SIKA MASONRY MORTARS AND GROUTS

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PRODUCT-SPECIFIC TYPE III ENVIRONMENTAL PRODUCT DECLARATION (EPD)

The development of this environmental product declaration (EPD) for Sika masonry mortars and grouts manufactured in Canada was commissioned by Sika Canada Inc. This product-specific type III environmental product declaration (EPD) was developed in compliance with CAN/CSA-ISO 14025 and ISO 21930:2017 by Groupe AGÉCO and has been verified by the Athena Sustainable Materials Institute.

This EPD includes life cycle assessment (LCA) results for the production stage only (cradle-to-gate) and is intended for business-to-business (BtoB) communication.

For more information about Sika Canada Inc., please go to www.sika.ca

Issue date: July 7, 2023

Environmental Product Declaration

CSA Group Registered Based on ISO 14025 and Other Requirements
For more information visit
csaregistries.ca/epd

0452-1789
July 2023-July 2028

This product-specific type III environmental product declaration (EPD) for Sika Masonry Mortars and Grouts is in compliance with the requirements set out by ISO 14025:2006 and ISO 21930:2017. EPDs within the same product category but from different programs may not be comparable. Moreover, EPDs of construction products may not be comparable if they do not comply with EN 15804. Any EPD comparison must be performed in conformance with ISO 21930 guidelines. Care should be taken when comparing results since differences in certain assumptions, data quality and datasets are unavoidable, even when using the same product category rules (PCR). This declaration shall solely be used in a Business to Business (B2B) capacity.

1. EPD Information

Declared products	Sika masonry mortars and grouts
EPD recipient organization	**Sika Canada** 601 Delmar Ave., Pointe-Claire (Quebec) H9R 4A9 | www.sika.ca *The EPD owner has the sole ownership, liability and responsibility of the EPD.*
Program operator	**CSA Group** 178 Rexdale Blvd, Toronto, ON, Canada M9W 1R3 | www.csagroup.org
EPD registration number	0452-1789
Date of issue (approval)	July 07, 2023
Period of validity	July 07, 2023 - July 05, 2028
The LCA and EPD were prepared by	**Groupe AGÉCO** | www.groupeageco.ca | ageco@groupeageco.ca
Declared unit	One (1) metric ton of product (see section 3.1)
Software	SimaPro 9.3 software using ecoinvent 3.8 database (released in 2021)
Manufacturing locations	Boisbriand, Québec, Canada Brantford, Ontario, Canada
For additional explanatory material: Christophe Culis, culis.christophe@ca.sika.com	

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at https://www.csaregistries.ca.

2. EPD Verification

Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006

_ internal _x_ external

Third-party verifier:
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3. PCR Information

ISO standard ISO 21930:2017 serves as the core Product Category Rules (PCR)

Product Category Rules for Construction Products 2019:14, version 1.11, UN CPC code: 375
The International EPD® System | Valid until December 20, 2024

PCR review was conducted by: The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Review chair: Claudia A. Peña, University of Concepción, Chile.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with ISO 21930. EPDs are comparable only if they comply with ISO 21930, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

Environmental Product Declaration Summary Sheet

Sika Canada | Sika Masonry Mortars and Grouts

This is a summary of the product-specific type III environmental product declaration (EPD) describing the environmental performance of mortars and grouts manufactured by Sika Canada Inc. and used specifically for masonry applications.

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EPD commissioner and owner	Period of validity	Program operator and registration number	Product Category Rule	LCA and EPD consultants
Sika Canada	July 07, 2023 - July 05, 2028	CSA Group 0452-1789	Product Category Rules for Construction Products 2019:14, version 1.11 (2021)	Groupe AGÉCO

What is a Life Cycle Assessment (LCA)?

LCA is a science-based and internationally recognized tool to evaluate the relative potential environmental impacts of products and services throughout their life cycle, beginning with raw material extraction and including all aspects of transportation, production, use, and end-of-life treatment. The method is defined by the International Organization for Standardization (ISO) 14040 and 14044 standards. For EPD development, Product Category Rules (PCR) give additional guidelines on how to conduct the LCA of the product.

Why an EPD?

Sika Canada is seeking to provide the industry, decision makers, influencers, and the public with more transparency, in terms of its sustainability efforts and environmental performance of its products, relying on a rigorous and recognized communication tool, the EPD. By selecting products with an EPD, building projects can earn credits towards the Leadership in Energy and Environmental Design (LEED) rating system certification. In the latest LEED versions (v4 and 4.1), points are awarded in the Materials and Resources category.

Product description

The EPD developed by Sika Canada covers fifteen (15) mortars and grouts, used specifically for masonry applications. According to CAN/CSA-A179-14, mortars and grouts are defined as follow: A mortar is a mixture of a cementitious material or materials, aggregate, and water used for bedding, jointing, and bonding of concrete masonry units, but also clay bricks, natural stones, and other masonry products. A grout is a highly flowable mixture of cementitious material, aggregate, and water, with or without admixtures, of a consistency suitable for pouring or pumping without segregation of the constituents. Grouts are designed to fill cells in concrete masonry units and cavities encountered in masonry works.

Declared unit

One (1) metric ton of masonry mortars and grouts

Scope and system boundary

Cradle-to-gate: production stage (A1-A3).

Products included in the EPD

See the product list on the next page.

Potential environmental impacts

The potential environmental impacts of **one (1) metric ton of masonry mortars and grouts** are summarized below for each system assessed and for the main environmental indicators (based on life cycle impact assessment method TRACI 2.1). Results on resource use, waste generated, and output flows are presented in the full EPD.

Cradle-to-gate (A1-A3) results for one (1) metric ton of masonry mortars and grouts

Masonry Mortars and Grouts	Global warming kg CO_2 eq.	Acidification kg SO_2 eq.	Eutrophication kg N eq.	Smog kg O_3 eq.	Ozone depletion kg CFC-11 eq.
Mortars					
King® 1-1-6	2.59E+02	1.04E+00	2.33E-01	1.52E+01	3.18E-05
King® 2-1-9	2.90E+02	1.26E+00	2.82E-01	1.77E+01	3.19E-05
King® Block	2.59E+02	1.44E+00	3.26E-01	1.99E+01	2.04E-05
King® MasonGo 100	1.84E+02	1.01E+00	2.42E-01	1.47E+01	1.81E-05
King® MasonGo 200	2.77E+02	1.54E+00	3.47E-01	2.12E+01	2.10E-05
Grouts					
King® CellFiller E-15	2.40E+02	1.34E+00	3.03E-01	1.85E+01	2.01E-05
King® CellFiller E-20	2.71E+02	1.52E+00	3.43E-01	2.11E+01	2.03E-05
King® CellFiller E-25	3.05E+02	1.71E+00	3.85E-01	2.32E+01	2.23E-05
King® CellFiller E-30	3.41E+02	1.91E+00	4.30E-01	2.57E+01	2.37E-05
King® CellFiller E-35	3.75E+02	2.11E+00	4.74E-01	2.79E+01	2.52E-05
King® CellFiller C-15	2.03E+02	1.12E+00	2.53E-01	1.57E+01	1.79E-05
King® CellFiller C-20	2.31E+02	1.28E+00	2.88E-01	1.76E+01	1.89E-05
King® CellFiller C-25	2.48E+02	1.38E+00	3.10E-01	1.88E+01	1.96E-05
King® CellFiller C-30	2.50E+02	1.39E+00	3.12E-01	1.89E+01	1.97E-05
King® CellFiller C-35	2.54E+02	1.40E+00	3.18E-01	1.87E+01	1.91E-05

Additional environmental information

This section provides additional relevant environmental information about the manufacturer and the products covered by this EPD that was not derived from the LCA.

Sika's Commitment to sustainability

Sika is committed to measure, improve, and communicate sustainable value creation: "More value, less impact" refers to the company's commitment to maximize the value of its solutions to all stakeholders while reducing resource consumption and impact on the environment.

As a leading manufacturer and marketer of construction materials, Sika has recognized for many years the importance of providing its customers with quality, high performance, and sustainable materials. To this end, the company has obtained ISO 9001 certification for quality management and ISO 14001 certification for environmental management (refer to the certificates for applicability to each site). Since 2020, Sika has been using the external and independent assessment service EcoVadis to measure its corporate social responsibility performance. As a result, in 2022, SIKA AG received a gold medal in recognition of its EcoVadis assessment and managed to achieve a score of 68/100. This score places Sika in the 94th largest percentile of the industry "Manufacture of other chemicals n.e.c." and, with this result, in the top 6 % of companies assessed by EcoVadis in the relevant industry sector. It should be noted that the scope of this assessment includes the Sika Group and all its subsidiaries.

For more information: https://can.sika.com/en/ressource-center/certifications-iso.html

1. Description of Sika Canada

Sika Canada Inc., a member of the Sika Group, is a leader in the field of specialty chemicals for construction. Sika's product portfolio encompasses a vast range of construction solutions, "From Foundations Upwards", including waterproofing solutions, concrete production (ready mix and precast concrete), concrete repair and protection, masonry & building finishing products, joint sealing, elastic & structural bonding, specialized flooring including industrial, commercial, institutional & decorative systems, roofing systems and shotcrete, mining & tunnelling solutions. This extensive range of products enables tailor-made solutions, in new construction as well as refurbishment. Beyond the quality and performance of its products, Sika has earned its reputation by offering an unparalleled level of expertise and support, from conception to completion.

2. Description of products

2.1. Definition and product classification

The EPD developed by Sika covers fifteen (15) mortars and grouts, specifically formulated for masonry applications. According to CAN/CSA-A179-14, mortars and grouts are defined as follow: A mortar is a mixture of a cementitious material or materials, aggregate, and water used for bedding, jointing, and bonding of concrete masonry units, but also clay bricks, natural stones, and other masonry products. A grout is a highly flowable mixture of cementitious material, aggregate, and water, with or without admixtures, of a consistency suitable for pouring or pumping without segregation of the constituents. Grouts are designed to fill cells in concrete masonry units and cavities encountered in masonry works.

Table 1: Sika masonry mortars and grouts covered by this EPD

Mortars	Grouts	
King® 1-1-6	King® CellFiller C-15	King® CellFiller E-15
King® 2-1-9	King® CellFiller C-20	King® CellFiller E-20
King® Block	King® CellFiller C-25	King® CellFiller E-25
King® MasonGo 100	King® CellFiller C-30	King® CellFiller E-30
King® MasonGo 200	King® CellFiller C-35	King® CellFiller E-35

Products Standards

All products included in this EPD are mortars and grouts.
Mortars comply with:

- ASTM C270-19ae1 Standard Specification for Mortar for Unit Masonry;
- CAN/CSA-A179-14 (R2019) Mortar and grout for unit masonry.

Grouts comply with:

- ASTM C476-22 Standard Specification for Grout for Masonry;
- CAN/CSA-A179-14 (R2019) Mortar and grout for unit masonry.

More information on these solutions is available on Sika Canada's website:
https://can.sika.com/en/construction/building-finishing/masonry-mortars-grouts.html

Figure 1: Applications examples for masonry mortars and grouts

2.2. Material content

The material composition of each product as disclosed in SDS (Safety Data Sheets) are provided in Table 2.

They are generally composed of, but not limited to containing, Type GU Portland cement, hydrated lime, sand, admixtures (air-entrainers and superplasticizers), masonry sand with controlled grain size, and pigments (iron oxide, carbon oxide or other).

The complete product formulations are confidential and were used to calculate the LCA results.

Table 2: Composition of masonry mortars and grouts included in this EPD

Products	Ingredients	CAS No.	Concentration (%)
King® 1-1-6 (all colours)	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
	Calcium carbonate	471-34-1	1-5
	Calcium dihydroxide	1305-62-0	1-5
	Calcium magnesium hydroxide oxide (CaMg(OH)2O)	58398-71-3	1-5
King® 2-1-9 (all colours)	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
	Calcium hydroxide / dihydroxide	1305-62-0	1-5
King® Block	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
King® MasonGo 100	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
King® MasonGo 200	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
King® CellFiller E-15	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
King® CellFiller E-20	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
King® CellFiller E-25	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
King® CellFiller E-30	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
King® CellFiller E-35	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	60-80
King® CellFiller C-15	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
King® CellFiller C-20	Portland cement	65997-15-1	10-30
	Silica, total quartz	14808-60-7	65-85
King® CellFiller C-25	Portland cement	65997-15-1	10-30
	Silica Fume	69012-64-2	1-5
	Silica, total quartz	14808-60-7	65-85
King® CellFiller C-30	Portland cement	65997-15-1	10-30
	Silica Fume	69012-64-2	1-5
	Silica, total quartz	14808-60-7	65-85
King® CellFiller C-35	Portland cement	65997-15-1	10-30
	Silica Fume	69012-64-2	1-5
	Silica, total quartz	14808-60-7	65-85

3. Scope of EPD

3.1. Declared unit

The declared unit is defined as follows:

One (1) metric ton of masonry mortars and grouts

Since this is cradle-to-gate EPD, which does not include the use stage, a declared unit is used in lieu of a functional unit and no service lives (RSL) are reported in accordance with the PCR.

3.2. System boundaries

This cradle-to-gate LCA includes modules related to the production stage as shown Table 3 and described in this section.

Figure 2 on page 11 shows the cradle-to-gate processes for the manufacturing of masonry mortars and grouts included in this EPD.

Table 3: Life cycle stages included or not considered in the system boundaries

Production stage			Construction process stage		Use stage							End-of-life stage				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / Demolition	Transport	Waste processing	Disposal of waste	Reuse-Recovery-Recycling-potential
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Legend: *ND: Module not declared;* ***X****: module included*

A1 – EXTRACTION AND UPSTREAM PRODUCTION

Masonry mortars and grouts are composed of many different ingredients manufactured in different parts of Canada, United States, and Asia. This module includes the production of the ingredients needed for the mixing at the Sika plants, including raw material extraction and processing, and energy related to the ingredients.

A2 – TRANSPORT TO MANUFACTURING PLANTS

Materials are transported from suppliers to the Sika's manufacturing plants by truck, and boat if shipped from oversees. This module includes the transport of ingredients and other inputs to the factory.

This module includes the transport air emissions as well as fuel, vehicle, and background infrastructure production.

A3 – MANUFACTURING

The manufacturing of masonry mortars and grouts mainly involves dry blending ingredients. After reception, ingredients are stored at the Sika plant until their use. Then, materials are mixed according to the product formulation. The final product goes under quality control and is stored until shipping via 30 kg triple lined paper bags, or flexible intermediate bulk containers (FIBCs). Natural gas and electricity are the main source of energy used at the manufacturing plants.

Non-hazardous waste produced on-site is sent to landfills (50%) or to specialized centers for recycling (50%). There is no production of hazardous waste at Sika plants considered in this study.

This module also includes the production and transport of primary packaging for the final products as described in Table 4.

Table 4: Packaging description*

Packaging type	Dry Mass (kg)	Source	Biogenic carbon content (kg C)**	Biogenic carbon (kg CO_2 eq. / kg masonry mortars and grouts)
30 kg triple-lined bag	0.122	Sika's bag supplier	0.06	7.46E-03

** Sika masonry mortars and grouts are also delivered in FIBCs. They are not considered primary packaging and are therefore excluded from this EPD.*
***Source: ecoinvent (default 50% C-content assumption)*

Table 4 above reports the value of the biogenic carbon content in packaging, as a technical information scenario only, but this value cannot be used in the results.

