Statement of Verification

BREG EN EPD No.: 000387 Issue 03

This is to verify that the

Environmental Product Declaration

provided by:

GCP Applied Technologies

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1m2 of Bituthene® 3000 and Bituthene® 3000 LT waterproofing membrane products installed over a 100-year period.

Company Address

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Signed for BRE Global Ltd	Hayley Thomson Operator	27 November 2025 Date of this Issue
05 November 2021 Date of First Issue		26 November 2030 Expiry Date

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Environmental Product Declaration

EPD Number: **000387**

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019.
Commissioner of LCA study	**LCA consultant/Tool**
GCP Applied Technologies 487/488 Ipswich Road Slough Berkshire SL1 4EP	Bala Subramanian / BRE LINA A2
Functional Unit	**Applicability/Coverage**
1m^2 of Bituthene® 3000 and Bituthene® 3000 LT waterproofing membrane products installed over a 100-year period.	Product Average.
EPD Type	**Background database**
Cradle to Grave	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: Francis Yu
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)

350 Magnolia Drive
Mt. Pleasant, Tennessee 38474
USA

Construction Product:

Product Description

Bituthene® is a flexible waterproof membrane combining a high performance cross laminated, HDPE carrier film with a unique super sticky self-adhesive rubber bitumen compound. Bituthene® is used to waterproof the exterior structures under backfill materials. This EPD covers the Bituthene® 3000 and Bituthene® 3000 LT. The results are based on a production-weighted average, as all products share a similar composition and are manufactured using the same process.

Technical Information

Property	Bituthene® 3000 and Bituthene® 3000 LT Value, Unit
Visible defects (EN1850-2)	None
Straightness (EN1848-2)	Pass
Length (EN1848-2)	20.15 m ± 0.15
Thickness (EN1849-2)	1.52 mm ± 0.08
Width Carrier Sheet (EN1848-2)	0.987 mm ± 0.007
Width Overall (roll) (EN1848-2)	1.000 m ± 0.010
Mass per unit area net of release paper (EN1849-2)	1.5 kg/m^2 ± 90 max
Water tightness to liquid water (at 60 kPa) (EN1928)	Pass
Resistance to impact (Al board) (EN12691)	≥ 150 mm
Resistance to tearing (Nail Shank)- unreinforced sheets (EN12310-1)	≥ 120 N
Joint strength (EN12317-2)	≥ 150 N/50mm
Water vapour transmission (EN1931)	110.000 μ (= sD/d) ± 30%

Property	Bituthene® 3000 and Bituthene® 3000 LT Value, Unit
Durability of water tightness against ageing/degradation (at 60 kPa) (EN1296 / EN1928 Method B)	Pass
Durability of water tightness against chemicals (at 60 kPa) (EN 1847 Method B / EN 1928 Method B)	Pass
Durability of tensile properties against chemicals (EN13967 Annex C)	Pass
Compatibility with bitumen (EN1548)	Pass
Resistance to static loading (EN12730)	≥ 20 - Pass
Tensile properties – unreinforced sheets (EN 12311-2 Method A)	Longitudinal ≥ 200 N/50mm Transversal ≥ 240 N/50mm
Tensile properties – unreinforced sheets - elongation (%) (EN 12311-2 Method A)	Longitudinal ≥ 270% Transversal ≥ 220%
Reaction to fire (Class; test conditions) (EN 13501-1)	E

Note: The above technical properties are applicable to all the products covered in this EPD. For more information please see - https://gcpat.uk/en-gb/solutions/products/bituthene-post-applied-waterproofing#products-amp-accessories or please contact the GCP technical team.

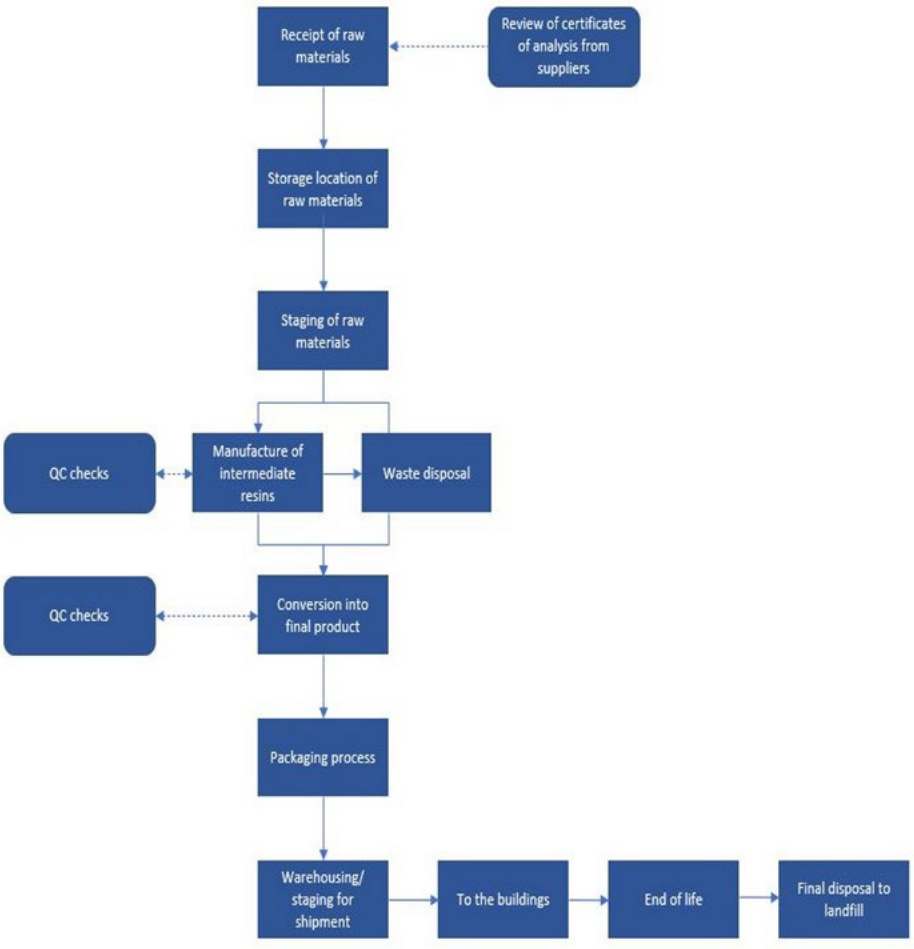
Main Product Contents

Bituthene® Material/Chemical Input	%
Bitumen	50-60
Rubber	10-20
Petroleum distillate	10-20
HDPE and other	5-10
Paper	5-10
Note: The above main product contents are same for all the products covered in this EPD	

Manufacturing Process

Heated adhesive is coated onto a film. A release liner/protective coating is applied, and the product is cut to length, rolled and boxed for shipment.

Process flow diagram



Construction Installation

Prior to beginning application of Bituthene® membranes, all surfaces must be inspected to assure that they are free of frost, or condensation. Internal and external corners, penetrations and other “special” areas need to be fully detailed in accordance with GCP drawings and specifications with Bituthene primer in advance of placement of Bituthene® membranes. After completion of the surface preparation and detailing, Bituthene® membranes shall be laid by peeling back the protective release paper and applying the adhesive face onto the prepared surface.
Adjacent rolls are aligned using printed lines and overlapped 50 mm minimum at side and ends and well rolled with a firm pressure, using a lap roller to ensure complete adhesion and continuity between the layers. On high walls it may be necessary to batten fix the membrane to prevent slippage. Once the membrane is applied, cover with a protection board as soon as possible. On “green” concrete or damp surfaces, cover the membrane immediately.

Use Information

Bituthene® membrane is a flexible waterproof membrane combining a high performance cross laminated, HDPE carrier film with a unique super sticky self-adhesive rubber bitumen compound. The membrane, installed on the wall's surface, bonds with the structure, and protects it from the below ground water. If the Bituthene® system is properly and correctly installed as per GCP instructions, no maintenance, repair or replacement is required during the service life of the structure. The highly durable, robust, and extremely reliable feature of the Bituthene® system will limit any repair work to a minimum, if membrane damage occurs. The fully bonded membrane will prevent any water migration and between membrane and the concrete structure in the event of puncturing or damaging the membrane. Thus, no scenario for repair work is defined. .

End of Life

When a building is demolished at the end of its service life, the Bituthene® membrane system bonded to the concrete cannot be separated and remains part of the construction rubble. This is in general taken to landfill. Bituthene® membrane is only a minor part of the whole volume during demolition of the concrete structure. Therefore, no other steps are considered as necessary with the exception for a transportation to a landfill. If the client and wrecking contractor are required according to local regulations to separate the demolished concrete from steel reinforcement and other embedded items, the Bituthene® will remain bonded to the concrete, which can be grinded to smaller concrete particles and used as backfilling material or substrate in other construction work.

Life Cycle Assessment Calculation Rules

Declared unit description.

1m^2 of Bituthene® 3000 and Bituthene® 3000 LT waterproofing membrane products installed over a 100-year period.

System boundary

This is a cradle to grave LCA of GCP's Bituthene® 3000 and Bituthene® 3000 LT waterproofing membrane products, manufactured by GCP in the United States and distributed in the UK. It follows the modular design defined in EN 15804:2012+A2:2019 and BRE PCR EN 15804+A2 PN 514 Rev 3.1 which covers product stage impacts (A1 to A3), construction/installation (A4 to A5), Use stage (B1-B7) and End of life modules (C1-C4), and module D.

Data sources, quality and allocation

The LCA analysis has been conducted for 1 m² of Bituthene® 3000 and Bituthene® 3000 LT waterproofing membrane products, with a manufactured weight of 1.8 kg/m² based on the average production quantity. Therefore, the average results are included in this EPD.

Manufacturer-specific data from GCP covering a production period from 1st January to 30th April 2021 has been used for this EPD. Only four months of production data was used for the LCA modelling due to limited data availability and the manufacturer has confirmed that the manufacturing process and the electricity used for the manufacturing remains the same. Figures for input materials and packaging were uplifted to account for production waste.

GCP manufacture other products at the Mt. Pleasant site. Allocation by mass has been used to calculate the input energy flows (electricity and natural gas), packaging, ancillary, emissions to air and water and waste flows per selected products according to the provisions of the BRE PCR PN514 and EN 15804+A2. Product formulations including ancillary and packaging data were combined with allocated manufacturing data to calculate the cradle to gate (A1-A3) LCA profiles for the Bituthene® products. Since all the products have the same weight per square metre, a production weighted average has been calculated for all entries. Bituthene® 3000 and Bituthene® 3000 LT products form 10.7% of total production at the site. The difference in weight between manufactured and installed weights is due to the release paper being removed during installation. During the LCA modelling, some datasets were not available in ecoinvent 3.8; therefore, suitable proxy datasets were used. The product production output is higher than the raw material input; however, the values are within an acceptable range. To balance the figures, the input entries have been adjusted upwards.

All data for modules A4 to C4 has been supplied by GCP. The waste created at installation is assumed to go to landfill. The Bituthene® products at end of life are assumed to go to landfill. The scenario of transport to a landfill site in South London from an installation in the centre of London has been assumed for both installation and end of life phases. Bituthene primer is used for the installation of the membrane.

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 EN15804 A2.

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).	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Country specific datasets have been selected from the ecoinvent LCI for this LCA. Manufacturer uses the national grid electricity and natural gas for production; therefore, the national grid electricity and natural gas (RoW) dataset has been from Ecoinvent 3.8 for the LCA modelling. The GWP carbon footprint for using 1 kWh of Electricity – US consumption mix is 0.549 in kgCO2e/kWh and the GWP carbon footprint for using 1kWh of Natural gas (RoW) is 0.256 kgCO2e/kWh. The quality level of time representativeness is also Very 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.

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, and direct emissions to air have been included. Direct emissions to water and soil have not been included as these are not measured.

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	2.94E+00	2.38E+00	-6.99E-01	1.25E+00	1.13E-06	1.66E-02	6.60E-04
	Transport	A2	1.96E-01	1.96E-01	1.62E-04	9.42E-05	4.30E-08	1.07E-03	1.50E-05
	Manufacturing	A3	3.19E-01	4.95E-01	-1.80E-01	1.22E-03	4.04E-08	2.04E-03	3.63E-04
	Total	A1-3	3.45E+00	3.08E+00	-8.79E-01	1.25E+00	1.21E-06	1.97E-02	1.04E-03
Construction process stage	Transport	A4	4.15E-01	4.15E-01	2.45E-04	2.01E-04	9.23E-08	4.87E-03	2.32E-05
	Construction	A5	7.60E-01	6.71E-01	5.82E-02	3.14E-02	5.80E-08	3.34E-03	3.65E-05
Use stage	Use	B1	0.00E+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
Product end of life 100% Landfill									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.10E-03	2.09E-03	1.79E-06	8.22E-07	4.85E-10	8.50E-06	1.35E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.11E-01	2.11E-01	1.36E-04	2.16E-05	5.80E-09	1.73E-04	3.17E-06
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	-8.15E-02	-1.16E-01	3.61E-02	-6.69E-04	-1.31E-08	-6.06E-04	-6.01E-05

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)

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

Parameters describing environmental impacts									
			EP-marine	EP-terrestrial	POCP	ADP-mineral &metals	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	5.65E-03	2.84E-02	1.20E-02	2.59E-05	9.89E+01	1.19E+00	1.51E-07
	Transport	A2	3.76E-04	4.11E-03	1.18E-03	6.93E-07	2.87E+00	1.46E-02	1.80E-08
	Manufacturing	A3	9.12E-04	5.43E-03	1.47E-03	1.53E-06	7.40E+00	1.80E-01	2.31E-08
	Total	A1-3	6.93E-03	3.79E-02	1.47E-02	2.81E-05	1.09E+02	1.38E+00	1.92E-07
Construction process stage	Transport	A4	1.27E-03	1.40E-02	3.82E-03	1.21E-06	6.01E+00	2.40E-02	2.96E-08
	Construction	A5	7.97E-04	7.80E-03	2.77E-03	1.06E-06	2.04E+01	3.55E-01	3.05E-08
Use stage	Use	B1	0.00E+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
Product end of life 100% Landfill									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.56E-06	2.80E-05	8.57E-06	7.28E-09	3.17E-02	1.42E-04	1.81E-10
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	3.85E-03	6.25E-04	2.24E-04	6.70E-08	4.60E-01	2.04E-02	3.27E-09
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	-2.83E-04	-1.72E-03	-3.77E-04	-4.90E-07	-1.70E+00	-6.68E-02	-8.69E-09

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)

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

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	4.34E-01	7.96E+01	1.82E-09	3.95E-08	7.51E+01
	Transport	A2	1.47E-02	2.37E+00	9.44E-11	2.39E-09	1.94E+00
	Manufacturing	A3	9.06E-02	7.85E+00	2.77E-10	4.42E-09	3.92E+01
	Total	A1-3	5.39E-01	8.98E+01	2.19E-09	4.64E-08	1.16E+02
Construction process stage	Transport	A4	3.00E-02	4.45E+00	1.83E-10	4.31E-09	3.34E+00
	Construction	A5	2.25E-02	3.84E+00	3.31E-10	3.32E-09	3.89E+00
Use stage	Use	B1	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
	Repair	B3	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
	Refurbishment	B5	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
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Product end of life 100% Landfill							
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.63E-04	2.47E-02	8.00E-13	2.59E-11	2.18E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.24E-03	9.62E-01	1.54E-11	4.08E-10	1.07E+00
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	-1.71E-02	-2.16E+00	-5.73E-11	-1.32E-09	-4.59E+00

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)

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

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.01E+01	4.63E+00	1.47E+01	5.24E+01	4.65E+01	9.89E+01
	Transport	A2	3.28E-02	0.00E+00	3.28E-02	2.29E+00	0.00E+00	2.29E+00
	Manufacturing	A3	2.62E+00	4.16E+00	6.78E+00	2.74E-01	2.85E+00	3.12E+00
	Total	A1-3	1.28E+01	8.79E+00	2.15E+01	5.50E+01	4.93E+01	1.04E+02
Construction process stage	Transport	A4	7.42E-02	0.00E+00	7.42E-02	5.90E+00	0.00E+00	5.90E+00
	Construction	A5	-1.83E+00	2.45E+00	6.14E-01	8.64E+00	1.14E+01	2.00E+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
Product end of life 100% Landfill								
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	4.46E-04	0.00E+00	4.46E-04	3.11E-02	0.00E+00	3.11E-02
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	9.43E-03	0.00E+00	9.43E-03	-5.50E+01	5.54E+01	4.53E-01
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	3.88E-01	-1.39E+00	-1.00E+00	-1.63E+00	-1.13E-02	-1.65E+00

