THERMOSASH

Delta 40 Commercial

PRODUCT DISCLOSURE INFORMATION

Thermosash
BUILDING ENVELOPE SOLUTIONS™

Thermosash Commercial Ltd

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CLASS 2

DELTA 40 COMMERCIAL SUITE

PRODUCT DISCLOSURE INFORMATION

Product Name	Delta 40
Product Line	18 Series
Product Identifier	Delta 40
Place of manufacture	New Zealand - Designed, Engineered, Fabricated
Legal and trading name of the manufacturer(s):	Thermosash Commercial Ltd
Address of service (Head Office):	158 Central Park Drive, Henderson, Auckland, 0610, New Zealand
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PRODUCT DESCRIPTION

The Delta 40 Commercial Suite is a robust and adaptable integrated product range which can be fitted with awning, casement, hopper, spinner (i.e. reversible) sliding sashes and doors all within the same frame design - which can be internally or externally glazed and integrate with perimeter seismic frames.

The Delta Suite has been specified on a great majority of New Zealand projects where product quality and long term high performance levels are required. It was originally designed in the early 1970s and has been progressively upgraded and developed to become the clear market leader,

INTENDED USE

A1 BUILDING USE CLASSIFICATION

- Housing
- Communal residential
- Communal non-residential
- Commercial
- Industrial
- Ancillary

A3 BUILDING IMPORTANCE LEVELS

- Importance level 1
- Importance level 2
- Importance level 3
- Importance level 4
- Importance level 5

BUILDING TYPE

- High-rise
- Mid-rise
- Low-rise
- Specific design - subject to project wind pressure

BUILDING PART

- Façade
- Exterior doors and windows
- Suitable for use in areas requiring safety glass

BUILDING LOCATION

Suitable for the following zones / areas in New Zealand:

- Wind zones*
- Climate zones*
- Corrosion zones*
- Seismic risk areas*

*Subject to specific design, building design and specific test parameters

OTHER PROPERTIES

APPLICATION AND FUNCTIONALITY

- Mitigation of water ingress
- Provision of airtightness
- Resistance to wind actions
- Seismic resilience
- Thermal and acoustic insulation
- Provision of solar gain and natural light
- Ability to incorporate passive and active ventilation – louvres, sashes, sliders, rollers
- Access – Integrated sashes, sliders, rollers and doors
- Ventilation – by means of opening sashes, awnings, sliding, hopper and spinner windows

OTHER PROPERTIES

- Size or size range: as specified by project architect or engineer
- Type of opening if relevant: casement/awning, sliding, hinged, bi-fold – as specified by project architect or engineer
- Minimum construction R-value values as relevant to product selection
- Ventilation as per project architect
- Glazing transmittance values as per project consultant, architect or engineer
- Glass to meet requirements as specified by project architect or engineer – safety/performance/ impact/intruder/blast
- An extremely versatile product - outer frame construction - tenoned in a unique manner to provide a very strong and twist-free connection which removes the reliance on assembly screws for strength and small joint sealant for weathering of fabricated joints.
- An integrated wide-ranging robust product range that can be fitted with awning, casement, hopper, spinner (i.e. reversible) sliding sashes and doors all within the same frame design - inside / outside glazed and seismic frame.
- Sashes are mitred and crimped or cleated to provide superior torsional strength, enabling large sashes to be provided and which are capable of large spans.
- Sashes are designed with pressure seals internally (rear air seal) and externally to the heads and jambs to provide high-performance rainscreen pressure equalised weathering.
- Sashes have an integral drainage channel in the web of the section,

eliminating the need for externally applied weather bars.

- The system is generally dry-glazed with high-quality Santoprene gaskets.
- Glazing rebates of 22mm comply with minimum required commercial glass engagements and edge clearances for sophisticated high-performance architectural glass products (particularly insulated glass units). An important design requirement to obtain glass warranties.
- Delta windows can accommodate virtually any thickness of glass or panel from 4mm to 28mm.
- Delta windows integrate with perimeter seismic frames and (where required) seismic transoms to meet specified vertical or horizontal building movements (internally or externally glazed). This generally enables the installation of the product in high-rise applications from within the building, removing the need for costly external scaffolding.
- Specifically designed extruded sill trays are provided on all products to ensure rainscreen pressure equalised drainage principles are maintained. This design feature ensures fixings do not penetrate critical weathering lines and is particularly important with long-run coupled strip window units, a common feature on commercial window projects.
- Fire safety: subject to fire engineer's detail
- None of our products support combustion and all are designed with non-combustible materials

Finishes:

- Polyester powder coat - both standard and special colours available.
- Anodised - all anodised colours available - commercial grade 20 micron finish recommended.
- PVF2 Fluorocarbon finishes - available on request

FRAME SIZES

Single and double glazed options available

Fixed window frames	61mm Seismic 41mm Non Seismic
Awning / Sliding Hopper / Spinner window inserts	30mm
Hinged Doors	47mm Heavy Duty
Bifold Doors	47mm Heavy Duty
Glazing Pocket	4mm - 28mm

MAXIMUM SPANNING ABILITY

Thermosash specifically engineers the best suite option for your project taking into consideration span, structural system, and environmental loads (e.g. wind). The spanning ability will vary depending on the above.

INTEGRATED ELEMENTS

- Awning
- Casement
- Hopper
- Spinner (Reversible)
- Sliding sashes
- Doors
- 40mm Thermosash Mechanical Air Louvres can be integrated into panel doors

COMPOSITION

SYSTEM - TYPICAL COMPOSITION

- Aluminium
- General Purpose Weldable Steel
- Stainless Steel (304/316)
- Stainless Steel Bolts, Screws & Studs
- Galvanized Steel Bolts
- BUMAX Bolts 109
- Glass: Generally, number of glazing units (e.g. single, double, triple) and safety factors (e.g. safety glass)
- Structural Silicone
- Insulation
- Neoprene Rubber
- Nylon, molybdenum disulfide
- PVB, Polyvinyl butyral

SYSTEM - TYPICAL COMPONENTS

Each product/project is a fully specific design and engineered solution, utilising common components, such as extruded aluminium, sheet metal, fixings, sealants, insulation, and glass, fabricated in New Zealand and sold as a complete system. No part or parts sold individually / separately, for wholesale or retail.

CONDITIONS OF USE

INSTALLATION REQUIREMENTS

Must be installed by an approved Thermosash installer

DESIGN REQUIREMENTS

Delta 40 is prefabricated and glazed in a factory environment, to the requirements of each project. Prior to fabrication, the following project selections must be confirmed by the project architect, engineer or specifier:

- Opening panel size(s) and type(s), and configuration of fixed and opening panels, including any specific requirements for doors that are on access routes or escape routes.
- Project Wind Zone
- Project Exposure Zone
- IGU performance selections, including R-value, solar heat gain (SHGC), VLT, and safety glazing requirements
- Safety fittings and hardware
- Finish requirements and colour for aluminium components

Structural

Differential Movement Report generated by the Structural Engineer identifying:

- Max vertical movements "total" at interfaces with façade/window/curtainwall
- Beam deflections live load, creep, column shortening etc
- Precast joints in window openings. Nominate differential movements at corners of the precast panel
- ULS and SLS maximum inter-storey horizontal structure movements
- c(o) the site hazard coefficient
- Max unsupported spans between supports
- Barrier loadings on façade glazing to be nominated

- Floor usage to be nominated
- Wind Loads (ULS and SLS)
- Snow Loads
- Earthquake Loads
- Roof / Skylight / Canopy / Façade load - Maintenance Load (0.5 / 1.1 kN) / Trafficable Load (1.8kN)

Mechanical

- Glass performance required
  - SC, LT, LR
- Acoustic performance
  - STL/STC
- Colour aesthetics

Architectural

- Deflection limitation on glass
- Minimum Code L/90 annealed, or L/60 heat treated short span or higher
- RAB behind composite panels as air seal (not Tyvec type building wrap)
- Surface finish of joinery / composite panel
- Architectural Sheetmetal required for non-curtainwall/window areas
- Provision of Producer Statements Design (PS1) and Construction (PS3) B1, B2, E2, F2 Building Code Compliance

BUILDING CODE PERFORMANCE

RELEVANT CLAUSES

- B1 Structure
  - B1.3.1, B1.3.2 and B1.3.3 (g), (h) and (j), B1.3.4
  - PS1 for B1 Structure
- B2 Durability
  - B2.3.1 (b) and (c)
  - PS1 for B2 Durability
- C3 Fire affecting areas beyond the source
  - While we are not fire engineers and do not engage in the fire design of buildings, our products can be tailored to support compliance with Clause C3. We recommend collaborating with a fire engineer to ensure proper customisation and adherence to fire safety requirements.
  - We can provide a PS3 - Construction
- E2 External Moisture
  - E2.3.1 and E2.3.2
  - PS1 for E2 External Moisture
- F2 Hazardous Building Materials
  - F2.3.1. and F2.3.3 (a)
  - PS1 for F2 Hazardous Materials
- F4 Safety from falling
  - F4.3.1
- G4 Ventilation
  - While we do not assume responsibility for the design of fenestration and ventilation within buildings, we offer fenestration advice for compliance with code requirements and have the capacity to customise our products to aid in achieving compliance with Clause G4 standards.
- G7 Natural Light
  - While we do not assume responsibility for fenestration and lighting design within buildings, we have the capacity to customise our products to aid in achieving compliance with Clause G4 standards.
- H1 Energy Efficiency
  - H1.3.1 and H1.3.2E
  - We do not assume responsibility for overall building envelope H1 compliance – we are able to provide average R-Value for our system solutions along with fenestration and material options to improve our system's H1 performance, which would include options for Thermally Insulated and Thermally Broken solutions.

KEY NEW ZEALAND STANDARDS

Below is a list of some key New Zealand standards parts and clauses that can apply to aluminium windows in building projects. Please note that this list is not exhaustive, and you should consult with professionals and relevant authorities to ensure compliance with all applicable codes and standards for your specific project:

- NZS 4211:2008 – Performance of Windows
- NZS 4218:2019 – Thermal Insulation – Housing and Small Buildings
- NZS 4223.1:2008 – Glass selection and glazing
- NZS 4223.2:2016 – Glazing in Buildings
- NZS 4223.3:2016 – Human impact safety requirements
- NZS 4223.4:2008 – Wind, dead, snow, and live actions
- NZS 4223 Supp. 1:2008 – Supplement 1 to NZS 4223.1:2008 and NZS 4223.4:2008
- BS 8118: Part 1:1991 – Structural use of Aluminium
- EN. 1999 – Eurocode 9: Design of Aluminium structures
- AS/NZS 1170.0:2002 – Structural Design Actions – Part 0: General Principles
- AS/NZS 1170.0:2002 – Structural Design Actions – Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2:2011 – Structural Design Actions – Part 2: Wind Actions
- AS/NZS 1170.3:2011 – Structural Design Actions – Part 3: Snow and Ice Actions
- AS/NZS 1170.5:2011 – Structural Design Actions – Part 5: Earthquake Actions
- AS/NZS 1664.1:1997 – Aluminium Structures, Part 1: Limit state design
- AS/NZS 4284:2008 – Testing of Building Façades: Relevant for testing methods and performance standards for building façades, including windows. (Water / Air Pressure/ Air Leakage - Meets and exceeds minimum requirements)
- AS/NZS 4666:2012 – Insulating glass units: Requirements and guidelines for the long-term type testing, glazing, and periodic manufacturing testing of insulating glass units intended for use in buildings.
- ISO 12567-1:2020 – Thermal Performance of Windows, Doors and Shutters – Calculation of Thermal Transmittance – Part 1: General: Relevant for thermal transmittance calculations of windows.
- ISO 140-3:1995 – Acoustics – Measurement of Sound Insulation in Buildings and of Building Elements – Part 3: Laboratory Measurement of Airborne Sound Insulation of Building Elements: Relevant for laboratory measurements of airborne sound insulation of windows.