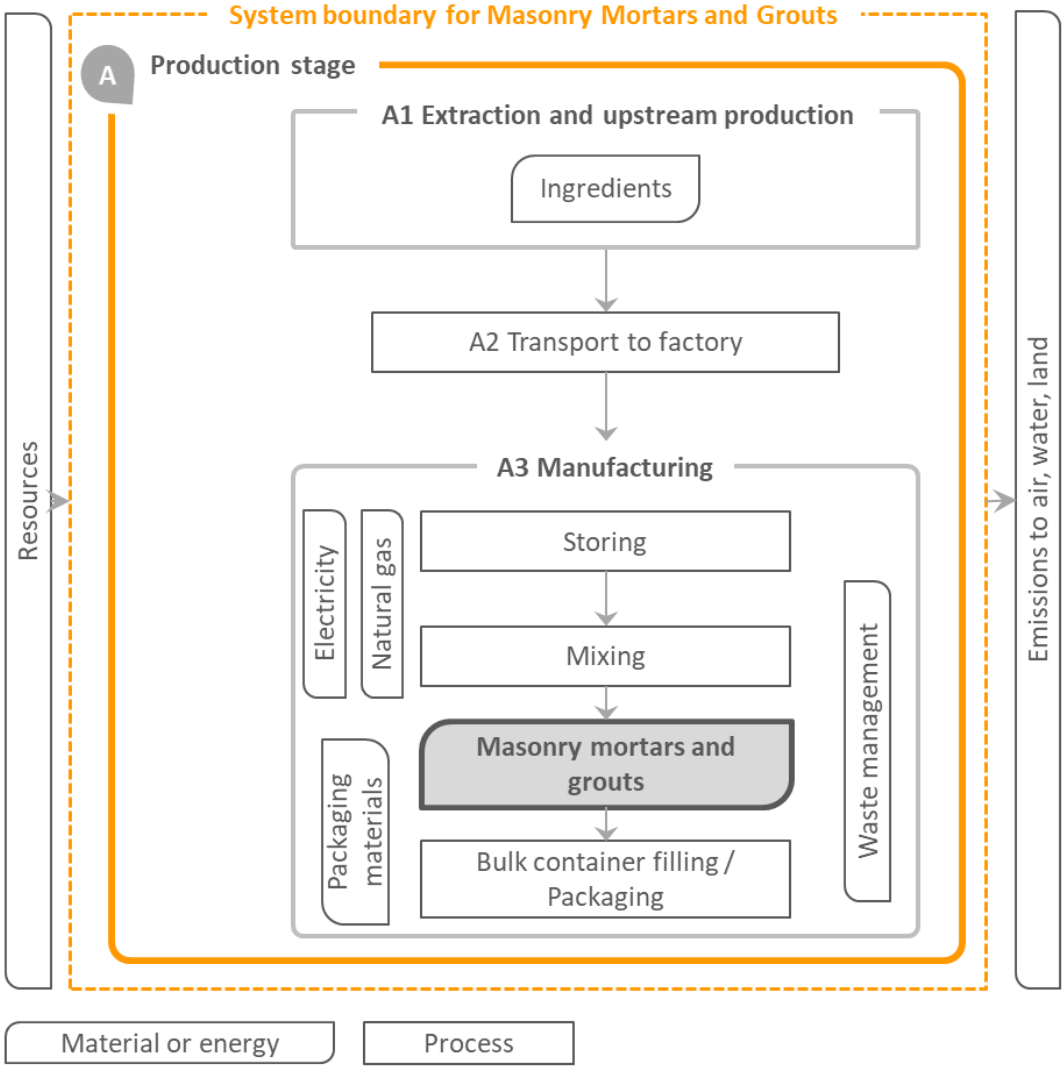


Figure 2: Process flow for all life cycle modules considered

3.3. Geographical and temporal boundaries

The geographical boundaries are representative of current equipment and processes associated with masonry mortars and grouts manufacturing in Canada.

Since the data were collected for the year 2021 (12 consecutive months), they are considered temporally representative (i.e., less than 5 years old), except for two products. For CELLFILLER C-30 and CELLFILLER C-35, production data is an extrapolation of the 2018 production because those products are not manufactured every year. A weighed average of production volume (on a mass basis) at each location is utilized for calculation purposes.

All background data were modelled using the ecoinvent 3.8 database released in 2021 (ecoinvent, 2021).

4. Potential environmental impacts assessment, use of resources and generation of waste and output flows

Potential environmental impacts were calculated with the impact assessment method TRACI 2.1 (US EPA, 2012). A supplementary indicator for climate impact (GWP-GHG) is reported. This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013).

The description of these indicators reported are provided in the Glossary (section 6.2).

Some LCA impact categories and inventory items (resource use indicators and waste and output flows) are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories.

4.1. Assumptions

When specific data was not available, generic data which fulfilled the minimum criteria of the PCR were used. The ecoinvent database v3.8 recycled content allocation served as the main source of secondary data. Other assumptions included in this LCA were related to raw material modelling and transportation.

4.2. Criteria for the exclusion of inputs and outputs

All product components and production processes were included in the study when the necessary information was readily available or when a reasonable estimate could be made. In accordance with ISO 21930, some input and output flows have been excluded if they represented less than 1% of the cumulative mass input, renewable primary energy or non-renewable primary energy of a unit process and its environmental contribution to the total impacts was estimated to be less than 1%. Also, it is estimated that at least 95% of total flows in terms of mass and energy have been included in the system boundaries to capture at least 95% of the environmental relevance. All materials characterized as hazardous or toxic by the Globally Harmonized System (GHS) were included.

In addition, for the components that go into the products, if less than 100% of the inflows are accounted for, proxy data or extrapolation have been used to achieve 100% completeness, as required by PCR.
In accordance with ISO 21930 and the Product Category Rules, the following items were excluded:

- Production and manufacture of production equipment, delivery vehicles, and laboratory equipment,
- Personnel-related activities (travel, furniture, and office supplies),
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location,
- Secondary and tertiary packaging,
- Propane or diesel for on-site material handling (forklifts and wheel loaders).

4.3. Data quality

Data sources

Specific data were collected from Sika Canada for operations occurring in 2021 (less than 5 years old). **Generic data** collected for the upstream processes were representative of the Canadian context and technologies used.

Table 5: Data source used to complete the upstream material LCI background data

Module	Main processes	Data source	Region	Year
A1	Raw material extraction and processing for the production of products	Background dataset for North American processes (ecoinvent 3.8 database)*	North America (Canada and U.S.)	12 consecutive months, 2021
A2	Transportation to manufacturers	Survey answers from Sika	Canada	12 consecutive months, 2021
A3	Mortars and grouts, as well as packaging, manufacturing	Survey answers from Sika	Canada	12 consecutive months, 2021

*When specific data was not available, generic data which fulfilled the minimum criteria of the PCR were used.

Data quality

The overall data quality ratings show that the data used were good. This data quality assessment confirms the high reliability, representativeness (technological, geographical, and time-related), completeness, and consistency of the information and data used for this study.

4.4. Allocation

Allocation at Sika's manufacturing plant

Sika's plants produce many different products, including several that are not part of the scope of this study. Product ingredients were available for each product and did not need to be allocated. However, general inputs such as electricity and natural gas were allocated based on the production volume (mass) provided by the manufacturer through the data collection.

Ecoinvent processes with allocation

Many of the processes in the ecoinvent database also provide multiple functions, and allocation is required to provide inventory data per function (or per process). This study uses the cut-off implementation of the database, which uses the cut-off approach for recycled content and waste recycling, as well as economic allocation as default for coproducts. This is considered coherent with the rest of the product systems (similar products have similar allocation approaches).

4.5. Life cycle impact assessment - results

Table 6 presents acronyms used in the results table.

Table 7 presents the results for one (1) metric ton of masonry mortars and grouts over the production stage (A1 to A3).

Table 6: Legend for environmental impact, resource use, waste, and output flows indicators

Acronym	Indicator name
AP	Acidification potential
CR	Components for reuse
EE	Exported energy
EP	Eutrophication potential
GWP-GHG	Indicator for climate impact that includes all greenhouse gases
GWP	Global warming potential (GWP100)
HLRW	High-level radioactive waste
HW	Hazardous waste disposed
ILLRW	Intermediate/low-level radioactive waste
ME	Materials for energy recovery
MR	Materials for recycling
NFW	Consumption of freshwater resources
NHW	Non-hazardous waste disposed
NRPE	Non-renewable primary resources used as an energy carrier
NRPM	Non-renewable primary resources with energy content used as a material
NRSF	Non-renewable secondary fuels
ODP	Ozone depletion potential
POCP	Smog creation potential
RE	Recovered energy
RPE	Renewable primary resources used as an energy carrier
RPM	Renewable primary resources with energy content used as a material
RSF	Renewable secondary fuels
SM	Secondary materials

Table 7: Results for one (1) metric ton of masonry mortars and grouts over the production stage (A1 to A3)

Indicators	Units	King® 1-1-6	King® 2-1-9	King® Block	King® MasonGo 100	King® MasonGo 200	King® CellFiller E-15	King® CellFiller E-20	King® CellFiller E-25	King® CellFiller E-30	King® CellFiller E-35	King® CellFiller C-15	King® CellFiller C-20	King® CellFiller C-25	King® CellFiller C-30	King® CellFiller C-35
Environmental indicators																
GWP*	kg CO_2 eq.	2.59E+02	2.90E+02	2.59E+02	1.84E+02	2.77E+02	2.40E+02	2.71E+02	3.05E+02	3.41E+02	3.75E+02	2.03E+02	2.31E+02	2.48E+02	2.50E+02	2.54E+02
ODP	kg CFC-11 eq.	3.18E-05	3.19E-05	2.04E-05	1.81E-05	2.10E-05	2.01E-05	2.03E-05	2.23E-05	2.37E-05	2.52E-05	1.79E-05	1.89E-05	1.96E-05	1.97E-05	1.91E-05
EP	kg N eq.	2.33E-01	2.82E-01	3.26E-01	2.42E-01	3.47E-01	3.03E-01	3.43E-01	3.85E-01	4.30E-01	4.74E-01	2.53E-01	2.88E-01	3.10E-01	3.12E-01	3.18E-01
AP	kg SO_2 eq.	1.04E+00	1.26E+00	1.44E+00	1.01E+00	1.54E+00	1.34E+00	1.52E+00	1.71E+00	1.91E+00	2.11E+00	1.12E+00	1.28E+00	1.38E+00	1.39E+00	1.40E+00
POCP	kg O_3 eq.	1.52E+01	1.77E+01	1.99E+01	1.47E+01	2.12E+01	1.85E+01	2.11E+01	2.32E+01	2.57E+01	2.79E+01	1.57E+01	1.76E+01	1.88E+01	1.89E+01	1.87E+01
GWP-GHG*	kg CO_2 eq.	2.14E+02	2.45E+02	2.60E+02	1.85E+02	2.78E+02	2.41E+02	2.72E+02	3.06E+02	3.42E+02	3.76E+02	2.03E+02	2.32E+02	2.49E+02	2.51E+02	2.55E+02
Resource use																
RPE	MJ, net calorific value	1.80E+02	2.02E+02	2.43E+02	2.24E+02	2.58E+02	2.37E+02	2.46E+02	2.82E+02	3.08E+02	3.38E+02	2.17E+02	2.39E+02	2.52E+02	2.52E+02	2.58E+02
RPM	MJ, net calorific value	4.32E+01	4.32E+01	4.29E+01	5.77E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01	4.29E+01
NRPE	MJ, net calorific value	1.91E+03	2.07E+03	1.74E+03	1.36E+03	1.81E+03	1.63E+03	1.83E+03	1.96E+03	2.14E+03	2.29E+03	1.39E+03	1.52E+03	1.61E+03	1.62E+03	1.61E+03
NRPM	MJ, net calorific value	2.22E+02	2.22E+02	0	0	0	1.56E+01	1.05E+01	1.11E+01	1.27E+01	1.49E+01	0	0	0	0	1.24E+00
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ, net calorific value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ, net calorific value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RE	MJ, net calorific value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADPfossil	MJ, net calorific value	2.85E+03	2.99E+03	1.69E+03	1.33E+03	1.76E+03	1.62E+03	1.77E+03	1.93E+03	2.11E+03	2.27E+03	1.37E+03	1.50E+03	1.58E+03	1.60E+03	1.58E+03
NFW	m^3	3.02E+00	3.17E+00	2.67E+00	2.51E+00	2.72E+00	2.63E+00	2.76E+00	2.84E+00	2.96E+00	3.07E+00	2.29E+00	2.34E+00	2.40E+00	2.44E+00	2.42E+00
Waste																
HW**	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NHW**	kg	5.49E+00	1.23E+01	8.65E+00	2.37E+00	7.41E+00	7.35E-01	1.63E+01	4.18E+00	5.05E+00	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01
HLRW	m^3	5.45E-08	8.31E-08	7.17E-08	3.90E-08	6.97E-08	4.26E-08	1.00E-07	6.41E-08	7.25E-08	6.32E-08	3.64E-08	4.07E-08	4.33E-08	4.34E-08	4.43E-08
ILLRW	m^3	4.02E-06	4.14E-06	2.13E-06	1.66E-06	2.19E-06	1.88E-06	2.21E-06	2.29E-06	2.51E-06	2.65E-06	1.59E-06	1.74E-06	1.84E-06	1.86E-06	1.75E-06
Output flows																
CR	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MR	kg	1.62E+01	1.40E+01	1.52E+01	1.73E+01	1.56E+01	1.78E+01	1.26E+01	1.67E+01	1.64E+01	1.78E+01	1.78E+01	1.78E+01	1.78E+01	1.78E+01	1.78E+01
ME	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	MJ per energy carrier	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note : "E±Y" means "× 10 $^{\pm Y}$". E.g. "2.8E-1" means 0.28.

**GWP-100, IPCC AR4 and GWP-GHG (Total GWP-100, IPCC AR5)*

***Significant data limitations currently exist within the LCI data used to generate waste metrics for life cycle assessments and environmental product declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates (foreground only) and are for informational purposes only. As such, no decisions regarding actual cradle-grave waste performance between products should be derived from these reported values.*

4.6. Life cycle impact assessment – interpretation

King® 1-1-6

The interpretation of the King® 1-1-6 environmental results is presented in this section. This product was chosen to present detailed results in accordance the manufacturer, because King® 1-1-6 is as a typical product in terms of sales.

Potential environmental impact indicators

As observed in Figure 3, the raw material supply (A1) is the main contributor to most environmental indicators (58% to 83% of all impact indicators). This is mainly due to cement production used in the King® 1-1-6 formulation. The transport of raw materials to the manufacturing plant (A2) contributes between 7% and 26%, and the manufacturing stage (A3) has an equivalent contribution, from 10% to 27% contribution for all indicators.

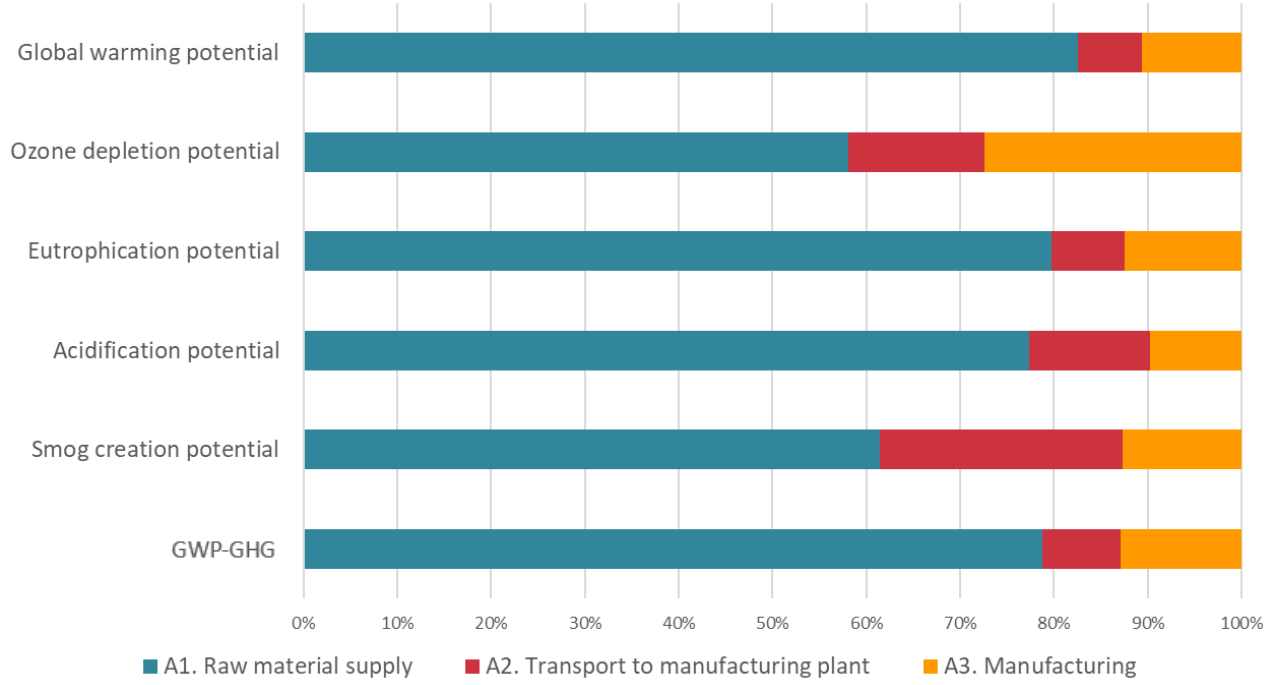


Figure 3: Relative contribution of life cycle modules to potential environmental impacts for one (1) metric ton of King® 1-1-6

Resource use indicators

The raw material supply (A1) stage dominates the resource use categories, ranging from 54% to 83%. The transport to manufacturing plant (A2) has a lower contribution (from 1% to 14%). Manufacturing (A3) stages has the most important contribution to "Use of renewable primary energy excluding renewable primary energy resources used as raw materials" indicator (44%), and a contribution between 14% and 22% for the other indicators.

The electricity grid mix used at Quebec plants has a low impact as it is composed mainly of hydroelectricity, which contributes to the renewable energy use during manufacturing (A3). In Ontario the electricity grid mix is mostly nuclear.

Fresh water is mostly consumed during raw material supply (A1) and manufacturing (A3).

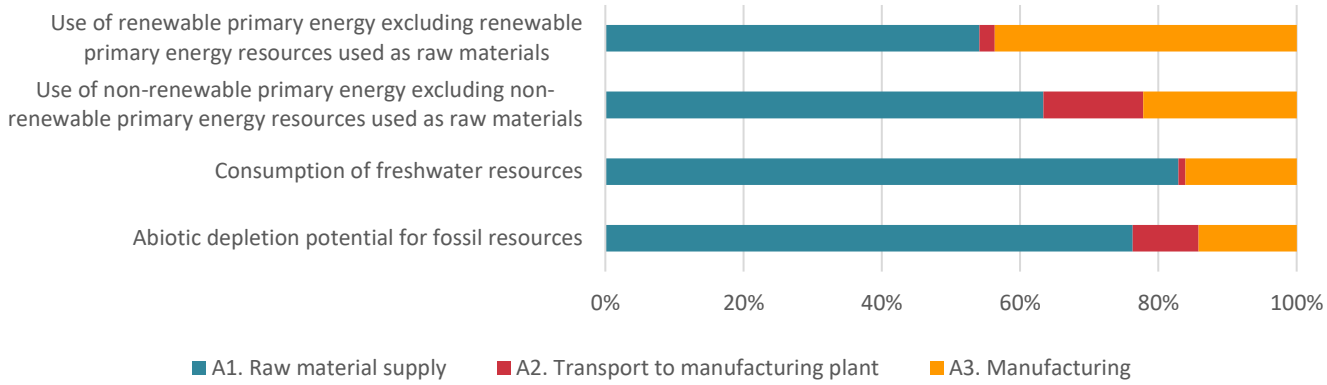


Figure 4: Relative contribution of life cycle modules to resource use indicators for one (1) metric ton of King® 1-1-6

Waste generation and output flows indicators

All non-hazardous are generated at the manufacturing (A3) stage. No hazardous waste is generated. Note that generated non-hazardous wastes over the production stage have been estimated with the foreground processes.

High-level, intermediate, and low-level radioactive waste are generated during the production of electricity consumed at the Ontario plant.

5. Additional environmental information

This section provides additional relevant environmental information about the manufacturer and masonry mortars and grouts that was not derived from the LCA.

Sika's Commitment to sustainability

Providing long lasting and high-performance solutions to the benefit of our customers, Sika is committed to pioneering sustainable solutions that are safer, have the lowest impact on resources and address global environmental challenges.

Therefore, Sika assumes the responsibility to provide sustainable solutions in order to improve material, water and energy efficiency in construction and various industrial sectors. Sika strives to create more value for all its stakeholders with its products, systems, and solutions along the whole value chain and throughout the entire life span of its products.

Sika is committed to measure, improve, and communicate sustainable value creation: "More value, less impact" refers to the company's commitment to maximize the value of its solutions to all stakeholders while reducing resource consumption and impact on the environment.

As a leading manufacturer and marketer of construction materials, Sika has recognized for many years the importance of providing its customers with quality, high performance, and sustainable materials. To this end, the company has obtained ISO 9001 certification for quality management and ISO 14001 certification for environmental management (refer to the certificates for applicability to each site). Since 2020, Sika has been using the external and independent assessment service EcoVadis to measure its corporate social responsibility performance. As a result, in 2022, SIKA AG received a gold medal in recognition of its EcoVadis assessment and managed to achieve a score of 68/100. This score places Sika in the 94th largest percentile of the industry "Manufacture of other chemicals n.e.c." and, with this result, in the top 6 % of companies assessed by EcoVadis in the relevant industry sector. It should be noted that the scope of this assessment includes the Sika Group and all its subsidiaries.

