Statement of Verification

BREG EN EPD No.: 000614 Issue 01

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 Decseal or Safetrack SC waterproofing membrane system

Company Address

measurable. energy HQ,
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Fountain House,
2 Queens Walk,
Reading

gcp applied technologies

Signed for BRE Global Ltd	Emma Baker Operator	15 July 2024 Date of this Issue
15 July 2024 Date of First Issue		14 July 2029 Expiry Date

Environmental Product Declaration

EPD Number: 000614

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, Gate Street, Dukinfield, SK16 4RU	Bala Subramanian/ BRE LINA A2
Declared/Functional Unit	**Applicability/Coverage**
1m^2 of Decseal or Safetrack SC waterproofing membrane system	Other (please specify). 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: Jiacheng (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)

GCP Applied Technologies,
Gate Street,
Dukinfield,
SK16 4RU

Construction Product:

Product Description

GCP Applied Technologies offers a range of waterproofing, wearing course, and coloured surfacing solutions for applications including Car Parks, Bus & Bike lanes, and other applications where coloured demarcation may be required. This product range is based on GCP Applied Technologies' unique ESSELAC(R) advanced resin technology and includes:

DECSEAL®: A rapid curing, liquid applied car park coating. It can be applied as a full system, comprising both waterproofing and a wearing course, or as a wearing course only. The components of the system include PAR1 primer, DECSEAL waterproofing membrane and DECSEAL wearing course. The system may also be partially or fully reinforced depending on the specific design/requirements of the car park being treated.

SAFETRACK® SC: a fast curing, UV stable coating supplied in a range of vibrant colours to provide a highly visible, slip resistant demarcation system.

SAFETRACK® SC is available with a choice of two encapsulated aggregates and can be applied to both asphalt and concrete. It is the ideal coating for a variety of trafficked and pedestrian areas including:

- Retail parks
- Traffic calming & ghost isles.
- Cycle and bus routes
- Walkways
- Village Gateways, Congestion Charge Zones
- Parking Bays, , surface carparks.

This is the system EPD in which Decseal Reinforced, Decseal Unreinforced, Decseal Wearing Course, and Safetrack SC systems have been modelled.

Technical Information

Property	Value
Application Temperature Range	0 to 30°C
Minimum Overcoating times	
PAR1 Primer	
10°C	15 Minutes
0°C	30 Minutes
30°C	45 Minutes
DECSEAL® Membrane	
30°C	45 Minutes
10°C	90 Minutes
0°C	2 Hours
DECSEAL® Wearing Course	
30°C	20 Minutes
10°C	50 Minutes
0°C	60 Minutes
SAFETRACK® SC	
30°C	20 Minutes
10°C	50 Minutes
0°C	60 Minutes
Skid Resistance Value (TRL Pendulum)	Typically, 45 – 60 dependants on substrate profile

Note: Technical information for all the products assessed in this EPD.

Industry Standards:

DECSEAL® is CE Marked under EN 1504-2

Main Product contents

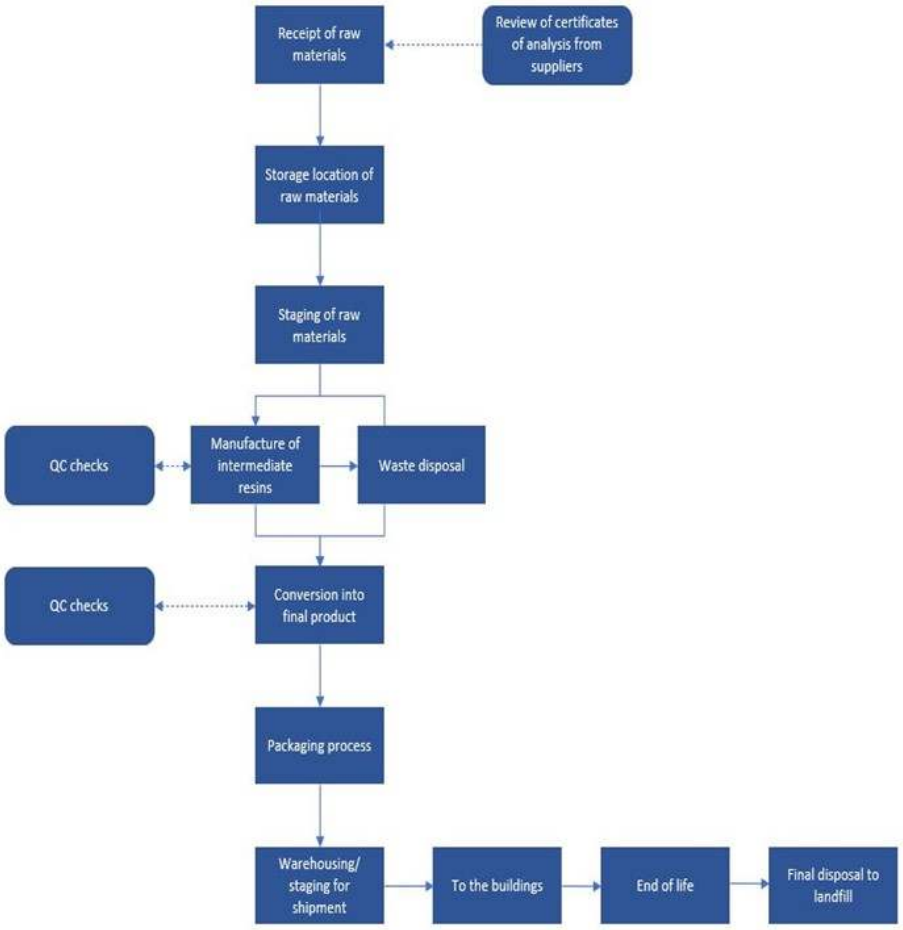
Material/Chemical Input	%
Organic liquids and powders	65-85
Aggregates and inorganic powders	15-35

Note: Main product content for all the products assessed in this EPD.

Manufacturing Process

Ingredients are mixed in a vessel to produce intermediate masterbatch formulations. Masterbatch formulations are then mixed with additional ingredients to produce end products.

Process flow diagram



Construction Installation

Primer:

Concrete substrates must be primed with PAR1 Primer. Steel substrates should be primed with ZED S94. Apply using a brush or roller. Further information is available on the relevant primer datasheets.

Waterproofing Membrane:

The DECSEAL® Membrane is metered, mixed and spray applied using plural component spray equipment.

Wearing Course:

Decseal Wearing Course and Safetrack SC consist of a liquid resin, a powder catalyst (BPO) and hardwearing aggregates, all supplied in pre-weighed quantities ready for on-site mixing. The resin contents of the kit should be stirred thoroughly using a mechanical stirrer, such as an air-driven drill (400-800rpm) fitted with a dedicated mortar mixing paddle. Some settlement may occur during storage and transportation so stirring should continue. until the mix is fully homogenised.

Immediately prior to use add the full bag of aggregate ensuring that it is thoroughly stirred in and wetted out. Then add the correct amount of BPO to the stirred contents of the kit and mix thoroughly using a mechanical stirrer until all the BPO has dispersed. Scrape round the sides and base of the drum to ensure thorough mixing. The lower the temperature the longer dispersion takes but is typically no more than one minute. Once the BPO

is added this initiate the 'working life' of the material during which time it should be applied. Do not add fresh material to partially cured material.

End of Life

C1- Deconstruction: The membrane lasts for the design life of the structure. Deconstruction of the system would only happen when structure is demolished, and it would stay bonded to the substrate. It is not removed separately. It can be safely assumed that the energy attributed to deconstructing the system compared to the overall demolition will be effectively negligible. As a result, no impacts are attributed to module C1. Removed membranes will be sent to the disposal unit, along with any attached substrate.

C2 – Transportation: 50km by road has been modelled for module C2 as a typical distance from the demolition site to the disposal unit. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.

C3 – Waste Processing: Membrane waste will be sent to disposal sector without any further processing therefore no impacts from C3.

C4 – Disposal: Membrane wastes are cured resins so they are considered as non-hazardous therefore it is assumed as 100% of the product waste will be landfilled at the end of life.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1m^2 of Decseal or Safetrack SC waterproofing membrane system

System boundary

This is a Cradle to Gate with C and D and Options EPD, reporting all production life cycle stages of modules A1 to A3, Construction and Installation A4-A5, and end of life stages C1-C4, and D in accordance with EN 15804:2012+A2:2019 and BRE 2023 Product Category Rules (PN 514 Rev 3.1).

Data sources, quality and allocation

In this EPD, the Decseal Reinforced, Decseal Unreinforced, Decseal Wearing course, and Safetrack SC have been modelled, and the results are enclosed. The design mix of all the four products is the same, and they will be mixed together along with the primer depending on the usage. Therefore, the results have been calculated for the generic composition of each system. Initially, the LCA analysis has been conducted for individual components keeping the declared unit as 1 kg and each system impacts have been calculated by multiplying the weight of each component that goes into the system and added them all to get the total result of the entire system.

For the Decseal Reinforced, the results have been calculated for 1 m2 with a membrane weight of 4.95 kg/m2, for the Decseal Unreinforced, the results have been calculated for 1 m2 with a weight of 3.75 kg/m2, and for the Decseal Wearing Course system, the results have been calculated for 1.95 kg/m2 and the Safetrack SC system the results have been calculated for 2 kg/m2. The composition of each system has been enclosed in this LCA analysis.

Each system is made up of a number of components and the quantity used in the data collection for all the components. In this EPD is the total quantity of each product manufactured as a proportion of the total manufacturing during the data collection period (01/01/2021 - 31/12/2021). Other products are manufactured in addition to all components therefore, the allocation of electricity and water consumption and discharge are required, and this has been done using ‘mass’ allocation according to the provisions of the BRE PCR PN514 and EN 15804. Upon the data review it was noted that the input quantity is less than the production output therefore the data uplift has been made. During the LCA modelling some of the chemical dataset was missing in the background database therefore the appropriate proxy dataset has been selected. Site wide values for

energy, water and wastewater have been taken from bills. Figures for the raw materials, ancillary materials, and packaging were from actual usages. 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).	n/a
Very Good	n/a	n/a	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European datasets have been selected from the ecoinvent LCI for this LCA. Manufacturer uses the national grid electricity for production, therefore the national grid electricity dataset “Electricity – GB (kWh)” has been used for the LCA modelling (Ecoinvent 3.8). The GWP carbon footprint for using 1 kWh of Electricity – GB is 0.311 in 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, have been included where appropriate, except for direct emissions to air, water, and soil, which are not measured

LCA Results: Decseal Reinforced with the coverage rate of 4.95 kg/m$^{2.}$

(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	1.98E+01	1.96E+01	1.77E-01	2.35E-03	3.98E-07	1.08E-01	1.78E-03
	Transport	A2	4.87E-01	4.87E-01	4.40E-04	1.95E-04	1.12E-07	2.00E-03	3.24E-05
	Manufacturing	A3	7.62E-01	7.18E-01	4.00E-02	6.94E-04	4.32E-08	2.80E-03	1.71E-04
	Total (Consumption grid)	A1-3	5.70E+00	5.67E+00	3.89E-02	1.43E-03	1.77E-07	3.01E-02	4.77E-04
Construction process stage	Transport	A4	1.23E+00	1.22E+00	1.18E-02	7.64E-04	9.84E-07	8.88E-03	2.78E-04
	Construction	A5	4.74E-01	4.67E-01	6.66E-03	3.55E-04	4.23E-07	3.76E-03	1.03E-04
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% - Landfill									
End of life	Deconstruction, demolition	C1	2.50E-02	2.49E-02	2.12E-05	9.78E-06	5.76E-09	1.01E-04	1.61E-06
	Transport	C2	1.62E-02	1.62E-02	1.38E-05	6.36E-06	3.74E-09	6.57E-05	1.04E-06
	Waste processing	C3	3.18E-02	3.15E-02	2.43E-04	3.21E-05	9.60E-09	2.66E-04	9.18E-06
	Disposal	C4	2.07E-02	2.05E-02	1.58E-04	2.09E-05	6.24E-09	1.73E-04	5.97E-06
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	0.00E+00

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 &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	2.01E-02	1.52E-01	6.84E-02	4.55E-05	3.27E+02	9.29E+00	1.45E-06
	Transport	A2	6.02E-04	6.60E-03	2.02E-03	1.69E-06	7.34E+00	3.38E-02	4.21E-08
	Manufacturing	A3	7.76E-04	7.13E-03	2.47E-03	3.40E-06	1.77E+01	3.62E-01	3.39E-08
	Total (Consumption grid)	A1-3	5.10E-03	4.33E-02	1.86E-02	1.30E-05	8.69E+01	2.00E+00	1.52E-06
Construction process stage	Transport	A4	1.70E-03	1.55E-02	5.20E-03	1.59E-05	1.90E+01	5.59E-01	2.27E-08
	Construction	A5	7.87E-04	7.19E-03	2.26E-03	5.79E-06	6.64E+00	1.57E-01	1.32E-07
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% - Landfill									
End of life	Deconstruction, demolition	C1	3.06E-05	3.33E-04	1.02E-04	8.67E-08	3.78E-01	1.70E-03	0.00E+00
	Transport	C2	1.99E-05	2.16E-04	6.63E-05	5.64E-08	2.46E-01	1.10E-03	3.55E-09
	Waste processing	C3	9.18E-05	9.99E-04	2.89E-04	1.03E-07	7.41E-01	3.33E-02	0.00E+00
	Disposal	C4	5.97E-05	6.49E-04	1.88E-04	6.71E-08	4.82E-01	2.16E-02	8.81E-09
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	0.00E+00

