This On-line Learning Seminar is available through a professional courtesy provided by:

Tile of Spain Center
Trade Commission of Spain
2655 Le Jeune Road, Suite 1114
Coral Gables, FL 33134
Tel: 305-446-4387
Fax: 305-4462602
Email: miami@mcx.es
Web: http://tileofspainusa.com/ or www.spaintiles.info

Getting Started

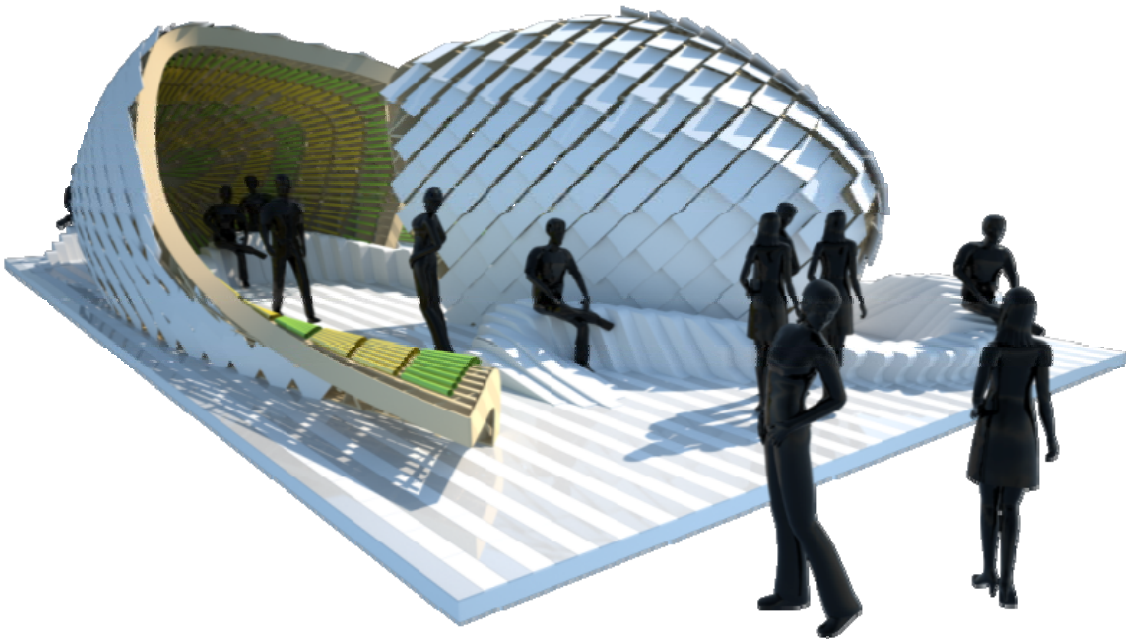
Click on the start button to begin this course

START

powered by www.aecdaily.com AECDAILY

tile of spain®

Ceramic Tile: An Eco-*Logical* Choice



Ceramic Tile: An Eco-*Logical* Choice

Presented By: Tile of Spain Center
Trade Commission of Spain
2655 Le Jeune Road, Suite 1114
Coral Gables, FL 33134

Description: The ceramic tile industry has a viable place in today's sustainable design initiatives. This course examines current qualifiers in relation to green materials, challenges preconceptions about ceramic tile, and validates ceramic tile as a lifelong sustainable solution in our built environment.

To ensure the accuracy of this program material, this course is valid only when listed on AEC Daily's On-line Learning Center. Please *click here* to verify the status of this course.

If the course is not displayed on the above page, it is no longer offered.

The American Institute of Architects · Course No. AEC526 · This program qualifies for 1.0 HSW/SD/LU hour.

AEC Daily Corporation is a Registered Provider with The American Institute of Architects Continuing Education Systems (AIA/CES). Credit(s) earned on completion of this program will be reported to AIA/CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request. This program is registered with AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

This course is approved by other organizations. Please *click here* for details.

EDUCATION PROVIDER

AEC DAILY CORPORATION
is a USGBC Education Provider committed to enhancing the professional development of the building industry and LEED Professionals through high-quality continuing education programs.

As a USGBC Education Provider, we have agreed to abide by USGBC-established operational and educational criteria, and are subject to course reviews and audits for quality assurance.

Ceramic Tile: An Eco-Logical Choice
#0090007500

GBCI CMP

Approved for 1 GBCI CE Hours for LEED Professionals.

How to use this On-line Learning Course

- To **view** this course, use the **arrows** at the bottom of each slide or the up and down arrow keys on your keyboard.
- To **print or exit** the course at any time, press the **ESC** key on your keyboard. This will minimize the full-screen presentation and display the menu bar.
- Within this course is an  **exam password** that you will be required to enter in order to proceed with the on-line examination. Please be sure to remember or write down this exam password so that you have it available for the test.
- To receive a **certificate** indicating course completion, refer to the instructions at the end of the course.
- For **additional information** and post-seminar assistance, click on any of the logos and icons within a page or any of the links at the top of each page.

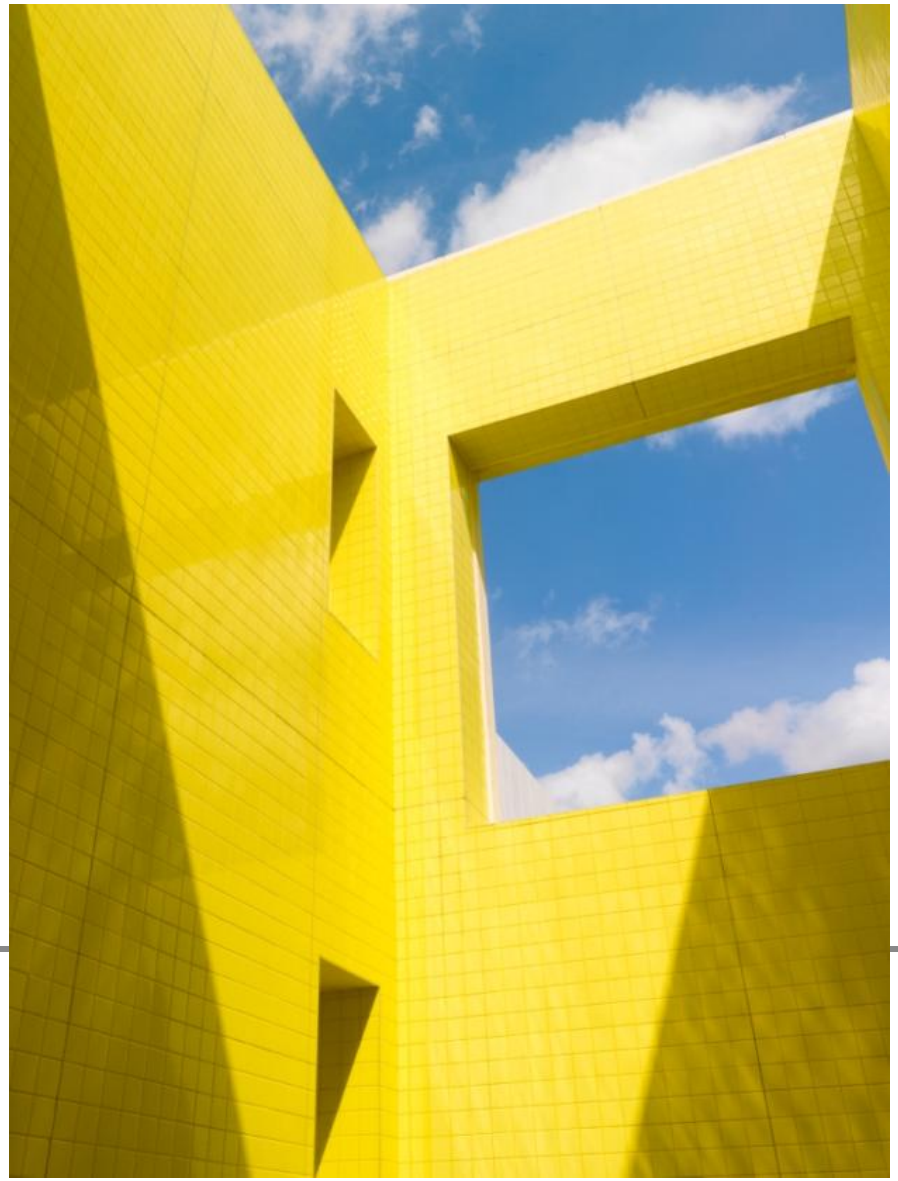
Learning Objectives

At the end of this program, participants will be able to:

- reassess the complete list of inherent ceramic tile environmental benefits, including those addressed by current rating systems and those not yet included
- challenge past perceptions and re-examine technical advances and innovations within the ceramic tile industry
- re-evaluate the possible sustainable contribution of ceramic tile by following the “First R” (*Reduce* consumption through the use of long lasting durable materials)
- reduce consumption through the use of long-lasting durable materials and confirm quality ceramic tile as a long-term sustainable building material, and
- discuss the long-term occupant health advantages of materials with: no chemical emissions such as volatile organic compounds, non-toxic cleaning and maintenance requirements and superior hygienic qualities.

Table of Contents

Click on title to view



Jaume I Institute for Higher Education, Ontinyent, Spain

Introduction

Environmental Design

The North American environmental design landscape has been gaining traction and evolving steadily as awareness for sustainable structures spreads through the design community to the general population.

Today, environmental design initiatives have moved far beyond their humble roots on the fringes of society's awareness and are becoming prime directives, globally adopted and important to all.

Photo credit: Spanish Pavilion for Expo Zaragoza 2008, Francisco Mangado, www.fmangado.com

The Driving Force

Major influences in the North American green movement have been environmental design certification programs, most notably, the U.S. Green Building Council's LEED® green building certification program.

The U.S. Green Building Council (USGBC) is a 501(c)(3) non-profit organization composed of leaders from every sector of the building industry working to promote buildings and communities that are environmentally responsible, profitable and healthy places to live and work. USGBC developed the LEED (Leadership in Energy and Environmental Design) green building certification program, the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

For detailed information about the council, their principles and programs, please visit www.usgbc.org.

Keeping Focused

It is important to remember that since the introduction of LEED in 1998, there have been continuous refinements to the categories and credits within the program to reflect emerging research and new-found knowledge. LEED and other similar rating systems continue to be *works in motion*.

Design professionals must constantly challenge the status quo and each other to promote and adopt the best solutions available while working toward the same ultimate environmental goal:

> "To promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man."[1]

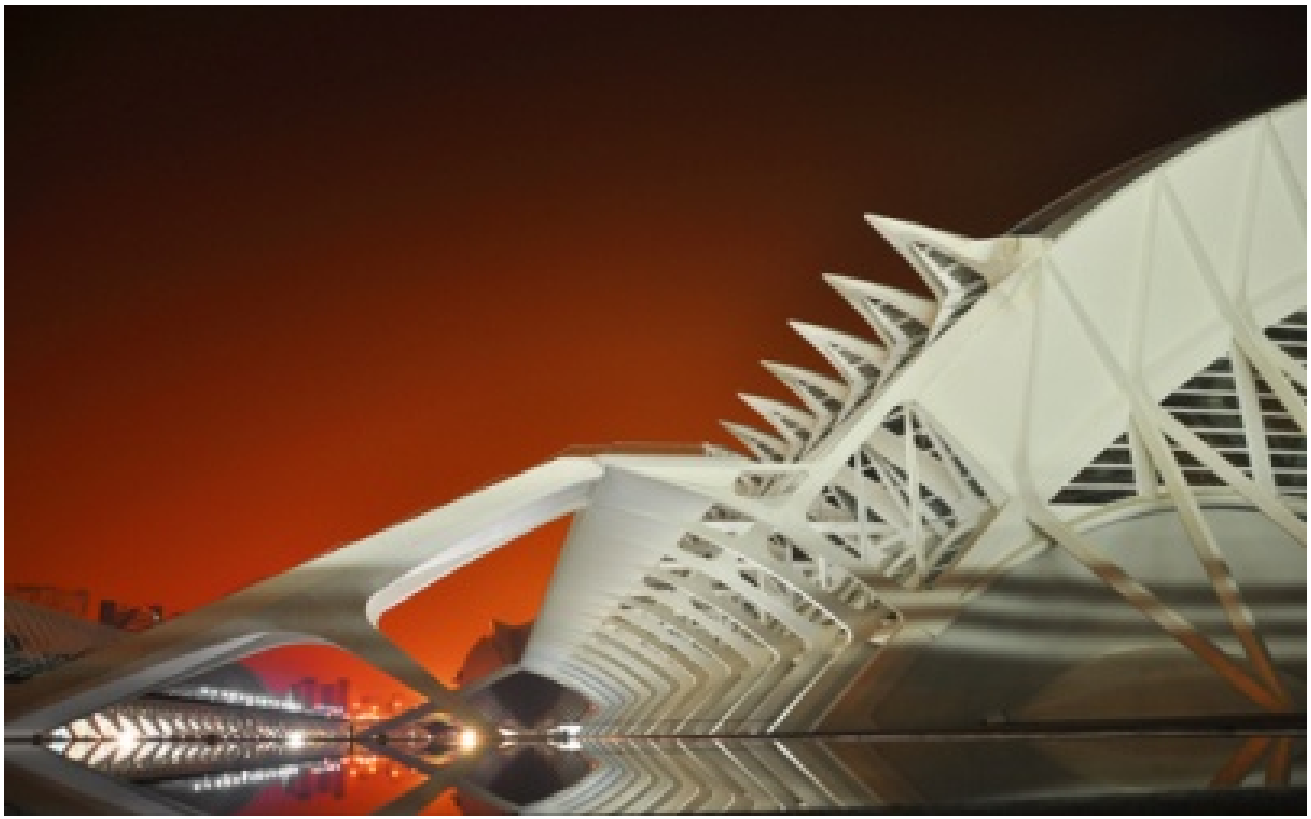
“Evolution is not a force, but a process.” [2]

Looking back at the history of sustainable design in North America and the evolution of what currently defines a green material demonstrates how ceramic tile can contribute to the sustainable built environment at present.

Looking forward, convincing initiatives pertaining to other intrinsic values are creating the potential for ceramic tile to impact sustainable design in a much more significant way.

Changes influencing the status quo are:

- language changes to LEED 2009
- new industry certification standards
- a growing body of experience-based case studies, and
- the public’s shifting preference for quality, long-lasting goods.



City of Arts & Sciences, Valencia, Spain
Photo courtesy of Bob Borson, www.lifeofanarchitect.com

Ceramic Tile and LEED

Stakeholders Set the Parameters

The creation of USGBC's LEED rating system endeavors to be as open and transparent as possible. Development of criteria and requirements is a consensus-based process for stakeholders and USGBC member individuals and companies under LEED committees.

Each strategy has a clearly defined intent that describes the desired outcome. For an industry's experience to be represented, they must be at the table.

Now, Ecology…

The ceramic industry was a late entry to the collaborative process of LEED. This was not due to an apathetic view of environmental issues or lack of sustainable qualities of the material—it was more a difference in viewpoint between Europe and North America.

Europeans, the largest producers and consumers of ceramic tile, have experienced the lifelong contribution of tile in cultural and historic sites. Material which provides service and beauty for generations is regarded as logically sustainable.

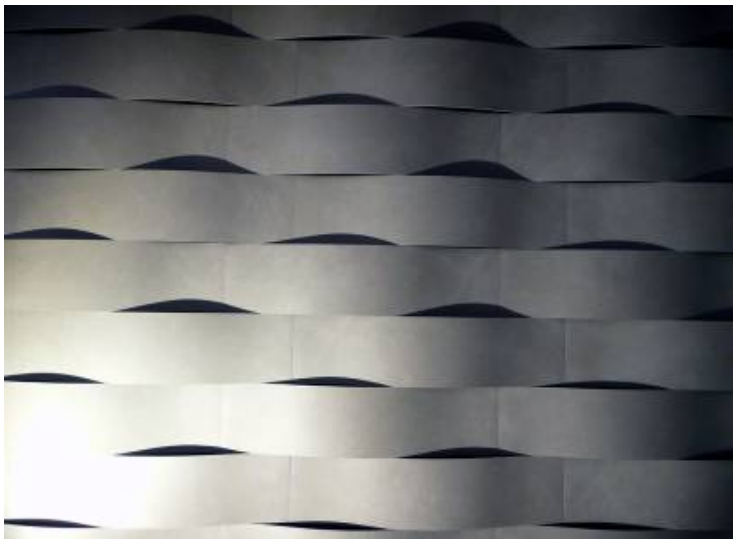
Realizing that qualities identifying and defining green material are not universally shared prompted the ceramic tile industry to become active collaborators and members of USGBC.

Service and Beauty for Centuries

Casa Batlló, Barcelona, Spain

Opportunities are never lost—someone will take the one you miss

Prior to membership, the inaugural and second incarnations of the LEED program were developed. Initial material qualifiers and credits did not include beneficial environmental strategies that should be considered in regard to long-lasting hard surface materials generally, and ceramic tile specifically. Alternate materials which did contribute to credits under versions 1 and 2 were understandably perceived as the most environmentally beneficial choices.



There’s never a second chance to make a first impression

Despite updates and amendments which highlight the positive sustainable role ceramics can contribute, many professionals and consumers remain unaware or unconvinced of the meaningful sustainable impact lifelong products such as ceramic tile possess.

“How you first meet the public is how the industry sees you. You can’t argue with them. That’s their perception.”
Meryl Streep

Systems Approach

The primary focus of LEED is to alleviate the major environmental burdens regarding energy and water consumption combined with waste reduction. While ceramic tile can form part of a building envelope system and exterior paving components, its most significant use is on interior floor and wall applications.

The LEED green building certification program is a point-based system where points are awarded for actions taken during design, construction, and use phases to reduce the impact a project and its construction will have on the environment and natural resources. The program has five main categories:

- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy & Atmosphere (EA)
- Materials & Resources (MR), and
- Indoor Environmental Quality (IEQ).

Two additional categories for actions not specifically addressed in the five main categories are:

- Innovation in Design (ID), and
- Regional Priority.

Systems Approach

LEED credit requirements cover the performance of materials in aggregate, not the performance of individual products or brands. Therefore, products that meet the LEED performance criteria can only contribute toward earning points needed for LEED certification; they cannot earn points individually toward LEED certification.

Even so, the individual products selected are vitally important decisions for LEED and other sustainable design projects since a well planned specification can provide substantial benefits to occupant health, safety and productivity in addition to contributing towards credits.

LEED 2.0 introduced the tiered version in which projects were classified as certified, silver, gold or platinum. This approach expanded building certification and material contribution opportunities.

Ceramic Tile's "Big Five" LEED Qualifiers

1. Salvage or Reuse and Construction Waste Management
2. Recycled Content (post-consumer + ½ pre-consumer)
3. Regional Materials
4. Rapidly Renewable Materials
5. Low Emitting Materials: Sealants, adhesives
   Low Emitting Materials: Carpet systems

The above identified credits were once the only attributes within the LEED system which could pertain to ceramic tile material. With consideration defined by these attributes, other strategies and qualities relating to ceramic tile were marginalized. While some can be highly beneficial, they are not yet perceived or identified as sustainable because no credit is awarded for their contribution. In the earliest versions of LEED, an additional credit was awarded for Low Emitting Materials: Carpet Systems. This language has now been changed to Flooring Systems.

Ceramic Tile's Current Contribution

The next few slides discuss ceramic tile's contribution to a building project achieving LEED certification. For exact wording of intent and credit numbers for these and all other references to the LEED program, please view the document, "LEED for New Construction and Major Renovations Rating System" (updated November 2011), www.usgbc.org/ShowFile.aspx?DocumentID=8868.

Salvage or Reuse and Waste Management

Credits:

MR 1.1 and MR 1.2 Building Reuse

MR 2 Construction Waste Management

MR 3 Materials Reuse

Intent: These strategies are to *divert waste* from landfill, thereby saving on environmental costs related to new material.[3]

Any time material can be repurposed and re-specified for new construction, or demolition material from renovations can be sorted, repurposed and/or recycled, there are multiple environmental benefits.

Preservation

Because quality ceramic tile is extremely durable, it outlasts most other types of flooring, which enables the salvage of antique and historic installations.

Photo: Salvage, restoration & preservation of 11th Century Aljafería Palace, Zaragoza, Spain

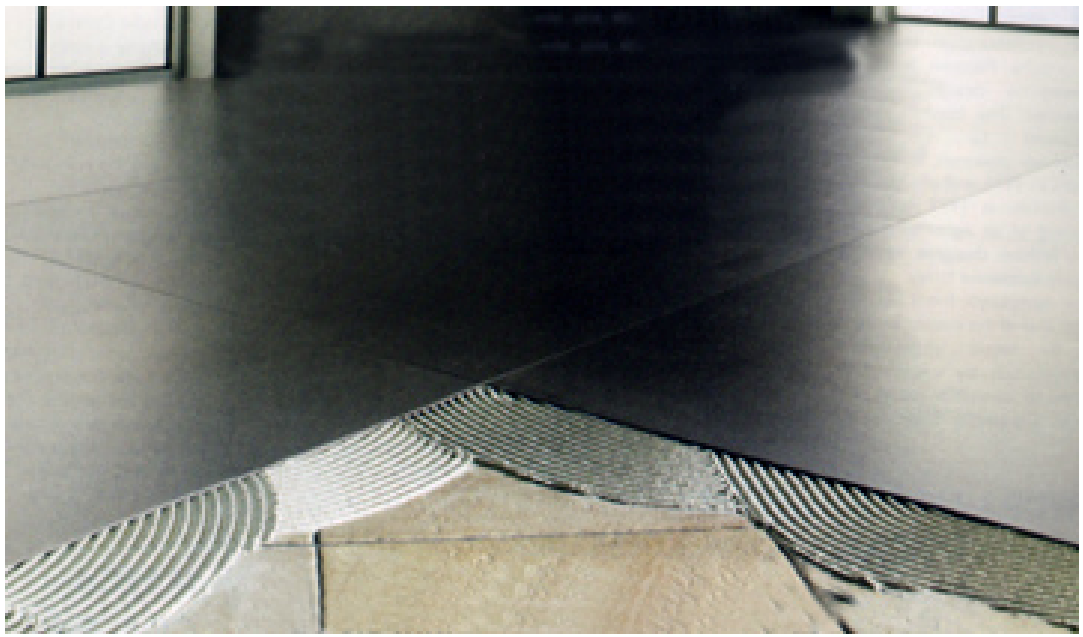
Durability and Impact on Waste Management

The potential reuse, rather than the premature replacement, of an existing floor, can greatly affect renovations initiated by insurance claims such as fires and floods. Ceramic tile is one of the only materials which can survive these disasters.

While this type of renovation may not be a certified project, the generated construction waste has a significant impact on landfill burden. When ceramic tile reaches its useful end of life, it is inert and easily converted to clean fill material for road bases or the re-grading of sites.

Reuse Saves Time, Money and Resources

With the advent of slim, 3-6mm thick porcelain material, tile-over-tile installations are a viable option in many cases. The original ceramic is reused as a stable backing for the slim tile. No construction waste is sent to landfill including the underlying substrate material, which also means no virgin material is used to replace the subfloor. While saving resources, this application can also significantly reduce installation cost and time for renovations.



Ventilated Porcelain Façades

In renovation projects, a ventilated façade does not require the removal and disposal of the original exterior facing material.

In both new construction and renovation, a ventilated porcelain façade improves energy efficiency and occupant comfort, and reduces noise penetration.

Recycled Content

Credits:

MR 4.1 and MR 4.2 Recycled Content

Intent: Increase the demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.[4]

Photo credit: Steve Snodgrass, www.flickr.com/photos/10710442@N08/5548193945
Accessed January 2012

Recycled Content in Ceramics

Tile manufacturers are recycling water and post-industrial waste, conserving energy by using their own solar power, and using co-generation, the use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

The ceramic tile industry incorporates post-consumer glass and re-milled fired tile waste (called chamotte) whenever inclusion enhances either the technical or aesthetic value of the tile. Their main recycling efforts are focused on eliminating process or production waste to ensure industrial by-products do not enter the waste stream. To capture suspended clays and minerals, the vast majority of quality ceramic tile manufacturers employ closed-loop manufacturing processes. This entails purifying and recycling 100% of production water and reclaiming the residual raw material sediment for reuse in production.

Currently, classified as pre-consumer waste under LEED, only 50% of the content value can be used toward the recycled content credit.

Closed-Loop Manufacturing

Production process water is sent to recycling facility

Settlement tanks extract clay particulates and clarify water for reuse

Recycled Content in Ceramics

To maximize recycled content value and increase the merit of using ceramic tile in sustainable projects, many manufacturers concentrate all pre-consumer waste into a small group of collections.

The close proximity of the ceramic industrial cluster has enabled larger companies to consolidate available industry waste from smaller manufacturers and other synergistic industries. These firms have programs with 90%+ pre-consumer recycled content.

The current strategy of discounting industrial waste in comparison to post-consumer waste is being questioned by some members of the green building industry.

Recycled Content – Winds of Change

In a 2011 International Green Construction Code (IgCC) Public Hearing it was argued that any type of recycled content—post-consumer, pre-consumer or non-categorized—diverts material from waste streams.[5]

Whether diversion occurs during the manufacturing process or after consumer use is of equal merit, as it will still occupy the same landfill space regardless of where it came from. Reducing the benefit of diverting industrial waste could in fact discourage manufacturers from continuing their waste diversion efforts. This school of thought is gaining acceptance and will garner even greater recognition for the many closed-loop ceramic tile manufacturing facilities.

Synopsis, International Green Construction Code™ Public Version 2.0 , November 2010. Section 503: Material Selection, www.iccsafe.org/cs/IGCC/Documents/PublicVersion/IGCC_PV2_Synopsis.pdf (accessed January 10, 2012)

At least 55 percent of the total materials in each building project must be any combination of the following (Section 503.2):

- Used materials,
- Recycled content materials (must contain at least 25 percent combined post-consumer and pre-consumer recovered material, and must be recyclable),
- Recyclable materials (with a minimum recovery rate of 30 percent),
- Bio-based materials (with at least 50 percent bio-based content), or
- Indigenous materials (materials recovered, harvested, extracted and manufactured within 500 miles of the site, with special provisions for materials transported by water or rail).

Regional Materials

Credit:

MR 5 Regional Materials

Intent: To increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.[6]

When comparing materials of equal technical and functional attributes, product produced within close proximity of the building site lowers the embodied energy of the material by reducing transportation fuel consumption.

Regional Materials and Performance

The initial consideration for product specification should be the technical and functional viability of the material; i.e. will the material survive the design life, based on expected use, climate conditions and anticipated maintenance? If the material longevity is compromised to qualify for this credit, and premature replacement is required, the intended sustainable outcome and benefit will be negligible.

Porcelain pool deck

Regional Materials and Aesthetics

Aesthetic goals are often as significant a deciding factor as technical merits with regard to material selection. All product within a specific category are not created equal. Too often, material choices are replaced due to poor appearance retention long before they wear out.

Only after performance and aesthetic criteria are met should locally produced material become a deciding factor. Regional material should be sought out whenever possible, but this single attribute is not the most relevant guide to selecting a holistic environmental solution.

Spanish Pavilion - ceramic façade, 2005 Expo, Aichi, Japan

Rapidly Renewable Materials

Credit:

MR 6 Rapidly Renewable Materials

Intent: To reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.[7]

Requirements: Rapidly renewable building materials and products are made from agricultural products that are typically harvested within a 10-year cycle or shorter.

- Reducing consumption of raw materials which are in danger of depletion.

Rapidly Renewable Materials

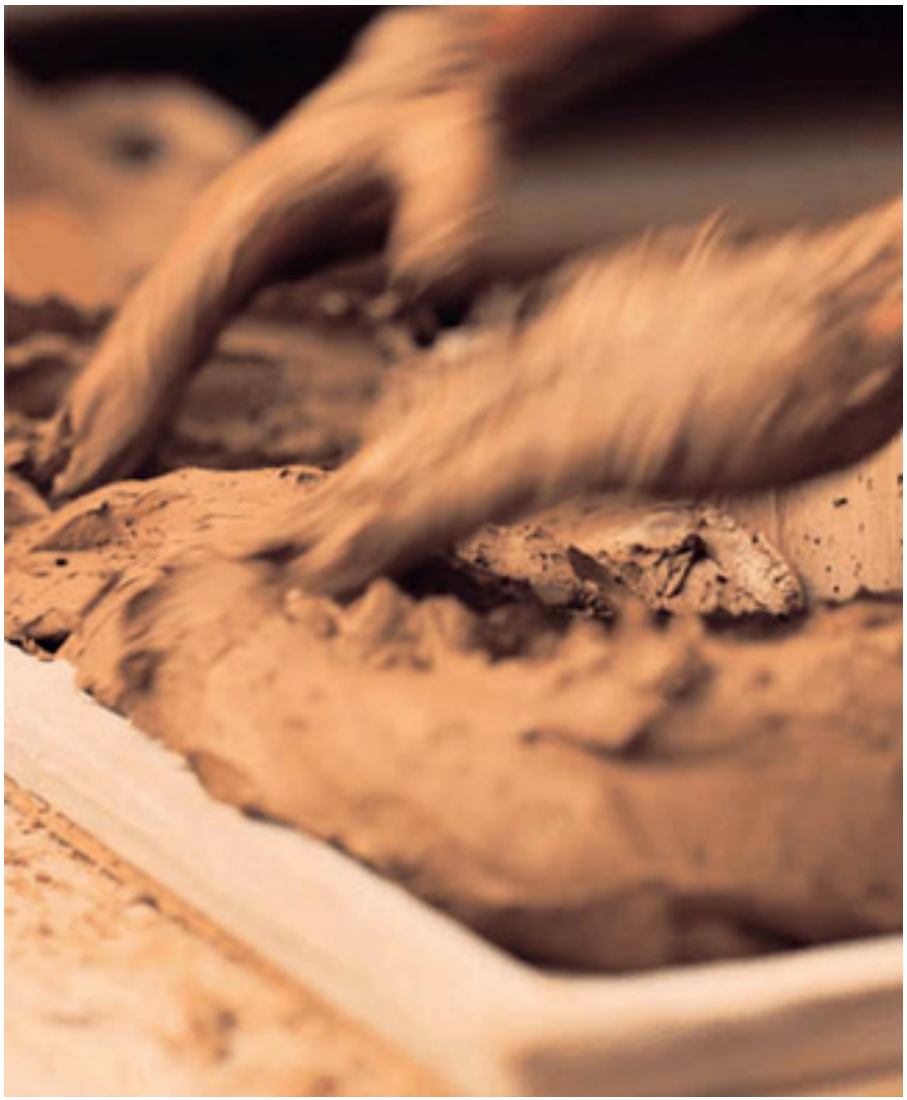
Ceramic tile is composed of three main ingredients: clay, feldspar and sand.

The reserves of silicates, feldspar and common clays are in the hundreds of millions of tons and found in many countries and on every continent.[8]

Clay cannot be qualified under the language of LEED as rapidly renewable; however, it has been quantified as a *perpetual resource.*[9] The only other material resources included in this list are salt, stone and magnesium.

Perpetual Raw Materials

The raw materials used for ceramic tile perpetually regenerate; they are not at risk of depletion. It may not fit into the language of this LEED credit, but it definitely meets the intent.



Low Emitting Materials

Credits:

IEQ 4.1 Adhesives and Sealants and IEQ 4.3 Flooring Systems

Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.[10]

Volatile organic compounds (VOCs) are a key contaminant and the largest contributor to poor indoor air quality (IAQ).

Low Emitting Material Changes

LEED 2009 version changed the language for the IEQ 4.3 credit. Low Emitting Materials: Carpet Systems was replaced by Low Emitting Materials: Flooring Systems. This change provides design professionals the opportunity to compare a diverse range of floor coverings, including ceramic tile, and select materials which not only seek to limit pollutants, but are also ones that improve air quality and are neither an original source of pollution (during installation) or a secondary source (during the life of the product).

Ceramics and Low Emitting Materials

Ceramic tile and installation materials are one choice that in almost all applications contribute zero VOCs.

An addendum to credit IEQ 4.3 in April 2010 qualifies ceramic tile for an exemption from the VOC testing requirement.

Mineral-based finish flooring products such as tile, masonry, terrazzo, and cut stone without integral organic-based coatings and sealants and unfinished/untreated solid wood flooring qualify for credit without any IAQ testing requirements.[11]

This exemption allows architects to apply for this credit without third-party certification when ceramic tile is specified.[12]

Material Matters

Over the past decade, there has been heightened interest in all strategies which concern occupant health.

Material resources and their effect on indoor air quality and the health, safety and productivity of building occupants are much more significant foci today.

In 2005, Rick Fedrizzi, CEO and co-founder of USGBC stated:

> "I believe the smoking gun of green buildings and the reason you're going to see more of them is productivity." [13]

Healthier Occupants = Big Gains

Over the last 20 years, a growing body of research based on LEED compliant buildings illustrates the potential benefits improved indoor air quality and green building strategies can have on occupant health, safety, and productivity.[14]

- School students achieve up to 20% better test scores.
- Hospitals discharge patients on average 2.5 days sooner.
- Retail spaces saw an increase in sales per square foot.
- Office and production facilities saw 2-16% increase in productivity.

The Smoking Gun

Image credit: USGBC South Florida Chapter,
Green Building Advocacy www.usgbcsf.org/advocacy
(accessed January 10, 2012)

Is Low VOC Emission Good Enough?

As it stands today, one LEED point is possible for using low emitting flooring systems. Should there be additional incentives—an extra point for using systems that add no VOCs?

Reducing something in order to make it less negative should be just a first step. "Less bad isn't better."[15]

Discussions in architectural circles have suggested adherence to the "Precautionary Principle": Avoid substances that are known or suspected to be associated with an adverse finding in relation to human and environmental health.[16]

"Even if there is only a chance of a material containing something harmful, why use it?"[17]

Creative Thinking

One of the largest roles ceramic tile can play in LEED is in contributions to the Material Resources and Indoor Environment Quality credits previously detailed. However, there are other areas in the LEED checklist where tile can be integrated to form the basis of a sustainable system solution.

Santa Caterina Market - tile roof, Barcelona, Spain

Ceramic Tile in LEED Beyond the “Big Five”

Credits:

SS 7.1 and SS 7.2 Heat Island Effect – Non-Roof and Roof

Intent: To reduce heat islands to minimize impacts on microclimates and human and wildlife habitats.

- Exterior tiling in a light color with a Solar Reflectance Index (SRI) of at least 29, on at least 50% of the site hardscape areas.
- Roofing tile with defined SRI for a minimum of 75% of the roof surface.[18]

Congressional Palace - Tile and GFRC (glass fiber reinforced concrete) panel roof, 2008 Expo, Zaragoza, Spain

Ceramic Tile in LEED Beyond the “Big Five”

Credits:

EA Prerequisite 2 and EA 1: Optimize Energy Performance

Prerequisite Intent: To establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

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

Ventilated porcelain façades can offer up to 25% energy savings.[19]

Ceramic Tile in LEED Beyond the “Big Five”

Credit:

EA 2: On-site Renewable Energy

Intent: To encourage and recognize increasing levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use.

For installation of a ventilated façade system, where ceramics are complemented by photovoltaic modules of exactly the same size, PV modules are fitted in the same way as the façade’s ceramic units. The system can be used in new and existing buildings.[20]

Ceramic Tile in LEED Beyond the “Big Five”

Credit:

ID 1: Innovation in Design

Intent: To provide design teams and projects the opportunity to achieve exceptional performance above the requirements set by the LEED® green building certification program and/or innovative performance in green building categories not specifically addressed by the LEED® green building certification program.

Vegetative panels inserted in a porcelain ventilated façade

Elementary School - tile façade and roof, Gandia, Spain
Photo credit: Paredes Pedrosa Arquitectos, www.paredespedrosa.com

Ceramic's Evolving Role: Contemporary Green Design Outside LEED

Some Other Influencers

Several organizations have initiated complementary green building rating systems. These environmental design initiatives have contributed to the evolution and definition of green over the past decade in relation to our built environment.

ICC 700 National Green Building Standard™ (www.nahbgreen.org)

- A standards and rating system developed by the National Association of Home Builders (NAHB, www.nahb.org) and the International Code Council (ICC, www.iccsafe.org) for single- and multi-family homes.[21]

The Collaborative for High Performance Schools (CHPS, www.chps.net)

- A checklist for enhancing students' learning experience while reducing operating costs and environmental impacts.[22]

Some Other Influencers

International Green Construction Code (IgCC, www.iccsafe.org/cs/igcc)

- Similar to any other building code, IgCC will be administered by code officials and offered for adoption on national, regional and municipal levels. Where adopted, the code will be law for how buildings shall be constructed. The new Code will launch Spring 2012.[23]
- While the IgCC and the LEED certification system share many common features, they differ significantly in the commitment required from developers. While LEED is voluntary and based on implementation by individual developers, the IgCC is intended to become part of a local jurisdiction's building code. Jurisdictions that adopt the IgCC are expected to integrate the code with their existing building codes to create a new regulatory baseline for green construction.

Life Cycle Assessment (LCA)

LCA studies should be a valuable tool for assessing the environmental impact of materials.[24] They could identify the most sustainable option if reliable data, obtained by universally adopted methods, enabled cross-comparison of competitive materials on a level playing field.

To date, there is no single methodology; proprietary information, disparate goals, outdated data and lack of universal criteria make cross-comparison of LCAs a frustrating and difficult endeavor.

Emerging initiatives will provide a degree of standardized context for design professionals to better apply LCA data.

Image: Solidworks, www.solidworks.com/sustainability/index.htm

Reference Service Life

Accurate Reference Service Life (RSL) values of competitive products will more clearly establish a product's complete environmental impact and help to equalize and quantify LCA data. Service life planning attempts to ensure, as far as possible, that a building or material's estimated service life will meet or exceed its design life, resulting in fewer premature renovations.[25]

Compiled from in-use building case studies and extrapolation-model programs, an RSL database provides a life expectancy of buildings and materials in various uses and climatic conditions. Using RSL values, pertinent data can be extracted from LCAs to determine a material's amortized lifetime environmental and financial costs in the context of a building's lifespan. The durability of products will factor heavily in RSL values, as all relevant impacts will be added each time a material is replaced within a normalized timeframe—usually the expected life of a building.

Environmental Product Declarations

Another tool, an Environmental Product Declaration, EPD® (www.environdec.com) is akin to the standardized nutrition labels found on foods and is intended to help consumers make a more informed choice.

EPDs will be based on LCA data according to ISO 14040 and will be an effective tool for communicating the summary of a product's full environmental story.[26] Criteria will be set on product category rules (PCR) to ensure information will be consistent and comparable across all products that fall within a common category or sector.

This new initiative will further highlight the perpetual service life recognized in quality ceramic tile verified by durability criteria as described by the American National Standards Institute (ANSI, www.ansi.org), American Society for Testing and Materials (ASTM, www.astm.org) and International Organization for Standardization (ISO, www.iso.org).

Multi-Attribute Standards

Each of these initiatives is in development to attempt to *standardize* information so materials can be compared across a range of attributes.

In addition, multi-attribute standards are now becoming a requirement for manufacturers to substantiate green assertions. Single attribute claims can be misleading: products advertised as green when they are only green in one area, but not in several others.[27] Consumer demands for environmentally responsible goods, despite skepticism of environmental claims, are forcing markets to respond with more stringent product standards.[28]

In late 2011, Green Squared[SM], a multi-attribute standard for environmental ceramic tiles, was approved and published by the American National Standards Institute (ANSI). Written by the Tile Council of North America (TCNA), this standard was modeled after other well respected multi-attribute standards from competitive industries.[29] It will be an important tool for North American design professionals when choosing sustainable ceramic tile systems in the future.[30]

Green Squared^{SM} Certification

The Green Squared standard (ANSI 138.1) covers porcelain, pressed floor, mosaic, quarry and glazed wall tiles. As the first sustainable building material standard to encompass the full range of products used in an installation system, the standard also covers mortar, grout, membranes, backer-boards and other ancillary installation materials. This comprehensive standard is meant to assist green design professionals in specifying complete wall and floor systems.

The comprehensive standard sets criteria throughout a product's life cycle from raw material extraction, to manufacturing, use, and end-of-life management. It consists of the following sections:

- Characteristics (product)
- Environmental Product Manufacturing (including raw material extraction)
- End-of-Product-Life Management
- Progressive Corporate Governance, and
- Innovation.

MUCA Auditorium and Music Complex, Algueña (Alicante) Spain

Sustainable Benefits of Quality Ceramic Tile - Outside Current Framework

Thermal Mass

The high density and low conductivity of ceramic tile creates a thermal sink for both heating and cooling a space. Ceramic tile stores energy and releases that energy back into the living space when it's needed. The more mass, the more energy that can be stored. Thermal mass will prevent rapid temperature fluctuation.[31]

When ceramics are selected early in the design process, applications in both interior and exterior installations can utilize the benefits of this attribute when paired with intelligent design and subsidiary systems.

Thermal Mass and Thermal Comfort

In places where geothermal power is an approachable option, often both heating and cooling of the space can be achieved more efficiently. This solution can offer the benefit of little or no traditional energy costs when paired with the thermal mass of ceramic tile.[32]

Temperature regulation through phase-changing materials (PCM) using nano-technology works in tandem with tile's thermal mass. Enhanced PCM storage cells in the tile excel at absorbing thermal energy and are capable of extending heat transfer, creating tiles which help keep ambient room temperature between 18-22°C. Tile using this technology has been tested to reduce energy use by 16% in a 1,000 square foot space.[33]

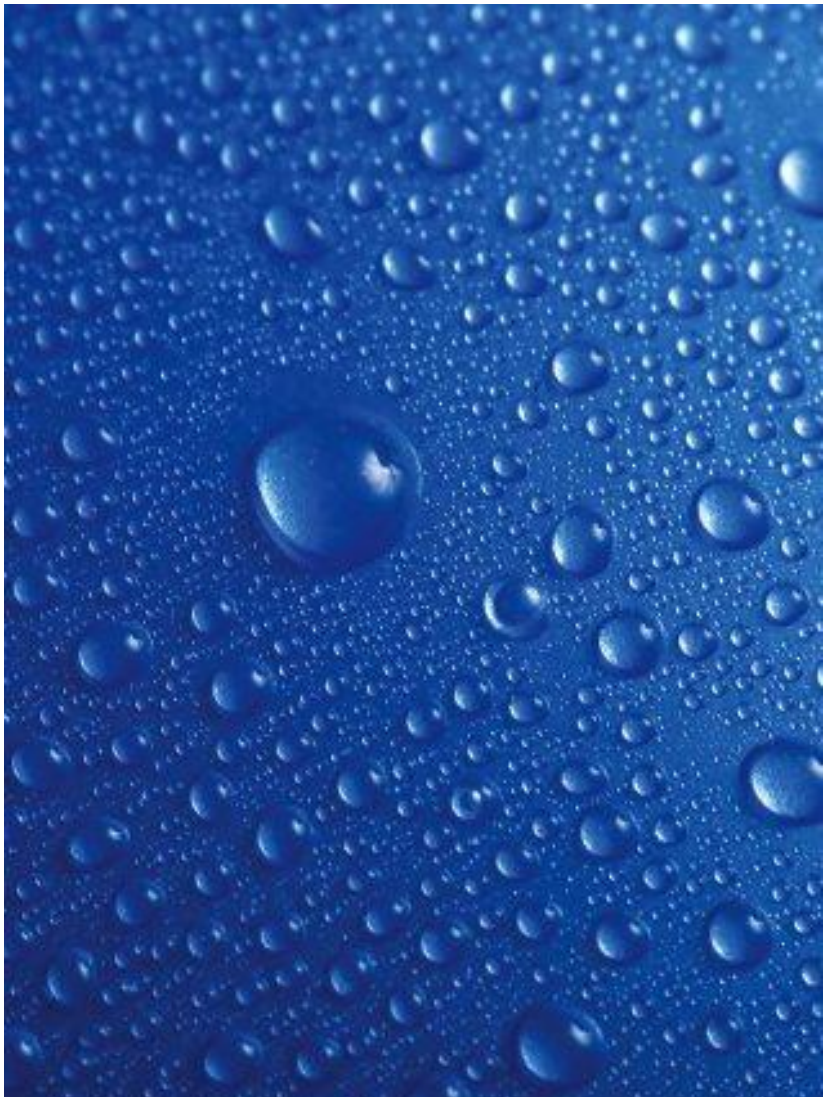
Thermal comfort (TC) has become another buzzword in terms of occupant health and safety. Any means of achieving better TC at a lower energy cost becomes a valuable sustainable design tool.[34]

In addition to passive solar gain strategies using ceramic tile, under floor radiant heating systems, paired with the thermal mass of ceramic tile, can offer significant benefits to TC and associated energy saving strategies—especially in renovations with less than optimal building envelopes.[35]

IAQ Benefits Beyond Zero VOCs

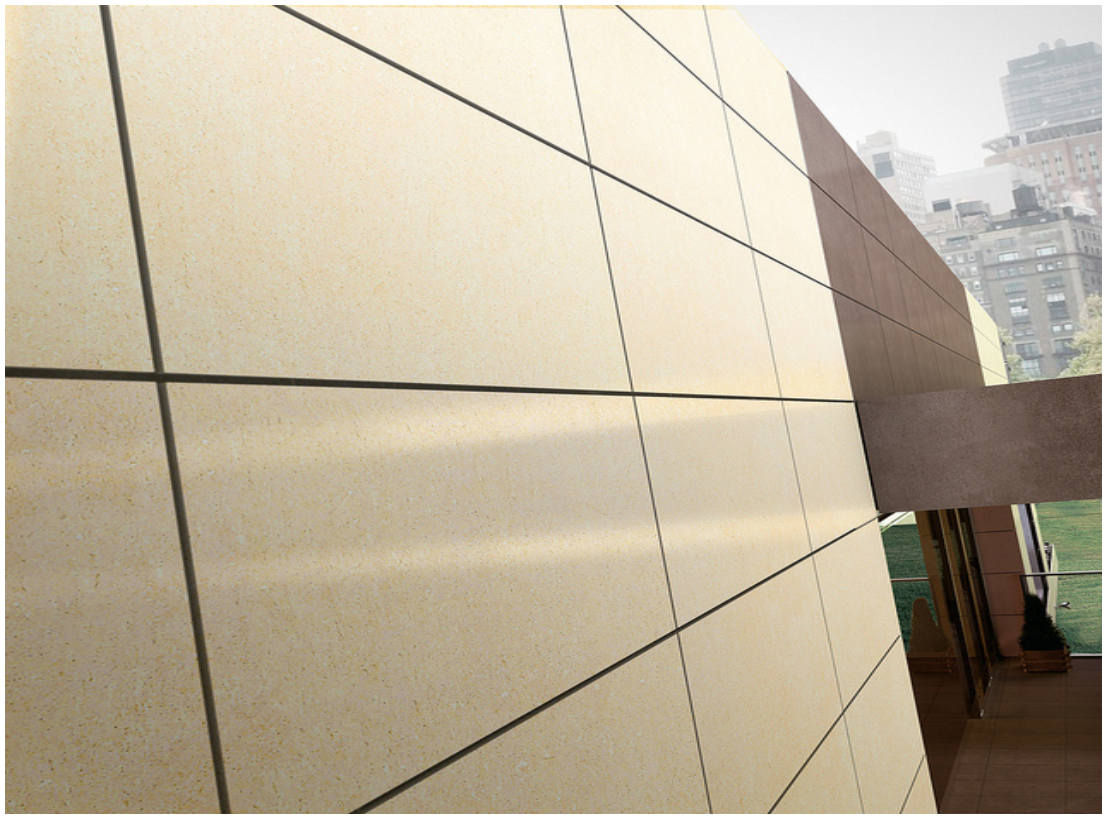
Ceramic tile is an inorganic and inert material that adds no VOCs to indoor air and also inhibits the growth of mold, mildew and other organic irritants.[36]

Progressive technology has introduced anti-microbial, anti-fungal, self-cleaning glazes that utilize minerals to reduce the surface tension of water (hydrophilic property) and improve cleanability as well as rinse organic residue from the tile surface.



What if a building worked like a tree?[37]

Exterior air quality can also benefit with photo-catalytic glazes, which are activated with light and water and can neutralize atmospheric contaminants (nitrogen oxides-acid rain) in the air and convert them into harmless compounds.[38]



A biomimetic surface structure and advanced glaze technology can neutralize NOx

Wellness and Livability

The impermeable surface of ceramic does not absorb odors or provide a sink for VOCs or other allergens introduced to a space. Reducing indoor contaminants which can accumulate in other surfaces is an important consideration specifically for public space such as restaurants, hospitality properties, schools and health care facilities.

Hypoallergenic spaces are easily achieved since no harsh or heavily scented cleaners are necessary to keep the surface sanitized and fresh on a daily basis; perfumes in cleaners and air fresheners are a common allergen for many people.[39]

Maintenance

Over the lifespan of a building, which can and should cover many generations of occupants, a properly installed ceramic installation needs little maintenance beyond sweeping and mopping.

No caustic sealers, strippers or refinishing processes are required to maintain glazed ceramic tile on floors and walls; therefore, no toxic chemicals are repeatedly flushed into water treatment facilities.

Ongoing minimization of known or suspected health hazards in indoor airspace is achievable since none are introduced by the product, maintenance or repair/refinishing process.

Durability

It is well documented that ceramic tile is one of the most durable materials at our disposal. Cone shaped ceramic tiles installed in columns from ancient Mesopotamia have been uncovered dating back to 900 B.C.

Much of what we know about past civilizations has been preserved due to recovered ceramic material.[40] Classic hand-made tile has survived for millennia; top quality tile produced today will exceed performance experience and stand the test of time for generations.

UV Light Does Not Harm Ceramics

Ceramic tile is unaffected by ultra-violet light. It is one of the few materials rendered in color that does not fade or deteriorate with exposure to the sun. This one aspect has numerous sustainable benefits:

- Tile can be spot repaired years in the future with reserve pieces from the same production run. Other cladding materials require complete replacement even when a small section is worn or faded.
- Reconfiguration of spaces is easier since the removal of furniture, rugs or temporary interior walls does not expose patches of discoloration.
- Phased installations for large commercial projects are possible even in exterior applications. There are large commercial developments with porcelain façades where three or more phases of construction have spanned several years, and the oldest building is indistinguishable from the newest. One need only look at the Washington Monument to realize this is not the case with many materials.

The Chameleon

A repeated criticism from the architectural and design community is that ceramic tile is imitative, faux and not a natural (authentic) material. Most commonly, ceramic tile mimics stone—a natural material made of clay and weathered minerals transformed over millions of years.

Using nature as a guide, the ceramic industry uses the same raw materials, applies equivalent pressure, and fires clay at temperatures duplicating the earth's heat to produce ceramic gres[41] with stone-like permanence in less than an hour; some call this "innovation inspired by nature."[42]

The Value of Quality

Material science research has led to engineered improvements in ceramic tile in technical consistency and reliability, lowered porosity, increased surface hardness and abrasion resistance, and with advanced digital processes the ceramic industry can duplicate the random and spontaneous, visual and textural appearance of virtually any material.

Choosing the Best Performance

There are applications and environments where ceramic gres is a superior performance specification: spaces where tile will last longer and be easier to maintain with fewer chemical and no refinishing/resealing requirements, when compared to “natural” alternatives.

Quality ceramic tile in stone, wood, fabrics, textiles and metal renditions does not propose to replace natural products in every application—only those where ceramic gres is a better solution for extended service life, occupant health and the environment.

Performance-Based Specification

All floor and wall surfaces in this lounge are ceramic tile.

The Quality Value Equation

Early industrialized ceramic material was not aesthetically or technically close to the natural material imitated. Unfortunately, without investment in advanced technologies, similar low value/quality programs continue to be abundant in the market today. Competing on price alone, these programs perpetuate the low perceived value, fashion and reliability of all ceramic tile across the entire category.

The most egregious fact is low technology, low aesthetic ceramic programs do not provide sustainable benefits. They are engineered and designed with short-term planned obsolescence in mind rather than lifelong service, fashion permanence and quality control precision.

Planned obsolescence and the corresponding initial low cost of non-durable, frequently replaced materials is a false economy used to attract consumers.

Flooring is usually a significant portion of the design budget due to the expanse involved. Often, low price has a disproportional influence on material selection—appearing to save money in the short term, but over a longer period of time, resulting in more money wasted than saved.

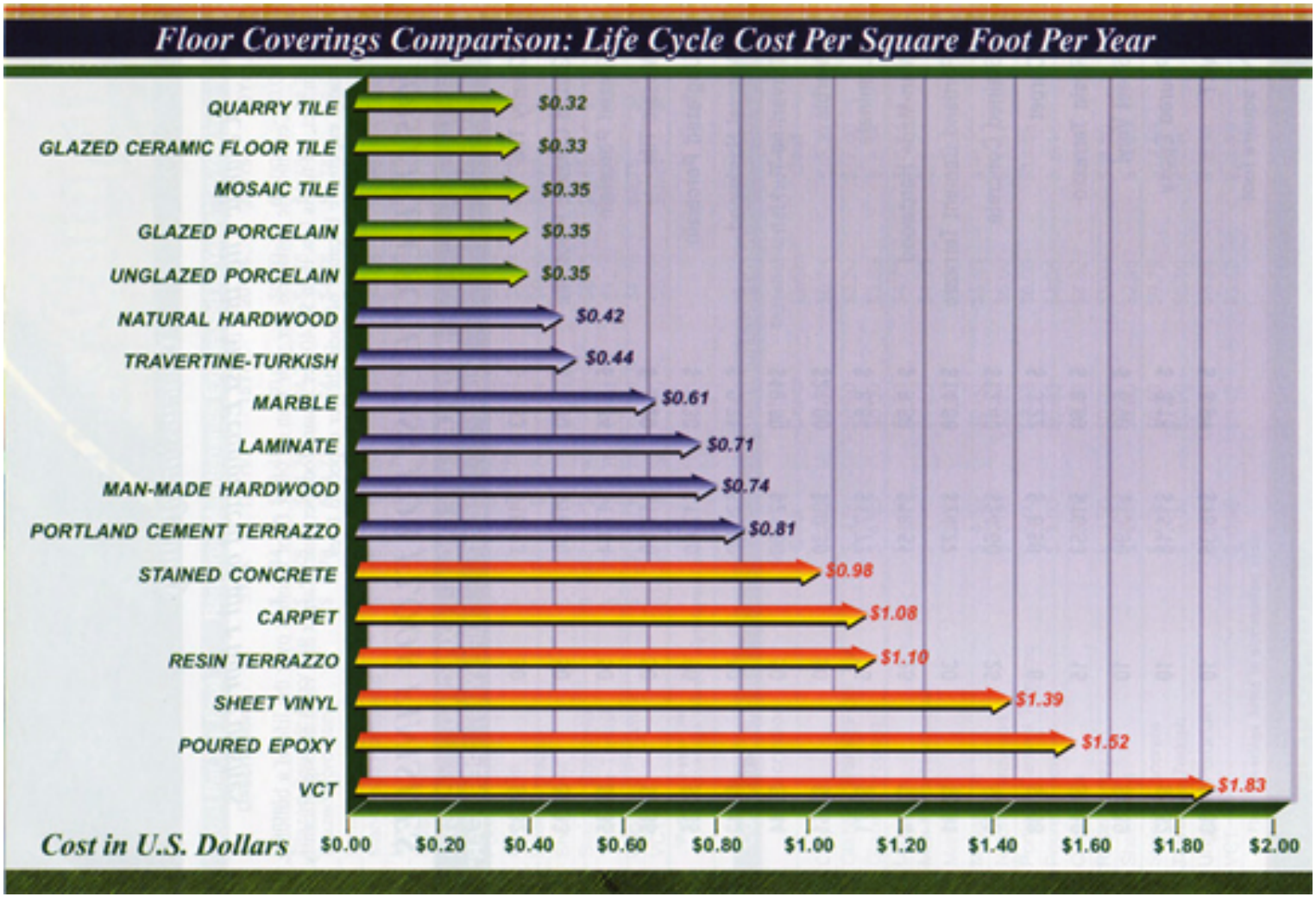
Amortization = True Price

People can easily grasp that spending $1.00 a day on a bottle of water far exceeds the expense of purchasing a refillable $30 stainless canteen which is virtually permanent.

The same principle applies to material choices in buildings. Only once the number of replacements and maintenance costs are calculated and extended over the lifespan of a building, can the actual accumulated expense of material choices be identified and evaluated.

VS

TCNA Commissioned Life Cycle Costing[43]



Published with permission from the Tile Council of North America, Inc., www.tileusa.com | www.TileTheNaturalChoice.com. (January 12, 2012)

Beach Promenade, Benidorm, Spain

Conclusions

It’s “green-washing,” not “sustainable-washing”

Commonly, two words have been used interchangeably when speaking about environmental design: “green” and “sustainable.” However, “green” is an abstract, a social construct with a definition as fluid as the concept it represents; it can never truly be an acceptable synonym for “sustainable.”

As discussed, spurious environmental claims have created public skepticism and coined the term “green-washing,” when “green” is used to white-wash ecological truths. “Sustainable,” on the other hand, is definable and constant.

Sustainability Is the True Goal

Many environmentalists would agree that a sustainable material should be primarily measured by its purposefulness, longevity and beauty.

we strive to preserve buildings we admire and love

For a building material to be considered sustainable, it must afford a high level of aesthetics and be durable enough to survive the life of the building, while being cost and resource effective to produce, install and maintain.

Please remember the **exam password BALDOSA**. You will be required to enter it in order to proceed with the on-line examination.

Rethink

When selecting a green material, revisit the classic three R's—dubbed the waste hierarchy—for guidance, in addition to compliance in a rating system. The precepts in order of preference are: Reduce, Reuse, Recycle. The aim of the order is to extract the maximum practical benefits from products and to generate the minimum amount of waste. Waste must be generated in order to be recycled. Although recycling is a very good thing, ideally it would be better to not generate any waste.

"The value of impermanence is to call attention to the permanent."
Stuart Davis

If recycled content were taken away from some perceived "green" materials, would they still be green? If the answer is no, aren't they simply "landfill" with a temporary life as a building material?

Isn't it time to *Re-think*?

There Is Always a Choice

The question is, do we care more about making the most sustainable buildings, or buildings with the highest green rating? Unfortunately, the two are not always the same.

"'Meeting code' is almost always an exercise in fulfilling minimum expectations, typically designed to limit the negative impacts of architecture rather than to encourage innovations that generate positive, socially beneficial effects. When one meets code, one has met the lowest acceptable standard for building performance."

William McDonough[44]

One who walks in another’s tracks leaves no footprints *– Proverb*

Ceramic tile is a unique material with convincing benefits that enable designers to create their own path toward logical sustainable design.

As language and systems evolve, ceramic’s value to green design will become clearer due to an industry that continues to innovate and provide performance-based, added-value solutions for generations to come.

After all…

…isn't working to make things better for those who come after what environmentalism is all about?

Villa Nurbs, Empuriabrava, Spain

Villa Nurbs - façade Tile

End Notes and Additional Resources

End Notes

1. Lewis, Jack. “The Birth of EPA.” *EPA Journal*, November 1985, National Environmental Policy Act (NEPA), Web. www.epa.gov/aboutepa/history/topics/epa/15c.html (accessed January 10, 2012)
2. Morley, John, 1st Viscount Morley of Blackburn. *On Compromise*. 1874.
3. “LEED for New Construction and Major Renovations Rating System,” Building Reuse credits MR 1.1 & 1.2, Construction Waste Management credit MR 2, Materials Reuse credit MR 3. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)
4. “LEED for New Construction and Major Renovations Rating System,” Recycled Content credits MR 4.1 & 4.2. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)
5. “Synopsis, International Green Construction Code™ .” Public Version 2.0 , November 2010. Section 503: Material Selection. www.iccsafe.org/cs/IGCC/Documents/PublicVersion/IGCC_PV2_Synopsis.pdf (accessed January 10, 2012) “Guideline for Recycled Content.” www.icc-es.org/guidelines/recycled_content-public_comment.pdf (accessed January 10, 2012)
6. “LEED for New Construction and Major Renovations Rating System,” Regional Materials credit MR 5. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)
7. “LEED for New Construction and Major Renovations Rating System,” Rapidly Renewable Materials credit MR 6. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)
8. “Clays.” *Mineral Information Institute*. www.mii.org/Minerals/photoclay.html “Clay.” *The Encyclopedia of Earth*. http://eoearth.org/article/clay (accessed January 10, 2012)
9. “Perpetual Resources.” *Environmental Economics Organization.* www.environmentaleconomics.org/Natural-Resource-Economics.html *Encyclopedia of Earth*. www.eoearth.org (accessed January 10, 2012)
10. “LEED for New Construction and Major Renovations Rating System,” Low Emitting Materials credits IEQ4.1 Adhesives and Sealants and IEQ 4.3 Flooring Systems. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)

End Notes

11. "LEED 2009 for New Construction & Major Renovations," Page 81. www.usgbc.org/ShowFile.aspx?DocumentID=8868 (accessed January 10, 2012)
12. *Tile Council of North America*. www.tilethenaturalchoice.com/IEQCredit4.3.html (accessed January 10, 2012)
13. LaMonica, Martin. "Selling Green Buildings with People Power." *CNET News*, October 28, 2005, Washington. http://news.cnet.com/Selling-green-buildings-with-people-power/2100-1008_3-5918004.html?tag=nefd.lede (accessed January 10, 2012)
14. Body of work (e.g. Kaplan 1989, Browning 1994, Milton 2000, Fisk 2000, Kats 2003, Kats 2010, Carnegie MellonUniversity).Carnegie Mellon University, Center for Building Performance Diagnostics. *eBIDS*. http://cbpd.arc.cmu.edu/ebids (accessed January 10, 2012)
15. Braungart, Michael, co-author Cradle to Cradle. "The Do Lectures." http://thedolectures.co.uk/lectures/why-less-bad-isn%E2%80%99t-better (accessed January 10, 2012)
16. "Wingspread Conference on the Precautionary Principle." *Science & Environmental Health Network*. January 1998. www.sehn.org/wing.html (accessed January 10, 2012)
17. Yale, Kadie. "Healthy made easy." *Metropolis,* March 24, 2011. Citing the "Precautionary List." (Perkins & Will at http://transparency.perkinswill.com) (accessed January 10, 2012)
18. "Cool Roof Guide." *U.S. Department of Energy*. http://www1.eere.energy.gov/femp/pdfs/coolroofguide.pdf (accessed January 10, 2012)
19. Roca Ceramica, Ventilated façade paper. http://www.rocatile.com/servlet/portal/FvEcorporateSvl?sesid=3149792711260&planguage=EN&ppais=ES&page=935085543801&codpage=&contenidoid=&fechapublicacion=&tipoambid=&ambienteid=&serieid=&applicationid=&sizeid=&referencia=&novedad=&provinciaid=&tiendaid=&b_referencia=&b_serie=&b_formato=&b_estilo=&b_componente=&b_color=&b_tipologia=&b_aplicacion=&imprimir= (accessed January 10, 2012)

End Notes

20. "Photovoltaic Ventilated Façade Tau Ceramica and Atersa." *PV Database*. www.pvdatabase.org/projects_view_detailsmore.php?ID=337 (accessed January 10, 2012) *Solar Headlines.* www.solarheadlines.com/content/atersa-undertakes-first-ventilated-photovoltaic-facade (accessed January 10, 2012)
21. *ICC National Green Building Standard*. www.nahbgreen.org (accessed January 10, 2012)
22. *Collaborative for High Performance Schools, CHPS*. www.chps.net/dev/Drupal/node (accessed January 10, 2012)
23. "International Green Construction Code," subtitled, "Safe & Sustainable by the Book." *International Code Council: IgCC*. www.iccsafe.org/cs/IGCC/Pages/default.aspx (accessed January 10, 2012)
24. "What Are LCAs?" *The Green Standard*. www.thegreenstandard.org/LCAs.html (accessed January 10, 2012)
25. "Defining Reference Service Life: An Open Innovation Approach." *International Conference on Durability of Building Materials & Components*, Lyon [France], April 17-20, 2005, Cooperative Research Centre for Construction Innovation. http://eprints.qut.edu.au/27297/1/27297.pdf (accessed January 10, 2012)
26. Griese, Bill. "Tile industry making it easier to understand green attributes." *Floor Covering News*, September 26/October 3, 2011. www.tileusa.com/Articles/TileIndustryMakingItEasier_Griese11.pdf (accessed January 10, 2012)
27. "The Sins of Greenwashing Report." *TerraChoice*. http://sinsofgreenwashing.org/findings/greenwashing-report-2010/28 (accessed January 10, 2012)
28. Daken, Abigail. "A Multi-Attribute Sustainability Standards Guide and the ANSI/BIFMA e3 Furniture Sustainability Standard Case Study." *BIFMA International*, EPA case study on multi-attribute standard. http://erb.umich.edu/News-and-Events/news-events-docs/11-12/eco-labels2011/ManishMehta-BradMiller.pdf (accessed January 10, 2012)
29. Green Squared Certified. "Sustainability Certification for the Tile Industry." *Scientific Certification Systems*. www.scscertified.com/docs/green_squared_sell_sheet.pdf (accessed January 10, 2012)
30. Griese, Bill. "Ceramic Tile's Game Changing Transition." *Floor Daily*. www.floordaily.net, August/September 2011. www.tileusa.com/Articles/CeramicTilesGameChanging_Griese11.pdf (accessed January 10, 2012)

End Notes

31. "Hydronic Radiant Floor Heating." *Canada Mortgage and Housing Corporation (CMHC).* http://www.cmhc-schl.gc.ca/en/co/renoho/refash/refash_010.cfm (accessed January 10, 2012)
32. "Can a Geothermal Heat Radiant Floor Heat Your Home?" *TotallyInsulated.co.uk*. www.totallyinsulated.co.uk/geothermal-heat-radiant-floor.html (accessed January 10, 2012)
33. *Inhabitat*. http://inhabitat.com/energy-saving-ecom4-tiles-could-shave-16-off-your-power-bill/ecom4tile-ed01 (accessed January 10, 2012)
34. "Radiant Tile Floor Heating Makes Going Barefoot a Pleasure!" *TotallyInsulated.co.uk*. www.totallyinsulated.co.uk/radiant-tile-floor-heating.html (accessed January 10, 2012)
35. "Radiant Heating." *Energy Efficiency & Renewable Energy.* U.S. Department of Energy. www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12590 (accessed January 10, 2012)
36. Vittori, Gail. "Green and Healthy Buildings for the Healthcare Industry," white paper. *Health Care Without Harm*. www.noharm.org/lib/downloads/building/Green_Healthy_Bldgs_Vittori.pdf (accessed January 10, 2012)
37. "Can we make a building function like a tree?" *Bionic Tile NOx*. www.youtube.com/watch?v=00Yt98rtuFo (accessed January 10, 2012)
38. "Can we make a building function like a tree?" *Bionic Tile NOx*. www.youtube.com/watch?v=00Yt98rtuFo (accessed January 10, 2012)
39. "Fragrance and parfum." *David Suzuki Foundation*. www.davidsuzuki.org/issues/health/science/toxics/fragrance-and-parfum/ (accessed January 10, 2012)
40. "Archeology." *The International History Project*, 2003, http://history-world.org/archeology.htm (accessed January 10, 2012)
41. Definition of Gres/stonewares. *Webster's On-line Dictionary*. www.websters-online-dictionary.org/definitions/stoneware (accessed January 10, 2012)
42. "What is Biomimicry?" *Biomimicry Institute*. http://biomimicryinstitute.org/about-us/what-is-biomimicry.html (accessed January 10, 2012)

End Notes

43. Tile Council of North America (TCNA), Floor Coverings Cost Comparison Study, Scharf-Godfrey. The complete study is included in *TCNA Handbook for Ceramic, Glass, and Stone Tile Installation Manual*, 48th Edition. "Economical." *Tile…The Natural Choice*. http://www.tilethenaturalchoice.com/economical.html (accessed January 10, 2012)
44. McDonough, William. "Principles, Practices and Sustainable Design." 2004. www.mcdonough.com/writings/principles_practices_and.htm (accessed January 10, 2012)

Additional Resources

Web

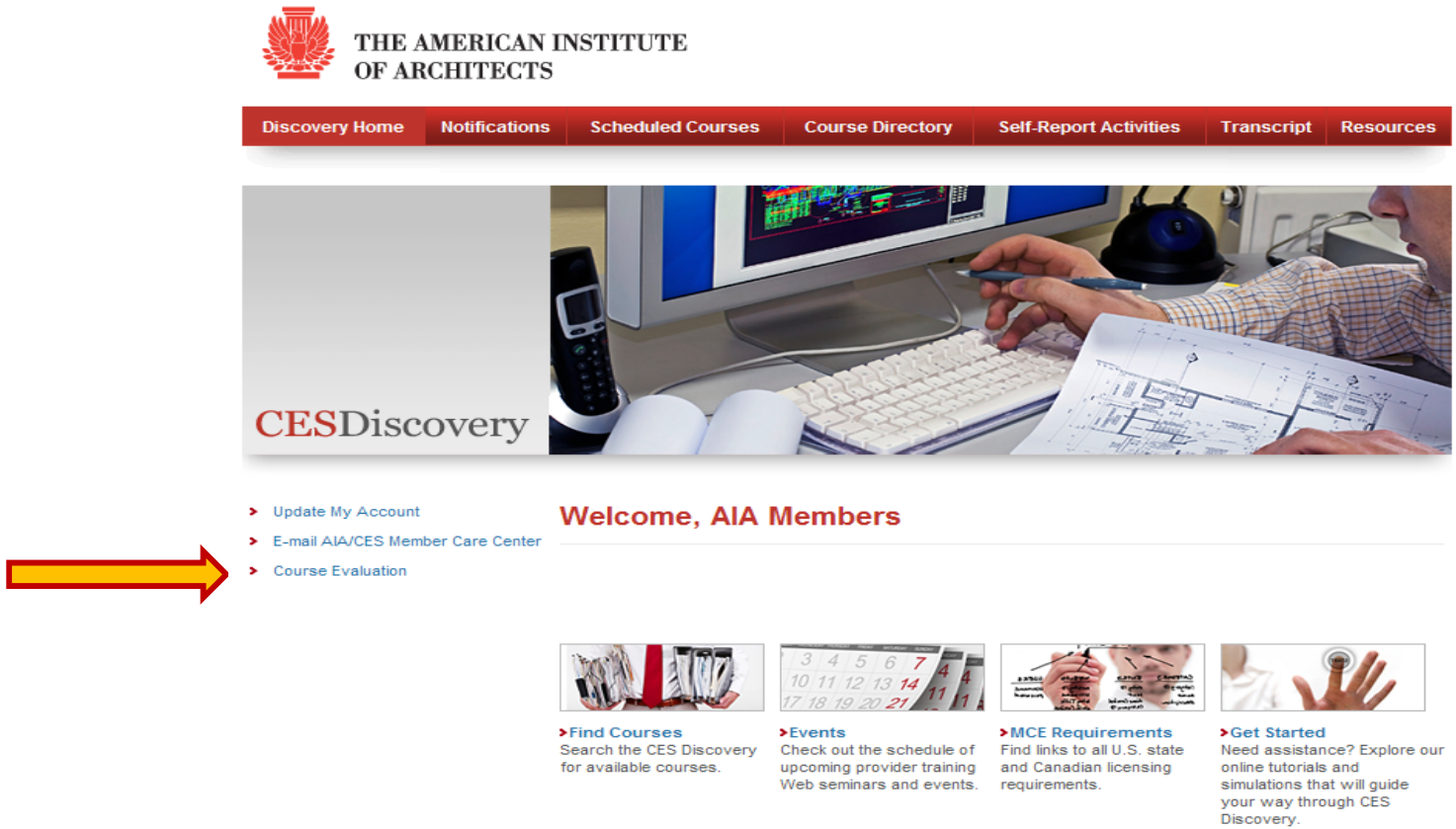
- U.S. Green Building Council (USGBC), www.usgbc.org (accessed January 10, 2012)
- Tile Council of North America (TCNA) , www.tileusa.com (accessed January 10, 2012)
- Tile…the Natural Choice, www.tilethenaturalchoice.com (accessed January 10, 2012)
- Cool Roof Rating Council, “Cool Roof Codes and Programs,” www.coolroofs.org/codes_and_programs.html (accessed January 10, 2012)
- U.S. Department of Energy, “Cool Roofs,” www.energysavers.gov/your_home/designing_remodeling/index.cfm/mytopic=10095 (accessed January 10, 2012)
- U.S. Environmental Protection Agency (EPA), “Lifecycle Assessment: Principles and Practice,” May 2006, www.epa.gov/NRMRL/lcaccess/pdfs/600r06060.pdf (accessed January 10, 2012)

Print

- Kats, Greg. *Greening Our Built World: Costs, Benefits and Strategies*. 2009. Island Press.

Course Evaluations

In order to maintain high-quality learning experiences, please access the evaluation for this course by logging into CES Discovery and clicking on the Course Evaluation link on the left side of the page.



Conclusion

If you desire AIA/CES and/or state licensing continuing education credits, please click on the button below to commence your on-line examination. Upon successful (80% or better) completion of the exam, please print your Certificate of Completion.

For additional knowledge and post-seminar assistance, please visit the Ask an Expert forum (click on the link above and bookmark it in your browser).

If you have colleagues that might benefit from this seminar, please let them know. Feel free to revisit the AEC Daily web site to download additional programs from the On-line Learning Center.

MORE

powered by www.aecdaily.com AECDAILY

Click Here To Take The Test

Exit