

Statement of Verification

BREG EN EPD No.: 000470

Issue 01

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



is in accordance with the requirements of:
EN 15804:2012+A1:2013
and
BRE Global Scheme Document SD207

This declaration is for:
1 kg of StronGuard Palisade fencing

Company Address

Barkers Engineering Ltd
ETNA Works
Duke Street
Stoke on Trent
ST4 3NS



Emma Baker
Operator

06 December 2022
Date of this Issue

06 December 2022
Date of First Issue

07 December 2027
Expiry Date



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



Environmental Product Declaration

EPD Number: 000470

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013
Commissioner of LCA study	LCA consultant/Tool
Barkers Engineering Ltd ETNA Works Duke Street Stoke on Trent ST4 3NS	LCA Tool: BRE LINA v2.0 LCA Consultant: Simon Watts, Barkers Engineering Ltd
Declared Unit	Applicability/Coverage
1 kg of StronGuard Palisade fencing	Product Average.
EPD Type	Background database
Cradle to Gate	Ecoinvent 3.2
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 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
(Where appropriate ^b)Third party verifier: Roger Connick	
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+A1:2013. 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+A1:2013 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
<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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Barkers Engineering is comprised of Barkers Fencing, Barkers Finishing and Barkers Fasteners all based at the Stoke-on-Trent site.

Barkers Engineering
 ETNA Works
 Duke Street
 Stoke on Trent
 ST4 3NS

Construction Product:

Product Description

StronGuard High Security Palisade Fence is a range of third party accredited fencing systems that are manufactured, galvanised and powder coated on the Barkers site in Stoke on Trent. Subject to the security requirements of the site where the fencing is to be installed a range of specifications can be chosen. Typically, the higher the security required, the thicker the materials used and StronGuard is available in 2.5mm, 3.0mm and 4.0mm materials. This EPD represents 1kg of StronGuard Palisade Fencing. This is to enable the impacts for the range of StronGuard High Security Palisade Fencing to be calculated for the available thicknesses.

The fencing systems have been created to meet the high-security requirements of police facilities, airports and ports, datacentres, utility plants, critical national infrastructure, and vulnerable industrial and commercial premises. It's a modular bay style system means it is flexible when installing and can cope with varying degrees of slope up to 33 degrees without the need for onsite modifications. The StronGuard range is independently tested to CPNI, LPCB or PAS68 against forced entry or vehicle impact.

Technical Information

Properties/ Standards	Value/ Unit
Density ρ	$\approx 7850 \text{ kg/m}^3$
Modulus of elasticity (E) (Young's modulus)	210000 MPa
Shear modulus (G)	$G = E / [2 \cdot (1 + \nu)] \approx 81000 \text{ MPa}$
Yield strength (f_y)	235 MPa
Ultimate strength (f_u)	360 MPa
Poisson's ratio in elastic range (ν)	0.30
Coefficient of linear thermal expansion (α)	$12 \times 10^{-6} \text{ }^\circ\text{K}^{-1}$
BS EN ISO 1461:2009 - Hot Dip Galvanized coatings on fabricated iron and steel articles.	ISO 1461:2009 specifies the general properties of coatings and test methods for coatings applied by dipping fabricated iron and steel articles (including certain castings) in a zinc melt (containing not more than 2 % of other metals).
BS EN ISO 12206-1:2021 - Powder Coating - Paints & Varnishes.	Details requirements and test methods for organic coating of extrusions, sheet, and preformed sections for architectural purposes, using coating powders. It covers the pre-treatment, coating powder, coating process and the final product.
DIN 931 & DIN 934 - Supply of Fasteners.	DIN (Deutsch's Institut für Normung - German Institute for Standardization) standards are issued for a variety of components including industrial fasteners as Metric DIN 931 Hexagon Head Cap Screws/Bolts. The DIN standards remain common in Germany, Europe and globally even though the transition to ISO standards is taking place. DIN standards continue to be used for parts which do not have ISO equivalents or for which there is no need for standardization. In this case the ISO equivalent for DIN 931 is ISO 4014.
The Stronguard range of fencing products are independently tested by a number of different bodies, namely CPNI and LPCB. LPS 1175 (certificate no.1198) and PAS 68 are two of the certification standards, products within the range are tested to.	<p>CPNI is the UK Government's National Technical Authority for physical and personal protective security and is the government authority for protective security advice to the UK national infrastructure.</p> <p>LPS 1175 is an LPCB certification used to test the resistance to unauthorised access offered by physical security products.</p> <p>PAS 68 is a publicly available specification (PAS) for impact-testing and rating hostile vehicle mitigation products such as bollards, blockers and barriers used for security and counter-terrorism purposes</p>

Note: Above listed technical properties relate to the mild steel raw material input and are similar for the different thicknesses, i.e., 2.5mm, 3 mm, and 4.0 mm. The technical properties relate to the S235 structural steel constituent material; the ISO 12206 reference relates to the powder coating component; and the DIN 931 & DIN 934 references relate to the fastener component.



Main Product Contents

StronGuard Palisade High Security fencing is constructed from mild steel and subject to customer specification, galvanised and powder coated at the Stoke-on-Trent site. It is accepted that these main products detailed do not total 100% of the whole, however this is due to there being many lower quantity items that would complete the sum.

Material/Chemical Input	%
Mild Steel	80-90%
Zinc	5-10%
Electrostatic powder paint	1-2%
Other chemicals	2-3%

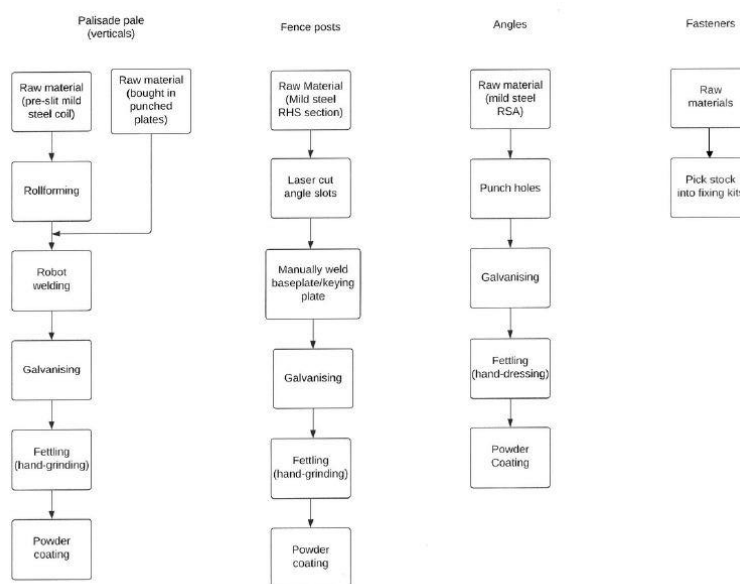
Manufacturing Process

All components are manufactured independently of one another on different production process routes. Palisade (Vertical fence pales) - Roll-formed from slit mild-steel coil into the required profile (shape) and cut to length. Typically, three small mild steel plates welded to the rear around the fixing holes to provide additional strength.

Vertical Posts - Rolled Hollow Section (RHS) cut to length c/w laser cut holes to accommodate horizontal mounting angles. Posts have either base-plates for surface mounting onto a concrete plinth, or "keying-plates" for setting in concrete (site dependent).

Horizontal angles - Rolled Steel Angle (RSA) cut to length, punched, and notched to accommodate fixings for securing pale. Once manufactured to the correct specification, all products are hot dip galvanised and powder coated in-house at the Barkers site prior to shipping to customers. The StronGuard fencing system requires fixings to secure the component parts together when erecting the fence. All fixings are sent as a kit of parts with the fence components after being picked at Barkers. The fixings are typically bought from India and stored at the Barkers site in Stoke. All assembly is carried out by sub-contractors once on site.

Process flow diagram



Life Cycle Assessment Calculation Rules

Declared unit description

1 kg of StronGuard Palisade fencing.

System boundary

This is a cradle-to-gate LCA study that follows the modular design defined in EN 15804:2012+A1:2013.

Data sources, quality and allocation

Datasets are derived from ecoinvent v3.2 (2015) and the LCA tool used was BRE LINA v2.0. The LCA models and reports the production stage modules, A1 to A3. No inputs or outputs have been excluded, all the ancillary materials, energy, and water use are included and emissions to air, water, and soil are included.

Barkers manufactures other products in addition to StronGuard Palisade Fencing therefore an allocation of fuel consumption, water consumption & discharge, and waste emissions was required. The StronGuard range of products includes materials of varying thicknesses i.e., 2.5mm, 3.0mm, & 4.0mm. The quantity used in the data collection for this EPD is for the total quantity of StronGuard Palisade fencing manufactured as a proportion of the total manufactured during the data collection period (01/01/2021 – 31/12/2021), which was calculated at 11.9%.

The original data collection form has been used while doing an LCA analysis, there was no uplift in the given data. 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 3.2 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.

StronGuard High Security Palisade Fence involves TIB Flux D 5700, TIB Flux 60PH+, TIB additive Fferrexal, and MASCO 245-DMX as raw material inputs. Where no direct dataset in LINA to represent these materials was available, chemical compositions from the manufacturer were modelled in SimaPro to represent the raw material. Two proxy datasets have been used while modelling these chemical datasets: Firstly, for TIB Flux D 5700 and TIB Flux 60PH+, which include zinc chloride as one of their main components. There is no appropriate dataset in the ecoinvent database for zinc chloride, so the zinc dataset was considered the most appropriate proxy for zinc chloride. Because zinc chloride is synthesised by treating zinc with hydrogen chloride, zinc is the parent material for producing zinc chloride. Secondly, MASCO 245-DMX chemical, which contains sodium gluconate as one of its components, has no direct dataset in the ecoinvent database to represent sodium gluconate, so the sodium chloride dataset has been used as a proxy, because sodium gluconate is the sodium salt of gluconic acid.

The recording of transport of raw materials and other resources are dealt with differently depending on circumstances: Products are supplied from only one source were simple, we simply calculated the kilometres from the distribution location to the Barkers site using postcodes. Where there were multiple supply routes, the mean of the total distance if there were many locations, and if there were only two or three, we chose the furthest distance.

Quantities of Emissions to Air have been calculated in the same way i.e., 11.9% of total recorded. The totals are included in the Redwing Environmental Emissions Monitoring Report dated 23 September 2021 that has been uploaded along with this report.

Emissions to Water - Barkers do not emit any waste to water, all liquid waste is removed via road tanker and processed by specialist waste disposal Company's. These licensed Companies extract all impurities so that the remaining liquids can be returned to the natural water courses safely.

Emissions to soil - Barkers do not emit any waste to soil, all hazardous/chemical waste is removed from site by specialist licensed companies. Once the harmful impurities are removed from this waste the water is disposed to drain and solids to soil if appropriate.

Some information about waste processing production waste and non-production waste. The hydrochloric acids used in the production procedures are diluted with water, and once spent are collected from site and process by external licensed companies as mentioned above.

Variance is water inputs to water outputs. The variance in water received compared with water to sewerage is due to water being used to dilute the hydrochloric acids used in the production processes.

Specific European and UK datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore very good. The quality level of time representativeness is fair as the background LCI datasets are based on ecoinvent v3.2 which was compiled in 2015. Therefore, there is approximately 5-6 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All the raw materials, ancillary materials, process energy, general energy, water use/discharge and production waste have been included.

LCA Results

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

Parameters describing environmental impacts			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO ₂ equiv.	kg CFC 11 equiv.	kg SO ₂ equiv.	kg (PO ₄) ³⁻ equiv.	kg C ₂ H ₄ equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	2.28E+00	1.38E-07	2.35E-02	5.14E-03	3.29E-03	4.30E-04	2.81E+01
	Transport	A2	1.51E-02	2.76E-09	8.74E-05	1.94E-05	1.27E-05	3.81E-08	2.30E-01
	Manufacturing	A3	4.25E-01	4.44E-08	1.07E-03	4.61E-04	1.16E-04	6.93E-07	4.60E+00
	Total (of product stage)	A1-3	2.72E+00	1.85E-07	2.46E-02	5.62E-03	3.42E-03	4.31E-04	3.30E+01