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	2.73E-01	4.78E+02	2.17E-08	3.59E-07	9.91E+00
	Transport	A2	3.81E-02	5.74E+00	1.88E-10	6.02E-09	5.05E+00
	Manufacturing	A3	3.03E-01	8.88E+00	2.51E-09	6.41E-09	4.49E+00
	Total (Consumption grid)	A1-3	6.13E-01	4.91E+02	2.44E-08	3.72E-07	1.94E+01
Construction process stage	Transport	A4	2.04E-02	3.11E+00	1.00E-10	3.26E-09	2.73E+00
	Construction	A5	9.19E-02	1.65E+03	1.56E-09	6.95E-08	4.26E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
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	3.20E-03	4.86E-01	1.57E-11	5.10E-10	4.27E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	5.79E-03	8.71E-01	3.75E-11	5.84E-10	2.93E+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

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	7.45E+00	0.00E+00	7.45E+00	2.45E+02	8.10E+01	3.25E+02
	Transport	A2	1.03E-01	0.00E+00	1.03E-01	7.16E+00	0.00E+00	7.16E+00
	Manufacturing	A3	1.40E+00	5.01E-01	1.90E+00	1.23E+01	5.08E+00	1.73E+01
	Total (Consumption grid)	A1-3	8.95E+00	5.01E-01	9.45E+00	2.64E+02	8.61E+01	3.50E+02
Construction process stage	Transport	A4	5.59E-02	0.00E+00	5.59E-02	3.91E+00	0.00E+00	3.91E+00
	Construction	A5	1.01E+00	5.01E-04	1.01E+00	1.66E+01	7.04E+00	2.37E+01
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	8.76E-03	0.00E+00	8.76E-03	6.09E-01	0.00E+00	6.09E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.98E-02	0.00E+00	1.98E-02	1.14E+00	0.00E+00	1.14E+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

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	1.34E-02	0.00E+00	0.00E+00	2.17E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	8.40E-04
	Manufacturing	A3	8.10E-02	0.00E+00	0.00E+00	8.76E-03
	Total (Consumption grid)	A1-3	9.44E-02	0.00E+00	0.00E+00	2.27E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	4.44E-04
	Construction	A5	8.16E-04	0.00E+00	0.00E+00	1.70E-02
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
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	6.93E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	1.30E-03
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

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	5.10E-01	5.36E+00	1.31E-04
	Transport	A2	8.04E-03	1.43E-01	4.94E-05
	Manufacturing	A3	7.41E-02	7.72E-01	8.08E-05
	Total (Consumption grid)	A1-3	5.92E-01	6.29E+00	2.61E-04
Construction process stage	Transport	A4	4.39E-03	7.77E-02	2.69E-05
	Construction	A5	1.45E-01	1.53E+00	1.61E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
100% - Landfill					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	6.83E-04	1.22E-02	4.21E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.26E-03	4.75E+00	6.96E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

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	3.29E-05	1.16E-06	1.79E-02	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	-3.06E-03
	Total (Consumption grid)	A1-3	0.00E+00	3.29E-05	1.16E-06	1.79E-02	0.00E+00	-3.06E-03
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	3.10E-01	1.16E-09	1.79E-05	0.00E+00	-3.06E-06
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	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

LCA Results: Decseal Un-reinforced with the coverage rate of 3.75 kg/m$^{2.}$

(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	1.40E+01	1.39E+01	1.16E-01	1.85E-03	2.81E-07	7.61E-02	1.23E-03
	Transport	A2	3.26E-01	3.26E-01	2.94E-04	1.31E-04	7.51E-08	1.35E-03	2.17E-05
	Manufacturing	A3	5.46E-01	5.12E-01	3.01E-02	5.10E-04	3.17E-08	1.98E-03	1.25E-04
	Total (Consumption grid)	A1-3	1.48E+01	1.47E+01	1.46E-01	2.49E-03	3.89E-07	7.93E-02	1.38E-03
Construction process stage	Transport	A4	2.00E-01	2.00E-01	1.70E-04	7.84E-05	4.61E-08	8.10E-04	1.29E-05
	Construction	A5	1.15E+00	1.13E+00	1.37E-02	7.89E-04	9.99E-07	8.83E-03	2.66E-04
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
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	3.12E-02	3.12E-02	2.66E-05	1.22E-05	7.20E-09	1.26E-04	2.01E-06
	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	3.98E-02	3.94E-02	3.04E-04	4.01E-05	1.20E-08	3.33E-04	1.15E-05
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	0.00E+00

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 &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	1.39E-02	1.07E-01	4.78E-02	3.18E-05	2.28E+02	6.33E+00	1.01E-06
	Transport	A2	4.04E-04	4.43E-03	1.35E-03	1.13E-06	4.91E+00	2.26E-02	2.82E-08
	Manufacturing	A3	5.52E-04	5.03E-03	1.71E-03	2.40E-06	1.25E+01	2.60E-01	2.39E-08
	Total (Consumption grid)	A1-3	1.48E-02	1.16E-01	5.07E-02	3.53E-05	2.45E+02	6.60E+00	1.06E-06
Construction process stage	Transport	A4	2.44E-04	2.66E-03	8.18E-04	6.94E-07	3.02E+00	1.36E-02	1.72E-08
	Construction	A5	1.73E-03	1.57E-02	5.12E-03	1.51E-05	1.71E+01	4.89E-01	9.71E-08
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
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	3.83E-05	4.16E-04	1.28E-04	1.08E-07	4.73E-01	2.12E-03	2.69E-09
	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	1.15E-04	1.25E-03	3.62E-04	1.29E-07	9.26E-01	4.16E-02	6.68E-09
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	0.00E+00

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	1.90E-01	3.16E+02	1.39E-08	2.39E-07	7.94E+00
	Transport	A2	2.55E-02	3.84E+00	1.26E-10	4.03E-09	3.38E+00
	Manufacturing	A3	2.28E-01	6.52E+00	2.28E-09	4.77E-09	3.38E+00
	Total (Consumption grid)	A1-3	4.43E-01	3.25E+02	1.63E-08	2.48E-07	1.47E+01
Construction process stage	Transport	A4	1.55E-02	2.36E+00	7.61E-11	2.47E-09	2.07E+00
	Construction	A5	6.51E-02	1.19E+03	1.12E-09	4.92E-08	3.21E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
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	2.42E-03	3.68E-01	1.19E-11	3.86E-10	3.24E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	4.39E-03	6.60E-01	2.84E-11	4.43E-10	2.22E+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

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	4.99E+00	0.00E+00	4.99E+00	1.70E+02	5.68E+01	2.27E+02
	Transport	A2	6.88E-02	0.00E+00	6.88E-02	4.80E+00	0.00E+00	4.80E+00
	Manufacturing	A3	1.04E+00	3.80E-01	1.42E+00	8.86E+00	3.30E+00	1.22E+01
	Total (Consumption grid)	A1-3	6.09E+00	3.80E-01	6.47E+00	1.84E+02	6.01E+01	2.44E+02
Construction process stage	Transport	A4	4.24E-02	0.00E+00	4.24E-02	2.96E+00	0.00E+00	2.96E+00
	Construction	A5	7.13E-01	3.80E-04	7.13E-01	1.09E+01	5.85E+00	1.68E+01
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	6.64E-03	0.00E+00	6.64E-03	4.61E-01	0.00E+00	4.61E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.48E-02	0.00E+00	1.48E-02	8.51E-01	0.00E+00	8.51E-01
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

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	1.01E-02	0.00E+00	0.00E+00	1.48E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	5.62E-04
	Manufacturing	A3	7.98E-02	0.00E+00	0.00E+00	6.28E-03
	Total (Consumption grid)	A1-3	8.99E-02	0.00E+00	0.00E+00	1.55E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	3.36E-04
	Construction	A5	6.39E-04	0.00E+00	0.00E+00	1.17E-02
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
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	5.25E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	9.83E-04
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

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	3.70E-01	4.09E+00	9.74E-05
	Transport	A2	5.38E-03	9.56E-02	3.31E-05
	Manufacturing	A3	5.88E-02	5.60E-01	6.04E-05
	Total (Consumption grid)	A1-3	4.34E-01	4.75E+00	1.91E-04
Construction process stage	Transport	A4	3.32E-03	5.89E-02	2.04E-05
	Construction	A5	1.06E-01	1.08E+00	1.61E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
100% - Landfill					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	5.18E-04	9.23E-03	3.19E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.68E-03	3.54E+00	5.18E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

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	3.00E-05	1.15E-06	1.59E-02	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	-2.29E-03
	Total (Consumption grid)	A1-3	0.00E+00	3.00E-05	1.15E-06	1.59E-02	0.00E+00	-2.29E-03
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	2.44E-01	1.15E-09	1.59E-05	0.00E+00	-2.29E-06
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	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

LCA Results: Decseal Wearing Course with the coverage rate of 1.95 kg/m$^{2.}$

(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	5.24E+00	5.21E+00	2.35E-02	1.10E-03	1.06E-07	2.84E-02	4.05E-04
	Transport	A2	8.47E-02	8.47E-02	7.42E-05	3.39E-05	1.95E-08	3.59E-04	5.54E-06
	Manufacturing	A3	2.22E-01	2.05E-01	1.52E-02	2.32E-04	1.45E-08	7.47E-04	5.58E-05
	Total (Consumption grid)	A1-3	5.54E+00	5.51E+00	3.87E-02	1.37E-03	1.40E-07	2.95E-02	4.67E-04
Construction process stage	Transport	A4	1.04E-01	1.04E-01	8.83E-05	4.08E-05	2.40E-08	4.21E-04	6.69E-06
	Construction	A5	4.74E-01	4.67E-01	6.66E-03	3.55E-04	4.23E-07	3.76E-03	1.03E-04
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
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	1.62E-02	1.62E-02	1.38E-05	6.36E-06	3.74E-09	6.57E-05	1.04E-06
	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	2.07E-02	2.05E-02	1.58E-04	2.09E-05	6.24E-09	1.73E-04	5.97E-06
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	0.00E+00

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 &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	4.59E-03	3.81E-02	1.71E-02	1.13E-05	7.88E+01	1.88E+00	3.43E-07
	Transport	A2	1.07E-04	1.17E-03	3.57E-04	2.94E-07	1.28E+00	5.81E-03	7.28E-09
	Manufacturing	A3	2.15E-04	1.88E-03	5.60E-04	8.85E-07	4.55E+00	1.06E-01	8.87E-09
	Total (Consumption grid)	A1-3	4.90E-03	4.12E-02	1.79E-02	1.24E-05	8.45E+01	1.99E+00	3.60E-07
Construction process stage	Transport	A4	1.27E-04	1.38E-03	4.25E-04	3.61E-07	1.57E+00	7.06E-03	8.95E-09
	Construction	A5	7.87E-04	7.19E-03	2.26E-03	5.79E-06	6.64E+00	1.57E-01	4.40E-08
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
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	1.99E-05	2.16E-04	6.63E-05	5.64E-08	2.46E-01	1.10E-03	1.40E-09
	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	5.97E-05	6.49E-04	1.88E-04	6.71E-08	4.82E-01	2.16E-02	3.47E-09
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	0.00E+00

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	6.61E-02	7.29E+01	2.16E-09	5.93E-08	4.99E+00
	Transport	A2	6.61E-03	9.99E-01	3.27E-11	1.04E-09	8.76E-01
	Manufacturing	A3	1.15E-01	2.97E+00	1.93E-09	2.30E-09	1.73E+00
	Total (Consumption grid)	A1-3	1.87E-01	7.69E+01	4.13E-09	6.26E-08	7.58E+00
Construction process stage	Transport	A4	8.05E-03	1.22E+00	3.96E-11	1.28E-09	1.08E+00
	Construction	A5	2.50E-02	5.09E+02	4.51E-10	1.88E-08	1.63E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
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	1.26E-03	1.91E-01	6.20E-12	2.01E-10	1.68E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.28E-03	3.43E-01	1.48E-11	2.30E-10	1.15E+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

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	1.30E+00	0.00E+00	1.30E+00	5.86E+01	2.04E+01	7.89E+01
	Transport	A2	1.79E-02	0.00E+00	1.79E-02	1.25E+00	0.00E+00	1.25E+00
	Manufacturing	A3	4.93E-01	1.98E-01	6.89E-01	3.77E+00	6.40E-01	4.41E+00
	Total (Consumption grid)	A1-3	1.81E+00	1.98E-01	2.01E+00	6.37E+01	2.10E+01	8.46E+01
Construction process stage	Transport	A4	2.20E-02	0.00E+00	2.20E-02	1.54E+00	0.00E+00	1.54E+00
	Construction	A5	2.63E-01	1.98E-04	2.63E-01	2.32E+00	4.06E+00	6.38E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	3.45E-03	0.00E+00	3.45E-03	2.40E-01	0.00E+00	2.40E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	7.17E-03	0.00E+00	7.17E-03	4.13E-01	0.00E+00	4.13E-01
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

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	5.16E-03	0.00E+00	0.00E+00	4.42E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	1.44E-04
	Manufacturing	A3	7.79E-02	0.00E+00	0.00E+00	2.55E-03
	Total (Consumption grid)	A1-3	8.30E-02	0.00E+00	0.00E+00	4.68E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.75E-04
	Construction	A5	3.72E-04	0.00E+00	0.00E+00	3.77E-03
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
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	2.73E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	5.11E-04
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

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	1.59E-01	2.18E+00	4.68E-05
	Transport	A2	1.41E-03	2.49E-02	8.62E-06
	Manufacturing	A3	3.57E-02	2.41E-01	2.98E-05
	Total (Consumption grid)	A1-3	1.96E-01	2.45E+00	8.54E-05
Construction process stage	Transport	A4	1.73E-03	3.06E-02	1.06E-05
	Construction	A5	4.74E-02	3.88E-01	1.59E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
100% - Landfill					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.69E-04	4.80E-03	1.66E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	8.16E-04	1.72E+00	2.52E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

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	2.57E-05	1.13E-06	1.30E-02	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	-1.12E-03
	Total (Consumption grid)	A1-3	0.00E+00	2.57E-05	1.13E-06	1.30E-02	0.00E+00	-1.12E-03
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	1.45E-01	1.13E-09	1.30E-05	0.00E+00	-1.12E-06
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	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

LCA Results: 1 m^2 of Safetrack SC with the coverage rate of 2 kg/m^2

(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	4.04E+00	4.02E+00	1.96E-02	1.11E-03	8.88E-08	2.28E-02	3.42E-04
	Transport	A2	1.21E-01	1.21E-01	1.08E-04	4.84E-05	2.78E-08	5.06E-04	8.00E-06
	Manufacturing	A3	2.56E-01	2.46E-01	8.60E-03	3.34E-04	1.74E-08	1.04E-03	9.60E-05
	Total (Consumption grid)	A1-3	4.42E+00	4.40E+00	2.84E-02	1.50E-03	1.34E-07	2.44E-02	4.46E-04
Construction process stage	Transport	A4	1.07E-01	1.06E-01	9.06E-05	4.18E-05	2.46E-08	4.32E-04	6.86E-06
	Construction	A5	4.26E-01	4.08E-01	1.72E-02	3.06E-04	3.20E-07	3.16E-03	8.36E-05
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% - Landfill									
End of life	Deconstruction, demolition	C1	7.30E-02	7.28E-02	2.58E-05	7.32E-06	1.56E-08	7.58E-04	2.26E-06
	Transport	C2	1.66E-02	1.66E-02	1.42E-05	6.52E-06	3.84E-09	6.74E-05	1.07E-06
	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	2.12E-02	2.10E-02	1.62E-04	2.14E-05	6.40E-09	1.78E-04	6.12E-06
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	0.00E+00

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 &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	3.52E-03	3.00E-02	1.31E-02	8.70E-06	6.10E+01	1.66E+00	2.86E-07
	Transport	A2	1.52E-04	1.66E-03	5.06E-04	4.20E-07	1.83E+00	8.36E-03	1.04E-08
	Manufacturing	A3	2.80E-04	2.54E-03	7.00E-04	1.43E-06	4.92E+00	1.54E-01	1.62E-08
	Total (Consumption grid)	A1-3	3.96E-03	3.42E-02	1.43E-02	1.06E-05	6.76E+01	1.83E+00	3.12E-07
Construction process stage	Transport	A4	1.30E-04	1.42E-03	4.36E-04	3.70E-07	1.61E+00	7.24E-03	9.18E-09
	Construction	A5	6.96E-04	6.62E-03	2.04E-03	4.40E-06	5.82E+00	1.30E-01	3.98E-08
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% - Landfill									
End of life	Deconstruction, demolition	C1	3.36E-04	3.68E-03	1.01E-03	3.86E-08	1.00E+00	2.32E-03	2.02E-08
	Transport	C2	2.04E-05	2.22E-04	6.80E-05	5.78E-08	2.52E-01	1.13E-03	1.43E-09
	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	6.12E-05	6.66E-04	1.93E-04	6.88E-08	4.94E-01	2.22E-02	3.56E-09
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	0.00E+00

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	5.84E-02	6.60E+01	2.12E-09	5.12E-08	5.12E+00
	Transport	A2	9.46E-03	1.43E+00	4.68E-11	1.49E-09	1.25E+00
	Manufacturing	A3	1.37E-01	4.08E+00	6.20E-09	4.32E-09	2.84E+00
	Total (Consumption grid)	A1-3	2.06E-01	7.16E+01	8.38E-09	5.70E-08	9.20E+00
Construction process stage	Transport	A4	8.26E-03	1.26E+00	4.06E-11	1.32E-09	1.10E+00
	Construction	A5	2.04E-02	3.78E+02	3.52E-10	1.44E-08	1.39E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
100% - Landfill							
End of life	Deconstruction, demolition	C1	4.50E-03	5.86E-01	2.28E-11	4.26E-10	1.28E-01
	Transport	C2	1.29E-03	1.96E-01	6.36E-12	2.06E-10	1.73E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	2.34E-03	3.52E-01	1.52E-11	2.36E-10	1.18E+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

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	1.13E+00	0.00E+00	1.13E+00	4.52E+01	1.62E+01	6.14E+01
	Transport	A2	2.56E-02	0.00E+00	2.56E-02	1.78E+00	0.00E+00	1.78E+00
	Manufacturing	A3	6.86E-01	2.78E-01	9.64E-01	4.64E+00	1.82E-01	4.84E+00
	Total (Consumption grid)	A1-3	1.84E+00	2.78E-01	2.12E+00	5.16E+01	1.64E+01	6.80E+01
Construction process stage	Transport	A4	2.26E-02	0.00E+00	2.26E-02	1.58E+00	0.00E+00	1.58E+00
	Construction	A5	2.16E-01	2.78E-04	2.18E-01	4.40E+00	1.36E+00	5.76E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
100% - Landfill								
End of life	Deconstruction, demolition	C1	5.64E-03	0.00E+00	5.64E-03	9.80E-01	0.00E+00	9.80E-01
	Transport	C2	3.54E-03	0.00E+00	3.54E-03	2.46E-01	0.00E+00	2.46E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	8.44E-03	0.00E+00	8.44E-03	4.86E-01	0.00E+00	4.86E-01
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

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	5.42E-03	0.00E+00	0.00E+00	3.90E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.08E-04
	Manufacturing	A3	2.58E-01	0.00E+00	0.00E+00	3.74E-03
	Total (Consumption grid)	A1-3	2.62E-01	0.00E+00	0.00E+00	4.28E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.79E-04
	Construction	A5	5.52E-04	0.00E+00	0.00E+00	3.12E-03
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
100% - Landfill						
End of life	Deconstruction, demolition	C1	3.84E-04	0.00E+00	0.00E+00	5.72E-05
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	2.80E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	5.24E-04
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

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	1.93E+00	4.08E-05
	Transport	A2	2.00E-03	3.54E-02	1.23E-05
	Manufacturing	A3	9.68E-02	4.26E-01	3.68E-05
	Total (Consumption grid)	A1-3	2.40E-01	2.40E+00	9.00E-05
Construction process stage	Transport	A4	1.77E-03	3.14E-02	1.09E-05
	Construction	A5	4.38E-02	3.04E-01	1.86E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
100% - Landfill					
End of life	Deconstruction, demolition	C1	1.31E-03	9.26E-03	7.32E-03
	Transport	C2	2.78E-04	4.92E-03	1.70E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	9.60E-04	2.02E+00	2.96E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

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	1.23E-05	6.48E-08	8.31E-03	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	-3.72E-03
	Total (Consumption grid)	A1-3	0.00E+00	1.23E-05	6.48E-08	8.31E-03	0.00E+00	-3.72E-03
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	1.00E-01	6.48E-11	8.31E-06	0.00E+00	-3.72E-06
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
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	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	Transportation of Decseal/Safetrack SC from GCP manufacturing site to the customer unit		
	Fuel type / Vehicle type	Road transport	16–32-ton lorry
	Distance: GCP manufacturing unit to customer site	km	320
	Capacity utilisation (incl. empty returns)	%	49
	Bulk density of transported products	kg/m^3	1.5
A5 – Installation in the building	Installation of Decseal/Safetrack SC is simple. Depending on the specific application, the primer is applied initially, followed by the waterproofing membrane and finally the wearing course.		
	Installation waste percentage	< 0.1% left in Tin	
Installation wastages	Storage Pail	kg	0.01
	Storage Drum	kg	0.05
Packaging waste	Wood pallet waste	kg	0.0017
C1 - End of life	The membrane lasts for the design life of the structure. Deconstruction of the system would only happen when structure is demolished, and it would stay bonded to the substrate. It is not removed separately. It can be safely assumed that the energy attributed to deconstructing the system compared to the overall demolition will be effectively negligible. As a result, no impacts are attributed to module C1. Removed membranes will be send to the disposal unit, along with any attached substrate.		
C2 – Transportation	50km by road has been modelled for module C2 as a typical distance from the demolition site to the disposal unit. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.		
	Fuel type / Vehicle type	Road transport	16–32-ton lorry
	Deconstruction site to the disposal unit	km	50
Module D	All the membrane wastes are cured resins so they are considered as non-hazardous therefore it is assumed as 100% of the product waste will be landfilled at the end of life. Therefore, no module D benefits.		

Interpretation of results:

The majority of environmental impacts are attributed to the manufacturing of all products goes into the system covered by information modules A1-A3 of EN15804:2012+A2:2019. In the Decseal Reinforced and Unreinforced System, the Decseal and Decseal wearing course membrane product comprises most of the composition and is responsible for the environmental impacts. In the Decseal wearing course system, most of the environmental impacts are attributed to the Decseal wearing course.

Individual Product calculation:

The LCA results listed in the tables above are for the Decseal Reinforced, Decseal Unreinforced, Decseal Wearing Course, and Safetrack SC systems. The LCA results for each system were calculated for 1m^2 based on the standard components and coverage rate of each system, the details of which are shown in table below.

System	Decseal Reinforced	Decseal Unreinforced	Decseal Wearing Course	Safetrack SC
Unit	Kg/m^2	Kg/m^2	Kg/m^2	Kg/m^2
PAR1	0.25	0.25	0.25	-
Decseal membrane	3.0	1.8	-	-
Decseal wearing course	1.7	1.7	1.7	-
Safetrack SC	-	-	-	2.0
Total	4.95	3.75	1.95	2.0

Note: If a non-standard coverage rate has been used, the end-user of this EPD can calculate the impact of the system as used by applying a factor to the published LCA results.

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.

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EN 1504-2 - Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete