Statement of Verification

BREG EN EPD No.: 000364 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

SoluForm

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

Concrete Bagwork

Company Address

Hoben International Ltd
Manystones Lane
Brassington
Matlock
DE4 4HF

SoluForm

Signed for BRE Global Ltd	Emma Baker Operator	22 July 2021 Date of this Issue
22 July 2021 Date of First Issue		21 July 2026 Expiry Date

BRE Global Verified EPD

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ECO PLATFORM EPD EN 15804 VERIFIED

Environmental Product Declaration

EPD Number: 000364

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013
Commissioner of LCA study	**LCA consultant/Tool**
Hoben International Ltd Manystones Lane Brassington Matlock DE4 4HF	Andrew Dutfield/ BRE LINA v2.0
Functional Unit	**Applicability/Coverage**
1 tonne of SoluForm high-strength lined concrete bagwork as installed over a 120 year period	Manufacturer specific product.
EPD Type	**Background database**
Cradle to Grave	ecoinvent v3.2

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Pat Hermon
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A1:2013 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☐

Note: Ticks indicate the Information Modules declared.

Manufacturing site

Hoben International Ltd
Manystones Lane
Brassington
Matlock
DE4 4HF

Construction Product

Product Description

SoluForm is a pre-filled lined concrete bagwork product, for placement manually both in and out of water, for a range of river or outside applications. Typically, this will be the building of walls and headwalls, structural underpinning of structures affected by scour and erosion, scour protection and similar schemes. The concrete bagwork product is only available in 32N concrete strength, with two different types of liner (depending upon whether placement is in or out of water).

Technical Information

Property	Value, Unit
High Strength Concrete Blend Compressive Strength (BS EN 206-1)	
Strength Test Cube 7 days laboratory tested	25 N/mm2
Strength Test Cube 7 days representative (in situ)	18 N/mm2
Strength Test Cube 28 days laboratory tested	32 N/mm2
Strength Test Cube 28 days representative (in situ)	25 N/mm2
Concrete Density	2200 kg/m3
Installed volume of 1000 kg bagwork	0.69 m3

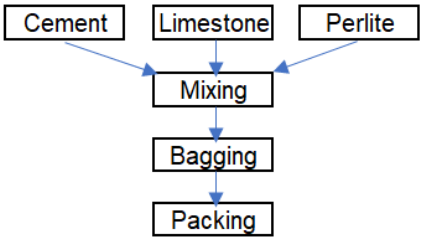
Main Product Contents

Material/Chemical Input	%
Cement	10-30
Limestone	60-90
Perlite	0-10

Manufacturing Process

Raw materials are delivered from the suppliers (Cement and Limestone) and blown into a holding silo. Expanded Perlite is manufactured on site from Perlite Ore and blown to the same silo. The 3 materials are screwed into a mixer by weight, as per the recipe, and mixed for the allotted time. The mixed material is conveyed by bucket elevator to a holding hopper situated above the baggers. Material is then bagged off into the required liner type and outer hessian, before being tied off. Bags are palletised and shrink-wrapped to secure and weatherproof to await collection. Factory filling in a dry controlled environment also ensures a satisfactory shelf life of up to 9 months for the bagwork product.

Process flow diagram



Construction Installation

The concrete bagwork is placed manually, both in rivers and out, for a wide variety of applications including walls, underpinning, scour protection, etc. The bagwork is fixed in place with 300mm long steelwork pins inserted every two bags, piercing 3 rows of bagwork with a single pin. The waste created at installation is negligible. Water from the surrounding source is used for the under water product by piercing the bag with rebar to allow water in. The above water product is wetted in situ once the bags have been installed in the required orientation, or pre-soaked for 15 minutes before being placed. Both scenarios above and below water would use 200 l/tonne water. Tap water usage for the above water product is estimated to be 20% of total. Any product not used on a particular scheme will have sufficient shelf life to be used on another project.

Use Information

Once placed and the concrete bags have hardened into blocks, the concrete will perform in its required function. In practice, given the nature of the product and its application, no impacts are associated with the use stage of the SoluForm bagwork over the lifetime of their installation. However, carbonation of concrete will occur over the lifetime of the product as installed and is included in module B1. Carbonation is assumed to occur on surfaces exposed to air and so will only occur on above water installations and not on below water installations. Carbonation is calculated using the approach in the BRE PCR.

End of Life

From independent testing the product has a design life of 120 years, by which time the concrete will lose its integrity and the steelwork has corroded beyond the limits of its design life. At this point repairs or a replacement solution is to be considered. The product could be removed by hand or excavator, and the bagwork recycled. The concrete could be reused as aggregate and the steel (if used) recycled.

Life Cycle Assessment Calculation Rules

Functional unit description

1 tonne of SoluForm high-strength lined concrete bagwork as installed over a 120 year period.

System boundary

This is a cradle to grave EPD, reporting all production life cycle stages of modules from A1 to C4 inclusive in accordance with EN 15804:2012+A1:2013 but excluding module D.

Data sources, quality and allocation

Data collected by SoluForm for the production of concrete bagwork products at the Brassington site for the period 1st December 2019 to 30th November 2020 has been used for this EPD. As there were less input materials than output materials (including waste), this resulted in a mass balance of 98.82% and so an uplift of input materials of 1.18% was applied.

SoluForm is a subsidiary of Hoben International and other products are made on the site. Site wide values for energy, water, waste and wastewater have been allocated by mass of production. SoluForm concrete bagwork products form 7.7% of total production. The product is only available with 32N high-strength concrete.

Data for distance to installation and water usage for installation were supplied by SoluForm. Once the bags harden and the bags and liners decompose they form permanent blocks. Data for the mechanical excavation of blocks, transport to crushing and energy of crushing at end of life have been derived from industry sources.

Figures for the raw materials, ancillary materials and packaging were from actual usages. Allocation of energy, water, and waste has been done according to the provisions of the BRE PCR PN514 and EN 15804. Secondary data have been drawn from the BRE LINA database v2.0.79 and the background LCI datasets are based on ecoinvent v3.2 (2015).

Quality Level	Geographical representativeness	Technical representativeness	Time representativeness
Very Good	Data from area under study	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e. identical technology)	n/a
Fair	n/a	n/a	Less than 10 years of difference between the reference year according to the documentation, and the time period for which data are representative

The quality level of geographical and technical representativeness is Very Good. The quality level of time representativeness is Fair as the background LCI datasets are based on ecoinvent v3.2 which was compiled in 2015 and so there is less than 10 years between the reference year according to the documentation, and the time period for which data are representative.

Cut-off criteria

All inputs or outputs have been included and all raw materials, packaging and transport, energy, water use and wastes, are included, except for direct emissions to air, water and soil, which are not measured. Upstream extraction and/or processing of inputs are included within the use of the background datasets within LINA.

LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	2.49E+02	1.37E-05	1.06E+00	3.35E-01	1.15E-01	2.46E-04	2.57E+03
Construction process stage	Transport	A4	4.23E+01	7.79E-06	1.41E-01	3.73E-02	2.47E-02	1.11E-04	6.39E+02
	Construction	A5	8.78E-02	3.92E-09	1.43E-04	6.18E-03	3.10E-05	9.58E-08	4.29E-01
Use stage	Use	B1	-5.2E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	1.50E+01	9.73E-07	8.14E-02	1.87E-02	4.64E-03	1.81E-05	2.31E+02
	Transport	C2	1.67E+01	3.08E-06	5.59E-02	1.48E-02	9.75E-03	4.40E-05	2.53E+02
	Waste processing	C3	3.07E+00	5.64E-07	2.35E-02	5.85E-03	4.04E-03	1.05E-06	4.43E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	MND	MND	MND	MND	MND	MND	MND

