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Agrément Certificate
11/4862
Product Sheet 1

CORDEK CELLULAR VOID FORMERS

CELLCORE HX

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Cellcore HX, an expanded polystyrene (EPS) cellular void former for use in limiting the pressure exerted on in-situ, reinforced, suspended concrete floors or piled ground beams caused by expansion of clay soils (clay heave) or ground recovery.

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 aspects — the safe-load and fail-load capacities of the product have been assessed. Each grade has adequate strength to support a specified depth of wet concrete during construction and will collapse under its specified fail-load, limiting the upward pressures experienced during periods of clay heave (see section 5).

Durability — the product will continue to perform effectively as a void former for the life of the building (see section 8).

Installation — when handled with normal precautions for EPS materials, the product has adequate strength to withstand temporary loading normally encountered during loading, unloading, storage and installation (see sections 9 and 10).

The BBA has awarded this Agrément Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Brian Chamberlain

Head of Approvals — Engineering

Greg Cooper

Chief Executive

Date of First issue: 30 August 2011

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.bbacists.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, Cellcore HX, 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 2010 (England and Wales)

Requirement: A2

Ground movement

Comment:

The product is designed to collapse under a specified fail-load thereby preventing the expansion of clay soils impairing the stability of the building. See section 3 of this Certificate.

Requirement: Regulation 7

Materials and workmanship

Comment:

The product is acceptable. See section 8 and *Installation* part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation: 8(1)

Fitness and durability of materials and workmanship

Comment:

The product can contribute to a construction satisfying this Regulation. See section 8 and the *Installation* part of this Certificate.

Regulation: 9

Building standards — construction

Standard: 1.1(b)

Structure

Comment:

The product contributes to meeting the relevant requirements of this Standard, with reference to clause 1.1.1⁽¹⁾⁽²⁾. See section 3 of this Certificate.

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



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

In the opinion of the BBA, there are no requirements in these Regulations pertaining to the use of the product.

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 sections:

2 *Delivery and site handling* (2.2 and 2.5) of this Certificate.

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of Cellcore HX, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 4.2 (D5 – D8) *Building near trees*, 4.4 *Strip and trench fill foundations* and 4.5 *Raft, pile, pier and beam foundations*.

General

This Certificate relates to Cellcore HX, a range of expanded polystyrene (EPS) cellular void formers used to limit the pressure exerted on in-situ, reinforced, suspended concrete floors or piled ground beams caused by expansion of clay soils (clay heave) or ground recovery.

Cellcore HX must not be used on the vertical faces of concrete foundations.

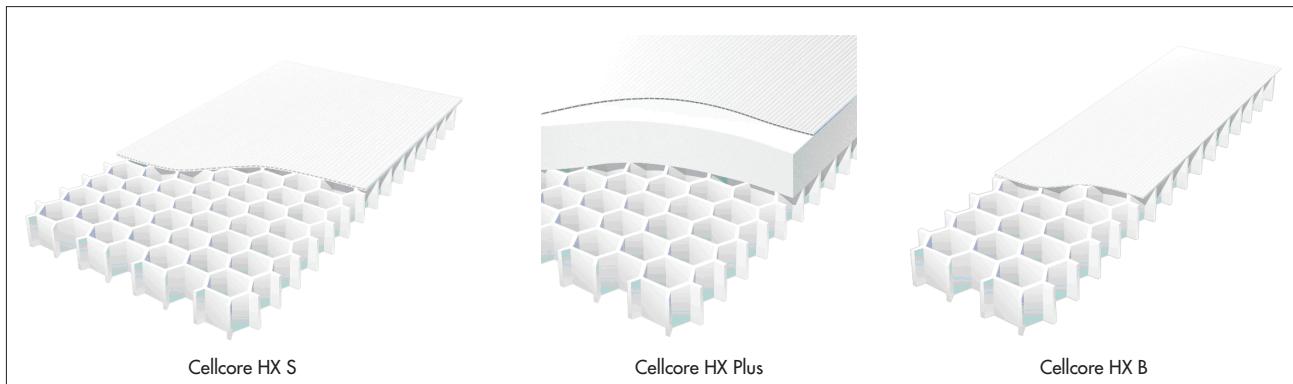
Technical Specification

1 Description

1.1 Cellcore HX consists of a moulded hexagonal cellular EPS compressible base in a range of different grades and depths, with three different options for the integrally bonded top (see Figure 1):

- Cellcore HX S — for use under reinforced concrete slabs, it has a 10 mm thick top of twin-wall polypropylene sheet and is available in a standard size of 2400 mm by 1200 mm and in depths (overall) of 90 mm, 160 mm and 225 mm
- Cellcore HX Plus — for use under reinforced concrete slabs, it has a top comprising a 2 mm thick polypropylene sheet bonded to a 48 mm thick (minimum) EPS 100 insulation layer, which will contribute to the thermal insulation of the building. The panels are available in a standard size of 2400 mm by 1200 mm and in depths (overall) of 130 mm, 200 mm and 265 mm
- Cellcore HX B — for use under reinforced concrete ground beams, it has a 5 mm thick top of twin-wall polypropylene sheet and is available in strips 2400 mm long and in widths from 300 mm to 1200 mm in increments of 25 mm to suit the associated beam, and in depths (overall) of 85 mm, 155 mm and 220 mm.

Figure 1 Cellcore HX cellular void formers



1.2 The product is available in four grades (see Table 1). Each grade is designed to support its specified safe-load for a period of 16 hours with compression limited to less than 5 mm and to collapse by a specified amount dependent on the selected product depth under its specified fail-load (see section 5).

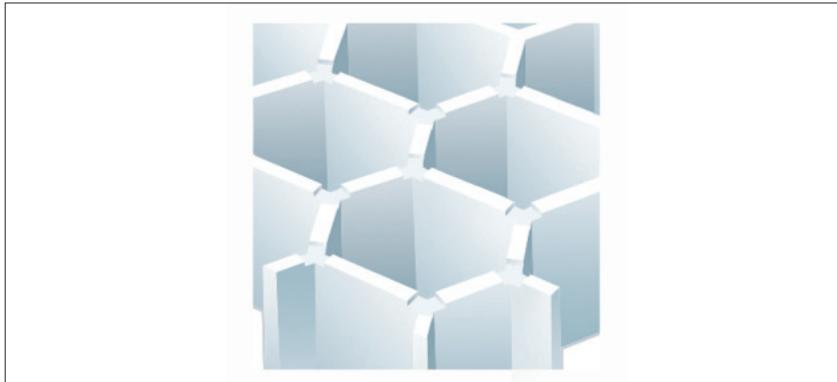
Table 1 Product grades and associated safe- and fail-loads

Product grade	Safe-load (kN·m ⁻²)	Fail-load (kN·m ⁻²)
7/10 ⁽¹⁾	7	10
9/13	9	13
13/18	13	18
18/24	18	24

(1) In this grade, Cellcore HX B is not available as standard.

1.3 Drainage slots are incorporated in the cellular base of each panel to allow water trapped within the cells to escape as the product compresses (see Figure 2). The shallowest panel depth incorporates drainage slots in just the top face of the cellular base. The two deeper panel depths include drainage slots in both faces of the cellular base.

Figure 2 Drainage slots



1.4 Formwork sealing tape typically 50 mm wide is used to seal the joints between adjacent panels.

1.5 Quality control is exercised over raw materials, during production and on the final product.

2 Delivery and site handling

2.1 Panels are delivered to site stretch-wrapped in polythene sheet⁽¹⁾.

(1) Can be supplied unwrapped to order.

2.2 Each panel carries a label bearing details of the product type, grade, length, width and overall depth and the BBA logo incorporating the number of this Certificate. Site handling and installation instructions and health and safety data sheets are attached to each delivery ticket.

2.3 The panels must be stored flat and be protected from high winds and prolonged exposure to sunlight.

2.4 Contact with solvents and organic based materials should be avoided.

2.5 Cellcore HX must not be exposed to flame or ignition. Careful consideration should also be given to the management of fire risk when in storage — detailed guidance is given in the associated health and safety data sheet (see section 2.2).

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Cellcore HX.

Design Considerations

3 General

 Cellcore HX, when designed and installed in accordance with the recommendations of this Certificate, is effective in limiting the pressure exerted on in-situ, reinforced, suspended concrete floors and piled ground beams.

4 Practicability of installation

4.1 The product is designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

4.2 Adequate supervision must be maintained to ensure correct installation (see sections 9.1 and 9.2).

5 Structural aspects

5.1 The appropriate product for each project is specified by :

- panel type
- product grade (see section 5.5)
- product depth.

Panel type

5.2 The appropriate panel type (Cellcore HX S, Cellcore HX Plus or Cellcore HX B) is selected according to its intended use (see section 1.1)

Product grade

5.3 The appropriate product grade is selected according to the maximum thickness of wet concrete that the panel will be required to support during construction of the project (see Table 2).

Table 2 maximum permissible slab/beam thicknesses

Product grade	Maximum concrete thickness ⁽¹⁾ (mm)
7/10	220
9/13	300
13/18	460
18/24	660

(1) Calculation of the maximum concrete thickness includes an allowance of 1.5 kN·m⁻² for imposed load including heaving.

Product depth

5.4 The appropriate product depth is selected such that its specified compression under fail-load is equal to, or greater than, the maximum anticipated ground movement due to clay heave as established from site investigations (see Table 3). Further guidance on predicted ground movements in shrinkable soils is given in the NHBC Standards 2011.

Table 3 Product depth and compression under failure load

NHBC volume change potential ⁽¹⁾	Required product compression under fail-load (mm)	Product depth (mm)		
		Cellcore HX S	Cellcore HX Plus	Cellcore HX B
Low	50	90	130	85
Medium	100	160	200	155
High	150	225	265	220

(1) NHBC Standards, Chapter 4.2 (D6 and D8).

Upward pressure on slabs, beams and overall structure

5.5 In addition to the normal downward acting loads, the suspended floor slabs, ground beams, connection between the slab and ground beams and, where piles are used, the pile/ground beam connections, should be designed to take account of the upward pressure that will be transferred through the product during periods of clay heave.

5.6 The ultimate upward pressure to be resisted (P_{ult}) should be determined as:

$$P_{ult} = (\gamma_Q \times PFL) - (\gamma_G \times G_k)$$

where:

PFL is the product fail-load (see Table 1)

G_k is the self-weight of the slab or beam, including concrete blinding when used

γ_Q and γ_G are partial factors in accordance with BS EN 1992-1-1 : 2004 and BS EN 1990 : 2002, where $\gamma_Q = 1.5$ and $\gamma_G = 0.9$.

Temporary loads during construction

5.7 Provided that the recommendations given in section 9 are satisfied, Cellcore HX S and HX Plus panels are not affected by the normal foot traffic and other short-term loads normally associated with installation and can be used without further protection.

5.8 Cellcore HX B panels should be covered with a 50 mm thickness of concrete blinding where heavy reinforcement is proposed, or where the reinforcement will be subjected to significant point loads from foot traffic or other imposed loading.

5.9 Reinforcement should be supported on proprietary spacers selected to have a base area of sufficient size and positioned at appropriate centres to ensure that the maximum imposed load beneath each spacer is appropriate to the grade of panel used.

6 Thermal performance

Although Cellcore HX Plus will contribute to the thermal insulation of the floor, it has not been assessed by the BBA for this purpose.

7 Maintenance

Once installed, the product does not require maintenance.

8 Durability

 The product is dimensionally stable under varying conditions of temperature and humidity, is rot-proof and water-resistant and will continue to perform effectively as a void former for the life of the building.

