Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for: PrīmX SFRSSC (Steel Fiber Reinforced Self-Stressing Concrete) Slab Systems

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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This document includes different products and results are displayed individually

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 www.environdec.com

General information

Program information

The EPD owner has sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804

Programme:	**The International EPD® System**
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ISO Standard ISO 21930 and CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR): Construction Products, PCR 2019:14 Version 1.11 and Concrete and Concrete Elements C-PCR-003 (TO PCR 2019:14), UN CPC 375

PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción (Chile). The review panel may be contacted via the Secretariat info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Third party verifier: Marcel Gómez Ferrer, Marcel Gómez Consultoria Ambiental. Email: info@marcelgomez.com

Approved by: The International EPD® System

EPD and LCA has been worked out by Bureau Veritas Latvia. Email: riga@bureauveritas.com

Procedure for follow-up of data during EPD validity involves third party verifier:

☒ Yes ☐ No

Company information

Owner of the EPD: **Primekss Group**
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Description of the organization:

Founded in 1997, concrete contractor and highly innovative concrete specialist Primekss is the world's leading concrete technology company. Within its own concrete R&D center, the company has developed a unique high-performance truly joint-less concrete flooring technology – PrīmX.

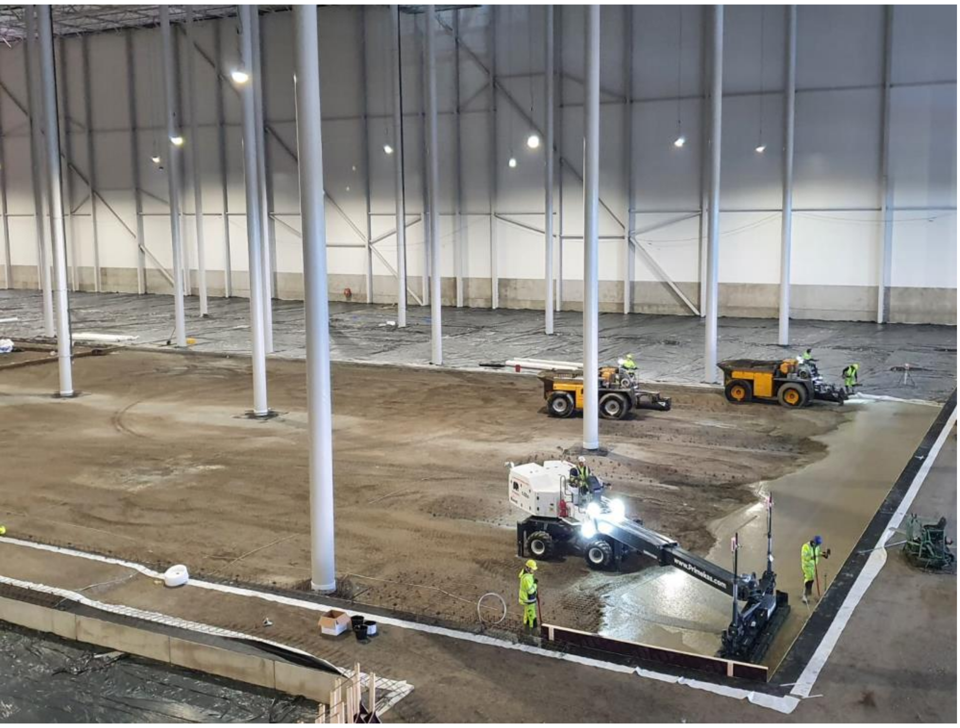
From its very beginning, the PrīmX system was developed to achieve 3 main goals:

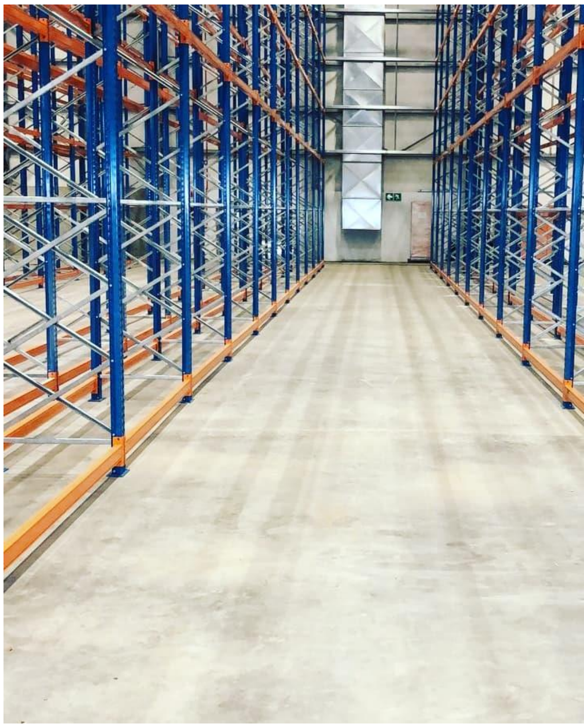
- To overcome the biggest drawback of concrete: shrinkage and the problems it causes, namely curling and cracking
- To create a sustainable and eco-friendly concrete technology;
- Technology that allows consistent quality slabs to be built anywhere in the world.

PrīmX technology is delivered via its own resources (Baltics, Scandinavia, Germany, Israel) as a concrete contractor or qualified license partners worldwide who implement projects under strict Primekss quality control, ensured by Primekss Labs engineers (cement and aggregates testing, mix design adjustment, design, etc.) using only approved PrīmX materials.

Primekss as specialized contractors delivers design-build service – from the agreement until the ready floor handover.

Name and location of production site(s): United States of America (USA)





Product information

Product name:

PrīmX SFRSSC (Steel Fiber Reinforced Self-Stressing Concrete) Slab Systems

Product Description:

PrīmX is a unique and patented PrīmX steel fiber reinforced self-stressing concrete (SFRSSC) slab technology.

PrīmX contains steel fibers and proprietary admixtures combined with ready-mix concrete to create a composite material. It requires no joints or saw cuts within each daily pour. PrīmX technology floor slabs are designed to facilitate the rapid development of automated logistics and warehousing operations. This zero-shrinkage high-performance steel-fiber-reinforced concrete system represents the pinnacle of consistent, high-quality concrete flooring anywhere in the world. The jointless concrete technology makes it possible to construct high-quality, jointless, saw-cut-free floors that ensure true flatness over the long term – lifetime flatness for fast.

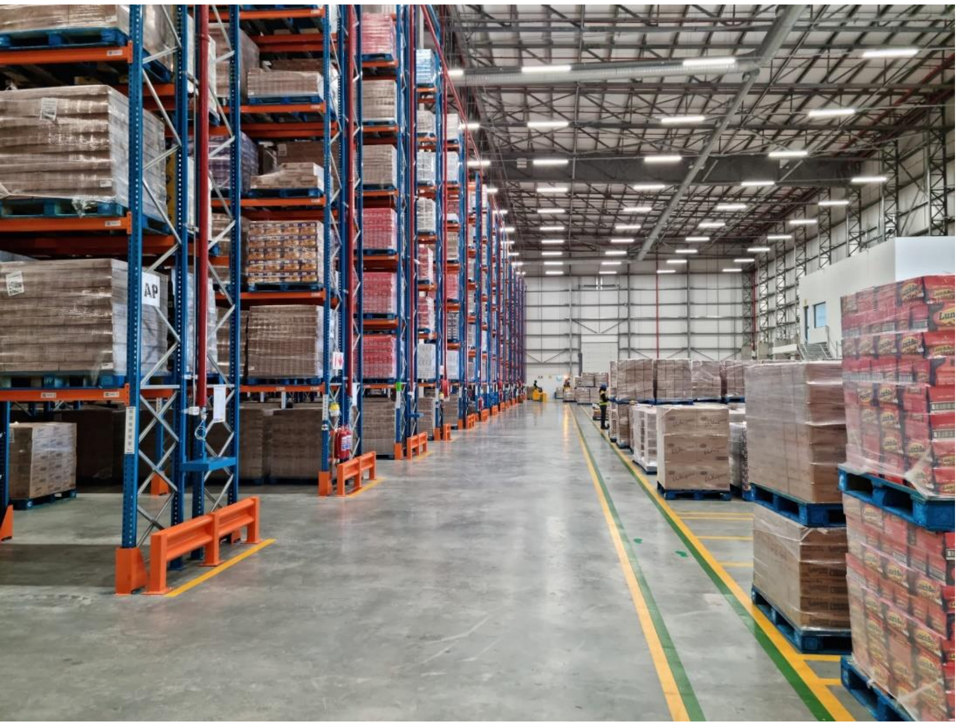
More than 15 million square meters of PrīmX floors on the ground, on piles, and on pavements, are in service in distribution centers, warehouses, and manufacturing facilities around the world.

The surface density of the products varies with the thickness presented in each slab category, with 41.8-45.5 lb/ft^2 for the 3.5-inch version, 47.8-52 lb/ft^2 for the 4.5-inch version, 53.8-58.5 lb/ft^2 for the 4.5-inch version, 59.8-65 lb/ft^2 for the 5.0-inch version, and 71.7-78 lb/ft^2 for the 6.0-inch version.

The abrasion resistance is AR1 mm. It presents a compressive strength of C25/30 N/mm^2, a tensile strength of 2.7 Nmm^2, and an elasticity modulus of 30000 N/mm^2.

This construction material corresponds to the R120 class.

UN CPC code: 375 - Articles of concrete, cement, and plaster.



LCA information

Declared unit:
In accordance with the PCR, the declared unit is one (1) pound of slab system. This declared unit applies for the 3.5, 4.0, 4.5, 5.0, and 6.0 inches thickness, and one square foot (1 ft^2) of slab system.

Reference service life:
The reference service life for the slab system is estimated at 50 years.

Time representativeness:
The primary data was gathered internally. All production data corresponds to values for the year 2020.

Scope of the EPD:
This EPD has a Global Scope, as installation activities and main raw materials are common independently from the region where the slab system is to be installed. Nonetheless, it must be clarified, that transport distances data used for the model under study, correspond to a construction site located in the USA. Hence, results must be treated carefully, especially those in modules A2 and A4.

Database(s) and LCA software used:
The Ecoinvent 3.7. was used to conduct the quantitative evaluation in this study. This database provided the life cycle inventory data for raw and processes materials in the background system. The LCA software was Simapro 9.2.

Description of system boundaries:
b) Cradle to gate with options. The LCA was carried out considering the product stage A1-A3, modules C1–C4, module D, and the additional optional modules A4-A5.

Data quality:
The foreground data was collected internally considering the latest available average production amounts and measures during the last year. Data regarding waste processes and scenarios were taken from average waste scenarios contained in Ecoinvent 3.7.

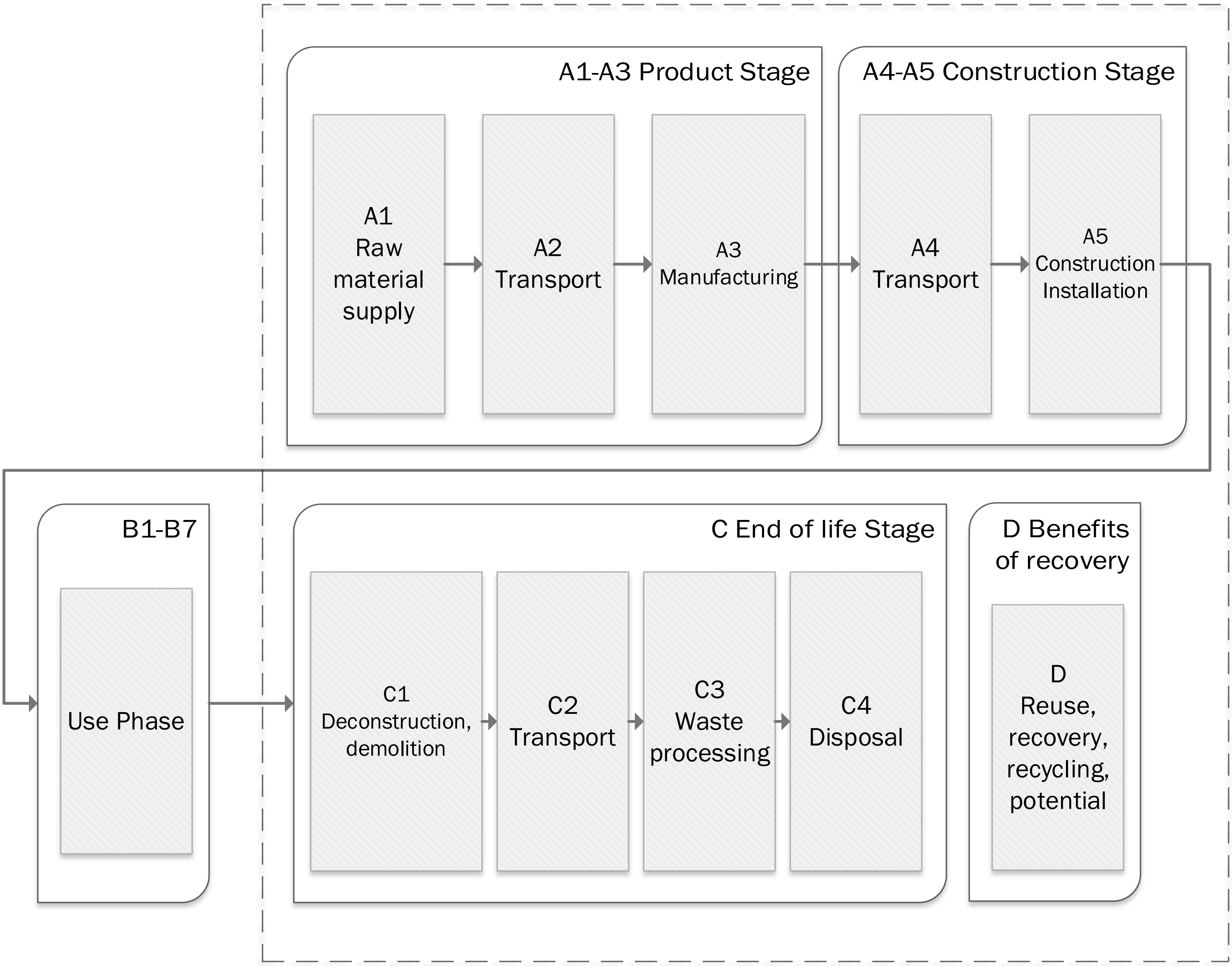
According to the criteria of the UN Environment Global Guidance on LCA database development, the quality level can be defined as very good. Data is geographically representative as it comes from the area of study, it is technical representative as it comes from processes and products under study using the same state of technology defined in goal and scope, and it is also time representative as data used was collected less than 3 years difference between the reference year according to the documentation. A data quality rating was performed with a rating system where 1 means excellent and 5 is poor. An average for each criterion is presented as follows:

Technological Representativeness, TER	Geographic representativeness, GER	Time Representativeness, TIR	Precision, P	Average DQR
2.0	2.75	1.96	2.27	2.25

Cut-off criteria:
All major raw materials and processes have been considered and only less than 1% of total material and energy flows were excluded, and 5% of materials and energy per module.

Allocation:
Following the recommendations in EN 15804 and PCR 2019:14, allocation among products and co-products has been avoided. Material and energy flows have been allocated to the main product following physical/mass criteria.

System diagram:



More information:

During this LCA, the *polluters pay,* and modularity principles have been followed. As well as double counting avoided

The processes related to infrastructure, construction, and production of equipment and tools that are not directly consumed in the production process, have been excluded.

Activities personnel-related, such as transportation to and from work, as well as research and development activities, have been excluded. Long-term emissions are also excluded from the impacts.

Stages and Production process description

Product Stage

A1: This stage considers the extraction and processing of all raw materials.
A2: In this stage, raw materials transported to the warehouse in the USA are modeled.
A3: As there is no manufacturing in any facility, and the product installation occurs directly on the construction site, this stage has been left blank.

Construction Stage

A4: This stage stands for the transport of materials to the construction site, either from the warehouse in the USA or other materials acquired directly from local suppliers. For calculations, transport distances were aggregated depending on the type of vehicle.

A5: This stage includes the pre-manufacturing process conducted at the construction site previous to the full assembly of the product in its declared unit as well as the activities related to the construction and installation of the slab system on-site. Packaging materials are sent for waste processing and disposal accordingly with waste treatment scenarios for each specific material, described and available in Ecoinvent 3.7.

PARAMETER	VALUE per DU
Ancillary materials used during installation of the product	Curing and slab washing water – 0.0032 – 0.000063 US Gal
Electricity and/or other energy sources required for the installation process.	Diesel – (0.00055 – 0.00097 US Gal)*

* Range values represent the different values depending on the thickness

Activities related to the recycling and waste disposal of packaging materials are accounted for in this stage. End-of-life processes for such materials correspond to the typical waste treatment scenario for the specific materials under a global scenario, to recycling, incineration, and inert landfilling in the following quantities per declared unit:

Material	Recycling (lb)	Incineration (lb)	Landfilling (lb)
Paperboard	71.3%	13.14%	15.56%
Polyethylene	13.5%	39.6%	46.9%

Use Stage

During the normal use scenario, it is assumed that no maintenance, repair, replacement, and/or refurbishment is required, hence this optional stage is not considered (B1–B5). Energy or water consumption for the concrete flooring system (referred to as the declared unit) is not declared for the building operation (B6-B7).

End of Life Stage

C1: The consumption of fuel during the deconstruction and dismantling process is considered using as a reference the background process available in Ecoinvent 3.7 for conducting this specific activity. Other air emissions are also accounted for during deconstruction.
C2: The transport of the dismantled slab system is considered in this stage. A distance of 50 miles is assumed to the disposal facility.
C3: No reuse or recycling of the product is considered.
C4: The waste disposal scenario corresponds to the inert landfilling of 100% of the product.

The main assumptions during the end-of-life stage are presented as follows:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	Deconstruction and demolition of floor system
Recovery system specified by type	No re-use, recycling or energy recovery
Disposal specified by type	1 declared unit landfilled
Assumptions for scenario development (e.g. transportation)	Municipal waste collection service by 21 metric ton lorry, 50 miles of average distance to landfill site

Benefits and loads beyond system boundaries

D: Benefits of recycled packaging materials (Polyethylene and cardboard) are taken into account in module D. The amount to recycle is considered avoided product to the technosphere.

System Boundaries

Modules declared, geographical scope, the share of specific data (in GWP-GHG indicator), and data variation:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	GLO	GLO	GLO	ND	ND	ND	ND	ND	ND	ND	GLO	GLO	GLO	GLO	GLO
Specific data used	> 90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	NOT RELEVANT					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	NOT RELEVANT					-	-	-	-	-	-	-	-	-	-	-	-

Description of the system boundary (X = Included in LCA; ND = Not declared; NR = Not relevant)

Content information

Product components	Weight, lb	Post-consumer material, weight-%	Renewable material, weight-%
Concrete	0.96	0.00%	0.00%
Steel fiber	0.015 – 0.017	0.00%	0.00%
Cement	0.015 – 0.017	0.00%	0.00%
Additives	0.0022 – 0.0024	0.00%	0.00%
Water	< 0.007	0.00%	0.00%
TOTAL	1	0.00%	0.00%
Packaging materials	Weight, lb	Weight-% (versus the product)	
-	-	-	
TOTAL	-	-	

Biogenic carbon content :

The biogenic carbon content in the product leaving the factory gate is less than 5%, hence the declaration of biogenic carbon content has been omitted.

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per declared unit **
-	NA	NA	NA

During the life cycle of the product any hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" has not been used in a percentage higher than 0,1% of the weight of the product

** The content information is presented for the range of 90 to 150 mm slab thickness.*

*** The content information is presented for the range of 3.5 – 6.0 inch slab thickness.*

Environmental Information

The environmental results can be used by the users to calculate the overall impact of the different slab thicknesses, by multiplying any given result by the slab total weight presented in the next table.

Slab thickness	3.5 inch	4.0 inch	4.5 inch	5.0 inch	6.0 inch
Weight (lb)	45.5	49.9	56.2	62.4	74.9

Potential environmental impact – mandatory indicators according to EN 15804:2012+A2 2019

Results per declared unit									
Indicator	Unit	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	7.7E-02	3.2E-03	8.1E-03	2.5E-03	2.8E-02	0.0E+00	2.4E-03	-2.1E-05
GWP-biogenic	kg CO_2 eq.	2.1E-03	9.9E-06	1.2E-05	2.0E-06	7.2E-06	0.0E+00	7.4E-06	-4.2E-06
GWP-LULUC	kg CO_2 eq.	2.6E-05	1.8E-06	6.4E-07	2.0E-07	5.2E-07	0.0E+00	6.5E-07	-3.7E-07
GWP-total	kg CO_2 eq.	7.9E-02	3.2E-03	8.1E-03	2.5E-03	2.8E-02	0.0E+00	2.4E-03	-2.5E-05
ODP	kg CFC 11 eq.	7.6E-09	6.4E-10	1.7E-09	5.5E-10	6.1E-09	0.0E+00	9.8E-10	-1.7E-12
AP	mol H+ eq.	5.2E-04	1.5E-05	8.4E-05	2.6E-05	1.8E-04	0.0E+00	2.2E-05	-1.5E-07
EP-freshwater	kg P eq.	3.7E-05	1.4E-06	7.4E-07	2.3E-07	3.2E-07	0.0E+00	6.7E-07	-3.2E-08
EP-marine	kg N eq.	1.2E-05	4.5E-07	2.5E-07	7.7E-08	1.1E-07	0.0E+00	2.2E-07	-1.1E-08
EP-terrestrial	mol N eq.	1.6E-04	4.8E-06	3.7E-05	1.2E-05	7.2E-05	0.0E+00	7.8E-06	-5.3E-08
POCP	kg NMVOC eq.	1.7E-03	5.2E-05	4.1E-04	1.3E-04	7.9E-04	0.0E+00	8.6E-05	-4.7E-07
ADP-minerals& metals*	kg Sb eq.	4.7E-04	1.7E-05	1.1E-04	3.5E-05	2.8E-04	0.0E+00	2.5E-05	-1.0E-07
ADP-fossil*	MJ	3.2E-07	4.3E-08	3.3E-09	1.0E-09	1.2E-09	0.0E+00	5.3E-09	-1.5E-10
WDP*	m^3	6.3E-01	4.6E-02	1.1E-01	3.5E-02	3.8E-01	0.0E+00	6.7E-02	-4.2E-04
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Global warming calculated as EN 15804+A1

The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013

Results per declared unit									
Indicator	Unit	Total A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	1.08E-01	7.59E-02	3.10E-03	8.01E-03	2.54E-03	1.57E-02	0.00E+00	2.33E-03

Use of resources

Results per declared unit									
Indicator	Unit	Total A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3.7E-02	8.3E-04	4.3E-04	1.4E-04	3.7E-04	0.0E+00	3.7E-04	-2.0E-05
PERM	MJ	1.6E-02	2.1E-04	1.4E-04	4.4E-05	1.3E-04	0.0E+00	1.7E-04	-1.4E-04
PERT	MJ	5.3E-02	1.0E-03	5.8E-04	1.8E-04	5.0E-04	0.0E+00	5.4E-04	-1.6E-04
PENRE	MJ	6.3E-01	4.6E-02	1.1E-01	3.5E-02	3.8E-01	0.0E+00	6.7E-02	-4.2E-04
PENRM	MJ.	1.7E-05	1.5E-06	2.9E-07	9.1E-08	2.0E-06	0.0E+00	3.4E-07	-4.3E-07
PENRT	MJ	6.3E-01	4.6E-02	1.1E-01	3.5E-02	3.8E-01	0.0E+00	6.7E-02	-4.2E-04
SM	kg	6.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RSF	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NRSF	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
FW	m^3	7.9E-04	7.3E-06	7.4E-06	1.7E-06	4.8E-06	0.0E+00	7.1E-05	-8.8E-07
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste production and output flows

Waste production

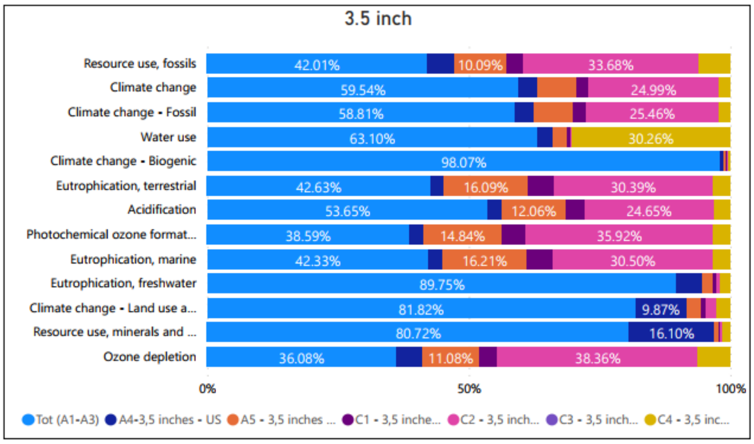
Results per declared unit									
Indicator	Unit	Total A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.6E-06	7.6E-07	2.9E-07	9.2E-08	9.9E-07	0.0E+00	9.6E-08	-5.5E-10
Non-hazardous waste disposed	kg	1.2E-02	1.4E-03	4.3E-04	4.1E-05	1.7E-05	0.0E+00	4.4E-01	-2.8E-06
Radioactive waste disposed	kg	3.5E-06	3.0E-07	7.6E-07	2.4E-07	2.7E-06	0.0E+00	4.3E-07	-1.4E-09

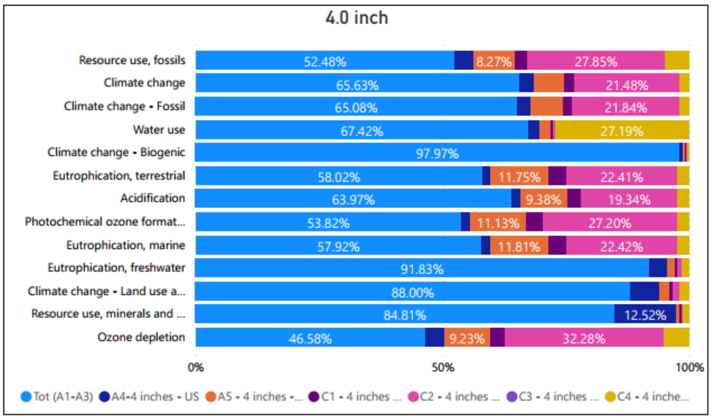
Output flows

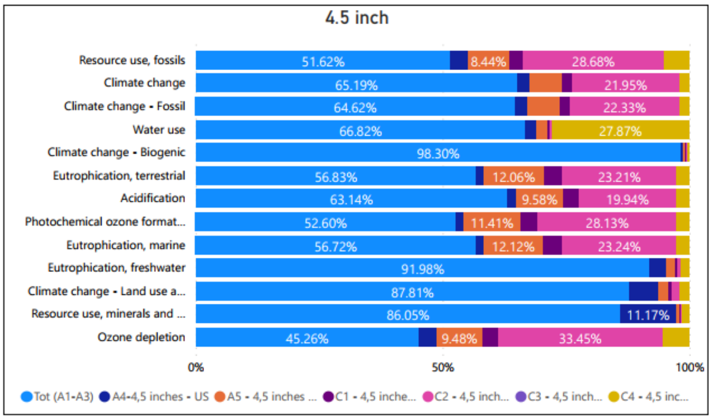
Results per declared unit									
Indicator	Unit	Total A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Material for recycling	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Exported energy, electricity	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Exported energy, thermal	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

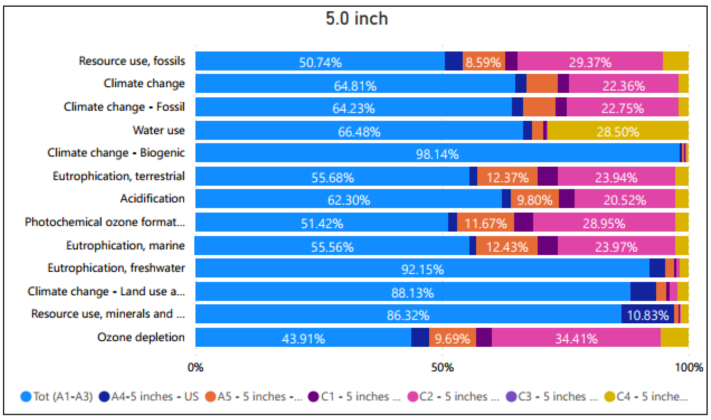
LCA Interpretation

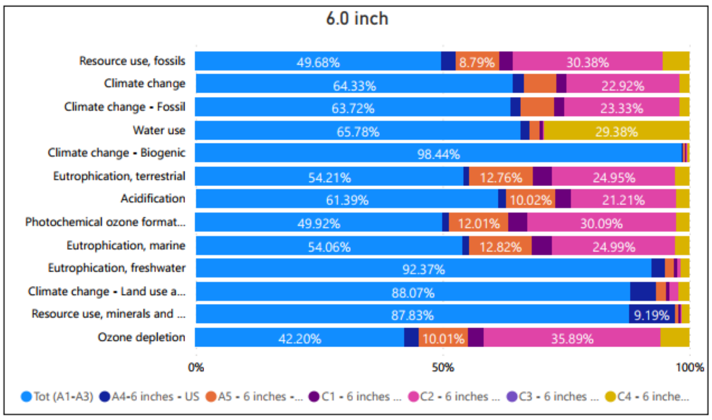
The impact on the environment of the life cycle of 1 declared unit of PRIMEKSS's PrīmX SFRSSC on Global Warming Potential varies from 4.3 to 8.2 kg CO_2eq for the 3.5 inch and 6.0 inch respectively. The overall environmental burden in all of the impact categories of the PrīmX SFRSSC life cycle is dominated by the Product stage (A1-A3) followed by the EoL stage (C1-C4). The transport of the product to the warehouse in the USA is an important driver for some impact categories such as acidification, marine and terrestrial eutrophication, photochemical ozone formation, and climate change (land use and land use change). The Use phase has not been considered as it is assumed there is no impact from this stage.











The transport of the dismantled product to the landfill site is the most relevant module in the EoL stage (Module C2) and plays an important role in the overall impact of the PrīmX SFRSSC in several impact categories. Module D, accounting for benefits or loads beyond the system boundaries, shows a small benefit from the recycling of packaging materials according to the modeled waste treatment scenario within the time boundaries, with values lower than 1.0%

Information related to the EPD Sector

This EPD® is individual.

Differences with previous versions

This is the first version of this EPD®

Additional information

Key Parts of the PrīmX Technology

To ensure predictable quality in each project anywhere in the world, Primekss has implemented a system to control the quality of the whole production process and adjust Technology according to each project's available materials, ambient conditions, etc.

Improved, efficient materials

- 3 types of admixtures in a patented system
- Steel fibers
- Adjusted mix design to project needs

Design – build approach, own concrete R&D center

- Lab testing of cement, aggregates for reactivity and compatibility with the admixtures
- Advanced, customized mix-design preparation according project needs
- Design, engineering assistance

PRIMX TECHNOLOGY

Special online quality system: *PrīmX Quality*

- End-to-end online quality system
- Monitoring of 21 parameter at jobsite
- Controlled by Primekss engineers

Specialized Equipment & training

- Best in class equipment: laser screeds, fiber blowers, dumpers etc.
- Onsite concrete testing
- Trainings for partners

Less CO_2 emissions

Up to 70% CO_2 emission saving due to optimized designs - thinner slab that still exceeds defined loading requirements, smart material choices, and technological and process optimization. Steel fiber reinforcement and PrīmX special material formula allow to build of much thinner design slabs, whilst improving stiffness and load bearing capacities. Thinner slabs lead to meaningful material and energy savings.

Maintenance

PrīmX floors have an estimated life of 50 years. The product does not require special maintenance but its lifespan can be prolonged by carrying out maintenance as outlined in TR34, 4th Edition - Chapter 13- Maintenance. Regular floor cleaning should be done with a disk rotary automatic washing machine with solid brushes or light abrasive cleaning rings used as cleaning pads. Regular use of abrasive pads will improve the luster of the floor.

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