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Agrément Certificate
86/1650
Product Sheet 3

BENTONITE WATERPROOFING SYSTEM FOR STRUCTURES

VOLTEX DS

This Agrément Certificate Product Sheet⁽¹⁾ relates to Voltex DS, a sodium bentonite geotextile membrane with an HDPE liner, for use in waterproofing and damp-proofing underground reinforced concrete structures.

(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

Resistance to water and water vapour — the system, including joints, provides an effective barrier to the passage of liquid water and water vapour from the ground (see section 6).

Resistance to mechanical damage — the system is resistant to damage and has the ability to self-repair if punctured (see section 7).

Durability — when fully protected, the system provides an effective barrier to the transmission of water and water vapour for the life of the building in which it is incorporated (see section 12).

The BBA has awarded this 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

Date of Fourth issue: 14 March 2016

John Albon — Head of Approvals

Claire Curtis-Thomas

Originally certificated on 25 June 2004

Construction Products

Chief Executive

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, Voltex DS, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement: A1	Loading
Comment:	Application of the system will not adversely affect a structure's ability to transmit loadings and will satisfy this Requirement. See section 9 of this Certificate.
Requirement: C2(a)	Resistance to moisture
Comment:	The system, including joints, will enable a structure to satisfy this Requirement. See section 6 of this Certificate.
Regulation: 7	Materials and workmanship
Comment:	The system is acceptable. See section 12 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation: 8(1)	Durability, workmanship and fitness of materials
Comment:	The system can contribute to a construction satisfying this Regulation. See section 12 and the <i>Installation</i> part of this Certificate.
Regulation: 9	Building standards applicable to construction
Standard: 1.1(a)(b)	Structure
Comment:	Application of the system will not adversely affect a structure's ability to transmit loadings, with reference to clauses 1.1.1 ⁽¹⁾⁽²⁾ and 1.1.4 ⁽¹⁾⁽²⁾ . See section 9 of this Certificate.
Standard: 3.4	Moisture from the ground
Comment:	The system, including joints, will enable a structure to satisfy clauses 3.4.1 ⁽¹⁾⁽²⁾ , 3.4.2 ⁽¹⁾⁽²⁾ , 3.4.5 ⁽¹⁾⁽²⁾ , 3.4.6 ⁽¹⁾⁽²⁾ and 3.4.7 ⁽¹⁾⁽²⁾ of this Standard. See section 6 of this Certificate.
Standard: 7.1(a)	Statement of sustainability
Comment:	The system can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation: 12	Building standards applicable to conversions
Comment:	Comments made in relation to the system under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation: 23(a)(i)(iii)b(i)	Fitness of materials and workmanship
Comment:	The system is acceptable. See section 12 and the <i>Installation</i> part of this Certificate.
Regulation: 28	Resistance to moisture and weather
Comment:	The system is an effective barrier to water and water vapour, and therefore will enable a structure to satisfy the requirements of this Regulation. See section 6 of this Certificate.
Regulation: 30	Stability
Comment:	Application of the system will not adversely affect a structure's ability to transmit loadings and will satisfy the requirements of this Regulation. See section 9 of this Certificate.

Construction (Design and Management) Regulations 2015

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

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

See sections: 3 *Delivery and site handling* (3.1 to 3.4) and 13 *General* (13.4) of this Certificate.

Additional Information

NHBC Standards 2016

NHBC accepts the use of Voltex DS, provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 5.1 *Substructure and ground bearing floors* and 5.4 *Waterproofing of basements and other below ground structures*.

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), the product should be used in combination with either a Type B or Type C waterproofing protection.

CE marking

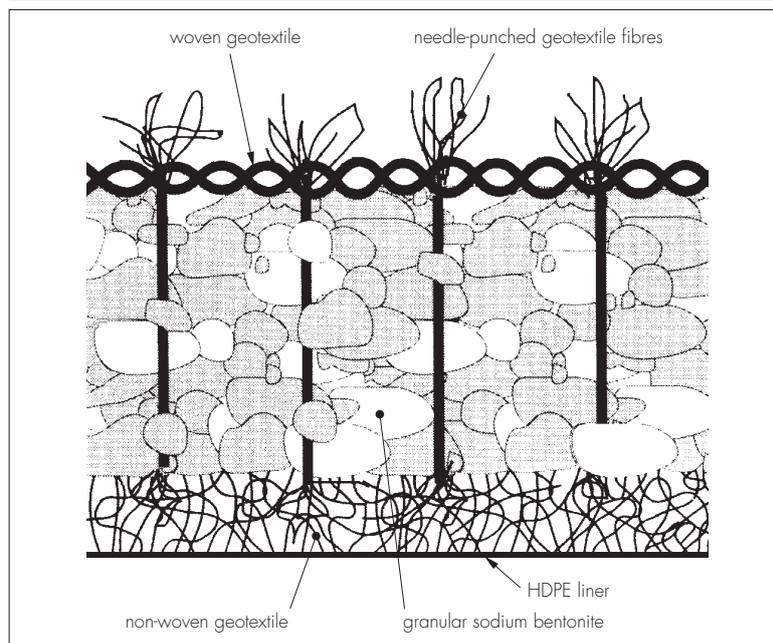
The Certificate holder has taken the responsibility of CE marking the system in accordance with harmonised European Standard BS EN 13491 : 2013. An asterisk(*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Voltex DS is a waterproofing membrane, approximately 6.5 mm thick, consisting of two polypropylene geotextiles, one woven and one non-woven, enclosing granular sodium bentonite at a minimum weight of $4.8 \text{ kg}\cdot\text{m}^{-2}$. An HDPE liner is integrally bonded to the non-woven geotextile (see Figure 1).

Figure 1 Cross-section through Voltex DS



1.2 Ancillary items for use with the system include:

- Waterstop-RX — a black, flexible, extruded strip of sodium bentonite/butyl rubber, with one side backed by a silicone-treated paper, for use as a water bar in construction joints and in conjunction with Voltex, available in two sizes:
 - RX101 — 25 mm wide by 20 mm thick
 - RX103 — 15 mm wide by 10 mm thick
- Volclay Granules — a loose form of granular sodium bentonite used for detailing. It can be installed in a dry unactivated state or mixed with water to form a paste for sealing
- Cetsel — a multi-purpose, single-component moisture-cure adhesive, to prevent Waterstop-RX from moving during the pouring and placement of concrete at construction joints and around penetrations
- Bentoseal — a trowel-grade sodium bentonite compound used for detailing work, eg around penetrations
- Revo-Fix Mesh — a metal overlay strip used to prevent Waterstop-RX from moving during placement of concrete
- CETCO SeamTape — tape for sealing membrane overlaps.

2 Manufacture

2.1 Voltex DS is manufactured in a controlled continuous process in which partially-hydrated bentonite granules are uniformly distributed between woven and non-woven geotextiles. The two geotextiles are interlocked by a needle-punching process pushing fibres from the non-woven layer through and beyond the woven layer. This process links the geotextiles and contains and confines the bentonite.

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 manufacturer's management system has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Q&R (Certificate Q&R_503).

3 Delivery and site handling

3.1 Voltex DS is supplied in 1.1 m wide by 5.0 m long rolls, on pallets of 32 rolls, stacked horizontally and shrink-wrapped. Each roll weighs between 33 kg and 38.5 kg⁽¹⁾.

3.2 Coils of Waterstop RX101 are packaged six coils of 5 m length⁽¹⁾ in cartons, each carton weighing 25 kg. Coils of Waterstop RX103 are packaged eight coils of 6 m length in cartons, each carton weighing 10.5 kg.

3.3 Bentoseal is supplied in 25 kg tubs⁽¹⁾.

3.4 Volclay Granules are supplied in 20 kg bags.

3.5 The system components must be stored in dry conditions, under cover and away from the possibility of damage or premature contact with water. Waterstop-RX must be stored away from direct heat.

(1) Weights and sizes are subject to change. Users are advised to consult current manufacturer's literature.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Voltex DS.

Design Considerations

4 Use

4.1 Voltex DS is satisfactory for use as a fully-bonded Type A waterproofing protection as defined in BS 8102 : 2009 for the waterproofing of new structures.

4.2 Voltex DS can be used externally on concrete substrates to provide an effective barrier to the transmission of liquid water where Grade 1 to 3 waterproofing protection is required, as defined in Table 2 of BS 8102 : 2009.

4.3 Where Grade 3 waterproofing protection is required, the environment must also be controlled by the use of ventilation, dehumidification and/or air conditioning (as appropriate) to ensure that dampness does not occur.

4.4 The membrane stops the passage of water between itself and the concrete structure to which it is fixed. The membrane must be adequately confined to ensure a watertight seal is achieved in service.

4.5 Waterstop-RX is satisfactory for use as a water bar in reinforced concrete construction joints, on Type B constructions as defined in BS 8102 : 2009. It is also used as an accessory in structures waterproofed with Voltex DS.

4.6 Waterstop-RX is not designed for use in movement joints.

4.7 The system components must never remain permanently exposed.

5 Practicability of installation

The system should only be installed by contractors who have been trained and approved by the Certificate holder.

6 Resistance to water and water vapour



Results of tests confirm that the membrane, including joints, when completely sealed and consolidated, will adequately resist the passage of moisture from the ground and so meet the requirements of national Building Regulations.

7 Resistance to mechanical damage

The membrane is robust and resistant to normal site activities. The dropping of heavy articles will normally have no damaging effect on the membrane. Any accidental cuts will self-repair when the membrane is hydrated following correct installation, provided that bentonite material is not lost from the edges of the cut.

8 Chemical resistance

8.1 The gelling of sodium bentonite is adversely affected by the presence of electrolytes (particularly trivalent ions) and may also be affected by the presence of soluble cations such as those found in chalk or lime soils. In such cases advice should be sought from the Certificate holder.

8.2 The membrane is not affected by organic contaminants.

8.3 In chemically-contaminated areas the membrane can be pre-hydrated by spraying with mains water at a rate of 5 litres per m² and leaving for four to eight hours before pouring concrete or placing backfill material.

9 Resistance to loading



Provided the membrane is adequately confined, properly hydrated and not subjected to point loading, an installation beneath a foundation slab will transmit dead and imposed loads to the ground safely and without excessive deformation. In situations where point loading is anticipated the Certificate holder's advice should be sought.

10 Adhesion

When concrete is cast against the membrane the free ends of the needle-punched fibres become embedded in the concrete, creating a permanent bond between the concrete and membrane.

11 Maintenance

As the membrane is confined by the concrete and has suitable durability (see section 12), maintenance is not required.

12 Durability



A fully-protected Voltex DS membrane, when installed with the appropriate ancillary products, will provide an effective barrier to water and water vapour for the life of the building in which it is incorporated.

Installation

13 General

13.1 Voltex DS is installed with the woven geotextile in contact with the concrete surface to be waterproofed.

13.2 The membrane bonds to poured concrete to form an integral seal to prevent water migration and requires no priming, fillets or protection boards.

13.3 The formation of a continuous waterproof barrier is achieved using lap joints with a minimum overlap of 100 mm between adjoining edges and roll ends. It is recommended to stagger laps at a minimum of 300 mm to avoid four sheets overlapping in one location. All lap joints are secured by either stapling laps together or fixing them to the base with fasteners.

13.4 Voltex DS may be applied under most normal site conditions, including sub-zero temperatures and during heavy rainfall. Under wet conditions the product can withstand light construction traffic without significant extrusion of the bentonite. Slight losses at the exposed edges of a lap joint will not impair the watertightness, provided the conditions given in section 13.3 are met. Any bentonite that extrudes from the membrane will become slippery when wet which can have an adverse effect on site safety.

13.5 Waterstop-RX must not be applied during heavy rainfall or where there is standing water.

13.6 The membrane is easy to handle and can be cut using a sharp knife.

13.7 Sealing around protrusions through the membrane, eg at such details as piles and service pipes, is carried out by cutting a hole in the membrane and fitting over the protrusion, bedding the membrane onto either Bentoseal or a paste made up, in situ, by mixing Volclay Granules with water.

14 Procedure

Voltex DS

Vertical surfaces

14.1 Voltex DS can be either installed against the outside of existing walls or applied to the inside face of shuttering to be subsequently filled with poured concrete.

14.2 On cast concrete substrates, the membrane is aligned horizontally (although vertical alignment is possible) and fixed through the overlaps using proprietary washer-headed fasteners. CETCO Seamtape is applied centred along the membrane seams, to overband membrane overlaps prior to backfill. A minimum overlap of 100 mm must be achieved between the vertical membrane and the membrane protruding from the base slab.

14.3 Backfilling is carried out as soon as possible after placing the membrane. Backfill material must be free from builders' debris and angular aggregate, and compacted to a minimum 85% Modified Proctor.

14.4 After backfilling, the application of the membrane is continued. The membrane must not be installed above the intended final ground level and is terminated on the concrete structure at ground level.

Horizontal surfaces

14.5 Surfaces to be waterproofed must be reasonably smooth and may be damp, but free from standing water. Earth and sand substrates should be compacted to a minimum 85% Modified Proctor.

14.6 At the edge of the slab the membrane must extend vertically a minimum of 300 mm above the top surface to form an overlap with the vertical membrane.

14.7 Overlaps must be stapled or secured with proprietary washer-head fasteners to prevent displacement during concrete placement.

14.8 The concrete slab to be poured must have a minimum thickness of 150 mm.

Waterstop-RX

Surface preparation

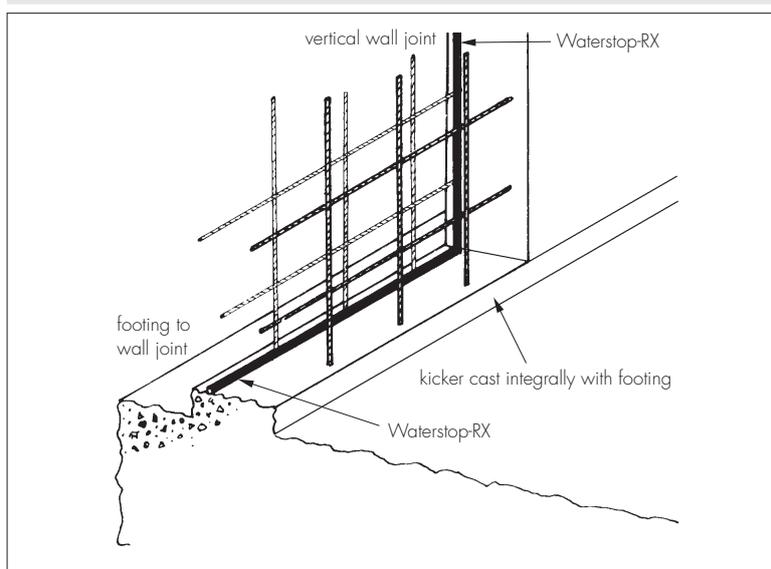
14.9 Joint surfaces must be clean, dry and free from cavities and spalling. Any irregularities in the surface do not normally need to be filled, but if necessary these can be filled with a suitable strength cement grout or mortar while the concrete is still green, and made smooth.

14.10 Waterstop-RX is positioned in the centre of the reinforced concrete construction joint, ensuring that a minimum of 75 mm concrete cover is provided to all sides of the product.

Installation

14.11 Waterstop-RX can be installed around all through wall pipes and mechanical penetrations, and around all structural elements such as steel columns penetrating the slab. Installation details are shown in Figure 2.

Figure 2 Waterstop-RX installation details



Fixing mesh method (for construction joints)

14.12 The release paper is removed, and lengths of Waterstop-RX are placed so as to minimise coil end joints, ensuring that a minimum 75 mm depth of concrete will be maintained.

14.13 Using a sharp knife or utility blade, coil ends are cut to fit tightly butted together, without overlapping, to form a continuous waterstop.

14.14 Revo-Fix strips are placed over the waterstop, and the strip-ends lapped by 25 mm maximum. The lap is nailed through using the fixings supplied, and an additional fixing is installed 300 mm centre to centre along the Revo-Fix.

Adhesive method (for construction joints and service penetrations)

14.15 A continuous bead of Cetseal (typical bead diameter 6 mm) is applied to the dry, smooth concrete surface, ensuring that a minimum 75 mm depth of concrete will be maintained.

14.16 The release paper is removed, and lengths of Waterstop-RX are placed so as to minimise coil end joints. The waterstop is pressed into the adhesive bead, so that the adhesive spreads to coat most of the bottom of the waterstop.

14.17 Using a sharp knife or utility blade, coils ends are cut to fit tightly butted together, without overlapping, to form a continuous waterstop.

Swelling

14.18 If the material exhibits considerable swelling prior to confinement in the joint, it must be replaced with new material.

Concrete casting

14.19 Casting of retaining walls and floor slabs is carried out immediately after fixing Waterstop RX in position.

15 Repair

Where material is lost from the membrane, Bentoseal can be applied over the damaged area or, if the damage is more extensive, the product must be replaced with fresh Voltex DS.

16 Tests

Voltex DS

16.1 Tests were conducted and the results assessed to determine:

- resistance to electrolytes
- resistance to rainfall (natural exposure)
- resistance to rainfall (cyclic water spray with simulated traffic)
- bond strength between Voltex DS and poured concrete
- stability of bentonite granules within the membrane during normal site handling
- hydraulic conductivity
- low-temperature flexibility
- hydrostatic pressure
- tensile strength
- puncture resistance
- water vapour transmission.

16.2 A trial installation was built and observations were made of the ease of installation at corners, laps and around obstructions, and the rate and pattern of water penetration.

Waterstop-RX

16.3 Tests were conducted and the results assessed to determine:

- characterisation
- resistance to hydrostatic pressure.

16.4 Observations were made of the ease of installation, in particular around obstructions.

17 Investigations

17.1 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.

17.2 An assessment was made of independent reports relating to:

- hydraulic conductivity under water pressure
- low-temperature flexibility
- resistance to hydrostatic pressure
- mechanical properties of the geotextiles
- water vapour transmission through hydrated membrane.

17.3 Visits were made to sites in progress to assess the application properties of the product.

17.4 A survey of contractors was conducted to assess the practicability of application and the performance in use.

17.5 Existing data on the effectiveness and durability of natural sodium bentonite as a waterproofing membrane were examined.

Bibliography

BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*

BS EN 13491 : 2013 *Geosynthetic barriers – Characteristics required for use as a fluid barrier in the construction of tunnels and associated underground structures*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

18 Conditions

18.1 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.

18.2 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.

18.3 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.

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

18.5 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.

18.6 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.