



# Statement of Verification

BREG EN EPD No: 000800

Issue: 01

This is to verify that the Environmental Product Declaration provided by:

## Steintec

are in accordance with the requirements of:

**EN 15804:2012+A2:2019**

and

**BRE Global Scheme Document SD207**

This declaration is for:

99 Kg (1 unit) of tuffflow: composed of 1x24kg bag of cementitious binder and 3x25kg bags of semi-dry 2-6mm granodiorite aggregate.

### Company Address

tuffbau Limited,  
1 Northwick Road,  
Canvey Island, Essex,  
SS8 0PU



*Hayley Thomson*  
Signed for BRE Global Limited

Hayley Thomson  
Operator

16 June 2026  
Date of this Issue

16 June 2026  
Date of First Issue

15 June 2031  
Expiry Date



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# Environmental Product Declaration

EPD Number: 000800

## General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2025 Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.2
Commissioner of LCA study	LCA consultant/Tool
Steintec tuffbau Limited, 1 Northwick Road, Canvey Island, Essex, SS8 0PU	LCA Consultant: Raghavi Mugundan Tool: BRE LINA A2
Declared/Functional Unit	Applicability/Coverage
99 Kg (1 unit) of tuffflow: composed of 1x24kg bag of cementitious binder and 3x25kg bags of semi-dry 2-6mm granodiorite aggregate.	Other (please specify). Product specific
EPD Type	Background database
Cradle to Gate with Module C and D	Ecoinvent 3.8

### Demonstration of Verification

CEN standard EN 15804 serves as the core PCR <sup>a</sup>

Independent verification of the declaration and data according to EN ISO 14025:2010

Internal

External

(Where appropriate <sup>b</sup>)Third party verifier:

Kim Allbury

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
A1	A2	A3	A4	A5	Related to the building fabric					Related to the building						D
					B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	
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
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Note: Ticks indicate the Information Modules declared.

### Manufacturing site(s)

Steintec  
tuffbau Limited,  
1 Northwick Road,  
Canvey Island, Essex,  
SS8 0PU

### Construction Product:

#### Product Description

This LCA is for 1 unit of tuffflow weighing 99 Kg: composed of 1x24kg bag of cementitious binder and 3x25kg bags of semi-dry 2-6mm granodiorite aggregate. tuffflow is a fully permeable jointing mortar, for use in the bound construction of permeable modular pavements. The product is a specialist proprietary jointing mortar with declared vertical permeability characteristics for use in bound permeable pavement construction, as described in BS 7533-103:2026, Clause 6.10. Performance data relating to Type 25 jointing mortar characteristics is available in reference to BS 7533-101:2021, Table 12.

This two-part product is composed of a carefully graded aggregate and a specialist cementitious, resin-free binder in dry powder form. The aggregate and binder components are packaged separately, avoiding the need for energy intensive central drying and blending. This greatly reduces overall energy use, haulage and waste because it also facilitates optimal use of the cementitious binder content. All mixing is carried out on site using the factory controlled, measured and packaged quantities to ensure the mix ratio is accurate for every batch prepared. This further reduces site waste.

tuffflow permeable jointing mortar has a declared vertical permeability of  $>5.5 \times 10^{-4} \text{m/s}$  making it possible to calculate the design surface infiltration rate when the surface size of the paving units and the proposed joint widths are known.



## Technical Information

Property	Value, Unit
Density	1.84t/m <sup>3</sup>
Colour	Dark Grey
Packaging	bags
Packaging weight	24 kg bag (3 x 8kg sachets)
Joint width	10 - 20 mm
Typical water used	1 litre per 33 kg mix (8kg sachet + 25kg aggregate)
Packages per pallet	Binder 48 Aggregate 40
Pallet quantity	1,182 kg inc. pallet (binder) 1,030 kg inc. pallet (aggregate)
Working time	30 min at 20°C
Working temperature	≥ 2°C
Compressive strength (20 degrees Celsius)	28 days: ~25 MPa
Flexural strength	≥3.5MPa
Vertical permeability	> 5.5 x 10 <sup>-4</sup> m/s
Shrinkage	≤ 0.15%
Horizontal permeability (EN 12697-19)	NA
Storage life	2 years from manufacture date
NBS sections	Q24
Compliance	BS 7533-101:2021
Uniclass 2015 (Paving Laying Course Mortars)	Pr_20_31_53_60 Paving jointing mortars
Reaction to fire (EN 13813:2002)	A1fl
Compressive strength (EN 13813:2002)	C 25
Release of corrosive substances (EN 13813:2002)	CT

For more information please contact the Steintec Technical Support Team or visit: [tuffflow](https://www.tuffflow.com) and head to Technical / Specification section for more details

Note: Distribution pallets are excluded from the system boundary and LCA modelling, as they are used for transport and storage purposes only.



## Main Product Contents

Material/Chemical Input	%
Cementitious binder	24.3%
Crushed igneous aggregate	75.7%

## Manufacturing Process

'tuffflow' permeable jointing mortar comprises two principal components,

- i) The Aggregate
- ii) The Binder.

Each component is the result of a separate and distinct production process.

- i) The aggregate is a crushed hard angular igneous rock produced to an exacting grading of 2-6mm. In undried form the aggregate is delivered as bulk sea freight to Steintec in Canvey Island UK where it is bulk loaded into a four storey high protective indoor silo. The silo delivers measured 25kg loads with consistent moisture content into recycled and recyclable foil packs which are sealed. These are palletised and stored ready for dispatch alongside the binder component.
- ii) The binder is the dry powdered cementitious component to tuffflow produced from a number of specialist constituent ingredients. These are delivered to Steintec's production facility where they are precisely measured and blended in dry powder form. The finished dry powder binder is then packed into 24kg bags, palletised and held in protected dry storage ready for dispatch to customers together with the separately packaged tuffflow aggregate. There is no further processing to the tuffflow product.

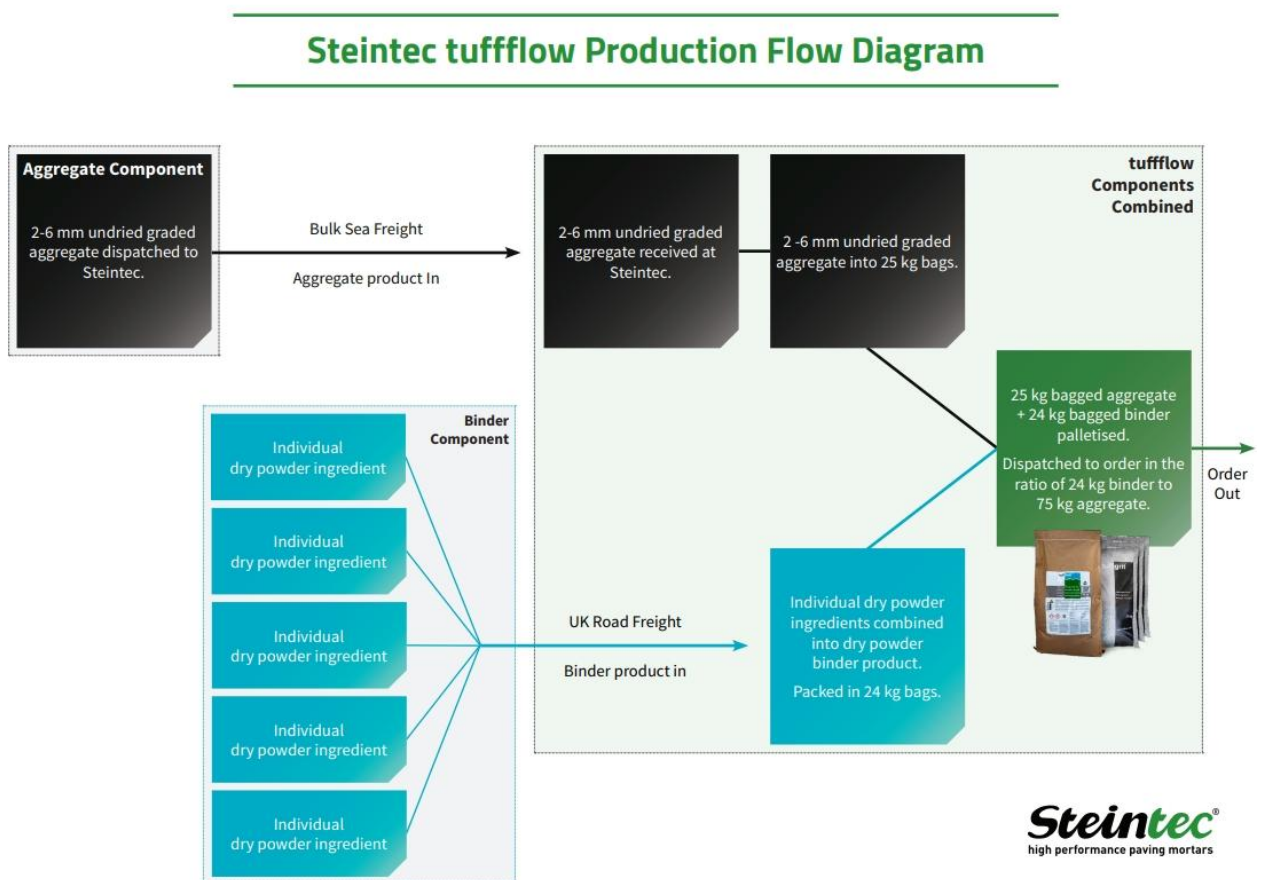
On receipt of order tuffflow is dispatched from Steintec, to store or site, from Canvey Island in the ratio of 75kg (25kg bag x 3) : 24kg (24kg bag x 1).

The mixing of the binder and aggregate is performed on site by the customer or customer's installer in ratio stated above. Handling, mixing and the installation process are described in the Steintec tuffflow Method Statement.

Note: The manufacturing process for tuffflow permeable jointing mortar relies on grid electricity.

There is no significant production waste generated during the manufacturing process. Minor ancillary waste arises from maintenance activities, such as lubrication oil used in machinery, which is classified as mineral oil waste and is sent for incineration.

### Process flow diagram



### End of Life

tuffflow is designed and formulated as a permeable jointing mortar for the construction of 'bound' and 'fully bound' permeable modular pavements constructed in concrete, stone, clay or porcelain paving units. At end of life, because of its characteristics, the product is not easily separated from the paving units so is sent to recycling along with the paving units.

Dependant on the pavement design and construction method, in some situations tuffflow and the adjoining paving units can be separated from the laying course and base so that recycling can be carried out separately.

In conclusion, the product can be recycled at end of its life.



## Life Cycle Assessment Calculation Rules

### Declared / Functional unit description

99 Kg (1 unit) of tuffflow: composed of 1x24kg bag of cementitious binder and 3x25kg bags of semi-dry 2-6mm granodiorite aggregate.

### System boundary

This is a cradle-to-gate with modules C and D, reporting all production life cycle stages of modules A1 to A3 and end of life stages C1-C4, and D in accordance with EN 15804:2012+A2:2019 and BRE 2025 Product Category Rules (PN 514 Rev 3.2).

### Data sources, quality and allocation

The quantity used in the data collection for this EPD is the total quantity of tuffflow permeable jointing mortar manufactured as a proportion of the total manufactured during the data collection period (01/05/2023 - 30/04/2024) that was calculated at 0.778%. In addition to the tuffflow permeable jointing mortar, other products are manufactured, necessitating the allocation of electricity, water consumption, and discharge. This allocation has been performed using mass allocation, in line with the provisions of BRE 2025 PCR PN514 Rev 3.2 and EN15804+A2:2019. It was noted in the original data collection form submission that enough input material mass was consumed to cover total product output, therefore no input material mass uplift was required. The material composition of the tuffflow permeable jointing mortar component was provided from Steintec's supplier, but no factory process data was submitted. However, it is noted that the supplier's process essentially combines dry powders to Steintec's specific formula which are then packaged and dispatched to Steintec. The impact of the binder supplier's factory process is therefore considered negligible. Steintec use GGBS as a secondary raw material input for the tuffflow permeable jointing mortar product. Generally, GGBS is a co-product of steel manufacturing, so these impacts have been economically allocated to the GGBS by 2.3% following EN15804 recommendations. Non-production waste is not measured accurately; the figures are based on general estimates of typical usage as provided by Steintec's office and factory managers.

Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the ecoinvent 3.8 database. All Ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN 15804:2012+A2:2019. Where specific datasets were unavailable, proxy datasets have been applied. An appropriate proxy dataset ("unspecified organic chemical") was used to represent minor additive components (<2% of the binder component, equivalent to <1% of the total raw material mass) for which no suitable datasets were available within the database.

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 less than 3 years between the Ecoinvent v3.8 (2021) LCI reference year, and the time-period for which the LCA was undertaken

Specific datasets have been selected from the ecoinvent LCI for this LCA. For Energy and fuels, manufacturer uses the UK grid electricity for production and heat-pump technology for heating, therefore location-based approach for the UK grid dataset has been used for the LCA modelling (Ecoinvent 3.8). The GWP carbon footprint for using 1 kWh of electricity, UK Consumption mix was used for electricity with an emission factor of 0.239kgCO<sub>2</sub>e/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 3 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.