COMPLIANCE

THERMOSASH COMPLIANCE STATEMENT

Thermosash expertly engineers and designs each bespoke façade to the design and performance requirements of the individual project. We ensure that all compliance claims are backed by a comprehensive set of documents, including a PS1, PS3 and PS4, as well as a submitted compliance pathway.

Thermosash Group owns and operates the largest accredited façade testing facility in New Zealand (WEC) where we test our systems and custom-designed suites to ensure compliance with the codes or project-specific requirements.

All the Thermosash suites are independently laboratory tested to IANZ (International Accreditation New Zealand).

ACCEPTABLE SOLUTIONS AND VERIFICATION METHODS

NZBC Clause B1 Structure

COMPLIANCE BY B1/VM1 (project-specific design)

Compliance with B1 is shown by way of engineering calculations and/or testing, and reports are attached to the compliance pathway submission.

NZBC Clause B2 Durability

ACCEPTABLE SOLUTIONS B2/AS1

There are no Acceptable Solutions available for aluminium and steel, and protection is provided through surface treatment in accordance with:

- AS/NZS 2312:2014 - Guide to the protection of structural steel against atmospheric corrosion by the use
- of protective coatings.
- AAMA 2605-05 - Voluntary specification, performance requirements and test procedures for superior performing organic coatings on aluminium extrusions and panels.
- AS 37155:2002 - Metal finishing thermoset powder coatings for architectural applications of aluminium and aluminium alloys.
- AS 1231:2000 - Aluminium and aluminium alloys - anodic oxidation coatings.
- WANZ - Specification for powder coatings on architectural aluminium products.
- SNZ TS 3404:2018 - Durability requirements for steel structures and components

COMPLIANCE BY B2/VM1

All elements of the Thermosash product/system are specified by Thermosash to (with only normal maintenance) satisfy the performance requirements of the Building Code for 5 years (Surface Finish), 15 years (System), 50 years (Fixings/Connections) as appropriate.

Generally, all elements are designed from aluminium. Where engineering requirements demand stronger materials stainless steel (304 or 316 as appropriate), or steel (coated to SNZ TS 3404:2018) will be used.

NZBC Clause C3 Fire affecting areas beyond the source

COMPLIANCE – IF APPLICABLE

In the event that the incorporation of an element into our façade solution is necessary to adhere to Building Code C3 Fire affecting areas beyond the source, Thermosash will provide an engineered solution along with a comprehensive compliance pathway for approval.

While we are not fire engineers and do not engage in the fire design of buildings, our products can be tailored to support compliance with Clause C3. We recommend collaborating with a fire engineer to ensure proper customisation and adherence to fire safety requirements.

NZBC Clause E2 External Moisture

COMPLIANCE BY E2 ALTERNATIVE SOLUTION

Compliance of E2 Alternative Solution testing to AS/NZS4284 and good practice detailing as shown by way of testing, and test results are attached to every compliance pathway submission. Any complex/high risk details that arise will be checked specifically for weather tightness by our in-house Producer Statement Author following best practice design principles, making use of pressure-equalised drained cavities and specialist expertise and experience.

If required Thermosash can complete QA/QC site water testing in accordance with the following:

AAMA 501.2 test - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems (for fixed elements).

NZBC Clause F2 Hazardous Materials

COMPLIANCE BY F2/AS1 NZS4223.3

Thermosash can confirm there are no hazardous materials except glass within our systems. Compliance with F2 Hazardous Materials for glass is shown by compliance with NZS4223.3 or specific design. Compliance with F2 Hazardous Materials for Porcelain will be shown by physical testing of samples.

NZBC Clause F4 Safety from falling

COMPLIANCE BY NZS/AS 1170.1

Thermosash follows the safety in design intent on the architectural drawings and designs the doors/windows/curtainwall for C3 barrier loads where protecting a fall greater than 1 m NZS/AS 1170.1. Thermosash's responsibility is limited to the door/window/curtainwall.

NZBC Clause G4 Ventilation

COMPLIANCE – IF APPLICABLE

In the event that the incorporation of an element into our façade solution is necessary to adhere to Building Code G4 Ventilation for natural or mechanical ventilation, Thermosash will provide an engineered solution along with a comprehensive compliance pathway for approval.

NZBC Clause G7 Natural Light

COMPLIANCE – IF APPLICABLE

In the event that the incorporation of an element into our façade solution is necessary to adhere to Building Code G7 Natural Light, Thermosash will provide an engineered solution along with a comprehensive compliance pathway for approval.

NZBC Clause H1 Energy Efficiency

COMPLIANCE BY H1/AS2 – IF APPLICABLE
COMPLIANCE BY H1/VM2 – IF APPLICABLE

In the event that our façade solution is required to comply with Building Code H1 Energy Efficiency, compliance will be shown by way of Engineer's report, using calculation methods contained in NZBC Acceptable Solution H1/AS1 or H1/AS2 or the modelling methods contained in NZBC Verification methods H1/VM1 or H1/VM2 and include test results attached to a compliance pathway submission.

WARNINGS AND BANS

SUBJECT TO ANY WARNINGS OR BANS

None

MAINTENANCE

It is recommended that building washing should occur every 3-6 months to prevent staining to glass and environmental pollutants from corroding metals and to maintain the material warranties.

A full maintenance manual is provided on completion of a project for all the elements integrated within a project.

WARRANTY

The standard warranty is 10 years from the date of practical completion for these products. This covers workmanship and weather tightness, providing the subcontract includes fabrication, installation and glazing of all components.

- Structural integrity (framing, brackets, fixings) - 50 years
- Material and components life to first maintenance - 10 years
- Surface finish / seals / hardware - 5 years

DOCUMENTATION

DELTA 40 COMMERCIAL

The Thermosash Product Disclosure documents package includes:

- Delta 40 Commercial Product Disclosure Information -V01
- Delta 40 Awning Window with fixed sidelight_Test Report -V01
- Delta 40 Bi-Parting Sliding door_Test Report -V01
- Delta 40 Sliding Door & Flush Vent_Test Report -V01
- Delta 40 Spinner Window_Test Report - V01
- Delta 40 Stacking Sliding Door_Test Report - V01
- Thermosash Operations and Maintenance Manual - Example -V01

Document url:

https://www.thermosash.co.nz/downloads-resources/bpir-documents/

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Thermosash are members of:

NZGBC
TE KAUNIHERA HANGANGA TAUTAIAO

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Thermosash
BUILDING ENVELOPE SOLUTIONS™

DELTA40 COMMERCIAL SUITE

AWNING WINDOW WITH FIXED SIDELIGHT

TEST REPORT

Performance Tests of Thermosash Delta Awning Window with Fixed Sidelight to AS/NZS 4284:2008 Testing Of Building Facades

THERMOSASH COMMERCIAL LTD productinfo@thermosash.co.nz

Every project comes with its own set of special requirements, like wind loads, SLS, USL, seismic demands, inter-storey requisites, and more. The outcomes of this report illustrate a standard test conducted according to a project's distinct demands. The showcased results pertain to a past project. If needed, tests can be carried out to the exact requirements of a new project.

Test Facility: Window Engineering Consultants Testing Laboratory
Test Report #: 1423
Building Location: Central Auckland

PROJECT SPECIFIC PERFORMANCE REQUIREMENTS:

Serviceability Pressure:	+1300 Pa, -1300 Pa
Structural Deflection:	Mullion: Span/250
Test Sample:	The prototype was 2449 mm high by 3020 mm wide with two internal mullions centered 1041 mm from each side of O/A frame creating two large fixed sidelights. Two internal transoms centered 885 and 1182 from the bottom of the O/A frame creating an underlight and overlight with a center bay which incorporated an awning sash window. All lights were glazed with 6.76 mm laminated glass, fitted into the panel frames with an internal backing gasket, and external glazing wedges and beads. The awning sash with an overall size of 993 wide and 1176 high is pivoted off an integral Transom-Sash Head detail and utilizes a pair of restrictor stays and closes onto an internal gasket with an external gasket which is only installed along the head and jambs of the panel. The entire unit is situated within a seismic frame with an O/A size of 3080 wide and 2509 high consisting of a beaded, 50mm deep seismic head, jambs and placed onto a sill tray and fixed into place with internal backing gaskets and external wedges.

The test sample met the requirements for clauses (a), (b), (c), (d) and (g) in AS/NZS 4284:2008 Testing of Building Facades.

(B) STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

The sample was tested using the procedure described in AS/NZS 4284:2008.

The pressure loading sequence followed the sequence shown in Figure 1 of AS/NZS 4284:2008.

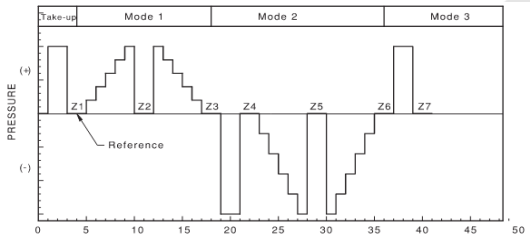


Figure 1

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

SERVICEABILITY	MAXIMUM DEFLECTION SPAN RATIO	POSITIVE PRESSURE TEST	NEGATIVE PRESSURE TEST	SUCCESSIVE MEMBER DISPLACEMENT	RESULT
+1300 Pa	Span/250 9.52mm	0.9mm @ +260 Pa 1.5mm @ +520 Pa 2.3mm @ +780 Pa 3.1mm @ +1040 Pa 3.8mm @ +1300 Pa	0.8mm @ -260 Pa 1.5mm @ -520 Pa 2.3mm @ -780 Pa 3.0mm @ -1040 Pa 2.8mm @ -1300 Pa	Z2 = 0.0 Z3 = 0.0 Z4 = -01 Z5 = -0.1 Z6 = -0.1 Z7 = -0.0	PASSED ✓

(C) AIR INFILTRATION (AIRTIGHTNESS)

AIR INFILTRATION	
NOTE	
Overall area: 7.75 m^2 The AS/NZS 4284:2008 recommended maximum air infiltration of 1.61 l/s.m^2 for air conditioned.	
Positive Air Leakage Test @ 150 Pa	<0.1 l/s
Negative Air Leakage Test @ -150 Pa	9.9 l/s

(D) WATER PENETRATION TEST BY STATIC PRESSURE, FOLLOWED BY CYCLIC PRESSURE TEST

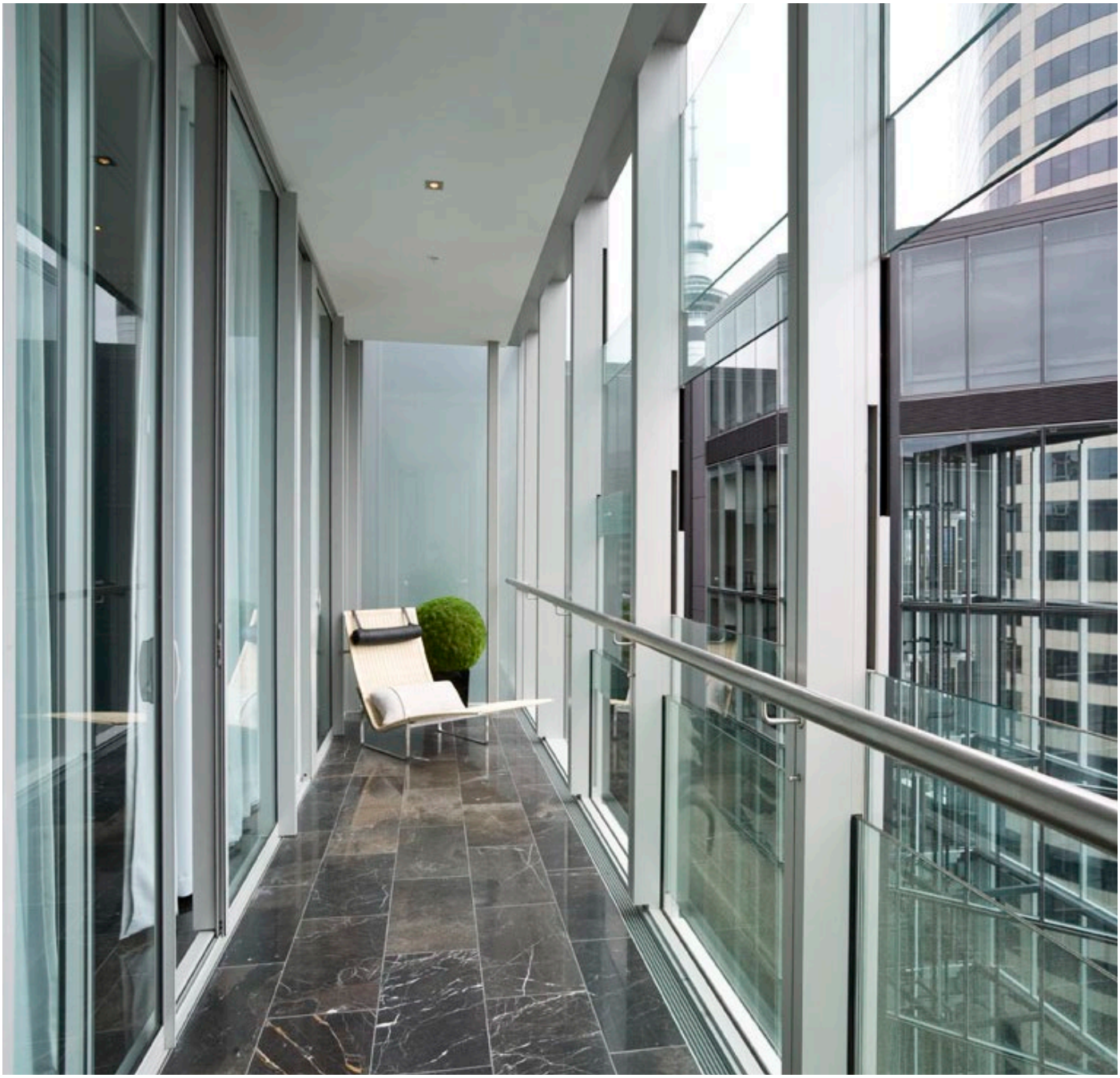
WATER PENETRATION TEST BY STATIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Static pressure stage 1	+1300 Pa	0 Pa	5 Minutes	No water penetration	PASSED ✓
Static pressure stage 2	+1300 Pa	390 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 2	+1300 Pa	450 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 4	+1300 Pa	525 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 5	+1300 Pa	600 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 6	+1300 Pa	800 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 7	+1300 Pa	1000 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 8	+1300 Pa	1200 Pa	15 Minutes	No water penetration	PASSED ✓
Static pressure stage 9	+1300 Pa	1500 Pa	15 Minutes	No water penetration	PASSED ✓

WATER PENETRATION TEST BY CYCLIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Cyclic pressure stage 1	+1300 Pa	+195-390 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 2	+1300 Pa	+260-520 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 3	+1300 Pa	+390-780 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 4	+1300 Pa	+450-900 Pa	5 Minutes	No overflow of door sill	PASSED ✓
Cyclic pressure stage 5	+1300 Pa	525-1050 Pa	5 Minutes	No overflow of door sill	PASSED ✓
Cyclic pressure stage 6	+1300 Pa	600-1200 Pa	5 Minutes	Slight leak at the sill, Not significant	NOTE ⚠

(G) STRUCTURAL TEST AT ULTIMATE LIMIT STATE

The test sample was subjected to ULS test pressures of +2000 Pa and -2000 Pa for 10 seconds each.

STRENGTH TEST AT ULTIMATE LIMIT STATE					
TEST	**SERVICEABILITY**	**WIND PRESSURE**	**DURATION**	**RESULT**	
ULS test stage 1	+1300 Pa	+2000 Pa	10 Seconds	No permanent distortion of structural collapse of the test unit was observed	PASSED ✓
ULS test stage 2	+1300 Pa	-2000 Pa	10 Seconds	No permanent distortion of structural collapse of the test unit was observed	PASSED ✓
ULS test stage 3	+1300 Pa	-2700 Pa	10 Seconds	No permanent distortion of structural collapse of the test unit was observed	PASSED ✓



DELTA40 COMMERCIAL SUITE

SLIDING DOOR WITH FLUSH VENT

TEST REPORT

Performance Tests of Thermosash Delta Sliding Door with Flush Vent to AS/NZS 4284:1995 Testing Of Building Facades

THERMOSASH COMMERCIAL LTD productinfo@thermosash.co.nz

Every project comes with its own set of special requirements, like wind loads, SLS, USL, seismic demands, inter-storey requisites, and more. The outcomes of this report illustrate a standard test conducted according to a project's distinct demands. The showcased results pertain to a past project. If needed, tests can be carried out to the exact requirements of a new project.

Test Facility: Window Engineering Consultants Testing Laboratory
Test Report #: 1385
Building Location: Central Auckland

PROJECT SPECIFIC PERFORMANCE REQUIREMENTS:

Serviceability Pressures:	+1400Pa, -2270 Pa
Structural Deflection:	Mullion: Span/217.5
Test Sample:	The prototype was 2150mm (H) x 1700mm (W). A single sliding panel with acoustic seals, Interlock proprietary handle, a vision rail centred approximately 660mm above the sill, opened to the external side of the fixed panel. The fixed panel had a lower transom matching height to the sliding panel vision rail, with an additional transom approximately 500mm below the head to provide the perimeter for the outward opening vent sash. The vent sash was fastened with a pair of Interlock proprietary catches positioned approximately 200mm from the lower corners on the bottom rail.

The test sample met the requirements for clauses (a), (b), (c), (d) and (g) in AS/NZS 4284:1995 Testing of Building Facades.

(B) STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

The sample was tested using the procedure described in AS/NZS 4284:1995.

The pressure loading sequence followed the sequence shown in Figure 1 of AS/NZS 4284:1995.

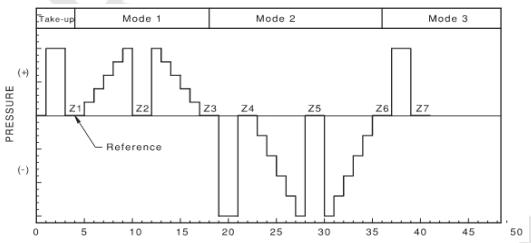


Figure 1

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

SERVICEABILITY	MAXIMUM DEFLECTION SPAN RATIO	POSITIVE PRESSURE TEST	NEGATIVE PRESSURE TEST	SUCCESSIVE MEMBER DISPLACEMENT	RESULT
+1400 Pa	Span/217.5 9.30mm	1.6mm @ +280 Pa 2.7mm @ +560 Pa 3.3mm @ +840 Pa 3.9mm @ +1120 Pa 4.5mm @ +1400 Pa	-2.6mm @ -454 Pa -4.3mm @ -900 Pa -5.6mm @ -1362 Pa -6.9mm @ -1818 Pa -8.2mm @ -2270 Pa	Z2 = 0.0 Z3 = 0.0 Z4 = -0.6 Z5 = -0.7 Z6 = -0.8 Z7 = -0.2	PASSED ✓

(C) AIR INFILTRATION (AIRTIGHTNESS)

AIR INFILTRATION	
NOTE	
Overall area: 3.66 m2 The AS/NZS 4284:1995 recommended maximum air infiltration of 1.0 l/s.m² based on overall area is accordingly: 3.66 l/s.	
Positive Air Leakage Test @ 300 Pa	<0.1 l/m²s
Negative Air Leakage Test	<0.1 l/m²s

(D) WATER PENETRATION TEST BY STATIC PRESSURE, FOLLOWED BY CYCLIC PRESSURE TEST

WATER PENETRATION TEST BY STATIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Static pressure stage 1	+1400 Pa	680 Pa	15 Minutes	Small quantity of water observed	NOTE ⚠
Sealant was added to glazing backing seals after test stage 1 – no further water penetration was observed.					PASSED ✓
Subsequent static penetration test 1	+1400 Pa	840 Pa	15 Minutes	No overflow of door sill	PASSED ✓
Subsequent static penetration test 2	+1400 Pa	900 Pa	15 Minutes	No overflow of door sill	PASSED ✓
Subsequent static penetration test 3	+1400 Pa	1000 Pa	15 Minutes	No overflow of door sill	PASSED ✓
WATER PENETRATION TEST BY CYCLIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Cyclic pressure stage 1	+1400 Pa	+150-300 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 2	+1400 Pa	+300-600 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 3	+1400 Pa	+420-840 Pa	5 Minutes	No visible water penetration	PASSED ✓
Subsequent cyclic penetration test 1	+1400 Pa	+540-1080 Pa	5 Minutes	No overflow of door sill	PASSED ✓
Subsequent cyclic penetration test 2	+1400 Pa	585-1170 Pa	5 Minutes	No overflow of door sill	PASSED ✓
Subsequent cyclic penetration test 3	+1400 Pa	660-1320 Pa	5 Minutes	No overflow of door sill	PASSED ✓

(G) ULTIMATE WIND LOAD TEST

The test sample was subjected to ULS test pressures of +1900 Pa and -3230 Pa for 10 seconds each.

