Statement of Verification

BREG EN EPD No.: 000544 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Forterra Building Products

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1 tonne of HS2 Culvert

Company Address

Forterra Building Products
Northampton
5 Grange Park Court, Roman Way
Northamptonshire
NN4 5EA

Signed for BRE Global Ltd	Emma Baker Operator	16 January 2024 Date of this Issue
16 January 2024 Date of First Issue		15 January 2029 Expiry Date

BRE Global Ltd., Garston, Watford WD25 9XX.
T: +44 (0)333 321 8811 F: +44 (0)1923 664603 E: Enquiries@breglobal.com

Environmental Product Declaration

EPD Number: 000544

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2021 Product Category Rules (PN 514 Rev 3.0) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019.
Commissioner of LCA study	**LCA consultant/Tool**
Forterra Building Products Northampton 5 Grange Park Court, Roman Way Northamptonshire NN4 5EA United Kingdom	LCA consultant: Joseph Gosling Tool: BRE LINA A2
Declared/Functional Unit	**Applicability/Coverage**
1 tonne of HS2 Culvert	Product Specific
EPD Type	**Background database**
Cradle to Gate with options	Ecoinvent 3.8

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+A2:2019. 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+A2:2019 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(s)

Culverts are bespoke products manufactured at our Somercotes works.

Somercotes works
Cotes Park Industrial Estate
Birchwood Way
Somercotes
Alfreton
DE55 4NH
United Kingdom

Construction Product:

Product Description

Bison (Forterra) Precast box culverts are designed and manufactured to meet a project's specific scheme requirements. Our in-house design team is on hand to provide immediate guidance and information where required to optimise the design to provide the most economical solution.

In its simplest form, the box culvert system comprises straight units with no access or pipe openings. For longer runs of culvert, special units can be included which incorporate access openings and pipe openings.

The system can be further adapted by including special units with end walls to create attenuation tanks. Gradual changes in direction can also be incorporated with skewed units.

Bison Precast box culverts are available in a wide range of sizes, from 1000mm x 600mm to 6000mm x 3600mm. Non-standard sizes and internal profiles can also be provided, including shaped inverts, dry weather flow channels and units with cross over channels.

Technical Information

Property	Value, Unit
Concrete Compressive Strength	C45/55 (N/mm m^2)
Grade B500A: Ultimate tensile strength	525 (N/mm2)
Grade B500B: Ultimate tensile strength	540 (N/mm2)
Grade B500C: Ultimate tensile strength	575 (N/mm2) minimum
Grade B500D: Ultimate tensile strength	675 (N/mm2) maximum
Tensile yield strength (all grades)	500 (N/mm2)
Dangerous Substances	NPD

Main Product Contents

Material/Chemical Input	%
Gravel	32.5
Sand	31.5
Steel	10.8
Cement	10.8
GGBS	6.1
Water	5.9
Limestone	1.8
Admixture	0.5

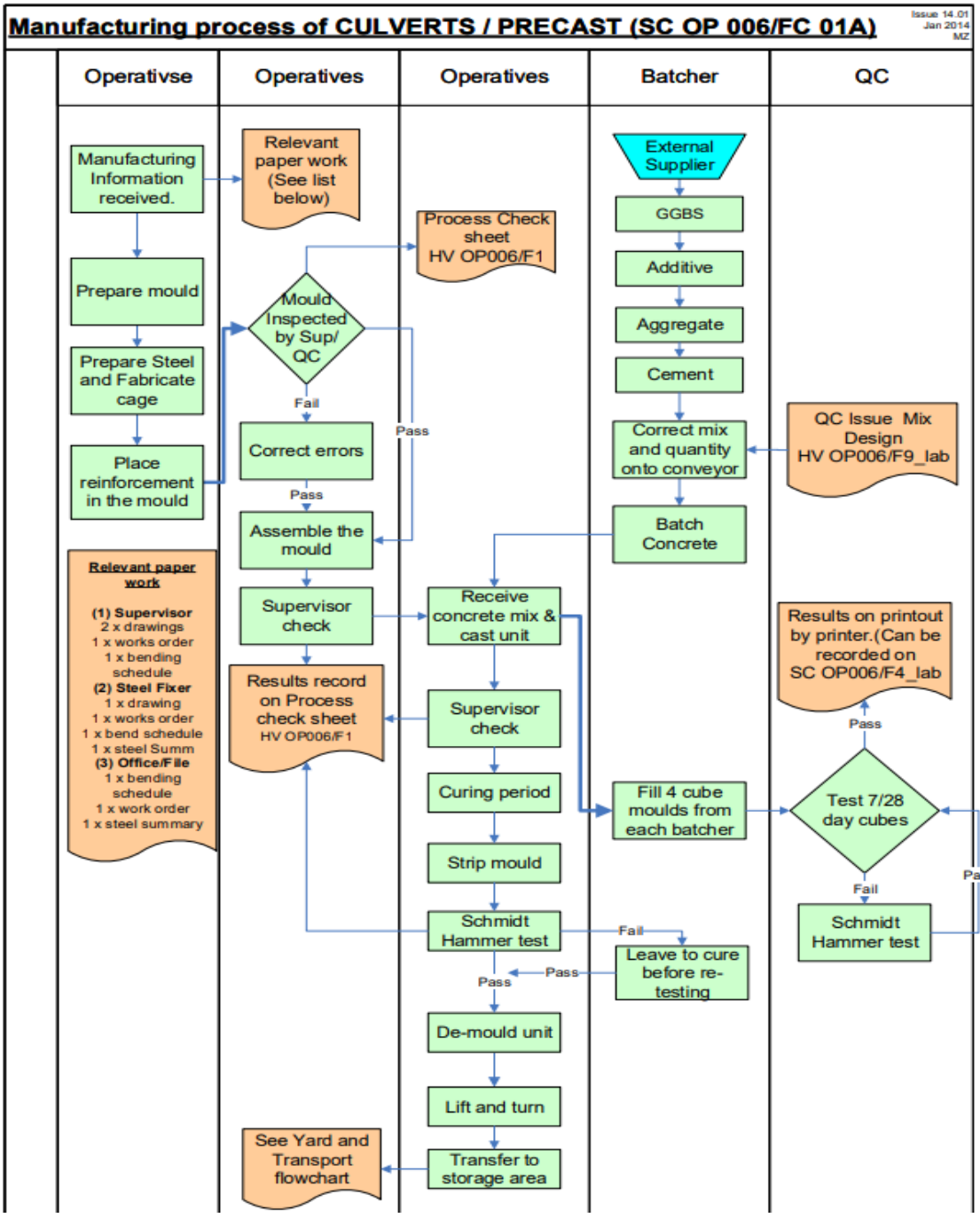
Manufacturing Process

A reinforcement cage is produced for the unit to be cast based on the engineering drawing supplied, this is then placed into an open mould (specific to the type of unit to be manufactured), spacers are used to locate the cage in the correct position within the mould and then ancillary fittings are attached. When the cage has been signed off by the quality team the mould is closed and is now ready for concrete to be poured.

Concrete is batched from the onsite concrete mixer according to the design required by the engineering specification, the concrete is discharged from the mixer into a skip, and this is then moved to the mould via overhead crane. The concrete is poured into the mould from the skip, which has a door at the base, until there is sufficient concrete to fill the mould. The exposed surface of the concrete is then finished to the required standard for the type of product (float finish, power float finish, roughened finish, etc).

The concrete is then allowed to cure until it reached sufficient strength that the mould can be struck (opened). The cast unit is then lifted from the mould and moved to the inspection and finishing area, once this process is completed it is moved to the storage area to await dispatch.

