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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
No 05/4257

KESKIN TENCON CONCRETE

PRODUCT SHEET 1 — KESKIN TENCON SUSPENDED FLOOR SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Keskin Tencon Suspended Floor System, a fibre-reinforced concrete mix and an associated design procedure for use as a suspended ground floor slab.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Structural performance — the system has adequate strength and stiffness when designed and installed in accordance with this Certificate (see section 5).

Moisture penetration — the system will provide adequate resistance to moisture from the ground (see section 6).

Thermal performance — the system can provide levels of thermal insulation and airtightness which will contribute to a dwelling achieving its Target Emission Rate (see section 7).

Condensation risk — the system can adequately limit the risk of condensation (see section 8).

Durability — the system has equivalent durability to a conventional reinforced suspended ground floor slab (see section 10).

The BBA has awarded this Agrément Certificate for the Keskin Tencon Suspended Floor System to Keskin Tencon Ltd as fit for its intended use provided it is installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

B C Chamberlain — Head of Approvals — Engineering

G N Cooper — Chief Executive

Date of First issue: 19 October 2005

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The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, the Keskin Tencon Suspended Floor System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	A1	Loading
Comment:		Floors constructed using the system can be designed to sustain and transmit dead and imposed loads to the ground. See sections 5.1 to 5.7 of this Certificate.
Requirement:	C2(a)(c)	Resistance to moisture
Comment:		Floors constructed with the system can meet these Requirements. See sections 6, 8.1 and 8.2 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		Floor U values and airtightness can contribute to a dwelling achieving its Target Emission Rate. See sections 7.1 to 7.7 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		Floors constructed from the system are acceptable. See section 10 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The system can contribute to a construction satisfying this Regulation. See sections 9 and 10 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	1.1(a)(b)	Structure
Comment:		Floors constructed using the system can satisfy this Standard, with reference to clause 1.1.1[1]. See sections 5.1 to 5.7 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		Floors constructed using the system can satisfy this Standard, with reference to clause 3.4.1[1] See section 6 of this Certificate.
Standard:	3.15	Condensation
Comment:		Floors can adequately limit the risk of surface and interstitual condensation, with reference to clauses 3.15.1[1] and 3.15.5[1]. See sections 8.1 and 8.3 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		Floor U values and airtightness can contribute to a dwelling achieving its Target Emissions Rate, with reference to clauses 6.1.6[1], 6.2.1[1] and 6.2.4[1]. See sections 7.1 to 7.7 of this Certificate.
Standard:	6.2	Building insulation envelope
Comment:		Floors constructed using the system can satisfy this Standard, with reference to clauses 6.2.1[1][2], 6.2.4[1][2] and 6.2.5[1][2]. See sections 7.1 to 7.4 of this Certificate.

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 10 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See section 9 of this Certificate.
Regulation:	C4(a)	Resistance to ground moisture and weather
Comment:		Floors constructed using the system can satisfy this Regulation. See section 6 of this Certificate.
Regulation:	C5	Condensation
Comment:		Floors constructed using the system can adequately limit the risk of interstitial condensation. See section 8.1 of this Certificate.
Regulation:	D1	Stability
Comment:		Floors incorporating the system can be designed to sustain and transmit dead and imposed loads to the ground. See sections 5.1 to 5.7 of this Certificate.
Regulation:	F2(a)(i)	Conservation measures
Regulation:	F3(2)	Target carbon dioxide Emissions Rate
Comment:		Floor U values and airtightness can contribute to a dwelling achieving its Target Emission Rate. See sections 7.1 to 7.7 of this Certificate.

Construction (Design and Management) Regulations 2007
Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section:	11 *Site preparation* (11.2).

Non-regulatory Information

NHBC Standards 2007

NHBC accepts the use of the Keskin Tencon Suspended Floor System when installed and used in accordance with this Certificate, in relation to *NHBC Standards* Chapters 2.1 *Concrete and its reinforcement* and 5.2 *Suspended ground floors*.

Zurich Building Guarantee Technical Manual 2006

In the opinion of the BBA, the Keskin Tencon Suspended Floor System, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual*, Section 3 *Substructure*, Sub-section *Floors*.

General

This Certificate relates to the Keskin Tencon Suspended Floor System and is used to construct in-situ insulated ground-floor slabs.

It is used in conjunction with rigid sheet insulation panels, damp-proof membrane and polyethylene sheet grout barrier to the Certificate holder's specification. These components are outside the scope of this Certificate.

Technical Specification

1 Description

1.1 The Keskin Tencon Suspended Floor System comprises a synthetic, structural fibre-reinforced concrete mix to one specification and designated 'Tencon Concrete to BBA Certificate No 05/4257', defined floor construction details and a design procedure. The system allows residential building suspended ground floor slabs to be constructed with a slab thickness of between 150 mm and 225 mm.

1.2 The floor slab is cast in-situ to form an insulated suspended ground floor. This is achieved using the Certificate holder's specified ancillary items(1). These include:

- rigid sheet thermal insulation — plain edged, extruded, polystyrene board of appropriate thickness, to achieve required U value with a $\lambda_{90/90}$ *value* of 0.030 $Wm^{-1}K^{-1}$ or lower with a minimum compressive strength at 10% compression of 100 kNm^{-2}
- damp-proof membrane — reinforced, high density, polyethylene membrane, minimum thickness 1000 gauge, compliant to Building Regulations
- polyethylene sheet grout barrier — 1000 gauge polyethylene sheet
- Cellcore Cellular Void former — cellular expanded polystyrene compressible base with a polyethylene top sheet for use as ground heave protection (covered by BBA Certificate No 93/2868)
- Tyvek Radon Plus Gas Barrier Membrane — 0.35 mm thick, three-layer membrane of high density, polyethylene between two layers of linear low-density polyethylene (covered by BBA Certificate No 02/3885)
- partial void former — expanded polystyrene with a minimum compressive strength of 8 kNm^{-2} at 1% compression and maximum thickness of 300 mm.

(1) These items are outside the scope of this Certificate, although many are covered by existing separate Certificates provided they are installed and used in accordance with the relevant manufacturer's instruction and the relevant BBA Certificate.

1.3 The Tencon Concrete is supplied by Cemex UK Materials Ltd, with production controls in accordance with their Quality Scheme for Ready Mixed Concrete (see section 2.2).

1.4 The design and detailing of the floor is project specific and must only be carried out by the Certificate holder or chartered structural engineer proficient in the use of Finite Element Analysis for slab design and authorised to do so by the Certificate holder.

1.5 The system can be used with strip, trench fill, pile and beam and innovative foundation systems.

2 Delivery and site handling

2.1 Manufacturer's instructions for storage and handling should be adhered to for insulation and membranes.

2.2 The ready-mixed concrete is delivered to site by the producer. All delivery notes must state that the concrete is in accordance with BBA Certificate No 05/4257.

2.3 Tencon Concrete should be handled in accordance with standard good practice for handling concrete paying attention to BS 8000-2.2: 1990.

2.4 Concrete should not be placed when the temperature of the air or concrete is 5°C or below.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Keskin Tencon Suspended Floor System.

Design Considerations

3 Use

3.1 The Keskin Tencon Suspended Floor System is assessed as suitable for ground-floor applications where temporary support is available from the ground. Where ground heave is likely to occur, a void former as described in section 1.2 must be provided.

3.2 All design and detailing involving the use of the system must be carried out in accordance with section 1.4 and the Certificate holder's design procedures, UK good working practice and Building Regulations.

3.3 For each project the structural engineer described in section 1.4 will examine the loading configuration to be applied to the floor and specify a suitable design.

3.4 Provision of services is undertaken as for conventional reinforced concrete slabs. These provisions must be strictly in accordance with the design specifications given by the Certificate holder.

3.5 Where radon or other harmful gases are present, additional care is required to ensure provision of taped and sealed membrane joints and effective sealing of services passing through the floor (see section 12.9). Steps should be taken to ensure compliance with the relevant national Building Regulations in areas where harmful gases are present. Where permanent ventilation is required, a suitable partial void former (see section 1.2) must be provided.

4 Practicability of installation

The system may be installed and handled using standard good practice for concrete placement by operatives with experience of ready-mixed concrete.

5 Structural performance

5.1 The system has adequate strength and stiffness to withstand domestic floor and partition loads when used in accordance with this Certificate.

5.2 Where an internal foundation is required, the slab design must include cross (T) beams.

5.3 Supporting or non-supporting walls may be located anywhere on the floor, but the loads imposed by these must be considered at the design stage.

5.4 The system's design is based on Finite Element Analysis of the floor system. This method of analysis has been verified by laboratory testing of sample floor systems.