Data quality has been assessed in accordance with Table E.2 of EN 15804+A2, Annex E. The Life Cycle Assessment (LCA) has been carried out in accordance with EN 15804+A2, applying the cut-off approach as defined within the standard. Characterisation factors have been applied in line with Annex C (Table C.1) of EN 15804+A2.

### **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.

Material composition data for the constituent ingredients of the tuffflow binder were provided by Steintec's suppliers; however, primary manufacturing process data were not provided due to industrial confidentiality.

Packaging associated with the declared unit consists of paper and foil sacks with a polyethylene lining (14% PE), which are included within the study scope (Module A2). The paper sack component corresponds to approximately 0.1118 kg per declared unit. Distribution pallets are used for transport and storage purposes only and are therefore excluded from the system boundary.

The paper-based packaging contains biogenic carbon which, in accordance with EN 15804+A2 requirements, would be released during packaging disposal at the installation stage (Module A5). The associated impact is substantially below the  $\pm 10\%$  significance threshold defined in the BRE PCR relative to the Module A3 GWP result. The biogenic carbon impact associated with packaging disposal has therefore been considered insignificant and hence Module A5 has not been declared within the scope of this EPD.



## 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 <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CFC11 eq	mol H <sup>+</sup> eq	kg (PO <sub>4</sub> ) <sup>3-</sup> eq
Product stage	Raw material supply	A1	6.57E+00	6.53E+00	2.43E-02	8.82E-03	9.29E-07	4.41E-02	1.90E-03
	Transport	A2	1.91E+00	1.91E+00	7.46E-04	1.06E-03	4.13E-07	3.36E-02	9.44E-05
	Manufacturing	A3	9.30E-01	9.31E-01	-2.65E-03	9.68E-04	5.76E-08	3.94E-03	2.32E-04
	Total (Consumption grid)	A1-3	9.41E+00	9.38E+00	2.24E-02	1.08E-02	1.40E-06	8.17E-02	2.22E-03
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	8.24E-01	8.23E-01	7.01E-04	3.23E-04	1.90E-07	3.34E-03	5.30E-05
	Waste processing	C3	3.78E-01	3.78E-01	1.33E-04	3.77E-05	8.08E-08	3.93E-03	1.17E-05
	Disposal	C4	2.61E-02	2.61E-02	2.58E-05	2.46E-05	1.05E-08	2.45E-04	2.39E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.92E-01	-7.80E-01	-1.01E-02	-1.10E-03	-6.29E-08	-5.02E-03	-4.25E-04

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 <sup>3</sup> world eq deprived	disease incidence
Product stage	Raw material supply	A1	7.10E-03	8.23E-02	2.37E-02	3.25E-05	1.04E+02	3.13E+00	3.64E-07
	Transport	A2	8.49E-03	9.41E-02	2.50E-02	4.74E-06	2.68E+01	9.57E-02	1.15E-07
	Manufacturing	A3	1.10E-03	1.11E-02	3.61E-03	4.95E-06	2.40E+01	4.68E-01	4.51E-08
	Total (Consumption grid)	A1-3	1.67E-02	1.87E-01	5.24E-02	4.22E-05	1.55E+02	3.70E+00	5.24E-07
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	1.01E-03	1.10E-02	3.37E-03	2.86E-06	1.24E+01	5.60E-02	7.10E-08
	Waste processing	C3	1.74E-03	1.91E-02	5.24E-03	1.94E-07	5.18E+00	1.20E-02	8.05E-07
	Disposal	C4	8.52E-05	9.33E-04	2.71E-04	5.95E-08	7.28E-01	3.34E-02	4.94E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.16E-03	-1.39E-02	-3.59E-03	-7.38E-06	-1.15E+01	-1.50E+00	-6.35E-08

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 <sup>235</sup> eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	2.89E-01	3.63E+02	2.27E-08	3.51E-07	4.67E+01
	Transport	A2	1.30E-01	1.90E+01	9.31E-10	1.70E-08	1.20E+01
	Manufacturing	A3	3.46E-01	1.45E+01	3.52E-10	8.47E-09	8.67E+00
	Total (Consumption grid)	A1-3	7.66E-01	3.96E+02	2.40E-08	3.76E-07	6.73E+01
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	6.39E-02	9.71E+00	3.14E-10	1.02E-08	8.55E+00
	Waste processing	C3	2.34E-02	3.03E+00	1.17E-10	2.20E-09	6.60E-01
	Disposal	C4	3.23E-03	4.60E-01	1.17E-11	3.02E-10	1.53E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.78E-01	-1.33E+01	-7.73E-10	-1.40E-08	-1.06E+01

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	2.79E+00	0.00E+00	2.79E+00	9.65E+01	6.30E+00	1.03E+02
	Transport	A2	2.92E-01	0.00E+00	2.92E-01	2.63E+01	0.00E+00	2.63E+01
	Manufacturing	A3	1.74E+00	1.74E+00	3.48E+00	1.95E+01	6.89E+00	2.64E+01
	Total (Consumption grid)	A1-3	4.83E+00	1.74E+00	6.56E+00	1.42E+02	1.32E+01	1.55E+02
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	1.75E-01	0.00E+00	1.75E-01	1.22E+01	0.00E+00	1.22E+01
	Waste processing	C3	2.91E-02	0.00E+00	2.91E-02	5.08E+00	0.00E+00	5.08E+00
	Disposal	C4	6.21E-03	0.00E+00	6.21E-03	7.15E-01	0.00E+00	7.15E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.08E+00	0.00E+00	-1.08E+00	-1.15E+01	0.00E+00	-1.15E+01

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 <sup>3</sup>
Product stage	Raw material supply	A1	2.01E+00	7.27E-06	0.00E+00	7.44E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.37E-03
	Manufacturing	A3	3.47E-03	7.09E-06	0.00E+00	1.25E-02
	Total (Consumption grid)	A1-3	2.01E+00	1.44E-05	0.00E+00	8.93E-02
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	1.39E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	2.96E-04
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	7.80E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-3.55E-02

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	3.05E+00	5.21E+00	1.63E-04
	Transport	A2	3.23E-02	4.24E-01	1.83E-04
	Manufacturing	A3	3.75E-02	1.06E+00	9.77E-05
	Total (Consumption grid)	A1-3	3.12E+00	6.70E+00	4.45E-04
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.37E-02	2.44E-01	8.42E-05
	Waste processing	C3	6.80E-03	4.78E-02	3.58E-05
	Disposal	C4	7.57E-04	1.07E-02	4.77E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-6.61E-02	-2.01E+00	-5.87E-05

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	2.66E-05	1.03E-07	1.29E-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	1.67E-02	5.28E-08	5.66E-03	0.00E+00	5.11E-02
	Total (Consumption grid)	A1-3	0.00E+00	1.67E-02	1.56E-07	6.96E-03	0.00E+00	5.11E-02
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	6.77E-06	1.08E-07	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
C1 - Deconstruction	<p>tuffflow is designed and formulated as a permeable jointing mortar for use in 'bound' and 'fully bound' permeable modular pavements constructed with concrete, stone, clay, or porcelain paving units. At end of life, due to its bonded characteristics, the product is not easily separable from the paving units and is therefore typically sent for recycling together with the paving units. Depending on the pavement design and construction method, tuffflow and the adjoining paving units may, in some cases, be separated from the laying course and base, allowing recycling to be carried out separately.</p> <p>100% recovery rate for the product during the deconstruction process.</p> <p>The end-of-life scenarios for the permeable jointing mortar is based on the industrial scenario for Aggregate/Fill, aggregate (UK typical) according to BRE EN15804 A2 PCR 3.2. i.e 95% recycling and 5% landfill.</p>		
	<p>50km by road has been modelled for module C2 as a typical distance from the demolition site to the recycling plant. However, end users of the EPD can use this information to calculate the impacts of bespoke transport distance for module C2 if required.</p>		
C2 Transport	Distance: Deconstruction unit to pre-processing unit	km	50
	Transportation	Road transport	Lorry, 16 – 32 metric ton
C3 – Waste processing	<p>The waste processing scenario outlines the end-of-life processing for pavements constructed from concrete, natural stone, clay or porcelain and joined with tuffflow permeable jointing mortar. Due to the physical characteristics of tuffflow it cannot be efficiently separated from the paving units. At the waste processing facility, materials are crushed into a mixed recycled aggregate. The recycled aggregate is graded and re-used in applications such as roadbase material or as inert fill for new construction projects. According to the BRE Global PCR Rev 3.2 waste scenario for Aggregate/Fill, aggregate (UK typical), 95% of the Aggregate waste will be recycled and 5% is un-recoverable and so is sent to landfill. Crushing and pulverising processes have not been included in Module C3 since no data was available.</p>		
	95% sent to recycling	kg	94.05
C4 - Disposal	<p>Remaining un-recoverable 5%, is sent to landfill.</p>		
	5% sent to Landfill	kg	4.95
Module D	<p>It is assumed that 95% of the tuffflow permeable jointing mortar along with the paving units are recovered and sent to recycling. The calculation assumes that there is no yield-loss during the recycling process and there is no pre-existing recycled content accounted for in the Module D calculation.</p>		
	Benefits of recycling Concrete	kg	94.05

## Interpretation

The environmental impacts of tuffflow permeable jointing mortar are dominated by upstream raw material extraction and manufacturing processes reported in modules A1 to A3 in accordance with EN 15804:2012+A2:2019. The results presented in Figure 1 show that Module A1 (raw material supply) is the primary contributor to Global Warming Potential.

This is further explained by the process contribution results shown in Figure 2, which indicate that the cementitious binder is the main driver of environmental impacts. Although the binder accounts for approximately 25% of the product mass, it contributes more than 50% of the Global Warming Potential in Module A1, reflecting the energy-intensive nature of cementitious binder production. The use of an alternative cementitious binder in place of Portland cement, combined with optimisation of the binder content, enables the required performance to be achieved with a reduced binder proportion.

In contrast, the aggregate fraction, which represents around 75% of the product mass, contributes comparatively little to the overall environmental impacts, as shown in Figure 2. As the aggregate does not require pre-drying or pre-blending, energy-intensive processing steps are avoided, resulting in reduced energy use and emissions within modules A1 to A3. The second largest contribution is associated with transport processes, although this remains significantly lower than that of the binder.

Overall, the results demonstrate that the environmental impacts of tuffflow are primarily driven by the cementitious binder, as reflected in both the life cycle stage results (Figure 1) and the process contribution analysis (Figure 2). Product formulation and manufacturing choices, such as binder optimisation and the avoidance of energy-intensive aggregate processing, help to minimise environmental impacts compared to conventional cement-rich formulations while maintaining the required functional performance.

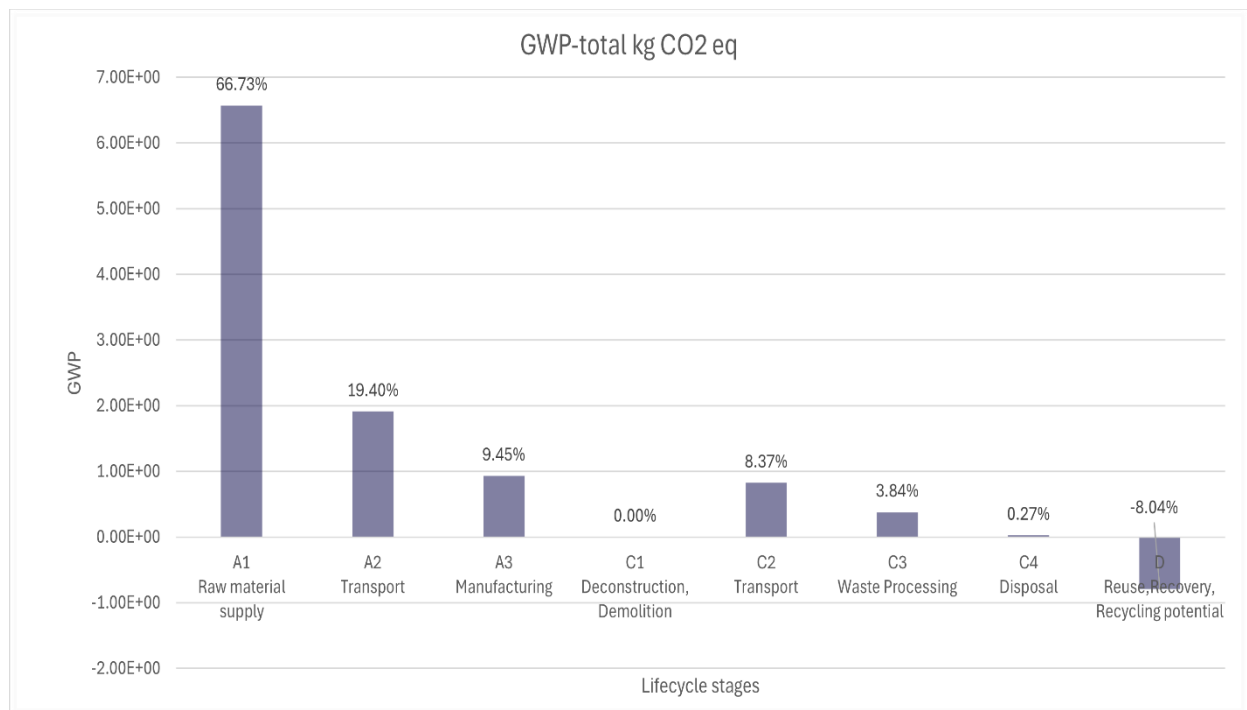


Figure 1 : GWP total

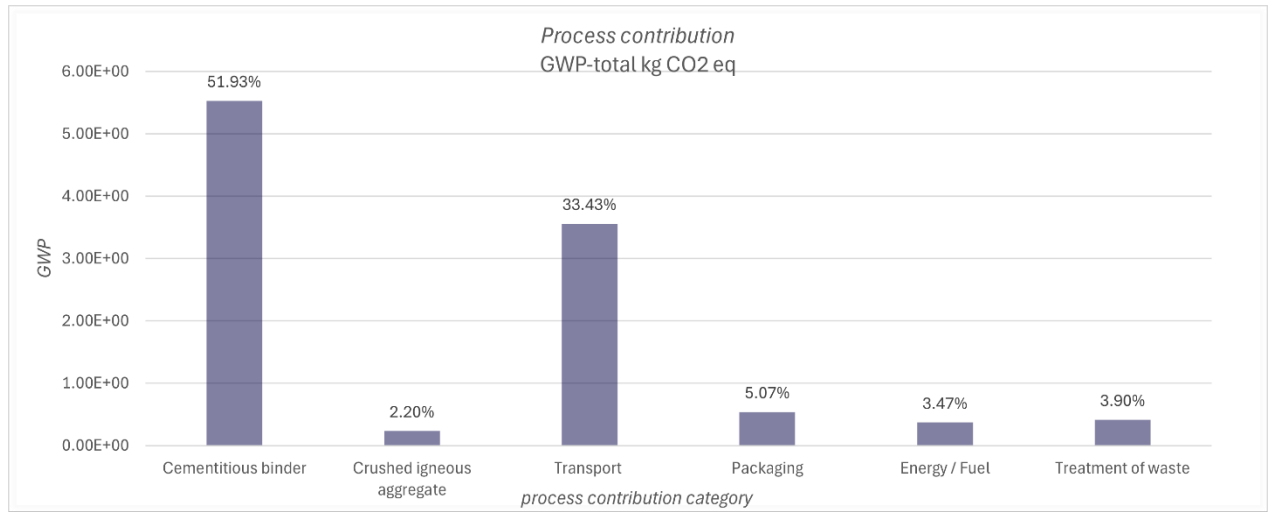


Figure 2: *Process contribution*

### Summary for the Designer

The most used figure for carbon impact when designing a scheme is kg CO<sub>2</sub>.

The GWP figure given in the LCA Results table for A1-A3 is **9.41 kg CO<sub>2</sub> eq. per 99 kg (product unit as detailed in Declared/ Functional unit description)**. This equates to the following kg CO<sub>2</sub> eq. figures for other commonly used (product) quantities.

- 0.095 kg CO<sub>2</sub> per 1 kg
- 2.38 kg CO<sub>2</sub> per 25 kg
- 11.88 kg CO<sub>2</sub> per 125 kg
- 95.05 kg CO<sub>2</sub> per 1000 kg (kg CO<sub>2</sub>/t)
- 174.9 kg CO<sub>2</sub> per m<sup>3</sup> (tuffflow has a density of 1.84 t/m<sup>3</sup>).



## 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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BS 7533-101:2021 – Pavements constructed with clay, concrete or natural stone paving units – Code of practice for the structural design of pavements using modular paving units.

BS 7533-103:2026 – Pavements constructed with clay, concrete or natural stone paving units – Code of practice for the design of permeable pavements using modular paving units.

BS EN 13813:2002 – Screed material and floor screeds. Screed material. Properties and requirements.