

## ENVIRONMENTAL PRODUCT DECLARATION

# PORCELAIN TILE

DEFINED BY ANSI A137.1

MANUFACTURED BY CROSSVILLE, INC. IN CROSSVILLE, TN



Founded in 1986, Crossville Inc. is a U.S.-owned and operated manufacturer and supplier of porcelain, glass, and stone tile collections for residential and contract applications. The company is the first U.S. tile manufacturer to achieve the following:

- production of large format porcelain tile on site,
- manufacturing porcelain tile with certified recycled content
- development of the Tile Take-Back® Program for recycling fired porcelain tile
- SCS third party certification of its fired and wet waste recycling programs
- TCNA's Green Squared certification for all of its U.S.-produced porcelain tile lines,
- became a net consumer of waste.

For more information, on Crossville, visit [www.crossvilleinc.com](http://www.crossvilleinc.com)



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**PORCELAIN TILE**  
 FLOORING: CARPET, RESILIENT, LAMINATE, CERAMIC, WOOD

According to ISO 14025

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



PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	Crossville, INC.
DECLARATION NUMBER	4786432511.101.1
DECLARED PRODUCT	Porcelain Tile
REFERENCE PCR	NSF PCR for Flooring (Carpet, Resilient, Laminate, Ceramic, and Wood)
DATE OF ISSUE	September 18, 2014
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	NSF International
	Accepted by PCR Review Panel
	<a href="mailto:ncss@nsf.org">ncss@nsf.org</a>
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment
	 Brad McAllister, WAP Sustainability
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Brad McAllister, WAP Sustainability

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### Product Definition

#### Product Classification and Description

Porcelain tile produced in North America is a mixture of multiple mineral-based natural materials, including but not limited to clay, sand, feldspar, and talc. The tiles are pressed into the desired shape and fired in kilns at high temperatures. Porcelain tile is fire resistant, non-combustible, durable (lasts a lifetime) and extremely easy to maintain (Figure 1).

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

Porcelain tiles are classified by their shaping or production method (dry pressed), and the level of water absorption measured as a percentage.

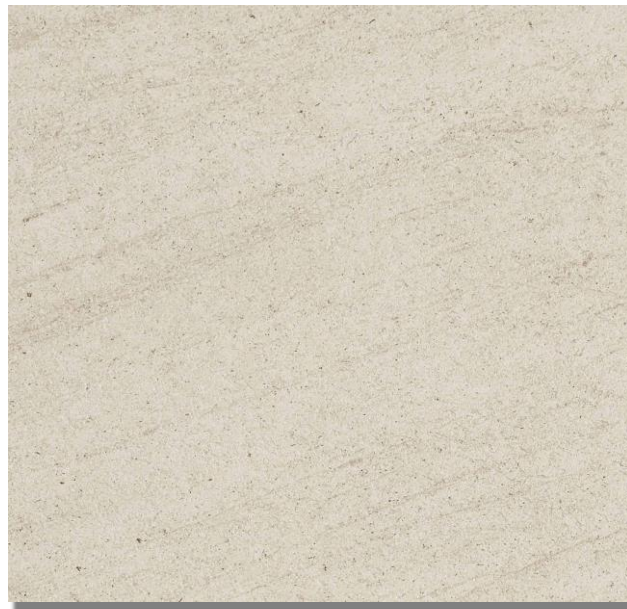


Figure 1: Image of Crossville porcelain tile

#### Range of Applications

Porcelain tile products are commonly used in commercial, light commercial, institutional, and residential interior and exterior applications.

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## Product Standards

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

- ANSI A137.1 - American National Standard Specifications for Ceramic Tile
- ISO 13006 - International Organization for Standardization Specifications for Ceramic Tile

Fire Testing:

- Classification: A
- Flame Spread: 0
- Smoke Development: 0

## Product Characteristics

	Nominal Value	Minimum Value	Maximum Value
<b>Class</b>	P1 (Pressed 1)	N/A	N/A
<b>Tile type</b>	Porcelain	N/A	N/A
<b>Grade</b>	Standard	N/A	N/A
<b>Nominal facial area</b>		3"	36"
<b>Nominal thickness</b>		6.0mm	10.5mm
<b>Product weight</b>	22.2 kg/m <sup>2</sup>	22.0 kg/m <sup>2</sup>	22.4 kg/m <sup>2</sup>
<b>Dimensional categories</b>	calibrated and rectified	N/A	N/A
<b>Sustainable certification</b>	All products are Green Squared® certified by SCS	N/A	N/A

Table 1: Tile Specifications



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## Material Content

Component	Material	Mass %	Availability			Origin of raw materials
			Renewable	Non-renewable	Recycled	
<b>Body</b>	Clay	20-25%		Mineral perpetual		US
	Dispersant	0.1-0.3%		Mineral perpetual		US
	Feldspar	50-55%		Mineral perpetual		US
	Talc	1-3%		Mineral perpetual		US
	Kaolin	15-20%		Mineral perpetual		US
	Sand	1-3%		Mineral perpetual		US
	Scrap	4-6%			Pre-Consumer Post-Consumer	US
<b>Surface</b>	Stain	0.1-1.0%		Mineral perpetual		US, Mexico, Europe
	Glaze	0.1-3.0%		Mineral perpetual		US, Mexico, Europe
	Alumina	0.1-0.5%		Mineral perpetual		US

Table 2: Material Content of the Product

## Production of Main Materials

### Alumina

Alumina, or aluminum oxide, is a chemical compound comprised of aluminum and oxygen. The main function of alumina in a glaze formulation is to increase viscosity as well as increase mechanical and scratch resistance.

### Clay / Kaolin

Clay is an earthen material comprised of extremely fine particles of minerals, organic matter, and trace amounts of naturally occurring metal oxides. It can be molded when wet and hardened into shape by heating at high temperatures. Clay is mined directly from the earth and can be used in the production of porcelain tiles with minimal processing. While clay is the primary ingredient in any tile, it is often blended with fluxing minerals to achieve the desirable characteristic of the tile product.



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### Silicate minerals

Tile production uses various silicate minerals. Minerals are categorized as *silicate* when any combination of SiO—silicon and oxygen—appear in its molecular composition. Silicate minerals used in tile products are as follows: Feldspar, Granite, Pyrophyllite, Wollastonite, Talc, and Kaolin.

### Sand

Sand is a granular material made of fine mineral particles. While sand does not have a defined mineral composition, most commonly it is comprised of silica in the form of quartz. Sand is a common additive in tile production to give the fired tiles size stability.

### Feldspar

Feldspar is an igneous rock, composed of mostly feldspar with traces of mica and silica.

### Glaze

Glaze is a smooth, protective coating commonly applied to tile products. Color and other aesthetic qualities can be given to the tiles through a glaze coating. Glazing materials are comprised of glass frits, minerals, opacifiers, pigments, and water. It is sprayed, rolled or poured onto the tile, and fired to form an inseparable top coating.

### Stain

Stain is a mixed metal oxide colorant or pigment used to change the color of porcelain tile's aesthetic and/or appearance.

### Dispersant

Dispersants allow for a homogenous mixing of porcelain ingredients in water. It minimizes the sedimentation of solid particles in a liquid medium.



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## Production of the Floor Covering

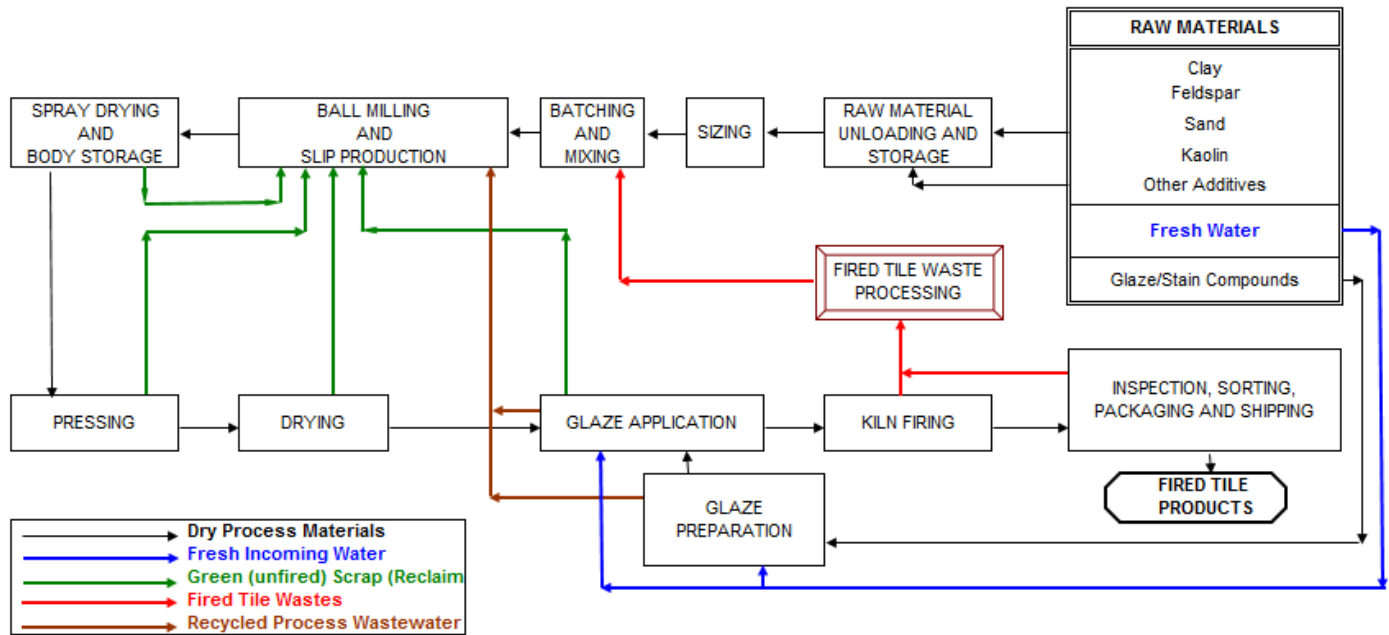


Figure 2 Process flow diagram for tile manufacturing – with recycled fired scrap

## Production Waste

Most scrap and waste is recycled back into the product, but the different sites produce a small amount of waste (approximately 1 kg of waste per m<sup>2</sup> of tile) which is sent offsite to a landfill.

Tile manufacturers offer wide varieties of products with pre- and post-consumer recycled content. This can contribute to overall building recycled content and help achieve compliance with recycled content targets in green building projects. Additionally, high levels of responsibly recovered waste, including dust, powder, unfired scrap and water are commonly reincorporated into tile manufacturing. Waste reclamation in such processes is a vital component to minimizing waste and maximizing resources. In fact, many tile factories are so efficient at waste reclamation, they are effectively closed loop facilities. Reducing waste to zero and fully utilizing all inputs is paramount to efficient manufacturing.



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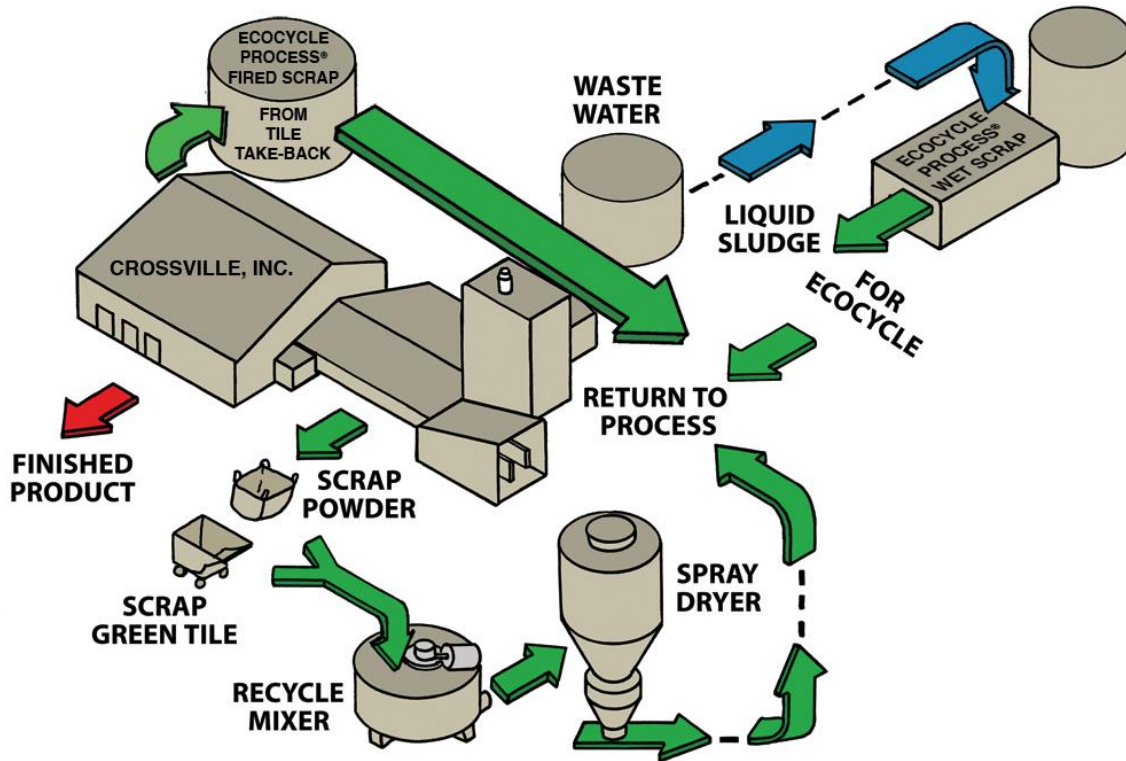


Figure 3: Illustration of recycling pre-consumer and post-consumer waste back into the Crossville manufacturing process

## Delivery and Installation of the Floor Covering

### Delivery

For purposes of this study, the average transport distance from manufacturing to construction site was assumed to be 100 miles by truck. LCA impacts associated with installation of the tile products in the building project are included.

### Installation

Mortar is required (0.833 lbs / ft<sup>2</sup>) for product installation. Sanded grout is also required (0.043 lbs / ft<sup>2</sup>). During installation, approximately 4.5% of the total material is lost as waste. Though some of this waste could be recycled, this scrap is modeled as being disposed of in a landfill.

### Waste

Based on current best information a small amount of installation waste is incinerated for energy recovery, but for the purposes of this EPD 100% of all such waste is assumed to be disposed of in a landfill.





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## Packaging

Primary packaging is 100% cardboard, but secondary/tertiary packaging are film and pallets. 100% of the packaging waste is recyclable. However, for this study, no documentation is available to quantify the percentage of packaging which is actually recycled, therefore all packaging waste is assumed to be sent to a landfill. Landfill emissions from cardboard packaging are allocated to installation. Electricity generated from landfill gas (produced from the decomposition of bio-based packaging) is ignored since the cut-off approach is applied to recycled materials.

## Use stage

The service life of porcelain tile is unique in that it's not dependent on the amount of floor traffic and the type and frequency of maintenance. The level of maintenance is dependent on the actual use and desired appearance of the floor. For the NSF Flooring PCR, the building's Reference Service Life (RSL) is assumed to be 60 years. Since porcelain tile is expected to last at least as long as the building itself, the product will also have an RSL of 60 years.

Since the EPD must present results for both one-year and 60-year time periods, impacts are calculated for both time horizons. In the case of one-year results, the use phase impacts are based on the cleaning and maintenance model for one year. In the case of 60-year results, use phase impacts are scaled to represent maintenance for 60 years.

## Cleaning and Maintenance

Tile products should be cleaned routinely with tap water. For the purposes of this EPD, average maintenance is presented based on a mix of residential and commercial installations.

Level of use	Cleaning Process	Cleaning Frequency	Consumption of energy and resources
Commercial / Residential	Dust mop	Daily	None
	Damp mop	36 times / year (Commercial) 4 times / year (Residential)	Tap water; 0.783 L / m <sup>2</sup> / yr.

Table 3: Cleaning process and inputs

## Prevention of Structural Damage

Interior floor covering should not be installed until any and all structural damage has been adequately repaired and determined to be code compliant. Surfaces must be structurally sound, stable and rigid enough to support the porcelain tile finish.



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### Health Aspects During Usage

Since tile is fired in kilns at high temperatures, there are no volatile organics in the finished product that can be released into the air we breathe. There are also adhesives, grouts, and backer boards available that contain zero, or very low VOCs. Additionally, tile is inhospitable to dust mites, mold, germs, and bacteria and often the preferred floor covering for people with allergies or asthma. Tile grouts and backer boards with built-in mold and mildew protection complement tile's inherent resistance to mold and mildew growth.

### End of Life

Because these tile products are comprised primarily of naturally occurring mineral based materials and no hazardous ingredients are added during the manufacturing process, they are basically inert and can be used in multiple applications: e.g., clean fill material in land reclamation/contouring projects, base or substrate material for roadways and/or parking lots, replacement for raw materials used in cement or brick kilns, etc. Crossville also has the ability to "take-back" tile at the end of its useful life. However, for purposes of this EPD, we have taken the most conservative approach and assumed that 100% of all tile removal waste is disposed of in a landfill.

### Life Cycle Assessment

A full Life Cycle Assessment has been carried out according to ISO 14025, 14040 and 14044, per the Product Category Rules (PCR) for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood, as published by NSF International (2012).

The following life cycle stages are considered:

- Sourcing / Extraction
- Manufacturing
- Delivery & Installation
- Use stage
- End-of-life stage

The main purpose of EPDs is for use in business-to-business communication. As all EPDs are publicly available via the Program Operator and therefore are accessible to the end consumer, they can also be used in business-to-consumer communication.

### Functional Unit Description

The declaration refers to the functional unit of 1m<sup>2</sup> installed floor covering. 1m<sup>2</sup> is equivalent to 10.76 ft<sup>2</sup>.



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## Cut-off Criteria

Packaging materials which may accompany procured raw materials are excluded from the study. Additionally, plastic or metal banding that may be used to hold tiles together is excluded as being below the 1% mass cutoff.

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## Background Data

As a general rule, specific data derived from specific production processes or average data derived from specific production processes shall be the first choice as a basis for calculating LCA results.

For life cycle modeling of the considered products, the GaBi 6 Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, has been used to model the product systems considered in this assessment. All relevant background datasets are taken from the GaBi 2013 software database. The datasets from the GaBi database are documented in the online documentation / GaBi 6 2013D/. To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

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## Data Quality

A variety of tests and checks were performed throughout the project to ensure high quality of the completed LCA. Checks included an extensive review of project-specific LCA models as well as the background data used.

### Temporal Coverage

Primary data collected from Crossville is based on 12 month averaged data representing the calendar year of 2012. Background datasets are all based on data from the last 3 years (since 2010), with the majority of datasets based on data from 2012.

### Technological Coverage

Data on material composition and manufacturing are primary data from Crossville. The raw material inputs, energy, waste, and emissions in the calculation for this LCA are based on annual total purchases divided by annual production during the reference year.

### Geographical Coverage

This background LCA represents Crossville products produced in the United States.

Manufacturing energy was representative for the country, but proxy datasets were used as needed for raw material inputs to address lack of data for a specific material or for a specific geographical region. These proxy datasets were chosen for their technological representativeness of the actual materials.

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## System Boundaries

The scope of the study includes raw material sourcing / extraction, manufacturing, installation, use, and disposal of porcelain tile.

Table 4 summarizes major components being considered for inclusion and exclusion from the study and have been shaped by the need to accurately reflect the environmental burden associated with the functional unit.

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Included	Excluded
<ul style="list-style-type: none"><li>✓ Raw materials production (chemicals, minerals, etc.)</li><li>✓ Use of auxiliary materials, water, and energy during manufacturing, installation, and use</li><li>✓ Packaging of products</li><li>✓ Emissions to air, water, and soil during manufacturing, installation, and use</li><li>✓ Transport of raw materials and finished products</li><li>✓ Disposal</li><li>✓ Overhead (heating, lighting, warehousing) of manufacturing facilities – due to data granularity</li></ul>	<ul style="list-style-type: none"><li>✗ Construction of capital equipment</li><li>✗ Maintenance and operation of support equipment</li><li>✗ Human labor and employee commute</li><li>✗ Internal transportation (within a manufacturing facility)</li></ul>

Table 4: System Boundaries

## Allocation

### Co-Product Allocation

Inputs and outputs at manufacturing are allocated by production mass in relation to the total known production volume at the facility.

### Multi-Input Processes Allocation

No multi-input allocation occurs in the product system.

### Reuse, Recycling, and Recovery Allocation

The cut-off allocation approach is adopted in the case of any post-consumer recycled content, which is assumed to enter the system burden-free. Only environmental impacts from the point of recovery and forward (e.g., collection, sorting, processing, etc.) are considered.

Product and packaging waste is modeled as being disposed in a landfill rather than incinerated or recycled. Plastic and other construction waste is assumed to be inert in landfills so no system expansion or allocation is necessary as landfill gas is not produced. In the case of landfill gas generated by the decay of bio-based packaging after installation, the cut-off approach is used; no credit is given for capture or utilization of the landfill gas.



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## Impact Categories

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The impact assessment results are calculated using characterization factors published by the University of Leiden's CML 2001 – Apr. 2013.

Abbreviations for the impacts described here are used in the results tables below.

- Environmental Impact Categories (CML 2001):
  - o Abiotic Depletion, Elements (ADP-e) [kg Sb-eq]
  - o Abiotic Depletion, Fossil (ADP-f) [MJ]
  - o Acidification Potential (AP) [kg SO2 eq]
  - o Eutrophication Potential (EP) [kg Phosphate eq]
  - o Global Warming Potential (GWP) [kg CO2 eq]
  - o Ozone Depletion Potential (ODP) [kg R 11 eq];
  - o Photochemical Oxidant Formation Potential (POCP) [kg Ethene eq];
- Environmental Indicators:
  - o Primary Energy of non-renewable resources [MJ]
  - o Primary energy of renewable resources [MJ]
  - o Secondary materials [kg]
  - o Non-renewable material sources [kg]
  - o Output flows [kg]



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## Results

Results for one square meter installed porcelain tile are presented in the sections below.

### Life Cycle Inventory Analysis

#### Primary Energy Demand

Primary energy resources and water use are presented below.

	Total	1. Sourcing / extraction	2. Manufacturing	3. Delivery & Install	4. Use stage	5. End of Life
Non renewable energy resources	411	41.4	342	11.7	0.03	15.8
Crude Oil	45.7	23.4	5.2	8.42	0.0115	8.62
Hard Coal	78.7	3.68	73.2	0.67	0.00497	1.14
Lignite	5.68	1.68	2.89	0.677	0.00257	0.431
Natural Gas	250	9.83	233	1.53	0.00858	5.11
Peat	0.0133	0.0123	0.000868	9.02E-005	2.21E-006	0.0001
Uranium	30.8	2.84	27.2	0.353	0.00241	0.496

Table 5: Primary energy, non-renewable for 1 square meter of porcelain tile for 1 year Use [MJ]

	Total	1. Sourcing / extraction	2. Manufacturing	3. Delivery & Install	4. Use stage	5. End of Life
Renewable energy resources	18.6	11.3	6.25	0.312	0.00159	0.729
Geothermal	0.0485	0.035	0.00685	0.00251	2.11E-006	0.00418
Hydro	4.79	0.501	4.14	0.0488	0.000299	0.097
Solar	12.4	10.4	1.29	0.19	0.000727	0.526
Primary energy from waves	6.88E-013	4.43E-013	1.92E-014	9.72E-014	2.71E-017	1.28E-013
Wind	1.42	0.425	0.819	0.0706	0.000565	0.101
Primary forest	5.97E-011	3.78E-011	2.61E-012	8.28E-012	2.6E-014	1.09E-011

Table 6: Primary energy, renewable for 1 square meter of porcelain tile for 1 year Use [MJ]





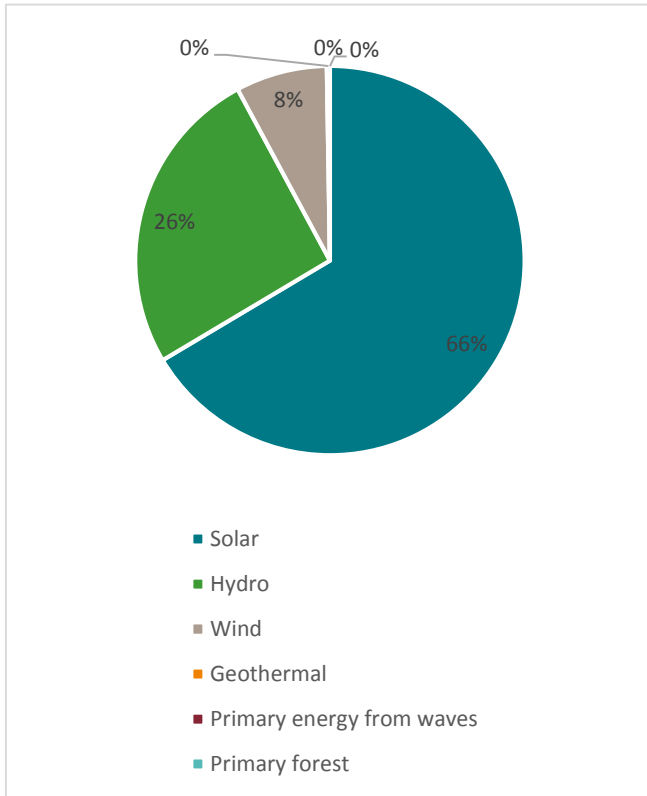
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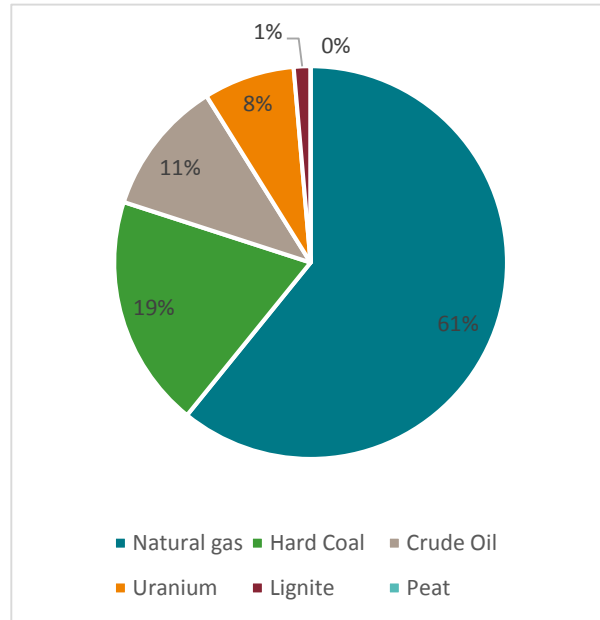
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## Renewable Primary Energy



## Non-Renewable Primary Energy



## Other Resources and Wastes

Secondary material and secondary fuel (fossil and renewable) consumption are presented below.

	Total	1. Sourcing / extraction	2. Manufacturing	3. Delivery & Install	4. Use stage	5. End of Life
Non renewable elements	0.097	0.0074	0.05	0.0068	8.4E-005	0.032
Non renewable resources	65	35	18	6.9	0.0041	5.2
Hazardous waste [kg]	0.012	0.0011	0.011	0.00014	9.9E-007	0.0002
Non-hazardous waste [kg]	57	13	18	3.2	0.0047	23
Non-renewable material sources [kg]	65	35	18	6.9	0.0042	5.2
Secondary fuel (fossil) [MJ]	1.5	0.02	0.11	1.3	0.00039	0.04
Secondary fuel (renewable) [MJ]	0.16	0.002	0.011	0.13	3.7E-005	0.017

Table 7: Other resources and wastes for 1 square meter of porcelain tile for 1 year Use [kg]



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PORCELAIN TILE  
FLOORING: CARPET, RESILIENT, LAMINATE, CERAMIC, WOOD

According to ISO 14025

## Life Cycle Impact Assessment

The impact assessment results are calculated using characterization factors published by the University of Leiden's CML 2001 – Apr. 2013 methodology.

	Total	1. Sourcing / extraction	2. Manufacturing	3. Delivery & Install	4. Use stage	5. End of Life
ADP-e [kg Sb-Equiv.]	1.01E-005	1.6E-006	6.71E-006	1.42E-006	1.68E-009	3.92E-007
ADP-f [MJ]	380	38.6	315	11.3	0.0276	15.3
AP [kg SO2-Equiv.]	0.103	0.0117	0.0833	0.00324	7.54E-006	0.00453
EP [kg Phosphate-Equiv.]	0.00839	0.00183	0.00533	0.000686	6.53E-006	0.000532
GWP [kg CO2-Equiv.]	26.9	2.6	22.3	1.08	0.00203	1.01
ODP [kg R11-Equiv.]	3.36E-009	2.55E-010	3.07E-009	1.35E-011	1.15E-012	2.09E-011
POCP [kg Ethene-Equiv.]	0.0124	0.00105	0.0106	0.000325	9.55E-007	0.000442

Table 8: CML Impact assessment results of 1 square meter for 1 year use

	Total	1. Sourcing / extraction	2. Manufacturing	3. Delivery & Install	4. Use stage	5. End of Life
ADP-e [kg Sb-Equiv.]	1.02E-005	1.6E-006	6.71E-006	1.42E-006	1.01E-007	3.92E-007
ADP-f [MJ]	381	38.6	315	11.3	1.65	15.3
AP [kg SO2-Equiv.]	0.103	0.0117	0.0833	0.00324	0.000452	0.00453
EP [kg Phosphate-Equiv.]	0.00877	0.00183	0.00533	0.000686	0.000392	0.000532
GWP [kg CO2-Equiv.]	27.1	2.6	22.3	1.08	0.122	1.01
ODP [kg R11-Equiv.]	3.43E-009	2.55E-010	3.07E-009	1.35E-011	6.92E-011	2.09E-011
POCP [kg Ethene-Equiv.]	0.0125	0.00105	0.0106	0.000325	5.73E-005	0.000442

Table 9: CML Impact assessment results of 1 square meter for 60 year use



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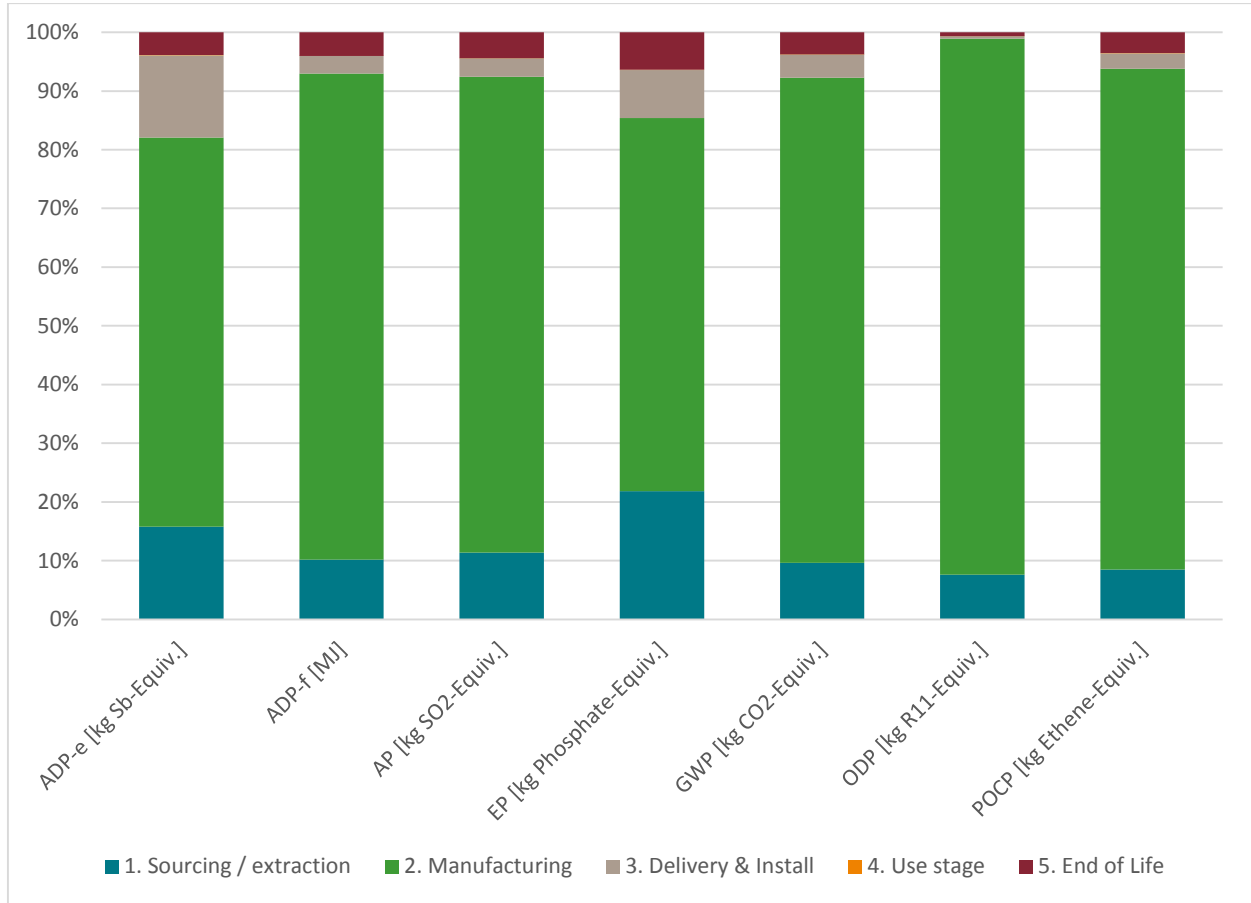


Figure 4: CML Impact assessment results of 1 square meter for 1 year use



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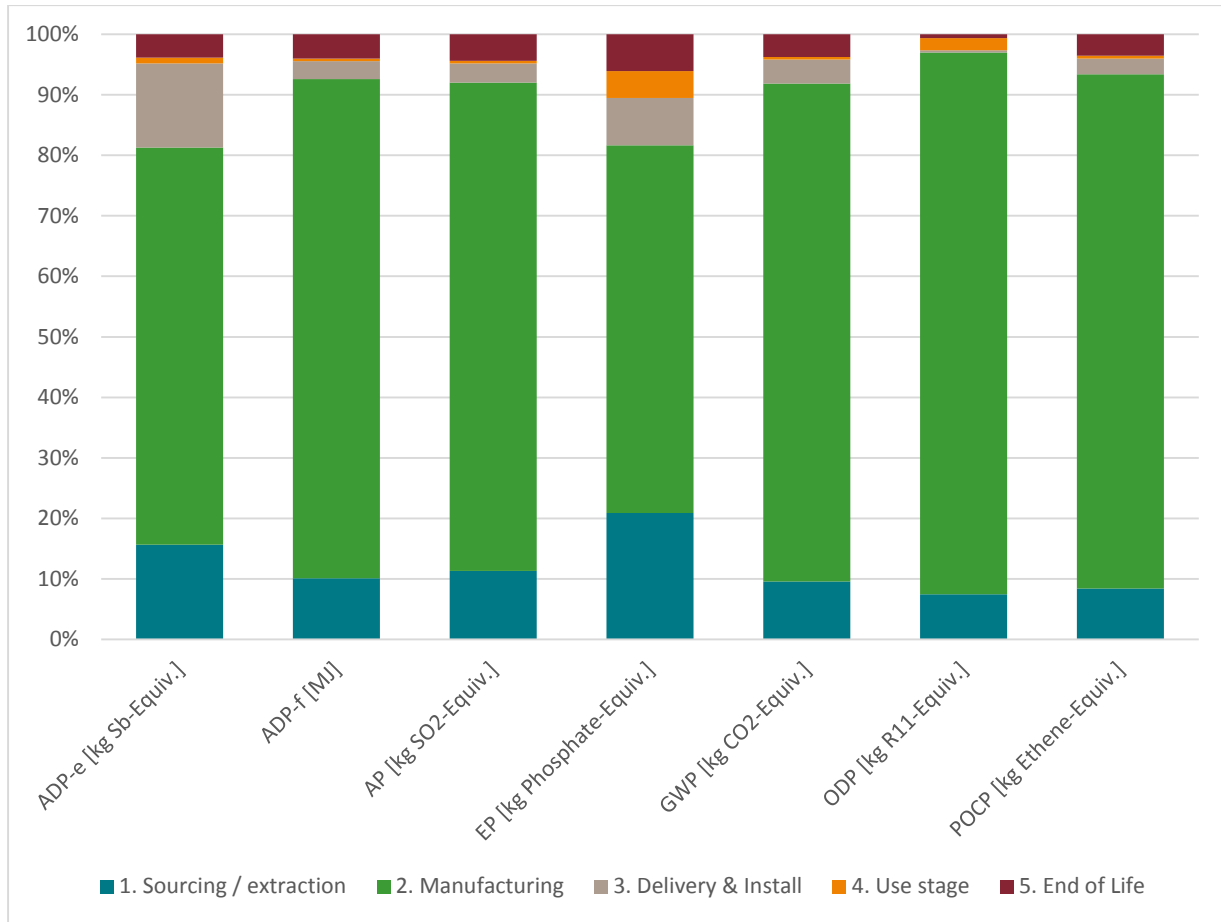


Figure 5: CML Impact assessment results of 1 square meter for 60 year use

## Interpretation

When considering a 60-year product life, energy for manufacturing and production of raw materials are the two largest contributors in all impact categories considered. Maintenance during use also represents a small but relevant fraction of the Eutrophication and Ozone Depletion categories.

When considering a 1-year product life, production of raw materials and energy for manufacturing are by far the two largest contributors in all impact categories considered. The transportation and installation of tile is also a small but relevant contributor to Abiotic Depletion (fossil) and Eutrophication.



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FLOORING: CARPET, RESILIENT, LAMINATE, CERAMIC, WOOD

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### Additional Environmental Information

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#### **TOTO partnership**

Crossville's landmark partnership with TOTO, maker of luxury sanitary ware, to recycle pre-consumer fired porcelain fixtures, has resulted in a minimum of 4% recycled content in all U.S.-made Crossville products and spared more than 21 million pounds of waste from entering landfills.

#### **All major raw materials sourced from within 350 miles**

Crossville's manufacturing facilities are strategically located off of Interstate 40 in Tennessee to ensure reasonable proximity to sources of raw materials. This minimizes the environmental impact of transporting materials, including reduced fuel consumption.

#### **Green Squared Certifications**

Crossville is a leader in the definitive standard for the identification of green tile products—Green Squared Certification, developed by the Tile Council of North America. Crossville was the first manufacturer to achieve Green Squared certification for all its U.S.-made products

#### **Tile Take Back**

When Crossville developed a proprietary method for recycling fired porcelain, it solved the key sustainability issue that had plagued the tile industry. Prior to the invention of Crossville's capability, fired porcelain could not be recycled in mass quantity. Today, Crossville's Tile Take Back program collects fired porcelain (including scraps, samples, and post-consumer tiles extracted from installations) and recycles the refuse to create new tile. More than 19 million pounds of tile that would have otherwise been landfilled have been 'taken back' since 2009 as a result.

#### **Sustainability Report**

Because sustainability is at the core of Crossville's approach to business and manufacturing, the company provides quick access to relevant information of the range of policies and practices on its website at <http://crossvilleinc.com/sustainability/>. This section of the Crossville website is a transparent offering of pertinent aspects of how the company proactively seeks to be the leader in sustainability for the U.S. tile industry.

#### **LEED point contributions**

Crossville supports the architectural and design community in achieving LEED points. The company provides thorough documentation and forms on its website to simplify the process of identifying LEED point contributions. Crossville's sustainable products are commonly selected by architects and designers seeking LEED certification.



## ENVIRONMENTAL PRODUCT DECLARATION



PORCELAIN TILE  
FLOORING: CARPET, RESILIENT, LAMINATE, CERAMIC, WOOD

According to ISO 14025

### References

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GaBi 6 2013	PE INTERNATIONAL AG; GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2013.
GaBi 6 2013D	GaBi 6: Documentation of GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2013. <a href="http://www.gabi-software.com/support/gabi/">http://www.gabi-software.com/support/gabi/</a>
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
NSF PCR 2012	NSF Product Category Rule for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood

