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Celotex
Insulation Specialists

Floors Specification Guide

Contents

Hepworth Gallery,
Wakefield

Introduction

Increasingly, thermal performance has become a critical element of modern floor design as specifiers strive to minimise downward heat loss in dwellings. In order to meet the demands of current Building Regulations, designers must address the key issues of thermal transmittance, thermal bridging and thermal mass. These must be addressed in a way that is sympathetic and compliments the traditional design goals of floors; structural performance, resistance to the passage of sound and resistance to moisture.

Celotex FR5000 is a premium performance PIR insulation solution featuring a super low lambda value of 0.021 W/mK ensuring Regulation compliance can be achieved with minimal insulation thickness. FR5000 closed cell formulation offers excellent resistance to moisture and has a high compressive strength making it the ideal solution for a range of flooring applications.

Celotex FF4000 is a specialist flooring product targeted at under screed applications including underfloor heating systems. Featuring an enhanced compressive strength value of ≥150 kPa and a thermal conductivity value of 0.022 W/mK, FF4000 provides greater resistance to site traffic and better clip retention for underfloor pipe installations.

Increasingly, thermal performance has become a critical element of modern floor design as specifiers strive to minimise downward heat loss in dwellings.

Product Properties

Celotex FR5000

Celotex FR5000 is a multi-purpose insulation board with a rigid polyisocyanurate foam core adhesively bonded in the manufacturing process to super low emissivity aluminium foil facings on both sides.

Dimensions: 1200mm x 2400mm

Thickness Range: 25mm – 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 FR5000 has a declared thermal conductivity (λ-value) of 0.021 W/mK in accordance with BS EN 13165:2008 (Thermal insulation for products – factory made rigid polyurethane foam (PUR) products).

Celotex FF4000

Celotex FF4000 is a high performance insulation board comprising a rigid polyisocyanurate foam core with low emissivity aluminium foil facings on both sides for use in underfloor heating systems.

Dimensions: 1200mm x 2400mm

Thickness Range: 50mm – 125mm

Compressive Strength: ≥150 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 FF4000 has a declared thermal conductivity (λ-value) of 0.022 W/mK in accordance with BS EN 13165:2008 (Thermal insulation for products – factory made rigid polyurethane foam (PUR) products).

Floor Insulation

Celotex FR5000 Technical Data

Product Code	Thickness (mm)	R-value (m^2K/W)	Weight (kg/m^2)
FR5025	25	1.15	1.01
FR5040	40	1.90	1.49
FR5050	50	2.35	1.81
FR5060	60	2.85	2.16
FR5070	70	3.30	2.48
FR5075	75	3.55	2.64
FR5080	80	3.80	2.80
FR5090	90	4.25	3.12
FR5100	100	4.75	3.38
FR5120	120	5.70	4.02
FR5150	150	7.10	4.98

Underfloor Heating

Celotex FF4000 Technical Data

Product Code	Thickness (mm)	R-value (m^2K/W)	Weight (kg/m^2)
FF4050	50	2.25	1.98
FF4070	70	3.15	2.68
FF4075	75	3.40	2.86
FF4085	85	3.85	3.21
FF4090	90	4.05	3.38
FF4100	100	4.50	3.73
FF4125	120	5.65	4.61

Celotex FR5000 is faced with super low emissivity aluminium foil facings on both sides

Fire Performance

Floor Insulation

Celotex FR5000 is Class O fire rated as described by the national Building Regulations having achieved:

- 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).

Underfloor Heating Insulation

Celotex FF4000 is classified as Class 1 in accordance with:

- 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).

Celotex IQ Emissivity

Celotex FR5000 is faced with super low emissivity aluminum foil facings on both sides. The highly reflective foil facings deliver better U-values in constructions by enhancing the thermal resistance of the unventilated cavity air space adjacent to the board.

Willowfield, West Midlands

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, Ofgem and ISO. These approvals include independent validation of thermal, fire and other product standards.

Product Code	Application	BBA No.	ISO 9001	ISO 14001
FR5000	Floors	95/3197	✓	✓
FF4000	Underfloor Heating	95/3197	✓	✓

The Co-operative Society, St. Helier

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 independently certify the environmental impact for a selection of its product ranges. This includes Celotex FR5000.