STRENGTH TEST AT ULTIMATE LIMIT STATE					
TEST	**SERVICEABILITY**	**WIND PRESSURE**	**DURATION**	**RESULT**	
ULS test stage 1	+1400 Pa	+1900 Pa	10 Seconds	No visible failure or permanent distortion of the structural members or other components was observed	PASSED ✓
ULS test stage 2	+1400 Pa	-3230 Pa	10 Seconds	No visible failure or permanent distortion of the structural members or other components was observed	PASSED ✓

DELTA40 COMMERCIAL SUITE

BI-PARTING SLIDING DOOR

TEST REPORT

Performance Tests of Thermosash Bi-Parting Sliding Door to AS/NZS 4284:2008 Testing Of Building Facades

THERMOSASH COMMERCIAL LTD

productinfo@thermosash.co.nz

Every project comes with its own set of special requirements, like wind loads, SLS, USL, seismic demands, inter-storey requisites, and more. The outcomes of this report illustrate a standard test conducted according to a project's distinct demands. The showcased results pertain to a past project. If needed, tests can be carried out to the exact requirements of a new project.

Test Facility: Window Engineering Consultants Testing Laboratory at Woods Glass, 11 Olive Rd, Penrose
Test Report #: 1447
Building Location: Central Auckland

PROJECT SPECIFIC PERFORMANCE REQUIREMENTS:

Wind Pressures:	SLS: +1700, -1700 Pa	ULS: +2300, -2300 Pa
Inter-story Seismic:	SLS: +/- 8 mm	ULS: +/- 40 mm
Structural Deflection:	Mullion: Span/250	
Sample Size:	4000mm (H) x 2750mm (W)	

The sample consisted of powder-coated Aluminium glazed joinery fixed and fully sealed into the opening frame.
Fixed-lite window panels PFX1 and PFX2. Sliding door panels PS1 and PS2.

The test sample met the requirements for clauses (a), (b), (c), (d), (e) and (g) in AS/NZS 4284:2008 Testing of Building Facades. The sample was tested in the sequence described in Section 8.1.

(A) PRELIMINARY TESTS

TEST PARAMETERS	DURATION	RESULT	
Positive SLS wind pressures +1700	10 Seconds	No visible deformation	PASSED ✓
Negative SLS wind pressures -1700	10 Seconds	No visible deformation	PASSED ✓
WATER STATIC			
TEST PARAMETERS	**DURATION**	**RESULT**	
Static test pressure of 510 Pa	15 Minutes	No visible water penetration	PASSED ✓
WATER CYCLIC			
TEST PARAMETERS	**DURATION**	**RESULT**	
Stage 1: 255-510 Pa	5 Minutes	No visible water penetration	PASSED ✓
Stage 2: 340-680 Pa	5 Minutes	No visible water penetration	PASSED ✓
Stage 3: 510-1020 Pa	5 Minutes	No visible water penetration	PASSED ✓

(B) STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

The sample was tested using the procedure described in AS/NZS 4284:2008.

The pressure loading sequence followed the sequence shown in Figure 1 of AS/NZS 4284:2008 consisting of 5 stages being 20, 40, 60, 80 and 100% of the positive pressure pf 1700 Pa, and the negative SLS test pressure of -1700 Pa.

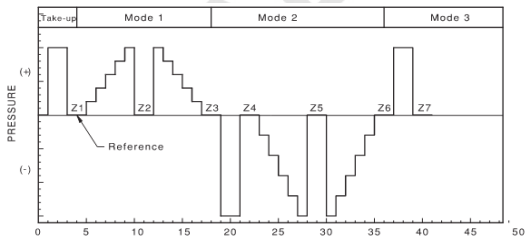


Figure 1

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

MEMBER JUNCTION	MAXIMUM NET DEFLECTIONS	SPAN	MAXIMUM DEFLECTION / SPAN RATIO	MAXIMUM NET DEFLECTION	RESULT
Fixed light window panel and sliding door panel two (PFX1-PS1)	1700 Pa	2612mm	1:287	-9.1mm	PASSED ✓
Sliding door panels one and two (PS1-PS2)	1700 Pa	2614mm	1:319	-8.2mm	PASSED ✓

SUCCESSIVE MEMBER DISPLACEMENT

STAGE	NET DEFLECTION OF PFX1-PS2 FIXED LIGHT TO SLIDER INTERLOCK	NET DEFLECTION OF PS1-PS2 SLIDING DOORS INTERLOCK	RESULT
Z1	0.0	0.0	PASSED ✓
Z2	0.1	0.1	
Z3	0.1	0.1	
Z4	-0.1	0.1	
Z5	-0.1	-0.1	
Z6	-0.1	-0.1	
Z7	-0.2	0.1	

(C) AIR INFILTRATION (AIRTIGHTNESS)

AIR INFILTRATION

NOTE	
Total air infiltration/exfiltration was measured at +150 and -150 Pa as required in Clause 8.4 and additional measurements at +300 Pa and -300 Pa.	
AS/NZS 4284 Allowable leakage	1.6 L/m^{2}s @ 150 Pa
Total internal surface area	11.89 m^2
Sample allowable leakage	17.4 L/s

AIR INFILTRATION			
TEST PARAMETERS	**POSITIVE PRESSURE (INFILTRATION) l/s**	**NEGATIVE PRESSURE (EXFILTRATION) l/s**	
±150 Pa	0.5 ± 0.5	1.4 ± 0.3	PASSED ✓
±300 Pa	N/A ± N/A	1.8 ± 0.3	PASSED ✓

(D) WATER PENETRATION TEST BY STATIC PRESSURE, FOLLOWED BY CYCLIC PRESSURE TEST

WATER PENETRATION TEST BY STATIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Static pressure stage 0	+1700 Pa	0	5 Minutes, water	No visible water penetration	PASSED ✓
Static pressure stage 1	+1700 Pa	510	15 Minutes, water	No visible water penetration	PASSED ✓
Static pressure stage 2	+1700 Pa	0	5 Minutes, no water	No visible water penetration	PASSED ✓
Subsequent static penetration test 1		+800 Pa	15 Minutes	Small initial leak, panel engagement re-set and timer started. No visible water penetration	PASSED ✓
Subsequent static penetration test 2		+1000 Pa	15 Minutes	No visible water penetration	PASSED ✓
Subsequent static penetration test 3		+1200 Pa	15 Minutes	No visible water penetration	PASSED ✓
WATER PENETRATION TEST BY CYCLIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Cyclic pressure stage 1	+1700 Pa	+255-510 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 2	+1700 Pa	+340-680 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 3	+1700 Pa	+510-1020 Pa	5 Minutes	No visible water penetration	PASSED ✓

(E) SEISMIC TEST AT SERVICEABILITY LIMIT STATE DISPLACEMENT

SEISMIC TEST AT SERVICEABILITY LIMIT STATE DISPLACEMENT						
TEST	**CYCLES OF DISPLACEMENT**	**SEISMIC RACKING**	**DURATION**	**AIR PRESSURE**	**RESULT**	
Pressure stage 1	10	±10 mm	5 Minutes	225-510 Pa	No visible water penetration	PASSED ✓
Pressure stage 2	10	±10 mm	5 Minutes	340-680 Pa	No visible water penetration	PASSED ✓
Pressure stage 3	10	±10 mm	5 Minutes	510-1020 Pa	No visible water penetration	PASSED ✓

(G) STRUCTURAL TEST AT ULTIMATE LIMIT STATE

The test sample was subjected to ULS test pressures of +2500 Pa and -2000 Pa for 10 seconds each following the additional water penetration tests in section D.

STRENGTH TEST AT ULTIMATE LIMIT STATE				
TEST	**AIR PRESSURE**	**DURATION**	**RESULT**	
ULS test stage 1	+2300 Pa	10 Seconds	No collapse	PASSED ✓
ULS test stage 2	-2300 Pa	10 Seconds	No collapse	PASSED ✓
ULS test stage 3	-2600	10 Seconds	No collapse	PASSED ✓

(H) SEISMIC TEST AT ULTIMATE LIMIT STATE DISPLACEMENT

SEISMIC TEST AT ULTIMATE LIMIT STATE DISPLACEMENT				
TEST	**CYCLES OF DISPLACEMENT**	**SEISMIC RACKING**	**RESULT**	
Stage 1	5	±40 mm	No visible damage. Door fully operational.	PASSED ✓

DELTA40 COMMERCIAL SUITE

STACKING SLIDING DOOR

TEST REPORT

Performance Tests of Thermosash Delta Awning Window with Fixed Sidelight to AS/NZS 4284:2008 Testing Of Building Facades

THERMOSASH COMMERCIAL LTD productinfo@thermosash.co.nz

Every project comes with its own set of special requirements, like wind loads, SLS, USL, seismic demands, inter-storey requisites, and more. The outcomes of this report illustrate a standard test conducted according to a project's distinct demands. The showcased results pertain to a past project. If needed, tests can be carried out to the exact requirements of a new project.

Test Facility: Window Engineering Consultants Testing Laboratory at Woods Glass, 11 Olive Rd, Penrose
Test Report #: 1459
Building Location: Central Auckland

PROJECT SPECIFIC PERFORMANCE REQUIREMENTS:

Wind Pressures:	SLS: +1700, -1700 Pa	ULS: +2300, -2300 Pa
Inter-story Seismic:	SLS: +/- 8 mm	ULS: +/- 40 mm
Structural Deflection:	Mullion: Span/250	
Sample Size:	4000mm (H) x 2750mm (W)	

The sample consisted of powder-coated Aluminium glazed joinery fixed and fully sealed into the opening frame.
Fixed-lite window panel PFX1. Sliding door panels PS1 and PS2.

The test sample met the requirements for clauses (a), (b), (c), (d), (e) and (g) in AS/NZS 4284:2008 Testing of Building Facades. The sample was tested in the sequence described in Section 8.1.

(A) PRELIMINARY TESTS

TEST PARAMETERS	DURATION	RESULT	
Positive SLS wind pressures +1700	10 Seconds	No visible deformation	PASSED ✓
Negative SLS wind pressures -1700	10 Seconds	No visible deformation	PASSED ✓
WATER STATIC			
TEST PARAMETERS	**DURATION**	**RESULT**	
Static test pressure of 510 Pa	15 Minutes	No visible water penetration	PASSED ✓
WATER CYCLIC			
TEST PARAMETERS	**DURATION**	**RESULT**	
Stage 1: 255-510 Pa	5 Minutes	No visible water penetration	PASSED ✓
Stage 2: 340-680 Pa	5 Minutes	No visible water penetration	PASSED ✓
Stage 3: 510-1020 Pa	5 Minutes	No visible water penetration	PASSED ✓

(B) STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

The sample was tested using the procedure described in AS/NZS 4284:2008.

The pressure loading sequence followed the sequence shown in Figure 1 of AS/NZS 4284:2008 consisting of 5 stages being 20, 40, 60, 80 and 100% of the positive pressure pf 1700 Pa, and the negative SLS test pressure of -1700 Pa.

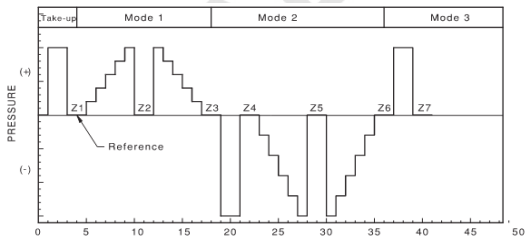


Figure 1

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

MEMBER JUNCTION	MAXIMUM NET DEFLECTIONS	SPAN	MAXIMUM DEFLECTION / SPAN RATIO	MAXIMUM NET DEFLECTION	RESULT
Fixed light window panel and sliding door panel two (PFX1-PS2)	1700 Pa	2594mm	1:250	-10.4mm	PASSED ✓
Sliding door panels one and two (PS1-PS2)	1700 Pa	2586mm	1:267	-9.7mm	PASSED ✓

SUCCESSIVE MEMBER DISPLACEMENT

STAGE	NET DEFLECTION OF PFX1-PS2 FIXED LIGHT TO SLIDER INTERLOCK	NET DEFLECTION OF PS1-PS2 SLIDING DOORS INTERLOCK	RESULT
Z1	0.0	0.0	PASSED ✓
Z2	0.0	0.1	
Z3	0.1	0.1	
Z4	0.6	0.2	
Z5	0.6	0.2	
Z6	0.6	0.2	
Z7	-0.0	0.2	

(C) AIR INFILTRATION (AIRTIGHTNESS)

AIR INFILTRATION

NOTE	
Total air infiltration/exfiltration was measured at +150 and -150 Pa as required in Clause 8.4 and additional measurements at +300 Pa and -300 Pa.	
AS/NZS 4284 Allowable leakage	1.6 L/m^{2}s @ 150 Pa
Total internal surface area	11.0 m^2
Sample allowable leakage	17.6 L/s

AIR INFILTRATION			
TEST PARAMETERS	**POSITIVE PRESSURE (INFILTRATION) l/s**	**NEGATIVE PRESSURE (EXFILTRATION) l/s**	
±150 Pa	0.2 ± 0.2	0.5 ± 0.2	PASSED ✓
±300 Pa	0.0 ± 1.0	9.1 ± 0.5	PASSED ✓

(D) WATER PENETRATION TEST BY STATIC PRESSURE, FOLLOWED BY CYCLIC PRESSURE TEST

WATER PENETRATION TEST BY STATIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Static pressure stage 0	+1700 Pa	0	5 Minutes, water	No visible water penetration	PASSED ✓
Static pressure stage 1	+1700 Pa	510	15 Minutes, water	No visible water penetration	PASSED ✓
Static pressure stage 2	+1700 Pa	0	5 Minutes, no water	No visible water penetration	PASSED ✓
Subsequent static penetration test 1		+800 Pa	15 Minutes	No visible water penetration	PASSED ✓
Subsequent static penetration test 2		+1000 Pa	15 Minutes	1 small drop at PS1 jamb after 13 minutes – not visible from occupied space. 1 small drop at PS2-PFX1 interlocker.	FAILED ✗
Subsequent static penetration test 3		+1000 Pa	15 Minutes	No visible water penetration	PASSED ✓
Subsequent static penetration test 4		+1200 Pa	15 Minutes	After 14 minutes water noticed leaking through sill tray backing bulb seal. All other junctions no leaks for 15 minutes.	FAILED ✗

WATER PENETRATION TEST BY CYCLIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Cyclic pressure stage 1	+1700 Pa	+255-510 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 2	+1700 Pa	+340-680 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 3	+1700 Pa	+510-1020 Pa	5 Minutes	No visible water penetration	PASSED ✓

(E) SEISMIC TEST AT SERVICEABILITY LIMIT STATE DISPLACEMENT

SEISMIC TEST AT SERVICEABILITY LIMIT STATE DISPLACEMENT						
TEST	**CYCLES OF DISPLACEMENT**	**SEISMIC RACKING**	**DURATION**	**AIR PRESSURE**	**RESULT**	
Pressure stage 1	10	±10 mm	5 Minutes	225-510 Pa	No visible water penetration	PASSED ✓
Pressure stage 2	10	±10 mm	5 Minutes	340-680 Pa	No visible water penetration	PASSED ✓
Pressure stage 3	10	±10 mm	5 Minutes	510-1020 Pa	Tiny bead in sill tray at bulb seal Oversealed and ok.	PASSED ✓
Pressure stage 4	10	±20 mm	5 Minutes	225-510 Pa	No visible water penetration	PASSED ✓
Pressure stage 5	10	±20 mm	5 Minutes	340-680 Pa	No visible water penetration	PASSED ✓
Pressure stage 6	10	±20 mm	5 Minutes	510-1020 Pa	No visible water penetration	PASSED ✓

(G) STRUCTURAL TEST AT ULTIMATE LIMIT STATE

The test sample was subjected to ULS test pressures of +2500 Pa and -2000 Pa for 10 seconds each following the additional water penetration tests in section D.

STRENGTH TEST AT ULTIMATE LIMIT STATE				
TEST	**AIR PRESSURE**	**DURATION**	**RESULT**	
ULS test stage 1	+2300 Pa	10 Seconds	No collapse	PASSED ✓
ULS test stage 2	-2300 Pa	10 Seconds	No collapse	PASSED ✓
ULS test stage 3	-2700	10 Seconds	No collapse	PASSED ✓

(H) SEISMIC TEST AT ULTIMATE LIMIT STATE DISPLACEMENT

SEISMIC TEST AT ULTIMATE LIMIT STATE DISPLACEMENT				
TEST	**CYCLES OF DISPLACEMENT**	**SEISMIC RACKING**	**RESULT**	
Stage 1	5	±40 mm	No visible damage. Door still fully operational.	PASSED ✓

DELTA40 COMMERCIAL SUITE

SPINNER WINDOW

TEST REPORT

Performance Tests of Thermosash Delta Spinner Window to AS/NZS 4284:2008 Testing Of Building Facades

THERMOSASH COMMERCIAL LTD productinfo@thermosash.co.nz

Every project comes with its own set of special requirements, like wind loads, SLS, USL, seismic demands, inter-storey requisites, and more. The outcomes of this report illustrate a standard test conducted according to a project's distinct demands. The showcased results pertain to a past project. If needed, tests can be carried out to the exact requirements of a new project.

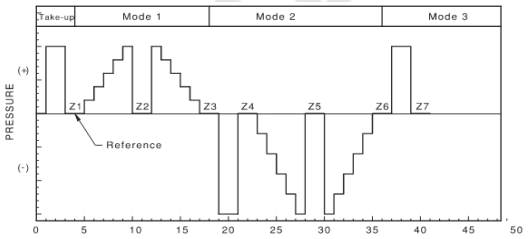
Test Facility: Window Engineering Consultants Testing Laboratory
Test Report #: 1417
Building Location: Wellington

PROJECT SPECIFIC PERFORMANCE REQUIREMENTS:

Serviceability Pressure:	+1300 Pa, -1300 Pa
Test Sample:	The prototype spinner window was 5511mm (H) x 600mm (W). The individual spinner sashes are arranged at 270mm centres, having overall dimensions of 492mm (W) x and 265mm (H) exclusive of the internal and external overlap flanges. The individual spinner sashes are glazed with 6.37mm laminated glass, and glazed with structural sealant into the Aluminium sash frames.

The test sample met the requirements for clauses (b), (c), and (d) in AS/NZS 4284:2008 Testing of Building Facades.

(B) STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE	
The sample was tested using the procedure described in AS/NZS 4284:2008. The pressure loading sequence followed the sequence shown in Figure 1 of AS/NZS 4284:2008.	 Figure 1

STRUCTURAL TEST AT SERVICEABILITY LIMIT STATE					
SERVICEABILITY	**MAXIMUM DEFLECTION SPAN RATIO**	**POSITIVE PRESSURE TEST**	**NEGATIVE PRESSURE TEST**	**SUCCESSIVE MEMBER DISPLACEMENT**	**RESULT**
+1300 Pa	N/A	+1300 Pa	-1300 Pa	N/A	NOT TESTED ⊘
NOTE: No deflection measurements on structural components were required					

(C) AIR INFILTRATION (AIRTIGHTNESS)

AIR INFILTRATION	
NOTE	
Overall area: 3.31 m^2 The AS/NZS 4284:2008 recommended maximum air infiltration of 5.30 l/s.	
Positive Air Leakage Test @ 150 Pa	6.0 l/s
Negative Air Leakage Test @ -150 Pa	6.5 l/s

(D) WATER PENETRATION TEST BY STATIC PRESSURE, FOLLOWED BY CYCLIC PRESSURE TEST

WATER PENETRATION TEST BY STATIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Static pressure stage 1	+1300 Pa	390 Pa	15 Minutes	Inor penetration through seals was retained within the additional sill and transom drainage channels. Water droplets from the transom drainage were adequately captured by a cover flange.	PASSED ✓
Static pressure stage 2	+1300 Pa	500 Pa	15 Minutes	Inor penetration through seals was retained within the additional sill and transom drainage channels. Water droplets from the transom drainage were adequately captured by a cover flange.	PASSED ✓
WATER PENETRATION TEST BY CYCLIC PRESSURE					
TEST	**SERVICEABILITY**	**AIR PRESSURE**	**DURATION**	**RESULT**	
Cyclic pressure stage 1	+1300 Pa	+195-390 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 2	+1300 Pa	+260-520 Pa	5 Minutes	No visible water penetration	PASSED ✓
Cyclic pressure stage 3	+1300 Pa	+390-780 Pa	5 Minutes	Occasional droplets emitted over the top edge of the transom drainage channel cover.	NOTE ⚠

(G) STRUCTURAL TEST AT ULTIMATE LIMIT STATE

The test sample was subjected to ULS test pressures of +2000 Pa and -2000 Pa for 10 seconds each.

STRENGTH TEST AT ULTIMATE LIMIT STATE					
TEST	**SERVICEABILITY**	**WIND PRESSURE**	**DURATION**	**RESULT**	
ULS test stage 1	+1300 Pa	+1900 Pa	10 Seconds	No visible damage was observed. Spinner window was able to be opened and closed.	PASSED ✓

SAMPLE ONLY
OPERATIONS & MAINTENANCE MANUAL

THERMOSASH COMMERCIAL LTD productinfo@thermosash.co.nz

Thermosash
BUILDING ENVELOPE SOLUTIONS™

CONTENTS:

1. INTRODUCTION

The purpose of the Operations & Maintenance Manual is to provide the following three major objectives:

1. The first and major aim is to supply to the building owner a concise document outlining all the relevant scope of works supplied by Thermosash Commercial Ltd (TCL) for this project that will require future cleaning, servicing, or maintenance. Whilst finished aluminium and glass for instance, usually only require an approved programmed cleaning regime, some products such as hardware items and automatic doors necessitate a preventative maintenance program to ensure that these components supplied and installed by TCL provide a maximum and serviceable life.
2. Secondly to provide details and specifications on TCL products and components utilised on the project to enable straightforward cleaning and maintenance of that product.
3. Thirdly to inform the building owner of their responsibilities in ensuring the products and components return maximum longevity under the individual products warranty conditions.

This section outlines to the building owner a concise document outlining all pertinent areas of the products supplied by TCL for the specified project.

The following scope is deemed to require application of this manual.

2. OPERATION AND MAINTENANCE INFORMATION

2.1 ALLOWABLE REPLACEMENT COMPONENTS

Where the replacement of a damaged product, or a substitution of a product is required, TCL must be notified of the intended work and shall verify all materials and methodology proposed for use. This is to occur before the work is to be carried out. Preferably this replacement work should be performed by TCL or as a minimum, under the supervision of a suitable TCL authorised representative.

Once this verification has been requested and given, TCL should be notified of time and date when the actual replacement of such materials will be performed. This is to ensure that the correct and compatible materials notified previously are used and that the products are suitable for the intended purpose or have not reached their batch use by dates.

NB. TCL manufacturer's warranties are dependent on the use of approved materials that are applied correctly.

2.2 FUTURE ADDITIONAL MODIFICATIONS

In the instances where modification of existing TCL installations is required, TCL must first grant approval of the modifications. If the modifications are allowable, TCL shall nominate the materials proposed for use. This is to occur before the work is to be carried out. Preferably this modification work should be performed by TCL or as a minimum, under the supervision of a suitable TCL authorised representative.

Common modifications to commercial installations are, but not limited to:

- Addition of internal blinds directly behind windows and doors (Affects the thermal safety assessment of the glass).
- Addition of solar tint film directly onto curtain windows and doors (Affects the thermal safety assessment of the glass).
- Addition of signage directly onto windows and doors glass or draped over the external face of the system (Affects the thermal safety assessment of the glass).
- Screw fixing any component directly to aluminium framing and cladding members (Affects the pressure equalisation and drainage principles of the system).
- Temporary removal and replacement of part or whole of any of the original contract scope (For instance to allow installation of large equipment).
- Permanent demolition of part or whole of any of the original contract scope.

Once this verification has been requested and given, TCL should be notified of time and date when the actual modification of such materials will be performed. This is to ensure that the correct and compatible materials notified previously are used and that the products are suitable for the intended purpose or have not reached their batch use by dates.

NB. TCL manufacturers warranties are dependent on the use of compatible materials that are fit for purpose.

2.3 RECOMMENDED REPLACEMENT PARTS TO BE HELD ON-SITE

It is recommended that the client/end user purchase a number of replacement parts to be stored in a suitable area on site at all times. In the case of broken glass, quick replacement of broken glazing addresses the obvious safety issues as well as prevents any potential for weather ingress. In the case of locking hardware and operable sash actuating mechanisms, if there is not quick replacement of damaged or broken parts within a product, other assemblies and parts may be affected, and potentially cause further damage. This is most prevalent under strong wind conditions where there are broken friction stays within operable sashes.
TCL can assist in the compilation of a suggested spares list based on the original orders placed for the project.

Spare Materials
Any spares required and/or replacement glass required must be ordered from TCL to ensure they are fit-for-purpose for the application, loading and seismic performance for human safety.

2.4 FREQUENCY OF CLEANING AND MAINTENANCE

The need for the window/façade cleaning and maintenance is a result of three requirements:

1. Aesthetic need to ensure that both the building is perceived to look acceptably clean and well maintained from the general public's point of view and for tenants or occupants' requirements.
2. For preventative maintenance.
3. To facilitate validity of product warranties.

Advice is often sought concerning the frequency of cleaning of products, and the answer is quite simply "clean it when it is dirty in order to restore its original appearance". This may vary from **two to four times minimum a year for external applications**, or it may be once a day for an item in aggressive situations. The cleaning schedule should be defined specifically for each project in association with the Thermosash Service & Maintenance Division.

The frequency of cleaning and preventative maintenance schedules is dependent on the severity of the building environment and is determined by the amount of accumulation of grime and use and wear (especially on hardware items) that can be observed.

SUBCONTRACTOR'S AND SUPPLIER'S RECOMMENDATIONS

In general - It is recommended that the building façade / windows are to be inspected visually every three (3) months, commencing upon practical completion, except as specified otherwise in subcontract maintenance recommendations, or set out as a warranty condition for that product.

In a rural atmosphere where grime deposition and pollution of the atmosphere are at a minimum, cleaning may not be needed more frequently than every three months in order to remove deposits and restore the appearance. In commercial, industrial, and marine environments more frequent cleaning, e.g., monthly, is necessary and **the maximum period between cleaning should never be more than three months.** Under the worst conditions involving heavy grime deposition and atmospheric pollution by both sulphur compounds and chlorides, even more frequent cleaning is advisable if deterioration of the anodic and painted finishes is to be prevented.

It is important to recognise that the physical presence of grime and dirt, or other foreign matter takes precedence over any routine maintenance scheduling recommended in this maintenance manual. Building management should take a pro-active approach to the inspection of the entire scope of the project works and schedule non-typical cleaning and maintenance as required, as unpredictable events such as spillages or renovation works internally or externally may necessitate additional attention.

2. 5 SCHEDULE OF CLEANING

It is anticipated that the building will be exposed to a "Normal" range of environmental conditions. The following are guidelines for the cleaning frequency of individual elements within the façade based on exposure to "Normal" range of environmental conditions. However, if heavy soiling occurs, then more regular cleaning is required.

GLASS – External for Typical Façade

External glass must be cleaned at regular intervals (every three (3) months but not exceeding six (6) months) after the final construction clean at Practical Completion as set out in the warranty conditions. These cleaning intervals are required to prevent the build-up of detrimental substances on the surface of the glass, and extra non-typical cleaning may be required to achieve this.

GLASS – External for Sheltered Areas

These can be more at risk of degradation than exposed areas. This is because windblown salt and other pollutants may adhere to the surface and will not be cleaned away with rainfall. These areas should be inspected and cleaned on a more regular basis. The external glass must be cleaned at regular intervals (every four (4) months) after the final construction clean at Practical Completion. These cleaning intervals are required to prevent the build-up of detrimental substances on the surface of the glass, and extra non-typical cleaning may be required to achieve this.

GLASS – Internal

Internal glass should be cleaned at regular intervals to the end user's own satisfaction after the trade clean at practical completion. These intervals are planned to prevent the build-up of detrimental substances on the surface of the glass, and extra non-typical cleaning may be required to achieve this.

POWDER-COAT Typical Façade Types

Painted finishes must be cleaned in accordance with AAMA 610.1-1979. **As a guide the typical cleaning regimes range from three-month intervals up to six months.** These intervals are planned to prevent the build-up of detrimental substances on the surface of the finish, and extra non-typical cleaning may be required to achieve this.

POWDER-COAT for Sheltered Areas can be more at risk of degradation than exposed areas. This is because windblown salt and other pollutants may adhere to the coated surface and will not be cleaned away with rainfall. These areas should be inspected and cleaned on a more regular basis. The external painted finishes must be cleaned at regular intervals (**every four months)** after the trade clean at practical completion as set out in the warranty conditions. These cleaning intervals are required to prevent the build-up of detrimental substances on the coated surfaces. Painted finishes must be cleaned in accordance with AAMA 610.1-1979.

ANODISED Surfaces

The frequency with which cleaning should be carried out will range from **monthly to six monthly** intervals according to the degree of contamination of the service environment. Aggressive environments may require more frequent cleaning.

HARDWARE

Inspections, cleaning, and maintenance as required must be held every **three (3) months** to prevent the build-up of detrimental substances on the external surfaces and internal mechanisms of all hardware items. Extra non-typical cleaning may be required to achieve this.

GASKETS, SEALS AND MOHAIR

Inspections, cleaning, and maintenance as required must be held every **six to 12 (6 – 12) months** to prevent the build-up of detrimental substances on the external surfaces and internal mechanisms of all hardware items. Extra non-typical cleaning may be required to achieve this. Moving parts/ sliding doors will cause higher levels of wear and degradation and shorter service life affecting replacement cycle.

SILICONE SEALS - Structural and Weather Seals

Inspections, cleaning, and maintenance as required must be held every **three (3) months** to prevent the build-up of detrimental substances on the external surfaces and internal mechanisms of all hardware items. Extra non-typical cleaning may be required to achieve this.

DRAINAGE WEEP SLOTS

Ensure drainage weep slots are free of debris and cleaned concurrently with all other cleaning schedules. Objective evidence of cleaning and any inspections by way of written records may be required. Insecticide should be used to kill spiders as required.

2.6 INSPECTION PROCEDURE

The condition and serviceability of any façade and/or window product, directly depends upon the frequency of inspections and tests and identification of any abnormalities that may reduce the effectiveness of the product over time affecting service life.

These inspections should be completed on both typical and non-typical portions of the building, thereby encompassing a portion of all the scope of work at each inspection. Each individual component of the contract works must be sighted, such as:

- Glass.
- Aluminium framing.
- Aluminium coating condition.
- Gaskets and mohair seals.
- Hardware operation and condition.
- Structural/Weather silicone seals.
- Drainage weep slots.
- Parapet caps for potential gaps at joints.

Should any abnormality be found with the product then it is recommended that the defect should be inspected and/or tested in the presence of a representative of TCL and our opinion sought in the cause of the abnormality and advice on further inspection requirements.

The representative of TCL and relevant suppliers shall make recommendations on possible remedial action and determine the cause and extent of the abnormality.

2.7 RECORDS AND REPORTS OF CLEANING MAINTENANCE, INSPECTIONS, OR REPLACEMENT OF COMPONENTS

Reporting of work carried out during cleaning and maintenance, removal, and reinstatement of window and/or façade components and results of inspection and testing performed on the building façade shall be recorded.

Evidence of cleaning and any inspections by way of written records must be kept.

1. Notes of inspections must be marked on the supplied 'As Built' drawings for future reference, to facilitate easy identification of inspected areas, and to show clearly the appropriate details studied.
2. This recorded information not only provides the building maintenance personnel with an accurate history of maintenance carried out to aid in the scheduling and budgeting of same but can help in determining if a common pattern of maintenance issues will emerge in the future.
3. Recording of this information should be performed by the Building Maintenance Supervisor. This information must remain available to TCL during the warranty period for reference as required.

Failure to provide objective evidence of façade works and maintenance completed will void TCL warranties.

3. CLEANING AND MAINTENANCE PROCEDURES

The following procedures are designed for the purpose of supplying the building management with guidelines on how to successfully clean and maintain the various surface finishes and hardware elements of the project.

Cleaning and maintenance procedures include general descriptions of the products and recommend the most practical cleaning and maintenance solutions to implement.

3.1 FAÇADE CLEANING & INSPECTION

ROUTINE MAINTENANCE AND INSPECTION

The requirements fall into four different categories:

1. **Every three months:**

   1.1 Cleaning down of aluminium with non-alkaline detergent and warm water, applied using a soft cloth or sponge (refer cleaning specification).

2. **Every six months:**

2.1 Check structural silicone joints as noted under "Sealant - Dow Corning".

2.2 Check all internal Santoprene gaskets to ensure that there is sufficient compression between the curtainwall member of the glazed or panelled area. Also check to ensure that corner joints are still acceptable and that seals have not shrunk away from these joints.

2.3 Check that all external drain holes of the horizontal façade members are clear.

2.4 Check to ensure that the transom to mullion fixings are still secure and that excessive gaps or misalignment have not developed.

2.5 Structural glass tension truss and/or spider assemblies to be checked/adjusted.

2.6 Externally bolted façade elements, eg Sunblade/solarshade louvres, Treadgrate, Shadegrate, Skylights/rooflights with screwed on cappings, spider assembles should be checked to ensure bolts are secure.

3. **After five years and then at 10 yearly intervals:**

3.1 Mullion to structure fixings to ensure that fixings have not corroded excessively and the restraining fasteners are secure.

In practice, for those checks in Category 3, it may not be possible to carry out all those on 100% of the building. It is therefore acceptable that, provided the external checks are satisfactory, the amount of internal checking required can be reduced to those areas visible or random checks of the internal areas are covered to highlight any potential problems (especially in a high wind-load area).

In Category 4 checks, these are, in practise, the most difficult to carry out as one of the main features of curtainwalling is that structural fixings are hidden from view. Every consideration should be given on all curtainwalling installations to a requirement for routine inspection of these fixings and we would recommend that a random check is done.

Provided the above checks are carried out and problems developing are remedied, we would estimate that a normal building life of some 60 years is achievable before a major refurbishment of the system is required. However, during this period it may be necessary to replace structural silicone joints, glazing gaskets and other like material where either inspection or performance deterioration highlight the requirements.

3.2 GLASS CLEANING

All glass surfaces should be kept clean by prompt removal of all dirt and residue.

Many substances can form on glass and should be removed as often as possible to ensure an acceptable appearance and to avoid permanent damage resulting in either a more

expensive clean up methodology or eventual replacement. Glass is normally hydrophilic which means that water is attracted to the glass. Water generally carries differing amounts of sediments and residues and deposits these on the glass during evaporation.

LIMITATIONS OF WARRANTIES APPLICABLE TO CLEANING AND MAINTENANCE

The product must be kept free from contact with wet cement, hard foreign objects, metals, and abrasives. No liquid set films, plastic film or sign or similar device is applied to any surface of the glass by others without written approval from TCL.

Warranties are limited to "normal" range of environmental conditions.

Normal atmospheric conditions exclude:

a) Corrosive or aggressive atmospheres such as those contaminated with chemical fumes, gasses other than those present in normal clean atmospheric air.
b) Exposure to water or moisture, intermittent or continued submersion in water or any other liquid or solid material which may cause rainbow type staining.
c) Exposure to radiation of any type other than normal sunlight.
d) Corrosive salt spray.
e) Acid rain from high density traffic flows.
f) Strong wind with sand.

Consultation with TCL before project initiation is required for these situations.

GENERIC GLASS CLEANING METHODOLOGY AND PRODUCTS

If possible, apply a pre-clean soaking of water onto the glass to soften the dirt particles. Apply a nonabrasive mild detergent solution or dilute ammonia and water to glass either by spraying or using a clean grit free cloth, sponge or paper towel saturated with cleaning solution. Complete coverage of area to be cleaned is a necessity. For ease in cleaning, an area not exceeding ten to fifteen square meters at a time is recommended.

Wipe the above cleaning solutions on the glass in a circular motion and apply light to moderate pressure. Approximately three to five passes of the affected area may be required, depending on the adhesion and severity of the residue or sedimentation on the glass.

After cleaning with solution rinse the glass surface with generous amounts of clean water, removing all traces of cleaning solution from glass surface. Using a squeegee or clean, lint free dry cloth or paper towel to remove water from the glass surface. If dirt residue is still evident on the glass when dry, repeat the above.

NB CAUTIONS AND TECHNIQUES

Alkalis that have leached from construction concrete onto glass can cause staining or etching

of the glass surface. It is important that all glass should be cleaned, as soon as possible, if such conditions exist. In most cases, the longer the residue is left on the glass, the greater potential for permanent marking/staining of the glass.

The run-off from other adjacent materials used by sub trades may be difficult to remove from the glass surface. It is important that all glass should be cleaned, as soon as possible, if such conditions exist. In most cases, the longer the residue is left on the glass, the greater potential for permanent marking/staining of the glass.

Do not clean glass when glass is exposed to direct sunlight. Glass should be cleaned by starting at the top of the building or top pane of glass and systematically working down to glass installed on lower levels. This technique reduces the possibility of residue and cleaning solution run down on glass previously cleaned.

Additional care should be exercised when cleaning all glass surfaces to ensure that gritty cloths, the metal parts of squeegees, or other sharp, hard objects do not scratch the glass surface during the cleaning procedures. Metal scrapers must not be used at any time. Scratched glass due to improper cleaning procedures is easily identified and damaged glass due to this occurrence will not be replaced under a warranty claim.

It is suggested that the building owner provide a qualified inspector who will see that the desired effect is being obtained with the use of sound procedures. Inspection should commence early in the cleaning procedure.

Consideration must be given to the adjacent building surrounding possible effect of run down on shrubbery, personnel, equipment etc located below. These factors may require considerations toward methodologies and timing.

Exposed aluminium silicone seals – either structural or weather seals, and glazing gasketry and mohair's should be cleaned concurrently with the glass.

3.3 ALUMINIUM POWDER-COATED PAINTED SURFACES

Aluminium possesses excellent resistance to atmospheric corrosion even in its natural or 'mill finish' condition although the appearance is much improved and resistance to atmospheric attack is greatly increased by finishing with powder-coat paint. However, the surface condition may deteriorate in certain circumstances, and it is therefore necessary to maintain the finish by regular cleaning if the original appearance is to be retained. It is emphasised that this deterioration does not materially affect the strength or service life of the aluminium itself although roughening of the surface can ultimately interfere with the operation of moving parts such as sliding sash units.
Powder coating is available in 4 levels of application. Each higher level of application offers an increasing level of paint warranty in regard to retention of colour and film integrity. The maintenance of powder-coated aluminium is covered by AAMA 610.1-1979 (ref Appendices) which end users must follow regarding cleaning interval recommendations, with atmospheric environments acting as a variable affecting the intervals.

Limitations of warranties applicable to cleaning and maintenance

Warranties are limited to “normal” range of environmental conditions. Normal atmospheric conditions exclude:

a) Corrosive or aggressive atmospheres such as those contaminated with chemical fumes, gasses other than those present in normal clean atmospheric air.
b) Exposure to water or moisture, intermittent or continued submersion in water or any other liquid or solid material which may cause rainbow type staining.
c) Exposure to radiation of any type other than normal sunlight.
d) Corrosive salt spray.
e) Acid rain from high density traffic flows.
f) Strong wind with sand.

Consultation with TCL before project initiation is required for these situations.

CLEANING METHODOLOGY

The exact procedure for cleaning will vary depending on the nature and degree of soiling. Method of cleaning, type of cleaning, etc. of one component of the building must be used with consideration for other components such as glass, sealants, painted surfaces, etc.

Removal of light surface soiling may be accomplished in several ways. Some testing is recommended to determine the degree of cleaning necessary to accomplish the task. An initial step of forceful water rinse from the top down is recommended prior to any cleaner application. Significant benefit is gained with some type of surface agitation. Low water volume with moderate pressure is much better than considerable volume with little pressure.

Physical rubbing of the surface with soft, wet brushes, sponges or cloth is also helpful. As an initial step, apply a water rinse with moderate pressure to dislodge the soil. If this does not remove the soiling, then a concurrent water spray with brushing or sponging. We do not recommend the use of water blasters. The washing should be done with uniform pressure, cleaning first with a horizontal motion and then with a vertical motion. Apply cleaners only to an area that can be conveniently cleaned without changing position. The surface must be thoroughly rinsed with clean water. It may be necessary to sponge the surface while rinsing, particularly if cleaner is permitted to dry on the surface. The rinsed surface is permitted to air dry or is wiped dry with a chamois, squeegee or lint free cloth.

Rundown of cleaner (from any operation) to the lower portions of the building should be minimised and these areas should be rinsed as soon as possible to lessen streaking, etc. Do not allow cleaning chemicals to collect on surfaces or to "puddle" on horizontal surfaces, crevices, etc. These should be flushed with water and dried. Always clean coated surfaces down from top to bottom and follow with a thorough rinsing with clean water.

Mild soaps or detergents ruled safe for bare hands are safe for coated aluminium. Stronger detergents such as some dishwater detergents should be carefully spot tested. Some of the

latter would necessitate rubber gloves, long handled brushes, etc. With any, the finish should be thoroughly rinsed with clean water and dried. A non-abrasive mild detergent solution will not have any deleterious effects. Use cloth, sponges or a soft bristle brush for application and rinse well after use.

NB. CAUTIONS AND TECHNIQUES

Over cleaning or excessive rubbing can do more harm than good. Strong solvents or strong cleaner concentrations can cause damage to painted surfaces. Always test a small area first. Avoid abrasive cleaners. Do not scour painted surfaces. Do not use household cleaners that contain abrasives on painted surfaces. Abrasive material such as steel wool, abrasive brushes etc can abrade, wear and harm finishes. Additional care should be exercised when cleaning all surfaces to ensure that gritty cloths, the metal parts of squeegees, or other sharp, hard objects do not scratch the surface during the cleaning procedures. Metal scrapers must not be used at any time. Scratched finishes due to improper cleaning procedures are easily identified and damages due to this occurrence will not be replaced under a warranty claim.

Never use paint removers, aggressive alkaline, acid, or abrasive cleaners. Do not use trisodium phosphate or highly alkaline or highly acid cleaners. Follow manufacturers' recommendations for mixing and diluting cleaners. Never mix cleaners. The mixing of cleaners may not only be ineffective but also very dangerous. Avoid drips and splashes.

Remove run downs as quickly as possible.

Avoid temperature extremes. Ideally, cleaning should be done at moderate temperature. Heat accelerates chemical reactions and may evaporate water from solution. Cleaning should be done on the shaded side of the building or ideally on a mild, cloudy day. Cleaning under adverse conditions may result in streaking or staining.

Do not substitute a heavy-duty cleaner for a frequently used mild cleaner.

It is suggested that the building owner provide a qualified inspector who will see that the desired effect is being obtained with the use of sound procedures. Inspection should commence early in the cleaning procedure.

Consideration must be given to the adjacent building surrounding possible effect of run down on shrubbery, personnel, equipment etc located below. These factors may require considerations toward methodologies and timing.

3.4 ALUMINIUM ANODISED SURFACES

Aluminium possesses excellent resistance to atmospheric corrosion even in its natural or ‘mill finish' condition although the appearance is improved and resistance to atmospheric attack is greatly increased by anodising. However, the surface condition may deteriorate under certain circumstances, and it is therefore necessary to maintain the finish by regular cleaning if the original appearance is to be retained. It is emphasised that this deterioration does not materially affect the strength or service life of the aluminium itself although

roughening of the surface can ultimately interfere with the operation of moving parts such as sliding sash units.

Anodising film is general available in a limited range of colours with varying anodising film thickness, ranging from 10 to 25 microns. The maintenance of anodised aluminium is covered by NZ SFA 3503-03 in regard to cleaning intervals, with film thicknesses and atmospheric environments acting as variables affecting the intervals.

The following is an extract from SFA 3503-03, Maintenance of anodised aluminium:

"Regular cleaning is essential if the finish of anodised aluminium is to be preserved over the years. Deterioration of the anodic oxide coating can occur, mainly as a result of grime deposition and subsequent attack by moisture, particularly when it is contaminated with sulphur compounds. Deposited grime retains the contaminated moisture on the anodised surface permitting attack to proceed and, thereby, damaging the anodic oxide coating, which cannot be renewed in situ."

Limitations of warranties applicable to cleaning and maintenance

Warranties are limited to "normal" range of environmental conditions. Normal atmospheric conditions exclude:

a) Corrosive or aggressive atmospheres such as those contaminated with chemical fumes, gasses other than those present in normal clean atmospheric air.
b) Exposure to water or moisture, intermittent or continued submersion in water or any other liquid or solid material which may cause rainbow type staining.
c) Exposure to radiation of any type other than normal sunlight.
d) Corrosive salt spray.
e) Acid rain from high density traffic flows.
f) Strong wind with sand. Consultation with TCL before project initiation is required for these situations.

CLEANING METHODOLOGY

The exact procedure for cleaning will vary depending on the nature and degree of soil. Method of cleaning, type of cleaning, etc of one component of the building must be used with consideration for other components such as glass, sealants, painted surfaces, etc. Removal of light surface soil may be accomplished in several ways. Some testing is recommended to determine the degree of cleaning necessary to accomplish the task. An initial step of a forceful water rinse from the top down is recommended prior to any cleaner application. Significant benefit is gained with some type of surface agitation.
Low water volume with moderate pressure is much better than considerable volume with little pressure.

Physical rubbing of the surface with soft, wet brushes, sponges or cloth is also helpful. As an initial step, apply a water rinse with moderate pressure to dislodge the soil. If this does not remove the soil, then a concurrent water spray with brushing or sponging. The washing

should be done with uniform pressure, cleaning first with a horizontal motion and then with a vertical motion. Apply cleaners only to an area that can be conveniently cleaned without changing position. The surface must be thoroughly rinsed with clean water. It may be necessary to sponge the surface while rinsing, particularly if cleaner is permitted to dry on the surface. The rinsed surface is permitted to air dry or is wiped dry with a chamois, squeegee or lint free cloth.
Rundown of cleaner (from any operation) to the lower portions of the building should be minimised and these areas should be rinsed as soon as possible to lessen streaking, etc. Do not allow cleaning chemicals to collect on surfaces or to "puddle" on horizontal surfaces, crevices, etc. These should be flushed with water and dried. Always clean coated surfaces down from top to bottom and follow with a thorough rinsing with clean water.

Mild soaps or detergents ruled safe for bare hands are safe for coated aluminium. Stronger detergents such as some dishwater detergents should be carefully spot tested. Some of the latter would necessitate rubber gloves, long handled brushes, etc. With any, the finish should be thoroughly rinsed with clean water and dried. A non-abrasive mild detergent solution will not have any deleterious effects. Use cloth, sponges or a soft bristle brush for application and rinse well after use.

NB. **CAUTIONS AND TECHNIQUES**

Over cleaning or excessive rubbing can do more harm than good. Strong solvents or strong cleaner concentrations can cause damage to painted surfaces. Always test a small area first. Avoid abrasive cleaners. Do not scour painted surfaces. Do not use household cleaners that contain abrasives on painted surfaces. Abrasive material such as steel wool, abrasive brushes etc can abrade, wear and harm finishes. Additional care should be exercised when cleaning all surfaces to ensure that gritty cloths, the metal parts of squeegees, or other sharp, hard objects do not scratch the surface during the cleaning procedures. Metal scrapers must not be used at any time. Scratched finishes due to improper cleaning procedures is easily identified and damages due to this occurrence will not be replaced under a warranty claim.

Never use paint removers, aggressive alkaline, acid, or abrasive cleaners. Do not use trisodium phosphate or highly alkaline or highly acid cleaners. Follow manufacturers' recommendations for mixing and diluting cleaners. Never mix cleaners. The mixing of cleaners may not only be ineffective but also very dangerous. Avoid drips and splashes. Remove run downs as quickly as possible.

Avoid temperature extremes. Ideally, cleaning should be done at moderate temperature. Heat accelerates chemical reactions and may evaporate water from solution. Cleaning should be done on the shaded side of the building or ideally on a mild, cloudy day. Cleaning under adverse conditions may result in streaking or staining.
Do not substitute a heavy-duty cleaner for a frequently used mild cleaner.
It is suggested that the building owner provide a qualified inspector who will see that the desired effect is being obtained with the use of sound procedures. Inspection should commence early in the cleaning procedure.

Consideration must be given to the adjacent building surrounding possible effect of run down on shrubbery, personnel, equipment etc located below. These factors may require considerations toward methodologies and timing.

3.5 GENERAL HARDWARE

Regular periodic maintenance is required on all proprietary hardware items supplied such as (but not limited to) Locks, hinges, catches, rollers, door closers and the like.

Maintenance schedules are proportional to usage and wear, site and environmental conditions. The effects of ultraviolet light, atmospheric pollution, general dirt and grime and airborne salt deposits can all accumulate over time and should be removed at regular intervals. These intervals are planned to prevent the build-up of detrimental substances on the external or internal mechanisms of the hardware's, and extra non-typical cleaning may be required to achieve this in extreme environments.

Limitations of warranties applicable to cleaning and maintenance

Warranties are limited to "normal" range of environmental conditions. Normal atmospheric conditions exclude:

a) Corrosive or aggressive atmospheres such as those contaminated with chemical fumes, gasses other than those present in normal clean atmospheric air.
b) Exposure to water or moisture, intermittent or continued submersion in water or any other liquid or solid material which may cause rainbow type staining.
c) Exposure to radiation of any type other than normal sunlight.
d) Corrosive salt spray.
e) Acid rain from high density traffic flows.
f) Strong wind with sand.

CLEANING METHODOLOGY

FIXING SCREWS. All hardware's are kept in place by fixing screws or some type of similar proprietary retaining item. Inspections of the screws to check for integrity of fixings and connection to frames must precede cleaning. Despite the use of base aluminium and high-grade stainless steel for fixings – it is impossible to prevent completely the initiation of the corrosion process due to the chemical reaction between dissimilar metals. This process occurs only after time and it is imperative that the fixings are regularly cleaned alongside the aluminium surfaces and that they are lightly coated after cleaning with oil-based sprays such as CRC, RP7 or WD40.

HINGES. Must be kept free of dirt, grime, and foreign materials. Inspections of the hinges to check for integrity of fixings and connection to door frames and/or glass must precede cleaning. Hinges should be brushed to remove loose particles. A concurrent water spray with brushing or sponging should remove stubborn dirt residuals. Any remaining substances can be removed with a non-abrasive mild detergent solution. Use cloth, sponges or a soft bristle

brush for application and rinse well after use. Ensure that hinge joints are lightly coated after cleaning with oil-based sprays such as CRC, RP7 or WD40.

***LOCKS*.** The mechanism of locks relies on the function of many parts. These parts must be kept free of deleterious materials. Inspections of the handles to check for integrity of fixings and connection to door frames and/or glass must precede cleaning. External surfaces must be kept clean with a non-abrasive clean cloth damp with a mild detergent solution. Atmospheres with a high level of saltwater deposit a layer of fine salt particles that must be removed as soon as it is sighted upon inspection. Internal workings of locks, catches etc., should be kept in good working order by applying a light spray of lubricant similar to CRC, RP7 or WD40. Care should be taken to ensure that any finished surfaces (e.g., paint etc.), in close proximity to the hardware being maintained, are well protected to avoid damage to the finishes.

***HANDLES*.** Inspections of the handles to check for integrity of fixings and connection to door frames and/or glass must precede cleaning. External surfaces must be kept clean with a non-abrasive clean cloth damp with a mild detergent solution. A concurrent water spray with brushing or sponging should remove stubborn dirt residuals.

FREQUENCIES

The procedures mentioned above need to be carried out as often as necessary to prevent deterioration in the installed environment, however we recommend the following minimum frequency of application:

- General environments — 6 monthly minimum.
- Marine and industrial environments — 3 monthly maximum.

Regular maintenance is required to all hardware, even stainless steel; otherwise, the manufacturer's warranty may be voided.

PERFORMANCE STANDARD FOR MAINTENANCE & INSPECTION (IF APPLICABLE)

Thermosash Commercial requires an annual facade inspection to check all moving parts, façade cleaning, external bolted fins, structural glass/canopies, solarshade items, tension assembly tension loads and auto doors for fire egress compliance requirements and Thermosash PS 1 Design Producer Statement conditions. Inspections/service work required must be completed by Thermosash Commercial due to product guarantees including any reglazes given the specialist nature and engineering solutions incorporated in the scope of work. NB Main Contractors must provide water-tight openings and structure.

4. REMOVAL AND REINSTATEMENT OF COMPONENTS

The following procedures are provided solely as a general descriptive methodology regarding removal and reinstatement of components supplied or installed by TCL. Before any such procedures are carried out, please notify TCL.

If any procedure is performed whilst still under the project warranty periods, this work shall be done by TCL to ensure that the project warranties on the components is not void due to incorrect work / methods being performed. If is not possible to supply personnel from TCL directly then an appropriate level of supervision should be requested to guide the labour provided. Personnel performing such maintenance work on the building façade should be suitably qualified and have industry experience in the work that is required to be done.

Record of maintenance and repairs is to be documented and evidence retained in Section 6 of this maintenance manual. Records are to be completed during any removal and reinstatement of components inspection or maintenance on the façade as a historical record or work completed.

External access must be provided to all façade elements. If the project has a flush façade and there is no Building maintenance unit available on the building, a purpose made swing stage shall be installed to allow external access where required. In addition, if re-glazing, a roof mounted lifting device is required with suitable battery-operated suction plates for supporting the components.

Note: The following procedures should only be considered as technical working procedures and not a safe work method statement. Full risk assessment documentation and appropriate work method statement should be prepared based on the local governing workplace health and safety laws, prior to any work commencing on site. TCL can assist in this documentation.

5. INSPECTION AND MAINTENANCE PROGRAMME

RECOMMENDED PREVENTATIVE PROGRAMME FOR MAINTENANCE OF FAÇADE AND ALUMINIUM JOINERY						
TASK	**3 MONTHLY**	**6 MONTHLY**	**9 MONTHLY**	**12 MONTHLY**	**2 YEARLY**	**5 YEARLY**
Clean Aluminium Joinery/Curtainwall Panels						
Clean Glass (Including Rubber Gaskets)						
Automatic Door Service						
Check Weather Seals						
Check Rubber Glazing Gaskets						
Check Structural Silicone Joints						
Check External Drain Holes are Clear of Debris						
Check Transom to Mullion Gaps & Alignment						
Care & Maintenance of Window & Door Hardware						
Check Externally Bolted Façade Elements – Skylights – Adjustment by Thermosash personnel only						

6. Inspection and Maintenance Records

With reference to the Preventative Programme, the format below shows the minimum information required to be recorded when cleaning, inspections, maintenance is performed:

Date start	Date Finished	Maintenance description	Location	Contractor	Contractor name and signature