

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 manufactures details in the application described below.

Compliance Statement for IKO Enertherm ALU Insulation – Roof 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 groove profile formed in the edge of the boards enabling them to lock together.

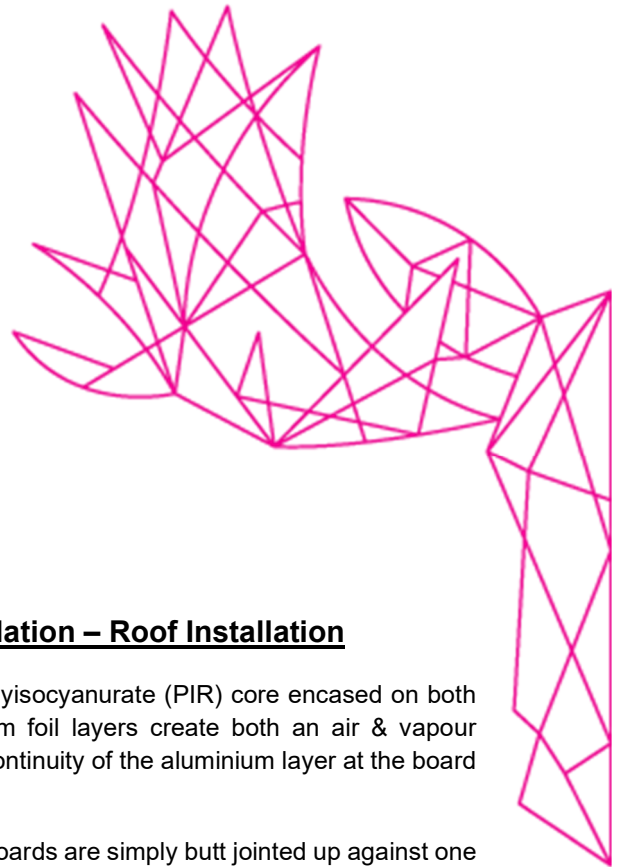
The IKO Enertherm product range also contains other insulation boards comprised of the same PIR core material but with different facers to suit installation. However, this compliance statement is limited to the ALU insulation board.

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:

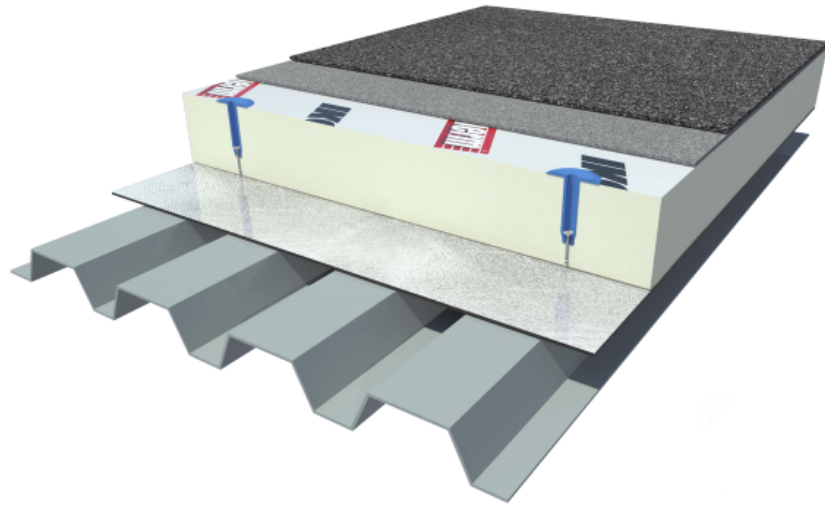
- EN 13165:2012 Thermal Insulation Products for Buildings (with reference to the following test standards):
 - BS EN 826:2013 Determination of Compression Behaviour
 - BS EN 1607:2013 Determination of Tensile Strength Perpendicular to Faces



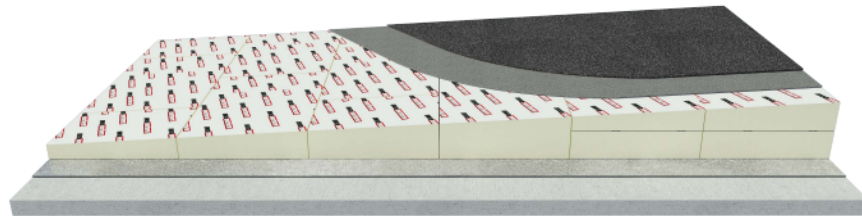
Typical product installation:

The IKO Enertherm insulation board can be installed in many different enclosure assemblies as an insulation material. However, this compliance statement is specific to flat warm roof installations an example of which is shown below

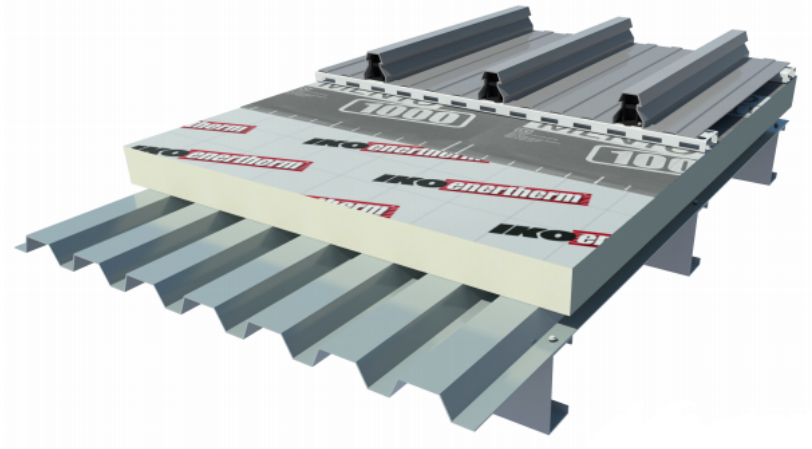
- Warm roof installation – In this assembly the insulation board is installed over a timber, steel or concrete structure with the insulation boards installed above the roof structure with a waterproofing layer installed above the insulation
 - Warm roof over steel tray with membrane waterproofing layer



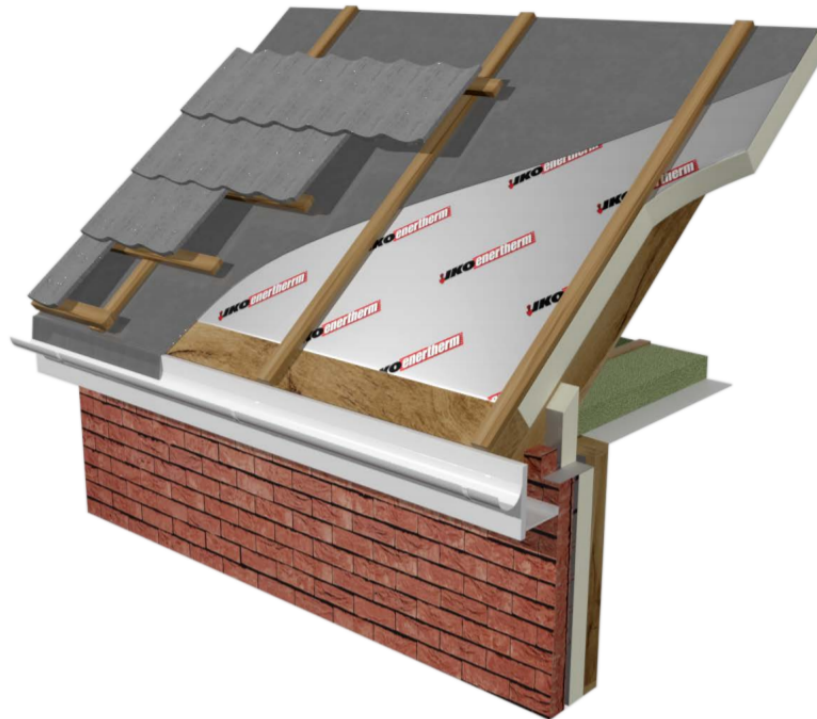
- Warm roof over flat concrete slab with membrane waterproofing layer



- Warm roof over steel tray with additional steel waterproofing layer



- Pitched roof installation – In this assembly the insulation board is installed over a timber roof structure & OSB sheathing board. Timber battens may then be installed over the insulation board to support the roof cladding (Tiles or sheet steel)



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 roof installation the insulation board must transfer loads applied by wind and people accessing the roof back to the supporting structure. How this is achieved depends on the assembly chosen. For steel deck assemblies or timber roof structures the insulation board is mechanically fixed to the substrate with screw fasteners recessed into a proprietary plastic washer.

