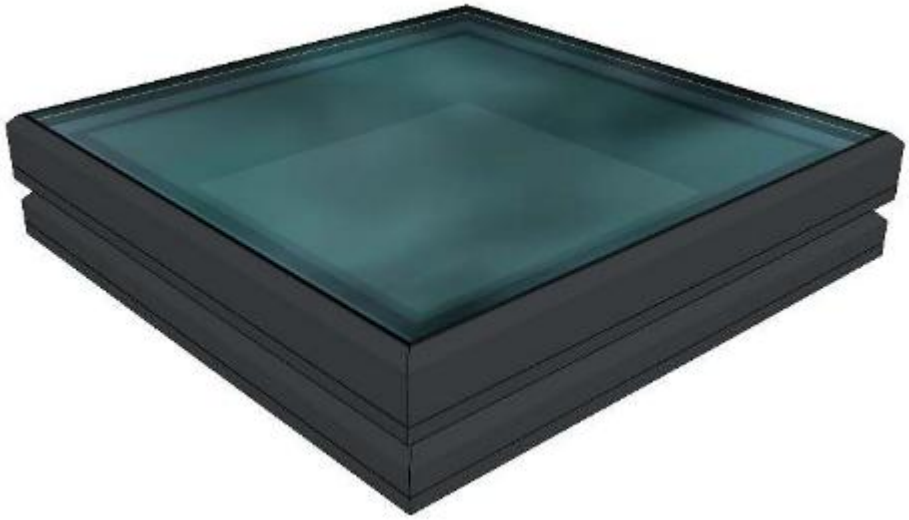
AUTHOR: Margaret Amankrah

DATE: 30/04/2025

OCULUS REFERENCE: J250413

PREPARED FOR

ADLUX INDUSTRIES LIMITED



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Revision Control

Revision number	Date published	Reviewed by
1	05/09/2023	Margaret Amankrah
2	24/11/2023	Margaret Amankrah
3	30/04/2025	Peter Raimondo

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1 PURPOSE

This report sets out:

- the applicable joinery performance requirements for Adlux Harmony Roof Windows,
- the proposed components comprising the Adlux Harmony Roof Windows, and
- the compliance evidence with the New Zealand Building Code.

This report constitutes documentation to convey the pathway for compliance of the proposed design with the New Zealand Building Code. It must be read in conjunction with the corresponding architectural package.

2 PROJECT SUMMARY

Adlux Harmony Roof Windows propose a range of thermally improved skylight products. The architectural drawings suggest insulated double or triple glazed panes with low-E coating and argon infill that are set within a steel frame with polyamide thermal breaks. The flush glazing would be weather sealed and chemically adhered via dedicated beads of structural glaze silicone sealant. The fixed or operable units are intended to be mounted on a wooden upstand. Associated flashings tying into roof assembly are excluded from this report and will need project-specific design by an appropriate consultant.

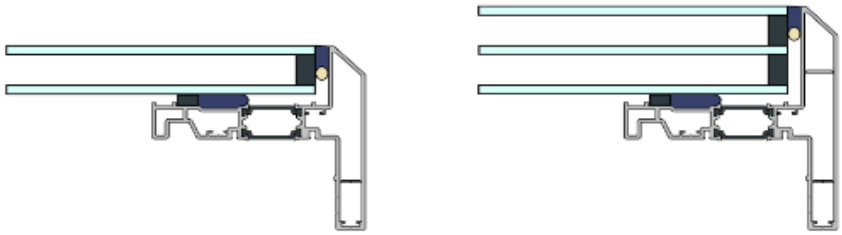


Image 1: Fixed Roof Window – Double Glazed and Triple Glazed

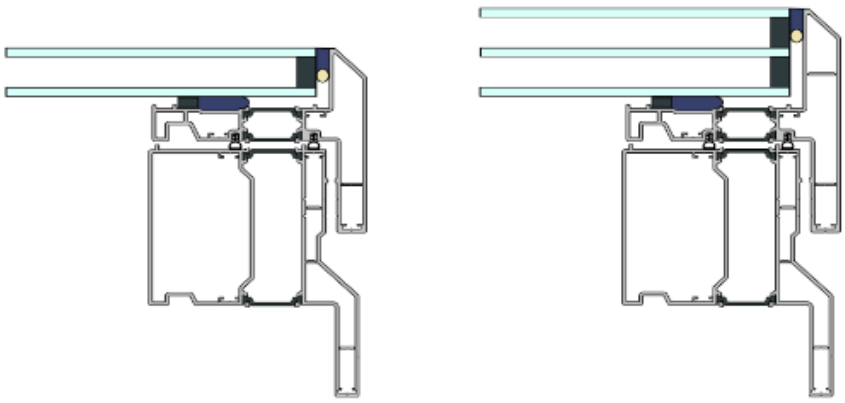


Image 2: Opening Roof Window – Double Glazed and Triple Glazed

3 PERFORMANCE REQUIREMENTS

The NZBC Clauses and applicable Performance Requirements included within this review's scope are listed in Table 1 below. Demonstration that a product or assembly can meet the Performance Requirements of the clause ensures that the Functional Requirement and the Objective of the clause will be met.

Table 1: NZBC Functional Requirements, and Applicable Performance Requirements

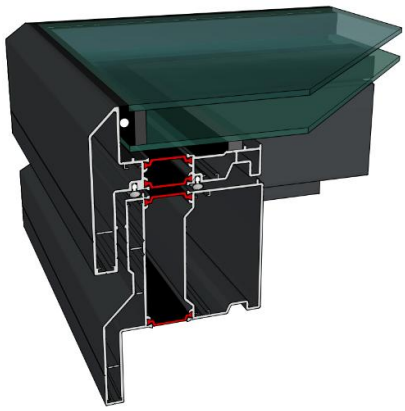
NZBC	Functional Requirement	Applicable Performance Requirements within the scope of review
B1 Structure	B1.2 *Buildings*, *building elements*, and *site work* shall withstand the combination of loads that they are likely to experience during *construction* or *alteration* and throughout their lives.	B1.3.2 and B 1.3.3 a), g),h)
B2 Durability	B2.2 *Building* materials, components, and *construction* methods shall be sufficiently durable to ensure that the *building*, without reconstruction or major renovation, satisfies the other functional requirements of this code throughout the life of the *building*.	B2.3.1 b) and B2.3.2 a), b)
E2 External moisture	E2.2 *Buildings* must be constructed to provide *adequate* resistance to penetration by, and the accumulation of, moisture from the outside.	E2.3.1 and E2.3.2
H1 Energy efficiency	H1.2 Buildings must be constructed to achieve an adequate degree of energy efficiency when that energy is used for— a) modifying temperature, modifying humidity, providing ventilation, or doing all or any of those things (does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings); or b) providing hot water to and from sanitary fixtures or sanitary appliances, or both; or c) providing artificial lighting (applies only to commercial buildings and communal non-residential buildings whose floor area is greater than 300 m^2)	H1.3.1 and H1.3.3

4 COMPLIANCE OF ROOF WINDOWS COMPONENTS

This section sets out:

- The proposed product components for the roof window design to achieve the performance requirements set out in Section 3 of this report,
- Summary of their compliance with relevant clauses of the New Zealand Building Code, and
- Relevant documentation considered in establishing compliance is attached in the Appendices.

4.1 Adlux Harmony Roof Window



Documentation to Support NZBC Compliance

- SWTL-R0073 Test Report
- IBA 8032-S1Rep Test Report
- Adlux Thermal Roof Window Drawings
- Adlux Roof Windows H1 Summary Report by Oculus

Table 2: Glazing compliance Pathway

NZBC Clause	Method of Compliance with Applicable Performance Requirements
B1 Structure	Method of compliance: B1/VM1 and Alternative Solution ▪ The current version of the Adlux Harmony roof window was successfully tested to test standard AS/NZS4284:2008, which was modified to allow for sloped installation. The sample passed with an SLS pressure of +1625Pa/-1405 Pa and ULS pressure of +2285 Pa /-1975 Pa ▪ Testing was conducted by an IANZ accredited laboratory in accordance with ISO/IEC 17025. ▪ Structural testing required taping to the interior joint of the operable sash to maintain airtightness to achieve test pressures. ▪ An earlier version of Adlux roof windows was successfully evaluated to AS 4285-2007 for skylights. While this standard has been superseded by AS 4285-2021, the results are still comparable. Specific structural design actions considered in this report are wind and imposed loads. ▪ Resistance to wind pressures was tested to AS 4040.2 methodology which addresses criteria for AS/NZS 1170.2. Testing followed procedures for non-cyclonic regions (as determined by Australian Standard) for Ultimate Design Wind Speeds of up to 187 km/h, or approximately 52 m/s, which is comparable to NZS extra high wind zone unfactored wind pressures. ▪ Resistance to concentrated loads was tested to AS 4040.1 methodology which addresses criteria for AS/NZS 1170.1. Limitation of use:

	▪ Any site-specific wind load in exceedance of extra high wind load threshold will require project-specific engineering design. ▪ Roof windows are generally not meant to be trafficked and should not be subject to point loads unless designed and tested accordingly. ▪ For roof windows installed at higher pitches, verifications should be made regarding potential for seismic racking and how that can be accommodated within the frame. ▪ The design of the roof structure to support the weight of the roof window is outside of this scope.
B2 Durability	Method of compliance: B2/VM1 and Alternative Solution ▪ In-service history: Earlier models of Adlux roof windows are BRANZ appraised with an expected serviceable life of not less than 15 years in accordance with section B2 of the New Zealand Building Code. ▪ Comparable performance of similar building elements o The proposed Harmony Roof Windows are of similar composition to earlier models of Adlux roof windows and are expected to have a serviceable life of not less than 15 years. This relates specifically to the structural elements of the joinery. o The glazing system comprises aluminium and stainless-steel fasteners, which are widely recognised as sufficiently durable to achieve a 50-year design life. ▪ If the proposed unit is designed and installed per the manufacturer documentation, using IGUs constructed in accordance with NZS 4223.2, we are satisfied on reasonable grounds that the criteria for B2 is met. Limitation of use: ▪ Durability of the product is conditional to general maintenance and periodic inspection per technical literature. Items such as sealants, gaskets, glazing splines, hardware, and glazing stops may require replacement if deteriorated.
E2 External Moisture	Method of compliance: Alternative Solution ▪ The skylight assembly was successfully tested to the AS/NZS4284 standard (modified for sloped glazing) demonstrating weathertightness to wind pressures of 455Pa ▪ Per Adlux drawings, thermal roof windows are to be curb mounted. This effectively removes the unit from the roof's catchment area. ▪ The framing to curb interface is made watertight with an internal air seal and an external weather seal. The framing downturn lap provides further protection from backsplash. ▪ The glazing is finished flush with the framing to prevent accumulation of rainwater. ▪ Frames are fully welded, preventing gaps at the mitres Limitation of use: ▪ The roof water management provisions to prevent pooling of water around roof penetrations is outside of this scope and will need project-specific design by an appropriate consultant
H1 Energy Efficiency	Method of compliance: AS1/VM1, AS2/VM2 ▪ Specific R-values for various sizes and types of the proposed thermal roof windows were tabulated in the H1 Summary Report. While not all combinations met minimum requirement for thermal resistance, the report outlines suitable climate zones for which they can be used. Limitation of use: ▪ Calculated R-values are valid for an installation angle range of 0°-50°.

5 OTHER CONSIDERATIONS

5.1 STRUCTURAL CONNECTIONS

The following are to be reviewed by a suitably qualified professional to determine compliance with B1.

- The connection of the frame to the building structure. i.e., screw size and spacing requirements for the relevant wind and earthquake zones, which will vary depending on the framing substrate.
- The capacity of the hinge and locking mechanism for operable skylights could be verified through a methodology similar to 4211 testing and elements of AS 4285.

5.2 MATERIALS

As mentioned in paragraph B2 of Section 4, should the proposed roof window be composed of similar materials to the existing range (Aluminium, UV stabilised ABS and powder coated/304 grade stainless steel), we would expect the units to offer similar durability potential.

The proposed design has exposed weather seals. Silicone is a suitable sealant for exterior use where UV is a concern as it does not breakdown under sunlight. Their expected lifespan is far in excess of the required 15 years. They also retain great flexibility at low temperatures. Both proposed products, Shin-Etsu Sealant-90N and DOWSIL 795, are neutral-cure silicones. Contrary to their acetoxy-cure counterparts, these do not release acetic acid which can corrode certain grades of aluminium. Per their respective technical data sheets, they are also suitable for use in weather seal applications and are compatible with aluminium and glass materials.

Refer in Appendix to:

- Shin-Etsu SSG Sealant-90N Technical Data Sheet
- DOWSIL 795 SSG Technical Data Sheet
- DOWSIL Statement on silicone sealants

6 ASSUMPTIONS AND LIMITATIONS

The compliance potential set out in Section 4 of this report takes account of several assumptions regarding construction, quality assurance, and proper implementation of the design that would be expected. Limitations for each building code clause is listed within that section. The following overall assumptions inform the compliance potential for this design:

- The design is implemented strictly per the drawings, details, and specifications.
- Products are installed in accordance with the manufacturer's instructions or site-specific protocol.
- All applicators are sufficiently competent to carry out the relevant installation and will issue PS3 statements and warranties for their relevant trade.

7 COMPLIANCE STATEMENT

Based on the documentation received at the time of review, Oculus Limited is satisfied on reasonable grounds that the Adlux Harmony Roof Windows will meet the relevant provisions of the New Zealand Building Code.

Prepared by:

Margaret Amankrah
Senior Building Enclosure Consultant

Reviewed by:

Peter Raimondo, CPEng
Associate Director

Appendix a. SUPPORTING DOCUMENTATION

- SWTL-R0073 Test Report
- IBA 8032-S1Rep Test Report
- Oculus H1 Summary Report dated 24/11/2023
- Adlux Harmony Roof Window Details
- Shin-Etsu SSG Sealant-90N Technical Data Sheet
- DOWSIL 795 SSG Technical Data Sheet
- DOWSIL Statement on silicone sealants

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Report Number: SWTL R0073
Report Date: 13 February 2025

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Shelby Wright Test Labs
515 Rosebank Road
Avondale, Auckland
New Zealand, 1026

ADLUX INDUSTRIES LIMITED – AS/NZS 4284

Shelby Wright Test Report

Report Writer:	Report Date:	SWTL Reference:
Mark Ashforth	13 February 2025	J-24073

Client Information	
Client Name and Address	**Adlux Industries Limited** **30 Sistema Way, Mangere, Auckland 2022**
Report Administered to	**Adlux Industries Limited**
Test Report Number	**SWTL - R0073**
Testing	
Test Location	**Shelby Wright Test Labs – 515 Rosebank Road, Avondale Auckland 1026**
Test Date	**12-16th December 2024**
Test Number	**T0252 – T0261**
Report Date	**13 th February 2025**
Project Name	**J24073 – Adlux Skylight - 4284**
Test Procedure	**SWTM-1.0 AS_NZS 4284 2008 Test Procedure v2**
Testing Officer	**Mark Ashforth**
Observers	**Mathew Church (Adlux Industries Limited), Mathew Lewis (SWTL), Jon Davies (Pro Clima)**
Sample	
Sample	**Adlux Harmony Roof Window 2.04m (W) x 2.54m (H)**
Manufacturer	**Adlux Industries Limited**
Specifier	**Adlux Industries Limited**
Sample Designer	**Adlux Industries Limited**
Sample Installer	**Adlux Industries Limited**
IANZ	
IANZ Accredited KTP	**Bernard Farrington**
IANZ Accreditation No	**1438**

REVISION CONTROL

Revision number	Date published	Reviewed by
1	20 January 2025 (DRAFT)	BF
2	28 January 2025 (DRAFT)	BF
3	13 February 2025 (FINAL)	BF

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List of Tables

1 EXECUTIVE SUMMARY

Testing of Adlux Industries Limited Harmony Roof Window was carried out at Shelby Wright Test Labs (SWTL) Avondale laboratory. The sample was prepared by the client and installed in the test booth by the client on 11 December 2024.

Because New Zealand does not have a standard for testing skylights, testing was requested using test methods adopted from AS/NZS 4284, and pressures aligning with NZS 3604 "Extra High" wind zone.

Structural tests were carried out with the sample fixed in the in the vertical orientation and pressures were adjusted for the sample weight and inclination to account for the self-weight of the operable sash.

Serviceability pressure (SLS) and subsequent self-weight adjusted pressures can be found in Table 1.

Table 1 Target Building Pressures

Serviceability Pressure
+ 1515 / 1625 Pa.
- 1515 / 1405 Pa

The test sample was found to have the following results for AS/NZS 4284:2008 compliance with any modifications as noted in this report:

Table 2 Summary of Results

Test Date	AS/NZS 4284:2008 Test	Result
12th December 2024	Clause 8.2 – Preliminary tests	Pass
12th December 2024	Clause 8.3 – Structural test as serviceability limit state	Pass
12th December 2024	Clause 8.4 – Air infiltration test	Pass
13th December 2024	Clause 8.5 – Water penetration by static pressure	Pass
12th December 2024	Clause 8.6 – Water penetration by cyclic pressure	Pass
16th December 2024	Clause 8.8 – Structural test at ultimate limit state	Pass

2 REQUEST FOR TESTING

Adlux Industries Limited requested testing of the sample to AS/NZS 4284:2008 with the test sequences as detailed in section 5 of this report. The completed test request form can be found in Appendix A.

3 METHOD

The tests were carried out in accordance with SWTL procedures:

SWTM-1.0 AS_NZS 4284 2008 Test Procedure v2

4 TEST SAMPLE

The test sample is as per the drawings in Appendix B of this report.

4.1 Description

The sample was comprised of the operable Harmony Skylight. The skylight was mounted on a 95mm upstand fixed to a structural timber wall frame of predominantly 140mm x 45mm SG8 H1.2 pine with 10mm structural ply sheathing and covered with Solitex Extasana Adhero adhesive membrane. The upstand had Extoseal flashing tape applied.

The structural timber perimeter frame of 140mm x 90mm SG8 H1.2 pine frame was fixed to the test booth opening. The sample wall with skylight mounted was able to pivot to the prescribed angles on two aluminium axles within the perimeter frame. Vertical supports and rigging supported the sample during test sequences.

The skylight sash was operable using three electric 500N actuator assemblies on three 100mm x 75mm x 2mm hinges with harmony IGU in accordance with NZS 4223.4.

The sample featured:

- One operable Harmony Roof Window Skylight

For this report:

- Reference to the “Exterior” side of the sample refers to the side of the sample facing inwards to the test booth and would normally represent the external faces of the building.
- Reference to the “Interior” side of the sample refers to the side of the sample facing outwards from the test booth and would normally represent the internal faces of the building.

Client supplied “As Built” drawings and details in Appendix B of this report.

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Table 3 Test Sample Setup

Photo/Figure Reference	Description
	*Figure 1 – Overall view of the sample viewed from interior side.* *Note: cross bracing within skylight opening to support perspex for negative pressure enclosure.*
	*Figure 2 – Left hand side of sample with temporary deflection plastic accross top of skylight – Adlux Harmony Roof Window*

	*Figure 3 – One of three motors used to operate skylight*

4.2 Client Documentation

Test request and parameters form. Refer to Appendix A

Drawings. Refer to Appendix B

Worksheets. Refer to Appendix C

4.3 Components

The components of the sample are as listed in drawings. Refer to Appendix B

5 TEST PROCEDURE

The test procedure was carried out following SWTM-1.0 AS_NZS 4284 2008 Test Procedure v2 Test Sequence AS/NZS 4284:2008

(a) Preliminary tests
(b) Structural test at serviceability state
(c) Air infiltration test
(d) Water penetration test by static pressure followed by cyclic pressure test
(e) Seismic test at serviceability limit state displacement: Not carried out
(f) BMU restraint test – Not carried out
(g) Strength test at ultimate limit state
(h) Seismic test at ultimate limit state displacement – Not carried out
(i) Seal degradation test: Not carried out

5.1 Deviation, variation, or exclusion to the test procedure

Variation:

There is no specific test standard for skylights in New Zealand. Structural tests were carried out with the sample in the vertical orientation, pressures were adjusted for the sample weight and inclination within the test booth to account for the self-weight of the operable sash.

The client requested additional static water penetration tests at 0.5°, 37.5° and 75° from the horizontal to simulate likely skylight installation applications.

At both 0.5°and 37.5° water was applied with a WGANZ 502 spray rack calibrated rate of > 3.0 lpm/m² with - 455 Pa (NZS 3604 "Extra High" wind zone) applied to the interior side of the sample.

At 75° the test booth water sprayer system calibrated rate of > 3.0 lpm/m² was used with - 455 Pa applied to the interior side of the sample.

Exclusion:

Following the preliminary water penetration test sequence, further static and cyclic water penetration tests were not undertaken in the vertical position as it was not considered relevant for the designed installation of the skylight.

The skylight was subject to further static water penetration tests at 0.5°, 37.5° and 75° inclination only.

6 Modification

Under negative pressure the SLS and ULS test pressures were not achievable due to deflection at the centre of the sides of the sash and the following modifications were made:

Adlux removed rubber bushes within the three electric motors to reduce play and applied PVC and Tescon Extora tape to seal the internal side of the operable sash to frame of the skylight due to leakage caused by non-permanent deflection at the centre of the sash.

During the static and cyclic water penetration test a temporary plastic film was placed along the top of the skylight to deflect water from the upstand and hinge side of the skylight. This was in part because the initial test was undertaken in the vertical position. This plastic film was removed for subsequent static water penetration testing undertaken in several inclinations' representative of the likely product installation (0.5°, 37.5° and 75°).

7 TESTING EQUIPMENT

Table 4 Testing Equipment

Item	Description	ID	Calibration
Manometer	DG 1000	SWTL - 068 (Serial No: 11040)	Date of next calibration: 04 November 2025
Anemometer	FLSchmidt	SWTL - 050 (Serial No: 000011234)	Date of next calibration: 17 January 2025
Anemometer	FLSchmidt	SWTL - 017 (Serial No: 000008907)	Date of next calibration: 27 May 2025
LDS	Bojke BLG-250N-485	SWTL - 108 (Serial No: SWTL-108)	Date of next calibration: 26 February 2025
LDS	Bojke BLG-250N-485	SWTL – 109 (Serial No: SWTL-109)	Date of next calibration: 26 February 2025
LDS	Bojke BLG-250N-485	SWTL - 110 (Serial No: SWTL-110)	Date of next calibration: 26 February 2025

8 ENVIRONMENTAL CONDITIONS

Table 5 Environmental Conditions

12 December 2024			
Temperature °C	Barometric Pressure hPa	Humidity	Calm / Windy
21	1007	87%	Light/East
13 December 2024			
21	1005	83%	Variable
16 December 2024			
18.5	1014	96%	Light/South

9 TEST RESULTS

9.1 Results

9.2 AS/NZS 4284:2008

(a) Preliminary tests:

Table 6: Preliminary Tests

Clause	Test Date	Applied Pressure	Result
8.2	12th December 2024	+ 1625 Pa	Pass
8.2	12th December 2024	- 1405 Pa	Pass
Comments	No damage noted. Deflection at approximately -900 Pa caused sufficient sash deflection and leakage that the operable sash required tape to the frame on the internal side to achieve SLS of -1405 Pa.		

Test	Applied Pressure	Result
Static Pressure	489 Pa	PASS
Cyclic Pressure	244-488 Pa	PASS
Cyclic Pressure	325-650 Pa	PASS
Cyclic Pressure	489-975 Pa	PASS
Comments	Temporary plastic was fitted to the top of the skylight to deflect water from the hinged/upstand side of the skylight.	

(b) Structural test at serviceability state:

Table 7: Structural test at SLS

Clause	Test Date	Applied Pressure	Deflection/Span Result	Successive Member Displacement Result
8.3	12th December 2024	+ 1625 Pa	Pass	Pass
8.3	12th December 2024	- 1405 Pa	Pass	Pass
Criteria	Clause 8.3.5, no framing members shall deflect by an amount greater than span/250 mm.			
Comments	No damage noted.			