GWP = Global Warming Potential;
 ODP = Ozone Depletion Potential;
 AP = Acidification Potential for Soil and Water;
 EP = Eutrophication Potential;

POCP = Formation potential of tropospheric Ozone;
 ADPE = Abiotic Depletion Potential – Elements;
 ADPF = Abiotic Depletion Potential – Fossil Fuels;

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.42E+00	1.79E-05	1.42E+00	3.00E+01	0.00E+00	3.00E+01
	Transport	A2	3.82E-03	1.61E-08	3.82E-03	2.29E-01	0.00E+00	2.29E-01
	Manufacturing	A3	3.33E-01	7.24E-07	3.33E-01	5.06E+00	0.00E+00	5.06E+00
	Total (of product stage)	A1-3	1.75E+00	1.87E-05	1.75E+00	3.53E+01	0.00E+00	3.53E+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

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	0.00E+00	0.00E+00	0.00E+00	5.47E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	5.46E-05
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	2.11E-03
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	5.69E-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)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	2.07E-01	1.20E-01	5.22E-05
	Transport	A2	1.15E-04	1.16E-02	1.57E-06
	Manufacturing	A3	1.29E-01	9.58E-03	1.97E-05
	Total (of product stage)	A1-3	3.37E-01	1.41E-01	7.35E-05

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

Other environmental information describing output flows – at end of life						
			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	5.86E-6
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	5.82E-02	0.00E+00	0.00E+00
	Total (of product stage)	A1-3	0.00E+00	5.82E-02	0.00E+00	5.86E-6

CRU = Components for reuse;
 MFR = Materials for recycling

MER = Materials for energy recovery;
 EE = Exported Energy

Additional information

Individual product calculations

The LCA results listed in the tables above are for StronGuard High Security Palisade Fencing processing of 1 kg of Palisade fencing products. The end-user of this EPD can therefore use these results to calculate impact profiles for each StronGuard High Security Palisade Fencing product listed in the tables below. The LCA results for each EN15804 indicator will need to be multiplied by the weight per linear meter or weight per panel of the respective product:

StronGuard Fencing Type	Thickness of Pale (mm)	Pales per section	Weight per linear meter (kg)	Weight per panel (kg)
StronGuard Marso	4	26	74.55	205.01
StronGuard MS Base	3	18	64.73	178.00
StronGuard RCS	3	24	97.05	266.89
StronGuard SL2	2.5	26	77.60	213.4

Example calculation:

If the customer wants to use the 2.5-mm-thick fencing product, by multiplying the weight per linear meter, 77.60 kg/m, by the impacts e.g. GWP Total = 2.72 E+00 x 77.60 yields 2.11 E+02 kg CO₂ equivalent for 2.5mm thickness. Please see the table below for the results for the product of 2.5 mm thickness.

Parameters describing environmental impacts			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO ₂ equiv.	kg CFC 11 equiv.	kg SO ₂ equiv.	kg (PO ₄) ³⁻ equiv.	kg C ₂ H ₄ equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	1.77E+02	1.07E-05	1.82E+00	3.99E-01	2.55E-01	3.34E-02	2.18E+03
	Transport	A2	1.17E+00	2.14E-07	6.78E-03	1.51E-03	9.86E-04	2.96E-06	1.78E+01
	Manufacturing	A3	3.30E+01	3.45E-06	8.30E-02	3.58E-02	9.00E-03	5.38E-05	3.57E+02
	Total (of product stage)	A1-3	2.11E+02	1.44E-05	1.91E+00	4.36E-01	2.65E-01	3.34E-02	2.56E+03

Interpretation of Results

The bulk of the environmental impacts and primary energy demand are attributed to the upstream manufacturing process of the galvanised steel, covered by information modules A1-A3 of EN15804:2012+A1:2013.

References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.

Pre-Consultants by. SimaPro 9 LCA Software 2021. <http://www.pre-sustainability.com>.

Ecoinvent Centre. Swiss Centre for Life Cycle Inventories. <http://www.ecoinvent.org>

Redwing Environmental – Barkers Fencing Emissions Monitoring Report. September 2021

<https://eurocodeapplied.com/design/en1993/steel-design-properties>