In other applications such as the flat concrete slab it is also possible to adhere the insulation boards to the substrate to prevent uplift. In either case a specification by the manufacturer should be provided for the wind uplift forces expected on a given building.

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

<i>Tested property:</i>	<i>Classification & test standard:</i>	<i>Functional description:</i>
Tensile strength perpendicular to faces	TR80 to EN 1607	The foil facer of the product should be able to resist a tensile stress applied perpendicular to the facer of at least 80 kPa.
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

Where waterproofing membranes are bonded to the insulation board the IKO Enertherm board should be strong enough that the foil facer will not detach from the polyisocyanurate core under negative wind pressure. As shown by the tensile strength perpendicular to facer test the board should be able to withstand 80 kPa of uplift pressure before the facer delaminates from the PIR core. In most applications we expect the bond strength between the waterproofing membrane and the foil facer to limit the maximum uplift pressure the system can withstand.

In roofing applications, we expect wind loading to be the most onerous load case this insulation board will be exposed to. However, for installations including a trafficable waterproofing membrane, loading will be imposed by users accessing the roof.

In these cases, we expect the roof to be subject to a distributed load of considerably less than 1.5 kPa as defined by the NZS 1170.1 standard. As shown above the compressive strength the product achieved far exceeds this and as a result, we believe that the product is suitable to transfer floor loads where the board is continuously supported by the substrate below.

Where regular access to the roof is expected, it is advisable to install a cover board to prevent damage to the insulation for example where tools or other pointed items might be dropped onto the roof during access.

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” also noting that “when the waterproofing covering is renewed at a later date, the insulation will remain suitable for continued used, provided it is undamaged by replacement of the waterproofing covering” 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:

<i>Tested property:</i>	<i>Classification & test standard:</i>	<i>Functional description:</i>
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 exposed to an environment of 70°C @ 90% RH & -20°C

In addition to the testing described above, PIR insulation is more dimensionally stable than other insulation products such as 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)** “Safeguard 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 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. However, clause C3 of the NZBC does not specifically address the fire performance of roof assemblies with the only clause relating to external fire spread C3.5 stating:

“Buildings must be designed and constructed so that fire does not spread more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings. The performance requirements in clause C3 of the NZBC only refer to floor surfaces and define a minimum imposed radiant flux at which flame continues to travel across the material. The test standard is generally applied to the internal surface (i.e carpeting products, laminate flooring, ect) not the substrate or elements below this internal surface.”

Taking into account the above clause, objectives, and functional requirements of C3, should a fire break out on a roof the fire spread should be limited only to the roof and should not travel to the lower floors of the building. As a result, when installed in one of the typical assemblies shown above with no habitable space above the roof this product will achieve the functional requirements of C3 where proximity of other buildings to the roof is sufficient that the requirements of clause C3.6 will also be met.

- **C3.6** “Buildings must be designed and constructed so that in the event of fire in the building the received radiation at the relevant boundary of the property does not exceed 30 kW/m² and at a distance of 1 m beyond the relevant boundary of the property does not exceed 16 kW/m².”

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 roof assembly the board is not required or expected to contribute to compliance with any of the performance requirements of E2.

Instead the waterproofing layer (i.e membrane or steel profile) 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 within an assembly. 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 and escape, but can reach the cold side of the assembly and therefore form condensation.

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.

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 floor assembly similar to those shown above. Note that in most application it is advisable to include a dedicated vapour control layer in addition to the insulation board for robustness should defects in the installation allow water vapour to penetrate the board's foil facer.

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 typical roof 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 without thermal bridges through the insulation. As a result, a minimum thermal resistance of R2.3 m²K/W can be expected from a 50mm thickness of insulation.

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."*