ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025

Owner of the Declaration                Kaleseramik Çanakkale Kalebodur Ceramic Industries Inc
Programme holder                        Institut Bauen und Umwelt (IBU)
Publisher                               Institut Bauen und Umwelt (IBU)
Declaration number                       EPD-KSK-2012311-E
Issue date                              01.07.2012
Valid to                                30.06.2017

Ceramic Floor Tiles
Kaleseramik Çanakkale Kalebodur Ceramic Industries Inc

www.bau-umwelt.com
Kaleseramik Çanakkale Kalebodur Ceramic Industries Inc

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Rheinufer 108
D-53639 Königswinter

Declaration number
EPD-KSK-2012311-E

This Declaration is based on the Product Category Rules:
PCR Ceramic tiles and panels, 06-2011
(PCR tested and approved by the independent expert committee, SVA)

Issue date
01.07.2012

Valid to
30.06.2017

Owner of the Declaration
Kaleseramik Çanakkale Kalebodur Ceramic Industries Inc
Büyükdere Caddesi Kaleseramik Binasi 34330 Levent, Istanbul, Turkey

Declared product / Declared unit
Ceramic floor tiles / 1 m³

Scope:
This declaration is relevant to ceramic floor tiles produced at a single location at Çan Plant in Turkey. The EPD declaration applies to all ceramic floor tiles as products selected represent 80% of the production. The remainings are similar in terms of composition and thickness with only differences in sizes, which makes no difference per 1 m².

Verification
The CEN standard EN 15804 serves as the core PCR.
Verification of the EPD by an independent third party as per ISO 14025

For interior applications, floor tiles should be selected regarding the technical specifications such as PEI value, hardness, stain resistance, chemical resistance and easy cleaning, if they are to be used in the interiors of a residence.

The tiles selected for exteriors should be frost resistant and have low water absorbency.

The numbers beside ceramic floor tiles indicate the abrasion resistance of the ceramic surcafe according to Turkish and European Standard TS-EN ISO10545-7:
Class-1: Suitable for walls and bedroom and bathroom floors.
Class-2: Suitable for light traffic areas, such as the floors of a house.
Class-3: Suitable for moderately heavy traffic floors such as in entrances and corridors.
Class-4: Suitable for heavy traffic area floors such as in restaurants, stores, etc.
Class-5: Suitable for floors subject to heavy foot traffic and abrasion, such as in shops, hotels, restaurants, offices, schools, exhibition halls, etc.

Technical Data
Kale's ceramics are manufactured under the warranty of the ISO 9001:2000 Quality Management System to comply with the product requirement spe-

Product
Ceramic tiles are primarily made of kaolin, clay and feldspar, but they also include other raw materials such as marble, frit, dolomite, bentonite and quartz. The required composition is blended with water to form uniform slurry. This slurry then fed into spray driers to form uniform granules ready for compaction. These granules are then shaped to form the bisque or green body. This can be glazed or left unglazed depending on its intended use. The green ceramic body is fired at high temperatures, resulting in a hard body. Floor tiles tend to have better mechanical strength compared to wall tiles, due to their lower porosity. Depending on the use, tiles might be glazed to control abrasion and slip resistance.

This EPD declaration is applicable to entire floor tile range as the data collected from two products, Tamara White (33x33x0.8cm) and Momentum Kemik (45x45x0.8cm).

Application
Ceramic floor tiles are largely used as interior and exterior floor coverings. Interior applications include bathrooms, kitchens, living rooms, halls, balconies etc. Exterior applications can be in public buildings, commercial and industrial areas, swimming pools and façades etc.
The ceramic floor tiles conform to following standards and specifications:
- Water absorption as a percentage by mass, measured as per EN ISO 10545-3: 3%
- Breaking load to DIN EN ISO 10545-4: 1550 [N]
- Bending strength to DIN EN ISO 10545-4: min 30 [N/mm²]

The following details can be provided as an option:
- Chemical resistance to DIN EN ISO 10545-13
  Resistance to low concentrations of acids and alkalis: GLA-GLB
  Resistance to high concentrations of acids and alkalis: Affirmative
- Resistance to household chemicals and swimming pool salts: min GB
- Stain resistance to DIN EN ISO 10545-14: min Class-3

Only for floor coverings:
- Non-slip properties
- R evaluation groups to DIN 51130 and A,B,C - evaluation classes to DIN 51093: R:09-10-11-12, CLASS A-B-C

Unglazed:
- Resistance to deep abrasion as per DIN EN ISO 10545-6: Ave.130mm³

**Base materials / Ancillary materials**

Ceramic floor tiles are primarily made of raw materials such as kaolin, clay, feldspar, bentonite, water glass, sodium phosphate and granite. Major constituents are kaolin, clay, granite and feldspar. There are no products that can be included in “Candidate List of Substances of Very High Concern for Authorisation” and raw materials used are not part of the EU REACH regulation.

The background to which the tiling will be applied must be clean, smooth, and free from dust, oil free and grease. If using rough surface, matte or polished porcelain or anti-slip ceramic tiles, residual filling material must be removed as soon as possible from the tile surface. Ceramic floor tiles have a long life and can be disposed of in inert landfill sites at the end of their useful life.

**Reference service life**

This EPD is relevant to cradle to factory gate and therefore no reference to useful life is required.

**LCA: Calculation rules**

**Declared unit**

The declared unit is 1 m² ceramic floor tiles with average weight of 17 kg.

**System boundary**

This is a cradle to gate EPD.

The system boundary involves raw materials, transport and production. Raw materials include pre-treatment before production such as slurry preparation and production of granules by spray drying. Production stages include forming, drying, glazing, firing and packaging. Transport is only relevant for delivery of raw materials to the plant and forklift usage within the factory. With reference to the end of life, process waste is recycled within the process. Broken ceramics are used for green body formulation as part of closed loop recycling.

**Comparability**

Basically, a comparison or an evaluation of EPD data is only possible if all the 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.

This EPD is comparable with ceramic floor tiles that comply with the product requirement specifications of EN 14411 Group BI for floor tiles and evaluated according to EN 15804.

The floor tile manufacturing process flow is depicted below:

![Floor tile manufacturing process flow](image)

**LCA: Scenarios and additional technical information**

**Reuse- Recovery- and Recycling potential (D)**

Ceramic floor tiles normally end up in inert landfill sites with other building waste. They can be recycled back for utilization in different applications. However, no possible benefits of recycling were taken into account in the LCA work here.
# LCA: Results

## Description of the System Boundary (X = Included in LCA; MND = Module Not Declared)

<table>
<thead>
<tr>
<th>Product Stage</th>
<th>Construction Process Stage</th>
<th>Use Stage</th>
<th>End of Life Stage</th>
<th>Benefits and Loads Beyond the System Boundaries</th>
</tr>
</thead>
</table>

## Results of the LCA - Environmental Impact: [FU: 1 m² of ceramic floor tiles]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Manufacturing</th>
<th>EoL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Potential [kg CO₂ Eq.]</td>
<td>3.60</td>
<td>0.544</td>
</tr>
<tr>
<td>Depletion Potential of the Stratospheric Ozone Layer [kg CFC11 Eq.]</td>
<td>3.93E-07</td>
<td>7.44E-08</td>
</tr>
<tr>
<td>Formation Potential of Tropospheric Ozone Photochemical Oxidants [kg ethene Eq.]</td>
<td>1.63E-03</td>
<td>7.24E-04</td>
</tr>
<tr>
<td>Acidification Potential of Land and Water [kg SO₂ Eq.]</td>
<td>1.31E-02</td>
<td>3.46E-03</td>
</tr>
<tr>
<td>Eutrophication Potential [kg PO₄³⁻ Eq.]</td>
<td>6.09E-03</td>
<td>7.09E-04</td>
</tr>
<tr>
<td>Abiotic Depletion Potential for Non Fossil Resources [kg Sb Eq.]</td>
<td>2.72E-02</td>
<td>3.97E-03</td>
</tr>
<tr>
<td>Abiotic Depletion Potential for Fossil Resources [MJ Eq.]</td>
<td>61.6</td>
<td>9.13</td>
</tr>
</tbody>
</table>

## Results of the LCA - Resource Use: [FU: 1 m² of ceramic floor tiles]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Manufacturing</th>
<th>EoL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Renewable Primary Energy Excluding Renewable Primary Energy Resources Used as Raw Materials [MJ]</td>
<td>1.70</td>
<td>0.121</td>
</tr>
<tr>
<td>Use of Renewable Primary Energy Resources Used as Raw Materials [MJ]</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Use of Renewable Primary Energy Resources [MJ]</td>
<td>1.70</td>
<td>0.121</td>
</tr>
<tr>
<td>Use of Non Renewable Primary Energy Excluding Non Renewable Primary Energy Resources Used as Raw Materials [MJ]</td>
<td>51.5</td>
<td>8.60</td>
</tr>
<tr>
<td>Use of Non Renewable Primary Energy Resources Used as Raw Materials [MJ]</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Use of Non Renewable Primary Energy Resources [MJ]</td>
<td>51.5</td>
<td>8.60</td>
</tr>
<tr>
<td>Use of Secondary Material [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Use of Renewable Secondary Fuels [MJ]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Use of Non Renewable Secondary Fuels [MJ]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Use of Net Fresh Water [m³]</td>
<td>2.07E-01</td>
<td>4.72E-03</td>
</tr>
</tbody>
</table>

## Results of the LCA – Output Flows and Waste Categories: [FU: 1 m² of ceramic floor tiles]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Manufacturing</th>
<th>EoL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Waste Disposed [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non Hazardous Waste Disposed [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Radioactive Waste Disposed [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Components for Re-use [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Materials for Recycling [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Materials for Energy Recovery [kg]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Exported Energy per Energy Carrier [Typ] [MJ]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Exported Energy per Energy Carrier [Typ] [MJ]</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
References

EN ISO 10545-3
Ceramic tiles -- Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density

ISO 9001
DIN EN ISO 9001:2008, Quality Management System-Requirements

DIN EN ISO 10545-4
Ceramic tiles -- Part 4: Determination of modulus of rupture and breaking strength

ISO 14001

DIN EN ISO 10545-5
Ceramic tiles -- Part 5: Determination of impact resistance by measurement of coefficient of restitution

OHSAS 18001
DIN EN OHSAS 18001:2007, Occupational Health and Safety Management System

DIN EN ISO 10545-6
Ceramic tiles -- Part 6: Determination of resistance to deep abrasion for unglazed tiles

ISO 14025
DIN EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

DIN EN ISO 10545-7
Ceramic tiles -- Part 7: Determination of resistance to surface abrasion for glazed tiles

ISO 14040-44

PCR 2011, Part A
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 2011
www.bau-umwelt.de

PCR 2011, Part B
PCR Guidance-Texts for Building-Related Products and Services, from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part B: Requirements on the EPD for ceramic tiles and panels.
www.bau-umwelt.de

Ecoinvent
Ecoinvent Centre www.ecoinvent.org

EN 14411:2006
Ceramic tiles. Definitions, classification, characteristics and marking

SimaPro
SimaPro LCA Package, Pré Consultants, the Netherlands
www.pre-sustainability.com