

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 21930:2017

SmartEPD-2024-024-0133-01

KreyslerFire B21



KREYSLER &
ASSOCIATES



Date of Issue:
May 28, 2024

Expiration:
May 28, 2029

Last updated:
May 29, 2024

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General Information

Kreysler & Associates

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Product Name:	KreyslerFire B21
Functional Unit:	1 m2 of installed cladding product
Declaration Number:	SmartEPD-2024-024-0133-01
Date of Issue:	May 28, 2024
Expiration:	May 28, 2029
Last updated:	May 29, 2024
EPD Scope:	Cradle to grave A1 - A3, A4, A5, B1 - B7, C1 - C4
Market(s) of Applicability:	North America

Reference Standards

Standard(s):	ISO 21930:2017
Core PCR:	UL Part B: Cladding Product Systems EPD Requirements v.2 Date of issue: April 13, 2021 Valid until: April 13, 2026
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

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Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 :
Alison Conroy | Independent Contractor | alisonleeconroy@gmail.com

External

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) :
Alison Conroy | Independent Contractor | alisonleeconroy@gmail.com

External

Limitations, Liability, and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

Kreysler & Associates, headquartered in American Canyon, CA, has for over 40 years pioneered the use of advanced composite materials in art, architecture, and unique industrial applications. We are dedicated to realizing our customers' designs without compromise.

Product Description

KreyslerFire B21 is a high performance fire resistant FRP cladding product featuring highly customizable shape, size and finish options, designed for outdoor and indoor architectural use.

Product Information

Functional Unit:	1 m2 of installed cladding product
Mass:	9.94 kg
Reference Service Life:	75 Years
Product Specificity:	☒ Product Average ☒ Product Specific

Averaging:

Averaging was not conducted for this EPD

Plants



Kreysler & Associates
501 Green Island Road, American Canyon, CA 94503, United States of America

Product Specifications

Product Classification Codes: UNSPSC - 30151800

Thickness to achieve Functional or Declared Unit: 0.0048 m

Density: 1907.92 kg/m³

Material Composition

Material/Component Category	Origin	% Mass
Gelcoat	None	25.25
Additive	None	25.25
Resin	None	15.23
Alumina Trihydrate	None	15.23
Fiberglass	None	18.64
Methyl Ethyl Ketone Peroxide	None	0.35
Cobalt Naphthenate	None	0.03
DimethylAniline	None	0.01

Packaging Material	Origin	kg Mass
Ratchet Straps	None	0.04677
Steel	None	15.52109171

Hazardous Materials

No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year:	September 2022 - August 2023
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	 SimaPro v. 9.5
LCI Foreground Database(s):	 Ecoinvent v. 3.8  RoW  Mass
LCI Background Database(s):	 US LCI v. FY17.Q4.02  RNA  Mass

