# Alucolux Cladding Systems

This compliance statement, produced by Oculus Architectural Engineering Limited, is an evaluation of the following product's ability to fulfil the following performance requirements of the New Zealand Building Code (NZBC) based on the available international performance documentation referenced below:

- B1 Structure,
- B2 Durability,
- C3 Fire affecting areas beyond the source,
- E2 Exterior Moisture

This compliance statement has been produced assuming the product will be utilised in accordance with the manufactures details in the application described below.

## Compliance Statement for SPS Building System's Alucolux Cladding System

Alucolux is aluminium cladding material manufactured into panels installed as part of a rainscreen cladding system.

The Alucolux cladding panel is a 3mm thick solid aluminium panel without a polymer core. As a result, the panel also achieves an A1 classification (non-combustible materials) to the EN 13501-1 standard and boasts an increased strength for the same thickness over polymer core products but is, as a result, heavier.

Metal panel systems perform substantially similar with regard to many building code requirements. Thus testing done with one panel, attached in a similar method will be expected to perform substantially similar. Where differences in properties are relevant, they are explained in the sections below.

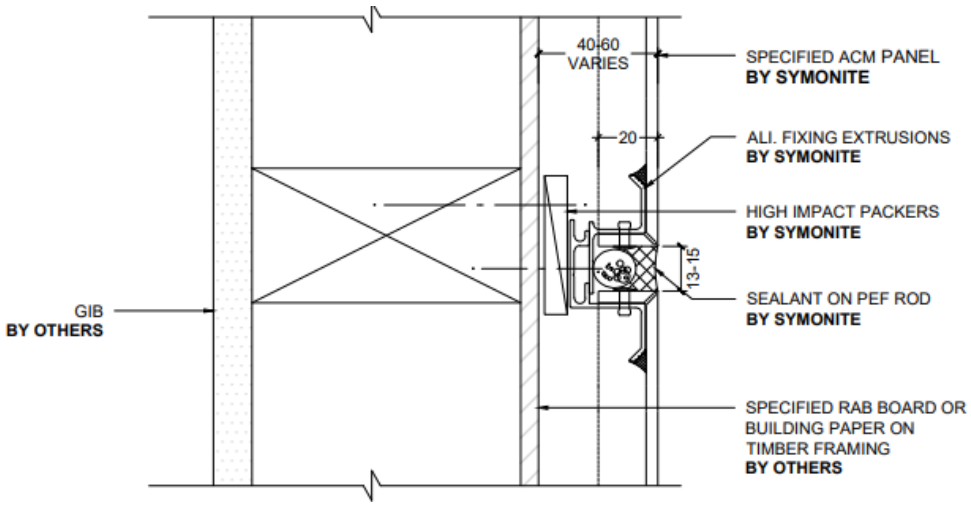
### *Compliance documentation provided by SPS Building Supplies:*

- Intertek Test Report – 190605005SHF-001-R1 Alucobond Composites (Jiangsu) Ltd – June 2019
- ACMF Rout & Return System Typical Installation Details – June 2017
- AS/NZS 4284 Test Report 12/16 by FMI Research Ltd – July 2012
- Symonite – Open Joint System (Hook and Pin) Typical Details – Sept 2015

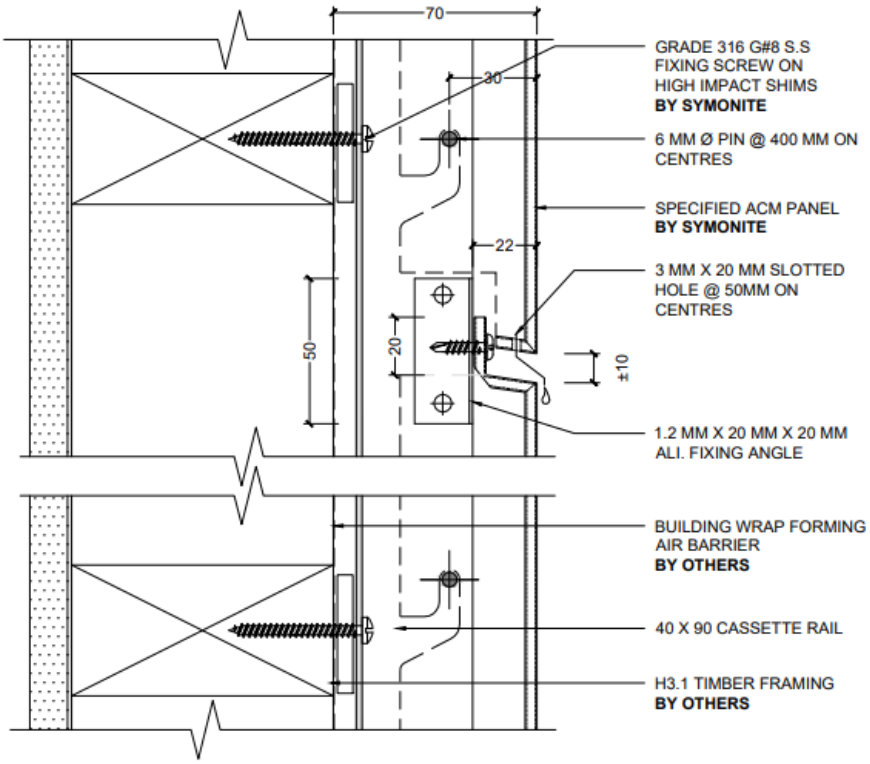
## Typical product installation:

