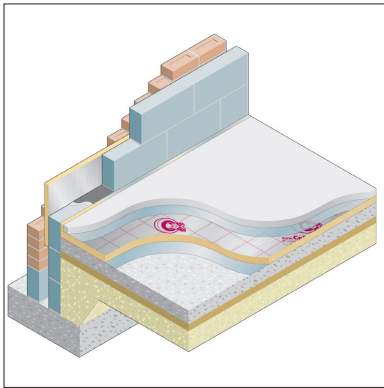


## Product



- THIS DETAIL SHEET RELATES TO CELOTEX T-BREAK TB3000, TUFF-R GA3000, EXTRA-R XR3000 AND FAST-R FF3000 (FLOORING INSULATION).
- The products are for use on ground-supported or suspended concrete or timber floors and also for use with exposed or semi-exposed intermediate concrete or timber floors.
- The products are used to reduce the thermal transmittance of new or existing floors of dwellings or buildings of similar occupancy, type and condition.
- It is essential that the floors comply with the conditions set out in the Design Data and Installation parts of this Certificate.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the Conditions of Certification.

## Technical Specification

### 1 Description

Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are rigid polyisocyanurate-modified polyurethane foam boards with a foil/kraft/foil tri-laminate facing on both sides. The boards are available in nominal dimensions given in Table 1.

Table 1 Nominal dimensions

	Board type			
	TB3000	GA3000	XR3000	FF3000
Length (mm)	2400	2400	2400	1200
Width (mm)	1200	1200	1200	600
Thickness (mm)	12-45	50-100	110-200	50-150

## Design Data

### 2 General

2.1 Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are effective in reducing the U value (thermal transmittance) of new or existing concrete or timber floors.

2.2 Ground-supported floors incorporating the boards must include a suitable damp-proof membrane, laid in accordance with the relevant sections of CP 102 : 1973, BS 8102 : 1990 and/or BS 8215 : 1991 (see section 4 of this Detail Sheet).

2.3 Suspended concrete or timber ground floors incorporating the boards must include suitable ventilation of the sub-floor void or a damp-proof membrane (see section 4).

2.4 The overlay to the boards should be:

- a floor screed, laid in accordance with the relevant clauses of BS 8204-1 : 2003 and BS 8204-2 : 2003, or
- wood-based floor, eg tongue-and-groove plywood 16 mm thick (minimum) to BS EN 636 : 2003, flooring grade particle board (Types P4 to P7) to BS EN 312 : 2003 or oriented strand board of types OSB/2 to OSB/4 to BS EN 300 : 1997, 18 mm thick (minimum), installed in accordance with DD ENV 12872 : 2000, or
- a concrete slab.

### 3 Behaviour in relation to fire

3.1 The boards do not prejudice the fire resistance properties of the floor.

3.2 When properly installed on concrete or timber floors the boards will not add significantly to any existing fire hazard. The boards will be contained within the floor by the overlay until the overlay itself is destroyed and therefore, will not contribute to the development stages of a fire or present a smoke or toxic hazard.

### 4 Moisture penetration

4.1 The boards are not a water vapour control layer, however, they will not allow moisture to cross the completed floor construction.

4.2 For floors subject to national Building Regulations, construction should be as detailed or designed in accordance with:

### England and Wales

Approved Document C, Technical Solutions 4.13 to 4.20

### Scotland

Mandatory Standard 3.4, clauses 3.4.2<sup>(1)(2)</sup> to 3.4.4<sup>(1)(2)</sup> and 3.4.6<sup>(1)(2)</sup>

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

### Northern Ireland

Technical Booklet C, Section 1.

## 5 Thermal performance


5.1 Calculations of the thermal transmittance (U value) of a floor should be carried out in accordance with BS EN ISO 6946 : 1997, BS EN ISO 13370 : 1998 and BRE report (BR 443 : 2006) *Conventions for U-value calculations* using the declared thermal conductivity ( $\lambda_{90/90}$  value) of the insulation of  $0.023 \text{ Wm}^{-1}\text{K}^{-1}$ .

5.2 The U value of a floor will depend on the thickness of the board, the perimeter/area ratio and the floor type. Examples of U values are given in Table 1. This table is for use as guidance only, a detailed calculation should be carried out for each proposed application.

Table 1 Floor U values<sup>(1)</sup> ( $\text{Wm}^{-2}\text{K}^{-1}$ )

Floor type	Perimeter/area ratio	Insulation thickness (mm)			
		25	50	70	75
Slab on ground supported	0.2	0.24	0.19	0.16	0.15
	0.4	0.35	0.25	0.20	0.19
	0.6	0.41	0.28	0.22	0.21
	0.8	0.45	0.30	0.24	0.23
Suspended beam and block	1.0	0.47	0.31	0.25	0.23
	0.2	0.25	0.20	0.17	0.16
	0.4	0.33	0.24	0.20	0.19
	0.6	0.37	0.26	0.21	0.20
Suspended timber	0.8	0.40	0.28	0.22	0.21
	1.0	0.42	0.29	0.23	0.22
	0.2	0.29	0.24	0.21	0.20
	0.4	0.39	0.30	0.25	0.24
	0.6	0.44	0.32	0.27	0.26
	0.8	0.48	0.34	0.28	0.27
	1.0	0.50	0.36	0.29	0.28

(1) Excluding edge insulation for the ground-supported floor system.

 5.3 Subject to the selection of an appropriate construction, P/A ratio and insulation thickness, a floor construction can contribute to achieving the following design U values:

### England and Wales and Northern Ireland

- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$  required for 'notional' dwellings in SAP 2005
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$  limit average specified in Approved Documents L1A (Table 2), and Technical Booklet F1 (Table 2.2)
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$  limit for an individual element specified in Approved Documents L1A (Table 2), and Technical Booklets F1 (Table 2.2).

### Scotland

- $0.20 \text{ Wm}^{-2}\text{K}^{-1}$  required for the 'simplified approach' — solid fuel packages 3 and 6 'notional' dwelling
- $0.22 \text{ Wm}^{-2}\text{K}^{-1}$  required for 'notional' dwellings in SAP 2005 (for Scotland) and the 'simplified approach' — packages 1, 2, 4 and 5' in Mandatory Standard 6.1, clause 6.1.2<sup>(1)(2)</sup>
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$  required for notional dwellings as described in Mandatory Standard 6.1, clause 6.1.6<sup>(1)</sup>
- $0.22 \text{ Wm}^{-2}\text{K}^{-1}$  for extensions the value described by the Table to Mandatory Standard 6.2, clauses 6.2.9<sup>(1)</sup> and 6.2.10<sup>(2)</sup>
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$  limit for an individual element specified in Mandatory Standard 6.2, clause 6.2.1<sup>(1)</sup>.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

5.4 Where a proposed floor U value is not greater than the relevant 'notional' value specified in section 5.3, additional energy saving measures will be required in the building envelope and/or services to achieve the required overall carbon dioxide emission rate reduction of about 20% in dwellings (18% to 25% in Scotland).

5.5 Compliance with the guidance referred to in section 5.6 will allow the use of the default psi values from Table 3 of BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2005), in Target Emission Rate calculations to SAP 2005 or the simplified approach in Scotland.

5.6 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the external wall and other building elements. Guidance in this respect, and on limiting heat loss by air infiltration, can be found in:

### England and Wales

*Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings* TSO 2002.

### Scotland


Accredited Construction Details (Scotland)

### Northern Ireland

Accredited Construction Details (version 1.0).

## 6 Condensation

### Surface condensation

 6.1 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed  $0.7 \text{ Wm}^{-2}\text{K}^{-1}$  at any point, and the junctions with walls are designed in accordance with the relevant

requirements of *Limiting thermal bridging and air leakage* : *Robust construction details for dwellings and similar buildings*, TSO 2002 or BRE Information Paper IP 1/06.



6.2 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed  $1.2 \text{ Wm}^{-2}\text{K}^{-1}$  at any point. Guidance may be obtained from Section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks*.

### Interstitial condensation



6.3 Floors will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8.5 and Appendix D.

6.4 When the products are used above the damp-proof membrane on a ground-supported floor, or on a beam-and-block floor, a vapour control layer is installed on the warm side of the insulation to inhibit the risk of interstitial condensation on the upper slab surface.

6.5 For a timber suspended ground floor, it is not necessary to introduce a vapour control layer as long as adequate sub-floor cross ventilation is provided.

## 7 Floor loading

7.1 The design loadings for self-contained dwelling units as defined in BS 6399-1 : 1996 are:

intensity of distributed load (kPa)	1.5
concentrated load (kN)	1.4



7.2 The insulation boards covered with particle board or screed can support these design loadings without undue deflection.

7.3 A BRE survey of imposed floor loading in domestic buildings (see BRE current paper No 2/77 *Floor loadings in domestic buildings — the results of a survey*) indicates that loadings in flats are commonly in the region of 0.6 kPa and loadings of 1.5 kPa are normally associated with fixed items.

7.4 Where the boards are used under a concrete slab, resistance to concentrated and distributed loads is a function of the slab specification.

## 8 Durability



The boards are rot-proof, dimensionally stable and, when installed with the overlays specified in this Detail Sheet, will remain effective as an insulating material for the life of the building in which they are incorporated.

# Installation

## 9 General

9.1 Typical methods of installing Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are shown in Figures 1 and 2. Reference should also be made to BR 262 : 2002.

Figure 1 Ground supported concrete floor

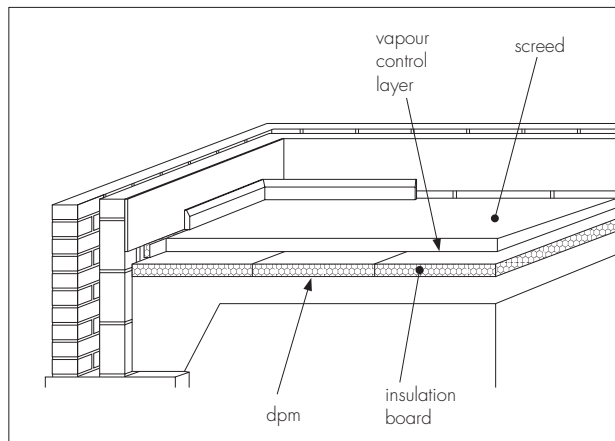
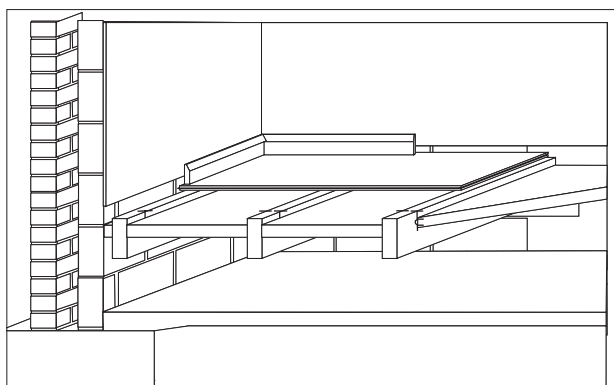


Figure 2 Suspended timber floor



9.2 The concrete floor over which the boards are to be laid should be left for as long as possible to maximise drying out and dissipation of constructional moisture.

9.3 The floor surface should be smooth and flat to within 5 mm when measured with a two-metre straight-edge. Irregularities greater than this must be removed. Minor irregularities (up to 10 mm deep) may be levelled with mortar.

9.4 The boards can be used on a beam and block suspended concrete floor that is the subject of a current Agrément Certificate and installed in accordance with, and within the limitations imposed by, that Certificate. Where the board is laid over a suspended block and beam floor a levelling screed or compound may be required.

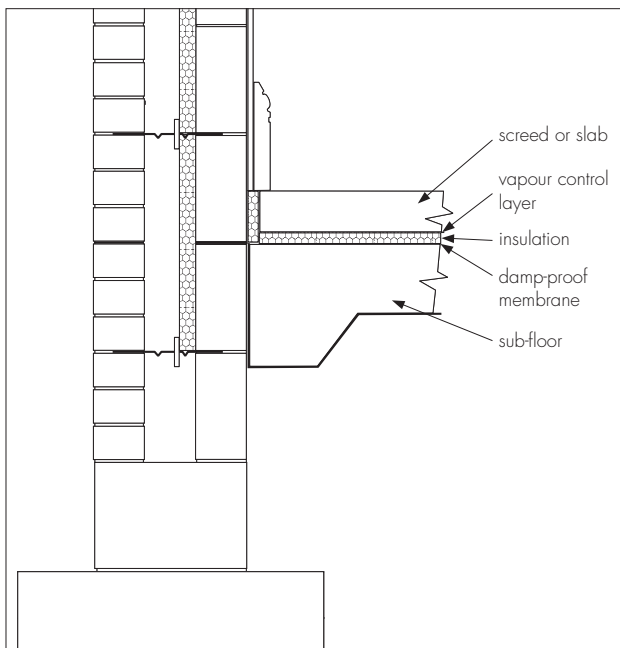
9.5 Where the boards are used over ground-supported concrete floor slabs a suitable damp-proof membrane, for example, in accordance with CP 102 : 1973, should be incorporated to resist moisture from the ground. If a liquid-type damp-

proof membrane is applied to the slabs, it should be of a type compatible with the boards and be allowed to dry out fully before laying the boards.

9.6 Where the boards are used on hard core bases under ground-supported concrete slabs, the hardcore must be blinded and a dpm laid over before the boards are laid.

9.7 Where a screed or concrete slab is laid over the product, vertical upstands of insulation should be provided and be of sufficient depth to fully separate the screed or slab from the wall. In addition, a polyethylene vapour check (minimum 0.125 mm thick) should be laid over the boards with 150 mm laps and turned up at abutments before laying the screed or slab (see Figure 3).

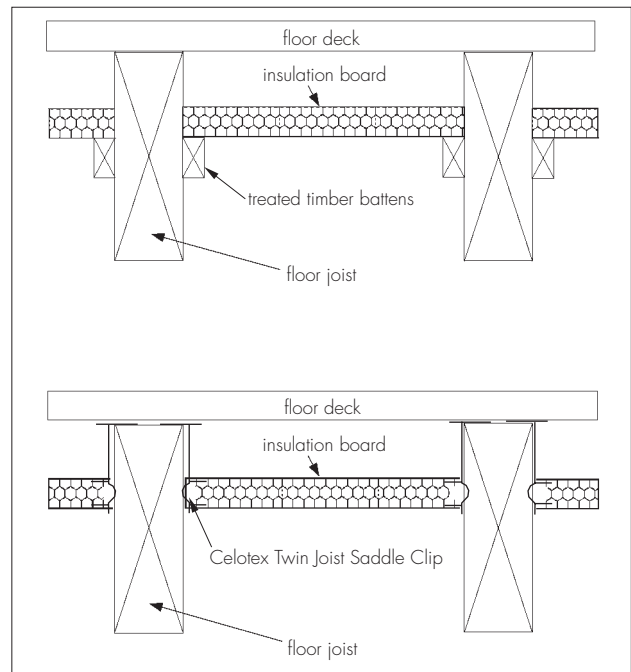
Figure 3 Ground supported floor



9.8 To limit the risk of damage from condensation and other sources of dampness, the boards and the overlay should only be laid after the construction is made substantially weathertight, eg after glazing. The boards must also be protected from water spillage, plaster droppings, traffic, during construction.

9.9 Boards are installed between floor joists using Celotex insulation saddle clips or timber stop beads. Tongue-and-groove particle board flooring or softwood floor boarding is then installed in the conventional manner (see Figure 4).

Figure 4 Suspended timber floors



## 10 Procedure

10.1 The boards are cut to size, as necessary, and laid with closely butted joints.

### Screed overlay

10.2 A polyethylene vapour control layer, minimum 0.125 mm thick, is laid over the boards with 150 mm laps. A properly-compacted screed of mean thickness 65 mm is then laid over. The relevant clauses of BS 8204-1 : 2003 or BS 8204-2 : 2003 should be followed and BRE *Building Elements, floors and flooring*, chapter 4.2, should be consulted.

### Particle board or oriented strand board (OSB) overlay

10.3 Before laying the boards, preservative-treated battens, in accordance with BS 1282 : 1999, are positioned at doorways and to support partitions. Adequate time should be allowed for CCA-based preservatives to be fixed, and the solvents from solvent-based preservatives to evaporate.

10.4 Tongue-and-groove particle board Grade P4 to P7 or OSB/3 or OSB/4, 18 mm thick, to the relevant clauses in DD ENV 12872 : 2000 is laid with staggered cross-joints.

10.5 An expansion gap between the particle board and the perimeter walls should be provided at the rate of 2 mm per metre run or a minimum of 10 mm, whichever is the greater.

10.6 Where there are long, uninterrupted lengths of floor, eg corridors, proprietary expansion joints should be installed at intervals on the basis of a 2 mm gap per metre run of particle board.

10.7 Before the boards are interlocked, either a PVA or panel adhesive is applied to the joints.

10.8 Once the particle board is laid, temporary wedges are inserted between the walls and the floor to maintain tight joints until the adhesive has set.

10.9 To prevent cold-bridging a suitable compressible filler, eg pieces of insulation, should be fitted around the perimeter of the floor between the particle board and the walls when the wedges are removed and before the skirting boards are affixed.

10.10 Where there is a likelihood of regular water spillage (such as kitchens, bathrooms, shower and utility rooms), additional particle board protection may be considered, eg by the use of flexible vinyl sheet flooring with welded joints and cove skirtings.

#### **Concrete slab overlay (ground-bearing only)**

10.11 Perimeter edge pieces are cut and placed around the edges and taped at joints. A vapour control layer, minimum 0.125 mm thick, is laid over the boards with 150 mm laps. The concrete slab is laid to the required thickness.

#### **Timber floors**

10.12 Insulation boards can be supported between timber joists using either Celotex insulation clips or timber beads. Where timber beads are used, a void may be incorporated above the insulation to accommodate services, if required.

10.13 Boards are cut to size to fit tightly between the joists. The clip spikes are pressed into the long edges of the board, ensuring the flange sits flat on the face of the board (see Figure 4). Clips should be fitted at one metre intervals. The board is then pushed into place until the clip is level with the surface of the joist. For additional security, the clip can be fixed to the joist with a small flat head nail driven through the flange of the clip.

10.14 Where a service void is required above the insulation, preservative-treated timber beads may be used to retain the boards. Beads should be

wide enough to retain the boards in place and secured with corrosion-protected nails at a depth that will accommodate the thickness of the insulation board and leave a suitable depth void (minimum 25 mm) between the top of the insulation and the underside of the flooring deck. Boards are cut to fit between the joists and pushed down onto the beads.

## **11 Incorporation of services**

11.1 The maximum continuous working temperature of the boards is 100°C. De-rating of electrical cables should be considered where installation restricts air cooling of cables. Where underfloor heating systems are to be used, the advice of the Certificate holder should be sought.

11.2 Where the boards are installed on a floor of a suspended beam and block design, all services must be installed in accordance with the Agrément Certificate for that floor.

11.3 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 (see section 3.2). Electric cables should be enclosed in a suitable conduit. With hot pipes the insulation must be cut back to maintain an air space.

11.4 Where water pipes are installed below the insulation they should be pre-lagged. Generally, insulation will be relatively thin so it would not be possible to install pipes within the insulation. Pipes installed above the insulation will not require lagging, although some provision needs to be made for expansion and contraction.

11.5 For floors incorporating particle board overlays, where access to the services is desirable, a duct may be formed by mechanically fixing to the floor timber bearers of the same thickness as the insulation to provide support for a particle board cover. The duct should be as narrow as possible and not exceed 400 mm in width without intermediate support.

11.6 On intermediate/exposed floors all the services should be incorporated beneath the existing floor, above the insulation if possible.

## Technical Investigations

The following is a summary of the technical investigations carried out on Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation).

### 16 Tests

Tests were carried out to determine:

- load compression characteristics
- effect of cyclic loading
- thermal conductivity
- compressive strength.

### 17 Investigations

17.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

17.2 An examination was made of data relating to:

- thermal conductivity (fresh and aged)
- dimensional accuracy
- dimensional stability
- water vapour resistance
- compressive strength at 10% compression
- density
- fire risk.

17.3 An assessment of the risk of interstitial condensation in typical constructions was made.

## Bibliography

BS 1282 : 1999 *Wood preservatives — Guidance on choice, use and application*

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*

BS 8102 : 1990 *Code of practice for protection of structures against water from the ground*

BS 8204-1 : 2003 *Screeds, bases and in-situ floorings — Concrete bases and cement sand levelling screeds to receive floorings — Code of practice*

BS 8204-2 : 2003 *Screeds, bases and in-situ floorings — Concrete wearing surfaces — Code of practice*

BS 8215 : 1991 *Code of practice for design and installation of damp-proof courses in masonry construction*

BS EN 300 : 1997 *Oriented Strand Boards (OSB) — Definitions, classification and specifications*

BS EN 312 : 2003 *Particleboards — Specifications*

BS EN 636 : 2003 *Plywood— Specifications*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BS EN ISO 13370 : 1998 *Thermal performance of buildings — Heat transfer via the ground — Calculation methods*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

DD ENV 12872 : 2000 *Wood-based panels — Guidance on the use of load-bearing boards in floors, walls and roofs*



On behalf of the British Board of Agrément

Date of Third issue: 13th November 2007

A handwritten signature in black ink, appearing to read 'G. A. Cooper'.

Chief Executive

*\*Original Detail Sheet issued on 31st March 1996. This amended version includes change of product names, reference to revised national Building Regulations and British Standards and updated Thermal insulation and Condensation sections.*

