Statement of Verification

BREG EN EPD No.: 000375 Issue 02

This is to verify that the

Environmental Product Declaration

provided by:

Shay Murtagh Ltd

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

1m³ Prestressed Concrete W-Beam

Company Address

Raharney, Mullingar,
Co. Westmeath
N91 WY91

SHAY MURTAGH

Signed for BRE Global Ltd	Emma Baker Operator	05 October 2023 Date of this Issue
19 November 2021 Date of First Issue		18 November 2026 Expiry Date

Environmental Product Declaration

EPD Number: 000375

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**
Shay Murtagh Ltd Raharney, Mullingar, Co. Westmeath N91 WY91	LCA consultant: Roger Connick Tool: BRE LINA v2.0.7
Declared/Functional Unit	**Applicability/Coverage**
1m^3 Prestressed Concrete W-Beam (2,563 kg/m^3)	Product specific
EPD Type	**Background database**
Cradle to Gate	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

Raharney, Mullingar
Co. Westmeath
N91 WY91

Construction Product:

Product Description

W-beams are pre-tensioned pre-stressed concrete beams. They comprise of high strength concrete, high yield steel reinforcement and steel pre-stressing strands. The pre-stressing strands are used to apply both an axial compression and a relieving moment to the beams. The pre-stressing strands are tensioned, the concrete beam is cast around the strands, and the pre-stressing force in the strands is applied to the concrete beam after the concrete reaches a required grade.

Structural concrete is well known for its strength, durability and versatility. These properties are enhanced for structural elements manufactured as pre-stressed concrete. Pre-stressed concrete W-beams have become firmly established as the preferred option for a wide range of bridge spans and types.

Precast Concrete W-beams are ideal for:

- Road Bridges
- Rail Bridges
- Foot Bridges
- Any building, civils infrastructure or highway application incorporating long spans.

W-beams can be used in beam-and-slab and voided slab deck types and are suitable for simply supported, continuous and integral spans. Shay Murtagh precast pre-stressed concrete W-beams reduce and simplify in-situ concrete construction whilst simultaneously ensuring a high quality, robust structural core.

Typical applications of W-beams are medium and long span bridges, large civils structures and commercial developments.

Technical Information

Property	Value, Unit
Types	W1 to W19
Depth	800 to 2300 (mm)
Height of centroid above soffit (Y_c)	303,0 to 1067,0 (mm)
Area	572206 to 1200356 (mm^2)
Second moment of area (I_{xx})	35,2006 to 745,112 (mm^4x10^9)
Self-weight	14.31 to 30.01 (kN/m)

Main Product Contents

Material/Chemical Input	%
Steel strands	3.8%
Steel reinforcement	4.3%
Cement	19.1%
Calcium Carbonate	6.4%
Aggregates	33.3%
Sand	32.9%
Additives	0.2%

Manufacturing Process

Mould preparation:
The mould bed is cleaned to remove dirt and/or debris from the previous pours and the unit length is marked out on the mould bed. Stopends are fitted and checked for distance, plumb & square. The internal faces of the mould are thoroughly rubbed down using a lightly oiled cloth to remove any dust or debris that may be present.

Reinforcement and Strand Setup:
Reinforcement links for each beam are placed onto a bed between mould stop ends. The strand pattern is then marked on the appropriate strand locators on the head and/or anchor of the stressing bed. Coils of strand selected for use on the beams are checked to ensure that the diameter, type, nominal strength and characteristic load are in accordance with the design. Next, the pre-stressing strand is pulled from one end of the mould bed, ensuring at all times that the cable goes through correct location in the stopends and in the head and anchor. When the prestressing strand has been pulled through the bed, it is cut from the coil, and the barrels and wedges are fitted to the strands. When setting up is complete, a line setup check is undertaken by the Production Engineer.

Stressing Operation:
The Production Engineer ensures that the stressing pump has been set out to the required load for the strand type which is to be stressed in accordance with stress load table. With the use of stressing pump, the strand is stressed to ensure that the pressure gauge reaches the correct psi. When the strand is stressed to the required load, the stressing jack is withdrawn. A visual check is then made to ensure that all the wedges have locked in place around the strand. The stressing is repeated on all other strands in the sequence determined by the design.

Final Setup:
After completion of the prestressing operations the strand extensions on the first, middle and last strands are checked. The stopends are checked by the Engineer to ensure they have not moved during the stressing operation. The engineer marks spacings of the shear links on the top strand, and the operatives begin spacing the links to ensure they are tied securely to prestressing cables using tying wire. Concrete spacers are then fitted to the reinforcement to ensure correct nominal cover is achieved to all faces. The Vertical lifting and Site lifting (strand) loops are tied into place in accordance with beam lifting arrangement drawings and details. While the sides are open, the mould has a coat of release agent applied using a spray can. The sides of the mould are pushed into position and closed.

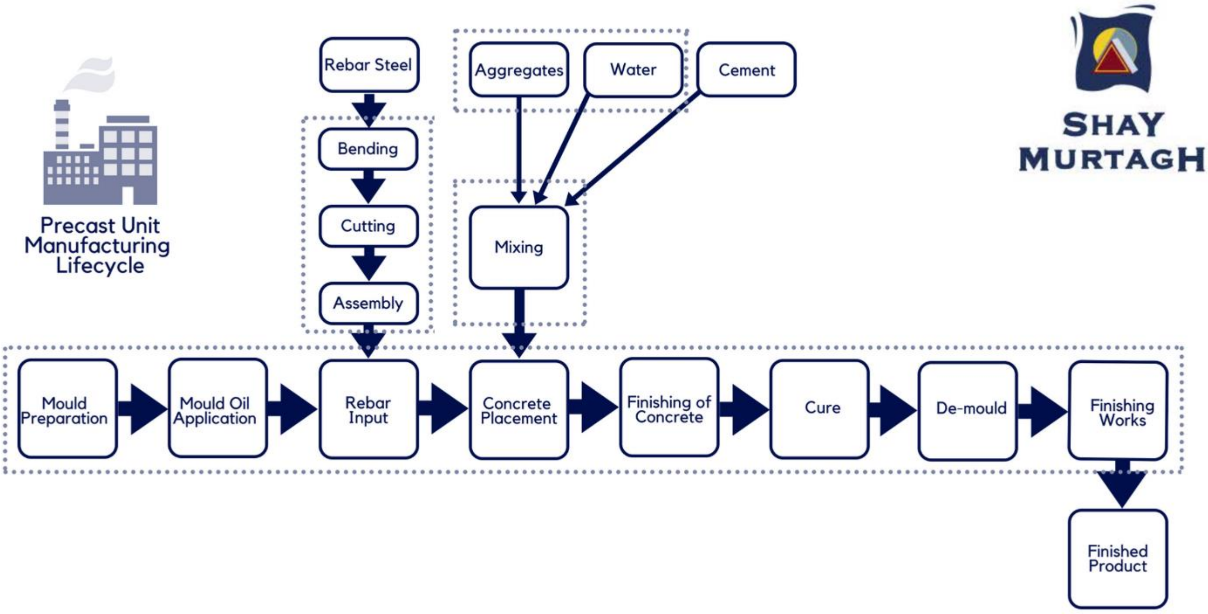
Pouring and finishing (concrete delivery to pouring area):
The area foreman ensures that access to the mould is clear before ordering concrete from the batching plant. Concrete mixes are prepared in batches of 1.45m^3 unless otherwise required by the manufacturing process. The mix is then delivered to the requesting area and discharged into a pouring skip.

Pouring and finishing (pouring concrete into mould):
Any concrete remaining in the pouring skip from previous pours is emptied out. The overhead gantry is used to position the skip over the pouring area of the mould. The skip is positioned as low as possible, and at a height no more than one metre from the top of the mould. The output from the skip is then controlled to ensure a consistent, even flow of concrete into the mould. The overhead gantry is used to move the skip slowly and smoothly along the length of the mould to ensure even distribution of concrete into the mould. Next, the concrete is sampled for quality control and product compliance purposes. When the concrete has achieved its initial set, the top surface of the beam is scabbled using a wire brush. The mould is cleaned of concrete overspill on completion.

Detensioning and Storage:
When the last beam has been manufactured on the line, the beam is allowed adequate curing time before striking cubes are crushed and the line is de-tensioned. When the beams have been lifted off the bed and all shutters are stripped, boxouts removed and sockets cleared and inspected, the Production Engineer completes the post pour checks. The beams are lowered onto timber support bearers on the factory floor until they are ready to be moved to the outdoor stock yard. The beams are then marked using a permanent marker on their

internal face with their cast date and unique identification number, as well as receiving a sticker containing the same information. Where required, pier end or abutment ends are also marked.

Process flow diagram



Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1m³ Prestressed Concrete W-Beam (2,563 kg/m³)

System boundary

In accordance with the modular approach as defined in EN15804:2012+A1:2013, this cradle-to-gate EPD includes the processes covered in the manufacturing site and product stage A1 to A3.

Data sources, quality and allocation

Specific primary data derived from the Shay Murtagh Ltd production process in Raharney, Mullingar have been modelled using Simapro v9.1 LCA software and the BRE LINA database v2.0.73. In accordance with the requirements of EN15804, the most current available data has been used. The manufacturer-specific data from Shay Murtagh Ltd covers a period of one year (01/09/19 – 30/09/20). Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.2 database. All ecoinvent datasets are complete within the context used, and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804. Calculations were performed to enable allocation of processes to the Prestressed Concrete W-Beam products. Allocation procedures were by physical allocation and are according to EN15804 and are based on ISO14044 guidance.

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	There is approximately 5-6 years between the ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European and Irish datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore 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. Therefore, there is approximately 5-6 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

No inputs or outputs have been excluded. All raw materials and packaging inputs, plus their transport, process and general energy and water use, production and non-production waste, have been included where appropriate, except for direct emissions to air, water and soil, which are not measured.

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	8.75e+2	3.99e-5	2.82e+0	1.38e+0	5.84e-1	4.28e-3	7.57e+3
	Transport	A2	3.51e+1	6.39e-6	1.79e-1	3.59e-2	2.35e-2	8.44e-5	5.27e+2
	Manufacturing	A3	1.58e+1	8.51e-7	5.69e-2	1.40e-2	3.63e-3	1.17e-5	2.39e+2
	Total (of product stage)	A1-3	9.26e+2	4.72e-5	3.05e+0	1.43e+0	6.11e-1	4.37e-3	8.34e+3

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	5.05e+2	1.44e-3	5.05e+2	8.16e+3	0.00e+0	8.16e+3
	Transport	A2	7.57e+0	2.49e-5	7.57e+0	5.25e+2	0.00e+0	5.25e+2
	Manufacturing	A3	2.49e+1	2.02e-5	2.49e+1	2.12e+2	0.00e+0	2.12e+2
	Total (of product stage)	A1-3	5.37e+2	1.49e-3	5.37e+2	8.90e+3	0.00e+0	8.90e+3

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	0.00e+0	0.00e+0	0.00e+0	1.42e+1
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	1.16e-1
	Manufacturing	A3	0.00e+0	0.00e+0	0.00e+0	2.01e-1
	Total (of product stage)	A1-3	0.00e+0	0.00e+0	0.00e+0	1.45e+1

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

Other environmental information describing waste categories			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	9.41e+1	4.02e+1	2.19e-2
	Transport	A2	2.21e-1	2.23e+1	3.63e-3
	Manufacturing	A3	3.62e-2	1.03e+0	1.29e-4
	Total (of product stage)	A1-3	9.44e+1	6.36e+1	2.57e-2

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste 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	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Transport	A2	0.00e+0	0.00e+0	0.00e+0	0.00e+0
	Manufacturing	A3	0.00e+0	1.16e+1	7.51e-2	0.00e+0
	Total (of product stage)	A1-3	0.00e+0	1.16e+1	7.51e-2	0.00e+0

CRU = Components for reuse;
MFR = Materials for recycling
MER = Materials for energy recovery;
EE = Exported Energy

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.

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BS 8500-1 (+A1 2012) Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.

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BS 4449 (+A2 2009) Steel for the reinforcement of concrete. Weldable reinforcing steel, bar, coil and decoiled product. Specification.

BS 8666 Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete. Specification.

BS EN 15050:2007 (+A1:2012) Precast concrete products. Bridge Elements.

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