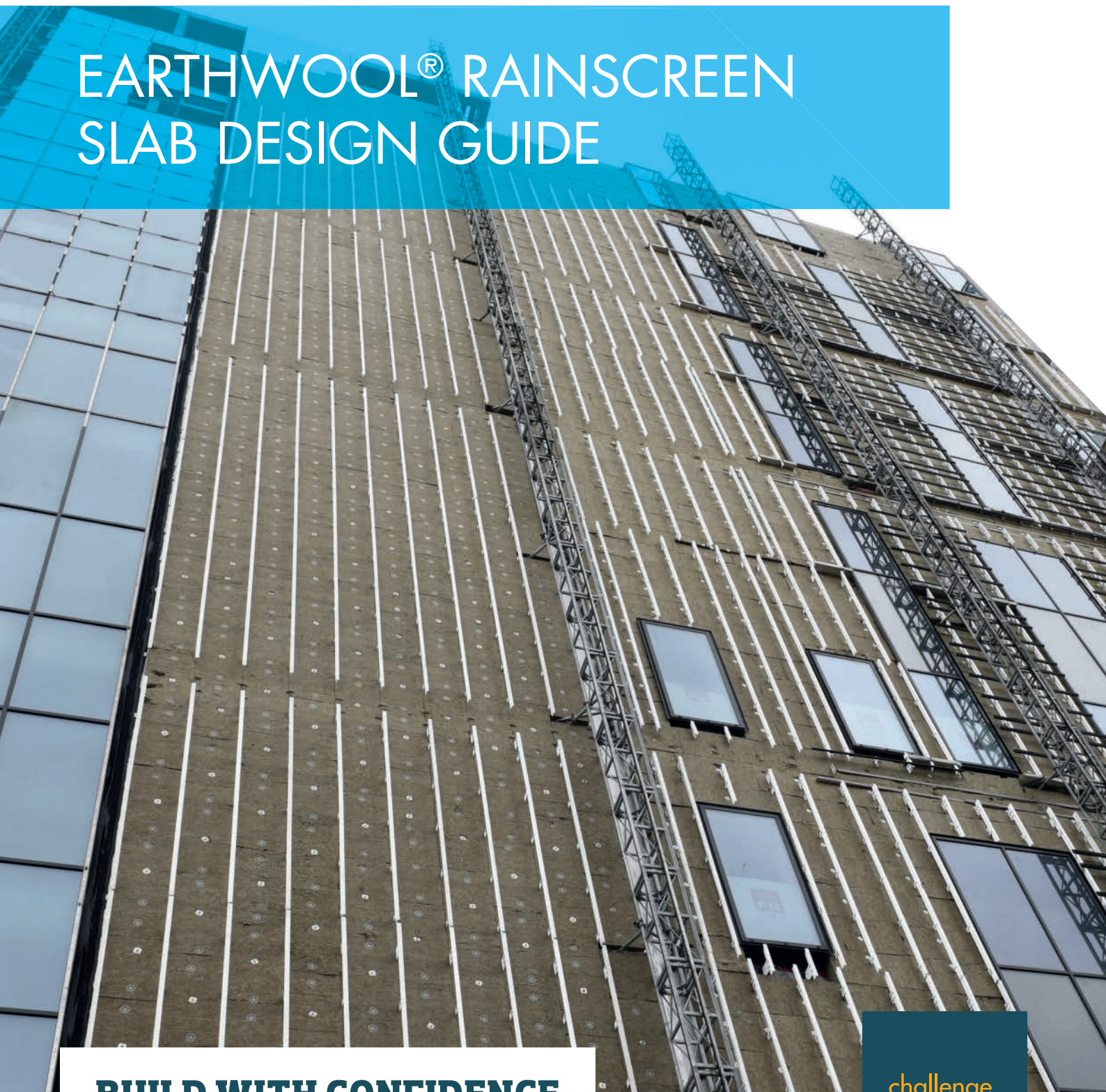


EARTHWOOL® RAINSCREEN SLAB DESIGN GUIDE



BUILD WITH CONFIDENCE

challenge.
create.
care.

CONTENTS

INTRODUCTION	3
TYPICAL RAINTHREEN SYSTEMS	4
Masonry Substrate Installation	
Light Steel Frame Installation	
PERFORMANCE BENEFITS	5
Fire performance	
Thermal performance	
Wind loading	
Acoustic performance	
BBA approved	
Temperature and dewpoint profiles	
Environmental	
Interstitial condensation	
Workability	
WEATHER RESISTANCE	9
Exposure to the elements	
U-VALUE CALCULATIONS	10
U-Value Calculations using 3D Modelling Software	
SUPPORTING INFORMATION	11
Mechanical damage	
Experienced installers	
Packaging	
CASE STUDIES	12
Birmingham Control Tower	
Birmingham City University	

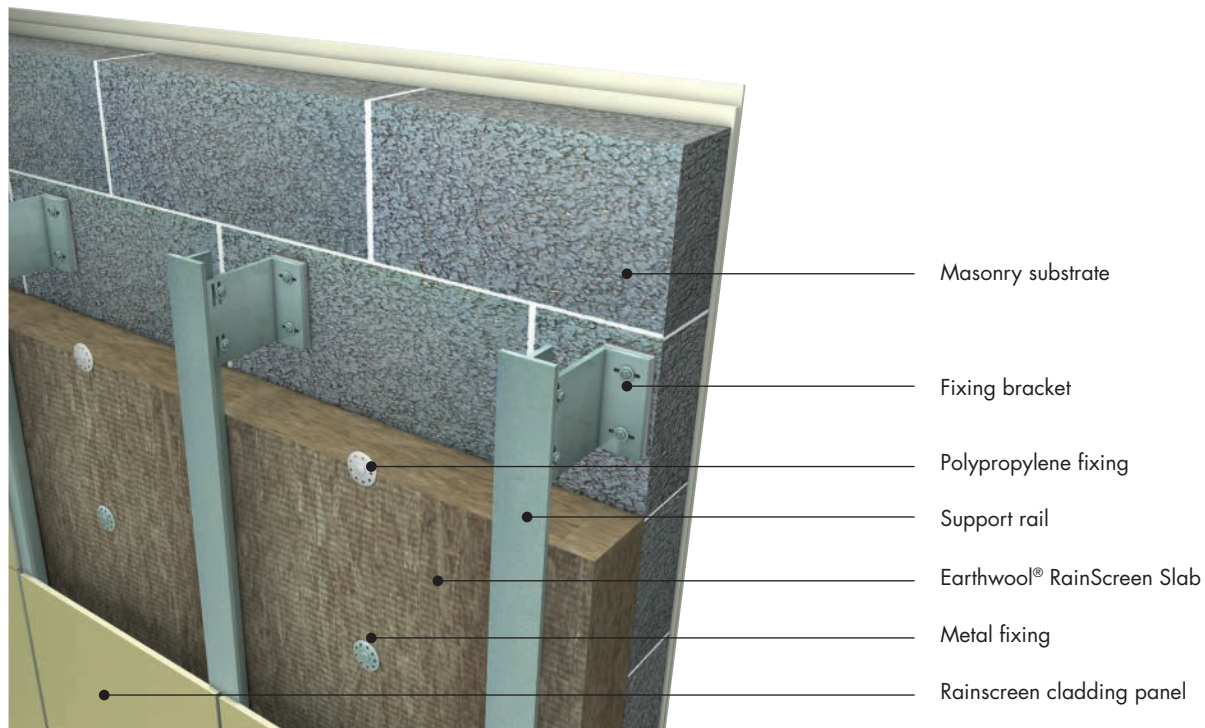
A background image showing a person in a blue denim shirt leaning over a desk, working on architectural plans. A smartphone is on the desk, and a laptop is partially visible. To the left, there are stacks of insulation materials. A blue semi-transparent box is overlaid on the top left of the image, containing the word 'INTRODUCTION' in white capital letters.

INTRODUCTION

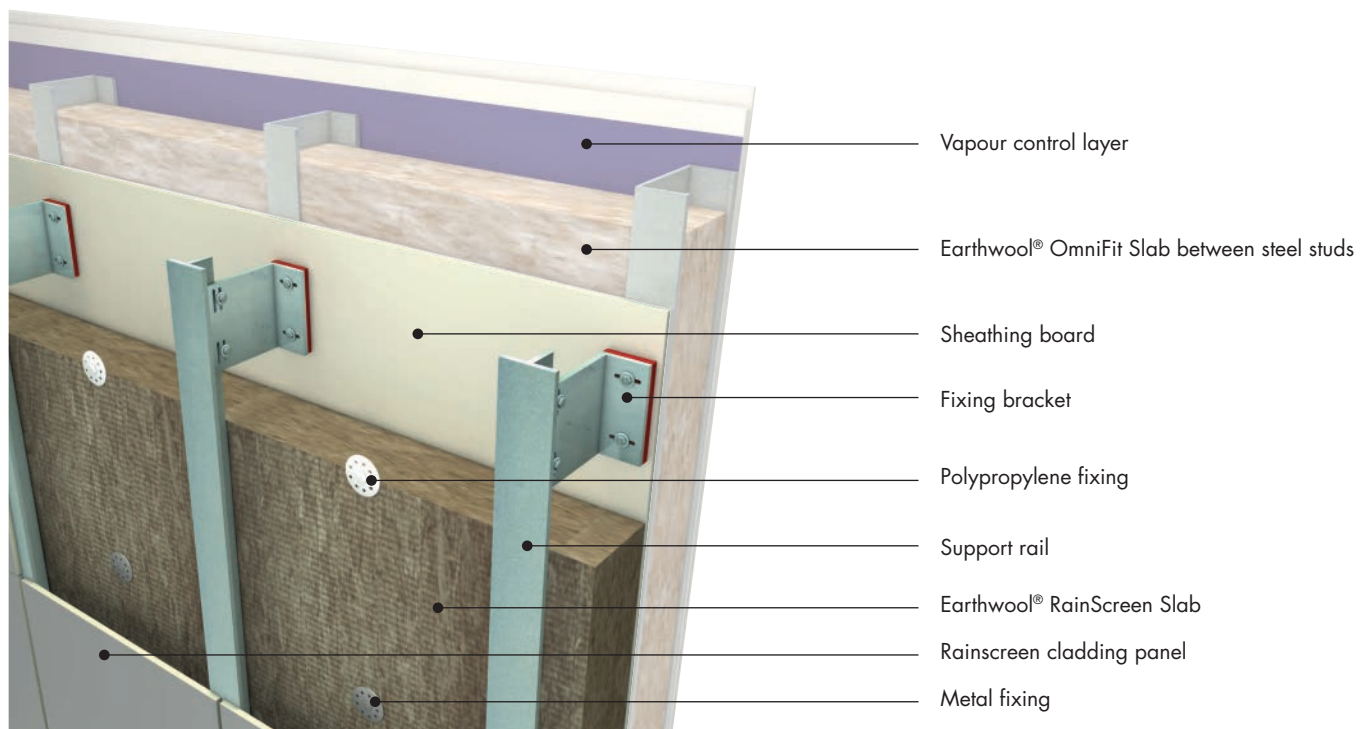
This guide sets out the key principles and standards to ensure that construction utilising Earthwool® RainScreen Slab is of the highest quality, while real, on-site performance is maximised using the most efficient design.

TYPICAL RAINSCREEN SYSTEMS

MASONRY SUBSTRATE INSTALLATION



LIGHT STEEL FRAME INSTALLATION



Note: Breather membrane can be used although not shown

PERFORMANCE BENEFITS



FIRE PERFORMANCE

Earthwool® RainScreen Slab achieves the highest possible Euroclass A1 Reaction to Fire Classification in accordance with BS EN 13501.

The product therefore complies with the 2018 amendments to the Building Regulations 2010 and Approved Document B: Fire safety Volume 2 – Buildings other than dwelling houses which limits materials in high rise applications to products achieving a Euroclass Reaction to Fire Classification of Class A1 or A2-s1,d0 when tested in accordance with BS EN 13501-1 :2007+A1:2009.

Amended regulation 7(2) applies to any building with a storey height of at least 18m above ground level and which contains one or more dwellings; an institution; or a room for residential purposes. This includes student accommodation, care homes, sheltered housing, hospitals and dormitories in boarding schools.

Additionally, Material Changes of Use to a building described in Regulation 7(4) require that the construction of the external walls, and specified attachments, must be investigated and, where necessary, work must be carried out to ensure they only contain materials achieving Euroclass Reaction to Fire Classification of A2-s1, d0 or Class A1.

EUROCLASS REACTION TO FIRE CLASSIFICATION TABLE


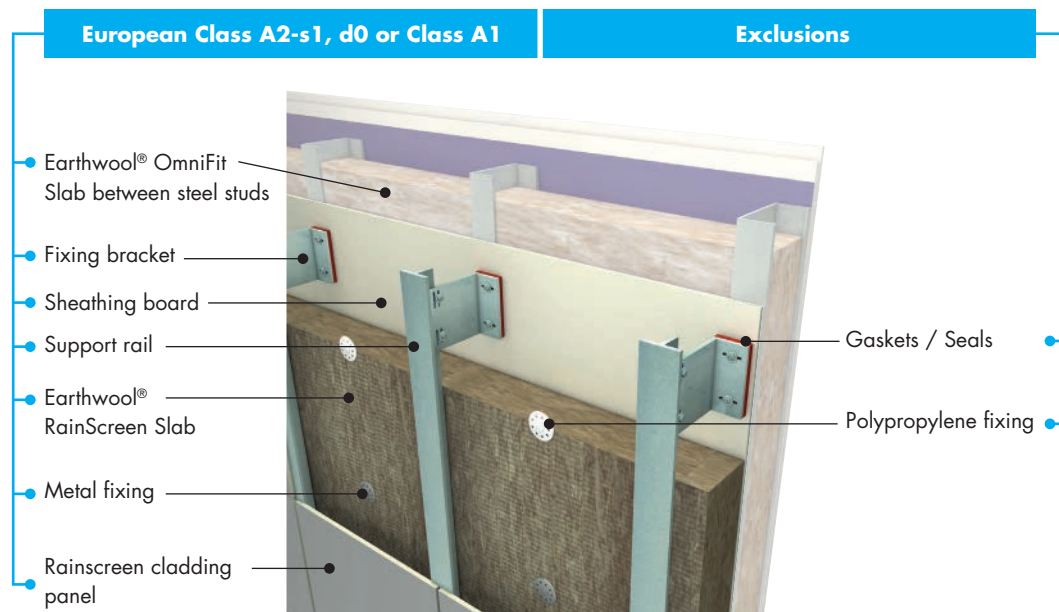
<ul style="list-style-type: none">• Unfaced Glass Mineral Wool• Unfaced Rock Mineral Wool		<ul style="list-style-type: none">• Polyisocyanurate (PIR)• Polyurethane (PUR)• Phenolic					<ul style="list-style-type: none">• Extruded Polystyrene (XPS)• Expanded Polystyrene (EPS)
							
A1	A2	B	C	D	E	F	
Non-combustible	Limited combustibility	Very limited contribution to fire	Limited contribution to fire	Medium contribution to fire	High contribution to fire	Easily flammable	

Illustration for guidance only. It is crucial to check the actual Euroclass Reaction to Fire Classification of a product before use.

Designing and building using A1 non-combustible products offers the greatest confidence in a buildings fire performance. This is because “Euroclass A1 products will not contribute in any stage of the fire including the fully developed fire” - British Standard BS EN 13501: Fire classification of construction products and building elements.

COMPONENTS AFFECTED BY APPROVED DOCUMENT B UPDATE



THERMAL PERFORMANCE

Earthwool® RainScreen Slab is fully CE marked and has a declared thermal conductivity of 0.034W/mK in accordance with BS EN 13162.

The degree of thermal bridging in a rainscreen cladding system significantly influences the U-Value, as a result standard methods cannot be used complex analysis is required.

Please consult our Technical Support Team for U-Value Calculations on **01744 766 666**



WIND LOADING

Earthwool® RainScreen Slab has been tested by BRE to BRE digest 346 The assessment of wind loads – Part 7: Wind speeds for serviceability and fatigue assessments, withstanding the applied dynamic wind loading at a maximum design pressure of -3600Pa, or 76m/s as calculated to BS EN 1991 without showing signs of damage or distress, maintaining its structural integrity.

The test was designed to focus the integrity of the insulation slab by fixing into the studs of the light steel framed wall structure that formed the substrate.

For fixing patterns and methodology when installing Earthwool® RainScreen Slab to defined wind load requirements into differing substrates, please consult fixing manufacturers and/or manufacturers of substrates to ensure adequate performance is achieved.



ACOUSTIC PERFORMANCE

Acoustic performance is becoming an increasingly important consideration when designing a building due to the increase in urbanisation and as such the rise in noise levels around populated areas.

Earthwool® RainScreen Slab has excellent acoustic absorbance properties, which contribute towards the acoustic performance of the structure onto which it is mounted.

As sound waves hit the insulation, a fraction of the sound waves are reflected, transmitted or absorbed. The random orientation of the fibres in Earthwool® RainScreen Slab allow for a greater number of sound waves to be absorbed, converting part of the energy into heat and transmitting part through the fibres, because the sound waves cannot travel using a direct path from surface to surface.

Achieving strong levels of acoustic performance is key to delivering a building in which the occupants can enjoy a comfortable environment whether that be for working, living or enjoying leisure activities.

The effects of noise are many, its intensity depends on the volume of sound. Noise causes fatigue, irritation, loss of efficiency and permanent damage to hearing with vulnerable adults and children most susceptible to its effects.

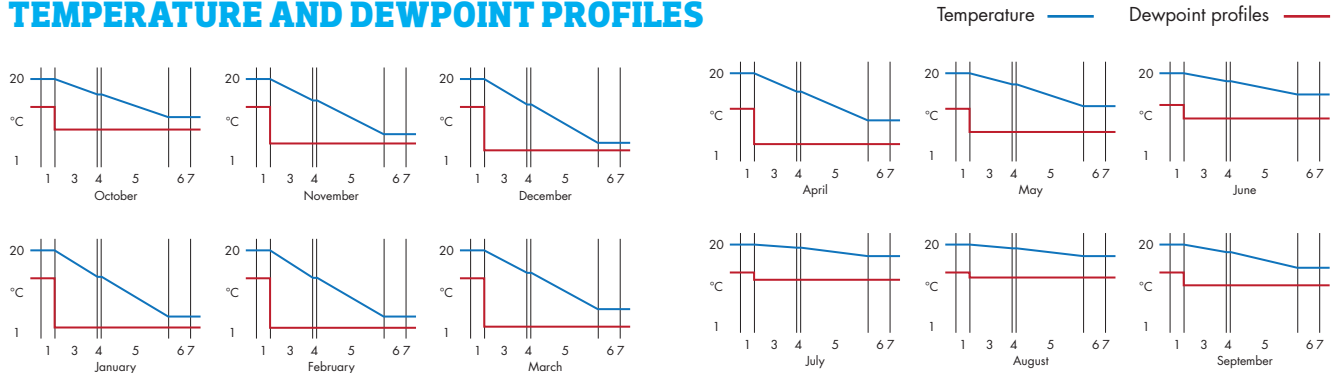


BBA APPROVED

Earthwool® RainScreen Slab has been assessed by the British Board of Agrément (BBA) under Certificate 19/5609 for use as a thermal insulation material in rainscreen cladding systems on new and existing timber, steel-frame or masonry walls.

The certification offers contractors and specifiers utmost confidence that Earthwool® RainScreen Slab is fit for its intended use and that the product will have a life equivalent to that of the wall structure in which it is incorporated.

TEMPERATURE AND DEWPOINT PROFILES



Description: Rsi, Plasterboard 2 x 15mm, Vapour control layer, OmniFit Slab/LSF, Cement bonded particle board, Earthwool® RainScreen Slab, Cavity Ventilation, RainScreen Cladding, Rse

ENVIRONMENTAL

Earthwool® RainScreen Slab is manufactured with ECOSE® Technology, a patented, sustainable, bio-based, no-added formaldehyde binder, offering optimum performance plus an A+ Generic Green Guide Rating.

Earthwool RainScreen Slabs contain no ozone-depleting substances or greenhouse gases. For further environmental information consult the relevant Environmental Product Declaration, available on our website. Up to 4 credits can be obtained depending on materials used in conjunction with other BREEAM compliant materials, please visit https://www.knaufinsulation.co.uk/sites/ki_gb/files/uploads/RMW-BREEAM-Information%20sheet.pdf for more information on BREEAM credits using Rock Mineral Wool products.

Earthwool® RainScreen Slab is also manufactured to the BES 6001 standard, demonstrating our responsible approach to manufacturing processes, including the sourcing of materials, how products are manufactured and waste prevention throughout all of the products we manufacture. BES 6001 also contributes to BREEAM credits on schemes where they are used.

Earthwool RainScreen Slab has received the coveted Eurofins Indoor Air Comfort Gold standard.

Earthwool® RainScreen Slab with ECOSE® Technology is certified as an outstanding material according to the VOC (Volatile Organic Compounds) Indoor Air Quality emissions regulations.

WORKABILITY

Earthwool® RainScreen Slab has been designed for ease of handling and compatibility with a wide range of cladding systems. The design of the product provides flexibility whilst allowing for minor imperfections in the surface of the substrate, yet maintaining the required rigidity that allowing for minimal fixings.

INTERSTITIAL CONDENSATION

Earthwool® RainScreen Slab can aid with the prevention of interstitial condensation due to its low vapour resistivity. Our Technical Support Team can provide condensation analyses for various construction types in accordance with BS 5250:2011 +A1:2016 and BS EN ISO 13788:2012





WEATHER RESISTANCE

Earthwool® RainScreen Slab is produced using a water repellent additive to improve its ability to resist water uptake.

Coupled with a fibre matrix that promotes the run off of water, this ensures that the slab will resist moisture ingress whilst maintaining its excellent vapour permeability.

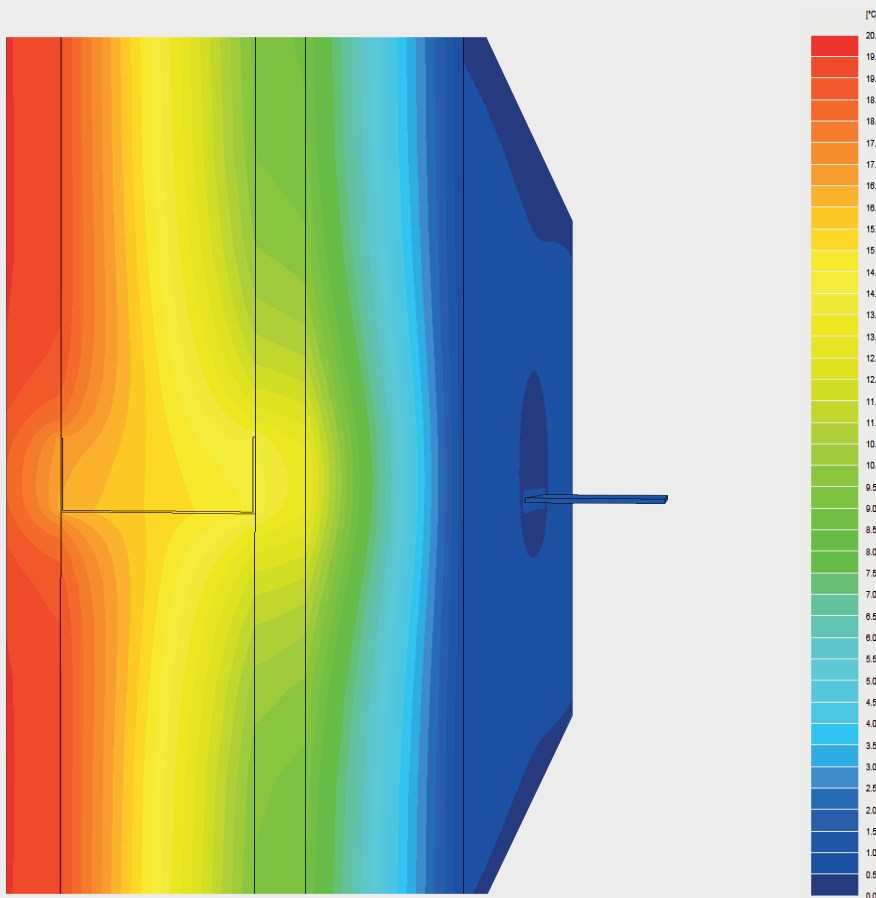
Should Earthwool® RainScreen Slab be exposed to very high levels of moisture or wetting it will dry out; the rate of drying is dependent on ventilation, air movement and temperature difference. In a ventilated construction such as rainscreen cladding, the rate of drying will be high, in winter because there will be a relatively steep thermal gradient from inside to out and in summer because of natural convection and ventilation through the rainscreen system.

The physical characteristics of the fibres are unaltered by wetting. Therefore, the thermal properties of Earthwool® RainScreen Slab are not affected by exposure to moisture and the product will perform as expected once it has dried out.

EXPOSURE TO THE ELEMENTS

Earthwool® RainScreen Slabs should be covered up with the cladding as work proceeds, on the basis of an advancing front. However, due to variances in climate, season, orientation and geographical location it is not possible to state a definitive timescale to exposure.

U-VALUE CALCULATIONS



We offer three dimensional (3D) finite element heat loss calculations to comply with Building Regulations.