Typically, the cladding panels will be installed as part of a rainscreen cladding system. However, several different panel attachment methods exist to suit any given application. This engineering judgement relates to the following typical installation methods:

- Symonite - WAB Extrusion System – The WAB extrusion system utilises extruded Z angle sections that are riveted to the folded edges of the aluminium panels. These angle extrusions reinforce the edges of the panels and help to create a drainage cavity behind the cladding panels. To secure the panels to the structural wall self drilling screws are driven through the fixing angles and into the framing behind.




- Hook and Pin Open Joint System – The hook and pin system utilises a extruded U shaped cladding rail with pins installed between the two sides of the channel. The cladding rail is securely fastened to the supporting wall with fasteners installed through the rail. The panels are then fabricated with slots in their return edges which hook over the pins on the cladding rail securing the panel to the rail.



## Performance in relation to the New Zealand Building Code:

### B1 Structure

The objectives and functional requirements of NZBC clause B1 relevant to this product are listed below:

*Objectives:*

- **B1.1(a)** "Safeguard people from injury caused by structural failure"
- **B1.1(b)** "*Safeguard people from loss of amenity caused by structural behaviour.*"
- **B1.1(c)** "Protect other property from physical damage caused by structural failure"

*Functional Requirements:*

- **B1.2** *"Building elements shall withstand the combination of loads that they are likely to experience during construction or alteration and throughout their lives."*

When installed within a rainscreen cladding installation the cladding panels and supporting components must be sufficient to resist any loads imposed on the cladding system. Examples of the typical types of load applied to the cladding system would include but are not limited to, self weight, wind loading, & seismic loading.

The Alucobond system has been subjected to a AS/NZS 4284 test which includes testing of the cladding systems performance under a differential air pressure to simulate wind loading. In a typical assembly the air barrier is created behind the cladding line at the back of the rainscreen cavity. The cavity itself typically features openings for drainage and ventilation that enable the space behind the cladding line to pressure equalize with the environment and therefore any wind pressure effectively resisted by the air barrier behind.

In theory, this approach should result in a zero-wind pressure being applied to the cladding itself. However, during the AS/NZS 4284 test, the air barrier was partially removed to evaluate how the panel deflects under a conservative wind load and test the capacity of the fixings should failure of the air barrier occur. During this test the Alucobond cladding system was subjected to the following pressures:

- Maximum positive pressure = 2000 Pa
- Maximum negative pressure = 1500 Pa

During this test the report notes that no structural failure of the panel or fasteners occurred. While the panels did deflect under the applied load it appears the deflection remained elastic and the panels returned to their original positions following the removal of the load.

As the Alucolux panel is a solid aluminium panel, the strength of the panel exceeds that of the Alucobond Plus and Alucobond A2 panels. We therefore conservatively assume that the panel would match the performance achieved in the AS/NZS 4284 test referenced above.

During a seismic event, the panels are expected to be subjected to a minor seismic load due to their relatively low weight. The panels are not expected to withstand any additional seismic loads other than their own inertia. However, the panels and support system must be able to accommodate the movement of the buildings structure during a seismic event without detaching from the building or without permanent damage for lower intensity seismic events.

