




# Environmental Product Declaration

# Mexicali, Mexico Floor Tile



**AMERICAN OLEAN®**  
PROVEN IN TILE™

|   |   |   |
|---|---|---|
| Program Operator                                | NSF Certification LLC<br>789 N. Dixboro, Ann Arbor, MI 48105<br>www.nsf.org   |  |
| General Program instructions and Version Number | Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2  |   |
| Manufacturer Name and Address                   | American Olean<br>Carretera Ejido Michoacán de Ocampo Km 2.75 Ejido Puebla<br>21290 Mexicali, B.C., Mexico  |   |
| Declaration Number                              | EPD10208  |   |
| Declared Product and Functional Unit            | Floor Tile manufactured at Mexicali, Mexico<br>1 square meter of installed flooring and with a building service life of 75 years                          |   |
| Reference PCR and Version Number                | Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2<br>Part B: Flooring EPD Requirements. UL 10010-7, September 28, 2018 |   |
| Product's intended Application and Use          | Flooring and Wall Applications  |   |
| Product RSL                                     | 75 years  |   |
| Markets of Applicability                        | North America   |   |
| Date of Issue                                   | 05/17/2019  |   |
| Period of Validity                              | 5 years from date of issue  |   |
| EPD Type  | Product Specific  |   |
| Range of Dataset Variability                    | N/A   |   |
| EPD Scope                                       | Cradle to Grave   |   |
| Year of reported manufacturer primary data      | 2018  |   |
| LCA Software and Version Number                 | GaBi 8.7.0.18   |   |
| LCI Database and Version Number                 | GaBi Database Version 8.7, Service Pack 37  |   |
| LCIA Methodology and Version Number             | TRACI 2.1<br>CML 2001-Jan 2016  |   |
| The sub-category PCR review was conducted by:   | Jack Geibig (Chair)<br>Thomas Gloria, PhD<br>Thaddeus Owen  |   |

|   |   |
|---|---|
| <p>This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Life Cycle Assessment Calculation Rules and Report Requirements" v3.2 (December 2018), based on CEN Norm EN 15804 (2012) and ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017)</p> <p><input type="checkbox"/> Internal      <input checked="" type="checkbox"/> External</p> | <p>Jenny Oorbeck<br/><a href="mailto:joorbeck@nsf.org">joorbeck@nsf.org</a></p>                |
| <p>This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:</p>  | <p>WAP Sustainability Consulting</p>  |
| <p>This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:</p>   | <p>Jack Geibig - EcoForm<br/><a href="mailto:jgeibig@ecoform.com">jgeibig@ecoform.com</a></p>  |

**Limitations:**  
Environmental declarations from different programs (ISO 14025) may not be comparable.  
Comparison of the environmental performance of Flooring Products 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 energy use phase as instructed under this PCR.  
Full conformance with the PCR for Products allows EPD comparability only when all stages of a life cycle have been considered. 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.

## 1. PRODUCT DEFINITION AND INFORMATION

### 1.1 Description of Company

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Founded in 1923, American Olean is an established manufacturer of an extensive array of quality tile products. Through an appealing selection and a trusted network of industry professionals, American Olean empowers the creative visions of residential and commercial design and construction. For more information, please visit [www.americanolean.com](http://www.americanolean.com).

### 1.2 Product Description

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This Environmental Product Declaration covers all tile products manufactured at the location in the EPD's title for the duration of this document.

#### 1.2.1 Product Identification

Dal-Tile brands of ceramic tile are a mixture of multiple mineral-based natural materials, that can include various combinations of clay, sand, feldspar, talc, nepheline, shale and/or others. The tiles are either pressed or extruded into the desired shape and generally receive a glaze or ceramic ink application to the surface prior to being fired in kilns at high temperatures. The finished product, ceramic or porcelain tile, is fire resistant, non-combustible, durable

(lasts a lifetime) and extremely easy to maintain.

As floor and wall coverings, fired tile products provide dual functions. They serve 1) an aesthetic function as a design component, and 2) a technical function as a building finishing material. As a building material, fired tile is capable of withstanding a wide range of environmental stresses.

The versatility of fired tile is further enhanced by the extensive ranges of colors, textures, and decorative motifs offered by Dal-Tile under multiple brand names. Dal-Tile has multiple manufacturing locations producing products in a wide range of sizes from less than 1" x 1" to 24" x 48".

Ceramic tiles are classified by their shaping or production method (either dry pressed or extruded), and the level of water absorption measured as a percentage in the fired product.

#### Classifications of Ceramic Tile - Wear Ratings from the Porcelain Enamel Institute

- Group I Classification - Tile that is suitable for residential bathrooms with light foot traffic.
- Group II Classification - Tile that can be used in residential areas, but not areas with high foot traffic, such as in kitchens, foyers, laundry rooms, etc.
- Group III Classification - Tile that is recommended for all residential installations with normal foot traffic.
- Group IV Classification - Tile that is suited for light to medium commercial applications, such as offices, sales rooms.
- Group V Classification - Tile used in heavy commercial traffic areas and is suited for exterior areas, shopping centers, airports, hotel lobbies, and public walkways.

### 1.2.2 Product Specification and Application Rules

The products considered in this EPD meet or exceed the following Technical Specifications:

- ANSI A137.1 - American National Standard Specifications for Ceramic Tile
- ISO 10545 - International Organization for Standardization Specifications for Ceramic Tile

Fire Testing:

- Classification: A, Flame Spread: 0, Smoke Developed: 0
- Interior wall: ASTM E84, NFPA 255, UL 723
- Interior floor: ASTM E 648, NFPA 253

### 1.2.3 Product Average

Multiple body formulations are used to manufacture tile products at this facility. To determine the average formulation for the purposes of this EPD, a production weighted average was used based on 2018 production values to create a single, representative body formulation. The range of products evaluated in the representative product are within the guidelines of the PCR.

## 1.3 Application

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Ceramic tile products are commonly used in a variety of applications including commercial, light commercial, institutional, and residential interior and exterior applications for flooring applications.

## 1.4 Technical Data

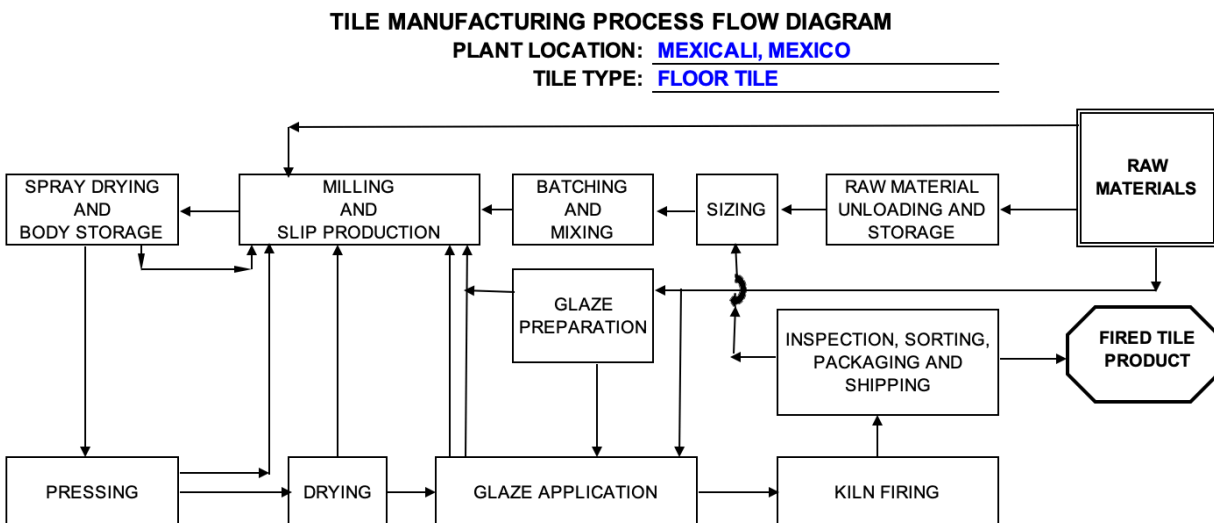
Table 1: Technical Details

| Parameter                                  | Mexicali, Mexico - Floor Tile                |
|--|--|
| Nominal Area (mm <sup>2</sup> )            | 92903, 90322, 185806, 109032, 247741, 258064 |
| Nominal Value Sizes (in)                   | 6x24, 7x20, 12x24, 13x13, 18x18, 20x20       |
| Average Fired Weight (g/m <sup>2</sup> )   | 18,602.0                                     |
| Average Fired Weight (lb/ft <sup>2</sup> ) | 3.81   |
| Thickness min value (mm)                   | 6.350  |
| Thickness max value (mm)                   | 9.525  |
| Class                                      | P4   |
| Tile Type                                  | Ceramic                                      |
| Grade                                      | Standard                                     |
| Dimensional Categories                     | Calibrated                                   |

## 1.5 Declaration of Methodological Framework

This EPD is considered a Cradle-to-Grave study. A summary of the life cycle stages included in this EPD is presented in 2.2. The reference service life is outlined in Table 10 and is only applicable if all manufacturing guidelines are followed regarding site-selection and installation, found online. No known flows are deliberately excluded from this EPD. Third party verified ISO 14040/44 secondary LCI data sets contribute more than 67% of total impacts in all impact categories required by the PCR.

## 1.6 Flow Diagram



## 1.7 Manufacturing

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The manufacturing process begins with the mining of raw materials, which is a mixture composed mostly of clay, feldspar, sand, and other minerals. The raw materials are mixed and ground together with water in a mill to form a wet slurry called body slip. This slurry is then pumped into a large spray dryer to make the mixture uniform as well as reduce its moisture content. Next, the spray dried powder is pressed to form tiles of the desired shape and size. After that, the tiles are dried to remove most of their moisture. Depending on the product, pigments or stains can be mixed into the body powder and/or the glazes. Glazes and/or ceramic inks may be applied to the surface of the tile. Finally, the tiles are fired in a kiln at extremely high temperature. Any unfired and/ or fired scrap generated during the manufacturing process is recovered, crushed and returned to the mixing process. This virtually eliminates the generation of waste. Different sites produce a small amount of waste (between 0.01 and 1.769 kg of waste per m<sup>2</sup> of tile) which is sent offsite to a landfill. Once the tiles are manufactured, they are packaged in cardboard boxes and palletized.

## 1.8 Material Composition

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Table 2: Material Composition

| Component | Material      | Recycled | Mexicali, Mexico - Floor Tile (Mass %) |
|-----------|---------------|----------|--|
| Body      | Kaolin Clay   | No       | 42.0%                                  |
|           | Feldspar      | No       | 7.8%                                   |
|           | Sand          | No       | 28.4%                                  |
|           | Fired Scrap   | Yes      | 2.6%                                   |
|           | Unfired Scrap | Yes      | 12.9%                                  |
|           | Nepheline     | No       | 4.5%                                   |
| Surface   | Glaze         | No       | 1.3%                                   |

This product contains no regulated substances.

## 1.9 Packaging

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Table 3: Packaging Inputs

| Input (per m <sup>2</sup> ) | Disposal Mechanism                                       | Value | Unit              |
|-----------------------------|--|-------|-------------------|
| Cardboard                   | Recycled (75%),<br>Landfilled (20%),<br>Incinerated (5%) | 0.241 | kg/m <sup>2</sup> |

Packaging waste disposal has been modeled as per guidelines in section 2.8.5 of Part A: Life Cycle Assessment Calculation Rules and Report Requirements.

## 1.10 Product Installation

Installation instructions and materials are referenced from guidelines published by the Tile Council of North America (TCNA). Cement mortar acts as the adhesive that binds the tile to the floor or wall surface. It is recommended that 4.07 kg of mortar on average is required to install 1 m<sup>2</sup> of tile. 4.5% of the total material is lost as waste which is then sent to the landfill. Cement grout acts as the filler for the spaces in between the tiles. It was determined that 0.212 kg of grout on average is required to fill an area of 1 m<sup>2</sup> of ceramic tiles. Along with cement and mortar, installation solution made up of acrylate and water is also used in the installation process. These are detailed in the table below.

Table 4: Installation Materials

| Material         | Amount | Unit              | Amount | Unit               |
|------------------|--------|-------------------|--------|--------------------|
| Mortar           | 4.07   | kg/m <sup>2</sup> | 0.83   | lb/ft <sup>2</sup> |
| Grout            | 0.212  | kg/m <sup>2</sup> | 0.043  | lb/ft <sup>2</sup> |
| Water            | 0.37   | kg/m <sup>2</sup> | 0.075  | lb/ft <sup>2</sup> |
| Acrylate         | 0.043  | kg/m <sup>2</sup> | 0.008  | lb/ft <sup>2</sup> |
| Waste for mortar | 4.5    | %                 | 4.5    | %                  |
| Waste for grout  | 4.5    | %                 | 4.5    | %                  |

## 1.11 Use Conditions

The floors are cleaned using a dust mop every day and using a damp mop 4 times a year for residential and 36 times a year for commercial applications as recommended by the Tile Council of North America (TCNA). Commercial use case scenario has been applied as a conservative estimate.

Table 5: Use Phase Parameters

| Use        | Cleaning Process | Cleaning Frequency          | Consumption of energy and resources |
|------------|------------------|-----------------------------|-------------------------------------|
| Commercial | Dust mop         | 365 times/ year             | -                                   |
|            | Damp mop         | 36 times/ year (Commercial) | Tap water                           |

Table 6: Use Phase Inputs

| Input     | Amount | Unit                 |
|-----------|--------|----------------------|
| Tap water | 0.783  | l/m <sup>2</sup> /yr |

## 1.12 Product Reference Service Life and Building Estimated Service Life

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According to Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment, V3.2, 2018, the Estimated Service Life (ESL) of the building is assumed to be 75 years. Since ceramic tiles are expected to last as long as the building itself, the Reference Service Life (RSL) of ceramic tiles is taken to be 75 years.

## 1.13 Disposal

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All waste has been classified according to regional-specific legislation as laid out in Section 2.8.6 in Part A: Life Cycle Assessment Calculation Rules and Report Requirements from UL Environment. Since ceramic is a non-metal, all of it is landfilled at end-of-life as per the aforementioned PCR.



## 2. LIFE CYCLE ASSESSMENT BACKGROUND INFORMATION

### 2.1 Functional Unit

The functional unit according to the PCR is 1 m<sup>2</sup> of finished flooring.

Table 7: Functional Unit

|                                   | Mexicali, Mexico – Floor Tile |
|-----------------------------------|-------------------------------|
| Functional Unit [m <sup>2</sup> ] | 1                             |
| Average Weight [kg]               | 18.60                         |

### 2.2 System Boundary

This EPD is considered a Cradle-to-Grave study. A summary of the life cycle modules included in this EPD is presented in Table 8. Infrastructure flows have been excluded.

Table 8: Summary of Included Life Cycle Modules

| Module Name | Description                              | Analysis Period | Summary of Included Elements  |
|-------------|--|-----------------|---|
| A1          | Product Stage: Raw Material Supply       | 2018            | Raw Material sourcing and processing as defined by secondary data.  |
| A2          | Product Stage: Transport                 | 2018            | Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and measured and calculated distance.                |
| A3          | Product Stage: Manufacturing             | 2018            | Energy, water and material inputs required for manufacturing products from raw materials. Packaging materials and manufacturing waste are included as well. |
| A4          | Construction Process Stage: Transport    | 2018            | Shipping from manufacturing site to project site. Fuel use requirements estimated based on assumed distance recommended by the PCR (Part B).                |
| A5          | Construction Process Stage: Installation | 2019            | Installation materials, installation waste and packaging material waste.  |
| B1          | Use Stage: Use                           | 2019            | Use of the product.   |
| B2          | Use Stage: Maintenance                   | 2019            | Cleaning water.   |
| B3          | Use Stage: Repair                        | 2019            | Ceramic tile typically does not need to be repaired.  |
| B4          | Use Stage: Replacement                   | 2019            | No inputs required for replacement manufacturing. Ceramic tile does not need to be replaced for over 75 years.  |
| B5          | Use Stage: Refurbishment                 | 2019            | Ceramic tile is typically not refurbished.  |
| B6          | Operational Energy Use                   | 2019            | Operational Energy Use of Building Integrated System During Product Use   |
| B7          | Operational Water Use                    | 2019            | Operational Water Use of Building Integrated System During Product Use  |
| C1          | EOL: Deconstruction                      | 2019            | No inputs required for deconstruction.  |
| C2          | EOL: Transport                           | 2019            | Shipping from project site to landfill. Fuel use requirements estimated based on product weight and assumed distance recommended by the PCR (Part B).       |
| C3          | EOL: Waste Processing                    | 2019            | Waste processing not required. All waste can be processed as is.  |
| C4          | EOL: Disposal                            | 2019            | Assumes all products are sent to landfill. Landfill impacts modeled based on secondary data.  |
| D           | Benefits beyond system                   | MND             | Credits from energy or material capture.  |

## 2.3 Estimates and Assumptions

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All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the LCA, the usage information was divided by the production to create an energy and water use per square meter. Another assumption is that the installation tools are used enough times that the per square meter impacts are negligible.

## 2.4 Cut-off Rules

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Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit. No known flows are deliberately excluded from this EPD.

## 2.5 Data Sources

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Primary data was collected by American Olean associates for onsite energy, water and waste during the course of manufacturing. Whenever available, supplier data was used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production was used from GaBi Database Version 8.7, Service Pack 37. All calculation procedures adhere to ISO14044.

## 2.6 Data Quality

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The geographical scope of the manufacturing portion of the life cycle is Mexicali, Mexico. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent. Primary data were provided by the manufacturer and represent all information for calendar year 2018. Primary data provided by the manufacturer is specific to the technology that the company uses in manufacturing their product. It is site-specific and considered of good quality. Data used to allocate energy and water on a per unit of product produced includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering was not available to extract process only energy and water use from the total energy use. Sub-metering would improve the technological coverage of data quality.

## 2.7 Period under Review

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The period under review is calendar year 2018.

## 2.8 Allocation

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General principles of allocation were based on ISO 14040/44. There are no products other than ceramic tiles that are produced as part of the manufacturing processes studied in the LCA. Since there are no co-products, no allocation based on co-products is required. To derive a per unit value for manufacturing inputs such as electricity, natural gas and water, allocation based on total production in square meters was adopted. Discussions with American Olean staff divulged this was a more representative way than via mass to allocate the manufacturing inputs based on the manufacturing processes used and the types of products created. As a default, secondary GaBi datasets use a physical mass basis for allocation. Throughout the study recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated with the previous life of a raw material from recycled stock are excluded from the system boundary. Additionally, impacts and benefits associated with secondary functions of materials at end of life are also excluded (i.e. production into a third life or energy generation from the incineration plant). The study does include the impacts associated with reprocessing and preparation of recycled materials that are part of the bill of materials of the products under study.

## 2.9 Comparability and Benchmarking

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The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the variability of the final results and make comparisons misleading. Without understanding the specific variability, the user is therefore, not encouraged to compare EPDs. Even for similar products, differences in use and end-of-life stage assumptions, and data quality may produce incomparable results. Comparison of the environmental performance of Flooring Products 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 energy use phase as instructed under this PCR. Full conformance with the PCR for flooring products allows EPD comparability only when all stages of a life cycle have been considered. 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.



### 3. LIFE CYCLE ASSESSMENT SCENARIOS

Table 9: Transport to building site (A4)

| Name                               | Truck   | Unit    |
|------------------------------------|---|---------|
| Fuel type                          | Diesel  | -       |
| Liters of fuel                     | 39.0625                                       | l/100km |
| Vehicle type                       | Heavy duty diesel truck/<br>50,000 lb payload | -       |
| Transport distance                 | 800   | km      |
| Capacity utilization               | 65  | %       |
| Weight of products transported     | 18.97   | kg      |
| Capacity utilization volume factor | 1   | -       |

Table 10: Reference Service Life

| Name  | Value  | Unit  |
|---|--|-------|
| RSL   | 75   | years |
| Declared product properties (at the gate) and finishes, etc.                                  | See Table 1  | -     |
| Design application  | Installation per recommendation<br>by manufacturer | -     |
| An assumed quality of work, when installed in accordance with the manufacturer's instructions | Accepted industry standard                         | -     |
| Indoor environment (if relevant for indoor applications)                                      | Normal building operating conditions               | -     |
| Use conditions, e.g. frequency of use, mechanical exposure                                    | Normal building operating conditions               | -     |

Table 11: Installation into the building (A5)

| Name  | Value   | Unit               |
|---|---|--------------------|
| Mortar  | 4.07  | kg                 |
| Grout   | 0.212   | kg                 |
| Acrylate  | 0.043   | kg                 |
| Net freshwater consumption specified by water source and fate                                       | 0.0004 m <sup>3</sup> tap water,<br>installation solution | m <sup>3</sup>     |
| Product loss per functional unit  | 0.37  | kg                 |
| Waste materials at the construction site before waste processing, generated by product installation | 0.814   | kg                 |
| Packaging waste, cardboard  | 0.242   | kg                 |
| Biogenic carbon contained in packaging  | 0.857   | kg CO <sub>2</sub> |



Table 12: Maintenance (B2)

| Name  | Value   | Unit                        |
|---|---|-----------------------------|
| Maintenance process information                               | Use phase parameters as recommended by <a href="#">ICNA guidelines</a>  |                             |
| Dust mop  | 27,375  | Cycles/ RSL and Cycles/ ESL |
| Damp mop (Commercial)   | 2,700   | Cycles/ RSL and Cycles/ ESL |
| Damp mop (Residential)  | 300   | Cycles/ RSL and Cycles/ ESL |
| Net freshwater consumption specified by water source and fate | 0.05 m <sup>3</sup> tap water, evaporated   | m <sup>3</sup>              |
| Further assumptions for scenario development                  | Floor cleaned with dust mop daily and with damp mop 36 times/year for commercial applications and 4 times/year for residential applications |                             |

Table 13: End of life (C1-C4)

| Name  |  | Value  | Unit               |
|---|--|--|--------------------|
| Assumptions for scenario development              |  | Product is either disposed of with the underlying floor or manually removed via scraping |                    |
| Collection process                                | Collected separately                     | 0  | kg                 |
|   | Collected with mixed construction waste  | 23.3   | kg                 |
| Recovery  | Reuse                                    | 0  | kg                 |
|   | Recycling                                | 0  | kg                 |
|   | Landfill                                 | 23.3   | kg                 |
|   | Incineration                             | 0  | kg                 |
|   | Incineration with energy recovery        | 0  | kg                 |
|   | Energy conversion efficiency rate        | 84-94  | %                  |
| Disposal  | Product or material for final deposition | 23.3   | kg                 |
| Removals of biogenic carbon (excluding packaging) |  | 0.095  | kg CO <sub>2</sub> |

## 4. LIFE CYCLE ASSESSMENT RESULTS

All results are given per functional unit, which is 1 m<sup>2</sup> of installed flooring over an estimated building life of 75 years. Environmental Impacts were calculated using the GaBi software platform. Impact results have been calculated using both TRACI 2.1 and CML 2001-Jan 2016 characterization factors. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development, however the EPD users shall not use additional measures for comparative purposes.

Table 14: Description of the system boundary modules

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

Table 15: Biogenic Carbon Uptake and Emissions

| Parameter | Parameter                               | Mexicali, Mexico – Floor Tile | Unit               |
|-----------|---|-------------------------------|--------------------|
| BCRP      | Biogenic Carbon Removal from Product    | 0.0958                        | kg CO <sub>2</sub> |
| BCEP      | Biogenic Carbon Emission from Product   | 0.0762                        | kg CO <sub>2</sub> |
| BCRK      | Biogenic Carbon Removal from Packaging  | 0.857                         | kg CO <sub>2</sub> |
| BCEK      | Biogenic Carbon Emission from Packaging | 0.394                         | kg CO <sub>2</sub> |

See Impact Category Key below for definition of acronyms.

Table 16: Acronym Key

| Acronym           | Text   | Acronym   | Text                                    |
|-------------------|--|-----------|---|
| ADP-elements      | Abiotic depletion potential for non-fossil resources   | GWP       | Global warming potential                |
| ADP-fossil        | Abiotic depletion potential for fossil resources   | OPD       | Depletion of stratospheric ozone layer  |
| AP                | Acidification potential of soil and water  | POCP      | Photochemical ozone creation potential  |
| EP                | Eutrophication potential   | Resources | Depletion of non-renewable fossil fuels |
|                   |  |           |   |
| RPR <sub>E</sub>  | Use of renewable primary energy excluding renewable primary energy resources used as raw materials         | SM        | Use of secondary materials              |
| RPR <sub>M</sub>  | Use of renewable primary energy resources used as raw materials  | RSF       | Use of renewable secondary fuels        |
| NRPR <sub>E</sub> | Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | NRSF      | Use of non-renewable secondary fuels    |
| NRPR <sub>M</sub> | Use of non-renewable primary energy resources used as raw materials  | FW        | Net use of fresh water                  |
| HWD               | Disposed-of-hazardous waste  | MR        | Materials for recycling                 |
| NHWD              | Disposed-of non-hazardous waste  | MER       | Materials for energy recovery           |
| HLRW              | High-level radioactive waste, conditioned, to final repository   | EE        | Exported energy                         |
| ILLRW             | Intermediate- and low-level radioactive waste, conditioned, to final repository                            | CRU       | Components for reuse                    |
| RE                | Recovered energy   |           |   |

## 4.1 Mexicali, Mexico – Floor Tile

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### 4.1.1 CML Results

| Impact Category             | A1-A3    | A4        | A5       | B1       | B2       | B3       | B4       | B5       | B6       | B7       | C1       | C2        | C3       | C4       | D   |
|-----------------------------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|-----|
| ADP-elements [kg Sb eq]     | 6.95E-06 | 2.29E-07  | 5.38E-06 | 0.00E+00 | 2.90E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.33E-08  | 0.00E+00 | 4.23E-07 | MND |
| ADP-fossil fuel [MJ]        | 2.28E+02 | 1.70E+01  | 2.05E+01 | 0.00E+00 | 1.34E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.94E+00  | 0.00E+00 | 1.59E+01 | MND |
| AP [kg SO <sub>2</sub> eq]  | 1.75E-02 | 4.07E-03  | 4.56E-03 | 0.00E+00 | 2.33E-05 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.59E-04  | 0.00E+00 | 4.32E-03 | MND |
| EP [kg Phosphate eq]        | 2.87E-03 | 1.15E-03  | 6.46E-04 | 0.00E+00 | 8.54E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.87E-04  | 0.00E+00 | 5.67E-04 | MND |
| GWP [kg CO <sub>2</sub> eq] | 1.43E+01 | 1.22E+00  | 2.79E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.79E-01  | 0.00E+00 | 1.03E+00 | MND |
| ODP [kg CFC 11 eq]          | 7.21E-11 | 1.14E-16  | 2.78E-10 | 0.00E+00 | 3.22E-17 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.65E-17  | 0.00E+00 | 3.73E-15 | MND |
| POCP [kg Ethene eq]         | 1.69E-03 | -5.81E-04 | 7.44E-04 | 0.00E+00 | 1.96E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -2.24E-04 | 0.00E+00 | 3.66E-04 | MND |

### 4.1.2 TRACI Results

| Impact Category             | A1-A3    | A4        | A5       | B1       | B2        | B3       | B4       | B5       | B6       | B7       | C1       | C2        | C3       | C4        | D   |
|-----------------------------|----------|-----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|----------|-----------|-----|
| AP [kg SO <sub>2</sub> eq]  | 1.98E-02 | 5.53E-03  | 5.04E-03 | 0.00E+00 | 2.91E-05  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.82E-04  | 0.00E+00 | 4.69E-03  | MND |
| EP [kg N eq]                | 1.60E-03 | 4.62E-04  | 4.55E-04 | 0.00E+00 | 1.23E-05  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.16E-05  | 0.00E+00 | 2.40E-04  | MND |
| GWP [kg CO <sub>2</sub> eq] | 1.42E+01 | 1.22E+00  | 2.77E+00 | 0.00E+00 | 2.51E-02  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.79E-01  | 0.00E+00 | 1.02E+00  | MND |
| ODP [kg CFC 11 eq]          | 7.48E-11 | -6.46E-15 | 3.56E-10 | 0.00E+00 | -3.55E-16 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | -1.50E-15 | 0.00E+00 | -5.37E-14 | MND |
| Resources [MJ]              | 3.01E+01 | 2.27E+00  | 2.30E+00 | 0.00E+00 | 1.50E-02  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.28E-01  | 0.00E+00 | 2.05E+00  | MND |
| POCP [kg O <sub>3</sub> eq] | 4.26E-01 | 1.29E-01  | 8.47E-02 | 0.00E+00 | 5.62E-04  | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.97E-02  | 0.00E+00 | 9.40E-02  | MND |



### 4.1.3 Resource Use Results

| Impact Category        | A1-A3    | A4       | A5       | B1       | B2       | B3       | B4       | B5       | B6       | B7       | C1       | C2       | C3       | C4       | D   |
|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----|
| RPR <sub>E</sub> [MJ]  | 1.05E+01 | 5.28E-01 | 2.62E+00 | 0.00E+00 | 7.62E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.23E-01 | 0.00E+00 | 1.25E+00 | MND |
| RPR <sub>M</sub> [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| NRPR <sub>E</sub> [MJ] | 2.43E+02 | 1.71E+01 | 2.17E+01 | 0.00E+00 | 1.40E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.97E+00 | 0.00E+00 | 1.63E+01 | MND |
| NRPR <sub>M</sub> [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| SM [kg]                | 3.00E+00 | 0.00E+00 | 6.00E-02 | 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 | MND |
| RSF [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| NRSF [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| RE [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| FW [m <sup>3</sup> ]   | 3.56E-02 | 2.05E-03 | 7.33E-03 | 0.00E+00 | 5.89E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.76E-04 | 0.00E+00 | 1.94E-03 | MND |

### 4.1.4 Output Flows and Waste Results

| Impact Category | A1-A3    | A4       | A5       | B1       | B2       | B3       | B4       | B5       | B6       | B7       | C1       | C2       | C3       | C4       | D   |
|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----|
| HWD [kg]        | 1.26E-07 | 1.38E-07 | 7.58E-08 | 0.00E+00 | 2.37E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.21E-08 | 0.00E+00 | 5.72E-08 | MND |
| NHWD [kg]       | 1.62E-01 | 6.43E-04 | 8.04E-01 | 0.00E+00 | 7.76E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.49E-04 | 0.00E+00 | 2.34E+01 | MND |
| HLRW [kg]       | 6.72E-06 | 4.56E-08 | 6.04E-07 | 0.00E+00 | 3.47E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.06E-08 | 0.00E+00 | 1.99E-07 | MND |
| ILLRW [kg]      | 5.61E-03 | 3.77E-05 | 4.76E-04 | 0.00E+00 | 2.34E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.78E-06 | 0.00E+00 | 1.58E-04 | MND |
| CRU [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 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MND |
| MR [kg]         | 0.00E+00 | 0.00E+00 | 1.81E-01 | 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 | MND |
| MER [kg]        | 0.00E+00 | 0.00E+00 | 1.21E-02 | 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 | MND |
| EE [MJ]         | 0.00E+00 | 0.00E+00 | 2.09E-02 | 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 | MND |

## 5. LIFE CYCLE ASSESSMENT INTERPRETATION

Overall for American Olean’s ceramic tile products, Global Warming (GWP) and Abiotic Depletion of fossil fuels are the impact categories of most significance. Within these impact categories, the vast majority of impacts are aggregated in the A1-A3 phase of the life cycle of the product. A1-A3 includes raw material sourcing, transportation and manufacturing. The second largest life cycle stage is A5 in terms of global warming impacts which is transport of product to customer.

For ceramic tiles, in the sourcing and extraction stage, the largest contributors to the impacts in terms of raw materials are kaolin (14.8%), feldspar (2%), and glaze (0.5%). Within manufacturing, electricity contributes to 15% of overall GWP impacts while thermal energy from natural gas contributes to 40%.

Shipping to customer contributes around 5.5% of total GWP impacts, while, mortar used during installation contributes around 11% of GWP impacts. Finally, disposal of the product to landfill contributes 6.7% to total GWP impacts over the life cycle of the product.



## 6. ADDITIONAL ENVIRONMENTAL INFORMATION

### 6.1 Extraordinary Effects

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#### **Fire**

Fire testing and performance results are mentioned in 1.2.2.

#### **Water**

Any excess water from flooding must be removed and tile should be dried as soon as possible.

#### **Mechanical Destruction**

Any damaged or broken tiles must be removed and replaced only by a qualified contractor.

Additional information about products can be found here:

<https://americanolean.com/catalog.cfm>



## 7. REFERENCES

1. Life Cycle Assessment, LCA Report for Dal-Tile. WAP Sustainability Consulting. March 2019.
2. Product Category Rule (PCR) for Building-Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL 10010. Version 3.2, December 12, 2018.
3. Part B: Flooring EPD Requirements. UL Environment. Version 2.0, September 2018.
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
6. ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
7. European Standard DIN EN 15804: 2012.04+A1 2013. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products (includes Amendment A1:2013)