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**

Floor Insulation		
Name of Insulation Material	FR5000	✓
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	✓

Underfloor Heating Insulation		
Name of Insulation Material	FF4000	✓
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	815320017	✓
Environmental Management System (EMS) - Key Process	ISO 14001	✓
Environmental Management System (EMS) - Supply Chain Process	ISO 14001	✓

Specification Support

Specification Clause

Celotex FR5000

The floor insulation shall be Celotex FR5000 _____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. FR5000 is A+ rated when compared to the BRE Green Guide, is CFC/HCFC free with low GWP and zero ODP and acheives CE marking compliance to BS EN 13165. FR5000 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.

Celotex FF4000

The underfloor heating insulation shall be Celotex FF4000 _____mm thick comprising a polyisocyanurate rigid foam insulation core with a thermal conductivity of 0.022 W/mK with low emissivity aluminium foil facings on both sides. Celotex FF4000 is CFC/HCFC free with zero ODP and low GWP and achieves CE marking compliance to BS EN 13165. Celotex FF4000 is manufactured in accordance with quality management system ISO 9001 and environmental management system ISO 14001. All products must be installed in accordance with instructions issued by Celotex.

Building Information Modelling (BIM)

Celotex FR5000 and FF4000 are available for BIM in the following software formats:

- Autodesk Revit
- ArchiCAD
- Vectorworks
- Bentley
- Industry Foundation Classes (IFC)

Celotex products are available for BIM through both **celotex.co.uk/bim** and the NBS National BIM Library.

NBS Specifications

Celotex FR5000 and FF4000 are referenced in the following NBS clauses:

- M10 40
- M10 290
- M10 260

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**

For more information on how to download Celotex FR5000 and FF4000 for BIM, visit **celotex.co.uk/bim**

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.

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 CO_2 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*

U-value Tables

U-value calculations: floors over a vacant space using Celotex FR5000

Timber floor over a vacant space
FR5000 bridged between 150mm timber joists at 400 ctrs. 22mm Chipboard floor finish and 2x12.5mm plasterboard finish

Product Code	U-value
FR5075	-
FR5080	-
FR5090	0.24
FR5100	0.23
FR5120	0.20
FR5150	0.19

Concrete soffit - exposed
FR5000 to underside of 150mm concrete slab.

Product Code	U-value
FR5075	-
FR5080	-
FR5090	0.23
FR5100	0.21
FR5120	0.18
FR5150	0.14

Concrete floor over a vacant space
FR5000 above a concrete slab with 65mm screed

Product Code	U-value
FR5075	-
FR5080	0.24
FR5090	0.22
FR5100	0.20
FR5120	0.17
FR5150	0.13

U-value calculations: ground floors using Celotex FR5000

Suspended beam and block
FR5000 over beam and block under 65mm screed

	Perimeter / Area Ratio									
Product Code	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
FR5050	0.16	0.21	0.24	0.25	0.26	0.27	0.28	0.28	0.29	0.29
FR5060	0.15	0.19	0.21	0.23	0.24	0.24	0.25	0.25	0.25	0.26
FR5070	0.14	0.18	0.19	0.20	0.21	0.22	0.22	0.22	0.23	0.23
FR5075	0.14	0.17	0.18	0.19	0.20	0.21	0.21	0.21	0.21	0.22
FR5080	0.13	0.16	0.18	0.19	0.19	0.20	0.20	0.20	0.20	0.21
FR5090	0.12	0.15	0.16	0.17	0.18	0.18	0.18	0.18	0.19	0.19
FR5100	0.12	0.14	0.15	0.16	0.16	0.17	0.17	0.17	0.17	0.17
FR5120	0.11	0.12	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.15
FR5150	0.09	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12

Suspended timber floor
FR5000 bridged between 150mm timber joists @ 400 ctrs

	Perimeter / Area Ratio									
Product Code	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
FR5070	0.16	0.21	0.24	0.26	0.27	0.28	0.29	0.29	0.30	0.30
FR5075	0.16	0.21	0.23	0.25	0.26	0.27	0.27	0.28	0.28	0.29
FR5080	0.16	0.20	0.22	0.24	0.25	0.26	0.26	0.27	0.27	0.28
FR5090	0.15	0.19	0.21	0.22	0.23	0.24	0.24	0.25	0.25	0.25
FR5100	0.14	0.18	0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.24
FR5120	0.13	0.16	0.18	0.19	0.19	0.20	0.20	0.20	0.20	0.21
FR5150	0.12	0.14	0.15	0.16	0.16	0.17	0.17	0.17	0.17	0.17

Ground bearing slab-insulation under slab
FR5000 under 100mm concrete slab

	Perimeter / Area Ratio									
Product Code	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
FR5050	0.12	0.18	0.21	0.23	0.24	0.26	0.27	0.27	0.28	0.28
FR5060	0.12	0.16	0.19	0.20	0.22	0.23	0.24	0.24	0.25	0.25
FR5070	0.11	0.15	0.17	0.19	0.20	0.21	0.21	0.22	0.22	0.22
FR5075	0.11	0.15	0.17	0.18	0.19	0.20	0.20	0.21	0.21	0.21
FR5080	0.10	0.14	0.16	0.17	0.18	0.19	0.19	0.20	0.20	0.20
FR5090	0.10	0.13	0.15	0.16	0.17	0.17	0.18	0.18	0.18	0.18
FR5100	0.09	0.12	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.17
FR5120	0.09	0.11	0.12	0.13	0.13	0.14	0.14	0.14	0.14	0.15
FR5150	0.08	0.09	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.12

Ground bearing slab- insulation under 65mm screed
FR5000 under 100mm concrete slab

	Perimeter / Area Ratio									
Product Code	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
FR5050	0.12	0.18	0.21	0.23	0.24	0.26	0.27	0.28	0.28	0.29
FR5060	0.12	0.16	0.19	0.21	0.22	0.23	0.24	0.24	0.25	0.25
FR5070	0.11	0.15	0.17	0.19	0.20	0.21	0.21	0.22	0.22	0.22
FR5075	0.11	0.15	0.17	0.18	0.19	0.20	0.20	0.21	0.21	0.21
FR5080	0.10	0.14	0.16	0.17	0.18	0.19	0.19	0.20	0.20	0.20
FR5090	0.10	0.13	0.15	0.16	0.17	0.17	0.18	0.18	0.18	0.18
FR5100	0.09	0.12	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.17
FR5120	0.09	0.11	0.12	0.13	0.13	0.14	0.14	0.14	0.14	0.15
FR5150	0.08	0.09	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.12

Ground bearing slab- underfloor heating
FF4000 under 65mm concrete screed

	Perimeter / Area Ratio									
Product Code	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
FF4050	0.12	0.18	0.22	0.24	0.25	0.26	0.28	0.28	0.29	0.30
FF4070	0.11	0.16	0.18	0.19	0.20	0.21	0.22	0.23	0.23	0.23
FF4075	0.11	0.15	0.17	0.18	0.20	0.20	0.21	0.21	0.22	0.22
FF4085	0.10	0.14	0.16	0.17	0.18	0.19	0.19	0.20	0.20	0.20
FF4090	0.10	0.13	0.15	0.16	0.17	0.18	0.18	0.19	0.19	0.19
FF4100	0.10	0.13	0.14	0.15	0.16	0.17	0.17	0.17	0.17	0.18
FF4125	0.09	0.11	0.12	0.13	0.14	0.14	0.14	0.14	0.15	0.15

Design Considerations and Installation Guidelines

Design Considerations for Celotex FR5000

Celotex insulation can be used to insulate different floor types as part of the thermal envelope of a building. Floor types may be divided into three broad categories.

These are ground bearing, suspended concrete or timber and floors above an unheated space.

Ground Bearing Floors

Celotex can be installed above a ground bearing concrete slab or below.

Where insulation is positioned above the slab, the thermal mass of the slab is isolated from the internal environment. This may allow the building to respond more quickly to the heating system.

When insulation is installed below the slab, the thermal mass of the slab is coupled to the internal environment. This may assist the building in maintaining a steady internal temperature.

Suspended Floors

Celotex can be installed over a suspended concrete slab or beam and block floor deck.

Where insulation is positioned above the slab or floor deck, the thermal mass of the slab is isolated from the internal environment. This may allow the building to respond more quickly to the heating system.

Suspended timber floors can be insulated with insulation positioned between the timber floor joists.

Floors over an unheated space

When a concrete slab separates a heated space above from an unheated space below, the direction of heat loss is downwards. In this instance Celotex can be positioned directly under the concrete soffit with little risk of interstitial condensation.

The position of the insulation increases the thermal capacity of the building and may assist with maintaining a steady internal temperature.

Celotex can be installed above the concrete slab in the same way as a ground bearing slab. Where insulation is positioned above the slab, the thermal mass of the slab is isolated from the internal environment. This may allow the building to respond more quickly to the heating system.

Timber floors over an unheated space can be insulated in the same way as a suspended timber ground floor, with insulation positioned between the timber floor joists.

Floor Loadings

The compressive strength of Celotex FR5000 is equal to or exceeds 120 kPa as tested to BS EN 826.

The compressive strength of Celotex FF4000 is equal to or exceeds 150 kPa as tested to BS EN 826.

The ability of the overall floor construction to resist the intended floor loadings should be assessed by a qualified person.

For more information please refer to BBA Certificate 95/3197.

Thermal Performance

U-values

Perimeter Area Ratio

The potential for heat loss from a ground floor is dependant on the ratio of exposed perimeter to floor area.

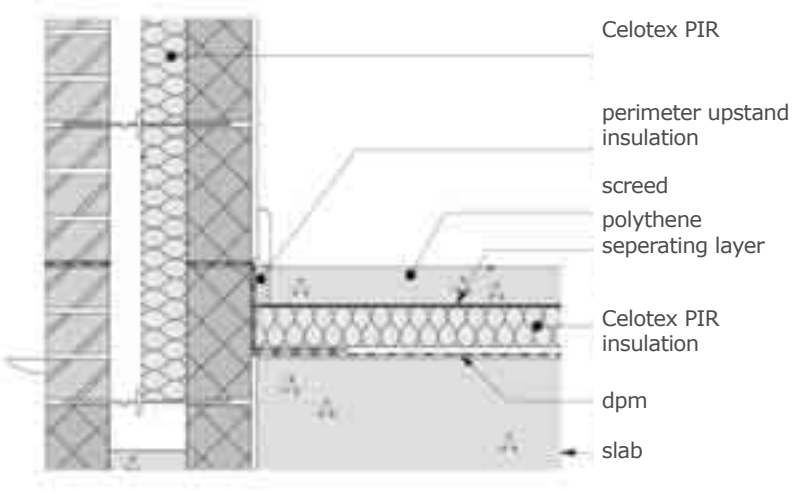
The insulation thickness required for a ground floor is calculated by dividing the exposed internal perimeter in linear metres by the internal floor area in m^2 to give the perimeter/area ratio (P/A ratio).

The tables on page 9 demonstrate how Celotex insulation can contribute to meeting the energy conservation requirements outlined in the Building Regulations in floors with different P/A ratios.

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"



Source: Celotex Floors BBA Certificate

Figure 1.

Similar performance standards are required in Scotland and Northern Ireland.

As insulation standards continue to evolve, is 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, including ground floors.

Where work is being undertaken in an existing building – for example extensions, 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.

Perimeter Upstand Insulation

Where Celotex is laid under screed or concrete slab, provide a vertical strip of insulation to form a perimeter upstand between the screed or slab and external wall.

The up stand should

- Have a thermal resistance equal to or greater than 0.75 m^2K/W
- Overlap 150mm with cavity wall insulation

This will limit heat loss through the junction and minimise the risk of surface condensation forming.

Resistance to Moisture

Ground Moisture

Floors subject to national Building Regulations should be designed in accordance with the below standards.

- England and Wales: Approved Document C, Section 4
- Scotland: Mandatory Standard 3.4, clauses 3.4.2 to 3.4.4 and 3.4.6 in both the domestic and non-domestic technical handbooks.
- Northern Ireland – Technical Booklet C, Section 1

As part of the floor design Celotex is installed above the damp proof membrane.

When Celotex is installed below the concrete slab it should not come into contact with the subsoil.

Condensation

Interstitial Condensation

A vapour control layer is required on the warm side of the insulation to minimise the risk of interstitial condensation forming on a concrete slab or beam and block floor deck below the insulation layer.

BS5250: 2011 Control of Condensation requires the vapour control layer to have the same moisture resistance as the damp proof membrane.

When positioned between the insulation and a sand and cement screed, it also acts as a separating layer protecting the insulation from coming into contact with moisture and chemicals within the screed.

There is no requirement to tape together the Celotex board joints.

Surface Condensation

Floors insulated to not exceed a U-value of $0.7W/m^2K$ will minimise the risk of surface condensation forming.

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

Services

Water supply pipes installed below the floor insulation can be damaged by frost. This damage may result in leaks through the building envelope. Where water pipes are installed below the insulation they should be pre-lagged.

Pipes installed above the insulation will not require lagging, although some provision needs to be made for expansion and contraction.

Where possible, electrical conduits, gas and water pipes or other services should be contained within ducts or channels within the concrete slab. Where this is not possible, the services may be accommodated within the insulation, provided they are securely fixed to the concrete slab. Electric cables should be enclosed in a suitable conduit.

For more information please refer to BBA Certificate 95/3197.

Design Considerations for Celotex FF4000

Underfloor Heating

Wet underfloor heating systems may be used with Celotex FF4000. The Celotex insulation is positioned above the concrete slab or floor deck. Compatibility with any given system should be checked with the system manufacturer. Underfloor heating systems must be installed carefully in line with the manufacturers recommendations.

Celotex FF4000 is recommended for use with underfloor heating systems. It features enhanced compressive strength, greater resistance to damage from trafficking and improved retention of pipe clip systems.

For more information please contact the Celotex Technical Centre on **01473 820850** or email **technical@celotex.co.uk**

For underfloor heating both layers must be Celotex FF4000

Installation Guidelines

General

- Use scaffold boards or other protection to prevent wheelbarrows and other traffic damaging the insulation
- The recommendations are suitable for normal domestic floor loadings. If higher loadings are required, it may be necessary to increase the screed thickness and provide reinforcement within the screed. Consult a structural engineer or a specialist flooring contractor.
- Wet under floor heating systems are compatible with Celotex FF4000. The system generally comprises of retaining clips and pipework. The manufacturer's installation guidelines should be referenced.

Two Layer Guidelines

Celotex policy remains that the best solution for flooring is the use of a one layer solution. However, should a two layer system be required we recommend

- Both layers must be laid in the same orientation
- The thickest board should be on top
- Boards should be laid with a cross-breaking joint so that the board joints are staggered to avoid a vertical joint through the 2 layers
- The boards should be protected from trafficking during and after installation
- Time between laying of boards and laying screed should be kept to minimum - ideally no more than 48 hours
- For underfloor heating both layers must be Celotex FF4000 product

The Co-operative Society, St. Helier

Concrete floor - under slab

- Level any projections from the hardcore with a thin layer of sand blinding.
- Install a damp proof membrane minimum (1200 gauge)with joints well folded and lapped. The membrane continue up the side of the walls until it connects with or forms the dpc course.
- Loose lay Celotex insulation boards across the damp proof membrane. They should be break bonded with board joints tightly butted.
- Place the perimeter edge insulation vertically around the edge of the floor slab to prevent cold bridging. The upstand should have a minimum R-value 0.75m^{2}K/W. Ensure the top of the perimeter upstand is level with the top of the finished floor slab.
- Lay a polythene vapour control layer over the insulation to minimise the risk of interstitial condensation forming at the slab/insulation interface. Ensure the polythene sheet edges overlap by 150mm, taped at the joints and is turned up to cover the perimeter edge insulation.
- Lay concrete to required finished floor level and smooth over with float finish.

Concrete floors - below a floor screed

- Level the surface of the concrete slab so that it is smooth and free from projections. Use a thin layer of sand blinding on a rough tamped slab to ensure that the insulation boards are continuously supported.
- Install a damp proof membrane below the Celotex. This can be over the top of a concrete slab to prevent any residual moisture within the slab contacting Celotex Insulation or below the slab.
- The damp proof membrane must provide continuity with the damp proof course in the surrounding walls by continuing the membrane up the side of the walls until it connects with or forms the dpc course.
- Loose lay Celotex insulation boards across the damp proof membrane. They should be break bonded with board joints tightly butted.
- Place the perimeter edge insulation vertically around the edge of the floor slab to prevent cold bridging. The up stand should have a minimum R-value 0.75m^{2}K/W. Ensure the top of the perimeter up stand is level with the top of the finished floor layer.
- Lay a 1000 gauge polythene vapour control layer over the insulation to minimise the risk of interstitial condensation forming at the slab/insulation interface. It also separates the moisture within the liquid screed contacting the surface of Celotex Insulation. Ensure the polythene sheet edges overlap by 150mm, taped at the joints and is turned up to cover the perimeter edge insulation.
- Apply a sand/cement or self levelling screed over the VCL and Celotex insulation boards to a minimum thickness of 65mm.

Concrete floor – under chipboard floor finish

- Install Celotex insulation as for under screed for the first four points.
- Lay a 1000 gauge polythene vapour control layer over the insulation to minimise the risk of interstitial condensation forming on the slab/insulation interface. Ensure the polythene sheet edges overlap by 150mm, taped at the joints and is turned up 100mm at room perimeters behind the skirting.
- The chipboard must be a minimum 18mm tongued and grooved flooring grade type C4 to BS5669. Lay the chipboard with staggered joints, glued with a woodworking adhesive.
- Provide a 10-12mm gap at all perimeter and abutments to allow for expansion. This can be achieved by the use of temporary wedges.
- Where chipboard is butted together without a tongued and grooved joint and all external doorways (for the width of the threshold) a treated timber batten must be used in lieu of the insulation boards.

Suspended timber floors

- Install joists in the conventional manner, with solid or strut bracing as necessary (diagonal bracing may lead to thermal bridging).
- Measure accurately the width of each joist space to be filled prior to cutting the board. Ensure there is a tight fit between insulation and joists to minimise air leakage and heat loss.
- Secure the board between the joists using Celotex insulation clips or stop battens.

Insulation clips

- Push the insulation clips into the board at 1000mm intervals with the two prongs piercing the exposed foam down the long edge of the board.
- Start the clips in between joists and push the board into place. This should be a tight fit to minimise heat loss through the gaps between the joists and insulation board.
- Push the board fully into the void so that the base of the insulation clip is level with the face of the joists.
- Nail through the base of the clip directly into the joists to provide additional fixing.

Stop battens

- Where insulation is to partially fill the joist space, ensure there is enough joist depth for the thickness of Celotex so that it is flush with the top of the joists. Where under floor heating is to be installed on top of Celotex insulation make an allowance for the cavity space.
- Fix 'stop' battens down the side of each joist to support Celotex insulation.
- Push the board into the void between the rafters until it contacts the stop batten below and is flush with the top of the joists with no gaps to reduce air movement and minimise air leakage.
- Fill any gaps between the joists and insulation with a softer more pliable insulation to further reduce air movement and minimise air leakage.
- Maintain insulation continuity by packing the space between final joist and wall with 50mm insulation. Where floor abuts a masonry cavity wall, ensure insulation overlaps cavity wall insulation by 150mm.
- Install either chipboard or softwood floor boarding directly onto the joists.
- Seal skirting board to wall and floor with a flexible sealant to minimise air movement and heat loss. Seal service openings in the same way.
- Ensure the void below the timber floor is ventilated and insulation does not block openings.

Forge Lane Water Tower, Congleton

Where underfloor heating is to be used in a suspended timber floor

- Install Celotex with the unprinted foil surface into the air cavity for optimum thermal performance. Push the board into the void between the joists until it contacts the stop batten below.
- Lay a proprietary underfloor heating system within the cavity, generally comprising pipework in coils, to the manufacturers' guidelines.
- Install either chipboard or softwood floor boarding directly onto the joists.
- Ensure the void below the timber floor is ventilated.

Suspended timber floors above a vacant space – installation from below

- Measure accurately the width of each joist space to be filled prior to cutting the board. Ensure there is a tight fit between insulation and joists to minimise air leakage and heat loss.
- Push the board into the void between the joists until it contacts the timber flooring above.
- Ensure any gaps between the joists and around the edges are filled to reduce air movement and minimise heat loss. A soft pliable insulation or expanding urethane foam can be used depending on the size.
- Hold the Celotex in place flush with the top of the rafters using 'stop' battens positioned along the inside of the joists.
- Install plasterboard under the joists where required by building regulations to provide a timed resistance to the passage of fire.

Direct fix to concrete soffit – unprotected

- It is recommended that Celotex board joints are installed with joints break bonded.
- Directly fix Celotex insulation to concrete soffit. Fixings should be evenly laid out with a minimum of 12 fixings per 1200x2400 board.
- Fixings should be installed between 50mm-150mm from the edge and corners of the board. Suitable fixings should comprise a screw type suitable for the concrete deck into which it is being driven, combined with a circular or rectangular plate washer having a surface area of not less than 45cm^2.
- Please note that the foil facer of the Celotex insulation is not intended to provide a decorative finish. Where additional protection is required please follow the installation guidelines shown below.

Direct fix to concrete soffit – protected

- It is recommended that Celotex board joints are installed with joints break bonded.
- For optimum thermal performance, the unprinted foil surface should face the air cavity.
- Directly fix Celotex insulation and 25mmx50mm timber fixing battens to concrete soffit. The timber battens should be fixed underneath the layer of Celotex. Ensure that the timber fixing battens are secured at 600mm centres and that the fixings through the concrete soffit are also at 600mm centres.
- Fixings should be installed between 50-150mm from the edge and corners of the board. Suitable fixings should comprise a screw type suitable for the concrete deck into which it is being driven. Advice on suitable fixings should be sought from the fixing manufacturer.
- To provide additional protection, fix a layer of cementitious board to the timber battens using suitable screws or nails.

For more information please contact the Celotex Technical Centre on **01473 820850** or email **technical@celotex.co.uk**

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.

Find out more at celotex.co.uk

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