STONE DESIGN SEMINARS

25 - 28 NOVEMBER 2019
Trade Centre Arena
Dubai World Trade Centre

MIDDLE EAST STONE
International Stone and Marble Show

The Art of Specifying Natural Stone

Held in conjunction with

Natural Stone Institute

Organised by

dmg events

Co-located with

THE BIG 5 International Building & Construction Show

STONE DESIGN SEMINARS

MIDDLE EAST STONE
International Stone and Marble Show

OUR VISION

Provide accurate & ongoing education about the value, benefits, and best practices of using natural stone as a building material to architects, designers, and other professionals in the construction industry.

YOUR SPEAKER

In order to become certified by Natural Stone Institute, your speaker must complete a strategic training process followed by an oath that outlines his/her responsibilities and a promise to uphold NSI's educational standards.

CEU PROGRAM
CERTIFIED SPEAKER
NATURAL STONE INSTITUTE

2019 CEU CERTIFIED SPEAKER

Sajiv Shrivastva

AL MILAD

Continuing Education Information

- AIA Course Number: NSI13, 1.0 HSW LU
- IDCEC: CEU-104505, 0.1 HSW CEU, Subject Code: 6.1
- LACES: NSI13
- NKBA: 0.1 CEU

AIA Continuing Education Provider

IDCEC APPROVED

LACES

NKBA CEU APPROVED

This CEU is registered with the Interior Design Continuing Education Council (IDCEC) for continuing education credits. This credit will be accepted by the American Society of Interior Designers (ASID), International Interior Designers Association (IIDA) and Interior Designers of Canada (IDC).

The content included is not deemed or construed to be an approval or endorsement by IDCEC of any material or 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 should be directed to the instructor or provider of this CEU.

This program is registered for 0.1 CEU value. The IDCEC class-code is: (refer to sign in sheet)

This CEU will be reported on your behalf to IDCEC and you will receive an email notification. Please log in and complete the electronic survey for this CEU. Certificates of completion will be automatically issued once you have submitted the online survey for this CEU. Attendees who do not belong to ASID, IIDA or IDC and do not have a unique IDCEC number will be provided with a Certificate of Completion after this CEU.

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Credit(s) earned on completion of this course 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 course 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.

Description

This one hour session is designed to give architects and designers an overview of how to specify natural stone. There are many factors to consider to ensure you are choosing the proper material for your project. What do you need to know about its species, color variations, and finish possibilities? Is the quarry able to produce the sizes and quantities you need? And finally, what factors affect the price of the stone you specify? Get the resources you need to help ensure the stone you choose meets the standards and design intent set for your application.

Learning Objectives

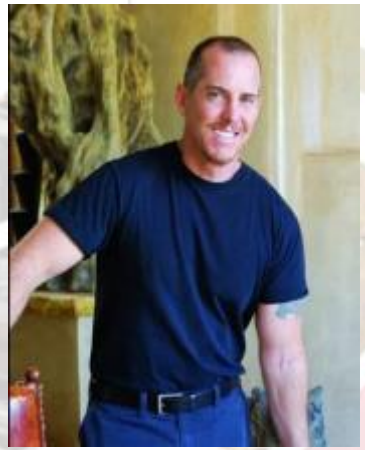
1. Discuss the responsibilities and liabilities of each pillar in the typical construction project.
2. Review resources to find more information about natural stone standards.
3. Learn how to plan for the longevity of an installation by specifying appropriate materials.
4. Evaluate factors specific to the price of different materials, finishes and methods.

Responsibilities & Liabilities

- It should be clear that all parties have varying responsibilities in this process. Communication is extremely important among all aspects of the project team (the earlier in the process the better).





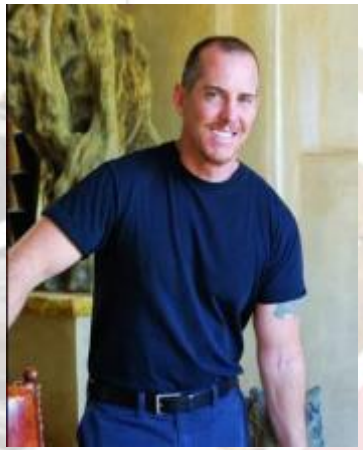


Responsibilities & Liabilities

- Specifier (Architect/Designer)
- General Contractor
- Material Supplier(s)
- Installing Contractor
- Owner/End User







Responsibilities & Liabilities

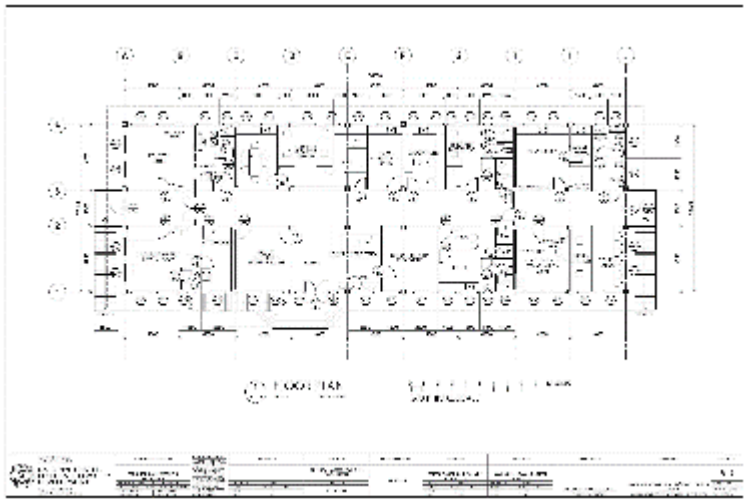
DESIGN PROFESSIONAL

The design professional needs to make material selections that have the required performance characteristics, are obtainable, and have been adequately demonstrated in both visual sampling and test specimen sampling.

Responsibilities & Liabilities

GENERAL CONTRACTOR

The general contractor is responsible for the overall implementation of the Owners vision and the Architect's design in accordance with the Contract and Construction Documents in a safe, quality, and cost effective method.



Responsibilities & Liabilities

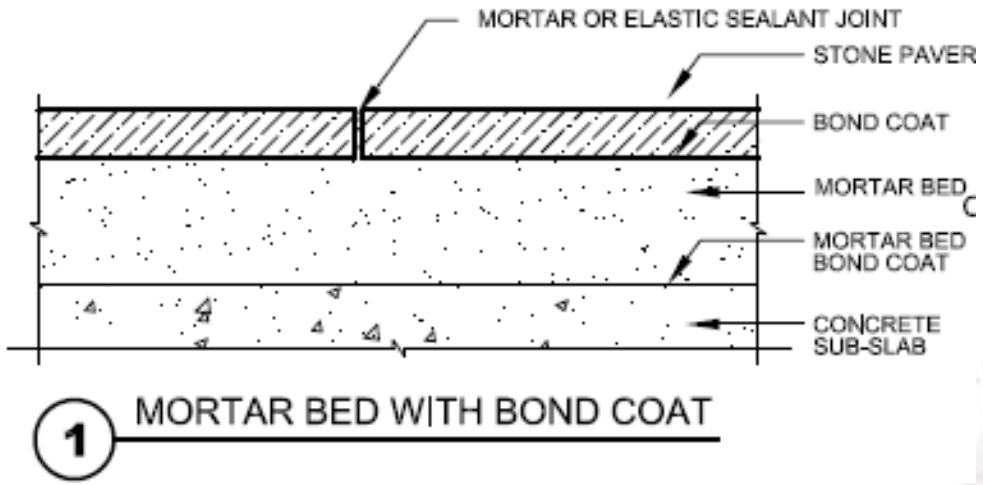
MATERIAL SUPPLIER(S)

The material supplier must be able to obtain material that meets or exceeds the performance parameters outlined in the specification and related documents, and needs to provide specimens and/or perform testing to document that the performance attributes have been met.

Responsibilities & Liabilities

INSTALLING CONTRACTOR

The installation contractor must be able to provide the project with skilled mechanics capable of performing the work in a craftsman-like and professional manner, with adherence to project specifications and contract documents.



Responsibilities & Liabilities

OWNER/END USER

Owner must first provide realistic information on the project requirements. When the project is coming to an end, the owner and end user must understand that at some point construction is complete, and after that point, maintenance must begin. Maintenance must be done using prescribed, industry approved methods so as to preserve the beauty and serviceability of the stone product.

Practical Applications

I. Resources
II. Admirable
III. Suitable
IV. Available
V. Affordable

Resources

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MODULE I

Resources

STANDARDS ORGANIZATIONS

ASTM INTERNATIONAL

Test Methods, Guides, and, Specifications

ICC INTERNATIONAL CODE COUNCIL®

Mandatory building codes adopted in the U.S.

CEN European Committee for Standardization

European Standards

ANSI American National Standards Institute

Standards & Specifications

Resources

ASTM TESTING

ASTM C97 – Absorption and Density

- Stain resistance

ASTM C170 – Compressive Strength of Stone

- Crush resistance

ASTM C99 – Modulus of Rupture

- Bending strength and load resistance

ASTM C880 – Flexural Strength

- Bending and cracking

Resources

ASTM TESTING

ASTM C241 – Abrasion Resistance

- Scratching

DCOF

- Slip resistance

Petrographic and mineralogical analysis

- Chemical resistance

Resources

INDUSTRY ASSOCIATIONS

Indiana Limestone Institute of America

Natural Stone Council

NBGQA

TCNA
Tile Council of North America, Inc.

aci
American Concrete Institute (ACI)

National Tile Contractors Association

The Masonry Society

Resources

SUMMARY OF ASTM DIMENSION STONE SPECIFICATIONS

TYPE OF STONE	ABSORPTION C97 (WT%, MAX).	DENSITY C97 (KG/M³, MIN)	COMPRESSIVE STRENGTH C170 (MPA, MIN)	MODULUS OF RUPTURE C99(MPA, MIN)	FLEXURAL STRENGTH C880 (MPA, MIN)	ABRASION RESISTANCE* C1353, (Ha MIN)	ACID RESISTANCE C217 (MM, MAX)
GRANITE C616	0.40	2560	131	10.34	8.27	25	-
MARBLE C503	0.20		52	7	7	10	-
I. CALCITE		2595					
II. DOLOMITE		2800					
III. SERPENTINE		2690					
IV. TRAVERTINE		2305					
LIMESTONE C568					NS	10	-
I. LOW-DENSITY	12	1760	12	2.9			
II. MEDIUM-DENSITY	7.5	2160	28	3.4			
III. HIGH-DENSITY	3	2560	55	6.9			
QUARTZ-BASED C616					NS		-
I. SANDSTONE	8	2003	27.6	2.4		2	
II. QUARTZITIC SANDSTONE	3	2400	68.9	6.9		8	
III. QUARTZITE	1	2560	137.9	13.9		8	
SLATE C629	C121	NS	NS	C120	NS		
I. EXTERIOR	0.25					8	0.38
ACROSS GRAIN				62.1			
ALONG GRAIN				49.6			
II. INTERIOR	0.45					8	0.64
ACROSS GRAIN				49.6			
ALONG GRAIN				37.9			

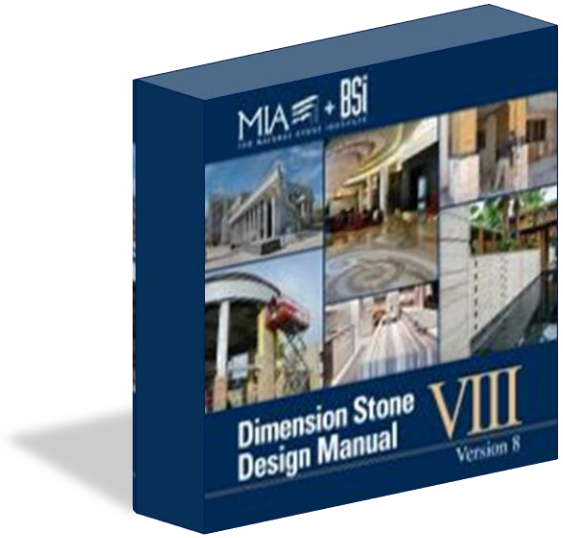
NS = NOT SPECIFIED * LIGHT FOOT TRAFFIC ONLY

Resources

MATERIAL SUPPLIER

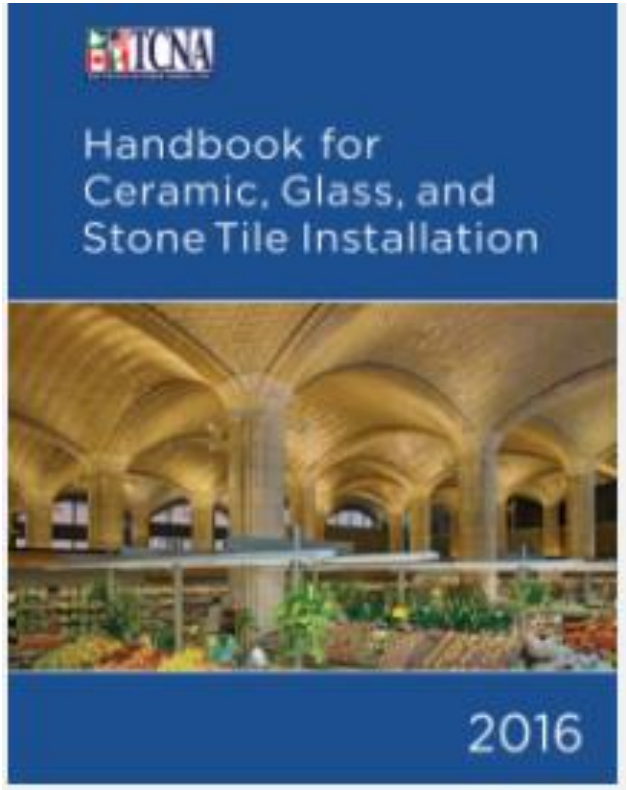
- The most comprehensive set of specification, installation and maintenance information.
- Many construction materials on the market are proprietary to a single manufacturer/supplier.

NSI



- Primary Publication is Dimension Stone Design Manual
- Also publish Specific subject manuals & Videos, Safety, and Business Management documents
- iPad Apps
- NSI Membership Directory (Accredited Companies)

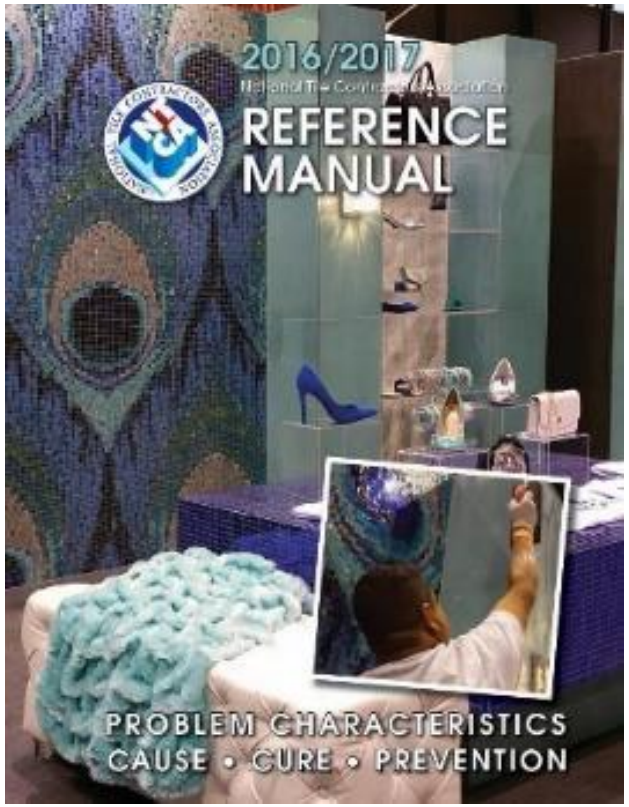
TCNA



- Publishes TCNA Handbook for Ceramic, Glass, and Stone Tile Installation
- Respected as an industry consensus document

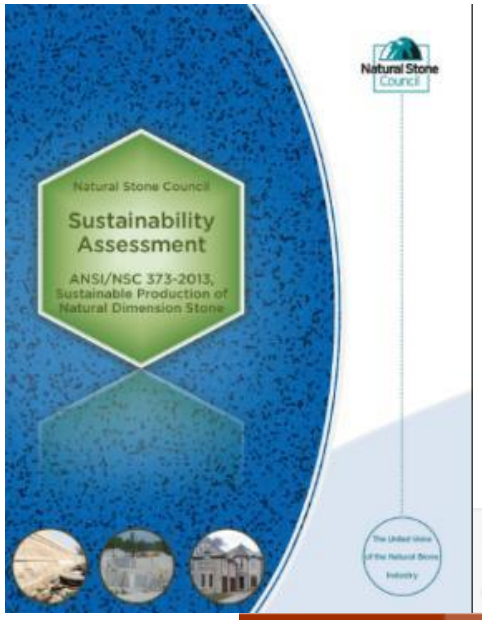
TCNA
Tile Council of North America, Inc.

NTCA



- Publishes NTCA Reference Manual
- Covers multiple aspects of tile installation from substrate preparation to grouting

Resources



	Life Cycle Cost (per year)	Life Expectancy (in years)
Ceramic Tile	$0.33	50
Natural Hardwood	$0.42	50
Travertine (Turkish)	$0.44	50
Marble	$0.61	50
Terazzo (portland cement)	$0.81	30

- NSI CEU Class "Natural Stone & Green Design"
- LEED 4.0
- NSC 373

Module I Recap

RESOURCES

- What Standards Organizations publish resources for the stone industry?
- What Industry Associations publish resources for the stone industry?

Admirable

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MODULE II

Admirable

DESIGN INTENT

AESTHETICS

- Initial Selection
  - Work from current samples- resist the temptation to hastily pull that 8 year old sample from the library
  - Partner with a knowledgeable firm or individual who can help control the process from initial control sample to the final piece on the saw

Admirable

DESIGN INTENT

- Range Considerations
  - Select a range for the project based on reasonable and mutually agreeable expectations of the following:
    - Color and tone
    - Variegation
    - Veining
    - Inclusions
    - Pits and fissures

Admirable

DESIGN INTENT

- Range Considerations
  - A tight a range can add unnecessary complexity and cost to the project
  - Range samples vs. quarry/factory range review
  - Make use of current range photos during the process



Admirable

DESIGN INTENT

Admirable

- Specify appropriate qualifications for installers and installation methods
  - Natural Stone Institute Accredited
  - Ceramic Tile Education Foundation (CTEF) CTI
  - NTCA 5 Star Certified Installers
- Care and Maintenance objectives

Admirable

- Plan for Performance
  - Longevity
  - Stain resistance
  - Slip resistance
  - Durability of the finish
  - Sealers, sealants, and accessories

Admirable

Does the material contribute to green design and sustainability objectives of the project?

- Local Regional
- Material Use and Yield
- Reclaimed Material Use
- Long-Life Cycle

Module II Recap

ADMIRABLE

- What aesthetic factors should you consider when specifying stone?
- Aside from aesthetics, what other admirable factors should you consider when specifying stone?

Suitable

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MODULE III

Suitable

STONE SPECIES

	Sedimentary	Metamorphic	Igneous
Calcareous	Limestone Travertine Onyx	Marble	
Siliceous	Sandstone	Slate Quartzite Serpentine Soapstone	Granite Basalt

Dimension Stone Design Manual VIII Version 8

GEOLOGY CHAPTER
Sections 1.0 – 4.5

Suitable

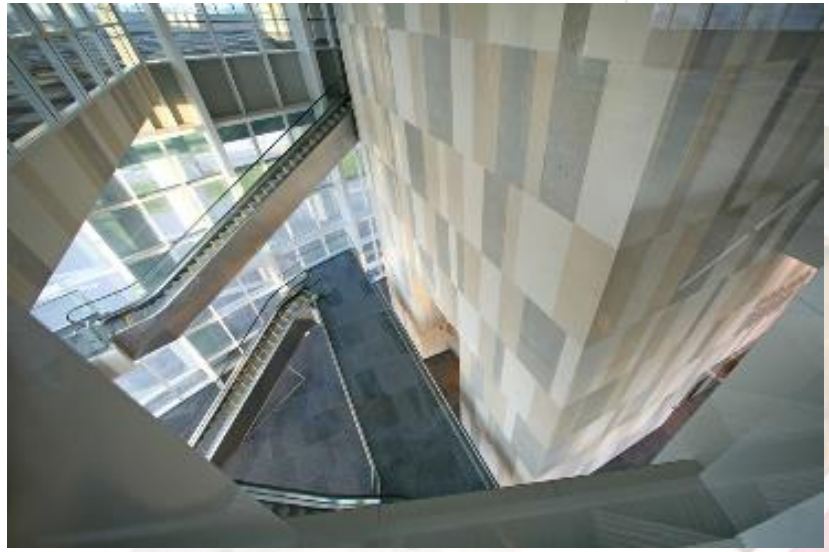
COMMON EXTERIOR APPLICATIONS

- Cladding
- Veneer
- Hardscape
- Landscape
- Monuments
- Water features
- Pools
- Water fountains

Suitable

COMMON INTERIOR APPLICATIONS

- Cladding
- Veneer
- Flooring
- Countertops
- Tile
- Stair treads
- Wet areas
  - Showers
  - Spas / saunas
  - Pools



Suitable

PERFORMANCE CONSIDERATIONS

- Stone for Exterior use must be resistant to weathering and decay
  - Rain, snow, hail
  - Freeze thaw cycles
  - High temperature variations
  - Pollutants
    - Carbon monoxide, sulfates, acid rain, ultraviolet light, salts

Suitable

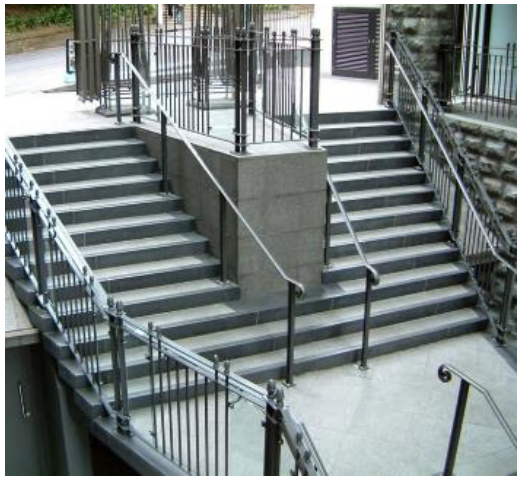
PERFORMANCE CONSIDERATIONS

- Stone must be suited to expected traffic volume- measured by abrasive hardness (ASTM C241)
  - Light traffic- residential (Abrasive Hardness (HA) minimum of 6.0)
  - Moderate traffic-residential entries and small commercial installations (HA minimum of 7.0)
  - Heavy traffic- commercial installations +50 persons/minute (HA minimum of 10.0)
    - EX. 3/8” limestone not suitable

Suitable

PERFORMANCE CONSIDERATIONS

- Stone must be suited to expected traffic volume- measured by abrasive hardness
  - Stairways, elevator lobbies, high concentration (HA minimum of 12.0)
  - Exterior paving (HA minimum of 12.0)



Suitable

SPECIES SPECIFIC COGITATIONS

- Siliceous Stone
  - Granites- generally well suited for all exterior or interior applications
  - Basalts- generally well suited for all exterior or interior applications
  - Sandstone - generally suited for all exterior or interior applications with some exceptions. Careful attention is required for mechanically anchoring




Suitable

SPECIES SPECIFIC COGITATIONS

- Siliceous Stone
  - Slate, Quartzite, Serpentine, Soapstone
    - Exterior – certain varieties depending on the application
    - Interior - certain varieties depending on the application
  - Countertops – Quartzites and Soapstones are good for countertop applications



Suitable

SPECIES SPECIFIC COGITATIONS

- Calcareous Stone
  - Limestone, Travertine
    - Exterior – certain varieties depending on the application
    - Interior - certain varieties depending on the application
    - Countertops – certain varieties, but not in food or beverage prep areas



Suitable

SPECIES SPECIFIC COGITATIONS

- Calcareous Stone
  - Marble
    - Exterior Use - Limited Marble use – must be thoroughly vetted.
    - Interior Use – Good for many vertical and horizontal applications
    - Countertops – certain varieties, but not ideal for food or beverage prep areas



Suitable

COLOR

- Some Light colored materials will show more dirt and may stain more easily
- Light colored materials are subject to staining from setting materials and sealants
  - Use white thin set
  - Perform stain testing on all materials

Suitable

COLOR

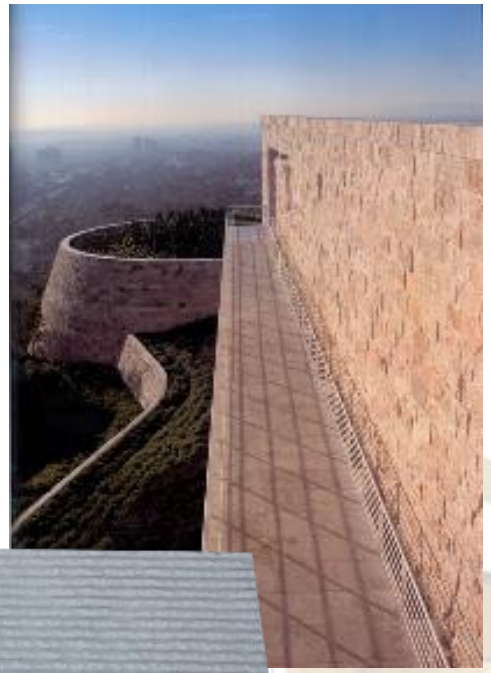
- Albedo and heat resistance
  - Heat islands
  - Pool decks

Suitable

FINISH – VERTICAL WORK

Split Face

- Not many limitations
- A polish may luster over time
- Heavy texture will collect more dirt



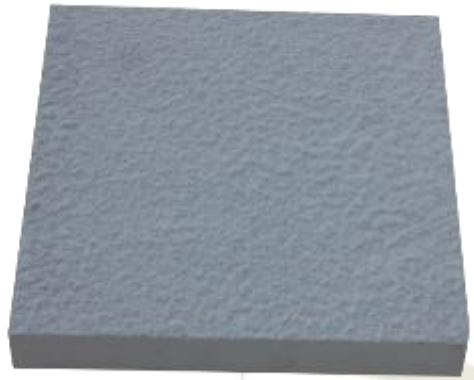
Deep Line Cleft

Suitable

FINISH – HORIZONTAL WORK

Sandblasted

- Horizontal work
- Exterior use limit to textured finish to maximize slip resistance



Bush Hammered

Flamed

Suitable

FINISH – HORIZONTAL WORK

- Interior polished or honed is best.
  - Slip resistance – limited or unachievable with a polished finish in some materials
  - Textured finishes can be more difficult to maintain given that they tend to collect more dirt – foot traffic, mop water, etc.

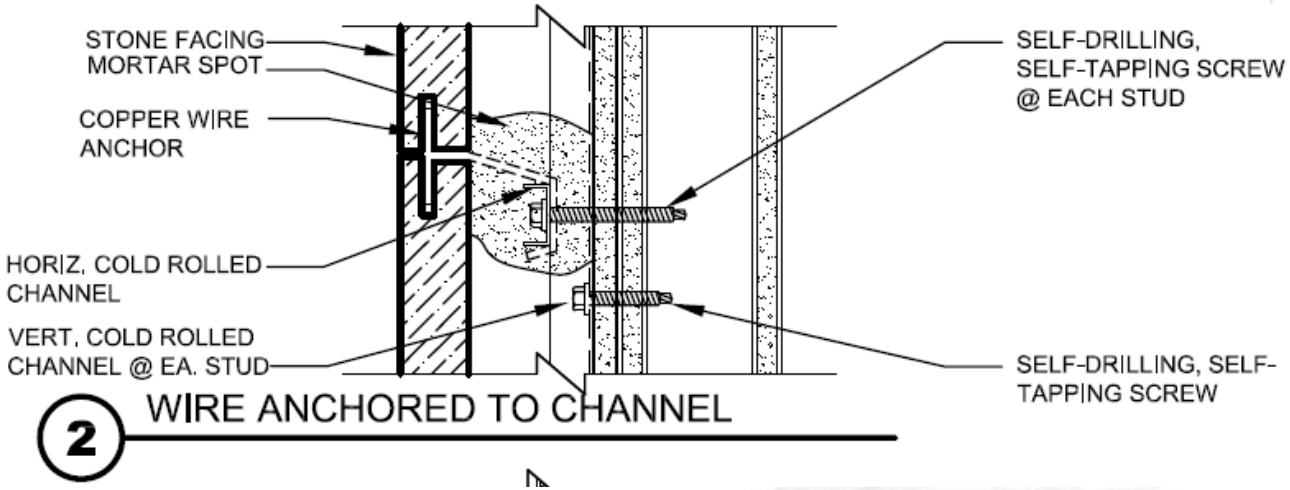
Polished

Brushed

Honed

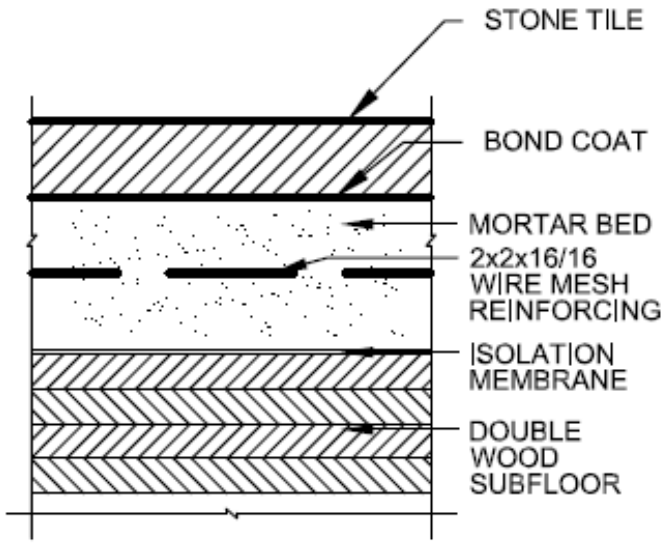
Suitable

- **Substrates, Setting Materials and Accessories**
  - Substrates
    - Backup systems
      - Stainless steel, extruded aluminum, non-staining, corrosion resistant metals (no copper wire in exterior applications)
      - Typically requires professional design and engineering



Suitable

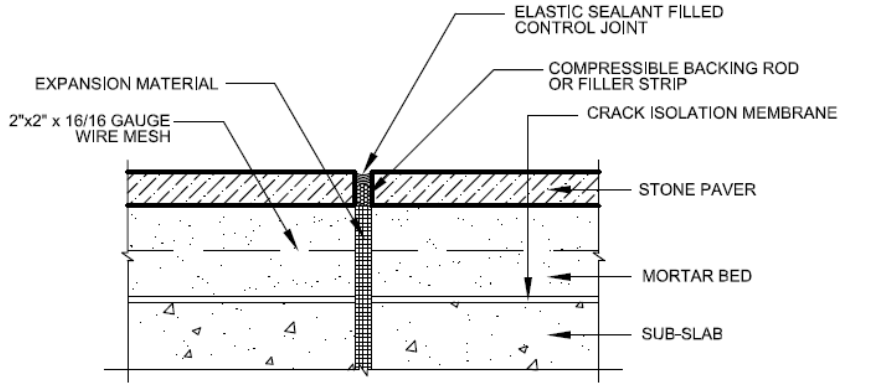
- **Substrates, Setting Materials and Accessories**
  - Substrates
    - Structural Layers
      - Stone requires 2 where ceramic only requires 1
    - Setting beds
      - Adequate compressive and flexural strength (deflection)
      - Appropriate drainage



3 STONE TILE SET IN REINFORCED MORTAR BED OVER WOOD FRAME

Suitable

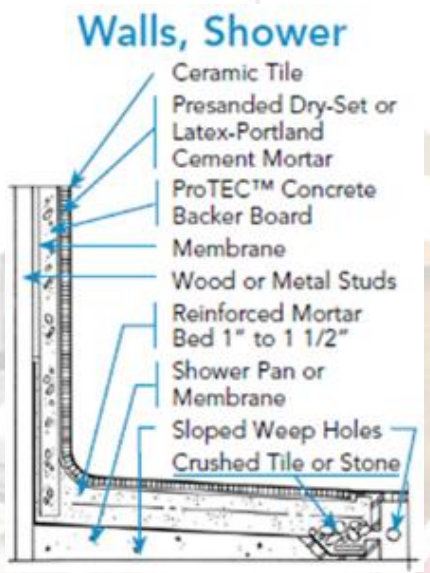
- **Substrates, Setting Materials and Accessories**
  - Substrates
    - Expansion and control joints
    - Code requirements and limitations
      - Allowable height for adhered veneer
      - Maximum piece size for adhered veneer



3 FULL MORTAR BED WITH MEMBRANE AND EXPANSION JOINT

Suitable

- **Sealants, Seals, Flashings and Gaskets**
  - Sealers
    - Note proper expectations of sealers in wet areas. Though sealers make stone water and stain resistant, they do NOT make them water-proof and stain-proof.



Module III Recap

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SUITABLE

- Which type of stone is more resistant to acids and bases? Calcareous or Siliceous?
- Which type of stone is typically the hardest? Metamorphic or Sedimentary?
- Sealing a stone makes it stain-proof and water-proof. True or False?

Available

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MODULE IV

Available

QUARRIES

Can the quarry produce adequate yield for the project?

Available

QUARRIES

Can the quarry produce adequate yield for the project?

- Quantity
- Winter quarries – Reserves?
- Recent impacts from Mother Nature
  - Earthquake in China
  - Flooding in Carrara
- Holiday and maintenance shutdowns

Available

QUARRIES

Is there any risk of the quarry running dry?

- St. Maximum Limestone Bench G
- Winter quarries – Reserves?
- Recent impacts from Mother Nature
  - Earthquake in China
  - Flooding in Carrara
- Holiday and maintenance shutdowns

Available

QUARRIES

Is there any risk of the quarry running dry?

- St. Maximum Limestone Bench G

Are the quarries subject to government controls?

- Indian Kashmire White, etc.
- Chinese Luna Pearl

Available

FABRICATION PRACTICALITIES

Is the grade selection or desired range selection prohibitive?

- Crema Marfil Ivory – extremely low yield = very long lead time
- Tundra Grey – color shifts from beige to light grey to medium grey
- Greywood Limestone – Wood vein materials tough to control the glass veining

Available

QUARRIES

Is the grade selection or desired range selection prohibitive?

- Crema Marfil Ivory – extremely low yield = very long lead time
- Tundra Grey – color shifts from beige to light grey to medium grey
- Greywood Limestone – Wood vein materials tough to control the glass veining

Available

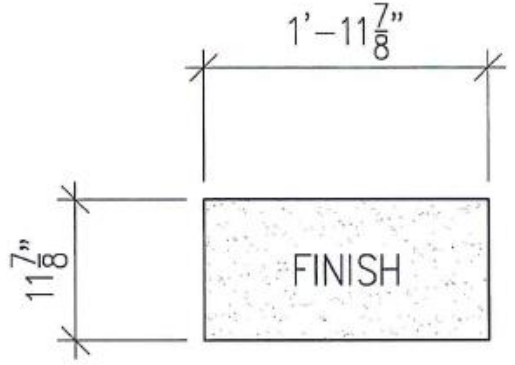
FABRICATION PRACTICALITIES

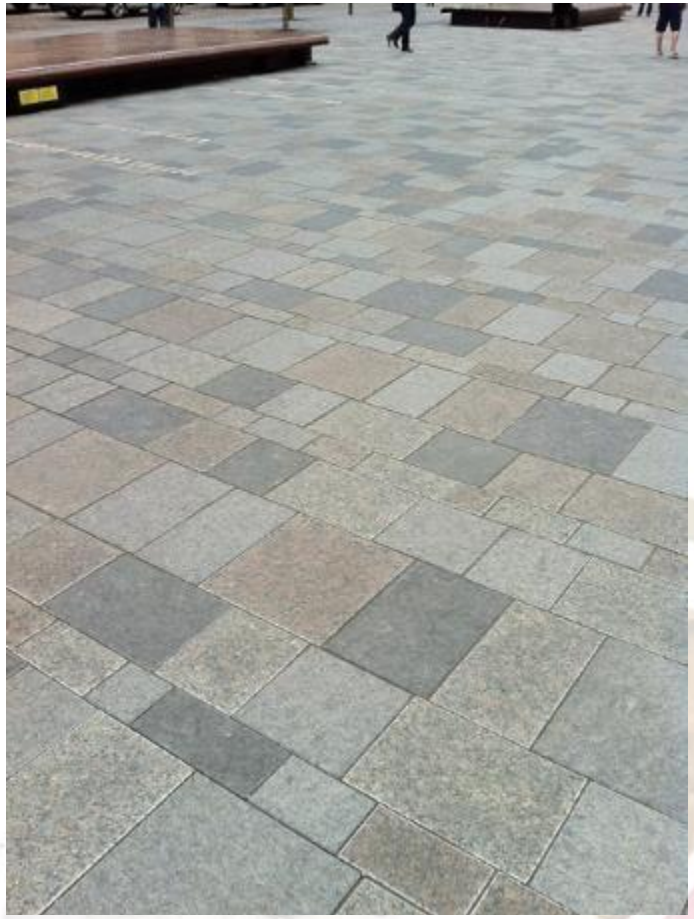
- Is the module restrictive?
  - Nature of Quarry process and resulting blocks
    - HP project – UT Quartzite – limited sizes
    - Greek White Marble – Nestos White – small blocks
    - Basalt – boulders or columns, not blocks

Available

FABRICATION PRACTICALITIES

- Is the module restrictive?
  - Blocks quarried for slabs vs blocks quarried for tile
  - Cut-to-size vs. slab vs. tile
  - Standard vs. Custom tile modules
    - Gross 12”x24” vs. Nominal 11-7/8” x 1’-11-7/8”





Available

MARKET FACTORS

Is the material in high demand?

- Calacatta Gold
- Statuary White

Are there obstacles with the country of origin?

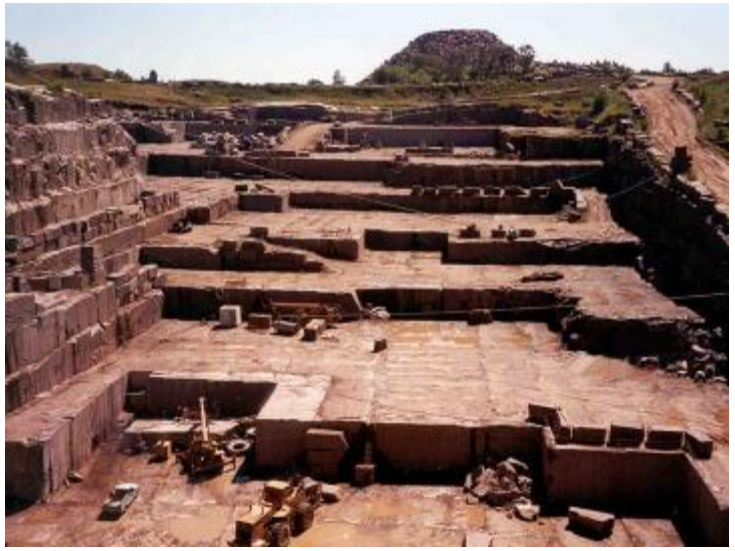
- Pakistan
- Tunisia
- Iran

Available

SUPPLIER / FACTORY / FABRICATOR

Does the supplier have consistent and reliable access to the material?

- Winter quarries
- Block yards
- Stone that originates from one country to be fabricated in another



Available

SUPPLIER / FACTORY / FABRICATOR

- **Can the supplier produce enough volume to meet the fabrication schedule?**
- **Can the supplier cut and pack in the required sequence?**
  - By area not by ticket - Private Residence
  - By unit floor by floor - Addison Ridge, Pine St. Seattle

Available

SUPPLIER / FACTORY / FABRICATOR

Is the supplier specifically qualified to do the work?

- Tile
- Cut-to-size
- Cubic
- Marble vs. Granite vs. Limestone vs. Travertine

Module IV Recap

AVAILABLE

What are some factors at the quarry that will affect a stone's availability for your project?

What are some factors at the supplier / factory / fabricator that will affect a stone's availability for your project?

Affordable

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MODULE V

Affordable

- Consider the Source
  - Yield of the quarry.
  - What types of technology does the quarry have to efficiently extract the stone?
  - Is the quarry easy to access?
  - Is it close the processing factory?
    - Many stones are shipped to another country for processing.
  - Is it close to transportation?

Affordable

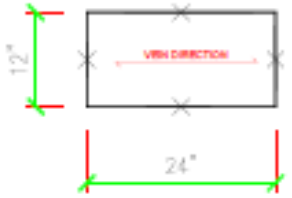
- **Environmental Responsibility**
  - The cost of environmental responsibility is quite high for a quarry.
  - Waste material must be converted into usable byproducts.
  - Those costs become embedded into the cost of the finished product.

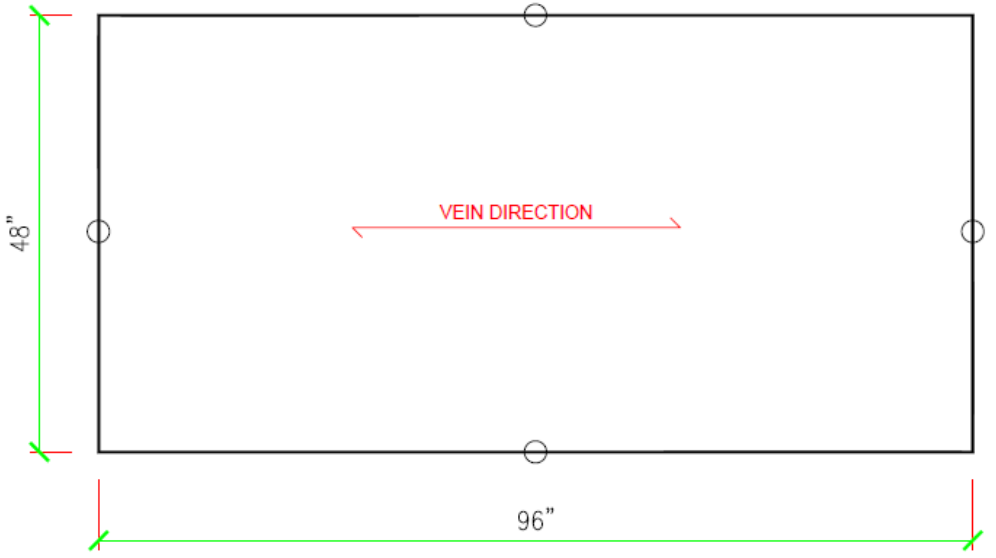
Affordable

- **Labor & Logistics**
  - Is the stone particularly difficult to cut/process?
  - Thickness of finished product affects amount of material required & the shipping costs. 2cm / 3cm
  - Complex products like mosaics are more labor intensive.
  - Unique finishes and profiles can also be more labor intensive and may affect material thickness.

Affordable

- Manufacturing Efficiency
  - 60-70% yield in fabricating stone slabs
  - 12” x 24” tile has less waste than large format panel
- Care & Maintenance
- Supply & Demand





Module V Recap

AFFORDABLE

What factors affect the price of stone?

Practical Applications Recap

I. Resources

II. Admirable

III. Suitable

IV. Available

V. Affordable

STONE DESIGN SEMINARS

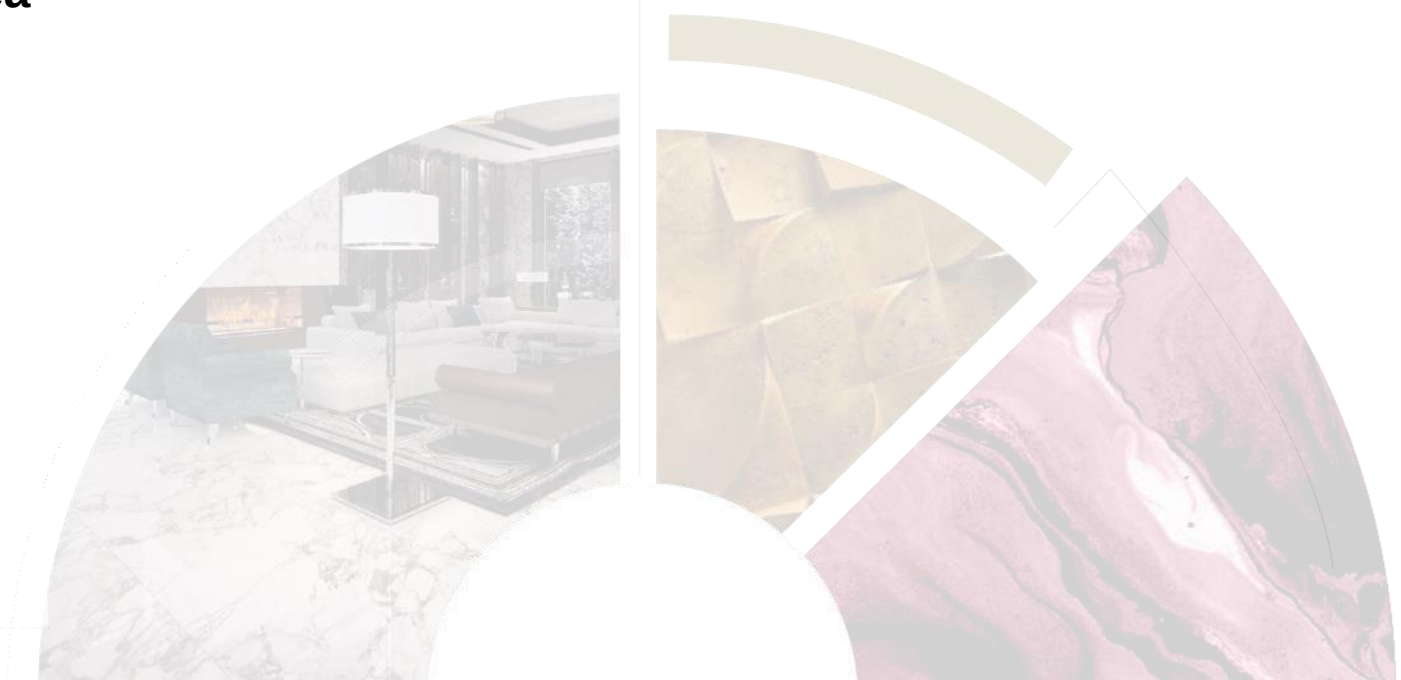
25 - 28 NOVEMBER 2019
Trade Centre Arena
Dubai World Trade Centre

MIDDLE EAST STONE
International Stone and Marble Show

THANK YOU

FOR ATTENDING THE PRESENTATION

Please don´t forget to collect your CPD certificate during the event from the CPD collection area



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THE BIG 5 International Building & Construction Show