## Environmental Product Declaration

# Greenwich™ K-2032

20-3/4" x 18-1/4" wall-mount/concealed arm carrier bathroom sink with 4" centerset faucet holes

THE BOLD LOOK OF KOHLER®

When your lavatory needs to stand up to rigorous use, depend on premium KOHLER materials. Crafted of vitreous china with our exclusive KOHLER glaze, this Greenwich wall-mount lavatory will provide a lifetime of beauty and reliable performance. Its remarkably hard, glossy finish protects the surface for a clean, sanitary sink that maintains its shine under repeated use.

**Packaged product weight** 19.8 kg

**Top 3 ingredients** (>90% by weight)

1. Clay
2. Feldspar
3. Silica

**Product recycled content** 0%
**Product recyclable content** 2.9%

**Carbon footprint** 255 kg CO2-eq

**Relevant certifications**

- ADA
- ICC/ANSI A117.1
- ASME A112.19.2/CSA B45.1
- OBC

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

## WHEN IT COMES TO BELIEVING IN BETTER., *EVERY BIT COUNTS.*

We believe that the path to a better place is a constant endeavor. Every day nearly 30,000 Kohler associates worldwide are moving forward. And we believe positive steps, big or small, ours or yours, are worth celebrating and sharing.

# Environmental Product Declaration

**Greenwich™ K-2032**

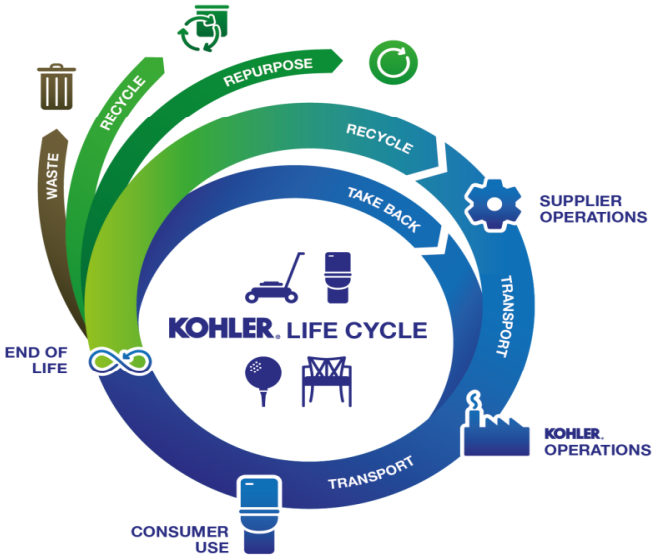
Vitreous Sanitary Ceramic Ware

THE BOLD LOOK OF KOHLER

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL ENVIRONMENT

According to ISO 14025

This document 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 cycles. At Kohler, we believe that the path to a better place is a constant endeavor. Our Design for Environment program, embedded within the Kohler New Product Development culture, considers 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. When we design products with the environment in mind, we believe that every choice counts.




| | |
|---|---|
| PROGRAM OPERATOR | UL Environment |
| DECLARATION HOLDER | Kohler |
| DECLARATION NUMBER | 4786429138.106.1 |
| DECLARED PRODUCT | Greenwich™ K-2032 |
| REFERENCE PCR | PCR for Building-Related Products and Services. Adapted for UL Environment from the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU). Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Part B: Requirements on the EPD for Sanitary Ceramics |
| DATE OF ISSUE | 16-Oct-14 |
| PERIOD OF VALIDITY | 5 Years |
| CONTENTS OF THE DECLARATION | Product definition and information about building physics<br>Information about basic material and the material's origin<br>Description of the product's manufacturing<br>Indication of product processing<br>Information about the in-use conditions<br>Life cycle assessment results<br>Testing results and verifications |

| | |
|---|---|
| The PCR review was conducted by | The Independent Expert Committee, SVR |
| This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories<br>☐ INTERNAL ☒ EXTERNAL | UL Environment |
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by | Thomas Gloria, Life-Cycle Services, LLC |

1 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.

## Product Definition and Information

### Product Description

The wall-mount lavatory shall be made of vitreous china. Lavatory shall be with overflow or without overflow. Lavatory shall be 20-3/4″ (527 mm) in length, and 18-1/4″ (464 mm) in width. Lavatory shall be for 4″ (102 mm) centers and drilled for concealed arm carrier. Lavatory shall have hanger. Lavatory shall be available with optional soap dispenser hole on left (-L) or right (-R).

### Applications and Uses

- Made from premium materials that withstand high-volume usage
- Constructed of vitreous china
- 20-3/4"L x 18-1/4"W
- Wall-mount installation
- Faucet not included

### Product Standards, Approvals and Certifications

Specified model meets or exceeds the following:

- ADA
- ICC/ANSI A117.1
- ASME A112.19.2/CSA B45.1
- OBC

## 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 |
| Balance | Miscellaneous Hardware and Packaging | 5-10 |

## Kohler Operations

### 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

**Kohler Plant**
*Kohler, Wisconsin*

**Spartanburg Plant**
*Spartanburg, South Carolina*

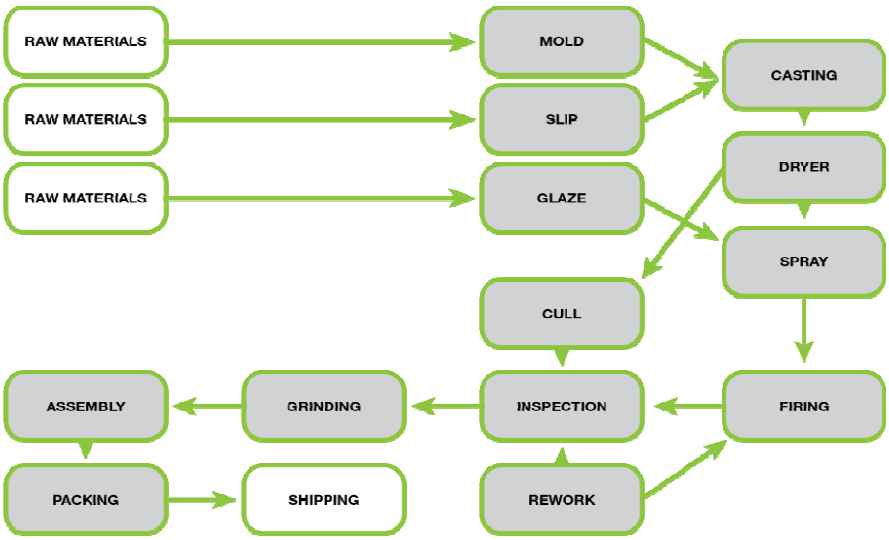
**Brownwood Plant**
*Brownwood, Texas*

**Monterrey Plants I, II**
*Monterrey, Mexico*

★ = Kohler manufacturing locations with completed SKU-specific Environmental Product Declarations
● = other Kohler manufacturing locations with SKU-specific Environmental Product Declarations in process

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

### Manufacturing Process



### Health, Safety and Environmental Aspects during Production

**Kohler Safety Management System (KSMS) and Kohler Environmental Management System (KEMS)**
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. The management systems are based on best management practices, and the application of these programs consistently delivers significant results. Some Kohler Co. locations have elected the additional step of becoming certified to OHSAS 18001 and/or ISO 14001.

### 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.

## Consumer Use

### Conditions of Use

The majority of product use phase environmental impacts for vitreous ceramic sanitary ware are related to water throughput. It is important to note that water use impacts are assigned to the device that controls water flow rate. For example, a lavatory sink EPD will not include these impacts, as water consumption is controlled by the faucet that is paired with it. Similarly, a toilet bowl EPD will not include water use impacts, as the tank or flushometer it is paired with provides this function. However, a one-piece toilet with integrated tank and bowl will include water use impacts within its EPD.

### Reference Service Life

Commercial lavatories and sinks are assumed to remain in service for 20 years.

### Cleaning and Maintenance

Commerical lavatories and sinks are assumed to require 365 cleanings per year with 10 ml of 1% sodium lauryl sulfate solution. 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 at end-of-life is possible, but not widely available at the present time.

### Disposal

The KOHLER® LCA model assumes the vitreous portion of the product is disposed of in a municipal landfill. Accessory and packaging materials are modeled as landfilled or recycled, depending on typical rates within the United States.

## Life Cycle Assessment

### Description of Declared or Functional Unit

The functional unit represented here is a single lavatory sink including the associated packaging and accessories.

To express these impacts in terms of 1 metric ton of product, multiply each result by 50.5.

### Cut-off Criteria

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

### Allocation

Impacts are allocated to individual products with a unit process approach. Typically, product mass is used to build the impact allocation factors. Product-specific quality data is also employed to match impacts to products.

### Background Data

Primary manufacturing data was collected directly from Kohler Co. vitreous manufacturing operations for calendar year 2013. Secondary (supply chain) data was taken from the U.S.-Ecoinvent v2.2 database.

### Data Quality

Primary manufacturing data was collected directly from process experts for the five Kohler vitreous plants within North America. 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 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.
Secondary data primarily references the U.S.-ecoinvent v2.2 database. This database is widely distributed throughout the United States and is referenced within the LCA community. All ecoinvent datasets have been critically reviewed.

When a product is produced at more than one plant, impacts are weighted by unit volume to produce a single result.

## System Boundaries

| 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)**

## LCA Modeling Scenarios

| Transport from gate to the building site (A4) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Liters of fuel | 38 | l/100 km |
| Transport distance | 853 | km |
| Capacity utilization (including empty runs) | 89 | % |
| Gross density of products transported | - | $kg/m^3$ |
| Capacity utilization volume factor | 89 | % |

| Installation into the building (A5) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Auxiliary | - | kg |
| Water consumption | - | $m^3$ |
| Other resources | - | kg |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Material loss | - | kg |
| Output substance following waste treatment on-site | - | kg |
| Dust in the air | - | kg |
| VOC in the air | - | kg |

| Use phase reference (B1) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Flushes/day/person | N/A | - |
| Reference service life (RSL) | 20 | years |

| Maintenance (B2) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Information on maintenance | - | - |
| Maintenance cycle (cleaning) | 7300 | Number/RSL |
| Water consumption | - | $m^3$ |
| Auxiliary | - | kg |
| Other resources (cleaning product) | 73 | kg |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Material loss | - | kg |

| Repair (B3) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Information on the repair process | - | - |
| Information on the inspection process | - | - |
| Repair cycle | - | Number/RSL |
| Water consumption | - | $m^3$ |
| Auxiliary | - | kg |
| Other resources | - | kg |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Material loss | - | kg |

| Replacement (B4)/Refurbishment (B5) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Replacement cycle | - | Number/RSL |
| Electricity consumption | - | kWh |
| Liters of fuel | - | l/100 km |
| Replacement of worn parts | - | kg |

| Operational energy use (B6) and water use (B7) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Water consumption | 0 | $m^3$/p/RSL |
| Electricity consumption | - | kWh |
| Other energy carriers | - | MJ |
| Equipment output | - | kW |

| End of life (C1-C4) | | |
|---|---|---|
| **Name** | **Value** | **Unit** |
| Collected separately | 2 | kg |
| Collected as mixed construction waste | 18 | kg |
| Reuse | - | kg |
| Recycling | 2 | kg |
| Energy recovery | - | kg |
| Landfilling | 18 | kg |

## Results of the Assessment

| TRACI 2.1 Impact Assessment | | | |
|---|---|---|---|
| **Parameter** | **Parameter** | **Value** | **Unit** |
| GWP | Global warming potential | 255 | kg $CO_2$-Eq. |
| ODP | Depletion potential of the stratospheric ozone layer | 2.49E-05 | kg CFC-11 Eq. |
| AP Air | Acidification potential for air emissions | 1.07 | kg $SO_2$-Eq. |
| EP | Eutrophication potential | 0.76 | kg N-Eq. |
| SP | Smog formation potential | 13.25 | kg $O_3$-Eq. |

| CML 4.1 Impact Assessment | | | |
|---|---|---|---|
| **Parameter** | **Parameter** | **Value** | **Unit** |
| GWP | Global warming potential | 255 | kg $CO_2$-Eq. |
| ODP | Depletion potential of the stratospheric ozone layer | 1.97E-05 | kg CFC-11 Eq. |
| AP Air | Acidification potential for air emissions | 1.02 | kg $SO_2$-Eq. |
| EP | Eutrophication potentials | 0.42 | kg $(PO_4)^3$-Eq. |
| POCP | Formation potential of tropospheric ozone | 0.241 | kg ethane-Eq. |
| ADP elements | Abiotic depletion potential for non-fossil resources | 1.52 | kg Sb-Eq. |
| ADP fossil fuels | Abiotic depletion potential for fossil resources | 8 | MJ, calorific value |

| Resource Use | | | |
|---|---|---|---|
| **Parameter** | **Parameter** | **Value** | **Unit** |
| PERE | Renewable primary energy as energy carrier | 3253 | MJ, lower calorific value |
| PERM | Renewable primary energy resources as material utilization | 0.43 | MJ, lower calorific value |
| PERT | Total use of renewable primary energy resources | 3254 | MJ, lower calorific value |
| PENRE | Nonrenewable primary energy as energy carrier | 3432 | MJ, lower calorific value |
| PENRM | Nonrenewable primary energy as material utilization | 189 | MJ, lower calorific value |
| PENRT | Total use of nonrenewable primary energy resources | 3620 | MJ, lower calorific value |
| SM | Use of secondary material | 0 | MJ, lower calorific value |
| RSF | Use of renewable secondary fuels | 0 | MJ, lower calorific value |
| NRSF | Use of nonrenewable secondary fuels | 0 | MJ, lower calorific value |
| FW | Use of net fresh water | 16 | $m^3$ |

| Output Flows and Waste Categories | | | |
|---|---|---|---|
| **Parameter** | **Parameter** | **Value** | **Unit** |
| HWD | Hazardous waste disposed | 0 | kg |
| NHWD | Non-hazardous waste disposed | 41 | kg |
| RWD | Radioactive waste disposed | 0 | kg |
| CRU | Components for re-use | 0 | kg |
| MFR | Materials for recycling | 4 | kg |
| MER | Materials for energy recovery | 0 | kg |
| EEE | Exported energy | 0 | MJ, lower calorific value |

### Interpretation

Due to the high degree of value add within the vitreous product manufacturing process, the Kohler Operations life cycle stage drives most of the environmental impact categories for vitreous ceramic sanitary ware. Exceptions are products that control water flow rate, such as toilet tanks and one-piece toilets, which will see these consumer use phase impacts dominate the product life cycle.
Manufacturing impacts are primarily driven by energy (natural gas and electricity) use. Therefore, projects that improve energy efficiency have been and will continue to be a primary area of focus. Hardware accessories, especially those that contain metals such as brass and steel, also carry a greater contribution toward overall product environmental impact. Mass reduction and material substitution are areas of focus within the supplier operations portion of the product life cycle.
Where applicable, water use reduction efforts will see the greatest return on investment due primarily to the associated reduction in energy required to pump and treat this water. These efforts must be balanced against the product and product system's capacity to operate effectively when less water is available as a motive force.

## 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. (IBU). Product Category Rules Part B: Requirements on the Environmental Product Declaration for Sanitary ceramics.
- SimaPro 7.2 — PRé Consultants. SimaPro Life Cycle Assessment version 7.2 (software).
- 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
- ULE 2013 — UL Environment, General Program Instructions, 2013.
- OHSAS 18001 — Occupational Health and Safety Management Systems - Requirements
- ISO 14001 — Environmental Management Systems - Requirements with guidance for use
- ADA — Americans with Disabilities Act - Standards for Accessible Design
- ICC/ANSI A117.1 — International Code Council - Accessible and Usable Buildings and Facilities
- ASME A112.19.2/CSA B45.1 — Ceramic Plumbing Fixtures
- OBC — Ontario Building Code Section 3.8 - Barrier-Free Design