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)

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

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	4.54E-03	0.00E+00	0.00E+00	2.84E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	3.62E-04
	Manufacturing	A3	1.09E-01	0.00E+00	0.00E+00	4.41E-03
	Total	A1-3	1.14E-01	0.00E+00	0.00E+00	3.31E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	5.94E-04
	Construction	A5	2.85E-03	0.00E+00	0.00E+00	8.30E-03
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
Product end of life 100% Landfill						
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	3.53E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.59E-04	0.00E+00	0.00E+00	4.79E-04
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	-1.07E-01	0.00E+00	0.00E+00	-1.61E-03

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)

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

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.41E-01	2.41E+00	4.90E-04
	Transport	A2	2.57E-03	4.56E-02	1.26E-01
	Manufacturing	A3	1.83E-02	5.11E-01	8.58E-06
	Total	A1-3	1.62E-01	2.97E+00	1.27E-01
Construction process stage	Transport	A4	6.96E-03	1.05E-01	4.09E-05
	Construction	A5	1.01E-02	1.67E-01	3.18E-03
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
Product end of life 100% Landfill					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.49E-05	6.20E-04	2.14E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	9.68E-04	1.82E+00	2.70E-06
Potential benefits and loads beyond the system boundaries	Packaging waste recycling/incineration benefits	D	-5.84E-03	-2.13E-01	-5.80E-06

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

LCA Results (continued)

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

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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.28E-01
	Total	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.28E-01
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	0.00E+00	2.13E-01	2.00E-03	0.00E+00	2.40E-02	4.57E-02
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
Product end of life 100% Landfill								
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	0.00E+00	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	Packaging waste recycling/incineration benefits	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

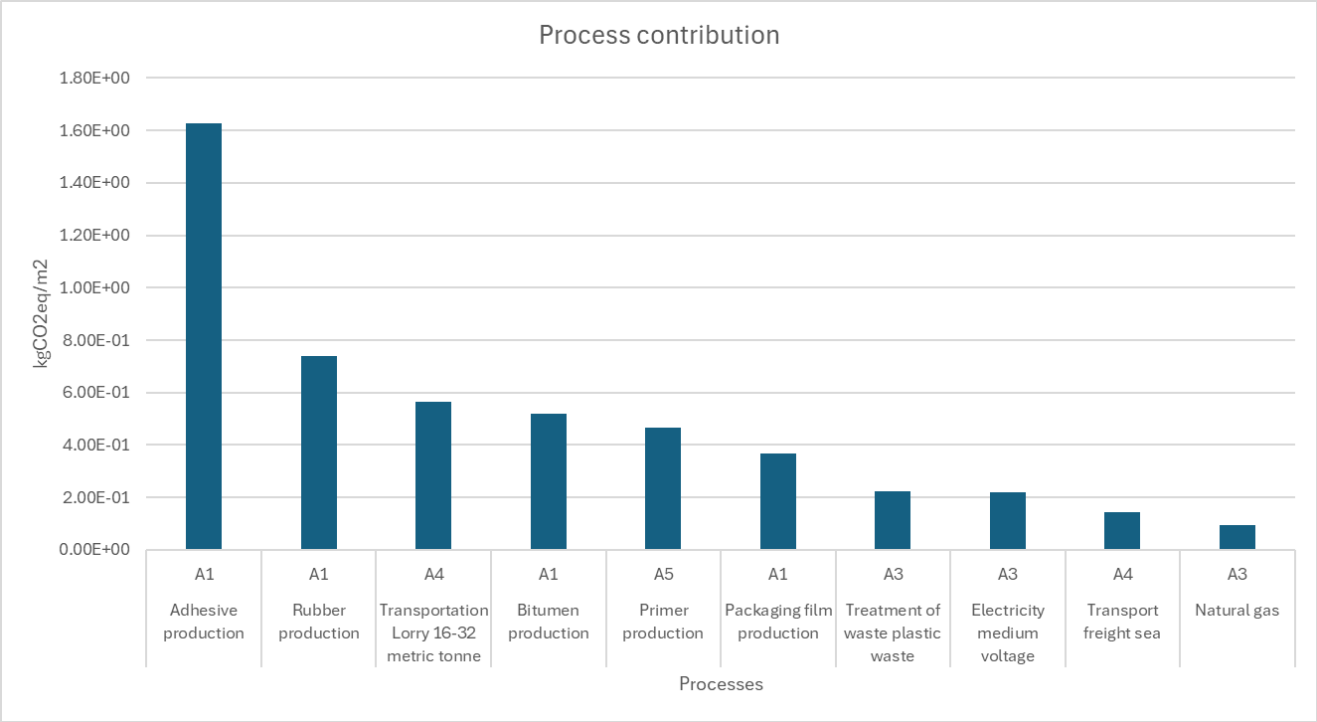
Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Distances from US plant to UK distribution		
	Diesel/ 16-32 t lorry	Kg/vkm	0.3
	Distance:	km	1012.3
	Capacity utilisation (incl. empty returns)	%	24
	Ship distance by sea	km	6614.4
	Ship capacity utilisation (incl. empty returns)	%	65
	Weight of transported products	kg per roll	36
A5 – Installation in the building	Prior to beginning application of Bituthene® membranes, all surfaces must be inspected to assure that they are free of frost, or condensation. Internal and external corners, penetrations and other “special” areas need to be fully detailed in accordance with GCP drawings and specifications with Bituthene® LM (E) in advance of placement of Bituthene® membranes. After completion of the surface preparation and detailing, Bituthene® membranes shall be laid by peeling back the protective release paper and applying the adhesive face onto the prepared surface. Adjacent rolls are aligned using printed lines and overlapped 50 mm minimum at side and ends and well rolled with a firm pressure, using a lap roller to ensure complete adhesion and continuity between the layers. On high walls it may be necessary to batten fix the membrane to prevent slippage. Once the membrane is applied, cover with a protection board as soon as possible. On “green” concrete or damp surfaces, cover the membrane immediately. Cutting waste and loss of material, between 1 - 2.5%, depending on geometry of building structure and necessary detailing. For this analysis, the cutting waste of 2.5% has been taken as a representative.		
	Installation wastage rate	%	2.5
	Bituthene Primer	kg	0.26
	Transport of Bituthene Primer to installation	km	1012.3
	Transport to installation: Diesel/ 16-32 t lorry	kg/vkm	0.3
	Capacity utilisation (incl. empty returns)	%	26
	Transport of installation waste to landfill: Diesel/ 16-32 t lorry	kg/vkm	0.3
	Distance	km	7
	Capacity utilisation (incl. empty returns)	%	24

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
B1 - Use B2 – Maintenance B3 – Repair B4 – Replacement B5 – Refurbishment	Bituthene® membrane is a flexible waterproof membrane combining a high performance cross laminated, HDPE carrier film with a unique super sticky self-adhesive rubber bitumen compound. The membrane, installed on the wall's surface, bonds with the structure, and protects it from the below ground water. If the Bituthene® system is properly and correctly installed as per GCP instructions, no maintenance, repair, or replacement is required during the service life of the structure. The highly durable, robust, and extremely reliable feature of the Bituthene® system will limit any repair work to a minimum, if membrane damage occurs. The fully bonded membrane will prevent any water migration and between membrane and the concrete structure in the event of puncturing or damaging the membrane. Thus, no scenario for repair work is defined.		
Reference service life	According to the BBA Agrement Certificate 97/3325 the service life for the Bituthene® system is stated for the lifetime of the structure. Bituthene® is based on a highly durable HDPE carrier film with lifetime expectations > 100 years in service. Therefore, at least a 100-year building service life can be assumed.		
C1 - Deconstruction	When a building is demolished at the end of its service life, the Bituthene system bonded to the concrete cannot be separated and remains part of the construction rubble. This is in general taken to landfill. Bituthene is only a minor part of the whole volume during demolition of the concrete structure. Therefore, no other steps are considered as necessary with the exception for a transportation to a landfill. It is assumed as a 100% recovery from the demolition site. If the client and demolition contractor are required according to local regulations to separate the demolished concrete from steel reinforcement and other embedded items, the Bituthene will remain bonded to the concrete, which can be grinded to smaller concrete particles and used as backfilling material or substrate in other construction work.		
C2- Transport	Distance calculated is 7Km based on distance of a middle-sized landfill from the Centre of London (where major projects are).		
	Diesel/ 16-32 t lorry	Kg/vkm	0.3
	Distance	km	7
	Capacity utilisation (incl. empty returns)	%	26
C3 – Preprocessing	The worst-case end of life scenario has been assumed i.e., 100% of the product waste will be landfilled at the end of life without any pre-processing. Therefore, no impacts on C3 and module D benefits.		
C4 – Disposal	100% of the Bituthene product presumed to be landfilled	Kg/m^2	1.8
Module D	100% of the product will be landfilled therefore no Module D benefits The Module D benefits beyond the system boundaries have been calculated based on the packaging waste recycled/incinerated at the construction site during product installation.		
	Cardboard waste to recycling	kg	0.049
	Carton waste to recycling	kg	0.06
	Wood waste to incineration	kg	0.049
	Plastic waste to incineration	kg	0.002

Interpretation of results

The majority of environmental impacts are attributed to the manufacturing of all systems covered by information modules A1-A3 of EN15804:2012+A2:2019. The below chart illustrates the average Global Warming Potential (GWP) in kg CO_2 equivalent per square meter for various processes. Adhesive production (A1), Bitumen production (A1), and rubber production (A1) has the most contributing emissions in the A1 - modules. Other notable contributors include freight transport by lorry (A4), and packaging film production (A3). Processes such as waste treatment, electricity use, and sea freight transport contribute the least to GWP, all below 0.3 kg CO_2e/m². Overall, the A1 stage (raw material extraction and production) dominates the carbon footprint, especially due to energy-intensive chemical processes.



References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A2:2019. London, BSI, 2019.

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.

EN 1849-2:2019 Flexible sheets for waterproofing - Determination of thickness and mass per unit area - Part 2: Plastics and rubber sheets for roof waterproofing

BS EN 1928:2000 Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of watertightness

BS EN 1928:2000 Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of watertightness

EN 12691:2018 Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of resistance to impact

BS EN 12310-1:2000 Flexible sheets for waterproofing. Determination of resistance to tearing (nail shank) - Bitumen sheets for roof waterproofing

EN 12317-2:2010 Flexible sheets for waterproofing - Determination of shear resistance of joints - Part 2: Plastic and rubber sheets for roof waterproofing

BS EN 1931:2000 Flexible sheets for waterproofing. Bitumen, plastic, and rubber sheets for roof waterproofing. Determination of water vapour transmission properties (British Standard)

EN 1296:2000 Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roofing - Method of artificial ageing by long term exposure to elevated temperature

EN 1548:2007 Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Method for exposure to bitumen

BS EN 12730:2015 Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of resistance to static loading

BS EN 12311-2:2013 Flexible sheets for waterproofing. Determination of tensile properties Plastic and rubber sheets for roof waterproofing

BS EN 12311-2:2013 Flexible sheets for waterproofing. Determination of tensile properties Plastic and rubber sheets for roof waterproofing

BS EN 13501-1:2018 Fire classification of construction products and building elements - Classification using data from reaction to fire tests

BS EN 1850-2:2001. Flexible sheets for waterproofing. Determination of visible defects - Plastic and rubber sheets for roof waterproofing.

BS EN 1848-2:2001. Flexible sheets for waterproofing. Determination of length, width and straightness - Plastic and rubber sheets for roof waterproofing.

BS EN 1847:2009. Flexible sheets for waterproofing. Plastics and rubber sheets for roof waterproofing. Methods for exposure to liquid chemicals, including water.

BS EN 13967:2012+A1:2017. Flexible sheets for waterproofing. Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet. Definitions and characteristics.