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Agrément Certificate

93/2888

Product Sheet 1

EVERDURE CALTITE SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Everdure Caltite System, a two-component system incorporating a hydrophobic and a pore-blocking ingredient to provide watertight concrete.

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

Resistance to water penetration — concrete containing the system has reduced permeability compared to the equivalent plain concrete (see sections 5 and 6).

Reinforcement protection — concrete containing the system has enhanced resistance to reinforcement corrosion when compared to the equivalent plain concrete (see section 7).

Mechanical properties — the mechanical properties of the concrete are not adversely affected by the incorporation of the system (see section 8).

Durability — concrete containing the system is more durable than the equivalent plain concrete mix due to its reduced permeability (see section 17).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. This system 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

Simon Wroe
Head of Approvals — Materials

Greg Cooper
Chief Executive

Date of First issue: 19 November 2008

Originally certificated on 9 March 1993

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 Everdure Caltite System, is not subject to these Regulations:



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



The Building (Scotland) Regulations 2004 (as amended)



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

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* (2.1 and 2.3) and 21 *Placing* (21.1).

Non-regulatory Information

NHBC Standards 2008

In the opinion of the BBA, there are no requirements in these Standards relating to the Everdure Caltite System.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, the use of the Everdure Caltite System when installed and used in accordance with this Certificate is capable of satisfying the requirements of the *Zurich Building Guarantee Technical Manual, Section 5 Internal/external works, services & finishes, Sub-sections External works and Concrete mixes — General*.

General

The system gives concrete enhanced durability and improved protection against reinforcement corrosion by providing a hydrophobic action that protects resulting concrete against water ingress via absorption and hydrostatic pressure.

The use of the system gives concrete the following improved properties relative to a control:

- reduced porosity
- reduced permeability
- increased water resistance
- increased corrosion resistance.

The system does not have a detrimental affect on the properties of concrete.

The products comply with the requirements of BS EN 934-2 : 2001, Table 9, and the system packaging has CE Marking accordingly.

Technical Specification

1 Description

1.1 The Everdure Caltite System comprises two components:

- Everdure Caltite — an aqueous, hydrophobic liquid that provides waterproofing, pore-blocking and enhanced durability properties to concrete in which it is incorporated
- Superplastet SR or F⁽¹⁾ — Superplastet SR is a liquid admixture that reduces the water/cement ratio of the mix while enhancing the workability of the concrete. Superplastet F is used when a very low water/cement ratio is required for higher early strength concrete.

(1) Alternatively the workability of concrete can be adjusted using a suitable high range water reducing or superplasticising admixture complying with BS EN 934-2 : 2001, Tables 3.1 and 3.2.

1.2 The system is manufactured by a blending process. Quality control is exercised over raw materials, during manufacture and on the final system.

2 Delivery and site handling

2.1 The products are delivered to site either in 210 litre drums or by bulk tanker. Drums are stencilled with the relevant product details and the batch number. A label containing the BBA identification mark incorporating the number of this Certificate is attached to the drum. A copy of each material's Safety Data Sheet accompanies the delivery.

2.2 The components should be stored protected from frost.

2.3 The components of the system are classified as 'non-hazardous', but Everdure Caltite is alkaline with a pH value of 10 to 11 and may evolve ammonia. Overalls and gloves should be worn when handling the products and contact to the eyes should be avoided.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Everdure Caltite System.

Design Considerations

3 Use

3.1 The Everdure Caltite System is satisfactory for use in concrete mixes at an addition rate of 30 litres per cubic metre of concrete for the Everdure Caltite and Superplastet SR or F at 1% by weight of cement⁽¹⁾. It provides watertight concrete for basements, roofs, swimming pools, tunnels, and culverts, without the requirement for additional applied protection.

(1) May be varied between 0.8% and 1.5% by agreement with the Certificate holder.

3.2 Concrete containing the system should be designed in accordance with BS EN 206-1 : 2000 and BS 8500-2 : 2006 for use as all normal types, including precast, pre-stressed, post tensioned, ready-mixed, reinforced, slip formed, sprayed and pumped concretes.

3.3 The system is compatible with cement blends containing pulverized-fuel ash, ground granulated blastfurnace slag and silica fume blends as defined in BS EN 197-1 : 2000.

3.4 The use of the system with an air-entraining agent is not covered by this Certificate.

3.5 When incorporated into concrete the system is suitable for use in contact with potable water and has been approved by the Water Regulations Advisory Scheme for this purpose.

4 Practicability of installation

Concrete containing the system can be placed, compacted and cured, by operatives with experience of conventional concreting methods and equipment.

5 Water penetration and absorption

5.1 Concrete containing the system has greater resistance to water penetration than an equivalent plain concrete.

5.2 Concrete containing the system has lower water absorption than an equivalent plain concrete.

6 Water vapour permeability

6.1 Concrete containing the system has a lower permeability to water vapour than an equivalent plain concrete.

6.2 Concrete made with a high water/cement ratio can have a water vapour permeability greater than $3000 \times 10^{-12} \text{ gm(Ns)}^{-1}$. The permeability of concrete is very dependent on the exact mix design to be used.

6.3 The appropriate thickness for concrete with a specific permeability to achieve a water vapour resistance of 200 MNsg^{-1} or 550 MNsg^{-1} (suitable for grades 3 and 4 respectively of BS 8102 : 1990) is given by:

For 200 MNsg^{-1} $t = 0.2 \times 10^{12} \times p$

For 550 MNsg^{-1} $t = 0.55 \times 10^{12} \times p$

where t = concrete thickness in mm and p = water vapour permeability in gm(Ns)^{-1} .

7 Reinforcement protection

7.1 The high alkalinity ($\text{pH} > 13$) of concrete necessary to prevent corrosion of the reinforcement is not adversely affected by the incorporation of the system.

7.2 Corrosion of reinforcement is normally caused by the ingress of chloride to the steel or by the reduction in alkalinity of the concrete by the diffusion of carbon dioxide. The reduced permeability of concrete containing the system slows down diffusion of aggressive agents into the concrete and so provides improved protection against reinforcement corrosion.

8 Mechanical properties

8.1 The compressive strength of concrete containing the system is higher than the equivalent plain concrete with the same slump. Higher compressive strength may alternatively be obtained with the use of a suitable high range water reducing or superplasticising admixture complying with BS EN 934-2 : 2001, Tables 3.1 and 3.2.

8.2 The flexural strength of concrete containing the system is higher than the equivalent plain concrete with the same slump.

9 Drying shrinkage and wetting expansion

The drying shrinkage of concrete containing the system shows a reduction compared to that of an equivalent plain concrete. The wetting expansion is reduced compared to that of an equivalent plain concrete.

10 Setting characteristics

10.1 The setting time of concrete containing the system is similar to equivalent plain concrete.

10.2 The effect of the system for a specific mix and site conditions should be evaluated through site trials prior to use.

11 Carbonation resistance

Concrete containing the system has a greater resistance to carbon dioxide diffusion than an equivalent plain concrete.

12 Frost resistance

Concrete containing the system has a greater resistance to frost resistance than an equivalent plain concrete.

13 Sulfate resistance

The lower permeability of the concrete containing the system reduces the ingress of sulfates. However, if sulfate-resistant concrete is required, the advice of the Certificate holder should be sought.

14 Alkali silica reaction (ASR)

14.1 Concrete containing the system should be designed according to BS EN 206-1 : 2000, Section 5.2.3.4, and BS 8500-2 : 2006, Section 5.2.1.

14.2 The sodium oxide equivalent of the system should be used when calculating the contribution of the system to the total alkali content of a given concrete mix. In turn, this can be used to assess the susceptibility of that concrete to alkali-silica reaction.

15 Resistance to leaching

15.1 Use of the system reduces the leaching of lime from the hydrated cement in the concrete.

15.2 Inspected sites and investigation of Everdure Caltite concrete up to 30 years old show no evidence of the active ingredients of the system within the concrete leaching out.

16 Maintenance

For a specific installation, the maintenance regime should be considered to ensure that the required design life of the concrete is achieved.

17 Durability

17.1 Under normal conditions of service, concrete containing the system is more durable than an equivalent plain concrete due to its reduced permeability.

17.2 Where exposure to aggressive soil conditions or chemicals is anticipated, a full assessment of the site should be made. In these situations the Certificate holder should be consulted on the suitability of the system.

Installation

18 General

18.1 Structures built with concrete containing the Everdure Caltite System should be designed to the relevant sections of BS 8007 : 1987, BS 8102 : 1990, BS 8110-1 : 1997, BS EN 1992-1-1 : 2004 and BS EN 1992-1-2 : 2004.

18.2 Concrete containing the system is suitable for Type B constructions as defined in BS 8102 : 1990, and can meet the requirements for all grades defined in Table 1 of this Standard. For Grades 3 and 4 (where control of water vapour is required), it will be necessary to provide a mix with a sufficiently low vapour permeability in combination with an adequate section thickness (see sections 6.2 and 6.3).

18.3 Basements for dwellings should be designed in accordance with the guidance given in the Approved Document Basement for dwellings⁽¹⁾.

(1) Published by the British Cement Association, Document No 48.062.

19 Mix design

19.1 Concrete containing the system is normally supplied as ready-mixed concrete but may be prepared on sites where there is adequate mix control. Concrete prepared on site should be carried out in accordance with BS 8000-2.1 : 1990, the Certificate holder's instructions and this Certificate.

19.2 The concrete must have a minimum cement content of 335 kgm⁻³ and be batched with a maximum water/cement ratio of 0.45 and to a consistence class S2 or S3. Further details of suitable mixes can be obtained from the Certificate holder or their approved representatives.

19.3 Once mixed, further materials must not be added to the fresh concrete.

19.4 The workability of concrete can be adjusted using Superplastet SR or F or a suitable⁽¹⁾ high range water reducing or superplasticising admixture complying with BS EN 934-2 : 2001, Tables 3.1 and 3.2 to ensure the maximum water/cement ratio given in section 19.2 is not exceeded.

(1) The suitability and compatibility of a high range water reducing or superplasticising admixture should be evaluated before use and site trials should be carried out to establish the appropriate dose required.

20 Site mixing

20.1 The system is added to the concrete at the correct dose (see section 3.1) in accordance with the Certificate holder's instructions.

20.2 The resulting concrete is mixed in accordance with the Certificate holder's instructions to ensure even distribution of the system throughout the concrete.

20.3 Where the system is to be added to concrete on site care must be taken to ensure that adequate mix control is available.

21 Placing

21.1 Concrete containing the system is placed in the same way as normal concrete, in accordance with BS 8000-2.2 : 1990, ENV 13670-1 : 2000, the Certificate holder's health and safety guidance and the normal routine precautions for handling concrete.

21.2 Concrete containing the system should not be placed at temperatures of 5°C or below.

21.3 Concrete containing the system should be fully compacted.

22 Curing

The concrete should be cured strictly in accordance with BS 8110-1 : 1997, ENV 13670-1 : 2000 and the Certificate holder's recommendations where site specific information exists.

23 Joints

23.1 Joints should be designed with waterstops as recommended in BS 8102 : 1990, to maintain the watertightness of the whole structure. The advice of the Certificate holder should be sought on particular applications.

23.2 Penetrations in the concrete, such as pipe entries or formwork ties, must be securely sealed to maintain watertightness. The Certificate holder can advise on suitable systems.

24 Finishes

When water-based systems are used to coat the hardened concrete, a bonding agent may be needed. For specific cases, advice should be sought from the Certificate holder.

Technical Investigations

25 Test

25.1 The effect of the Everdure Calite System on the typical properties of concrete is given in Table 1.

Property	Control concrete	Everdure Calite concrete	Test reference
Water absorption (%)	3.1	0.8	BS 1881-5
Water permeability (ms ⁻¹)			
0-50 mm	2.23 x 10 ⁻¹²	1.14 x 10 ⁻¹²	Taywood/ Valenta
50-100 mm	1.43 x 10 ⁻¹²	0.15 x 10 ⁻¹²	
Drying shrinkage (%)	0.036	0.024	BS 1881-5
Wetting expansion (%)	0.020	0.007	BS 1881-5
Freeze/thaw expansion (%)	0.031	0.010	BS 5075-2
Initial surface absorption test (ISAT) (mlm ⁻² s ⁻¹)			BS 1881-5
10 mins	0.50	0.11	
30 mins	0.25	0.08	
60 mins	0.16	0.04	
120 mins	0.10	0.02	

25.2 Tests were carried out by the BBA to determine:

- characterisation tests on the system components including specific gravities, differential thermal analysis and gas chromatography
- comparative workability of fresh concrete
- compressive strength of cured concrete, and
- slip resistance of cured concrete.

26 Investigations

26.1 Data relating to the following aspects of the Everdure Caltite System concrete were examined and assessed:

- mix designs
- curing regime
- toxicity
- setting and hardening concrete characteristics (including setting time, bleeding, heat of reaction, curing and plastic shrinkage)
- hardened concrete characteristics (including density, colour, compressive strength, modulus of elasticity, drying shrinkage/wetting expansion, thermal shock resistance, tensile strength, porosity, pore distribution, bond strength to steel, permeability, resistance to carbonation, sulfate attack, chlorides, acid, freeze/thaw, water penetration and leaching, and water vapour permeability)
- requirements for surface finishes
- maintenance and repair requirements.

26.2 Visits were made to sites where installation of the system was taking place.

26.3 Visits were made to a number of sites where the system has been in service for some time.

26.4 Cementaid (UK) Limited's methods of technical support to clients were observed and assessed.

Bibliography

BS 1881-5 : 1970 *Testing concrete — Methods of testing hardened concrete for other than strength*

BS 5075-2 : 1982 *Concrete admixtures — Specification for air-entraining admixtures*

BS 8000-2.1 : 1990 *Workmanship on building sites — Code of practice for concrete work — Mixing and transporting concrete*

BS 8000-2.2 : 1990 *Workmanship on building sites — Code of practice for concrete work — Sitework with in-situ and precast concrete*

BS 8007 : 1987 *Code of practice for design of concrete structures for retaining aqueous liquids*

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

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

BS 8500-2 : 2006 *Concrete — Complementary British Standard to BS EN 206-1 — Specification for constituent materials and concrete*

BS EN 197-1 : 2000 *Cement — Composition, specifications and conformity criteria for common cements*

BS EN 206-1 : 2000 *Concrete — Specification, performance, production and conformity*

BS EN 934-2 : 2001 *Admixtures for concrete, mortar and grout — Concrete admixtures — Definitions and requirements, conformity, marking and labelling*

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

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

ENV 13670-1 : 2000 *Execution of concrete structures — Common*

27 Conditions

27.1 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.

27.2 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.

27.3 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.

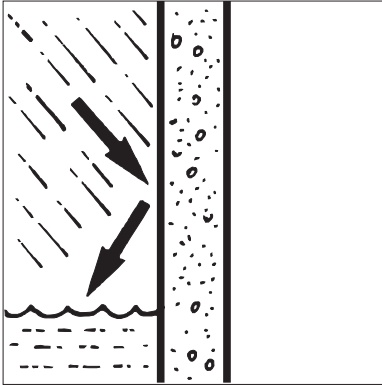
27.4 In granting this Certificate, the BBA is not responsible for:

- 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.

27.5 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.

**EVERDURE CALTITE SYSTEM
(BBA CERTIFICATE No 93/2888)
IRISH BUILDING REGULATIONS STATEMENT**

Second issue*



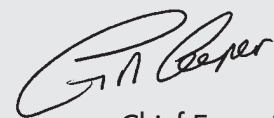
- THIS STATEMENT RELATES TO THE EVERDURE CALTITE SYSTEM AND SETS OUT THE OPINION OF THE BBA ON THE POSITION OF THE PRODUCT UNDER THE BUILDING REGULATIONS IN THE REPUBLIC OF IRELAND.
- It must be read in conjunction with BBA Certificate No 93/2888.
- It will remain valid provided BBA Certificate No 93/2888 is valid.

The Building Regulations 1997–2002 (Ireland)

In the opinion of the BBA, the Everdure Caltite System, is not subject to these Regulations.

On behalf of the British Board of Agrément

Date of Second issue: 30th June 2006



Chief Executive

*Original Statement issued 19th April 2002.