SIKA CONCRETE ADMIXTURES AND CEMENT ADDITIVES

BUILDING TRUST
CONSTRUIRE LA CONFIANCE

ENVIRONMENTAL PRODUCT DECLARATION

Concrete Admixtures

Air Entrainers
Sika® Air-60
Sika® Air-260
Sika® Air-360

Set Accelerators
SikaSet® HE
SikaSet® NC
SikaSet® RHE

Set Retarders
Sika® Plastiment®
Sika® Plastiment®CA
Sika® Plastiment® RX
Sika® Stabilizer-4R
SikaTard®-440
SikaTard®-930

Special Applications
Sika® Control-312 SE
Sika® Control-75

Water Reducers
Sika® Plastocrete-10N
Sika® Plastocrete-161CA
Sika® Plastocrete-161N
Sika® Plastocrete-250

Water Reducers, Mid-Range
SikaPlast®-200
SikaPlast®-500

Water Reducers, High-Range
Sikament®-300N
Sikament®-475
Sika® ViscoCrete®-1000
Sika® ViscoCrete®-2100
Sika® ViscoCrete®-2110
Sika® ViscoCrete®-6100
Sika® ViscoFlow®-2020
Sika® ViscoFlow®-2050

Cement Additives

Grinding Aids
SikaGrind®-455GNT
SikaGrind®-710
SikaGrind®-721

The development of this type III environmental product declaration (EPD) for Sika concrete admixture and cement additives manufactured in Canada was commissioned by Sika Canada. It 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).

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

Issue date: July 10, 2025

Environmental Product Declaration

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

4414-2877
July 2025-July 2030

This product-specific type III environmental product declaration (EPD) for Sika concrete admixtures and cement additives is in accordance with ISO 14025:2006 and core standard 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 ISO 21930:2017. 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). EPDs are comparable only if they comply with this document, 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. This declaration shall solely be used in a Business to Business (B2B) capacity.

Program operator	**CSA Group** 178 Rexdale Blvd, Toronto, ON, Canada M9W 1R3 | www.csagroup.org
Program Operator General Program Instructions	CSA Group general program instructions for Type III environmental product declarations. CSA-SDP-5.1:25
Product	Sika concrete admixtures and cement additives The complete list of products is presented in section 2.1
EPD registration number	4414-2877
EPD recipient organization	**Sika Canada** 601 avenue Delmar, Pointe-Claire (Quebec) H9R 4A9 | www.sika.ca
Reference PCR	ISO 21930:2017 used as core product category rule
EPD Scope	Cradle-to-gate
Date of issue (approval)	July 10, 2025
Period of validity	July 10, 2025 - July 9, 2030

The LCA and EPD were prepared by	Groupe AGÉCO | www.groupeageco.ca | ageco@groupeageco.ca
This EPD and related data were independently verified by an external verifier, Lindita Bushi, according to CAN/CSA-ISO 14025:2006 and ISO 21930:2017.	__ Internal x External *Lindita Bushi* Lindita Bushi, Ph.D. Athena Sustainable Materials Institute 280 Albert St., Suite 404, Ottawa, Ontario, Canada K1P 5G8 lindita.bushi@athenasmi.org | www.athenasmi.org

Declaration product and declared unit	1 kg of concrete admixtures and cement additives
Manufacturing locations	Cambridge, Ontario, Canada Edmonton, Alberta, Canada Surrey, British Columbia, Canada
EPD type	Product-specific
Markets of applicability and specificity	Canada
LCA Software/database used	Simapro 9.6 with ecoinvent 3.10

Environmental Product Declaration Summary Sheet

Sika Canada | Sika Concrete Admixtures and Cement Additives

This is a summary of the product-specific type III environmental product declaration (EPD) describing the environmental performance of concrete admixtures and cement additives manufactured by Sika Canada and used in the production of concrete and cement.

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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 10, 2025 - July 9, 2030	CSA Group 4414-2877	ISO 21930:2017 used as core product category rule	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 LEED v4, v4.1 and v5, points are awarded in the Materials and Resources category.

Product description

Concrete admixtures are liquid additives added to concrete during production to improve its specific properties in the fresh or hardened state, such as workability, set time, waterproofing, durability, load-bearing capacity, or initial and final strength. Cement additives are liquid solutions designed for the production of cement in order to optimize the grinding process, reduce the energy required to grind clinker and increase the overall quality and performance of cement.

Declared unit

One kilogram (1 kg) of concrete admixture or cement additive.

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 **1 kg of concrete admixture or cement additive** are summarized below for each solution assessed and for the main environmental indicators (based on the requirements of ISO 21930:2017). Refer to the body of the EPD for more detailed results. Results on resource use, waste generated, and output flows are presented in the full EPD.

Cradle-to-gate (A1-A3) results for 1 kg of concrete admixture or cement additive

(complete results are available in the full EPD)

Concrete admixtures	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.
Air Entrainers					
Sika® Air-60	2.39E-01	1.16E-03	8.62E-04	1.25E-02	6.91E-09
Sika® Air-260	6.50E-01	2.23E-03	2.89E-03	2.51E-02	9.80E-09
Sika® Air-360	6.12E-01	2.95E-03	2.09E-03	3.08E-02	1.91E-08
Set Accelerators					
SikaSet® HE	7.02E-01	6.40E-03	3.09E-03	5.04E-02	5.80E-09
SikaSet® NC	3.04E+00	1.13E-02	4.28E-03	8.62E-02	2.81E-08
SikaSet® RHE	3.87E+00	1.67E-02	9.98E-03	1.30E-01	5.05E-07
Set Retarders					
Sika® Plastiment®	2.59E+00	8.08E-03	3.40E-03	6.94E-02	1.95E-08
Sika® Plastiment®CA	8.75E-01	4.82E-03	3.17E-03	4.10E-02	1.79E-08
Sika® Plastiment®RX	1.93E+00	1.22E-02	7.94E-03	9.90E-02	4.21E-08
Sika® Stabilizer-4R	5.51E-01	3.08E-03	3.92E-03	3.61E-02	2.65E-08
SikaTard®-440	6.15E-01	3.13E-03	2.21E-03	2.98E-02	1.60E-08
SikaTard®-930	1.43E+00	6.45E-03	4.48E-03	6.88E-02	4.58E-08
Special Applications					
Sika® Control-312 SE	2.78E+00	1.37E-02	6.90E-03	9.82E-02	2.60E-07
Sika® Control-75	3.65E+00	1.43E-02	1.50E-02	1.96E-01	1.79E-07
Water Reducers					
Sika® Plastocrete-10N	1.69E+00	8.64E-03	8.18E-03	9.44E-02	3.65E-08
Sika® Plastocrete-161CA	1.66E+00	9.00E-03	6.07E-03	8.03E-02	3.65E-08
Sika® Plastocrete-161N	1.88E+00	1.03E-02	7.53E-03	9.40E-02	3.99E-08
Sika® Plastocrete-250	7.01E-01	3.41E-03	2.99E-03	4.03E-02	1.24E-08
Water Reducers, Mid-Range					
SikaPlast®-200	3.38E+00	1.42E-02	1.46E-02	1.39E-01	3.97E-08
SikaPlast®-500	1.46E+00	8.67E-03	5.62E-03	7.11E-02	3.25E-08
Water Reducers, High-Range					
Sikament®-300N	2.02E+00	1.31E-02	8.18E-03	1.02E-01	4.53E-08
Sikament®-475	1.00E+00	3.71E-03	2.68E-03	5.63E-02	2.72E-08
Sika® ViscoCrete®-1000	1.52E+00	5.66E-03	3.95E-03	8.58E-02	4.22E-08
Sika® ViscoCrete®-2100	2.13E+00	7.85E-03	5.53E-03	1.20E-01	5.89E-08
Sika® ViscoCrete®-2110	1.80E+00	5.66E-03	3.65E-03	7.20E-02	5.45E-08
Sika® ViscoCrete®-6100	2.03E+00	8.51E-03	4.12E-03	1.21E-01	6.15E-08
Sika® ViscoFlow®-2020	1.29E+00	4.81E-03	3.39E-03	7.33E-02	3.56E-08
Sika® ViscoFlow®-2050	1.71E+00	6.35E-03	4.45E-03	9.69E-02	4.75E-08

Cement additives	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.
Grinding Aids					
SikaGrind®-455GNT	2.31E+00	9.31E-03	1.44E-02	9.82E-02	5.35E-08
SikaGrind®-710	2.72E+00	9.41E-03	1.13E-02	1.13E-01	6.17E-08
SikaGrind®-721	2.38E+00	8.84E-03	8.08E-03	1.02E-01	5.06E-08

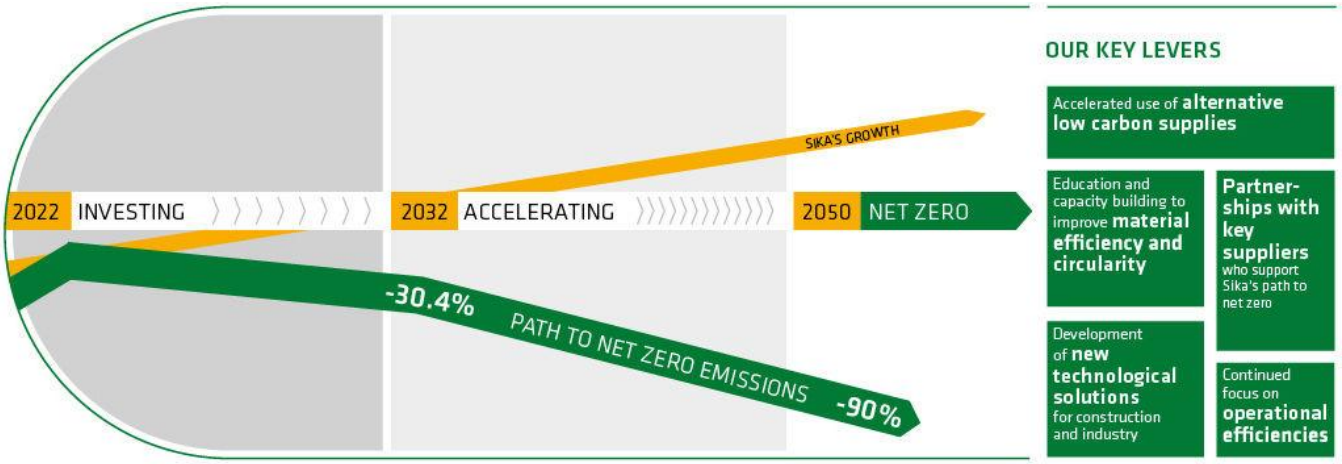
Additional environmental information

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

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 to improve material, water and energy efficiency in construction and transportation. 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. In 2023, Sika launched its new strategy for the upcoming five years. Strategy 2028 lays out ambitious financial targets and non-financial objectives, marking a continued commitment to excellence and expansion. The strategy is based on four key pillars: Market Penetration, Innovation & Sustainability, Acquisitions, People & Culture. It is aligned with eight megatrends that are transforming the industry and driving Sika's continuous success.

Sika is committed to reach net-zero no later than 2050. Sika commits to report annually on its progress towards meeting these targets (see figure below). Sika also acknowledges that the latest climate science may change and is committed to reviewing all active targets every 5 years to ensure consistency with the latest Science Based Targets Initiative (SBTi) criteria.



On the perspective of reducing the environmental impacts of their products, some components studied in the present document present a biobased carbon content, measured in accordance with ASTM D6866-24.

Sika is the 1st company within the specialty chemicals and building materials sector to develop and implement the **Sustainability Portfolio Management (SPM)** Concept based on the World Business Council of Sustainable Development framework. The SPM evaluates solutions based on 12 sustainability and 6 performance categories. SPM is used to classify, and market sustainable solutions.

Volatile organic compound (VOC) content

Individual products in this EPD contain between 0 and ≤ 638 grams of VOC per litre. The VOC content was measured according to EPA 24 or ASTM D2369 standard methods. VOC contents were calculated by Sika Canada's ISO 9001 laboratory. All products were compliant with national standards and LEED requirements at the time of the study.

Sika Canada discloses the VOC content of its products in publicly available safety data sheets. Sika Canada submits annual reports to the National Pollutant Release Inventory (NPRI) for all its sites. To date, no exceedances of regulatory thresholds have been recorded, particularly regarding VOCs listed in Section 4 of the NPRI Reporting Guide. Additionally, to ensure rigorous monitoring of our air emissions, Sika Canada collaborates annually with a consultant to conduct a detailed pollutant inventory, including VOCs, at the following sites: Sika Boisbriand, Sika Brantford and Sika Cambridge. This proactive approach reflects Sika Canada's commitment to environmental compliance and transparency.

Waste packaging management

Most Sika concrete admixtures and cement additives are delivered to customers (ready-mix and precast/manufactured concrete producers and cement producers) with tanker trucks, or in1040 L intermediate bulk containers (IBC) or 205 L steel drums. Sika Canada encourages its customers to responsibly dispose of used packaging when its products are delivered in a single-use packaging such as drums.

For more information: www.sika.ca

1. Description of Sika Canada

Sika Canada Inc., a wholly owned subsidiary of Sika AG, is active in the field of specialty chemicals supplying the building and civil engineering sectors with a complete range of high-quality solutions for new construction, concrete repair and protection, and structural reinforcement with products such as specialty mortars/grouts/concrete; sealants and adhesives; waterproofing solutions; structural strengthening systems; concrete admixtures and additives; industrial and commercial flooring systems; protective and decorative coatings; as well as roofing systems. Sika Canada is also present on the home improvement market with a specific range of products specifically developed for homeowners. The industrial product division serves the manufacturing sector, including industries such as automotive (car, bus, trucks, commercial body manufacturers, AEM, AGR, etc.), shipbuilding, rail, building components/envelopes and, alternative-energy sectors by providing high-performance sealing and bonding solutions and other specialty materials.

Visit Sika Canada's website for more information at www.sika.ca

2. Description of product

2.1. Definition and product classification

This EPD developed with the ISO 21930:2017 core PCR covers 28 admixtures, and 3 additives used in concrete production, in order to improve specific properties in the fresh or hardened state, such as workability, set time, waterproofing, durability, load-bearing capacity or initial and final strength, and 3 cement additives ("grinding aids") designed to improve the efficiency of the grinding process, reduce the energy consumption for grinding clinker, and ultimately increase the cement quality.

Table 1: Sika concrete admixtures and cement additives covered by this EPD

Concrete admixtures			Cement additives
Air Entrainers	**Set Retarders**	**Water Reducers, Mid-Range**	**Grinding Aids**
Sika® Air-60	Sika® Plastiment®	SikaPlast®-200	SikaGrind®-455GNT
Sika® Air-260	Sika® Plastiment®CA	SikaPlast®-500	SikaGrind®-710
Sika® Air-360	Sika® Plastiment® RX	**Water Reducers, High-Range**	SikaGrind®-721
Set Accelerators	SikaTard® -930	Sika® ViscoCrete®-1000	
SikaSet® HE	SikaTard® -440	Sika® ViscoCrete®-2100	
SikaSet® NC	Sika® Stabilizer-4R	Sika® ViscoCrete®-2110	
SikaSet® RHE	**Special Applications**	Sika® ViscoCrete®-6100	
	Sika® Control-75	Sika® ViscoFlow®-2020	
	Sika® Control-312 SE	Sika® ViscoFlow®-2050	
	Water Reducers	Sikament®-300N	
	Sika® Plastocrete-10N	Sikament®-475	
	Sika® Plastocrete-161CA		
	Sika® Plastocrete-161N		
	Sika® Plastocrete-250		

UN CPC product code: 375

More information on these solutions is available on Sika Canada's website:
https://can.sika.com/en/construction/concrete-admixtures.html



Figure 1: Applications for concrete admixtures

2.2.Material content

The material composition of each component as disclosed in SDS (Safety Data Sheets) are provided in Table 2. The complete product formulations were used to calculate the LCA results.

Table 2: Composition of concrete admixtures and cement additives included in this EPD

Components	Hazardous Ingredients	CAS No.	Concentration (%w/w)
Sika® Air-60	Sulfonic acids, C14-16-alkane hydroxy and C14-16-alkene, sodium salts	68439-57-6	>= 1 - < 5
Sika® Air-260	Sulfonic-acids,-C14-16-alkane-hydroxy-and-C14-16-alkene, -sodium-salts	68439-57-6	>= 1 - < 5
	Sodium hydroxide	1310-73-2	>= 1 - < 5
	Diethylene glycol	111-46-6	>= 1 - < 5
Sika® Air-360	Sulfonic acids, C14-16-alkane hydroxy and C14-16-alkene, sodium salts	68439-57-6	>= 1 - < 5
Sika® Control-75	2-(2-butoxyethoxy)ethanol	112-34-5	>= 30 - < 60
	2,2-dimethyl-1,3-propanediol	126-30-7	>= 10 - < 30
Sika® Control-312 SE	Calcium nitrate tetrahydrate	13477-34-4	>= 30 - < 60
	Salts of thiocyanic acid	540-72-7	>= 5 - < 10
	2,2'-(methylimino)diethanol	105-59-9	>= 1 - < 5
	l-(+)-lactic acid	79-33-4	>= 1 - < 5
	Methenamine	100-97-0	>= 1 - < 5
Sika® Plastiment®	No hazardous ingredients reported		
Sika® Plastiment®CA	No hazardous ingredients reported		
Sika® Plastiment® RX	No hazardous ingredients reported		
Sika® Plastocrete-10N	No hazardous ingredients reported		
Sika® Plastocrete-161CA	2,2-iminodiethanol	111-42-2	>= 0 - < 1
	Chlorocresol (4-chloro 3-methylphenol)	59-50-7	>= 0 - < 1
Sika® Plastocrete-161N	2,2-iminodiethanol	111-42-2	>= 1 - < 2
Sika® Plastocrete-250	No hazardous ingredients reported		
Sika® ViscoCrete®-1000	No hazardous ingredients reported		
Sika® ViscoCrete®-2100	No hazardous ingredients reported		
Sika® ViscoCrete®-2110	Tributyl phosphate	126-73-8	>= 0.1 - < 1
Sika® ViscoCrete®-6100	Tributyl phosphate	126-73-8	>= 0.1 - < 1
Sika® ViscoFlow®-2020	Tributyl phosphate	126-73-8	>= 0.1 - < 1
Sika® ViscoFlow®-2050	Polyethylene glycol	25322-68-3	>= 1 - < 5

Components	Hazardous Ingredients	CAS No.	Concentration (%w/w)
SikaGrind®-455GNT	Diethylene glycol	111-46-6	>= 10 - < 30
SikaGrind®-710	Diethylene glycol	111-46-6	>= 10 - < 30
	1,1',1''-nitrilotripropan-2-ol	122-20-3	>= 5 - < 10
	2,2'-iminodiethanol	111-42-2	>= 1 - < 5
SikaGrind®-721	1,1,1-nitrilotripropan-2-ol	122-20-3	>= 10 - < 20
	2,2-iminodiethanol	111-42-2	>= 3 - < 5
Sikament®-300N	No hazardous ingredients reported		
SikaPlast®-200	Sodium thiocyanate	540-72-7	>= 1 - < 5
	2,2-iminodiethanol	111-42-2	>= 0.1 - < 1
SikaPlast®-500	2,2-iminodiethanol	111-42-2	>= 0.1 - < 1
	Tributyl phosphate	126-73-8	>= 0.1 - < 1
SikaSet® HE	Calcium chloride	10043-52-4	>= 25 - < 35
SikaSet® NC	Calcium nitrate tetrahydrate	13477-34-4	>= 50 - < 60
	Sodium thiocyanate	540-72-7	>= 2 - < 5
	Calcium nitrate tetrahydrate	13477-34-4	>= 30 - < 60
	Sodium thiocyanate	540-72-7	>= 1 - < 5
SikaSet® RHE	Calcium nitrate tetrahydrate	13477-34-4	>= 30 - < 60
	Sodium thiocyanate	540-72-7	>= 5 - < 10
	Methenamine	100-97-0	>= 1 - < 5
Sika® Stabilizer 4R	No hazardous ingredients reported		
SikaTard-440	No hazardous ingredients reported		
SikaTard-930	2-phosphonobutane-1,2,4-tricarbocylic acid	37971-36-1	>= 10 - < 30
	Citric acid monohydrate	5949-29-1	>= 5 - < 10
Sikament®-475	Tributyl phosphate	126-73-8	>= 0.1 - < 1

3. Scope of EPD

3.1. Declared unit

A declared unit is used in lieu of a functional unit in accordance with the PCR since the precise function of some products cannot be defined. The environmental impact results of products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. 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 comparisons can be inaccurate and could lead to erroneous selection of materials or products that have a higher impact, at least in some impact categories.

The declared unit is defined as follows:

One kilogram (1 kg) of concrete admixtures or cement additives

Since this is cradle-to-gate EPD, which does not include the use stage, no service lives are reported.

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. Modules not declared are considered not relevant for the covered systems. Figure 2 on page 12 shows the

cradle-to-gate processes for the manufacturing of concrete admixtures included in this EPD. Module A3 is representative of Canada, while A1 and A2 have a global representation.

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

Production stage			Construction stage		Use stage							End-of-life stage				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Legend:
X: considered in the system boundaries *MND: Module not declared*

A1 – Raw material supply

Several different ingredients are required for the manufacturing concrete admixtures. They include antifoam agents, salts, biocides, acids, amines, and other products. They are manufactured in many parts of Canada, the United States, Europe and Asia in liquid or powder forms. This module includes the production of the ingredients needed for the mixing at the Sika plants, including raw material extraction and transformation, and energy production.

A2 – Transport to manufacturing plants

Materials are transported from suppliers to the Sika's manufacturing plants by truck, and boat if shipped from overseas. This module includes transport-related air emissions as well as fuel, vehicles, and infrastructure production.

A3 – Manufacturing

The manufacturing of concrete admixtures involves liquids in aqueous solution. Ingredients are shipped to the Sika plant and stored until their use. Then, materials are mixed following the product formulation. The result goes under quality control and is transferred to a tanker truck or packaged in steel drums (205 L).

Natural gas and electricity are the main source of energy used at the manufacturing plants. Electricity is used in various processes and natural gas is used for heating. Non-hazardous waste generated on-site is primarily sent to landfills (and recycling to a lesser extent). Hazardous waste is incinerated.

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	End-of-life treatment	Mass (kg)	Source	Biogenic carbon content (kg C)
205-litre steel drum	Landfill**	17	Manufacturer	0

** Sika concrete admixtures are mainly delivered in bulk with compartmentalized tanker trucks directly to the concrete plant. Thus, no packaging is used most of the time.*
*** Metallic containers may be recycled at the construction site, especially in a LEED project. However, it was judged that it would not be a representative case of how this packaging waste is usually treated.*

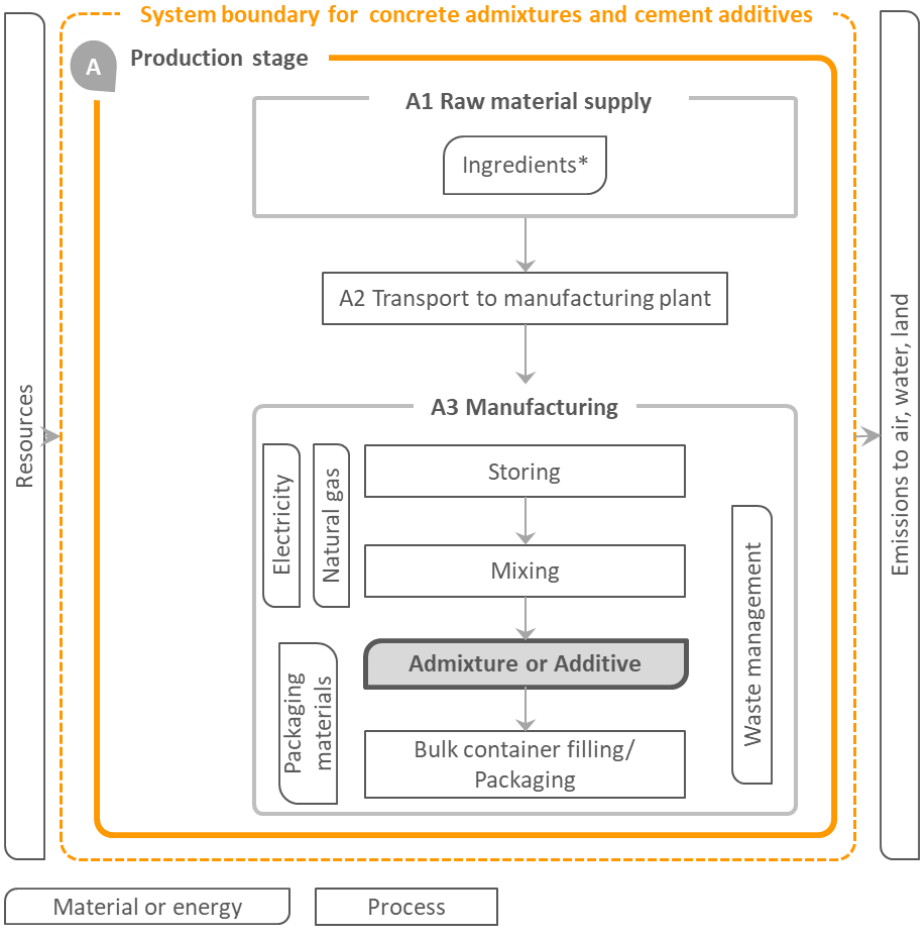


Figure 2: Process flow for all life cycle modules considered

*Note: ingredients include antifoam agents, salts, biocides, acids, amines, and others

3.3. Geographical and temporal boundaries

The geographical boundaries are representative of current equipment and processes associated with concrete admixture manufacturing in Canada. Since the data were collected for the year 2023 (12 consecutive months), they are considered temporally representative (i.e., less than 5 years old). A weighted average of production volume (on a mass basis) at each location is utilized for calculation purposes. All data were modelled using the ecoinvent 3.10 database released in 2023 (ecoinvent, 2023), which meets the PCR requirements.

4. Potential environmental impacts assessment

This cradle-to-gate life cycle assessment has been conducted according to ISO 14040 and 14044 standards as well as ISO 21930:2017 used as core PCR. Potential environmental impacts were calculated according to ISO 21930:2017 used as core PCR. The description of these indicators reported are provided in the glossary (section 6.2).

4.1. Assumptions

When specific data was not available, generic data which fulfilled the minimum criteria of the PCR were used. The ecoinvent database v3.10 recycled content allocation served as the main source of secondary data. It should be noted that most, though not all, of the data within ecoinvent is of European origin and developed to represent

European industrial conditions and processes. Therefore, in some cases, these modules were further adapted in order to enhance their representativeness of the products and contexts being examined. However, in the recent updates of the ecoinvent database, a lot of efforts have been put into creating market groups for regions, countries, and products. 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. Input and output flows may 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. It should be noted that the following items were excluded:

- Personnel impacts
- Research and development activities
- Business travel
- Any secondary or tertiary packaging
- All point-of-sale infrastructure

4.3. Data quality

Data sources

Specific data were collected from Sika Canada for operations occurring in 2023 (less than 5 years old). **Generic data** collected for the upstream processes were representative of the Canadian context and technologies used.

The LCA model was developed with the SimaPro 9.6 software using ecoinvent 3.10 database, which was released in 2023. Since most of the data within ecoinvent is of European origin and produced to represent European industrial conditions and processes, several data were adapted to enhance their representativeness of the products and contexts being examined.

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 of multi-output processes

When unavoidable allocation was done by mass, or other physical relationship. Economic value allocation was not used.

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 in tonnes. Percentages were calculated by the manufacturers through the data collection.

No burdens are allocated across the system boundary with secondary material, secondary fuel or recovered energy flows arising from waste.

Allocation for end-of-life processes

A recycled content approach (i.e., cut-off approach) was applied when a product is recycled. The impacts associated with the recycling process are thus attributed to the products using these materials.

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 accepts the allocation method used by ecoinvent for those processes. The ecoinvent system model used was "Allocation, cut-off". It should be noted that the allocation methods used in ecoinvent for background processes (i.e., processes representing the complete supply chain of a good or service used in the life cycle of a concrete admixture) may be inconsistent with the approach used to model the foreground system (i.e., to model the manufacturing of a concrete admixture with data collected in the literature and from manufacturers). While this allocation is appropriate for foreground processes, continuation of this methodology into the background datasets would add complexity without substantially improving the quality of the study.

4.5. Life cycle impact assessment - results

Table 5 to Table 11 present the results for 1 kg of concrete admixture and cement additive over the production stage (A1 to A3).

Table 5: Results for 1 kg of concrete admixtures over the production stage (A1 to A3)

Indicators	Units	Sika® Air-60	Sika® Air-260	Sika® Air-360	SikaSet® HE	SikaSet® NC
Environmental indicators						
Global warming potential	kg CO_2 eq.	2.39E-01	6.50E-01	6.12E-01	7.02E-01	3.04E+00
Ozone depletion potential	kg CFC-11 eq.	6.91E-09	9.80E-09	1.91E-08	5.80E-09	2.81E-08
Eutrophication potential	kg N eq.	8.62E-04	2.89E-03	2.09E-03	3.09E-03	4.28E-03
Acidification potential	kg SO_2 eq.	1.16E-03	2.23E-03	2.95E-03	6.40E-03	1.13E-02
Smog formation potential	kg O_3 eq.	1.25E-02	2.51E-02	3.08E-02	5.04E-02	8.62E-02
Resource use						
Depletion of abiotic resources (fossil)	MJ	4.31E+00	6.05E+00	1.19E+01	6.81E+00	2.44E+01
Renewable primary energy	MJ	3.03E-01	2.42E+00	5.92E-01	1.17E+00	1.12E+00
Renewable primary materials	MJ	0.00E+00	3.05E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary energy	MJ	4.95E+00	6.76E+00	1.34E+01	7.77E+00	2.72E+01
Non-renewable primary materials	MJ	0.00E+00	3.59E-01	0.00E+00	3.15E-03	1.50E-04
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	2.91E-03	8.38E-03	5.63E-03	2.13E-02	2.34E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste and output flows						
Hazardous waste disposed	kg	0.00E+00	1.54E-03	1.49E-03	1.11E-03	6.17E-04
Non-hazardous waste disposed	kg	1.84E-03	2.89E-03	2.99E-03	2.66E-03	2.13E-03
High-level radioactive waste	m^3	5.33E-10	3.77E-10	6.31E-10	5.64E-10	7.97E-10
Intermediate/low-level radioactive waste	m^3	1.22E-09	1.39E-09	2.54E-09	2.21E-09	3.31E-09
Biogenic carbon						
Biogenic carbon content in product	kg C	0.00E+00	6.03E-02	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

Indicators	Units	Sika® Air-60	Sika® Air-260	Sika® Air-360	SikaSet® HE	SikaSet® NC
Output flows						
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	4.12E-04	3.48E-04	2.75E-04	2.14E-04
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6: Results for 1 kg of concrete admixtures over the production stage (A1 to A3), continued

Indicators	Units	SikaSet® RHE	Sika® Plastiment®	Sika® Plastiment® CA	Sika® Plastiment® RX	Sika® Stabilizer-4R
Environmental indicators						
Global warming potential	kg CO_2 eq.	3.87E+00	2.59E+00	8.75E-01	1.93E+00	5.51E-01
Ozone depletion potential	kg CFC-11 eq.	5.05E-07	1.95E-08	1.79E-08	4.21E-08	2.65E-08
Eutrophication potential	kg N eq.	9.98E-03	3.40E-03	3.17E-03	7.94E-03	3.92E-03
Acidification potential	kg SO_2 eq.	1.67E-02	8.08E-03	4.82E-03	1.22E-02	3.08E-03
Smog formation potential	kg O_3 eq.	1.30E-01	6.94E-02	4.10E-02	9.90E-02	3.61E-02
Resource use						
Depletion of abiotic resources (fossil)	MJ	3.53E+01	1.71E+01	9.48E+00	1.99E+01	7.48E+00
Renewable primary energy	MJ	2.07E+00	8.94E-01	7.60E-01	2.80E+00	1.48E+00
Renewable primary materials	MJ	0.00E+00	0.00E+00	0.00E+00	5.60E-01	3.25E-01
Non-renewable primary energy	MJ	3.78E+01	1.92E+01	1.09E+01	2.32E+01	7.22E+00
Non-renewable primary materials	MJ	2.27E+00	5.66E-02	6.33E-03	8.98E-02	1.30E+00
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	1.23E-02	2.12E-02	1.36E-02	4.26E-02	2.38E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste and output flows						
Hazardous waste disposed	kg	0.00E+00	0.00E+00	3.33E-03	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	1.84E-03	1.84E-03	4.40E-03	1.84E-03	1.08E-03
High-level radioactive waste	m^3	1.65E-09	8.14E-10	5.38E-10	1.71E-09	4.05E-10
Intermediate/low-level radioactive waste	m^3	7.50E-09	2.72E-09	2.85E-09	7.56E-09	2.10E-09
Biogenic carbon						
Biogenic carbon content in product	kg C	0.00E+00	0.00E+00	0.00E+00	3.73E-02	2.99E-02
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	SikaSet® RHE	Sika® Plastiment®	Sika® Plastiment® CA	Sika® Plastiment® RX	Sika® Stabilizer-4R
Output flows						
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	7.75E-04	0.00E+00	2.99E-04
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 7: Results for 1 kg of concrete admixtures over the production stage (A1 to A3), continued

Indicators	Units	SikaTard®-440	SikaTard®-930	Sika Control-312 SE	Sika Control-75	Sika Plastocrete®-10N
Environmental indicators						
Global warming potential	kg CO_2 eq.	6.15E-01	1.43E+00	2.78E+00	3.65E+00	1.69E+00
Ozone depletion potential	kg CFC-11 eq.	1.60E-08	4.58E-08	2.60E-07	1.79E-07	3.65E-08
Eutrophication potential	kg N eq.	2.21E-03	4.48E-03	6.90E-03	1.50E-02	8.18E-03
Acidification potential	kg SO_2 eq.	3.13E-03	6.45E-03	1.37E-02	1.43E-02	8.64E-03
Smog formation potential	kg O_3 eq.	2.98E-02	6.88E-02	9.82E-02	1.96E-01	9.44E-02
Resource use						
Depletion of abiotic resources (fossil)	MJ	9.52E+00	2.41E+01	2.99E+01	6.12E+01	2.14E+01
Renewable primary energy	MJ	5.76E-01	2.90E+00	1.60E+00	2.92E+00	8.61E+00
Renewable primary materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+00
Non-renewable primary energy	MJ	1.07E+01	1.89E+01	2.91E+01	5.19E+01	2.49E+01
Non-renewable primary materials	MJ	4.52E-02	7.94E+00	4.76E+00	1.70E+01	8.98E-02
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	7.40E-03	1.94E-02	1.43E-02	3.07E-02	6.16E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste and output flows						
Hazardous waste disposed	kg	3.33E-03	2.27E-04	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	4.40E-03	1.31E-03	1.84E-03	1.08E-03	1.84E-03
High-level radioactive waste	m^3	4.10E-10	6.80E-10	1.40E-09	2.60E-09	1.37E-09
Intermediate/low-level radioactive waste	m^3	2.21E-09	3.65E-09	6.30E-09	1.36E-08	5.83E-09
Biogenic carbon						
Biogenic carbon content in product	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-01
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	SikaTard®-440	SikaTard®-930	Sika Control-312 SE	Sika Control-75	Sika Plastocrete®-10N
Output flows						
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.75E-04	3.31E-04	0.00E+00	2.99E-04	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 8: Results for 1 kg of concrete admixtures over the production stage (A1 to A3), continued

Indicators	Units	Sika Plastocrete®-161CA	Sika Plastocrete®-161N	Sika Plastocrete®-250	SikaPlast®-200	SikaPlast®-500
Environmental indicators						
Global warming potential	kg CO_2 eq.	1.66E+00	1.88E+00	7.01E-01	3.38E+00	1.46E+00
Ozone depletion potential	kg CFC-11 eq.	3.65E-08	3.99E-08	1.24E-08	3.97E-08	3.25E-08
Eutrophication potential	kg N eq.	6.07E-03	7.53E-03	2.99E-03	1.46E-02	5.62E-03
Acidification potential	kg SO_2 eq.	9.00E-03	1.03E-02	3.41E-03	1.42E-02	8.67E-03
Smog formation potential	kg O_3 eq.	8.03E-02	9.40E-02	4.03E-02	1.39E-01	7.11E-02
Resource use						
Depletion of abiotic resources (fossil)	MJ	1.96E+01	2.24E+01	8.53E+00	3.13E+01	1.63E+01
Renewable primary energy	MJ	2.46E+00	3.64E+00	3.34E+00	4.62E+00	1.34E+00
Renewable primary materials	MJ	6.17E-01	1.08E+00	1.50E+00	1.43E+00	0.00E+00
Non-renewable primary energy	MJ	2.10E+01	2.59E+01	8.83E+00	3.59E+01	1.88E+01
Non-renewable primary materials	MJ	1.49E+00	8.98E-02	1.10E+00	1.68E-01	1.42E-01
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	3.31E-02	4.46E-02	2.95E-02	4.96E-02	2.51E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste and output flows						
Hazardous waste disposed	kg	3.33E-03	0.00E+00	6.39E-04	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	4.40E-03	1.84E-03	1.94E-03	1.84E-03	1.84E-03
High-level radioactive waste	m^3	1.01E-09	1.68E-09	5.40E-10	1.88E-09	1.37E-09
Intermediate/low-level radioactive waste	m^3	5.39E-09	7.56E-09	2.51E-09	9.00E-09	5.81E-09
Biogenic carbon						
Biogenic carbon content in product	kg C	4.12E-02	1.12E-01	9.98E-02	1.05E-01	1.39E-02
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	Sika Plastocrete®-161CA	Sika Plastocrete®-161N	Sika Plastocrete®-250	SikaPlast®-200	SikaPlast®-500
Output flows						
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.75E-04	0.00E+00	3.03E-04	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9: Results for 1 kg of concrete admixtures over the production stage (A1 to A3), continued

Indicators	Units	Sikament®-300N	Sikament®-475	Sika® ViscoCrete®-1000	Sika® ViscoCrete®-2100	Sika® ViscoCrete®-2110
Environmental indicators						
Global warming potential	kg CO_2 eq.	2.02E+00	1.00E+00	1.52E+00	2.13E+00	1.80E+00
Ozone depletion potential	kg CFC-11 eq.	4.53E-08	2.72E-08	4.22E-08	5.89E-08	5.45E-08
Eutrophication potential	kg N eq.	8.18E-03	2.68E-03	3.95E-03	5.53E-03	3.65E-03
Acidification potential	kg SO_2 eq.	1.31E-02	3.71E-03	5.66E-03	7.85E-03	5.66E-03
Smog formation potential	kg O_3 eq.	1.02E-01	5.63E-02	8.58E-02	1.20E-01	7.20E-02
Resource use						
Depletion of abiotic resources (fossil)	MJ	2.06E+01	1.84E+01	2.85E+01	3.98E+01	3.91E+01
Renewable primary energy	MJ	1.89E+00	8.27E-01	1.18E+00	1.62E+00	9.30E-01
Renewable primary materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary energy	MJ	2.42E+01	8.47E+00	1.26E+01	1.74E+01	1.36E+01
Non-renewable primary materials	MJ	0.00E+00	1.31E+01	2.08E+01	2.92E+01	3.10E+01
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	3.76E-02	7.14E-03	1.03E-02	1.40E-02	1.01E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste and output flows						
Hazardous waste disposed	kg	0.00E+00	1.11E-03	7.09E-04	1.25E-03	0.00E+00
Non-hazardous waste disposed	kg	1.84E-03	2.41E-03	2.16E-03	2.57E-03	1.84E-03
High-level radioactive waste	m^3	1.79E-09	1.08E-09	1.66E-09	2.23E-09	1.80E-09
Intermediate/low-level radioactive waste	m^3	8.03E-09	7.20E-09	1.10E-08	1.56E-08	1.12E-08
Biogenic carbon						
Biogenic carbon content in product	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	Sikament®-300N	Sikament®-475	Sika® ViscoCrete®-1000	Sika® ViscoCrete®-2100	Sika® ViscoCrete®-2110
Output flows						
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	3.72E-04	2.55E-04	3.83E-04	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 10: Results for 1 kg of concrete admixtures over the production stage (A1 to A3), continued

Indicators	Units	Sika® ViscoCrete®-6100	Sika® ViscoFlow®-2020	Sika® ViscoFlow®-2050
Environmental indicators				
Global warming potential	kg CO_2 eq.	2.03E+00	1.29E+00	1.71E+00
Ozone depletion potential	kg CFC-11 eq.	6.15E-08	3.56E-08	4.75E-08
Eutrophication potential	kg N eq.	4.12E-03	3.39E-03	4.45E-03
Acidification potential	kg SO_2 eq.	8.51E-03	4.81E-03	6.35E-03
Smog formation potential	kg O_3 eq.	1.21E-01	7.33E-02	9.69E-02
Resource use				
Depletion of abiotic resources (fossil)	MJ	4.41E+01	2.41E+01	3.20E+01
Renewable primary energy	MJ	1.02E+00	1.04E+00	1.33E+00
Renewable primary materials	MJ	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary energy	MJ	1.52E+01	1.07E+01	1.42E+01
Non-renewable primary materials	MJ	3.52E+01	1.75E+01	2.34E+01
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	1.10E-02	9.01E-03	1.17E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00
Waste and output flows				
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	1.84E-03	1.32E-03	1.84E-03
High-level radioactive waste	m^3	1.99E-09	1.40E-09	2.06E-09
Intermediate/low-level radioactive waste	m^3	1.26E-08	9.49E-09	1.28E-08
Biogenic carbon				
Biogenic carbon content in product	kg C	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	Sika® ViscoCrete®-6100	Sika® ViscoFlow®-2020	Sika® ViscoFlow®-2050
Output flows				
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	2.06E-04	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00

Table 11: Results for 1 kg of cement additives over the production stage (A1 to A3)

Indicators	Units	SikaGrind®-455 GNT	SikaGrind®-710	SikaGrind®-721
Environmental indicators				
Global warming potential	kg CO_2 eq.	2.31E+00	2.72E+00	2.38E+00
Ozone depletion potential	kg CFC-11 eq.	5.35E-08	6.17E-08	5.06E-08
Eutrophication potential	kg N eq.	1.44E-02	1.13E-02	8.08E-03
Acidification potential	kg SO_2 eq.	9.31E-03	9.41E-03	8.84E-03
Smog formation potential	kg O_3 eq.	9.82E-02	1.13E-01	1.02E-01
Resource use				
Depletion of abiotic resources (fossil)		2.16E+01	4.08E+01	3.99E+01
Renewable primary energy	MJ	1.44E+01	7.04E+00	2.18E+00
Renewable primary materials	MJ	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary energy	MJ	2.14E+01	4.11E+01	4.55E+01
Non-renewable primary materials	MJ	5.03E+00	6.00E+00	0.00E+00
Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00
Fresh water	m^3	2.12E-02	2.62E-02	2.93E-02
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00
Waste and output flows				
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	1.84E-03	1.84E-03	1.84E-03
High-level radioactive waste	m^3	1.31E-09	2.15E-09	2.18E-09
Intermediate/low-level radioactive waste	m^3	5.28E-09	1.03E-08	1.12E-08
Biogenic carbon				
Biogenic carbon content in product	kg C	2.03E-01	2.22E-01	2.26E-01
Biogenic carbon content in accompanying packaging	kg C	0.00E+00	0.00E+00	0.00E+00

Indicators	Units	SikaGrind®-455 GNT	SikaGrind®-710	SikaGrind®-721
Output flows				
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00

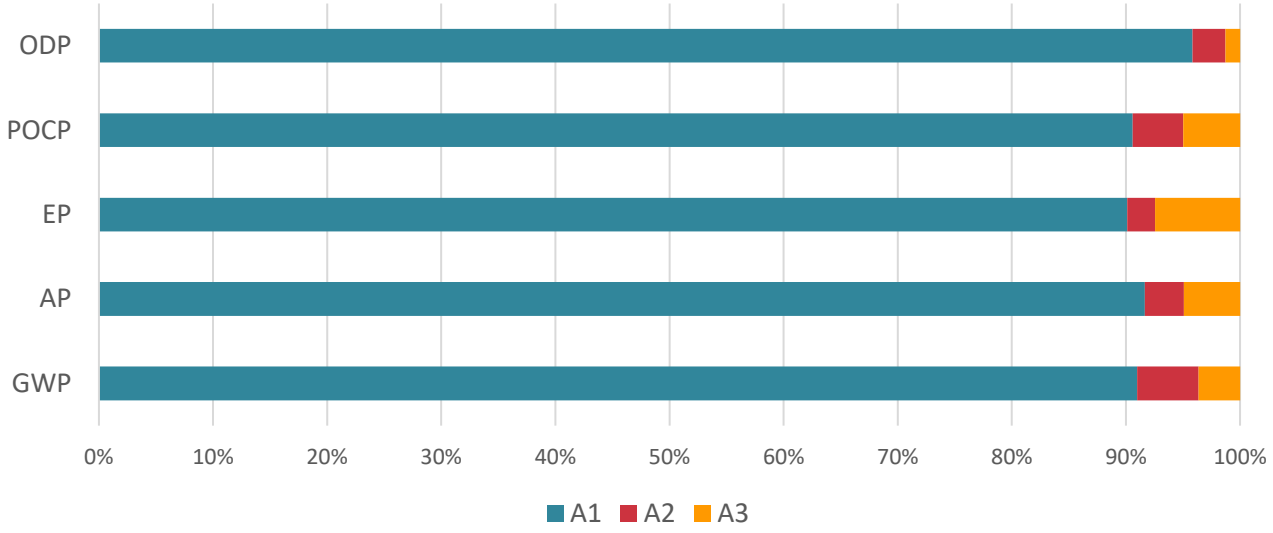
4.6. Life cycle impact assessment – interpretation

Sika® ViscoCrete®-2110

The interpretation of the Sika® ViscoCrete®-2110 environmental results (Figure 3) is presented in this section. It was chosen with the manufacturer as a typical concrete admixture.

Potential environmental impact indicators

The **raw material supply (A1)** is the main contributor to most indicators (82% to 100% of all impact indicators). This is mainly due to the inputs required to produce the **chemical ingredients** used in the ViscoCrete formulation. The **manufacturing stage (A3)** contributes between 1% to 7% (average at 4,5%) for all indicators, due to the impact of the **steel drum packaging**. It should be noted that no material was transported by sea for this specific product, which makes this stage less impactful than for various products in this study.



GWP Global warming potential
AP Acidification potential
EP Eutrophication potential
POCP Smog formation potential
ODP Ozone depletion potential

Figure 3: Relative contribution of life cycle modules to potential environmental impacts for 1 kg of Sika® ViscoCrete®-2110

Resource use indicators

The **raw material supply (A1)** stage dominates the resource use categories, ranging from 82% to 100%. The **transport to manufacturing plant (A2) and manufacturing (A3)** stages have minimal contribution to the overall energy use. No renewable materials were used.

Waste generation indicators

The waste and output flows are minimal but are mainly generated by the **manufacturing (A3)** stage in the form of non-hazardous waste sent to landfill.

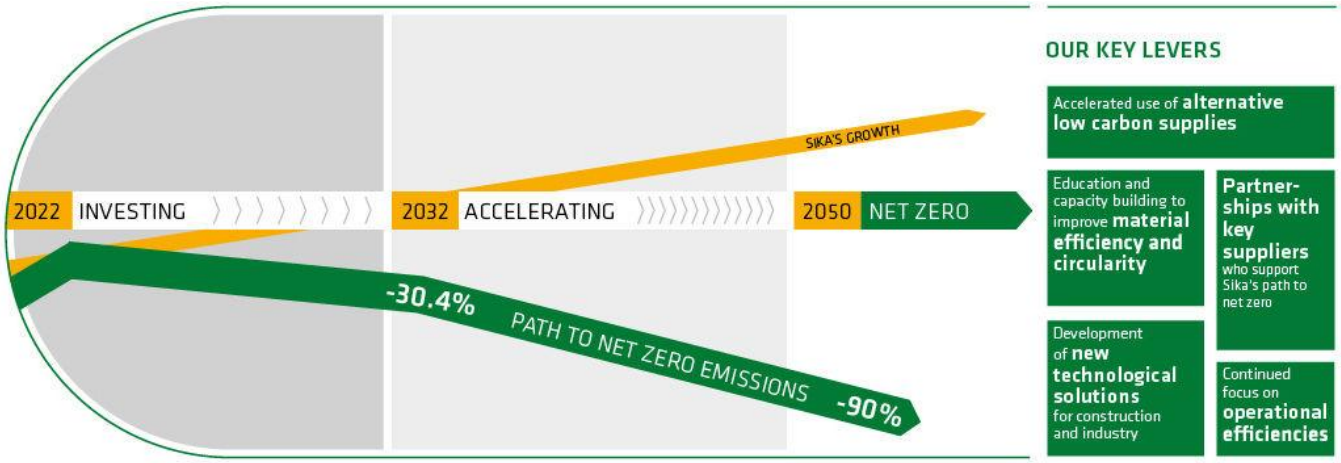
5. Additional environmental information

This section provides additional relevant environmental information about the manufacturer and the concrete admixtures 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 to improve material, water and energy efficiency in construction and transportation. 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. In 2023, Sika launched its new strategy for the upcoming five years. **Strategy 2028** lays out ambitious financial targets and non-financial objectives, marking a continued commitment to excellence and expansion. The strategy is based on four key pillars: Market Penetration, Innovation & Sustainability, Acquisitions, People & Culture. It is aligned with eight megatrends that are transforming the industry and driving Sika's continuous success.

Sika is committed to reach **net-zero** no later than 2050. Sika commits to report annually on its progress towards meeting these targets (see figure below). Sika also acknowledges that the latest climate science may change and is committed to reviewing all active targets every 5 years to ensure consistency with the latest Science Based Targets Initiative (SBTi) criteria.



On the perspective of reducing the environmental impacts of their products, some components studied in the present document present a biobased carbon content, measured in accordance with ASTM D6866-24.

SPM | Sustainability Portfolio Management

Sika is the 1st company within the specialty chemicals and building materials sector to develop and implement the **Sustainability Portfolio Management (SPM)** Concept based on the World Business Council of Sustainable Development framework. The SPM evaluates solutions based on 12 sustainability and 6 performance categories. SPM is used to classify, and market sustainable solutions.

Waste packaging management

Most Sika concrete admixtures are delivered in bulk with a tanker truck or using 1040 L intermediate bulk containers (IBC), or 205 L steel drums directly to concrete plants. Sika Canada encourages its customers to responsibly dispose of used packaging when its products are delivered in a single-use packaging such as drums.

6. GLOSSARY

6.1. Acronyms

AP	Acidification potential
CSA	Canadian Standards Association
EP	Eutrophication potential
GHG	Greenhouse gas
GWP	Global warming potential
ISO	International Organization for Standardization
kg C	Kilogram of carbon
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
L	litre
LCA	Life cycle assessment
LEED	Leadership in Energy and Environmental Design
LHV	Lower heating value
MJ	Megajoule
m^3	Cubic metre
ODP	Ozone depletion potential
PCR	Product category rules
POCP	Photochemical ozone (smog) creation potential
TRACI	Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts
VOC	Volatile organic compound

6.2. Environmental impact categories and parameters assessed

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 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).

Net fresh water consumption accounts for the imbalance in the natural water cycle created by the water evaporated, consumed by a system or released to a different watershed (i.e., not its original source). This imbalance can cause water scarcity and affect biodiversity. This indicator refers to the waste of the resource rather than its pollution. Also, it does not refer to water that is used but returned to the original source (e.g., water for hydroelectric turbines, cooling or river transportation) or lost from a natural system (e.g., due to evaporation of rainwater). The quantity of fresh water consumed is expressed as a volume of water in metre cube (m³ of water consumed).

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).

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 smog formation potential (or photochemical ozone creation 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 is expressed in kg of ozone equivalents (kg O_3 equivalent).

The renewable/non-renewable primary energy consumption parameters refer to the use of energy from renewable resources (e.g., wind, solar, hydro) and non-renewable resources (e.g., natural gas, coal, petroleum). The quantity of primary energy used is expressed in megajoules, on the basis of the lower heating value of the resources (MJ, LHV).

The renewable/non-renewable material resources consumption parameters represent the quantity of material made from renewable resources or non-renewable resources used to manufacture a product, excluding recovered or recycled materials. The quantity of these resources is reported in megajoules (MJ).

7. REFERENCES

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