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Agrément Certificate
23/6783
Product Sheet 1 Issue 1

SOLUFORM

SOLUFORM CONCRETE FILLED BAGWORK

This Agrément Certificate Product Sheet(1) relates to SoluForm Concrete Filled Bagwork, hessian bag formwork closed around a liner containing concrete mix, for use as erosion protection or formation of scour protection within watercourses, pipe, culvert or bridge headwalls and river walls and training walls on structures at an inclination of up to 70 degrees.

(1) Hereinafter referred to as 'Certificate'.

The assessment includes

Product factors:
- compliance with Building Regulations
- compliance with additional regulatory or non-regulatory information where applicable
- evaluation against technical specifications
- assessment criteria and technical investigations
- uses and design considerations

Process factors:
- compliance with Scheme requirements
- installation, delivery, handling and storage
- production and quality controls
- maintenance and repair

Ongoing contractual Scheme elements†:
- regular assessment of production
- formal 3-yearly review

KEY FACTORS ASSESSED

Section 1. Mechanical resistance and stability
Section 2. Safety in case of fire
Section 3. Hygiene, health and the environment
Section 4. Safety and accessibility in use
Section 5. Protection against noise
Section 6. Energy economy and heat retention
Section 7. Sustainable use of natural resources
Section 8. Durability

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

Date of issue: 23 March 2023

Hardy Giesler
Chief Executive Officer

This BBA Agrément Certificate is issued under the BBA's Inspection Body accreditation to ISO/IEC 17020. Sections marked with † are not issued under accreditation.

The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 3537).

Readers MUST check that this is the latest issue of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

The Certificate should be read in full as it may be misleading to read clauses in isolation.

Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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SUMMARY OF ASSESSMENT AND COMPLIANCE

This section provides a summary of the assessment conclusions; readers should refer to the later sections of this Certificate for information about the assessments carried out.

Compliance with Regulations

In the opinion of the BBA, the use of SoluForm Concrete Filled Bagwork, is not subject to the national Building Regulations.

Fulfilment of Requirements

The BBA has judged SoluForm Concrete Filled Bagwork to be satisfactory for use as described in this Certificate. The product has been assessed as erosion protection or formation of scour protection within watercourses, pipe, culvert or bridge headwalls and river walls and training walls.

The product does not satisfy the requirements for retaining structures exceeding 70 degrees.

ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the product under assessment. SoluForm Concrete Filled Bagwork consists of hessian sacks around an interior degradable liner containing concrete mixture, intended for maintaining form during installation, after which the concrete mixture will be cured and form the structural portion of the build in accordance with PD ISO/TR 18228-6 : 2022 and the hessian bagwork will biodegrade away.

The product is available in two variations: Above-Water and Underwater, differentiated by their linings. The Above-Water variation has a water soluble liner that can be installed by soaking, while the Underwater variant includes an insoluble liner that will survive the curing process before breaking down.

The product has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (unit)	Value
Filled dimensions (mm)	500 × 250 × 100
Gross dry density ($kg \cdot m^{-3}$)	1765
Gross wet density ($kg \cdot m^{-3}$)	2289

Ancillary Items

The Certificate holder recommends the following ancillary items for use with the product, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- M12 rebar galvanised steel staple.

Definitions for products and applications inspected

The product is intended for protection, not structural reinforcement, for use in the following situations:

- scour protection
- void filling
- bridge headwalls
- culvert headwalls
- riverbanks
- underpinning.

The product has not been assessed for use in the following situations:

- slopes exceeding 70 degrees.

Definitions

The following terms are defined for the purposes of this Certificate as:

- alternating — a layer with long direction of bag parallel to the face and the next layer long direction perpendicular to the face
- cross bonding — each bag is placed in the opposite orientation to the adjacent bagwork (one parallel, one perpendicular, one parallel, one perpendicular) for the length of the face/layer.

Product assessment – key factors

The product was assessed for the following key factors, and the outcome of the assessments are shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data was assessed for the following characteristics.

1.1 Structural and mechanical properties

1.1.1 Results of bag characteristic tests are given in Table 2.

Table 2 Bag characteristics

Product assessed	Assessment method	Requirement	Outcome
Hessian bagwork outer layer	Tensile strength to BS 2576 : 1986	Value achieved	MD_{Dry} = 543 N MD_{Wet} = 417 N CMD_{Dry} = 519 N CMD_{Wet} = 335 N
Hessian bagwork outer layer	Warp and weft to BS 2862 : 1984 ISO 7211-2 : 1984	Value achieved	4 threads per cm weft 4.6 threads per cm warp

1.2 Resistance to External Factors

1.2.1 Results of liner characteristic tests for these factors are given in Table 3.

Table 3 Liner characteristics – Resistance to External Factors

Product assessed	Assessment method	Requirement	Outcome
Liner component of Above-Water bagwork	Resistance to static perforation to BS EN ISO : 12236 : 2006	Value achieved	Above-Water – 34 ± 2 N Underwater – 37 ± 5 N
Liner component of Underwater bagwork			
Liner component of Above-Water bagwork	Resistance to dynamic perforation to BS EN ISO 13433 : 2006	Value achieved	Above-Water – 23 ± 1 N Underwater – 28 ± 0 N
Liner component of Underwater bagwork			

1.3 Permeability

1.3.1 Results of liner characteristic tests for these factors are given in Table 4.

Table 4 Liner characteristics - Permeability

Product assessed	Assessment method	Requirement	Outcome
Liner component of Above-Water bagwork	Water permeability of liner (Above-Water) to BS EN ISO 11058 : 2019	No penetration	Pass
Liner component of Underwater bagwork	Solubility of Liner (Underwater) to a BBA Test Method	Liner dissolved	Pass

2 Safety in case of fire

Not applicable.

3 Hygiene, health and the environment

Data were assessed for the following characteristics.

3.1 Watercourse contamination

3.1.1 Results of testing to establish the effect of concrete curing within the watercourse are given in Table 5.

Table 5 pH testing

Product assessed	Assessment method	Requirement	Outcome
Underwater bagwork	Short term pH of watercourse during installation to a BBA Test Method	$pH_{Final} \leq 10.0$	Pass

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Not applicable.

7 Sustainable use of natural resources

Not applicable.

8 Durability

8.1 The potential mechanisms for degradation and the known performance characteristics of the materials in this product were assessed.

Table 6 Durability assessments

Product assessed	Assessment method	Requirement	Outcome
Soluform concrete mix	Concrete Classification to BS EN 1990 : 2002	Category determined for Concrete Category 5 – 120 years > 32 N·mm^2	Pass

8.2 Service life

Under normal service conditions, the product will have a life of at least 120 years, provided it is installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

PROCESS ASSESSMENT

Information provided by the Certificate holder was assessed for the following factors:

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 As the product is non-reinforcing, it is not assessed for use in slopes exceeding 70 degrees.

9.1.2 Care must be taken to ensure that, when laying the bags, the centre of gravity of the wall is maintained behind the face of the wall.

9.2 Installation

General

9.2.1 Installation instructions provided by the Certificate holder were assessed and judged to be appropriate and adequate.

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions. A summary of instructions and guidance are provided in Annex A of this Certificate.

Above-Water bagwork

9.2.3 Prefilled bagwork placed away from any watercourse must to be hydrated prior to placement, by pre-soaking in a bath of water for 15 minutes or by thoroughly wetting during placement for a minimum of 3 minutes.

9.2.4 Each bag must be placed horizontally in position, placed flat and built up in rows, alternating or cross bonding.

9.2.5 Should the bagwork be placed dry with intention of wetting in position, it is recommended that each row is placed and wetted individually, for at least 3 minutes.

Underwater bagwork

9.2.6 After the second or third row of bags, steel rebar pins can be pushed vertically through to tie all the blockwork together. Steelwork must pass through every bag.

9.2.7 Once pierced, water will enter the bagwork and engage the cement.

9.3 Workmanship

Practicability of installation was assessed by the BBA, on the basis of Certificate holder's information. To achieve the performance described in this Certificate, installation of the product can be carried out by a general tradesman familiar with this type of product.

9.4 Maintenance and repair

As the product is a static mass of concrete held in place by gravity and has suitable durability, maintenance is not required.

10 Manufacture

10.1 The production processes for the product have been assessed, and provide assurance that the quality controls are satisfactory according to the following factors:

10.1.1 The product is manufactured by pre-mixed concrete being sealed in the bag liner before being sealed into hessian bagwork.

10.1.2 The manufacturer has provided documented information on the materials, processes, testing and control factors.

10.1.3 The quality control operated over batches of incoming materials has been assessed and deemed appropriate and adequate.

10.1.4 The quality control procedures and product testing to be undertaken have been assessed and deemed appropriate and adequate.

10.1.5 The process for management of non-conformities has been assessed and deemed appropriate and adequate an audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

† 10.1.6 The BBA has undertaken to review 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.

11 Delivery and site handling

11.1 The Certificate holder stated that the product is delivered to site in packaging bearing the product name, Certificate holder's name, batch number, health and safety information and weight of contents in kilograms.

11.2 Delivery and site handling must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

11.2.1 The bags must be stored clear of the ground and must be protected from rain and water from the ground until it is time to be placed.

11.2.2 All prefilled bagwork must remain palletised and wrapped until ready to use. Palletised bagwork must be stored in a dry location, or suitably covered and protected if stored outside.

11.2.3 Care must be taken in removing protective wrapping, so as to not cut or damage the bagwork. When ready to use, bagwork must be removed from the pallet wrapping and individual bags gently shaken, rolled or squeezed to loosen any compacted dry mix concrete contained within the bag.

11.2.4 Should there be any small amounts of cement powder on the outside of the bag, resulting from the filling process, this can be brushed away. Damaged bags must not be used although the dry mix can be reused to refill empty bagwork or reutilised for other purposes.

ANNEX A – SUPPLEMENTARY INFORMATION †

Supporting information in this Annex is relevant to the product but has not formed part of the material assessed for the Certificate.

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.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of ISO 9001 : 2015 by the British Standards Institute (Certificate FM 37487).

Additional information on installation

A.1 Specific instructions regarding Above-Water bagwork and Underwater bagwork in varying conditions are included in the product datasheets.

Above-Water bagwork

A.2 Bagwork can be patted flat or shaped once placed, to improve appearance and reduce voids.

A.3 After the second or third row of bags, steel rebar pins can be pushed vertically through to tie all the blockwork together.

Underwater bagwork

A.5 Bagwork should be taken from pallets and wrapping with care to avoid damage.

A.6 Underwater bagwork placed by divers can be lowered into the river in 1T bulk bags from which individual bags are removed.

A.7 The bagwork is carried by hand and positioned in the watercourse.

A.8 The bagwork is placed flat and built up in rows. Shaping must be completed before piercing.

A.9 Further rows of bagwork can then be added, up to the surface level.

Bibliography

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

BS EN 1990 : 2002 *Eurocode — Basis of Structural Design*

BS EN ISO ISO 12236 : 2006 *Geosynthetics — Static puncture test (CBR test)*

BS EN ISO 13433 : 2006 *Geosynthetics — Dynamic perforation test (cone drop test)*

BS EN ISO 11058 : 2019 *Geotextiles and geotextile-related products — Determination of water permeability characteristics normal to the plane, without load*

BS 2576 : 1986 *Method for determination of breaking strength and elongation (strip method) of woven fibres*

BS 2862 : 1984 *Method for determination of number of threads per unit length*

ISO 7211-2 : 1984 *Textiles — Woven fabrics — Construction — Methods of analysis — Part 2 : Determination of number of threads per unit length*

PD ISO TR 18228-6 : 2022 *Design using geosynthetics — Part 9 : Barriers*

Conditions

1 This Certificate:

- relates only to the product 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.

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.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the product 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.

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

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 or any other product
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product
- actual installations of the product, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to UKCA marking and CE marking.

6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product which is contained or referred to in this Certificate is the minimum required to be met when the product 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.

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