Installation

9 General

9.1 Adequate supervision must be maintained and, if required, the Certificate holder's specialists, experienced in site practice and installation of the material, will attend the site to provide demonstrations to ensure correct installation.

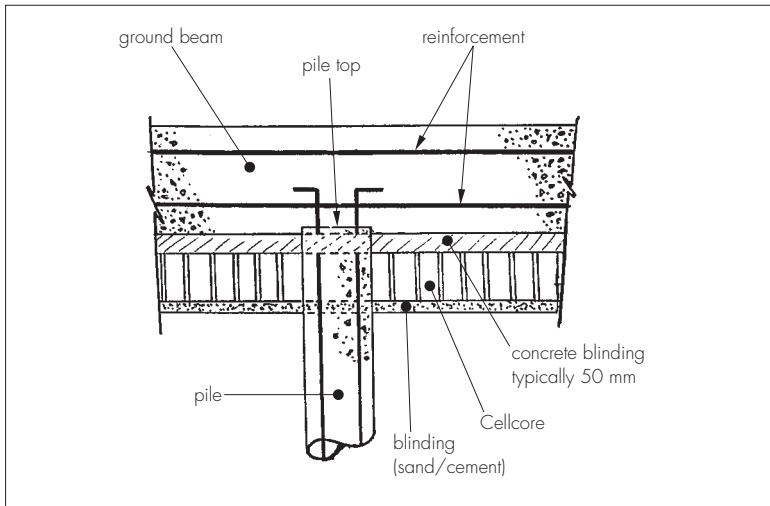
9.2 Normal precautions for handling EPS materials should be taken to avoid damaging the product during off-loading, storage, handling and installation. Any damaged areas should be repaired or replaced before pouring the concrete.

10 Procedure

10.1 Cellcore HX must be placed on a firm level surface and the bottom of the excavation properly compacted and blinded with a layer of concrete or a sand/cement blinding.

10.2 For piled ground beams, the top of each pile should be trimmed so that it extends slightly above the proposed underside of the ground beam (see Figure 3). Each pile should penetrate through the void former to allow for an approximate 50 mm thickness of concrete blinding on top where applicable, and a keying depth of approximately 25 mm into the ground beam.

Figure 3 Typical piled ground beam



10.3 When required, the product can be cut to shape with a fine-toothed saw. Care should be taken to ensure that after cutting, exposed ends of the cellular stiffening ribs do not exceed a maximum length of 50 mm.

10.4 Joints between panels should be sealed with formwork tape supplied by the Certificate holder.

10.5 Reinforcement should be fixed and adequately supported to ensure that the correct depth of concrete cover is achieved and to ensure that the maximum imposed load beneath each support is appropriate to the grade of panel being used (see section 5.10). The panels should be covered with a 50 mm thickness of concrete blinding where heavy reinforcement is proposed, or where the reinforcement will be subjected to significant point loads from foot traffic or other imposed loading.

10.6 During construction, spreader boards are recommended to reduce the imposed load transmitted to the panels.

10.7 Concrete should be placed with care to avoid overloading the panels.

Technical Investigations

11 Tests

An examination was made of test data and tests were conducted to determine:

- density
- dimensional accuracy
- ability to withstand short-term foot traffic loading, concentrated loads from rebar spacers and other anticipated short-term construction loads
- ability to withstand the design safe-load for 16 hours
- that, when the load is increased beyond the safe-load to fail-load, the product fails by compressing to the required amount within reasonable timescales
- transfer of load to the underside of the slab or beam when the product is compressed.

12 Investigations

12.1 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.

12.2 An assessment was made of the practicability of installation, including site handling and storage.

12.3 An assessment was made of the performance characteristics and durability of the product.

Bibliography

BS EN 1990 : 2002 *Eurocode — Basis of structural design*

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

Conditions of Certification

13 Conditions

13.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- 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.

13.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

13.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and 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.

13.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

13.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- 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 their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal.

13.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal 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, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue 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.