The software gives us the ability to calculate two and three dimensional heat flows through construction elements resulting in exact thickness recommendations in order to meet specific U-Value requirements.

The calculations are carried out in accordance with building regulations, using a finite element analysis computer program, which is fully compatible with BS EN ISO 10211:2017 - Thermal bridging in building construction - heat flows and surface temperatures Part 1.

U-VALUE CALCULATIONS USING 3D MODELLING SOFTWARE

There are several options for calculating U-Values in rainscreen applications. If these are only marginally inaccurate it can have greater effects on the overall U-Value of a wall and therefore the thermal performance of an overall building. The most accurate method of calculating U-Values is using a 3D calculation as offered by Knauf Insulation.

BR443 Conventions for U-Value Calculations (section 4.9.5) make specific mention to the correct calculation of U-Values for rainscreen cladding systems. Designers should take care and consider the best approach in each situation to ensure that as built performance is optimised by using a suitable method. Fixing point loss corrections for brackets and rails or top hats etc, are unique to each through wall build-up and should take into account calculations to allow for both point (CHI) and Linear (PSI) thermal losses where applicable by calculating to BS EN 10211. Our Technical Support Team can provide calculations to BS EN 10211 and help to ensure that due diligence has been taken when calculating U-Values in rainscreen cladding systems.



For any U-Value Calculations for alternative construction build-ups, please contact our Technical Support Team on 01744 766 666.

For written U-Value Calculations, please email details of your full through construction build-up to technical.uk@knaufinsulation.com and we will respond accordingly to meet your requirements.

We are a fully accredited member of the industry leading British Board of Agrément (BBA) U-Value and Condensation Calculation Competency Scheme which promotes and assists accurate, objective and consistent calculations of U-Values and condensation calculations within the UK construction industry. As part of our ongoing participation in the scheme, we are required to maintain written records for audit trail purposes.

SUPPORTING INFORMATION

MECHANICAL DAMAGE

If mineral wool insulation is subjected to mechanical damage, where the overall physical dimensions of the product are changed, then the thermal performance of the product may be altered. If the product thickness is reduced then the thermal resistance will be reduced proportionally to the reduction in thickness.

If the product is damaged at edges and corners so that the slabs are no longer able to be tightly butted up to each other (with all joints closed), then the thermal performance of the system will be affected due to increased heat loss in these areas. This sort of physical damage could occur due to exposure to very high winds and resulting suction forces or transportation of debris, water jetting or high water flow rates typically from a gutter or an unintended drainage point. This sort of physical alteration could occur in all thermal insulation products under such conditions.

Any physical damage can be observed by inspection and if any product is left exposed then it would be good practice to examine the insulation prior to installation of the rainscreen cladding in order to ensure that no damage has occurred in the time elapsed between installation of the insulation and the weatherproof cladding. After extreme weather events, it is recommended that all materials making up the system should be inspected.

EXPERIENCED INSTALLERS

There is no formal British or European test method demonstrating a particular class of weather resistance of a rainscreen product. It is therefore valid for the installer to refer to his own experience of installing products in conjunction with the system manufacturer's recommended build sequence for the system under construction or consideration. A suitable way forward is to check the physical condition of the insulation immediately prior to the installation of the rainscreen cladding and undertake any necessary repairs.

PACKAGING

Individual packs of Earthwool® RainScreen Slab are compression-packed together to form a "Supakube", a durable, weatherproof, recyclable unit that eliminates the need for internal storage and allows ease of transportation and delivery.

Each "Supakube" is broken down into small more easy to handle packs during installation.



BIRMINGHAM CONTROL TOWER CASE STUDY



CHALLENGE

Towering 105ft above the terminal, the air traffic control building at Birmingham Airport is an iconic addition to the city's skyline. Built to replace the 79ft control tower that had been in use since the original terminal opened in 1939, the new £10m building has been designed to meet high standards of sustainability.

With such an ambitious project, ensuring the accuracy of the performance specifications was absolutely paramount.

SOLUTION

Knauf Insulation's Earthwool® RainScreen Slab was chosen as the insulation component, thanks to the product's excellent thermal and acoustic performance – as well as the high-level technical advice, U-Value Calculations and condensation analysis provided by the manufacturer.

Providing a comfortable internal environment where aviation officials could focus in a pressurised setting without the distraction of heavy noise pollution was a key design consideration. Achieving this specification was aided by the excellent acoustic properties of Earthwool® RainScreen Slab.

Its flexible nature made it perfect for the curved walls of the funnel shaped control tower, as the insulation moulded easily to the substrate, creating a snug fit that could not be achieved by using rigid foam boards.

Knauf Insulation's Earthwool® RainScreen Slab is also non-combustible and has the highest Euroclass A1 Reaction to Fire Classification, ensuring that buildings designed and manufactured using this product are minimising their risk in terms of fire performance.

PRODUCT USED

Earthwool® RainScreen
Slab 100mm

PROJECT

Birmingham
Control Tower

CLIENT

Birmingham City
Airport

MAIN CONTRACTOR

Simco External
Framing Solutions Ltd



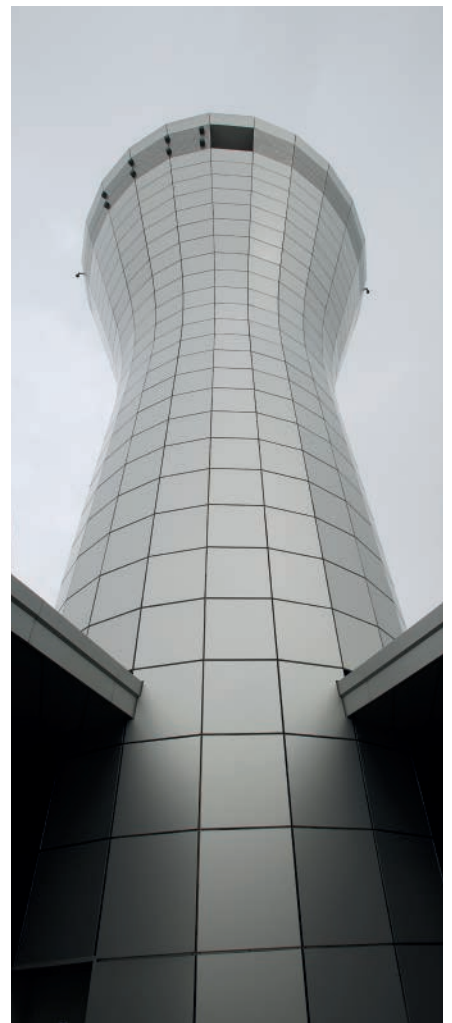
Luke Cresswell, Designer at Simco, commented;

"The U-Value Calculations provided by Knauf Insulation's Technical Support Team were extremely important as they helped us to integrate our RainScreen system design with the rest of the building and with the client's design team. We have worked with Knauf Insulation many times before and chose them again for this project as we knew they would deliver accurate calculations quickly and efficiently, enabling us to establish our insulation requirements with minimum fuss. We will be using Knauf Insulation's products again in the future, without question".



Will Heynes, the Airport's Development Director said: "Sustainability, energy performance, fire safety and acoustic protection were all crucial factors taken into account during the design of the new air traffic control tower and so all materials specified with the project needed to meet these multiple requirements. We are extremely pleased with the building which will be operational in April 2013 and believe it is a leading example within aviation construction".

Earthwool® RainScreen Slab is made with ECOSE® Technology, a no-added formaldehyde binder derived from rapidly renewable materials, instead of traditional petro-based chemicals used in other insulation. Additionally, products manufactured using ECOSE® Technology are up to 70% less energy intensive than using traditional binders.



BIRMINGHAM CITY UNIVERSITY CASE STUDY

CHALLENGE

Targeted with achieving a minimum BREEAM rating of Excellent and with only a short window of time to complete the project designers, Associated Architects, needed insulation products that would meet strict thermal, acoustic and environmental requirements – as well as a manufacturer that could offer quick turn around times and a high level of technical support.

In a learning environment located in a busy city centre, reducing the levels of noise pollution entering the building through the external walls is an important design consideration, helping to provide a comfortable environment where students and professionals alike can focus without unnecessary distraction.

SOLUTION

With the help of Knauf Insulation specification manager, Marc Lawson, a through wall solution using 5,000m² of Knauf Insulation's 100mm Earthwool® RainScreen Slab – a rock mineral wool slab containing a water repellent additive, specifically designed for Rainscreen cladding systems was used. This build up provided the necessary performance in terms of decibel reduction while delivering a solution that was both strong thermally while helping to meet fire performance requirements.

Knauf Insulation's Earthwool® RainScreen Slab is non-combustible and has the highest Euroclass A1 Reaction to Fire Classification, offering peace of mind in that specifiers using this product are minimising their risk in terms of fire performance of a completed building.

PRODUCT USED

Earthwool®
RainScreen Slab
100mm, Earthwool®
Flexible Slab 100mm

PROJECT

Birmingham Institute
of Art and Design
(BIAD)

CLIENT

Birmingham City
University

MAIN CONTRACTOR

Willmott Dixon

ARCHITECTS

Associated Architects

James Hall Director of Associated Architects commented:

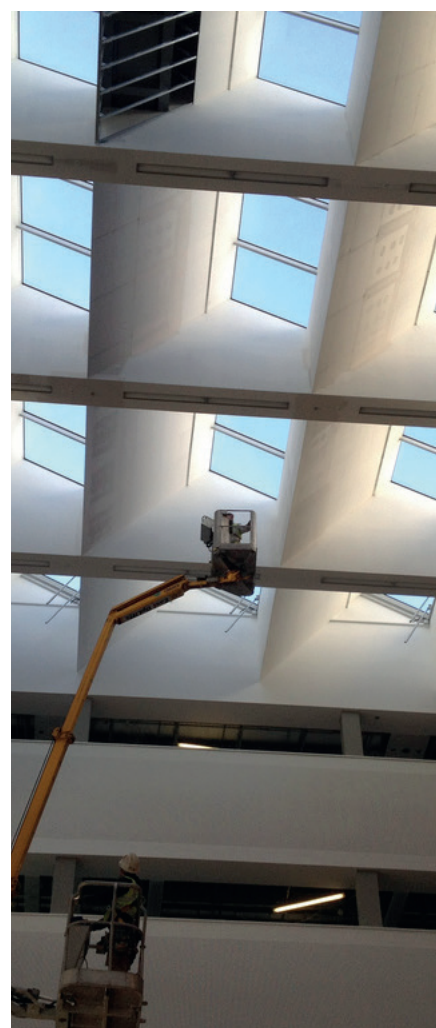
"The technical support from Knauf Insulation was really beneficial, especially during the early design stages, helping us achieve the correct insulation specification for the wall build-up. We have used Knauf Insulation many times in the past and would certainly be happy to work with them again".



Chris Kinman, Senior Design Manager at Willmott Dixon commented;
"Knauf Insulation's products are easy to handle and cut which makes them very easy to use on site. The first phase of the project has gone well and the architect has adopted a similar approach to Phase 2 - which is testament to the excellent performance so far. Overall, we have been very impressed by the help and support we have received from Knauf Insulation on the project and we have since recommended them to other colleagues."

Earthwool® RainScreen Slab and Earthwool® Flexible Slab Rock Mineral Wool products are made with ECOSE® Technology, non-added formaldehyde binder derived from rapidly renewable materials, instead of traditional petro-based chemicals used in other insulation.

Additionally, products manufactured using ECOSE® are up to 70% less energy intensive than using traditional binders.



CONTACTS

Customer Service (sales)

01744 766 766

sales.uk@knaufinsulation.com

Technical Support Team

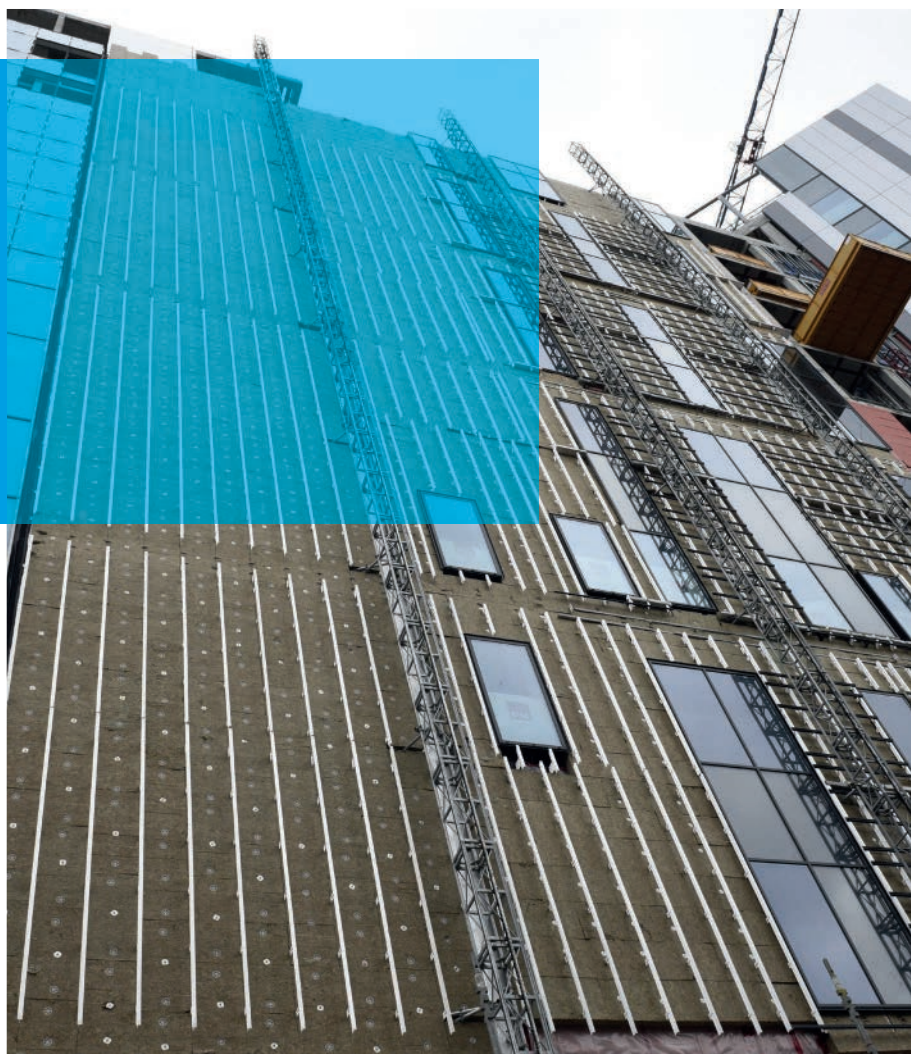
01744 766 666

technical.uk@knaufinsulation.com

Literature

08700 668 660

info.uk@knaufinsulation.com



Knauf Insulation Ltd PO Box 10, Stafford Road, St.Helens, Merseyside, WA10 3NS. UK

For more information please visit www.knaufinsulation.co.uk

All rights reserved, including those of photomechanical reproduction and storage in electronic media. Extreme caution was observed when putting together and processing the information, texts and illustrations in this document. Nevertheless, errors cannot quite be ruled out. The publisher and editors cannot assume legal responsibility or any liability whatever for incorrect information and the consequences thereof. The publisher and editors will be grateful for improvement suggestions and details of possible errors pointed out.

challenge.
create.
care.