Environmental Product Declaration

LIQUID CHEMICAL HARDENERS

KAUFMAN

Concrete Treatments

Environmental Product Declaration for all Liquid Chemical Hardeners manufactured by Kaufman Products, Inc. in Baltimore, Maryland USA.

AMERICAN OWNED & MANUFACTURED

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers hardening compound products produced by Kaufman Products Inc. Declared unit: 1 kg of hardening compound.
Declaration Owner:	Kaufman Products Inc. 3811 Curtis Avenue Baltimore, Maryland www.kaufmanproducts.net
Program Operator:	Labeling Sustainability 1800 Vine St. Los Angeles, CA 90028 www.labelinsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services PCR Program Operator: International Organization for Standardization PCR review was conducted by: Technical Committee: ISO/TC 59/SC 17 Sustainability in buildings and civil engineering works
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006 Independent verification of the declaration, according to ISO 14025:2006 Internal ☐ ; External ☐ X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca)
Date of Issue:	21 June 2023
Period of Validity:	5 years; valid until 20 June 2028
EPD Number:	a6571ef6-d8a2-48a1-97a8-b277b7b55965-4

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COMPANY DESCRIPTION

Kaufman Products, Inc. offers more than two hundred products for use on new concrete construction projects and restoration and repair work of existing concrete structures. Among the various powders and chemicals manufactured, Kaufman Products offers epoxy adhesives, cementitious and polymer-modified repair mortars, curing compounds, form release agents, coatings, non-shrink grouts, retarders and accelerating agents, curing and sealing compounds, shake-on hardeners, penetrating hardeners, and anchoring materials. In addition, the breadth of its product line continues to grow, allowing its business partners to carry a complete line of products that meet a wide range of needs.

Kaufman Products is specified throughout North America through our long-time business partnerships with the two leading specification programs, SpecLink and MasterSpec. As a result, our brand name is called for routinely on both commercial and residential construction projects. In addition, Kaufman Products actively participates in the National Transportation Product Evaluation Program (NTPEP) through the American Association of State Highway Transportation Officials (AASHTO). As a result, many of our epoxies, repair mortars, grouts, and curing compounds were tested and are approved throughout the United States for use on roadways, bridges, sidewalks, and manufactured concrete products. At present, Kaufman Products has more than six-hundred approvals on these products from the many states and local authorities and is considered to be among the leaders in DOT approved materials throughout the United States.

Kaufman Products remains dedicated to preserving and protecting the environment. While they were perhaps the first company to use safer and greener materials, exemplified by our early adoption of emulsion technology and water-based curing compounds over forty years ago, we continue to pursue our vision of using recycled or waste-stream in our selection of both packaging materials and raw materials. To this end, Kaufman Products uses recycled plastic pails, re-conditioned drums, totes, and restored wood pallets to reduce our environmental impact. Moreover, its product formulations incorporate many waste-stream materials to reduce our environmental impact. Accordingly, Kaufman Products can provide LEED credits related to these decisions.

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STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com . This level of study is in accordance with EPD Product Category Rule (PCR) published by; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Kaufman Products Inc. from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Kaufman Products Inc. by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Kaufman Products Inc.'s license to operate in the community. The intended audience for this LCA report is Kaufman Products Inc.'s employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

DESCRIPTION OF PRODUCT AND SCOPE

Liquid chemical hardeners are engineered to penetrate a concrete slab, and to react with the free lime in the concrete to produce C-S-H gel. This in turn hardens and dustproofs the floor, while also making it easier to diamond polish the slab and to maintain the slab. There are several chemistries that are used to achieve these goals, including the use of magnesium and/or zinc fluosilicate, sodium silicate, potassium silicate, and lithium silicate. These types of chemistries are often used in conjunction with diamond polishing, which can make the slab more reflective of overhead lighting and therefore keeps lighting costs lower. In addition, these types of products are commonly used on existing concrete that are dusting so badly that they are unusable until treated.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

LIQUID CHEMICAL HARDENING COMPOUND DESIGN SUMMARY

The following tables provide a list of the hardening compound products considered in this EPD along with key performance parameters.