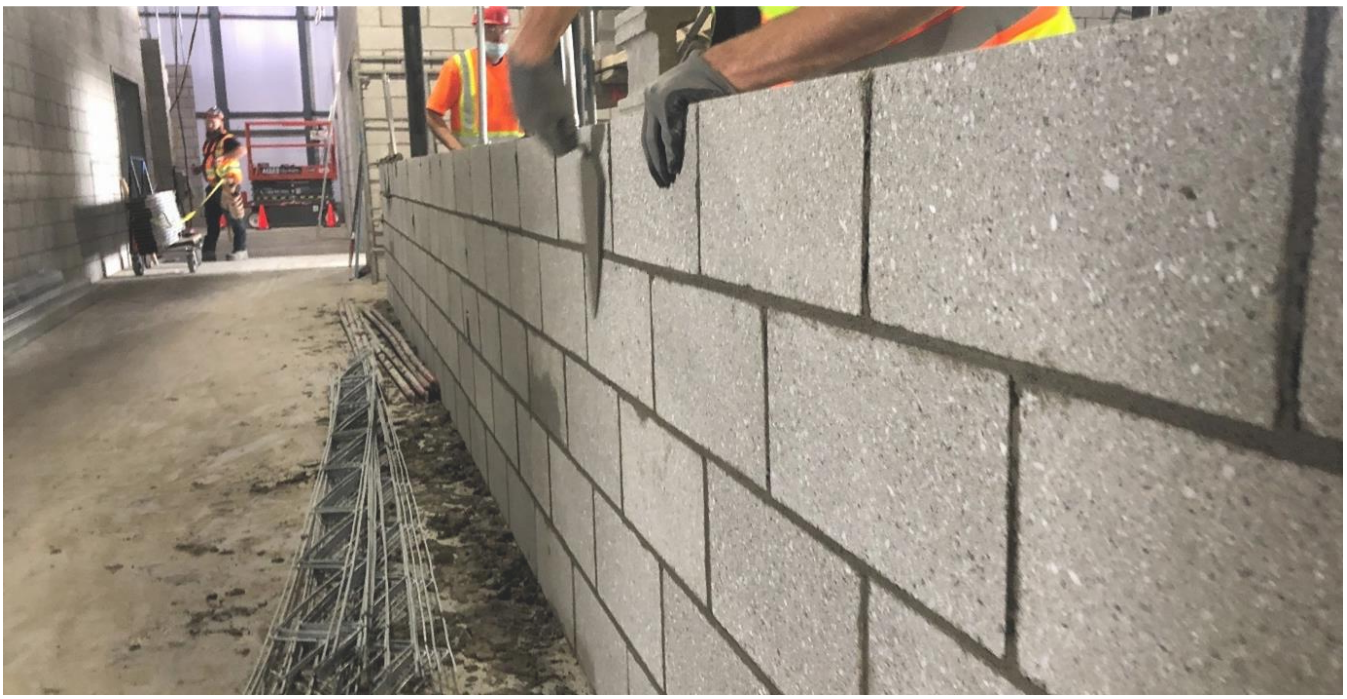
Waste packaging management

Most Sika masonry mortars and grouts are delivered to customers in 30 kg lined bags or with intermediate bulk containers (FIBCs) which offer the advantage of replacing 50 lined bags. Sika Canada encourages its customers to responsibly dispose of used packaging when its products are delivered in a single-use packaging such as bags. At the end of their life, these bags are not yet recyclable (because of contamination by cement and other raw materials) but it is a subject under study.

6. GLOSSARY

6.1. Acronyms

CSA	Canadian Standards Association
ISO	International Organization for Standardization
kg CFC-11 eq.	Kilogram of trichlorofluoromethane equivalent
kg CO_2 eq.	Kilogram of carbon dioxide equivalent
kg N eq.	Kilogram of nitrogen equivalent
kg O_3 eq.	Kilogram of ozone equivalent
kg SO_2 eq.	Kilogram of sulphur dioxide equivalent
LCA	Life cycle assessment
LEED	Leadership in Energy and Environmental Design
LHV	Lower heating value
MJ	Megajoule
m^3	Cubic meter
PCR	Product category rules



6.2. Environmental impact categories and parameters assessed

The **global warming potential** refers to the impact of a temperature increase on the global climate patterns (e.g., severe flooding and drought events, accelerated melting of glaciers) due to the release of greenhouse gases (GHG) (e.g. carbon dioxide and methane from fossil fuel combustion). GHG emissions contribute to the increase in the absorption of radiation from the sun at the earth's surface. These emissions are expressed in units of kg of carbon dioxide equivalents (**kg CO_2 equivalent**). Values reported for GWP are based on accumulated radiative forcing over 100 years.

The **ozone depletion potential** indicator measures the potential of stratospheric ozone level reduction due to the release of some molecules such as refrigerants used in cooling systems (e.g., chlorofluorocarbons). When they react with ozone (O_3), the ozone concentration in the stratosphere diminishes and is no longer sufficient to absorb ultraviolet (UV) radiation which can cause high risks to human health (e.g., skin cancers and cataracts) and the terrestrial environment. The concentration of molecules that are responsible of ozone depletion is expressed in kilograms of trichlorofluoromethane equivalents (**kg CFC-11 equivalent**).

The **eutrophication potential** measures the enrichment of an aquatic or terrestrial ecosystem due to the release of nutrients (e.g. nitrates, phosphates) resulting from natural or human activity (e.g. the discharge of wastewater into watercourses). In an aquatic environment, this activity results in the growth of algae which consume dissolved oxygen present in water when they degrade and thus affect species sensitive to the concentration of dissolved oxygen. Also, the increase in nutrients in soils makes it difficult for the terrestrial environment to manage the excess of biomass produced. The concentration of nutrients causing this impact is expressed in nitrogen equivalents (**kg N equivalent**).

The **acidification potential** refers to the change in acidity (i.e. reduction in pH) in soil and water due to human activity. The increase in NO_x and SO_2 emissions generated by the transportation, manufacturing and energy sectors are the main causes of this impact category. The acidification of land and water has multiple consequences: degradation of aquatic and terrestrial ecosystems, endangering numerous species and food security. The concentration of the gases responsible for the acidification is expressed in sulphur dioxide equivalents (**kg SO_2 equivalent**).

The **smog formation potential** indicator covers the emissions of pollutants such as nitrogen oxides and volatile organic compounds (VOCs) into the atmosphere. They are mainly generated by motor vehicles, power plants and industrial facilities. When reacting with the sunlight, these pollutants create smog which can affect human health and cause various respiratory problems. The concentration of pollutants causing smog are expressed in kg of ozone equivalents (**kg O_3 equivalent**).

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