

Rainscreen Cladding Specification Guide



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Introduction

Ventilated facade systems offer a number of benefits to the building designer. Lightweight, durable and available in a huge range of materials – rainscreen systems allow buildings to achieve their aesthetic goals whilst utilising practical construction methods.

Rainscreen cladding is relevant to both new build and refurbishment projects. It is a popular choice for large multi-storey buildings due to the speed of installation and other inherent benefits associated with this modern method of construction. The challenges for the building designer include structural performance and wind loading, fire performance and thermal efficiency.

Strong thermal performance of the building fabric is a critical design goal, driven by both the Building Regulations and an increasing desire from clients for energy efficient buildings. Buildings designed with high levels of insulation benefit from reduced running costs and lower levels of carbon emissions.

Celotex RS5000 is uniquely positioned to help meet these goals. Celotex RS5000 is a premium performance PIR solution for use in rainscreen cladding applications and suitable for use in building above 18 metres in height. RS5000 comprises a rigid polyisocyanurate foam core with a super low lambda value of 0.021 W/mK and can be used as sheathing to warm steel frame constructions or fixed directly to masonry for overcladding applications.

The challenges for the building designer include structural performance and wind loading, fire performance and thermal efficiency.

Product Properties

Celotex RS5000

Celotex RS5000 is a premium performance PIR solution for use in rainscreen cladding applications comprising a rigid polyisocyanurate foam core with aluminium foil facings on both sides.

Dimensions: 1200mm x 2400mm

Thickness Range: 50mm – 150mm

Compressive Strength: ≥ 120 kPa
BS EN 826: 1996 (Thermal insulating products for building applications – determination of compressive behaviour)

Dimensional Stability: DS (TH) 8
BS EN 1604: 2013 (Thermal insulating products for building applications – determination of dimensional stability under specified temperature and humidity conditions)

Thermal Performance: Celotex RS5000 has a declared thermal conductivity (λ value) of 0.021 W/mK in accordance with BS EN 13165:2012 (Thermal insulation products for buildings – factory made rigid polyurethane foam (PUR) products)

Celotex RS5000 Technical Data

Product Code	Thickness (mm)	R-value (m ² K/W)	Weight (kg/m ²)
RS5050	50	2.35	1.81
RS5060	60	2.85	2.16
RS5070*	70	3.30	2.48
RS5075*	75	3.55	2.64
RS5080	80	3.80	2.80
RS5090*	90	4.25	3.12
RS5100	100	4.75	3.38
RS5120*	120	5.70	4.02
RS5150*	150	7.10	4.98

*Not available from stock. Minimum order quantities and extended lead time applies.

Celotex RS5000 has been successfully tested to BS 8414-2:2005 (Fire performance of external cladding systems)

Fire Performance

Rainscreen Insulation

Celotex RS5000 is Class O fire rated as described by the national Building Regulations having achieved both:

- ▶ A pass to BS 476 Part 6: 1989 (fire tests on building materials and structures-method of test for fire propagation for products)
- ▶ Classification as Class 1 in accordance BS 476 Part 7: 1997 (fire tests on building materials and structures-method of test to determine the classification of the surface spread of flame of products)

Building above 18 metres

Celotex RS5000 has been successfully tested to BS 8414-2:2005 (Fire performance of external cladding systems: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame), meets the criteria set out in BR 135 and is therefore acceptable for use in buildings above 18 metres in height.

The system tested to BS 8414-2:2005 was as follows:

- ▶ 12mm fibre cement panels
- ▶ Supporting aluminium brackets and vertical rails
- ▶ 100mm Celotex RS5000
- ▶ 12mm non-combustible sheathing board
- ▶ 100mm SFS system
- ▶ 2 x 12.5mm plasterboard

Fire stopping was provided by ventilated horizontal fire breaks positioned at each floor slab edge and above the hearth opening. Vertical non-ventilated fire breaks were provided at the edges of both the main face and the return wing and around the hearth opening.

N.B. Ventilated fire barriers comprised of stonewool insulation with Class O aluminium foil facings and a continuous bonded intumescent strip. Non-ventilated fire barriers comprised of stonewool insulation with Class O aluminium foil facings specifically intended to fully fill the void.

The fire performance and classification report for Celotex RS5000 only relates to the components detailed above. Any changes to the components listed will need to be considered by the building designer.

For full specification details, please refer to our separate Rainscreen Cladding Compliance Guide or contact the Celotex Technical Centre.

Celotex IQ Emissivity

Celotex RS5000 is faced with super low emissivity aluminium foil facings on both sides. The highly reflective foil facings help to deliver better U-values in rainscreen cladding constructions.

Jim Lawrence, Hadleigh

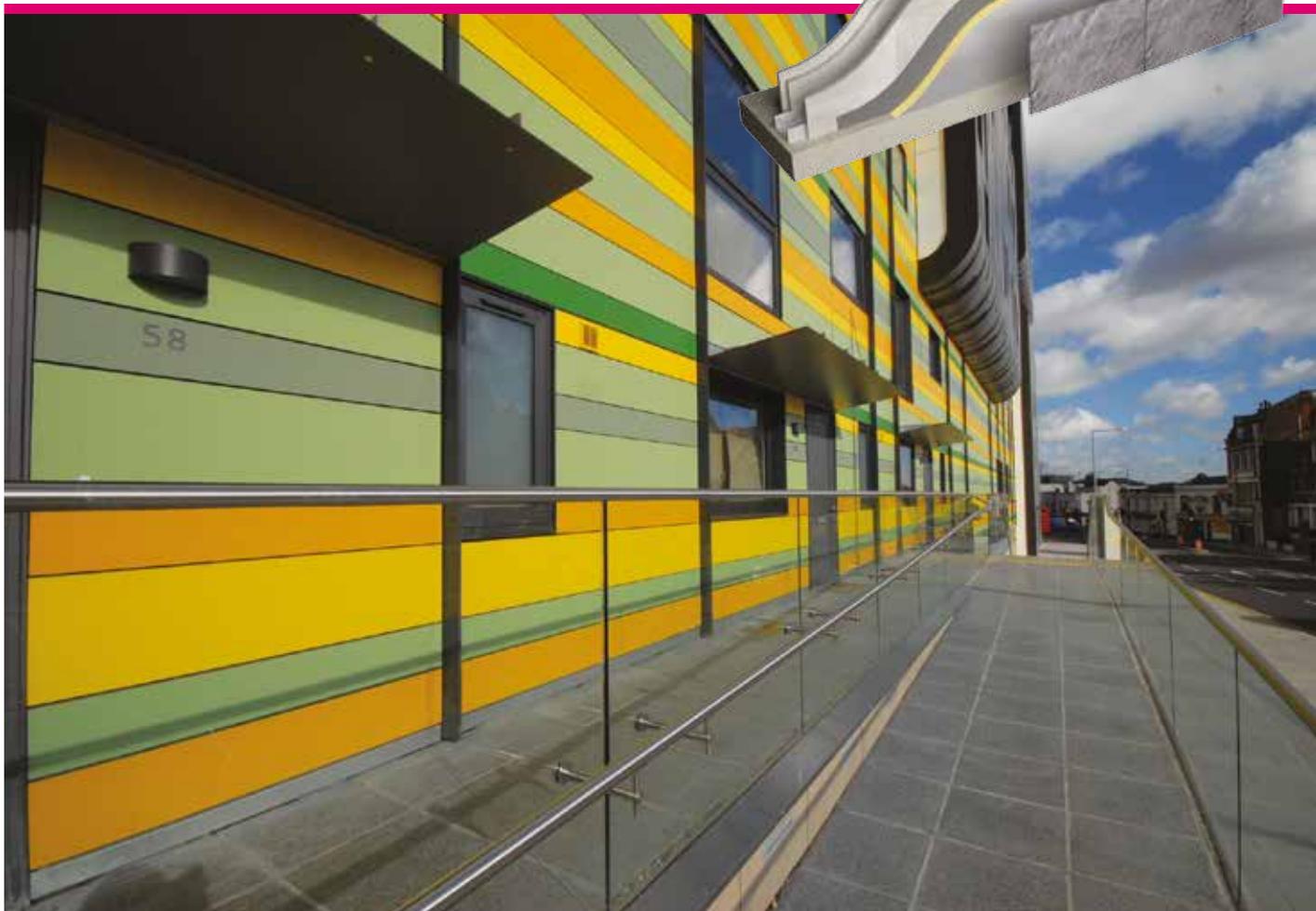


Certification

Third party approvals play a key role in distinguishing product performance between different manufacturers. To eradicate the perception that all PIR is the same, we recognise the importance of approvals and certifications from a number of leading organisations, including BBA, BRE and ISO. These approvals include independent validation of thermal, fire and other product standards.

Product Code	Application	CE Marking	ISO 9001	ISO 14001	LABC Registered Detail (Product)
RS5000	Rainscreen	✓	✓	✓	✓

Tesco, Woolwich



Sustainability

Suitable for use within a number of applications within the building fabric, the specification of Celotex products will significantly contribute to improving the energy efficiency of the UK's building stock.

Celotex is also able to provide independent certification on the environmental impact on a selection of its product ranges.

Measured by its BRE Ecopoint score, Celotex achieve the lowest environmental impact of any PIR manufacturer and from its most recent recertification, has improved this score by over 5% since 2010. Moreover, when compared to the generic PIR Ecopoint value, Celotex' impact is over 20% better than that of non-certified PIR manufacturers.

Through its BRE Approved Environmental Profile, Celotex was the first PIR manufacturer to achieve an A+ Green Guide rating. This rating has been maintained through ongoing recertification and now includes even more Celotex products as part of the profile.

Celotex products are all manufactured in accordance with environmental management system ISO 14001. As well as this, the suppliers of the principal raw materials used in the manufacture of Celotex products also possess this standard allowing a credit to be achieved within the Materials category of BREEAM assessments.

Celotex manufacture solutions that start saving energy as soon as they are installed. Over its useful life, PIR insulation saves over 100 times more energy than was used in its manufacture.*

For further information please see Celotex' Sustainability Guide available at celotex.co.uk



Rainscreen Cladding Insulation		
Name of Insulation Material	RS5000	✓
Manufacturer	Celotex	✓
Unfoamed, Foamed or Installed using Propellants	Foamed	✓
Global Warming Potential (GWP)	Less than 5	✓
Blowing Agent	Pentane	✓
Green Guide Rating	A+	✓
Element Number	1315320025	✓
Environmental Management System (EMS) - Key Process	ISO 14001	✓
Environmental Management System (EMS) - Supply Chain Process	ISO 14001	✓

* Source: PU Europe (Sustainability and Polyurethane insulation - Today's solution for tomorrow's needs)

Specification Support



Celotex
Energy Assessments

Specification Clause

Celotex RS5000

The rainscreen cladding insulation shall be Celotex RS5000 _____mm thick, comprising a polyisocyanurate (PIR) rigid foam insulation core featuring Celotex IQ providing super low emissivity textured aluminium foil facings on both sides and Class O fire performance throughout the product in accordance with BS 476. RS5000 has been successfully tested to BS 8414-2:2005 and meets the performance criteria of BR 135. RS5000 is A+ rated when compared to the BRE Green Guide and is CFC/HCFC free with low GWP and zero ODP. RS5000 is manufactured in accordance with quality management systems ISO 9001 and environmental management system ISO 14001. All products must be installed in accordance with instructions issued by Celotex.

NBS Specifications

Celotex RS5000 is referenced in the following NBS clauses:

H92 776

For a full breakdown of the services Celotex Energy Assessments can provide please phone 0333 733 0850

Customers should be aware that Celotex and Darren Evans Assessments are separate legal entities and Celotex makes no warranty as to the quality of the services that DEA provides and assumes no responsibility in connection with those services. Customers should also be aware that, as an Assured Partner of Celotex, Darren Evans Assessments operate under a commercial agreement with Celotex for services provided by Darren Evans Assessments under the Celotex Energy Assessment Service.

Technical Services

Celotex provide outstanding levels of technical expertise and personal assistance through two industry leading services:

Celotex Technical Centre

When it comes to finding easy-to-understand, quick and helpful advice regarding PIR insulation, the Celotex Technical Centre (CTC) is where you will discover high levels of support and guidance on finding the most appropriate solutions to meet your requirements.

This includes provision of:

- ▶ U-value calculations
- ▶ Condensation risk analysis
- ▶ Application and installation advice
- ▶ Guidance on compliance to Building Regulations
- ▶ Information on our product and environmental credentials

Call the Celotex Technical Centre on **01473 820850** to speak to one of our advisors, or alternatively email **technical@celotex.co.uk**

Celotex Energy Assessments

Offering energy calculations including SAP, SBEM and bespoke thermal modelling as well as additional services for pre-tender planning and sustainability assessments for the Code for Sustainable Homes and BREEAM.

For more information on Celotex Energy Assessments (CEA) please take a look at the CEA brochure on celotex.co.uk with a full breakdown of the services we can provide for your project requirements. For more information please phone **0333 733 0850** or email **info@celotexea.co.uk**

Building Regulations

England Part L 2013

Part L is an Approved Document within the Building Regulations for England dealing with the Conservation of Fuel and Power. It ensures that the design and construction of new buildings, as well as work done on existing buildings, meets targets designed to limit the associated CO₂ emissions from the building following its construction or modification. Below is a guidance table of U-values to help comply with Part L 2013 Building Regulations.

	New Build		Existing Buildings	
	Domestic Notional Value/Backstop	Non-Domestic Notional value/Backstop	New Thermal Element e.g. Extensions	Existing Thermal Element e.g. Garage Conversions
Walls	0.18 / 0.30	0.26 / 0.35	0.28	0.30
Floors	0.13 / 0.25	0.22 / 0.25	0.22	0.25
Pitched Roofs	0.13 / 0.20	0.18 / 0.25	0.18	0.18
Flat Roofs	0.13 / 0.20	0.18 / 0.25	0.18	0.18

Scotland Section 6 2010

Section 6 of the Scottish Building Regulations is the Technical Handbook that deals with Energy within the built environment. Section 6 supports the Climate Change (Scotland) Act 2009 as it seeks to meet the target of an 80% reduction in carbon emissions by 2050 by ensuring that effective measures for the conservation of fuel and power are taken with constructing new or modifying existing buildings. Below is a guidance table of U-values to help comply with Section 6 2010 Building Regulations.

	New Build		Existing Buildings	
	Domestic Notional Value/Backstop	Non-Domestic Notional Value/Backstop	New Thermal Element e.g. Extensions	Existing Thermal Element e.g. Garage Conversions
Walls	0.19 / 0.25	0.26 / 0.27	0.19* / 0.22*	0.30
Floors	0.15 / 0.20	0.22 / 0.22	0.18* / 0.18*	0.25
Pitched Roofs	0.13 / 0.18	0.18 / 0.20	0.18* / 0.18*	0.25
Flat Roofs	0.13 / 0.18	0.18 / 0.20	0.18* / 0.18*	0.25

*Value required when extensions for houses have a reasonable standard of insulation

Wales Part L 2014

Historically, Part L, the Approved Document for the Conservation of Fuel and Power, applied to Wales and England. In 2014 this changed and the Welsh Government has issued their own version of Part L for use in Wales which came into force on 31st July. Part L ensures that the design and construction of new buildings, as well as work done on existing buildings, meets targets designed to limit the associated CO₂ emissions from the building following its construction or modification.

	New Build		Existing Buildings				
	Domestic Notional Value/ Backstop	Non-Domestic Notional value/ Backstop	New Thermal Element	Retained Thermal Element	New Thermal Elements Domestic in Character	New Thermal Elements Other Domestic buildings	Retained Thermal Elements
Walls	0.18 / 0.21	0.26 / 0.35	0.21	0.30	0.21	0.26	0.30
Floors	0.13 / 0.18	0.22 / 0.25	0.18	0.25	0.18	0.22	0.25
Roofs	0.13 / 0.15	0.18 / 0.25	0.15	0.18	0.15	0.18	0.18
Ceiling	-	-	-	0.16	0.15	0.15	0.16

Premier Inn, Canterbury



U-value Tables

Masonry substrate with overcladding

Build up:

200mm concrete
Celotex RS5000
Drained and vented cavity
Proprietary rainscreen cladding

Product code	U-value (W/m ² K)
RS5075	0.29
RS5080	0.28
RS5090	0.26
RS5100	0.24
RS5120	0.21
RS5150	0.18

SFS. Insulation sheathing frame

Build up:

2 x 12.5mm plasterboard
Air and vapour control layer
150mm SFS
12mm sheathing board
Breathable membrane
Celotex RS5000
Drained and vented cavity
Proprietary rainscreen cladding

Product code	U-value (W/m ² K)
RS5075	0.28
RS5080	0.27
RS5090	0.25
RS5100	0.23
RS5120	0.21
RS5150	0.18

SFS. Insulation sheathing frame and mineral wool / glass fibre between frame

Build up:

2 x 12.5mm plasterboard
Air and vapour control layer
150mm SFS filled with 150mm mineral wool - lambda = 0.040 W/mK
12mm sheathing board
Breathable membrane
Celotex RS5000
Drained and vented cavity
Proprietary rainscreen cladding

Product code	U-value (W/m ² K)
RS5050	0.24
RS5075	0.21
RS5080	0.21
RS5090	0.20
RS5100	0.19
RS5120	0.17
RS5150	0.16

Design Considerations and Installation Guidelines

Design Considerations

Celotex RS5000 can be incorporated behind ventilated facade (rainscreen) systems.

The product is suitable for use in both new and existing buildings and can be applied to both steel frame structures and masonry walls.

Thermal Performance

U-values

The tables on page 11 demonstrate how Celotex insulation can contribute to meeting the energy conservation requirements outlined in the relevant Building Regulations.

Linear Thermal Bridging

Building Regulations require building designers to consider heat loss through junctions within the construction. Approved Document L clarifies the requirement:

"The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings"

As insulation standards continue to evolve, it has become increasingly critical to consider heat loss in these areas. Accredited Construction Details (ACDs) for England & Wales, Scotland and Northern Ireland provide practical guidance on meeting this requirement. The documents provide approved design details for junctions within many common constructions.

Where work is being undertaken in an existing building the requirement can be met by adopting the designs given in Accredited Construction Details. Where a new building is being constructed, heat loss through each junction is considered as part of the whole building carbon dioxide emissions calculation.

Using improved junction detailing will allow buildings to more easily meet the requirements of the Building Regulations. Heat loss through each junction is represented by the psi (ψ) value. Where ACDs have been adopted then a default ψ value may be used for each junction.

Junctions can also be individually modelled by a competent person and the ψ value calculated. This value can be used directly in the whole building calculation. This approach will allow easier compliance and promotes strong fabric performance of the building. Celotex Energy Assessments are able to provide bespoke junction calculations.

Resistance to Moisture

The overall wall construction should be designed to adequately resist rainwater penetration.

Consideration should be paid to the height, location and overall design of the building.

For framed walls, a vapour permeable (breathable) membrane should be installed to the outside of the sheathing board. This may be positioned behind the insulation.

In all cases, the joints of the insulation boards should be taped with a self-adhesive aluminium rainscreen foil tape with a minimum width of 75mm.

Ventilation

Rainscreen cladding systems can be variously described as drained and ventilated or pressure equalised.

A drained and vented cavity should be provided behind the exterior cladding. The minimum cavity dimension may vary depending upon the unique design of the cladding system.

Where buildings are subject to NHBC Standards a minimum cavity dimension of 50mm should be adopted for cladding with open joints and a minimum cavity dimension of 38mm should be adopted for cladding with baffled or labyrinth (rebated) joints.

Joints

Rainscreen cladding systems are subject to specialist design and joints between cladding panels should be provided as per the manufactures specification.

Where buildings are subject to NHBC Standards; open, baffled or labyrinth (rebated) joints should normally have a minimum opening of 10mm.

Condensation

Surface Condensation

Walls designed and constructed so that the thermal transmittance (U-value) does not exceed 0.7 W/m²K at any point will adequately limit the risk of surface condensation.

Insulation and vapour control layers should be installed in accordance with Accredited Construction Details to minimise the risk of surface condensation forming at the junctions of elements.

Interstitial Condensation

The overall wall construction should be designed to adequately resist interstitial condensation. Guidance is provided in BS 5250:2011 Code of practice for control of condensation in buildings.

Masonry Walls

Where insulation is installed to the exterior of a masonry wall, the requirement for an AVCL (Air and Vapour Control Layer) should be determined by a condensation risk analysis.

Framed Walls (SFS)

Where insulation is provided externally to a framed wall, the requirement for an AVCL should be determined by a condensation risk analysis.

Celotex recommends the use of an AVCL, provided on the warm side of the insulation.

Where insulation is provided both externally to a framed wall and between the framing members, an AVCL should be provided on the warm side of the insulation.

Careful consideration should be given to maintaining the continuity of the AVCL – especially at junctions between elements.

A void behind the internal surface finish may be provided, to allow services to be installed without penetrating the Air and Vapour Control Layer.

Fire

Cavity Fire Barriers

Cavity fire barriers should be provided to meet the requirements of the national Building Regulations.

Cavity fire barriers must be installed carefully in line with the manufacturer's guidance.

In the absence of specific guidance from the manufacturer, cavity fire barriers should not be interrupted by Celotex RS5000 and should be anchored directly to the substrate behind.

Buildings above 18 metres

Buildings with a storey height greater than 18 metres have additional requirements under the national Building Regulations.

For fire performance details, please refer to page 5.

Travelodge, Maidstone



Celotex insulation boards should not be installed when the temperature is at or below 4°C and falling.

Installation Guidelines

Celotex insulation boards should not be installed when the temperature is at or below 4°C and falling.

Rainscreen cladding systems are subject to specialist design and should be installed in line with the manufacturer's guidelines.

Fixing of insulation boards

Secure Celotex RS5000 securely to the substrate with an appropriate fixing detail.

Insulation boards should be closely butted and installed break bonded.

A minimum of 9 fasteners per 1200mm x 2400mm board should be provided.

Fasteners should be positioned no less than 50mm and no greater than 150mm from board edges. Please refer to the following diagram for a recommended fixing pattern.

Where the board may be subject to external wind pressure, the requirement for additional fixings should be assessed in accordance with:

- ▶ BS 6399:2:1997 (Loadings for buildings, Code of practice for wind loads)

or

- ▶ BS EN 1991-1-4:2005 (UK National Annex to Eurocode 1 Actions on Structures, General Actions, Wind Actions).

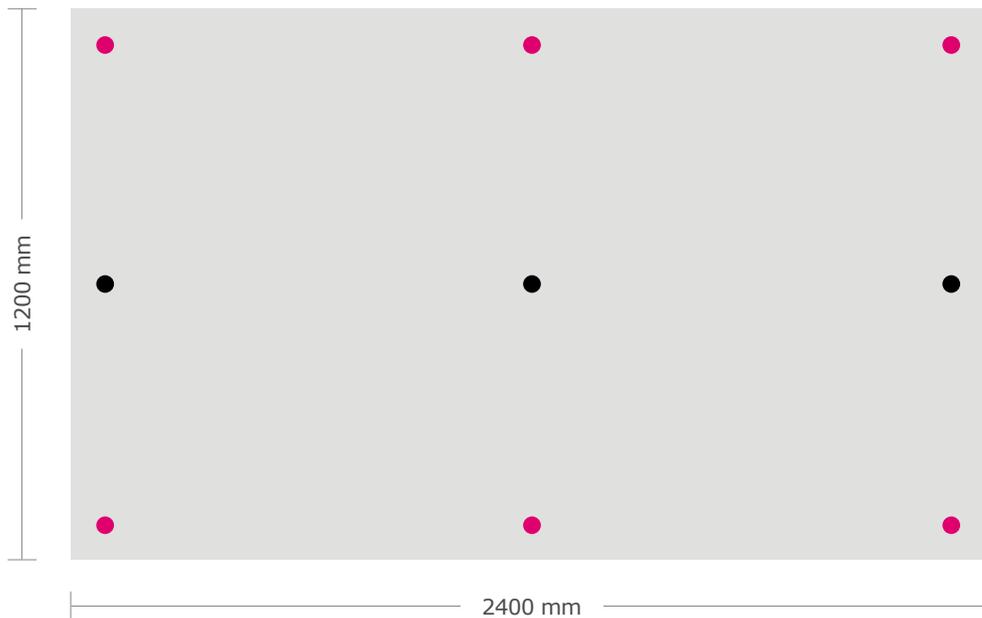
In all cases, the joints of the insulation boards should be taped with a self-adhesive aluminium rainscreen foil tape with a minimum width of 75mm.

Selection of fasteners

Fixings should be suitable for the specified substrate and thickness of insulation board.

Guidance on the selection of fixings should be sought from a fixings manufacturer.

Typical mechanical fixing patterns



● *It is recommended that at least one stainless steel fixing is used per square metre of insulation.*

General Information

Storage

Celotex insulation boards should be stored dry, flat and clear of the ground. Only as much material as can be installed during a single working period should be removed from storage at any one time. If boards are stored under tarpaulins, care should be taken to prevent rope damage to boards.

Installation

Always install Celotex insulation boards in accordance with the instructions supplied by Celotex.

Celotex insulation boards should not be installed when the temperature is at or below 4°C and falling.

Where possible, cut the product using the Celotex Insulation Saw to minimise dust creation.

When cutting Celotex insulation, dust extraction equipment, eye protection and face masks should be provided. Dust or particles in the eyes should be washed out with liberal quantities of water. If skin is sensitive to fibre irritation, apply a barrier cream to exposed areas before handling.

Handling

Care should also be taken to ensure that packs are not dropped on to corners or edges.

Aluminium foil edges may be sharp. Avoid sliding bare hands along board edges.



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