



DARE TO BE BOLD™

# STONE USAGE GUIDE



# STONE USAGE GUIDE

To assist in deciding whether a specific stone is appropriate for certain uses, the coding system below was developed and corresponds with the charts on the following pages for all available natural stone.

## SPECIAL NOTES

- Not recommended in wet areas.
- ◆ Can be used in interior wet wall areas, if sealed and maintained properly. If not properly maintained, the stone look could be altered. Please contact your sealer manufacturer or your Marazzi sales representative for information about products that can protect the stone from moisture exposure.
- ▼ Might contain dry seams, pits, fossils and glass veins that are filled at the factory or during installation. These are all inherent characteristics of the stone. Since these voids can sometimes lose their fillings, they should be refilled as part of normal maintenance.
- A sealer is recommended. (Note: Some stones, such as limestone and tumbled stone among others, should be sealed prior to grouting.)
- This mosaic has pieces of natural stone and crackled ceramic/porcelain, seal the entire mosaic including the crackled ceramic and porcelain prior to grouting to prevent the grout from staining the mosaic.
- ✕ These stones contain deposits of minerals and iron that may react to moisture. Stone bleeding or rusting is a common example of this. These stones should not be used in installations where they would be exposed to standing, run-off water or too much humidity. A sealer is strongly recommended but will not prevent the chemical reaction from happening. Contact your sealer manufacturer or Daltile sales representative for information about products that can protect the stone from moisture exposure.
- ✱ White setting materials are recommended.
- ✧ Install with a non-staining epoxy. Do not use any water-based setting material with these stones.
- ✦ Not recommended for shower floors.
- ✪ Medium bed mortar is required for tiles with at least one side greater than 15".
- ✚ These stones may change color over time if exposed to direct sunlight.
- ✚ Use a temporary water soluble grout release during installation.
- ✧ The slip resistance of natural stone tiles vary. Caution should be used in determining if the selected stone will be sufficiently slip resistant for exterior use.
- ♣ Refer to the "Special Limestone Installation Guide"

## COLOR VARIATIONS

- L Low: Background color is relatively uniform.
- M Medium: Background color contains slight variations.
- H High: Background color contains distinct variations.
- R Random: Variegated in color and veining. Blending allowances during installation are strongly recommended.

## CONDITIONS OF PURCHASE

Natural stone products inherently lack uniformity and are subject to variation in aesthetics (color, shade, finish, etc.) and performance (hardness, strength, slip resistance, etc.). Natural stone products do not meet minimum coefficient of friction thresholds recommended by safety standard setting organizations. No warranties, expressed or implied, relative to merchantability or fitness for a particular purpose are made regarding the natural stone products distributed by Marazzi. Check local building codes prior to specification or installation to verify that product technical characteristics comply with required parameters.

**NOTE:** The existence and dimensions of a bevel may vary from lot to lot. Be sure to request a sample of the specific lot you are planning to order, if the bevel is an important feature for your job.

## EXTERIOR USAGE

- Ⓔ Suitable for uncovered exterior floor and wall applications in freezing and non-freezing climates.
- Ⓕ Suitable for uncovered exterior wall applications in freezing and non-freezing climates.
- Ⓖ Suitable for uncovered exterior floor and wall applications in non-freezing climates only.
- Ⓖ Suitable for uncovered exterior wall applications in non-freezing climates only.
- EF Suitable for covered\* exterior floors in freezing and non-freezing climates.
- EW Suitable for covered\* exterior walls in freezing and non-freezing climates.
- SF Suitable for covered\* exterior floors in non-freezing climates only.
- SW Suitable for covered\* exterior walls in non-freezing climates only.
- N/A Not recommended for exterior applications.

\*Covered implies an area protected from the elements.

Natural stone products are not recommended for any wet areas where they may be exposed to chemicals such as waterlines and pools, or to extreme humidity and heat, such as steam rooms, among others.

## DURABILITY (FLOOR)

N/A not recommended for floor use.

- 1 Residential: Suitable for residential use. Not recommended for commercial areas.
- 2 Medium/Light Commercial: Suitable for light commercial and residential use.
- 3 Heavy Commercial: Suitable for most commercial and/or high traffic areas.

**NOTE:** Polished surfaces are not recommended for floor areas where slip resistance is a concern. Our durability recommendations are only based on the technical characteristics of the stones, however, slip resistance shall still be taken into consideration when selecting the product for a specific application. Natural stone products do not meet minimum coefficient of friction thresholds recommended by safety standard setting organizations.

## SOUNDNESS

**Group A:** Sound stones with no geological voids or fissures. These stones do not require any filling or patching.

**Group B:** Similar to Group A, but geological imperfections could be evident. These stones may contain holes or voids, which are filled with epoxy or resin.

**Group C:** These stones may contain holes, voids, lines of separation and structural flaws. It is standard practice to repair these stones by filling them or reinforcing them.

**Group D:** Similar to Group C but these stones contain larger natural faults and require more refinishing over time.

Soundness is meant to help classify denser stones (Group A and B) from more fragile stones (Group C and D). Stones classified under Groups C and D may require additional fabrication before, during or after installation as part of regular maintenance.