As part of the AS/NZS 4284 test regime the cladding assembly was subject to a seismic racking test. The test was conducted by pushing on the top of the backup wall assembly with a hydraulic ram. The test assembly was subject to two tests. The first an SLS seismic movement test of ±20mm and the second a ULS seismic movement of +88mm (the maximum travel the ram could achieve).

Following both tests the report notes that no structural damage to the cladding system was observed. As a result, we are confident that the cladding system is suitable to accommodate inter-storey movements of 0.5% without damage from the SLS test. We note that based on the results of the test report we believe that larger seismic movements will also be accommodated by the system without detachment of the cladding panels.

As before, while the Alucolux panel was not featured in the test referenced above, we are satisfied that, given the nature of the Alucolux product, and its similarities with the Alucobond product, we believe the Alucolux product will perform comparably in regards to structural performance to what was observed in the AS/NZS 4284 test of the Alucobond panels.

Based on the information contained above we believe that this product will fulfill the performance requirements clauses of B1:

- **B1.3.1** *"Building elements shall have a low probability of rupturing, becoming unstable, loosing equilibrium, or collapsing throughout their lives"*
- **B1.3.2** *"Building elements and sitework shall have a low probability of causing loss of amenity through undue deformation, vibratory response, degradation, or other physical characteristics when the building is in use"*

## B2 Durability

The objective and functional requirement of NZBC clause B1 relevant to this product are listed below:

*Objective:*

- **B2.1** "*The objective of this provision is to ensure that a building will throughout its life continue to satisfy the other objectives of this code."*

*Functional Requirement:*

- **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."*

The Alucolux cladding panel features a coil coated fluorocarbon lacquer. The coil coating process is a continuous automated process used to coat sheet metal products before fabrication into a finished product. The process typically combines cleaning, priming, application of paint finish and packaging back into coils in one production line.

This process offers significant quality control benefits where the consistency of the finish is ensured and handling between processes is eliminated. The polyvinylidene fluoride (PVDF) coating is non-reactive and resistant to solvents, acids, and other environmental pollutants. As a result, the coating should not be affected by airborne contaminants encountered in service. In addition, the boasted wear resistance means the product should remain durable throughout the service life of the panel without chalking or fading.

The base aluminium by its nature is inherently durable, the aluminium quickly forms a stable oxide layer upon contact with the atmosphere which the seals the raw aluminium below from further oxidisation. Unlike galvanised coatings which are sacrificial and do intern react with the environment. The oxide layer formed on aluminium is stable and does not degrade in contact with the atmosphere under the conditions expected to be experienced in use.

In addition to the panels, the cladding rails and fixings are also manufactured from aluminium or stainless steel which similarly should easily remain serviceable throughout the expected service of the cladding system.

Based on the information contained above we believe that this product will fulfill the performance requirements clauses of B2:

- **B2.3.1** *"Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:"*
  - **(a)** *" The life of the building, being not less than 50 years, if:"*
    - **(i) "***Those building elements are difficult to access or replace."*

- **B2.3.2** *"Individual building elements which are components of a building system and are difficult to access or replace must either:"*
  **(a) "**All have the same durability"

## C3 Fire affecting areas beyond the source

The objective and functional requirement of NZBC clause C3 relevant to this product are listed below:

*Objectives:*

- **C1(a)** "S*afeguard people from an unacceptable risk of injury or illness caused by fire.*"
- **C1(b)** *"protect other property from damage caused by fire"*

*Functional Requirements:*

- **C3.1** *"Buildings must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a fire source."*
- **C3.2** *"Buildings with a building height greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the building."*
- **C3.3** *"Buildings must be designed and constructed so that there is a low probability of fire spread to other property vertically or horizontally across a relevant boundary."*

The Alucolux cladding panels are classified as non-combustible under the EN13501-1 standard.

The MBIE External Wall Cladding system vertical fire spread – risk assessment approach outlines the following fire testing pathways which would be relevant to the product depending on the risk classification of a given building from Table 1 of the MBIE guidance document:

**Low:**
For buildings categorized as low risk (<10m high) there are no requirements for fire testing protocols P1 to P5 and therefore all products are suitable for use in these applications.

