

## Sika Limited

Watchmead  
Welwyn Garden City  
Hertfordshire AL7 1BQ  
Tel: 01707 394444 Fax: 01707 329129  
e-mail: technical@uk.sika.com  
website: www.sika.co.uk



Agrément Certificate  
**08/4606**  
Product Sheet 1

## SIKA WATERTIGHT CONCRETE CONSTRUCTION SYSTEM

### SIKA WATERTIGHT CONCRETE POWDER

#### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Sika Watertight Concrete Powder, a combined water-resisting and HRWR/superplasticising admixture used to provide Sika Watertight Concrete, suitable for basements, roofs, swimming pools, tunnels, and culverts without the requirement for additional applied protection.

#### 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** — Sika Watertight Concrete has reduced permeability when compared to the equivalent plain concrete (see sections 6 and 7).

**Reinforcement protection** — Sika Watertight Concrete has enhanced resistance to reinforcement corrosion when compared to 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 is more durable than the equivalent plain concrete mix due to its reduced permeability (see section 18).

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

A handwritten signature in black ink, appearing to read 'Simon Wroe'.

Simon Wroe  
Head of Approvals — Materials

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

Greg Cooper  
Chief Executive

Date of Second issue: 13 January 2012

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.*

British Board of Agrément  
Bucknalls Lane  
Garston, Watford  
Herts WD25 9BA

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tel: 01923 665300  
fax: 01923 665301  
e-mail: mail@bba.star.co.uk  
website: [www.bbacerts.co.uk](http://www.bbacerts.co.uk)

# Regulations

In the opinion of the BBA, Sika Watertight Concrete Powder is not subject to these Regulations:



## The Building Regulations 2010 (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: 3 *Delivery and site handling* (3.1, 3.2, 3.4 and 3.5) and 22 *Placing* (22.1) of this Certificate.

# Additional Information

## NHBC Standards 2011

In the opinion of the BBA, the use of Sika Watertight Concrete Powder, in relation to this Certificate, is not subject to the requirements of these Standards.

## CE marking

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

# Technical Specification

## 1 Description

Sika Watertight Concrete Powder is a combined water-resisting and High Range Water Reducing (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 To ensure product quality is consistently maintained to the required specification, the BBA has:

- agreed with the Certificate holder 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 as part of a surveillance process to ensure that standards are maintained and that the product or system remains as Certificated.

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

## 3 Delivery and site handling

3.1 The product is supplied in 1.75 kg water soluble bags, of which six are packed into 25 litre containers, each container weighs approximately 12 kg. There are 18 containers on each pallet, the total weight of which is approximately 200 kg.

3.2 Each 25 litre container bears the manufacturer's and product name, batch number, health and safety information and the BBA identification mark 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°C and 25°C. The product has a shelf-life of 12 months, when stored under these conditions.

3.4 The product is not classified as 'hazardous' under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4)/Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulations) 2009*.

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 rate 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 Concrete containing the product 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.

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

4.4 The use of the product with an air-entraining agent is outside the scope of this Certificate.

#### 5 Practicability of installation

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

#### 6 Water penetration and absorption

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

#### 7 Water vapour permeability

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

7.2 Concrete made with a high water/cement ratio can have a water vapour permeability greater than 3000 by 10<sup>-12</sup> g·m(N·s)<sup>-1</sup>. The permeability of concrete is strongly dependent on the exact mix design and the figures given in Table 2 indicate the levels that can be obtained using the product.

7.3 The appropriate thickness for concrete with a specific permeability to achieve a water vapour resistance of 200 MN·s·g<sup>-1</sup> or 550 MN·s·g<sup>-1(1)</sup> (suitable for BS 8102 : 2009, Grade 3) is given by:

For 200 MN·s·g<sup>-1</sup>,  $t = 0.2 \times 10^{12} \times p$

For 550 MN·s·g<sup>-1</sup>,  $t = 0.55 \times 10^{12} \times p$

where  $t$  = concrete thickness in mm and  $p$  = water vapour permeability in g·m(N·s)<sup>-1</sup> (from BS 3177 : 1959 test).

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

#### 8 Reinforcement protection

8.1 The high alkalinity required to prevent corrosion of the reinforcement (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 will slow down diffusion of aggressive agents into the concrete and so give 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 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 is higher than the equivalent plain concrete with the same consistence.

9.2 The flexural strength of Sika Watertight Concrete is higher than the equivalent plain concrete.

9.3 The static modulus of elasticity of Sika Watertight Concrete is higher than the equivalent plain concrete.

## 10 Drying shrinkage and wetting expansion

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

## 11 Setting characteristics

11.1 The setting time of concrete mixes containing the product will be similar to an equivalent plain concrete.

11.2 The setting time will depend on the concrete mix design used and ambient temperature during placing and curing.

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

## 12 Carbonation resistance

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

## 13 Frost resistance

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

## 14 Sulfate resistance

The lower permeability of the Sika Watertight Concrete reduces 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 according to BS EN 206-1 : 2000, Section 5.2.3.4 and BS 8500-2 : 2006, Section 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 reduces 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 the equivalent plain concrete due 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 the product is used in concrete it enhances durability and improves protection against reinforcement corrosion by providing a concrete with reduced permeability that protects the resulting concrete against water ingress via hydrostatic pressure.

19.2 The use of the product therefore, 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 the concrete.

19.4 Structures built with concrete containing Sika Watertight Concrete Powder should be designed to the relevant Sections of BS 8007 : 1987, BS 8102 : 2009, BS 8110-1 : 1997, BS EN 1992-1-1 : 2004, BS EN 1992-1-2 : 2004, BS EN 1992-3 : 2006 and their respective UK National Annexes.

19.5 Sika Watertight Concrete is suitable for Type B constructions as defined in BS 8102 : 2009, and can meet 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 6.2 and 6.3). 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 Approved Document Basement for dwellings<sup>(1)</sup>.

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

## 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. Concrete prepared on site should be carried out in accordance with BS 8000-2.1 : 1990, the Certificate holder's instructions and this Certificate.

20.2 The concrete must have a minimum cement content of  $350 \text{ kg}\cdot\text{m}^{-3}$ , be batched with a maximum water/cement ratio of 0.45 and have a minimum consistence of S3. Further details of suitable mixes can be obtained from the Certificate holder.

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

20.4 The consistence of the concrete can be adjusted using a suitable<sup>(1)</sup> water reducing or superplasticising admixture complying with BS EN 934-2 : 2009 to ensure the maximum water/cement ratio given in section 20.2 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 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 should be added after the addition of the product.

21.3 The resulting concrete should be mixed for a minimum of five minutes 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 8000-2.2 : 1990, BS EN 13670 : 2009 and 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  $5^{\circ}\text{C}$  or below.

22.3 Sika Watertight Concrete should be fully compacted.

## 23 Curing

The concrete should be cured strictly in accordance with BS 8110-1 : 1997, BS EN 13670 : 2009, BS EN 1992-1-1 : 2004, its UK National Annex and the Certificate holder's recommendations where site specific information exists.

## 24 Joints

24.1 Joints should be designed with waterstops as recommended in BS 8102 : 2009, to maintain 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 advice of the Certificate holder should be sought on suitable systems.

## 25 Finishes

When water-based products 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

## 26 Tests

26.1 Tests were conducted to assess the effect of the Sika Watertight Concrete Powder on the properties of concrete designed to BS EN 480-1 : 1998, Reference concrete 1. The results are given in Tables 1 and 2.

**Table 1 Effects of Sika Watertight Concrete Powder on the properties of fresh wet concrete<sup>(1)</sup>**

Property	Control Concrete	Sika Watertight Concrete Powder	Test reference
Sika Watertight Concrete Powder (kg·m <sup>-3</sup> )	—	1.75	
Water/cement ratio	0.47	0.40	
Slump (mm)			BS EN 12350-2
0 min	115	120	
30 min	75	40	
Plastic density (kg·m <sup>-3</sup> )	2370	2424	BS EN 12350-6
Air content (%)	1.8	1.0	BS EN 12350-7
Setting time (min)			BS 5075-1
initial set	170	230	
final set	240	290	

(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.

**Table 2 Effects of Sika Watertight Concrete Powder on the hardened properties of concrete<sup>(1)</sup>**

Property	Control Concrete	Sika Watertight Concrete Powder	Test reference
Water permeability (m·s <sup>-1</sup> )	9.32 x 10 <sup>-13</sup>	4.75 x 10 <sup>-13</sup>	Taywood/Valenta
Capillary absorption (% by mass of control)	100	48	BS EN 480-5
7 day	100	57	
90 day			
Drying shrinkage (%)	0.037	0.039	BS 1881-5
Wetting expansion (%)	0.021	0.023	
Freeze/thaw	No scaling	No scaling	DD CEN/TS 12390-9
Compressive strength (N·mm <sup>-2</sup> )	17.5	28.2	BS EN 12390-3
24 hours	57.7	72.2	
28 days			
Flexural strength (N·mm <sup>-2</sup> )	2.4	4.1	BS EN 12390-5
24 hours	5.7	6.7	
28 days			
Modulus of elasticity (N·mm <sup>-2</sup> )	36500	43000	BS 1881-121
28 days			
Water vapour permeability [g·m (N·s) <sup>-1</sup> ]	417 x 10 <sup>-12</sup>	296 x 10 <sup>-12</sup>	BS 3177

(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.

26.2 Tests were carried out and the results assessed to determine:

**Fresh concrete**

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

**Hardened concrete**

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

**27 Investigations**

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

27.2 Test data supplied by the Certificate holder was assessed 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 strength*
- BS 1881-121 : 1983 *Testing concrete — Method of 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 and retarding water reducing 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 : 2009 *Code of practice for protection of below ground 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 : 2011 *Cement — Composition, specifications and conformity criteria for common cements*
- BS EN 206-1 : 2000 *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 480-5 : 2005 *Admixtures for concrete, mortar and grout — Test methods — Determination of capillary absorption*
- BS EN 480-12 : 1998 *Admixtures for concrete, mortar and grout — Test methods — Determination of the 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 12350-2 : 2000 *Testing fresh concrete — Slump-test*
- BS EN 12350-6 : 2000 *Testing fresh concrete — Density*
- BS EN 12350-7 : 2000 *Testing fresh concrete — Air content — Pressure methods*
- BS EN 12390-3 : 2002 *Testing hardened concrete — Compressive strength of test specimens*
- BS EN 12390-5 : 2009 *Testing hardened concrete — Flexural 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*
- DD CEN/TS 12390-9 : 2006 *Testing hardened concrete — Freeze/thaw resistance scaling*

## 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 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.

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
- 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
- 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.