# STONE USAGE GUIDE

## CASTELLINA™

### A COLLECTION OF MOSAICS WITH STONE, METAL & PORCELAIN ELEMENTS

Color #	Finish	Size/Thickness	Recommended Grout Joint	Durability Floor	Soundness Variation		Exterior Residential Usage	Exterior Commercial Usage	Country of Origin	Country of Manufacture	Special Notes
CT54 White and Gray Trellis	Polished	14-5/16"x12-1/16"x3/8"	1/8"	3	A H				China	China	
CT55 Beige and Gray Trellis	Honed	14-5/16"x12-1/16"x3/8"	1/8"	2	C L		N/A	N/A	Turkey/China	China	
CT56 White and Gray Linear Hex	Polished	15-1/4"x13-1/16"x3/8"	1/8"	3	A M		EF/EW	EF/EW	Italy/Greece	China	
CT57 Beige and Gray Linear Hex	Honed	15-1/4"x13-1/16"x3/8"	1/8"	2	C L		N/A	N/A	Turkey/China	China	
CT58 White and Brass Harlequin	Polished	13"x12"x3/8"	1/8"	N/A	A M		N/A	N/A	China	China	
CT59 White and Brass Baroque	Polished	16-3/16"x14-3/16"x3/8"	Not Required	1	A M		N/A	N/A	China	China	
CT60 White and Titanium Nouveau	Polished	11-11/16"x11-3/4"x3/8"	Not Required	1	A M		N/A	N/A	Italy/China	China	
CT61 White and Steel Basilica	Polished	15-3/16"x13-5/8"x3/8"	Not Required	1	A M		N/A	N/A	China	China	
CT62 White and Midnight Gray Neo Arrow	Polished	10-7/8"x12-1/16"x3/8"	1/8"	3	A H				China	China	
CT63 Gray and Fawn Neo Arrow	Honed	10-7/8"x12-1/16"x3/8"	1/8"	2	A H				China	China	
CT64 White and Midnight Gray Diamond	Polished	19-3/8"x12"x3/8"	1/8"	3	A H				China	China	
CT65 Gray and Fawn Diamond	Honed	19-3/8"x12"x3/8"	1/8"	2	A H				China	China	
CT66 White and Midnight Gray Modern Arabesque	Polished	13-7/8"x14-3/8"x3/8"	1/8"	3	A H				China	China	
CT67 Gray and Fawn Modern Arabesque	Honed	13-7/8"x14-3/8"x3/8"	1/8"	2	A H				China	China	
CT68 White and Midnight Gray Elongated Hex	Polished	13-3/8"x17-3/8"x3/8"	1/8"	3	A H				China	China	
CT69 Gray and Fawn Elongated Hex	Honed	13-3/8"x17-3/8"x3/8"	1/8"	2	A H				China	China	



# STONE USAGE GUIDE

## HAVEN POINT™


















### NATURAL STONE

							Exterior Residential Usage	Exterior Commercial Usage	Country of Origin	Country of Manufacture				
Color #	Finish	Size/Thickness	Recommended Grout Joint	Durability Floor	Soundness Variation						Special Notes			
Candid Heather Marble M109 (Vein-cut)	Honed	12" x 24" x 3/8", 3"x8" x 3/8"	1/16"	3	A	H	SW	SW	Turkey	Turkey	◀♦●✱✧▶			
Candid Heather Marble M109 (Vein-cut)	Polished	12" x 24" x 3/8"	1/16"	3	A	H	SW	SW	Turkey	Turkey	◀♦♦●✧▶			
Candid Heather Marble Chevron M109 (Vein-cut)	Honed	1-1/4" x 5-7/8" (14-5/8" x 17-3/8" sheet)	1/8"	3	A	H	SW	SW	Turkey	Turkey	◀♦♦●✱✧			
Candid Heather Marble 4" Hexagon M109 (Vein-cut)	Honed, Sandblasted & Scraped	4" x 4" (14-1/8" x 11-1/2" sheet)	1/8"	N/A	A	H	SW	SW	Turkey	Turkey	♦♦●✱			
Candid Heather Marble Leaf M109 (Vein-cut)	Honed	1" x 2-3/8" (10-1/4" x 13-1/4" sheet)	1/8"	3	A	H	SW	SW	Turkey	Turkey	◀♦♦♦●✱			
Candid Heather Marble Modern Stack M109 (Vein-cut)	Honed, Sandblasted & Bush-Hammered	8-3/4" x 12-1/8" x 3/8" to 3/4"	As needed	N/A	A	H	SW	SW	Turkey	Turkey	♦♦♦✱✧			
Honest Greige Limestone L101 (Vein-cut)	Honed	12" x 24" x 3/8", 3" x 8" x 3/8"	1/16"	2	A	L	SW	SW	Portugal	Portugal	♦♦♦✱✧▶			
Honest Greige Limestone Chevron L101 (Vein-cut)	Honed	1-1/4" x 5-7/8" (14-5/8" x 17-3/8" sheet)	1/8"	2	A	M	SW	SW	Portugal	Portugal	♦♦♦✱✧			
Honest Greige Limestone 4" Hexagon L101 (Vein-cut)	Honed, Sandblasted, Scraped and Bush-Hammered	4" x 4" (14-1/8" x 11-1/2" sheet)	1/8"	N/A	A	M	SW	SW	Portugal	Portugal	♦♦♦✱			
Honest Greige Limestone Leaf L101 (Vein-cut)	Honed	1" x 2-3/8" (10-1/4" x 13-1/4" sheet)	1/8"	2	A	M	SW	SW	Portugal	China	♦♦♦✱			
Honest Greige Limestone Modern Stack L101 (Vein-cut)	Honed, Sandblasted, Scraped and Bush-Hammered	8-3/4" x 12-1/8" x 3/8" to 3/4"	As needed	N/A	A	M	SW	SW	Portugal	Portugal	♦♦♦✱✧			

# STONE USAGE GUIDE





















































## HAVEN POINT™

### NATURAL STONE

Open Horizon Marble M110 (Vein-cut)	Honed	12" x 24" x 3/8", 3" x 8" x 3/8"	1/16"	3	B	R	EF/EW	EF/EW	Turkey	Turkey	      
Open Horizon Marble M110 (Vein-cut)	Polished	12" x 24" x 3/8"	1/16"	3	B	R	EF/EW	EF/EW	Turkey	Turkey	      
Open Horizon Marble Chevron M110 (Vein-cut)	Honed	1-1/4" x 5-7/8" (14-5/8" x 17-3/8" sheet)	1/8"	3	B	R	EF/EW	EF/EW	Turkey	Turkey	     
Open Horizon Marble 4" Hexagon M110 (Vein-cut)	Honed, Sandblasted & Scraped	4" x 4" (14-1/8" x 11-1/2" sheet)	1/8"	N/A	B	R	EF/EW	EF/EW	Turkey	Turkey	   
Open Horizon Marble Leaf M110 (Vein-cut)	Honed	1" x 2-3/8" (10-1/4" x 13-1/4" sheet)	1/8"	3	B	R	EF/EW	EF/EW	Turkey	Turkey	    
Open Horizon Marble Modern Stack M110 (Vein-cut)	Honed, Sandblasted & Bush-Hammered	8-3/4" x 12-1/8" x 3/8" to 3/4"	As needed	N/A	B	R	EF/EW	EF/EW	Turkey	Turkey	    

## PREDELLA

### NATURAL STONE - MARBLE

Lumen White Marble M024	Honed	12"x24"x3/8" & 3"x9"x3/8"	1/16"	3	A	H	EF/EW	EF/EW	China	China	       
Lumen White Marble M024	Polished	12"x24"x3/8" & 3"x9"x3/8"	1/16"	3	A	H	EF/EW	EF/EW	China	China	       
Lumen White 2" Hexagon M024	Honed	2"x2"x3/8" (11-7/8"x11-3/4"x3/8" sheet)	1/8"	3	A	H	EF/EW	EF/EW	China	China	    
Lumen White River Pebble M024	Tumbled	Irregular shape x 3/8" (1 sq. ft. sheet)	As needed	3	A	H	EF/EW	EF/EW	China	China	    
Lumen White Linear Random M024	Splitface, Bush hammered, and Honed	12-1/16"x11-3/4"x3/8"	As needed	N/A	A	H	EW	EW	China	China	     
Lumen White Blend Modern Lantern DES2	Polished & Ceramic	11-1/8"x7-1/4"x3/8"	1/8"	N/A	A	H	N/A	N/A	China	China	     
Meta Silver Marble M023	Honed	12"x24"x5/8" & 3"x9"x5/8"	1/16"	3	A	H	EF/EW	EF/EW	Turkey	Turkey	      
Meta Silver Marble M023	Polished	12"x24"x5/8" & 3"x9"x5/8"	1/16"	3	A	H	EF/EW	EF/EW	Turkey	Turkey	      

# STONE USAGE GUIDE

## PREDELLA

### NATURAL STONE - MARBLE

Meta Silver Marble 2" Hexagon M023	Honed	2"x2"x3/8" (12"x12"x3/8" sheet)	1/8"	3	A	H	EF/EW	EF/EW	Turkey	Turkey	◆ ▼ ● *
Meta Silver Marble River Pebble M023	Tumbled	Irregular shape x 3/8" (1 sq. ft. sheet)	As needed	3	A	H	EF/EW	EF/EW	Turkey	Turkey	◆ ▼ ● *
Meta Silver Marble Linear Random M023	Splitface, Bush hammered, and Honed	12-1/8"x11-7/8"x3/8"	As needed	N/A	A	H	EW	EW	China	China	◆ ▼ ● * ✦ ✧
Meta Silver Blend Modern Lantern DE51	Polished & Ceramic	11-1/8"x7-1/4"x3/8"	1/8"	N/A	A	H	N/A	N/A	China	China	◆ ▼ ● * ✦ ✧
Reverent Taupe Marble M022	Honed	12"x24"x3/8" & 3"x9"x3/8"	1/16"	3	A	H	EF/EW	EF/EW	Greece	China	◀ ◆ ▼ ● * ✦ ✧ ✨ ✧
Reverent Taupe Marble M022	Polished	12"x24"x3/8" & 3"x9"x3/8"	1/16"	3	A	H	EF/EW	EF/EW	Greece	China	◀ ◆ ▼ ● * ✦ ✧ ✨ ✧
Reverent Taupe Marble 2" Hexagon M022	Honed	2"x2"x3/8" (11-3/4"x11-3/4"x3/8" sheet)	1/8"	3	A	H	EF/EW	EF/EW	Greece	China	◆ ▼ ● * ✨ ✧
Reverent Taupe Marble River Pebble DE54	Tumbled	Irregular shape x 3/8" (1 sq. ft. sheet)	As needed	3	A	H	EF/EW	EF/EW	Greece	China	◆ ▼ ● * ✨ ✧
Reverent Taupe Marble Linear Random DE53	Splitface, Bush hammered, and Honed	12-1/8"x11-7/8"x3/8"	As needed	N/A	A	H	EW	EW	Greece/ China	China	◆ ▼ ● * ✦ ✧ ✨ ✧
Reverent Taupe Blend Modern Lantern DE50	Polished & Ceramic	11-1/8"x7-1/4"x3/8"	1/8"	N/A	A	H	N/A	N/A	Greece/ China	China	◆ ▼ ● * ✦ ✧ ✨ ✧

## NATURAL STONE CARE AND MAINTENANCE GUIDE

Marazzi does not manufacture installation products or tile cleaning/maintenance products. Marazzi provides the information below to its customers as an information source only. *Please contact an installation product manufacturer directly, PRIOR to usage, to obtain proper handling instructions, application instruction and warnings concerning potential health hazards for any product contemplated for use.* Marazzi also strongly recommends testing a small area PRIOR to usage of any installation/tile cleaning/maintenance product to determine whether the product serves its intended purpose.

### SAFETY PRECAUTION TO CUSTOMERS

The products described in this document may have chemicals that cause reactions in certain individuals. Marazzi strongly recommends the use of safety glasses, respirators (masks) and gloves in handling any materials that contain chemicals. Marazzi recommends the proper disposal of any scrap tile/stone, installation and/or maintenance products discussed herein.

Natural stone has its own unique qualities that not only distinguish it from man-made materials, but also should be considered in selecting it for a particular project. Stone is not manufactured; it is a product of nature. Blocks are removed from the quarry, slabs are cut from these blocks, and the slabs are further fabricated into the final stone to be installed. Each block is different; each slab is different. Skillful blending or matching of the dimension stone blocks, veneer panels, tops, etc., results in a beautiful blending of nature's variety and man's design. "Uniformity of material," when applied to natural stone, is a term of relative value that needs to be understood when making a selection.

To ensure your natural stone products will provide you with a lifetime of aesthetics and utility, proper maintenance is crucial. Natural stone products are porous by nature and require a different maintenance program than traditional ceramic tile.

### NEW INSTALLATION

Sealing is strongly recommended for newly installed natural stones to provide maximum stain protection. Be careful to select a high quality sealer to protect your natural stone.

#### • Pre-Grout Sealing

Due to the narrow grout joints customarily preferred, a non-sanded grout is strongly recommended for natural stone installations with a grout joint smaller than 1/8". (Grout joints larger than 1/8" should use sanded grout.) This type of grout has very fine particles of cement, polymers, and color pigments that can penetrate the microscopic pores of the stone surface, where they become trapped and may appear as a stain in the stone. Therefore, all travertine, slate, tumbled stone, limestone, honed granites and any stones with a textured surface (such as flamed or scraped) should be sealed prior to the grouting process to protect them from staining. The application of a good quality sealer should be used as a pre-grout sealer and applied again during the final sealing process once the installation is finished.

#### • Sealing

A premium natural look penetrating/impregnating sealer is the normal choice on polished or honed marble, travertine, limestone, granite, or where the natural color of a slate is desired. A stone enhancer sealer is often used on tumbled, brushed stones, where a darker, enriched or highlighted character is desired. When choosing either one of these two types of sealers, make sure the brand you have chosen is formulated to provide maximum stain protection for stone products. Stone products should be tested periodically to ensure that the sealer is working effectively. Penetrating/impregnating stone sealers are a no-sheen, natural look sealer that can be water-based or solvent-based, good for interior and exterior applications. Most quality sealers of this type are rated to protect the stone for several years.

Stone enhancer sealers are also a no-sheen, penetrating/impregnating sealer that is formulated to darken, enrich, and highlight the natural color and beauty of stone products. They will rejuvenate and improve the appearance of worn and weathered stone. However, they will also darken the color of grout joints. They are, generally, suitable for interior and exterior use, and rated to protect the stone for several years.

Always reference manufacturers' literature for specific information on the duration of the sealer's protection and make sure that the sealer is applied in strict accordance with the manufacturer's instructions.

### ROUTINE STONE CARE

Natural stone requires a different maintenance routine than traditional, man-made ceramic tile. Many of the cleaners acceptable for use on ceramic tile can stain, damage, or dull stone. Dirt and dust will scratch the surface of stone. Therefore, stone floors should be vacuumed or dust mopped frequently to remove abrasive agents from the stone surface. Natural stone should be cleaned with neutral cleaners specifically designed for stone. These cleaners contain no acids and are concentrated neutral pH cleaners that will not affect existing sealers or other types of coatings. Stone cleaners should never contain acid or bleach. Acids, even a light solution of vinegar and water, will etch and eventually damage many varieties of natural stone. A solution of the cleaner and water mixed to manufacturer instructions should be applied to the tile surface with a sponge or mop. On walls, kitchen counters, or vanity tops, a spray bottle can be used to apply the cleaning solution. Allow sitting per manufacturer recommended specified amount of time. Agitate with a sponge, synthetic mop, soft bristle brush, or through the use of a floor-scrubbing machine with soft brushes. Mop up dirty solution and buff dry. Be sure to change out the cleaning solution every 100 square feet to avoid reintroducing dirty water during the cleaning process. Rinse thoroughly with clean water when finished. Make sure to always limit the time water puddles and sits on any type of natural stone and mop dry as soon as possible. Some textured stones may require a different cleaning method or additional procedures not specified in this document.

### HEAVY-DUTY STONE CLEANING

When stone areas have been neglected, you will need to use a heavy-duty stone cleaner and degreaser to effectively remove dirt, grease, grime, waxes, and floor finishes. These cleaning products are concentrated and designed to deep clean the stone without damaging it. Apply the solution of the cleaner and water mix per manufacturer instructions to the stone surface with a sponge or mop. Allow to stand for manufacturer-specified amount of time. Agitate with a sponge, synthetic mop, soft bristle brush, or through the use of a floor-scrubbing machine with soft brushes. Mop up dirty solution and buff dry. Be sure to change out the cleaning solution every 100 square feet to avoid reintroducing dirty water during the cleaning process. Rinse thoroughly with clean water when finished. Make sure to always limit the time water puddles and sits on any type of natural stone and mop dry as soon as possible.

### STAIN REMOVAL

A stone poultice can be used to remove stains and grout haze from stone. Poultice is a fine, non-acidic, absorptive clay cleaning powder that removes stains and light cementitious grout haze from polished and unpolished natural stone. Stone poultice efficacy depends on the nature of the stain and how long the stain has been in the stone. Base the selection of the type of poultice on the nature of the stain. If the stain is too old or has penetrated the stone too deeply, a poultice may not be enough to remove it. Spills should always be cleaned up as soon as possible.

**CAUTION:** Poultice may dull the shine of the polished stone. If this occurs you will need to use a marble polish to restore the natural shine.

### RESTORATION

If your natural stone floor has been damaged or is worn, we recommend that you contact a professional stone restoration company.

### SOME RECOMMENDATIONS FOR USING NATURAL STONE:

**Green Marbles & Serpentes:** A mechanism exists in many green colored marbles and serpentes that produces a warp in the tile when exposed to water, or a water-based adhesive. Since all standard portland-based thinset compounds are water activated, setting these stones in standard thinset will likely warp the freshly set tiles. The only failsafe method for setting these stones is to use epoxy-based thinset. Research is encouraged on the particular stone species that is being installed, because some green marbles and serpentes exist that do not exhibit this behavior, and therefore can be installed with water-based adhesives. Other green stones exist that only mildly exhibit this behavior, and can be successfully installed using thinset with reduced water volumes, or by wetting the exposed surface of the tiles after installation to provide balanced saturation levels on both surfaces.

**Fiberglass Mesh Reinforcement:** Many stone products exist on the commercial market with a mesh reinforcement adhered to the back surface of the slab or tile. The adhesive used to attach the mesh is not uniform within the industry, but is commonly an epoxy or polyester based adhesive. Portland cement based adhesives will not reliably bond to this surface. The use of epoxy based thinset is required to provide adequate bonding of these tiles.

**Staining of Light Colored Marbles and Limestones:** Light colored marbles and nearly all limestones are subject to staining from grey portland cement components in thinset adhesive. Only white thinsets are to be used when installing these stones.

**Sanded Grouts:** The sand found in sanded grout compounds is generally harder than any of the calcium carbonate based stones (limestones, travertines, marble, onyx). The use of a sanded grout with these materials, particularly if polished, will result in unsightly scratches on the surface finish of the stone tile.

**Filled Voids in Travertine:** Travertine, due to its unique method of formation, will typically include voids within the stone fabric. Most commonly, these holes will be filled at the fabrication site with either cementitious or resinous filler. Particularly in the case of cross cut tiles, many voids can exist just below the finished surface, concealed only by a slight shell of stone material. This concealment prevents detection and filling of this void in the factory. Once in service, a concentrated load on a small area (commonly from a spike heeled shoe, or a heavily loaded service cart with small diameter wheels) will fracture the thin shell of stone, exposing the void below. This is a common and expected occurrence in travertine flooring, and several return visits to the installation will be required to fill these voids as they appear.

**Pinholes in Marble:** On a much smaller scale than the voids found in travertine, many marbles may have pinholes visible in the face of the material. Frequency can be as high as 100 or more per square foot. This is not considered a defect, but rather a natural characteristic of the material.

**Excessive Depth of Thinset:** Many stone varieties, particularly the softer marbles, limestones, and travertines, are extremely vulnerable to non-uniform shrinkage of thinset adhesives. The shrinkage during cure of the thinset can actually warp the tile enough to produce an extremely fine, although visible, crack in the stone. Extreme care should be exercised in substrate prep and installation to provide a uniform depth of thinset adhesive that is within the minimum and maximum depths prescribed by the adhesive manufacturer.

## NATURAL STONE CARE AND MAINTENANCE GUIDE (CONTINUED)

**Proper Bedding Area:** Natural stones are more vulnerable to cracking as a result of voids in the setting bed than most ceramic products. Back-buttering of the stone tile is essential, and the minimum acceptable bedding area is 95% contact with no voids exceeding 2 inØ and no voids within 2" of tile corners on 3/8" tile. The minimum acceptable bedding area is 80% contact with no voids exceeding 4 inØ and no voids within 2" of tile corners on Ø" or thicker material. All corners and edges of stone tiles must always be fully supported and contact shall always be a minimum of 95% in water-susceptible conditions.

**Grout Dye Staining:** The use of dyes in grouts should always be tested to verify that the dyes will not leach into the stone, causing a "picture frame" stain. This is most common when using grouts of contrasting color, although grouts dyed with matching color to the stone have been known to cause staining in some instances.

**Acid Sensitivity:** The use of natural stones in environments where acid exposure is likely requires a proper stone selection to avoid attack to the stone. Most notably, the calcium carbonate and calcite based stones will react to relatively mild acids, such as lemon juice, vinegar, and sliced tomatoes. The result is not a stain, which could be removed, but an etching of the stone surface, which cannot be removed without refinishing the stone. In polished finish stones, a mild acid attack will usually manifest itself as a "dull" spot within the surrounding glossy surface.

**Delamination:** Many stone varieties have pronounced bedding planes, along which a predetermined "rift" exists. "Rift" is defined simply as the direction along which a stone is most easily split. Bedding planes can be a region of weakness, and some stones, particularly sandstones and some slates, will actually delaminate along inter-bedding plane boundaries after installation. This will result in a portion of the stone thickness separating and dislodging itself from the rest of the stone, and is not related to any failure in adhesive, since the bonded portion of the stone remains in place. Research is required to verify the adequacy of the stone material for the intended application. Differential mineral expansion due to weathering and thermal cycles tend to accelerate this occurrence, and freeze/thaw cycling is obviously an additional factor.

**Lot Specific Issues:** Being products of nature, stones are subject to the variability of any product harvested from nature. Some stone deposits are remarkably uniform through hundreds of feet of depth times vast lateral distances. There are cases of replacement pieces having been quarried to repair or extend building decades old, and the replacements matched the existing nearly seamlessly. In contradiction to these examples, there are quarries where the inter-block, and even intra-block variability are so great that a given lot of material cannot be matched one month later. In such cases, extreme care is necessary to ensure that adequate quantities are ordered, including requirements for waste, breakage, and attic stock.

**Lippage vs Grinding in Place:** Lippage in stone tile flooring is accentuated from what would be perceived in a ceramic tile flooring for several reasons. Natural stones tend to be installed with tighter joints, they typically have extremely slight, or no chamfer at their edges, and many natural stones are provided in a very high gloss, polished surface finish. Industry standards limit lippage between adjacent units of smooth finished natural stone flooring to 1/32", which is approximately the thickness of a standard, plastic credit card. When this is not achieved, there is the option of grinding the stone tiles in place to eliminate the lippage. This work is to be done by skilled, experienced technicians, as care must be taken to avoid a "wavy" looking finished floor. In some cases, installing contractors will plan to grind the finished floor regardless of the lippage amount, usually per the requirement of the client. Lippage should still be minimized to the extent possible during installation to avoid extremely thin stone sections after grinding.

**Requirement for Pre-soaking:** Installing high porosity stones in hot, dry climates often requires that the stone be pre-soaked prior to installation. Failure to do so can result in the stone wicking excessive amounts of water out of the setting bed, leaving the bed with inadequate water to accomplish proper hydration of the cements.

**Translucence:** May occur in some white or very lightly colored marbles and onyxes having a crystal structure that will transmit light to varying degrees depending upon stone thickness and finish. Translucence can be an aesthetically intriguing decorative attribute.

**Mixing Types of Materials:** Designs calling for a mixture of stones with different physical properties, while aesthetically interesting, can give rise to problems of wear and of maintenance, mainly on floor areas. Re-polishing will pose problems, should that need arise. The Specifier should be aware that mixing types of stones means there will be different abrasion resistance levels as well as different densities of stones that must be considered in the long term maintenance of the stone and its wearability.

**Yellowing:** A stone may turn yellow due to dirt or soap scum set in it. Waxes and other types of coatings can also yellow with age. Certain stones will naturally yellow with age as a result of oxidation of the iron within the stone. This is especially true with white marbles.

**Rusting:** Some stones, and specifically slates, contain deposits of minerals that can react to moisture. Stone bleeding or rusting is a common example of this. Caution should be used in installations where slate would be exposed to standing, run off water or too much humidity. As water works its way through the stone, if the stone contains iron oxide, some of it may liquefy. This iron will eventually surface through the stone and deposit itself on the surface of the stone. The rust will return over time and may have to be cleaned periodically.

### MOST COMMON STONE FINISHES:

**Polished:** Mirror gloss, with sharp reflections.

**Honed:** Dull sheen, without reflections, achieved by abrasive heads. The degree of honing depends on the stone, but may vary from light to heavy. Generally, it is recommended that a natural stone floor receive a honed rather than a highly polished finish in commercial applications. Etching, scratching, and traffic paths will be far less obvious on a honed surface, thus making for easier maintenance.

**Flamed or Thermal:** Plane surface with flame finish applied at high temperature by mechanically controlled means to ensure uniformity; changes the color of the stone.

**Water-jet Finish:** Gives a more uniform, textured finish and allows more of the natural color to show.

**Sandblasted:** Coarse plane surface produced by blasting an abrasive, allowing a fine-textured finish; may lighten the color.

**Bush-hammered:** Coarsely textured surface produced by hammering, and may vary according to the metallic head used, from fine point to very coarse, and may leave high, lighter-colored markings.

**Natural Cleft:** A cleavage face formed when the stone is split into any thickness.

**Tumbled:** Method of putting tiles in a mixing container with sand and rotating them, allowing the edges and corners of the tiles to chip. This method is used to give an antique and old look.

**Brushed:** This finish is created by using specific brushes to give the stone a softer, aged look. When stones are brushed, micro-veins open up. With traffic, brushed stones will increase their patina naturally and more veins may open up.

**Gauged:** Done by a machine, usually with circular abrasives to grind the material to a specific thickness.



## SPECIAL LIMESTONE INSTALLATION GUIDE

Limestones are natural stone products and due to their natural characteristics it is important that the proper installation materials and methods are used. We recommend that the installation materials are specified by a single source/manufacturer of natural stone installation products. All installation materials should be used according to the manufacturer's instructions. The stone is to be installed per industry standards and applicable building codes.

### MATERIALS:

These stones can be moisture sensitive during the installation process; therefore, the thin-set adhesive must be an **ANSI A118.4 or ANSI A118.15 Rapid Setting Modified Dry-Set Cement Mortar** that will allow the stone to achieve a "Class A rating," when tested according to the **Modified British Standards (BS) EN 14617-12 Dimensional Stability Test within the first 24 hours**. For exterior applications, use an ANSI A118.3 Epoxy adhesive to achieve a Class A rating. Follow the Stone Usage Guide to determine if the stone is suitable for Exterior Residential and/or Exterior Commercial Usage.

### SUBSTRATE:

It is recommended to install these Limestone over a clean and sound concrete substrate, which is flat, with a steel trowel and fine broom finish. The concrete substrate should readily absorb water and be free of contaminants; including curing compounds, which may prevent a good bond. Deflection of a concrete substrate should not exceed L/360 for horizontal surfaces or more than L/600 for vertical applications. For wood subfloors deflection is not to exceed L/720. Floor configurations shall be in conformance with the IRC for residential applications, and IBC for commercial applications. Mortar bed applications must comply with ANSI A108.1. Tiles installed using a wet-set mortar method, must only use dry-pack mortars that are fully compacted, and reinforced for unbonded mortar beds. Substrates should be free of cracks. Use the installation material manufacturer's membrane for crack isolation and waterproofing protection.

### PREPARATION:

Prior to installation the installer shall examine the areas to be covered, and notify the general contractor or owner representative of any visually obvious defects or conditions that will prevent a satisfactory tile installation. Installation work shall not proceed until satisfactory conditions are provided. Before starting, the surface to be tiled shall be cleaned/scarified to remove curing compounds, sealers, soil, mortar, or any type of contaminate that would interfere with bonding. All rough, uneven or "out-of-plumb" surfaces shall be made flat, "plumb and true" to within 1/8" in 10' (3mm in 3m) and 1/16" in 24" (1.6mm in 600mm). High spots should be ground down and low spots should be filled. If necessary, use a cementitious self-leveling underlayment to bring floor into tolerance for flatness.

## MOVEMENT JOINTS:

Locate, design, and install movement joints per TCNA EJ171-(Current Year) Industry recommendations. Existing joints in subsurface must be carried through tile work. Movement joints should be installed at all "changes of plane" in the tile work and where tile abuts restraining surfaces, at every 20' to 25' for interiors and 8' to 12' for all exteriors and interior areas exposed to direct sunlight or moisture, in each direction.

## WATERPROOFING AND CRACK ISOLATION MEMBRANES:

Follow the Stone Usage Guide to determine if the stone is suitable to be installed in wet applications and/or in exterior areas.

A waterproof membrane should always be applied over the substrate prior to installing the stone to minimize the risk of efflorescence and spalling. Additional waterproofing protection is required in all wet applications and exterior areas. Where necessary, a crack isolation membrane should be used to either isolate existing cracks in the substrate or to provide protection against future substrate cracking. When using Limestone in showers get approval by installation product's manufacturer. Use only membranes as supplied by the installation manufacturer for single source responsibility that is part of their labor and material warranty. For stone to be used successfully in wet areas, it must be installed in a manner so there are no voids behind the tile for water to collect, and surface and sub-surface water must be able to readily drain away from the stone. Surfaces and sub-surfaces in wet areas must have a slope to drain between 1/4" per foot to 1/2" per foot. Exterior applications must have a waterproof membrane beneath the tile.

## INSTALLATION OF TILE:

Install stone tiles per installation product manufacturer's instructions and to meet industry standards per ANSI A108, TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, and Natural Stone Institute of America Dimension Stone Design Manual Standards. It is necessary to contact the manufacturer of installation products to qualify which products to use for the intended application. The thin-set adhesive should be an **ANSI A118.4 or ANSI A118.15 Modified Dry-Set Cement Mortar, or a Rapid Setting Modified Dry-Set Cement Mortar** if accelerated curing is required. White thin-set should be used for light color tiles and when using light color grouts. For concerns with dimensional stability the rapid thin-set selected for installing this stone must achieve a **"Class A rating,"** when tested according to the **Modified British Standards (BS) EN 14617-12 Dimensional Stability Test within the first 24 hours**. Use an epoxy adhesive if necessary. For exterior applications an epoxy must be utilized.

## SPECIAL LIMESTONE INSTALLATION GUIDE CONTINUED

Clean the back of the tile and the substrate during the installation process. The thin-set adhesive must be applied to the cleaned substrate surface to be tiled and to the back of the tile with the flat side of trowel using a firm scraping motion to key the thin-set into the surface to be covered. While the thin-set applications are still tacky, back-butter the tile with more thin-set by troweling so the thin-set ridges are parallel to the short side of the tile, and parallel to each other, to ensure substantially 100% thin-set coverage and full contact between the tile and substrate (no thicker than 1/4" after compressed). Only apply as much thin-set to the substrate that can be covered with tile without the thin-set skinning over. Set the tile into the setting bed of thin-set, and beat and slide it into place perpendicular to the direction of the trowel ridges to ensure full contact. Tiles should be installed to be in-plane to the surface of adjacent tiles to avoid excessive tile lippage. It is recommended that grout joint widths are at least 1/8" wide and never butted together. Tiles should be aligned to achieve uniform grout joints. Thin-set should be allowed to set until firm before grouting. Excess thin-set must be cleaned from the tile surface and grout joints while the thin-set is still fresh.

### GROUTING:

If necessary, prior to grouting apply an appropriate breathable stone sealer or grout release to the tile to facilitate cleaning and for protection against staining from setting materials and contrasting color grouts. Grout joints should be packed full and free of all voids and pits. Excess grout should be cleaned from the surface as the work progresses, while grout is fresh and before it hardens. No acids should be used for cleaning. Prior to grouting, test an area to make sure the surface does not scratch or stain during grouting. Follow manufacturers' recommendation for the use of sanded or unsanded grout, which is determined by the width of the grout joint. For wider grout joints use a grout bag to fill joints and strike joints after they have become finger-print hard.

### SEALING:

After the stone is installed, grouted, properly cured, and clean, seal the stone with an appropriate high quality breathable stone sealer to minimize water absorption, efflorescence, and potential staining. If necessary, apply an anti-graffiti coating that is compatible with the stone. Follow sealer manufacturers' installation instructions and reseal the tile as necessary to provide adequate protection from staining and spalling.

### PROTECTION:

The tile installer shall take precautions to protect the finished work from damage by other trades and traffic. Do not allow construction traffic on fresh tile or grout joints. Allow the grout to cure for a minimum of 7 days before aggressive use or steam cleaning.

### MAINTENANCE:

Regular dust mopping or sweeping to remove grit and dirt from the surface is recommended, or use an appropriate mechanical method. Keep the tile surface clean and use walk-off mats at door entrances to minimize wear on tile and to provide protection against slipping during wet conditions. For cleaning, as needed, use a neutral cleaner to scrub tile and grout. For floors it is recommended to use a wet and dry vacuum for picking up dirty water after cleaning and rinsing. As necessary reseal the tile to maintain protection against staining and spalling. If drops of water do not bead up on tile surface and/or if stone absorbs water causing it to darken in those spots, then it is time to reseal the tile. Proper maintenance of a stone tile installation will extend the beauty and functional life of the tile, as well as keep it a safe area for public use. For exterior applications, don't allow sprinklers to over spray onto the tile surface.



Photo features Lumen White 12 x 24 on the floor/shower wall and Lumen White Modern Lantern Mosaic on the wall.