**Medium:**
For buildings classified as medium risk, any of the compliance pathways P1 to P5 can be used.

**High:**
For buildings classified as high risk, compliance pathways P2 – P5 can be used.

Descriptions of the MBIE guidance compliance pathways are summarised below:

P1. All cladding and rigid air barriers used in the external wall construction may be individually tested using ISO 5660-1 to meet requirements in C/AS2 to C/AS7 Paragraph 5.8. Insulation products, and filler materials (not including gaskets, sealants etc) to be limited combustibility*. Timber framing and combustible battens may be permitted in buildings with a building height of up to 25m, and must be properly encapsulated and/or protected (see P5) in buildings with a building height over 25m. All external wall cavities need to be fire stopped using cavity barriers at each floor level and at the junctions to other vertical fire separations. ACP materials must be tested without Aluminium (metal) facing as per C/AS2 to C/AS7 Appendix C7.1.5.

Compliance pathways P2 to P4 relate to full scale wall tests which, at the time of writing, to our knowledge the Alucolux products have not been included in such a test and therefore cannot be used as a means of demonstrating compliance.

P5. All cladding, framing**, battens, insulation products**, rigid air barriers and filler materials (not including gaskets, sealants etc) used in the external wall construction may be of limited combustibility*. If vapour barriers,

drainage mats, building wraps or similar are not of limited combustibility* then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

* Limited combustibility means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS 1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings not exceeding 1 mm thickness.

** Timber framing (or combustible insulation products within a framed wall assembly) may be used if a robust protective lining material (being of limited combustibility) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the framing during the period of external fire exposure. 'Protect framing' can be assumed to be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS 1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity side of the fire-exposed protective lining material during the test period to be no greater than 300 degrees Celsius.

Based on the information above, and the classifications in relation to the EN 13501-1 standard. The Alucolux product may be used as an external cladding system in buildings defined as both “Low” and “Medium” risk. As the product achieves a rating of A2-s1,d0 (Non-combustible) to EN 13501-1 compliance pathway P1 can be used for “Medium risk” buildings.

To use this product in a “High risk” building the system would have to be tested to one of the full-scale system tests setout in compliance pathways P2 to P4 as explained previously.

Or, this product may be used through compliance pathway P5 where all components in the wall assembly are classed as limited combustibility*.

## E2 Exterior moisture

The objectives and functional requirements of NZBC clause E2 that are relevant to this product are shown below:

*Objectives:*

- **E2.1** *“The objective of this provision is to safeguard people from illness or injury that could result from external moisture entering the building.”*

*Functional Requirement:*

- **E2.2** *“Buildings must be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.”*

The cladding products listed above are intended to be installed as part of a rainscreen cladding system where the panels form the outermost water shedding layer. In the completed wall assembly, the weather resistant line is located at the back of the rainscreen cavity provided by a flexible building wrap or rigid air barrier. In a system like this the cladding line is expected to deflect the majority of the water hitting the façade.

Where water does penetrate the cladding line the cavity between the cladding and structural wall is expected to prevent water being able to migrate onto the structural wall and allow water to drain down towards the midfloor where flashings direct the water out past the cladding line. These openings at each level encourage ventilation which aid drying of any residual water in the cavity and drying of the structural wall should these other weathertightness measures fail.

In addition, the Alucobond products have been tested to the AS/NZS 4284 standard which includes water penetration testing. During the testing the test assembly was subject to two water penetration tests. The first a

static water penetration test whereby the tested system was subject to a positive static wind pressure of 534 Pa. The second test was conducted under a cyclic wind loading condition with pressures between 534 Pa and 1068 Pa.

This test regime was carried out twice once before and once after conducting the seismic racking tests. In all instances the test report notes that “no water penetration” was observed during testing.

Based on the information contained above we believe that this product will fulfill the performance requirements clauses of E2:

- **E2.3.2** *“Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.”*
- **E2.3.3** *“Walls, floors, and structural elements in contact with, or in close proximity to, the ground must not absorb or transmit moisture in quantities that could cause undue dampness, damage to building elements, or both.”*
- **E2.3.5** *“Concealed spaces and cavities in buildings must be constructed in a way that prevents external moisture being accumulated or transferred and causing condensation, fungal growth, or the degradation of building elements.”*
- **E2.3.6** *“Excess moisture present at the completion of construction must be capable of being dissipated without permanent damage to building elements.”*
- **E2.3.7** *“Building elements must be constructed in a way that makes due allowance for the following:”*
    - **(a)** *“the consequences of failure:”*

## Closure

The evidence above shows the system can likely achieve the requirements of the building code. The systems need to be further documented by designers to consider the project specific details; however, if good design principles are implemented, we see no reason the system could not perform as required.

Please do not hesitate to contact the writer should you have any questions.

Regards,

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