ENVIRONMENTAL PRODUCT DECLARATION

Dimension - Grout

Certified Environmental Product Declaration
www.nsf.org

Program Operator	NSF Certification LLC 789 N. Dixboro, Ann Arbor, MI 48105 www.nsf.org
Manufacturer Name and Address	Bostik, Inc. Paulsboro New Jersey Plant, 2000 Nolte Drive, Paulsboro, NJ, 08066
Declaration Number	EPD10976
Declared Product and Declared Unit	Dimension manufactured at Paulsboro, NJ. 1 kg of non-cementitious grout
Reference PCR and Version Number	ISO 21930: Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services (ISO, 2017)
Product's intended Application and Use	Flooring and Wall Applications
Product RSL	N/A
Markets of Applicability	North America
Date of Issue	07/05/2024
Period of Validity	5 years from date of issue
EPD Type	Product Specific
Range of Dataset Variability	N/A
EPD Scope	Cradle to Gate with Options (A1-A5, C1-C4)
Year of reported manufacturer primary data	2019
LCA Software and Version Number	GaBi 10.6.1.265
LCI Database and Version Number	GaBi Database Service Pack 2022.1
LCIA Methodology and Version Number	TRACI 2.1 IPCC AR6
The sub-category PCR review was conducted by:	No subcategory PCR is available. ISO 21930 serves as the core PCR for this EPD.

This declaration was independently verified in accordance with ISO 14025: 2006, ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) **☐ Internal ☒ External**	Jack Geibig - EcoForm jgeibig@ecoform.com
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig - EcoForm jgeibig@ecoform.com

Limitations:
Environmental declarations from different programs (ISO 14025) may not be comparable.
EPDs are comparable only if they comply with ISO 21930:2017, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

Product Definition and Information

Description of Company

Bostik is a world-class leader in sealing and bonding technologies. We create smart adhesive solutions for both industries and consumers, covering a broad range of markets such as construction, packaging, automotive, high tech, hygiene products, etc. The adhesive division of the Arkema Group, a specialty materials leader, Bostik benefits from unique research & development capabilities to help build a world that is safer, more sustainable, and adaptive. With over 2 billion USD annual sales and over 6,000 people, Bostik is present in more than 50 countries.

Product Description

Bostik Dimension RapidCure Glass-Filled, Pre-Mixed Urethane Grout is a patented, water-based formula that contains reflective micro-glass beads, and a translucent urethane binder that reflect light and allow it to pass through grout joints and into the tile itself. No substances required to be reported as hazardous are associated with the production of this product.

Application

Dimension RapidCure is a water based, urethane grout, used as a product for filling crevices such as the spaces and joints between wall or floor tiles and often serves as a design element during tile installation.

Declaration of Methodological Framework

This LCA follows an attributional approach and is a cradle to gate with options (A1-A5, C1-C4) study.

Technical Requirements

Table 1 shows the technical specification of Dimension RapidCure, including any testing data as appropriate.

Table 1: Technical Data

Dimension		
Mass (when installed)	1	kg
Density (when installed)	1,725	kg/m^3
Compressive Strength	503,526	kg/m^2 @ 28 days
Pot Life	Not Applicable (1K)	mins
Mixture Proportion	Not Applicable (1K)	Liters liquid/kg powder
Microorganism Resistance (if applicable)	Pass	-

Properties of Declared Product as Delivered

Grouts are traditionally packaged in paper bags or pals, which in turn are packaged into cardboard boxes. These cardboard boxes are shrink wrapped and loaded onto wooden pallets which are then delivered to the customer or job site.

Material Composition

Typical product composition provided by Bostik is summarized in Table 2.

Table 2: Product Composition

Ingredient Category	% of product by mass
Acrylic Polymer	7.3%
Aluminum Oxide	0.2%
Glass Wool	64.6%
Quartz	16%
Water	10.1%
Proprietary Additives	1.7%

***This product contains no regulated substances.**

Manufacturing

Raw materials, including quartz, silica, calcium carbonate, portland cement, and other additive are stored into required for production. To manufacture Dimension grout, these materials are batch mixed based on formulation and packaged in bags and then palletized. After this, they are transported to customer locations or job sites.

Packaging
Dimension is primarily packaged in a plastic pail, with secondary/ tertiary packaging of shrink film and pallets.

Transportation
In this stage, the product is transported from the manufacturing site to the distributor, and finally to the application site. The product is delivered to the customer via truck and transportation distances were calculated based on sales records provided by Bostik.

Production Installation
Cement grout for tile installation is primarily installed by hand, with potential limited use of machines to mix the grout prior to application. Due to its material composition, grout is typically quite alkaline and, as such, eye and skin contact should be avoided, especially for prolonged periods and within small spaces. Additionally, precautions should be taken to reduce dust emissions and inhalation during the installation process. The installation safety instructions of a given grout product should be followed during application. Polymer modifier and water are mixed with grout powders for wet application. 4.5% of the total material is lost as waste which is then sent to the landfill.

Use
No use phase has been declared for the adhesive and sealant products since the anticipated reference service life depends on the specific installation situation and exposure associated with the products. It can be influenced by weather factors as well as by mechanical or chemical loads.

Reuse, Recycling, and Energy Recovery
Grout is typically not reused, recovered, and recycled.

Disposal
Dimension is bonded to flooring substrates, therefore, when the substrate is removed or replaced, the product is disposed of with it. It was assumed at 100% of the product is sent to landfill. Distance to end-of-life facilities is assumed to be 100 km.

Life Cycle Assessment Background Information

Declared Unit
The declared unit according to the PCR is the 1 kg non-cementitious grout. This product requires no accessories to meet the requirements of the declared unit.

Table 3: Mass per declared unit

	Dimension
Mass per declared unit [kg]	1.05
Productiveness [kg/m²]	0.22

System Boundary

This LCA is a Cradle-to-Gate with Options (A1-A5, C1-C4) study. An overview of the system boundary is shown in Figure 1.

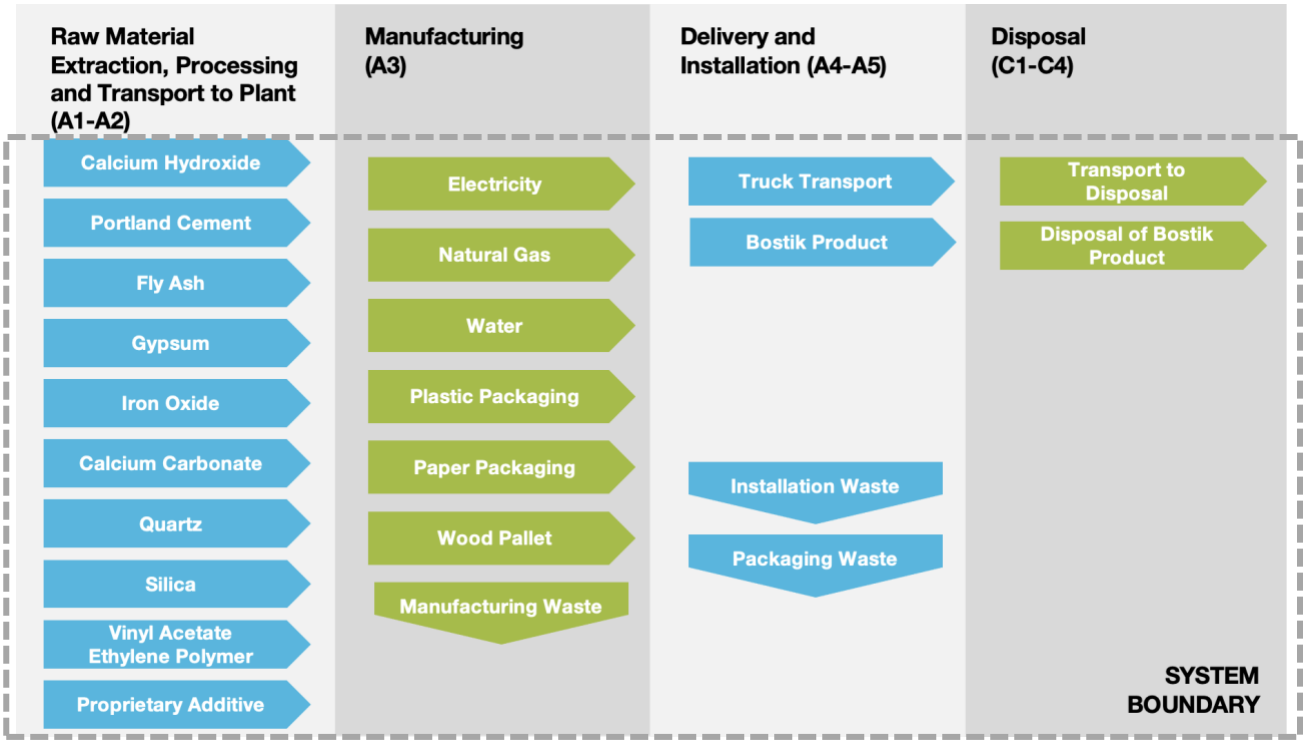

Figure 1: System Boundary

Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the LCA, the usage information was divided by the production volume to create an energy use per declared unit. Other assumptions are listed below:

- Availability of geographically more accurate datasets would have improved the accuracy of the study.
- Since this LCA uses the cut-off approach to recycled material in the product, no credit is given to product system but rather is exempted from the burden of extracting virgin material in place of using recycled material.
- Only known and quantifiable environmental impacts are considered.

- Due to the assumptions and value choices listed above, these do not reflect real-life scenarios and hence they cannot assess actual and exact impacts, but only potential environmental impacts.

Cut-off Criteria

Material and energy inputs greater than 1% (based on total mass of the final product) were included with the scope of this analysis. Material inputs less than 1% were included if sufficient data was available to warrant and/or the material input was thought to have significant environmental impact.

The list of excluded materials and energy inputs include:

- Some minor additives have been excluded (0.2%). The exclusion of these materials has no major impacts on the overall results. However, to account for this difference, the inputs were scaled up to fill in the missing additives to total the composition to 100%.
- As the tools used during the installation of the product are multi-use tools and can be reused after each installation, the per-declared unit impacts are considered negligible and therefore are not included.
- Some material inputs may have been excluded within the GaBi datasets used for this project. All GaBi datasets have been critically reviewed and conform to the exclusion requirement of ISO 21930.

There are no substances with hazardous and toxic properties that can be of concern for human health and/ or the environment in the products included in this study.

Data Sources

Primary data was collected by facility personnel and from utility bills and was used for all manufacturing processes. Whenever available, supplier data was used for raw materials used in the production processes. When primary data did not exist, secondary data for raw material production was utilized from LCA for Experts (formerly known as GaBi) Version 10.6.1.35, Database V2021.2.

Data Quality Assessment

The overall data quality is considered very good.

Geographical Coverage

The geographical scope of the manufacturing portion of the life cycle is Paulsboro, NJ. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent.

The geographical scope of the raw material acquisition is the United States. Customer distribution, site installation, and use portions of the life cycle is mostly the United States.

In selecting secondary data (i.e. GaBi Datasets), priority was given to the accuracy and representativeness of the data. When available and deemed of significant quality, country-specific data were used. However, priority was given to technological relevance and accuracy in selecting secondary data. This often led to the substitution of regional and/or global data for country-specific data. Overall geographic data quality is considered good.

Time Coverage

Primary data were provided by the manufacturer and represent all information for calendar year 2019. The project commenced in 2021. Due to deviation from business-as-usual manufacturing in 2020, attributed to the COVID-19 pandemic, utility data from 2019 were used. Using these data meets the PCR requirements. Time coverage of these primary data is considered excellent.

Data necessary to model cradle-to-gate unit processes were sourced from Sphera LCA for Experts (formerly known as GaBi) LCI datasets. Time coverage of the LCA for Experts (formerly known as GaBi) datasets varies from approximately 2010 to present. All datasets rely on at least one 1-year average data. Overall time coverage of the datasets is considered good and meets the requirement of the PCR that all data be updated within a 10- year period.

Technological Coverage

Primary data provided by the manufacturer is specific to the technology the company uses in manufacturing their product. It is site-specific and considered of good quality. It is worth noting that the energy used in manufacturing the product includes overhead energy such as lighting, heating, and sanitary use of water. Sub-metering was not available to extract process-only energy use from the total energy use. Sub-metering would improve the technological coverage of data quality.

Data necessary to model cradle-to-gate unit processes was sourced from GaBi LCI datasets. Technological coverage of the datasets is considered good relative to the actual supply chain of the manufacturer. While improved life cycle data from suppliers would improve technological coverage, the use of lower-quality generic datasets does meet the goal of this LCA.

Period under Review

The period under review is calendar year 2019.

Allocation

General principles of allocation were based on ISO 14040/44. There are no products other than the product under study that are produced as part of the manufacturing processes. Since there are no co-products, no allocation based on co-products is required. To derive per-unit values for manufacturing inputs, allocation based on total production by mass was adopted.

Of relevance to the defined system boundary is the method in which recycled materials were handled. Throughout the study recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated with the previous life of a raw material from recycled stock are excluded from the system boundary. Additionally, impacts and benefits associated with secondary functions of materials at end of life are also excluded (i.e., production into a third life or energy generation from the incineration plant). The study does include the impacts associated with reprocessing and preparation of recycled materials that are part of the bill of materials of the products under study.

Life Cycle Assessment Scenarios

Table 4: Transport to the building site (A4)

Name	Value	Unit
Fuel Type	Diesel	-
Fuel Efficiency	44.7	L/100km
Vehicle Type	US: Truck-Heavy Heavy-duty Diesel Truck / 53,333 lb payload	-
Transportation Distance	500	km
Capacity utilization (including empty runs, mass based)	67	%
Weight of products transported (if gross density not reported)	1.045	kg
Capacity utilization volume factor (factor: =1 pr <1 or ≥1 for compressed or nested packaging products)	1	1

Table 5: Installation into the building (A5)

Name	Value	Unit
Polymer modifier	0.02	kg
Net Freshwater Consumption	0.22	m^3
Product wastage	4.5	%
Waste materials at the construction site before waste processing, generated by product installation	0.09	kg
Plastic waste to incineration	0.0001	kg
Plastic waste to landfill	0.0002	kg
Plastic waste to recycling	0.00005	kg
Pulp waste to incineration	0.0021	kg
Pulp waste to landfill	0.009	kg
Pulp waste to recycling	0.032	kg
Biogenic Carbon in wooden pallet	0.0660	kg CO_2e

Table 6: End of life (C1-C4)

Name		Value	Unit
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method, and transportation)		-	-
Collection process (specified by type)	Collected separately	-	kg
	Collected with mixed construction waste	1.24	kg
Recovery (specified by type)	Reuse	-	kg
	Recycling	-	kg
	Landfill	1.24	kg
	Incineration	-	kg
	Incineration with energy recovery	-	kg
	Energy conversation efficiency rate	-	-
Disposal (specified by type)	Product of material for final deposition	1.24	kg
Removals of biogenic carbon (excluding packaging)		-	kg CO_2

Life Cycle Assessment Results

Table 7: Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT - ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
Cradle to Gate with Options	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	ND

Life Cycle Impact Assessment Results

Table 8: North American Impact Assessment Results

Impact Category	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
TRACI LCIA Impacts and IPCC AR6 (North America)									
AP [kg SO_2 eq]	7.16E-03	2.03E-04	7.05E-04	ND	0.00E+00	2.82E-05	0.00E+00	4.57E-04	ND
EP [kg N eq]	3.19E-04	1.81E-05	5.19E-05	ND	0.00E+00	2.97E-06	0.00E+00	3.44E-04	ND
IPCC AR6 GWP [kg CO_2 eq]	1.96E+00	4.39E-02	1.92E-01	ND	0.00E+00	1.00E-02	0.00E+00	1.06E-01	ND
ODP [kg CFC 11 eq]	9.65E-08	8.25E-17	4.34E-09	ND	0.00E+00	1.89E-17	0.00E+00	3.37E-15	ND
ADP-fossil fuel [MJ] (CML)	2.44E+01	5.12E-01	2.87E+00	ND	0.00E+00	1.17E-01	0.00E+00	1.23E+00	ND
SFP [kg O_3 eq]	9.49E-02	4.69E-03	7.12E-03	ND	0.00E+00	6.43E-04	0.00E+00	8.03E-03	ND
Carbon Emissions and Uptake									
BCRP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
BCEP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
BCRK [kg CO_2]	7.37E-02	0.00E+00	3.32E-03	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
BCEK [kg CO_2]	0.00E+00	0.00E+00	7.70E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
BCEW [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
CCE [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
CCR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
CWNR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND

Life Cycle Inventory Results

Table 9: Resource use, waste, and output flow results

Impact Category	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Resource Use Indicators									
RPR_E [MJ]	2.61E+00	2.39E-02	2.42E-01	ND	0.00E+00	5.47E-03	0.00E+00	1.50E-01	ND
RPR_M [MJ]	7.74E-01	0.00E+00	3.48E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
RPR_T [MJ]	3.38E+00	2.39E-02	2.77E-01	ND	0.00E+00	5.47E-03	0.00E+00	1.50E-01	ND
$NRPR_E$ [MJ]	3.10E+01	6.14E-01	3.29E+00	ND	0.00E+00	1.41E-01	0.00E+00	1.60E+00	ND
$NRPR_M$ [MJ]	4.09E+00	0.00E+00	1.84E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
$NRPR_T$ [MJ]	3.51E+01	6.14E-01	3.48E+00	ND	0.00E+00	1.41E-01	0.00E+00	1.60E+00	ND
SM [kg]	5.00E-02	0.00E+00	2.25E-03	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
FW [m^3]	9.39E-03	8.59E-05	1.05E-03	ND	0.00E+00	1.96E-05	0.00E+00	2.30E-04	ND
Output Flows and Waste Categories									
HWD [kg]	8.84E-10	2.55E-12	1.38E-10	ND	0.00E+00	5.84E-13	0.00E+00	6.00E-11	ND
NHWD [kg]	2.82E-02	5.28E-05	1.56E-01	ND	0.00E+00	1.21E-05	0.00E+00	2.49E+00	ND
HLRW [kg]	2.40E-06	2.02E-09	1.33E-07	ND	0.00E+00	4.62E-10	0.00E+00	1.60E-08	ND
ILLRW [kg]	1.55E-03	1.70E-06	1.02E-04	ND	0.00E+00	3.89E-07	0.00E+00	1.40E-05	ND
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
MR [kg]	3.20E-03	0.00E+00	3.70E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
MER [kg]	3.30E-03	0.00E+00	1.07E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
EEE [MJ]	6.36E-03	0.00E+00	2.86E-04	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
EET [MJ]	1.15E-03	0.00E+00	5.19E-05	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND

LCA Interpretation

Overall, the dominance analysis shows that the vast majority of the impacts for all products are in the aggregated A1-A3 phase. A1-A3 includes raw material sourcing, transportation, and manufacturing. Following the A1-A3 phase in magnitude is the A5 phase which includes installation of the product. Global warming impacts from the installation phase are due to the use of materials for installation of grout.

For grout, in the sourcing and extraction stage, the largest contributors to the impacts in terms of raw materials are portland cement (51%), colorants (8.3%), sand (3.7%) and VAE copolymer (2.3%). Within manufacturing, electricity contributes to 20.2% of overall GWP impacts while thermal energy from natural gas contributes to 5.1%.

Shipping to customer contributes around 4% of total GWP impacts, while installation contributes around 6.3% of GWP impacts. Finally, disposal of the product to landfill contributes 6.74% to total GWP impacts.

Additional Environmental Information

Environmental and Health During Manufacturing

Bostik is governed by federal and local requirements for dust control. Where applicable, dust collection systems are incorporated in processes to optimize material usage and mitigate airborne dust and particulate matter with the factory.

Environment and Health During Installation

Refer to SDS for any PPE requirements. Contact manufacturer for OSHA Respirable Silica compliance information.

Extraordinary Effects

Fire

Once cured, grout is fire resistant.

Water

Once cured, grout is non-sensitive to moisture.

Mechanical destruction

Tile should not be installed until any and all structural damage to the building has been adequately repaired and determined to be code compliant. Surface must be structurally sound, stable, and rigid enough to support grout, mortar, and tile, in additional to any other ancillary tile installation products.

Delayed Emissions

Inherently, cement grouts do not emit VOCs.

Environmental Activities and Certifications

Dimension has a Health Product Declaration (HPD) which can be found at https://www.hpd-collaborative.org/hpd-public-repository/.

These products also have FloorScore certificates that can be found here: https://www.scsglobalservices.com/certified-green-products-guide?q=bostik&program=301.

More information on Bostik's products can be found on their website.

Supporting Documentation

The full text of the acronyms are found in Table 10.

Table 10: Acronym Key

Acronym	Text	Acronym	Text
LCA Indicators			
ADP-elements	Abiotic depletion potential for non-fossil resources	**GWP**	Global warming potential
ADP-fossil	Abiotic depletion potential for fossil resources	**OPD**	Depletion of stratospheric ozone layer
AP	Acidification potential of soil and water	**POCP**	Photochemical ozone creation potential
EP	Eutrophication potential	**Resources**	Depletion of non-renewable fossil fuels
LCI Indicators			
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	**RPR_M**	Use of renewable primary energy resources used as raw materials
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	**$NRPR_M$**	Use of non-renewable primary energy resources used as raw materials
SM	Use of secondary materials	**FW**	Net use of fresh water
RSF	Use of renewable secondary fuels	**NRSF**	Use of non-renewable secondary fuels
HWD	Disposed-of-hazardous waste	**MR**	Materials for recycling
NHWD	Disposed-of non-hazardous waste	**MER**	Materials for energy recovery
HLRW	High-level radioactive waste, conditioned, to final repository	**ILLRW**	Intermediate- and low-level radioactive waste, conditioned, to final repository
CRU	Components for reuse	**EE**	Exported energy
RE	Recovered Energy		
Biogenic Carbon Indicators			
BCRP	Biogenic Carbon Removal from Product	**BCEW**	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes
BCEP	Biogenic Carbon Emission from Product	**CCE**	Calcination Carbon Emissions
BCRK	Biogenic Carbon Removal from Packaging	**CCR**	Carbonation Carbon Removals
BCEK	Biogenic Carbon Emission from Packaging	**CWNR**	Carbon Emissions from Combustion of Waste from Non- Renewable Sources used in Production Processes

References

CEN. (2013). EN 15804+A1: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products. European Committee for Standardization.

CML - Department of Industrial Ecology. (2016, September 05). CML-IA Characterisation Factors. Retrieved from https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors

IPCC. (2013). Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

ISO. (2006). ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures. Geneva: International Organization for Standardization.

ISO. (2006). ISO 14040/Amd 1:2020: Environmental management - Life cycle assessment - Principles and framework. Geneva: International Organization for Standardization.

ISO. (2006). ISO 14044/Amd 1:2017/Amd 2:2020: Environmental Management - Life cycle assessment - Requirements and Guidelines. Geneva: International Organization for Standardization.

ISO. (2017). ISO 21930: Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services. Geneva: International Organization for Standardization.

UL Environment. (2022). Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010, V4.0.

UL Environment. (2022). Part B: Cement-based Grout, Adhesive Mortar and Self-Leveling Underlayment EPD Requirements.

US EPA. (2012). TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 - User Guide. Retrieved from https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf