

## Highcliff™ Ultra K-96057-0

Floor-mount top spud flushometer bowl

Product Group

Vitreous



### Product Specifications

Packaged Product Weight (kg)	35.1
Product Recycled Content	0
Product Recyclable Content	7%
Product Life time (years)	30
Product Application	Commercial

### Use Phase Specifications

Annual Cleaning Frequency (times)	260
Cleaner	50 mL of a 1% Sodium lauryl sulfate solution.

### Greenhouse Gas Emission (kg CO2- eq.)

Material & Manufacturing	172
Use & Maintenance	327

### Water Intensity (m3)

Material & Manufacturing	393
Use & Maintenance	737

### Manufacturing Locations

Saraburi, Thailand

## Believing in Better

We believe in a better world. We are passionate about protecting the environment and enhancing the quality of life for current and future generations. And that means designing products that look beautiful and deliver exceptional performance, while being as sustainable as possible.



# Environmental Product Declaration

Floor-mount top spud flushometer bowl

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Program Operator Name, Address, and Website	UL Solutions   333 Pfingsten Road Northbrook, IL 60062-2096 USA   <a href="http://www.ul.com">www.ul.com</a>
General Program Instructions and Version Number	Program Operator Rules V2.7 March 2022
Location of Explanatory Material	If you would like to learn more about the background LCA or any information provided in this EPD, please reach out to us at <a href="mailto:Transparency@Kohler.com">Transparency@Kohler.com</a> ..
Declaration Holder and Address	Kohler Co. 444 Highland Drive, Kohler, WI
Declaration Number	4791422286.149
Declared Product and Functional Unit	Single Toilet Bowl Without tank in an average commercial environment over the estimated service life of the building
Product Definition	Floor-mount top spud flushometer bowl
Reference PCR and Version Number	Sustainable Minds Transparency Report™/ EPD Framework: Part A: LCA calculation rules and report requirements, v2023. Part B: Residential toilets (v.3) & Commercial toilets (v.3)
Markets of Applicability	North America
Date of Issue	22-Dec-25
Period of Validity	5 Years
EPD Type	Product Specific
EPD Scope	Cradle-to-grave
Year of Reported Manufacturer Primary Data	2021-24
LCA Software and Version Number	SimaPro v. 10.2.0.1
LCIA Database(s) and Version Numbers	Ecoinvent 3.11 DATASMART LCI Package (USEI 2.2) TRACI 2.2 v1.00
LCIA Methodology and Version Number	CML-IA baseline v3.11 Cumulative Energy Demand (CED) v1.12
Applicable Green Building Certifications Schema	LEED v4.1/BD+C/Materials and Resources/Building Product Disclosure and Optimization- Environmental Product Declarations

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# Environmental Product Declaration

Floor-mount top spud flushometer bowl

The PCR review was conducted by:

Jack Geibig, Chair (Ecoform)  
Hugues Imbeault-Tétreault, (ing., M.Sc.A. Groupe AGÉCO)  
Rebe Feraldi, LCACP, CLAR (Pacific Northwest National Laboratory)

This declaration was independently verified in accordance with ISO 14025:2006. Sustainable Minds Transparency Report™/ EPD Framework: Part A: LCA calculation rules and report requirements, v2023. Part B: Residential toilets (v.3) & Commercial toilets (v.3), based on ISO 21930:2017, serves as the core PCR.




INTERNAL

EXTERNAL

This life cycle assessment was conducted in accordance with ISO 14044, ISO 21930, and reference PCR by:

Ankit Bhardwaj, Punam Bagde, Shahana Bano, Maithili Bachhuwar  
(Product Transparency, Kohler Co.)

This life cycle assessment was independently verified in accordance with ISO 14044, ISO 21930, and the reference PCR by

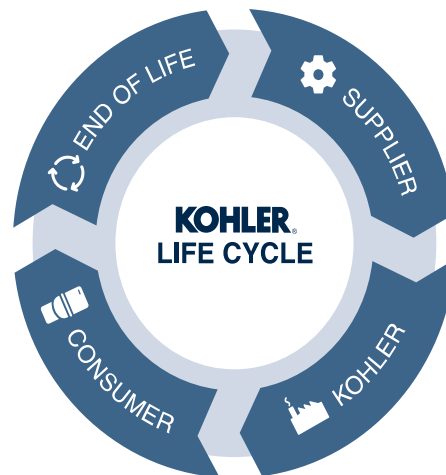
  
James Mellentine, Thrive ESG

LIMITATIONS: 1) Environmental declarations from different programs (ISO 14025) may not be comparable; 2) Comparison of the environmental performance using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building use phase as instructed under this PCR; 3) Full conformance with the PCR allows EPD comparability when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category PCR, and use equivalent scenarios with respect to construction work. However, variations and deviations are possible. example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

This document is an environmental product declaration (EPD) in accordance with ISO 21930. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycles.

Environmental product declarations enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. TRs/EPDs of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore cannot be used as comparative assertions unless the conditions as defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied.

At Kohler Co., we believe in protecting the environment and enhancing the quality of life for current and future generations. When developing new products, we consider the environmental impact at each stage of a product's existence - from the activities of our suppliers through the end of the product's useful life. Designing for a better world means every choice counts.



## Environmental Product Declaration

Floor-mount top spud flushometer bowl

### Product Description



The Highcliff Ultra floor-mount flushometer bowl features a revolutionary flushing engine and refined aesthetic design. Measuring 16-7/8" to the top of the rim, the Highcliff Ultra meets both ADA and CSA height requirements. The Ultra engine represents a breakthrough in flush performance, tolerating a wide range of water supply conditions found in R&R and new construction. The Highcliff Ultra top spud is listed from 1.0 to 1.6 gpf and performs well at every flush interval, making it uniquely effective with dual flush valves. It has been proven with all manner of valves (diaphragm, piston, manual, and electronic) from a variety of manufacturers.

Additional data can be found at:

<https://www.kohler.com/en/products/commercial/shop-commercial-toilets/highcliff-ultra-floor-mounted-top-spud-flushometer-bowl-96057>

### Product Features

- Elongated bowl offers added room and comfort
- 1-1/2" (38 mm) top spud
- 2-1/8" (54 mm) fully glazed trapway
- 10" x 7" (254 mm x 178 mm) water surface

### Product Standards, Approvals and Certifications

Specified model meets or exceeds the following:

- ASME A112.19.2/CSA B45.1
- DOE - Energy Policy Act 1992
- EPA WaterSense®

## SUPPLIER OPERATIONS

### Base Material Content of the Product

Material	Function	Quantity (% By Weight)
Clay	Slip and Glaze Ingredient	45-55
Feldspar	Slip and Glaze Ingredient	25-35
Silica	Slip and Glaze Ingredient	10-20
Corrugate	Packaging	5-10
Steel + Brass +Bronze	Miscellaneous Hardware	1-5

# Environmental Product Declaration

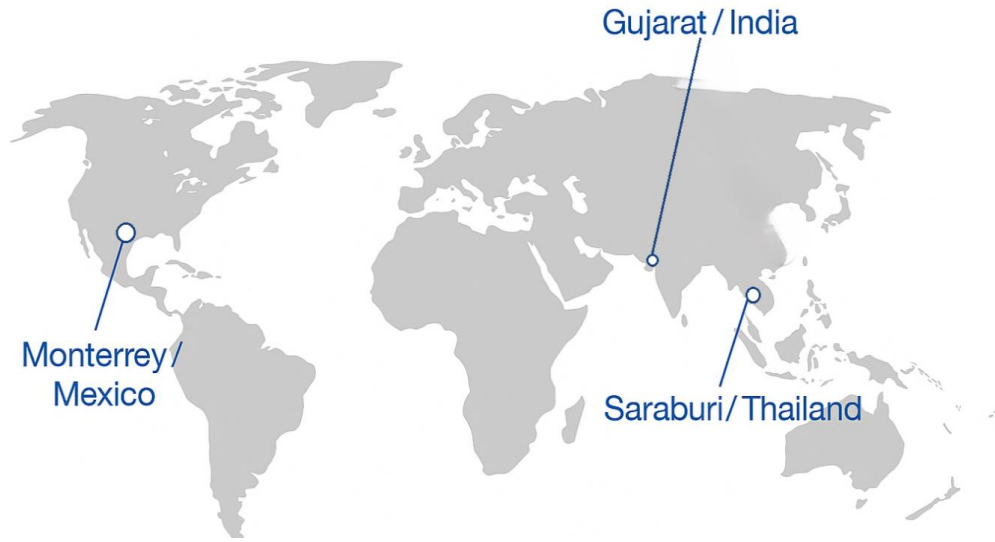
Floor-mount top spud flushometer bowl



## Manufacturing Process Description

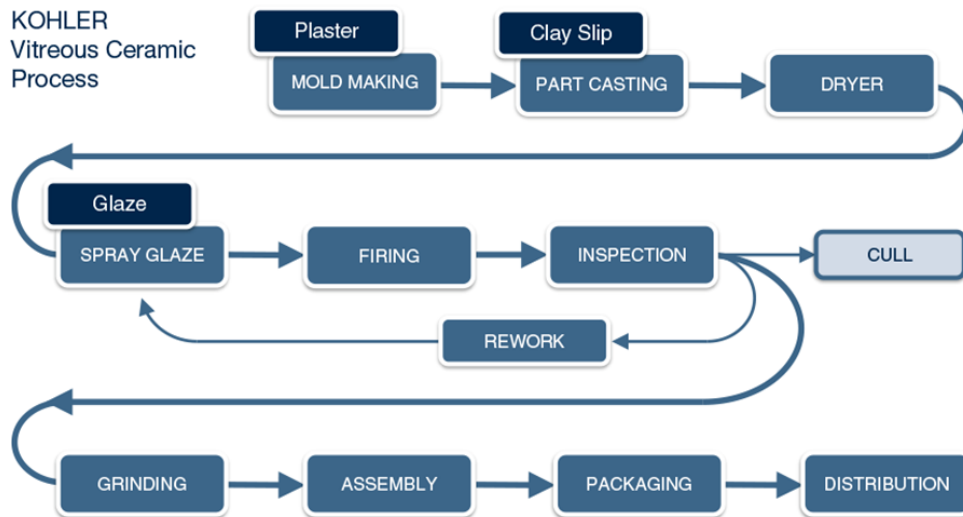
The body of vitreous ceramic sanitary ware is manufactured by casting slip - a mixture of water, clay, feldspar and silica - into a reusable mold. The cast body is partially dried, sprayed with an aqueous glaze mixture, and fired in a kiln to vitrify the product. An inspection process follows that ensures a singular high level of product quality. Finally, the ware is fitted with non-vitreous components, packaged and shipped.

## Manufacturing Locations



Not all products are produced in all plants. EPDs for specific models only include data from plants in which they are produced.

## Manufacturing Process



## Environmental Product Declaration

Floor-mount top spud flushometer bowl

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### Health, Safety and Environmental Aspects during Production

Kohler Co. has established program management guidelines for safety, accident prevention and environmental performance. These systems enable Kohler Co. operations to achieve world-class performance: Kohler Safety Management System (KSMS) and Kohler Environmental Management System (KEMS). The management systems are based on best management practices, and the application of these programs consistently delivers significant results.

### Packaging

Vitreous ware is packaged primarily with double-wall corrugated containerboard. When utilized, white exterior wrapping is manufactured with an Elemental Chlorine Free (ECF)/Totally Chlorine Free (TCF) bleaching process. Other packaging materials can include expanded polystyrene (EPS), low density polyethylene bags (LDPE) and honeycomb paperboard blocking. Corrugated containerboard and honeycomb blocking are 100% recyclable, and collection is available in most municipalities. Other materials are typically recyclable; however, this is dependent on local availability of collection programs.

### Installation A5

<https://www.kohler.com/en/products/commercial/shop-commercial-toilets/highcliff-ultra-floor-mounted-top-spud-flushometer-bowl-96057>

Installation guidance is provided on the product page of the Kohler website, as highlighted above link. Packaging waste generated during installation is sent for recycling, and a transportation distance of 100 km is considered in accordance with cut-off criteria modeling.



### CONSUMER USE

#### Conditions of Use

The use phase impacts of Toilet Bowl are primarily related to replacements and maintenance. If sold with a tank, impacts from operational water use are also relevant.

#### Reference Service Life

Toilet Bowl Without tank are assumed to remain in service for 30 years.

#### Cleaning and Maintenance

Toilet Bowls are assumed to require 260 cleanings per year with 50 ml of 1% sodium lauryl sulfate. These impacts are included within the product use stage of the LCA.



### END OF LIFE

#### Recycle or Reuse

Collection and processing for vitreous product beneficial reuse and end-of-life are possible, but not widely available at present time

#### Disposal

Upon PCR default assumptions, The KOHLER® LCA model assumes 100% of the vitreous portion of the product, accessories and packaging materials are landfilled.

## Environmental Product Declaration

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### Description of Declared or Functional Unit

The functional unit represented here refers to a single Toilet Bowl Without Tank.

Name	Value	Unit
Functional Unit	Single Toilet Bowl Without tank in an average commercial environment over the estimated service life of the building	
Mass	35.14	kg
Conversion factor to 1 kg	0.03	

### Estimates and Assumptions

The LCI/ LCA assumptions are mentioned below:

- Product transport from Manufacturing Plant to final customer and from customer to disposal site are modeled based on PCR specifications
- Product and packaging disposal scenarios are adopted from the PCR specifications
- Building estimated service life (ESL) is assumed to be 75 years
- Biogenic carbon content is estimated for three types of packaging materials: plywood, corrugate box and kraft paper
- Carbon calcination emission factors are sourced from US-EPA technical support document
- Infrastructure and capital equipment's were considered only to the extent represented in Ecoinvent secondary datasets, as their impacts in certain cases were found to exceed the cut-off threshold.

### Cut-off Criteria

Cutoff criteria: exclusions are allowed if <1% of mass, energy, and impacts, with total exclusions ≤5% per module; hazardous materials are never excluded regardless of quantity.

This LCA is in compliance with the cutoff criteria specified above, as no known processes were excluded from this assessment outside of the specific items listed within the System Boundary.

### Allocation

Impacts are allocated to individual products using a unit process approach. Product mass is typically used as the basis for allocating impacts. In some cases, differences in production quality is also considered. For materials that cross the system boundary, the cut-off rule was applied.

### Data Sources

Primary manufacturing data was collected directly from process experts for the five Kohler vitreous plants within North America and Thailand, for calendar year of 2021-2024. Secondary data primarily references the Ecoinvent 3.11 LCI and DATASMART databases. Both databases are widely distributed and are referenced within the LCA community. All ecoinvent datasets have been critically reviewed.

### Data Quality

Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. The data sources used are complete and representative of North America, and Thailand in terms of the geographic and technological coverage and are a recent vintage (i.e., less than ten years old). Any deviations from these initial data quality requirements for secondary data are documented in the critically reviewed LCA report. When a product is produced at more than one plant, impacts are weighted by unit production quantities at each plant.

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## LCA Modeling Scenarios

Transport from gate to the building site (A4)		
Name	Value	Unit
Road transport distance (Diesel freight lorry)	1,801	km
Amount of Diesel	38	l/100km
Transoceanic distance ( Heavy fuel oil container ship)	18,524	km
Amount of Heavy Fuel	60,000	Kg/100km

Installation into the building (A5)		
Name	Value	Unit
Auxiliary material	-	kg
Water consumption	-	m <sup>3</sup>
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Product loss per functional unit	-	kg
Waste material at the construction site before waste processing	5.05	kg
Output materials resulting from on-site waste processing	-	kg
Direct emissions to ambient air, soil and water	-	kg

Reference service life		
Name	Value	Unit
Reference service life (RSL)	30	years

Maintenance (B2)		
Name	Value	Unit
Maintenance process information	-	-
Maintenance cycle	7800	Number/RSL
Maintenance cycle	19500	Number/ESL
Water consumption	-	m <sup>3</sup>
Auxiliary material (cleaning agent)	975	l/ESL
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Power output of equipment	-	kW
Material loss	-	kg
Direct emissions to ambient air, soil and water	-	kg

Repair (B3)		
Name	Value	Unit
Repair process information	-	-
Inspection process information	-	-
Repair cycle	-	Number/RSL
Repair cycle	-	Number/ ESL
Water consumption	-	m <sup>3</sup>
Auxiliary	-	kg
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Material loss	-	kg
Direct emissions to air, soil and water	-	kg

Replacement (B4)/Refurbishment (B5)		
Name	Value	Unit
Reference service life	30	Number/RSL
Replacement cycle	1.50	Number/ESL
Electricity consumption	-	kWh
Liters of fuel	-	l/100 km
Water consumption	-	m <sup>3</sup>
Auxiliary material	-	kg
Replacement of worn parts	-	kg
Direct emissions to air, soil and water	-	kg

Operational energy use (B6) and water use (B7)		
Name	Value	Unit
Water consumption	-	m <sup>3</sup> /p/RSL
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Equipment output	-	kW
Direct emissions to air, soil and water	-	kg

End of life (C1-C4)		
Name	Value	Unit
Road transport distance (Diesel freight lorry)	100	km
Amount of Diesel	38	l/100km
Reuse	-	kg
Recycling	-	kg
Energy recovery	-	kg
Landfilling	35.14	kg

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## System Boundaries

Cradle to grave	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundaries	Reference Service Life
	Raw material supply	Transport	Manufacturing	Transport from gate to the site	Assembly/ Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction	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)

## Results of the Assessment

TRACI 2.2 Impact Assessment					
Module	GWP	ODP	AP	EP	POCP
	(kg CO2 Eq.)	(kg CFC-11 Eq.)	(kg SO2- Eq.)	(kg N-Eq.)	(kg O3-Eq.)
Total	5.20E+02	1.80E-05	1.99E+00	3.41E-01	3.33E+01
A1- A3	1.72E+02	6.59E-06	4.71E-01	7.12E-02	7.82E+00
A4	1.86E+01	2.74E-07	2.10E-01	3.56E-02	4.19E+00
A5	1.60E+00	6.47E-10	1.73E-04	3.64E-05	4.27E-03
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B2	3.74E+01	8.25E-07	2.76E-01	7.22E-02	3.06E+00
B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4	2.89E+02	1.03E-05	1.03E+00	1.62E-01	1.82E+01
B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2	5.79E-01	8.42E-09	2.25E-03	4.73E-04	5.56E-02
C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4	2.01E-01	1.98E-08	1.40E-03	3.09E-04	3.66E-02

