

Stone in The Age of Green:

Mitigating Environmental Impacts of Stone Use

SUN-B04

75-Minute Education Session

Sunday November 13, 2022

2:00 PM - 3:15 PM

SESSION DESCRIPTION

Stone is overlooked as a sustainable construction material. It is durable, recyclable, nontoxic, easily maintained, and has lower embodied energy. Still, over 50% of dimension stone is imported, and current quarrying practices produce substantial waste. This session looks at dimension stone's sustainability scorecard, design opportunities, and the industry's environmental practices.

LEARNING OBJECTIVES

- Understand the environmental and human health impacts of dimension stone quarrying, fabrication, and transportation.
- Identify ways to design with dimension and natural forms of stone to take advantage of their inherent aesthetics while also considering cost, performance, durability, and environmental footprint.
- Compare the benefits and challenges of sustainable stone specifications.
- Understand the new Natural Stone Council Stone Sustainability Standard, and the way it supports LEED and SITES credits.

SPEAKERS



MEG CALKINS

FASLA, SITES AP

***Professor, Landscape Architecture and
Environmental Planning, NC State University***

Meg Calkins is the author of the book *Materials for Sustainable Sites* and editor of the *Sustainable Sites Handbook*. Calkins has taken an active leadership role in development and implementation of the Sustainable Sites Initiative (SITES) since 2003. She is a frequent Contributing Editor to *Landscape Architecture* magazine writing several articles on site construction materials and exemplary designed works.



SARAH B. GREGG

Marketing Director, Natural Stone Institute

Sarah B. Gregg began her career working in-house at a countertop fabrication shop. After 8 years of field experience in sales and marketing, she started her own business to free-lance for various companies and associations in the natural stone industry. In 2019 she began focusing even more time and energy on researching what would be needed to properly align natural stone products with the green building movement. She has become our industry's leader on sustainability initiatives.



LAURA SOLANO

***FASLA, Partner, Michael Van Valkenburgh
Associates, Inc.***

Laura Solano has been a landscape architect for 40 years. As a Partner at MVVA she has led projects such as Teardrop Park, St. Louis Arch Grounds, and the Toronto Port Lands. She has taught at Harvard's GSD and was the Trott Distinguished Visiting Professor at her alma mater The Ohio State University. Laura lectures nationwide and her writings have appeared in multiple publications. Laura contributed to the soil portion of SITES and is a Lead Facilitator for the Landscape Architecture Foundation's Fellowship for Innovation and Leadership. She is a Fellow of the American Society of Landscape Architects.

SESSION OUTLINE

I. INTRODUCTION - STONE QUALITIES AND DEFINITIONS

- A. Biophilia and Stone**
- B. Stone Reflects Landscape**
- C. Definitions**



II. ENVIRONMENTAL AND HUMAN HEALTH IMPACTS OF STONE AND STRATEGIES TO REDUCE THEM

- A. Waste, Waste Reduction and Beneficial Reuse**
 - Waste in quarrying
 - Waste in processing
 - Beneficial reuses of stone waste
- B. Air Pollution**
- C. Water Pollution**
- D. Habitat Destruction/Quarry Reclamation**
- E. Carbon Footprint**
 - Imported stone vs. domestic stone
 - Embodied Energy (EE) and Embodied Carbon (EC) of stone and other construction materials
 - Tracing the chain of custody of stone
 - Stone structures
 - Comparing EC of Pavement assemblies
 - Comparing EC of wall materials
 - Stone processing and carbon
 - Increasing the life-cycle of stone
 - Increasing durability of stone structures and maintenance
 - Design for reuse
 - Reclaimed stone use and sources
 - Using stone efficiently
 - Use thinner panels when possible
 - Appreciate the color variation and natural pattern variation. Don't reject stones
- F. Safe Working Conditions and Labor Abuses in the Stone Industry**
- G. Intro to the Natural Stone Council Stone Sustainability Standard**
- H. Stone Synergies with Rating Systems**
(see chart below)

III. **REDUCING THE ENVIRONMENTAL AND HUMAN HEALTH IMPACTS OF DIMENSION STONE**

A. LCA Results

- GWP is low in all parts of the life cycle
 - Quarry Operations & Transport
 - Processor Operations
 - Transport to Building Site
 - Installation
 - Waste Transport
 - Disposal
- Areas for improvement
 - Grid Electricity & Fuels
 - Reduce/Repurpose Excess Process Materials
 - Environmentally Friendly Adhesives
 - Care & Maintenance
- Find EPDs and HPDs in Transparency Catalog



B. Natural Stone Sustainability Standard

- Third party verified multi-attribute industry standard
- Identifies opportunities for improvement and rewards progress
 - Water
 - Custody & Transportation
 - Site Management
 - Land Reclamation & Adaptive Reuse
 - Social Governance
 - Energy
 - Excess Process Materials
 - Solid Waste
 - Human Health & Safety

C. Sourcing Sustainably Produced Stone

- Certified Materials Gallery
 - 9 Fabricators, 23 Quarries
 - 11 Granites, 17 Limestones, 5 Marbles, 5 Quartzites
- Specification Language
- Regional Materials
 - NSI Membership Directory. Filter by quarrier and radius of a particular address.
 - Natural Stone Sourcing Catalog (coming in 2023!)
 - ASTM data
 - Standard sizes
 - Other names the stone is known by
 - Multiple images
 - Sourcing details

D. Endless Opportunities for Reuse

- Nearly 100% of excess process materials are reused or reclaimed
- Site improvements: berms, on-site roads
- Aggregate
- New product lines: mosaics, thin veneer, beauty products
- Reclaimed Stone: reusing material from projects
- Boneyard: imperfect blocks set aside for suitable projects, or awaiting reclamation of the quarry site

IV. ENVIRONMENTALLY RESPONSIBLE DESIGN WITH STONE

A. Poetic and Prosaic Drivers for Using Stone

- Program
- Aesthetics and extents
- Form, scale, and heft
- Cost-benefit: new, reused, or recycled
- Durability and maintenance
- Sustainability and resilience



B. Sustainable Design and Documentation with Stone

- Choosing the right stone
- Understanding the limitations of size and weight
- Designing efficiencies in dimensioned stone
- Efficiencies of using models and mockups
- Sourcing from quarry boneyards and waste
- Using less to make more
- Repurposing stone from demolished projects
- Effectively conveying ideas in drawings and specifications

C. Sustainable and Resilient Construction

- Efficiencies of using mockups and in-quarry construction
- Stability and the need for foundations, setting beds, mortars, sands, clips, or pins
- Shipping efficiencies
- Maintenance and care considerations

RATING SYSTEM CREDITS SUPPORTED THROUGH USE OF STONE MATERIALS

LEED BD+C V4.1 CREDITS		
MR Credit	Environmental Product Declarations	2 points
MR Credit	Sourcing of Raw Materials	2 points
MR Credit	Material Ingredients	2 points
EQ Credit	Low Emitting Materials	2 points
SS Credit	Heat Island Reduction	2 points
Pilot Credit	Certified Multi-Attribute Products and Materials	1 points
Pilot Credit	Social Equity within the Supply Chain	1 points

SITES V2 CREDITS		
Soil + Veg Credit 4.9	Reduce urban heat island effects	4 points
Materials Credit 5.3	Design for adaptability and disassembly	3-4 points
Materials Credit 5.4	Reuse salvaged materials and plants	3-4 points
Materials Credit 5.6	Use regional materials	3-5 points
Materials Credit 5.7	Support responsible extraction of raw materials	3-5 points
Materials Credit 5.9	Support sustainability in materials manufacturing	1-5 points
Materials Credit 5.9	Divert construction and demolition materials from disposal	3-4 points
Construction Credit 7.6	Divert reusable vegetation, rocks and soil from disposal	3-4 points
Pilot Credit 3	Assess and Improve Site Carbon Performance	

RATING SYSTEM CREDITS SUPPORTED
THROUGH USE OF STONE MATERIALS

LIVING BUILDING CHALLENGE		
I-12	Responsible Materials	
I-13	Red List	
I-14	Responsible Sourcing	
I-15	Living Economy Sourcing	
I-16	Net Positive Waste	
I-19	Beauty + Biophilia	



RESOURCES

- **Natural Stone Institute**

- [Natural Stone Institute](#)
- [Natural Stone Sustainability Standard](#)
- [Certified Sustainable Stone Materials Gallery](#)
- [Natural Stone Sustainability Resources](#)
- [Sustainable Minds Transparency Catalog](#)
- [Natural Stone Resource Library](#)

- **Other Resources**

- [Athena Sustainable Materials Institute](#)
- [Athena Pavement LCA](#)
- [Carbon Smart Materials Palette](#)
- [Climate Positive Design: Pathfinder](#)
- [Carbon Conscience](#)

- **Voluntary Rating Systems**

- [LEED Rating System Sustainable](#)
- [Sites Initiative \(SITES\) Living](#)
- [Building Challenge](#)

