Environmental Product Declaration

Princeton™ Americast® Integral Apron Bathtub

Bathtub

American Standard Princeton:
2391.XXX
2395.XXX
2397.XXX
2392.XXX
2393.XXX

DXV Byrdcliffe:
D239X

Making life healthier, safer and more beautiful at home, at work, and throughout the world.

Cast iron can't keep up. Americast® is our revolutionary alternative to cast iron that's more durable, lighter and costs less to install. This traditionally styled, integral-apron bathtub features a beveled headrest, lumbar support and a StanSure slip-resistant surface. Alcove installation.

Americast® is our proprietary, revolutionary alternative to cast iron that’s more durable, lighter and costs less to install. Thanks to inherent manufacturing advantages, Americast bathtubs can be made deeper, flatter and roomier than their cast iron counterparts.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	LIXIL Water Technology
DECLARATION NUMBER	4788268911.107.1
DECLARED PRODUCT	Princeton™ Americast® Integral Apron Bathtub
REFERENCE PCR	UL PCR for Plumbing Vessels (2018)
REFERENCE PCR STANDARD	☒ EN 15804 (2012) ☒ ISO 21930 (2007) ☐ ISO 21930 (2017)
DATE OF ISSUE	March 13, 2018
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacturing Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications

The PCR review was conducted by:	PCR Review Panel Chair:Thomas P. Gloria Industrial Ecology Consultants
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by	Thomas Gloria, Industrial Ecology Consultants

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Product Definition and Information

Production Description

Book smarts, beautifully applied. This Princeton® bathtub is made using the Americast® process, resulting in our revolutionary alternative to cast iron that's more durable, lighter and costs less to install. Features include a traditional glossy porcelain finish, beveled headrest, lumbar support and a slip-resistant surface. Alcove installation. Learn more about Americast.

Americast® is our proprietary, revolutionary alternative to cast iron that’s more durable, lighter and costs less to install. Thanks to inherent manufacturing advantages, Americast bathtubs can be made deeper, flatter and roomier than their cast iron counterparts.

Manufacturing Location: Salem, OH

Application

Americast Tub products are used in a variety of bathroom applications, including but not limited to hospitality, healthcare, education, government, military, office, and residential settings.

Environmental Activities and Certification

The LIXIL Group promotes conservation of water and raw materials and sustainable practices across the entire lifecycle of our products from inputs, procurement, through use and disposal. On September 17, 2017 LIXIL Group Corporation announced placement in the Dow Jones Sustainability Indices (DJSI) for sustainability performance. LIXIL Group was included in the DJSI Asia-Pacific Index as the highest scoring company in the Building Products Industry, and ranked third globally in this industry group.

Techincal Data

For the declared product, the following technical data in the delivery status must be provided with reference to the test standard:

Technical Data

Category	Value
Width	30"
Length	60"
Height	14"

Market Placement / Application Rules

This product is certified against the following standards:
- ASME A112.19.1
- CSA B45.2

Properties of Declared Product as Delivered

The product arrives to the site of installation packaged in a cardboard box with similar dimensions to the product size stated above. Installation instructions are available online, and additional installation materials may be required.

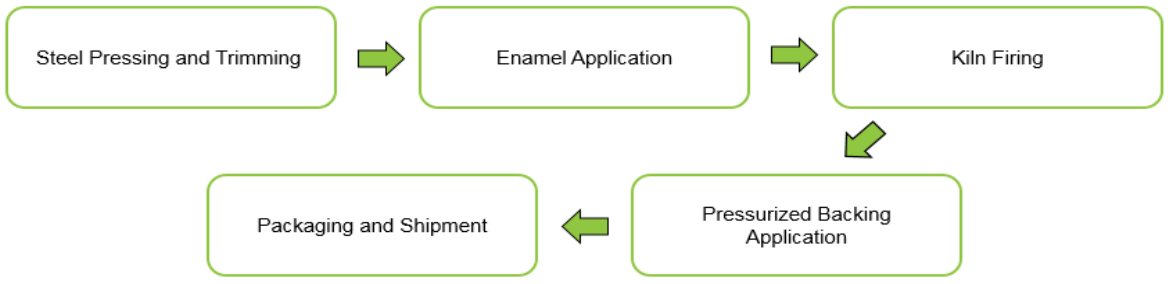
Material Composition

The composition of the Princeton™ Americast® Integral Apron Bathtub is as follows:

Component	Percentage in mass (%)
Steel	60-75%
Enamel	5-15%
Backing	5-15%
Limestone	1-10%
Other	0-5%
Total	100.00%

Manufacturing

The manufacturing process of Americast Tub products begins with the pressing of a steel sheet into the shape of a tub. The shaped steel is coated with two layers of enamel, which is fired in a kiln. Once cooled, a textured pattern is applied to the floor of the tub. The final steps involves the application of the Americast backing material to the underside of the tub. Finally, the tubs are inspected, packaged, and shipped.
Manufacturing Location(s): Salem, OH



Environmental and Health During Manufacturing

Lixil is committed to producing and distributing sanitary ceramics and tub products with minimal environmental impact, where health and safety is the primary focus for all employees and associates.
• Environmental operations, GHG, energy, water, waste, VOC, surface treatment and H&S are being routinely monitored. Inspections, audits, and reviews are conducted periodically to ensure that applicable standards are met and environment management program effectiveness is evaluated.
• Code of Conduct covers human rights, labor practices, and decent work. Management of Lixil is aware of their environmental roles and responsibilities, providing appropriate training, supporting accountability, and recognizing outstanding performance.
• Any waste metals during machining are separated and recycled. Process water is treated internally before being discharged to municipal wastewater treatment.

Transportation

The product is transported an average of 2696 km to the site of installation via a diesel-powered truck, consuming 32 MJ of diesel fuel.

Installation

The product is installed through a manual installation process, and as such, no noise reduction measures are required. Caulk is used to create a waterproof seal around the edges of the installed product. In some instances, a wax ring may be used to create a secure connection between the product and the existing infrastructure. The installation phase also considers the disposal of packaging materials.

Packaging

These products are packaged with cardboard, paper, and plastic wrap. All of these materials are recyclable.

Use Conditions

For vitreous and tub products, the majority of use phase impacts are the result of cleaning required to maintain the product over its stated reference service life. Operational water and energy use is only included for products that control the flow of water. The majority of vitreous and tub products do not control the flow of water, and therefore have no operational water or energy use impacts. The exception is for one-piece toilets with an integrated flushing system, which do have water and energy use impacts.

Environmental and Health During Use

There is no harmful emissive potential. No damage to health or impairment is expected under normal use of the product.

Reference Service Life

The Reference Service Life is determined by the guidance from the Product Category Rules and varies by product type. This specific product has a RSL of 7.5 years

Extraordinary Effects

Fire
No danger to the environment is anticipated during exposure to fire.

Water
No substances are used which have a negative impact on ecological water quality on contact by the product with water.

Mechanical Destruction
No danger to the environment is anticipated during mechanical destruction.

Re-use Phase

Although it is possible to recycle these products at the end of life, it is not the typical disposal pathway.

Disposal

Final product disposal is modeled as 100% to inert material landfill.

Further Information

LIXIL Water Technologies
One Centennial Avenue
Piscataway, NJ, 08854

Life Cycle Assessment

Functional Unit

The declaration refers to the functional unit of 1 unit (or piece) of Princeton™ Americast® Integral Apron Bathtub.

Name	Value	Unit
Functional unit	1	Piece
Mass	40.17	kg
Conversion factor to 1 kg	0.02	-
Flush rate	n/a	m^3 / sec
Flow rate	n/a	m^3 / sec

System Boundary

This is a cradle to grave Environmental Product Declaration. The following life cycle phases were considered:

Product Stage			Construction Process Stage		Use Stage							End of Life Stage*				Benefits and Loads Beyond the System Boundaries
Raw material supply	Transport	Manufacturing	Transport from gate to the site	Construction/ installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

Description of the System Boundary Stages Corresponding to the PCR
(X = Included; MND = Module Not Declared)

*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

Estimates and Assumptions

Transport:
For materials and pre-products, the actual means of transport and distances, provided by the suppliers, were considered.
EoL:
In the End of Life phase, all materials are assumed to be disposed of in a 100% inert material landfill.

Cut-off Criteria

In the assessment, all available data from the production process are considered, i.e. all raw materials used, auxiliary materials (e.g. lubricants), thermal energy consumption, and electric power consumption - including material and energy flows contributing less than 1% of mass or energy (if available). In case a specific flow contributing less than 1% in mass or energy is not available, worst case assumption proxies are selected to represent the respective environmental impacts. Impacts relating to the production of machines and facilities required during production are out of the scope of this assessment.

Background data

For life cycle modeling of the considered products, the SimaPro 8.2.0.0 software is used. Primary data was collected from the Lixil owned facilities. Secondary data was used for upstream raw material production and downstream inventory flows. This secondary data was sourced from either the Ecoinvent 3.1 or USLCI databases.

Data Quality

The data sources used are complete and representative of North America in terms of the geographic and technological coverage and are a recent vintage (i.e. less than ten years old). The data used for primary data are based on direct information sources of the manufacturer. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty.

Period Under Review

The period under review is the 2017 Fiscal Year.

Allocation

Allocation was determined on a mass basis.

Comparability

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account. Environmental delarations from different programs may not be comparable. Full conformance with the selected PCR allows EPD comparability only when all stages of a product's life cycle have been considered. However, variations and deviations are possible.

LCA: Modeling Scenarios and Additional Technical Information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared. Any information omitted from the following scenario tables was done so intentionally as it was unrelated and had no presentable values.

Transport to Building Site (A4)		
Name	**Value**	**Unit**
Liters of fuel	38	l/100km
Transport distance	2696	km
Capacity utilization (including empty runs)	90	%
Gross density of products transported	-	kg/m^3
Capacity utilization volume factor	1.00	-

Installation into the Building (A5)		
Name	**Value**	**Unit**
Auxiliary materials	0.70	kg
Water consumption	-	m^3
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Waster materials at construction site	5.50	kg
Output substance (landfill)	4.40	kg
Output substance (incineration)	1.10	kg
Direct emissions to ambient air*, soil, and water	2.61	kg CO_2

** CO_2 emissions to air from disposal of packaging*

Maintenance (B2)		
Name	**Value**	**Unit**
Information on maintenance	*	-
Maintenance cycle	390	Number / RSL
Maintenance cycle	3510	Number / ESL
Water consumption (from tap, to sewer)	3.9E-03	m^3
Auxiliary materials (cleaing agent)	0.04	kg
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Material loss	-	kg

** Daily with 10ml of 1% sodium lauryl sulfate solution*

Replacement (B4) / Refurbishment (B5)		
Name	**Value**	**Unit**
Replacement cycle	-	Number / RSL
Replacement cycle	9.0	Number / ESL

Operational Enery Use (B6) and Water Use (B7)		
Name	**Value**	**Unit**
Water consumption (from tap, to sewer)	-	m^3
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Equipment output	-	kW
Direct emissions to ambient air, soil, and water	-	kg
Further assumptions	*	-

** No associated operational energy or water use*

End of Life (C1 - C4)		
Name	**Value**	**Unit**
Collected separately	-	kg
Collected as mixed construction waste	40.17	kg
Reuse	-	kg
Recycling	-	kg
Energy recovery	-	kg
Landfilling	40.17	kg

LCA Results

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5	B2*	C1	C2	C3	C4
GWP	Global warming potential	kg CO_2-Eq.	1.72E+02	9.49E+00	9.49E+00	5.20E-01	0.00E+00	2.44E-01	0.00E+00	4.21E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	6.97E-06	3.62E-10	4.81E-07	5.39E-08	0.00E+00	1.03E-11	0.00E+00	1.45E-07
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	1.08E+00	5.66E-02	9.52E-03	2.53E-03	0.00E+00	1.74E-03	0.00E+00	3.32E-03
EP	Eutrophication potential	kg N-Eq.	5.93E-01	3.16E-03	8.82E-02	1.51E-03	0.00E+00	9.91E-05	0.00E+00	1.33E-03
SP	Smog formation potential	kg O_3-Eq.	9.16E+00	1.55E+00	1.10E-01	2.68E-02	0.00E+00	4.82E-02	0.00E+00	7.67E-02
FFD	Fossil fuel depletion	MJ-surplus	2.05E+02	1.71E+01	1.82E+00	1.06E+00	0.00E+00	4.86E-01	0.00E+00	1.33E+00

**All use phase stages have been considered, and only maintenance (B2) contains non-zero values, which are reported above. The remainder of use phase stages have values of zero.*

Results shown below were calculated using CML 2001 - April 2013 Methodology.

CML 4.1 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5	B2*	C1	C2	C3	C4
GWP	Global warming potential	kg CO_2-Eq.	1.72E+02	9.49E+00	1.66E+01	5.20E-01	0.00E+00	2.44E-01	0.00E+00	4.21E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	5.68E-06	3.58E-10	4.54E-07	4.63E-08	0.00E+00	1.02E-11	0.00E+00	1.09E-07
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	1.14E+00	4.67E-02	8.41E-03	2.56E-03	0.00E+00	1.41E-03	0.00E+00	2.90E-03
EP	Eutrophication potential	kg$(PO_4)^3$-Eq.	2.89E-01	8.28E-03	3.37E-02	7.80E-04	0.00E+00	2.61E-04	0.00E+00	8.72E-04
POCP	Formation potential of tropospheric ozone photochemical oxidants	kg ethane-Eq.	6.91E-02	2.15E-03	4.15E-03	1.72E-04	0.00E+00	6.62E-05	0.00E+00	1.35E-04
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1.01E-03	0.00E+00	2.67E-06	2.22E-06	0.00E+00	0.00E+00	0.00E+00	5.70E-07
ADPF	Abiotic depletion potential for fossil resources	MJ	2.36E+03	1.29E+02	1.80E+01	9.44E+00	0.00E+00	3.70E+00	0.00E+00	1.06E+01

**All use phase stages have been considered, and only maintenance (B2) contains non-zero values, which are reported above. The remainder of use phase stages have values of zero.*

Results below contain the resource use throughout the life cycle of the product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B2*	C1	C2	C3	C4
PERE	Renewable primary energy as energy carrier	MJ, lower calorific value	6.21E+01	0.00E+00	7.71E-01	1.74E-01	0.00E+00	0.00E+00	0.00E+00	1.20E-01
PERM	Renewable primary energy resources as material utilization	MJ, lower calorific value	1.14E+02	0.00E+00	2.64E+00	2.03E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-01
PERT	Total use of renewable primary energy resources	MJ, lower calorific value	1.76E+02	0.00E+00	3.41E+00	2.21E+00	0.00E+00	0.00E+00	0.00E+00	3.10E-01
PENRE	Nonrenewable primary energy as energy carrier	MJ, lower calorific value	2.49E+03	1.29E+02	1.96E+01	1.04E+01	0.00E+00	3.70E+00	0.00E+00	1.09E+01
PENRM	Nonrenewable primary energy as material utilization	MJ, lower calorific value	9.31E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	Total use of nonrenewable primary energy resources	MJ, lower calorific value	2.49E+03	1.29E+02	1.96E+01	1.04E+01	0.00E+00	3.70E+00	0.00E+00	1.09E+01
SM	Use of secondary material	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	4.95E+00	0.00E+00	1.23E-01	3.15E-02	0.00E+00	0.00E+00	0.00E+00	8.15E-03

**All use phase stages have been considered, and only maintenance (B2) contains non-zero values, which are reported above. The remainder of use phase stages have values of zero.*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5	B2*	C1	C2	C3	C4
HWD	Hazardous waste disposed	kg	4.11E-03	0.00E+00	1.82E-05	6.57E-06	0.00E+00	0.00E+00	0.00E+00	7.85E-06
NHWD	Non-hazardous waste disposed	kg	2.90E+01	0.00E+00	1.25E+01	4.60E-02	0.00E+00	0.00E+00	0.00E+00	4.03E+01
RWD	Radioactive waste disposed	kg	2.62E-03	0.00E+00	5.03E-05	1.53E-05	0.00E+00	0.00E+00	0.00E+00	6.28E-05
CRU	Components for re-use	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
MFR	Materials for recycling	kg	2.30E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	Materials for energy recovery	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
EEE	Exported electrical energy	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
EEE	Exported thermal energy	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

**All use phase stages have been considered, and only maintenance (B2) contains non-zero values, which are reported above. The remainder of use phase stages have values of zero.*

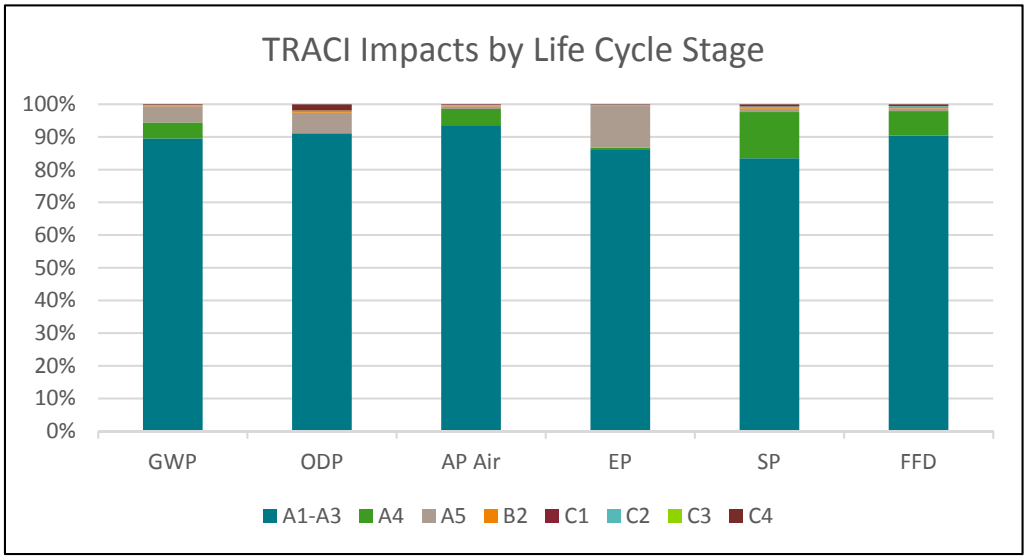
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Resource Use										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B2***	**C1**	**C2**	**C3**	**C4**
BCRP	Biogenic Carbon Removal from Product	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	MJ, lower calorific value	2.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	MJ, lower calorific value	0.00E+00	0.00E+00	2.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Cabron Emissions from Combustion of Waste from Renewable Sources Used in Production Process	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Cabron Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	MJ, lower calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**All use phase stages have been considered, and only maintenance (B2) contains non-zero values, which are reported above. The remainder of use phase stages have values of zero.*

Interpretation

The production (A1-A3) life cycle stages drive the results in all impact categories. Within the production phase, raw materials and energy used in the production process drive the impacts. Distribution or installation is typically the second most impactful phase.



References

- PCR Part A — UL Environment and Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. July 2014, version 1.3.
- PCR Part B — UL Environment and Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Sanitary Ceramics. Version January 2018.
- ISO 14025 — ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040 — ISO 14040:2009-11, Environmental management — Life cycle assessment — Principles and framework.
- ISO 14044 — ISO 14044:2006-10, Environmental management — Life cycle assessment — Requirements and guidelines.
- EN 15804 — EN 15804:2012-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product.
- TRACI 2.1 — US EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI).
- CML 2001 — Center of Environmental Science of Leiden University impact categories and characterisation methods for impact assessment (CML).