(c) Air infiltration test:

Table 8: Air infiltration tests at 150 Pa (vertical mount / 90° within test booth)

Clause	Test Date	Applied Pressure	Allowable Leakage l/s	Leakage l/s	Leakage l/s/m²	Result
8.4	12th December 2024	+/- 150 Pa	8.38	+0.21 - 5.58	1.07	Pass
Criteria	Clause 9.3 Air infiltration for airconditioned buildings shall not exceed 1.6 L/m²s.					
Comments	Air leakage area and result values are the combination of both samples.					

Table 9: Air infiltration tests at 75 Pa (45° inclination)

Clause	Test Date	Applied Pressure	Allowable Leakage l/s	Leakage l/s	Leakage l/s/m²	Result
8.4	13th December 2024	+/- 75 Pa	8.38	+/- 0.01	0.002	Pass
Criteria	Clause 9.3 Air infiltration for airconditioned buildings shall not exceed 1.6 L/m²s.					
Comments	Air leakage area and result values are the combination of both samples.					

Table 10:Air infiltration tests at 150 Pa (45° inclination)

Clause	Test Date	Applied Pressure	Allowable Leakage l/s	Leakage l/s	Leakage l/s/m²	Result
8.4	13th December 2024	+/- 150 Pa	8.38	+0.01 -0.04	0.008	Pass
Criteria	Clause 9.3 Air infiltration for airconditioned buildings shall not exceed 1.6 L/m²s.					
Comments	Air leakage area and result values are the combination of both samples.					

(d) Water penetration test by static pressure and cyclic:

Undertaken in vertical position as part of the preliminary test (T0252).

Due to installation design < 75°incination additional water penetration testing of the sample was undertaken to simulate most likely skylight installation scenarios of 0.5°, 37.5° and 75°. Only static water penetration tests were performed.

Table 11: Three additional static water penetration tests at different roof pitch installations

Clause	Test Date	Applied Angle (°) and Pressure (Pa)	Result
8.5 / 8.6	13th December 2024	0.5°, - 455 Pa	Pass
Criteria	Clause 9.4, Under static and cyclic pressures there shall be no leaks. For both the static and cyclic water tests, a leak is considered to occur when one or more of the following occur: (a) Water appears on any inside surface of the facade and is visible from an occupied space. (b) Uncontrolled water appears on any inside surface of the facade. (c) Water appears that is likely to wet insulation, fixtures and finishes. (d) Water appears in other locations specified as unacceptable by the Specifier.		
Comments	No leaks evident.		

Clause	Test Date	Applied Angle (°) and Pressure (Pa)	Result
8.5 / 8.6	13th December 2024	37.5°, - 455 Pa	Pass
Criteria	Clause 9.4, Under static and cyclic pressures there shall be no leaks. For both the static and cyclic water tests, a leak is considered to occur when one or more of the following occur: (a) Water appears on any inside surface of the facade and is visible from an occupied space. (b) Uncontrolled water appears on any inside surface of the facade. (c) Water appears that is likely to wet insulation, fixtures and finishes. (d) Water appears in other locations specified as unacceptable by the Specifier.		
Comments	No leaks evident.		

Clause	Test Date	Applied Angle (°) and Pressure (Pa)	Result
8.5 / 8.6	16th December 2024	75°, - 455 Pa	Pass
Criteria	Clause 9.4, Under static and cyclic pressures there shall be no leaks. For both the static and cyclic water tests, a leak is considered to occur when one or more of the following occur: (a) Water appears on any inside surface of the facade and is visible from an occupied space. (b) Uncontrolled water appears on any inside surface of the facade. (c) Water appears that is likely to wet insulation, fixtures and finishes. (d) Water appears in other locations specified as unacceptable by the Specifier.		
Comments	No leaks evident.		

(e)Seismic test at serviceability limit state displacement: Not carried out.

(f) BMU restraint test: Not carried out.

(g)Strength test at ultimate limit state:

Table 12: Strength test at ULS

Clause	Test Date	Applied Pressure	Duration	Result
8.8	16th December 2024	+ 2285 Pa -1975 Pa	10 sec.	Pass
Criteria	Clause 9.7 Under structural test at ultimate limit state there shall be no collapse of the test sample. Collapse shall mean any one or any combination of the following: (a) Disengagement or partial disengagement of any framing member, facade panel or any part thereof. (b) Failure of any fixings that connect the façade to the building structure. (c) Failure of any stop, locking device, fastener or support which could allow an opening light to come open. (d) Repeated breakage of glass resulting in loss of chamber pressure. Glass may only be replaced once before the sample is deemed to have collapsed. (e) Repeated cracking of glass which does not result in loss of chamber pressure. Glass may only be replaced twice before the sample is deemed to have collapsed.			
Comments	Deflection at approximately -900 Pa caused sufficient leakage that the operable sash required tape to the frame on the internal side to achieve SLS of - 1975 Pa.			

Table 13: ULS to Failure

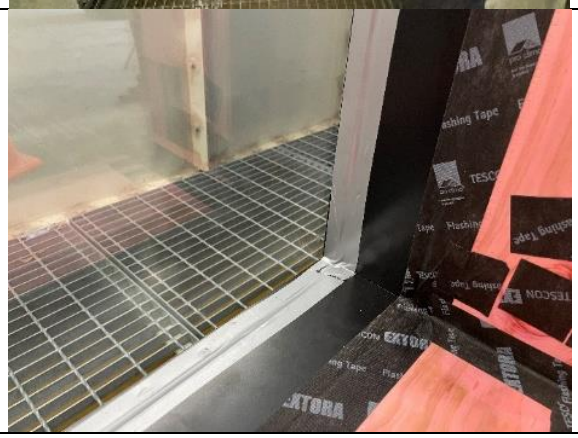
Clause	Test Date	Applied Pressure	Duration	Result
8.8	16th December 2024	-4100 Pa	10 sec.	Pass
Criteria	Clause 9.7 Under structural test at ultimate limit state there shall be no collapse of the test sample. Collapse shall mean any one or any combination of the following: (a) Disengagement or partial disengagement of any framing member, facade panel or any part thereof. (b) Failure of any fixings that connect the façade to the building structure. (c) Failure of any stop, locking device, fastener or support which could allow an opening light to come open. (d) Repeated breakage of glass resulting in loss of chamber pressure. Glass may only be replaced once before the sample is deemed to have collapsed. (e) Repeated cracking of glass which does not result in loss of chamber pressure. Glass may only be replaced twice before the sample is deemed to have collapsed.			
Comments	Tape was required between frame on the internal side to achieve SLS and ULS under negative pressure. Signification deflection at mid span of sides of sash that tape was bellowed to allow for movement due to deflection. At approximately 4200 Pa the lower left corner of the glazing sealant failed, and two sides of the glazing released, ejecting the gasket and exposing the backer rod. No permanent deformation to the sash or glass breakage was noted.			

(h) Seismic test at ultimate limit state displacement: Not carried out.

(i) Seal degradation test: Not carried out.

9.3 Observations

Table 14 Observations

Obs. No:	Test	Observation	Photo
1	Water testing – Static	No leaking or water penetration evident. Temporary plastic deflection sheet at top of skylight.	
2	SLS – Negative pressure (-1405 Pa)	Tape required between operable sash and frame to achieve negative SLS.	

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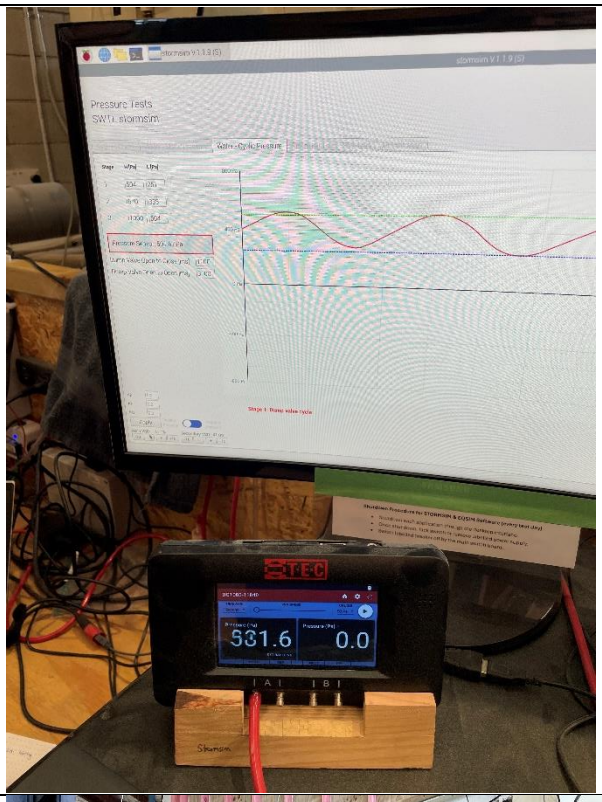
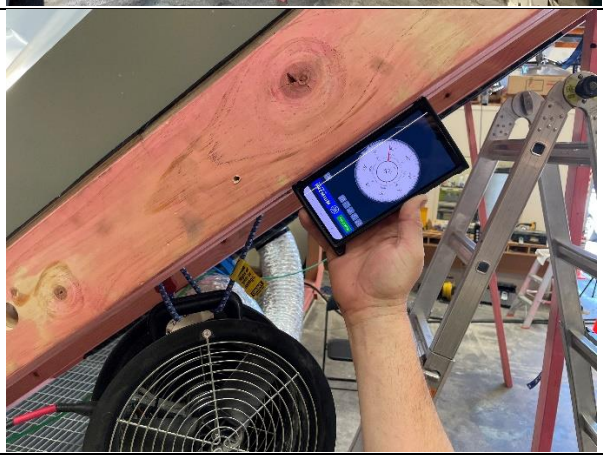
3	Cyclic water test at vertical position within booth	Target pressure 244 Pa – 488 Pa	
4	Air infiltration test at 45° inclination	Perspex enclosure on inside of frame.	
5	Static water penetration test setup at 37.5° inclination		

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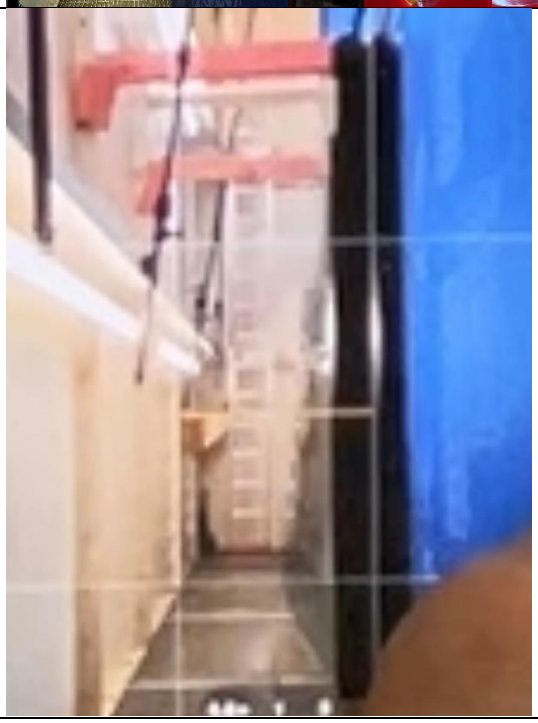
6	Static water penetration test at 37.5° inclination	Setup uses (WGANZ 502) spray rack to apply > 3.0 lpm/m² with negative 488 Pa applied to internal surface of the sample	
7	Static water penetration test at 75° inclination	Setup uses (WGANZ 502) spray rack to apply > 3.0 lpm/m² with negative 488 Pa applied to internal surface of the sample at 75°	 
8	Post Structural ULS Negative Pressure	Further to structural ULS testing (+ 2285 Pa, -1975 Pa), client requested test to failure (-4100 Pa achieved)	

10 DISCLOSURE/QUALIFICATIONS

On instruction of Adlux Industries Limited:

- Adlux Industries Limited Drawings attached to this report have been provided by the client and SWTL accepts no liability with regards to the accuracy of the drawings.
- SWTL has not be provided with any other test reports from the manufacturer or manufacturing instructions.
- This report has been prepared solely for the party of who it was addressed within the terms of the brief provided to this company. This report may not be used for any other context or for any other purpose without prior agreement.
- This report may not be read or reproduced other than a complete document.

11 IANZ ACCREDITATION

This testing has been produced under IANZ accreditation number: **1438**

12 TESTING OFFICERS

Name: Mark Ashforth Date: 13 February 2025

Signature: 

Matt Lewis Date: Date: 13 February 2025

Signature: 

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13 REPORT WRITER

Name: Mark Ashforth Date: 13 February 2025

Signature: 

14 PEER REVIEWED BY

Name: Bernard Farrington Date: 13 February 2025

Signature: 

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15 Appendix A – Test Request Form

J-24073 Adlux Skylight (2.05m x 2.54m) 12/12/24

SHELBY WRIGHT TEST LABS

SPECIFIC TEST REQUIREMENTS

Section	Test Name	Clause	Required parameters
a	Preliminary test	8.2.1	
	SLS pressure	8.2.2/8.3	SLS(+) = Pa 1625
			SLS(-) = Pa 1405
	Water static	8.2.3/8.5	Static water test pressure = Pa
	Water—Cyclic	8.2.3/8.6	Cyclic test pressure Stage 1 = 244 - 488 Pa
		8.2.3/8.6	Cyclic test pressure Stage 2 = 325 - 650 Pa
		8.2.3/8.6	Cyclic test pressure Stage 3 = 488 - 975 Pa
b	Structural test at SLS	8.3.2	Location of transducers noted on drawings? Y/N
		8.3.3	Pressure steps?
			Max. displacement? = mm
Members or panels		Deflection/span limit ratio	
c	Air infiltration test	Test pressure	(+) = 150 Pa
			(-) = 150 Pa
		Air infiltration limit = (l/m²s)	
d	Water test (static and cyclic)	Pressure (Pa)	Duration (mins) / Duration and spray intensity
	Static		5 — 15 min, 0.05 L/m² s
	Cyclic 1		5 — 5 min, 0.05 L/m² s
	Cyclic 2		5 — 5 min, 0.05 L/m² s
	Cyclic 3		5 — 5 min, 0.05 l/m²s
Additional water penetration requirements?			
e	Seismic at SLS		Water test repeated after Yes / No
	Instructions for location and attachment of Seismic support beam:		
	Drawing reference for location of Seismic support beam attachment =		
	Support beam movement allowed =		
	Number of cycles =		
	Frequency of movement =		
f	BMU restraint test required Yes / No		Test load across face of sample = kN
			Test load perpendicular to sample = kN
g	Strength at ULS	Test pressure	(+) = 2925 Pa
			(-) = 1975 Pa
h	Seismic at ULS		
	Support beam movement allowed = mm		
	Number of cycles =		
	Frequency of movement = Hz		
i	Seal degradation		10% air seal removal? Y/N
Describe seals to be altered			

SWTL\Lab Manuals\Quality Manual & Supporting Doc's\SWQM-7.1 External Client Contract – Test Booth Hire.docx
Page 9 of 9

Client: Adlux Industries
Matthew Church

Date: 12/12/24

16

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17 Appendix B – Drawings

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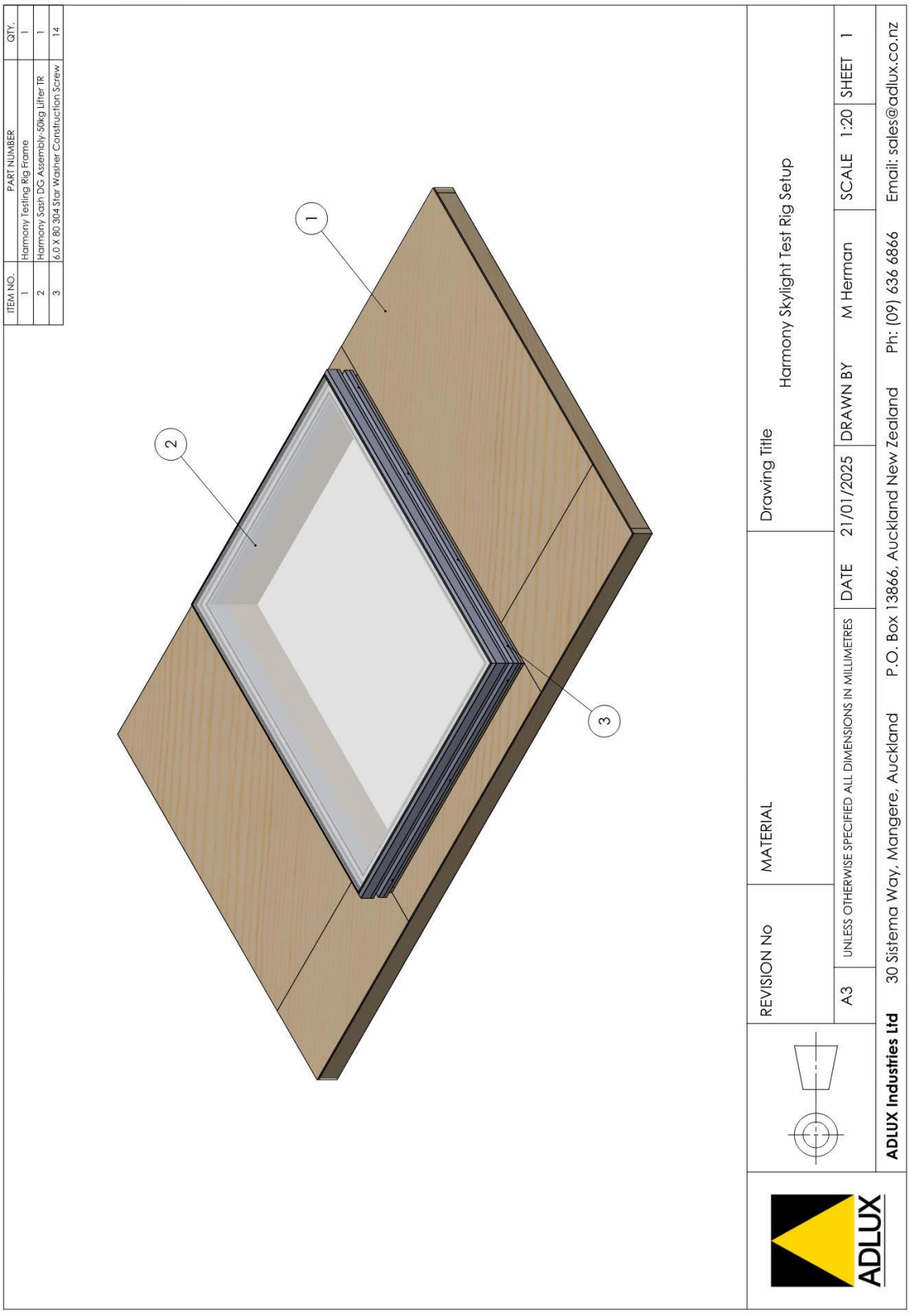

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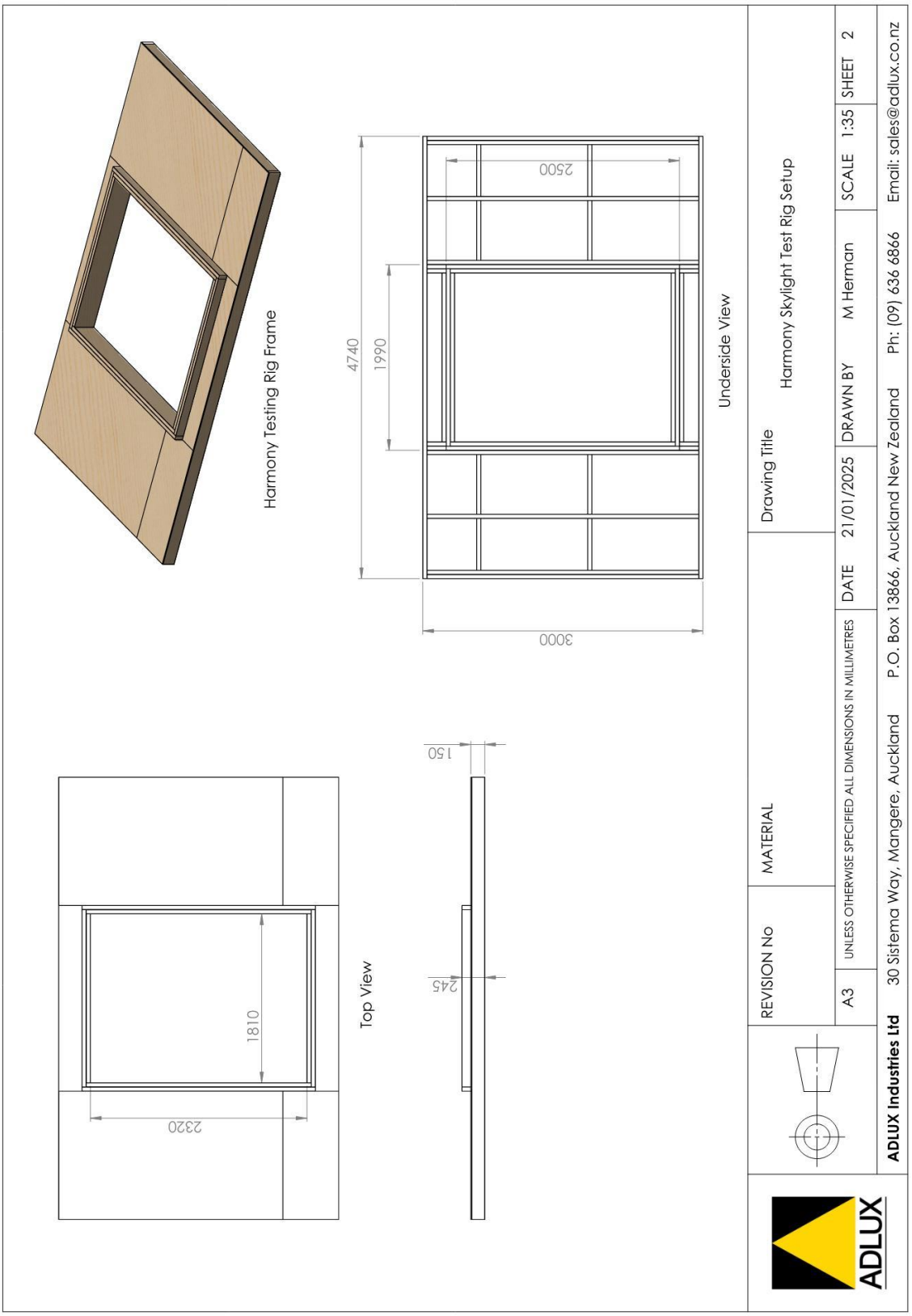

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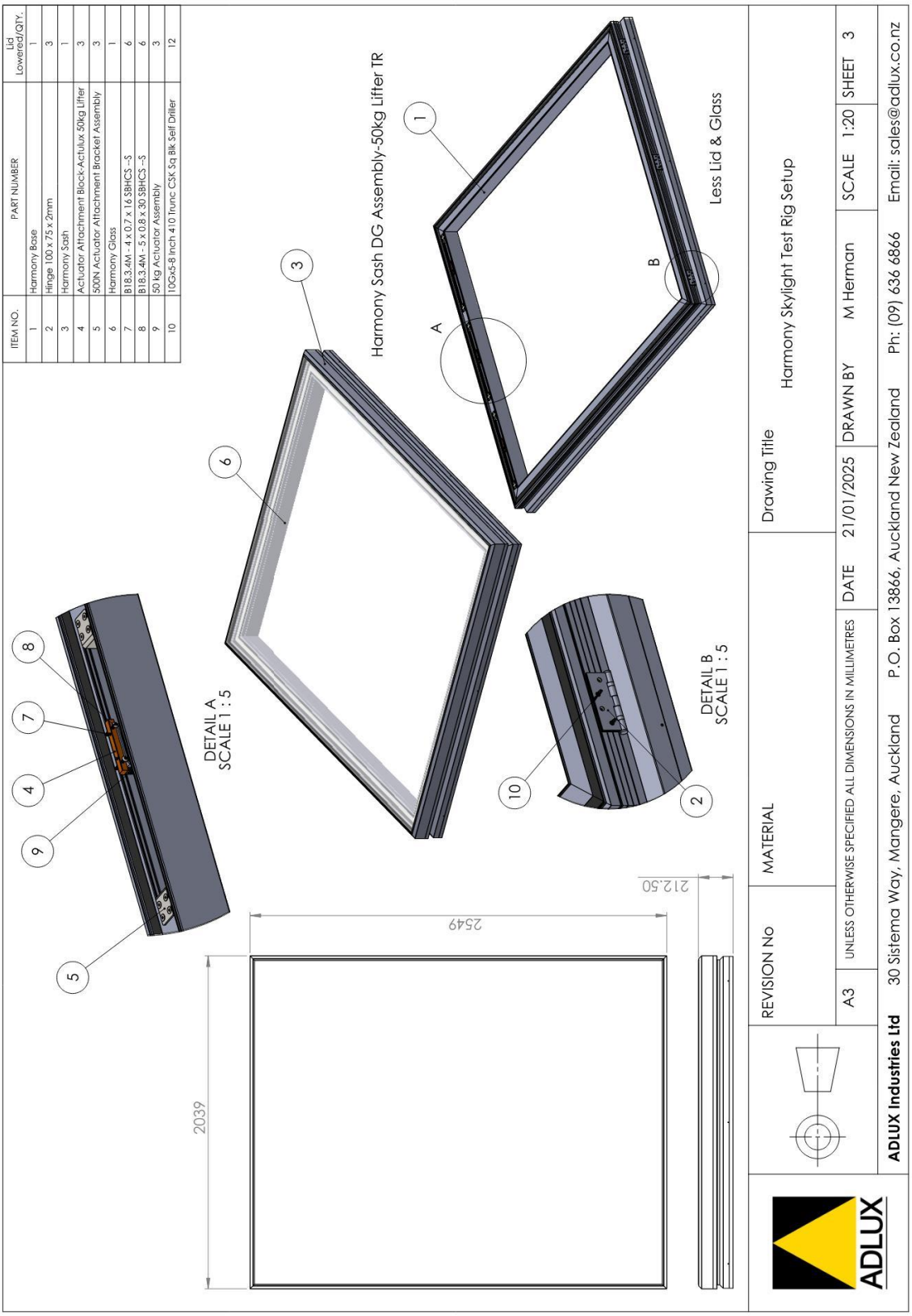

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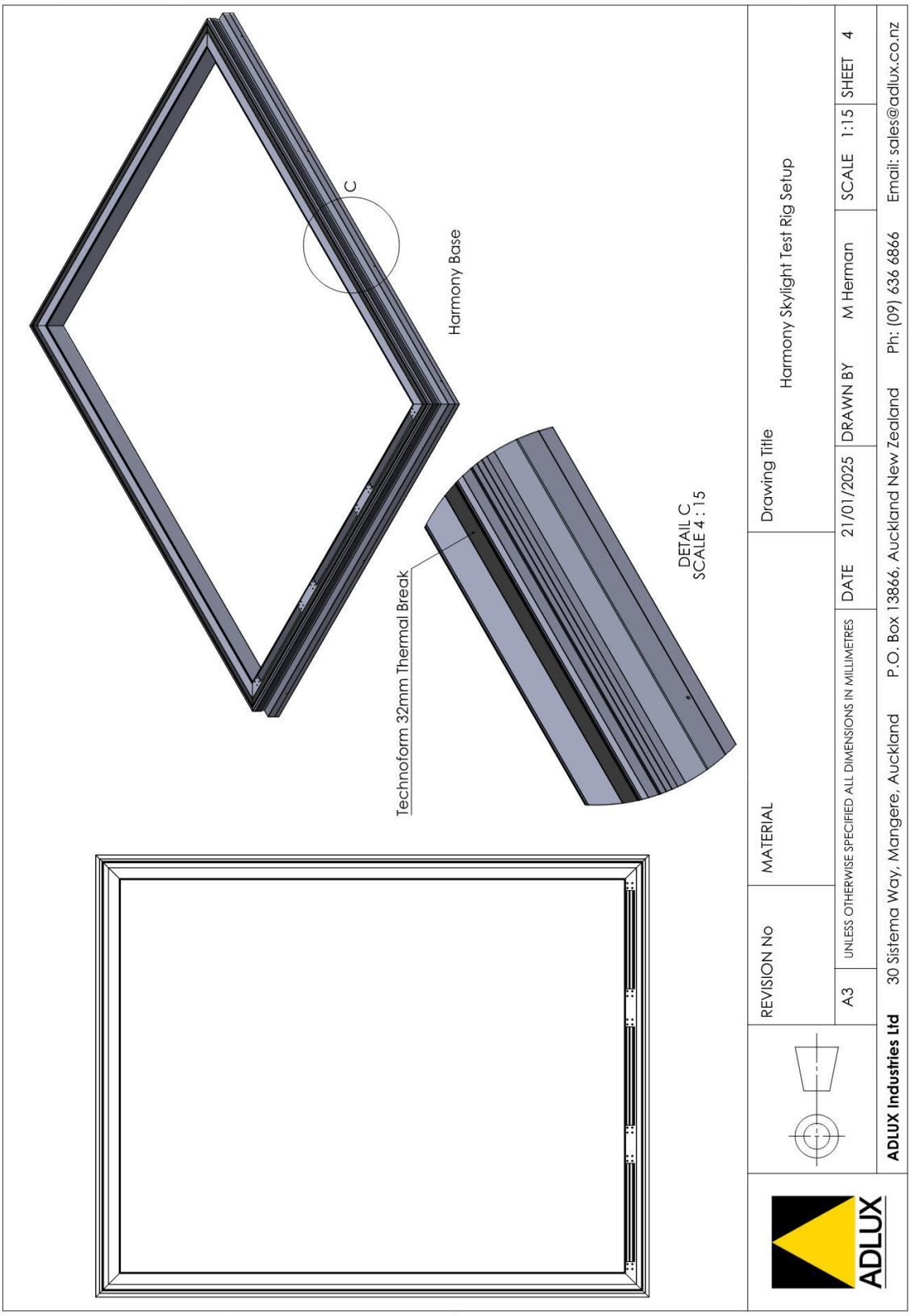

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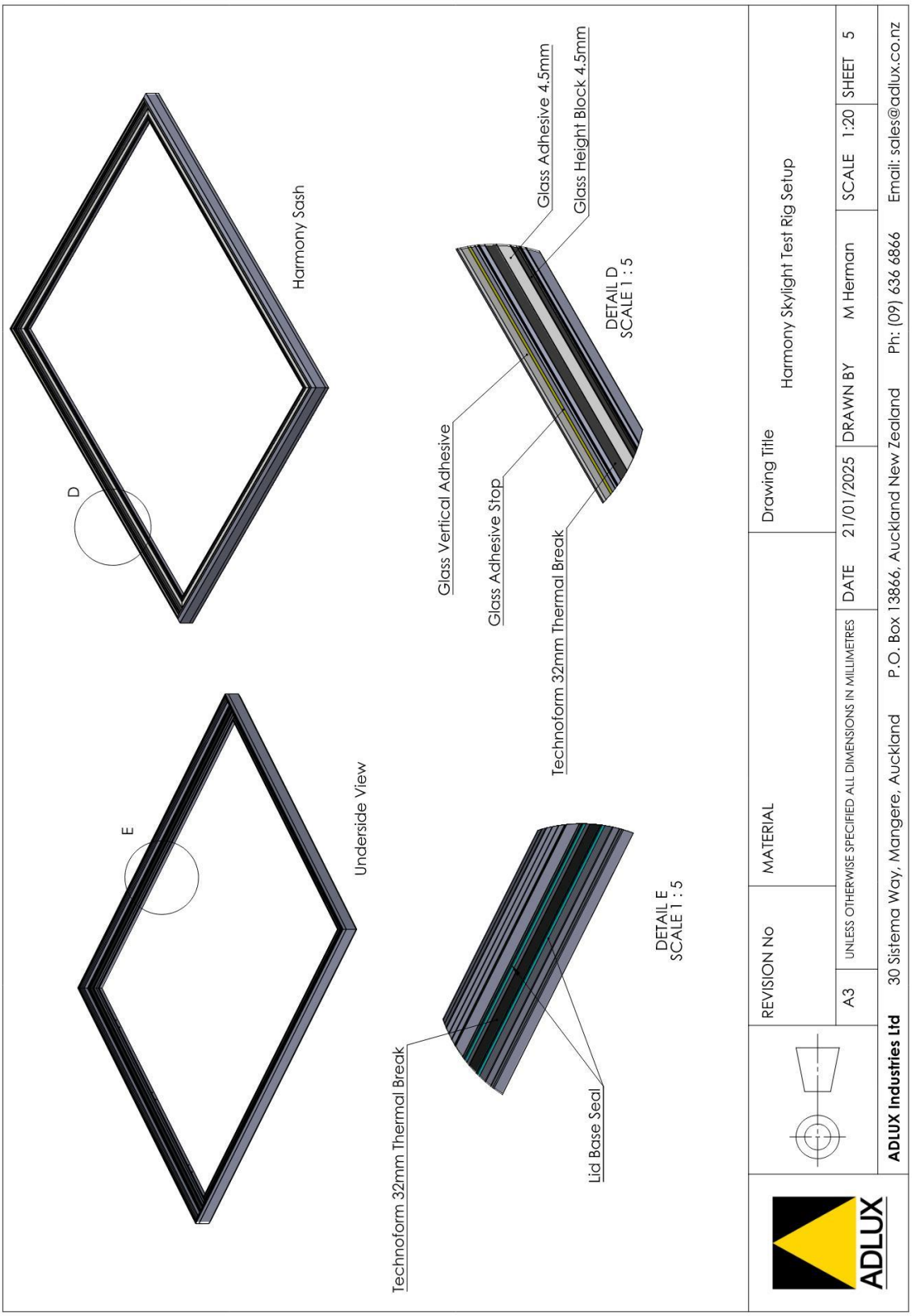

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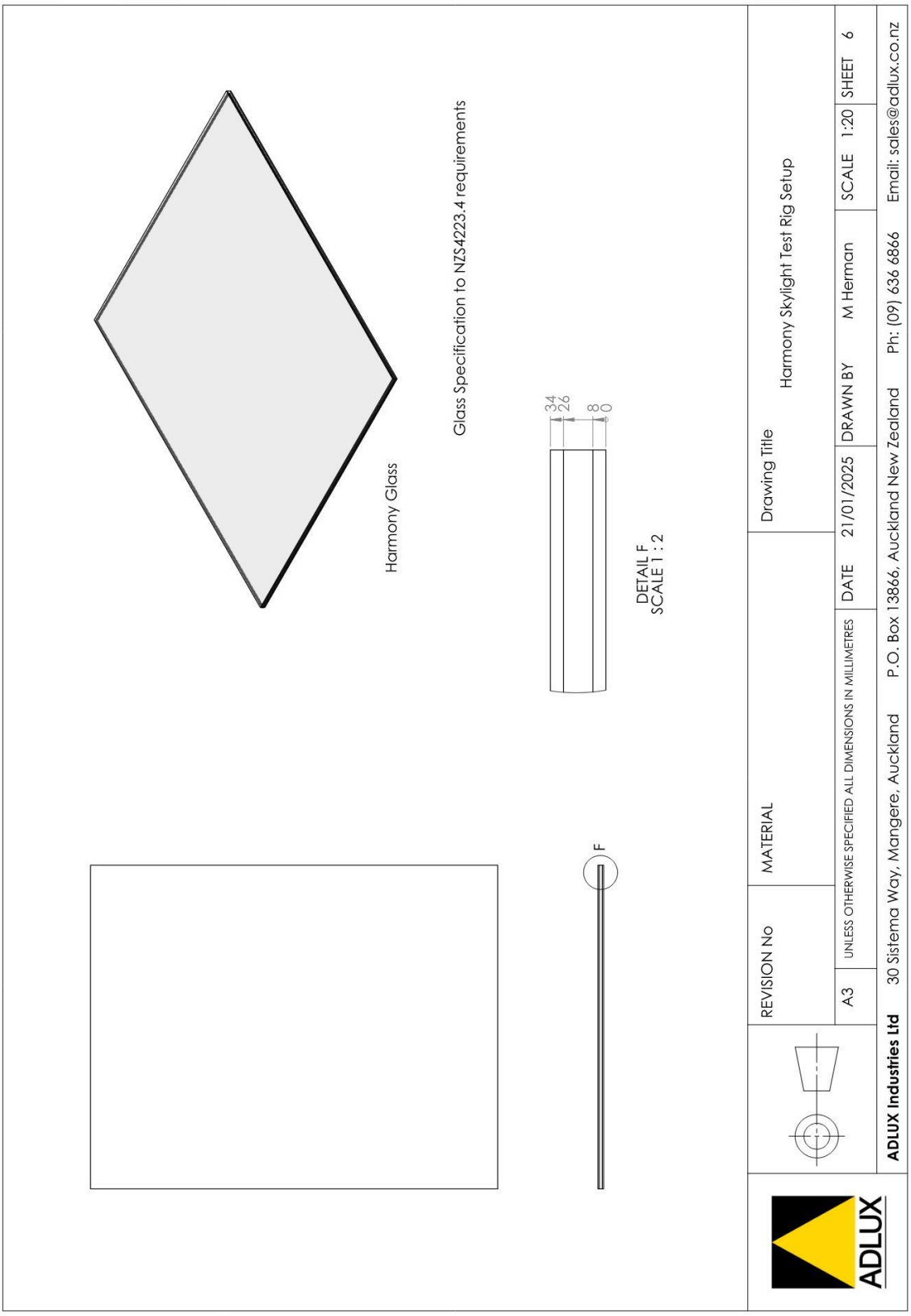

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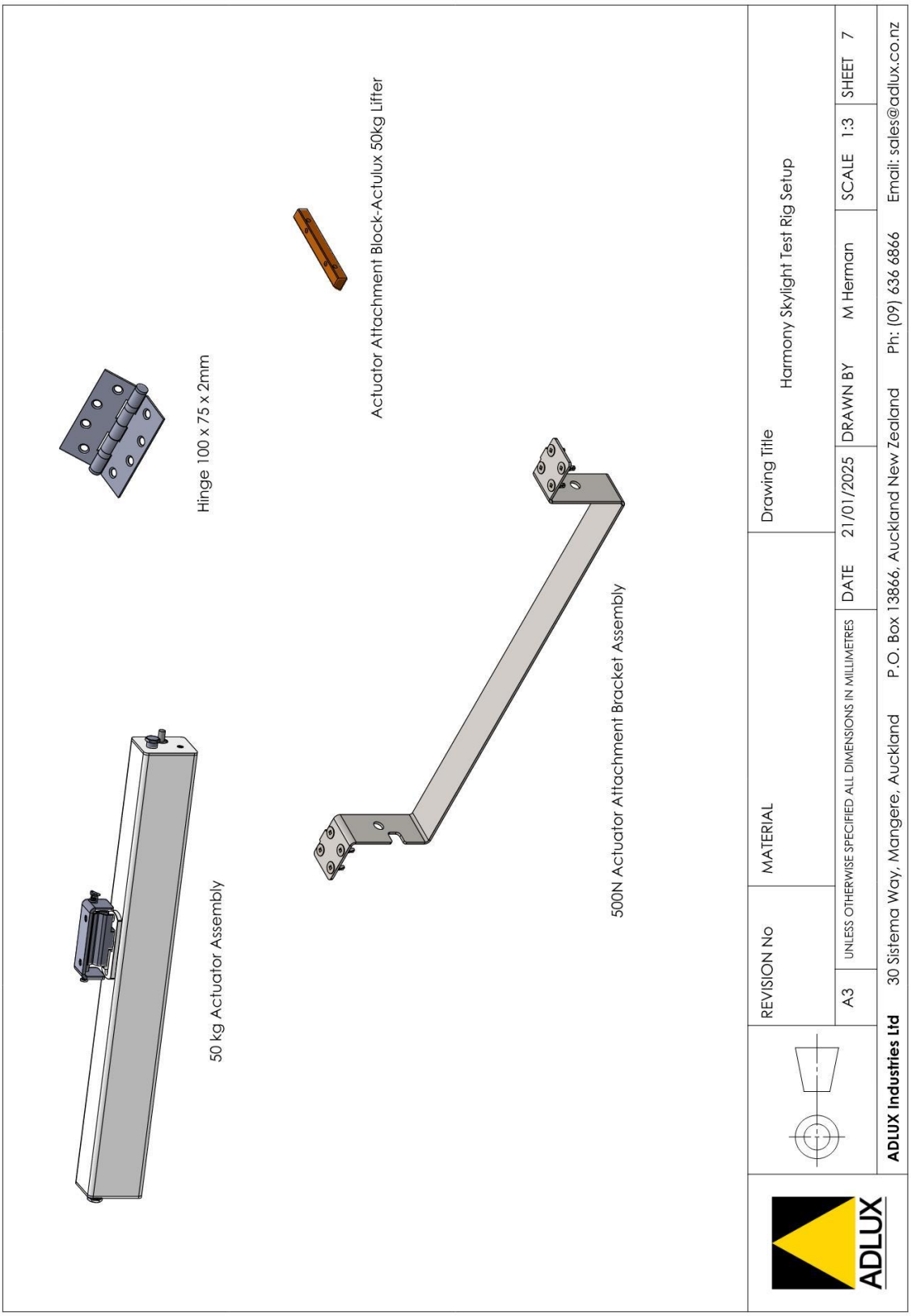

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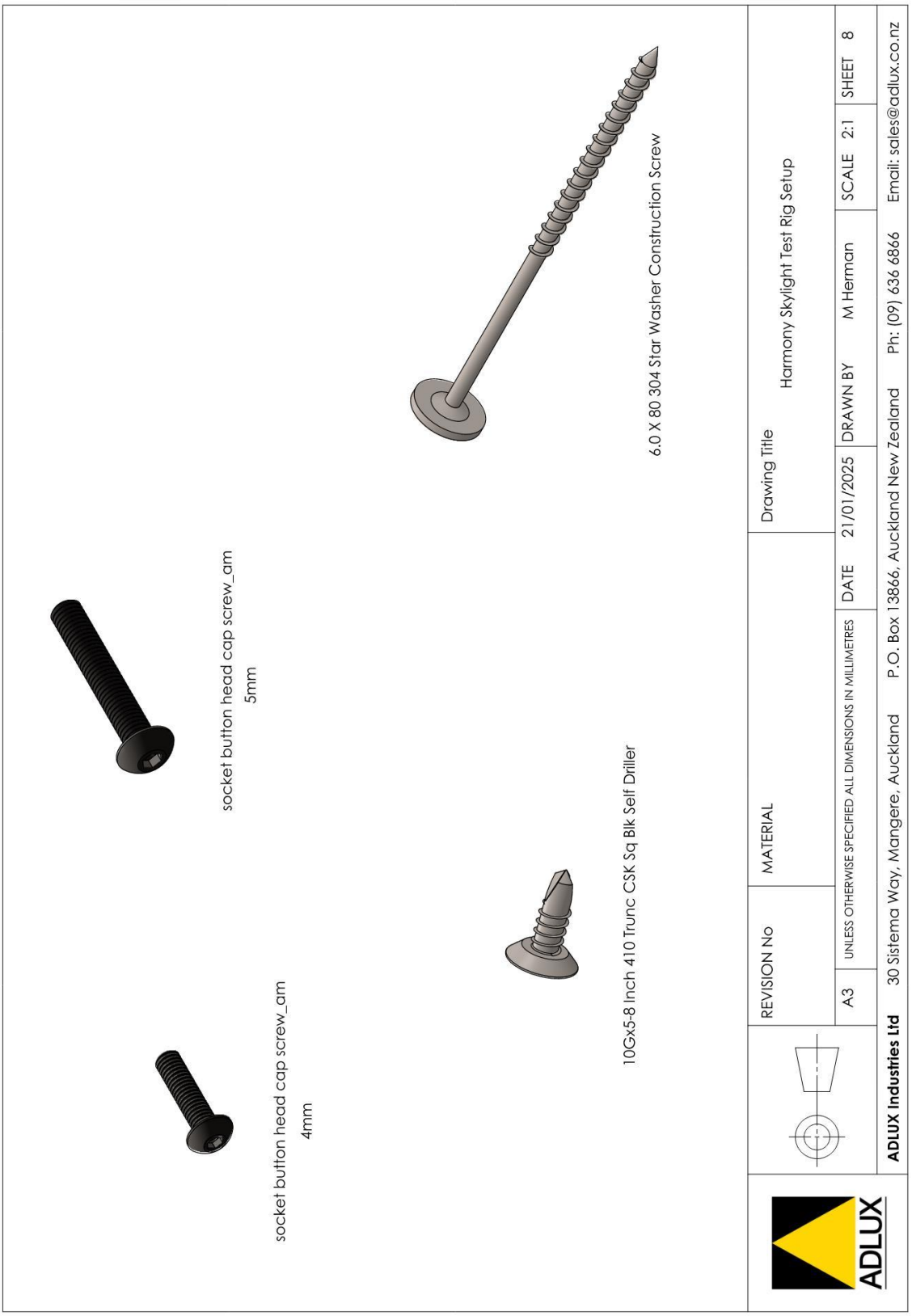

Tested By Mark Ashforth

Report Writer Mark Ashforth

Authorised by Bernard Farrington

18 Appendix C – Worksheets

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Report Date: 13 February 2025

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CLIENT / DATE	Adlux Skylight 12/12/24 - 16/12/24
TEST OPERATOR	Mark Ashforth
DESCRIPTION OF SAMPLE	Harmony skylight, 2.544m x 2.052m
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig Setup

4284 Cl.	TEST				RESULT
8.3	Structural Test at Servicability Limit State				
	SERVICEABILITY LIMIT STATE TEST PRESSURE	+	1625	Pa	Pass
		-	1405	Pa	
8.4	Air Infiltration				
			150	Pa	Pass
			Airconditioned Building		Y
			Non-Airconditioned Building		
8.5	Water Penetration Test by Static Pressure				
	Specified Test Pressure		300	Pa or	Pass
	Test Pressure: 0.3 x SLS Pressure		487.5	Pa	
8.6	Water Penetration Test by Cyclic Pressure				
			243.75	487.5 Pa	N/A
			325	650 Pa	N/A
			487.5	975 Pa	N/A
8.9	Servicability Seismic Displacment Test				
	Reverse cycles at SLS inter-storey displacement				N/A
	Specified SLS displacement:			mm	
	Cycle Frequency			Hz	
8.6	Water Penetration Test by Cyclic Pressure - Post Seismic SLS				
			243.75	487.5 Pa	N/A
			325	650 Pa	N/A
			487.5	975 Pa	N/A
8.8	Structural Test at Ultimate Limit State				
	ULTIMATE LIMIT STATE TEST PRESSURE	+	2284.5	Pa	Pass
		-	1975.35	Pa	
8.9	Ultimate Seismic Displacment Test				
	Reverse cycles at SLS inter-storey displacement				N/A
	Specified SLS displacement:			mm	
	Cycle Frequency			Hz	

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SWTM-1.1 AS_NZS4284 Worksheet Preliminary Testing v3

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Version	3		TEST No: SWTL T-	T0252
Date Created	04-Apr-24 BF		Sheet #	1
Date Checked	23-Apr-24 BF		of sheets	

	+	1625 Pa	10 sec	
SERVICEABILITY LIMIT STATE TEST PRESSURE	-	1405 Pa	10 sec	Unable to reach - SLS pressure without taping between frame and operable sash on internal side.

STATIC PRESSURE TEST AS/NZS 4284:2008

Specified Test Pressure 300 Pa

Test Pressure: 0.3 x SLS Pressure 487.5 Pa

Note: Adjust water pump to meet noted spray nozzle calibration pressure

Pressure	Time	Comments
0 Pa	5 min.	water tests along top of skylight to deflect water from hinge/upstand side of skylight.
487.5 Pa	15 min.	No water evident
0 Pa	5 min.	No Water evident

CYCLIC PRESSURE TEST AS/NZS 4284:2008

5 MINS @ 0.15 - 0.30 +ve SLS Test Pressure Pa	Based on minimum +ve SLS of 1000 Pa. 2 minutes zero pressure between each stage.
5 MINS @ 0.20 - 0.40 +ve SLS Test Pressure Pa	
5 MINS @ 0.30 - 0.60 +ve SLS Test Pressure Pa	

Note: If Cyclic test is more than 30 minutes after Static test, then water must be turned on for 5 minutes prior to cyclic pressure.

Pressure			Water On/Off	Time	Comments
243.75	487.5	Pa	On	5 min.	Minor leak at base of wall where taped to booth. Outside of skylight test sample area.
0		Pa	On	2 min.	No leaks
325	650	Pa	On	5 min.	No Leaks
0		Pa	On	2 min.	No Leaks
487.5	975	Pa	On	5 min.	No Leaks
0		Pa	Off	5 min.	No Leaks

Result Pass Checked MA

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SWTM-1.2 AS_NZS4284 Worksheet Deflection Measurements v3

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Version	3	TEST No: SWTL T-	53
Date Created	04-Apr-24 BF	Sheet #	2
Date Checked	23-Apr-24 BF	of sheets	

Note: This worksheet is for use with laser distance measurement

CLIENT	Adlux Skylight 12/12/24 - 16/12/24
TEST OPERATOR	Mark Ashforth
DESCRIPTION OF SAMPLE	Timber frame, Adhero membrane with operable skylight unit.
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig Setup
MEMBER TESTED	Left side looking out of building. Using brackets temporarily fixed to jamb.

SERVICEABILITY LIMIT	+	1625	Pa	Overall length	2310	mm
STATE TEST PRESSURE	-	1405	Pa	Gauge length	2232	mm
*Specified maximum deflection ratio				Max defl. (1/	250	)
				Max defl. Specified	8.93	mm
SNZ TS 4284 default = span/250				Max defl. Default	8.93	mm
Atmospheric Conditions				Temperature	21	°C
				Barometric Pressure	1007	hPa
				Relative Humidity	87	%

	Bottom	Middle	Top
Gauge #	108	109	110

	SLS test pressure			Input Values (Direct Displacement			Net centre deflection mm	Default Ratio Check	Specified Ratio Check		Successive Member Displacement		
Stage	Time	%	Pa							Mode	Value	Limit Δ	Check
	0 min	0%	0	267.3	283.7	295.6							
	2 min	100%	1625	261.0	271.0	278.3	-0.9			Take Up			
Z1	2 min	0%	0	266.6	282.5	293.8	0.95	<<= Zero Ref			0.95	3	
	1 min	20%	325	265.7	280.9	292.1	-0.3	-3%	-3%	Mode 1			
	1 min	40%	650	264.1	278.7	288.0	0.35	4%	4%				
	1 min	60%	975	262.7	276.7	285.9	0.1	1%	1%				
	1 min	80%	1300	262.6	273.8	281.9	-0.75	-8%	-8%				
	1 min	100%	1625	260.8	271.1	277.8	-0.5	-6%	-6%				
Z2	2 min	0%	0	266.5	282.0	293.1	-0.1	-1%	-1%		-0.1		-0.1
	1 min	100%	1625	260.8	270.9	277.5	-0.55	-6%	-6%				
	1 min	80%	1300	260.8	272.2	280.0	-0.5	-6%	-6%				
	1 min	60%	975	262.5	275.1	282.3	0.4	4%	4%				
	1 min	40%	650	262.8	277.0	286.0	0.3	3%	3%				
	1 min	20%	325	264.5	278.7	288.2	0.05	1%	1%				
Z3	2 min	0%	0	266.3	281.8	292.7	2.84217E-14	0%	0%		0		0
	NEGATIVE PRESSURE												
	2 min	-100%	-1405	275.8	297.7	316.4	-0.7	-8%	-8%	Mode 2			
Z4	2 min	0%	0	268.60	288.20	301.90	0.65	<<= Zero Ref			0.65	3	
	1 min	-20%	-281	270.00	288.90	302.80	-0.45	-5%	-5%				
	1 min	-40%	-562	271.20	291.50	307.30	-0.7	-8%	-8%				
	1 min	-60%	-843	272.20	293.20	309.10	-0.4	-4%	-4%				
	1 min	-80%	-1124	273.80	294.80	312.40	-1.25	-14%	-14%				
	1 min	-100%	-1405	275.60	296.60	316.00	-2.15	-24%	-24%				
Z5	2 min	0%	0	268.90	289.30	301.90	0.95	11%	11%		0.95		0.95
	1 min	-100%	-1405	275.70	296.70	316.20	-2.2	-25%	-25%				
	1 min	-80%	-1124	274.80	295.00	314.90	-2.8	-31%	-31%				
	1 min	-60%	-843	273.80	293.80	312.00	-2.05	-23%	-23%				
	1 min	-40%	-562	272.30	291.70	309.10	-1.95	-22%	-22%				
	1 min	-20%	-281	270.50	290.70	306.50	-0.75	-8%	-8%				
Z6	2 min	0%	0	269.10	289.80	301.90	1.35	15%	15%		1.35		1.35
	POSITIVE PRESSURE												
	2 min	100%	1625	260.40	270.50	278.00	-1	-11%	-11%	Mode 3			
Z7	2 min	0%	0	266.70	283.20	294.70	0.2	2%	2%		0.2		0.2

Result: Pass Checked: MA

Note: Laser delfection sensor layout was 108 - bottom, 109-middle, 110-top. Drawing in appendices.

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SWTM-1.3 AS_NZS4284 Worksheet Air Infiltration Measurements v4

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Version	4	TEST No: SWTL T-	254
Date Created	04-Apr-24 BF	Sheet #	3
Date Checked	23-Apr-24 BF	of sheets	
CLIENT		Adlux Skylight 12/12/24 - 16/12/24	
TEST OPERATOR		Mark Ashforth	
DESCRIPTION OF SAMPLE		Harmony skylight, 2.544m x 2.052m	
CLIENT DRAWING REF(S)		Harmony Skylight Test Rig Setup	

Sample Width	2.052	m	Sample Perimeter Length	9.208	m
Sample Height	2.552	m			
Sample Area	5.236704	m^2			

AS/NZS 4284:2008 Maximum permitted air flow, l/s at	150	Pa booth pressure		
Overall Sample Area x 1.6	=	8.378726	l/s	
Sample Perimeter Length x 0.6	=	5.5248	l/s	

Atmospheric Conditions	Temperature	21	°C
	Barometric Pressure	1005	hPa
	Relative Humidity	83	%

POSITIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	150	12.5	3.47	150	11.86	3.29
Reading 2	150	12.83	3.56	150	11.42	3.17
Reading 3	150	12.44	3.46	150	12.21	3.39
Average Air Flow			3.50			3.29
Net Air Leakage	0.21	l/s				

NEGATIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	150	35.81	9.95	150	15.68	4.36
Reading 2	150	36.43	10.12	150	15.81	4.39
Reading 3	150	36.02	10.01	150	16.53	4.59
Average Air Flow			10.02			4.45
Net Air Leakage	5.58	l/s				

Result	Pass	Checked	MA

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SWTM-1.3 AS_NZS4284 Worksheet Air Infiltration Measurements v4

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Version	4	TEST No: SWTL T-	255
Date Created	04-Apr-24 BF	Sheet #	4
Date Checked	23-Apr-24 BF	of sheets	
CLIENT		Adlux Skylight 12/12/24	
TEST OPERATOR		MA & ML	
DESCRIPTION OF SAMPLE		Harmony Skylight, 2.544m x 2.052m	
CLIENT DRAWING REF(S)		Harmony Skylight Test Rig Setup	

Sample Width	2.052	m	Sample Perimeter Length	9.208 m
Sample Height	2.552	m		
Sample Area	5.236704	m^2		

AS/NZS 4284:2008 Maximum permitted air flow, l/s at	75	Pa booth pressure	
Overall Sample Area x 1.6	=	8.378726	l/s
Sample Perimeter Length x 0.6	=	5.5248	l/s

Atmospheric Conditions	Temperature	18.4	°C
	Barometric Pressure	1012	hPa
	Relative Humidity	78	%

POSITIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	75	1.81	0.50	75	1.43	0.40
Reading 2	75	1.81	0.50	75	1.98	0.55
Reading 3	75	1.85	0.51	75	1.98	0.55
Average Air Flow			0.51			0.50
Net Air Leakage	0.01	l/s				

NEGATIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	75	1.9	0.53	75	1.64	0.46
Reading 2	75	1.67	0.46	75	1.73	0.48
Reading 3	75	1.66	0.46	75	1.72	0.48
Average Air Flow			0.48			0.47
Net Air Leakage	0.01	l/s				

Result	Pass	MA

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Report Number: SWTL R0073
Report Date: 13 February 2025

ACCREDITED IANZ TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Shelby Wright Test Labs
515 Rosebank Road
Avondale, Auckland
New Zealand, 1026

SWTM-1.3 AS_NZS4284 Worksheet Air Infiltration Measurements v4

G:\Shared drives\Shelby Wright Test Labs\Technical Records\2.0 Testing Procedures, Worksheets and Logs\Test Methods Worksheets

Version	4	TEST No: SWTL T-	256
Date Created	04-Apr-24 BF	Sheet #	5
Date Checked	23-Apr-24 BF	of sheets	
CLIENT		Adlux Skylight 12/12/24	
TEST OPERATOR		MA & ML	
DESCRIPTION OF SAMPLE		Harmony Skylight 2.5m x 2.05m	
CLIENT DRAWING REF(S)		Harmony Skylight Test Rig Setup	

Sample Width	2.052	m	Sample Perimeter Length	9.208 m
Sample Height	2.552	m		
Sample Area	5.236704	m^2		

AS/NZS 4284:2008 Maximum permitted air flow, l/s at	75	Pa booth pressure	
Overall Sample Area x 1.6	=	8.378726	l/s
Sample Perimeter Length x 0.6	=	5.5248	l/s

Atmospheric Conditions	Temperature	18.4	°C
	Barometric Pressure	1012	hPa
	Relative Humidity	78	%

POSITIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	150	3.29	0.91	150	2.99	0.83
Reading 2	150	2.96	0.82	150	2.8	0.78
Reading 3	150	2.83	0.79	150	3.14	0.87
Average Air Flow			0.84			0.83
Net Air Leakage	0.01	l/s				

NEGATIVE PRESSURE

	Sample Unsealed			Sample Sealed		
	Δ P, Pa	Flow, m^3/hr	Flow l/s	Δ P, Pa	Flow, m^3/hr	Flow l/s
Reading 1	150	2.96	0.82	150	2.84	0.79
Reading 2	150	2.58	0.72	150	3.02	0.84
Reading 3	150	2.73	0.76	150	2.86	0.79
Average Air Flow			0.77			0.81
Net Air Leakage	-0.04	l/s				

Result	Pass	Checked	MA

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Report Number: SWTL R0073
Report Date: 13 February 2025

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Shelby Wright Test Labs
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New Zealand, 1026

SWTM-1.4.1 AS_NZS4284 Static Water Penetration v1

G:\Shared drives\Shelby Wright Test Labs\Technical Records\2.0 Testing Procedures, Worksheets and Logs\Test Methods Worksheets

Version	1	TEST No: SWTL T-	257
Date Created	04-Apr-24 BF	Sheet #	6
Date Checked	23-Apr-24 BF	of sheets	

CLIENT	Adlux Skylight 12/12/24 - 16/12/24
TEST OPERATOR	Mark Ashforth
DESCRIPTION OF SAMPLE	Harmony skylight, 2.544m x 2.052m
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig Setup

STATIC PRESSURE TEST AS/NZS 4284:2008

Specified Test Pressure 300 Pa or

Test Pressure: 0.3 x SLS Press 487.5 Pa

Note: Adjust water pump to meet noted spray nozzle calibration pressure

Pressure	Time	Comments
0 Pa	5 min.	Test pressures were reduced (-455 Pa) to allow for sample self-weight at 0.5° and tested using a calibrated 502 rain rack with negative pressure applied to the internal side of the skylight. No Leaks
487.5 Pa	15 min.	No Leaks
0 Pa	5 min.	No Leaks

Result Pass Checked MA

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Report Number: SWTL R0073
Report Date: 13 February 2025

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New Zealand, 1026

SWTM-1.4.1 AS_NZS4284 Static Water Penetration v1

G:\Shared drives\Shelby Wright Test Labs\Technical Records\2.0 Testing Procedures, Worksheets and Logs\Test Methods Worksheets

Version	1	TEST No: SWTL T-	258
Date Created	04-Apr-24 BF	Sheet #	7
Date Checked	23-Apr-24 BF	of sheets	

CLIENT	Adlux Skylight 12/12/24
TEST OPERATOR	MA & ML
DESCRIPTION OF SAMPLE	Harmony Skylight, 2.544m x 2.052m
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig Setup

STATIC PRESSURE TEST AS/NZS 4284:2008

Specified Test Pressure 300 Pa or

Test Pressure: 0.3 x SLS Press 487.5 Pa

Note: Adjust water pump to meet noted spray nozzle calibration pressure

Pressure	Time	Comments
0 Pa	5 min.	Test pressures were reduced (-455 Pa) to allow for sample self-weight at 37.5° and tested using a calibrated 502 rain rack with negative pressure applied to the internal side of the skylight. No Leaks
487.5 Pa	15 min.	No Leaks
0 Pa	5 min.	No Leaks

Result Pass Checked MA

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Report Number: SWTL R0073
Report Date: 13 February 2025

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SWTM-1.4.1 AS_NZS4284 Static Water Penetration v1

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Version	1	TEST No: SWTL T-	259
Date Created	04-Apr-24 BF	Sheet #	8
Date Checked	23-Apr-24 BF	of sheets	

CLIENT	Adlux Skylight 12/12/24
TEST OPERATOR	MA & ML
DESCRIPTION OF SAMPLE	Harmony Skylight 2.5m x 2.05m
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig Setup

STATIC PRESSURE TEST AS/NZS 4284:2008

Specified Test Pressure 300 Pa or

Test Pressure: 0.3 x SLS Press 487.5 Pa

Note: Adjust water pump to meet noted spray nozzle calibration pressure

Pressure	Time	Comments
0 Pa	5 min.	Test pressures were reduced (-455 Pa to allow for sample self-weight at 75° and tested using a calibrated 502 rain rack with negative presure applied to the internal side of the skylight
487.5 Pa	15 min.	No Leaks
0 Pa	5 min.	No Leaks

Result Pass Checked MA

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Report Number: SWTL R0073
Report Date: 13 February 2025

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Shelby Wright Test Labs
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New Zealand, 1026

SWTM-1.7 AS_NZS4284 Worksheet Structural ULS Pressure v3

G:\Shared drives\Shelby Wright Test Labs\Technical Records\2.0 Testing Procedures, Worksheets and Logs\Test Methods Worksheets

Version	3	TEST No: SWTL T-	260
Date Created	04-Apr-24 BF	Sheet #	9
Date Checked	23-Apr-24 BF	of sheets	

Note: This worksheet is for use with laser distance measurement

CLIENT	Adlux Skylight 12/12/24 - 16/12/24				
TEST OPERATOR	Mark Ashforth				
DESCRIPTION OF SAMPLE	Harmony skylight, 2.544m x 2.052m				
CLIENT DRAWING REF(S)	Skylight Test Rig	0	0	0	0

ULTIMATE LIMIT STATE TEST PRESSURE	+	2284.5	10 sec	Comments	
	-	1975.35	10 sec	Comments	Taped perimeter of sash to frame

Atmospheric Conditions	Temperature	18.8	ºC
	Barometric Pressure	1013	hPa
	Relative Humidity	96	%

Result Pass Checked MA

Note:
Minor over run in positive to 2400 Pa, reduced to 2285 Pa

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SWTM-1.7 AS_NZS4284 Worksheet Structural ULS Pressure v3

G:\Shared drives\Shelby Wright Test Labs\Technical Records\2.0 Testing Procedures, Worksheets and Logs\Test Methods Worksheets

Version	3	TEST No: SWTL T-	261
Date Created	04-Apr-24 BF	Sheet #	10
Date Checked	23-Apr-24 BF	of sheets	

Note: This worksheet is for use with laser distance measurement

CLIENT	Adlux Skylight 12/12/24					
TEST OPERATOR	MA & ML					
DESCRIPTION OF SAMPLE	Harmony Skylight, 2.544m x 2.052m					
CLIENT DRAWING REF(S)	Harmony Skylight Test Rig					
	Setup	0	0	0	0	0

ULTIMATE LIMIT STATE TEST	+	2284.5	Pa	10 sec	Comments	
PRESSURE	-	1975.35	Pa	10 sec	Comments	

Atmospheric Conditions	Temperature	18.5	°C
	Barometric Pressure	1014	hPa
	Relative Humidity	96	%

Result N/A Checked MA

Note: The client requested to increase negative pressure from ULS pressure to sample failure. The pressure was increased by 250 Pa increments and held for 10 seconds at each increase until sample failure. Failure ocurred at 4,100 Pa when the glazing unit seperated from sash on two sides . Glazing , sash and frame appeaerd undamaged (not deformed).

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Report Number: SWTL R0073
Report Date: 13 February 2025

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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19 Appendix D – Uncertainty of Measurement

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Report Number: SWTL R0073
Report Date: 13 February 2025

Shelby Wright Test Labs
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SWTM-16.0 V1	Uncertainty of Measurement - Air Infiltration	
Date Created:	04-Dec-23	BF
Date Checked:	12-Dec-23	BF
G:\Shared drives\Shelby Wright Test Labs\Technical Records\12. Error Budget		

Client	Adlux
Test Sample	Harmony Skylight - Vertical orientation in test booth, 150 Pa (T0254)
Date	12-Dec-24
Operator	MA & ML

FLOW COMPENSATION FOR ATMOSPHERIC PRESSURE AND TEMPERATURE

PARAMETER	UNITS	INPUTS		RESULTS	
Flow Reading	m³/h	36.09		Flow Compensated	
Temperature Actual	Degrees Celcius	21	294		
Pressure Actual (Metservice)	Hectapascals	1007	100700	m³/h	35.945
Air Infiltration Pressure	Pascals	150			
				Actual Flow per m²	
Specimen Dimensions	Width (m)	2.052		l/m²/s	1.907
	Height (m)	2.552			
	Area (m²)	5.236704			

UNCERTAINTY OF SAMPLE SIZE

		Dimension measured in (m)	Tape Calibration UoM (%)	Reading Accuracy +/- 0.001 m		UoM of Sample Size %
Dimension (mm)	X-X (U_a)	2.052	0.5%	0.001	U_a	0.977%
Dimension (mm)	Y-Y (U_b)	2.552	0.5%	0.001	U_b	1.237%

$$U\,m^2 = \sqrt{\left[\left[\frac{U(A)}{A}\right]^2 + \left[\frac{U(B)}{B}\right]^2\right]}$$ 0.006794823 %

UNCERTAINTY OF AIR INFILTRATION FLOW RATE

Daaks Certificate UoM for Schmidt SS.20.260	1.3% %
$U^2\,[Flow] = [\frac{L}{S}]^2\,U^2\,m^2 + [m^2]^2\,U^2\,[\frac{L}{S}]$	10.087139%
UoM Air Infiltration	31.760257%

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Report Number: SWTL R0073
Report Date: 13 February 2025

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Shelby Wright Test Labs
515 Rosebank Road
Avondale, Auckland
New Zealand, 1026

SWTM-16.0 V1	Uncertainty of Measurement - Air Infiltration		
Date Created:	04-Dec-23	BF	
Date Checked:	12-Dec-23	BF	
G:\Shared drives\Shelby Wright Test Labs\Technical Records\12. Error Budget			

Client	Adlux
Test Sample	Harmony Skylight - 45 degrees, 75 Pa (T0255)
Date	12-Dec-24
Operator	MA & ML

FLOW COMPENSATION FOR ATMOSPHERIC PRESSURE AND TEMPERATURE

PARAMETER	UNITS	INPUTS			RESULTS	
Flow Reading	m³/h	1.82			Flow Compensated	
Temperature Actual	Degrees Celcius	21		294		
Pressure Actual (Metservice)	Hectapascals	1007		100700	m³/h	1.813
Air Infiltration Pressure	Pascals	150				
					Actual Flow per m²	
Specimen Dimensions	Width (m)	2.052			l/m²/s	0.096
	Height (m)	2.552				
	Area (m²)	5.236704				

UNCERTAINTY OF SAMPLE SIZE

		Dimension measured in (m)	Tape Calibration UoM (%)	Reading Accuracy +/- 0.001 m		UoM of Sample Size %
Dimension (mm)	X-X (U_a)	2.052	0.5%	0.001	U_a	0.977%
Dimension (mm)	Y-Y (U_b)	2.552	0.5%	0.001	U_b	1.237%

$$U\,m^2 = \sqrt{\left[\left[\frac{U(A)}{A}\right]^2 + \left[\frac{U(B)}{B}\right]^2\right]}$$

0.006794823 %

UNCERTAINTY OF AIR INFILTRATION FLOW RATE

Daaks Certificate UoM for Schmidt SS.20.260	1.3% %
$U^2\,[Flow] = [\frac{L}{S}]^2\,U^2\,m^2 + [m^2]^2\,U^2\,[\frac{L}{S}]$	0.086190%
UoM Air Infiltration	2.935808%

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Report Number: SWTL R0073
Report Date: 13 February 2025

Shelby Wright Test Labs
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New Zealand, 1026

SWTM-16.0 V1	Uncertainty of Measurement - Air Infiltration	
Date Created:	04-Dec-23	BF
Date Checked:	12-Dec-23	BF
G:\Shared drives\Shelby Wright Test Labs\Technical Records\12. Error Budget		

Client	Adlux
Test Sample	Harmony Skylight - 45 degrees, 150 Pa (T0256)
Date	12-Dec-24
Operator	MA & ML

FLOW COMPENSATION FOR ATMOSPHERIC PRESSURE AND TEMPERATURE

PARAMETER	UNITS	INPUTS
Flow Reading	m³/h	3.03
Temperature Actual	Degrees Celcius	21
Pressure Actual (Metservice)	Hectapascals	1007
Air Infiltration Pressure	Pascals	150
Specimen Dimensions	Width (m)	2.052
	Height (m)	2.552
	Area (m²)	5.236704

RESULTS			
		Flow Compensated	
294			
100700	m³/h		3.018
		Actual Flow per m²	
	l/m²/s		0.160

UNCERTAINTY OF SAMPLE SIZE

		Dimension measured in (m)	Tape Calibration UoM (%)	Reading Accuracy +/- 0.001 m		UoM of Sample Size %
Dimension (mm)	X-X (U_a)	2.052	0.5%	0.001	U_a	0.977%
Dimension (mm)	Y-Y (U_b)	2.552	0.5%	0.001	U_b	1.237%

$$U\,m^2 = \sqrt{\left[\left[\frac{U(A)}{A}\right]^2 + \left[\frac{U(B)}{B}\right]^2\right]}$$

0.006794823 %

UNCERTAINTY OF AIR INFILTRATION FLOW RATE

Daaks Certificate UoM for Schmidt SS.20.260	1.3%	%
$U^2\,[Flow] = [\frac{L}{S}]^2\,U^2\,m^2 + [m^2]^2\,U^2\,[\frac{L}{S}]$	0.168327%	
UoM Air Infiltration	4.102765%	

IAN BENNIE AND ASSOCIATES

TEST REPORT NO. 8032-S1Rep

"ROOF WINDOW ABS DOUBLE GLAZED" SKYLIGHT TESTS TO AS 4285-2007

for

Adlux Industries Ltd

March 2018

NATA

Accreditation No. 2371
Accredited for compliance with ISO/IEC 17025.

IAN BENNIE & ASSOCIATES PTY. LTD.
Building Performance Testing
ACN : 007 133 253

NATA
Accreditation
No. 2371

TEST REPORT NUMBER 8032-S1Rep

REPLACEMENT REPORT

This report is issued as a replacement for IBA Report Number 8032-S1. The reason for the replacement is the original report contained erroneous references to an earlier, superseded issue of AS4285. The sample was tested in accordance with AS4285-2007 which is correctly referenced in this document. No other changes have been made or were required. Report Number 8032-S1 should be removed from general circulation.

Client: **Adlux Industries Ltd**
42 Selwyn Street, Onehunge, Aukland

Sample: **"Roof Window ABS Double Glazed"**
The sample was supplied and mounted on a 90x45 timber frame with screw fixings per the Client's documentation..

Details of the sample provided by the Client are given in Appendix A.

Test Location: Ian Bennie & Associates Laboratory
Dandenong, Victoria

Test Date: 17 June 2008

Drawing(s) Received: 13 February 2014

Test Results: The sample was subjected to Watertightness, Resistance to Concentrated Loads, and Resistance to Wind Pressures for Non-cyclone Regions tests for Skylight assemblies nominated in Clause 3.2 of Australian Standard AS4285-2007, Skylights, with test methods and results as summarised below.

Watertightness ..... **PASS**

Method: AS4046.9 modified as required in AS4285

Test pitch angle(s): 27°, 65° and 5° roof pitch

Sample orientations: Ridge normal to the wind stream and at 45° to the windstream.

Observations: No water penetration was observed during the tests.

1 Luisa Avenue, Dandenong 3175, Victoria , Australia
Telephone : (03) 9768 3640 International : +613 9768 3640 Facsimile: (03) 9768 3642

Resistance to Concentrated Loads ..... **PASS**

Method: AS4040.1 modified as required in AS4285

Load applied: 1.1kN at the centre and corner of the glass.

Observations: The load was sustained for the test duration of 1 minute at both locations.

Resistance to Wind Pressures for Non-cyclone Regions

Method: AS4040.2 modified as required in AS4285.

Loads applied and sustained for 1 minute (kPa):

Positive	3.0	**PASS**
Negative	3.0	**PASS**

Observations: No sign of failure was observed at the test pressures.

Conclusion:

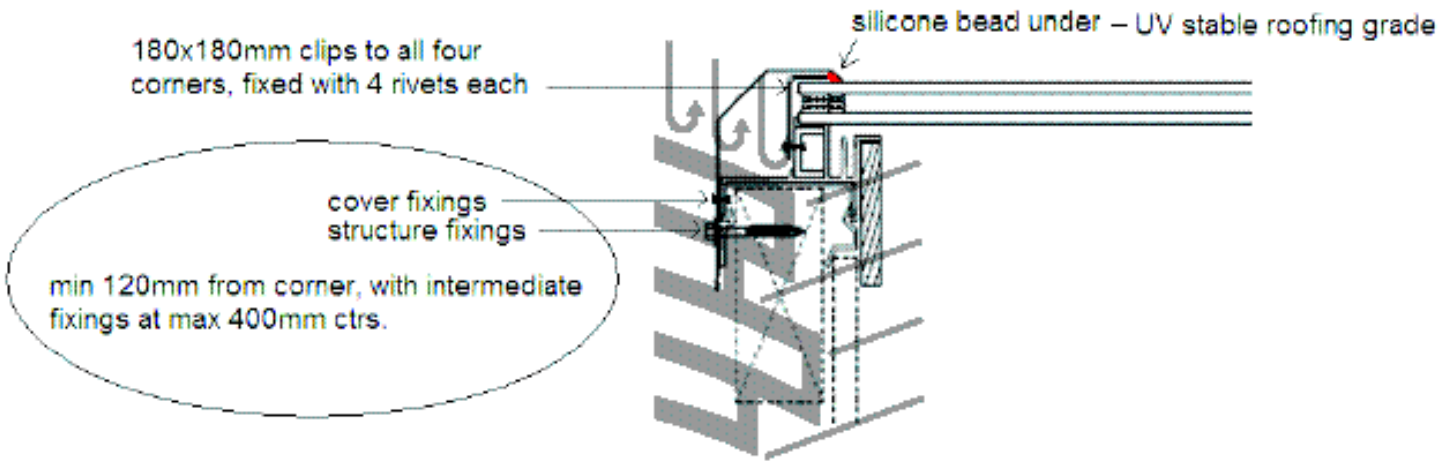
The test sample passed the test requirements of Australian Standard AS4285-2007 for Watertightness, Resistance to Concentrated Loads, and Resistance to Wind Pressures for Non-cyclone Regions.

The test of Resistance to Wind Pressures for Non-cyclone Regions determined the maximum Strength Limit State pressures sustained by the skylights during testing.

Maximum Strength Limit State Pressures Sustained	
+ 3.0 kPa	**- 3.0 kPa**

DISTRIBUTION:
Ian Bennie & Associates 2
Adlux Industries Ltd ..... PDF

Derek Dubout 22 March 2018
Authorised Signatory



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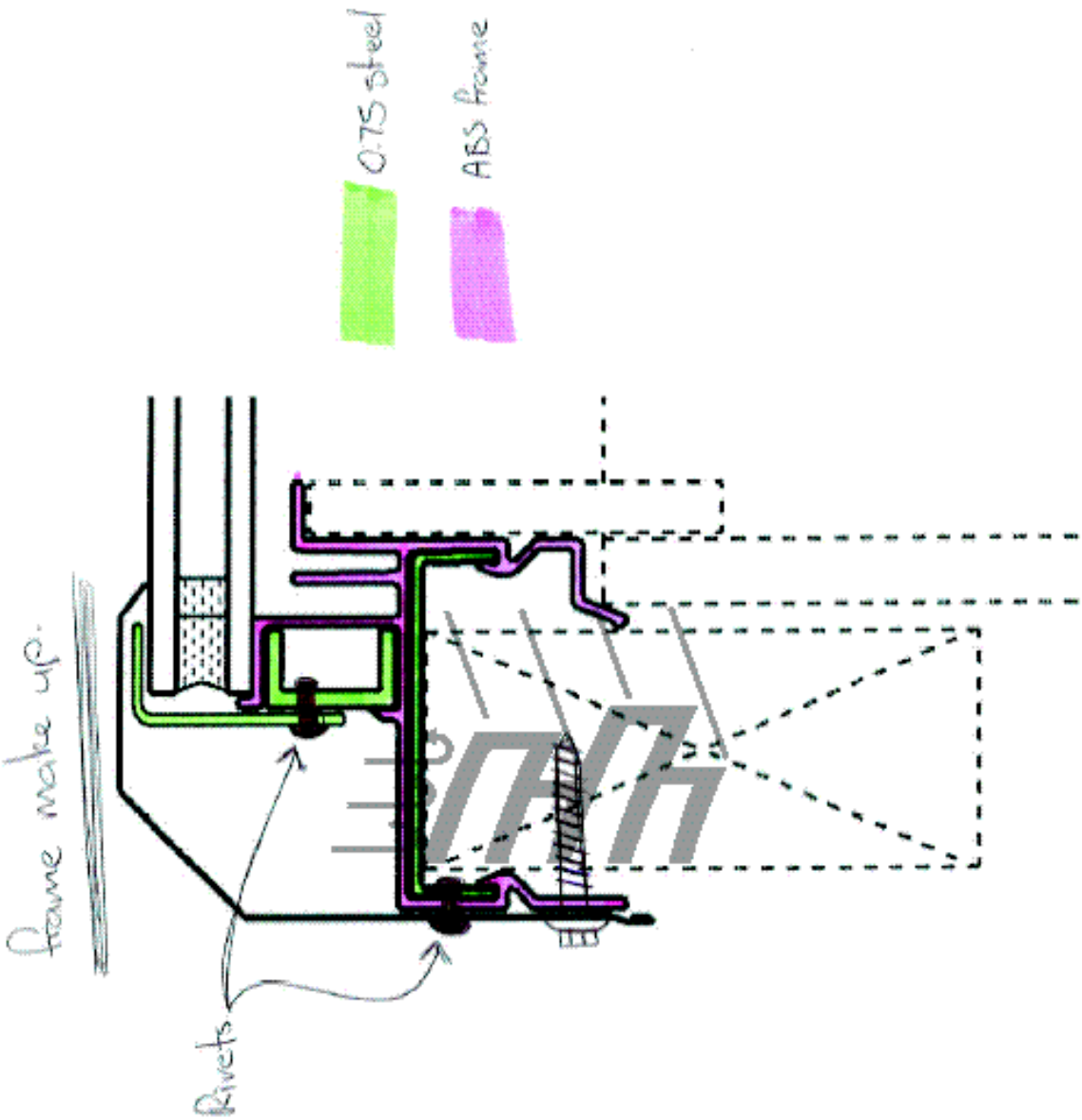
email: sales@adlux.co.nz

ROOF WINDOW ABS double glazed

DATE: 14/02/07 **DWG No:** RWAdg


0.75 steel
ABS Frame
Frame make up.
Rivets

oculus

H1 SUMMARY REPORT

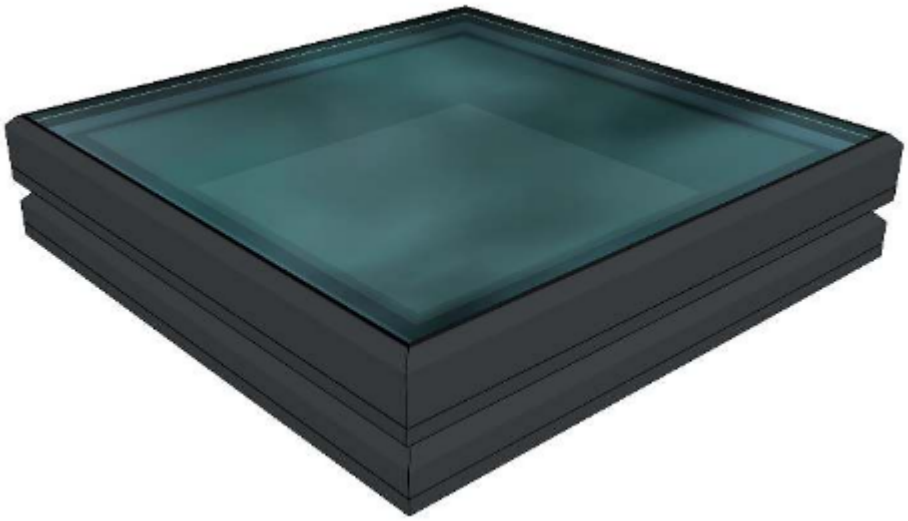
ABOUT

ADLUX ROOF WINDOWS

AUTHOR: Denise Martin
DATE: 24/11/2023
OCULUS REFERENCE: J230036

PREPARED FOR

ADLUX INDUSTRIES LIMITED



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REVISION CONTROL

Revision number	Date published	Reviewed by
2	24/11/2023	Margaret Amankrah

TABLE OF CONTENTS

1. PURPOSE

This report sets out:

- the applicable energy efficiency performance requirements for Adlux Roof Windows
- the compliance evidence of these components with the New Zealand Building Code Clause H1

This report constitutes documentation to convey the pathway for compliance of the proposed design with the New Zealand Building Code Clause H1. It should be read in conjunction with this project's corresponding architectural package.

2. CONDITIONS OF THIS REPORT

The compliance potential set out in this report for the Adlux Roof Windows has been evaluated using compliance documentation relevant to the proposed building enclosure design in relation to NZBC Clause H1.

This report and any building consent resulting does not guarantee the product will achieve compliance with the New Zealand Building Code clause H1; only that it can achieve compliance as designed.

The analysis contained within this report is based on the architectural drawings issued by Adlux, named Adlux Thermally Broken Rooflight.pdf and dated 13 July 2023.

Assumptions and limitations of the compliance potential set out in this report are described in Section 6.

3. PROJECT SUMMARY

Adlux provide a range of roof windows and skylights for the residential and commercial market of New Zealand. The following table represents the system U-Values calculated to ISO10077-1 including frame U-Values calculated to ISO 10077-2 in accordance with NZBC Clause H1, Appendix E.2 using the glass specification to ISO 673 at 0º installation angle.

Table 1: Input glass

Glass types and resulting U-Values at 0º installation angle (horizontal)		U [W/m²K]
Type 1	4mm PerformaTech /20 Argon/ 4mm clear	1.673
Type 2	4mm Clear /20 Argon/ 4mm LightBridge	1.742
Type 3	4mm PerformaTech /20 Argon/ 4mm PerformaTech /20 Argon/ 4mm clear	0.809
Type 4	4mm PerformaTech /20 Argon/ 4mm Clear or Tint /20 Argon/ 4mm Clear or Tint	1.200
Type 5	4mm Lightbridge /20 Argon/ 4mm LightBridge /20 Argon/ 4mm Clear or Tint	0.854
Type 6	4mm LightBridge /20 Argon/ 4mm Clear or Tint /20 Argon/ 4mm Clear or Tint	1.238

The corresponding R-Values for installation angles to 50º are generally better due to the reduced upward heat transfer of the glass: The resulting R-Values hence will be compliant for all application angles (0º-50º) for the respective climate zone.

Below are sketches of the roof window types assessed in this report.

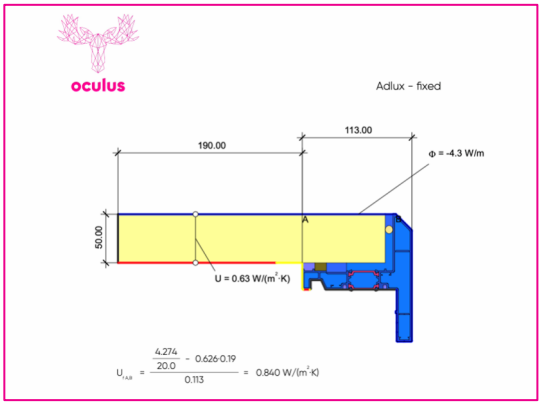


Image 1: Adlux roof window - fixed

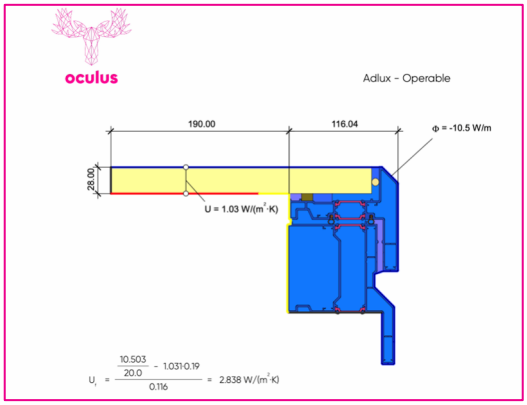


Image 2: Adlux roof window - operable

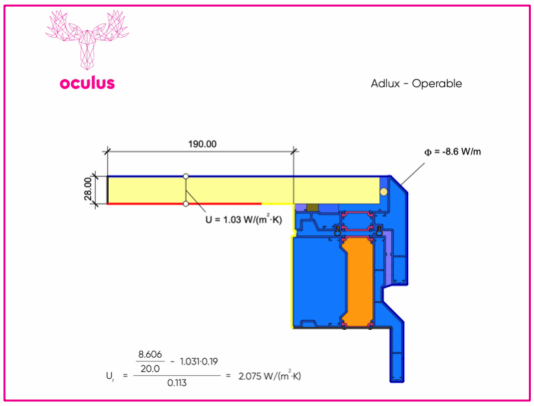


Image 3: Adlux roof window – operable with foam filled cavity

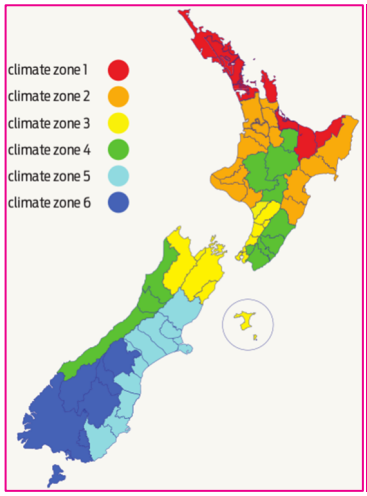
4. PERFORMANCE REQUIREMENTS

The NZBC Clause H1 and applicable Performance Requirements included within the scope of this report are listed in Table 2 below. Demonstration that a product or assembly can meet the Performance Requirements of the clause ensures that the Functional Requirement and the Objective of the clause will be met.

Table 2: NZBC, Functional Requirements, and Applicable Performance Requirements

NZBC	Functional Requirement	Performance provisions
H1 Energy efficiency	H1.2 Buildings must be constructed to achieve an adequate degree of energy efficiency when that energy is used for— a) modifying temperature, modifying humidity, providing ventilation, or doing all or any of those things (does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings); or b) providing hot water to and from sanitary fixtures or sanitary appliances, or both; or c) providing artificial lighting (applies only to commercial buildings and communal non-residential buildings whose floor area is greater than 300 m2)	H1.3.1 & H1.3.3

Table 3: New Zealand climate zones per NZBC



Climate Zone	
Not Permitted	
Climate Zone 1	
Climate Zone 2	
Climate Zone 3	
Climate Zone 4	
Climate Zone 5	
Climate Zone 6	

The roof windows must meet the following minimum construction R-values for building elements not containing embedded heating systems (m^2K/W) in accordance with:

Table 4: AS1/VM1 – All housing and buildings up to 300 m^2

Element	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
Skylights	R0.46	R0.46	R0.54	R0.54	R0.62	R0.62

Table 5: AS2/VM2 – Buildings greater than 300 m^2

Element	Climate Zone 1	Climate Zone 2	Climate Zone 3	Climate Zone 4	Climate Zone 5	Climate Zone 6
Skylights	R0.42	R0.42	R0.46	R0.46	R0.49	R0.51

5. NZBC ASSESSMENT

H1 Energy Efficiency

The following tables list the calculated $R_{skylight}$ values *[m²K/W]* for each specimen size *[mm]* and can be used to determine in which climate zones the skylight is most applicable. Refer to Table 3 for color coding. Non compliant operables can be made to comply with added foam per Table 8.

Table 6: Adlux roof window – fixed

AS1/VM1	Glass type 1	Glass type 2	Glass type 3	Glass type 4	Glass type 5	Glass type 6
700 x 700	0.75	0.73	1.06	0.89	1.04	0.88
1000 x 1000	0.70	0.68	1.09	0.87	1.06	0.85
1200 x 1200	0.68	0.66	1.11	0.86	1.07	0.85
2400 x 1500	0.65	0.63	1.14	0.85	1.10	0.83
AS2/VM2						
700 x 700	0.75	0.73	1.06	0.89	1.04	0.88
1000 x 1000	0.70	0.68	1.09	0.87	1.06	0.85
1200 x 1200	0.68	0.66	1.11	0.86	1.07	0.85
2400 x 1500	0.65	0.63	1.14	0.85	1.10	0.83

Table 7: Adlux roof window – operable

AS1/VM1	Glass type 1	Glass type 2	Glass type 3	Glass type 4	Glass type 5	Glass type 6
700 x 700	0.41	0.41	0.49	0.45	0.48	0.45
1000 x 1000	0.45	0.44	0.58	0.51	0.57	0.50
1200 x 1200	0.46	0.45	0.63	0.54	0.61	0.53
2400 x 1500	0.50	0.49	0.74	0.61	0.72	0.60
AS2/VM2						
700 x 700	0.41	0.41	0.49	0.45	0.48	0.45
1000 x 1000	0.45	0.44	0.58	0.51	0.57	0.50
1200 x 1200	0.46	0.45	0.63	0.54	0.61	0.53
2400 x 1500	0.50	0.49	0.74	0.61	0.72	0.60

Table 8: Adlux roof window – operable with foam filled cavity

AS1/VM1	Glass type 1	Glass type 2	Glass type 3	Glass type 4	Glass type 5	Glass type 6
700 x 700	0.50	0.49	0.62	0.56	0.61	0.55
1000 x 1000	0.52	0.51	0.70	0.61	0.69	0.60
1200 x 1200	0.53	0.52	0.75	0.63	0.73	0.62
2400 x 1500	0.55	0.53	0.86	0.68	0.83	0.67
AS2/VM2						
700 x 700	0.50	0.49	0.62	0.56	0.61	0.55
1000 x 1000	0.52	0.51	0.70	0.61	0.69	0.60
1200 x 1200	0.53	0.52	0.75	0.63	0.73	0.62
2400 x 1500	0.55	0.53	0.86	0.68	0.83	0.67

E3 External Moisture - Condensation Risk

As requested, he have reviewed the submitted documentation against NZBC clause E3 with specific regards to condensation. Condensation can be reduced by maintaining an adequate interior temperature and good ventilation. A ventilation strategy increases drying capacity should condensation occur. However, per E3/AS1, this is only mandated for residential buildings. Where good ventilation and adequate interior temperature cannot be provided by a mechanical system, the condensation risk requires mitigation in the roof window units and their installation.

The thermal resistance of a glazing component is optimized by using thermally broken or improved frames, employing a non-metal glass edge spacer, adding a low-E coating and insulating the multipaned glazing with an inert gas such as argon, krypton or xenon, which have higher thermal resistance than air. These have been incorporated or are customisable in the design of Adlux thermal roof windows.

Similar to a glass spacer, a bad installation can increase heat loss and the condensation potential at the roof window perimeter. An ideal installation aligns the insulated glazing unit (as described above) with the thermal layer of the surrounding enclosure assembly. By reducing linear transmittance at those interfaces, interior surface temperatures of the frame are kept warmer. This pushes the dew point temperature further out in the assembly, thus reducing risk of cold surfaces, internal condensation, and moisture related issues.

Table 9: Comparison of different types of windows

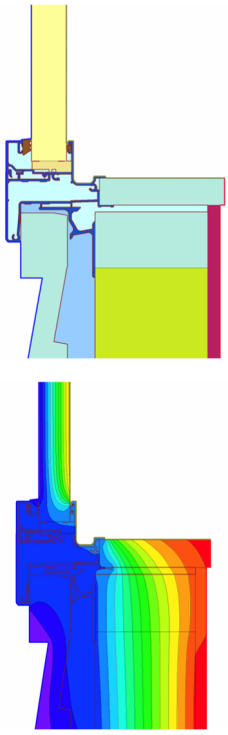
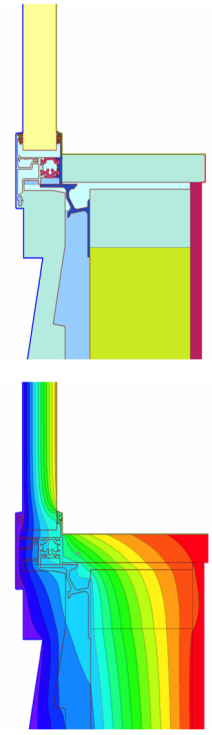
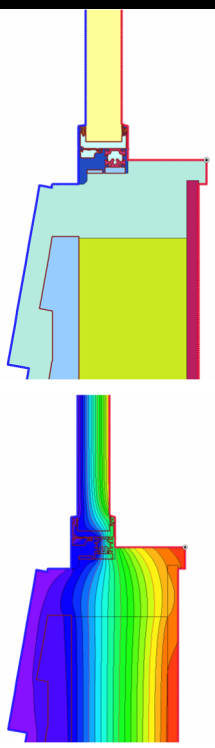
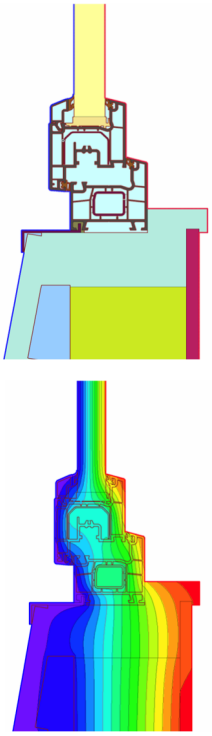
Non - thermally broken frame installed outside	Thermally broken frame installed outside	Thermally broken frame installed tucked in	uPVC frame installed inside
			

Table 9 shows thermal gradient of a various installations. Although shown with wall windows, the theory extends to roof windows and skylights as well.

6. ASSUMPTIONS AND LIMITATIONS

The compliance potential of the building component set out in Section 5 of this report takes account of several assumptions regarding construction, quality assurance, and proper implementation of the design that would be expected. The following assumptions inform the compliance potential for this design:

- The design is implemented strictly per the drawings, details, and specifications.
- Products are installed in accordance with the manufacturer's instructions or site-specific protocol.
- R-value calculations were done in accordance with Clause H1, Appendix E.2:

  E.2.1 Construction R-values

  E.2.1.1 The *construction R-values* for *skylights* ($R_{Skylight}$) shall include the effects of both the glazing materials and the frame materials and shall be calculated in accordance with Equation E.1. The *construction R-value* shall be rounded down to no less than two significant figures.

  Equation E.1: $R_{skylight} = \frac{1}{U_w}$

  where:

  $R_{skylight}$ is the *construction R-value* of the *skylight* (m2·K/W); and
  U_w is the thermal transmittance of the *skylight* ($W/(m^2 \cdot K)$), determined in accordance with Paragraph E.2.1.2.

  E.2.1.2 The thermal transmittance (U_w) of a *skylight* shall be determined in accordance with ISO 10077-1, with:

  a) the thermal transmittance of the glazing (U_g) determined using BS EN 673, considering the effects of horizontal or angled glazing on the heat transfer; and
  b) the thermal transmittance of the frame (U_f) determined using ISO 10077-2.

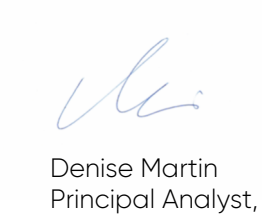
- Thermal Spacer:

  We used the typical value for linear thermal transmittance for glazing spacer bars with improved thermal performance according to table G.2, ISO 10077-1, for metal with thermal break frame types and double and triple glazing with air and gas fill (0.06 W/mK).

7. COMPLIANCE STATEMENT

Following our assessment of the current design we have determined that the proposed building component complies with the minimum R-Values according to the respective sizes and glass configurations in accordance with the tables provided. Therefore, we deem the component compliant with the requirements of the NZBC Clauses H1 and E3 subject to the proposed design being constructed in accordance with the plans and specifications that accompany this report

Prepared by:



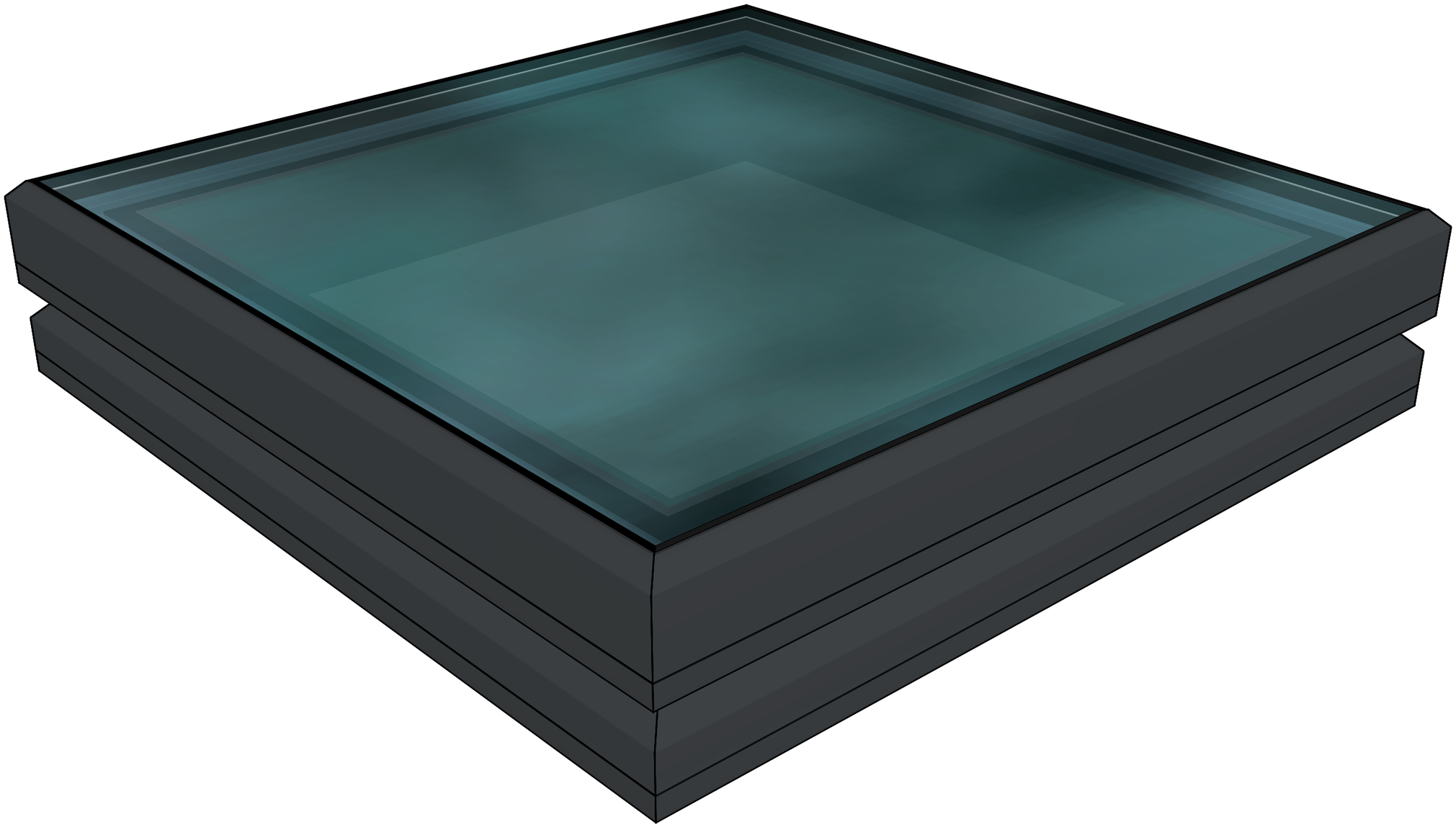
Denise Martin
Principal Analyst, Oculus Architectural Engineering Ltd

Reviewed by:

Margaret Amankrah
Building Enclosure Consultant, Oculus Architectural Engineering Ltd

Appendix a. SUPPORTING DOCUMENTS

- Adlux Drawings



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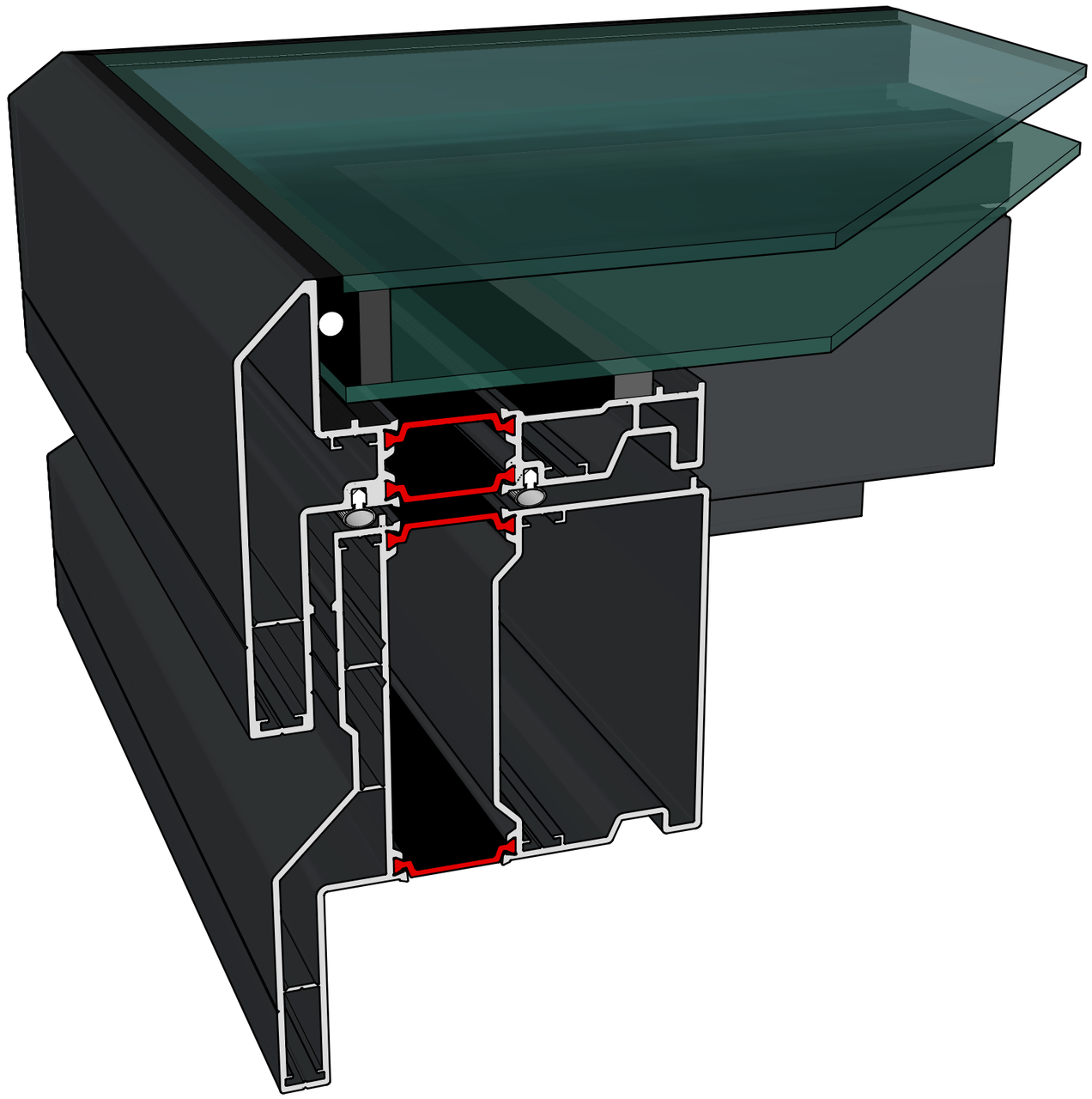

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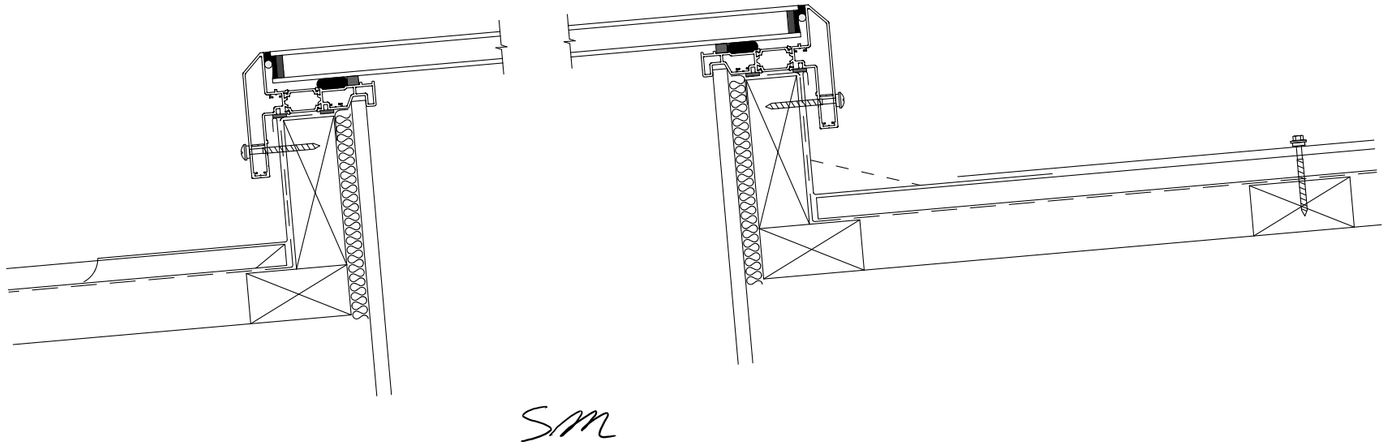

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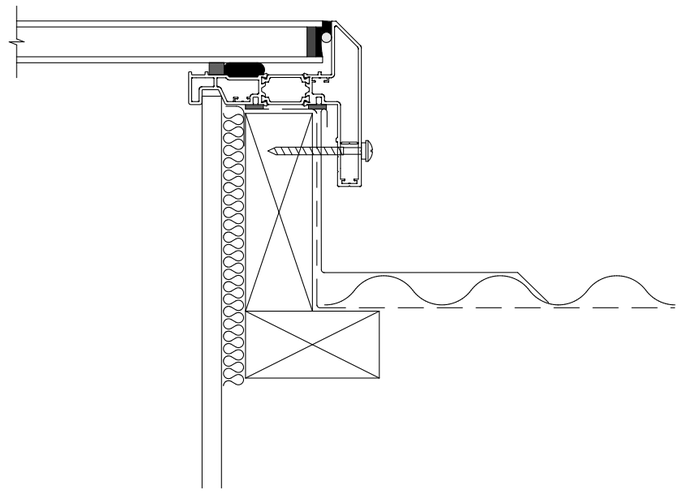

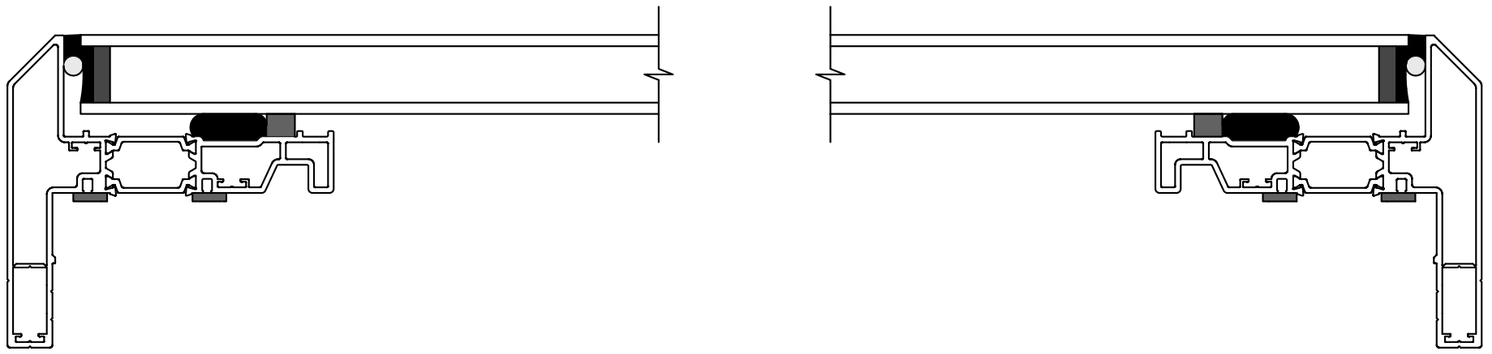

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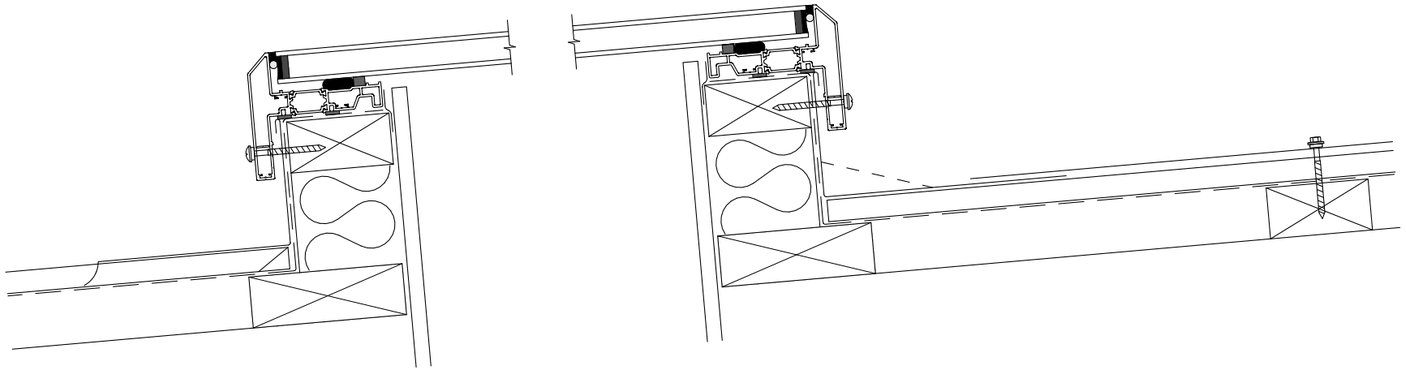

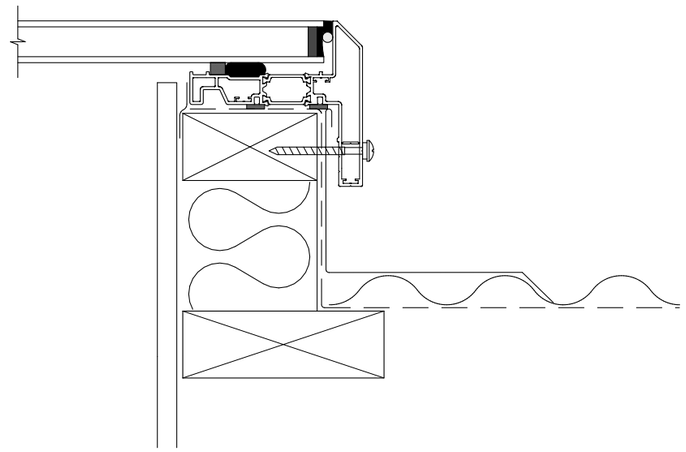

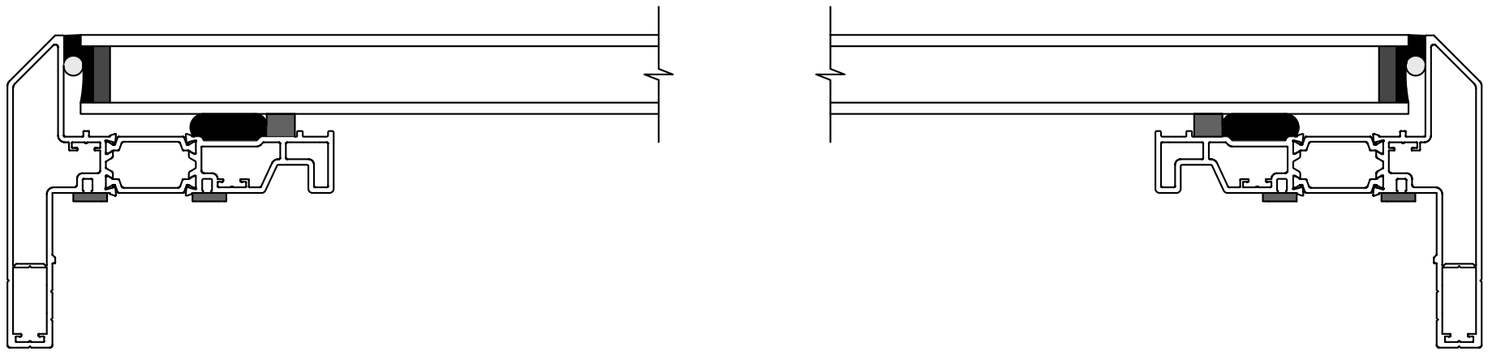

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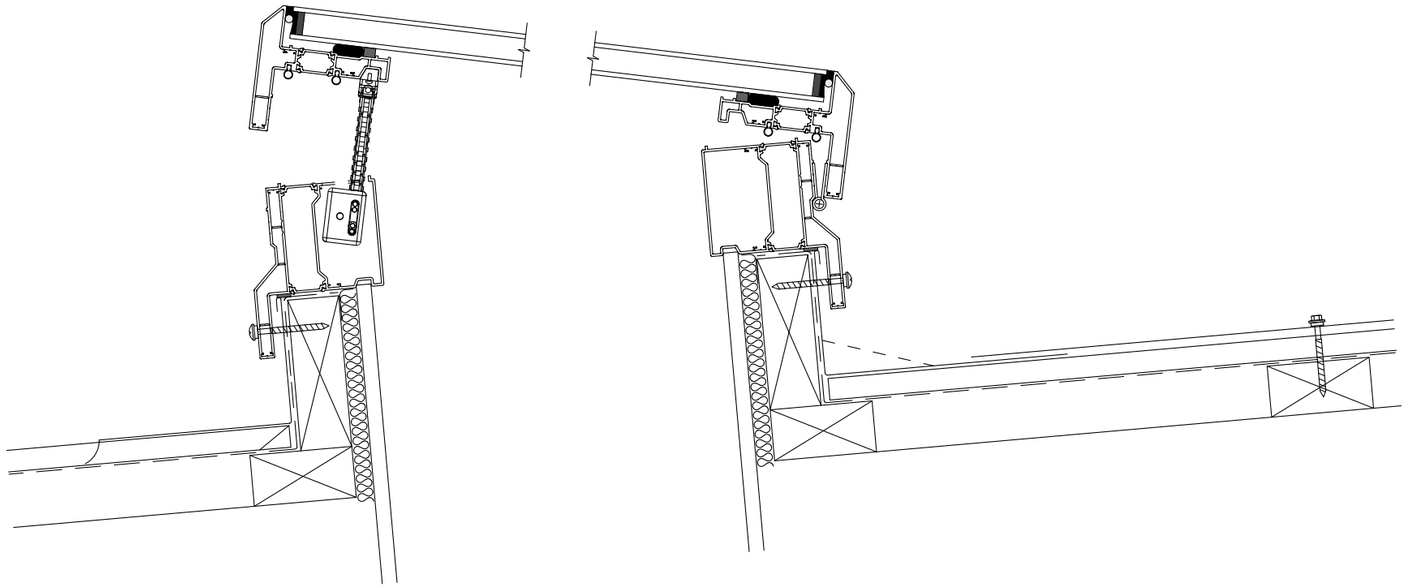

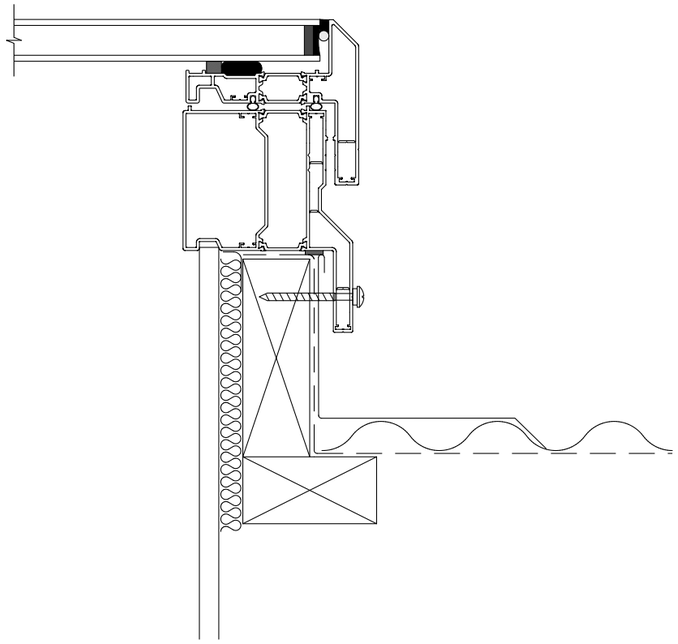

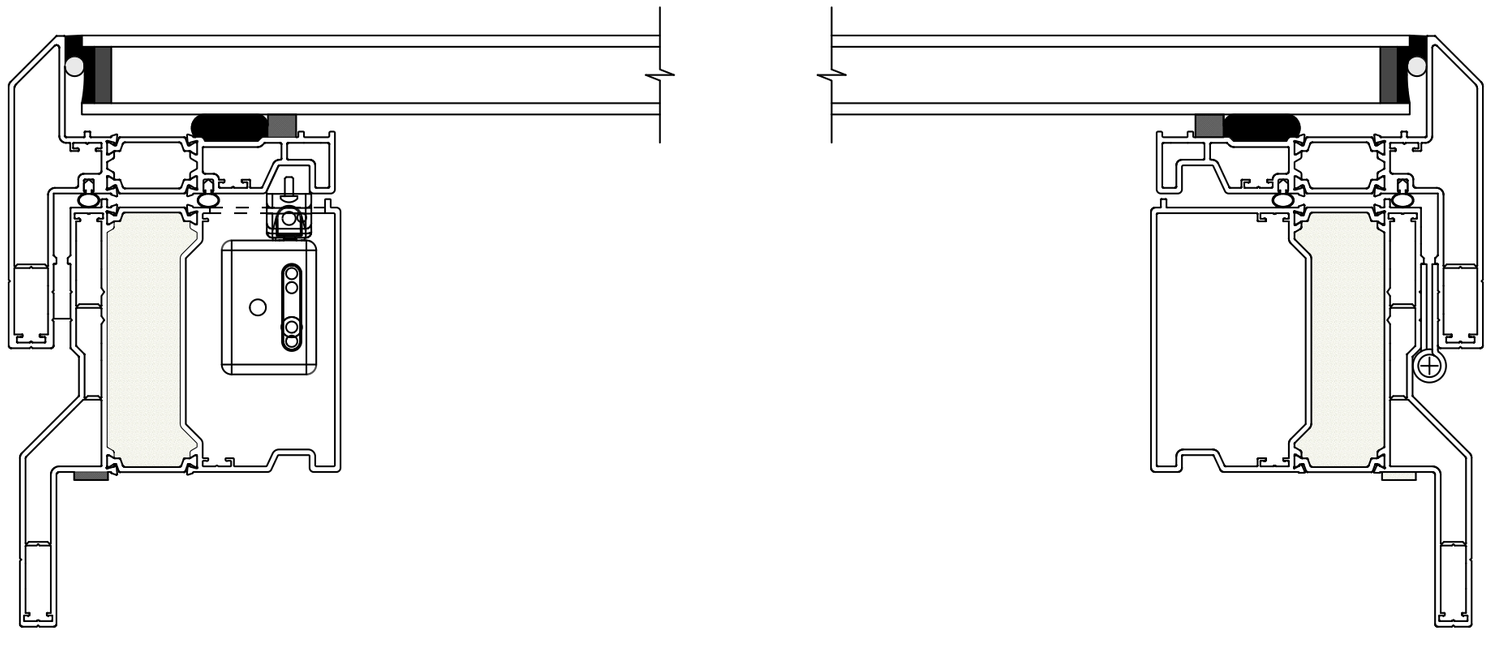

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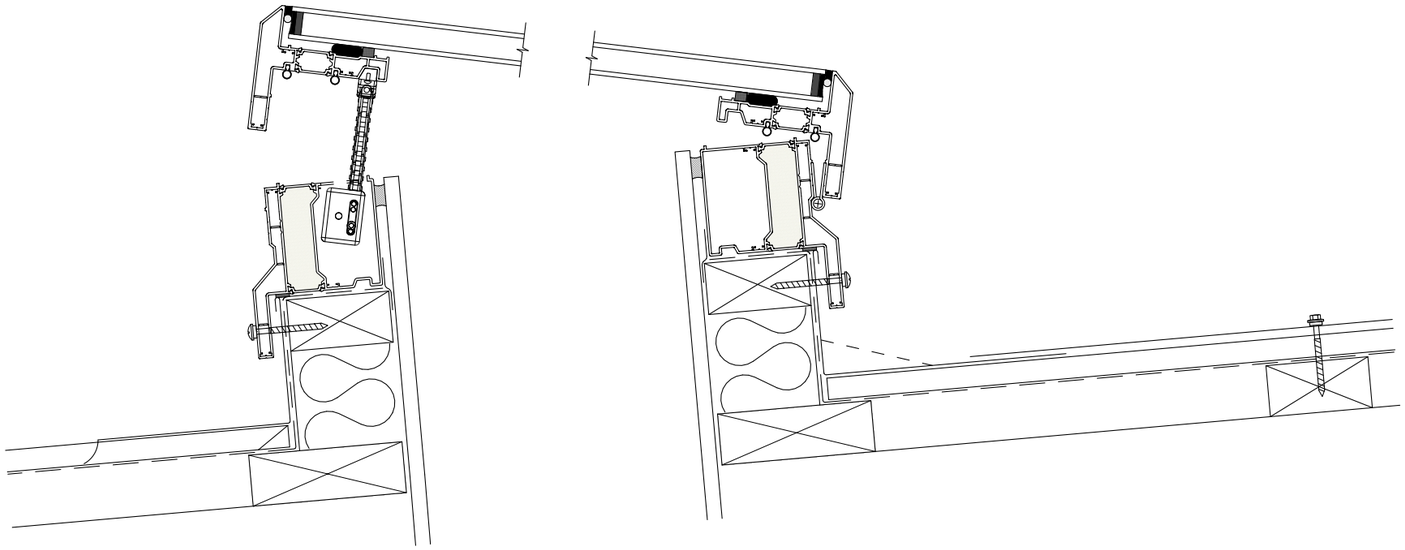

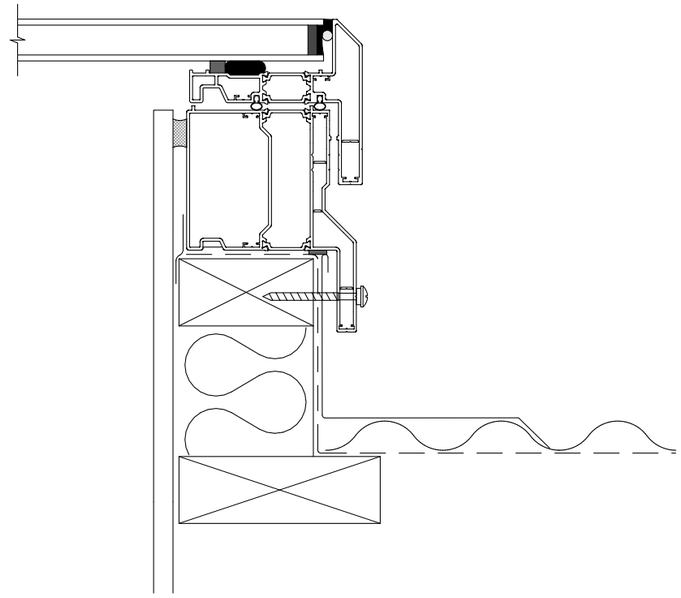

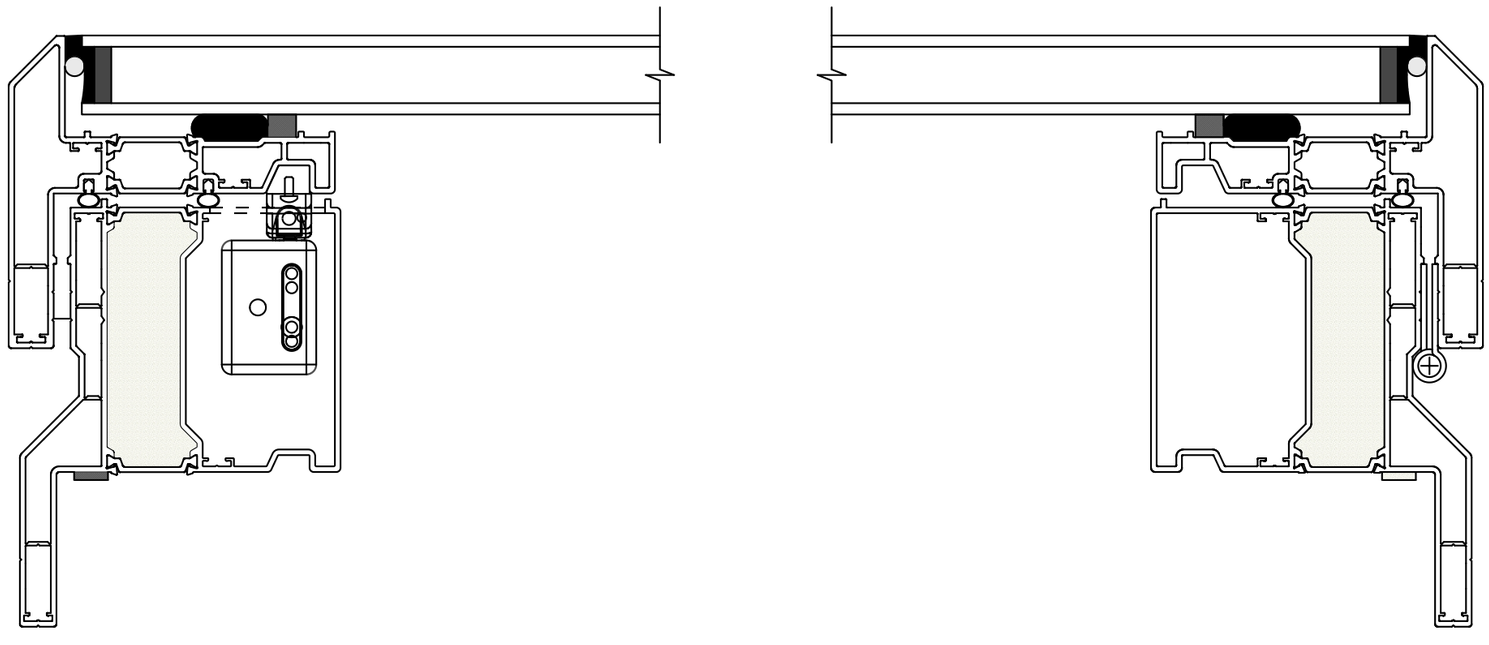

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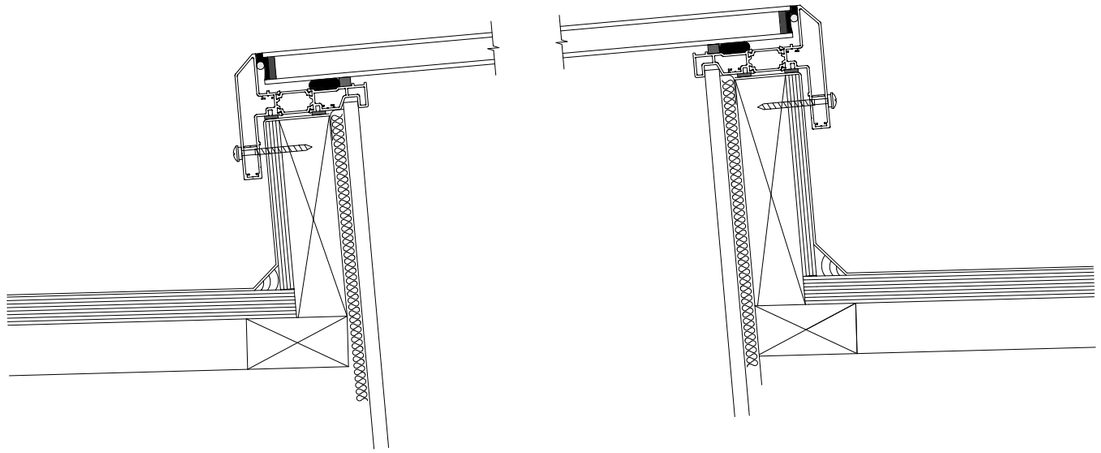

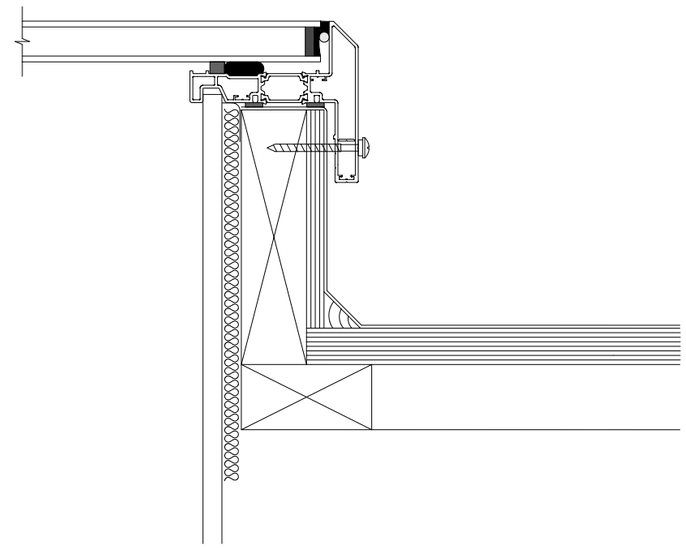

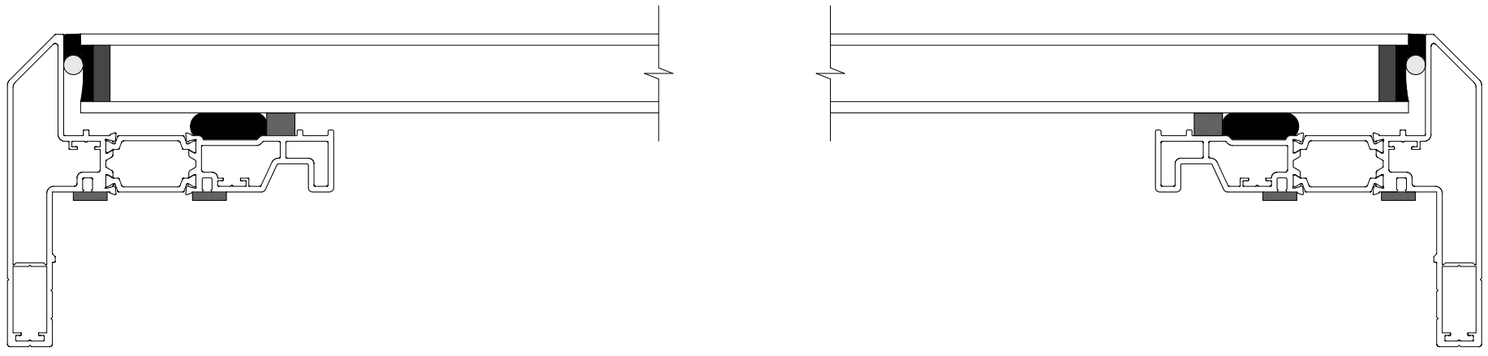

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MEMBRANE ROOF 45MM UPSTAND

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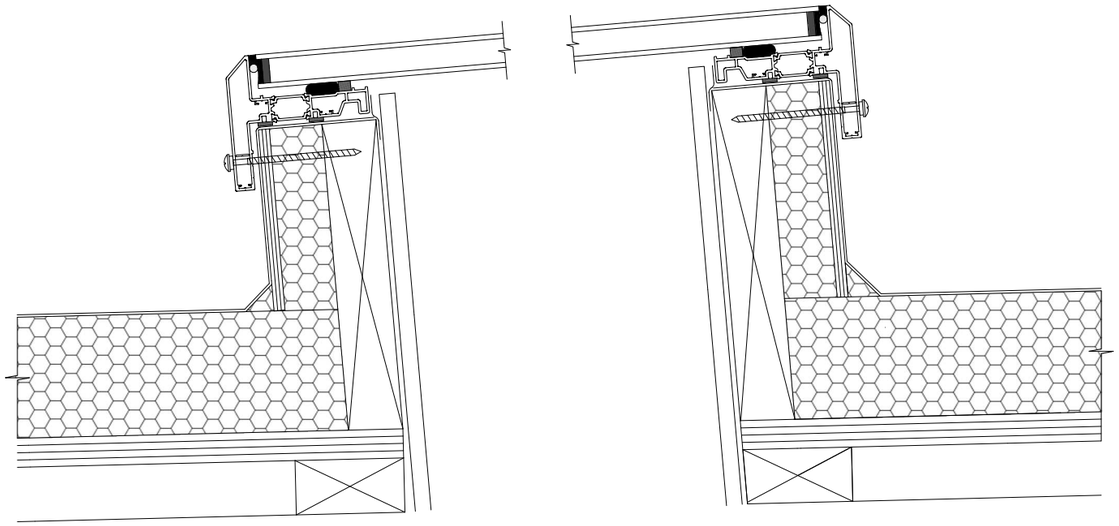

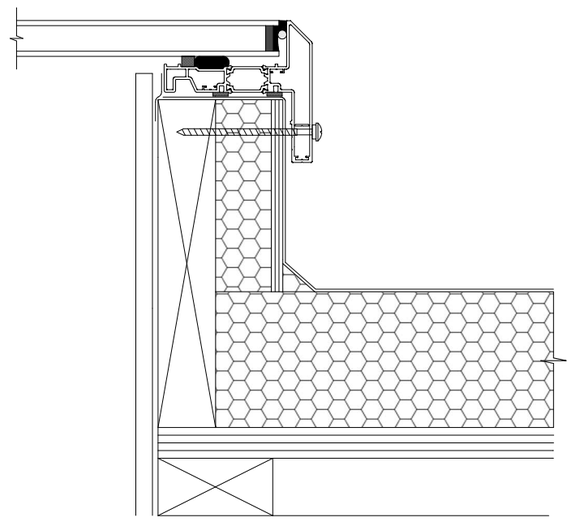

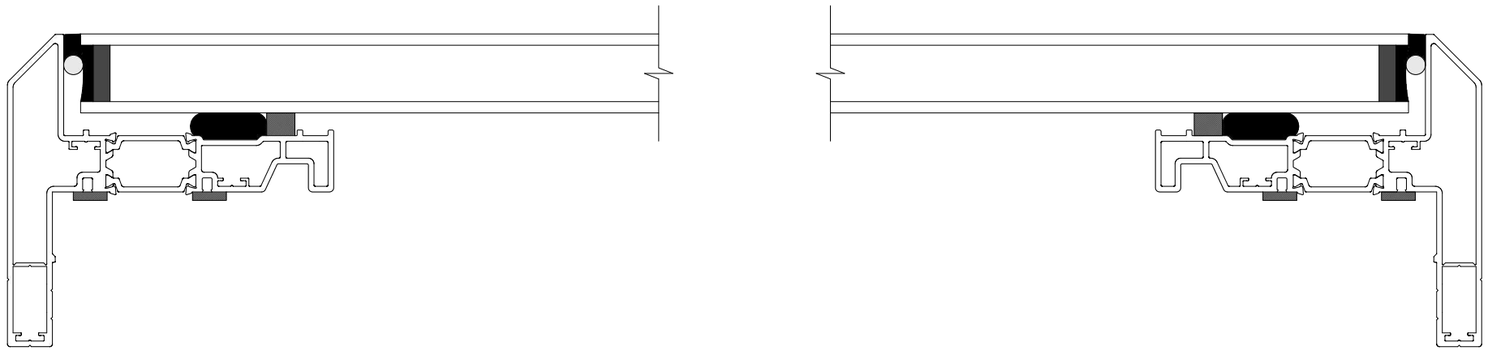

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WARM ROOF 90MM UPSTAND

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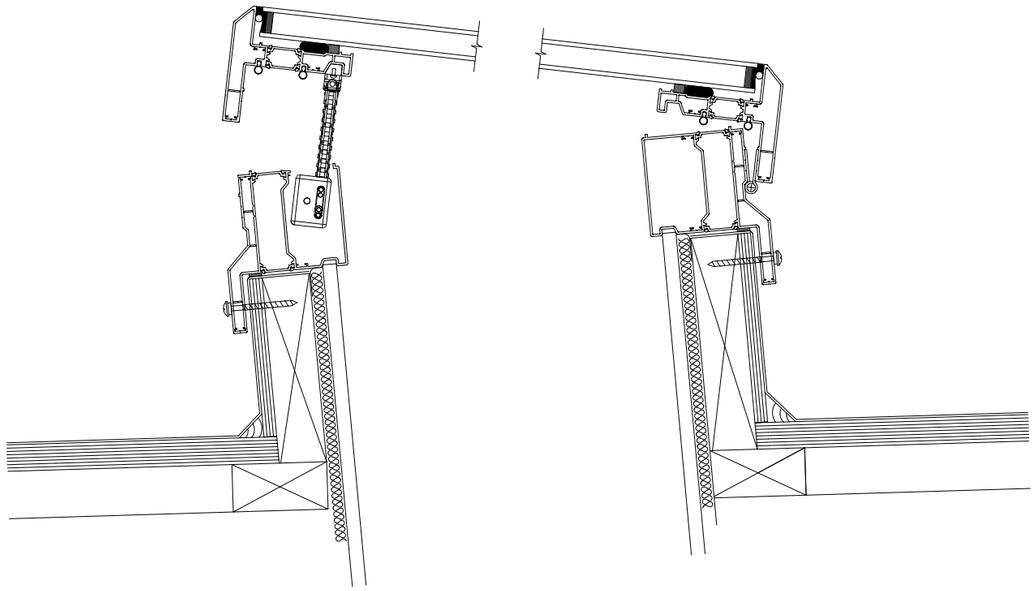

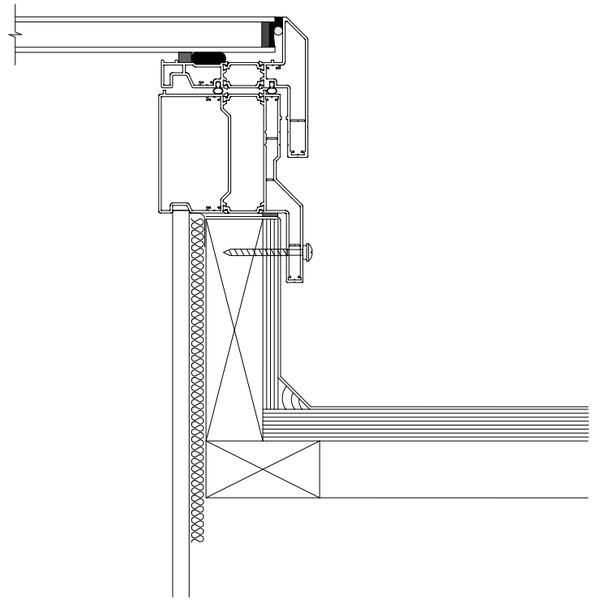

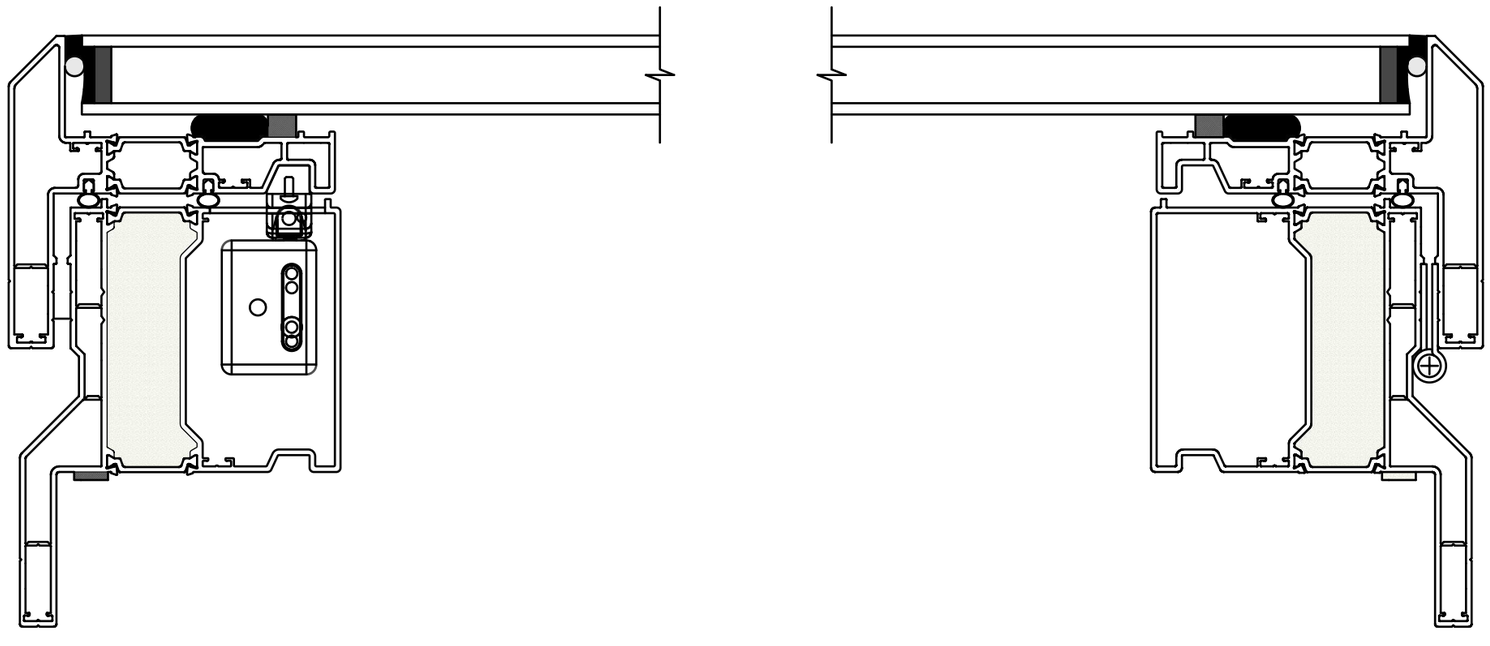

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MEMBRANE ROOF 45MM UPSTAND

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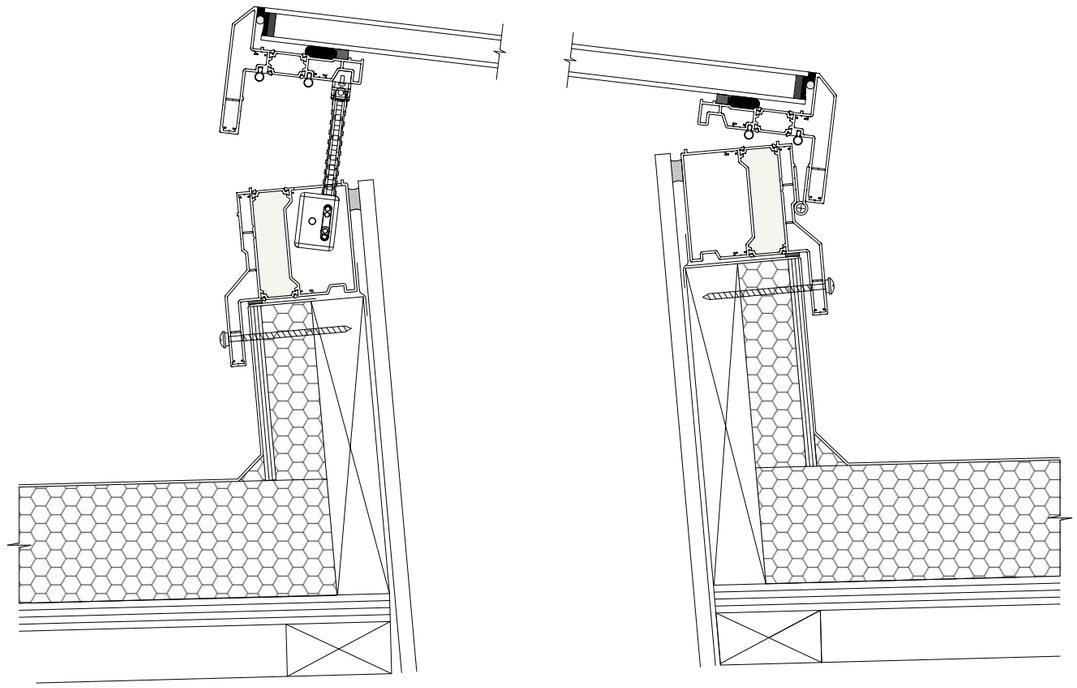

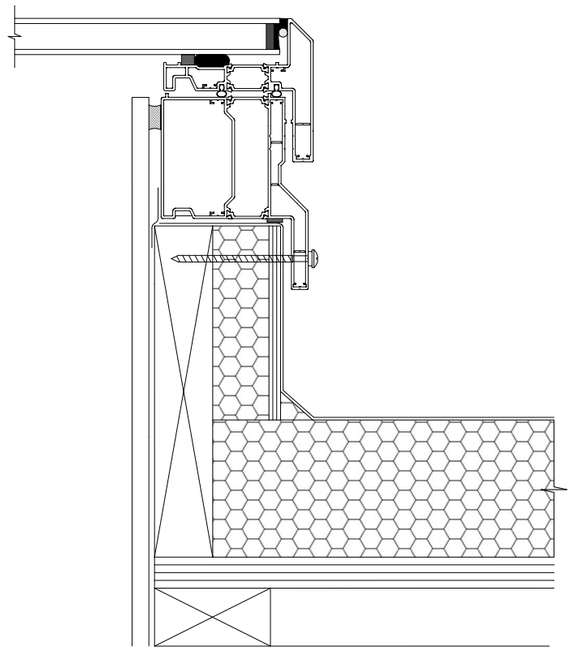

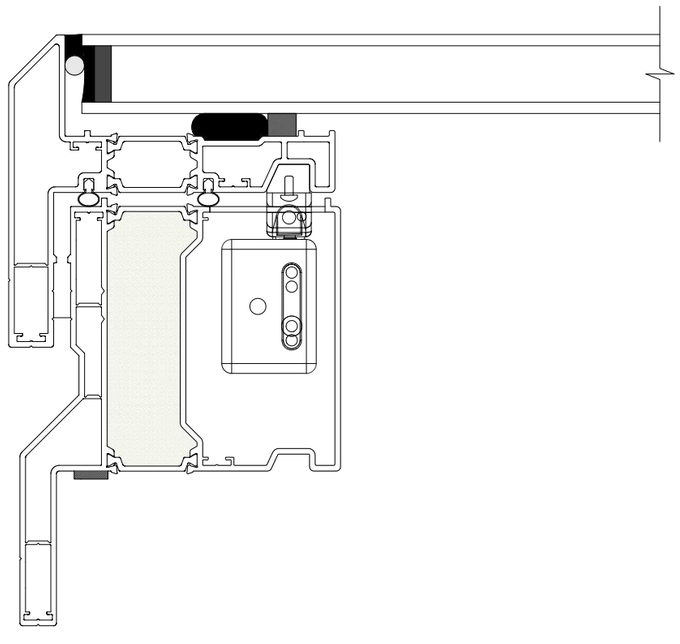

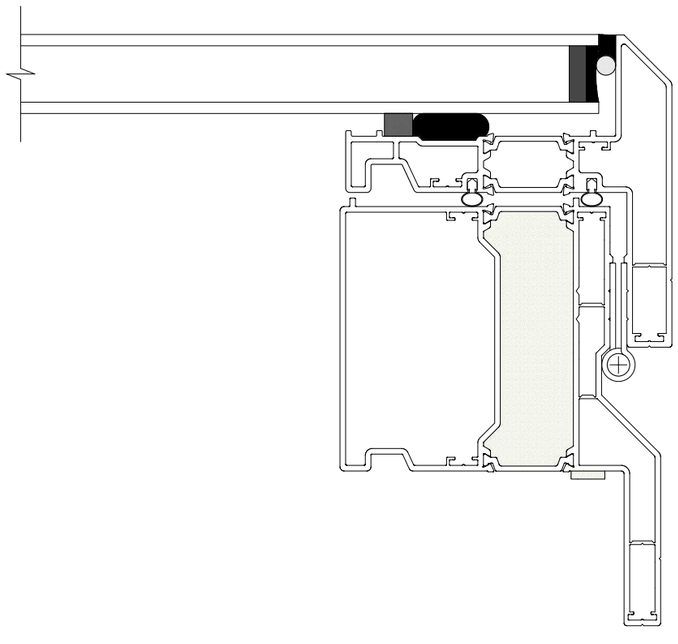

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WARM ROOF 90MM UPSTAND

ADLUX HARMONY ROOF WINDOW - OPENING

REVISIONS

	DD/MM/YY	REMARKS
1	__/__/__	...
2	__/__/__	...
3	__/__/__	... ...
4	__/__/__	... ...
5	__/__/__	... ...

A 04

Structural Glazing Sealant

SEALANT-90N

SEALANT-90N is a one-part, neutral-curing and non-corrosive silicone sealant. Once cured, this sealant becomes a high modulus and flexible silicone rubber suitable for structural and weatherseal applications.
This sealant contributes to the superior design and high reliability of buildings.

Package image

1 Features

- One-part and neutral-cure RTV* silicone sealant
- Superior weatherability performance when exposed to a wide range of temperatures, moisture, ozone, and ultraviolet rays
- Excellent storage stability within a wide range of temperatures
- Excellent unprimed adhesion to most common building materials and easy-to-use in a wide range of temperatures
- ±50% Joint Movement Capability of the original joint width

* RTV stands for "room temperature vulcanizing" which means that this material can be cured at room temperature.

2 Applications

Structural glazing and weatherseal applications

3 Specifications

- ASTM C1184*1
- ASTM C920*2 Type S, Grade NS, Class 50, Use NT, G, A
- KS F 4910*3 G-25HM

*1 Standard Specification for Structural Silicone Sealants
*2 Standard Specification for Elastomeric Joint Sealants
*3 Sealants for sealing and glazing in buildings

4 Colors

Black, Gray

5 Packaging

300 mL cartridges (25 pcs/carton box)
600 mL sausages (20 pcs/carton box)

6 General properties

Parameter \ Product name			SEALANT-90N
Consistency			Paste
Slump		mm	0
Skin-Over Time at 23°C/50%RH		min	10
Density at 25°C		g/cm^3	1.4
VOC Content*		g/L	30
After cured - After 7 days at 23°C/50%RH		Reference Test	
Hardness Shore A	points	ASTM D2240	36
Tensile strength	MPa	ASTM D412	2.4
Elongation at break	%		560
After cured - After 21 days at 23°C/50%RH		Reference Test	
50% Tensile stress	MPa	ASTM C1135	0.6
Maximum tensile stress	MPa		1.5
Joint movement capability	%	ASTM C719	±50

* Based on SCAQMD, Reported Volatile Organic Compound (VOC) content was expressed as grams of volatile organic compounds per litre of submitted sample.

(Not specified values)

7 Instructions for use & Handling precautions

Please read the latest Shin-Etsu published Functional Sealants Technical Manual. The manual can be obtained from the Shin-Etsu website.
http://www.shinetsusilicone-global.com/

8 Important

1) Please insure that application procedures and quality control are in strict compliance with the latest Shin-Etsu published Functional Sealants Technical Manual. Before applying sealant, applicators are required to obtain the manual from the Shin-Etsu website.
http://www.shinetsusilicone-global.com/
2) All quality control test results must be logged and archived.
3) The Shin-Etsu Sales Department is available for specific advise.

9 Limitations

1) SEALANT-90N must not be used in any structural applications without pre-testing.
2) SEALANT-90N must not be used in food, medical or pharmaceutical applications.
3) The contents of this catalog are believed to be correct, but project conditions regarding actual application and use of Shin-Etsu sealant are beyond Shin-Etsu's control. Therefore it is the users responsibility to confirm the product meets the requirements of the application.
4) Shin-Etsu warrants only the sealant will confirm to Shin-Etsu's product specifications at the time of shipment, and makes no further warranties in respect of the sealant. Warranty remedy for such failure is limited to refund of purchase price or replacement of product. If applicators need extended warranty for performance of sealants, please contact the Shin-Etsu Sales Department in advance of the project inception.

10 Storage conditions

Temperature: at or below 30°C
* Seal container tightly and store in a cool, dark place (out of direct sunlight) with good ventilation. Keep away from heat and flame.

11 Shelf life

12 months after production date under the above storage conditions in the original unopened container

12 Safety and hygiene

1) Uncured SEALANT-90N may cause skin irritation. When handling the products, take care to avoid contact with the skin and mucous membranes by wearing protective glasses and protective gloves. In case of skin contact, immediately wipe off with dry cloth and then flush thoroughly with running water. When using, be careful not to rub eyes with hands. In case of accidental eye contact, flush immediately with plenty of clean water for at least 15 minutes and then seek medical attention. Contact lens wearers must take special care. If the products get into the eye, the contact lens may become stuck to the eye.
2) Be sure to provide adequate ventilation when using the product. During curing, a small amount of Methanol gas is gradually generated. If you become uncomfortable with inhaling vapors, move to an area with fresh air immediately.
3) Keep out of reach of children.
4) Please read the Safety Data Sheets (SDS) before use. SDS can be obtained from our Sales Department.

ShinEtsu

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Technical Data Sheet

DOWSIL™ 795 Structural Glazing Sealant

One-part, neutral-cure silicone sealant

Features & Benefits

- Meets ASTM C1184 for Structural Silicone Sealant
- Meets ASTM C719 Class 50 High movement capability ±50% in well designed weatherseal joint
- Excellent adhesion to a wide range of substrates including glass, anodized and coated aluminum profiles
- Non corrosive cure system
- Ease of use – all-temperature gunnability and easy tooling
- The cured product exhibits excellent weathering characteristics, and a high resistance to ultra-violet radiation, heat and humidity
- High ultimate tensile strength which makes it suitable for structural bonding applications
- Excellent mechanical properties

Composition

- One-part, neutral-cure, RTV silicone sealant

Applications

- DOWSIL™ 795 Structural Glazing Sealant is a one-component Silicone sealant designed for site or factory glazing and curtainwall production. It requires contact with air as it reacts with atmospheric moisture to cure to a tough but flexible silicone rubber. DOWSIL™ 795 Structural Glazing Sealant can be used where dual structural and weatherseal applications are desired. It has up to ±50% movement capability in a well-designed weatherseal joint.

Typical Properties

Specification Writers: These values are not intended for use in preparing specifications.

Test[1]	Property	Unit	Result
	As supplied		
ASTM C 679	Tack-free time, 50% RH	hours	1.5 (max)
	Curing time at 25°C, 50% RH	days	7–14
	Full adhesion	days	14–21
ASTM C 639	Flow, sag or slump	mm	0
	Working time	minutes	20–30

1. ASTM – American Society for Testing and Materials.

Form No. 63-1217-01-0921 S2D

Typical Properties (Cont.)

Test	Property	Unit	Result
	Specific gravity		1.44
	VOC content[2]	g/l	32
	As cured - 7 days at 25°C (77°F), 50% RH		
ASTM D 412	Tensile strength (ultimate)	MPa	2.3
	Elongation	%	670
ASTM C 661	Durometer hardness, Shore A	points	35
ASTM D 624	Tear strength, die B	kN/m	13
	As cured – after 21 days at 25°C (77°F), 50% RH		
ASTM C 794	Peel strength	kg/cm	8.5
ASTM C 1135	Tensile strength, at 100% elongation	MPa	0.6
	Ultimate tensile strength, at break	MPa	1.2
	Ultimate elongation at break	%	400
ASTM C 719	Joint movement capability	%	±50
	As cured – after 21 days at 25°c, 50% relative humidity followed by 5,000 hours in a quv weatherometer, ASTM G 154-06		
ASTM C 1135	Tensile strength, at 100% elongation	MPa	0.6
	Ultimate tensile strength, at break	MPa	1.1

2. Based on South Coast Air Quality Management District of California. Maximum VOC is listed both inclusive and exclusive of water and exempt compounds. For a VOC data sheet for a specific sealant color, please send your request to Dow.

Description

DOWSIL™ 795 Structural Glazing Sealant is a one-part, neutral-cure, architectural-grade sealant that easily extrudes over a wide temperature range. This cold-applied, non-sagging silicone material cures to a medium- modulus rubber upon exposure to atmospheric moisture. The cured sealant is durable and flexible enough to accommodate ±50% movement of original joint dimension when installed in a properly designed weatherseal joint. In a properly designed structurally glazed joint, the sealant is strong enough to support glass and other panel materials under high wind-load and seismic effects.

Approvals/ Specifications

DOWSIL™ 795 Structural Glazing Sealant meets the requirements of: ASTM Specification C 1184 for structural silicone sealants ASTM Specification C 920, Class 50.

SINGAPORE GREEN BUILDING PRODUCT SGBC EXCELLENT

SGBP 2023-4337

Colors

DOWSIL™ 795 Structural Glazing Sealant is available in 4 colors: black, white, gray and bronze.

How to Use

When DOWSIL™ 795 Structural Glazing Sealant is used in structural applications the structural joint design MUST be reviewed by a technical service specialist.

Complete design and installation guidelines are contained in the Asia Technical Manual, and must be followed for warranty applications when using this product.

Joint Design

Structural joints sealed with DOWSIL™ 795 Structural Glazing Sealant should have a minimum depth (or bite) of 6 mm. For large site-glazed joints the sealant or bite should be not more than 12 mm when the sealant can cure from one side only. When an open-cell moisture-permeable spacer tape is used, a structural bite up to 24 mm can cure to optimum strength. The exact structural bite should always be calculated. The thickness of the structural sealant joint or glueline should be 6 mm minimum. As it must accommodate thermal and dynamic movements the actual joint movements should be calculated. Ideally the bite to glueline ratio should be not more than about 3:1.

Accessory Selection

The appropriate selection of all accessories such as setting blocks and backing materials is important to avoid discoloration or adhesion-related problems due to incompatibility. Dow will also assess the suitability of proposed accessory materials as part of the standard testing services. Silicone-based setting blocks are generally recommended for best compatibility.

Preparatory Work

Thoroughly clean all substrates to be sealed, removing all contaminants such as grease, oil, dust, frost or water. All metal, glass, or other surfaces should be cleaned with the recommended solvent, using a lint free cloth.

Method of Application

Install backing material or joint filler, setting blocks, spacer shims and tapes. Mask areas adjacent to joints to ensure neat sealant lines. Apply DOWSIL™ 795 Structural Glazing Sealant in a continuous operation using positive pressure. (The sealant can be applied using many types of air-operated guns and most types of bulk dispensing equipment.) Before a skin forms (typically within 15 minutes), tool the sealant with light pressure to spread the sealant against the backing material and joint surfaces. Remove masking tape as soon as the bead is tooled.

Handling Precautions

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW WEBSITE AT DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

Usable Life and Storage

When stored at or below 27°C (80°F), DOWSIL™ 795 Structural Glazing Sealant has a shelf life of 12 months from the date of manufacture. Refer to product packaging for “Use By Date.”

Questions about the use of DOWSIL™ 795 Structural Glazing Sealant can be answered by calling your local application sales engineer. Our laboratory personnel and technical service staff are also available for assistance.

Packaging Information

DOWSIL™ 795 Structural Glazing Sealant is supplied in 300 ml disposable plastic cartridges and 600 ml foil sausages.

Limitations

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

DOWSIL™ 795 Structural Glazing Sealant should not be used for structural applications without the prior written approval of the Construction Industry Technical Services Department. Each project should be specifically and separately approved by Dow.

Project specific approval involves the following prerequisites:

- Joint dimensioning and print reviews.
- Successful laboratory adhesion and compatibility testing to all building components.
- Observance of professional sealant application and workmanship standards.
- Users should always consult the Technical Services Department for adhesion recommendation.

Dow shall not be held liable for any possible claims arising from structural glazing use of DOWSIL™ 795 Structural Glazing Sealant for projects which have not been specifically approved by Dow.

For projects which have been approved, Dow will issue a structural adhesion warranty on a case by case basis at the user's request. It is the user's exclusive responsibility to ensure project compliance with local building regulations.

Health and Environmental Information

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

For further information, please see our website, dow.com or consult your local Dow representative.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user’s responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

dow.com

Why silicones are better than polyurethane?

1. Silicones are UV light stable. Organic (urethane or polyurethane) products are not and break down in sunlight. This is because UV does not have enough energy to cleave the SI-O, silicone bond. However, C-C bonds used in organic materials are very unstable. UV weathering is the main cause of sealant degradation.

2. Silicones do not get hard when they cold, organics products to. This causes adhesive failures in organic products even when adhesion looks good after a pull test. Note that the most important time for a sealant to work in the winter (as building substrates shrink and joints therefore get wider), which is exactly when organics have hardened.

3. Silicones maintain flexibility over time, organic products lose flexibility with aging.

4. Silicones can be applied at -20℉ (-29℃) without heating and will cure compared to organic sealants which need to be heated and will not cure unless they are above freezing.

5. DOWSIL silicones do not slump on hot days in the summer, polyurethanes tend to slump when hot.

6. Silicones skin over on average in 30 minutes versus 1-14 days for organic sealants, allowing the organic materials to pick-up more job site dirt. This dirt is embedded in the sealant permanently. Any dirt deposited on a silicone surface is easily cleaned away, even after years of build-up. Again, this is because silicone is basically a flexible Si-O (glass).

7. As organic sealants break down they crack, craze, split and chalk. Dirt can get embedded in the cracks easily. Silicone surfaces do not degrade.

8. Silicones last for 50+ years. This is because a silicone is basically glass. Just like you would not expect a pane of glass to melt after 20 or 30 years, neither will a silicone. Organic sealants begin to break down in 3-7 years. Where they are exposed to the most sunlight, like the south side of a building, they will break down faster. Urethanes can be thought of like paint in regard to weathering.

9. The DOWSIL CWS and 795 are low odor during cure and no odor after cure. As such they are approved for use inside healthy homes.

10. Many colors stocked and available in all products. 50 colors CWS in stock. We also offer custom colors with minimum quantities and 1-2 weeks lead times.

11. All our silicones (795, 792, 756, CWS, CCS) are independently tested and validated by SWRI (Sealant Weatherproofing and Restoration Institute). Please visit their web site at www.swrionline.org and note that all manufactures are part of SWRI but not all products are validated.

12. DOWSIL CWS is a single component sealant so no mixing is required on site versus a multi-component polyurethane. This gives much better quality control as you do not have to worry about the contractor properly mixing the sealant. Rarely do two-part products get mixed properly in the field.

13. DOWSIL silicones are non-staining on granite marble and limestone, specifically DOWSIL CCS, DOWSIL 790 and DOWSIL 756 SMS. Staining of sealants is an overblown issue as no sealants will stain brick or concrete or metals as these materials do not have the pour structure capillary action that pulls fluids out of sealants. On sensitive substrates DOWSIL employ proprietary cure systems that other manufacturer in the world.

14. All DOWSIL construction silicones are low VOC (less than 50g/L) and are LEED compliant.

15. Only silicones qualify for the LEED sustainability credit for building sealants.

16. The above information relates to DOWSIL silicones. Not all silicones are alike. Hybrid silicone/organic products exhibit the same degradation and failure rate as organics. ''Siliconized'' products are not silicones (they are leaning on the silicone quality reputation, but the free-fluid silicone used has little performance merit).

17. DOWSIL silicones are commonly used in re-caulking applications where urethanes were used previously.

18. Pull test for sealant performance and substrate preparation are important. However, silicones can often take 28 days at 68℉ (20℃) and 80% RH to develop full adhesion. Just because a silicone is a cured solid DOES NOT mean that full adhesion set has occurred. Urethanes often have quick green strength (initial adhesion) but don't be confused into thinking they have better overall adhesion in a dynamic joint. This is because a urethane MUST have better adhesion due to their poor performance in cold weather and the high bondline stresses they create. This is the reason that silicones have lower adhesive failure rates.

19. Urethanes and polyurethanes have drastically altered formulas since 2009 when they because to change their chemicals to meet new VOC guidelines. Also, many chemicals used in sealant production have changed (due to stricter environmental regulations) or discontinued production (US recession and Japanese tsunami). Dow has virtually full vertical integration with many products. Common silicone sealant formulas, due to their inherently low VOC, have not changed in decades. It many seem odd to have a formula that has not changed in years, but in a low margin market where competitors have cheapened their sealants considerably, Dow products remain an unthinned option with a proven track record.