Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Hostile Vehicle Mitigation Bollard from

Safetyflex Barriers Limited

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products (EN 15804+A2) (1.2.4)
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción (Chile). The review panel may be contacted via the Secretariat info@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: *Southwest Environmental Limited (London – UK)*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☐ EPD process certification ☒ EPD verification Third-party verification: Elisabet Amat, *GREENIZE* Approved by: The International EPD© System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No [Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period (see Sections 7.3.2 and 7.4.9 in the GPI). The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update (see Section 6.5 of the GPI) is identified, the EPD shall be re-verified by a verifier]

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs;

cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Safetyflex Barriers Limited
Contact: Courtney Dawson (cd@safetyflexbarriers.com)
Description of the organisation: Safetyflex's revolutionary barrier systems provides the ultimate protection from high and low impact collisions. The addition of PAS68 tested anti terrorist security products can also provide protection from possible terrorist attacks. Safetyflex Barriers are part of the GME Springs group who have over 40 years experience in manufacturing suspension systems for the automotive, rail and MOD sectors. We have now put our experience of spring technology into the design and manufacture of Anti Terrorist Security Barriers and Bollards Rated to PAS68.
Product-related or management system-related certifications: PAS68 tested
Name and location of production site(s):
Safteyflex Barriers
Boston Place
Foleshill
Coventry CV6 5NN
UK

Product information

Product name: Hostile Vehicle Mitigation Bollard (Car Stopper / Truck Stopper)
Product identification: Hostile Vehicle Mitigation Bollard
Product description: Structural Steel Bollard, set in a concrete foundation, fitted with decorative stainless steel shroud, the EPD covers a family of 8 products based on a worst case scenario. With Truckstopper 9-40+100 adopted as worst case.

- Carstopper 30 + 100
- Truckstopper 3+100
- Truckstopper 4+100
- Truckstopper 5+100
- Truckstopper 6+100
- Truckstopper 7+100
- Truckstopper 9-40+100 < Adopted Worst Case
- Truckstopper 9-50+100

UN CPC code: 4126 - Bars, rods, angles, shapes and sections, cold processed or further worked, of iron or steel; angles, shapes and sections, hot-rolled, hot-drawn or extruded, of alloy steel; steel wire.

Other codes for product classification: NA
Geographical scope: Global

See the GPI and the PCR for other required product information. In particular, note the additional requirements on EPDs of multiple products.

LCA information

Functional unit / declared unit: 1 Bollard which fulfills the specified functional criteria during its Reference Service Life (RSL). This worst case weight for installed unit is approx. 2000kg.
Functional criteria: Truckstopper 9-40 + 100 is designed to stop a 7.50 ton vehicle travelling at 40 mph of 64 kmh at 90 degrees.
Reference service life: 20 Years
Time representativeness: 2021

Database(s) and LCA software used: ecoinvent (Version 3.9) with allocation, cut-off, EN15804 Bespoke Model Created in Microsoft Excel.

Description of system boundaries:
Cradle-to-gate with options, modules C1-C4, module D, and with optional module A4 and A5. B is omitted on account of there being no operational impacts.

- Raw material supply (**A1**) - This stage includes the impacts related to the acquisition of materials needed to produce the bollard: low alloy steel and high alloy steel. Stainless steel is used to manufacture the protective / decorative shrouds. Cement is included in A3 stage since it is part of the installation materials needed.

- Transport (**A2**) - Raw materials are transported from multiple different countries in Europe by truck and by ferry.

- Manufacturing (**A3**) - The processes that are included in the manufacturing phase are: Cutting, Bending, Drilling, Welding.

- Transport from production place to user (**A4**) - From the production site at Safetyflex in Coventry (UK), the product is transported to the point of installation. Transportation by road includes transport type lorry of > 32 metric ton EURO5. Distance considered is 791km as theoretical scenario . The transportation impacts cover fuel direct exhaust emissions, environmental impacts of fuel production and related to infrastructure emissions. The information of these transports is shown in the table below.

Type	Vehicle	Distance km	Fuel/energy consumption	Value (l/t)
GLOBAL				
Truck	Lorry, >32t, EURO5	288	0,023 l/tkm	6.62
Boat	Ferry	503	0,04 l/tkm	20.12

- Installation (**A5**) - Installation of the bollard requires the excavation of a suitable sized footing. The bollard is then installed along with a re-bar cage. Concrete is then poured in to the footing. The shroud is fitted, and secured, and a final amount of concrete is added to cover mounting points at based on shroud. Excavated soil (presumed inert) is sent of recovery. Reinforcing Steel is also used at this point as part of the foundation.

- Operational (**B**) -This stage is considered negligible. Product does not use, any power, and does not require to be washed or lubricated for example of the course of its lifetime.

- Demolition (**C1**) - Upon removal a bollard is required to dig out with hydraulic excavator. The concrete based is broken up, and assumed use for recycled concrete aggregated.

- Transport (**C2**) - Average waste transportation for 100 km truck is assumed.

- Waste processing (**C3**)- Disposal (**C4**) - It is assumed as waste processing phase: crushing of concrete to retrieve re-bar, and disposal of inert waste to landfill (worst case).

- Reuse, recovery, recycling, potential (**D**) -Benefits and loads of steel recycling are included.

Data quality:

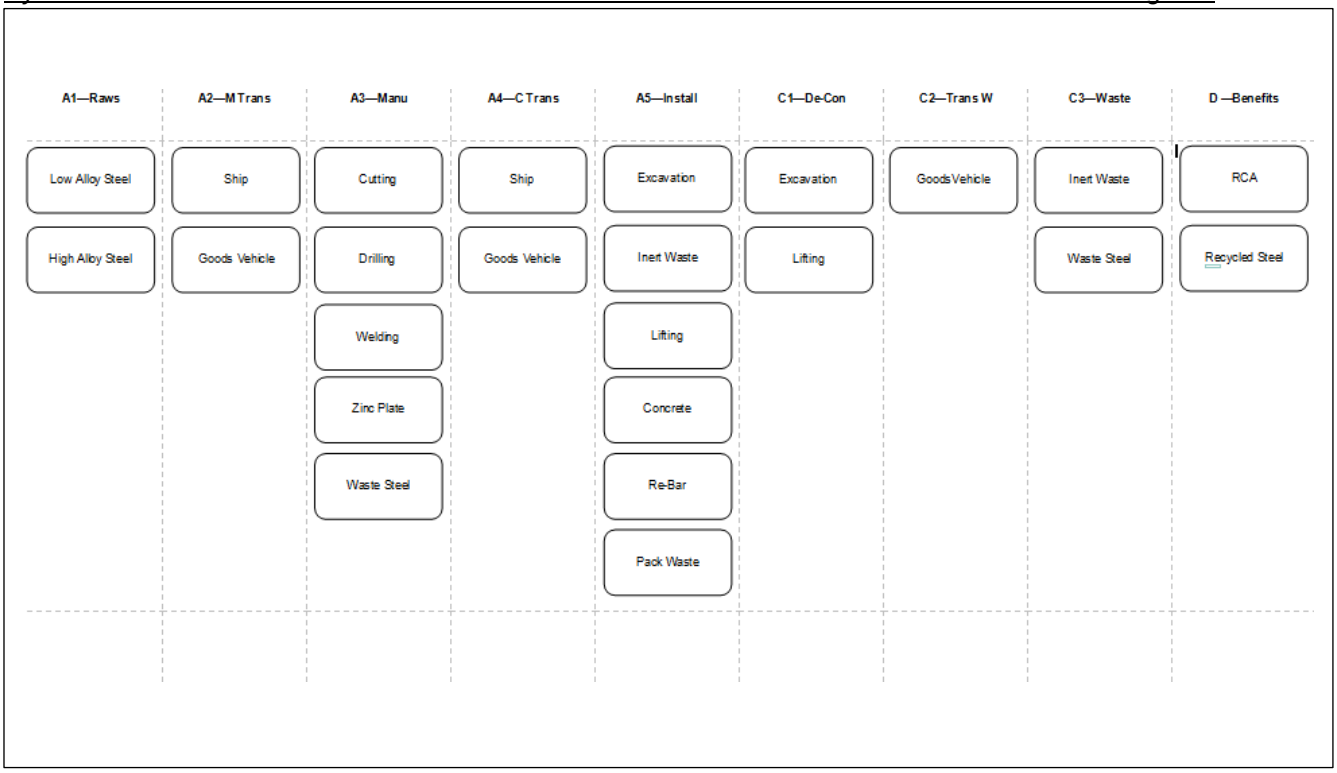
The foreground data was collected internally considering the latest available average production amounts and measures during the last year (2021). Data regarding the end-of-life modules are based on the experts' judgment and database data (Ecoinvent 3.9.).

According to the criteria of the UN Environment Global Guidance on LCA database development, the quality level can be defined as incredibly good. Data is geographically representative as it comes from the area of study, it is technical representative as it comes from processes and products under study using the same state of technology defined in goal and scope, and it is also time representative as data used was collected less than 3 years difference between the reference year according to the documentation.

Cut-off rules:

All major raw materials and all the essential energy are included. The marginal production process for raw materials and energy flows with a cut-off of 1% is not included. This cut-off rule does not apply to hazardous materials and substances.

System diagram:



Allocation and other information:

Electricity, waste and ancillary materials in production are calculated as an average weight per produced tonne of all products using yearly production data and the rate for 2021. For manufacturing processes, the specific country's mix of electricity is considered. For secondary data on materials' flow information has been gathered from the Ecoinvent 3.8. database. In addition, the allocation is made following the

provisions of PCR 2019:14 Construction products (EN 15804:A2) (1.2.4). The recycling process and transportation of the material is considered in this analysis. The polluter pays and modularity principles are followed. The processes excluded from the analysis are environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process and personnel-related impacts.

A full description of the products covered by this EPD, can be found in the underlying LCA study.
The underlying LCA study was carried out by Southwest Environmental Limited UK.

All electricity use is accounted for in the reference values used, which include for all upstream impacts including energy use.

Assumptions:

This EPD covers 8 products and some of the impact assessment results variate more than 10% by product. Because of that, the highest impact were taken into account (worst-case) for each impact category and impact assessment result shared in as single product format.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x
Geography	EU	EU	EU	GLO	GLO	MND	MND	MND	MND	MND	MND	MND	GLO	GLO	GLO	GLO	GLO
Specific data used	>90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Worst case					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	NA					-	-	-	-	-	-	-	-	-	-	-	-

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Content Information

Below weights are based on model 9-40+100 which is considered as the worst case scenario.

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Steel	799	52%	0
Concrete	1280	0%	0
TOTAL	2079		
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Pallet	4.2	0.2%	1.95
TOTAL	4.2		1.95

The product does not contain any REACH SVHC substances in amounts greater than 1%.

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Results per functional or declared unit

Indicator	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	1914	37.4	456		0.30	22.3	6.74	0.08	-874
GWP-biogenic	kg CO_2 eq.	2.11	0.05	3.01		4E-5	0.03	3.96	2E-4	-1.58
GWP-luluc	kg CO_2 eq.	0.62	0.01	1.05		4E-5	8E-4	0.16	8E-5	-2.48
GWP-total	kg CO_2 eq.	1916	37.6	464		0.30	22.02	6.76	0.07	-878
ODP	kg CFC 11 eq.	8E-6	8E-6	2E-6		6E-8	5E-6	3E-8	3E-8	-4E-5
AP	mol H^+ eq.	8.71	0.24	1.59		3E-3	0.11	4E-4	6E-5	-3.82
EP-freshwater	kg P eq.	0.83	0.01	0.07		1E-5	2E-6	6E-6	6E-6	-0.42
EP-marine	kg N eq.	1.84	0.07	0.45		1E-4	0.03	2E-5	2E-4	-1.61
EP-terrestrial	mol N eq.	19.4	0.84	5.02		0.01	0.41	3E-4	3E-4	-17.0
POCP	kg NMVOC eq.	8.26	0.23	1.44		2E-10	0.11	7E-4	7E-5	-3.92
ADP-minerals&metals*	kg Sb eq.	0.03	1E-5	3E-3		3E-7	8E-5	2E-7	3E-5	-0.01
ADP-fossil*	MJ	19319	542	3117		4.07	321	1.84	1.84	-8578
WDP*	m^3	553.1	2.33	68.5		0.02	1.41	6E-3	5E-4	-250
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; 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; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	1916	37.6	464.5		0.30	22.34	6.76	0.07	-878

Disclaimers shall be added, if required by EN 15804.

Use of resources

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	2347	10.9	106		4.07	3.76	38.5	0.02	-845
PERM	MJ	63.1	0.00	113		0.00	0.00	0.00	0.00	0.00
PERT	MJ	2412	10.9	106		0.03	3.76	38.5	0.02	-862
PENRE	MJ	19722	947	1793		4.07	321	427	1.84	-8408
PENRM	MJ	6.47	0.00	7E-5		0.00	0.00	0.00	0.00	0.00
PENRT	MJ	19726	947	1793		4.07	321	427	1.85	-8408
SM	kg	175	5E-5	11.7		2E-4	0.11	0.29	4E-4	-78.3
RSF	MJ	1.94	3E-4	66.3		7E-6	1E-3	0.01	1E-5	-0.1
NRSF	MJ	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
FW	m^3	12.86	0.10	1.78		3E-4	0.04	0.30	2E-3	-5.27
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste production and output flows

Waste production

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	943	1.35	1165		8E-5	0.46	0.99	2E-3	-370
Non-hazardous waste disposed	kg	3251	21.2	216		0.05	7.33	46.9	0.03	-1498
Radioactive waste disposed	kg	0.06	6E-3	69.6		3E-5	2E-3	1E-3	1E-6	-0.01

Output flows

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	0.13	8E-3	4.24		6E-6	1E-5	759	4E-6	-0.06
Materials for energy recovery	kg	0.01	6E-5	1.47		1E-7	2E-5	4E-5	4E-8	1.47
Exported energy, electricity	MJ	4.82	0.14	0.51		1E-4	0.05	0.10	3E-4	-1.33
Exported energy, thermal	MJ	16.0	0.69	1.99		0.01	0.22	0.31	3E-4	-4.88

Additional Environmental Information

Use of Product

These bollards are maintenance free.

Recycling & Potential Reuse

At end of service life, the bollards should be dug up. Concrete should be crushed for use as a recycled aggregate, and all steel components including reinforcing bar should be sent for recycling. Reuse or down cycling may also be an option, however this would depend on reuse scenarios.

References

General Programme Instructions of the International EPD® System. Version 4.0.
PCR 2019:14. Construction Products. Version 1.2.3
EcoInvent Database version 3.8 with EN1508 Cut-Off

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