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**Agrément Certificate**

**08/4606**

Product Sheet 1

## SIKA WATERTIGHT CONCRETE CONSTRUCTION SYSTEM

### SIKA WATERTIGHT CONCRETE POWDER

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to Sika Watertight Concrete Powder, a combined water-resisting and high range water reducing (HRWR)/superplasticising admixture, for use in Sika Watertight Concrete. The product is suitable for basements, roofs, swimming pools, tunnels and culverts, without the requirement for additional applied protection.

(1) Hereinafter referred to as 'Certificate'.

#### 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

**Water penetration and absorption, and water vapour permeability** — Sika Watertight Concrete containing the product has reduced permeability when compared with the equivalent plain concrete (see sections 6 and 7).

**Reinforcement protection** — Sika Watertight Concrete containing the product has enhanced resistance to reinforcement corrosion when compared with the equivalent plain concrete (see section 8).

**Mechanical properties** — the mechanical properties of the concrete are not adversely affected by the incorporation of the product (see section 9).

**Durability** — Sika Watertight Concrete containing the product is more durable than the equivalent plain concrete owing to its reduced permeability (see section 18).



The BBA has awarded this 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

*Claire Curtis-Thomas*

Date of Fourth issue: 9 March 2018

John Albon – Head of Approvals  
Construction Products

Claire Curtis-Thomas  
Chief Executive

Originally certificated on 8 December 2008

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](http://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 use of Sika Watertight Concrete Powder is not subject to the national Building Regulations.

### **Construction (Design and Management) Regulations 2015** **Construction (Design and Management) Regulations (Northern Ireland) 2016**

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* and 22 *Placing* (22.1) of this Certificate.

## Additional Information

### **NHBC Standards 2018**

In the opinion of the BBA, Sika Watertight Concrete Powder, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 5.4 *Waterproofing of basements and other below ground structures*.

Unless it can be demonstrated that the water table is permanently below the underside of the slab, the product should be used in combination with either a Type A or C waterproofing protection where Grade 3 protection is required and the below ground wall retains more than 600 mm (measured from the top of the retained ground to the lowest finished floor level).

### **CE marking**

The Certificate holder has taken the responsibility of CE marking the product, in accordance with harmonised European Standard BS EN 934-2 : 2009, Table 9. An asterisk (\*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

## Technical Specification

### **1 Description**

Sika Watertight Concrete Powder is a combined water-resisting and HRWR/superplasticising admixture for incorporation into concrete mixes, to enhance the water resistance and durability properties of the hardened concrete.

### **2 Manufacture**

2.1 The product is manufactured by a blending process.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Sika Limited has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 and BS EN ISO 14001 : 2004 by BSI (Certificates FM 12504 and EMS 45308 respectively).

### 3 Delivery and site handling

3.1 The product is supplied in 1.75 kg water-soluble bags, which are packed in sixes, into 25 litre containers. The containers, weighing approximately 12 kg each, are packed 18 to a pallet, the total pallet weight being approximately 200 kg.

3.2 Each 25 litre container bears the manufacturer's name, product name, batch number, Health and Safety information and the BBA logo incorporating the number of this Certificate.

3.3 The product must be stored in sealed original containers in a dry environment at temperatures between 5 and 25°C. The product has a shelf-life of 12 months when stored under these conditions.

3.4 The Certificate holder has taken the responsibility of classifying and labelling the product under the *CLP Regulation (EC) No 1272 / 2008 on the classification, labelling and packaging of substances and mixtures*. Users must refer to the relevant Safety Data Sheet(s).

3.5 When handling, the normal Health and Safety procedures associated with cementitious materials should be observed.

### Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Sika Watertight Concrete Powder.

### Design Considerations

#### 4 Use

4.1 Sika Watertight Concrete Powder is satisfactory for use in concrete mixes at an addition of 1.75 kg per m<sup>3</sup> of concrete to provide watertight concrete for basements, roofs, swimming pools, tunnels and culverts, without the requirement for additional applied protection.

4.2 The effects of the product on the properties of concrete designed to BS EN 480-1 : 1998 is shown in Table 1.

*Table 1 Effects of the product on the properties of fresh wet concrete<sup>(1)</sup>*

Property (unit)	Control concrete	Sika Watertight Concrete Powder (1.75 kg·m <sup>-3</sup> )
Slump (mm)	0.47	0.40
0 min	115	120
30 min	75	40
Plastic density (kg·m <sup>-3</sup> )	2370	2424
Air content (%)	1.8	1.0

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site specific trials prior to use.

4.3 Concrete containing the product should be designed in accordance with BS EN 206 : 2013 and BS 8500-2 : 2015, for use as all normal types, including precast, pre-stressed, post-tensioned, ready-mixed, reinforced, slip-formed, sprayed and pump concretes.

4.4 The product is compatible with cement blends containing pulverised-fuel ash, ground granulated blast furnace slag and silica fume blends, as defined in BS EN 197-1 : 2011.

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

## 5 Practicability of installation

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

## 6 Water penetration and absorption

6.1 Sika Watertight Concrete has greater resistance to water penetration and water absorption than an equivalent plain concrete.

6.2 Tests on Sika Watertight Concrete, at an addition rate of  $1.75 \text{ kg}\cdot\text{m}^{-3}$ , showed a water permeability<sup>(1)</sup> of  $4.75 \times 10^{-13} \text{ m}\cdot\text{s}^{-1}$  compared with  $9.32 \times 10^{-13} \text{ m}\cdot\text{s}^{-1}$  for the control concrete.

6.3 Tests on Sika Watertight Concrete, at an addition rate of  $1.75 \text{ kg}\cdot\text{m}^{-3}$ , showed a capillary absorption<sup>(1)</sup> of 48% by mass of the control concrete at 7 days and 57% by mass of the control concrete at 90 days.

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site trials prior to use.

## 7 Water vapour permeability

7.1 Sika Watertight Concrete has a lower permeability to water vapour than the equivalent plain concrete.

7.2 Tests on Sika Watertight Concrete containing the product at an addition rate of  $1.75 \text{ kg}\cdot\text{m}^{-3}$  showed a water vapour permeability<sup>(1)</sup> of  $296 \times 10^{-12} \text{ g}\cdot\text{m}(\text{N}\cdot\text{s})^{-1}$  compared with  $417 \times 10^{-12} \text{ g}\cdot\text{m}(\text{N}\cdot\text{s})^{-1}$  for control concrete.

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site trials prior to use.

7.3 Concrete made with a high water/cement ratio can have a water vapour permeability greater than  $3000 \times 10^{-12} \text{ g}\cdot\text{m}(\text{N}\cdot\text{s})^{-1}$ . The permeability of concrete is strongly dependent on the exact mix design, and the figures given in section 7.2 indicate the levels that can be obtained using the product.

7.4 The appropriate thickness for concrete with a specific permeability to achieve a water vapour resistance of 200 or 500  $\text{MN}\cdot\text{s}\cdot\text{g}^{-1(1)}$  (suitable for grade 3 of BS 8102 : 2009) is given by:

For 200  $\text{MN}\cdot\text{s}\cdot\text{g}^{-1}$ ,  $t=0.2 \times 10^{12} \times p$

For 500  $\text{MN}\cdot\text{s}\cdot\text{g}^{-1}$ ,  $t=0.55 \times 10^{12} \times p$

Where:

$t$  is the concrete thickness in mm

$p$  is the water vapour permeability in  $\text{g}\cdot\text{m}(\text{N}\cdot\text{s})^{-1}$  (from tests to BS 3177 : 1959).

(1) This figure may be used where a high resistance to water vapour is required.

## 8 Reinforcement protection

8.1 The high level of alkalinity required to prevent corrosion of the reinforcement ( $\text{pH}>13$ ) will not be adversely affected by the incorporation of the product into concrete.

8.2 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 Sika Watertight Concrete containing the product will slow down diffusion of aggressive agents into the concrete and so provide improved protection against reinforcement corrosion.

8.3 The Certificate holder has declared the chloride ion content\* of the product as  $< 0.1\%$ .

8.4 The Certificate holder has declared that the product complies with the corrosion behaviour requirements given in BS EN 934-1 : 2008, Clause 5.1 and is labelled accordingly.

## 9 Mechanical properties

9.1 The compressive strength of Sika Watertight Concrete containing the product is higher than that of an equivalent plain concrete with the same consistency.

9.2 Tests conducted on Sika Watertight Concrete showed a compressive strength<sup>(1)</sup> of 28.2 N·mm<sup>-2</sup> after 24 hours compared with 17.5 N·mm<sup>-2</sup> for control concrete, and of 72.2 N·mm<sup>-2</sup> after 28 days compared with 57.7 N·mm<sup>-2</sup> for control concrete.

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site trial prior to use.

9.3 The flexural strength and static modulus of elasticity of Sika Watertight Concrete containing the product is similar to that of an equivalent plain concrete.

9.4 Tests conducted on Sika Watertight Concrete showed a flexural strength<sup>(1)</sup> of 4.1 N·mm<sup>-2</sup> after 24 hrs compared with 2.4 N·mm<sup>-2</sup> for control concrete, and of 6.7 N·mm<sup>-2</sup> compared with 5.7 N·mm<sup>-2</sup> for control concrete.

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site trial prior to use.

## 10 Drying shrinkage and wetting expansion

10.1 The drying shrinkage and wetting expansion of Sika Watertight Concrete is similar to that of an equivalent plain concrete.

10.2 Tests conducted on Sika Watertight Concrete showed a drying shrinkage<sup>(1)</sup> of 0.039 % compared with 0.037% for control concrete, and a wetting expansion<sup>(1)</sup> of 0.023% compared with 0.021% for control concrete.

(1) The specific effect of the product on these properties for a particular mix and site conditions should be evaluated through site trial prior to use.

## 11 Setting characteristics and hardening

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

11.2 The setting time of concrete mixes containing the product will be similar to an equivalent plain concrete. The setting time will depend on the concrete mix design used and the ambient temperature during placing and curing.

## 12 Carbonation resistance

Sika Watertight Concrete has greater resistance to carbon dioxide diffusion than an equivalent plain concrete.

## 13 Frost resistance

Sika Watertight Concrete has a similar resistance to freeze/thaw to that of an equivalent plain concrete.

## 14 Sulfate resistance

The lower permeability of Sika Watertight Concrete will reduce the ingress of sulfates. However, if sulfate-resistant concrete is required, the advice of the Certificate holder should be sought.

## 15 Alkali silica reaction (ASR)

15.1 Concrete containing the product should be designed in accordance with BS EN 206 : 2013 Section 5.2.3.5, and BS 8500-2 : 2015 Clause 5.2.

15.2 The sodium oxide equivalent of the product, when measured in accordance with BS EN 480-12 : 1998, was 0.28% by mass of admixture. The Certificate holder's declared value\* of <0.4% should be used when calculating the contribution of the product 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.

## 16 Resistance to leaching

Use of the product will reduce the leaching of lime from the hydrated cement in the concrete.

## 17 Maintenance

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

## 18 Durability

18.1 Under normal conditions of service, Sika Watertight Concrete is more durable than an equivalent plain concrete owing to its reduced permeability.

18.2 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 concrete.

## Installation

## 19 General

19.1 When used in concrete mixes, Sika Watertight Concrete Powder enhances durability and improves protection against reinforcement corrosion by providing the concrete with reduced permeability that protects against water ingress via absorption and hydrostatic pressure.

19.2 The use of Sika Watertight Concrete Powder will produce a concrete with the following properties relative to a control:

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

19.3 The product has no known detrimental effect on the properties of concrete.

19.4 Structures built incorporating the product should be designed to the relevant clauses of BS 8102 : 2009, and BS EN 1992-1-1 : 2004, BS EN 1992-1-2 : 2004, BS EN 1992-3 : 2006 and their UK National Annexes.

19.5 Sika Watertight Concrete is suitable for Type B constructions as defined in BS 8102 : 2009, and can satisfy the requirements for all grades defined in Table 2 of this Standard. For Grade 3 (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 7.2 and 7.3). The use of suitable ventilation, dehumidification or air conditioning, appropriate to the intended use, must also be considered.

19.6 Basements for dwellings should be designed in accordance with the guidance given in the *Guidance Document — Basements for dwellings*<sup>(1)</sup>.

(1) Published by Basement Information Centre, Product code: TBIC/007.

## 20 Mix design

20.1 Sika Watertight Concrete is normally supplied as ready-mixed concrete but may be prepared on sites where there is adequate mix control. Preparation of concrete on site should be carried out in accordance with BS 8000-0 : 2014, the Certificate holder's instructions and this Certificate.

20.2 The concrete must have a minimum cement content of 350 kg·m<sup>-3</sup> and be batched with a maximum water/cement ratio of 0.45 to achieve a minimum consistence of S3. Further details of suitable mixes can be obtained from the Certificate holder.

20.3 Once the fresh concrete is mixed, further materials must not be added.

20.4 The workability of concrete can be adjusted using a suitable<sup>(1)</sup> water reducing or superplasticising admixture complying with BS EN 934-2 : 2009, to ensure that the maximum water/cement ratio given in section 20.2 of this Certificate is not exceeded. Specific admixtures have not been considered and are outside the scope of this Certificate.

(1) The Certificate holder's advice should be sought regarding the suitability and compatibility of water-reducing or superplasticising admixtures. Admixtures should be evaluated before use and site trials should be carried out to establish the appropriate dose required.

## **21 Site mixing**

21.1 The product is added to the mixer at the correct dose (see section 4.1) prior to batching the concrete constituents.

21.2 When an additional superplasticiser is required, it must be added after the addition of the product and in accordance with the supplier's recommendations.

21.3 The resulting concrete should be mixed for a minimum of five minutes and in accordance with the Certificate holder's instructions, to ensure even distribution of the product throughout the concrete.

21.4 Where the product is to be added to concrete on site, care must be taken to ensure that adequate mix control is available.

## **22 Placing**

22.1 Sika Watertight Concrete should be placed in the same way as normal concrete, in accordance with BS 8000-0 : 2014, BS EN 13670 : 2009, the Certificate holder's Health and Safety guidance and the normal routine precautions for handling concrete.

22.2 Sika Watertight Concrete should not be placed at temperatures of 5°C or below.

22.3 Sika Watertight Concrete mix should be fully compacted.

## **23 Curing**

The concrete must be cured strictly in accordance with BS EN 13670 : 2009, and BS EN 1992-1-1 : 2004 and its UK National Annex, and the Certificate holder's recommendations (where site specific information exists).

## **24 Joints**

24.1 Joints must be designed with waterstops as recommended in BS 8102 : 2009, to maintain the watertightness of the whole structure. The advice of the Certificate holder should be sought on particular applications.

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

## **25 Finishes**

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

### 26 Tests

26.1 Tests were carried out and the results assessed to determine the effect of Sika Watertight Concrete Powder on the properties of concrete designed in accordance with BS EN 480-1 : 1998.

26.2 Tests were carried out and the results assessed to determine the characteristics of the fresh concrete, including:

- setting time
- workability
- air content
- slump
- density.

26.3 Tests were carried out and the results assessed to determine the characteristics of the hardened concrete, including:

- flexural strength
- compressive strength
- bond to steel
- wetting expansion
- efflorescence
- freeze/thaw resistance
- water vapour permeability
- capillary absorption
- modulus of elasticity
- drying shrinkage
- liquid water permeability.

### 27 Investigations

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

27.2 A user survey was conducted to investigate the performance of the product in service.

27.3 An assessment of the test data supplied by the Certificate holder was made to determine characteristics of the admixture including:

- conventional dry material content
- pH
- total chlorine
- water soluble chloride
- alkali content
- corrosion behaviour.



## Bibliography

- BS 1881-5 : 1970 *Testing concrete. Methods of testing hardened concrete for other than*
- BS 1881-121 : 1983 *Testing concrete. Method for determination of static modulus of elasticity in compression*
- BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*
- BS 5075-1 : 1982 *Concrete admixtures. Specification for accelerating admixtures, retarding admixtures and water reducing admixtures*
- BS 8000-0 : 2014 *Workmanship on construction site — Introduction and general principles*
- BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*
- BS 8500-2 : 2015 + A1 : 2016 *Concrete — Complementary British Standard to BS EN 206 — Specification for constituent materials and concrete*
- BS EN 197-1 : 2011 *Cement — Composition, specifications and conformity criteria for common cements*
- BS EN 206 : 2013 + A1 : 2016 *Concrete — Specification, performance, production and conformity*
- BS EN 480-1 : 1998 *Admixtures for concrete, mortar and grout — Test methods — Reference concrete and reference mortar for testing*
- BS EN 480-12 : 1998 *Admixtures for concrete, mortar and grout — Test methods — Determination of alkali content of admixtures*
- BS EN 934-1 : 2008 *Admixtures for concrete, mortar and grout — Common requirements*
- BS EN 934-2 : 2009 *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*  
NA to BS EN 1992-1-1 : 2004 UK National Annex to *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 — Structural fire design*  
NA to BS EN 1992-1-2 : 2004 UK National Annex to *Eurocode 2: Design of concrete structures — Structural fire design*
- BS EN 1992-3 : 2006 *Eurocode 2: Design of concrete structures — Liquid retaining and containing structures*  
NA to BS EN 1992-3 : 2006 UK National Annex to *Eurocode 2: Design of concrete structures — Liquid retaining and containing structures*
- BS EN 12390-3 : 2002 *Testing hardened concrete. Compressive strength of test specimens*
- BS EN 12390-5 : 2009 *Testing hardened concrete. Compressive strength of test specimens*
- BS EN 13670 : 2009 *Execution of concrete structures*
- BS EN ISO 9001 : 2008 *Quality management systems — Requirements*
- BS EN ISO 14001 : 2004 *Environmental Management systems — Requirements with guidance for use*

### 28 Conditions

28.1 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 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.

28.2 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.

28.3 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.

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

28.5 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
- actual 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
- any claims by the manufacturer relating to CE marking.

28.6 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.