

Sustainability

Starts with Standards



Ceramic tile adorns Blue Line train stations in Chicago—outdoors, where other finishes wouldn't last.

Design / Build it to Last

ANSI A137 product performance standards for ceramic and glass tiles

ANSI A118 product performance standards for mortars, grouts, and membranes

ANSI A108 installation and workmanship standards

TCNA Handbook: installation systems for ceramic, glass and stone tile



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2 Tile: The Natural Choice

Overview of ceramic tile's performance- and sustainability-related attributes.

4 Tile and Green Building: Credits and Requirements

At-a-glance guide to the credits, points, and compliance parameters applicable to ceramic tile in today's green building standards and rating systems.

6 Ceramic Tile: For a Safe and Healthy Home

TCNA Bulletin outlining the properties of ceramic tile that make it a safe and healthy choice for residential installations.

8 TCNA Green Report: Life-Cycle Cost Study

Quick-reference data on various flooring options for cost per square foot over time.

9 Guide to Green Squared®: The Tile Industry's Standard and Certification Program for Product Sustainability

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Overview of the many ways that specifying products covered by these EPDs can help meet product transparency requirements in popular green building standards and rating systems.

TILE

THE NATURAL CHOICE



Stands the Test of Time

Ceramic tile has been the preferred choice around the world for centuries for its inherent beauty and durability, and because the natural materials used to make tile are so abundant. And the endless design options can make each installation a unique work of art to be enjoyed for generations.

Inspires Design

Explore unlimited design and customization possibilities. Mix colors, textures, patterns, shapes and styles to make every installation unique. Get the look of wood, natural stone, wallpaper, even delicate fabrics, but with the durability of ceramic tile. And with tiles following the latest color trends, color matching is a breeze. You can even take your design to the next level. Find a manufacturer that specializes in custom mosaic murals, waterjet cutting, or hand painting.



Provides Unequaled Versatility



Hypoallergenic



Easy to sterilize



Fire resistant



Chemical resistant



Enhanced traction products available



Stain resistant, easy to clean



Exteriors, including freeze/thaw climates



Dry, wet, and submerged applications



Durable: withstands heavy foot and wheel traffic

Delivers Robust Sustainability



Recycled Content and Waste Reclamation

Many factories are effectively closed loop facilities with zero waste, high levels of recycling, and efficient resource management.



Exceptional Life-Cycle Cost = Best Value

Ceramic tile has an exceptional life cycle. See the life-cycle cost study in this guide for data on how ceramic tile outperforms other floor finishes in terms of cost per square foot over time.



Regional Manufacturing and Raw Materials

With tile manufacturers in many regions of North America, tile and installation products made with local raw materials are widely available, greatly reducing the energy consumption and emissions of long distance shipping. In many cases, the raw materials are mined within 500 miles of both the manufacturing facility and the job site. Plus, the clays and other materials used to make tile are plentiful.



Best Indoor Air Quality and Zero VOCs

The high firing temperature of ceramic tile—generally more than 2000°F—burns off all organic compounds. Plus, ceramic tile is inhospitable to bacteria, fungi, mold, and other irritants that contribute to allergies and asthma. All this allows ceramic and glass tiles to easily meet low-emitting material requirements, contribute to pre-occupancy air quality plans, and provide superior indoor air quality for building occupants.



Lower Energy Needs

Tile can reduce the amount of energy needed for heating and cooling because of its exceptional thermal mass.



Reduced Heat Island Effect

Using light-colored tiles instead of traditional paving materials can lower an area's heat absorption, or heat island effect. Green buildings in urban areas in particular are required to reduce the potential heat island effect.



Building Material Reuse

Tile finishes are among the few surfaces that can be salvaged in a major renovation.



Eco-Friendly Maintenance

No harsh chemicals required!



Ceramic tile is an ideal choice for ventilated façade projects.

Tile can provide an aesthetic advantage, due to the wide range of colors, surfaces and sizes, allowing for virtually unlimited design opportunities.

A ventilated tile façade can reduce a building's energy consumption 20-30% due to the natural chimney effect it creates between the structure and the cladding. Hot air is evacuated in summer, and insulation is more effective in winter.

TILE AND GREEN BUILDING CREDITS AND REQUIREMENTS

	Leadership In Energy and Environmental Design (LEED v4)	2018 International Green Construction Code (Powered by ASHRAE Standard 189.1)
 MULTI-ATTRIBUTE SUSTAINABILITY: CONFORMANCE TO GREEN SQUARED®	Pilot Credit—Certified Multi-attribute Products and Materials	901.4.1.4.3 (9.4.1.4.3) Third-Party Multi-attribute Certification
LCA OR EPD	Building Product Disclosure and Optimization—Environmental Product Declarations	901.4.1.4.1 (9.4.1.4.1) Industry-Wide Declaration 901.4.1.4.2 (9.4.1.4.2) Product-Specific Declaration 901.4.1.4.4 (9.4.1.4.4) Product Life Cycle
RECYCLED CONTENT	Building Product Disclosure and Optimization—Sourcing of Raw Materials	901.4.1.1.1 (9.4.1.1.1) Recycled Content
PRODUCT REUSABILITY/ RECYCLABILITY	Building Life-Cycle Impact Reduction Building Product Disclosure and Optimization—Sourcing of Raw Materials	901.4.1.1.2 (9.4.1.1.2) Salvaged Material Content
REGIONAL MATERIALS	Building Product Disclosure and Optimization—Sourcing of Raw Materials	901.4.1.2 (9.4.1.2) Regional Materials
CONSTRUCTION/ DESIGN MANAGEMENT	Integrative Process Construction Indoor Air Quality Management Plan Indoor Air Quality Assessment Construction and Demolition Waste Management	901.3.1 (9.3.1) Construction Waste Management 1001.3.1.5 (10.3.1.5) IAQ Construction Management
INDOOR ENVIRONMENTAL QUALITY	Low-Emitting Materials Thermal Comfort Interior Lighting	801.4.2.1 (8.4.2.1) Adhesives and Sealants 801.4.2.3 (8.4.2.3) Floor Covering Materials 801.4.2.6 (8.4.2.6) Ceiling and Wall Assemblies and Systems
HEAT ISLAND EFFECT	Heat Island Reduction	501.3.5.1 (5.3.5.1) Site Hardscape
ENERGY EFFICIENCY	Optimize Energy Performance	701.4.2 (7.4.2) Building Envelope Performance Option 701.5 (7.5)
INHERENT DURABILITY	Building Life-Cycle Impact Reduction	1001.3.2.3 (10.3.2.3) Service Life Plan
OTHER PRODUCT ATTRIBUTES OR MANUFACTURER ENGAGEMENT INITIATIVES	Open Space Building Product Disclosure and Optimization—Sourcing of Raw Materials Building Product Disclosure and Optimization—Material Ingredients Innovation	105.4 Innovative Approaches and Alternative Materials, Design, and Methods of Construction and Equipment 1001.3.2.1.4.5 (10.3.2.1.4.5) Building Green Cleaning Plan

NAHB National Green Building Standard (ICC/ASHRAE 700-2015)	Green Globes for New Construction 2018 (v1.4)	
611.2 Sustainable Products	3.5.1.2 Building Core/Shell Path B 3.5.2.2 Interior Fit-Outs Path B	MULTI-ATTRIBUTE SUSTAINABILITY: CONFORMANCE TO GREEN SQUARED®
610.1 Life Cycle Analysis	3.5.1.2 Building Core/Shell Path B 3.5.2.2 Interior Fit-Outs Path B	LCA OR EPD
604.1 Recycled Content	3.5.1.1 Building Core/Shell Path A 3.5.2.1 Interior Fit-Outs Path A	RECYCLED CONTENT
603.1 Reuse of Existing Building 603.2 Salvaged Materials 605.2 Onsite Recycling 605.3 Offsite Recycling	3.5.3.1 Reuse of Building Façades 3.5.3.3 Reuse of Non-Structural Elements	PRODUCT REUSABILITY/ RECYCLABILITY
609.1 Regional Materials	3.5.1.1 Building Core/Shell Path A 3.5.2.1 Interior Fit-Outs Path A	REGIONAL MATERIALS
605.1 Construction Waste Management Plan	3.1.1 Integrated Design Process 3.1.2 Environmental Mgmt. During Construction	CONSTRUCTION/ DESIGN MANAGEMENT
901.7 Hard-Surface Flooring 901.8 Wall Coverings 901.10 Adhesives & Sealants	3.7.2.1 Volatile Organic Compounds	INDOOR ENVIRONMENTAL QUALITY
505.2 Heat Island Mitigation	3.2.2.4 Heat Island Effect	HEAT ISLAND EFFECT
702.2.2 Energy Performance Levels 703.2 Building Envelope	3.3.2.1 Passive Demand Reduction 3.3.4 Building Opaque Envelope	ENERGY EFFICIENCY
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601.3 Building Dimensions and Layouts 601.7 Pre-Finished Materials	3.5.9.2 Rainscreen Wall Cladding	OTHER PRODUCT ATTRIBUTES OR MANUFACTURER ENGAGEMENT INITIATIVES



TCNA BULLETIN

CERAMIC TILE FOR A SAFE AND HEALTHY HOME

Ceramic tile is not only beautiful, it's also healthy for your home. It contains none of the chemicals that have been in the news associated with other flooring products, and it's long-lasting, easy to clean, fire-safe, and offers many slip-resistant choices.

Made of Clay and other Naturally-Occurring Minerals: Free of Formaldehyde, VOCs, and PVC

Ceramic tile* does not contain the chemicals in other floor coverings that are receiving increased attention for their possible adverse health effects, such as formaldehyde,¹⁻⁴ VOCs (volatile organic compounds)⁵⁻⁹ or PVC (polyvinyl chloride).¹⁰⁻¹¹

Zero VOCs. Some VOCs emitted by non-ceramic building products can contribute to a wide variety of health problems and "Sick Building Syndrome," according to various health experts.¹²⁻¹⁵ Because ceramic tile is fired at extremely high temperatures, producing an inorganic material, it has zero VOCs.*

Formaldehyde-Free. Ceramic tile* contains none of the formaldehyde found in some other floor coverings. Formaldehyde is a chemical long associated with respiratory disorders, and exposure is a particular concern for children and the elderly, according to the Centers for Disease Control (CDC).¹⁶⁻¹⁷ In fact, formaldehyde emissions for several wood-based building and flooring products have been federally restricted since 2011 under the Formaldehyde Standards for Composite Wood Products Act.¹⁸⁻²¹ As a fired product, ceramic tile is formaldehyde-free and not subject to this or any other such restriction.

PVC-Free. Ceramic tile* is also free from PVC, a resin used in other types of floor coverings, and regularly a subject of concern and discussion among health experts.²²⁻³³

The easy solution for flooring? Use ceramic tile, which is free of VOCs, formaldehyde, and PVC!



✓ **HEALTHY**

- VOC-Free*
- Formaldehyde-Free*
- PVC-Free*
- Hypoallergenic*
- Natural Ingredients†
- 60-Year Service Life®

✓ **SAFE**

- Non-Flammable*
- Zero Smoke Development*
- Slip Resistant Options

Occupant Safety

Of the many flooring choices available, ceramic tile stands out when slip/fall safety is a consideration because of the thousands of floor tile choices that are slip-resistant when wet. This is in stark contrast to floorings that, according to their manufacturers, must be kept dry in order to be slip-resistant.

Additionally, ceramic tile* is non-flammable and does not produce smoke in a fire, meeting the flame spread and smoke development requirements of Section 803 of the International Building Code (IBC) for interior wall and ceiling materials.

Environment

The UL-certified Environmental Product Declaration (EPD) for North American-made ceramic tile shows that North American-made ceramic tile has the lowest environmental impact across all impact categories, when compared to other floorings with generic EPDs³⁴⁻³⁵ evaluated under the same product category rules.³⁶ With a 60-year service life³⁴ this makes ceramic tile both cost-effective and the best choice for reducing negative environmental impacts, resource use, and demolition waste, when compared to flooring products that need to be replaced more frequently.

Disclaimer: The above information is general in nature and is not specific to any one building product. Ceramic tile products and their properties can vary among manufacturers, products lines, and even among tiles in the same product line. Likewise, non-ceramic tile products have their own properties and can also vary among manufacturers and products. Products that contain any of the chemicals referenced above may contain them in manners that are not known to be harmful and/or that comply with applicable health and safety regulations. Contact the manufacturer of a specific building product to learn about its particular characteristics. See opposite for notes and numbered references.

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35. <http://www.rfci.com/environmental-product-declaration/>
36. http://www.nsf.org/newsroom_pdf/flooring_pcr-new.pdf

Notes

¹Applies to fired ceramics free of any mesh backing or topical sealer. Not all mesh backings and topical sealers produce volatile organic compounds or contribute to flame spread. Consult manufacturer for specific product information if desired.

²Based on independent studies performed at TCNA Laboratory on tiles without mesh backing or topical sealers.

³More than 95% of a fired ceramic tile is made from clay and other raw materials found in nature.

⁴Per UL-Certified Environmental Product Declaration (EPD) for North American-made Ceramic Tile.

TCNA GREEN REPORT

LIFE-CYCLE COST STUDY

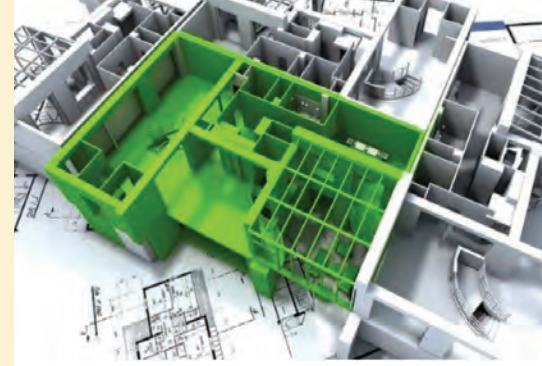


Because a tile installation will last as long as the building it's installed in, its environmental impacts are minimal when compared to other surface coverings that would

have to be replaced numerous times over the life of the building. This also means tile costs less per square foot over the long haul, whereas carpet, vinyl, and other floor coverings are significantly more expensive due to their replacement, maintenance, and refinishing requirements.

Construction cost consulting firm Scharf-Godfrey compared the life-cycle costs of various flooring types. The per year cost for each flooring type includes installation, maintenance, and removal costs. Their comparison, provided below, shows why ceramic tile is the natural choice for sustainable design and long-term value.

Life-Cycle Costs for Floor Finishes (per square foot)				
Floor Finish	Installed Cost	Life Cycle Cost	Expected Life (y)	Cost Per Year
Quarry Tile	\$6.83	\$16.13	50	\$0.32
Glazed Ceramic Floor Tile	\$7.00	\$16.30	50	\$0.33
Glazed Porcelain Tile	\$8.34	\$17.64	50	\$0.35
Mosaic Tile	\$8.20	\$17.50	50	\$0.35
Unglazed Porcelain	\$8.30	\$17.60	50	\$0.35
Natural Hardwood	\$9.31	\$20.80	50	\$0.42
Travertine-Turkish	\$12.50	\$21.80	50	\$0.44
Marble	\$21.00	\$30.30	50	\$0.61
Laminate	\$8.84	\$17.77	25	\$0.71
Man-Made Hardwood	\$9.58	\$18.51	25	\$0.74
Portland Cement Terrazzo	\$14.88	\$24.27	30	\$0.81
Stained Concrete	\$12.40	\$24.60	25	\$0.98
Carpet	\$3.22	\$ 6.50	6	\$1.08
Resin Terrazzo	\$8.50	\$16.53	15	\$1.10
Sheet Vinyl	\$6.90	\$13.90	10	\$1.39
Poured Epoxy	\$8.18	\$15.18	10	\$1.52
VCT	\$3.91	\$18.35	10	\$1.83



Guide to Green Squared®:

The Tile Industry's
Standard and Certification
Program for Product
Sustainability



2019



Stress-Free Sustainability



**GREEN
SQUARED
CERTIFIED®**

**Glass Tile
Ceramic Tile
Installation Products**

CREDITS

LEED v4

Green Globes

NAHB National Green Building Standard

COMPLIANCE

International Green Construction Code

GSA Facilities Standards for Public Buildings

ASHRAE Standard for the Design of High-Performance Green Buildings

CONFIDENCE

Life Cycle-Based, Multi-Attribute Criteria

Verification by Leading Certification Bodies

Listed in National Institute of Building Sciences' Whole Building Design Guide

Recommended by the US EPA for Federal Purchasing

For certified product lines, visit greensquaredcertified.com

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WHAT IS GREEN SQUARED®?



Green Squared® is the world's only multi-attribute sustainability standard and certification program for tile and the associated products needed to install it.

When you see the Green Squared Certified® mark, it means a product meets the broad array of rigorous sustainability requirements of the American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles and Tile Installation Materials (ANSI A138.1).

Including raw material extraction, end of product life management, and all life cycle stages in-between, Green Squared is a true cradle-to-grave performance standard that eliminates the need to cross evaluate single-attribute sustainability claims.

Products independently verified as conforming to the Green Squared standard may bear the Green Squared Certified mark. To be in conformance, products must meet a battery of requirements and electives, as set forth in the standard.

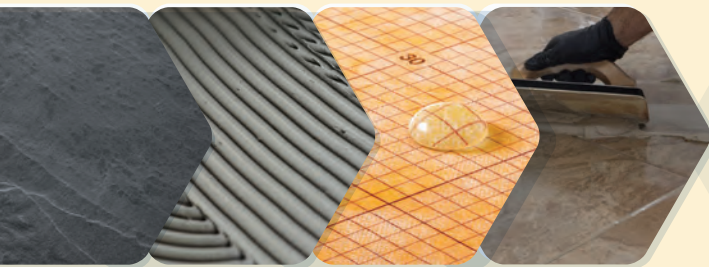
Qualities of the Green Squared Standard

Thorough Green Squared incorporates a full range of sustainability issues into one standard, one mark — allowing for easy marketplace recognition of sustainable tiles and tile installation materials.

Standardized Criteria Green Squared establishes performance-based thresholds, setting the bar for technical specification of sustainable tiles and installation materials.

Clarity As the tile industry's own sustainable product certification program, Green Squared facilitates increased uniformity and decreased confusion in green marketing.

Opportunity By passing rigorous third-party evaluation criteria, certification to the Green Squared standard confers a high level of credibility and a smooth, clear, and responsible path for products to be specified in green building projects.



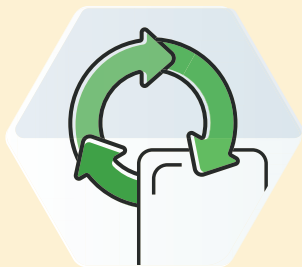
Sustainable Systems Green Squared addresses the components of a tile installation, allowing the specification and installation of systems of certified conforming products.



Multi-Attribute Sustainability (condensed from standard)	
Environmental Product Characteristics	Recycled Content/Reclaimed Waste Content
	Indigenous Raw Goods
	Environmental Packaging
	Durability
	Low Emissions
	Environmental Cleaning & Maintenance
	Solar Reflectance Index (SRI)
	Light Reflectance Value (LRV)
	Sound Abatement
	Third Party LCA & EPD
Environmental Product Manufacturing and Raw Material Extraction	Participation in LCA Database Initiatives
	Particulate Emissions
	Combustion and Fuel Usage
	Raw Goods Sourcing & Extraction
	Outsourced Packaging & Manufacturing Services
	Environmental Management Plans & Systems
	Utility Usage
	Renewable Energy
End of Life Product Mgmt.	Manufacturer Waste Diversion/Minimization
	Shipping Material Waste Minimization
	Manufacturer Guidelines on Clean Fill Usage
Progressive Corporate Governance	Post-Life Material Waste Minimization
	Social Responsibility Strategy
	Labor Law Compliance
	Environmental Regulation Compliance
	Health & Safety Regulation Compliance
	Voluntary Participation in Health/Safety Programs
	FTC Green Guides Compliance
	Continuous Community Involvement
	Public Disclosure
	Sustainability Reports
Certified "Green" Facilities	
Innovation	"Above & Beyond" Standardized Criteria
	Innovative Sustainability Technologies
	Carbon Footprint Awareness/Reduction Strategy

THE GREEN SQUARED® STANDARD

ANSI A138.1



Environmental Product Characteristics

The first section of ANSI A138.1, Environmental Product Characteristics, standardizes product attributes such as the amount of recycled content, level of volatile organic emissions, amount of indigenous raw materials, etc.

Three levels of recycled content and reclaimed waste are defined in the standard. Level one is mandatory for conformance, and levels two and three are elective. Thresholds vary depending on product type.

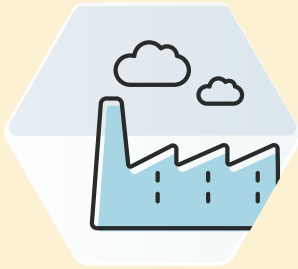
There are also three standardized levels of indigenous raw material content. Recognizing the environmental burden from transportation, indigenous raw materials are those extracted within 500 miles of the manufacturing site. If transported by rail or sea, the limit is 2000 miles. All three levels are elective.

There are five standard attributes for sustainable packaging. All five are elective, but it is mandatory that at least one be achieved:

- Minimal packaging (packaging cannot exceed a specified percentage of the product weight)
- Recyclable packaging (a specified percentage of the packaging is recyclable)
- On-site reusable packaging (100% reusable on site)
- Biodegradable or compostable packaging (meets specific ASTM biodegradability criteria)
- Recycled content packaging (contains a specified percentage of recycled content)

Mandatory for conformance to ANSI A138.1, a product must meet industry standards for durability and performance. For example, tile must comply with ANSI A137.1. Also mandatory for conformance, a product shall have low (for installation products) or no (for tile) volatile organic compound (VOC) emissions. Environmentally-friendly maintenance instructions must also be available.

Finally, as elective options for conformance to A138.1, criteria for solar reflectance index (SRI), light reflectance value (LRV), and sound abatement are all established. Also, electives for life cycle assessment (LCA) and/or environmental product declaration (EPD) are available.



Environmental Product Manufacturing and Raw Material Extraction

The second section of ANSI A138.1, Environmental Product Manufacturing and Raw Material Extraction, standardizes sustainable production practices.

Mandatory for a product to conform to the standard, buildings containing process equipment shall not allow visible particulate matter (PM) emissions. Additionally, there are four standardized PM pollution control levels based on grain size; the first is mandatory and other three are elective.

It is mandatory that the only types of fuels used are natural gas, LP gas, landfill generated methane, or bio-based fuel. The usage of landfill generated methane or bio-based fuel can earn elective credits.

Elective credits can also be achieved through the use of low nitrogen oxide (NO_x) burners and acid gas controls.

Also mandatory for a product to conform, the manufacturer of that product must have a written procurement policy for its raw material suppliers addressing social issues, environmental issues, and applicable requirements for mining laws. Additionally, the manufacturer is expected to maintain a list of all materials used to manufacture the product.

As an elective, the manufacturer may choose to enter into a sustainability-based buying agreement with the raw material suppliers contributing, in aggregate, at least 90% or more of the product by weight.

For outsourced services, such as packaging or additional manufacturing services, manufacturers must require that their service providers have written sustainability policies.

Manufacturers are required to have an environmental management plan that addresses waste minimization, lighting efficiency, heating fuel usage, electricity consumption, and water conservation. There are elective options for minimal water discharge, renewable energy usage, cogeneration, heat recovery or combined heat and power integration, ASHRAE auditing, and ISO 14001 environmental plan registration.

Finally, as electives, several innovative criteria for waste diversion are established. These include incorporation of waste into other manufacturers' products or beneficial reuse projects, donation of finished products to charitable organizations in lieu of disposal, and recycling/reuse of incoming shipping materials.

THE GREEN SQUARED® STANDARD ANSI A138.1



End of Product Life Management

This section of the standard opens with the following preface:

Inherently, tile products are durable, inert, and intended to have life spans as long as the buildings in which they are installed. They are engineered to serve as permanent finishes capable of outlasting multiple generations of building occupants. Tile product end of life management is pertinent to building demolition waste and small quantities of waste generated during construction.

It is perhaps self-evident—but worth noting—that a product with a long lifetime is more sustainable than a similar product with a short lifespan. When considering the environmental, social, and economic sustainability of a product, all relevant impacts are repeated each time that product is replaced. Ideally, a product's expected service life is at least as long as the building in which it is installed, in which case its impacts are considered only once.

Although a tiled finish is inherently durable and typically desirable for a lifetime, there are instances in which end of product life must be addressed. Thus, there are end of product life management electives in ANSI A138.1 that are intended for instances where buildings are demolished, scrap waste is generated during construction, or a remodel occurs.

The first end of product life management elective option requires that the product be eligible for use as clean fill. To satisfy this elective, a manufacturer shall provide documentation verifying that the product is inert and solid such that it can potentially be considered along with other eligible construction and demolition debris for state and local Clean Fill acquisition initiatives.

A second elective requires an end of product life collection plan. To satisfy this elective, the manufacturer shall establish and implement a plan that addresses the collection, processing, and recycling or re-tasking of a product for other purposes once the product's useful life is completed.



Progressive Corporate Governance

The fourth section of ANSI A138.1 specifies criteria for Progressive Corporate Governance.

Mandatory for conformance to the standard, a manufacturer shall have a written and implemented social responsibility strategy which addresses at least the following: labor law compliance, forced labor prohibitions, child labor prohibitions, environmental regulation compliance, health and safety regulation compliance, and community involvement.

As an elective, the manufacturer may choose to participate in a voluntary safety program such as OSHA Safety Consultation, Voluntary Protection Program (VPP), or OHSAS 18001.

It is mandatory that all green marketing claims made by the manufacturer be in compliance with the Federal Trade Commission (FTC) Fair Packaging and Labeling Act (FPLA) Green Guides (publicly available) that indicate how the FTC applies Section 5 of the FPLA, prohibiting unfair or deceptive acts or practices in environmental claims.

As an elective, the manufacturer may choose to regularly engage in its community, building upon the community involvement plan established in its mandatory social responsibility strategy.

Also, as an elective, the manufacturer may publicly disclose on an annual basis one of the following: utilities consumption, registered Environmental Management System (EMS) data, or Life Cycle Assessment (LCA) data.

An elective credit is also available if a manufacturer provides a detailed sustainability report each year, conforms to the requirements of the Global Reporting Initiative (GRI), or is selected for inclusion in the Dow Jones Sustainability Index (DJSI).

If a manufacturer has at least one facility with LEED® or Green Globes certification, an elective credit is also available for that.

Additionally, manufacturers are required to have a program in place that demonstrates continued conformance to the specified criteria of ANSI A138.1/Green Squared for all pertinent products.

THE GREEN SQUARED® STANDARD

ANSI A138.1



Innovation

Technological advancement and outstanding achievement, well beyond what is required, can be key to the development of sustainable products and operations. ANSI A138.1 allows products to achieve conformance, in part, through innovation. This may involve exceptional performance well above the requirements set forth in other sections of the standard, and/or innovative performance recognized by the ANSI ASC A108

Committee in categories not otherwise addressed by the standard.

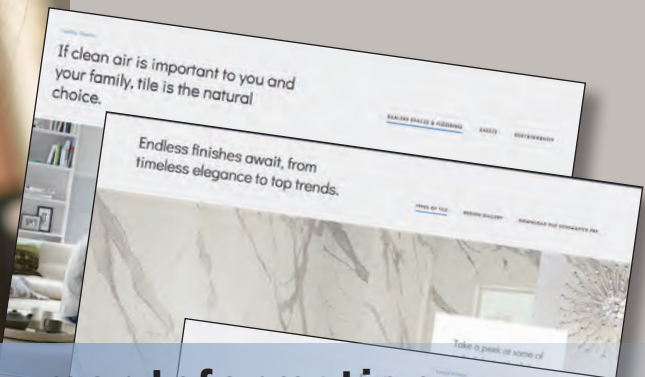
A product may earn up to two electives through exceptional conformance if quantitative criteria already addressed by the standard are greatly exceeded. Either, the most stringent threshold already established for a specific criterion must be exceeded by one and a half times, or certain specific requirements defined in the standard's Appendix C must be met.

For sustainability attributes not directly addressed by the standard, an evolving list of approved innovations is managed by the ANSI ASC A108 Committee. Innovations not included in this list can be added if they are submitted to and approved by the Committee. This can include ecological attributes or processes not otherwise addressed by the standard or innovative corporate governance.

A product may also earn a fourth innovation elective if the product's carbon footprint is provided and prescriptive measures were taken to reduce either the product's or the manufacturing organization's greenhouse gases.



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BEAUTIFUL.
RESOURCE.**



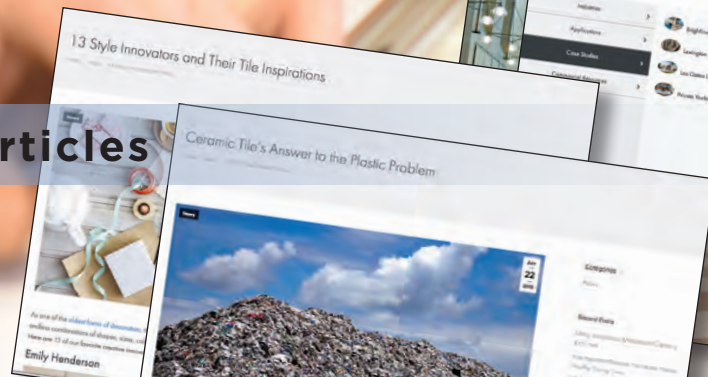
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THIRD PARTY CERTIFICATION GREEN SQUARED CERTIFIED®

Background on Green Squared Certification

Green Squared® certification was developed by TCNA for independent third-party certifiers to assess if products are in conformance with ANSI A138.1. Products certified under Green Squared may be labeled using the Green Squared Certified mark. This easily-recognizable mark helps architects, designers, and end users choose products, while resting assured that the products they choose meet the industry's broad range of sustainability criteria.

The Green Squared framework for product evaluation and certification is in accordance with ISO Type 1 environmental labeling and declaration requirements (ISO 14024). With so many different brands of green today, Green Squared certification provides authenticity and conveys that the product certified is the real deal. In a marketplace wary of unsubstantiated product sustainability claims, Green Squared third-party validation is provided by well-known and widely-recognized certification bodies.

The Green Squared Certification Process

A manufacturer seeking Green Squared certification for various products they make applies directly to a certification body approved under the Green Squared program. The certification body then makes necessary arrangements with the manufacturer to evaluate if the products meet the ANSI A138.1 standard. This evaluation, which is in accordance with the Green Squared Certification Program Criteria, includes a comprehensive and objective review of the products and the associated manufacturing facility. Based on this evaluation, for those products that meet ANSI A138.1, the certification body authorizes the use of the Green Squared Certified mark.

Global Applicability

The ANSI A138.1 standard, and certification of conformance to that standard (i.e. Green Squared certification) were developed specifically to be relevant to products no matter where in the world they are produced. Developed to meet the sustainability needs of the North American marketplace, the Green Squared standard and certification program provide all producers, foreign and domestic, with a clear benchmark for designing sustainable products that can be accepted by North American green building programs.

Six Steps of Certification

Here's what to expect when pursuing Green Squared® certification of your product(s):

1 APPLICATION PROCESS

Manufacturer interested in having a product certified applies directly to an authorized Green Squared certification agency.

Certification Agencies:  

2 EVALUATION

The certification process involves the following in determination of ANSI A138.1 conformance:

- General evaluation of the applicant organization
- Product evaluation
- On-site facility evaluation

3 CONFIDENTIALITY

All proprietary information remains confidential between the certification agency and the manufacturer.

4 CERTIFICATION

- Green Squared Certified® mark awarded by certification agency
- Scope of certified products determined by certification agency
- Certifications valid for a five-year period
- Surveillance audits each year
- Re-certification after five years

5 PRODUCT LISTING

- Agency lists all certified products
- Certified products also listed on GreenSquaredCertified.com
- Certified product data syndicated by Ecomedes to Fulcrum, as well as to many public and private A&D purchasing libraries

6 USING THE MARK

- Directly on certified products
- Packaging of certified products
- Promotional literature published about certified products

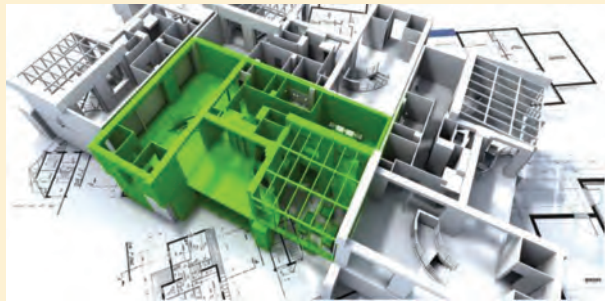


SPECIFYING GREEN SQUARED® GREEN BUILDING STANDARDS, CODES, AND RATING SYSTEMS

LEED v4 Under the LEED pilot credit, *Certified Multi-attribute Products and Materials*, a point toward LEED certification can be earned by using products from manufacturers who have confirmed multiple environmental attributes through an independent, third-party certification, such as Green Squared®.

In order to achieve this point, at least 25%, by cost, of the total value of permanently installed products in a project must have earned certification under any of the following programs: Level® certification for furniture, NSF 140 certification for carpet, NSF 332 certification for resilient flooring, Green Squared certification for tiles and tile installation materials, UL 100 certification for wall board, NSC 373 certification for natural stone, NSF 343 for wallcoverings, and NSF 347 for roofing membranes.

Additionally, the product literature must disclose which sections of the relevant multi-attribute sustainability standard were met, and an LCA (life-cycle assessment) conforming to ISO 14044 must be available, either as a component of or in addition to the product's multi-attribute certification.



- 75% of the total product cost if ANSI 138.1 Level 2 criteria for recycled/reclaimed content and/or Level 2 criteria for indigenous raw materials were met as part of the certification
- 100% of the total product cost if ANSI A138.1 Level 3 criteria for recycled/reclaimed content and/or Level 3 criteria for indigenous raw materials were met as part of the certification

Sample calculation for a project with \$1,000,000 in permanently installed products, including \$80,000 of Green Squared Certified tile and \$20,000 of Green Squared Certified mortar that meets ANSI A138.1 Level 3 criteria for indigenous raw materials.

Tile installation contribution to the 25%, by cost, of the total value of permanently installed products in the project

$$\frac{(0.5) (\$80k \text{ tile value}) + (1.0) (\$20k \text{ mortar value})}{\$1M \text{ (all materials value)}} = 6\%$$

In the example above, the contribution of Green Squared Certified® tiles and installation materials toward the 25% minimum would be 6%.



Tiles or installation materials that are Green Squared Certified® and for which an LCA is available (or which meet section 3.8.1 of Green Squared®/ANSI A138.1) can contribute:

- 50% of the total product cost for baseline certification

Green Globes

Under the provisions of Section 3.5.1.2, *Path B: Prescriptive Path for Building Core and Shell* and Section 3.5.2.2, *Path B: Prescriptive Path for Interior Fit-Outs*, using Green Squared Certified® products can contribute toward the 30 available points for using products with EPDs or that are third-party certified to multi-attribute standards. Points are awarded for using products with:

EPDs: Generic or Proprietary AND/OR Third-Party Verified Proprietary Life-Cycle Assessments AND/OR Third-Party Certifications to Multiple Attribute Standards

Points are awarded based on the percentage of products used (based on cost) and on where they are used.



Without limit, using Green Squared Certified tiles or installation materials will contribute to this requirement, in direct proportion to the product's value. Products that also have an LCA or EPD can contribute double.

Sample calculation for a project with \$1,000,000 in interior fit-out materials including \$150,000 in Green Squared Certified tiles and/or installation materials:

$$\frac{\$150\text{K (tile value, Green Squared Certified)}}{\$1\text{M (value, all interior fit-out materials)}} = 15\% \text{ (5 points)}$$

Sample calculation for the same project, but with tile that is Green Squared Certified and has an LCA or EPD:

$$\begin{aligned} & \$150\text{K (tile value, Green Squared Certified)} \\ & + \$150\text{K (LCA or EPD)} \\ \hline & \$300\text{K} \end{aligned}$$

$$\frac{\$300\text{K (tile value)}}{\$1\text{M (value, all interior fit-out materials)}} = 30\% \text{ (7 points)}$$

	Percentage of Products	Points
Section 3.5.1.2: Core and Shell	≥ 40%	20
	25% - 39%	15
	10% - 24%	10
Section 3.5.2.2: Interior Fit-Outs	≥ 40%	10
	25% - 39%	7
	10% - 24%	5

SPECIFYING GREEN SQUARED® GREEN BUILDING STANDARDS, CODES, AND RATING SYSTEMS

International Green Construction Code (IgCC) Powered by ASHRAE Standard 189.1

About IgCC: An initiative of the International Code Council (ICC), IgCC was developed as model code language for states and municipalities to establish baseline sustainability requirements for new and existing commercial buildings.

About ASHRAE 189.1: An ANSI-accredited standard, ASHRAE 189.1 was written to be incorporated into governing jurisdictions' codes and ordinances for commercial buildings and enforced by building officials and inspectors.

IgCC and ASHRAE Standard 189.1 are now integrated into a single model code and standard for high-performance buildings.

For compliance with the IgCC, specifically Section 901.4.1.4.3 (ASHRAE 189.1 Section 9.4.1.4.3), *Multiple-Attribute Product Declaration or Certification*, at least 10 different products installed in the building at the time of occupancy shall have a generic EPD, have a proprietary EPD, conform to a third-party multi-attribute certification, or have a third-party reviewed life cycle assessment (LCA).



Each Green Squared Certified® tile or installation material used on a project counts as one product toward the 10-product threshold, as the Green Squared® standard is one of the multi-attribute certification programs specified by the standard.





NAHB National Green Building Standard

Commonly referred to as ICC 700, NAHB's National Green Building Standard is an ANSI-accredited specification for residential construction. Green Squared Certified® tiles and installation materials can help achieve points under section 611.2, Sustainable Products.

Three points are awarded if 50% or more, based on square footage, of all tiles installed in a project have been Green Squared Certified. In order for such tiles to qualify, tile must make up at least 30% of the floor or wall area of the project.



Three points are awarded if 50% or more, based on square footage, of all tile installed in a project have been Green Squared Certified. In order for such tiles to qualify tile in general must make up at least 30% of the floor or wall area of the project.



GSA P-100 Facilities Standards

This standard incorporates sustainability criteria into design standards for the construction of government-funded buildings. Section 3.4 (Interior Performance) sets forth several provisions for ceramic tile:

The “Baseline” and Tier 1 High Performance provisions specify that tiles conform to ANSI A137.1, the ANSI standard for ceramic tile, and be Green Squared Certified.

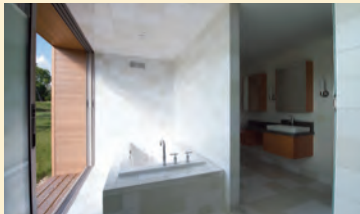
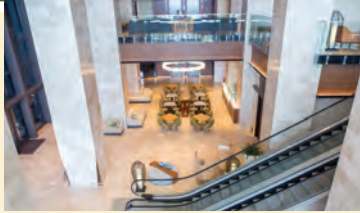
The Tier 2 High Performance and Tier 3 High Performance provisions specify that tiles conform to ANSI A137.1, the ANSI standard for ceramic tile, be Green Squared Certified, and have a publicly-available EPD.



Green Squared Certified tiles and installation materials satisfy GSA's baseline and Tier 1 High Performance tiling requirements. Green Squared Certified products that also have an EPD, are eligible for use on Tier 2 and Tier 3 federal building projects.

GREEN SQUARED® IN THE FIELD

PROJECTS WITH GREEN SQUARED CERTIFIED® PRODUCTS



The inherent eco-friendliness of tile and tile installation products is amply demonstrated by Green Squared Certified® products.

Green Squared® is a multi-attribute, industry-wide

standard that reflects the North American tile industry's commitment to sustainable manufacturing. The standard provides architects, specifiers, and consumers with a consistent set of criteria for evaluating the sustainability of tile and tile installation products.

Products bearing the Green Squared Certified logo are manufactured according to rigorous sustainability criteria that address a broad range of considerations, from the extraction of raw materials, to reuse or disposal at the end of a product's life.

Manufacturers of Green Squared Certified products invest considerable resources to ensure their facilities and manufacturing practices are socially and environmentally responsible, and to obtain third-party certification.

Besides being robustly sustainable, Green Squared Certified products are also beautiful, as the photos on the following pages illustrate.

The tile and installation products pictured here represent only a handful of the Green Squared Certified products that are currently available. Hundreds of products have been certified, and still more are in the certification process.



PROJECT SITE: Dusit Thani Guam Resort
Tumon Bay, Guam (U.S. Territory)

PROJECT SCOPE: 45,000 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- Ultralite Mortar Pro

Ultralite Mortar Pro was used to install tiles on 22 columns throughout the resort, as well as the floors of the lobby and promenades. Containing recycled materials that reduce its weight, the mortar facilitated easier installation at the highest portions of the columns, according to the mortar manufacturer.



PROJECT SITE: “The Little Woods House”
Oakwood, Ohio

PROJECT SCOPE: 3,800 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- Eco Tile Natural Hues (2"x 2" to 4"x 8")

Architect Michael Ruetschle, AIA LEED AP, received a Merit Award from the American Institute of Architects, Dayton Chapter, for this design of his private residence. Sustainable strategies employed include specification of building materials with high recycled content and using materials, sealants, and paints with low to zero VOC emissions.

— Architect’s blog, “The Little Woods House”
<http://ruetschle.blogspot.com>



PROJECT SITE: Hard Rock Hotel Riviera Maya
Puerto Aventuras, Mexico

PROJECT SCOPE: 1,264-room resort hotel on 250 acres

GREEN SQUARED CERTIFIED PRODUCTS:

- Extrema Rafting Unglazed Porcelain Floor Tile 12" x 24"

“ [The] design blends the natural beauty of Mexico with the easy luxury and playfulness of the Hard Rock brand. The JBI team was inspired by the Festival de Avândaro, a Woodstock-like music festival that took place in 1971 on Mexico’s Lake Avândaro. ”

— Jeffrey Beers International (JBI),
Architectural Firm
Website: jeffreybeers.com



PROJECT SITE: Founders Brewery
Grand Rapids, Michigan

PROJECT SCOPE: 9,660 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- #310 Mayflower Red Quarry Tile 6"x 6"

This craft brewery is located in the historic downtown area of Grand Rapids, Michigan. Quarry tile was chosen for its durability in heavy commercial settings such as those found in manufacturing, according to the tile manufacturer.



PROJECT SITE: Colorado College Athletic Facility
Colorado Springs, CO

PROJECT SCOPE: 120,000 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- Progetta Casa and Urbanite (Through Body Porcelain)
- PietraArt Stone Slate

“While this building was not LEED [certified], we wanted to be aware of our environmental impact. These products were chosen because of recycled content as well as performance. Sustainable products have come a long way; these products are performing great in a high traffic space.”

— Cally Dalton, Interior Designer
Oz Architecture Denver, CO



PROJECT SITE: Arizona Phoenix Children's Hospital

PROJECT SCOPE: 450,000 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- Semi-Gloss™ Glazed Ceramic Wall and Counter Tile 6"x6" in Coral Bead, Fire Brick, Galaxy, Key Lime, Mustard, Ocean Blue, Orange Burst, Vermilion, White, and Wood Violet

The design team from HKS Architect implemented sustainable strategies to lower the carbon footprint of the project, including materials selection. Semi-Gloss is made of 35% pre-consumer recycled material and is produced at a U.S. manufacturing facility, according to the tile manufacturer.



PROJECT SITE: San Francisco Toyota
San Francisco, CA

PROJECT SCOPE: Approximately 8,000 square feet total
Showroom is 5,800 square feet

GREEN SQUARED CERTIFIED PRODUCTS:

- Color Blox EcoCycle-Slinky 24 x 24 (showroom, hallway, and coffee bar)
- EcoCycle-Night Air 12 x 12 (Scion area and new car delivery area)
- EcoCycle-Pine Barren 12 x 12 (path on floor in the Eco/Prius area)

100 percent of the original structure, a 19th-century horse barn, was recycled for this LEED NC Platinum Certified San Francisco Toyota facility, and 75 percent of the construction waste was recycled, according to the tile manufacturer.

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Release date: January 2019

Green building standards and rating systems are living documents, and the consensus regarding their use and interpretation is ever-evolving. Check for updates to *Tile: The Natural Choice* at www.TCNAtile.com.



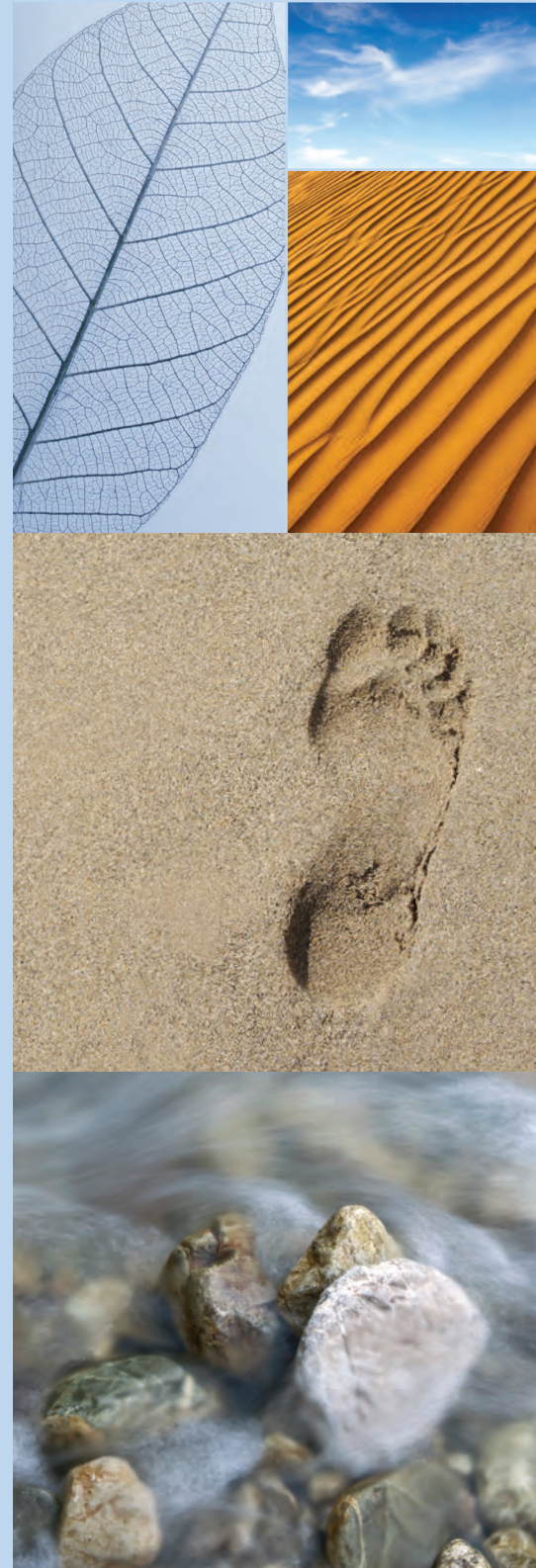


Guide to EPDs for Ceramic Tile, Mortar, and Grout Made in North America

2019

UL-Certified
ISO
STANDARDIZED
PCRS
Green
Building
Credits
Independently Verified
CREDIBILITY
Natural
Resources
Tile
Council
Transparency
ENERGY
DEMAND
Carbon
Footprint
LCA
60-YEAR IMPACT ASSESSMENT

CRADLE-TO-GRAVE
ATMOSPHERE
LOW ENVIRONMENTAL IMPACT



Total Transparency

The EPDs for North American-made Ceramic Tile, Mortar and Grout report the environmental footprints of North American-made ceramic tile, mortar and grout across all major impact categories within a 60-year building service life. Specify ceramic tile, mortar and grout covered by the EPDs to fulfill requirements of leading green building programs.



These EPDs are initiatives of the Tile Council of North America and participating members. Data analysis and modeling were performed by Thinkstep. Third-party certification by UL Environment ensures conformance to ISO standards for EPDs and LCAs.



Download EPDs at
www.TCNAtile.com

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TOTAL TRANSPARENCY

EPDs FOR NORTH AMERICAN-MADE CERAMIC TILE, MORTAR, AND GROUT

The environmental product declarations (EPDs) for North American-made ceramic tile, mortar, and grout provide a comprehensive overview of how these products impact the environment. The combination of the three provides environmental impact data, per square meter, of the main materials used to set tile.

The EPDs address the most important environmental considerations affecting the well-being of the planet and those who call it home—specifically, global warming, abiotic resource depletion, acidification, smog formation, eutrophication, and ozone depletion.

And, because EPDs and product environmental transparency are increasingly required in green construction standards and rating systems, specifying ceramic tiles, mortars, and grouts covered by the

EPDs can help achieve green building points and meet transparency requirements. In fact, as most green building standards, codes and rating systems provide incremental credit for the use of each product covered by an EPD, using tile in a project, with the accompanying mortar and grout, means that a single tile installation using materials covered by North American EPDs could potentially contribute “three times (3X).”

The Credibility Process

When selecting construction materials, it’s important to know decisions are supported by reliable, life cycle-based sustainability information. For the North American-made Ceramic Tile, Mortar, and Grout EPDs, the life-cycle assessments were independently performed by Thinkstep per the ISO standard 14040/44, *LCA*



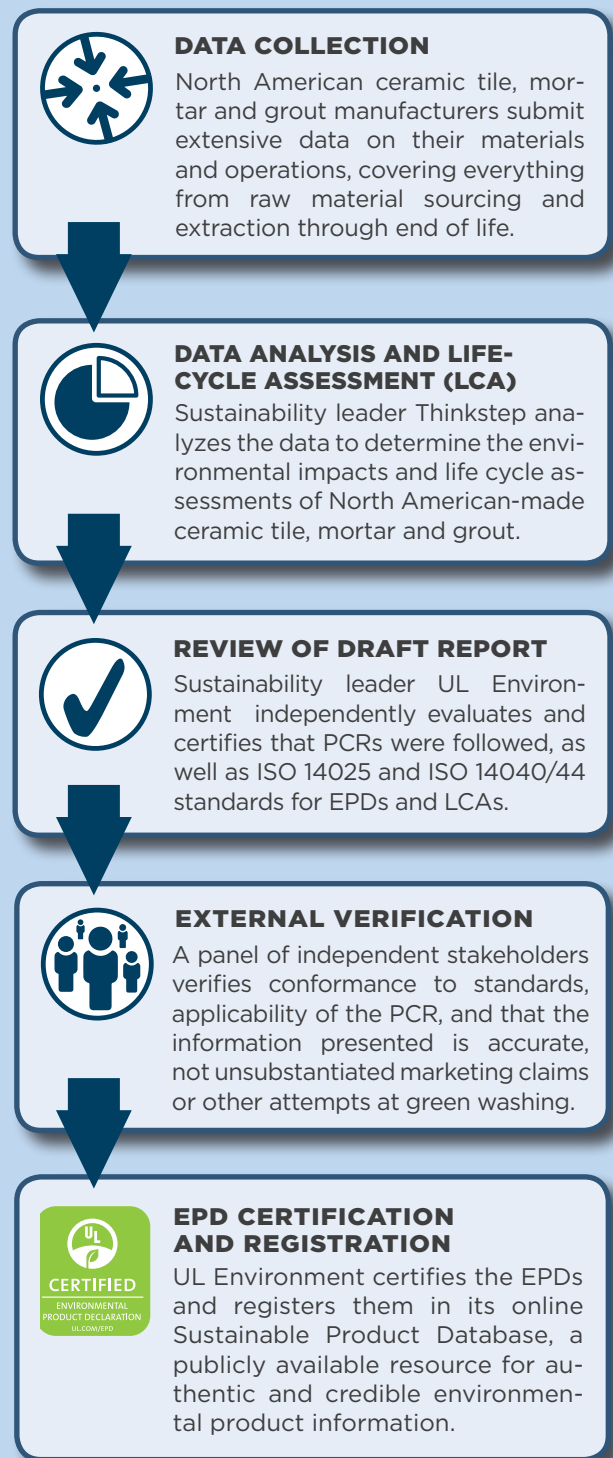
Principles, Framework, Requirements, and Guidelines. Additionally, UL Environment, as Program Operator, verified the validity of the LCAs and certified the requirements of ISO 14025, *Principles and Procedures for EPDs*, were met. Conformance to these standards, plus certification of the EPDs by a globally recognized sustainability leader, ensures the EPDs are accurate, not unsubstantiated marketing claims or other attempts at “green washing.”

To produce the EPDs, the participating manufacturers provided extensive data on their materials and operations and participated in a cradle-to-grave evaluation of their products, from raw material sourcing/extraction, through manufacturing, delivery, installation, use, and end of life.

For each EPD, the specific environmental impacts measured, and the methodology for measuring those, are dictated by a Product Category Rule (PCR). For the tile EPD, the North American PCR for flooring EPDs was followed. Using product category rules developed for all flooring allows tile covered by the EPD to be compared to other flooring products evaluated under the same PCR.

For the mortar and grout EPDs, international PCRs for factory-made mortar were adapted for North American usage per an addendum published by UL Environment. This allowed the North American PCR to build on criteria that was previously used in the development of EPDs for other types of cementitious construction products. This provides valuable references when analyzing and interpreting EPDs in a global context.

The standardized reporting of tile, mortar and grout required by the PCRs additionally provides transparency and prevents green washing, as all parameters and



TOTAL TRANSPARENCY

EPDs FOR NORTH AMERICAN-MADE CERAMIC TILE, MORTAR, AND GROUT

impacts in the PCR must be reported, not just those areas in which a product performs well.

Products Covered by the EPDs

Because the EPDs are based on aggregated data from all participating manufacturers, they are “generic” or “non-proprietary” EPDs. As most major North American tile industry manufacturers participated, over 95% of North American-made products are covered: 2.5 billion square feet of tile and 2.25 billion kilograms of mortar and grout.

To find out if a specific product line is covered by a certified EPD, contact the participating manufacturers.

Participating Tile Manufacturers

Arto
Crossville
Dal-Tile Corporation
Florida Tile
Florim USA
Interceramic
Ironrock
Porcelanite Lamosa
Quarry Tile Company
StonePeak Ceramics
Vitromex de Norteamérica

Participating Grout and Mortar Manufacturers

Ardex
Bexel
Bostik
Cemix/Texrite
Crest
Custom Building Products
HB Fuller/Tec
Interceramic
Laticrete
Mapei

The EPDs were initiated by Tile Council of North America (TCNA) and its participating members, with data analysis and modeling by Thinkstep and third-party, independent certification by UL Environment.



thinkstep



Environment



Download the EPDs at [TCNAtile.com](https://www.tcnatile.com)

Just as nutrition labels inform the calorie conscious on food choices, an EPD informs with respect to sustainability. When using the North American-made Tile EPD alongside other flooring products' generic EPDs, one thing is clear: Ceramic tile has the lowest 60-year environmental impact per square foot (and per square meter) across all major impact categories. Similarly, the industry-wide EPDs for North American-made mortar and grout report very low 60-year environmental impacts per installed square meter.

Environmental Facts	
Functional unit: 1 m ² of Ceramic Tile Floor Covering Reference Service Life (RSL): 60 Years	
60 YEAR IMPACT ASSESSMENT	Total
Primary Energy, Renewable (MJ)	10.4
Primary Energy, Non-Renewable (MJ)	225
Secondary Energy, Renewable (MJ)	0.15
Secondary Energy, Non-Renewable (MJ)	1.4
Global Warming Potential (kg CO ₂ eq)	15
Acidification Potential (kg SO ₂ eq)	0.0565
Ozone Depletion Potential (kg R11 eq)	8.11E-10
Smog Potential (kg Ethene eq)	0.0052
Eutrophication Potential (kg Phosphate eq)	0.00604
Abiotic Depletion Potential - Elemental (kg Sb eq)	1.22E-05
Abiotic Depletion Potential - Fossil (MJ)	219
OTHER INFORMATION	
Zero VOCs	
Boundaries	Cradle to Grave
Recycled Content	Varies
Green Squared Certification*	Some Tiles
Ceramic Tile Ingredients: Clay (70.3%), Quartz (4.8%), Feldspar (5.3%), Scrap (4.2%), Kaolin (3.2%), Granite (1.3%), Lime (1.1%), Glaze and Stain (5.4%), Other Minerals (4.0%)	
Visit www.TCNAtile.com for further information.	

Environmental Facts	
Functional Unit: 1 m ² of Installed Grout (Application Rate, 0.212 kg/m ²) Reference Service Life (RSL): 60 Years	
60 YEAR IMPACT ASSESSMENT	Total
Primary Energy, Renewable (MJ)	0.221
Primary Energy, Non-Renewable (MJ)	2.2
Global Warming Potential (kg CO ₂ eq)	0.203
Acidification Potential (kg SO ₂ eq)	0.000766
Ozone Depletion Potential (kg R11 eq)	2.94E-10
Smog Potential (kg Ethene eq)	6.11E-05
Eutrophication Potential (kg Phosphate eq)	9.46E-05
Abiotic Depletion Potential-Elemental (kg Sb eq)	2.34E-07
Abiotic Depletion Potential-Fossil (MJ)	2.1
OTHER INFORMATION	
VOC Emissions-CDPH Section 01350	Meets
Recycled Content	Varies
Green Squared® Certification	Some Grout
ANSI A118.6, ANSI A118.7	Meets
Tile Grout Ingredients: Sand, White Cement, Limestone, Grey Cement, Calcium Aluminate, Calcium Formate, Other Additives	
Visit www.TCNAtile.com for further information.	

Environmental Facts	
Functional Unit: 1 m ² of Installed Tile Mortar (Application Rate, 4.07 kg/m ²) Reference Service Life (RSL): 60 Years	
60 YEAR IMPACT ASSESSMENT	Total
Primary Energy, Renewable (MJ)	2.1
Primary Energy, Non-Renewable (MJ)	32.3
Global Warming Potential (kg CO ₂ eq)	2.88
Acidification Potential (kg SO ₂ eq)	0.0115
Ozone Depletion Potential (kg R11 eq)	4.43E-09
Smog Potential (kg Ethene eq)	0.000951
Eutrophication Potential (kg Phosphate eq)	0.00121
Abiotic Depletion Potential-Elemental (kg Sb eq)	3.51E-06
Abiotic Depletion Potential-Fossil (MJ)	30.9
OTHER INFORMATION	
VOC Emissions-CDPH Section 01350	Meets
Recycled Content	Varies
Green Squared® Certification	Some Mortar
ANSI A118.1, ANSI A118.4, ANSI A118.11, ANSI A118.15, ISO 13007	Meets
Tile Mortar Ingredients: Sand, Calcium Carbonate, Grey Cement, White Cement, Ethylene Vinyl Acetate, Admixture, Cellulose Ether, Other Additives	
Visit www.TCNAtile.com for further information.	

CREDITS AND COMPLIANCE

NORTH AMERICAN-MADE CERAMIC TILE, MORTAR, AND GROUT

LEED v4

Under the credit category Building Product Disclosure and Optimization—Environmental Product Declarations, up to 2 points toward LEED certification can be earned by using products with EPDs, such as North American-made ceramic tile, mortar and grout.

Option 1 (1 Point)

Environmental Product Declaration

AND/OR

One point can be earned for using at least 20 different permanently installed “products,” which are construction materials that meet one of the specified disclosure criteria and are therefore eligible for the valuation associated with that disclosure criteria. Valuations for such materials are awarded on a per-material basis, and this LEED point is earned by using enough materials that their combined valuations total at least 20 “products.”

Disclosure Criteria	Valuation
Proprietary LCA	¼ product
Generic EPD	½ product
Proprietary EPD	1 product

Materials that meet multiple criteria are eligible only for the highest valuation available; the valuations cannot be combined. Also, materials must be sourced from at least five different manufacturers.



Products covered by the North American-made Ceramic Tile, Mortar, and Grout EPDs can each contribute at least ½ product toward the 20-product requirement. For example, for a project with 8 different tiles installed with the same mortar but different grouts (all covered by EPDs), the 17 tiles and related installation materials would contribute 8.5 “products” toward the 20-product requirement (Example A). In the same scenario, if the mortar, grout, and 1 of the 8 tiles also have a proprietary EPD, the same 17 tiles and related materials would contribute 13.5 “products” (Example B).

Example A

$$(8 \text{ tiles} + 1 \text{ mortar} + 8 \text{ grouts}) \times .5 \text{ products} = 8.5$$

Example B

$$(1 \text{ tile} \times 1 \text{ product}) + (1 \text{ mortar} \times 1 \text{ product}) + (8 \text{ grout} \times 1 \text{ product}) + (7 \text{ tiles} \times .5 \text{ products}) = 13.5$$

Option 2 (1 Point)

Multi-Attribute Optimization

One point can be earned by using products with below-industry-average impacts, when those products comprise at least 50% of the total value of permanently installed products in the project and their environmental impacts are lower in at least 3 of the applicable impact categories: global warming potential, ozone depletion potential, acidification potential, eutrophication potential, photochemical oxidant creation potential, and fossil abiotic depletion potential.



For this LEED point, only tiles, mortars, or grouts included in generic EPDs that also have one or more proprietary EPDs showing below-industry-average impacts can contribute to meeting the 50% value threshold.

Sample calculation for a project with \$1,000,000 in permanently installed products, including \$100,000 of ceramic tiles, mortar or grout that has lower-than-industry-average environmental impacts in at least 3 categories.

$$\frac{\$100\text{K (tile, mortar, grout value)}}{\$1\text{M (all materials value)}} = 10\%$$

In the example above, the contribution of the tile and related installation materials toward the 50% minimum would be 10% points (20% of the requirement).

Green Globes

Under the provisions of Section 3.5.1.2, *Path B: Prescriptive Path for Building Core and Shell* and Section 3.5.2.2, *Path B: Prescriptive Path for Interior Fit-Outs*, using North American-made ceramic tiles, mortars, and/or grouts can contribute toward the 30 available points for using products with EPDs. Points are awarded for using products with:

EPDs:
Generic or Proprietary AND/OR Third-Party Verified
Proprietary Life-Cycle Assessment AND/OR Third-Party Certification
to Multiple Attribute
Standards

Points are awarded based on the percentage of product used (based on cost) and on where it is used. Products with EPDs are valued the same, regardless of whether their EPDs are generic or proprietary; both contribute equally toward the value percentage.

	Percentage of Products	Points
Section 3.5.1.2: Core and Shell	≥ 40%	20
	25% – 39%	15
	10% – 24%	10
Section 3.5.2.2: Interior Fit-Outs	≥ 40%	10
	25% – 39%	7
	10% – 24%	5

EPD Without limit, using North American-made ceramic tiles, mortars, and grouts covered by EPDs will contribute to this requirement, in direct proportion to the products' value. Products that are also Green Squared Certified will earn double points for also meeting the requirement for products with third-party certifications based on multiple attribute standards.

Sample calculation for a project with \$1,000,000 in interior fit-out materials including \$150,000 in tiles, mortars, and/or grouts covered by the EPD:

$$\frac{\$150\text{K (tile, mortar, grout value, EPD)}}{\$1\text{M (value, all interior fit-out materials)}} = 15\% \text{ (5 points)}$$

Sample calculation for the same project, but with tile, mortar and grout that is covered by the EPD and Green Squared Certified:

$$\begin{aligned} & \$150\text{K (tile, mortar, grout value, EPD)} \\ + & \$150\text{K (tile, mortar, grout value, Green Squared Certified)} \\ \hline & \$300\text{K} \end{aligned}$$

$$\frac{\$300\text{K (tile, mortar, grout value)}}{\$1\text{M (value, all interior fit-out materials)}} = 30\% \text{ (7 points)}$$

CREDITS AND COMPLIANCE

NORTH AMERICAN-MADE CERAMIC TILE, MORTAR, AND GROUT

NAHB National Green Building Standard

NAHB National Green Building Standard is commonly referred to as ICC 700. North American-made ceramic tile can help achieve points under Section 611.4, Product Declarations, in this ANSI-approved standard and rating system for residential construction. In this section of the standard, 5 points are awarded if EPDs are submitted for 10 different products installed in the building project. Each building material with an industry-wide EPD contributes a full ‘product’ toward the 10-product goal. Each building material with a product-specific EPD contributes two ‘products’ toward the 10-product goal.

Additionally, up to 10 points can be awarded under Section 610, Life Cycle Analysis, for using products with lower environmental impacts, compared to products intended for the same use. To garner points under Section 610, the selected product must improve upon multiple environmental impacts by an average of 15%, with the number of points awarded tied to the number of impact categories in which the selected product performs better.

Number of Impact Categories	Points
4	2
5	3

Applicable Impact Categories:

- Fossil fuel consumption
- Global warming potential
- Acidification potential
- Eutrophication potential
- Ozone depletion potential

The standard requires that the LCA tool used to determine the environmental impacts must be based on a reference service life of 60 years. It allows comparisons to be made between different types of products with the same use. It also allows comparison of individual product impacts to the industry averages for the same product type.

Each tiling product covered by the North American-made tile, mortar and/or grout EPDs contributes a full product toward the 10-product threshold specified by



Section 611.4 of this standard. Those which have product-specific EPDs count double, expanding opportunities for garnering the previously discussed 5 points and creating the possibility of satisfying the 10-product requirement solely with tile installations alone!

EPD Furthermore, the North American-made Ceramic Tile, Mortar, and Grout EPDs report environmental impacts over 60 years, as analyzed by GaBi LCA software, according to the requirements of the standard.

When choosing between tile and an alternate flooring material, using ceramic tile covered by the EPD is advantageous when building to this standard, because the EPD shows very low environmental impacts in all categories. In fact, tile covered by the EPD has the lowest impact in all six impact categories, as compared to the impacts reported for other common flooring options in their publicly available, generic EPDs. Refer to the 60-year impact analysis graphs included in this guide for details.

When choosing between specific tiles, mortars, and/or grouts, products covered by generic EPDs will additionally contribute when such products also have proprietary EPDs showing impacts that are on average 15% lower, as compared to the industry average reported in the generic EPD, in at least 4 categories.

Additionally, products that are Green Squared Certified® can also contribute points as detailed elsewhere in the NAHB Green Building Standard. Refer to the Tile and Green Building chart in *Tile: The Natural Choice* for details.



International Green Construction Code (IgCC) Powered by ASHRAE Standard 189.1

About IgCC: An initiative of the International Code Council (ICC). IgCC was developed as model code language for states and municipalities to establish baseline sustainability requirements for new and existing commercial buildings.

About ASHRAE 189.1: An ANSI-approved standard, ASHRAE 189.1 was designed to be incorporated into governing jurisdictions' codes and ordinances for commercial buildings and enforced by building officials and inspectors.

IgCC and ASHRAE Standard 189.1 are now integrated into a single model code and standard for high-performance buildings.

In IgCC Section 901.4.1.4 (ASHRAE 189.1 Section 9.4.1.4.2), *Multiple-Attribute Product Declaration or Certification*, at least 10 different products installed in the building by the time occupancy is allowed shall have a generic EPD, have a proprietary EPD, conform to a third-party multi-attribute certification, or have a third-party reviewed life cycle assessment (LCA).



Each tiling product used, if covered by one or more of the North American made Ceramic Tile, Mortar, and/or Grout EPDs, counts as one product toward the ten-product threshold.

CREDITS AND COMPLIANCE

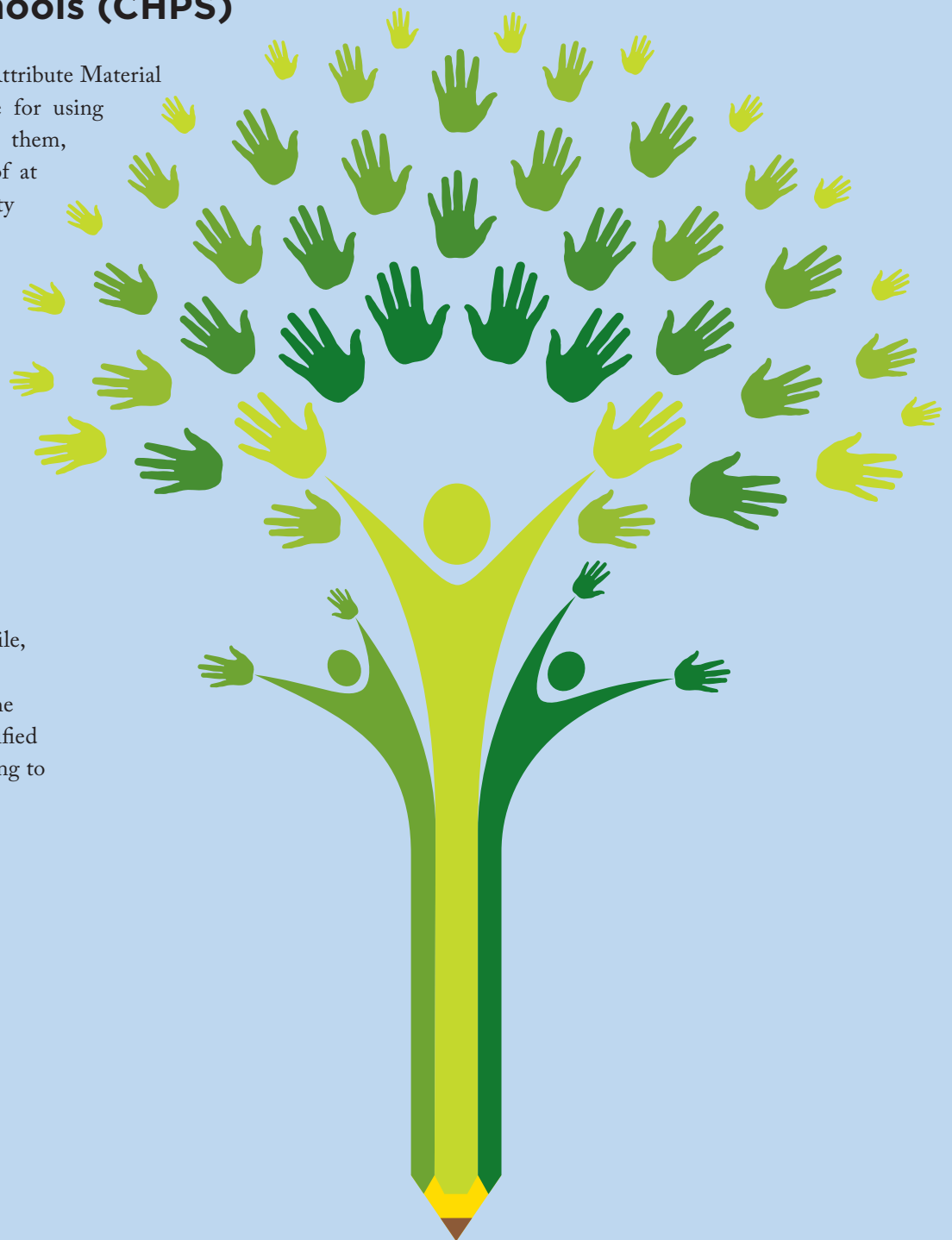
NORTH AMERICAN-MADE CERAMIC TILE, MORTAR, AND GROUT

Collaborative for High Performance Schools (CHPS)

Under Section MW 7.1, Multi-Attribute Material Selection, 3 points are available for using products with EPDs. To earn them, the standard requires selection of at least 10 products with third party certified EPDs conforming to ISO 14025 and/or ISO 21930. Products are valued the same, whether their EPDs are generic or proprietary.

EPD

North American-made ceramic tile, mortar and grout can contribute toward earning these points, as the EPDs have been third-party certified by UL Environment as conforming to ISO standards for EPDs.



CALGreen

This standard is part of the California Building Standards Code and is commonly adopted as model language by developers of green building standards and rating systems in other parts of the country.

Section A5.409.3 for Non-Residential Construction requires at least 50% use of materials or assemblies based on life-cycle assessment (LCA) of their global warming potential (climate change/greenhouse gases) and two more environmental impacts from the list below:

- Fossil fuel depletion
- Stratospheric ozone depletion
- Acidification of land and water resources
- Eutrophication
- Photochemical oxidants (smog)

EPD Tiling products covered by the North American-made Ceramic Tile, Mortar and/or Grout EPDs are eligible for consideration under this section of CALGreen, as the EPDs provides LCA data and address the referenced environmental impacts.

GSA P-100 Facilities Standards

This standard incorporates sustainability criteria into design standards for the construction of government-funded buildings. Section 3.4 (Interior Performance) sets forth several provisions for ceramic tile:

The “Baseline” and Tier 1 High Performance provisions specify that tiles conform to ANSI A137.1, the ANSI standard for ceramic tile, and be Green Squared Certified.®

The Tier 2 High Performance and Tier 3 High Performance provisions specify that tiles conform to ANSI A137.1, the ANSI standard for ceramic tile, be Green Squared Certified,® and have a publicly-available EPD.

EPD Tiles covered by the North American-made Ceramic Tile EPD are eligible for use on Tier 2 and Tier 3 federal building projects, provided they are also Green Squared Certified® and meet the tile performance standards given in ANSI A137.1.

*Note: At the time of this publication, there are no GSA P-100 provisions for tile mortar or tile grout.



ENVIRONMENTAL FOOTPRINT: TILE, MORTAR AND GROUT A 60-YEAR IMPACT ANALYSIS

Today, North American construction products are increasingly being evaluated based on their 60-year environmental footprint, a time frame chosen for the average service life of a building. Accordingly, the EPDs for North American-made Ceramic Tile, Mortar, and Grout provide long-term environmental impact data. In fact, the flooring Product Category Rule (PCR) requires EPDs to provide a life-cycle assessment (LCA) with a 60-year impact analysis. This appropriately includes the environmental impacts associated with acquiring a product's raw materials, manufacturing the product, and then delivering, installing, maintaining, and disposing of it, multiplied by the theoretical number of times the product would wear out and would have to be reinstalled (i.e. 60 years divided by the product's service life, in years).

In all six of the major environmental impact assessment categories, as included in the EPD for North American-made Ceramic Tile, Mortar, and Grout, the environmental benefits resulting from tile's inherent durability, long life, and low maintenance are clearly realized.

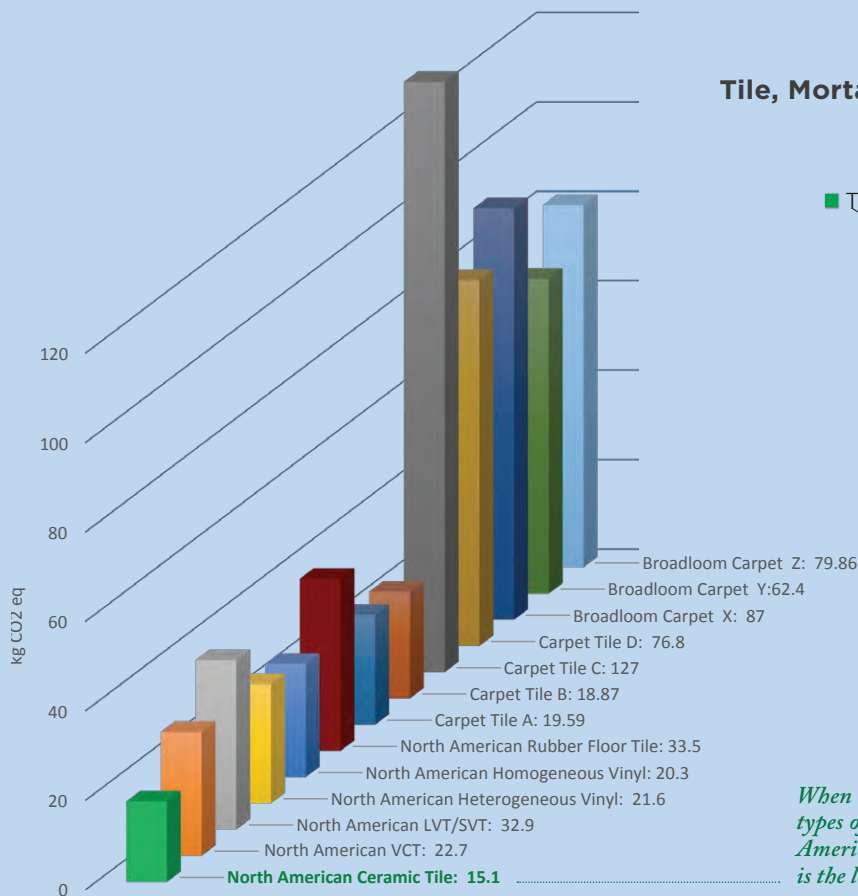
The EPDs for North American-made tiles, mortars, and grouts all report very low 60-year environmental impacts per installed square meter. In fact, when the EPD for North American-made Tile is compared to the generic EPDs for other types of flooring, developed under the same PCR and using the same building service life, North American-made ceramic tile has the lowest impact across all major categories.

Global Warming Potential (GWP)

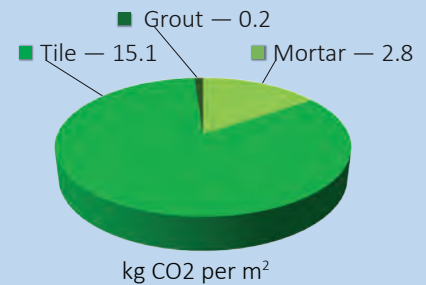
GWP, commonly referred to as “carbon footprint,” is measured by emissions of carbon-equivalent gases and relates to climate change.

The North American-made Ceramic Tile, Mortar and Grout EPDs report a 60-year GWP of 15.1 kg CO₂ equivalent (eq.) per square meter for tile, 2.8 kg per m² for mortar, and 0.2 kg per m² for grout.

GWP: Tile vs Other Types of Flooring



Tile, Mortar, and Grout: Combined GWP



When compared to the EPDs for other types of flooring developed under the North American Flooring PCR, tile's GWP value is the lowest.

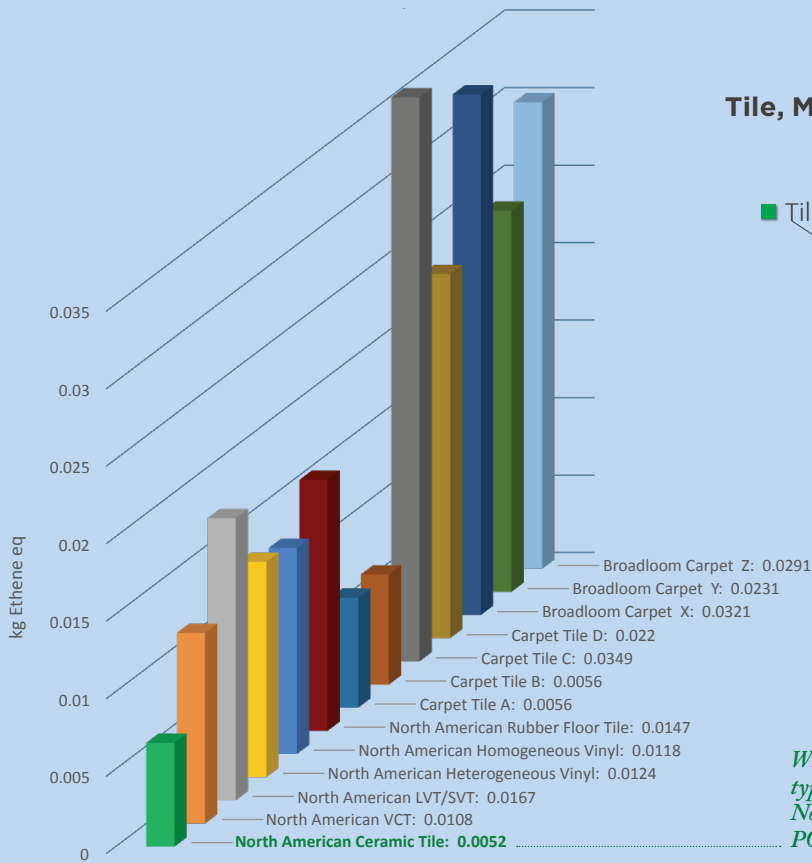
ENVIRONMENTAL FOOTPRINT: TILE, MORTAR AND GROUT A 60-YEAR IMPACT ANALYSIS

Photochemical Oxidant Creation Potential (POCP)

POCP is directly linked to smog formation. Smog is harmful to humans and animals, most notably for aggravating bronchial-related diseases; it also inhibits plant growth due to decreased UV radiation, and can discolor ground-level materials like building exteriors.

The North American-made Ceramic Tile, Mortar, and Grout EPDs report a 60-year POCP of 0.0052 kg Ethene equivalent (eq.) per square meter for tile, 0.00095 kg per m² for mortar, and 0.000061 kg per m² for grout.

POCP: Tile vs Other Types of Flooring



Tile, Mortar, and Grout: Combined POCP



When compared to the EPDs for other types of flooring developed under the North American Flooring PCR, tile's POCP value is the lowest.

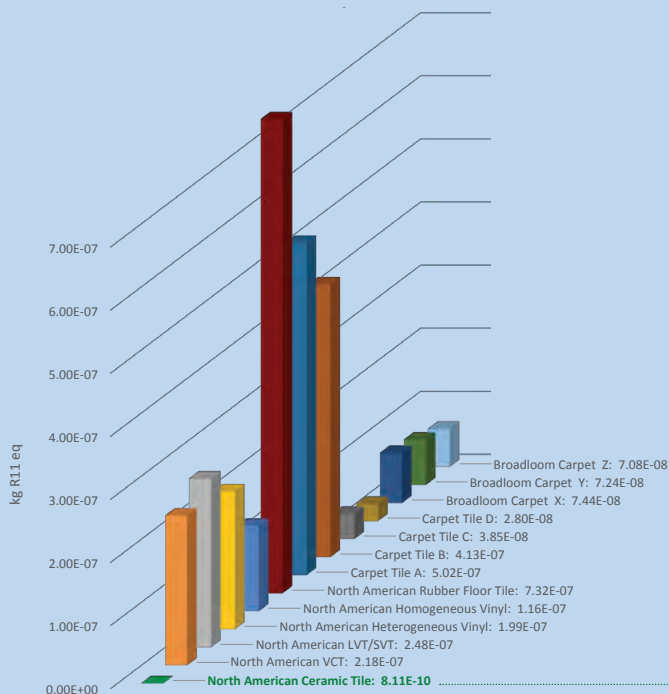
Ozone Depletion Potential (ODP)

Ozone depletion occurs when chlorofluorocarbons (CFCs) and hydrofluorocarbons (HCFCs) reach the stratosphere, react with the sun, and break down the ozone layer. Decreased ozone can lead to an increase in the amount of UV-B radiation that reaches Earth's surface, having harmful effects on human health, animal health, terrestrial and aquatic ecosystems, biochemical cycles, and materials.

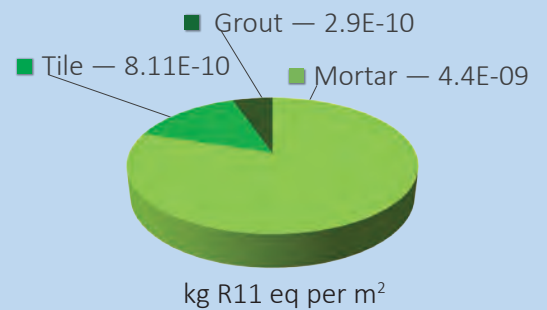
The North American-made Ceramic Tile, Mortar, and Grout EPDs report a 60-year ODP of 0.00000000811 kg R11 equivalent (eq.) per square meter for tile, 0.0000000044 kg per m² for mortar, and 0.0000000029 kg per m² for grout.



ODP: Tile vs Other Types of Flooring



Tile, Mortar, and Grout: Combined ODP



When compared to EPDs for other types of flooring products developed under the North American Flooring PCR, tile's ODP value is the lowest.

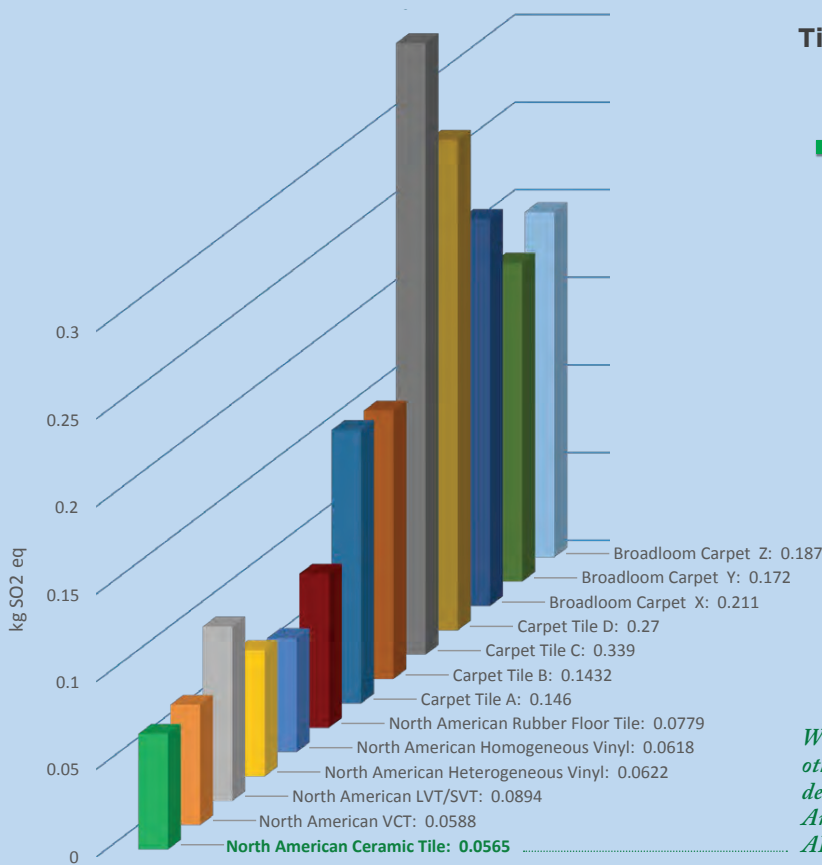
ENVIRONMENTAL FOOTPRINT: TILE, MORTAR AND GROUT A 60-YEAR IMPACT ANALYSIS

Acidification Potential (AP)

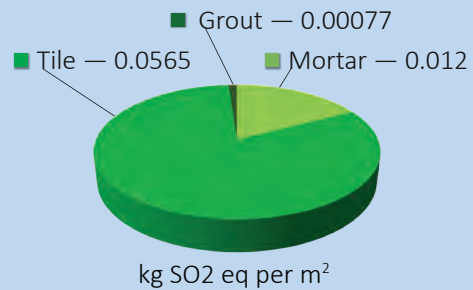
Acidification occurs when soil, groundwater, surface water and atmospheric moisture pH levels are lowered. This can have a harmful impact on organisms, ecosystems, and man-made materials, including buildings.

The North American-made Ceramic Tile, Mortar and Grout EPDs report a 60-year AP of 0.0565 kg SO₂ equivalent (eq.) per square meter for tile, 0.012 kg per m² for mortar, and 0.00077 kg per m² for grout.

AP: Tile vs Other Types of Flooring



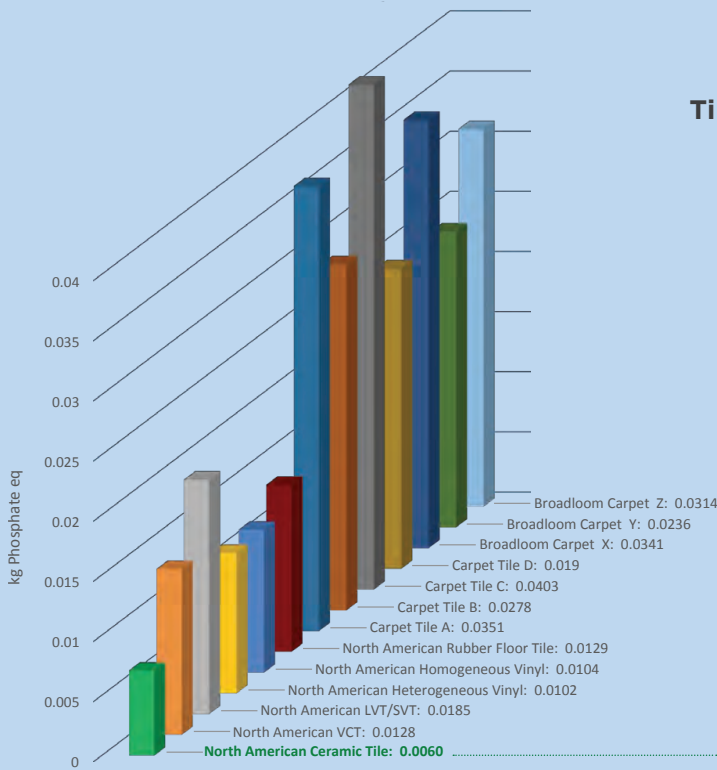
Tile, Mortar, and Grout: Combined AP



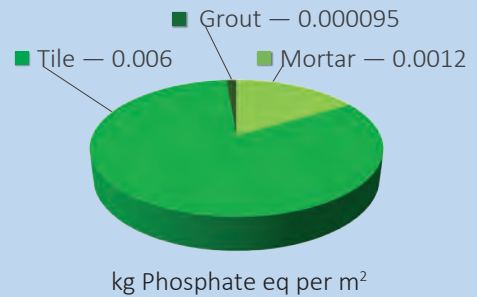
When compared to EPDs for other types of flooring products developed under the North American Flooring PCR, tile's AP value is the lowest.

Eutrophication Potential (EP)

EP: Tile vs Other Types of Flooring



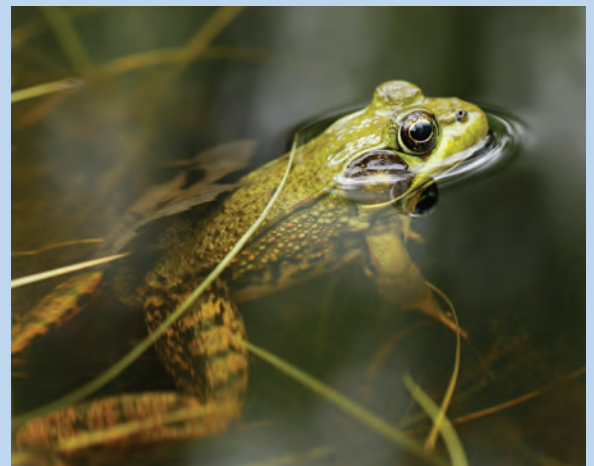
Tile, Mortar, and Grout: Combined EP



When compared to the EPDs for other types of flooring products developed under the North American Flooring PCR, tile's EP value is the lowest.

Eutrophication is the enrichment of a body of water (or ecosystem) with nutrients needed for photosynthesis, such as carbon dioxide and nutrient compounds containing nitrogen and/or phosphorus, commonly from fertilizer runoff and sewage. It is a significant cause of oxygen depletion in bodies of water, resulting from excess plant and algal growth, causing hypoxic conditions in which marine life cannot be sustained.

The North American-made Ceramic Tile, Mortar, and Grout EPDs report a 60-year EP of 0.0060 kg Phosphate equivalent (eq.) per square meter for tile, 0.0012 kg per m² for mortar, and 0.000095 kg per m² for grout.



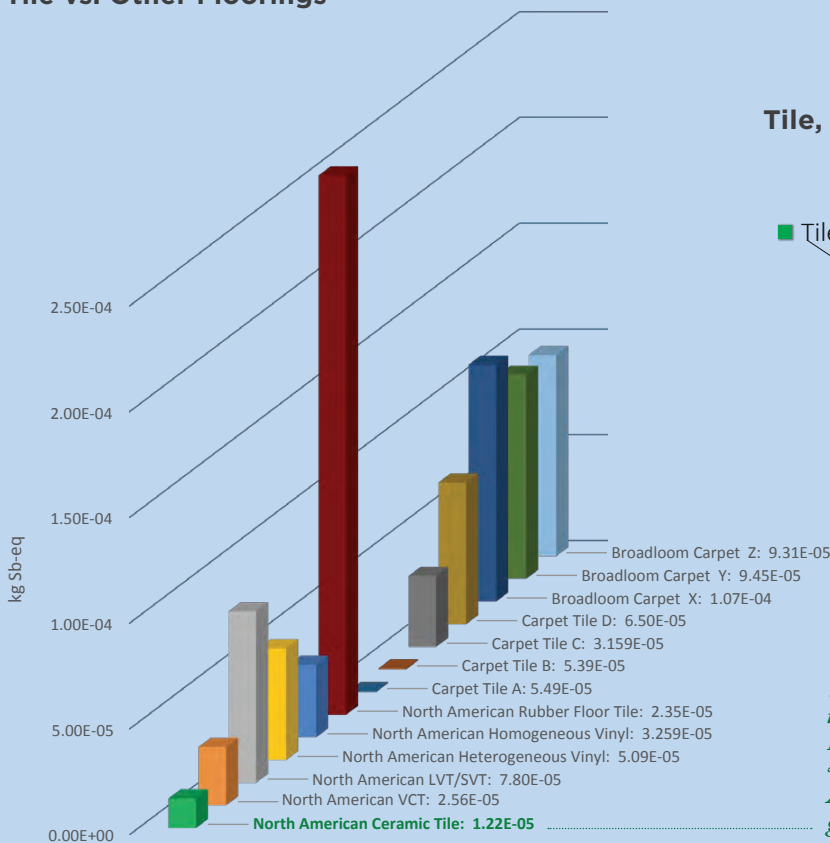
ENVIRONMENTAL FOOTPRINT: TILE, MORTAR AND GROUT A 60-YEAR IMPACT ANALYSIS

Abiotic Resource Depletion Potential (ADP)

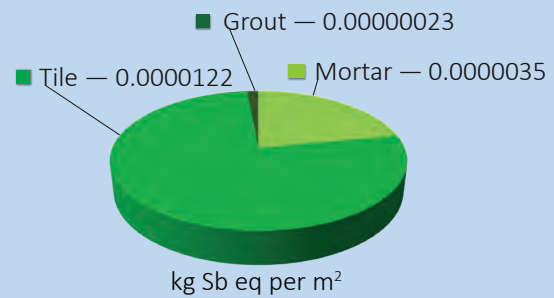
Abiotic resources are natural resources derived from non-living, non-organic materials. Since “non-living” can cover a wide variety of resources, ranging from renewable to non-renewable and finite to perpetual, there is debate about which types of resource depletion are worse, and whether or not all abiotic resources should be grouped together. Most commonly, LCAs take into account land, fossil fuels, and metals, and ADP can be considered elemental (ADP-e), or fossil (ADP-f).

The North American-made Ceramic Tile, Mortar and Grout EPDs report a 60-year elemental depletion of 0.0000122 kg Sb equivalent (eq.) per square meter for tile, 0.0000035 kg per m² for mortar, and 0.00000023 kg per m² for grout. and a 60-year fossil depletion of 219 MJ per square meter for tile, 31 MJ per m² for mortar, and 2 MJ per m² for grout

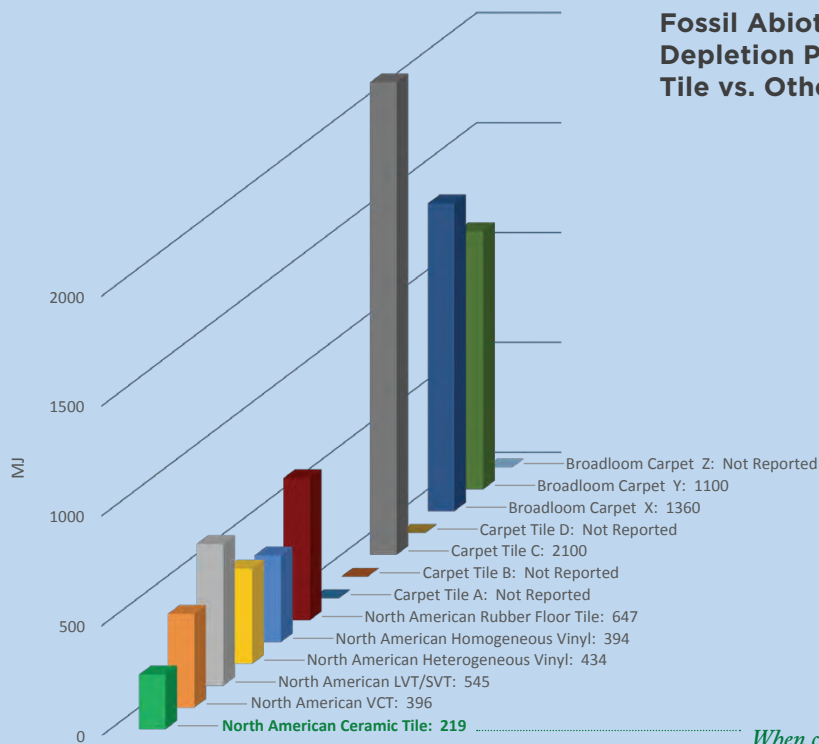
Elemental Abiotic Resource Depletion Potential (ADP-e): Tile vs. Other Floorings



Tile, Mortar, and Grout: Combined ADP-e

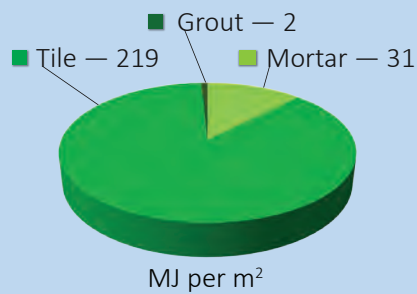


When compared to EPDs for other flooring types developed under the North American Flooring PCR, tile has the lowest ADP-f value of those reported and the lowest ADP-e value among values reported in generic flooring EPDs.



When compared to EPDs for other flooring types developed under the North American Flooring PCR, tile has the lowest ADP-f value of those reported and the lowest ADP-e value among values reported in generic flooring EPDs.

Tile, Mortar, and Grout: Combined ADP-f



EPD

TRANSPARENCY SUMMARY: TILE

COMPANY NAME	Industry-Wide
PRODUCT TYPE	Porcelain, Pressed Floor, Mosaic, Quarry, Wall
PRODUCT NAME	Ceramic Tile: Made in North America
PRODUCT DEFINITION	Floor or wall covering which is inert, fire resistant, non-combustible, durable, easy to maintain and made of mineral-based natural materials. Manufacturers include: Arto, Crossville, Dal-Tile, Florida Tile, Florim USA, Interceramic, Ironrock, Porcelanite Lamosa, Quarry Tile Co, Stonepeak, and Vitromex.
PRODUCT CATEGORY RULE (PCR)	NSF PCR for Flooring (Carpet, Resilient, Laminate, Ceramic, and Wood)
CERTIFICATION PERIOD	October 24, 2014 to October 24, 2019
DECLARATION NUMBER	4786483078.101.1



LIFECYCLE IMPACT CATEGORIES

The environmental impacts listed below were assessed throughout the product's lifecycle – including raw material extraction, transportation, manufacturing, packaging, use, and disposal at end of life.

	ATMOSPHERE			WATER		EARTH	
	Global Warming Potential refers to long-term changes in global weather patterns – including temperature and precipitation – that are caused by increased concentrations of greenhouse gases in the atmosphere.	Ozone Depletion Potential is the destruction of the stratospheric ozone layer, which shields the earth from ultraviolet radiation that's harmful to life, caused by human-made air pollution.	Photochemical Ozone Creation Potential happens when sunlight reacts with hydrocarbons, nitrogen oxides, and volatile organic compounds, to produce a type of air pollution known as smog.	Acidification Potential is the result of human-made emissions and refers to the decrease in pH and increase in acidity of oceans, lakes, rivers, and streams – a phenomenon that pollutes groundwater and harms aquatic life.	Eutrophication Potential occurs when excessive nutrients cause increased algae growth in lakes, blocking the underwater penetration of sunlight needed to produce oxygen and resulting in the loss of aquatic life.	Depletion of Abiotic Resources (Elements) refers to the reduction of available non-renewable resources, such as metals and gases, that are found on the periodic table of elements, due to human activity.	Depletion of Abiotic Resources (Fossil Fuels) refers to the decreasing availability of non-renewable carbon-based compounds, such as oil and coal, due to human activity.
TRACI							
CMV	15.1 kg CO2-Equiv.	8.11E-010 kg R11-Equiv.	0.0052 kg Ethene-Equiv.	0.0565 kg SO2-Equiv.	0.00604 kg Phosphate-Equiv.	1.22E-005 kg SB-Equiv.	219 MJ

FUNCTIONAL UNIT One square meter of ceramic tile. Life cycle impact results are expressed for 60 years of use.



Environment

MATERIAL CONTENT

Material content measured to 1%.

COMPONENT	MATERIAL	AVAILABILITY	MASS%	ORIGIN
Body	Clay	Mineral perpetual	70.3%	US, Mexico, Europe
	Feldspar	Mineral perpetual	5.3%	US, Mexico, Europe
	Sand	Mineral perpetual	4.8%	US, Mexico, Europe
	Scrap	Pre-consumer Post-consumer	4.2%	US, Mexico, Europe
	Kaolin	Mineral perpetual	3.2%	US, Mexico, Europe
	Granite	Mineral perpetual	1.3%	US, Mexico, Europe
	Lime	Mineral perpetual	1.1%	US, Mexico, Europe
	Other Additives	Mineral perpetual	4.0%	US, Mexico, Europe
Surface	Glaze & Stain	Mineral perpetual	5.4%	US, Mexico, Europe

ADDITIONAL ENVIRONMENTAL INFORMATION

PRE-CONSUMER RECYCLED CONTENT	VARIES %
POST-CONSUMER RECYCLED CONTENT	VARIES %
VOC EMISSIONS	ZERO/INORGANIC
WATER CONSUMPTION	

RECYCLING OR REUSE

Ceramic tile can outlast multiple generations of building occupants and is commonly reused in an existing building or salvaged for use in a new building. Solid and inert, it can also be used in a variety of post-life applications such as clean fill, roadway paving, and raw materials used to manufacture new products. To represent a "worst case" scenario, this EPD reports environmental impacts based on 100% of all tile removal waste being disposed of in a landfill.

ENERGY

RENEWABLE ENERGY	4.42 %	10.4 MJ
NON-RENEWABLE ENERGY	95.58 %	225 MJ

MANUFACTURER CONTACT INFO

NAME	Tile Council of North America (TCNA)
PHONE	864-646-8453
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WEBSITE	www.TCNAtile.com

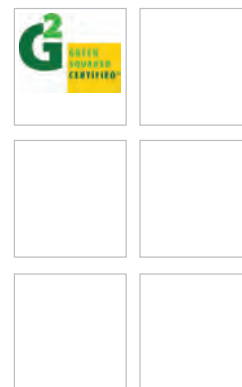
STANDARDS

ANSI A137.1 American National Standard Specifications for Ceramic Tile

ISO 13006 International Organization for Standardization Specifications for Ceramic Tile

ANSI A138.1/Green Squared® American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles, and Tile Installation Materials

CERTIFICATIONS



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EPD TRANSPARENCY SUMMARY: GROUT

COMPANY NAME	Industry-Wide
PRODUCT TYPE	ANSI A118.6, A118.7, and ISO 13007
PRODUCT NAME	Cement Grout for Tile Installation: Made in North America
PRODUCT DEFINITION	Factory-prepared mixture of cement, aggregate and other ingredients used to fill joints, or the spaces between tiles. Once cured, it is durable, fire-resistant, and moisture insensitive. Manufacturers include Ardex, Bexel, Bostik, Crest, Custom, HB Fuller/TEC, Interceramic, Laticrete, MAPEI, and Cemix/Texrite
PRODUCT CATEGORY RULE (PCR)	IBU Part A & B for Mineral Factory-made Mortar, 07.2014, with UL Addendum
CERTIFICATION PERIOD	September 30, 2016 to September 30, 2021
DECLARATION NUMBER	4787109018.101.1



LIFECYCLE IMPACT CATEGORIES

The environmental impacts listed below were assessed throughout the product's lifecycle – including raw material extraction, transportation, manufacturing, packaging, use, and disposal at end of life.

	ATMOSPHERE			WATER		EARTH	
	Global Warming Potential refers to long-term changes in global weather patterns – including temperature and precipitation – that are caused by increased concentrations of greenhouse gases in the atmosphere.	Ozone Depletion Potential is the destruction of the stratospheric ozone layer, which shields the earth from ultraviolet radiation that's harmful to life, caused by human-made air pollution.	Photochemical Ozone Creation Potential happens when sunlight reacts with hydrocarbons, nitrogen oxides, and volatile organic compounds, to produce a type of air pollution known as smog.	Acidification Potential is the result of human-made emissions and refers to the decrease in pH and increase in acidity of oceans, lakes, rivers, and streams – a phenomenon that pollutes groundwater and harms aquatic life.	Eutrophication Potential occurs when excessive nutrients cause increased algae growth in lakes, blocking the underwater penetration of sunlight needed to produce oxygen and resulting in the loss of aquatic life.	Depletion of Abiotic Resources (Elements) refers to the reduction of available non-renewable resources, such as metals and gases, that are found on the periodic table of elements, due to human activity.	Depletion of Abiotic Resources (Fossil Fuels) refers to the decreasing availability of non-renewable carbon-based compounds, such as oil and coal, due to human activity.
TRACI	0.203 kg CO ₂ -Equiv.	3.73E-10 kg CFC 11-Equiv.	0.0123 kg O ₃ -Equiv.	8.13E-04 kg SO ₂ -Equiv.	6.14E-05 kg N-Equiv.	N/A	N/A
CML	0.203 kg CO ₂ -Equiv.	2.94E-10 kg CFC 11-Equiv.	6.21E-05 kg Ethene-Equiv.	7.89E-04 kg SO ₂ -Equiv.	9.40E-05 kg Phosphate-Equiv.	2.34E-07 kg SB-Equiv.	2.07 MJ

FUNCTIONAL UNIT One square meter (1 sqm) of installed grout. Life cycle impact results are expressed for 60 years. Assumed application rate is 0.212 kilograms per square meter. Divide results by 0.212 to calculate impact per kilogram of grout.



Environment

MATERIAL CONTENT

Material content measured to 1%.

COMPONENT	MATERIAL	AVAILABILITY	MASS%	ORIGIN
Sand	Sand	Mineral perpetual	53	Locally sourced US, Canada, Mexico
Cement	White cement	Mineral manufactured	27	US, Canada, Mexico, Europe
Limestone	Limestone	Mineral perpetual	10	Locally sourced US, Canada, Mexico
Cement	Grey cement	Mineral manufactured	5	Locally sourced US, Canada, Mexico
Additive	Calcium aluminate	Mineral perpetual	2	Locally sourced US, Canada, Mexico
Additive	Calcium formate	Mineral perpetual	1	Locally sourced US, Canada, Mexico
Additive	Other additives	Various	2	US, Canada, Europe, Asia

ADDITIONAL ENVIRONMENTAL INFORMATION

PRE-CONSUMER RECYCLED CONTENT	VARIES %
POST-CONSUMER RECYCLED CONTENT	VARIES %
VOC EMISSIONS	CDPH 01350 COMPLIANT
WATER CONSUMPTION	0.51 L

ENERGY

RENEWABLE ENERGY	9 %	0.21 MJ
NON-RENEWABLE ENERGY	91 %	2.3 MJ

MANUFACTURER CONTACT INFO

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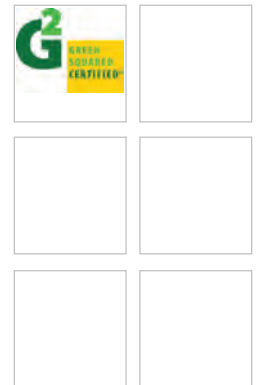
RECYCLING OR REUSE

Tile installations with cement grout can last as long as buildings and are often reused for multiple generations of building occupants. Although tile and cement grout can be used in a variety of post-life applications (e.g., clean fill, roadway paving, aggregate for new products, etc.), this analysis adopts a conservative approach and assumes that 100% of tile and associated waste are disposed in a landfill.

STANDARDS

ANSI A118.6 American National Standard Specifications, Standard Cement Grouts for Tile Installation
ANSI A118.7 American National Standard Specifications, High Performance Cement Grouts for Tile Installation
ISO 13007 Terms, Definitions and Specifications, Ceramic Tile Grouts and Adhesives
ANSI A138.1/Green Squared® American National Standard Specifications, Sustainable Ceramic Tiles, Glass Tiles and Tiles, and Tile Installation Materials

CERTIFICATIONS



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EPD TRANSPARENCY SUMMARY: MORTAR

COMPANY NAME	Industry-Wide
PRODUCT TYPE	ANSI A118.1, A118.4/11, A118.15, and ISO 13007
PRODUCT NAME	Cement Mortar for Tile Installation: Made in North America
PRODUCT DEFINITION	Blend of cement, sand, water retention compounds and other additives used to adhere tile to a substrate. Once cured, it is durable, fire-resistant, moisture insensitive, and maintenance-free. Manufacturers include Ardex, Bexel, Bostik, Crest, Custom, HB Fuller/TEC, Interceramic, Laticrete, MAPEI, and Cemix/Textrite
PRODUCT CATEGORY RULE (PCR)	IBU Part A & B for Mineral Factory-made Mortar, 07.2014, with UL Addendum
CERTIFICATION PERIOD	September 30, 2016 to September 30, 2021
DECLARATION NUMBER	4787109018.102.1



LIFECYCLE IMPACT CATEGORIES

The environmental impacts listed below were assessed throughout the product's lifecycle – including raw material extraction, transportation, manufacturing, packaging, use, and disposal at end of life.

	ATMOSPHERE			WATER		EARTH	
	Global Warming Potential refers to long-term changes in global weather patterns – including temperature and precipitation – that are caused by increased concentrations of greenhouse gases in the atmosphere.	Ozone Depletion Potential is the destruction of the stratospheric ozone layer, which shields the earth from ultraviolet radiation that's harmful to life, caused by human-made air pollution.	Photochemical Ozone Creation Potential happens when sunlight reacts with hydrocarbons, nitrogen oxides, and volatile organic compounds, to produce a type of air pollution known as smog.	Acidification Potential is the result of human-made emissions and refers to the decrease in pH and increase in acidity of oceans, lakes, rivers, and streams – a phenomenon that pollutes groundwater and harms aquatic life.	Eutrophication Potential occurs when excessive nutrients cause increased algae growth in lakes, blocking the underwater penetration of sunlight needed to produce oxygen and resulting in the loss of aquatic life.	Depletion of Abiotic Resources (Elements) refers to the reduction of available non-renewable resources, such as metals and gases, that are found on the periodic table of elements, due to human activity.	Depletion of Abiotic Resources (Fossil Fuels) refers to the decreasing availability of non-renewable carbon-based compounds, such as oil and coal, due to human activity.
TRACI	2.88 kg CO ₂ -Equiv.	5.65E-09 kg CFC 11-Equiv.	0.200 kg O ₃ -Equiv.	0.0122 kg SO ₂ -Equiv.	5.62E-04 kg N-Equiv.	N/A	N/A
CMV	2.89 kg CO ₂ -Equiv.	4.43E-09 kg CFC 11-Equiv.	9.66E-04 kg Ethene-Equiv.	0.0118 kg SO ₂ -Equiv.	1.21E-03 kg Phosphate-Equiv.	3.51E-06 kg SB-Equiv.	30.8 MJ

FUNCTIONAL UNIT One square meter (1 sqm) of installed mortar. Life cycle impact results are expressed for 60 years of use. Assumed application rate is 4.07 kilograms per square meter. Divide results by 4.07 to calculate impact per kilogram of mortar.



Environment

MATERIAL CONTENT

Material content measured to 1%.

COMPONENT	MATERIAL	AVAILABILITY	MASS%	ORIGIN
Sand	Sand	Mineral perpetual	37	Locally sourced US, Canada, Mexico
Calcium carbonate	Calcium carbonate	Mineral perpetual	30	Locally sourced US, Canada, Mexico
Cement	Grey cement	Mineral manufactured	15	Locally sourced US, Canada, Mexico
Cement	White cement	Mineral manufactured	13	US, Canada, Mexico, Europe
Additive	E/VA	Polymer manufactured	1	US, Europe
Additive	Admixture	Mineral perpetual	1	US, Mexico, Europe
Additive	Cellulose ether	Organic rapidly renewable	1	US, Europe
Additive	Other additives	Various	1	US, Canada, Europe, Asia

ADDITIONAL ENVIRONMENTAL INFORMATION

PRE-CONSUMER RECYCLED CONTENT	VARIES %
POST-CONSUMER RECYCLED CONTENT	VARIES %
VOC EMISSIONS	CDPH 01350 COMPLIANT
WATER CONSUMPTION	6.5 L

ENERGY

RENEWABLE ENERGY	6 %	2.11 MJ
NON-RENEWABLE ENERGY	94 %	32.5 MJ

MANUFACTURER CONTACT INFO

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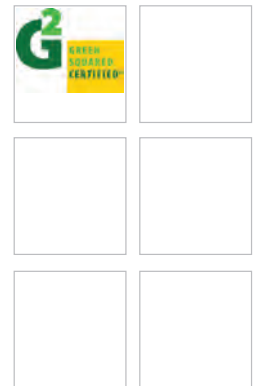
RECYCLING OR REUSE

Tile installations with cement mortar can last as long as buildings and are often reused for multiple generations of building occupants. Although tile and cement mortar can be used in a variety of post-life applications (e.g., clean fill, roadway paving, aggregate for new products, etc.), this analysis adopts a conservative approach and assumes that 100% of tile and associated waste are disposed in a landfill.

STANDARDS

ANSI A118.1 American National Standard Specifications, Dry-Set Cement Mortar
ANSI A118.4/11 American National Standard Specifications, Modified Dry-Set Cement Mortar
ANSI A118.15 American National Standard Specifications, Improved Modified Dry-Set Cement Mortar
ISO 13007 Terms, Definitions and Specifications, Ceramic Tile Grouts and Adhesives
ANSI A138.1/Green Squared® American National Standard Specifications, Sustainable Ceramic Tiles, Glass Tiles and Tiles, and Tile Installation Materials

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