

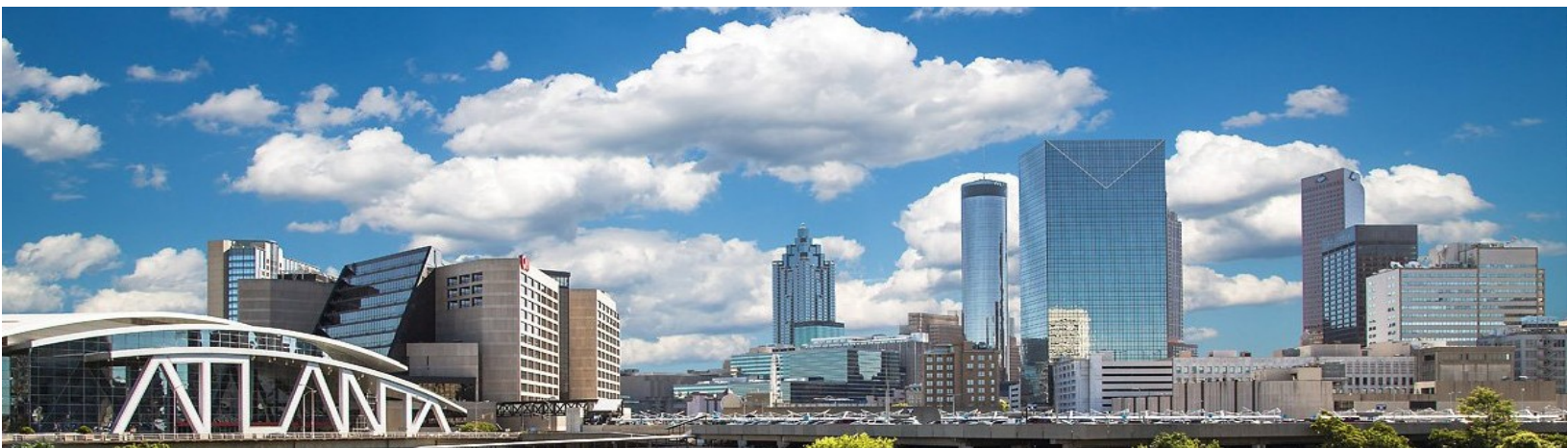


Building with conscience.

EPD for Sto DrainScreen®

Sto DrainScreen® is a tangled filament nylon core drainage mat for use in above grade vertical wall assemblies beneath stucco, stone, siding, and thin brick veneer. It is intended to promote drainage and drying of wall assemblies.





Manufacturer Name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120, Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD Program Operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Compliance to ISO21930:2017	Yes
Product Name	Sto DrainScreen®
Product's Intended Application and Use	Promote drainage and drying of wall assemblies
Declaration Number	01-005
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered substrate for 60 years
Reference Service Life used in assessment	10 Years
Overall Data Quality Assessment Score	Good
Manufacturing Location	Candler, NC, USA
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database, Service Pack 39
ISO 21930: 2017 serves as the core PCR	Kate McFeaters
Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006	kmcfeaters@epstengroup.com
<input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	<i>Katharine McFeaters</i>
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com <i>Katharine McFeaters</i>

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» **Company**

We believe in ‘**Building with conscience**’.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you’re always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That’s exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it’s new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That’s why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through Sto Studio or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» **Manufacturing Site Covered in this EPD**

Manufacturing location is Candler, North Carolina, USA



» **Product Identification**

Sto DrainScreen® is offered in roll diameters of 15 and 22 inches. Sto DrainScreen® is a tangled filament nylon core drainage mat for use in above grade vertical wall assemblies beneath stucco, stone, siding, and thin brick veneer. It is intended to promote drainage and drying of wall assemblies. The mat is offered in two thickness options: 6 mm and 10 mm. Though the 10 mm option is a specialized product, the results presented in this EPD are for a sales-weighted average of the two products.

Table 1: List of DrainScreen® Products

Product Name	Thickness	Product Number
Sto DrainScreen®	6 mm	81208
	10 mm	81588

» Product Description

Sto DrainScreen® is a drainage mat between the cladding and the fully adhered air and moisture barrier. Should water reach the back of the cladding, it can drain from the wall assembly via the drainage mat, which also helps speed the drying. Drainage and drying can be particularly important in hot and humid climates and in areas with wind-driven rain. Sto DrainScreen® functions as a wall cavity drainage component.

- Promotes drainage and drying in stucco, cement board stucco, stone, siding and thin-brick veneer wall assemblies;
- Water vapor moves freely through the drainage mat layer;
- Easy to handle, carry and roll onto the wall; and
- Prevents stucco or mortar from penetration into the cavity for unobstructed drainage

» Performance Features

Drainage and ventilation mat	Highly breathable
Lightweight, narrow diameter rolls	Laminated with lightweight breathable fabric

» Technical Details

Table 2: Technical Data*

Performance	Test Method	Test Criteria	Result
Flame Spread	ASTM E-84	Flame Spread: ≤25 Smoke Developed: ≤450	Flame Spread: <25 Smoke Developed: <75
Thickness (nominal)	Measure	n/a	Nominal ¼" (6mm) Nominal 3/8" (10mm)
Building Code Compliance	Meets requirements of NFPA 285 for use on all Types of construction; refer to ICC ESR 1233		

*Results are based on lab testing under controlled conditions. Results can vary between labs or from field tests.

» Material Composition

The material composition of DrainScreen® is listed below:

Table 3: Material composition of DrainScreen®

Ingredient	Drain-Screen®
Polypropylene	70-75%
Polyester	10-11%
Elastomeric Copolymer Modifier	6-8%
Nylon 6	4-5%
Flame Retardant	3-4%
Colorant	2-3%

» Components related to Life Cycle Assessment

The functional unit for the EPD was covering 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in ISO 21930:2017. The reference service life of the product is 10 years which is the warranty of Sto's wall system. The reference flow required for one functional unit is provided in Table 4.

Table 4: Reference flow and Functional Unit

Product	Functional Unit [1 m ²]	Reference Flow [kg]
Drain-Screen®	1	2.15

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in ISO 21930:2017.

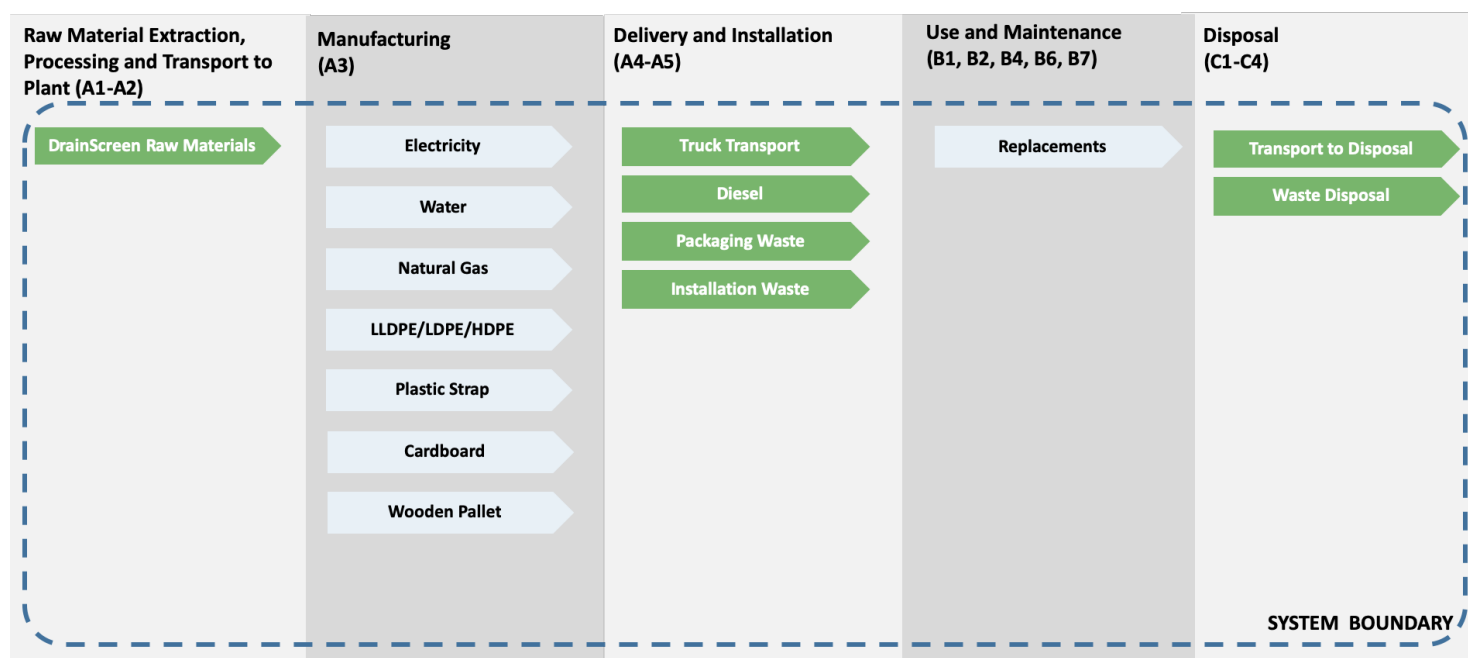


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data as it relates to formulation was collected from the manufacturing facility in North Carolina, USA for the 2018 reference year. For manufacturing specific data, data from Sto facilities manufacturing similar products was used. When primary data did not exist, secondary data were obtained from the Gabi V9.2.0.58 Database Service Pack 39. Overall, both primary and secondary data are considered acceptable quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions include up stream and downstream transportation distances, the disposal of packaging material, the method in which the product is disposed of at its end of life and relevant use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis. Utility data was allocated based on production values of different types of production in the same manufacturing facility. Then the data was further allocated among products of different specifications based on the mass because it is believed the energy consumption and water consumption correlated better on a mass basis.

» Production Stage (A1-A3)

DrainScreen® is manufactured in North Carolina, US. It consists of two layers: the core layer is mainly made of polypropylene and thermoplastic elastomer; and the fabric is made of nylon 6 fiber and polyester fiber. The mass ratio of core layer to fabric varies with the thickness options of DrainScreen®. For 6-mm version, the core layer takes up 84.48% and the percentage rises to 87.72% in 10-mm version. In this study, a weighted average based on the sales records in 2018 is calculated and used. The final product is packaged on cardboard trays and shipped on wood pallets.

» Transport to Construction Site (A4)

The product is assumed to be shipped from the manufacturing facility to distribution facilities in the US via truck. From the distribution facilities, the product is shipped to construction sites. Table 5 gives the transportation details including the distances and the truck dataset used in the model. Transport distances are calculated based on the locations of the manufacturing facility, the distribution facilities, and customers' zip codes retrieved from the sales records.

Table 5: Transport Details

Name	Details	Unit
Type of transport	Truck	-
Fuel type	Diesel	-
Liters of fuel	39.0625	l/100km
Vehicle type	Heavy duty diesel truck/ 45,000 lb payload	-
Transport distance from the manufacturing facility to distribution facilities	1293.48	km
Transport distance from the distribution facilities to construction sites	769.37	km

» Installation (A5)

DrainScreen® is installed as part of the wall assembly and no specific installation materials are required. The reference flow is calculated on the basis of the coverage rates on DrainScreen®'s product data sheets and a 10% installation waste was considered to account for the possibility of trimming. The disposal of the installation waste and packaging waste are modeled in accordance with EPA's Advancing Sustainable Materials Management: 2015 Fact Sheet. As the tools used during the installation of the product are multi-use tools and can be reused after each installation, the per-functional unit impacts are considered negligible and therefore are not included. Detailed installation instructions are provided online. Packaging waste is generated and disposed of in this stage.

Table 6: Installation (A5)

Name	Value	Unit
Product loss per functional unit	1.075	kg/ ESL
Waste materials at the construction site before waste processing, generated by product installation	1.626	kg/ ESL
Plastic waste, packaging	0.221	kg/ ESL
Cardboard waste, packaging	0.039	kg/ ESL
Wood waste, packaging	0.291	kg/ ESL
Direct emissions to ambient air, soil, water	0	kg

» Use Stage (B1-B5 & B6-B7)

Since the product is installed as part of the wall assembly, there are no use phase inputs required to maintain the product and there are no any emissions including any regulated substances to air, soil and water during the use phase. The RSL of the product is 10 years, so five replacements are required to cover the estimated service life (ESL). The product requires no maintenance once installed. It is assumed that the product requires no repairs or refurbishments if it is properly installed.

Table 7: Replacement (B4)

Name	Value	Unit
Reference Service Life (RSL)	10	Years
Estimated Service Life (ESL)	60	Years
Replacement cycle	5	(ESL/RSL)-1
Declared product properties	As per Product Identification section	-
Design application parameters	As per technical details in Table 2	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Industry Standard	-

» End-of-Life Stage (C1-C4)

In this stage, the product at its end of life is transported to the waste disposal facility and processed. Included in this stage are the following:

- Deconstruction – There are no impacts during this stage as the product is manually removed.
- Transportation to disposal – Estimated fuel requirements made based on weight of product and average distance to landfill.
- Waste processing for landfilling — This process is included in the landfilling process.
- Waste disposal — Due to the fact that all the products in study are installed as part of a wall system including the external coating/finish, and are not able to be dismantled based on their material type, it is reasonable to assume that the products at their end-of-life stage are landfilled.

• Table 8: End-of-Life Parameters

	DrainScreen®	Unit
Collected with mixed construction waste	1.94	kg/ESL
Landfilling	100	%
Product for final deposition	1.94	kg/ESL

» Life Cycle Assessment Results

As prescribed by the ISO 21930:2017, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 9 provides the acronym key for the impact indicators declared in this EPD.

Table 9: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
ADP-Fossil Fuel	Abiotic depletion potential for fossil resources (An indicator derived from CML 2001-Jan 2016)	MJ, net calorific value
Resource Use Parameters		
RPR _E	Renewable primary energy as energy carrier	MJ, net calorific value
RPR _M	Renewable primary energy resources as material utilization	MJ, net calorific value
NRPR _E	Non-renewable primary energy as energy carrier	MJ, net calorific value
NRPR _M	Non-renewable primary energy as material utilization	MJ, net calorific value
SM	Use of secondary material	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
RE	Recovered energy	MJ, net calorific value
FW	Use of fresh water	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste disposed	kg
ILLRW	Intermediate and low-level radioactive waste disposed	kg
Carbon Removal and Emission Parameter		
BCRP	Biogenic Carbon Removal from Product	kg CO ₂ eq
BCEP	Biogenic Carbon Emission from Product	kg CO ₂ eq
BCRK	Biogenic Carbon Removal from Packaging	kg CO ₂ eq
BCEK	Biogenic Carbon Emission from Packaging	kg CO ₂ eq
BCEW	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO ₂ eq
CCE	Calcination Carbon Emissions	kg CO ₂ eq
CCR	Carbonation Carbon Removals	kg CO ₂ eq
CWNR	Carbon Emissions from Combustion of Waste from Non- Renewable Sources used in Production Processes	kg CO ₂ eq

» Sto DrainScreen® -- Results

TRACI Results and ADP-Fossil Fuel

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO ₂ eq]	3.24E-03	3.25E-04	1.36E-04	0.00E+00	0.00E+00	0.00E+00	1.89E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E-06	0.00E+00	6.50E-05	MND
EP [kg N eq]	2.10E-04	2.69E-05	2.03E-05	0.00E+00	0.00E+00	0.00E+00	1.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-07	0.00E+00	3.32E-06	MND
GWP [kg CO ₂ eq]	1.15E+00	6.79E-02	7.03E-02	0.00E+00	0.00E+00	0.00E+00	6.52E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	0.00E+00	1.42E-02	MND
ODP [kg CFC 11 eq]	-1.32E-13	-3.65E-16	-2.40E-16	0.00E+00	0.00E+00	0.00E+00	-6.66E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.16E-18	0.00E+00	-7.44E-16	MND
POCP [kg O ₃ eq]	4.48E-02	7.42E-03	7.92E-04	0.00E+00	0.00E+00	0.00E+00	2.72E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E-05	0.00E+00	1.30E-03	MND
ADP-fossil fuel [MJ]	3.26E+01	9.57E-01	6.37E-02	0.00E+00	0.00E+00	0.00E+00	1.69E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-02	0.00E+00	2.21E-01	MND

Resource Use

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR _E [MJ]	2.74E+00	2.98E-02	4.49E-03	0.00E+00	0.00E+00	0.00E+00	1.40E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-04	0.00E+00	1.73E-02	MND
RPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPR _E [MJ]	3.51E+01	9.62E-01	6.56E-02	0.00E+00	0.00E+00	0.00E+00	1.82E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-02	0.00E+00	2.26E-01	MND
NRPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m ³]	5.74E-03	1.15E-04	6.34E-05	0.00E+00	0.00E+00	0.00E+00	2.97E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.32E-06	0.00E+00	2.69E-05	MND

Waste

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	1.31E-08	7.80E-09	2.24E-10	0.00E+00	0.00E+00	0.00E+00	1.10E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.90E-11	0.00E+00	7.93E-10	MND
NHWD [kg]	9.86E-02	3.63E-05	6.14E-02	0.00E+00	0.00E+00	0.00E+00	2.42E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.14E-07	0.00E+00	3.23E-01	MND
HLRW [kg]	1.37E-06	2.57E-09	9.43E-10	0.00E+00	0.00E+00	0.00E+00	6.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E-11	0.00E+00	2.75E-09	MND
ILLRW [kg]	1.00E-03	2.13E-06	7.60E-07	0.00E+00	0.00E+00	0.00E+00	5.03E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.43E-08	0.00E+00	2.19E-06	MND

Carbon removal and Emission

Indicator	DrainScreen®
BCRP [kg CO2 eq]	3.83E-02
BCEP [kg CO2 eq]	4.02E-02
BCRK [kg CO2 eq]	1.11E-01
BCEK [kg CO2 eq]	3.84E-02
BCEW [kg CO2 eq]	0.00E+00
CCE [kg CO2 eq]	0.00E+00
CCR [kg CO2 eq]	0.00E+00
CWNR [kg CO2 eq]	0.00E+00

» Interpretation

In one reference service life of the product, the production stage, which includes raw material extraction, transportation from suppliers and manufacturing, is the highest contributor to all impact indicators. The impact from the remaining stages is nearly negligible. From the perspective of a whole building lifespan, the vast majority of the impacts are derived from the number of replacements needed. This is directly related to the impacts associated with the manufacture of new products that are used to replace the original. Improving the relatively short lifespan of the product is essential to reducing the overall impact of the product.

» Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, October 2019
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
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- Product Bulletin – Sto DrainScreen®. Sto Corp. Available at https://www.stocorp.com/wp-content/content/Products_TechService/Mesh%20and%20Accessories/Product%20Bulletins/PB_81208_Sto_DrainScreen_EN.pdf