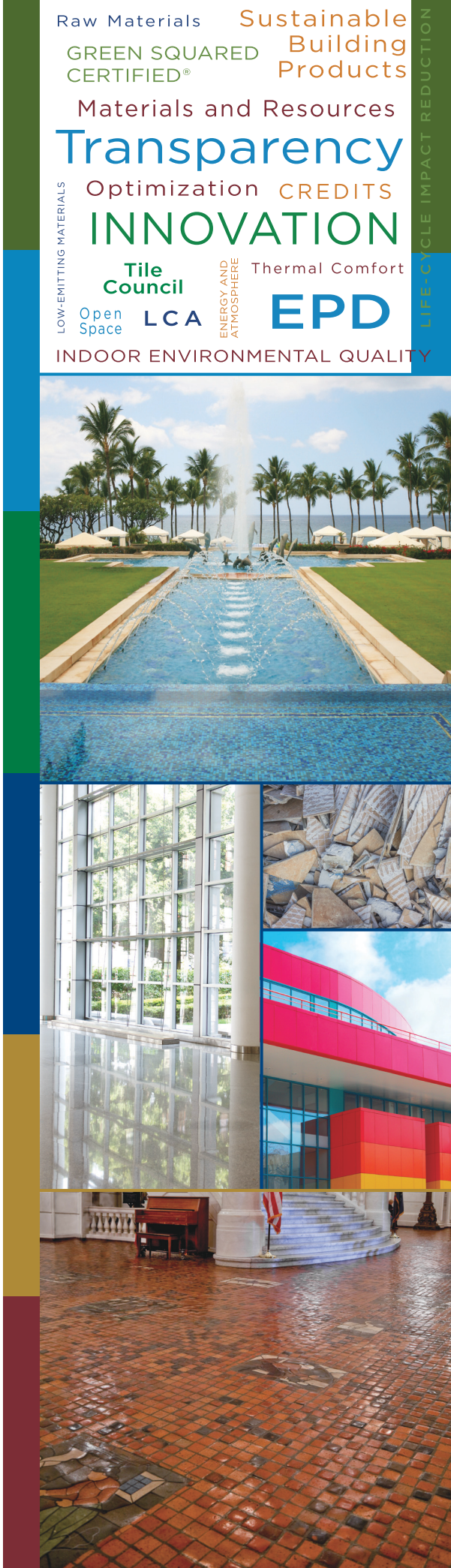
TCNA
TILE COUNCIL OF NORTH AMERICA, INC.

Guide to LEED v4 and TILE

2018



LEED (Leadership in Energy and Environmental Design) green building rating systems allow builders, owners, and tenants to evaluate the overall sustainability of their projects. Points toward LEED certification can be obtained by making sustainable choices while designing, constructing, and operating a new or existing building or major renovation. In LEED Building Design and Construction (BD+C) v4, there are 110 possible points. Through auditing by the U.S. Green Building Council (USGBC), the organization that developed LEED, a building can be awarded a certification ranging from LEED Certified (40-49 points) to LEED Platinum (80-110 points).

Changes implemented in Version 4 of LEED, which was released in late 2013, reflect increasing interest in life-cycle-based information for sustainable building materials. The completely revamped rating system takes a new, more flexible approach to building green. LEED v4 acknowledges product contribution not just by allocating points for specific attributes like recycled content, but also through increased perspective on the role products have in achieving a host of traditionally desired outcomes, such as energy efficiency, occupant comfort, and whole building performance. With more tile life-cycle information becoming readily available, design teams have the tools they need to creatively integrate tile installations into projects that meet performance-based credit requirements.

The building materials and systems chosen for a project play an important role in satisfying requirements needed to attain certification, and using ceramic tile can be quite advantageous, understanding the precise number of points earned depends on many factors and varies widely depending on project particulars. Sustainable applications for tile are virtually endless, limited only by the imaginations of architects, designers, and budgets.

This guide explains how ceramic tile can be integrated into projects that meet the criteria for pertinent LEED Credits in six LEED Credit categories: Integrative Process; Materials and Resources; Indoor Environmental Quality; Sustainable Sites; Energy and Atmosphere; and Innovation.

Credits, requirements, options, and other details found in LEED v4 were omitted in this guide where not relevant to tile and installation materials.

Green Squared Certified® products have extensive sustainability attributes that can help fulfill a broad range of LEED v4 criteria.

LEED points may be earned using a variety of approaches, and many factors can greatly influence the overall sustainability of any project.

Consult LEED Accredited Professionals (LEED APs) to help you better understand how tile installations can be integrated into projects to help achieve the desired sustainability and certification.

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U.S. GREEN BUILDING COUNCIL MEMBER

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Building Life-Cycle Impact Reduction

STATED INTENT

"To encourage adaptive reuse and optimize the environmental performance of products and materials."

PERTINENT REQUIREMENTS

Option 1: Historic building reuse

Maintain the existing building structure, envelope, and interior nonstructural elements of a historic building or contributing building in a historic district.

Option 3: Building and material reuse

Reuse or salvage building materials from off site or on site as a percentage of the surface area. Include structural elements (e.g., floors, roof decking), enclosure materials (e.g., skin, framing), and permanently-installed interior elements (e.g., walls, doors, floor coverings, ceiling systems).

Option 4: Whole-building life-cycle assessment

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile's inherent durability makes it one of the few interior surface coverings that can be reused in renovations without refinishing. Preservationists often incorporate exquisite historic tile installations into building restorations, honoring the industry's rich artistic heritage.

Tile's 60 year-plus lifespan and minimal environmental footprint offer significant advantages in a whole-building life-cycle assessment. And because Option 4 requires material selection based on a 60-year whole-building life-cycle assessment, specifying tile is an ideal way to contribute to this requirement.



Building Product Disclosure and Optimization—Environmental Product Declarations

STATED INTENT

"To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts."

PERTINENT REQUIREMENTS

Option 1: Environmental product declaration (EPD)

Use at least 20 different permanently-installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below.

- Products with a product-specific, publicly available life-cycle assessment (LCA)
- Products with an industry-wide (generic) EPD
- Products with a product-specific EPD

Option 2: Multi-attribute optimization

Use products that comply with the criterion below for 50%, by cost, of the total value of permanently-installed products in the project.

- Products that demonstrate impact reduction below industry average in at least three impact categories

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

To ensure that tile is taken into consideration when making EPD-based product comparisons, TCNA released an industry-wide EPD in 2014 that provides a third-party verified, comprehensive analysis of the majority of ceramic tile produced in North America. This EPD is based on a life-cycle assessment (LCA) that addresses everything from sourcing and extraction of raw materials to end of product life options.

Some tile products that were included in the generic EPD have proprietary life-cycle data available, and those that demonstrate impact reduction below industry average can further contribute to this credit.

Building Product Disclosure and Optimization—Sourcing of Raw Materials

STATED INTENT

"To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner."

PERTINENT REQUIREMENTS

Option 1: Raw material source and extraction reporting

AND/OR

Option 2: Leadership extraction practices

Use products that meet at least one of the responsible extraction criteria listed below for at least 25%, by cost, of the total value of permanently-installed building products in the project.

- Extended producer responsibility (EPR)
- Materials reuse
- Recycled content

Products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost.



Vaulted ceiling with Guastavino tiles, Manhattan Municipal Building, New York City, completed in 1914.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Query North American tile or related installation material manufacturers about whether or not sustainability reports are available from their raw material suppliers.

Tile can also fulfill responsible extraction criteria:

- Some North American tile manufacturers practice extended producer responsibility (EPR) through "take-back" programs.
- Tile's inherent durability makes it a great option as a reused or salvaged material (i.e. refurbished product), especially in decorative applications.
- The production of tile and related installation materials often incorporates pre- and post-consumer recycled content.

Responsible extraction practices, including the use of recycled or reclaimed waste material in manufacturing, are required of Green Squared Certified® products.

With tile and related installation material manufacturing facilities located in many regions of North America, regionally manufactured products are likely available, and those meeting the above provisions can double their contribution to satisfying the requirements of this credit.

LEED v4 CREDIT CATEGORY

MATERIALS AND RESOURCES

Building Product Disclosure and Optimization—Material Ingredients

STATED INTENT

"To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts."

PERTINENT REQUIREMENTS

Option 1: Material ingredient reporting

Use at least 20 different permanently-installed products from at least five different manufacturers that demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm).

AND/OR

Option 2: Material ingredient optimization

Use products that document their material ingredient optimization for at least 25%, by cost, of the total value of permanently-installed products in the project.

AND/OR

Option 3: Product manufacturer supply chain optimization

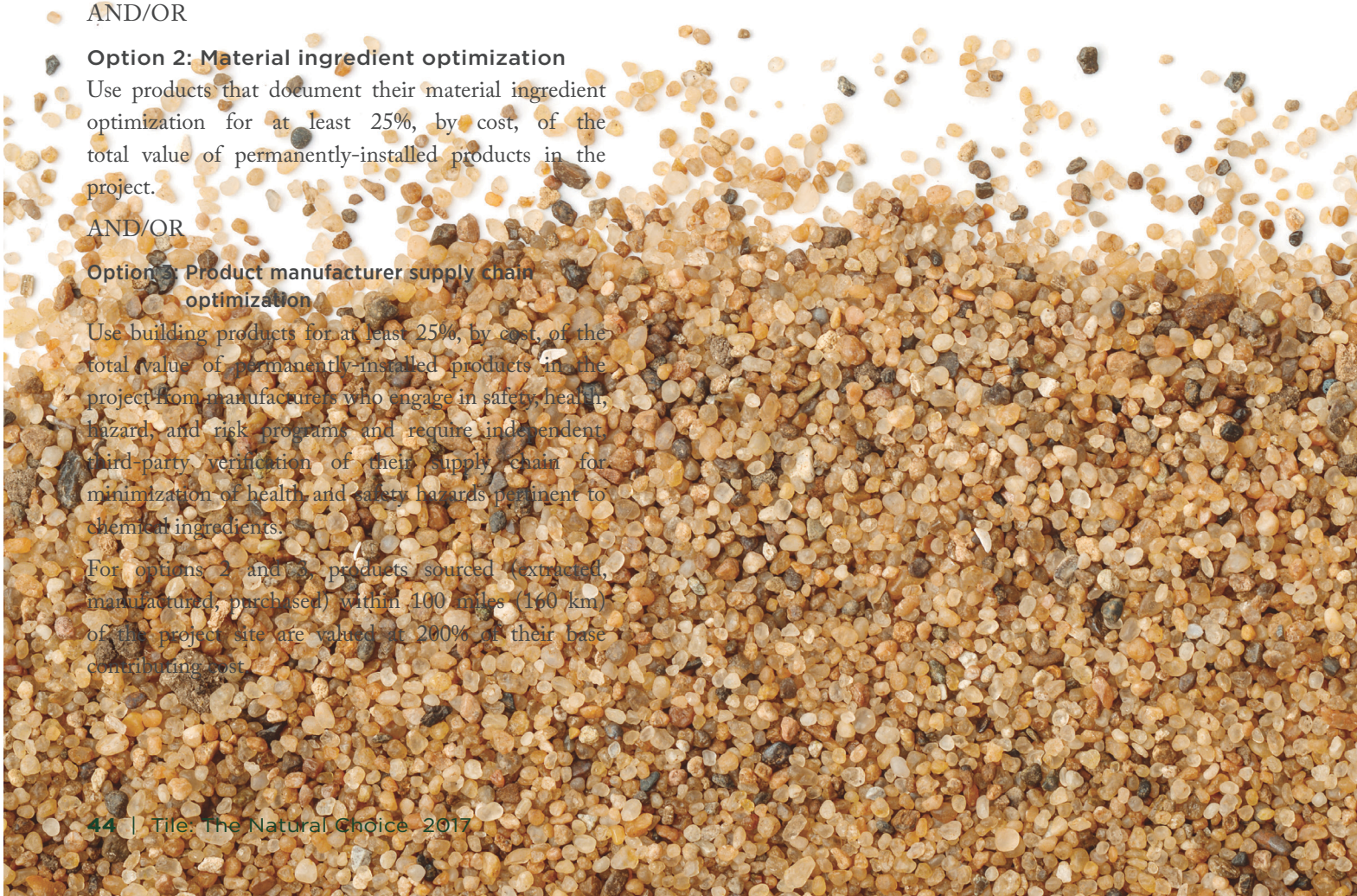
Use building products for at least 25%, by cost, of the total value of permanently-installed products in the project from manufacturers who engage in safety, health, hazard, and risk programs and require independent, third-party verification of their supply chain for minimization of health and safety hazards pertinent to chemical ingredients.

For options 2 and 3, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile and related installation materials are typically made of safe natural ingredients, and some manufacturers offer chemical inventories of their products, and/or have released health product declarations (HPDs) and other USGBC-approved material ingredient reports. Others provide such reporting on request. Additionally, material ingredient record keeping is required of Green Squared Certified® tiles and installation materials.

Inquire with manufacturers about whether they have voluntary ingredient reporting or optimization initiatives in place themselves or within their supply chain. Also ask about production and ingredient extraction locations as regionally manufactured products can double the contribution to the requirements of this credit.





Using broken ceramic tile in decorative applications is a time-honored practice, as evidenced in this early 20th-century mosaic designed by Antoni Gaudí in Barcelona, Spain.

Construction and Demolition Waste Management

STATED INTENT

"To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials."

PERTINENT REQUIREMENTS

Recycle and/or salvage nonhazardous construction and demolition materials:

Option 1: Diversion

Divert a minimum of 50% or 75% of the total construction and demolition material using a minimum of three or four material streams.

OR

Option 2: Reduction of total waste material

Do not generate more than 2.5 pounds of construction waste per square foot of the building's floor area.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile products are solid, inert, and non-hazardous, and can be crushed and recycled into new materials or aggregates for the manufacture of new products, clean fill, or other beneficial reuse projects (e.g. roadways). Additionally, tile and related installation material packaging is widely recyclable. This comprehensive recyclability makes tile a good fit for a variety of material diversion streams.

A typical tile installation involves products of standard material lengths and quantities, largely eliminating off-cuts and scrap and reducing job-site waste. Moreover, new reduced-thickness tile technologies are allowing tile to be installed over existing materials, eliminating the need for waste-producing demolition. Tile installations clearly contribute to the minimal waste per square foot requirements of Option 2.

Low-Emitting Materials

STATED INTENT

"To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment."

PERTINENT REQUIREMENTS

Option 1: Product Category Calculations

To demonstrate compliance, a product or layer must meet all of the following, as applicable.

Inherently non-emitting sources. Products that are inherently non-emitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.

General emissions evaluation. Building products must be tested and determined compliant in accordance with CDPH Standard Method v1.1-2010, using the applicable exposure scenario.

Additional VOC content requirements for wet-applied products. All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile is VOC-free, due to its inherent inorganic properties, and is cited by this credit as an "inherently non-emitting source." This means that ceramic tile may be used towards this credit without any requirements for testing.

Many tile adhesives, grouts, and backer boards with zero or very low VOCs are available; these materials are well below the thresholds of compliance in emissions and content standards.

Green Squared Certified® tiles and installation materials are verified as inorganic or within the content and emission limits specified by this credit.

Construction Indoor Air Quality Management Plan

STATED INTENT

"To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation."

PERTINENT REQUIREMENTS

Develop and implement an indoor air quality (IAQ) management plan for the construction and preoccupancy phases of the building.

During construction, meet or exceed all applicable recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.

Protect absorptive materials stored on-site and installed from moisture damage.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

SMACNA guidelines focus predominantly on pollutant abatement through ventilation and air circulation management, also acknowledging that the extent to which such abatement is required can be minimized when a plan specifies the use of low-toxicity and low-VOC construction materials. Furthermore, a good IAQ management plan establishes strategies to protect a project from the effects of mold and moisture.

Because tile and related installation materials are non-toxic, inherently VOC-free, and resistant to damage from moisture and mold, they facilitate contaminant source control measures on a project.





Tile's zero VOC emissions make it a perfect part of any indoor air quality management plan.

Indoor Air Quality Assessment

STATED INTENT

"To establish better quality indoor air in the building after construction and during occupancy."

PERTINENT REQUIREMENTS

To be implemented after construction ends and the building has been completely cleaned. All interior finishes must be installed, and major VOC punch list items must be finished.

Option 2. Air testing

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile products are helpful in achieving optimal air quality assessments, as they are VOC-free, formaldehyde-free, and non-toxic.

Tile cuts are typically made on wet saws, minimizing dust that could linger post-construction and adversely affect indoor air quality assessment. Impervious packaging and dust-reducing technologies in cement mortars and grouts also reduce airborne dust particles.

Thermal Comfort

STATED INTENT

"To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort."

PERTINENT REQUIREMENTS

Option 1. ASHRAE Standard 55-2010

Design heating, ventilating, and air-conditioning (HVAC) systems and the building envelope to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata or a local equivalent.

OR

Option 2. ISO and CEN Standards

Design HVAC systems and building envelope to meet the requirements of the applicable standard:

ISO 7730:2005, Ergonomics of the Thermal Environment, analytical determination and interpretation of thermal comfort, using calculation of the PMV and PPD indices and local thermal comfort criteria;

and

CEN Standard EN 15251:2007, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, addressing indoor air quality, thermal environment, lighting, and acoustics, Section A2.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Based on thermal comfort goals, consider whether a project is a candidate for natural conditioning, or the use of zero-energy strategies, such as cross ventilation, stack natural ventilation, passive solar heating, and thermal mass to moderate exterior conditions.

The inherent thermal mass of a tile installation, both as an interior finish or as an exterior building envelope component, helps moderate indoor temperature swings, creating a more stable and comfortable indoor environment. ASHRAE, ISO, and CEN standards all include compliance paths for natural conditioning, and the use of tile can strengthen a project's candidacy for natural conditioning and help it meet pertinent requirements in the referenced standards.

For mechanically conditioned projects, or those with combined mechanical and natural conditioning, tile's inherent thermal mass and capacity to moderate indoor temperature swings can help reduce the burden on HVAC systems, increase their efficiency, and introduce options for radiant and geothermal heating.



A tile installation's inherent thermal mass makes it an ideal flooring choice to use in conjunction with radiant heating systems.



The high light reflectance value (LRV) of light-colored tiles helps maximize the efficiency of interior lighting.

Interior Lighting

STATED INTENT

"To promote occupants' productivity, comfort, and well-being by providing high-quality lighting."

PERTINENT REQUIREMENTS

Option 2. Lighting quality

Strategy E

For 90% of the regularly occupied floor area, meet the following thresholds for area-weighted average surface reflectance: 85% for ceilings, 60% for walls, and 25% for floors.



TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Walls, floors, or ceilings with high surface reflectance, or light reflectance value (LRV), can facilitate improved interior lighting conditions, increase the efficiency of natural lighting, and reduce the number of artificial lighting fixtures needed.

Light beige, light grey, and off-white tiles often have LRVs around 60%, and LRVs for white tiles commonly exceed 85%. Tile is one of the rare surface coverings that can be used to cover floors, walls, and ceilings, creating a monolithic envelope that maximizes interior light reflectance. Furthermore, tiled surfaces are easily kept clean and are inherently colorfast, so tile maintains its LRV throughout its life cycle.

When specifying tile, refer to ASTM C609, the industry standard for determining LRV.

Some Green Squared Certified® products satisfy surface reflectance design needs, as an LRV criterion is an elective of the Green Squared® standard.

Open Space

STATED INTENT

"To create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities."

PERTINENT REQUIREMENTS

Provide outdoor space greater than or equal to 30% of the total site area (including building footprint). A minimum of 25% of that outdoor space must be vegetated.

The outdoor space must be physically accessible and be one or more of the following:

- A pedestrian-oriented paving or turf area with physical site elements that accommodate outdoor social activities
- A recreation-oriented paving or turf area with physical site elements that encourage physical activity

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tile can be used as a highly decorative, sustainable, and durable paving material in all or some of the 75% of open space permitted to be hardscaped. It offers numerous design possibilities, and does not detract from its natural surroundings.



Tile is durable enough for a variety of outdoor applications, and is uniquely suited to both complement green spaces and blend them seamlessly with their urban surroundings.



Tile offers many advantages over other materials used for reducing heat island effects. Tiles commonly have solar reflectance values far higher and longer lasting than those of other materials, and are available in a virtually limitless array of shapes, sizes, colors, textures, and thicknesses.

Heat Island Reduction

STATED INTENT

"To minimize effects on microclimates and human and wildlife habitats by reducing heat islands."

PERTINENT REQUIREMENTS

Use any combination of the following strategies:

Non-roof measures

Use paving materials with a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

High-reflectance roof

Use roofing materials that have a Solar Reflectance Index (SRI) equal to or greater than the values listed below:

	Inital SRI	3-Year Aged SRI
Low-sloped roof	82	64
Steep-sloped roof	39	32

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Light-colored tiles can be used in myriad exterior installations: thick tile pavers, ventilated ceramic façades, and even as roofing components. Because tile is inherently colorfast, it maintains its SR and SRI value far longer than the three years required for this credit and is a great alternative to traditional paving and roofing materials.

Data is available for many Green Squared Certified® products, as solar reflectance is an elective criterion of the Green Squared® standard.

LEED v4 CREDIT CATEGORY

INTEGRATIVE PROCESS



Consider the advantages inherent in tile installations for both interior and exterior building finishes.

Integrative Process

STATED INTENT

"To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems."

PERTINENT REQUIREMENTS

Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

All components of an installation—tile, related installation materials, and tile substrates—can positively impact the influence of interior finishes and building envelope components on other building systems, and should be evaluated as part of a project's integrative analysis.

Optimize Energy Performance

STATED INTENT

"To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use."

PERTINENT REQUIREMENTS

Establish an energy performance target

Option 1. Whole-building energy simulation

- Analyze efficiency measures during the design process and account for the results in design decision making.
- Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline.

Option 2. Prescriptive compliance: ASHRAE Advanced Energy Design Guide

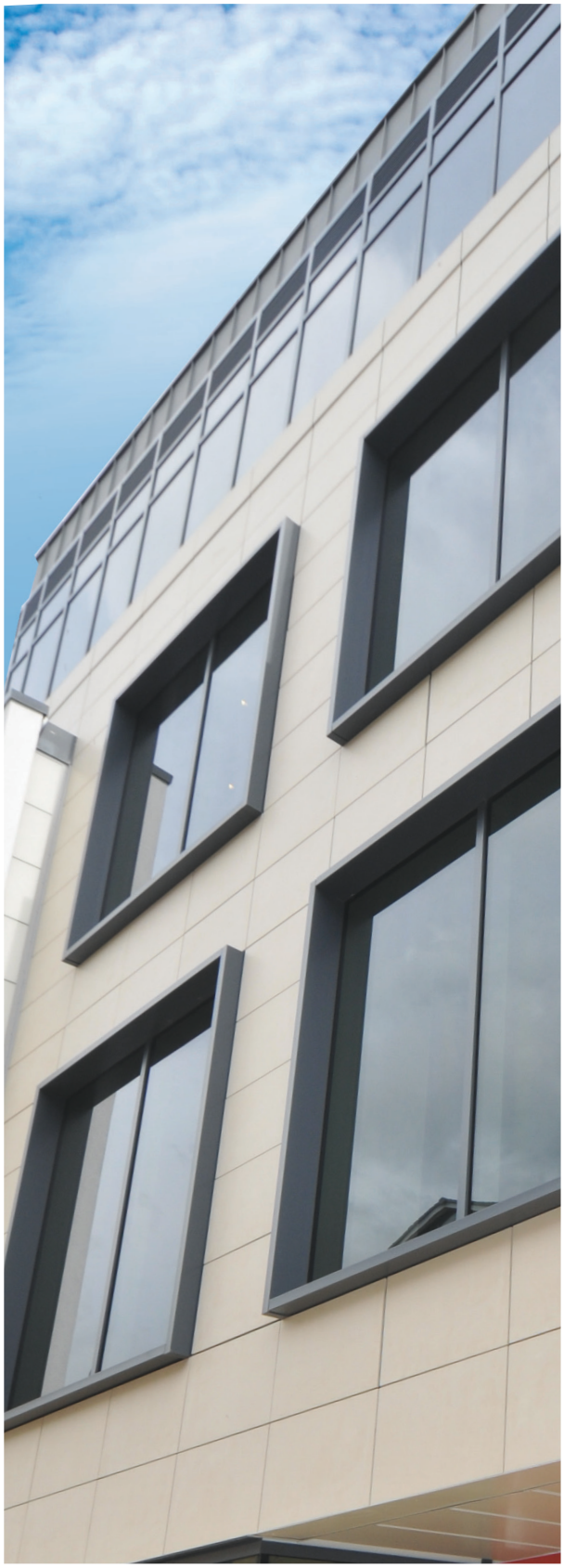
- Building envelope, opaque

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

The inherent thermal mass of a tile installation helps reduce peak heating and cooling loads and helps shift peak loads to non-peak hours, moderating indoor temperature swings and reducing the size of HVAC systems needed.

Radiant floor heating systems work particularly well with tile, and they can be far more energy-efficient than forced air heating systems.

Tile is an excellent option for a ventilated façade, which creates a "chimney effect" at the building exterior, evacuating hot air in the summer and improving insulation properties in the winter, potentially resulting in substantial energy savings.



Ventilated ceramic tile façades are highly colorfast, offer numerous design options, and can help increase a structure's overall energy efficiency.



Silicone-based photovoltaic cells can be fused to porcelain tiles for façade and roof installations that produce as well as conserve energy.

Innovation

STATED INTENT

"To encourage projects to achieve exceptional or innovative performance."

PERTINENT REQUIREMENTS

Option 1. Innovation

Achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system.

Option 2. Pilot

Achieve one pilot credit from USGBC's LEED Pilot Credit Library.

Option 3. Exemplary performance

Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements or the next incremental percentage threshold.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Many tile products today incorporate new, advanced technologies including photovoltaic cells fused to tiles, antimicrobial additives in grout, photocatalytic tile surfaces, underlayments with geothermal channels, and much more. These innovative products offer the potential to generate and conserve energy, clean the surrounding air, and facilitate more sustainable interior and exterior environments. Consult manufacturers to learn about the many exciting technologies available or in research and development.

Refer to the LEED Pilot Credit Library frequently at www.usgbc.org to discover potential new credits that may be relevant to tile.

Many tiles and installation materials offer the potential to contribute to achieving double the credit requirements and/or achieving the next incremental threshold.

Consider using Green Squared Certified® products that have innovative properties, are sustainable beyond baseline certification requirements, or could potentially be piloted for additional contribution to LEED v4.

Certified Multi-Attribute Products and Materials

STATED INTENT

"To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts."

PERTINENT REQUIREMENTS

Use products from manufacturers who have validated multiple environmental attributes relevant to the product via independent, consensus-based, third party certifications. The products must have earned and still maintain certification under the scheme.Only products which have undergone a life cycle assessment in conformance with ISO 14044 are eligible, and the manufacturer must publicly disclose all other credit achievement results of the product on which the certification has been granted. Use at least 25%, by cost, of the total value of permanently installed products in the project.

Approved third-party certification standards pertaining to tile and/or tile installation materials:

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

Note: A full list of approved 3rd party certification standards for other types of building products, including wallboard, furniture, roofing, and other types of floor and wall coverings, is available at www.usgbc.org.

TIPS TO INTEGRATE TILE INTO YOUR DESIGN

Tiles or tile installation materials that are Green Squared Certified can contribute toward the 25% threshold required by this credit as indicated below. The manufacturer must disclose all aspects of Green Squared/ANSI A138.1 that were met to achieve certification, including Section 3.8.1, Life Cycle Assessment.

- 50% of the total product cost for baseline certification
- 75% of the total product cost if ANSI A138.1 criteria for Level 2 recycled/reclaimed content and/or Level 2 indigenous raw materials were met as part of the certification
- 100% of the total product cost if ANSI A138.1 criteria for Level 3 recycled/reclaimed content and/or Level 3 indigenous raw materials were met as part of the certification



Green Squared Certified® tiles and installation materials offer robust sustainability and versatility. This floor design was created using Green Squared Certified tiles, which were installed throughout an 8,000 sq.ft., LEED NC Platinum Certified facility.

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Green building standards and rating systems are living documents, and the consensus regarding their use and interpretation is ever-evolving. Check for updates to this guide at www.TCNAtile.com.

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