Table 1: **Declared products with all declared products considered in this environmental product declaration.**

Prod#	Unique name/ID	Short description	Product type
1	Silicure	Sodium silicate liquid chemical hardener and concrete curing compound for hard-troweled concrete	Liquid-chemical hardener & curing compound
2	Silicure Concentrate	Liquid-chemical hardener	Liquid-chemical hardener

3	Silicure w/dye	Sodium silicate liquid chemical hardener and concrete curing compound for hard-troweled concrete; made with a fugitive red dye	Liquid-chemical hardener
4	SureHard	Sodium silicate liquid chemical hardener	Liquid-chemical hardener
5	SureHard LS	Lithium silicate liquid chemical hardener	Liquid-chemical hardener
6	SureHard PSR	Potassium silicate liquid chemical hardener and curing compound	Liquid-chemical hardener & curing compound
7	Diamond	Liquid-chemical hardener	Liquid-chemical hardener

LIQUID CHEMICAL HARDENING COMPOUND DESIGN COMPOSITION

The following table provides the breakdown (kg per functional unit) of the material composition of each hardening compound design considered. All proprietary information has been withheld.

Table 2: **Material composition - All declared products per 1 kg of hardening compound**

Prod#	Unique name/ID	Material	% of Composition
1	Silicure	Water	30-80%
		Sodium Silicate	10-50%
2	Silicure Concentrate	Water	0-100%
		Sodium Silicate	0-100%
3	Silicure w/dye	Water	30-80%
		Sodium Silicate	10-50%
4	SureHard	Water	0-60%
		Sodium Silicate	0-60%
5	SureHard LS	Water	0-60%
		Lithium Silicate	0-60%
6	SureHard PSR	Water	0-80%
		Sodium Silicate	0-20%
		Proprietary Ingredients	10-30%
7	Diamond	Water	80-100%
		Proprietary Ingredients	0-20%

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES –

Kaufman Products is committed to using as much not linear inflows to their products as possible. Recycled content in their products includes the reuse of steel barrels and totes as well as proprietary

ingredients. All recycled material in this study followed the "Polluter Pays" principle. A standard 2% material loss was used across all categories.

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study:

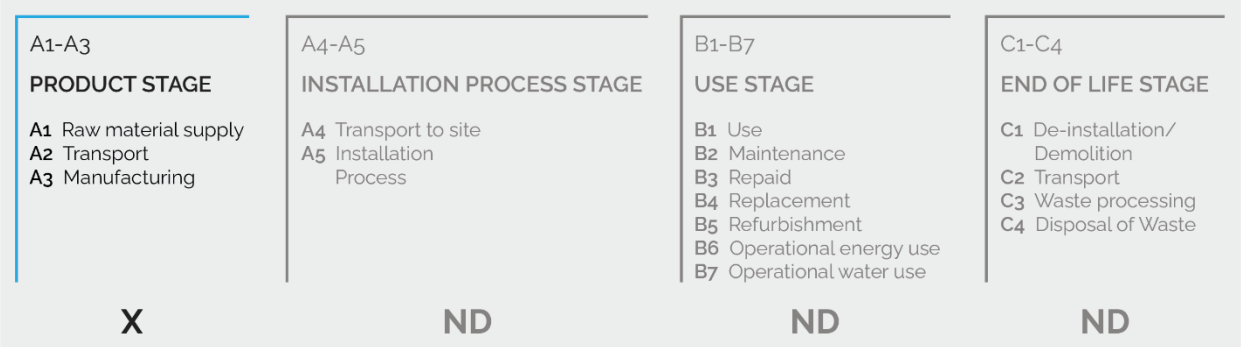

Figure 1: **General life cycle phases for consideration in a construction works system**

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacture the declared products and to operate the facility.

As according to the PCR, the following figure illustrates the general activities and input requirements for producing hardening compound products and is not necessarily exhaustive.

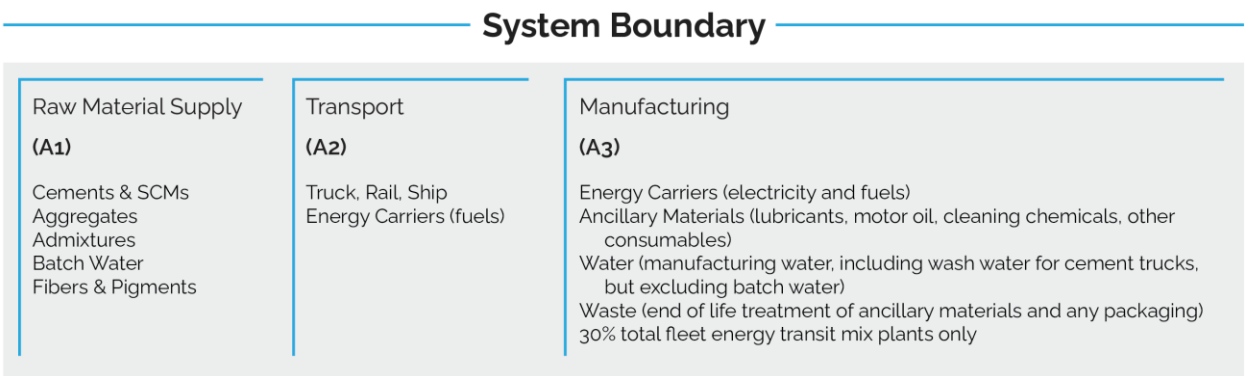

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies).
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Kaufman Products Inc., is located at their Kaufman Products facility in Northeast United States. All operating data is formulated using the actual data from Kaufman Products Inc.'s plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.8 database and a local EPD database in combination with primary data from Kaufman Products Inc. were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

No known flows are deliberately excluded from this EPD.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

Table 3: **Reused or recycled components/materials at the A3 facility site**

	Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
1	Plastic packaging	291.101	kg	Off-site
3	Plastic components	42547.100	kg	Off-site
4	Steel components	28580.900	kg	Off-site
5	Pallets	21563.033	kg	Off-site

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: All raw material and transportation data used in this study was primary reported Kaufman Products' data for the reference year, 2022.

Electricity: Electricity usage for the study was based on primary consumption data reported on the utility bills for the property.

Process/space heating: This facility does not use natural gas on-site.

Fuel required for machinery: Machinery at this facility uses either electricity, reported in the utility bills, or diesel, which was also calculated from direct purchases records for the 2022 reference year.

Waste generation: All waste generation values were taken from primary waste hauling records and then confirmed by Kaufman personnel.

Recovered energy: No on-site energy is recovered on site.

Recycled/reused material/components: Kaufman purchases recycled drums and totes for their products. They also use plastic pails made from 100% recycled content. Lastly, all pallets are purchased as used pallets.

Module A1 material losses: Default material losses, 2%, were used.

Direct A3 emissions accounting: Diesel combustion emissions on-site were assumed with a default ecoinvent process for burning diesel in a building machine.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 4: **LCI inputs assumed for module A3**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Bulk waste	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.8	Maryland	v3.8 in 2021	1	3	1	3	3
Diesel	diesel, burned in building machine/diesel,	ecoinvent v3.8	Maryland	v3.8 in 2021	2	3	1	3	3

	burned in building machine/GLO/MJ								
Electricity	market for electricity, medium voltage/electricity, medium voltage/US-SERC/kWh	ecoinvent v3.8	Maryland	v3.8 in 2021	2	3	2	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.8 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered hardening compound product materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.8 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary hardening compound product LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for hardening compound product designs. The tool auto-calculates results by

scaling base-unit Technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2022-01-01 to 2022-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.8 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table 5: **Life cycle impact categories and life cycle inventory metrics**

ID	LCIA.indicators	Abbreviations	Units
1	environmental impact: acidification	AP	moles of H+-Eq
2	environmental impact: eutrophication	EP	kg N
3	environmental impact: global warming	GWP	kg CO2-Eq
4	environmental impact: ozone depletion	ODP	kg CFC-11-Eq
5	environmental impact: photochemical oxidation	PCOP	kg NOx-Eq
6	material resources: metals/minerals: abiotic depletion potential (ADP): elements (ultimate reserves)	ADPe	kg Sb-Eq
7	energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPf	MJ, net calorific value
Inventory metrics			
8	Total primary energy	TPE	MJ-Eq
9	Renewable energy	RE	MJ-Eq
10	Non-renewable energy	NRE	MJ-Eq
11	Non-renewable resources	NRR	kg
12	Renewable resources	RR	m3
13	Water Depletion: WDP	WDP	m3
14	Land filling: bulk waste	LFW	kg waste
15	Land filling: hazardous waste	LFHW	kg waste

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

The inventory analysis of the hardening considered 99.9% of the material composition. Moreover, primary data was utilized for all utilities, materials, and distances, ensuring a detailed and rigorous evaluation. The database used in the study was Ecoinvent 3.9, an internationally recognized LCA database. Concerning geographical accuracy, the study employed many “Rest of World (RoW)” processes, confirming the breadth of its geographical representativeness. Therefore, data quality and geographical coverage collectively endorse the integrity and thoroughness of the LCA study.

Interpreting the global warming potential (GWP) contribution from the different lifecycle stages of the hardening compound, it is revealed that the carbon footprint ranges from a minimum of 0.317 CO2-Eq per kg to a maximum of 4.12 CO2-Eq per kg, with a mean value of 1.01 CO2-Eq per kg. A detailed breakdown of the GWP contributions indicates that the most substantial footprint originates from module A1, which represents raw materials. The manufacturing process (module A3) follows closely, and finally, transportation (module A2). This discovery suggests that strategies aimed at

minimizing the environmental impact of the hardening compound should primarily focus on raw material procurement and processing, followed by manufacturing and transportation.

The following table reports the total LCA results for each product produced at the given concrete hardening compound facility on a 1 kg of hardening compound basis.

Table 6: **Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 1 kg of hardening compound basis.**

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**moles of H+-Eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Silicure	0.092	.000009	0.317	1.98e-08	0.000761	8.07e-06	3.85
Silicure Concentrate	0.35	0.0004	1.09	6.16e-08	0.0029	3.38e-05	11.2
Silicure w/dye	0.10	000009	0.337	2.06e-08	0.000811	8.65e-06	4.01
SureHard	0.2	0.0002	0.67	4.04e-08	0.00165	1.8e-05	7.85
SureHard LS	1.6	0.028	4.12	4.55e-07	0.0148	0.000105	54.8
SureHard PSR	0.21	0.0002	0.8	3.7e-07	0.00211	1.12e-05	12.4
Diamond	0.275	0.00024	1.24	1.07e-07	0.00204	1.59e-05	20.0

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**
Silicure	4.29	0.343	3.91	0.126	2.19e-05	0.00285	0.147
Silicure Concentrate	12.9	1.21	11.7	0.408	7.61e-05	0.00735	0.327
Silicure w/dye	4.45	0.343	4.09	0.133	2.3e-05	0.00296	0.154
SureHard	8.77	0.748	7.97	0.265	4.67e-05	0.0049	0.285
SureHard LS	61.3	3.89	58	1.86	0.000138	0.0445	5.73
SureHard PSR	14.2	1.12	13.2	0.384	4.21e-05	0.00459	0.174
Diamond	21.6	1.16	20.5	1.59	6.19e-05	.0080	1.23

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations – Product Category Rules for concrete and concrete elements.
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products.

Other References:

- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf