

# Environmental Product Declaration

## BEGA North America Luminaire Products

Bollard Product Category



# BEGA

At BEGA, we believe companies must learn to live lightly, lift people up, and do everything possible to leave our planet better than we found it. Sustainable resource management and the creation of exemplary production facilities, for both our workforce and the environment, have been part of BEGA's basic entrepreneurial principles from the very beginning. We understand success is not just reflected in the profit and loss statement, and fundamentally believe in our ability to do good by being good.

Environmental Product Declaration for BEGA Product(s):

**77753 | 84238 | 84671 | 99326 | 84462**

**84690 Head with 84002 Tube**

**99853 Head with 99620 Tube**

*A series of LED bollards which includes standalone bollards and interchangeable bollard tubes and heads.*



ASTM INTERNATIONAL

# Environmental Product Declaration

**BEGA North America Luminaire Products**

Bollard Product Category

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According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and EN 15804+A2. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428 USA
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	ASTM, General Program Instructions, v8.0, April 29, 2020
MANUFACTURER NAME AND ADDRESS	BEGA North America 1775 W 160th Ave, Broomfield, CO 80023 United States of America
DECLARATION NUMBER	EPD 814
DECLARED PRODUCT & FUNCTIONAL UNIT	Bollard Luminaire Product Functional Unit = 1 system involving a luminaire, a lamp or a component for a luminaire
REFERENCE PCR AND VERSION NUMBER	PCR for Building-Related Products and Services, Institut Bauen und Umwelt e.V. (IBU) - Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Re-port according to EN 15804+A2:2019, Version 1.4, 15.04.2024. Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, V12, 30/09/2024
DESCRIPTION OF PRODUCT(S) APPLICATION/USE	Outdoor architectural lighting products
PRODUCT RSL DESCRIPTION	10 to 20 years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	11/22/2024
PERIOD OF VALIDITY	5 years
EPD TYPE	Product Specific
DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-Grave and Module D (A + B + C + D)
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	LCA for Experts 10.8.0.14
LCI DATABASE(S) & VERSION NUMBER	LCA for Experts Sphera database & USLCI v2.0
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1; CML 4.1; EN 15804+A2
The sub-category PCR review was conducted by:	Institut Bauen und Umwelt e.V.
<p>This declaration was independently verified in accordance with ISO 14025: 2006. The IBU: Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, based on EN 15804+A2 serves as the core PCR.</p> <p><input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL</p>	Tim Brooke, ASTM International
<p>This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:</p>	Lindita Bushi, PhD, Athena Sustainable Materials Institute

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of EN 15804+A2 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

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## General Information

### Description of Company/Organization

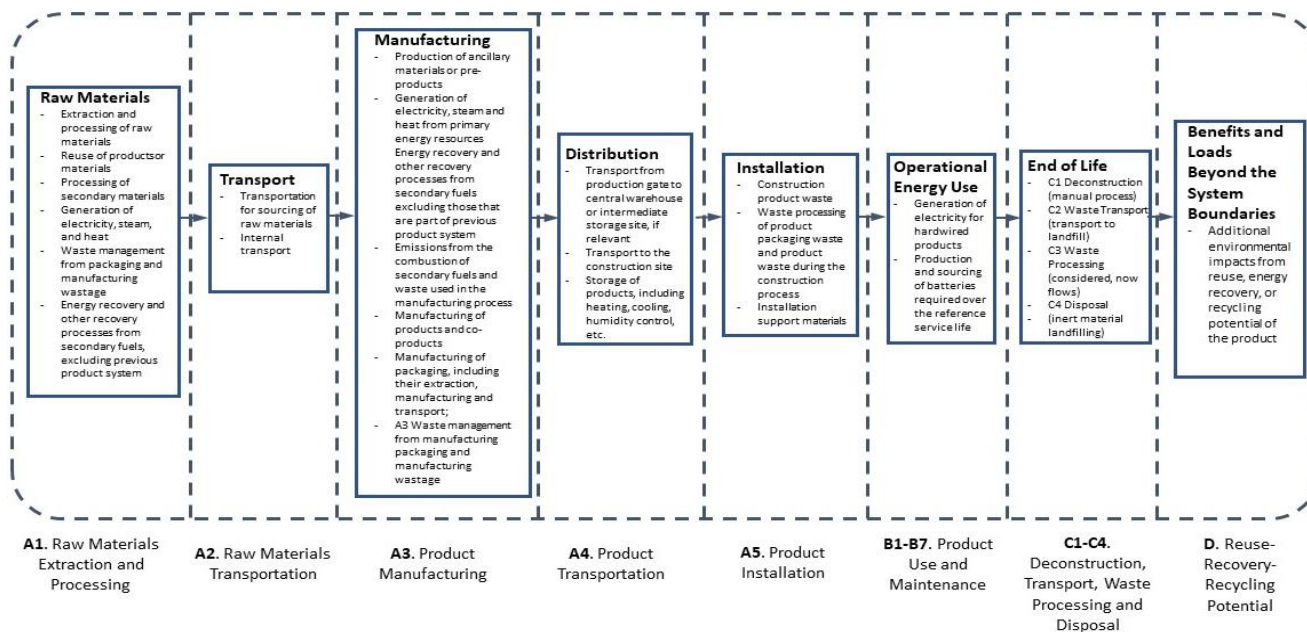
BEGA North America is a leading manufacturer of high-quality outdoor architectural lighting and furniture solutions, with a state-of-the-art manufacturing facilities in Carpinteria, CA, and Broomfield, CO. BEGA has an unwavering commitment to quality above all, in our people, products, partners, and processes.

### Product Description

Product Name: Bollard

A series of LED bollards, including standalone bollards and interchangeable bollard tubes and heads, designed to provide symmetric or one-sided, shielded or unshielded illumination for a wide range of outdoor applications.

### Flow Diagram



### Manufacturer Specific EPD

This product-specific EPD was developed based on the Cradle-to-Grave Life Cycle Assessment. This EPD represents BEGA North America's Broomfield, CO facility. The EPD accounts for raw material extraction and processing, transport, product manufacturing, distribution, installation, maintenance, disposal, and potential benefits and loads following the end of life disposal. Manufacturing data were gathered directly from company personnel. When updated company-specific data were not available the ratio of production units, within the 2023 calendar year, was used as a proxy. For any product group EPDs, an impact assessment was completed for each product and the highest impacts were reported as conservative representations of the product group. Product grouping was considered appropriate if the individual product impacts differed by no more than  $\pm 10\%$  in any impact category.

### Application

These robust luminaires are often found along public pathways and in plazas. They can be used to add structure to a large space and for wayfinding. Bollards produce either diffuse, ambient light, or precise, directed pathway lighting. Some create unique light and shadow patterns on the ground that can be used as a design element. Bollards come in a variety of shapes, sizes and finishes to ensure a complementary form to the surrounding architecture.

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## Material Composition

The primary product components and/or materials must be indicated as a percentage mass to enable the user of the EPD to understand the composition of the product in delivery status.

The composition of the Bollard product(s) is as follows:

Material	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620
Aluminum	0.20%	0.27%	0.23%	4.79%	10.39%	0.00%	0.00%	1.42%	0.00%
Recycled Aluminum	85.46%	91.01%	95.32%	90.45%	60.54%	84.22%	94.07%	60.17%	87.41%
Copper	0.23%	0.31%	0.19%	0.09%	0.54%	0.00%	0.14%	0.49%	0.19%
Copper with insulation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00%
Copper/Rubber	2.17%	2.34%	1.22%	0.88%	2.59%	6.54%	1.58%	5.83%	2.19%
Copper-Clad	1.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EPDM	0.53%	0.06%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%
EPDM Silicone	0.00%	0.31%	0.18%	0.00%	0.00%	1.23%	0.00%	0.00%	0.00%
Glass	3.11%	1.64%	0.34%	1.37%	18.17%	0.00%	0.00%	14.03%	0.00%
Nylon	0.62%	0.00%	0.00%	0.04%	0.77%	0.00%	0.00%	1.04%	0.00%
Plastic	2.34%	2.52%	1.31%	0.01%	0.01%	5.93%	1.00%	5.66%	2.25%
Plastic/ Aluminum	0.00%	0.28%	0.15%	0.14%	0.00%	0.66%	0.00%	0.00%	0.00%
PVC	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Silicone	2.17%	0.06%	0.03%	0.02%	0.37%	0.00%	0.00%	1.35%	0.00%
Silicone/Fiberglass	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.09%	0.00%
Stainless Steel	1.44%	1.20%	0.93%	2.09%	6.58%	1.41%	3.22%	9.66%	7.96%
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

## Technical Data

For the declared product, the following technical data in the delivery status must be provided with reference to the test standard:

Technical Data									
Product	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620
Dimensions	6 1/2" x 39 3/8"	6 1/4" x 37 1/4"	8 5/8" x 38 7/8" x 8 5/8"	13 3/8" x 5 3/4" x 4"	4 3/4" x 39 3/8" x 3 1/8" x 6 3/8"	6 1/4" x 5"	6 1/4" x 32 1/8"	5 1/2" x 5 1/2"	5 1/2" x 26"
Weight	19.0 lbs	12.8 lbs	27.1 lbs	18.0 lbs	17.9 lbs	21.0 lbs	11.5 lbs	5.5 lbs	7.7 lbs
Operating voltage	120-277V AC	120-277V AC	120-277V AC	120-277V AC	120-277V AC	120-277V AC	-	120-277V AC	-
Minimum start temperature	-30° C	-30° C	-30° C	-40° C	-30° C	-30° C	-	-30° C	-
LED module wattage	7.2 W	11.5 W	11.5 W	12.3 W	11.4 W	16.8 W	-	6.0 W	-
System wattage	10.0 W	15.0 W	18.0 W	14.5 W	19.0 W	21.0 W	-	10.0 W	-
Controllability	0-10V, TRIAC, and ELV dimmable	0-10V, TRIAC, and ELV dimmable	0-10V, TRIAC, and ELV dimmable	0-10V dimmable	0-10V dimmable	0-10V, TRIAC, and ELV dimmable	-	0-10V, TRIAC, and ELV dimmable	-
Color rendering index	Ra > 80	Ra > 80	Ra > 80	Ra > 80	Ra > 80	Ra > 80	-	Ra > 90	-
Luminaire lumens	411 lm	1650 lm	1514 lm	1100 lm	751 lm	388 lm	-	335 lm	-
LED service life (L70)	60000 hrs	60000 hrs	60000 hrs	60000 hrs	60000 hrs	60000 hrs	-	60000 hrs	-

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## Placing on the Market / Application Rules

The Bollard Luminaire Products conform to the certifications and sustainability regulations below:

- NRTL listed to North American Standards, suitable for wet locations
- Protection class IP 65
- 84238 is DarkSky approved

## Properties of Declared Product as Shipped

Packaging varies according to order quantity. Products are shipped in cardboard boxes and packaging may include plastic wrap and/or shrink wrap, edge protectors, cardboard dividers, vinyl strapping material, packaging tape, and labels. Wood pallets are used with larger shipments.

## Methodological Framework

### Functional Unit

The declaration refers to the functional unit of 1 system involving a luminaire, a lamp or a component for a luminaire as specified in the PCR.

Product	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620
Functional unit	1 system involving a luminaire, a lamp or a component for a luminaire								
Mass (kg / Functional Unit)	8.62	5.81	12.29	8.16	8.12	17.24	5.22	7.71	3.49

## System Boundary

This is a Cradle-to-Grave and Module D (A + B + C + D) Environmental Product Declaration.

The following life cycle phases were considered:

Product Stage			Construction Process Stage		Use Stage							End of Life Stage*				Benefits and Loads Beyond the System Boundaries
Raw material supply	Transport	Manufacturing	Transport from gate to the site	Construction/ installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse-Recovery- Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Description of the System Boundary Stages Corresponding to the PCR

(X = Included; MND = Module Not Declared)

\*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

Any stages not reported have an impact value of 0.

## Reference Service Life

The lifetime of these Luminaire Products varies from 10 to 20 years. The building estimated service life is 75 years.

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## Allocation

Allocation was determined on a per kilogram basis for primary data. For secondary data, cut-off methodology was used. All upstream recycling benefits that would have been accounted for in module A1 were nullified and accounted for in module D to avoid allocation by system expansion within the system boundaries.

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## Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

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## Data Sources

Primary data were collected for every process in the product system under the control of BEGA North America. Secondary data from the LCA for Experts Sphera database & USLCI v2.0 databases were utilized. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of the Luminaire Products product category.

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## Data Quality

The data sources used are complete and representative of North America in terms of the geographic and technological coverage and are a recent vintage (i.e. less than ten years old). The data used for primary data are based on direct information sources of the manufacturer. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty.

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## Period Under Review

The period under review is the full calendar year of 2023.

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## Treatment of Biogenic Carbon

The uptake and release of biogenic carbon throughout the product life cycle follows EN 15804+A2.

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## Comparability and Benchmarking

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to EN 15804+A2 and the building context, respectively the product-specific characteristics of performance, are taken into account. Environmental declarations from different programs may not be comparable. Full conformance with the IBU: Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, v.1.3, August 2021 and IBU: Product Category Rules Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, Version 7, Published August 2023. allows EPD comparability only when all stages of the product's life cycle have been considered. However, variations and deviations are possible.



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## Estimates and Assumptions

### End of Life

The 2021 PEP ecopassport Product Category Rules for Electrical, Electronic and HVAC-R Products, steel and other ferrous metals applies 20% landfill disposed and 80% recycled end of life parameters. As a result, in the End of Life phase, metal materials were assumed to have an 80% recycling rate and 20% landfill rate. All other materials were assumed to have a 100% landfill rate.

### Units

The LCA results within this EPD are reported in SI units.

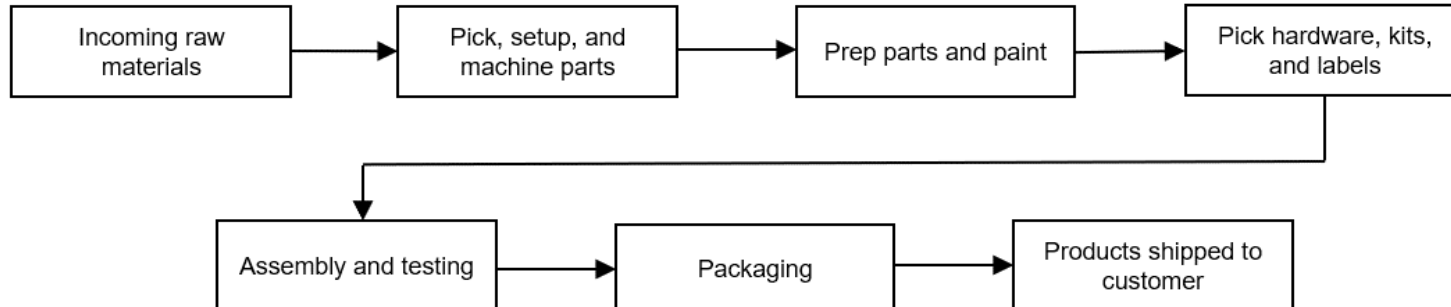
## LCA: Scenarios and Additional Technical Information

### Background data

For life cycle modeling of the considered products, the LCA for Experts for Life Cycle Engineering, developed by Sphera, is used. The LCA for Experts-database contains consistent and documented datasets which are documented in the online LCA for Experts-documentation. To ensure comparability of results in the LCA, the basic data of the LCA for Experts database were used for energy, transportation and auxiliary materials.

### Manufacturing

Materials are received on-site and sent to storage. When a purchase order requiring certain parts is created and scheduled, the required parts are picked and brought to the machine shop area where they are machined as required. If the product requires painting, the components will then go through the painting process. After that, all required parts as well as necessary hardware are prepared into kits and labeled. Next the kit components are assembled and tested and finally assembled. The products are then packaged and shipped from the manufacturing gate.



### Packaging

The packaging material is composed of plastic wrap, paper, cardboard, and tape as listed below.

Packaging Material	Unit	Product								
		B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620
Plastic Wrap	kg per Functional Unit	0.43106	0.29040	0.61483	0.40837	0.40610	0.86212	0.26090	0.38569	0.17469
Paper		0.00022	0.00015	0.00031	0.00020	0.00020	0.00043	0.00013	0.00019	0.00009
Cardboard		0.05463	0.03680	0.07792	0.05175	0.05147	0.10926	0.03306	0.04888	0.02214
Tape		0.00294	0.00198	0.00420	0.00279	0.00277	0.00589	0.00178	0.00263	0.00119

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## Transportation

Transport to Building Site (A4)										
Name	Unit	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620
Fuel type	-	Diesel								
Liters of fuel (for freight (combination) truck with a 32t payload)	l/100km	38								
Capacity utilization (including empty runs)	%	90								
Capacity utilization volume factor	-	1								
Transport distance	km	500								
Gross mass of products transported	kg	8.62	5.81	12.29	8.16	8.12	17.24	5.22	7.71	3.49

## Product Installation

Products are installed by luminaire industry professionals following national and local guidelines.

Installation into the building (A5)										
Name	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620	Unit per FU
Auxiliary materials	0.42	0.42	0.42	0.00	0.42	0.00	0.42	0.00	0.00	kg
Auxiliary material transport (Truck)	362.80	362.80	362.80	0.00	362.80	0.00	362.80	0.00	0.00	km
Auxiliary material transport (Ship)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	km
Water consumption	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	m <sup>3</sup>
Other resources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg
Electricity consumption	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kWh
Other energy carriers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	MJ
Product loss per functional unit	0.43	0.29	0.61	0.41	0.41	0.86	0.26	0.39	0.17	kg
Waste materials at install site	0.48	0.33	0.66	0.41	0.45	0.86	0.31	0.39	0.17	kg
Output substance (recycle)	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	kg
Output substance (landfill)	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	kg
Output substance (incineration)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg
Packaging waste (recycle)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg
Packaging waste (landfill)	0.02	0.02	0.02	0.00	0.02	0.00	0.02	0.00	0.00	kg
Packaging waste (incineration)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg
Direct emissions to ambient air*, soil, and water	0.10	0.07	0.14	0.10	0.09	0.20	0.06	0.09	0.04	kg CO <sub>2</sub>
VOC emissions	-	-	-	-	-	-	-	-	-	kg

\*CO2 emissions to air from disposal of packaging



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The replacement (B4) stage is the sum of the impacts for the life cycle of the product (A1+A2+A3+A4+A5+C1+C2+C3+C4) multiplied by the number of times it is replaced during the 75 year Estimated Building Service Life (ESBL), with the number of replacement within that ESBL based upon the product's Reference Service Life (RSL).

Replacement (B4)										
Name	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620	Unit per FU
Reference Service Life (RSL)	20	20	20	20	20	20	10	20	20	years
Estimated Building Service Life (ESBL)	75	75	75	75	75	75	75	75	75	years
Number of replacements / ESBL	2.8	2.8	2.8	2.8	2.8	2.8	6.5	2.8	2.8	replacements
Electricity consumption	0	0	0	0	0	0	0	0	0	kWh
Litres of fuel	0	0	0	0	0	0	0	0	0	l/100km
Replacement of worn parts	0	0	0	0	0	0	0	0	0	kg

## Product Use

The operational energy use phase involves the operational usage of the luminaire product during its Estimated Building Service Life (ESBL).

Operational Energy Use (B6)										
Name	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620	Unit per EBSL
Water consumption	-	-	-	-	-	-	-	-	-	m <sup>3</sup>
Electricity consumption	3120.0	4680.0	5616.0	4524.0	5928.0	6552.0	0.0	3120.0	0.0	kWh
Other energy carriers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	MJ
Equipment output	-	-	-	-	-	-	-	-	-	kW

## Disposal

The product can be mechanically disassembled to separate the different materials. 80% of the metal materials used are recyclable. The remainder of components are disposed of according to standard municipal solid waste deposition.

End of life (C1-C4)										
Name	B77753	B84238	B84462	B84671	B99326	B84690	B84002	B99853	B99620	Unit
Collected separately	6.01	4.30	9.49	6.36	5.03	11.81	4.06	4.40	2.66	kg
Collected as mixed construction waste	2.61	1.51	2.80	1.81	3.08	5.43	1.16	3.32	0.83	kg
Reuse	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg
Recycling	6.01	4.30	9.49	6.36	5.03	11.81	4.06	4.40	2.66	kg
Landfilling	2.61	1.51	2.80	1.81	3.08	5.43	1.16	3.32	0.83	kg
Energy recovery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	kg

## Re-use Phase

The product is not typically reused during its reference service life. At the end of life, metal components can be mechanically separated and 80% are recycled. The remaining metals and other materials are sent 100% to landfill.

Re-Use, Recovery, and/or Recycling Potential (D)		
Name	Value	Unit
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	0.00	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	0.00	MJ
Net energy benefit from material flow declared in C3 for energy recovery	0.00	MJ
Process and conversion efficiencies	-	
Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors);	80% of product metal materials are recycled at the end of life (Module D).	

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According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## Bollard B84690 Results per Functional Unit Over the Building Lifetime of 75 Years - Including Replacements

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	1.4E+02	8.0E-01	1.0E-01	3.9E+02	2.9E+03	0.0E+00	1.6E-01	0.0E+00	1.7E+00	-2.4E+01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.3E-10	3.0E-11	1.0E-15	4.7E-10	3.3E-10	0.0E+00	6.1E-12	0.0E+00	5.6E-15	-3.1E-12
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	6.8E-01	4.8E-03	3.4E-04	1.9E+00	3.6E+00	0.0E+00	9.6E-04	0.0E+00	7.8E-03	-8.1E-02
EP	Eutrophication potential	kg N-Eq.	2.1E-02	2.7E-04	1.9E-04	6.8E-02	3.0E-01	0.0E+00	5.3E-05	0.0E+00	2.4E-03	-4.1E-03
SP	Smog formation potential	kg O <sub>3</sub> -Eq.	6.7E+00	1.3E-01	2.6E-03	1.9E+01	5.3E+01	0.0E+00	2.6E-02	0.0E+00	2.4E-02	-1.3E+00
FFD	Fossil Fuel Depletion	MJ-surplus	2.4E+02	1.4E+00	4.2E-02	6.8E+02	3.1E+03	0.0E+00	2.8E-01	0.0E+00	2.3E-01	-2.2E+01

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results shown below were calculated using CML 2001 - April 2016 Methodology.

CML 4.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	1.4E+02	8.0E-01	1.1E-01	4.0E+02	2.9E+03	0.0E+00	1.6E-01	0.0E+00	1.8E+00	-2.4E+01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	3.7E-10	3.0E-11	6.0E-14	1.1E-09	2.0E-08	0.0E+00	6.0E-12	0.0E+00	3.3E-13	-1.8E-10
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	7.1E-01	3.9E-03	2.6E-04	2.0E+00	3.5E+00	0.0E+00	7.9E-04	0.0E+00	3.7E-03	-7.8E-02
EP	Eutrophication potential	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	4.3E-02	7.0E-04	2.5E-04	1.3E-01	3.9E-01	0.0E+00	1.4E-04	0.0E+00	3.5E-03	-8.0E-03
POCP	Formation potential of tropospheric ozone	kg C <sub>2</sub> H <sub>4</sub> -Eq.	4.8E-02	4.6E-04	6.1E-05	1.4E-01	3.0E-01	0.0E+00	9.2E-05	0.0E+00	1.1E-03	-6.1E-03
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	2.8E-03	3.3E-10	6.8E-09	7.7E-03	3.5E-04	0.0E+00	6.6E-11	0.0E+00	3.8E-08	-2.3E-05
ADPF	Abiotic depletion potential for fossil resources	MJ	2.3E+03	1.0E+01	3.1E-01	6.4E+03	3.5E+04	0.0E+00	2.0E+00	0.0E+00	1.7E+00	-2.4E+02

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the resource use throughout the life cycle of the product.

EN15804+A2 – Core environmental indicators, units and models												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP-total	Climate change - total	kg CO <sub>2</sub> -Eq.	1.4E+02	8.2E-01	1.3E-01	4.1E+02	3.0E+03	0.0E+00	1.6E-01	0.0E+00	2.2E+00	-2.4E+01
GWP-fossil	Climate change - fossil	kg CO <sub>2</sub> -Eq.	1.4E+02	8.2E-01	2.2E-02	4.1E+02	3.0E+03	0.0E+00	1.6E-01	0.0E+00	3.0E-01	-2.4E+01
GWP-biogenic	Climate change - biogenic	kg CO <sub>2</sub> -Eq.	3.6E-01	0.0E+00	1.1E-01	6.7E+00	6.9E-01	0.0E+00	0.0E+00	0.0E+00	1.9E+00	-6.4E-02
GWP-luluc	Climate change - land use and land use change	kg CO <sub>2</sub> -Eq.	3.0E-02	0.0E+00	9.8E-06	8.3E-02	3.0E-01	0.0E+00	0.0E+00	0.0E+00	5.4E-05	-5.1E-03
ODP	Ozone depletion	kg CFC-11 Eq.	3.3E-10	2.1E-11	5.1E-14	1.0E-09	1.7E-08	0.0E+00	4.2E-12	0.0E+00	2.8E-13	-1.5E-10
AP	Acidification	mol H <sup>+</sup> Eq.	8.2E-01	5.3E-03	3.2E-04	2.3E+00	4.0E+00	0.0E+00	1.1E-03	0.0E+00	4.4E-03	-9.2E-02
EP-freshwater	Eutrophication aquatic freshwater	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	1.8E-04	2.3E-07	2.4E-05	9.2E-04	1.6E-03	0.0E+00	4.6E-08	0.0E+00	1.2E-04	-3.1E-05
EP-marine	Eutrophication aquatic marine	kg N Eq.	1.1E-01	2.1E-03	6.1E-05	3.1E-01	8.8E-01	0.0E+00	4.1E-04	0.0E+00	1.9E-03	-2.1E-02
EP-terrestrial	Eutrophication terrestrial	mol N Eq.	1.1E+00	2.2E-02	1.2E-03	3.3E+00	9.5E+00	0.0E+00	4.5E-03	0.0E+00	1.9E-02	-2.3E-01
POCP	Photochemical ozone formation	NM VOC Eq.	3.4E-01	6.0E-03	1.8E-04	9.8E-01	2.6E+00	0.0E+00	1.2E-03	0.0E+00	2.2E-03	-6.1E-02
ADP-minerals & metals	Depletion of abiotic resources - minerals and metals	kg Sb Eq.	2.7E-03	0.0E+00	2.1E-09	7.6E-03	2.7E-04	0.0E+00	0.0E+00	0.0E+00	1.2E-08	-1.6E-05
ADP-fossil	Depletion of abiotic resources - fossil fuels	mol N Eq.	2.3E+03	1.0E+01	3.2E-01	6.5E+03	4.9E+04	0.0E+00	2.1E+00	0.0E+00	1.8E+00	-2.8E+02
WDP	Water use	m <sup>3</sup> world Eq. deprived	1.6E+01	0.0E+00	1.5E-03	4.6E+01	5.8E+02	0.0E+00	0.0E+00	0.0E+00	1.4E-02	-3.8E+00

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## EN15804+A2 – Indicators, units and models for additional impact categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PM	Particulate matter emissions	Disease incidence	8.2E-06	2.1E-08	2.8E-09	2.3E-05	3.6E-05	0.0E+00	4.2E-09	0.0E+00	3.4E-08	-1.8E-06
IRP	Ionizing radiation, human health	kBq U235 Eq.	9.3E-01	1.8E-19	3.3E-04	2.6E+00	4.0E+02	0.0E+00	3.6E-20	0.0E+00	1.8E-03	-1.7E+00
ETP-fw	Ecotoxicity (freshwater)	CTUe	1.6E+03	4.3E+01	2.0E+00	4.7E+03	1.3E+04	0.0E+00	8.7E+00	0.0E+00	3.1E+01	-1.4E+02
HTP-c	Human toxicity, cancer effects	CTUh	4.0E-07	2.2E-10	1.1E-11	1.1E-06	3.9E-07	0.0E+00	4.3E-11	0.0E+00	2.6E-10	-1.8E-08
HTP-nc	Human toxicity, non-cancer effects	CTUh	1.7E-06	2.0E-08	3.6E-10	5.0E-06	1.0E-05	0.0E+00	4.1E-09	0.0E+00	2.6E-08	-2.3E-07
SQP	Land use related impacts/Soil quality	dimensionless	1.2E+02	0.0E+00	2.9E-02	3.4E+02	5.4E+03	0.0E+00	0.0E+00	0.0E+00	1.6E-01	-5.2E+01

The table below presents disclaimers with regard to the declaration of relevant core and additional environmental impact indicators according to the following classification.

## Disclaimers to the declaration of core and additional environmental impact indicators

ILCD Classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 - This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Results below contain the resource use throughout the life cycle of the product.

## Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ	4.5E+02	0.0E+00	0.0E+00	1.3E+03	1.3E+04	0.0E+00	0.0E+00	0.0E+00	2.2E-01	-1.6E+02
PERM	Renewable primary energy resources as material utilization	MJ	2.1E+00	0.0E+00	4.0E-02	6.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PERT	Total use of renewable primary energy resources	MJ	4.5E+02	0.0E+00	4.0E-02	1.3E+03	1.3E+04	0.0E+00	0.0E+00	0.0E+00	2.2E-01	-1.6E+02
PENRE	Nonrenewable primary energy as energy carrier	MJ	2.3E+03	1.0E+01	0.0E+00	6.5E+03	4.9E+04	0.0E+00	2.1E+00	0.0E+00	1.8E+00	-2.8E+02
PENRM	Nonrenewable primary energy as material utilization	MJ	9.5E+01	0.0E+00	4.8E+00	2.8E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PENRT	Total use of nonrenewable primary energy	MJ	2.4E+03	1.0E+01	4.8E+00	6.8E+03	4.9E+04	0.0E+00	2.1E+00	0.0E+00	1.8E+00	-2.8E+02
SM	Use of secondary material	kg	1.5E+01	0.0E+00	0.0E+00	4.1E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RSF	Use of renewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FW	Use of net fresh water	m³	9.7E-01	0.0E+00	5.0E-05	2.7E+00	1.8E+01	0.0E+00	0.0E+00	0.0E+00	4.0E-04	-1.2E-01

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	1.1E-06	0.0E+00	7.9E-11	3.0E-06	2.8E-05	0.0E+00	0.0E+00	0.0E+00	4.4E-10	-6.7E-07
NHWD	Non-hazardous waste disposed	kg	2.9E+01	0.0E+00	9.5E-01	9.8E+01	1.4E+01	0.0E+00	0.0E+00	0.0E+00	4.9E+00	-3.7E+01
HLRW	High-level radioactive waste	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ILLRW	Intermediate- and low-level radioactive waste	kg	1.0E-02	0.0E+00	3.4E-06	2.8E-02	4.9E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-05	-6.2E-02
CRU	Components for re-use	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	Materials for recycling	kg	9.3E-03	0.0E+00	0.0E+00	2.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+01
MER	Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EE	Recovered energy exported from system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

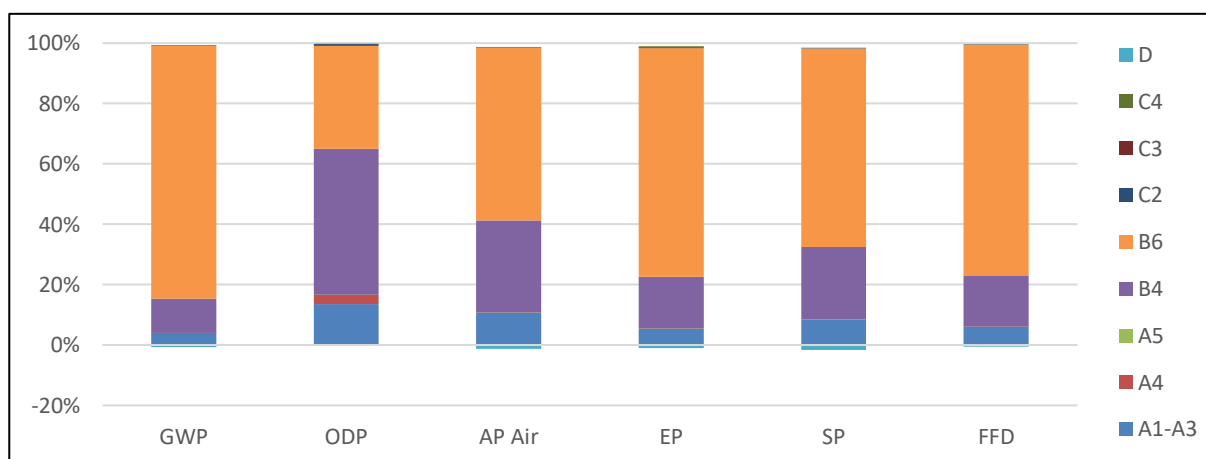
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Resource Use												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO <sub>2</sub>	2.01E-01	0.00E+00	0.00E+00	5.6E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO <sub>2</sub>	0.00E+00	0.00E+00	2.01E-01	5.6E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

## Bollard LCA Interpretation

The operational energy use life cycle stage (B6) dominates the impacts across most impact categories, and this is due to the energy applied to operate the luminaire products. For ozone depletion, the replacement stage (B4) dominates the overall life cycle impact from duplicating the upstream material production stages.



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## Bollard B99853 Results per Functional Unit Over the Building Lifetime of 75 Years - Including Replacements

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	6.7E+01	3.6E-01	4.5E-02	1.9E+02	1.4E+03	0.0E+00	7.2E-02	0.0E+00	1.0E+00	-9.5E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.0E-09	1.4E-11	4.5E-16	3.0E-09	1.6E-10	0.0E+00	2.7E-12	0.0E+00	3.4E-15	-1.1E-12
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	3.2E-01	2.2E-03	1.5E-04	9.1E-01	1.7E+00	0.0E+00	4.3E-04	0.0E+00	4.8E-03	-3.5E-02
EP	Eutrophication potential	kg N-Eq.	1.1E-02	1.2E-04	8.5E-05	3.5E-02	1.4E-01	0.0E+00	2.4E-05	0.0E+00	1.5E-03	-1.6E-03
SP	Smog formation potential	kg O <sub>3</sub> -Eq.	3.5E+00	5.9E-02	1.2E-03	1.0E+01	2.5E+01	0.0E+00	1.2E-02	0.0E+00	1.5E-02	-5.2E-01
FFD	Fossil Fuel Depletion	MJ-surplus	1.2E+02	6.3E-01	1.9E-02	3.4E+02	1.5E+03	0.0E+00	1.3E-01	0.0E+00	1.4E-01	-8.6E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results shown below were calculated using CML 2001 - April 2016 Methodology.

CML 4.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	6.8E+01	3.6E-01	4.9E-02	1.9E+02	1.4E+03	0.0E+00	7.2E-02	0.0E+00	1.1E+00	-9.5E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.1E-09	1.4E-11	2.7E-14	3.1E-09	9.4E-09	0.0E+00	2.7E-12	0.0E+00	2.0E-13	-6.6E-11
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	3.3E-01	1.8E-03	1.2E-04	9.3E-01	1.7E+00	0.0E+00	3.5E-04	0.0E+00	2.3E-03	-3.4E-02
EP	Eutrophication potential	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	2.2E-02	3.1E-04	1.1E-04	7.0E-02	1.8E-01	0.0E+00	6.3E-05	0.0E+00	2.2E-03	-3.1E-03
POCP	Formation potential of tropospheric ozone	kg C <sub>2</sub> H <sub>4</sub> -Eq.	2.1E-02	2.1E-04	2.7E-05	6.2E-02	1.4E-01	0.0E+00	4.1E-05	0.0E+00	6.5E-04	-2.5E-03
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1.4E-03	1.5E-10	3.0E-09	3.8E-03	1.7E-04	0.0E+00	3.0E-11	0.0E+00	2.3E-08	-4.5E-05
ADPF	Abiotic depletion potential for fossil resources	MJ	1.1E+03	4.6E+00	1.4E-01	3.1E+03	1.7E+04	0.0E+00	9.1E-01	0.0E+00	1.1E+00	-9.7E+01

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the resource use throughout the life cycle of the product.

EN15804+A2 – Core environmental indicators, units and models												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP-total	Climate change - total	kg CO <sub>2</sub> -Eq.	7.0E+01	3.7E-01	5.8E-02	2.0E+02	1.4E+03	0.0E+00	7.3E-02	0.0E+00	1.4E+00	-9.7E+00
GWP-fossil	Climate change - fossil	kg CO <sub>2</sub> -Eq.	7.0E+01	3.7E-01	9.8E-03	2.0E+02	1.4E+03	0.0E+00	7.3E-02	0.0E+00	1.8E-01	-9.6E+00
GWP-biogenic	Climate change - biogenic	kg CO <sub>2</sub> -Eq.	1.7E-01	0.0E+00	4.9E-02	3.9E+00	3.3E-01	0.0E+00	0.0E+00	0.0E+00	1.2E+00	-1.3E-02
GWP-luluc	Climate change - land use and land use change	kg CO <sub>2</sub> -Eq.	1.6E-02	0.0E+00	4.4E-06	4.4E-02	1.4E-01	0.0E+00	0.0E+00	0.0E+00	3.3E-05	-4.4E-03
ODP	Ozone depletion	kg CFC-11 Eq.	8.7E-10	9.3E-12	2.3E-14	2.5E-09	8.0E-09	0.0E+00	1.9E-12	0.0E+00	1.7E-13	-5.6E-11
AP	Acidification	mol H <sup>+</sup> Eq.	3.8E-01	2.4E-03	1.4E-04	1.1E+00	1.9E+00	0.0E+00	4.8E-04	0.0E+00	2.7E-03	-4.0E-02
EP-freshwater	Eutrophication aquatic freshwater	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	8.7E-05	1.0E-07	1.1E-05	4.8E-04	7.7E-04	0.0E+00	2.0E-08	0.0E+00	7.4E-05	-1.2E-05
EP-marine	Eutrophication aquatic marine	kg N Eq.	5.7E-02	9.2E-04	2.7E-05	1.7E-01	4.2E-01	0.0E+00	1.8E-04	0.0E+00	1.2E-03	-8.2E-03
EP-terrestrial	Eutrophication terrestrial	mol N Eq.	6.2E-01	1.0E-02	5.5E-04	1.8E+00	4.5E+00	0.0E+00	2.0E-03	0.0E+00	1.2E-02	-9.0E-02
POCP	Photochemical ozone formation	NM VOC Eq.	1.8E-01	2.7E-03	8.2E-05	5.1E-01	1.2E+00	0.0E+00	5.4E-04	0.0E+00	1.4E-03	-2.4E-02
ADP-minerals & metals	Depletion of abiotic resources - minerals and metals	kg Sb Eq.	1.3E-03	0.0E+00	9.6E-10	3.8E-03	1.3E-04	0.0E+00	0.0E+00	0.0E+00	7.3E-09	-4.3E-05
ADP-fossil	Depletion of abiotic resources - fossil fuels	mol N Eq.	1.1E+03	4.6E+00	1.4E-01	3.1E+03	2.3E+04	0.0E+00	9.2E-01	0.0E+00	1.1E+00	-1.1E+02
WDP	Water use	m <sup>3</sup> world Eq. deprived	7.2E+00	0.0E+00	6.8E-04	2.0E+01	2.7E+02	0.0E+00	0.0E+00	0.0E+00	8.5E-03	-1.8E+00

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## EN15804+A2 – Indicators, units and models for additional impact categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PM	Particulate matter emissions	Disease incidence	3.6E-06	9.4E-09	1.3E-09	1.0E-05	1.7E-05	0.0E+00	1.9E-09	0.0E+00	2.1E-08	-7.3E-07
IRP	Ionizing radiation, human health	kBq U235 Eq.	5.1E-01	8.1E-20	1.5E-04	1.4E+00	1.9E+02	0.0E+00	1.6E-20	0.0E+00	1.1E-03	-5.8E-01
ETP-fw	Ecotoxicity (freshwater)	CTUe	9.3E+02	1.9E+01	8.9E-01	2.7E+03	6.4E+03	0.0E+00	3.9E+00	0.0E+00	1.9E+01	-5.7E+01
HTP-c	Human toxicity, cancer effects	CTUh	1.3E-06	9.7E-11	4.9E-12	3.8E-06	1.8E-07	0.0E+00	1.9E-11	0.0E+00	1.6E-10	-8.5E-09
HTP-nc	Human toxicity, non-cancer effects	CTUh	2.9E-05	9.1E-09	1.6E-10	8.1E-05	4.8E-06	0.0E+00	1.8E-09	0.0E+00	1.6E-08	-8.8E-08
SQP	Land use related impacts/Soil quality	dimensionless	6.3E+01	0.0E+00	1.3E-02	1.8E+02	2.6E+03	0.0E+00	0.0E+00	0.0E+00	9.7E-02	-2.0E+01

Results below contain the resource use throughout the life cycle of the product.

## Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ	1.9E+02	0.0E+00	0.0E+00	5.3E+02	6.0E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-01	-5.9E+01
PERM	Renewable primary energy resources as material utilization	MJ	9.4E-01	0.0E+00	1.8E-02	2.7E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PERT	Total use of renewable primary energy resources	MJ	1.9E+02	0.0E+00	1.8E-02	5.4E+02	6.0E+03	0.0E+00	0.0E+00	0.0E+00	1.4E-01	-5.9E+01
PENRE	Nonrenewable primary energy as energy carrier	MJ	1.1E+03	4.6E+00	0.0E+00	3.1E+03	2.3E+04	0.0E+00	9.2E-01	0.0E+00	1.1E+00	-1.1E+02
PENRM	Nonrenewable primary energy as material utilization	MJ	4.3E+01	0.0E+00	2.2E+00	1.3E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PENRT	Total use of nonrenewable primary energy	MJ	1.2E+03	4.6E+00	2.2E+00	3.3E+03	2.3E+04	0.0E+00	9.2E-01	0.0E+00	1.1E+00	-1.1E+02
SM	Use of secondary material	kg	4.6E+00	0.0E+00	0.0E+00	1.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RSF	Use of renewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FW	Use of net fresh water	m <sup>3</sup>	3.8E-01	0.0E+00	2.2E-05	1.1E+00	8.4E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-04	-5.5E-02

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the output flows and wastes throughout the life cycle of the product.

## Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	4.5E-07	0.0E+00	3.5E-11	1.3E-06	1.3E-05	0.0E+00	0.0E+00	0.0E+00	2.7E-10	-2.4E-07
NHWD	Non-hazardous waste disposed	kg	1.2E+01	0.0E+00	4.3E-01	4.4E+01	6.7E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	-1.3E+01
HLRW	High-level radioactive waste	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ILLRW	Intermediate- and low-level radioactive waste	kg	5.2E-03	0.0E+00	1.5E-06	1.5E-02	2.3E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-05	-2.2E-02
CRU	Components for re-use	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	Materials for recycling	kg	1.1E-02	0.0E+00	0.0E+00	3.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E+00
MER	Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EE	Recovered energy exported from system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

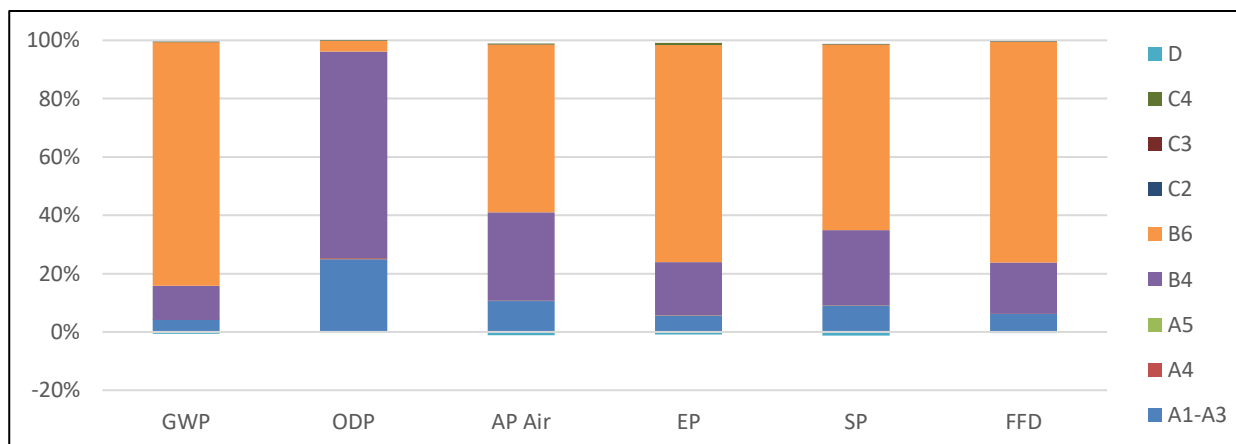
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Resource Use												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO <sub>2</sub>	9.0E-02	0.0E+00	0.0E+00	2.5E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO <sub>2</sub>	0.0E+00	0.0E+00	8.99E-02	2.5E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*\*All use phase and disposal stages have been considered and only those with non-zero values have been reported*

## LCA Interpretation

The operational energy use life cycle stage (B6) dominates the impacts across most impact categories, and this is due to the energy applied to operate the luminaire products. For ozone depletion, the replacement stage (B4) dominates the overall life cycle impact from duplicating the upstream material production stages.



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## Bollard B84002 Results per Functional Unit Over the Building Lifetime of 75 Years - Including Replacements

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	4.1E+01	2.4E-01	1.3E+00	2.8E+02	0.0E+00	0.0E+00	4.8E-02	0.0E+00	4.1E-01	-8.0E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	3.9E-11	9.2E-12	6.6E-13	3.3E-10	0.0E+00	0.0E+00	1.8E-12	0.0E+00	1.4E-15	-1.0E-12
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	2.0E-01	1.5E-03	6.1E-03	1.4E+00	0.0E+00	0.0E+00	2.9E-04	0.0E+00	1.9E-03	-2.8E-02
EP	Eutrophication potential	kg N-Eq.	6.4E-03	8.1E-05	2.4E-04	4.8E-02	0.0E+00	0.0E+00	1.6E-05	0.0E+00	6.1E-04	-1.4E-03
SP	Smog formation potential	kg O <sub>3</sub> -Eq.	2.1E+00	4.0E-02	5.3E-02	1.4E+01	0.0E+00	0.0E+00	8.0E-03	0.0E+00	6.0E-03	-4.5E-01
FFD	Fossil Fuel Depletion	MJ-surplus	7.1E+01	4.3E-01	1.8E+00	4.7E+02	0.0E+00	0.0E+00	8.6E-02	0.0E+00	5.7E-02	-7.4E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results shown below were calculated using CML 2001 - April 2016 Methodology.

CML 4.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	4.2E+01	2.4E-01	1.3E+00	2.9E+02	0.0E+00	0.0E+00	4.9E-02	0.0E+00	4.5E-01	-8.0E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.0E-10	9.1E-12	8.0E-12	8.0E-10	0.0E+00	0.0E+00	1.8E-12	0.0E+00	8.2E-14	-6.1E-11
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	2.1E-01	1.2E-03	6.5E-03	1.5E+00	0.0E+00	0.0E+00	2.4E-04	0.0E+00	9.1E-04	-2.7E-02
EP	Eutrophication potential	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	1.3E-02	2.1E-04	4.0E-04	9.6E-02	0.0E+00	0.0E+00	4.3E-05	0.0E+00	8.7E-04	-2.7E-03
POCP	Formation potential of tropospheric ozone	kg C <sub>2</sub> H <sub>4</sub> -Eq.	1.4E-02	1.4E-04	4.3E-04	9.9E-02	0.0E+00	0.0E+00	2.8E-05	0.0E+00	2.6E-04	-2.1E-03
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	2.5E-04	1.0E-10	4.2E-05	1.9E-03	0.0E+00	0.0E+00	2.0E-11	0.0E+00	9.3E-09	-1.2E-05
ADPF	Abiotic depletion potential for fossil resources	MJ	6.7E+02	3.1E+00	1.8E+01	4.5E+03	0.0E+00	0.0E+00	6.2E-01	0.0E+00	4.3E-01	-8.1E+01

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the resource use throughout the life cycle of the product.

EN15804+A2 – Core environmental indicators, units and models												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP-total	Climate change - total	kg CO <sub>2</sub> -Eq.	4.4E+01	2.5E-01	1.3E+00	3.0E+02	0.0E+00	0.0E+00	5.0E-02	0.0E+00	5.5E-01	-8.2E+00
GWP-fossil	Climate change - fossil	kg CO <sub>2</sub> -Eq.	4.4E+01	2.5E-01	1.3E+00	2.9E+02	0.0E+00	0.0E+00	5.0E-02	0.0E+00	7.4E-02	-8.2E+00
GWP-biogenic	Climate change - biogenic	kg CO <sub>2</sub> -Eq.	1.1E-01	0.0E+00	3.5E-02	4.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-01	-2.0E-02
GWP-luluc	Climate change - land use and land use change	kg CO <sub>2</sub> -Eq.	5.4E-03	0.0E+00	1.0E-03	4.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-05	-2.1E-03
ODP	Ozone depletion	kg CFC-11 Eq.	9.3E-11	6.3E-12	6.7E-12	7.0E-10	0.0E+00	0.0E+00	1.3E-12	0.0E+00	7.0E-14	-5.2E-11
AP	Acidification	mol H <sup>+</sup> Eq.	2.5E-01	1.6E-03	7.3E-03	1.7E+00	0.0E+00	0.0E+00	3.2E-04	0.0E+00	1.1E-03	-3.2E-02
EP-freshwater	Eutrophication aquatic freshwater	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	5.3E-05	6.9E-08	9.2E-06	6.0E-04	0.0E+00	0.0E+00	1.4E-08	0.0E+00	3.0E-05	-1.0E-05
EP-marine	Eutrophication aquatic marine	kg N Eq.	3.3E-02	6.2E-04	8.4E-04	2.3E-01	0.0E+00	0.0E+00	1.2E-04	0.0E+00	4.6E-04	-7.2E-03
EP-terrestrial	Eutrophication terrestrial	mol N Eq.	3.6E-01	6.8E-03	9.5E-03	2.5E+00	0.0E+00	0.0E+00	1.4E-03	0.0E+00	4.6E-03	-7.8E-02
POCP	Photochemical ozone formation	NM VOC Eq.	1.1E-01	1.8E-03	3.0E-03	7.2E-01	0.0E+00	0.0E+00	3.7E-04	0.0E+00	5.5E-04	-2.1E-02
ADP-minerals & metals	Depletion of abiotic resources - minerals and metals	kg Sb Eq.	2.5E-04	0.0E+00	4.1E-05	1.9E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-09	-1.0E-05
ADP-fossil	Depletion of abiotic resources - fossil fuels	mol N Eq.	6.9E+02	3.1E+00	1.9E+01	4.6E+03	0.0E+00	0.0E+00	6.2E-01	0.0E+00	4.4E-01	-9.6E+01
WDP	Water use	m <sup>3</sup> world Eq. deprived	4.6E+00	0.0E+00	2.2E-01	3.1E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-03	-1.3E+00

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## EN15804+A2 – Indicators, units and models for additional impact categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PM	Particulate matter emissions	Disease incidence	2.5E-06	6.4E-09	1.2E-07	1.7E-05	0.0E+00	0.0E+00	1.3E-09	0.0E+00	8.5E-09	-6.0E-07
IRP	Ionizing radiation, human health	kBq U235 Eq.	2.6E-01	5.5E-20	3.7E-02	1.9E+00	0.0E+00	0.0E+00	1.1E-20	0.0E+00	4.5E-04	-5.5E-01
ETP-fw	Ecotoxicity (freshwater)	CTUe	4.6E+02	1.3E+01	8.0E+00	3.2E+03	0.0E+00	0.0E+00	2.6E+00	0.0E+00	7.7E+00	-4.7E+01
HTP-c	Human toxicity, cancer effects	CTUh	2.6E-07	6.6E-11	4.4E-07	4.6E-06	0.0E+00	0.0E+00	1.3E-11	0.0E+00	6.4E-11	-6.2E-09
HTP-nc	Human toxicity, non-cancer effects	CTUh	4.9E-07	6.2E-09	1.2E-08	3.3E-06	0.0E+00	0.0E+00	1.2E-09	0.0E+00	6.5E-09	-7.8E-08
SQP	Land use related impacts/Soil quality	dimensionless	1.6E+01	0.0E+00	2.7E+00	1.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E-02	-1.8E+01

Results below contain the resource use throughout the life cycle of the product.

## Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ	1.4E+02	0.0E+00	0.0E+00	8.9E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.4E-02	-5.5E+01
PERM	Renewable primary energy resources as material utilization	MJ	6.3E-01	0.0E+00	3.6E+00	2.8E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PERT	Total use of renewable primary energy resources	MJ	1.4E+02	0.0E+00	3.6E+00	9.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.4E-02	-5.5E+01
PENRE	Nonrenewable primary energy as energy carrier	MJ	6.9E+02	3.1E+00	0.0E+00	4.5E+03	0.0E+00	0.0E+00	6.2E-01	0.0E+00	4.4E-01	-9.6E+01
PENRM	Nonrenewable primary energy as material utilization	MJ	5.1E+01	0.0E+00	2.5E+00	3.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PENRT	Total use of nonrenewable primary energy	MJ	7.4E+02	3.1E+00	2.5E+00	4.8E+03	0.0E+00	0.0E+00	6.2E-01	0.0E+00	4.4E-01	-9.6E+01
SM	Use of secondary material	kg	4.9E+00	0.0E+00	0.0E+00	3.2E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RSF	Use of renewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FW	Use of net fresh water	m <sup>3</sup>	3.0E-01	0.0E+00	6.3E-03	2.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-04	-4.1E-02

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the output flows and wastes throughout the life cycle of the product.

## Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	3.2E-07	0.0E+00	1.4E-07	3.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-10	-4.4E-07
NHWD	Non-hazardous waste disposed	kg	8.8E+00	0.0E+00	4.2E-01	6.8E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E+00	-2.5E+01
HLRW	High-level radioactive waste	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ILLRW	Intermediate- and low-level radioactive waste	kg	2.9E-03	0.0E+00	3.8E-04	2.1E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-06	-4.1E-02
CRU	Components for re-use	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	Materials for recycling	kg	5.4E-03	0.0E+00	3.0E+00	1.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.1E+00
MER	Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EE	Recovered energy exported from system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

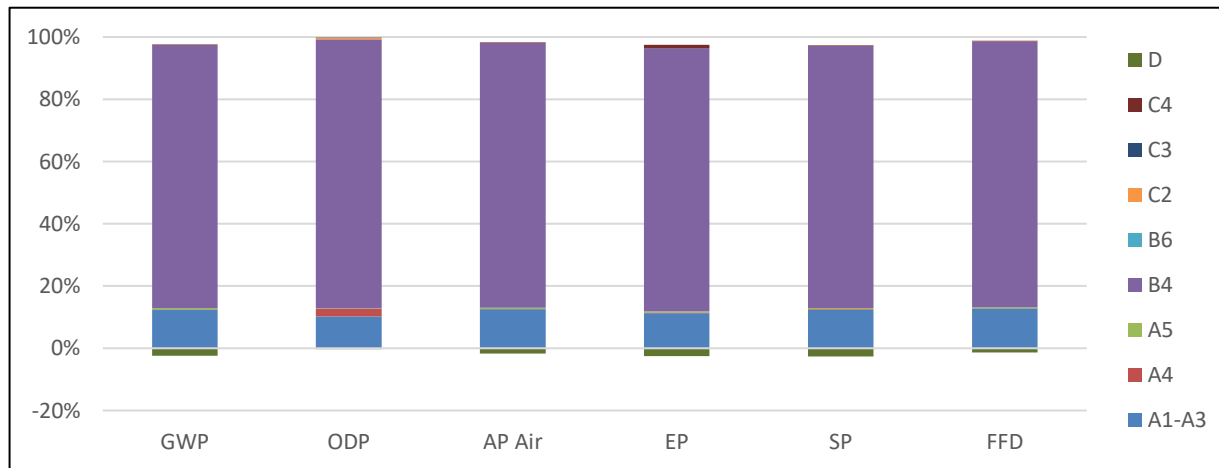
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Resource Use												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO <sub>2</sub>	6.1E-02	0.0E+00	0.0E+00	4.0E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO <sub>2</sub>	0.0E+00	0.0E+00	6.1E-02	4.0E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

## LCA Interpretation

The replacement stage (B4) dominates across all impact categories due to the duplication of upstream material production stages.



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## Bollard B99620 Results per Functional Unit Over the Building Lifetime of 75 Years - Including Replacements

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	2.8E+01	1.6E-01	2.0E-02	7.9E+01	0.0E+00	0.0E+00	3.2E-02	0.0E+00	2.6E-01	-5.3E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	2.6E-11	6.1E-12	2.1E-16	9.4E-11	0.0E+00	0.0E+00	1.2E-12	0.0E+00	8.6E-16	-6.5E-13
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	1.4E-01	9.7E-04	6.9E-05	3.9E-01	0.0E+00	0.0E+00	2.0E-04	0.0E+00	1.2E-03	-1.9E-02
EP	Eutrophication potential	kg N-Eq.	4.2E-03	5.4E-05	3.8E-05	1.3E-02	0.0E+00	0.0E+00	1.1E-05	0.0E+00	3.8E-04	-9.1E-04
SP	Smog formation potential	kg O <sub>3</sub> -Eq.	1.4E+00	2.7E-02	5.3E-04	3.9E+00	0.0E+00	0.0E+00	5.4E-03	0.0E+00	3.7E-03	-2.9E-01
FFD	Fossil Fuel Depletion	MJ-surplus	4.8E+01	2.9E-01	8.4E-03	1.3E+02	0.0E+00	0.0E+00	5.7E-02	0.0E+00	3.5E-02	-4.9E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results shown below were calculated using CML 2001 - April 2016 Methodology.

CML 4.1 Impact Assessment												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP	Global warming potential	kg CO <sub>2</sub> -Eq.	2.8E+01	1.6E-01	2.2E-02	8.0E+01	0.0E+00	0.0E+00	3.3E-02	0.0E+00	2.8E-01	-5.4E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	7.4E-11	6.1E-12	1.2E-14	2.3E-10	0.0E+00	0.0E+00	1.2E-12	0.0E+00	5.1E-14	-3.9E-11
AP Air	Acidification potential for air emissions	kg SO <sub>2</sub> -Eq.	1.4E-01	8.0E-04	5.4E-05	4.1E-01	0.0E+00	0.0E+00	1.6E-04	0.0E+00	5.6E-04	-1.9E-02
EP	Eutrophication potential	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	8.6E-03	1.4E-04	5.1E-05	2.6E-02	0.0E+00	0.0E+00	2.9E-05	0.0E+00	5.4E-04	-1.8E-03
POCP	Formation potential of tropospheric ozone	kg C <sub>2</sub> H <sub>4</sub> -Eq.	9.5E-03	9.3E-05	1.2E-05	2.7E-02	0.0E+00	0.0E+00	1.9E-05	0.0E+00	1.6E-04	-1.4E-03
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	2.5E-04	6.7E-11	1.4E-09	7.0E-04	0.0E+00	0.0E+00	1.4E-11	0.0E+00	5.8E-09	-1.8E-05
ADPF	Abiotic depletion potential for fossil resources	MJ	4.5E+02	2.1E+00	6.3E-02	1.3E+03	0.0E+00	0.0E+00	4.1E-01	0.0E+00	2.6E-01	-5.4E+01

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the resource use throughout the life cycle of the product.

EN15804+A2 – Core environmental indicators, units and models												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
GWP-total	Climate change - total	kg CO <sub>2</sub> -Eq.	2.9E+01	1.7E-01	2.7E-02	8.3E+01	0.0E+00	0.0E+00	3.3E-02	0.0E+00	3.4E-01	-5.5E+00
GWP-fossil	Climate change - fossil	kg CO <sub>2</sub> -Eq.	2.9E+01	1.7E-01	4.4E-03	8.2E+01	0.0E+00	0.0E+00	3.3E-02	0.0E+00	4.6E-02	-5.4E+00
GWP-biogenic	Climate change - biogenic	kg CO <sub>2</sub> -Eq.	7.2E-02	0.0E+00	2.2E-02	1.1E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-01	-1.0E-02
GWP-luluc	Climate change - land use and land use change	kg CO <sub>2</sub> -Eq.	4.4E-03	0.0E+00	2.0E-06	1.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.3E-06	-2.0E-03
ODP	Ozone depletion	kg CFC-11 Eq.	6.6E-11	4.2E-12	1.0E-14	2.0E-10	0.0E+00	0.0E+00	8.4E-13	0.0E+00	4.3E-14	-3.3E-11
AP	Acidification	mol H <sup>+</sup> Eq.	1.7E-01	1.1E-03	6.5E-05	4.7E-01	0.0E+00	0.0E+00	2.2E-04	0.0E+00	6.8E-04	-2.2E-02
EP-freshwater	Eutrophication aquatic freshwater	kg(PO <sub>4</sub> ) <sup>3</sup> -Eq.	3.6E-05	4.6E-08	4.9E-06	1.7E-04	0.0E+00	0.0E+00	9.3E-09	0.0E+00	1.9E-05	-6.7E-06
EP-marine	Eutrophication aquatic marine	kg N Eq.	2.1E-02	4.2E-04	1.2E-05	6.2E-02	0.0E+00	0.0E+00	8.3E-05	0.0E+00	2.9E-04	-4.7E-03
EP-terrestrial	Eutrophication terrestrial	mol N Eq.	2.3E-01	4.5E-03	2.5E-04	6.8E-01	0.0E+00	0.0E+00	9.1E-04	0.0E+00	2.9E-03	-5.1E-02
POCP	Photochemical ozone formation	NM VOC Eq.	6.9E-02	1.2E-03	3.7E-05	2.0E-01	0.0E+00	0.0E+00	2.4E-04	0.0E+00	3.4E-04	-1.4E-02
ADP-minerals & metals	Depletion of abiotic resources - minerals and metals	kg Sb Eq.	2.4E-04	0.0E+00	4.3E-10	6.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-09	-1.6E-05
ADP-fossil	Depletion of abiotic resources - fossil fuels	mol N Eq.	4.6E+02	2.1E+00	6.5E-02	1.3E+03	0.0E+00	0.0E+00	4.2E-01	0.0E+00	2.7E-01	-6.4E+01
WDP	Water use	m <sup>3</sup> world Eq. deprived	3.1E+00	0.0E+00	3.1E-04	8.8E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E-03	-9.5E-01

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

## EN15804+A2 – Indicators, units and models for additional impact categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PM	Particulate matter emissions	Disease incidence	1.7E-06	4.3E-09	5.7E-10	4.8E-06	0.0E+00	0.0E+00	8.5E-10	0.0E+00	5.3E-09	-4.1E-07
IRP	Ionizing radiation, human health	kBq U235 Eq.	1.9E-01	3.7E-20	6.6E-05	5.2E-01	0.0E+00	0.0E+00	7.3E-21	0.0E+00	4.5E-04	-3.5E-01
ETP-fw	Ecotoxicity (freshwater)	CTUe	3.1E+02	8.8E+00	4.0E-01	9.1E+02	0.0E+00	0.0E+00	1.8E+00	0.0E+00	4.8E+00	-3.2E+01
HTP-c	Human toxicity, cancer effects	CTUh	4.2E-07	4.4E-11	2.2E-12	1.2E-06	0.0E+00	0.0E+00	8.8E-12	0.0E+00	4.0E-11	-4.5E-09
HTP-nc	Human toxicity, non-cancer effects	CTUh	3.2E-07	4.1E-09	7.4E-11	9.3E-07	0.0E+00	0.0E+00	8.3E-10	0.0E+00	4.0E-09	-5.1E-08
SQP	Land use related impacts/Soil quality	dimensionless	1.3E+01	0.0E+00	5.8E-03	3.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-02	-1.2E+01

Results below contain the resource use throughout the life cycle of the product.

## Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	MJ	9.1E+01	0.0E+00	0.0E+00	2.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-02	-3.5E+01
PERM	Renewable primary energy resources as material utilization	MJ	4.3E-01	0.0E+00	8.0E-03	1.2E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PERT	Total use of renewable primary energy resources	MJ	9.1E+01	0.0E+00	8.0E-03	2.5E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-02	-3.5E+01
PENRE	Nonrenewable primary energy as energy carrier	MJ	4.6E+02	2.1E+00	0.0E+00	1.3E+03	0.0E+00	0.0E+00	4.2E-01	0.0E+00	2.7E-01	-6.4E+01
PENRM	Nonrenewable primary energy as material utilization	MJ	1.1E+01	0.0E+00	5.6E-01	3.3E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PENRT	Total use of nonrenewable primary energy	MJ	4.7E+02	2.1E+00	5.6E-01	1.3E+03	0.0E+00	0.0E+00	4.2E-01	0.0E+00	2.7E-01	-6.4E+01
SM	Use of secondary material	kg	3.1E+00	0.0E+00	0.0E+00	8.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RSF	Use of renewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FW	Use of net fresh water	m <sup>3</sup>	1.9E-01	0.0E+00	1.0E-05	5.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.2E-05	-2.9E-02

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Results below contain the output flows and wastes throughout the life cycle of the product.

## Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
HWD	Hazardous waste disposed	kg	2.1E-07	0.0E+00	1.6E-11	6.0E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.7E-11	-1.4E-07
NHWD	Non-hazardous waste disposed	kg	5.8E+00	0.0E+00	1.9E-01	1.9E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.6E-01	-7.9E+00
HLRW	High-level radioactive waste	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ILLRW	Intermediate- and low-level radioactive waste	kg	2.1E-03	0.0E+00	6.9E-07	5.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-06	-1.3E-02
CRU	Components for re-use	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	Materials for recycling	kg	1.1E-02	0.0E+00	0.0E+00	3.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
MER	Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EE	Recovered energy exported from system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

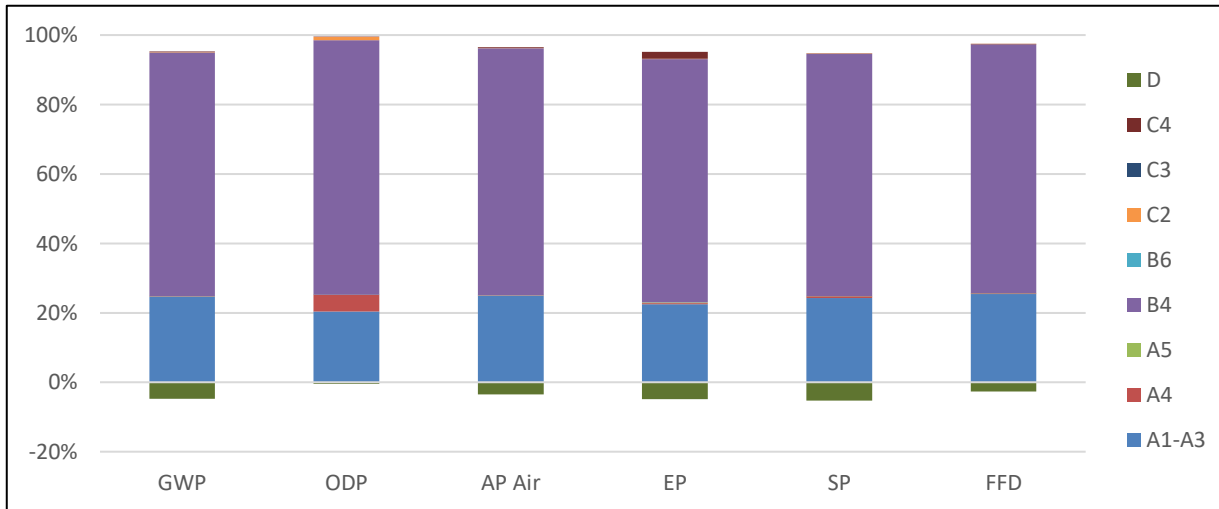
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Resource Use												
Parameter	Parameter	Unit	A1-A3	A4	A5	B4	B6	C1	C2	C3	C4	D
BCRP	Biogenic Carbon Removal from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO <sub>2</sub>	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO <sub>2</sub>	4.1E-02	0.0E+00	0.0E+00	1.1E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO <sub>2</sub>	0.0E+00	0.0E+00	4.07E-02	1.1E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO <sub>2</sub>	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

\*All use phase and disposal stages have been considered and only those with non-zero values have been reported

## LCA Interpretation

The replacement stage (B4) dominates across all impact categories due to the duplication of upstream material production stages.



# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

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## Environmental and Health During Manufacturing

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BEGA North America has established a robust Environmental, Health, and Safety (EHS) culture. BEGA products incorporate the highest quality materials for long service life and operational reliability. We use low-emissions equipment and less harmful chemical options for our manufacturing processes, and apply best management practices that assist in enforcing proper Industrial Hygiene (IH) evaluation and monitoring of materials, chemicals, and processes used for manufacturing. All programs meet or exceed the minimum requirements of Cal/OSHA and Cal/EPA to provide safe, healthy, and environmentally friendly work areas and products.

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## Environmental and Health During Installation

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Under normal use and installation procedures, there are no health or impairment concerns expected during the installation of BEGA products. The products and materials do not create hazardous waste or air emissions when installed or used.

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## Extraordinary Effects

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### Fire

There are no negative environmental effects resulting from exposure to fire.

### Water

There are no negative environmental effects resulting from exposure to water.

### Mechanical Destruction

There are no negative environmental effects resulting from mechanical destruction.

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## Delayed Emissions

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Global warming potential is calculated using the TRACI 2.1 and CML 4.1 impact assessment methodologies. Delayed emissions are not considered.

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## Environmental Activities and Certifications

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BEGA is committed to social responsibility and minimizing our impact on the environment over time. Our commitment to sustainable resource management is seen throughout our exemplary production facilities, where the electrical power needed for our daily operation includes solar energy at our site in Carpinteria, CA. We have also implemented recycling programs that consistently divert more than 90% of our waste from landfills, and manage all hazardous waste through a licensed vendor, and recycled, recovered, or re-used whenever possible. Our efforts towards sustainability earned BEGA North America the “Green Business of the Year” award from the South Coast Area Chamber of Commerce in 2023.

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## Further Information

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BEGA North America  
1000 BEGA Way, Carpinteria, CA 93013  
United States of America

# Environmental Product Declaration

BEGA North America Luminaire Products

Bollard Product Category

# BEGA



According to  
ISO 14025, ISO 14040,  
and EN 15804+A2

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## Contact Information

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### LCA Practitioner



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