TERREAL® Terracotta Cladding System

This engineering judgement, 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
- F2 Hazardous Building Materials

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

Limitations:

This engineering judgement is only applicable where subject to the following limitations. This judgement covers use of the Terreal Breeze, Piterak XS, and Piterak Slim terracotta cladding systems installed onto timber or steel stud framing, mass timber, precast concrete or masonry structural walls.

In relation to code clause B1:
This judgement is valid where the proposed building's expected wind and seismic drift do not exceed the maximum allowable values outlined in this report.

In relation to code clause B2:
Where the proposed building is located in NZS 3604 corrosivity zones B to D. This document does not cover use of the system in corrosivity zone E, in these applications seek professional advice.

In relation to code clause C3:
Where compliance is demonstrated through either all cladding materials or the entire cladding assembly (as appropriate for the building height) being able to satisfy the requirements outlined in the MBIE fire guidance document (Fire performance of external wall cladding systems) – Revision 2: 2020.

The performance of the complete cladding system and therefore compliance is dependant on the other components making up the complete system or assembly meeting the specific requirements outlined for each compliance pathway contained within the guidance document.

In relation to code clause E2:
Where the system in installed as part of a drained and back ventilated rainscreen cladding system and is therefore reliant on the inclusion of a continuous weather resistant barrier installed behind the cladding system to prevent water penetration into the structural wall.

In relation to code clause F2:
Where the product is installed in accordance with manufacturer's instructions and adequate health and safety practices are adopted during installation.

Engineering Judgement for TERREAL® Terracotta Cladding System:

Terreal Terracotta is a clay tile rainscreen cladding system supplied by The Building Agency. The system is comprised of extruded clay tiles supported on clips, fixed back by aluminium rail & bracket system which, in turn, is fixed to the supporting structural wall. Breeze is attached by clips attached to T-shape aluminium profiles that fix into supporting brackets. Piterak XS is attached by a rail and standard clip Piterak XS PXSO1 system.

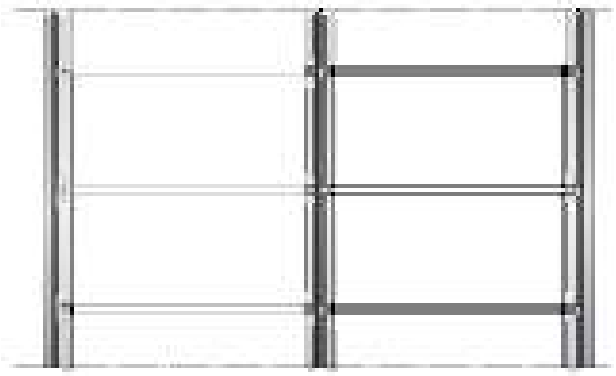

Figure 1 - BREEZE rail and fixing system

Figure 2 - Piterak XS and Slim rail and fixing system

Compliance documentation provided by The Building Agency:

For the Terreal Breeze tile system:

- Terreal Breeze Test Report No. BEB1-B-4040-1 Wind load testing – 19th September 2011
- Terreal Breeze Test Report No. BEB1-B-4040-2 Impact load testing – 19th September 2012
- Terreal Breeze Terracotta Breeze Brochure – 9th July 2015
- Terreal Breeze Symonite Detail Drawings – R20190122

For the Terreal Piterak XS tile system:

- Terreal Piterak XS Test Report No. CLC 11-26028466 Static negative air pressure test – 21st February 2010
- Terreal Piterak XS Test Report No. CLC 11-26032508 Impact load test – 8th September 2011
- Terreal Piterak XS Test Report SD039 NFPA 285:2012 Fire test – 12th July 2018

For the Terreal Piterak Slim tile system:

- Terreal Piterak Slim BBA Agreement Certificate 06/4298 – 19th December 2016
- Terreal Piterak Slim Test Report No. CLC 09-26018890/A Static negative air pressure test – 18th May 2009
- Terreal Piterak Slim Test Report No. CLC 09-2601891/A Impact load test – 18th May 2009
- Terreal Piterak Slim Test Report No. MRF 16 26065479 Seismic test – 1st June 2017

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 following section summarises the testing that the Terreal Breeze, Piterak XS, and Piterak Slim systems have been subject to and the level of performance in relation to wind pressure, seismic movement that was achieved.

Wind

In a typical assembly, an 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, a conservative approach is to assume the cladding system may have to resist the full design wind load. As a result, during AS/NZS 4284 testing, the air barrier is 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.

The BREEZE terracotta tile system, including its vertical rail system and stainless-steel clips, was tested for structural wind resistance as outlined in test report BEB1-B-4040-1. This test was conducted for tiles of dimensions 600mm x 300mm and vertical profiles at 600mm centres. The system was able to withstand wind pressures of up to +7.0 kPa & -5.25kPa without failure. With failure under negative pressure subsequently occurring at a negative pressure of -5.5 kPa. Residual deformation results show at +4.5 kPa a deformation of 3.0mm and at -2.0 kPa a deformation of 2.8mm which can be considered negligible.

The Piterak Slim terracotta tile system was similarly tested, as documented in Technical Appraisal 2.2/13-1584_V1. Results for different tile heights were as follows:

- SLS ±1.93 kPa – 200-250mm
- SLS ±2.21 kPa – 250-300mm
- SLS ±2.35 kPa – 300mm
- SLS ±1.46 kPa – 300-400mm

The Terreal Piterak Slim BBA Agreement Certificate showed similar results for differing tile heights:

- SLS ±1.69 kPa – 214mm
- SLS ±1.94 kPa – 219-264mm
- SLS ±2.06 kPa – 269-314mm
- SLS ±1.28 kPa – 319-414mm

However, the BBA Certificate SLS results were found by applying an arbitrary safety factor of 4.0 on ultimate failure results.

SLS values are supposed to represent pressures under which the aluminium supporting structure does not deflect significantly to the extent that people become uneasy observing the resulting movement or incur significant permanent deformation, or damage that would impair the weathertightness performance of the system.

In relation to the maximum allowable wind pressure the system can withstand. Test Report No. CLC 09-26018890/A outlines how a Piterak Slim tile wall setup of 314mm x 1520mm was subject to a wind pressure test where failure occurred at a pressure of 8.25 kPa. The mode of failure at this pressure was the clips holding the terracotta tiles to the structural aluminium rail failed. The panels themselves did not break and the sensors show that the difference in deflection along the panels was minimal. We can therefore assume that much of the deflection came from the metal attachments to the structure. Residual deflection results show that after being loaded to 3.00 kPa the panels rested back to a deflection of 5mm.

Additionally, testing requires the use of plastic sheeting to provide a continuous surface for the pressure to act onto. Since cladding will not be airtight when installed, a degree of pressure equalisation is expected to occur and as a result the cladding system should be subjected to reduced effective wind pressure. As a result, there is scope to utilise the cladding system in applications where the expected wind load exceeds the tested values.

It is Oculus's opinion that the Piterak Slim will be able to, at least, match the performance of the BREEZE terracotta tiles as follows:

- ULS ±3.00 kPa
- SLS ±2.00 kPa

The Piterak XS terracotta system test results from Test Report No. CLC 11-26028466 show that a 300 x 600 x 18 mm system resisted 8.90 kPa without failure. The panel system had a maximum residual deformation of 1.4mm after a loading of 4.5 kPa. As a result, it is Oculus's opinion that the Piterak XS of size 300 x 600 x 18 mm will be able to resist the following loads:

- ULS ±8.90 kPa
- SLS ±4.50 kPa

Gravity

The Terreal Breeze tiles have a weight of 27.1 kg/m^2, while the Piterak Slim tiles have a weight of 48.5 kg/m^2, and Piterak XS tiles have a weight of 30.2 kg/m^2.

All three tile systems are supported using clips which attach to vertical rails. In the case of the breeze tile system this vertical rail is a proprietary T profile extrusion. The rail is in turn supported by angle brackets that fix back to the structural wall. For the Piterak XS & Slim tile systems the vertical rail is a top hat shaped extrusion that is shown in the technical documentation as directly fastened to the structural wall or fastened to the supporting structural wall using angle brackets fastened along the length of the vertical rails.

The following bracket spacings are determined using a maximum wind load of 3.0 kPa, an offset between structural wall and centre of the tile of up to 100mm. The cladding system is assumed to be broken up into storey height sections (no greater than 3600mm in height). Each section of vertical rail features x1 dead load bracket that carries the gravity load of the full storey height of the cladding. The vertical rail in all cases is secured to the dead load bracket with x2 Gauge 10 self tapping screws.

Additional wind load brackets are provided at nominated cts as set out below. These wind load brackets are secured to the rail through the slotted holes in the brackets preventing them from resisting the cladding gravity load.

The spacing of vertical rails no greater than 600mm for the Breeze tile and 1200mm for the Piterak XS & Slim tiles.

The following specifications are provided for each substrate to which the cladding system may be applied:

For mass timber or timber stud framing; A dead load bracket with x2 14-gauge screws (achieving a minimum embedment of 70mm into timber substrate) spaced 160mm apart vertically within the 200mm high dead load bracket. For all tile systems, wind load brackets at a vertical spacing no greater than 1000mm.

For steel stud framing; provided the steel stud framing has; a base metal thickness of at least 1.15mm, a minimum ultimate tensile strength of 500 MPa, where the dead load bracket is secured with x3 14-gauge screws spaced 80mm apart vertically (160mm between top and bottom fastener) within the 200mm high dead load bracket.

For the Breeze tile system (where vertical rails are spaced at 600mm), wind load brackets should be set out at a vertical spacing no greater than 800mm.

For the Piterak XS & Slim tile systems (where vertical rails are spaced at 1200mm), wind load brackets should be set out at a vertical spacing no greater than 400mm.

For precast concrete structures; where the dead load bracket is secured with x2 Hilti HUS-CR 6mm diameter anchors (spaced 160mm apart vertically within the 200mm high dead load bracket), achieving a minimum 55mm embedment into the concrete substrate with a minimum compressive strength of C16/20 mPa. For all tile systems wind load brackets at a vertical spacing no greater than 1000mm.

For concrete reinforced masonry structures, it is possible to adopt the maximum spacing values above for precast concrete structures where the minimum embedment depth of 55mm into the concrete core can be achieved. For other masonry substrates, or where the minimum embedment cannot be achieved, technical guidance should be sought to confirm the suitability of the dead load bracket and allowable wind load bracket spacing.

Note the maximum spacing values above assume fastener pull out as the mode of failure. Other failure modes have not been investigated. Note that seismic load cases have not been considered as it is assumed that wind load will govern.

A summary of the fixing requirements is provided in the table on the next page.

Bracket and fixing requirement summary table:

Substrate type:	Bracket & fixing requirements:	Spacing of wind load brackets:
Timber stud	200mm high bracket with x2 14-gauge screws (minimum embedment of 70mm into timber) spaced 160mm apart	Vertical spacing of wind load brackets no greater than 1000mm for all tile systems
Steel stud *(minimum steel base metal thickness (BMT) = 1.15mm, minimum grade G500)*	200mm high bracket with x3 14-gauge screws (minimum embedment of 70mm into timber) spaced 80mm apart	Vertical spacing of wind load brackets no greater than 800mm for BREEZE tile system. (where vertical rails are spaced at max 600mm horizontal cts) Or 400mm for Piterak XS & SLIM tile systems (where vertical rails are spaced at max 1200mm horizontal cts)
Precast concrete *(minimum concrete compressive strength equivalent to C20/25)*	200mm high bracket with x2 Hilti HUS-CR 6mm diameter anchors spaced 160mm apart	Vertical spacing of wind load brackets no greater than 1000mm for all tile systems

Seismic

The Terreal terracotta cladding systems are not expected to withstand 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.

The Piterak Slim profile seismic test report MRF 16 26065479 shows that a 3.22m tall system could undertake 60mm cyclic deflection and maintain no damage and no fallen elements. This equates to a lateral deflection allowance of 18.6mm / 1m height or 1.8% seismic drift.

The Piterak XS tile features the same clip attachment methodology with a slightly lower weight per square meter of cladding. As a result, we expect the system to achieve a similar level of performance to that demonstrated during the Piterak Slim seismic test.

To our knowledge no seismic testing has been conducted on the Breeze tile system. However, as previously stated the tiles are secured with hooks that fit into continuous slots in the rear side of the Breeze tile. By inspection, these slots will provide some horizontal movement accommodation allowing the hooks to slide within the slots on the reverse of the tile.

Considering the information above we are confident that the Breeze, Piterak XS, and Piterak Slim cladding systems will be able to accommodate horizontal serviceability limit state (SLS) seismic interstorey drifts of up to 1% without incurring permanent damage. In addition, we believe the systems will also be able to accommodate horizontal ultimate limit state (ULS) seismic interstorey drifts of up to 1.8%, as demonstrated in the Piterak Slim test, without becoming detached from the structure.

While the tests above demonstrate how the systems will accommodate horizontal “racking” movement, to our knowledge, there is no widely adopted standard to test behaviour under vertical seismic actions that the Terreal terracotta cladding systems have been subject to. Typically, a shake table capable of producing vertical accelerations would be needed to test this behaviour, in absence of such a test we can only estimate how the systems will behave.

However, it can be assumed that in order for the tiles to lift of the supporting clips the vertical acceleration the tiles are subject to would have to exceed the force generated by self weight of the tile. This acceleration coefficient can be calculated using the method defined in section 8 of the NZS 1170.5:2004 standard. As a result, we are reasonably satisfied that the Terreal terracotta tiles should not become detached from the clips where vertical ultimate limit state (ULS) seismic accelerations calculated using section 8 of NZS 1170.5 do not exceed 1.0G.

Note as previously explained, failure as a result of wind loading is assumed to govern when compared to horizontal and vertical seismic action. Therefore, where adopting these maximum spacing values users should verify that the seismic action is less onerous than the maximum equivalent wind load covered in this report (3.0 kPa).

In summary, 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 manufacturer's technical specification sets out that the Piterak Slim tiles and suspension rails are sufficiently durable to achieve compliance with B2 when installed in accordance with the manufacturer's technical specification. The manufacturer offers a 15-year guarantee for replacement of any broken or defective tiles if they are installed and maintained according to their instructions.

The colour of the clay tiles is consistent through the entire thickness of the material, and so should not fade over time even if erosion of the tile surface occurs.

In addition to the above, the BBA agreement certificate states that the tiles and aluminium rails and brackets will have a service life in excess of 35 years in normal exposure conditions in the United Kingdom. Although this information is not New Zealand specific, this is well above the requirement in New Zealand with somewhat similar weather conditions.

As defined in AS/NZS 2312, aluminium is sufficiently durable for 25 years. Exposure to oxygen creates a transparent oxide film, providing a non-reactive and corrosion resistant layer that helps to protect the underlying metal from further corrosion. The manufacturer's technical specification sets out that the aluminium trim is sufficiently durable to achieve compliance with B2 when installed in accordance with the manufacturer's technical specification.

Fasteners should be made from stainless steel to prevent bi-metal corrosion between the aluminium support system and the fasteners.

It is Oculus' opinion that the product will be able to achieve the above mentioned durability performances when situated in corrosivity zones up to zone D.

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:"*
  - **(*b*)** *15 years if:*
    - **(*i*)** *Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or*
- **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"*
  - ***(b)*** *Be installed in a manner that permits the replacement of building elements of lesser durability without removing building elements that have greater durability and are not specifically designed for removal and replacement.*

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."*

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- **Clause C3.5** – *Limiting the vertical spread of fire.*
- **Clause C3.7** – *Covering the ignitability of external wall cladding materials.*

Revised MBIE guidance:

Revised guidance from MBIE and updates to the acceptable solution C/AS2 (5th November 2020) now defines compliance pathways for buildings over 10m, but less than 25m in height as needing to meet the following requirements:

Cladding materials* must:

1. Be non-combustible or limited combustible materials, or
2. Be tested in accordance with ISO 5660 Part 1 or AS/NZS 3837 and achieve the relevant performance classifications, or
3. Be part of an external wall cladding system that complies with the large scale or intermediate scale fire testing options described below for buildings above 25 m.

* *The MBIE guidance document defines cladding materials as "the exterior components including cladding, rigid air barriers, insulation products, sheet materials or blankets and filler materials (not including gaskets, sealants etc.)."*

While buildings over 25m in height will have to meet the following requirements:

The entire wall cladding system is required to:

1. Be comprised of non-combustible or limited combustible materials, or
2. Undergo large scale fire testing in accordance to BS 8414-1 or BS 8414-2 and achieve the relevant performance criteria specified in AS 5113 or BR 135, or
3. Undergo intermediate scale fire testing in accordance to NFPA 285 and additionally be comprised of cladding materials that are
   3.1. non-combustible or limited combustible materials; or
   3.2. tested in accordance with ISO 5660 Part 1 or AS/NZS 3837 and achieve the relevant performance classification.

System testing:

The Piterak Slim BBA certificate states under section 7 “Behaviour in relation to fire” that the tiles and aluminium support rails have an A1 reaction to fire classification in accordance with BS EN 13501-1:2007 and are non-combustible as defined in the UK’s national building regulations. Similarly, the MBIE guidance documents define an A1 or A2 classification per EN 13501-1:2007 as materials deemed to be of limited combustibility.

In addition, the guidance document also states that materials such as ceramic tiles and aluminium can also be assumed to be of limited combustibility. For that reason, we would also consider the Breeze and Piterak XS tiles to also be of limited combustibility per the definition given in the guidance document.

Compliance pathways:

Based on the information above, we believe the TERREAL BREEZE, PITERAK XS, and PITERAK SLIM tile systems may be used as an external cladding material in the following cases relating to the risk classifications set out in table 1 of the MBIE guidance document:

Buildings under 25m in height:
As the Terreal cladding system is defined as non-combustible (through its A1 classification to BS EN 13501-1:2007) the cladding system can be used in applications where the building considered has a height of less than 25m providing all other cladding materials (including cladding, rigid air barriers, insulation products, sheet materials or blankets and filler materials (not including gaskets, sealants etc.) can also satisfy the conditions for cladding materials set out above.

Buildings over 25m in height:
Again, as the Terreal cladding system is defined as non-combustible (through its A1 classification to BS EN 13501-1:2007) the cladding system can be used in applications where the building considered has a height over 25m, providing all other components within the wall assembly (including framing) can satisfy the conditions for entire wall cladding systems set out above.

Note - Timber framing within the wall assembly:
For buildings over 25m in height it is possible to use timber framing as the wall structure provided the following can be satisfied:

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.

Tested assemblies:

In addition, to the compliance pathways set out above, it is possible to demonstrate compliance with C/AS2 where the entire proposed wall cladding system has been subject to one of the entire wall cladding system fire tests listed above.

The Piterak XS cladding system has been subject to an NFPA 285:2012 intermediate fire test on the assembly described below:

Terreal Terracotta Piterak XS cladding tiles supported on Terreal PXS01 clips, vertical rail and bracket system. Air cavity (approx 50mm).
External Rockwool Insulation 50mm - Fujairah Rockwool Factory - Mineral Fibre with FSK facing.
Sheathing board – Knauf LLC 15.9mm Type X (GW-TX) with 2 layers of jointing compound over all board edges with embedded layer of joint tape.
Steel stud framing – approx. 90mm deep 1.2mm BMT double studs (fixed back-to-back) at 750 to 1200mm cts to suit layout of vertical rails.

Please refer to test report SD039 for full details regarding the assembly used in the NFPA 285 test.

Provided the tested wall assembly matches the wall assembly proposed it is possible to use this test as a means to demonstrate compliance with C/AS2. Note that it is the responsibility of the building designer to access and demonstrate that the proposed wall assembly exactly matches that of the wall assembly tested as outlined in test report SD039.

Oculus is not qualified to offer a technical assessment in place of a test where the designer may wish to modify the build up of the tested assembly. Similarly, while it may be assumed that the other tile systems contained within this engineering judgement could achieve a similar result when subject to an NFPA 285 test, the results of the NFPA 285 test described above may not be applied to the other tile systems covered within this engineering judgement without assessment of a suitably qualified professional.

In addition to the NFPA 285 test requirement for buildings over 25m point 3.1 or 3.2 must also be satisfied to demonstrate compliance through C/AS2. In the case of the tested assembly and the cladding materials (Terreal Terracotta Piterak XS, Fujairah Rockwool Factory - Mineral Fibre with FSK* facing, Knauf LLC 15.9mm Type X (GW-TX) sheathing board) must also be deemed to be non-combustible or be tested to ISO 5660.1 or AS/NZS 3837 to satisfy the requirements of C/AS2.

The Terreal Terracotta Piterak XS cladding system is substantially similar to the Piterak Slim cladding system that achieves an A1 (non-combustible) classification to EN 13501-1 as noted within the Piterak Slim BBA certificate and can therefore be defined as being non-combustible.

Review of the other elements within the tested assembly defined as cladding materials in C/AS2 is beyond the scope of this engineering judgement and would require the building designer to demonstrate that these components satisfy the requirements set out under point 3.1 or 3.2 as defined above.

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 TERREAL BREEZE, PITERAK XS, and PITERAK SLIM cladding material is 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 and/or rigid air barrier. In a system like this the cladding line is expected to deflect most 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 further into the assembly and allow water to drain down to the base of the cladding or midfloor joints where flashings direct the water out back through 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.

A weather resistant barrier installed at the back of the rainscreen cavity is recommended to prevent any water reaching the back of the cavity migrating further into the assembly.

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:"*

F2 Hazardous building materials

The objectives and functional requirements of NZBC clause F2 that are relevant to this product are shown 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 product consists of terracotta tiles and aluminium rail & bracket support structure. Oculus was not provided with a material safety data sheet (MSDS) at the time of review. However, having reviewed other details and technical literature regarding the Terreal terracotta cladding system we do not anticipate there being any hazardous materials contained within the product that would cause harm to those installing the product.

The product is comprised of terracotta and aluminum, both of these materials are typically accepted as not posing a significant risk to health when used in construction. It is expected that levels of dust arising from abrasion or impacts will comply with F2.3.1.

In addition, the Breeze tile has been subject to an impact resistance test as outlined in test report no: BEB1-B-4040-2 in accordance with French standard P 08-302, October 1990: "Exterior walls of buildings – Impact resistance – Methods and test criteria" and CSTB Workbook No 3534-v2, December 2005: "Procedures for impact loads performance tests on wall-cladding, insulated wall-cladding and wall facing systems."

During the test, the specimen was able to resist all of the impacts it was subject to for both the 1J "Hard dynamic impact load" & 3J "Non rigid dynamic impact load" tests.

Similarly, the Piterak Slim tile has been subject to an impact resistance test as outlined in test report no: CLC 09-26018891/A in accordance with CTSB Workbook no: 3534 - Procedures for impact loads performance tests on wall-cladding, insulated wall-cladding and wall facing systems.

During the test, the specimen was able to resist all of the small and large soft body impacts it was subject to. The report does not failure in the lower corners of two of the tiles when impact with the small hard body. Upon inspection of the report and the photos outlining this failure it is apparent that complete detachment of the tile did not occur with only a small section of the tile being broken off but still retained on the test wall.

As a result, we consider that injury, as a result of human impact causing a tile to become detached is unlikely. Therefore, based on the information contained above we believe that this product will fulfill the performance requirements clauses of F2.

Closure:

This report is an opinion of the probable performance of the system based on the information provided to us. We have assumed the system will be designed into projects by suitably qualified designers using good detailing practice. Designers need to consider the site-specific loads and requirements and adjust features and details of the system accordingly without altering the key performance parameters noted above.

Please do not hesitate to contact the undersigned with any questions,

Regards,

Peter Raimondo
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Referenced Compliance Documentation:

The documentation referenced at the start of this report can be accessed through the link below:

https://drive.google.com/drive/folders/1mm45h9spIqHz4XvTN3q9MeniuASm20SZ?usp=sharing