Process flow diagram



Construction Installation

Culverts are transported to site on trucks where a lifting device is attached to the product while still on the truck. It is then lifted from the truck and then set in the required position.

Use Information

Given the nature of the product and its application in the structure of the building, no impacts are associated with use stage of concrete over the lifetime of the building.

End of Life

At the end of life, the concrete products are deconstructed using heavy machinery, placed onto trucks, and transported to the relevant waste processing sites. At the site the waste undergoes crushing to prepare it for disposal where it is assumed that 90% of the waste is recycled and 10% is landfilled.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1 tonne of HS2 Culvert.

System boundary

This Cradle to Gate with options EPD has assessed in accordance with the modular approach as defined in EN15804:2012+A2:2019 and includes the processes covered in the manufacturing site and product stage A1 to A3, A4, B1-B7, C1-C4 and D.

Data sources, quality and allocation

Specific primary data derived from Forterra Building Products' production process in Somercotes works, Cotes Park Industrial Estate, Birchwood Way, Somercotes, Alfreton, DE55 4NH factory, have been modelled using the LINA LCA A2 software A2 and the ecoinvent 3.8 database. In accordance with the requirements of EN 15804:2012+A2:2019, the most current available data has been used. The manufacturer-specific data from from Forterra Building Products covers a period of one year (31/12/2021 – 30/12/2022). 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 3.8 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 EN 15804:2012+A2:2019.

Forterra manufactures other products in addition to HS2 Culvert (Forterra Somercotes), therefore an allocation of fuel, water, material usage, and waste emissions are required. The allocation has been made based on the total production output of Forterra Somercotes factory and weighted accordingly by mass. All the input and output materials such as, transportation, energy, water use and wastes are included according to the provisions of the BRE PCR PN514 and EN 15804:2012+A2:2019. Only exceptions are packaging and emissions to air, water & soil. Site wide values for energy, water and wastewater have been taken from bills. Figures for the raw materials, ancillary were from actual usages.

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).	There is less than 5 years between the ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific UK datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore good. The quality level of time representativeness is good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Consumption mix was used for energy with an emissions factor of 0.239kgCO2e/kWh for electricity, and a factor of 0.256kgCO2e/kWh for natural gas.

Cut-off criteria

All processes associated with the manufacturing process have been included. All inputs or outputs have been included and all raw materials, transport, energy, water use and wastes, are included, except for packaging and 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-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	3.83E+02	3.81E+02	1.99E+00	2.32E-01	1.79E-05	1.42E+00	1.35E-01
	Transport	A2	7.88E+00	7.87E+00	5.62E-03	3.52E-03	1.80E-06	8.52E-02	4.36E-04
	Manufacturing	A3	8.50E+00	8.47E+00	2.23E-02	2.61E-03	1.47E-06	6.20E-02	5.43E-04
	Total (of product stage)	A1-3	3.99E+02	3.97E+02	2.01E+00	2.38E-01	2.12E-05	1.56E+00	1.36E-01
Construction process stage	Transport	A4	1.77E-02	1.77E-02	1.72E-05	6.36E-06	4.23E-09	7.39E-05	1.10E-06
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	9.51E+00	9.51E+00	1.91E-03	5.40E-04	1.16E-06	5.62E-02	1.68E-04
	Transport	C2	1.36E-03	1.36E-03	1.32E-06	4.89E-07	3.25E-10	5.68E-06	8.48E-08
	Waste processing	C3	7.24E+00	7.24E+00	2.45E-03	6.92E-04	1.48E-06	7.21E-02	2.15E-04
	Disposal	C4	5.70E-01	5.69E-01	5.64E-04	5.37E-04	2.30E-07	5.35E-03	5.21E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.45E+02	-1.45E+02	2.26E-01	-9.67E-02	-6.83E-06	-5.73E-01	-6.46E-02

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

Parameters describing environmental impacts									
			EP-marine	EP-terrestrial	POCP	ADP-mineral &metal	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	3.32E-01	3.54E+00	1.45E+00	1.90E-03	3.36E+03	1.58E+02	2.24E-05
	Transport	A2	2.24E-02	2.48E-01	6.94E-02	1.65E-05	1.17E+02	5.08E-01	7.62E-07
	Manufacturing	A3	2.68E-02	2.92E-01	8.00E-02	1.52E-05	1.40E+02	4.30E-01	2.00E-06
	Total (of product stage)	A1-3	3.81E-01	4.08E+00	1.60E+00	1.93E-03	3.62E+03	1.59E+02	2.52E-05
Construction process stage	Transport	A4	2.25E-05	2.46E-04	7.93E-05	4.06E-08	2.76E-01	1.33E-03	2.08E-09
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	2.49E-02	2.73E-01	7.51E-02	2.78E-06	7.42E+01	1.72E-01	1.51E-06
	Transport	C2	1.73E-06	1.89E-05	6.10E-06	3.12E-09	2.12E-02	1.02E-04	1.60E-10
	Waste processing	C3	3.19E-02	3.50E-01	9.62E-02	3.57E-06	9.51E+01	2.20E-01	1.93E-06
	Disposal	C4	1.86E-03	2.04E-02	5.92E-03	1.30E-06	1.59E+01	7.28E-01	1.08E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.37E-01	-1.45E+00	-6.86E-01	-2.53E-04	-1.44E+03	-4.62E+01	-1.10E-05

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

Parameters describing environmental impacts							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.85E+01	8.60E+03	1.72E-06	7.48E-06	9.80E+02
	Transport	A2	5.81E-01	8.78E+01	3.15E-09	8.95E-08	1.10E+02
	Manufacturing	A3	1.98E+00	7.72E+01	2.64E-09	5.03E-08	2.97E+01
	Total (of product stage)	A1-3	2.11E+01	8.77E+03	1.72E-06	7.62E-06	1.12E+03
Construction process stage	Transport	A4	1.40E-03	2.15E-01	5.96E-12	2.36E-10	3.16E-01
	Construction	A5	MND	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	3.35E-01	4.34E+01	1.68E-09	3.15E-08	9.46E+00
	Transport	C2	1.07E-04	1.66E-02	4.58E-13	1.81E-11	2.43E-02
	Waste processing	C3	4.29E-01	5.57E+01	2.15E-09	4.04E-08	1.21E+01
	Disposal	C4	7.05E-02	1.00E+01	2.55E-10	6.60E-09	3.33E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-4.96E+00	-3.97E+03	-8.14E-07	-2.99E-06	-4.63E+02

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

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	1.96E+02	0.00E+00	1.96E+02	3.23E+03	0.00E+00	3.23E+03
	Transport	A2	1.35E+00	0.00E+00	1.35E+00	1.15E+02	0.00E+00	1.15E+02
	Manufacturing	A3	1.23E+01	0.00E+00	1.23E+01	1.52E+02	1.06E-02	1.52E+02
	Total (of product stage)	A1-3	2.10E+02	0.00E+00	2.10E+02	3.50E+03	1.06E-02	3.50E+03
Construction process stage	Transport	A4	3.51E-03	0.00E+00	3.51E-03	2.71E-01	0.00E+00	2.71E-01
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	4.16E-01	0.00E+00	4.16E-01	7.28E+01	0.00E+00	7.28E+01
	Transport	C2	2.70E-04	0.00E+00	2.70E-04	2.08E-02	0.00E+00	2.08E-02
	Waste processing	C3	5.33E-01	0.00E+00	5.33E-01	9.33E+01	0.00E+00	9.33E+01
	Disposal	C4	1.35E-01	0.00E+00	1.35E-01	1.56E+01	0.00E+00	1.56E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.19E+01	0.00E+00	-5.19E+01	-1.42E+03	0.00E+00	-1.42E+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

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	6.70E-02	0.00E+00	0.00E+00	3.79E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	1.25E-02
	Manufacturing	A3	3.35E-02	4.29E-05	0.00E+00	1.85E-02
	Total (of product stage)	A1-3	1.01E-01	4.29E-05	0.00E+00	3.83E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	3.28E-05
	Construction	A5	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	2.85E-02	0.00E+00	0.00E+00	4.24E-03
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.52E-06
	Waste processing	C3	3.65E-02	0.00E+00	0.00E+00	5.43E-03
	Disposal	C4	2.42E-04	0.00E+00	0.00E+00	1.70E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-1.10E+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	7.20E+01	5.07E+02	8.48E-03
	Transport	A2	1.31E-01	1.98E+00	6.17E+02
	Manufacturing	A3	1.67E-01	1.90E+00	9.43E-04
	Total (of product stage)	A1-3	7.23E+01	5.10E+02	6.17E+02
Construction process stage	Transport	A4	2.91E-04	5.05E-03	1.85E+00
	Construction	A5	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	9.74E-02	6.85E-01	5.12E-04
	Transport	C2	2.24E-05	3.89E-04	1.42E-01
	Waste processing	C3	1.25E-01	8.77E-01	6.56E-04
	Disposal	C4	1.65E-02	2.33E-01	1.04E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.62E+01	-2.37E+02	-2.67E-03

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	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	7.42E-04	3.16E-07	3.42E-02	0.00E+00	0.00E+00
	Total (of product stage)	A1-3	0.00E+00	7.42E-04	3.16E-07	3.42E-02	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MNR	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR	MNR
	Replacement	B4	MNR	MNR	MNR	MNR	MNR	MNR
	Refurbishment	B5	MNR	MNR	MNR	MNR	MNR	MNR
	Operational energy use	B6	MNR	MNR	MNR	MNR	MNR	MNR
	Operational water use	B7	MNR	MNR	MNR	MNR	MNR	MNR
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	9.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

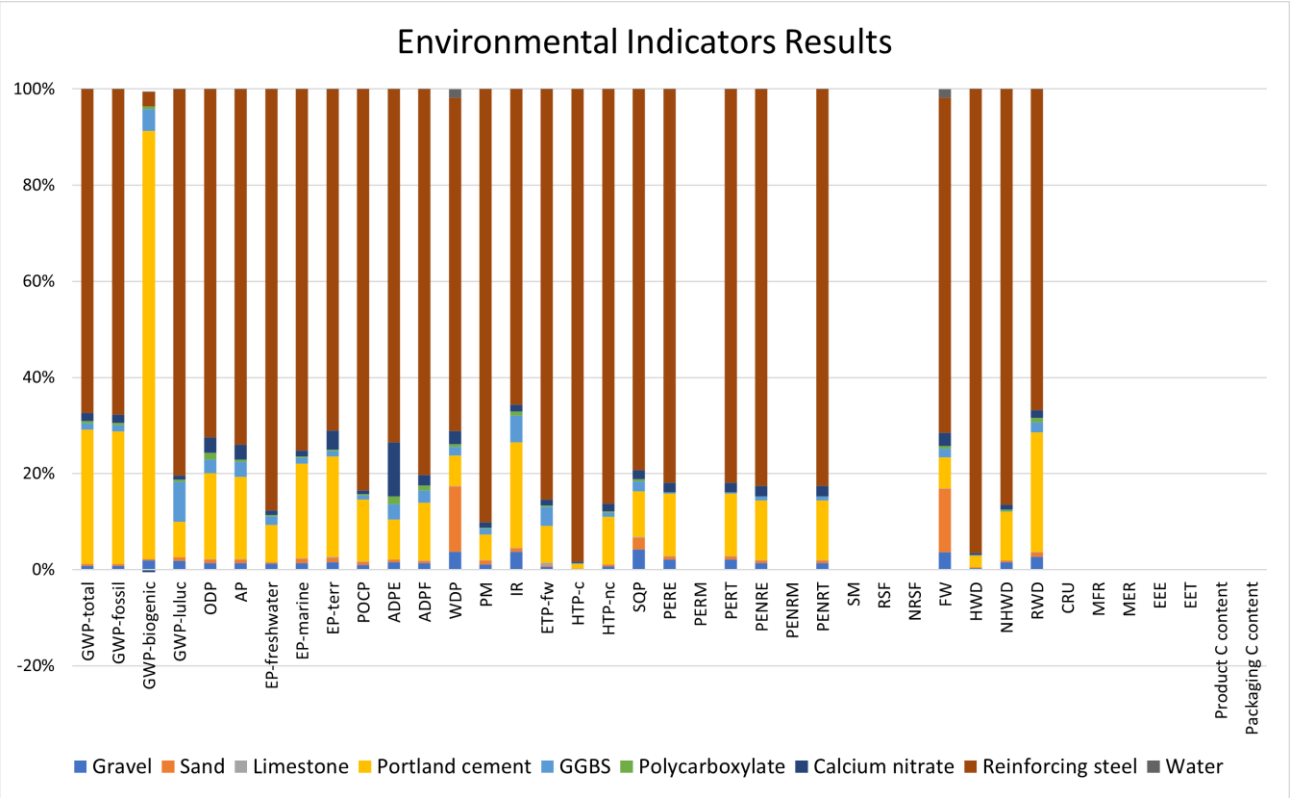
Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	The product will go to 3 sites for which the average distance has been used.		
	Fuel type / Vehicle type	Litre of fuel type per distance or vehicle type	Lorry >32t
	Distance:	km	179
	Capacity utilisation (incl. empty returns)	%	50
	Bulk density of transported products	kg/m^3	2550
A5 – Installation in the building	MND		
B2 – Maintenance	Once installed the panel does not require maintenance. Therefore, this module is not relevant (MNR).		
B3 – Repair	Once installed the panel does not require repair. Therefore, this module is not relevant (MNR).		
B4 – Replacement	Once installed the panel does not require replacement. Therefore, this module is not relevant (MNR).		
B5 – Refurbishment	Once installed the panel does not require refurbishment. Therefore, this module is not relevant (MNR).		
Reference service life	Description of scenario		
B6 – Use of energy; B7 – Use of water	Once installed the Hollowcore flooring slab does not require energy or water. Therefore, this module is not relevant (MNR).		
C1 to C4 End of life,	At the end of life, the concrete products are deconstructed using heavy machinery, placed onto trucks, and transported to the relevant waste processing sites. At the site the waste undergoes crushing to prepare it for disposal where it is assumed that 90% of the waste is recycled and 10% is landfilled.		
C1 – End-of-life deconstruction	Diesel for deconstruction	kg	1.2
C2 – End-of-life transport	Transport of waste to processing site	km	15
C3 – End-of-life processing	Diesel for crushing	kg	0.688
C4 – End-of-life disposal	10% steel to landfill	kg	8.3
C4 – End-of-life disposal	10% construction to landfill	kg	91.7
Module D	As mentioned, 90% of the waste is assumed to be recycled		
	90% steel recovered for recycling	Kg	74.7
	90% concrete recovered for recycling	Kg	825.3

Interpretation

Out of the total mass of input materials, averagely, gravel makes up 33%, followed by sand of 32%, Poland cement makes up 11%, reinforcing steel makes up 11%, GGBS makes up 6%, water, limestone and other additives make up the remaining of 7%. The bulk of the environmental impacts and primary energy demand are attributed to the manufacturing phase, covered by information modules A1-A3 of EN15804:2012+A2:2019.

As a result, reinforcing steel ranks first in terms of overall environmental impacts and is responsible for the greatest impact on all indicators except GWP-biogenic. Portland cement ranks second in terms of overall environmental impacts and is responsible for the greatest impact on GWP-biogenic.



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