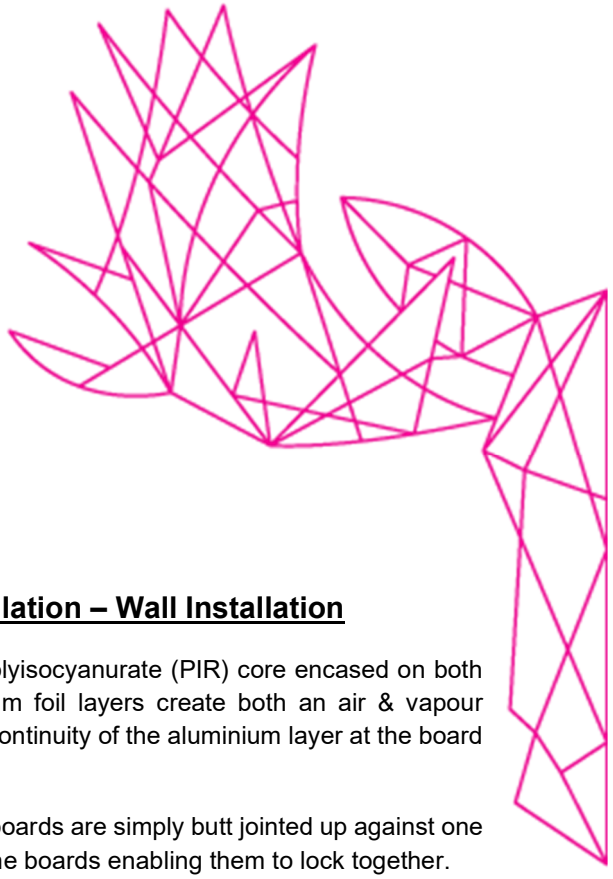
Outright Insulation – IKO Enertherm ALU

This compliance statement, produced by Oculus Architectural Engineering Limited, is an evaluation of the following product's ability to fulfil the following 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, E3 Internal Moisture, F2 Hazardous Materials, H1 Energy Efficiency

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



Compliance Statement for IKO Enertherm ALU Insulation – Wall Installation

IKO Enertherm ALU is a rigid insulation board comprising of a polyisocyanurate (PIR) core encased on both sides with a multi-layer "gas tight" aluminium foil. The aluminium foil layers create both an air & vapour impermeable barrier where properly taped at the joints to ensure continuity of the aluminium layer at the board edges.

The Enertherm ALU board is available with a square edge where boards are simply butt jointed up against one another or with a tongue and grove profile formed in the edge of the boards enabling them to lock together.

The IKO Enertherm product range also contains other insulation boards comprised of the same PIR core material but with different facers to suit installation. However, this compliance statement is limited to the ALU insulation board.

Compliance documentation provided by Outright Insulation:

- Outright Product Brochure (NZ) - August 2019
- IKO Enertherm ALU Declaration of Performance (UK) - April 2019
- BBA Certificate 15/5283 – IKO Enertherm ALU Insulation Board for Flat Roofs
- IKO Enertherm Material Safety Data Sheet (MSDS) – April 2017

Additional documentation referenced in this statement:

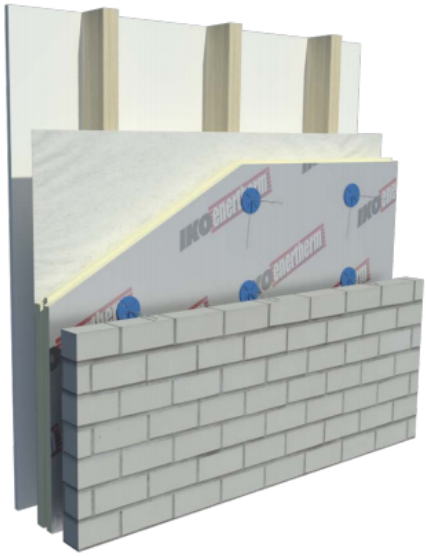
- EN 13165:2012 Thermal Insulation Products for Buildings (with reference to the following test standards):
    - BS EN 826:2013 Determination of Compression Behaviour
    - BS EN 1607:2013 Determination of Tensile Strength Perpendicular to Faces

Typical product installation:

The IKO Enertherm insulation board can be installed in many different enclosure assemblies as an insulation material. However, this compliance statement is specific to externally insulated rainscreen cavity installations, examples of which are shown below:

- Rainscreen cladding cavity installation – In this assembly, the insulation board is installed over a timber or steel framing structure over either a rigid air barrier or flexible weatherproof membrane. The insulation boards are then installed outside of the buildings weathertightness line. A rainscreen water-shedding layer installed outside of the insulation separated by a cavity typically framed out with vertical cavity battens.

- Brick veneer cavity wall installation – In this assembly, the insulation board again is installed over a timber or steel framing structure over either a rigid air barrier or flexible weatherproof membrane. The insulation boards are then installed outside of the buildings weathertightness line. In this assembly, with an external masonry veneer cladding installed outside of the insulation layer in place of the rainscreen system. In this assembly masonry veneer ties are installed to tie the brick back to the structural frame through the insulation layer.



- Precast/insitu concrete or masonry block – In this assembly the insulation board is installed directly over the concrete or masonry substrate, with mechanical fasteners installed to secure the board to the substrate. A rainscreen cladding system installed over the top of this to improve weathertightness by creating a water shedding layer separated from the structural wall.

Performance in relation to the New Zealand Building Code:

B1 Structure

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

Objective:

- **B1.1(b)** "*Safeguard people from loss of amenity caused by structural behaviour.*"

Functional Requirement:

- **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 wall installation the insulation board must enable the transfer of loads applied to the cladding system back to the structural frame. Typically, this will be achieved with the help of mechanical fasteners fixed through the insulation layer to resist negative wind pressures pulling the cladding off the building. While the board becomes compressed when resisting positive wind pressure pushing the cladding into the building through the cladding rails/battens.

A summary of the information relating to the structural performance of the board is provided below.

Tested property:	*Classification & test standard:*	*Functional description:*

Compressive strength at 10% deformation	CS(10/Y)175 to EN 826	The product should be able to resist a pressure of at least 175 kPa in compression at 10% deformation
Deformation under compressive load and temperature conditions	DLT(2)5 to EN 1605	The product can withstand a load of 40 kPa for 168 hrs at a temperature of 70°C with less than 5% deformation

In the applications shown above the cavity battens are expected to distribute any compressive load resulting from positive wind pressure applied to the cladding system into the insulation board. While the exact pressure applied will depend on the size and spacing of the installed cavity battens. However, in any case we expect that the compressive strength of 175 kPa will not be exceeded in the typical installations shown previously.

In cavity wall installations the brick ties are expected to transfer both positive and negative wind pressures back to the structural frame. While during a seismic event the larger stresses involved are expected to cause the board to deform around the masonry ties so as not to impede their function and allow them some degree of flex in the plane of the wall.

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."*

Where installed as an insulation material within any of the typical assemblies described above, the product will be reasonably well protected against environmental factors that would typically accelerate deterioration of such a product.

The products BBA certificate describes the product as "durable, rot proof, water resistant and sufficiently stable to remain effective as an insulation for the life of the building" suggesting the product is accepted as sufficiently durable to meet the requirements of the UK building regulations.

To support this claim, the product has been tested in accordance with the following overseas standards relating to durability:

Tested property:	***Classification & test standard:***	***Functional description:***
Dimensional stability under specified temperature and humidity conditions	DS(70,90)3 & DS(-20,-)1 to EN 1604	The product was able to remain dimensionally stable per the requirements of EN 13165:2012 after 48 hrs at 70°C @ 90% RH & -20°C

As shown above, PIR insulation is more dimensionally stable than other glass fibre insulation products that tend to slump over time is not properly supported or lose their thermal resistance if they become wet. PIR board has a greater structural stiffness and as shown by the EN 1604 test is not adversely affected by changes in environmental conditions.

As a result, the thermal performance of the insulation should not degrade significantly over the foreseeable life of the building such that it would constitute non-compliance with other elements of the building code.

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 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 this product is 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 IKO Enertherm ALU product has 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.

The IKO Enertherm ALU product is classified as a class E (combustible material with a high contribution to fire) material to the EN 13501-1 standard. Consequently, this product is not compliant with the requirements of the P1 or P5 compliance pathways as a material with a limited combustibility. As a result, this product should not be used on buildings whose height exceeds 10 meters without conducting a full-scale test of the wall assembly as defined in compliance pathways P2 to P4.
However, for buildings whose height does not exceed 10m the MBIE guidance referenced above classes the building as low risk and therefore not subject to the performance requirements set out above. As a result, the product is compliant for use in applications where the building's height does not exceed 10m.

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."*

In the typical assemblies shown above, the insulation board forms part of the enclosure system primarily intended to deliver thermal performance and slow the transfer of heat through the assembly. In a wall assembly the board is not required to ensure performance with E2 is met. However, it does feature elements that help the board prevent water penetration such as a tongue and grove interlocking joint between boards that should where taped also create a barrier against water penetration.

In this application, E2 performance is expected to be provided by a combination of cladding line water-shedding and a backup weather resistant layer (i.e membrane or rigid air barrier) behind the insulation board. This backup layer is expected to fulfill the performance requirements of clause E2.

E3 Internal moisture

The objectives and functional requirements of NZBC clause E3 that are relevant to this product are shown below:

Objectives:

- **E3.1** *"The objective of this provision is to-"*
    - **(a)** *"Safeguard people against illness, injury, or loss of amenity that could result from the accumulation of internal moisture; and"*

Functional Requirements:

- **E3.2** *"Buildings must be constructed to avoid the likelihood of-"*
    - **(a)** "Fungal growth or the accumulation of contaminants on linings and other building elements; and"
    - **(c)** *"Damage to building elements being caused by the presence of moisture."*

The IKO Enertherm insulation board does contribute to parts of the NZBC E3 clause that pertain to the passage of water vapour and its effects. The product features a foil face which is essentially completely vapour impermeable. This facer layer where unpunctured and continuous with taped seams should almost entirely prevent any internal water vapour from passing the insulation layer.

Typically, in enclosure assemblies fungal growth can occur where vapour pressure and therefore relative humidity remain high for extended periods of time. This can occur in a number of scenarios but generally occurs where vapour is able to enter an assembly but is prevented from moving all the way through to the outside but can reach the cold side of the assembly.

For vapour moving from inside to out, the vapour impermeable foil face of the insulation board is on the warm side of the assembly and as a result vapour pressure and therefore humidity will be prevented from reaching the cold side of the insulation reducing the risk of condensation and mould growth occurring under normal operating conditions. In addition, this foil face should also resist vapour being force from the outside in during the summertime where building are air conditioned.

As a result, this product should achieve the objective of E3.1(a) and the functional requirement of E3.2(a) when installed in a wall assembly similar to those shown above. Note that in most application it is essential to include a dedicated water control layer in behind the insulation board that may also contribute to the vapour resistance of the assembly.

F2 Hazardous Materials

The objective and functional requirement of NZBC clause F2 relevant to this product are listed below:

Objective:

- **F2.1** *"The objective of this provision is to safeguard people from injury and illness caused by exposure to hazardous building materials."*

Functional Requirement:

- **F2.2** *"Building materials which are potentially hazardous, shall be used in ways that avoid undue risk to people."*

The MSDS for the IKO Enertherm insulation board lists the product as "not hazardous for supply under CLP regulations" but does note that "Precautions should be taken to avoid inhaling dust when handling and cutting boards"

The MSDS for this product recommends the following exposure controls and personal protection measures be implemented to reduce the risk of injury occurring as a result of this product:

Respiratory protection:
The use of a general-purpose dust mask (P2 or P3) is recommended when cutting boards.

Skin protection:
The use of gloves is recommended when handling boards to protect against irritation from glass fibre faced boards or cuts when handling aluminium faced boards.

Eye Protection:
The use of light eye protection is advised to protect against ingress of dust, in the case of foil faced boards UV rated eye protection is recommended.

Where the above H&S procedures are implemented, we are satisfied that this product will meet the requirements of clause F2 of the NZBC.

H1 Energy Efficiency

The objective and functional requirements of NZBC clause H1 relevant to this product are listed below:

Objective:

- **H1.1** *"The objective of this provision is to facilitate efficient use of energy."*

Functional Requirements:

- **H1.2** *"*Buildings must be constructed to achieve an adequate degree of energy efficiency when that energy is used for—
    - **(a)** *"*modifying temperature, modifying humidity, providing ventilation, or doing all or any of those things; or"

The primary purpose of the IKO Enertherm ALU insulation board is to reduce the rate of heat flow in an enclosure assembly reducing the rate at which heat is lost in the winter making the building easier to heat while reducing the rate heat flows into the building during the summer reducing the cooling load on HVAC systems.

The product's BBA certificate lists a declared thermal resistance of 0.022 W/mK. The total assembly thermal resistance or R-value will depend on the thermal resistance of the other components in this assembly. For the wall assemblies shown above the insulation is likely to be the only component with a significant contribution to the assembly's thermal resistance and the board is installed as one continuous layer with nominal thermal bridges through the insulation in the form of ties and fixings.

Where installed in a manner similar to the typical installation details above we expect this product to contribute to compliance with the following clauses within H1 relevant to this product:

- **H1.3.1** *"The building envelope enclosing spaces where the temperature or humidity (or both) are modified must be constructed to—"*
    - **(a)** *"Provide adequate thermal resistance"*
- ***H1.3.2E*** *"Buildings must be constructed to ensure that their building performance index does not exceed 1.55."*