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

LCA Results (continued)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	8.42E+02	3.45E-04	8.42E+02	2.96E+03	0.00E+00	2.96E+03
Construction process stage	Transport	A4	8.48E+00	3.16E-05	8.48E+00	6.35E+02	0.00E+00	6.35E+02
	Construction	A5	3.80E-02	5.46E-07	3.80E-02	5.02E-01	0.00E+00	5.02E-01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	2.00E+01	3.61E-05	2.00E+01	3.08E+02	0.00E+00	3.08E+02
	Transport	C2	3.35E+00	1.25E-05	3.35E+00	2.51E+02	0.00E+00	2.51E+02
	Waste processing	C3	2.63E-01	6.10E-07	2.63E-01	4.37E+01	0.00E+00	4.37E+01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	MND	MND	MND	MND	MND	MND

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	2.30E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.38E-01
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	2.01E-01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	6.16E-02
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	5.47E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	7.65E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	MND	MND	MND	MND

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG
	Total (of product stage)	A1-3	2.64E+00	1.17E+01	1.29E-02
Construction process stage	Transport	A4	2.68E-01	2.98E+01	4.41E-03
	Construction	A5	6.06E-04	8.37E-1	2.82E-06
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	3.52E-02	3.75E-01	1.70E-03
	Transport	C2	1.06E-01	1.18E+01	1.74E-03
	Waste processing	C3	2.80E-02	2.17E-02	3.19E-04
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	MND	MND	MND

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	1.43E+01	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	2.00E+01	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	9.94E+02	5.80E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	MND	MND	MND	MND

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Deliveries to each customer are recorded based by postcode which was used to determine the distance delivered from SoluForm to the customer using an online route finder. 315 deliveries were used in a 12 month period with an average of 253km per journey. 16-32 tonnes trucks are assumed for deliveries.		
	Fuel type / Vehicle type	l/km	0.35
	Distance	km	253
	Capacity utilisation	%	26%
	Volume of 1000 kg transported products	m^3	0.69
A5 – Installation in the building	The concrete bagwork is placed manually both above and below water for a wide variety of applications including walls, underpinning, scour protection, etc. The waste created at installation is negligible. Water from the surrounding source is used for the under water product by piercing the bag with rebar to allow water in. The above water product is wetted in situ once the bags have been installed in the required orientation, or pre-soaked for 15 minutes before being placed. Both scenarios above and below water would use 200 l/tonne water. Tap water usage estimated to be 20% of total for above water applications. Any product not used on a particular scheme will have sufficient shelf life to be used on another project.		
	Water usage	l/tonne	200
B1 - Use	Once placed and the concrete bags have hardened into blocks, the concrete will perform in its required function. In practice, given the nature of the product and its application, the only impact associated with the use stage of the SoluForm bagwork is carbonation over the lifetime of their installation. Carbonation is assumed to occur on surfaces exposed to air and so will only occur on above water installations and not on below water installations. The carbonation calculation was carried out according to the BRE PCR.		
B2 – Maintenance B3 – Repair B4 – Replacement B5 – Refurbishment	It is assumed that the SoluForm bagwork covered by this EPD do not require maintenance, repair, replacement or refurbishment during their lifetime. Consequently, the impacts associated with these lifecycle stages are declared as zero.		
Reference service life	120 years (BS EN 1990:2002 category 5 design working life)		
B6 – Use of energy; B7 – Use of water	There is no operational energy or operational water requirement associated with the product. Therefore, these modules are not relevant		
C1 - Deconstruction, demolition	The product is assumed to be removed by excavator, and the bagwork recycled. The scenario assumes that the concrete is crushed and reused as aggregate; and the steel (if used) recycled.		
	Energy rating of excavator	kW	50
	Time taken to excavate 1 tonne of bagwork	mins	30
C2 - Transport	Distance to waste processing destination	km	100
	Fuel type / Vehicle type	l/km	0.35
	Capacity utilisation	%	26%
	Density of waste concrete	Kg/m3	2200

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C3 – Waste processing	Energy for crushing concrete	l/tonne	0.88
	Crushed Concrete waste for re-use	kg	994.2
	Steel waste for recycling	tonnes	5.8
C4 – Waste disposal	As 100% of product can be re-used and recycled at end of life therefore no impacts.		
Module D	Module not declared		

References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.