5.5 For the majority of floor slabs the load span information in Table 1 may be used.

5.6 The load capacity of the slab is affected by the width of the bearing on the foundations. The Tencon floor system allows bearing widths of 100 mm,150 mm or 215 mm (see Table 1).

Table 1 Maximum design imposed load for Tencon Floor Slab (kNm^{-2})

Slab thickness (mm)	Slab bearing width (mm)	Span (m)	Span (m)											
			2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
150	100	2.5	25.00	19.50	16.50	14.75	13.75	13.25	12.75	12.50	12.50	12.50	12.50	12.50
		3.0	19.50	16.25	12.50	10.75	9.50	8.75	8.25	8.00	7.75	7.50	7.50	7.50
		3.5	16.50	12.50	10.75	8.50	7.25	6.50	5.75	5.50	5.25	5.00	4.75	4.75
		4.0	14.75	10.75	8.50	7.50	6.00	5.00	4.25	3.75	3.50	3.25	3.00	–
		4.5	13.75	9.50	7.75	6.00	5.00	4.00	3.25	2.75	2.50	–	–	–
		5.0	13.25	8.75	6.50	5.00	4.00	3.50	2.75	2.00	–	–	–	–
		5.5	12.75	8.25	5.75	4.25	3.25	2.75	2.25	–	–	–	–	–
		6.0	12.50	8.00	5.50	3.75	2.75	2.00	–	–	–	–	–	–
		6.5	12.50	7.75	5.25	3.50	2.50	–	–	–	–	–	–	–
		7.0	12.50	7.50	5.00	3.25	–	–	–	–	–	–	–	–
		7.5	12.50	7.50	4.75	3.00	–	–	–	–	–	–	–	–
		8.0	12.50	7.50	4.75	–	–	–	–	–	–	–	–	–
150	150/215	2.5	25.00	27.00	22.00	20.00	18.50	17.75	17.25	17.00	17.00	17.00	17.00	17.00
		3.0	27.00	21.75	17.00	14.25	12.50	11.00	10.75	10.50	10.25	10.00	10.00	10.00
		3.5	22.00	17.00	14.00	11.00	9.25	8.25	7.50	7.00	6.50	6.50	6.25	6.25
		4.0	20.00	14.25	11.00	9.50	7.50	6.25	5.50	4.75	4.50	4.25	4.25	–
		4.5	18.50	12.50	9.25	7.50	6.50	5.00	4.25	3.50	3.25	–	–	–
		5.0	17.75	11.00	8.25	6.25	5.00	4.25	3.50	2.75	–	–	–	–
		5.5	17.25	10.75	7.50	5.50	4.25	3.50	3.00	–	–	–	–	–
		6.0	17.00	10.50	7.00	4.75	3.50	2.75	–	–	–	–	–	–
		6.5	17.00	10.25	6.50	4.50	3.25	–	–	–	–	–	–	–
		7.0	17.00	10.00	6.50	4.25	–	–	–	–	–	–	–	–
		7.5	17.00	10.00	6.25	4.25	–	–	–	–	–	–	–	–
		8.0	17.00	10.00	6.25	–	–	–	–	–	–	–	–	–
225	150	2.5	37.00	31.50	27.00	25.00	24.00	23.50	23.50	23.00	23.50	23.50	23.50	23.50
		3.0	31.50	30.00	26.50	23.00	21.00	20.00	19.00	19.50	19.00	19.50	19.50	19.00
		3.5	27.00	26.50	25.50	21.00	20.50	18.50	17.00	16.00	15.50	15.00	15.00	14.50
		4.0	25.00	23.00	21.00	20.50	17.50	15.00	13.50	12.50	11.50	11.00	10.50	10.50
		4.5	24.00	21.00	20.50	17.50	15.50	13.00	11.00	10.00	9.00	8.50	8.25	7.75
		5.0	23.50	20.50	18.50	15.00	13.00	11.50	9.50	8.50	7.50	7.00	6.50	6.00
		5.5	23.50	19.00	17.00	13.50	11.00	9.50	8.50	7.50	6.25	5.50	5.00	–
		6.0	23.00	19.50	16.00	12.50	10.00	8.50	7.50	6.50	5.25	–	–	–
		6.5	23.50	19.00	15.50	11.50	9.00	7.50	6.25	5.25	–	–	–	–
		7.0	23.50	19.50	15.00	11.00	8.50	7.00	5.50	–	–	–	–	–
		7.5	23.50	19.50	15.00	10.50	8.50	6.50	5.00	–	–	–	–	–
		8.0	23.50	19.50	14.50	10.50	7.75	6.00	–	–	–	–	–	–
225	215	2.5	50.00	45.00	42.00	40.00	38.00	36.00	35.00	34.00	33.00	32.00	32.00	32.00
		3.0	45.00	40.00	40.00	40.00	35.00	32.50	31.00	30.00	29.00	28.00	28.00	28.00
		3.5	42.00	40.00	38.50	31.50	27.00	24.00	22.00	21.00	20.00	19.00	18.50	18.50
		4.0	40.00	40.00	31.50	27.25	22.00	19.00	17.00	15.50	14.25	13.75	13.75	13.00
		4.5	38.00	35.00	27.00	22.00	19.00	16.00	14.00	12.25	11.00	10.50	9.50	9.25
		5.0	36.00	32.50	24.00	19.00	16.00	14.50	12.00	10.25	9.50	8.25	7.50	6.00
		5.5	35.00	31.00	22.00	17.00	14.00	12.00	10.50	8.75	7.50	6.75	6.00	–
		6.0	34.00	30.00	21.00	15.50	12.25	10.25	8.75	7.75	6.50	–	–	–
		6.5	33.00	29.00	20.00	14.25	11.00	9.50	7.50	6.50	–	–	–	–
		7.0	32.00	28.00	19.00	13.75	10.50	8.25	6.75	–	–	–	–	–
		7.5	32.00	28.00	18.50	13.75	9.50	7.50	6.00	–	–	–	–	–
		8.0	32.00	28.00	18.50	13.00	9.25	6.00	–	–	–	–	–	–

Notes

- Load factors in accordance with BS EN 1992-1-1 : 2004 of 1.35 for dead loads and 1.5 for imposed loads are incorporated in the above figures.
- The tables take account of flexural stress, shear stress, combined stress and deflection (see Table 2).
- When allowing for the provision of a lightweight partition wall (100 mm thick timber stud, faced with plasterboard and a skim coat or equivalent) at any location on the floor, subtract 1.0 kNm^{-2} from the above figures.
- Floors incorporating block wall partitions or structural partitions should be designed in accordance with section 5.7.
- Slab minimum bearing of 100 mm for 150 mm thick slabs and 150 mm for 225 mm thick slabs.
- Slabs are for residential use where the maximum design load will be 1.5 (imposed load) +1.0 (allowance for lightweight partition) = 2.5 kNm^{-2}. Values in the table exceeding 2.5 kNm^{-2} merely indicate an additional safety margin.

5.7 The design of all floors not covered in Table 1, eg non-rectangular slabs, slabs outside the dimensional constraints in the tables or slabs with loadbearing masonry partition walls, must be designed by the Certificate holder or a chartered structural engineer, proficient in the use of Finite Element Analysis for slab design and authorised to do so by the Certificate holder. Such designs should be in accordance with:

- the data provided in Table 2
- the requirements for edge and internal wall thickenings (see section 5.6)
- slab thickness of 150 mm to 225 mm
- the stress in the concrete at ultimate design loads.

Table 2 Concrete characteristics/design criteria

Characteristic (units)	Value
Modulus of elasticity (Nmm^{-2})	30500
Allowable shear stress (Nmm^{-2})	0.23
Minimum compressive strength (Nmm^{-2})	40.0
Permissible tensile stress (Nmm^{-2})(1)	3.05
Moment of resistance (kNm)	
— per m width for 150 mm slab without edge thickening	11.44
— per m width for 225 mm slab without edge thickening	23.73
Maximum slab deflection (mm)	1.1

(1) This stress limit incorporates an adequate material factor for Tencon Concrete.

6 Moisture penetration

The completed floor will provide adequate resistance to moisture from the ground where the specified damp-proof membrane is correctly installed and detailed in accordance with conventional good working practice.

7 Thermal performance

Thermal transmittance (U values)

7.1 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*. The thermal conductivity (λ value) of the concrete slab can be taken as 1.4 $Wm^{-1}K^{-1}$.

7.2 A floor U value will depend on its perimeter/area ratio and the thickness of thermal insulation used. Example U values are shown in Table 3 and design U values are:

England, Wales and Northern Ireland – Design floor U values

– 0.25 $Wm^{-2}K^{-1}$ for notional dwellings in SAP 2005

– 0.25 $Wm^{-2}K^{-1}$ limit mean in Approved Document L1A (Table 2) and Technical Booklet F1 (Table 2.2)

– 0.70 $Wm^{-2}K^{-1}$ limit individual in Approved Document L1A (Table 2) and Technical Booklet F1 (Table 2).

Scotland – Design floor U values

– 0.20 $Wm^{-2}K^{-1}$, for notional dwellings, 'simplified approach', fuel packages 3 and 6, clause 6.1.6(1)

– 0.22 $Wm^{-2}K^{-1}$, for notional dwellings, 'simplified approach', fuel packages 1, 2, 4 and 5, clause 6.1.6(1)

– 0.25 $Wm^{-2}K^{-1}$, limit mean in clause 6.2.1(1)

– 0.70 $Wm^{-2}K^{-1}$, limit individual in clause 6.2.1(1).

(1) Technical Handbook (Domestic).

Table 3 Example ground floor U values ($Wm^{-2}K^{-1}$)

Insulation thickness (mm)	Perimeter/area ratio			
($\lambda_{90/90}$ = 0.030 $Wm^{-1}K^{-1}$)	0.25	0.50	0.75	1.0
50	0.23	0.31	0.35	0.37
75	0.19	0.24	0.27	0.28
100	0.17	0.20	0.21	0.21
150	0.15	0.18	0.20	0.21

7.3 Floors will contribute to a dwelling achieving its Target Emission Rate, where their U value is better than (or in Scotland, the same as) specified for the 'notional dwelling'. Where it is worse (ie higher), additional compensating improvements may be required elsewhere in the building fabric. The limit mean and individual floor U values should not be exceeded.

Junctions

7.4 Junctions between floors and external walls will adequately limit heat loss by conduction where the ring (L) beam section of the floor slab is supported on low density block and cavity or external wall insulation extends below the bottom of the ring beam (see Figure 1), or, the junction detail achieves a psi value not more than 0.16 $Wm^{-1}K^{-1}$ when

modelled in accordance with IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings.*

7.5 For the purposes of SAP calculations the actual or default psi value may be taken for junctions as described in section 7.4 (see also section 7.7). For other junctions a more onerous default figure may be taken but care must also be taken to limit the risk of surface condensation and unwanted air infiltration.

Air infiltration

7.6 Monolithic concrete floor slabs will provide an inherently high resistance to unwanted air infiltration.

7.7 Care must be taken at junctions and penetrations to maintain air barrier continuity. Further guidance can be found in:

England and Wales — Accredited Construction Details (version 1.0) or TSO 2001 *Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings*

Scotland — Accredited Construction Details (Scotland)

Northern Ireland — Accredited Construction Details (version 1.0).

8 Condensation risk

Interstitial condensation

8.1 Floors incorporate a 1000 gauge polyethylene grout barrier and, when correctly installed, will adequately limit the risk of interstitial condensation. For the purposes of calculation, the μ value of the slab and the polyethylene sheet can be taken as 130 and 100 respectively.

Surface condensation

8.2 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.7 $Wm^{-2}K^{-1}$ at any point, and the junctions with walls comply with section 7.4 of this Certificate.

8.3 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $Wm^{-2}K^{-1}$ at any point, and detailing complies with section 8 of BS 5250 : 2002.

9 Maintenance

The structural concrete will have adequate durability, therefore, maintenance is not required.

10 Durability

The exposure condition beneath the suspended floor is considered to be 'moderate' and 'mild' for the upper surface as defined in BS 8110-1: 1997. The structural concrete will have an equivalent durability to a traditional reinforced concrete suspended ground floor slab.

Installation

11 Site preparation

11.1 The ground beneath the Keskin Tencon Suspended Floor System should be free of topsoil and vegetation.

11.2 The required foundations should be made to the correct level using conventional methods. Excavations must be carried out in accordance with BS 6031 : 1981, paying particular attention to safety procedures.

12 Procedure

12.1 Typical installation details of the system are given in Figure 1.

12.2 The outer face of the inner leaf of the wall is set out along the mid-line of the foundation.

12.3 Corner blocks should be laid first and dimensions and diagonals checked against design drawings, before completing the internal blockwork up to the height of the base of the ring beam. Solid concrete blocks of an appropriate width for the design are used for the inner leaf below the floor slab.

12.4 The slab may be formed by the methods described in sections 12.6 to 12.8.

12.5 Alternatively temporary formwork may be used to form the slab.

12.6 The outer leaf of the wall should be built up to a minimum of three courses of facing bricks above the inner wall level. The oversite should be back-filled to a level 50 mm below the inner leaf of blockwork with as-dug material.

12.7 Two sheets of rigid insulation are placed into the wall cavity. The top of the outer sheet should be a minimum of 225 mm below the outer leaf damp-proof course and the top of the inner sheet should be level with the proposed top of the floor slab (see Figure 1) and both insulation sheets should extend at least 150 mm below the bottom of floor slab.

12.8 The outer sheet is secured with plastic/timber wedges and cement grout poured into the gap to support the insulation sheet. The top of the inner sheet is temporarily supported using spacers (eg cut insulation/timber) when the concrete is poured. These temporary supports are removed once the concrete has cured.

12.9 The positions of all services to penetrate the floor slab are established. These must correspond to the design drawings.

12.10 Sand blinding of minimum 50 mm depth is laid level on the ground to the inner leaf blockwork. This should be placed and raked flat (not compacted).

12.11 The reinforced polyethylene dpm is laid on the sand blinding extending a minimum 500 mm beyond the face of the perimeter walls, ensuring corners, joints and services are folded and sealed in accordance with the manufacturer's and the Certificate holder's recommendations.

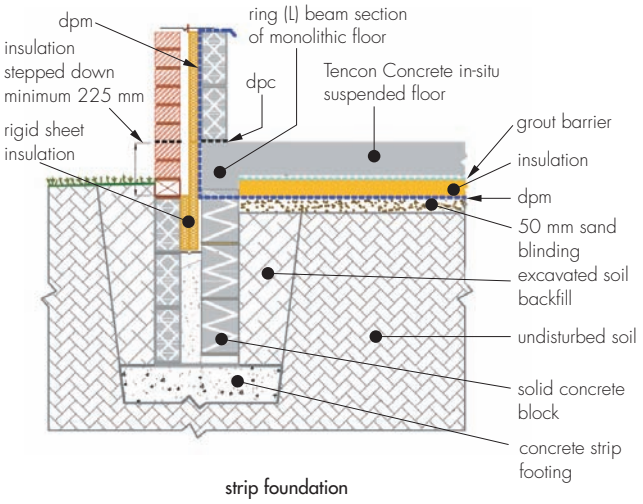
12.12 Rigid insulation board is placed on the dpm with concrete bricks or cut concrete blocks to the appropriate size used as spacers to create the ring (L) beam and cross (T) beams. The size and positions of spacers are checked to correspond with design and the position of supporting walls. A minimum distance of 750 mm should be maintained between adjacent spacers.

12.13 The polyethylene grout barrier is placed over the insulation (but below the spacers) and secured to the insulation using 25 mm clout nails. The grout barrier is generally trimmed back to the outer edge of the ring beam.

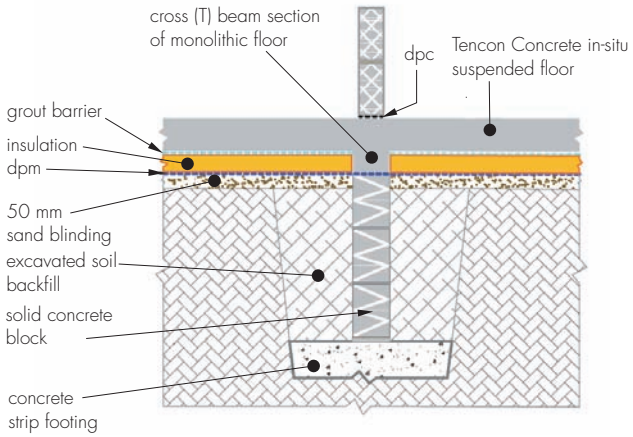
12.14 The Tencon Concrete is poured onto the prepared grout barrier. Traditional poker vibration and tamping methods are used to provide a level floor finish at the level of the outside brickwork. Standard finishing and curing techniques may be used.

12.15 Once the floor is cured the dpc is placed on the floor and the inner leaf is built up according to standard good practice. The dpm may be folded over at floor level or above the first or second course of the inner leaf and lapped into the mortar course. Any excess is trimmed off flush with the wall.

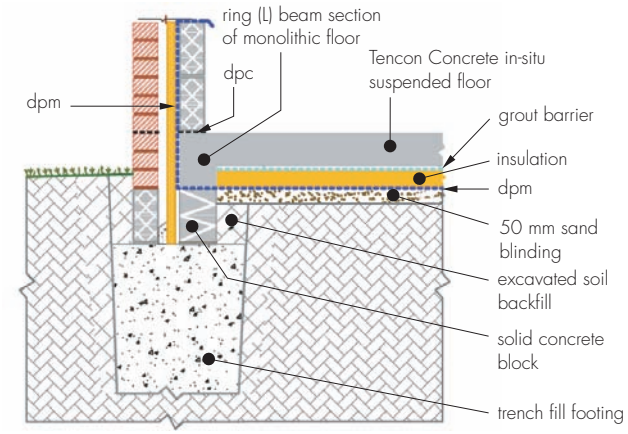
Figure 1 Typical installation details



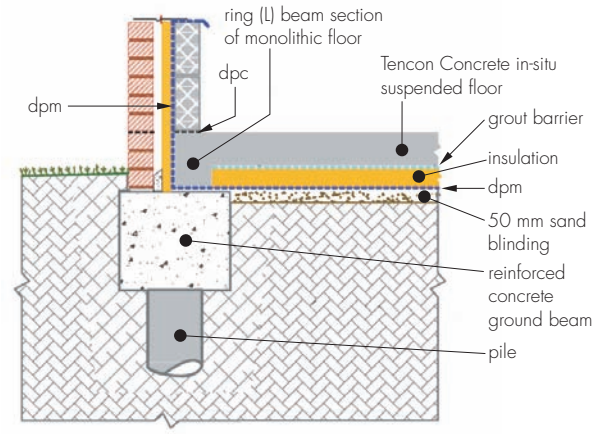
strip foundation



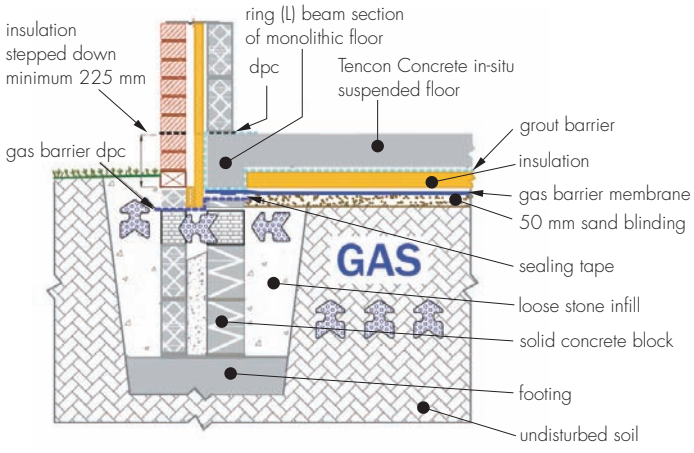
cross-beam foundation



trench fill foundation



pile and beam foundation



gas protection

Technical Investigations

13 Tests

Full-scale tests were carried out to determine:

- ability of the finished floor to withstand short- and long-term static loads
- creep under sustained loading
- ability of the finished floor to withstand impact loads
- ability of the finished floor to withstand line loads from blockwork partition walls
- failure stress in a simply supported short span situation.

14 Investigations

An examination was made of existing data in relation to:

- durability of the system
- condensation risk
- thermal properties.

15 Other investigations

15.1 Examination of full-scale test data in conjunction with mathematical predictions from conventional structural analysis and from Finite Element Analysis was carried out to verify the suitability of the design procedures.

15.2 A site visit was carried out to assess the practicability of installation.

15.3 An examination was carried out on the production control procedure.

Bibliography

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

BS 6031 : 1981 *Code of practice for earthworks*

BS 8000-2-2 : 1990 *Workmanship on building sites — Code of practice for concrete work — Sitework with in-situ and precast concrete*

BS 8110-1 : 1997 *Structural use of concrete — Code of practice for design and construction*

BS EN 1992-1-1 : 2004 *Eurocode 2 : Design of concrete structures. General rules and rules for buildings*

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*

16 Conditions

16.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

16.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

16.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

16.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

16.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

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