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CML 3.11 Impact Assessment							
Module	GWP	ODP	AP Air	EP	POCP	ADP element	ADP fossil fuels
	(kg CO <sub>2</sub> -Eq.)	(kg CFC-11 Eq.)	(kg SO <sub>2</sub> -Eq.)	(kg (PO <sub>4</sub> ) <sub>3</sub> - Eq.)	(kg C <sub>2</sub> H <sub>4</sub> Eq.)	(kg Sb-Eq.)	(MJ, LHV)
Total	5.24E+02	1.57E-05	1.85E+00	7.32E-01	1.88E-01	8.11E-03	7.29E+03
A1- A3	1.73E+02	5.76E-06	4.39E-01	1.99E-01	2.26E-02	2.98E-03	2.48E+03
A4	1.88E+01	2.08E-07	1.92E-01	2.98E-02	6.04E-03	4.74E-05	2.49E+02
A5	1.60E+00	4.93E-10	1.43E-04	4.60E-05	6.90E-06	1.49E-07	6.21E-01
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B2	3.75E+01	7.25E-07	2.67E-01	1.59E-01	1.16E-01	5.33E-04	4.42E+02
B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4	2.92E+02	8.99E-06	9.51E-01	3.44E-01	4.31E-02	4.55E-03	4.11E+03
B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2	5.84E-01	6.42E-09	1.86E-03	5.99E-04	8.98E-05	1.94E-06	8.08E+00
C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4	2.04E-01	1.49E-08	1.16E-03	2.80E-04	5.28E-05	2.94E-07	5.20E+00

Rest of the World Impact Assessment (CML & TRACI)					
Module	GWP	ODP	AP	EP	POCP
	(kg CO <sub>2</sub> -Eq.)	(kg CFC-11 Eq.)	(kg SO <sub>2</sub> -Eq.)	(kg N-Eq.)	(kg O <sub>3</sub> - Eq.)
Total	5.24E+02	1.57E-05	1.85E+00	7.31E-01	3.33E+01
A1- A3	1.73E+02	5.76E-06	4.39E-01	1.99E-01	7.82E+00
A4	1.88E+01	2.08E-07	1.92E-01	2.98E-02	4.19E+00
A5	1.60E+00	4.93E-10	1.43E-04	4.60E-05	4.27E-03
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B2	3.75E+01	7.25E-07	2.67E-01	1.59E-01	3.06E+00
B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4	2.92E+02	8.99E-06	9.51E-01	3.44E-01	1.82E+01
B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2	5.84E-01	6.42E-09	1.86E-03	5.99E-04	5.56E-02
C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4	2.04E-01	1.49E-08	1.16E-03	0.00E+00	3.66E-02

# Environmental Product Declaration

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Resource Use											
Module	RPR <sub>e</sub>	RPR <sub>m</sub>	RPR <sub>t</sub>	NRPR <sub>e</sub>	NRPR <sub>m</sub>	NRPR <sub>t</sub>	SM	RSF	NRSF	RE	FW
	(MJ)	(MJ)	(MJ)	(MJ)	(MJ)	(MJ)	(kg)	(MJ)	(MJ)	(MJ)	(M3)
Total	1.28E+03	1.49E+02	1.43E+03	8.18E+03	3.22E+00	8.19E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E+03
A1- A3	2.63E+02	5.94E+01	3.22E+02	2.78E+03	1.29E+00	2.78E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E+02
A4	3.00E+00	0.00E+00	3.00E+00	2.68E+02	0.00E+00	2.68E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-01
A5	8.73E-03	0.00E+00	8.73E-03	6.69E-01	0.00E+00	6.69E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-03
B1	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
B2	6.16E+02	0.00E+00	6.16E+02	5.25E+02	0.00E+00	5.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E+02
B3	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
B4	3.99E+02	8.92E+01	4.88E+02	4.60E+03	1.93E+00	4.60E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E+02
B5	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
B6	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
B7	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
C1	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
C2	1.14E-01	0.00E+00	1.14E-01	8.70E+00	0.00E+00	8.70E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.79E-02
C3	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
C4	4.40E-02	0.00E+00	4.40E-02	5.60E+00	0.00E+00	5.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E+00

Output Flows and Waste Categories								
Module	HWD	NHWD	HLRW	ILLRW	CRU	MFR	MER	EE
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	(MJ)
Total	4.77E-01	3.89E+02	0.00E+00	2.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
A1- A3	1.25E-01	9.65E+01	0.00E+00	8.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
A4	6.74E-03	1.11E+01	0.00E+00	4.23E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
A5	2.05E-05	3.81E-02	0.00E+00	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B2	1.45E-01	3.25E+01	0.00E+00	4.10E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4	1.99E-01	2.14E+02	0.00E+00	1.37E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2	2.67E-04	4.96E-01	0.00E+00	1.61E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4	6.03E-04	3.44E+01	0.00E+00	1.06E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00

## Environmental Product Declaration

Floor-mount top spud flushometer bowl

Greenhouse Gas Emissions and Removals								
Module	BCRP	BCEP	BCRK	BCEK	BCEW	CCE	CCR	CWNR
	(kg CO2e)	(kg CO2e)	(kg CO2e)	(kgCO2e)	(kg CO2e)	(kg CO2e)	(kg CO2e)	(kg CO2e)
Total	0.00E+00	0.00E+00	3.89E+00	3.89E+00	0.00E+00	2.33E-01	0.00E+00	0.00E+00
A1- A3	0.00E+00	0.00E+00	1.56E+00	0.00E+00	0.00E+00	9.31E-02	0.00E+00	0.00E+00
A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
A5	0.00E+00	0.00E+00	0.00E+00	1.56E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4	0.00E+00	0.00E+00	2.34E+00	2.34E+00	0.00E+00	1.40E-01	0.00E+00	0.00E+00
B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

### Interpretation

The environmental impact of Toilet Bowl is primarily influenced by their replacement during the estimated service life of a commercial building. This recurring replacement affects the overall life cycle impact.

Additionally, raw material extraction and the manufacturing processes contribute to various environmental impact categories. The manufacturing process mainly affects the environmental impacts due to energy consumption, particularly from natural gas and electricity. Therefore, improving energy efficiency, material substitution, supply chain localisation, and material reduction continues to be a key focus for ongoing projects.

Since most of our unit processes contribute more than 5% to the overall environmental impacts, we are providing the complete inventory table of secondary materials used in the LCA as an annexure to this file to ensure full transparency.

# Environmental Product Declaration

Floor-mount top spud flushometer bowl

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## REFERENCES

- PCR Part A SM transparency report™/EPD framework part A—LCA calculation rules and report requirements, 2023
- PCR Part B Sustainable Minds Transparency Report [EPD]™ Program. Part B: Residential toilets (v.3) & Commercial toilets (v.3)
- ISO 14025 ISO 14025:2006, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040 ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework
- ISO 14044 ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines
- ISO 21930 ISO 21930:2017, Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
- WaterSense® US EPA, Office of Wastewater Management <http://www.epa.gov/watersense>
- ULE 2022 UL Environment, General Program Instructions, v2.7, 2022.
- OHSAS 18001 Occupational Health and Safety Management Systems - Requirements
- ISO 14001 Environmental Management Systems - Requirements with guidance for use
- ASME A112.19.2/CSA B45.1 Ceramic Plumbing Fixtures
- ADA Americans with Disabilities Act - Standards for Accessible Design
- ICC/ANSI A117.1 International Code Council - Accessible and Usable Buildings and Facilities
- CSA B651 Accessible Design for Built Environment
- OBC Ontario Building Code Section 3.8 - Barrier-Free Design
- ICES-003 Industry Canada, Interference Causing Equipment Standard 003 - Information Technology Equipment (ITE) - Limits and methods of measurement
- FCC part 15 Federal Communications Commission, Title 47, Part 15 - Radio Frequency Devices
- DOE-Energy Policy Act 1992 Department of Energy - Energy Policy Act 1992
- ASME A112.19.14 Six Liter Closets Equipped with a Dual Flushing Device
- ADA-Children's Environment ADA Standards for Accessible Design - Clause 604.9
- ASME A112.19.19-06 Vitreous China Nonwater Urinals

**Annexure - Inventory table for Kohler's Thailand Viterous Production**

Thailand Plant 3			
List of Materials			
Materials	Database	Library	Remarks
Sodium silicate	Sodium silicate, solid (RoW) market for sodium silicate, solid   Cut-off, U	Ecoinvent v3.11	
Sodium based deflocculant	Sodium silicate, solid (RoW) sodium silicate production, furnace process, solid product   Cut-off, U	Ecoinvent v3.11	
Barium carbonate	Barium carbonate (GLO) market for barium carbonate   Cut-off, U	Ecoinvent v3.11	
Excel blend S50 ball clay	Clay (RoW) market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
LWCK (Low water content Kaolin)	Kaolin (RoW) kaolin production   Cut-off, U	Ecoinvent v3.11	
MULCOA 70 - 200MC Sand	Refractory, high aluminium oxide, packed (RoW) refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	
Thai cast ball clay	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	
LWCK (Low water content Kaoline)	Clay (RoW) market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Na carbonate	Kaolin (RoW) kaolin production   Cut-off, U	Ecoinvent v3.11	
Sericite	Potassium carbonate (GLO) market for potassium carbonate   Cut-off, U	Ecoinvent v3.11	
	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Aluminium oxide, non-metallurgical (RoW) market for aluminium oxide, non-metallurgical   Cut-off, U	Ecoinvent v3.11	
Quartz	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Aluminium oxide, non-metallurgical (RoW) treatment of aluminium scrap, new, at refiner   Cut-off, U	Ecoinvent v3.11	
	Magnesium oxide (GLO) market for magnesium oxide   Cut-off, U	Ecoinvent v3.11	
Wollastonite	Limestone, milled, loose (RoW) market for limestone, milled, loose   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	
CHAMOTTE MOLOCHITE 200 MESH	Kaolin (RoW) kaolin production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Glass fibre (RoW) glass fibre production   Cut-off, U	Ecoinvent v3.11	
CHAMOTTE MOLOCHITE 120 MESH	Kaolin (RoW) kaolin production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Glass fibre (RoW) glass fibre production   Cut-off, U	Ecoinvent v3.11	
BALL CLAY 90 SL	Clay (RoW) market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Sodium carbonate	Potassium carbonate (GLO) market for potassium carbonate   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Pottery stone	Kaolin (RoW) kaolin production   Cut-off, U	Ecoinvent v3.11	
Dolomite	Dolomite (RoW) dolomite production   Cut-off, U	Ecoinvent v3.11	
Soda feldspar	Feldspar (RoW) feldspar production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Cobalt Sulphate	Copper sulfate (GLO) market for copper sulfate   Cut-off, U	Ecoinvent v3.11	
Wollastonite	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Limestone, milled, loose (RoW) limestone production, milled, loose   Cut-off, U	Ecoinvent v3.11	
Calcium carbonate	Calcium carbonate, precipitated (RoW) market for calcium carbonate, precipitated   Cut-off, U	Ecoinvent v3.11	
Zirconium silicate	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Zirconium oxide (RoW) zirconium oxide production   Cut-off, U	Ecoinvent v3.11	
Dye	Copper carbonate (RoW) copper carbonate production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
BLANOSE 7H	Carboxymethyl cellulose, powder (GLO) market for carboxymethyl cellulose, powder   Cut-off, U	Ecoinvent v3.11	
GL washed sand	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	
ZIRCOSIL 1	Zirconium oxide (RoW) zirconium oxide production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	
Zinc Oxide	Zinc oxide (RoW) zinc oxide production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
Peptapon	Activated bentonite (RoW) activated bentonite production   Cut-off, U	Ecoinvent v3.11	
OPTAPIX C100G	Carboxymethyl cellulose, powder (RoW) carboxymethyl cellulose production, powder   Cut-off, U	Ecoinvent v3.11	
OPTAPIX C50G	Carboxymethyl cellulose, powder (RoW) carboxymethyl cellulose production, powder   Cut-off, U	Ecoinvent v3.11	
Talcum powder	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Anticide	Ammonium nitrite (GLO) market for ammonium nitrite   Cut-off, U	Ecoinvent v3.11	
STAIN DSPS 14029 GREEN BAG25KG	Iron ore, crude ore, 46% Fe (GLO) market for iron ore, crude ore, 46% Fe   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Rare earth concentrate, 70% REO, from bastnasite, at beneficiation/CN U	Ecoinvent v3.11	
	Zirconium oxide (RoW) zirconium oxide production   Cut-off, U	Ecoinvent v3.11	
	Silica sand (RoW) silica sand production   Cut-off, U	Ecoinvent v3.11	
Clay	Clay (RoW) market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Coating Material	Zinc oxide (RoW) zinc oxide production   Cut-off, U	Ecoinvent v3.11	
SMARTSILVER WC-10	Acrylic varnish, with water, in 53% solution state (RoW) market for acrylic varnish, with water, in 53% solution state   Cut-off, U	Ecoinvent v3.11	
Gypsum	Gypsum, mineral (RoW) gypsum quarry operation   Cut-off, U	Ecoinvent v3.11	
Pallet- to distribution center	EUR-flat pallet (RoW) market for EUR-flat pallet   Cut-off, U	Ecoinvent v3.11	
Honeycomb block	Corrugated board box (RoW) corrugated board box production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Stretch wrap- to distribution center	Polyethylene, linear low density, granulate (RoW) polyethylene production, linear low density, granulate   Cut-off, U	Ecoinvent v3.11	
Slip sheet- to distribution center	Polyethylene, high density, granulate (RoW) polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11	
Cusion Foam	Polyurethane, flexible foam (RoW) market for polyurethane, flexible foam   Cut-off, U	Ecoinvent v3.11	
PVC Film	Polyvinyl chloride, suspension polymerised (RoW) market for polyvinyl chloride, suspension polymerised   Cut-off, U	Ecoinvent v3.11	
Label	Kraft paper (RoW) kraft paper production   Cut-off, U	Ecoinvent v3.11	
Literature	Kraft paper (RoW) kraft paper production   Cut-off, U	Ecoinvent v3.11	
Plastic bag	Polyethylene, high density, granulate (RoW) polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11	
Plastic Tape	Polypropylene, granulate (RoW) polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11	
Ref- refractory- estiva	Refractory, high aluminium oxide, packed (RoW) refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Ref- refractory- icra	Refractory, fireclay, packed (RoW) refractory production, fireclay, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Ref- refractory- ips	Refractory, basic, packed (RoW) refractory production, basic, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Ref- refractory- a&s	Refractory, high aluminium oxide, packed (RoW) refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Ref-refractory -resco	Refractory, high aluminium oxide, packed (RoW) refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Ponge	Cellulose fibre (RoW) cellulose fibre production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1
Dobie pad	Cellulose fibre (RoW) cellulose fibre production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2
	Polypropylene, granulate (RoW) polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11	
Plywood for ware boards	Plywood, for indoor use (RoW) plywood production, for indoor use   Cut-off, U	Ecoinvent v3.11	
Metal, Steel	Steel, chromium steel 18/8 (GLO) market for steel, chromium steel 18/8   Cut-off, U	Ecoinvent v3.11	
Bulk bags	Polypropylene, granulate (RoW) polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11	
Plastic shrink wrap	Polyethylene, low density, granulate (RoW) polyethylene production, low density, granulate   Cut-off, U	Ecoinvent v3.11	
Corrugated carton	Corrugated board box (RoW) corrugated board box production   Cut-off, U	Ecoinvent v3.11	
Aluminium	Aluminium, wrought alloy (GLO) aluminium ingot, primary, to aluminium, wrought alloy market   Cut-off, U	Ecoinvent v3.11	
Brass	Brass (RoW) brass production   Cut-off, U	Ecoinvent v3.11	
EPS	Polystyrene, expandable (RoW) polystyrene production, expandable   Cut-off, U	Ecoinvent v3.11	
Steel hardware	Steel, chromium steel 18/8 (GLO) market for steel, chromium steel 18/8   Cut-off, U	Ecoinvent v3.11	
Synthetic rubber	Synthetic rubber (RoW) synthetic rubber production   Cut-off, U	Ecoinvent v3.11	
Polyethylene	Polyethylene, high density, granulate (RoW) polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11	
Polypropylene	Polypropylene, granulate (RoW) polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11	
Water	Water, deionised (RoW) market for water, deionised   Cut-off, U	Ecoinvent v3.11	
Sodium lauryl sulfate	Alkyl sulfate (C12-14) (GLO) market for alkyl sulfate (C12-14)   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1

Note: 1. Proxy: We have used the closest material if the required material is not available in SimaPro database, e.g., Clay, Feldspar  
 2. Modelled based on secondary data: As Material is not available in Simapro database so we have modeled it based on generic material composition.  
 3. Regional We have used the most suitable region data if dataset is not available in Simapro e.g. GLO

**Processing dataset**

Material	Processes	Library
Plastic	Blow moulding (RoW) blow moulding   Cut-off, U	Ecoinvent v3.11
Plastic	Extrusion, plastic film (RoW) extrusion, plastic film   Cut-off, U	Ecoinvent v3.11
Bronze	Casting, bronze (RoW) casting, bronze   Cut-off, U	Ecoinvent v3.11
Brass	Casting, brass (GLO) market for casting, brass   Cut-off, U	Ecoinvent v3.11
Steel/SS	Impact extrusion of steel, warm, deformation stroke (RoW) impact extrusion of steel, warm, defo	Ecoinvent v3.11

Transportation Mode	Dataset	Library
Road	orry, 16-32 metric ton, diesel, EURO 4 (RoW) transport, freight, lorry, 16-32 metric ton, diesel,	Ecoinvent v3.11
Train	Transport, freight, train, fleet average (RoW) transport, freight, train   Cut-off, U	Ecoinvent v3.11
Transoceanic	sea, container ship, heavy fuel oil (GLO) market for transport, freight, sea, container ship, heavy	Ecoinvent v3.11

**Electricity, Fuel and Water**

Electricity and Fuel	Dataset	Library
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Electricity Mix	Electricity, medium voltage (TH)   market for electricity, medium voltage   Cut-off, U	Ecoinvent v3.11
Photovoltaic	Electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, n	Ecoinvent v3.11
Natural Gas	Heat production, natural gas, at industrial furnace >100kW	Ecoinvent v3.11
Water	Tap water (RoW)   market for tap water   Cut-off, U	Ecoinvent v3.11

**Wastewater Treatment and Disposal**

Disposal	Dataset	Library
WWTP	Wastewater from ceramic production (RoW)   market for wastewater from ceramic production   Cut-off, U	Ecoinvent v3.11
Disposal	Inert waste, for final disposal (RoW)   treatment of inert waste, inert material landfill   Cut-off, U	Ecoinvent v3.11

Annexure - Inventory table for Kohier's Thailand Viterous Production				
Thailand Plant 7				
Materials	Database	Library	Remarks	
Sand	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11		
Soda feldspar	Feldspar (RoW)   feldspar production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Pottery stone	Kaolin (RoW)   kaolin production   Cut-off, U	Ecoinvent v3.11		
Excel blend 550 ball clay	Clay (RoW)   market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Thai cast ball clay	Clay (RoW)   market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
MILUCA 70 - 200MC	Refractory, high aluminium oxide, packed (RoW)   refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11		
Sericite	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Aluminium oxide, non-metallurgical (RoW)   market for aluminium oxide, non-metallurgical   Cut-off, U	Ecoinvent v3.11		
	Potassium hydroxide (RoW)   potassium hydroxide production   Cut-off, U	Ecoinvent v3.11		
Quartz	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Aluminium oxide, non-metallurgical (RoW)   treatment of aluminium scrap, new, at refiner   Cut-off, U	Ecoinvent v3.11		
	Magnesium oxide (GLO)   market for magnesium oxide   Cut-off, U	Ecoinvent v3.11		
Wollastonite	Limestone, milled, loose (RoW)   market for limestone, milled, loose   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11		
CHAMOTTE MOLOCHITE 200 MESH	Kaolin (RoW)   kaolin production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Glass fibre (RoW)   glass fibre production   Cut-off, U	Ecoinvent v3.11		
CHAMOTTE MOLOCHITE 120 MESH	Kaolin (RoW)   kaolin production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Glass fibre (RoW)   glass fibre production   Cut-off, U	Ecoinvent v3.11		
BALL CLAY 90 SL	Clay (RoW)   market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
LWCK (Low water content Kaolin)	Kaolin (RoW)   kaolin production   Cut-off, U	Ecoinvent v3.11		
Sodium silicate	Sodium silicate, solid (RoW)   market for sodium silicate, solid   Cut-off, U	Ecoinvent v3.11		
Barium carbonate	Barium carbonate (GLO)   market for barium carbonate   Cut-off, U	Ecoinvent v3.11		
EXCELBOND S200	Clay (RoW)   market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Dolomite	Dolomite (RoW)   dolomite production   Cut-off, U	Ecoinvent v3.11		
Cobalt Sulphate	Copper sulfate (GLO)   market for copper sulfate   Cut-off, U	Ecoinvent v3.11		
Wollastonite	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Limestone, milled, loose (RoW)   limestone production, milled, loose   Cut-off, U	Ecoinvent v3.11		
Calcium carbonate	Calcium carbonate, precipitated (RoW)   market for calcium carbonate, precipitated   Cut-off, U	Ecoinvent v3.11		
Calcium silicate	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Zirconium oxide (RoW)   zirconium oxide production   Cut-off, U	Ecoinvent v3.11		
SMARTSILVER WC-10	Acrylic varnish, with water, in 53% solution state (RoW)   market for acrylic varnish, with water, in 53% solution state   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
BLANOSE 7H	Carboxymethyl cellulose, powder (GLO)   market for carboxymethyl cellulose, powder   Cut-off, U	Ecoinvent v3.11		
Clay	Clay (RoW)   market for clay   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Washed sand	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11		
Sodium based deflocculant	Sodium silicate, solid (RoW)   sodium silicate production, furnace process, solid product   Cut-off, U	Ecoinvent v3.11		
ZIRCOSIL 1	Zirconium oxide (RoW)   zirconium oxide production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11		
Zinc Oxide	Zinc oxide (RoW)   zinc oxide production   Cut-off, U	Ecoinvent v3.11		
Dye	Copper carbonate (RoW)   copper carbonate production   Cut-off, U	Ecoinvent v3.11		
Pestapan	Activated bentonite (RoW)   activated bentonite production   Cut-off, U	Ecoinvent v3.11		
OPTAPIX C100G	Carboxymethyl cellulose, powder (RoW)   carboxymethyl cellulose production, powder   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Sodium hydroxide, without water, in 50% solution state (RoW)   market for sodium hydroxide, without water, in 50% solution state   Cut-off, U	Ecoinvent v3.11		
OPTAPIX C50G	Carboxymethyl cellulose, powder (RoW)   carboxymethyl cellulose production, powder   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Sodium hydroxide, without water, in 50% solution state (RoW)   market for sodium hydroxide, without water, in 50% solution state   Cut-off, U	Ecoinvent v3.11		
Talcum powder	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Anticid	Ammonium nitrite (GLO)   market for ammonium nitrite   Cut-off, U	Ecoinvent v3.11		
STAIN DSPS 14029 GREEN BAG25KG	Iron ore, crude ore, 46% Fe (GLO)   market for iron ore, crude ore, 46% Fe   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Rare earth concentrate, 70% REO, from bastnaesite, at beneficiation/CN U	Ecoinvent v3.11		
	Zirconium oxide (RoW)   zirconium oxide production   Cut-off, U	Ecoinvent v3.11		
	Silica sand (RoW)   silica sand production   Cut-off, U	Ecoinvent v3.11		
Coating Material	Zinc oxide (RoW)   zinc oxide production   Cut-off, U	Ecoinvent v3.11		
Gypsum	Gypsum, mineral (RoW)   gypsum quarry operation   Cut-off, U	Ecoinvent v3.11		
Corrugated carton	Corrugated board box (RoW)   corrugated board box production   Cut-off, U	Ecoinvent v3.11		
Pallet- to distribution center	EUR-flat pallet (RoW)   market for EUR-flat pallet   Cut-off, U	Ecoinvent v3.11		
Honeycomb block	Corrugated board box (RoW)   corrugated board box production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Stretch wrap- to distribution center	Polyethylene, linear low density, granulate (RoW)   polyethylene production, linear low density, granulate   Cut-off, U	Ecoinvent v3.11		
Slip sheet- to distribution center	Polyethylene, high density, granulate (RoW)   polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11		
Cusion Foam	Polyurethane, flexible foam (RoW)   market for polyurethane, flexible foam   Cut-off, U	Ecoinvent v3.11		
Plastic Tape	Polypropylene, granulate (RoW)   polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11		
Plastic baz	Polyethylene, high density, granulate (RoW)   polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11		
PVC Film	Polyvinyl chloride, suspension polymerised (RoW)   market for polyvinyl chloride, suspension polymerised   Cut-off, U	Ecoinvent v3.11		
Literature	Kraft paper (RoW)   kraft paper production   Cut-off, U	Ecoinvent v3.11		
Labels	Kraft paper (RoW)   kraft paper production   Cut-off, U	Ecoinvent v3.11		
Ref- refractory- estva	Refractory, high aluminium oxide, packed (RoW)   refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Ref- refractory- icra	Refractory, fireclay, packed (RoW)   refractory production, fireclay, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Ref- refractory- ijs	Refractory, basic, packed (RoW)   refractory production, basic, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Ref- refractory- zls	Refractory, high aluminium oxide, packed (RoW)   refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Ref- refractory- resc0	Refractory, high aluminium oxide, packed (RoW)   refractory production, high aluminium oxide, packed   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Sponage	Cellulose fibre (RoW)   cellulose fibre production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	
Dobi pad	Cellulose fibre (RoW)   cellulose fibre production   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 2	
	Polypropylene, granulate (RoW)   polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11		
Plywood for ware boards	Plywood, for indoor use (RoW)   plywood production, for indoor use   Cut-off, U	Ecoinvent v3.11		
Metal, Steel	Steel, chromium steel 18/8 (GLO)   market for steel, chromium steel 18/8   Cut-off, U	Ecoinvent v3.11		
Bulk bags	Polypropylene, granulate (RoW)   polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11		
Plastic shrink wrap	Polyethylene, low density, granulate (RoW)   polyethylene production, low density, granulate   Cut-off, U	Ecoinvent v3.11		
Aluminium	Aluminium, wrought alloy (GLO)   aluminium ingot, primary, to aluminium, wrought alloy market   Cut-off, U	Ecoinvent v3.11		
Brass	Brass (RoW)   brass production   Cut-off, U	Ecoinvent v3.11		
EPS	Polyethylene, expandable (RoW)   polyethylene production, expandable   Cut-off, U	Ecoinvent v3.11		
Steel hardware	Steel, chromium steel 18/8 (GLO)   market for steel, chromium steel 18/8   Cut-off, U	Ecoinvent v3.11		
Synthetic rubber	Synthetic rubber (RoW)   synthetic rubber production   Cut-off, U	Ecoinvent v3.11		
Bronze	Bronze (RoW)   bronze production   Cut-off, U	Ecoinvent v3.11		
Polyethylene	Polyethylene, high density, granulate (RoW)   polyethylene production, high density, granulate   Cut-off, U	Ecoinvent v3.11		
Polypropylene	Polypropylene, granulate (RoW)   polypropylene production, granulate   Cut-off, U	Ecoinvent v3.11		
Water	Water, demineral (RoW)   market for water, demineral   Cut-off, U	Ecoinvent v3.11		
Sodium lauryl sulfate	Alkyl sulfate (C12-14) (GLO)   market for alkyl sulfate (C12-14)   Cut-off, U	Ecoinvent v3.11	Kindly refer Note 1	

Note: 1. Proxy: We have used the closest material if the required material is not available in SimaPro database, e.g., Clay, Feldspar  
2. Modelled based on secondary data: As Material is not available in Simapro database so we have modelled it based on generic material composition.

#### Processing dataset

Material	Processes	Library
Plastic	Blow moulding (RoW)   blow moulding   Cut-off, U	Ecoinvent v3.11
Plastic	Extrusion, plastic film (RoW)   extrusion, plastic film   Cut-off, U	Ecoinvent v3.11
Bronze	Casting, bronze (RoW)   casting, bronze   Cut-off, U	Ecoinvent v3.11
Brass	Casting, brass (GLO)   market for casting, brass   Cut-off, U	Ecoinvent v3.11
Steel/SS	Impact extrusion of steel, warm, deformation stroke (RoW)   impact extrusion of steel, warm, deformation stroke   Cut	Ecoinvent v3.11

Transportation Mode	Dataset	Library
Road	Transport, freight, lorry, 16-32 metric ton, diesel, EURO 4 (RoW)   transport, freight, lorry, 16-32 metric ton, diesel, EURO 4   Cut-off, U	Ecoinvent v3.11
Train	Transport, freight, train, fleet average (RoW)   transport, freight, train   Cut-off, U	Ecoinvent v3.11
Transoceanic	Transport, freight, sea, container ship, heavy fuel oil (GLO)   market for transport, freight, sea, container ship, heavy fuel oil   Cut-off, U	Ecoinvent v3.11

#### Electricity, Fuel and Water

Electricity and Fuel	Dataset	Library
Electricity Mix	Electricity, medium voltage (TH)   market for electricity, medium voltage   Cut-off, U	Ecoinvent v3.11
Photovoltaic	Electricity, low voltage (TH)   electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted   Cut-off, U	Ecoinvent v3.11
Natural Gas	Heat, district or industrial, natural gas (RoW)   heat production, natural gas, at industrial furnace >100KW   Cut-off, U	Ecoinvent v3.11
Water	Tap water (RoW)   market for tap water   Cut-off, U	Ecoinvent v3.11

#### Wastewater Treatment and Disposal

Disposal	Dataset	Library
WWTP	Wastewater from ceramic production (RoW)   market for wastewater from ceramic production   Cut-off, U	Ecoinvent v3.11
Disposal	Inert waste, for final disposal (RoW)   treatment of inert waste, inert material landfill   Cut-off, U	Ecoinvent v3.11