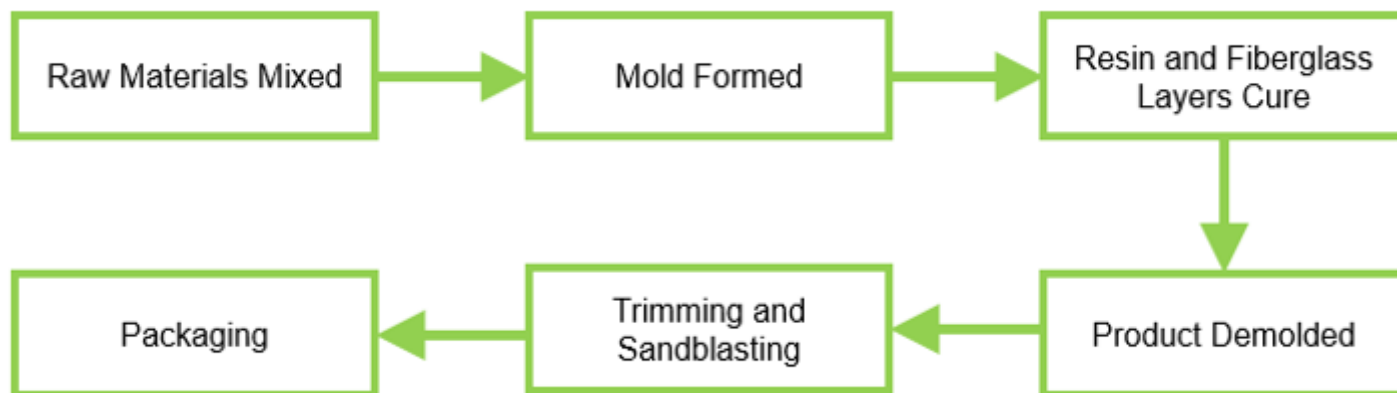
Renewable Electricity

Renewable electricity is used:	No
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System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	✓
	B2	Maintenance	✓
	B3	Repair	✓
	B4	Replacement	✓
	B5	Refurbishment	✓
	B6	Operational Energy Use	✓
	B7	Operational Water Use	✓
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

Manufacturing of the Kreyslerfire B21 product occurs at the American Canyon, CA facility. At this facility, the raw materials are combined in a mixer and resin and gelcoat are mixed and stored separately. In parallel, a plug is made, cut to shape, prepped with spray glue and aluminum foil, and gel-coated. Then, fiberglass and resin are layered onto the plug to make a fiberglass mold. The resultant mold is then refined with sandpaper and cutting equipment. Next, wax is added to the mold, gelcoat is sprayed on, and layers of resin and fiberglass are cured together. The product is then demolded, trimmed, sandblasted, and finally shipped to the customer.

LCA Discussion

Allocation Procedure

The LCI data was collected from the American Canyon, CA manufacturing facility from September 2022 to August 2023. Allocation was determined on a per product basis for primary data. For secondary data, cut-off methodology was used.

Cut-off Procedure

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.

Data Quality Discussion

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.

Results

Environmental Impact Assessment Results

TRACI 2.1, CML 2016 v4.8

per 1 m2 of installed cladding product.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	TRACI 2.1	kg CO2 eq	2.62e+1	4.31e-1	1.29e+0	ND	1.70e-2	ND	ND	ND	ND	ND	ND	8.49e-2	-1.63e+0	6.47e-1
ODP	TRACI 2.1	kg CFC 11 eq	2.38e-6	1.65e-11	1.41e-7	ND	1.73e-9	ND	ND	ND	ND	ND	ND	3.24e-12	4.18e-7	2.50e-8
AP	TRACI 2.1	kg SO2 eq	1.34e-1	2.58e-3	8.09e-3	ND	6.28e-5	ND	ND	ND	ND	ND	ND	5.07e-4	2.33e-2	6.64e-4
EP	TRACI 2.1	kg N eq	6.50e-2	1.44e-4	8.04e-3	ND	5.08e-4	ND	ND	ND	ND	ND	ND	2.83e-5	3.49e-4	9.51e-2
POCP	TRACI 2.1	kg O3 eq	6.47e+0	7.05e-2	3.36e-1	ND	7.54e-4	ND	ND	ND	ND	ND	ND	1.39e-2	1.23e-1	1.46e-2
ODP	CML 2016 v4.8	kg CFC-11 eq	1.95e-6	1.63e-11	1.18e-7	ND	1.59e-9	ND	ND	ND	ND	ND	ND	3.21e-12	3.84e-7	1.87e-8
AP	CML 2016 v4.8	kg SO2 eq	1.34e-1	2.13e-3	8.09e-3	ND	5.78e-5	ND	ND	ND	ND	ND	ND	4.18e-4	2.44e-2	5.36e-4
EP	CML 2016 v4.8	kg PO4 eq	3.47e-2	3.77e-4	3.57e-3	ND	2.21e-4	ND	ND	ND	ND	ND	ND	7.41e-5	9.68e-4	3.51e-2
POCP	CML 2016 v4.8	kg C2H4 eq	5.64e-2	9.80e-5	2.90e-3	ND	7.97e-6	ND	ND	ND	ND	ND	ND	1.93e-5	1.21e-3	1.29e-4
ADP-fossil	CML 2016 v4.8	MJ	3.70e+2	5.55e+0	2.13e+1	ND	8.72e-2	ND	ND	ND	ND	ND	ND	1.09e+0	4.53e+1	1.82e+0
ADP-minerals&met-als	CML 2016 v4.8	kg Sb eq	1.07e-3	0	5.34e-5	ND	1.33e-7	ND	ND	ND	ND	ND	ND	0	1.36e-7	2.73e-7

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicators

per 1 m2 of installed cladding product.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	9.14e+1	0	4.66e+0	ND	2.43e-1	ND	ND	ND	ND	ND	ND	0	1.66e+0	3.84e-2
PENRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	4.02e+2	5.55e+0	2.36e+1	ND	1.12e-1	ND	ND	ND	ND	ND	ND	1.09e+0	5.94e+1	1.87e+0
RPRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ	9.14e+1	0	4.66e+0	ND	2.43e-1	ND	ND	ND	ND	ND	ND	0	1.66e+0	3.84e-2
NRPRE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRPRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ	4.02e+2	5.55e+0	2.36e+1	ND	1.12e-1	ND	ND	ND	ND	ND	ND	1.09e+0	5.94e+1	1.87e+0
ADP-fossil	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 m2 of installed cladding product.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 m2 of installed cladding product.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	2.58e-3	0	1.29e-4	ND	6.33e-6	ND	ND	ND	ND	ND	ND	0	0	2.84e-6
NHWD	kg	9.29e+0	0	8.32e-1	ND	3.81e-3	ND	ND	ND	ND	ND	ND	0	1.99e-3	7.35e+0
RWD	kg	1.01e-3	0	5.08e-5	ND	3.78e-7	ND	ND	ND	ND	ND	ND	0	0	1.10e-5
HLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ILLRW	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0	0	0	ND	0	ND	ND	ND	ND	ND	ND	0	0	0
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MNER	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals

per 1 m2 of installed cladding product.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	Diesel
Liters of Fuel:	0.027 l/100km
Vehicle Type:	Truck
Transport Distance:	500 km
Capacity Utilization:	1 %
Gross density of products transported:	1908 kg/m3
Weight of products transported:	9.305 kg

Installation in to the building/construction site (A5)

A5 Module

Installation Scrap Rate Assumed:	5 %
Waste Materials at the Construction Site Before Waste Processing:	0.458 kg
Assumptions for scenario development:	During the A5 installation stage, the product is installed primarily by manual labor, and no energy use is required.

Reference Service Life

B1 Module

RSL:	75 Years
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Declared Product Properties:

KreyslerFire B21 is a high performance fire resistant FRP cladding product featuring highly customizable shape, size and finish options, designed for outdoor and indoor architectural use.

Design Application Parameters:

KreyslerFire B21 is ideal for FRP rainscreen and weather wall panels for applications ranging from highly complex 3D geometry to flat applications on buildings of any size.

Use Conditions:

There is no harmful emissive potential. No damage to health or impairment is expected under normal use corresponding to the intended use of the product.

Maintenance:

For the B2 maintenance stage, the product is assumed to be lightly cleaned with soap and water for aesthetic appearances. No additional impacts are contributed by the use phase.

Maintenance (B2)

B2 Module

Net Fresh Water Consumption Specified by Water Source and Fate:	0.0045 m3
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Other Resources:	0.0026 kg
Maintenance Process Information:	For the B2 maintenance stage, the product is assumed to be lightly cleaned with soap and water for aesthetic appearances.

End of Life
C1 - C4 Modules

Collection Process

Collected with Mixed Construction Waste:	9.16 kg
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Recovery

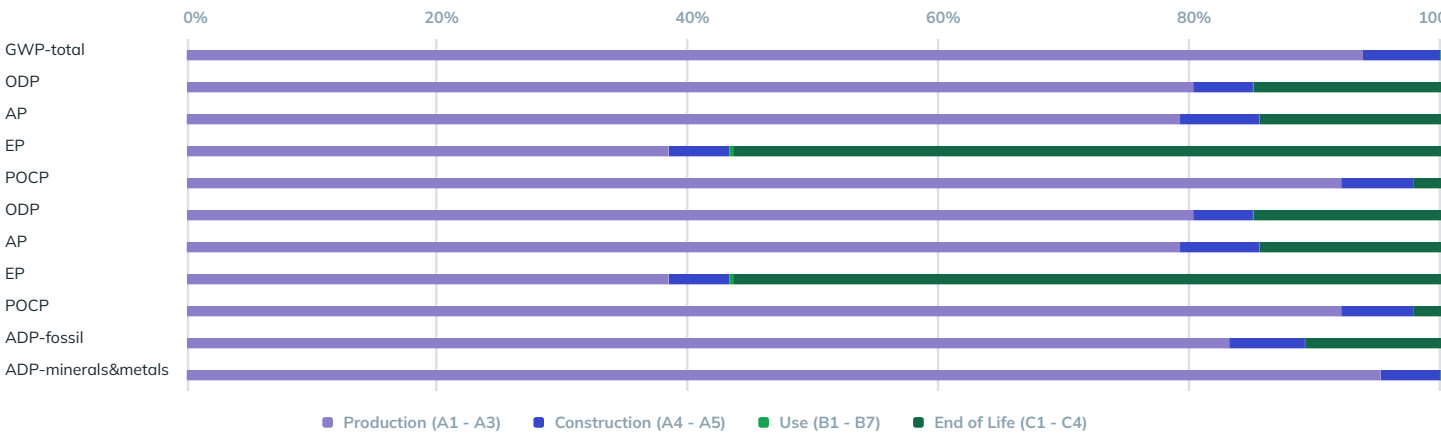
Landfill:	7.33 kg
Incineration:	1.83 kg

Disposal

Product or Material for Final Disposal:	9.15802995 kg
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Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories, except eutrophication. This is due to the upstream production of materials used in the product, along with the process emissions emitted in the manufacturing of the product. The disposal of waste dominates the impact in the eutrophication category which is heavily due to the processing of the material at a landfill.



Additional Environmental Information

Kreysler & Associates is committed to providing a safe and healthy work environment. Employees at all levels participate in the company's health and safety policies. Our health and safety program has been developed to ensure compliance with federal, state, and local regulations, with particular emphasis on the California Occupational Safety and Health Administration (Cal/OSHA), and the Bay Area Air Quality Management District (BAAQMD) requirements that apply to any of our operations.

Fire: No danger to the environment can be anticipated.

Water: Contains no known substance that have any impact on water in case of flood.

Mechanical Destruction: No danger to the environment can be anticipated during mechanical destruction.

Kreysler and Associates specializes in the use of lightweight durable FRP for high performance architectural applications. Over the past fifteen years, we have worked with Stanford University's School of Environmental Engineering to compare FRP to traditional systems in our ongoing effort to understand the environmental impact of FRP in the built environment. We have learned that FRP often has beneficial impacts on the performance and carbon footprint of a building. For example, a product's weight often plays a significant role in impacts like transportation, installation, and backup structure. By leveraging these advantages in combination with insight provided through LCAs, we are able to continually optimize our solutions to meet the rigorous environmental goals of our clients. Striving for continuous improvement with responsible manufacturing using high performance materials is woven into our ethos, and a perpetual effort at Kreysler & Associates.

References

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