Statement of Verification

BREG EN EPD No.: 000366 Issue 02

This is to verify that the

Environmental Product Declaration

provided by:

Ibstock Telling GRC Ltd

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

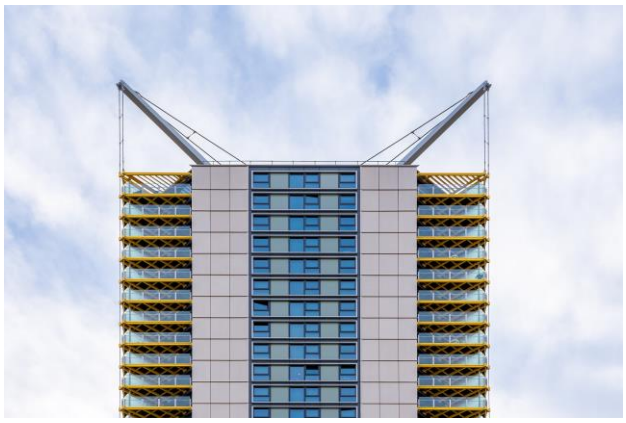
BRE Global Scheme Document SD207

This declaration is for:

Plain GRC Façade Panels

Company Address

Unit 4E Station Road
Four Ashes
Wolverhampton
WV10 7DB



Signed for BRE Global Ltd	Emma Baker Operator	22 April 2022 Date of this Issue
08 July 2021 Date of First Issue		07 July 2026 Expiry Date

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Environmental Product Declaration

EPD Number: 000366

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**
Ibstock Telling GRC Ltd Unit 4E Station Road Four Ashes Wolverhampton WV10 7DB	Andrew Dutfield / BRE LINA v2.0
Declared Unit	**Applicability/Coverage**
1 square metre (m^2) of Plain GRC panel maximum weight 65 kg/m^2	Product Average.
EPD Type	**Background database**
Cradle to Gate	ecoinvent 3.2

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

Ibstock Telling GRC Ltd
Unit 4E Station Road
Four Ashes
Wolverhampton
WV10 7DB

Construction Product

Product Description

Glassfibre Reinforced Concrete (GRC) is a composite material comprising of, cement, fine aggregates, alkali resistant glass fibres, acrylic polymers and admixtures/additives.

Ibstock Telling GRC manufacture bespoke GRC façade panels in accordance with the recommendations and guidelines stated within “Specification for the Manufacture, Curing and Testing of Glassfibre Reinforced Concrete (GRC) Products” published by The International Glassfibre Reinforced Concrete Association (GRCA) in addition to relevant British Standards.

Grade 18P mix design provides a spray grade material that achieves the highest technical performance of all the GRC grades. GRC is easily moulded, its high strength capabilities enable the design and off-site manufacture, of thin lightweight cladding elements to provide non-structural facades to buildings in both new build and refurbishment sectors.

Technical Information

Property	Value, Unit
Weight per m2	65 kg/m2
Thickness of GRC layers - Typically	12 mm + 3 mm decorative layer
Modulus of Rupture (flexural) (MOR28)	18-30 N/mm2
Limit of Proportionality (flexural) (LOP28)	5-10 N/mm2
Ultimate Tensile Strength (UTS28)	8-12 N/mm2
Bend over point (tensile) (BOP28)	4-6 N/mm2
Interlaminar Shear	2-4 N/mm2

Property	Value, Unit
In-Plane Shear	7-12 N/mm2
Punching Shear	25-35 N/mm2
Charpy Impact Strength	15-25 N/mm2
Dry Bulk Density	1800-2100 Kg/m3
Water Absorption	8-13%
Apparent Porosity	16-25%
BS EN 13501-1:2007 + A1:2009 Fire classification of construction products and building elements. Classification using test data from reaction to fire tests	Fire Classification A2 s1, d0

Main Product Contents

Material/Chemical Input	Values
Aggregate/cement ratio	0.5-1.5
Water/cement ratio	0.30-0.38
Glassfibre content (% by weight of total mix)	4.0-5.5%
Polymer solids content (% by weight of cement)	Nil (Grade 18), 4-7% (Grade 18P)
Extreme dimensional variations (mm/m)	0.6-1.2
Water absorption	5-11%
Minimum bulk dry density (kg/m3)	1800
Minimum bulk wet density (kg/m3)	2000

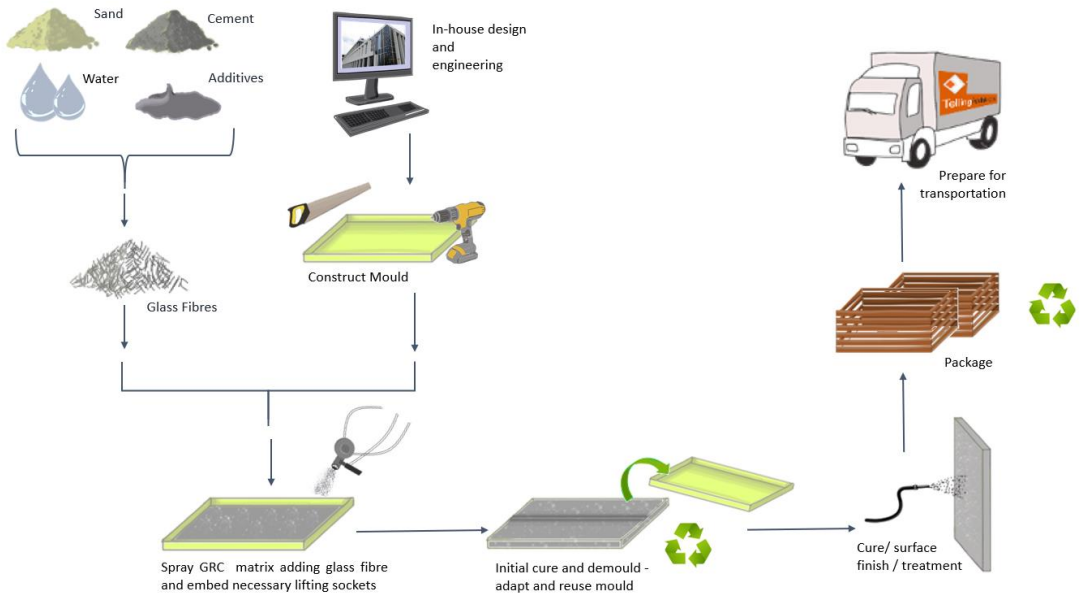
N.B. Mix design is from GRCA Specification for the Manufacture, Curing & Testing of Glassfibre Reinforced Concrete (GRC) Products Guide Mix Designs for Grades 18/18P.

Manufacturing Process

GRC backing material is manufactured as follows to a typical thickness of 12 mm with an additional 3 mm decorative layer. The base materials – Cement, Sand (fine aggregate), Water, Admixtures and Additives are batched in accordance with the stated design mix to form the matrix. This material may be applied to the surface of the mould to form the face layer coat. The backing mix comprises matrix material which is pumped through a concentric spray gun, where it meets with the correct proportion of chopped alkali-resistant glass fibre strands, enabling even distribution of fibres within the matrix. This GRC material is sprayed in 3 or 4 layers to the design thickness. Each layer is manually compacted to remove any trapped air before the addition of the next layer. Following initial curing, the resultant panels are demoulded. The mould can be adapted and reused multiple times in the manufacturing process to produce similar sized or repeat pattern panels. Panels are finally inspected for any defects.

Panels are packed sequentially to optimise delivery and installation sequence. Customers are required to return timber crates/stillages to Ibstock Telling GRC to enable any necessary repair or adaption to enable continued reuse. Similarly all wrappings should be returned to enable waste management in accordance with the objectives detailed in their ISO 14001 Environmental Management System.

Process flow diagram



Construction Installation

Our manufacturing process enables an “on time/just in time” delivery strategy which provides efficiencies in the installation process such as:-
Reduced time on site – premanufactured panels enable the façade to be removed from the critical path. Installation by the façade contractor without the need for a tower crane – can be installed by monorail or spider crane. It would be feasible for each crew to install 50-80m2 of plain GRC panels on site per day. The panels are attached to the façade using aluminium and steel support bracketry appropriate to the under-construction/supporting structure. The method of fixing is very much dependant on the panel system type, panel size and design parameters of individual projects. The installation work is generally undertaken by a Specialist Façade Contractor.

Use Information

GRC Grade 18P is the highest performance grade GRC recognised for its high tensile strength and ability to withstand impacts without resulting fail. In use, it is assumed that no maintenance is required. Weathering and long term appearance is dictated by numerous factors such as, specified finish, colour, texture, building type, dimension, location, orientation, climate etc. Based on past performance weathering is assessed to be little different to that of natural materials of equivalent porosity such as stone. The surface of our Plain Faced GRC panels may be treated with a hydrophobic coating which should further enhance the weathering properties of the surface of the material. The reference service life for the declared unit is 100 years.

End of Life

GRC elements are suitable for recycling in a similar way to concrete once any metallic parts of fixings are removed. Due to the high content of cement, crushed hardened GRC may still show residual capacity for hydration and contribute to the development of strength of concrete from such a recycled aggregate.

Life Cycle Assessment Calculation Rules

Declared unit description

1 square metre (m^2) of Plain GRC panel maximum weight 65 kg/m^2

System boundary

This is a cradle-to-gate LCA, reporting all production life cycle stages of modules A1 to A3 in accordance with EN 15804:2012+A1:2013.

Data sources, quality and allocation

This EPD covers all Plain GRC panel products manufactured by Ibstock Telling GRC and the 65 kg/m2 maximum weight represents a worse case scenario to represent all of the products assessed.

Data collected by Ibstock Telling GRC for the production of the Plain Glass Reinforced Concrete (GRC) panel at the Wolverhampton site for the period 1st September 2019 to 31st August 2020 has been used for this EPD. The difference between input and output materials resulted in a mass balance of 95.5% and so an uplift of input materials of 4.5% was needed. Ibstock Telling GRC manufacture other products in addition to Plain GRC panels which form 67% of the total Ibstock Telling GRC production. Figures for the raw materials, ancillary materials and packaging were from actual usages. Energy figures are calculated from an energy supplier analysis and water figures are calculated from water industry figures for water usage per employee. Energy, water, non-production waste and wastewater have been allocated on a m2 of production basis. Production waste was allocated from total site to the product on a mass of production basis. Allocation of energy, water, and waste has been done according to the provisions of the BRE PCR PN514 and EN 15804.

Secondary data has been drawn from the BRE LINA database v2.0.79 and the background LCI datasets are based on ecoinvent v3.2 (2015). The dataset for unspecified cement was used to represent white cement and all types of aggregate were represented by the generic crushed gravel dataset. Blasting grit was also represented by the generic crushed gravel dataset.

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 raw materials and energy input to the manufacturing process have been included, except for direct emissions to air, water and soil, which are not measured. The inventory process in this LCA includes all data related to raw material, packaging material and consumable items, and the associated transport to the manufacturing site. Process energy and water use and direct production waste are included.

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	2.65E+01	6.40E-06	4.18E-01	1.24E-01	5.52E-02	5.38E-04	1.31E+03

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;

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	5.38E+02	4.16E-04	5.38E+02	1.42E+03	8.79E+01	1.51E+03

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

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	1.69E+00

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	4.62E+00	1.41E+01	4.61E-03

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

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	0.00E+00	3.57E+01	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Additional information

The environmental performance of this EPD should not be used in isolation when comparing façade systems. It should be recognised that further environmental benefits pertinent to the groundworks and design of the structural frame can be expected when considering lightweight concrete façade solutions.

As this is a cradle to gate EPD, carbonation in the use and post demolition phases has not been taken into account.

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.

Specification for the Manufacture, Curing & Testing of Glassfibre Reinforced Concrete (GRC) Products, The International Glassfibre Reinforced Concrete Association (GRCA), Northampton, UK, latest edition available at https://www.telling.co.uk/gfrc/.