Expert Answers to Technical Questions About Working with Natural Stone

FABRICATION • INSTALLATION • FLOORING • VERTICAL SURFACES • COUNTERTOPS
GENERAL TOPICS • EXPLANATIONS • DEFINITIONS • TROUBLESHOOTING
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Those answers followed by the year 2002 were selected from the Q&A published in 2002, featuring advice from Vince Migliore, technical director for the MIA from 1997-2003. The answers followed by dates with month and year were chosen from the “Cutting Edge” newsletter column, My Opinion, written by Chuck Muchlbauer, technical director since 2004.  

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I. Installation

Q: We are installing granite on a large mausoleum. One feature is a thin and narrow horizontal trim strip between the lowest level crypt shutters and the second row. The architectural details require that the stone be attached at both ends with a nut and bolt to a shelf that will support only the last few inches of the length of the stone. The center (most of the stone) is unsupported. Many trim strips are failing about 1/3 of the distance from an anchor. What could be the cause of the problem, and how can we correct it?

A: There are several potential causes for the problem, and more than likely, you’re dealing with more than one, because these types of failures are generally caused by two or more problems. Building movement and/or metal expansion or contraction may have not been properly allowed for in the design; shimming might be performing at a location other than the anchor; or the anchor attachment to the structure may be flawed. 2002

Q: I’m an architect designing a pool house in the Washington D.C. area. We’re thinking of using a limestone tile wainscot on the interior of the building. It will be thinned to a scratch coat over CMU walls. It will be protected from the weather, but the building envelope is not heated in the winter months. We’re thinking of using a limestone tile wainscot for their resistance to the abrasion from foot traffic. If the installation is for pavement or step treads which would be subject to foot traffic, I would probably remove the stone from my list of candidates due to its low abrasion resistance. They have daily experience in handling the product and are intimately aware of its limitations and inherent variability. One cannot circumvent the quarry’s recommendations without assuming a large amount of liability in creating a public safety issue. Therefore, it is in everyone’s best interest to consult with an engineer. April 2005

Q: We’re specifying a dolomite for some coping and cladding on a chapel project. We are also specifying an “equal” as an approved alternate to the material, but the second stone has an abrasion resistance of only 6.0. Should we be removing it from our spec?

A: Abrasion resistance of stone is measured via ASTM C 241. This test procedure was specifically designed to test stones for their resistance to the abrasion from foot traffic. If the application was for pavement or step treads which would be subject to foot traffic, I would probably remove the stone from my list of candidates due to its low abrasion resistance. Since you are using the material for cladding and coping only, the low abrasion resistance should not be a factor. December 2005

Q: I installed 2 cm limestone on interior columns with plaster spots and anchor wire. It has been about 6 weeks since the installation, and the moisture from the spots is still showing on the face, although it has dissipated a bit. I have told the customer that the moisture spots will eventually go away, but they’re starting to doubt me because it is taking so long. Do you have any literature concerning this that would put the customer at ease?

A: There is discussion of this in the Dimension Stone Design Manual VII on page 15-8. There you will find documentation that this process has been known to take up to eight months for complete removal of the moisture mark. I wouldn’t be concerned about the marks still being visible after six weeks, especially if you’ve noticed improvement during that time. It can take longer than 6 months; perhaps a year. March 2007

Vertical Surfaces

Q: I am a structural engineer consulting on a project for which the client would like to edge-anchor some existing stone panels. The stone has been cut much thinner than the quarry recommends. The stones are roughly 5/8” thick and the pieces measure 1-1/2 feet by 5 feet. The quarry recommends a 1” minimum thickness, with a maximum height or width of 2 feet. The client tells me the quarry’s recommendations are overly conservative, and the edge anchoring of panels in these dimensions is commonplace. Is this safe to do? I don’t want this stone to break apart and fall on someone’s head.

A: You did not identify the stone type or anchor devise, but it really doesn’t matter. There is seldom a better opinion available on the performance and behavior of a particular stone than that of the quarrier. They have daily experience in handling the product and are intimately aware of its limitations and inherent variability. One cannot circumvent the quarry’s recommendations without assuming a large amount of liability in creating a public safety issue. Therefore, it is in everyone’s best interest to consult with an engineer. April 2005

Q: We’re preparing a bid for a sandstone project in San Antonio. The bid drawings show the sandstone in 1-1/4” thickness in a conventionally anchored “stacked” system with a cavity behind the stone. We generally think of 2” being the minimum thickness for most sandstone set in this manner and have advised the architect of this. Is there any industry document available to support our opinion?

A: Yes there is: ASTM C1528. On page 6 of this document you will find a discussion of the common thickness for various sandstone applications, and 2” is listed as the general minimum to consider for exterior sandstone cladding. May 2005

Q: I’m working with an architect for a Phoenix project. They want to use sandstone cladding in piece sizes ranging from 12” x 24” to 18” x 30”. The thickness is 3”. Do we need mechanical anchors for this application?
A: Yes, mechanical anchors would be required for this application. Because you have 3” thick beds available to you and because you are working with sandstone, which normally provides a good mechanical lock with the mortar bedding, you can likely satisfy the anchorage requirement by using simple “brick-tie” type anchors. This will eliminate the cost and coordination that would be required to cut preparations in the stone to receive bent-strap or dowel type anchors. I would recommend mocking up a simple test panel with the proposed anchor installed and verifying the pull-out strength of the assembly. Bond strength is very subjective (depending upon size and proportion of stone units, thermal environment, skill of the mason, and etc.) whereas the use of positively engaged anchorage provides immediate redundancy and forgiveness of some sins. September 2005

Q: We’re bidding a project where the designer has selected a dark, honed marble for the elevator lobby walls. We’re not sure that this is a good idea - any suggestions?

A: I don’t expect the client will be happy with it. No matter how large the protection plate is around the elevator call buttons, building occupants will still be smudging their fingerprints on the surrounding stone. Eventually there will be a dark stained region at this location. While the same fingerprinting also occurs with polished, it isn’t nearly as noticeable because it isn’t appreciably darker than the polished stone. December 2005

Q: We installed an Absolute Black interior wall in 30 mm thickness with a jointing pattern of 40” x 40” anchored panels. Since this was a small remodel project, there was no specification directing us on how to treat the joints, so we caulked them which would be our standard practice. The architect says they should have been grouted in lieu of caulked. Is there some kind of advantage in grouting versus caulking?

A: Either grout or elastomeric sealant would have been acceptable joint treatments for the installation you’ve described. Thin stones, with edges cut on modern stone fabrication equipment, tend to be difficult to grout due to the very smooth, thin beds on the stone. This makes proper grouting a two-step process, if one really wants to get the very smooth, thin beds on the stone. This makes proper grouting a two-step process, if one really wants to get the grout properly compacted and tooled into the joint. Modern building frames and backup walls behind stone cladding also tend to be much more flexible than the walls of load bearing masonry days of many years ago. This flexibility may be better accommodated with an elastomeric sealant than with the more rigid grout. For these reasons, my preference for this installation would be to caulk the joints as you did. Always verify that the sealant product you are using is nonstaining to the stone material to which it is applied. October 2006

Q: We’re getting beat up by a building inspector because we’re adhering a Jerusalem limestone that weighs about 17 pounds per square foot. He won’t allow it because the code limits it to 15 pounds per square foot. The pieces are 12” x 18” – if we cut them in half, to 12” x 9”, they would weigh less than 17 lbs. Would that satisfy the code?

A: The limitation is the weight per area, not per piece. If you cut the pieces in half, they will still be 17 pounds per square foot, and will still exceed the maximum allowed. February 2007

Q: We have a customer who wants us to install a 12-story high building façade using 10 millimeter thick granite tiles adhered to aluminum extrusions with structural silicone. The material they are proposing is Dow Corning 795. The granite tiles are 800 mm x 500 mm x 10 mm (±31-1/2” x 20” x 3/8”). I checked the DC 795 data sheet and they do approve its use as a structural bonding element not only for glass but also for other panels including stone. We have never heard about façades being installed this way, and even though the Dow Corning data sheet approves of it, as MIA members we don’t want to take on a project that doesn’t meet MIA standards. Should we pursue this job as designed, or should we take the cautious route and walk away from it?

A: I don’t see in the Dow Corning data sheet where they specifically state that the 795 product is recommended for structural attachment of stone. It reads “structural attachment of many other panels,” and I suspect that due to the wide variety of stones in the marketplace, they may endorse its use in structural attachment of some, but not all stones. In MIA documents, as well as in any other standards documents, you will find language that directs you to follow manufacturer’s directions and specifications. This is a case where you must contact the manufacturer and seek their endorsement of using their product in this application. Assuming the manufacturer does warrant this installation, MIA guidelines would still require a redundant system of attachment for the façade. The first issue that comes to my mind would be fire. Most silicone products fail in the range of 300° to 350°F (±150° to 175°C). When structurally attaching glass, this can be addressed by tempering the glass so that it will shatter first, in which case there are just tiny little chips raining down toward the sidewalk. In your case, the granite panels will come raining down in 22 pound sheets, which is obviously a considerable public safety issue. Building codes will prevail, but generally the redundant system would not be required to be designed to withstand maximum wind loads, since we aren’t typically required to design against simultaneous disasters (as a precedent, we aren’t typically required to design for cumulative seismic loads and wind loads, as we just accept the fact that the probability of an earthquake occurring on the same day as a hurricane is extremely low). January 2008

Q: How did ancient man anchor stone to buildings?

A: Ancient man’s methods were almost identical to those used today, even though the stones were quite a bit thicker. The ancient Greeks are known to have used iron split tail anchors. The Romans, learning from the Greeks that the iron anchors rusted, wrapped them in lead — early galvanizing! 2002
Q: Plaster spots have apparently stained the face of a limestone panel installation. What can be done?
A: These “stains” are more likely caused by a movement of calcium through the stone with the eventual deposit of calcium on the face of the stone. A little experimentation will develop a wash that will clean the excess calcium off the stone’s face. 2002

Q: We want to install exterior stone veneer 1-1/2” thick to metal studs on the exterior of our building. The stone will extend about 30’ high and be stacked from floor to floor with mortared joints. How should we proceed?
A: The studs must be 16 gauge or better, and the back-up wall deflection should not exceed L/720. Relieve weight at every floor or at 12'-0” with soft joints under the relief angle or clips. The building engineer should provide the anticipated deflection at these soft joints which will allow you to adequately size the joint width (typically 2x the deflection but never less than 1/4” inclusive of all tolerances).

We recommend you have a structural engineer determine the size and location of the anchors dependent on the size of the stone panels. We also recommend that the anchors positively engage the stone into holes or kerf slots and the building should be waterproofed prior to installation of the stonework. 2002

Q: I am installing marble tiles with resin reinforcement on their back faces in bathrooms in a 60-story tower. The thin set manufacturer supplied a thin set they claim is more than sufficient to the bonding task. The ceiling heights are approximately 9’-0”. The back-up is cementitious backer board on 25 gauge studs, 24” on center. I am achieving approximately 85% contact stone with thin set. Tiles are becoming de-bonded in approximately 9'-0”. The back-up is cementitious backer board on 25 gauge studs, 24” on center. I am achieving approximately 85% contact stone with thin set. Tiles are becoming de-bonded in rooms as other trades install shower doors. What is the problem?
A: Normally these kinds of failures are the result of an installation being overwhelmed by inadequacies. Deflection of the substrate is your first problem. Industry requirements are for 16 gauge studs and an L/720 maximum deflection. This is not achievable in 9'-0” ceiling heights with 25 gauge studs on 24” center. Second, we have a problem using a water-based product to adhere to a resin back. Some manufacturers claim they have water-based setting products that will do the job, but we have experience that tells us otherwise. Resin and cement products do not work well together. Third, stone tiles must be back buttered. You should try to achieve as close as possible to 100% contact stone with setting material. The back face of the stone tile must be free of dust. Setting material should be applied to the back face of the stone in a left-to-right direction, and to the substrate in an up-and-down direction, so that the setting material completely covers the entire stone and face of the substrate. 2002

Q: It’s necessary to penetrate a fire rated wall in order to install anchors for our panels. The building inspector is questioning the practice. What should we do?
A: This situation is demonstrated in detail 15-D-14 of MIA’s Design Manual VII. Photocopy the page and attach it with a short note to the building inspector noting that this is an accepted practice. 2002

Q: We are designing an exterior stone facing for a building. Will performing the ASTM tests for the particular variety of stone give us sufficient information to be positive that the stone selected will perform as required?
A: The ASTM tests provided for by the various dimension stones only satisfy the requirement that the tested stone fits into that stone category, i.e., marble, limestone, granite, etc. We suggest you check with the quarry and verify they recommend the stone based on its thickness and size for this installation and use. They should provide examples to show where this has been used before with success. Petrographic analysis, ASTM C295, including both SEM (Scanning Electron Microscope) and XRD (X-Ray Diffraction), may be indicated if there remains any doubt about performance. 2002

Q: I want to install some small stone tiles about 4” square and 3/8” thick as a border on a large mirror. How can I attach them?
A: You must understand before you start that the bond to the mirror will be by suction only, and that the bond should be checked periodically. There are two methods that can be used: Scotch® Brand Double Coated Acrylic Foam Tape #4930, with the tape occupying 25% of 3/8” stone tile’s back face area; or Dow® 795 caulk, which can be used as an adhesive. The caulk must cover 100% of the stone tile’s back face. Both of these materials require the back face of the stone and the face of the mirror to be absolutely clean. We recommend further washing the mirror contact area with a cleaner approved by the silicone manufacturer prior to placement. 2002

Q: I have been called in to a project where there are natural cleft slate modular stone tiles installed on the walls. The slate has been sealed. No one knows what product(s) were used in the sealing. The owner wants me to install new polished modular stone tile over the existing. I did a bond test over the weekend, and can’t get a good bond. What should I do?
A: If the sealant cannot be properly removed, good bond will be difficult to achieve. Try removing what sealant you can, then deeply scarify the existing surface and do another sample. If the bond is not adequate, one option may be to remove the existing or to attach a new layer of cement backer board wall screwed through the existing stone into the studs, and then install on top of that. 2002

Q: We are considering using either limestone or granite as a facing material for our new building. How can we compare their relative compressive strengths?
A: It is impossible to compare limestone as a group to granite as a group, except to note the minimum allowable ASTM test results of one to another. The individual compressive strengths of the actual stones in consideration, however, can be compared. 2002
Floors

Q: How can I make sure that the floor we are going to install will be properly installed?

A: Follow these five important steps:

1. Have the owner or contractors confirm that the LLD (Live Load Deflection) of the substrate is L/720 maximum.
2. Read ANSI requirements for bonding mortar and grouts, not just technical data sheets from the manufacturer. Do not accept oral information from suppliers on working qualities of their products.
3. Know the pros and cons of the installation method you are going to employ. Make sure the method chosen is consistent with the project’s requirements.
4. Use a moisture barrier on all on grade installation. Use a moisture barrier at the perimeter of the floor at exterior walls. Use a crack suppression membrane on all floors where the substrate is subject to deflection.
5. Where the stone is subject to water (bathroom), use a hard grout to avoid moisture movement through the grout joint. 2002

Q: We just moved into a building as a tenant, and there is a travertine floor in the elevator lobby. After only a few months of occupancy, we’re noticing there are holes developing in the travertine. Is this stuff defective?

A: No, it is not defective – it is simply travertine. Natural travertine will have voids, and these voids are filled with a cementitious or resin based filler during fabrication. In the case of fleuri cut travertine, some of the holes will be near the face, but will not actually window out of the face. Since these voids are not exposed during the fabrication process, they are not filled. Once in service, the thin shell of travertine separating the void from the face is not strong enough to support traffic, particularly heels. The stone will “pop” out at these locations, exposing the previously undetectable void. This is an expected occurrence in travertine (Ref: page 12-12 of the MIA Design Manual VII and ASTM C 1527 Section 4.3.2), yet we get monthly calls on this exact topic. The holes simply need to be refilled with a similar type and color of filler material as was used in the factory. Depending of the size and frequency of holes, this procedure may need to be repeated several times. It is analogous to a “break-in” period for the floor. April 2005

Q: I have enclosed a sketch I received from an artist. The design includes a 10’-0” diameter black granite disk, into which 1” wide x 1/2” deep stainless steel strips are to be epoxied. The longest of the stainless steel strips is approximately 8’-0” in length. The feature will be on an exterior plaza. Should I be concerned about the two different materials?

A: Yes, I would be concerned about the dissimilar materials used in this feature, as the exterior placement of the stone will subject it to large temperature swings. The stainless steel and the granite have significantly different rates of thermal expansion. Granites vary in their rate of linear thermal expansion, but a rough average would be 4.4 x 10-6/°F, meaning that for every one degree Fahrenheit of temperature gain, the material will expand to 1.000044 times its original length. Expansion rates of stainless steel also vary depending upon the particular alloy, but it can be as high as 1.0 x 10-5/°F, or more than double that of the stone. We also don’t know the sizing tolerance of the groove to receive the stainless steel strip, or the type of epoxy and its ability to accommodate shear movement along the length of the strips. Given all of the unknowns in this assembly, I would opt to stay on the conservative side and limit the difference in linear expansion between the stone and the stainless steel to no more than 0.015”, or roughly 1/64”. If we assume that the surface can get to 100° greater than its installed temperature, we would see this amount of differential expansion in lengths of only 2’-0”. I would recommend cutting the stainless into sections not exceeding 2’-0” lengths to prevent problems with differential expansion. Consult with the epoxy manufacturer to verify the ability to accommodate this amount of movement. June 2005

Q: What should absorption be for stone to be used as interior flooring?

A: This would be specific to the type of stone that is used. The various stone types have a corresponding ASTM specification which lists the physical properties required for that particular stone. The appropriate allowable absorption limit can be found in these ASTM standards: C 503 (Marble), C 568 (Limestone), C 615 (Granite), C 616 (Quartz based), C 629 (Slate), C 1526 (Serpentine), C 1527 (Travertine). November 2005

Q: We’re installing a St. Hubbard limestone (from Portugal) floor. This is a very soft material and it chips very easily. I need a document that clarifies that it acceptable to install chipped stone.

A: There are numerous references in the various stone industry association documents that reference the acceptability of patching chips, provided the patch is not distracting aesthetically and does not adversely influence the stone structurally. I do not know of any industry consensus document that states that chips that have not been repaired are acceptable in the finished stone work. August 2006

Q: We are designing a hotel lobby renovation and we’re considering a 12 x 12 fleuri-cut travertine tile throughout the lobby floor area. Should we be concerned about the wear resistance of this stone type?

A: Without knowing what specific travertine is being considered, one cannot say if limited abrasion resistance is an issue or not, but I doubt that it will be a primary concern. What does concern me is the fact that it is a hotel lobby,
which will receive constant rolling loads from the luggage carts used by the guests and/or bellmen. A fleuri-cut travertine will have numerous voids within the stone which do not get filled because a slim shell of stone conceals them. The wheels of the luggage carts will eventually “pop” through all of these voids, requiring numerous repair sessions. Also, some of the voids that are filled will wear unevenly. I would not specify the material unless the client is properly informed of this issue. October 2006

**Q:** We’ve been asked to install a granite tile over an existing ceramic tile floor in a remodel project. The specs call for abrading of the existing tile prior to setting the stone – is this really necessary? Can’t we just find a thinset that adheres to the ceramic face?

**A:** The practice of installing tile over existing tile is not one of which I’m particularly fond. By doing this install, you are combining the potential failures of either floor system into one. If there are any future problems with the existing ceramic tile installation, it will telegraph through the stone installation. It can be successfully done if the conditions of the existing installation are sound and all necessary preparation steps are completed. Reference the Tile Council of North America 2008 Handbook, detail TR712-07 on page 73. The first condition to verify is that the existing installation is “sound, well bonded, and without structural cracks.” In the preparations notes, it states that any “soap scum, wax, coatings, oil, etc” must be removed. It also states that “mechanical abrasion with a Carborundum disk followed by a clean water wash is recommended.” It doesn’t say mechanical abrasion is required, only recommended, but I would take this recommendation seriously and perform the additional preparation by abrading the surface. Since the deflection specs for stone and ceramic are different, the design professional will need to verify that the existing floor is adequately rigid to support the stone, particularly after you add the additional dead load of another layer of tile. July 2007

**Q:** Why should I use MIA or TCA recommendations when installing flooring?

**A:** There are various floor installation methods used throughout the country that do not comply with either the MIA or TCA recommendations. But using a non-standard method makes the installer stand alone in the event of a problem with the finished floor. 2002

**Q:** How do you install stone paving over radiant heat in residential frame construction?

**A:** The substrate must not exceed a Live Load Deflection of L/720 or a maximum of 3/32”, after allowing for all dead load and impact load. Install 1-1/2” of plywood subfloor, with a waterproof membrane (non-liquefied). Consider using a heat reflector on top of the membrane. The heating contractor should then install the heating system per manufacturer’s recommendation. Fill the cavity with Portland mix so that mortar bed covers pipes and at least 3/4” over top of pipes. Allow to cure for more than three days, and then apply a crack suppression membrane. If using a thin set method, insure that there is a minimum of 2-1/2” mortar to top of radiant system. This will allow sufficient mass to dissipate the heat and avoid damaging the stone or installation system. Use thin set method as usual. If using dry pack method, insure that setting space is a minimum of 1-1/4” thick. Use usual wire reinforcement at center of bed. 2002

**Q:** What provisions must I make for expansion joints when installing stone paving on a structural slab?

**A:** In the absence of specific installation details follow the recommendations in ANSI 108.01 and TCTA method EJ171.

**Q:** What will happen to my project if I do not install a moisture barrier between the subfloor and the setting bed in a slab-on-grade project?

**A:** Moisture may travel to the face of the stone from the ground or structural slab, carrying salts with it and causing the stone to darken. Salts in the cement in the structural slab will percolate to the face of the stone pavers. The floor may fail. 2002

**Q:** What must I consider when installing stone over a substrate that is partially frame and partially concrete?

**A:** Be careful when installing stone paving over a substrate that is partially wood frame and partially concrete. You’ll need an expansion joint at the junction of the two substrates, as they will move independently. The joint should go through the setting bed and should be filled with a good quality caulk. Do not use backer rod in this joint. Do not use cement-based grout or rely on a crack suppression membrane, as the grout will crack and the membrane will not work in this situation. Stone will fail if it spans the space between the two substrates. 2002

**Q:** What does it mean if a floor is “checking”?

**A:** A check is a crack that doesn’t go all the way through the thickness of a stone. It can’t be felt and can only be seen if the light reflection is perfect. Your customer will call it a crack. We recently consulted on two thin set installations experiencing checking. One involved a slab on grade in a corridor of a hotel with 3/8” marble tiles where the floor was heavily checked. In this project of less than 1,000 sq. ft., we determined that the stone was acceptable and should not be removed. The cause of the checking was attributed to the installer’s setting material/setting method. This thin set apparently set up faster at the edges of the stone than in the center, and exerted unequal force on the back face of the stone. About 25% of the stones checked. The stone is well bonded (now) to the substrate. Thus, we advised that no further action was required.
The other project was a residence in which about 5,500 sq. ft. of 18” x 18” x 3/8” granite tiles were installed. The calculated Live Load Deflection of the truss joist system was L/440. In some areas, the tile checked in an almost straight line in the truss joist direction. The stone failed at all the doorways – a full jamb width from one end to the other. Again, about 25% of the stone checked. Here, we determined that the checking was caused by (1) reinforcing the joist trusses after installation of the leveling bed and the stone; (2) failure to install stone saddles at the doorways (the cementitious bed was continuous from one room to another); and, (3) failure to follow manufacturer’s recommendations when mixing the thin set. Again, the thin set cured faster at the edges of the stone than in the center. In this project, we faulted the architect, the general contractor, and the marble contractor, and called for the stone to be removed and newly installed after reinforcing the truss joists.

Why was one project acceptable and the other not? The slab on grade project will not degrade further and its life will be unaffected. The other project was frame construction. The stone will move and the checks will become cracks. The stone will degrade more. In the first project, the client will have full use of the floor, in the second, he will not.

Q: Are flexural strength and modulus of rupture qualities important in a stone paving project?
A: They could be important if the piece size is large, if a thin set installation method is used, or if the substrate has minimal deflection acceptability. These tests measure the ability of the stone to withstand and resist bending forces. In large piece sizes, it is difficult to achieve full bonding of the stone. In a thin set method, there is the problem of unsupported edges of the stone, as water-based thin set materials shrink when curing. Deflection of the substrate will also cause the stone to have to resist weight of traffic.

Q: The floor in my newly installed marble shower is leaking. The stone is very dark from water. I used a waterproof membrane between the substrate and the mortar bed. What’s wrong?
A: The drain was improperly installed and water is percolating through the stone setting bed.

Q: I am grouting a Giallo (yellow) type marble tile. The green tinted grout is staining the marble. What should I do to insure a good end result?
A: The grout you are using contains pigments that will carry into the stone and stain it. The use of a sealer or grout release will stop the stain, but it will also put a bond break between the stone and the grout. In order for grout to work properly, it must adhere to the stone. We recommend that you use white Portland cement as your grout. The water from the grout may temporarily darken the edge of the stone, but the darkness will disappear as the water evaporates.

Q: We are in the pre-bid stage of a very large modular stone project. The tiles are of varying size, but are consistent at 1 cm thickness. The architect has specified that the stone supplier must provide warranty as to the flexural strength of the stone. We have the flexural strength test results, but are concerned that this data will mislead the architect and owner, because the thickness of the stone is only 1 cm. What do you think?
A: Dimension stones furnished for paving use under 1-1/4” thickness are not considered to have any engineering qualities, other than abrasive resistance. These stones receive their strength from the substrate and the setting bed. This is why the MIA recommends avoidance of notched trowels in setting stone tiles. The stone should always be fully back buttered and set to a full bed of mortar or thin set. Installers must always strive for 100% adhesion to insure that the stone is properly supported.

Q: I want to use 5’0” x 2’6” travertine paving stones on a slab subject to deflection. How thick must the stone be? Is it okay to vein the travertine in both the long and the short direction in order to form a pattern? What thickness setting bed is required?
A: The MIA recommends that the stone be 4 cm (1-1/2”) or 5 cm (2”) thick, depending on the type of travertine. The stone should not be veined in the short direction; cut those stones in half. The setting bed should be at least 1-1/4” thick (preferably 1-1/2” thick), 1 part Portland cement to 4 or 5 parts of sand. Back butter slabs for 100% contact. Use a crack suppression membrane and avoid thin set procedures.

Q: We had a project consisting of limestone tiles 16” x 16” x 3/8” thick installed on the first three floors of our new building. The installation on the ground floor is perfect, but both the second and the third floor installations are full of cracks. What could be the problem?
A: The problem is you used TCA method F113 for all three floors. This method is only suitable for on grade installations. You need to use TCA method F111 on the upper two floors.

Q: Is the slip resistance number 0.5 realistic?
A: Yes. Slipping on floors is more a matter of sudden reduction of slip resistance than from a low slip resistance number. Floors that are 0.3 can easily be walked on. Our human computer automatically reduces our length of stride to maximize surface contact. Slips and falls happen when an area contains a lower slip resistance than the balance of the floor, say from 0.5 to 0.2, because of a localized beverage spill, or wet floor. Most stones will meet the 0.5 standard.

Q: We are going to grind and refinish an existing filled travertine floor to remove excessive lippage. How and when should we refill the travertine to get a “factory” finish?
A: We recommend using a travertine fill, similar to that which was used in the shop during fabrication, over a colored grout. The floor should be ground as required. At the approximately 360 grit finish stage, stop and thoroughly clean the floor. Obtain a travertine fill (many of the stone supply houses stock it). The fill is composed primarily of travertine dust, white Portland cement, and cement color. It is important to understand that the amount of moisture in the stone and the quantity of water used in the fill is critical to success. Measure carefully the amount of fill and water used. Different quantities of water will affect the color and hardness of the fill. The stone should be fogged prior to using the fill. Use a trowel and grout the entire surface of the stone, leaving the fill slightly higher than the stone surface. Let cure at least 48 hours. Use the next stage of finish abrasive carefully. Remember, you have already completed the honing stage. You just want to remove the excess fill. The fill will grind rapidly. When completely ground and finished, expect to find some small holes. These should be filled with grout or touched up with the travertine fill. 2002

Q: We have recently completed installation of a Green Serpentine marble on a slab on grade. There is no moisture barrier. We are noticing efflorescence at the veins of the stone. How can we clean the stone and stop the efflorescence?

A: Unfortunately, any action you take will only yield limited results. The appearance of efflorescence at the stone’s vein is the first sign of a problem. The salts causing the efflorescence are in motion due to their natural tendency to seek the driest and warmest atmosphere. Sealing the floor will result in pressure building in the stone until sections of the stone de-laminate. We recommend removing some of the grout and replacing it with as soft a grout as possible. This will allow the efflorescence an almost barrier-free exit through the grout. This action, along with continual cleanup of the salts that accumulate on the face and at the stone joints, is an excellent maintenance procedure. Eventually, the floor will require replacement, having failed to last its expected lifetime. 2002

Q: Is it good maintenance practice to pressure wash stone paving?

A: No, at least not more often than two or three times a year. The pressure will push water through a grout joint and weaken a caulk joint. If you must use a pressure washer, keep away from the stone joints. 2002

Q: We installed a Rojo Alicante marble (geologically a micritic limestone) floor in a residence. Within three months, the stone is blistering and may have to be replaced. We sealed the floor. What’s the problem?

A: The MIA had a sample of the stone tested. There was a chemical reaction between a commonly used household cleanser and the sealer. The reaction created an acid that has digested a portion of the calcium in the stone. The digestion process created a gas that caused the blistering, until a small hole was formed to allow the gas to escape. The remedy is to deep grind the floor to remove all stone affected by the sealer, and then re-hone and polish. 2002

Q: We use a local method in installing stone floors. We use 15# felt paper as a bond break, and then nail diamond wire to the plywood. We recently had a problem with a portion of the floor cracking. Is our installation method wrong?

A: This is an old method of installing stone floors. There is some question today about the benefit of nailing diamond wire to wood substrates affecting the ability of the felt paper slip-sheet to perform properly. However, there are many experienced stone setters that use this method, and we would doubt that the method itself would cause the described failure. Look for another reason. 2002

Q: I am an artist. I recently completed a project in which 11 marble mosaic panels I designed were installed in exterior walkways in the downtown section of our city. All of these panels are debonding and the small 1/2” tiles are coming loose. What could be the problem?

A: After a lengthy conversation, it was determined that the tiles were installed with a white thin set mortar over a concrete substrate, and the grout used from tile to tile and tile to concrete was epoxy. No provision was made for expansion. The thin set is the weakest (although normally sufficient for the task) part of the installation, and it is failing as the mosaics and epoxy grow during the heat of the day. Temperatures can range over 50 degrees in a day. Epoxy joints account for approximately 15% to 25% of exposed area. The epoxy expands at a faster rate than the stone and the resultant pressure, especially when added to the normal stone expansion, albeit minimal, causes debonding. The colored marbles used to make the mosaics are in actuality geological limestone. All limestone expands and contracts when subject to temperature variation. Installation should include a grout that is favorable to the natural characteristics of the stone. 2002

Q: We have 60” x 60” x 2” granite pavers installed on 3/4” thick bed on a 9” structural slab. Many pavers have broken under load of trucks used in snow removal. What should we consider in replacing the stone?

A: Pavers 2” thick in a 60” x 60” size are too large for this use in this installation. The pavers are not uniform in thickness; the bottom face is irregular and probably slightly concave or convex. It is an almost impossible task to bed such large stones fully, which is necessary in order to transfer the loads to the slab. We suggest that you replace the pavers with stones one fourth this size, or redesign the project to use pavers of a thickness that can support the loads independently of the installation bed. In this instance, the project engineer will be required to use the ASTM flexural strength qualities of the granite to determine the appropriate thickness required. 2002
Q: Can I use TCA installation methods when installing stone tiles?
A: Yes. Where the TCA recommends that deflection not exceed 1/360 of span, substitute the MIA requirement of 1/720 of span, and use the TCA method. Remember to use white installation products for all limestone and light colored stones, back butter stone tiles, and strive for 100% contact of stone to installation mortar or mastic. When limestone is used in a thick bed, use the setting mortar recommended by the MIA in its Dimension Stone Design Manual VII (DSDM VII). 2002

Q: The grout in the limestone floor we installed recently is cracking. What could be the reason?
A: The probable reason is that the limestone absorbed some of the moisture in the grout before it could cure completely. 2002

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Q: What is a reasonable tolerance for joint width?
A: Tolerance is normally correct at a variation from true (specification) of 1/4 of the specified joint width. With a joint width of 3/32”, a tolerance of ± 1/32” is reasonable. A 3/32” joint is correct at 1/16” wide and at 1/8” wide. The joints should “eye up” straight and true. Be careful though, if the joint is specified at between X and Y (i.e., 1/4” to 3/8”) the minimum and maximum width is that specified. 2002

Q: I installed Crema Marfil tiles two months ago, and now I am noticing a crystallized substance oozing from the veins of the marble. The surface around the veins has also formed blisters that look like fine glass chips. These chips are lifting off, and as days go by the chipping has become intense and is spreading rapidly. Could it be a bad batch of tiles? The stone is sealed and has not been maintained with anything. Please advise on the problem and its solution.
A: There are several possibilities for the problem if this is a floor on grade, including a moisture barrier or a chemical reaction between the stone and the sealer. The only solution, however, is removal of the stone to repair the root cause of the problem. 2002

Q: We are installing a marble floor on the exterior patio of a building. The owner has told us not to be concerned with the possibility of freezing because of heat loss through the installation bed from the poorly insulated space under the patio. What do you think?
A: We would not rely on heat loss to prevent the bed from freezing. The issue is how to joint the stone. We suggest jointing it as if it were to be subject to freezing weather. That means grout joints of sufficient width to properly grout to the full depth of the stone, and using a caulk at the perimeter of the installation against abutting vertical surfaces. 2002

Q: In paving installations, it is very difficult and time consuming to place the wire reinforcement in the center of the bed. Can I leave it at the bottom?
A: No. The wire will only work if it is towards the center of the bed. You might want to try an alternate method of preparing your bed. The MIA endorses the use of fiber-reinforcement in lieu of wire for setting beds. See the MIA DSDM VII for details. 2002

Q: We have a project in the United Arab Emirates where the architect has specified a 6 mm stainless steel strip every 50 to 60 square meters. Can we use these strips as control joints?
A: A control joint is used to “control” shrinkage cracking in materials such as concrete, concrete masonry, stucco, etc. We know the material is going to crack due to shrinkage during cure, so we intentionally make a cut in the surface, creating a weakened plane to “control” where the cracks will occur, which means that the cracks will be in nice, neat straight lines as opposed to randomly located cracks. What I believe you are referring to is a “movement” joint. The purpose of the movement joint is to limit the amount of accumulated lateral stress that results due to differential expansion between the stone and the substrate. Since the rate of expansion of the finished stone layer can be either greater or lesser than that of the substrate, the movement joint must be capable of both contraction and extension. The rigid metal strip would not be adequate in this regard, although a movement joint could be incorporated into this detail by including an elastomeric sealant on one or both sides of the metal strip. You will also need to add more movement joints, since the recommended TCNA and ANSI interval is 2.5 to 4 meters on center, which would create bays that are between 6 and 16 m² in area. July 2007

Q: We installed travertine modular tile in a nail salon. The floor is deteriorating in areas where chairs on rollers are used. We understand that acetone is used in the treatment of the nails. What is happening and what can we do about it?
A: Actually, the fill is coming out of some of the stone, but only in areas where chairs on rollers are used. This is a slab on grade installation. Linoleum tile was removed and replaced with the stone. The stone was installed with a modified thin set. I suspect that the acetone is not causing the problem. More likely, all of the adhesive bonding on the linoleum was not removed, and there is some slight
movement in the area. The vibration caused by the chairs being moved is causing a small quantity of the fill to come out of the stone. I recommend re-grouting the stone. 2002

Q: We are installing an exterior wood frame porch. The plywood has been coated with fiberglass to prevent rot if water gets into the system. How do we install a stone tile floor on top of the fiberglass?

A: First insure that the substrate conforms to L/720 deflection. I would install a cement backer unit conforming to ANSI A118.9 in accordance with the manufacturer’s recommendations, using an epoxy conforming to ANSI A118.8 to bond the cement backer unit to the fiberglass. When cured, install the stone tile with a modified thin set mortar. Use white thin set mortar if the stone is limestone or light colored and maintain joints a minimum of 1/8" width. Use pure Portland cement as a grout. Dampen the edges of the stone and work a very dry mixture of the Portland into the joints. Caulk all edges that are not stone to stone. 2002

Q: What is meant by “blending stones?”

A: When more than one pallet of stone is to be used in an area, stone from all the pallets should be examined to verify that the colors, shading, and markings are going to be consistent within the requirements of the project. It is unrealistic to assume that two pallets of stone will blend together within the requirements of the project without verifying it. Only so much stone can be produced from one block, and stone will vary from block to block. Additionally, because of the methods employed in production, the MIA does not require modular stone tile (tiles up to 24” x 24” x under 3/4”) to blend together as well as a similar production in 2 cm or more thickness, or dimensions greater than 24” x 24”. Therefore, almost every complaint of shading with modular stone tile will be difficult to assert. It is the responsibility of the installer to understand the shading variations received, and to insure that shading in the entire floor is acceptable to the purchaser prior to installation. 2002

Q: Can I nail wire reinforcement to a wood substrate and then using a thin set mortar instead of a thick bed?

A: This is TCA method F145. This method is not intended to be used with a thin set mortar being substituted for the 3/4” or 1-1/4” thick mortar bed the TCA recommends. 2002

II. Fabrication

Marble

Q: We are planning to specify a Thassos marble for a small interior retail space. We have C 241 data and we find that it does not meet the values required per ASTM C 503. Is this a concern?

A: ASTM C 503 lists an H_a requirement of 10.0 for marbles in general. The application that you are referencing is a light duty, low traffic commercial floor. The MIA Dimension Stone Design Manual VII (pg 14-1) indicates that an abrasion resistance as low as 7.0 would be adequate for an installation such as yours. I would suggest keeping your specification as is and enjoying your marble floor. July 2005

Q: I am an architect who specified marble panels for the lobby walls of my client’s building. We traveled to Italy where we looked at and approved a mock-up for the marble walls. In the mockup panels there was no arris at the panel edges. The marble has now arrived with a non-uniform arris up to 1/8”. I’m told this is industry standard.

A: There is no industry specified standard for the dimensions of an arris at the panel edge, although it is extremely common to apply an arris to eliminate existing chips and to reduce the vulnerability to further chipping. Arris dimensions normally do not exceed 1/16” x 1/16” (1.5 x 1.5 mm), and should in all cases be uniform. The arris is sometimes, but not always, noted on the fabrication shop drawings. In your case, since there was a mockup provided for the project, the mockup becomes the standard for both material and workmanship. If the production material does not match the mockup material, you have a legitimate issue for not accepting the arris on the edge. September 2005

Q: Has the soundness of Colorado Yule marble been reclassified?

A: Yes, it is now included in MIA soundness group A. November 2005

Q: I am detailing a marble stair for a commercial office building and was wondering what you have found to be a good solution for providing slip resistance at the stair nosing. Is simply routing grooves in the stone enough?

A: Routing grooves in the stone and leaving them open usually yields a dirt-filled groove with chipped edges after a short time in service. My preference would be to fill the groove with an abrasive strip. Some fabricators will mix an abrasive compound and pour it in the groove allowing it to cure in place, while others prefer to purchase a pre-fabricated strip which can be adhered into the groove. January 2006

Q: We recently supplied some Emperador Dark marble, and the customer is now complaining that the material is inferior because there are epoxy repairs in the stone. This is, to our experience, a normal occurrence in Emperador Dark.

A: You are correct – Emperador Dark is classified as a “D” soundness marble, and adhesive repairs are both common and acceptable. Refer to the MIA Dimension Stone Design Manual VII pages 7-16 & 17, or the MIA Technical Bulletin.
of January 2005, for further explanation of Marble Soundness Classification. One item of clarification, however, is that the repairs were likely done with a polyester resin as opposed to an epoxy. July 2006

Q: We’re using Rojo Alicante marble on a swinging door frame. It’s within a wall where a door is needed, but the designer doesn’t want the door to be visible. What’s the best method for anchoring this material to the door frame and preventing breakage when the door is slammed shut?

A: Rojo Alicante is a dense, polishable limestone, or what was frequently referred to as “limestone marble.” Within the MIA soundness classifications for marble it is classified as soundness “C”, although some lots of it could easily be considered soundness class “D”. I have serious doubts about this material being mounted to a door frame and surviving the impact of the door being slammed shut. This application might be best served by using a bonded backer material, such as an aluminum honeycomb backer, to carry the load for the marble. This would result in a much lighter door due to the reduced marble thickness, which would be both easier to use and require less stoutness in hinge construction. Plus it would reinforce the stone and prevent an occupant safety issue by eliminating the possibility of the stone shattering. Color matching would be a concern, and it might be a requirement to make the entire wall of the same reinforced product to ensure a proper color blend. April 2007

Q: We recently fabricated and installed a Carrara White marble surround for an outdoor fire pit in a client’s patio. It was a one-piece fabrication from 30 mm stock which was 6’-0” in diameter, with a 3’-0” diameter hole in the center. In plan view it looks like a big marble doughnut. The first time they used the fire pit, the stone cracked in two places. They want us to replace the stone since they believe it was defective. We would gladly replace it, but we’re afraid the same thing will happen again. Is there a stone, perhaps granite, which is more heat resistant than White Carrara?

A: Albert Einstein is credited with the quotation: “The definition of insanity is doing the same thing over again and expecting a different result.” Congratulations on having an “Einstein-like” approach to resolving this. Replacing the stone in the same manner will only result in another cracked stone. Changing to granite isn’t the answer either. The only advantage in using granite in this case would be improved resistance to chocolate staining, just in case the owner drops his gooey “s’more” on the stone. Heat resistance isn’t truly the issue here, as it isn’t really heat that cracked the stone. The true problem is the difference in heat, more correctly referred to as “thermal gradient”. In the installed condition, you have a hot fire heating up the stone at its inside diameter. The outside diameter won’t be nearly as hot, since it is 18” further away from the fire. The interior portion of the stone wants to expand, but it is confined by the outside perimeter stone which is much cooler and therefore not expanding at the same rate. This creates a tensile stress, or actually a “hoop stress” at the outer perimeter of the stone. Since stones are much stronger in compression than they are in tension, the hot, expanded portion wins and a crack results. The solution would be to supply the stone in several smaller segments. If we knew the exact temperatures involved, the elastic moduli of the stone, the tensile strength of the stone, the thermal conductivity of the stone, and the thermal transfer from the stone to the substrate, we could feed the information into a computer program and mathematically model the condition to tell us how small the segments must be. Since we don’t have all of that information, I would suggest using the existing stone as your test laboratory. My guess is that you will need to supply the stone in either three 120° segments or four 90° segments. Make saw cuts into the un-cracked portions of the existing stone to create a 120° segment and a 90° segment. Then tell the owner to build a rip-roaring fire in the pit with extended duration and see if one or both of the segments survive. Supply the replacement material in segments based on what is learned from the test. December 2007

Q: When I cut serpentine marble, my saw blade dulls fast. How can I keep it sharp for the occasional serpentine project?

A: General-purpose marble blades will dull fast when cutting serpentine marble because these stones are not abrasive to the blade. Try placing a 3 cm slab of travertine, bottom up, on your saw and placing the serpentine on top of it. Cut about 1/4” into the travertine. This will keep the blade sharp. The travertine will still be usable if you don’t cut more than a few slabs of serpentine on it. If cut too much to use as 3 cm, grind to 2 cm and the cost should be minimal. 2002

Q: What do you think about installing green marble tile without epoxy? We have a customer whose tile man wants to use a regular thinset, with a green marble tile. He says that because the tile has a mesh backer applied to the backside with epoxy, the marble is sealed from the bottom and the water from the thinset won’t penetrate the marble and cause it to warp. Have you ever heard of anyone doing this and having success?

A: Green marbles are notorious for warping when set with water-based adhesives, such as standard thinset. There is caution regarding this combination in the MIA’s Dimension Stone Design Manual VII (pg 13-9 and 15-9). Generally, the safest way to eliminate the potential of warping is by using a 100% solids epoxy-based thinset. There is another condition when 100% solids epoxy based thinset is recommended, and that is when the tiles have resin-adhered mesh reinforcement on the back side of the tile. A standard thinset, which is Portland cement-based, does not provide adequate adhesion to the resin-coated surface. It will provide some, and the installation may look okay for a limited time, but the bond is not adequate for acceptable performance over the service life of the project. Epoxy sticks to Portland, but Portland doesn’t stick to epoxy. May 2007
Q: While fabricating a MIA Group “A” marble, we revealed a flaw in the stone. The flaw was not apparent prior to starting the work on this stone. Can we repair the flaw?

A: Maybe. Generally, these flaws are a marked change in color or a small start. The color change is acceptable as is, and no remedial work is required. The start, especially if it is white marble, will darken if you attempt to fill it with an epoxy. Try using a colored shellac stick, a little lighter than the prominent veining in the stone. 2002

Q: I am doing a renovation of an historic building constructed in 1901. We want to refinish the mosaic marble floors. The refinisher has given us a methodology using oxalic acid and tin oxide as the final polishing materials. Are these chemicals safe to use on our historic floor?

A: If the mosaic is white marble, they are safe to use providing the oxalic acid is limited to no more than 1 gram per 20 square feet of floor area, the floor is thoroughly rinsed after using the polish, and then is buffed lightly a second time only with the tin oxide. If there is any color to the floor, do not use the oxalic acid, and instead hone the floor to a 360- to 600-grit prior to polishing only with the tin oxide. Make sure that the tin oxide is maintained as slurry about the consistency of pancake batter mix. Note: Oxalic acid is a very sharp, crystal-shaped powder about the consistency of table salt (it is commonly called “salt”). It is used only with water, and is applied only one time to a stone. This is because this acid breaks down under heat and pressure into smaller-size crystals that remain sharp. They continue to slightly abrade the face of the stone, to a finer and finer degree. Thus adding new “salt” will not benefit the finish. Residue will burn the stone, thus the rinse. It is not recommended for colored stones because oxalic acid can contribute to recrystalization, which should be avoided on all stones. 2002

Granite

Q: We recently supplied a granite kitchen countertop. The granite selected had several areas where purple-colored quartz crystals, the size of a dime and smaller, were visible in the stone. Our client viewed the slab and made no objection to the quartz spots, but now that the top is installed, they are complaining because they can see and feel the quartz. What do we do?

A: This is a tough spot to be in. We recommend that this type of “inclusion” be filled in the shop, so that it is as smooth as possible. The NBGQA (National Building Granite Quarries Association) specifications for building granite allows these naturally appearing inclusions, providing they do not detract from the usability of the stone. We recommend that any occurrence in a stone that could be considered a flaw or fault be brought to the attention of the purchaser before the sale. 2002

Q: We have an exterior fountain with 3/8” granite panels on a backer board. There are three horizontal seams. The owner wants us to cover with one piece of 2 cm Absolute Black. The finished size of the panels would be 54” wide x 124” high. Can we thin-set it over the existing 3/8” material, or would this just be a failure waiting to happen?

A: Not only would it be a failure waiting to happen, it probably wouldn’t be waiting very long. Given just 100° Fahrenheit of temperature difference (and it could easily be more than that for an exterior, black granite panel), the growth of this panel would be about 0.055”, or just shy of 1/16”. I would suggest removing the existing 3/8” stone and backer board. I would also strongly advise considering 30 mm stone in lieu of 20 mm stone. You will need to accommodate the expansion of the stone panel, which you cannot with a direct adhered system. The simplest might be to reinforce the backside of the panel by mechanically anchoring it to stainless steel angles, and then anchoring the stainless steel angles to the substrate. August 2005

Q: What are the thickness tolerances for 20 and 30 mm granite slabs?

A: Granite slab thickness is established by the NBGQA (National Building Granite Quarries Association), and in the case of 20 or 30 mm slabs the thickness tolerance is ±1/8” (±3 mm). October 2005

Q: We were showing a customer some Yellow River Granite slabs with some pits in the surface. The customer visited us again after talking with our competitor. The competitor told the customer that quality granite should never have pits in the surface. Is there any existing documentation available that discusses the presence of pits in granite and the acceptance of same?

A: It’s difficult to say what your competitor actually told the customer, as customers can sometimes have rather inaccurate recall of what they were told. It may have been some confusion between pitted slabs and resin-filled pit-slabs, and the customer probably didn’t fully understand the explanation. But in any case, yes, there exists documentation that clarifies the presence of pits in granites and the acceptability of them. If you look on page 5-15 of your MIA Dimension Stone Design Manual VII, you will find exactly the discussion you request. Basically, the pits in granite occur in mica minerals, the most common of which is biotite. These minerals are softer than the surrounding minerals, will be black in color, and are “flakey” in structure. The minerals are solid and without voids when found internally in the granite mass. Once exposed in the sawing process, they have a tendency to “flake” or “pluck” out some of their depth when abraded by the reciprocating blades leaving a shallow pit. The amount of biotite or other mica minerals varies greatly amongst granite varieties, but most will be in the single- digit percent range. It is not considered to be a defect, but simply a trait of the natural product. If you are showing materials with a high
frequency and/or large size of pitting, I would encourage you to call the customer’s attention to this characteristic of the material. Most customers do not find them objectionable when the issue is properly explained to them. It is those customers that first notice the pits after the countertop slabs have been installed that are likely to object to them. Advance communication and customer education can save a few headaches later in the process. The pits will normally not be detectable on a resin-treated slab, as the resin (usually an epoxy-based product on granite, although not necessarily so) fills the pit prior to the polishing process. February 2006

Q: Do you have any published values for epoxy embedded dowels in granite? I’ve been doing a failure analysis of a monument that tipped over due to high winds. It had a 3/4” diameter smooth dowel epoxied into a 1-1/4” diameter hole, and the dowel pulled out of the epoxy. I’m thinking we should change the dowel to a threaded rod or otherwise deformed dowel when we do the replacement, but I can’t find any load data.

A: I don’t know of any generic data published for this application. Any testing that I am aware of has been done on a project specific basis using the exact components specified for that project. You will likely have to run your own physical test of the anchor to verify structural adequacy. Changing to a deformed dowel will help, but in this case it might not be the complete solution. The relationship between the dowel and hole diameters allows for a 1/4” annulus region of epoxy surrounding the dowel. Since epoxies are exothermic (heat producing) during cure, the temperature of the curing epoxy may have been high enough to prevent full bond strength to the dowel and/or granite. I would recommend using an epoxy grout in lieu of epoxy. The sand in the grout will displace much of the epoxy, so there won’t be as much heat produced during polymerization, and the sand will also provide some dissipation of the heat that is produced. November 2006

Q: Do “pits” in granite affect its usefulness?

A: Because of their crystal structure, more than several granites (larger crystal ones in particular) can be problematic, especially in residential construction. We recommend that these very shallow pits be specifically pointed out to the client during the selection process and left as is. If the customer requires that specific stone and it is necessary to fill them, most pits can be filled with stick shellac, but this is a very laborious project. It’s far better to advise the client that “this is the way nature made it” before the sale. The presence of pits will not impact the usefulness of the stone. 2002

Q: What is MIA’s ruling if a fabricator receives a granite slab with a crack in it (pre-existing condition) compared to if the slab was cracked during the fabrication process?

A: If the slab can be used by cutting around the crack, the fabricator is entitled to either a reasonable credit for his additional labor costs to yield finished sizes from the slab(s), or a credit on the square footage of the slab relative to the crack. It is the seller’s option, not the fabricator’s. If the slab cannot be used, it may be returned to the seller, at no cost to the buyer, inclusive of freight. The buyer is not entitled to costs incident to “handling” the broken slab. 2002

Q: If the slab already had a pre-existing crack, and the slab is installed at the job site, should the piece be removed?

A: Faulty material should not be installed. If a piece is installed, the installer is responsible. Neither the fabricator nor dealer has responsibility for faults in a stone after the stone is installed, unless the fault was “hidden” from the installer. 2002

Q: If a slab had no pre-existing crack, but was cracked during the fabrication process, should the piece be remade?

A: Yes, in this instance the fabricator is responsible. Cracked stones must be discarded or re-cut to yield smaller sizes that will be crack-free. 2002

Black Granite

Q: I’m installing an exterior patio countertop in California. It is black polished granite, and it will be in direct sunlight for several hours every afternoon. What should I use for joint filler – silicon, epoxy, or polyester?

A: In this particular case, I probably wouldn’t recommend any of them. The epoxy and polyester cure to be quite rigid, and therefore do not accommodate much expansion in the granite slabs. Some silicones contain plasticizers which can bleed into the stone, and this process is accelerated at elevated temperatures. My first choice for this application would probably be polyurethane. I would consider silicon if I can verify that it is non-staining. October 2005

Q: My new Absolute Black granite honed countertop has ring marks all over it. They are visible only when the top is wet. What is causing the marks and how can I remove them?

A: After viewing a photo of the stone, it appears that the rings are marks left by the suction cups used to move the stone in the fabricator’s shop. Repeat washings with stone soap should remove the marks. 2002

Q: We have received a supply of Absolute Black (polished) slabs. The slabs have areas where you can catch your finger-nail in the surface. The supplier is telling us that this is normal with this stone variety. What is your comment?

A: The Absolute Black that originates from Africa, Sweden, and India has not demonstrated this characteristic in the past, and I would question the small surface cracks that are visible to the eye and that you can feel. 2002
Limestone

Q: Will a sealer prevent a porous limestone in a fountain application from freeze/thaw damage? We have a fountain project in a freeze/thaw region of the country, and while it won’t be operating at temperatures below freezing, we want to make sure the stone isn’t harmed by frost action when the temperatures drop below freezing.

A: In this case, the sealer may do more harm than good. In a continuously saturated condition such as this, the sealer is not going to prevent the limestone from taking on water. Once the fountain operation is suspended, the sealer will likely retard the rate at which the water can be evacuated. Water trapped within the stone could cause surface exfoliation upon freezing. My first recommendation is to research any similar applications of this stone, although it may be difficult to find one. Then discuss the appropriateness of the application with the stone quarrier. If you can’t find enough history of the stone to provide confidence in its performance, the safest thing is to select an alternate source with proven performance. July 2005

Q: I’m using some 2” Indiana Limestone - do you have any document that tells me what size shelf angles are used to support limestone?

A: There is no standard size angle for shelf angles. Shelf angles for limestone, or for that matter, any anchorage device for any stone, are specifically engineered for the requirements of that application. Vertical and lateral loads must be quantified and the anchorage is then designed/selected to accommodate those loads with adequate factors of safety. Such activity is best left in the hands of a qualified engineer. July 2005

Q: I’m installing limestone pavers on an exterior porch over a 20’ x 80’ area. The pavers are 3’ x 3’ x 1-1/4” units, and I’m installing them on a 3/8” setting bed over a 2” mortar bed over waterproofing over a structural slab. The general contractor wants us to caulk the joints – is this recommended?

A: Either caulking with an elastomeric sealant or grouting of the joints is allowed per industry recommendations. My personal preference for this installation would be the grout, as it allows the paving system to breathe through the grout joints. November 2005

Q: A consulting engineer is asking that a limestone material be retested. The last tests were completed in 1998. Is this a reasonable request?

A: My opinion is that it is absolutely a reasonable request. Depending on the production volume and layout practices of the quarry, the area of stone extraction activity within the quarry could have moved significantly either laterally, vertically, or both. Some quarries have a half century of data indicating that the deposit is very uniform through its mass, but lacking that type of data, it would not be prudent to assume that today’s production stock will have similar properties to that of seven years ago. February 2006

Q: I need some information on the time required to dry out plaster spots in limestone. We installed a project two months ago, and the spots still show as being wet. Are they permanently stained?

A: As long as appropriate plaster or cementitious materials were used, it is not likely that the stains are permanent. You will find reference to this very issue on page 15-8 of the MIA Dimension Stone Design Manual VII. The Design Manual states that complete drying of these spots could take up to 8 months after installation. March 2006

Q: We are designing a building with a limestone base, and there are some conditions where the limestone will be in direct contact with the soil. Is this going to be a problem?

A: Yes, it very likely will be a problem. Historically, many limestone façade buildings have featured granite base courses due to the lower porosity of the granite. This is common in urban situations where the base course is adjacent to a concrete walk. Contact with soil is of even greater concern. My preference is to avoid using any stone, regardless of density or porosity, in direct contact with the soil. All stones will absorb moisture to some degree, and depending on the chemistry of the soil, they may also wick staining agents up from the soil. If contact with grade is unavoidable, the detail I would recommend is the rock-filled trench drain detail found on page 13 of the Indiana Limestone Handbook. This keeps the face of the stone free from the constantly moist soil condition. August 2006

Q: We are looking at a potential limestone project. The material is 2” thick and the back up structure is concrete floor decks with metal studs running from deck to deck. They are covering the metal studs with 5/8” plywood sheathing. They are planning to use slots, in lieu of continuous kerfs, and attaching the limestone restraint anchors directly to the sheathing. Is this advisable, or should they use continuous kerfs so they can attach the anchors to a stud?

A: I definitely would not attach to the sheathing. The 5/8” plywood sheathing would be effective in transferring uniform loads to the studs. The stone anchor connection is a concentrated load. The sheathing is not likely to be of adequate stiffness to effectively transfer this concentrated load to the studs. I’m also not a big fan of using strap-type anchors in a continuous kerf. Generally, a plunge-cut, half-moon shaped, local anchor slot will test out with slightly better strength than a continuous kerf with the same strap anchor. Using the continuous kerf will also require you to properly fill more kerf length to prevent water collection. Thirdly, and perhaps most significant, is that using the continuous kerf puts the responsibility of determining
the anchor positions in the hands of the mechanic that is installing the stone. This is actually an engineering decision, and beyond the scope of what he/she has been trained to do. When trying to locate anchors coincident with studs, the continuous kerfs would make it possible for the anchors to be positioned in an asymmetrical pattern, where one anchor is required to carry far more load than it is designed to carry. My preferred detail for this condition would be per detail #2 on page 15-D-2 of the MIA Dimension Stone Design Manual VII. The detail calls for a horizontal track (which could also be a channel or an angle) to carry the loads back to the metal studs. With the addition of this horizontal member, the anchor slots can be positioned at the optimum locations in the stone panels. January 2007

Q: I am an interior designer and I’d really like to put limestone countertops in my client’s kitchen because of the neutral grey color. I spoke with a local fabricator and he says he does not recommend it for kitchens. I know it’s recommended because I’ve seen it in home magazines. Is there some literature or document that I can cite to prove this?

A: What is shown in a magazine isn’t necessarily the most practical application, nor is it to be taken as an industry recommendation or endorsement. It is certainly possible to use limestone as a kitchen countertop, and there are many successful applications in service. It is absolutely paramount that the client be advised of the vulnerabilities of the product before selecting it. Limestones have varying porosities, and some can be quite high. Despite the availability of modern, high-performance impregnators, the stain resistance of the higher porosity varieties of limestone may be less than that desired by your client. Limestones are based on a building block of calcium carbonate, which is attacked by relatively mild acidic solutions commonly found in a kitchen setting. This stone type would require significantly more care and maintenance attention than other varieties of stone in this application. Only if the client is aware of, and agreeable to these issues, can it be successfully used. January 2007

Q: I’m an architect in Florida, and I designed an exterior terrace area using 5/8” limestone panels vertically at planter and as cheek walls at the stairs. I detailed a quirk miter at all of the vertical corners. The contractor wants to change the detail to lap joints, because according to him the stone is too soft for the original detail and the quirk miters will chip. Does he have a valid point, or is he just trying to cheapen up the job and save some money?

A: He does have a valid point. The MIA recommendations for any exterior panel in any stone type would be for a 3/4” minimum thickness, and 1-1/4” has some significant advantages for anchored panels. I personally wouldn’t detail a quirk miter for any exterior stone panel of 5/8” thickness due to the chipping vulnerability. While there are a wide variety of limestones in the marketplace, it is generally one of the softer types of commonly used dimension stone. This makes the installation even more vulnerable to chipping. The contractor, in this case, is trying to do you and your client a favor by requesting this detail change. Depending on the fabrication equipment used for the job, it would likely be a small cost savings to him as well. The lap joint requires a finished edge on one piece, while the quirk miter requires extra fabrication on both pieces. If there is a huge quantity of this detail, it might be worth requesting a credit for the detail change. If there are only a few conditions of it, the cost of processing the change order may be more than the credit is worth. November 2007

Q: We have a pattern floor consisting of Rosa Levanto, Crema Marfil, Portoro, and Juan Sienna marble. The Juan Sienna is crumbling. What is causing this, and what can we do to correct the situation?

A: The Juan Sienna is a limestone that has undergone partial metamorphous and is marketed as a group “C” marble. These types of stones commonly have silt deposits in the lines of separation. Silt expands on contact with moisture, and normal traffic will abrade the silt from the face of the stone. The density of the silt is reduced until there is an eventual void in the stone. I recommend cleaning the voids and filling with a color-blended resin. 2002

Travertine

Q: I’ve been specifying Roman Travertine for my projects for nearly my entire career, and it has been used by others for centuries. The absorption is low – it is well under 1%. Now I’ve been told that the standard has been changed to 2.5%. Can I still specify this material?

A: Prior to 2002, travertine was covered under the marble specification, but travertine is not marble and it has unique properties. Recognizing this, ASTM Committee C 18, which governs all ASTM dimension stone standards, published a new standard specific to travertine dimension stone. ASTM C 1527, Standard Specification for Travertine Dimension Stone, was adopted in 2002. January 2005

This standard established the absorption value for travertine, tested per ASTM C 97, at 2.5%. Unlike other physical properties where minimum values are established, absorption is the only property where the established value is a MAXIMUM value. Therefore, Roman Travertine easily complies with this specification.

Q: I have just had filled travertine from Turkey installed in my home. The fill is coming out of the stone and it is very soft. What should I do?

A: Too much color will kill the cure of the mortar-based fill and leave it “soft.” The only possibilities are to live with the situation, dig the fill out and refill it, or remove and replace the stone. 2002

Q: Is there a limit to the voids in a travertine?

A: No, neither size nor frequency of the holes is limited. There is a recommendation that larger holes (> 20 mm
diameter or holes penetrating full thickness of the slab) be filled with a stone chip in addition to the cementitious or resinous filler (Ref MIA Dimension Stone Design Manual VII page 12-3). November 2005

Q: We are evaluating a travertine for use as exterior cladding on a large project in China. We have completed accelerated weathering tests using rapid freeze/thaw cycling and sonic modulus of elasticity. The flexural strength results, post freeze/thaw, are rather low - they average about 2.0 MPa. The sonic modulus was still dropping when we finished the tests at 150 freeze/thaw cycles. Should we be concerned about the low flexural strength?

A: The 2.0 MPa (±290 lbs/in²) flexural strength is very low indeed, but a cladding attachment system could be engineered to safely restrain stones of this strength. It may require increased thickness, smaller panel sizes, increased or optimally positioned connection locations, or a combination of these and/or other solutions. As stones with similar flexural strengths have been successfully used in cladding applications, I wouldn’t necessarily abandon the stone selection based on the flexural strength alone. A bigger concern to me is the fact that the sonic modulus of elasticity is still dropping at 150 cycles. The sonic modulus of elasticity is performed at regular intervals (every 25 or 50 cycles) during accelerated freeze/thaw conditioning to allow us to track the strength degradation. Since we can test for modulus of elasticity nondestructively, it allows us to put the same test specimens back in the chamber and continue the freeze/thaw cycling. The modulus of elasticity value in itself is not of great importance, but we know that there is a relationship between it and the flexural strength. These data can then be graphed and indicate to us at what point in the freeze/thaw cycling did the tests specimens loose strength, and more importantly, is there a point where the strength loss of the specimens no longer occurs or occurs at a much reduced rate. What we normally see, depending on the type of stone, is somewhere between 50 and 150 cycles the graph will level out. This indicates that the stone has somewhat stabilized, and the rate of strength loss after this point is greatly reduced. Because the stone you are testing is still dropping strength at 150 cycles, you haven’t reached this point. There is little confidence that the 2.0 MPa wouldn’t be further reduced with continued cycling. One could suggest retesting the materials and increasing the total number of freeze/thaw cycles to perhaps 300 in hopes of seeing stabilization in later cycles. Unfortunately, if a travertine is going to show this stabilization, I would expect it to have occurred within the first 150 cycles. I wouldn’t be too optimistic about seeing anything other than more strength loss. Personally, my opinion would be to abandon the stone selection and start looking for an alternate material. July 2006

Q: We recently replaced the floor in our hotel lobby with travertine. It’s been in service for about 3 months, and we’ve noticed all kinds of little holes showing up in the flooring. Did we get a poor grade of travertine?

A: This is one of the more commonly fielded questions in the MIA technical office. No, you did not get a poor grade of travertine. You simply got travertine. There are many varieties of travertine on the market, sourced from a variety of continents. One thing they will have in common is voids within the stone fabric as a result of trapped gasses during their formation. This is a classic characteristic of all true travertines. During fabrication of the material, these voids can either be filled or left unfilled. In today’s marketplace, it is much more common to fill them, and the filler material will be either cementitious or resinous. During the filling process, all voids that “window” through the face of the stone slab are filled, and the filler material is then ground to an even plane with the stone slab face in the finishing process (reference graphic below). Voids occurring within the stone slab do not get filled in this process, since there is no way for the fabricator to access them. What you are seeing are voids that occur very close to the stone face, yet were not exposed and therefore not filled. A very thin shell of stone provides a roof over this void, and when a small concentrated load is applied at this point, the fragile shell of stone yields to the load and fractures into the void space. Rolling loads from hard (non-pneumatic) wheels and spike heels are two of the more common causes of these fractures. Fleuri cut travertine will have a higher incidence of these
than would vein cut, and today’s market seems to be dominated by fleuri. The high frequency of rolling loads in the form of luggage carts found in hotel lobbies will expose these voids in a relatively short time. One could argue that this material selection wasn’t perhaps the most appropriate for this application, although there are certainly a great number of travertine floors in hotels. The MIA Dimension Stone Design Manual VII (page 12-12) documents this behavior of travertine, and also clarifies that it is both acceptable and common practice to fill these voids in place as they become visible. Once the floor has been in service longer, most of the barely subsurface voids will have been exposed, and the discovery of newly formed holes will be reduced. It is akin to a “break-in” period for a travertine floor. A second possibility for what you are seeing is that surface voids in the material were filled in the fabrication process, but overly aggressive maintenance practices are dislodging or eroding the filler. I would suggest reviewing the maintenance with your staff to ensure that spray nozzle pressures and stiff brushes are not removing filler or grout materials. September 2007

III. Countertops & Tabletops

Q: We typically use silicon in countertop seams. A competitor told one of our customers that this is an unacceptable practice. Is there a document that substantiates the use of silicon?

A: It is an acceptable practice, and MIA’s Residential Countertop Module (Pg 23) discusses advantages and disadvantages of various joint fillers, including silicon. All practices vary by region, and the use of silicon as a seam filler is not very popular in many regions. Most residential customers seem to favor the harder-curing materials. May 2005

Q: Does the MIA have a documented standard on the maximum length of countertop pieces?

A: There is no established maximum length of individual pieces. Maximum length is influenced by stock availability, stone soundness, thickness, cutouts, handling equipment, and in some cases, jobsite conditions. To arrive at a general rule for maximum length would be impossible considering all of the variables involved. I am aware of some fabricators that have a general rule of not exceeding a given length for pieces with shop-finished sink cutouts, but most evaluate it on a job-by-job basis. May 2005

Q: We added a seam to a countertop layout because the stock we had available was too short. Now the customer is complaining. I need a letter telling them that it is perfectly acceptable to seam a countertop there.

A: There is no technical reason making the seam location unacceptable, but this issue is one of customer communication rather than compliance with industry practice. Our member companies handle this in many different ways. Some simply state on their contracts and/or shop drawings that the fabricator is the sole responsible party for locating the seams, and the customer must accept them wherever they occur. Other fabricators show the seam locations on their shop drawings, and if stock availability or other issues dictate that a seam be moved or added, they seek approval form the customer prior to proceeding. Either system will work, but your customer needs to be informed up front of how the issue will be handled. If your customer is led to believe that all seam locations are affirmed, and then later are surprised by a different seam location, they will likely be upset. June 2005

Q: Which thickness does the Marble Institute of America endorse for stone countertops - 2 cm or 3 cm?

A: Both, but we don’t limit countertops to one thickness or the other. Cubic material of any thickness may be used as a countertop surface to create unique effects, and tile thickness (with appropriate substrate surface) can be used as well. June 2005

Q: What about crowns in seams? Is the distributor responsible for slab quality? As a fabricator and installer, I can’t set a countertop without lipage when the slabs are bowed. Is there a standard that limits the amount of bow in a slab?

A: Yes there is, but it is not going to help you. The only standard that I am aware of for slab warpage is the NBGQA (National Building Granite Quarries Association) Architectural Specifications. In Section 3.2 (Flatness Tolerances) of this document, the “out of- plane” tolerance for polished or honed finish granite is a maximum of 1/16” within a 4’-0” length. The document doesn’t indicate that this is to be a uniform profile, so the 1/16” variation could all occur within one foot of the 4’-0” length. And it allows both concave and convex warpage. Theoretically, you could have a countertop with a slab featuring a 1/16” convex bow adjacent to a slab with a 1/16” concave bow resulting in a full 1/8” of lipage at that seam, but the slabs would meet the NBGQA specifications. Fortunately most suppliers provide materials that are significantly flatter than what the standard allows. August 2005

Q: What is the tolerance for uniformity of overhangs of stone countertops?

A: There is no specified tolerance for this dimension. There has been discussion of establishing a tolerance for it, but we have elected not to do so. The most common reason that the overhang is non-uniform in a countertop installation is that the walls, ca’blish a tolerance for our own industry which can’t be met due to the work of related trades over which we have no control. It is perhaps a more common problem in remodel work than it is in new construction. It is also more difficult to control in remodeling work, since the fabricator is usually taking field measurements when the existing countertops are still in place. The overhang dimen-
Q: We have some etching in a Dakota Mahogany countertop where a customer accidentally spilled some rust remover on the surface. How can this happen? I know that rust removers contain some acid, but I thought granites wouldn’t etch due to acid.

A: Granites will resist attack from many types of acid. However, many rust removers contain hydrofluoric acid (HF). Hydrofluoric acid attacks silicates, and will attack the major mineral components of a true granite. If you remember back in your high school chemistry lab days, there was one acid in the cabinet stored in a plastic bottle, because if stored in a glass bottle it would eat the glass. That was hydrofluoric acid. Glass and granite are both silicates and have similar vulnerabilities. September 2005

Q: Has MIA updated the countertop installation module?

A: The last revision for the trade is 2005. However, we’ve edited it for consumers. It’s available for your clients at www.usenaturalstone.com. Hard copies are available from the MIA Bookstore at www.marbleinstitute.com.

Q: Via e-mail: We would like to know the MIA requirements for setting 2 cm stone as countertops. Is it acceptable to support it with 5/8” plywood roughtops, SOBS, wood slats, etc? Please send us back a response so we can be assured that we are doing things properly and professionally.

A: My thanks and congratulations to you for your interest in performing proper and professional installations. Those of us involved in the stone failure investigation business already have an adequate revenue stream – I’m glad to hear that you’re not planning to add to it! Actually, we have recently revised the MIA Residential Countertop Installation module to allow use of SOUND 20 mm countertops without the structural augmentation of an underlayment (a.k.a. “subtop”, “subdeck”). A copy of the complete module is available for sale through our bookstore. We made this revision, because like any industry standards association, we note successful practices from the industry and then endorse them. While our documents previously required an underlayment for 20 mm tops, the majority of the industry was installing 20 mm tops (of sound stone) without an underlayment, and there weren’t significant numbers of failures attributable to the practice. This led to our endorsement of the practice. If an underlayment is used, however, we recommend marine-grade plywood, exterior-grade plywood, waterproofed medium-density particle board, or furring strips. OSB (Oriented Strand Board) is not recommended due to the possibility of delaminating and/or swelling in excessive moisture or humidity exposures, for instance, above a dishwasher. June 2006

Q: We’ve used a lot of OSB subtops in cabinets and haven’t had problems. Why is it not recommended per the MIA Residential Countertop Module? OSB seems just as strong as plywood to us.

A: Strength or stiffness isn’t really the issue, although plywood of the same thickness is roughly 10% stiffer (meaning it would deflect 10% less under the same load) than OSB (Oriented Strand Board). The concern over OSB subtops is moisture resistance and swelling. Moisture soak tests completed by the APA—The Engineered Wood Association in plywood versus OSB showed average thickness swelling of the saturated plywood to be 6% to 8%, while average thickness swelling of the saturated OSB was 10% to 15%. If you have a 23/32” OSB, and it swells in thickness by 15%, you need to accommodate a nearly 1/8” thickness increase. In addition to simply swelling, the OSB tends to show greater swelling at its edges, while the plywood swelling tends to be more uniform throughout the panel. OSB is manufactured under greater compaction stresses than plywood, and some of this compaction is released if the product becomes saturated. Therefore, a swollen, saturated plywood panel can be expected to return close to its original dimension after it dries, but a swollen, saturated OSB panel will likely retain some permanent dimensional change even after drying. Obviously, in a perfect world, the subtop would not get wet. My general rule for water control has always been to assume that water will find a way to get to wherever you don’t want it. Perhaps the biggest area of concern is over the dishwasher, where steam frequently attacks the countertop underlayment from the underside. There is also the potential for water ingress due to breaches in seam fillers and seals, particularly at the backsplash/countertop interface and the sink perimeter. With sound stones, a subtop is not likely to be required. If a subtop is necessary, I personally would prefer to pay the price difference and get the greater stability of the plywood. August 2006

Q: We recently had a granite countertop installed. The top surfaces of the stones match up well, but there is about a 1/8” lippage at the underside of the bullnose. Our vendor says it is OK per MIA guidelines.

A: The MIA guidelines, or more specifically the MIA Residential Countertop Installation Guide, clearly states that this condition would not be acceptable. On page 5 of this document, it clarifies that the underside of an exposed edge condition would carry the same lippage allowances as the top surface, or 1/32”. A quick gauge for this measurement is a standard, plastic credit card, most of which are within a few thousandths of an inch of 1/32”. If the lippage is more than the thickness of a credit card, it is out of tolerance. August 2006

Q: We’ve been rodding countertops for some time now. We’re considering cutting the kerf a bit deeper and epoxying two rods, one on top of each other, into the kerf. How much stronger can we expect this to be over our standard single rod?
Q: We have an overhang on a 3 cm granite island top of 12". It says in the MIA Design Manual that this requires corbels or some other type of support, but it doesn’t say what spacing is allowed between the corbels. What is the maximum?

A: The requirement for support underneath a cantilevered portion of a countertop is primarily addressing the concern of tipping, and not fracture. If the granite you are using is one of the more sound varieties on the market, it could likely support any loads it would encounter in a residential environment without risk of cracking. A more likely problem is failure of the adhesive between the stone and the cabinet frame and/or subtop, in which case the only thing holding the stone on the cabinet is its own mass. A heavy, concentrated load (like someone sitting on the countertop) would not be as efficient as when there is only one rod, you may actually get less strength from two rods versus one rod. September 2006

Q: We installed a kitchen countertop with rodding along the kitchen sink about two years ago. Our customer called us today and said the countertop is cracking in front of the sink, about half way between the sink edge and the bullnose on the countertop. This would be right where we put the rod – are there any explanations for this?

A: The rods you are using are likely mild steel, and the rod is not fully covered by the epoxy. While metals used for stone anchorage are normally corrosion-resistant alloys, we allow mild steel rods for rod reinforcement of countertops because the rod is fully encapsulated in epoxy, and therefore insulated from contact with moisture. If the epoxy doesn’t completely cover the rod and some region of the rod is left exposed, a mild steel rod can corrode within the kerf. If the corrosion continues for a long enough duration, the expansion within the kerf can create a force great enough to crack the stone. November 2006

Q: I have some questions about a countertop specification on a commercial countertop project. It says they want no inclusions larger than a dime, and no variation in veining or color. Can you recommend a material that will meet this spec?

A: Yes – Plastic Laminate! You could probably find a stone variety, or cut off a stone variety, that would not have any inclusions larger than a dime. But to insist that there is no variation in color or veining simply means that the specifier didn’t like or understand natural stone. Variation is what makes a natural product so attractive in the first place. From the business perspective, we’d like to think that everyone is a potential customer for our products. From a practical perspective, we have to accept that some people shouldn’t be buying natural stone because they simply don’t have the appreciation of the natural, random processes involved in its creation. February 2007

Q: We see recommendations for the location of rodding along sinks. We have been rodding the underside of overhangs as well, but we can’t find any documents that provide the recommended spacing between rods. What is the correct spacing and/or number of rods?

A: The correct number of rods would be zero, since rodding won’t help strengthen this condition. Rodding works like reinforcing in concrete – it uses a member that is strong in tension (like steel or fiberglass) and couples it with a material that isn’t strong in tension (like concrete or stone). For the rod to contribute strength to the stone, it has to be located at the tension face of the stone while the bending stresses are experienced. In other words, there has to be an elongation of that face of the stone, which is transferred to the rod by means of the epoxy, which is then resisted partly by the rod’s own resistance to elongation. In the case of an overhang, when your 350 pound brother-in-law leans on the overhanging portion of the countertop, it is the top face of the stone that is in tension and therefore elongated. The bottom face, where the rod is located, is in compression, and the rod will offer no benefit in crack prevention when located on the compression face. You are in fact trying to push on a rope. Now, despite the preceding dissertation on why the rod is useless in crack prevention, there is one benefit to rodding this condition, and that would be occupant safety. Should the stone fracture at this condition, an unreinforced stone will fracture with a brittle behavior, which would result in complete breakage with little or no warning. This would result in a portion of the stone crashing to the floor and potentially causing injury or worse (worst case scenario would be a toddler that may
have wandered underneath the overhang at exactly the wrong moment). A rod reinforced stone would crack and hang downwards, but wouldn’t likely become completely disengaged and crash to the floor. However, if I were using such a fragile stone that I was worried about fracture in the overhang region, I think I would opt for closely spaced corbels or better yet, continuous underlamenent rather than rods to address the safety issues. The MIA guidelines on maximum overhangs (10” and 6” for 30 and 20 mm stone thicknesses respectively) are established with the concern of the entire countertop tipping off of the cabinet, more so than fracture of the rock. These guidelines assume that a stone of reasonable soundness is being used. May 2007

Q: We seamed a countertop at the corners of a sink. Our customer doesn’t like it, and she talked to our competitor and was told that “seams should ALWAYS be located at the center of the sink”. Is there an industry documented standard for seam placement at sinks?

A: Yes there is, and it is the same standard that governs the choice between chocolate or vanilla ice cream – personal taste! The graphic on page 17-D-4 of the MIA Dimension Stone Design Manual VII clearly shows that both positions are acceptable. My personal preference is to locate two seams coincident with the sink corners, as I feel these are less obvious because the discontinuity of the sink corner helps distract the eye from the seam. Others feel strongly that the center location is more attractive. I would simply advise that prior to fabrication, you inform your customer of where you intend to locate the seam, and be prepared to adjust it based on their chocolate vs. vanilla bias. June 2007

Q: We are engaged in a discussion with a customer that wants us to supply a 115” length of countertop with a sink cutout in one piece, and we’re telling her it needs to be seamed. Where can I find the industry standard for the maximum lengths allowed for 2 and 3 cm countertops?

A: You won’t find an industry standard limitation for this condition, and I doubt that one will ever be produced because there are too many variables involved. There are some of our member companies that have set dimensional limits observed in their own shops, but it would be difficult, if not impossible, to establish a prescribed industry standard limitation. The soundness, thickness, strength, and stock availability of the stone material will greatly influence this decision. The size, shape, and location of cutouts required, plus the access to the installation site are factors as well. The maximum length that can be cut and safely handled is likely to be unique for every project. August 2007

Q: We just received some pre-fab granite vanity tops that are rodded with little fiberglass rods. The rods are about 1/8” thick and 3/8” wide. Are these an acceptable means of reinforcement that would be endorsed by the MIA?

A: The Marble Institute of America “recommends” the use of rod reinforcement at critical locations, such as in front of sink cutouts, but that’s not the same as mandating it. Since it’s not mandated, the particular type of rod would not actually require “endorsement” or “approval”, because it is technically acceptable to have no rod at all. With the cooperation of a few of our member companies, the MIA has just completed a comprehensive study of various rod reinforcement techniques. This study involved breaking several hundred test specimens, and incorporated different rod materials and profiles, as well as different adhesives. The data collection is complete, and we are now in the process of preparing the data into report and presentation formats so the industry can benefit from this research. What we did learn form this study is that the fiberglass rods did add strength to the stones, particularly the weaker stones, but not to the same magnitude as the steel rods. We also learned that there are really two advantages to rodding, one of which is greater load carrying capacity prior to fracture. The second benefit is a post-fracture repair, where even after the crack occurs, the elastic behavior of the rod draws the stone tightly back together to the point where the crack is no longer visible. In this regard, the steel rods were superior to the fiberglass. And as would be logically predicted, we found a large benefit to using two parallel rods as opposed to one single rod, and we found added benefit if mesh were epoxied over the rodded area. The results will vary with different stone types, with different adhesives, and will always be greatly influenced by fit, surface prep, and quality control. As a rough comparison based on the data we collected, I would say twin fiberglass rods will perform comparably, or even out perform a single steel rod. Given the narrower kerf requirement and the less labor-intensive rod prep requirement of the fiberglass, it may be easier to install two fiberglass rods than one steel rod. October 2007

Q: I was wondering if you could tell me if there is an industry standard for the width of seams in granite countertops, and the acceptable variation from that width?

A: The MIA Dimension Stone Design Manual VII addresses this on page 17-5, paragraph 10.2, which reads “Joint (seam) widths between two stone units should be a nominal 1/16” (1.5 mm), with a tolerance of ± 1/64” (± 0.4 mm). In such cases where a larger joint width has been specified, the tolerance is to be ± 25% of the nominal joint width.” Note that the text uses the word “should” as opposed to “shall”. In specifications and other directive documents, there is a distinct difference between these two auxiliary verbs. “Shall” is considered to be mandatory, and one must comply with the statement to be in compliance with the standard. “Should” is considered to be permissive, and it is interpreted to mean that the statement is one that describes good or common practice, but it is not an absolute requirement. As long as it is agreed upon between the supplier and the customer, the seam width could be whatever you want. January 2008
Q: We are doing an extensive remodel in our home. Both the interior designer and my wife have fallen in love with a selection of honed absolute black for the countertops. When we discussed the project with our fabricator he advised against it. Do you have any advice?

A: I’m in agreement with the fabricator. Honed black stones are currently popular choices in interior decorating, but many are dissatisfied with them once in service. We frequently get calls and emails regarding this issue. The most common problem seems to be fingerprints, as the residual oils from one’s skin will darken the stone. The same thing actually happens with a polished stone, but you don’t see it because the polished stone is already as dark as it is going to get. With lots of care and maintenance you could keep the honed black stone looking pristine, but most homeowners don’t want to be bothered with extra care and maintenance. Low maintenance should be one of the reasons you are selecting stone in the first place. February 2008

Q: How hot is too hot for granite countertops?

A: Normally, if the pot contains liquid other than cooking oil (fat, butter, etc.), it may be placed on the stone without causing heat damage. Frying pans that have accumulated large quantities of cooking oil along with other liquid, or pans used for frying should be allowed to cool away from the granite top. Hot, low viscosity oil may stain the stone, as well as the pot or pan being too hot for the stone. 2002

Q: Why are the black granite countertops I installed two years ago developing cracks?

A: The solid black Absolute granites do not have the same heat resistant qualities as quartz-based granites. Care should be exercised in recommending these stones for use in areas subject to heat. 2002

Q: The Absolute Black granite installed in my kitchen is beautiful. However, at the junction of two stones the joint was irregular due to variations in the flat polished face of the stone. The contractor ground and polished the joint on site. It looked okay for a few hours, but then the area worked became very apparent. What can be done?

A: This Absolute Black was chemically treated. The treatment needs to be reapplied to the area worked in order to have a uniform appearance. Also, the stone must be ground closely, matching the last two abrasives used in polishing the face. The refinishing is a project that will take an experienced hand. 2002

Q: The stone-to-stone joint edges of all the stones in the kitchen countertop I installed curled up. I used a sub-slab. What did I do wrong?

A: Some stones are more susceptible to curling than others. In this case, the stone was cut to length along the width edge of the slab. The stone was concave when polished. This was not apparent in the shop, as the stone was mostly wet. When the stone dried out, it returned to its concave shape. 2002

Q: What is the allowable variation in overhang?

A: The purpose of overhang is to ease the countertop installation by providing an allowable variation (as required) at the junction of cabinetry to the stone. It is uniform and correct if it is uniform to the hand. 2002

Q: I want to use a hard limestone for my kitchen countertop. The supplier has recommended that I coat the stone with mineral oil and avoid sealing it. What is your opinion of the stone selection and the sealing method?

A: Generally, even hard limestone will not have the very high abrasive resistance and low absorption of granites, which are more commonly used as kitchen countertops. I doubt the mineral oil would be absorbed uniformly, and have no idea how living with the odor of the oil will be received. 2002

Q: I am having a 3/4” thick granite countertop made. The stone is “L” shaped, 8’-10” long and 48” on the short leg. Wall and cabinet on the long side support the back edge and 11” of the width; 9” of the width is supported at the side; 11” of the width is overhang on both sides. Does the overhanging portion require support?

A: Yes. The total weight of the stone is approximately 235 pounds. The overhanging portion is slightly heavier than the supported section, so the supported section of the stone will always be carrying slightly more than half of the weight. Additionally, load will probably be applied to the leading edge more than the back edge. I recommend 4” x 1/2” x 3” less than overhang dimension supports at 30º OC. Start the supports with the first one at the junction of the “L” and set at a 45º angle to the stone. Set the balance at 180º. Cut the leading edge of the support bracket to a knife-edge, so the support does not interfere with someone sitting at the counter. 2002

Q: I’m an architect designing a table base for a 2’-9” x 6’-3” x 0’-2” thick stone tabletop. Is it possible to support the table at only the 2’-9” ends?
A: I would not recommend this design. Even if the stone had the flexural strength to perform properly, eventually it will bend from its own weight. Run a small metal bar at the center of the two end supports along the 6'-3” length and you can adequately support the stone and the load it will be subjected to. 2002

Q: I have designed a table to have an onyx top and be bottom lighted. The table base will be tubular metal, and the design calls for the top to be supported only by the metal frame. Size of the base is 6' - 0” x 2' - 0”. Is a 3/4” onyx top okay for this project?

A: 3/4” is a little thin, but it can be made to work. Insure that the base sits solidly on the floor and that the tubular support frame for the onyx is true and flat. Have the bottom face of the onyx ground perfectly flat and honed. Using clear epoxy, fix a 1/8” sheet of clear acrylic to the bottom face of the stone, insuring, as close as humanly possible, 100% contact. Avoid any air bubbles or pockets. Be careful in handling; the bond of the stone to the glass will not be strong. Set the completed assembly on the metal frame and enjoy. 2002

Q: I will be constructing a 36” x 6” x 48” high monument to be erected in a park where children will be playing. I am concerned that children will be climbing/leaning and/or attempting to push it over. Any recommendations?

A: We suggest that the foundation and monument be engineered to resist/accommodate the loads and forces as required by the building code. The completed monument should require somewhere in the neighborhood of a 2,000-pound horizontal force at the top in order to move it. 2002

IV. General Topics

Q: Do the legs of a hairpin anchor connect inside the stone? Where can I purchase them?

A: The legs do not connect inside the stone. A hairpin anchor is used for anchoring stone veneer panels to a precast concrete backer. The portion of the anchor that extends in the precast is fully encapsulated in concrete, and the “legs” portions of the anchor extend into predrilled holes in the stone. When tested to failure, the mode of failure is usually a conical failure in the back surface of the stone. Connecting the legs of the anchor, despite the difficulty of doing so, would not increase the strength of the anchor since the area or depth of the conical failure would not be increased because of it. There are two styles of hairpin anchors - one where the legs point inward and one where the legs point outward. The outward pointing variety is more common in modern construction. There are several MIA member firms that sell these anchorage devices. Consult your MIA Membership Directory—either print or online. August 2005

Q: During a recent countertop installation, we cut two electrical box cutouts into backsplashes using diamond blades. We did the cutting on saw horses in the customer’s driveway, and we swept up the mess when we were done. Two days and 3 inches of rain later, they have a rust stain in the driveway which they say is our fault. Is it possible that the rust stain came from the granite?

A: If there are corrosive minerals in the stone, they would be at trace levels, and cutting with a diamond blade does not put any metallic part of the blade in contact with the stone. The rust is from some other source. October 2005

Q: I’m looking at a quarry’s literature and a recent laboratory test report for the same stone. The laboratory report shows lower numbers for many of the properties. Shouldn’t the two documents match?

A: Not necessarily. All quarries will produce stone of varying properties and qualities. As quarry operations continue over years, the portion of the quarry that is being harvested will move both vertically and laterally within the deposit, so the stone properties may change. Sometimes this change is dramatic. There may be a variety of test data available to the quarrier when they print their marketing literature, and for the purposes of marketing, they will often choose to publish the most impressive numbers that they can substantiate. Subsequent tests from the same quarry may not meet these numbers consistently. October 2005

Q: What is the recommended spacing for weeps?

A: The MIA general recommendation is 5'-0” on center horizontally (Ref: MIA Dimension Stone Design Manual VII, Page 15-4 (3.3.5). October 2005

Q: My daughter lives in the New Orleans area, and she has granite countertops in her kitchen. Her home was flooded as a result of the post-Katrina floods. Is there any way to sanitize these granite tops so that they would become safe food preparation surfaces again?

A: This question has predictably arisen with frequency from that region of the country. We have also been receiving several calls regarding slab material that was stored in wholesalers’ or fabricators’ yards during the flood. My answer to this question is rather simple – I don’t know. And that’s one of the perks of this job. One doesn’t need to know all the answers – one simply needs to know someone who does. So I consulted with the microbiologists at Hospitality Institute of Technology and Management. I’ll paraphrase their response below: This question can be answered with absolute confidence as a result of the study that we performed in countertop surface cleanliness in 1999 (Reprinted with permission in the Marble Institute’s Technical bulletin on Countertop Sanitation in June, 2004). If you recall, we tested six countertop substrate...
surfaces by intentionally inoculating them with E. coli bacteria. We then washed the surfaces with common detergent and rinsed them. After taking readings of the residual bacteria, we then cleaned the countertop surfaces with a diluted solution of household vinegar. The bacteria reductions in the granite surfaces were very impressive, and proved to us that the bacteria produced a surface contamination only, without significant penetration into the stone. The murky flood waters as a result of Katrina held nothing more dangerous, and in fact a lower level of concentration, than would be found by placing a raw cut of chicken meat on one’s countertop surface. Using the same cleansing method as in our 1999 studies, these countertop surfaces can definitely be sanitized to once again become safe food preparation surfaces. First, wash the surface thoroughly with water and detergent. Then prepare a dilute vinegar solution. You need only an acidic concentration of 200 ppm (parts per million) or greater to be effective. Since common household vinegar is approximately 5% acidic, you need a vinegar-to-water ratio of about 1:250, or about one tablespoon of vinegar to one gallon of water. Wipe the surface thoroughly with this solution in alternating directions, rinse with clean water, and allow to dry. An alternative to the vinegar would be bleach, in approximately the same concentration. If using bleach, one should be mindful of the fact that bleach in itself is toxic, so the rinsing process becomes much more critical. (Note that the MIA does not normally suggest vinegar as a countertop cleaner, but in this case, and with the low concentration required, it seems to be the prudent choice.) December 2005

Q: We are planning to fill some anchor slots with epoxy. It was suggested to us that epoxy grout might be better. Which is preferred?

A: My personal preference is neither, as the epoxy-based fillers are generally too rigid and tend to restrict the ability of the anchor to flex within the slot. I prefer to use a non-staining, high modulus, elastomeric material in anchor slots. In cases where anchor movement needn’t be accommodated, and the rigid epoxy is desirable, the answer depends on the volume of epoxy being used. If, for example, the application involves a pin fitted to a snugly drilled hole, then epoxy is fine. If the application involves a larger void to be filled, epoxy can be problematic. Since the curing of epoxy is “exothermic”, or heat producing, large volumes of epoxy can generate levels of heat that actually reduce its strength and/or bond. In those cases, epoxy grout is preferable, since the sand in the grout displaces some of the epoxy thereby reducing the amount of heat generated, and also provides some thermal mass to dissipate the heat energy. Bear in mind that when using any adhesive in an anchor slot, the adhesive bond must be intentionally prevented when testing the anchor to determine capacity (ref: ASTM C 1354; Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone). This is commonly done by the use of a divorcing shield such as cellophane in the anchor prep or on the anchor surface. This practice is required because stone clad buildings are generally designed for long service lives, and the assumption is that during this extended time, the adhesive bond will either be reduced or fail. By testing the anchor without allowing the adhesive to bond, we are verifying its capacity by mechanical means only. March 2006

Q: How can I find out what the fire rating is for a particular stone?

A: A fire rating is based on a wall construction assembly, and is only valid for assemblies built with that exact composition and dimensions. Since all stones are unique, no one has ever invested in the testing required to establish this rating, as it wouldn’t likely be transferable to the next project. Compliance with fire rating requirements are normally done by building a fire-rated wall behind the stone cladding, generally with gypsum board. Stone is recognized as a fire resistant material, which is documented in the MIA Dimension Stone Design Manual VII, page 5-13. March 2006

Q: I am detailing a staircase using 2” thick treads. Is there any reason for the risers to be that thick? I’d like to make them 3/4” thick to save on cost.

A: The cost savings would be minimal, and in fact, it could be an additional cost in some cases. Many of the narrow riser pieces can be laid out with the larger tread pieces utilizing portions of the slab that would otherwise be unused, so there is a layout efficiency to be gained by keeping both stones the same thickness. A more important issue would be that of color control. When a sawyer saws a stone block, the block will generally be sawed to slabs of the same thickness. If you are using stone of two different thicknesses adjacenty, you are nearly guaranteeing that the material will come from two or more different blocks. Depending on the consistency of the quarry and the relative distance between the blocks in that quarry, this may be significant. Detailing the two tone elements in the same thickness could likely be the most cost effective, and also provide the best looking installation. April 2006

Q: We own an old house in the Historic District of town. The sidewalk in front of our home is made of marble slabs. The slabs are approximately 2” thick and vary in size from 3’-0” x 0’-6” to 3’-0” x 5’-0”. The city is currently repairing sidewalks in our area, and they want to remove the marble sidewalk and replace it with concrete! They claim that the marble is too dangerous for pedestrians when wet. This sidewalk has been in place for 100 years, and I’ve yet to hear of any injuries. The city has also said that if the marble is left in place, they will need to reset it, on concrete. To my knowledge, it is set in sand. Do you have any publications or information I could furnish to our city engineers about this use of marble and how it should be set?

A: Historic preservation is a noble desire, yet it cannot be prioritized over public safety. It could very well be that...
the marble slabs represent a slip/fall hazard when wet. Just because you are not aware of any injuries, there may have been some, as slip/fall accidents are frequently unreported unless there is significant injury. There is also no guarantee that the first serious accident in 100 year’s time won’t occur tomorrow. What can be asked of the city is, “What are the criteria for determining the adequacy of a walkway’s slip resistance?” There should be a prescribed method of measurement and a minimum static coefficient of friction documented by the city for them to deem the surface unsafe. There are many test methods for measuring friction, and the results don’t necessarily correlate well from one method to the next, so if they require a value, they also should specify the test method used to measure that value. Assuming this exists within the city engineer’s office, the remedy does not have to be removal and replacement of the marble. The surface could be textured either abrasively or chemically to increase the frictional properties of the walkway while still retaining the original marble slabs. If the slabs are currently set in sand and stable without excessive lippage between adjacent pavers, there is no reason why they cannot be set in sand again. This is a perfectly acceptable method of installing stone pavers. If they are not stable or free of lippage, the city engineer may have a very valid suggestion in modifying the setting method to improve the performance and safety of the walkway. May 2006

Q: We have a project in northern California that requires a Chinese slate with adhered attachment up to 75 ft. heights. What’s the best way to do it?

A: The best way is to not do it. The MIA recommendation of not exceeding 8'-0” heights is admittedly very conservative, and currently under review due to the recent advancements in both the performance and reliability of adhesive products. While I'm aware of products currently available that carry manufacturer’s warranties to 30 ft heights, 75 feet is simply out of the question. Particularly with a slate, which may still retaining the original marble slabs. If the slabs are currently set in sand and stable without excessive lippage between adjacent pavers, there is no reason why they cannot be set in sand again. This is a perfectly acceptable method of installing stone pavers. If they are not stable or free of lippage, the city engineer may have a very valid suggestion in modifying the setting method to improve the performance and safety of the walkway. May 2006

Q: I need your opinion. We’re having a big argument in our office about this and we need to know who is correct. Which is more porous – marble or granite? I think it’s marble.

A: Yes, you are definitely having a big argument about it, as of about 5 minutes ago I received an email from your colleague asking the same question! The answer isn’t quite as simple as you may have hoped, and there will be neither a clear winner nor a clear loser in your argument. “Porosity” is defined as “the ratio of the volume of a material’s pores compared to its total volume.” Under normal circumstances, we don’t actually make an attempt to measure the true porosity of a stone. What we do measure is the stone’s absorption, which we accomplish via the ASTM C 97 test method. In this test, we first oven-dry the test specimens for 48 hours. The test specimens are weighed at the 46th, 47th, and 48th hours to ensure that the weight is constant, and the drying period is extended if necessary until we achieve 3 consecutive hourly weights of the same reading. We then immerse the test specimens in water for 48 hours, or longer, to again achieve 3 consecutive uniform weight readings. Assuming that we achieve a state of full saturation when doing this test, it would give us a measure of the stone’s porosity by simply indicating how much water volume was taken into the pores of the stone.

When reporting the results of this test, the absorption of dimension stones is expressed as a percentage by weight. The minerals that make up a dimension stone are much heavier, anywhere from 2 to 3 times heavier, than water. So if the stone has a specific gravity of 2.5, and the absorption is 0.4% by weight, the volume of water absorbed into the stone would be 2.5 times more. The pore space within that stone would actually be about 1% by volume. If we look to the ALLOWABLE absorption, marble, per ASTM C 503 is allowed up to 0.20%, and granite, per ASTM C 615 is allowed up to 0.40%. Based on this, the granite is allowed twice the absorption (by weight) that marble is allowed. Looking at data from actual stones, we will find very few granites that are actually in this range, with most of them in the 0.10 to 0.20% range. We will also see that while there is perhaps more variability in the marbles, many of them are also in this same range. So if you are talking about the ALLOWABLE absorption, then granites are allowed higher porosity than marble. If you are talking about the ACTUAL absorption, it is specific to the particular stone, and it could be either the granite or the marble.

June 2006

Q: We are installing an exterior stone façade using stainless steel strap anchors. Our supplier says the anchors are of both type 302 and 304 stainless steel, as was specified. The architect visited the jobsite this morning and tested the anchors with a magnet. Since they stuck to the magnet, he insists they can’t be type 302 or 304 stainless since these metals aren’t supposed to be magnetic. Is our supplier giving us the wrong anchors?

A: No, your supplier is likely supplying exactly what was specified. It is the architect who should be doing a bit more research on metallurgy. Types 302 and 304 stainless steel, in their fully annealed state, are essentially nonmagnetic alloys. Both metals, however, when cold worked, will become weakly magnetic. Since you are using strap anchors, the strap anchors have been cold-worked into their current bent shape, and that is the cause of the magnetism detected by the architect. Field testing with a magnet is not a reliable means of determining the metallurgy of an anchor. October 2006

Q: We are doing a multi-unit installation for a particular general contractor who is very concerned about what sealer we are going to apply. They want an assurance from us that we are using the best sealer available. What type or brand of sealer do you think is the top of the line product and is best to prevent liquid from passing through? Which products does MIA endorse?
Q: We are specifying a marble tile and requested data from the supplier on the material’s abrasion resistance. The data we received is from European testing – what is the conversion to our ASTM value for this property?

A: Many of the physical properties of stone, such as flexural strength and compressive strength, are tested with similar fixtures and similar procedures whether the test method is a CEN test method or an ASTM test method. Unfortunately, abrasion resistance is not one of the test methods performed similarly between the two different standards organizations. Most likely, the data that you have was reported as a result of the EN 14157 test method, and there is no linear correlation to the ASTM C 241 results. You will have to have the material tested per ASTM C 241 to document compliance with your minimum abrasion resistance specification. You also have the option to test it per ASTM C 1353, which uses the Taber Abraser in lieu of the custom built C 241 apparatus. There are more laboratories with Taber Abraser equipment than C 241 equipment, so it might be easier to source a vendor for this test. The results of Taber Abraser test method will correlate to C 241 values quite well in the softer stone varieties. In harder stone varieties, the test method sometimes fails to abrade the test specimen, and actually just polishes the stone. For this reason, we still hang on to the C 241 procedure despite the scarcity of the equipment. February 2007

Q: I have a customer that is concerned with a granite installation. The granite is “St. Cecelia” and has a heavy grain. When you look at the vanity top the grain runs front to back. They said the grain should run left to right and I can’t find a point of reference to dispute this.

A: There is no documented right or wrong direction for the grain to run. Generally, in stones with pronounced, linear veining, the slabs are supplied with the vein direction more or less parallel to the long edge of the slab. For this reason, it is much more common to see the vein direction running from left to right, or roughly parallel with the front face of the cabinets. Most of these stones have some degree of anisotropic (directionally specific) strength properties, so there is a strength advantage to consider for long, narrow pieces, or for pieces with sink cutouts. Yet there is no document that says it is “wrong” to run the primary veining trend from front to back. Since your customer doesn’t like it, and it appears as if the layout direction wasn’t discussed prior to the installation of the material, I’m predicting that you’re going to lose this argument and end up replacing the top. March 2007

Q: We’re constantly getting asked by our customers what cleaners are safe for their granite countertops. Is there a cross reference guide available that would clarify which of today’s commercial cleaners are safe for which types of stones?

A: The general recommendation would be to use a low concentration of neutral soap, or alternatively a low concentration of mild liquid dishwashing detergent, in warm to hot water. Our American mindset of “more equals better” frequently causes people to use unnecessarily high concentrations of detergents. This doesn’t make the countertop cleaner – it only leaves films or streaks. Some homeowners feel that they need something more aggressive to ensure the safety and sanitation of these surfaces. They generally don’t need anything more aggressive, but we seem to have a difficult time convincing them of that. Many of the stones used in this application, particularly true granites, would in fact tolerate regular use of harsher chemicals. I have granite tops in my own home that I have repeatedly wiped down with vinegar, just to prove to people that it causes no ill effects. While I happen to know that that pavements are seldom adequate for vehicular loading. The bending stresses experienced by a solid material are inversely proportional to the square of its thickness. So a 30 mm thick stone has only about 36%, or just over one third, of the load carrying capacity that a 50 mm stone of the same type would have. There are many other factors that must be considered in this design, such as substrate rigidity, setting bed compressibility, paver size, and the type of vehicles that will traverse the installation. Don’t forget to include emergency and maintenance vehicles when considering traffic loads. My suggestion would be to compile this information and retain a consulting engineer to review the system using finite element analysis. March 2007

Q: We’re planning on using black granite from India for an exterior pavement which will have vehicular traffic. The supplier says we can safely use 1-1/4” thickness, since the flexural strength of the stone is very high at 31 MPa. Is this correct?

A: It might be, but flexural strength is only one factor in this analysis. While 31 MPa (4,500 lbs/ in²) is an impressively high flexural strength, 30 mm (1-1/4”) thick stone pavements are seldom adequate for vehicular loading. The bending stresses experienced by a solid material are inversely proportional to the square of its thickness. So a 30 mm thick stone has only about 36%, or just over one third, of the load carrying capacity that a 50 mm stone of the same type would have. There are many other factors that must be considered in this design, such as substrate rigidity, setting bed compressibility, paver size, and the type of vehicles that will traverse the installation. Don’t forget to include emergency and maintenance vehicles when considering traffic loads. My suggestion would be to compile this information and retain a consulting engineer to review the system using finite element analysis. March 2007

A: MIA doesn’t officially endorse any particular product or brand of sealer. We have numerous member companies who are involved in the manufacture, distribution, and sale of sealing products for natural stone. While I may tell someone that I’ve had good results using product “X” manufactured by company “Y” for a certain stone type in a certain application, I couldn’t responsibly say that it is the “best”, since I haven’t had direct experience with all of the sealing products from all of the companies on all of the stone types. Comprehensive testing of sealers is rather difficult and time consuming due to the number of variables involved. The testing with which I have been involved, the formal presentations and education sessions that I have attended, and the informal discussions I’ve held with applicators seem to agree that there is no universally “best” product. There exists a “best” product for every situation, depending on stone type, the types of staining agents, exposure, and maintenance practices. If any of these variables is changed, then a different product may perform better. And in many cases, the stone will perform just fine with no sealer at all. November 2006

A: The general recommendation would be to use a low concentration of neutral soap, or alternatively a low concentration of mild liquid dishwashing detergent, in warm to hot water. Our American mindset of “more equals better” frequently causes people to use unnecessarily high concentrations of detergents. This doesn’t make the countertop cleaner – it only leaves films or streaks. Some homeowners feel that they need something more aggressive to ensure the safety and sanitation of these surfaces. They generally don’t need anything more aggressive, but we seem to have a difficult time convincing them of that. Many of the stones used in this application, particularly true granites, would in fact tolerate regular use of harsher chemicals. I have granite tops in my own home that I have repeatedly wiped down with vinegar, just to prove to people that it causes no ill effects. While I happen to know that that pave
practice is safe for the particular granite in my home, I can't guarantee that the same is true for another granite. Stones are complex, heterogeneous materials, and even stones that are included in the broad commercial definition of "granite" may contain mineralogy that is attacked by certain cleaning agents. Producing a reference guide such as you are describing would be a Sisyphean task due to the number of stones on the market, all of which are uniquely different products. The number and variety of cleaners on the market is constantly changing as well. My suggestion for dealing with this question is to provide the cleaner with your own testing laboratory when you supply the stone. As the countertops are cut in your shop, there will always be some edges or ends of slabs that are discarded. Simply make a few extra cuts in this waste stock to provide a few pieces that are about 6" x 12". Label them with all of the information that you have on the stone (type of stone, primary mineralogy, country of origin, etc) and give them to the customer when the tops are installed. Instruct the customer that if they want to use any commercial cleaners on their stone tops, they should first test the cleaner rigorously on one of these sample pieces to ensure that there is no adverse reaction in the stone. Providing these simple attic stock pieces offers a little edge on customer service and saves you from fielding some future calls to which you really don't have the answers. Plus, for high-volume shops, it could mean 25 to 50 tons of waste material every year for which you don't have to pay for disposal! April 2007

Q: With the growing of the big sized tile market, we have been receiving many requests from our customers for sizes like 36 x 36 or 30 x 30 inches in 3/4” thickness. However it seems to be that the suppliers are not precise on the gauging and squareness of those tiles and we are receiving some complaints from our customers. Do you have any standard tolerance on materials in these large sizes?

A: The MIA defines a “tile” as a stone that does not exceed 24” in its major dimension and is less than 3/4” in thickness. The products that you are describing are not considered to be tiles, but dimension stone. They would therefore not be subject to the tolerancing and gauging of tiles, and are governed by dimension stone tolerances which do not necessarily accommodate thinset adhesive installation. This does not preclude the buyer from demanding more stringent tolerances; however they must be clearly communicated when the purchase of the stone is being negotiated. May 2007

Q: We’re installing a stone façade using T-31 anchors and clip angles. We’re using a plastic shim between the clip and the stone, but when we submitted our shop drawings with our engineer’s calculations, the architect rejected the detail because the clip angle is galvanized mild steel – he says it’s a stone anchor and therefore needs to be stainless. Is he correct?

A: No, stainless steel would not be required here per industry consensus documents and standard practice. Perhaps the best document to cite would be ASTM C 1242 (Standard Guide for Selection, Design, and Installation of Exterior Dimension Stone Anchors and Anchoring Systems), specifically paragraph 6.1.1.2, where it references the use of galvanized mild steel for components not in direct contact with the stone. The MIA Dimension Stone Design Manual also references the use of mild steel shelf angles (pg 15-4), and The Indiana Limestone Institute Handbook (Pg 21) calls out only the restraint lug on clip angles as required to be stainless. There would be a requirement, as your detail includes, to have a plastic or stainless steel isolation shim between the clip and the stone (see graphic below). There are projects however, where stainless steel is specified for the clip angle component. This upgrade might be done due to an extended design service life, a highly corrosive local atmosphere, or an owner that simply wants a higher quality of construction. You should recheck the specifications and drawings from which you bid the project. It could have been a requirement in these documents and simply missed by your estimator at the time of bid. If this is the case, you would be bound by the bid documents and obligated to supply it in stainless steel. August 2007

Q: I read with interest the Marble Institute of America’s publication of the cleanliness of stone tests done by Hospitality Institute of Technology and Management. The report doesn’t say what sealer was used on the stones. Can you identify what product was used to seal the stones?

A: The stones used in that test were intentionally not sealed prior to inoculation with the E. Coli bacteria. Using a sealer would have introduced another variable, in that we wouldn’t know if the data were reproducible if the sealer were changed, nor would we know if the same cleanliness performance would be demonstrated if the sealed surface were allowed to age for a few years prior to testing. We also wanted to challenge a popular contemporary opinion that all stones require sealing to be safe food preparation surfaces. We even intentionally selected one excessively pitted stone sample for the test just to establish a “worst case” scenario. August 2007
Q: I am looking at the MIA’s Dimension Stone Design Manual, specifically detail #12 on page 15-D-9 (Exterior Stone Veneer Restraint Anchorage Details). Is there a published capacity for this connection?

A: There are no published capacities for any of the anchorage details shown in this manual. In most cases, when a stone anchor assembly is tested to failure, the mode of failure is the fracture of the stone itself. Because of this, the strength of the stone is the governing factor in the capacity of the anchor. Because we are currently dealing with an estimated 6,000 types of dimension stone on the market, all with unique properties and varying strengths, there is no guarantee that your stone will perform similarly to the stone that was used when the anchor was tested. Stone engineers will sometimes use data derived from other stone materials when they know that the stone they are using has equal or superior strength to that stone that was tested, especially when they are not using the anchor to its full capacity. If actual capacity needs to be ascertained, the only way to verify it is by mocking it up and testing it to failure. ASTM C 1354, Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone is the recommended test procedure. August 2007

Q: I’m designing a high-end residential unit with marble tile flooring covering approximately 4,000 ft² of the main level. The details are now showing the marble tile to be thin-set over an uncoupling membrane, which is on a single layer of tongue and groove OSB. The floor is framed with floor trusses and fastened to the vertical members of the trusses. In the case of floor trusses in new construction, this can be problematic, not due to the displacement itself, but due to the differential displacement between adjacent trusses. L/800 produces a significant displacement. This can be addressed very easily by incorporating a “strongback”, usually about a 2 x 6, running perpendicular to the direction of the trusses and fastened to the vertical members of the trusses. This strongback will tie the trusses together and provide “load share” between them, thus providing much more gradual curvatures in the floor deck when loaded. October 2007

Q: Is there a stone listing that provides slip resistance by granite color? Which stones provide the greatest slip resistance?

A: Actually, slip resistance, which is measured as “Static Coefficient of Friction”, isn’t really very dependant on the color of the stone at all. It is influenced by the finish on the stone, and in many cases is fabricator specific, as different fabricators use slightly different processes to produce similar looking finishes. In the installed condition, it is also influenced by sealers, cleaners, maintenance practices, and wear due to traffic. October 2007

Q: What is the size tolerance for thin (1/2” or less) stone tiles?

A: The stone should be ± 1/32” in length, width, and thickness if the top face finish is achieved by grinding. Tolerances for natural cleft and bush hammer finishes will vary with the stone employed. 2002

Q: What concerns must I address in installing thin stone tiles for use as treads?

A: The substrate must not exceed L/720 deflection and the stone must be fully supported by the installation bed. 2002

Q: A very large historic granite monument commemorating local heroes who fought in the Civil War was recently cleaned and refurbished. During the process, gold leaf was applied to areas that were first painted with oil-base paint. These areas had not previously been gold gilded. What comments do you have on this?

A: First, historic stonework should be maintained as it was originally installed. The application of gold to gild specific sections is improper. Second, it is not proper work practice to apply oil-based paint to the granite for any purpose. When stonework requires gilding, as on letters, a special clear lacquer that contains gold dust is used. This product will not penetrate and stain the stone, as oil-based paint will. 2002

Q: Our client has requested that we give a 50-year warranty on new stone work. What should we do?
**Q:** I have a project where I have to drill some very small holes, about 1 mm in diameter. Any suggestions on how to do the project nicely?

**A:** We suggest you look into using a water jet to make the holes. 2002

**Q:** We use a hook grasping the center of a slab to move stone slabs into our shop with a boom truck. Is this safe?

**A:** Maybe, depending on the stone finish, distance, and terrain. It would be better to use hooks in the mill to move stone short distances in a bounce-free area, and use slings to transport slabs in the yard. Hooks can and do slip. I have seen lifts that fit to the bottom edge of slabs work as quickly as a hook, but much more safely. 2002

**Q:** What is the proper work procedure to notch a natural stone?

**A:** Mark the notch. Drill a hole in the waste portion at the junction (1/4” diameter is recommended) of the vertical and horizontal marks. Saw the stone to the drilled hole. Horizontally move the smaller section of the stone to separate the stone at the bottom face. Grind to dimension. **Note:** The drilled hole will relieve stress at the junction and prevent crystal damage in the work. 2002

**Q:** I have to fill drilled holes in place. Can you tell me how to achieve the best possible result?

**A:** Experience counts. I recommend practicing on several scrap stones prior to working on any new holes that will be contained in the project. First examine the hole to determine which of the two methods listed below will achieve the best results. If the hole is irregular or chipped at the face of the stone, procedure “A” will yield a superior result. If the hole is nicely round and crisp, you may use either “A” or “B”. The end result is going to be influenced by the stone’s absorbency rate. Lighter color stones with higher absorbency rates will discolor more from the epoxy used in the repair. For best results, apply a microscopically small amount of epoxy to the hole prior to working to seal the stone from darkening from the epoxy.

**Procedure “A”:** Use a scrap stone of the same variety. Make a plug using a core drill with an inside dimension equal to the diameter of the hole. Coat the edge as above with epoxy and let cure. Coat the hole with epoxy and insert the plug so that it is about 1/32” higher than the adjoining surface. Allow curing. Grind down and polish. The result will be almost perfect.

**Procedure “B”:** Coat the hole as above. Make a very thick paste of stone dust and epoxy. Fill the hole slightly above the face. Allow curing, then grind smooth and polish. 2002

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**Sealers & Resins**

**Q:** What kind of resin is on Fossil Brown?

**A:** Only the supplier of the slabs would know for sure. The general rule is that marbles would be treated with a polyester-based resin, and granites would be treated with an epoxy-based resin, but not everyone follows this practice. It could be polyester, an epoxy, or an acrylic. January 2006

**Q:** Do I need to seal a resin-treated stone?

**A:** Technically, you may not NEED to seal any particular stone, as we have used natural stone successfully as a countertop surface long before reliable sealers were marketed. But, since common modern practice is to seal most stone countertops, if you want similar stain resistance performance as your sealed materials, the answer would be yes. There are a variety of resin-applying processes used, some of which are more sophisticated than others. Take, for example, a typical semi-automated resin line. The sawn slab enters the resin application bay, where the resin is squeegee applied to one surface of the slab. The slab is then placed over a vacuum table, where a vacuum is applied to the underside of the slab to draw the resin deeper into cracks or fissures, and to eliminate any air pockets underneath the resin. From there it enters a heat chamber to accomplish an accelerated cure of the resin. Once the resin is polymerized, the resin coated slab is sent down the polishing line. In this process, nearly all of the resin that was so painstakingly applied and cured in the previous steps is abraded and removed from the surface of the slab. Depending on the amounts of cracks, fissures, or pits in the slab surface, it is unlikely that the amount of resin remaining on the slab exceeds 1% of the surface area. Commonly, it is well under 1%. Since more than 99% of the slab area is resin-free, the resin makes no practical contribution to the sealing of the stone. March 2006
Q: We’ve fabricated a rather porous granite for a job, and we sealed it in our shop and again in the customer’s home. It still shows water spots. We applied the sealer liberally and rubbed it in with a cloth very carefully. Is this stone just not sealable?

A: The key word in your question that I heard is “cloth”. Most sealer manufacturers, or more correctly impregnator manufacturers, do not recommend applying the product with a cloth, paper towel, or sponge. Cloths, paper towels, and sponges are designed to absorb things from surfaces, as opposed to apply things to surfaces. Application of a sealer with a cloth is likely to result in a high percentage of the solids being retained in the cloth, preventing them from being applied to the stone surface. A less than optimum performance of the sealer is the result. If you check the application instructions from the manufacturer, you will find in most cases they will recommend application by brush or roller. Once you’ve verified that the application is being performed in accordance with the instructions, you can try resealing it. There are some extremely high porosity stones in the market, and some will benefit from multiple (even up to 5 times) applications. However, water spots may still develop even after multiple sealer applications, particularly if the water is given significant dwell time to penetrate the stone. November 2007

V. Definitions & Explanations

Q: When writing my specification for marble, do I need to identify the soundness classification of the marble in the specification?

A: No – the soundness classification has been established for the material. Specify it by its recognized trade name, ideally including the quarry location. The soundness classification is something that has been documented for that material, and it cannot be changed by specification. The responsibility of the design professional is to evaluate the material and verify that it is an appropriate selection for the intended application. April 2005

Q: I was asked to provide a K Value for a granite panel. What is it, and why would anybody need it? I’ve never been asked for this before.

A: The person asking for this data is doing some type of heat transfer or heat loss calculation. K values, U values, and R values have to do with thermal conductivity, transmission of heat energy, and resistance to transmission of heat energy respectively. A K value, being the measure of thermal conductivity, is a measure of how rapidly the material conducts heat energy. It is normally expressed as Btu/hr/ft/°F. If a material had a K value of 1.0, it would mean that in one hour’s time, one Btu (British thermal unit) of heat energy would pass through one square foot of the material if it were one inch thick and the temperature difference from one side to the other was one degree Fahrenheit. A U value is a similar measure, but is used when one is talking about the heat transmission through an assembly of different materials, as would be found in a typical building envelope wall construction. R value is a measure of the resistance to heat transfer, and is the reciprocal of the U value. An R value can be calculated for an individual material if the K value (K) and thickness (d) are known, as R=d/K. Therefore, a low K value material has a high R value, and a high K value material has a low R value. Granite, because of its high density, is a rather good conductor of heat and therefore a rather poor insulator. I use a “generic” K value for granite of 12.6 btu/hr/ft²/in/°F, although a specific granite would likely have a different value due to its unique density and mineralogy. February 2006

Q: Can you please provide me with the test data for Absolute Black granite?

A: While we do keep a partial library of physical property data for various dimensions stones, the best source for this information is via the supply chain. With the overwhelming amount of natural stone being used in the market today, and the ever popular name games that are played, taking physical property data from a general file does not guarantee that it is representative of the actual product which you are purchasing.

To the case in point, there are many absolute blacks in the world from over 6 countries, each country may have more than one quarry and even within the quarry and depending on the date of the tests, the data will change.

I realize that many distributors do not have the data available for the stones they import, but making this data available to their customers is a requirement to market the material. My first preference is having the material tested in a domestic laboratory where I can have access to the laboratory. Depending on the country from which the material is imported, the laboratory in the exporting country may be capable of performing tests compliant with ASTM procedures, or they may have documented procedures which produce reliable, similar data that can be converted to verify compliance with ASTM specifications. If, as an industry, we persistently request these data from our suppliers, we hopefully will see the day when this information is readily available from all suppliers.

This may also help reduce the name changing game, in that changing the name of a material for marketing and/or specification purposes would require retesting under the new name. This would add considerable cost to the practice. In this regard, ours is an industry with poor control. You wouldn’t buy a box of cereal at your local supermarket without having the nutritional data available to you. Why should we be expected to buy a stone slab without having the basic product information available to us? My thanks and compliments to those suppliers who are already making this information available to their customers. May 2005
Q: I need Static Coefficient of Friction values for honed limestone & honed travertine.
A: Friction is a property that is influenced more by the finish than by the particular stone species. As such, it is really a fabricator-specific property. Particularly in the case of a honed finish, the coarseness of the honed finish can vary from one fabricator to another, and a slight difference in coarseness can make a significant difference in measured friction. The only source for valid data would be through the supply chain, as the tested samples need to be from the same supplier as the production stock. June 2005

Q: What are the applicable specifications for Dolomite?

Q: How do I ascertain mineral makeup of a stone?
A: Mineralogical makeup of a stone can be determined via Petrographic Analysis (essentially, in accordance with ASTM C 295) or by X-Ray Diffraction analysis (XRD). Oftentimes there is an advantage in doing both analyses. The petrographic analysis is done by viewing a thin-section of the stone, and can produce valuable information about the arrangement and relationship of the different minerals. The XRD analysis is an automated, computerized analysis, and tends to be more accurate in composition determination. August 2005

Q: We supplied 2 cm marble thresholds with a 1/2” vertical x 1-1/2” horizontal bevel on them. The original detail on the architect’s drawings shows a 1/2” x 1” bevel. The architect has no problem with the bevel that we cut, provided these thresholds are ADA compliant. Is our bevel ADA compliant?
A: I think where the confusion starts is with the graphic that the ADA includes in their standard. The graphic indicates that a 1:2 slope is required for changes in floor levels of between 1/4” and 1/2”. If you read the text from that section, it clarifies that the slope can be no greater than 1:2. The threshold that you supplied has a 1:3 slope, which is not greater, and is therefore compliant with the accessibility guidelines. September 2005

Q: Attached is an ASTM test result of an Egyptian limestone called Sunny. After sending this test result, the architect came back and asked the density of the stone. The report lists a specific gravity for the stone of 2.618. Is there a way to determine density from this?
A: Absolutely. Specific gravity is a comparison of the weight of the stone to the weight of water. You can convert specific gravity to density in pounds per cubic foot by multiplying by 62.4. The density of this stone is 2.618 x 62.4 = 163.36 lbs/ft³. October 2005

Q: We are bidding the supply and installation of a granite reception desk countertop for a local machining company. They are specifying “Laboratory Grade” granite – What is it?
A: Since they are a machining company, they are familiar with the specifications for granite surface plates. Granite surface plates are referred to as tool room, inspection, or laboratory grade based on their respective flatness tolerances (measured in micro inches). It does not apply to countertops. A countertop slab, if finished to this flatness tolerance, would not be capable of maintaining this degree of flatness due to its thickness. October 2005

Q: I have a question about the bevel on the edge of a tile. We have a batch of stone tiles here and the bevel is not consistent. What is the industry tolerance for the bevel size and consistency?
A: The bevel, or “arris” on the edge of the tile is applied both for the purpose of eliminating chips on the stone tile edge and also to make the tile less vulnerable to further chipping. While several industry documents reference the application of the arris and condone the use of this detail, I can find none that actually suggest an appropriate dimension for the arris. Obviously, the arris will make the joint in the installed tiles read wider than it actually is, so there is an aesthetic benefit to keeping the size of it to a minimum. Most commonly, the arris on a stone tile will be slight, in the neighborhood of 1 mm, but there is no industry standard to prevent the use of a larger arris. There is also no documented industry standard for the tolerance of this specific detail. There are a number of document tolerances for small revealed surfaces of stone (quirk miters, for example) that call for dimension accuracy of either ±25% or 25% unilateral. In my opinion ±25% would be a reasonable tolerance for this condition. November 2005

Q: What would be a generic value for the silica content of granite?
A: The mineralogical compositions of granites vary widely. I have analyses in my library that indicate anywhere from 28% to 77%, so there is no true “generic” value as it is specific to the actual granite. January 2006

Q: A local architect is asking for ASTM C 99 data for a travertine that we’ve proposed for his project. Can we substitute C 880 data, which we have for the stone?
A: The two test procedures use different fixturing, so you can’t actually “substitute” the data, but you can offer it in lieu of the C 99 data that was requested. The C 99 Modulus of Rupture test procedure uses a 2-1/4 thick test specimen over a 7” span, which is loaded with a single “knife edge” in the center of the span. This geometry induces a thick beam behavior in the test specimen, which is really not a very good replication of the stress distribution that a thin stone will experience in the building. The C 880 Flexural Strength test procedure requires the span to be at least 10...
times the thickness of the test specimen, and is loaded at
1/4 points of the span, which creates a region of constant
moment, or uniform stress, within roughly 50% of the
test specimen. For a thin stone application, this is a much better
test procedure to follow, and will yield more relevant data
than that C 99. A practical exception occurs in some of the
sedimentary stone types used in thick, cubic dimensions.

Q: I recently bought 16” x 16” x 5/8” limestone tiles. I was
shocked to open the boxes and learn that they were not 16” x 16”,
but only 15-3/4” x 15-3/4 “. I feel I should be issued a credit
for the amount of area that the tiles are undersized.

A: Hmmmmm… You may be on to something here – my
house is built with 2” x 6” studs, but they only measure
1-1/2” x 5-1/2”, so maybe there’s a big credit waiting for
me at the lumber yard! What you are talking about is the
difference between nominal and actual sizes. It is common
practice in the supply of construction materials to refer to a
product by its nominal sizes, while the actual, net size may
be slightly less. If the layout is critical, it would be nice for
the seller to advise you of the actual sizes, although if the
product is in unopened boxes it is possible that he/she
was unaware of it also. It is, however, neither unlawful nor
unethical to sell by reference to nominal sizing only. I
suspect the tile you purchased are intended to be installed
with 1/4” joints, which would produce a 16” x 16” installed
grid. Another possibility is that the tiles were produced
overseas at 400 x 400 mm, which converts nearly exactly
to 15-3/4” x 15-3/4”. May 2006

Q: I once heard that marble is always 11 degrees cooler
than the ambient air temperature. Is this true?

A: No, it is not true. The marble will react to thermal
influences working upon it. In a static environment, the
marble will eventually reach equilibrium with the ambient
air temperature. Due to the thermal mass of the stone, if
there are changing temperatures there would be some lag in
the temperature change in the stone relative the temperature
change of the air. Other influences, such as sunlight, can
cause the temperature of the marble to be greater than the
surrounding air. I don’t know the origin of the claim that
it is always colder than the surrounding air, but it might
be due to the fact that a marble (or any stone) table top
usually feels cool to the touch. This is simply because
room temperature is typically about 25 degrees less than
body temperature. July 2006

Q: I see references to L/360 and L/720 in several spots in
the MIA Dimension Stone Design Manual, but I can’t find
any place where it explains what this means. Can you please
explain this to me?

A: This is an extremely common question. The fractions
that you are asking about are references to maximum
allowable deflections and in most cases refer to framing
members. All structural members will bend, or deflect, when
subjected to loads. How much they deflect, is normally
expressed as a fraction of their span. For example, in
looking at the drawing above, the length of the span of a
framing member is usually referred to as “L”. The amount
that it bends under load is the deflection, and is often
abbreviated with the Greek letter delta (“Δ”). A deflection
of L/720 simply means that the deflection equals the span,
or L, divided by 720. If this span is twelve feet (144 inches),
and the deflection is 0.2”, the deflection would be L/720,
because 144” ÷ 720 = 0.2”. September 2006

Q: I am still having issues with the customer who claims
that his stone was not granite. The customer insists that the
material was misrepresented by us and is not a granite. He
claims it is something called a gneiss, and insists it should be
replaced with granite because that is what he paid for.

A: Your customer is likely correct in his identification
of the rock type being a gneiss. Many of the stones sold
commercially as “granite” are scientifically classified as
some other stone type, and gneisses are extremely popu-
lar in today’s available palette of stones. The American
Geological Institute defines a gneiss as “a foliated rock
formed by regional metamorphism, in which bands or
lenticles of granular minerals alternate with bands or lenticles
of minerals with flaky or elongate prismatic habit.” Gneiss
is definitely not granite, in the scientific sense, but since
gneisses are commonly feldspar and quartz rich rocks, they
are included in the much broader commercial definition
of “granite”. ASTM C 119 and ASTM C 1528 both recognize
the existence of the dual definitions of “granite”, where com-
cmercially, rock types with similar mineralogy, workability,
and performance characteristics are included in the gran-
ite group despite their different scientific classifications.
October 2006

Q: I just received some granite approval samples and the
label contains a disclaimer stating that “inclusions may occur
in sizes larger than what is demonstrated in the samples”.
What exactly is an inclusion?
**Q:** What is the true definition of an “eased edge”? We provided a slight radius on the edges of a countertop, and the designer insists that it should be a slight chamfer.

**A:** The true definition varies based on who is asked the question. It appears to be more common to use the term to describe a slightly radiused edge, but certain regions and producers use it to describe a slight chamfer. We show both variations in the MIA countertop documents. The best way to avoid confusion is to provide a small graphic of the condition in your literature or shop drawings. A picture is definitely the equivalent of 1,000 words in this case.

November 2006

**Q:** Is there an industry standard for the viewing distance when looking for defects or evaluating repairs in stone? We supplied and installed some stones for a project, and the architect is literally using a magnifying glass to point out objectionable areas.

**A:** No North American standard exists at this time, although we currently have a draft version of a document in review process that would address this situation. There is a European standard, EN 1469:2004, which calls for a 2 meter (about 6-1/2 ft) viewing distance when comparing reference samples to production samples. January 2007

**Q:** What is the Mohs’ hardness of granite?

**A:** Actually, there isn’t a Mohs’ hardness for granite. Mohs’ Scale, developed in 1812 by the German/ Austrian mineralogist Friedrich Mohs, is a scale of relative hardness of minerals, not stones. Mohs used ten common minerals, and ranked them numerically by their scratch resistance. His original scale, from softest to hardest, was 1 Talc, 2 Gypsum, 3 Calcite, 4 Fluorite, 5 Apatite, 6 Feldspar, 7 Quartz, 8 Topaz, 9 Corundum, and 10 Diamond. It is a relative scale, as opposed to a linear or absolute scale. Therefore, we cannot say that feldspar is twice as hard as calcite due to their numbers on the scale. We can only say that it is harder than apatite, which is harder than fluorite, which is harder than calcite. Granite, like all dimension stone types, is a heterogeneous material and includes minerals of varying hardnesses. The majority of the stone’s composition would likely be feldspar and quartz, which are 6 and 7 respectively on Mohs’ scale. The other minerals within the stone could be anywhere from 3 to 9 on Mohs’ scale. March 2007

**Q:** Do you have, or know where a generic MSDS form for granite, could be found? We need to have this on hand and have some customers looking for them. We called our supplier who imported the slabs, but they said they don’t have the forms.

**A:** This is an extremely popular question, and comes with a very simple, often ignored answer. As the importer of the product, your vendor is required to produce the Material Safety Data Sheet (MSDS). They cannot legally ship the product to you without it. The MSDS is a requirement of OSHA, and OSHA has jurisdiction over commerce transactions within the United States.

The Marble Institute of America issued a tech bulletin in June, 2005, offering an explanation of the purpose of this document and a guide to preparing it, but we cannot legally prepare it on someone else’s behalf (there are professional firms that do provide this service, however). If you prepare the MSDS, not only are you absorbing the administrative time to do so, you are also accepting a liability that shouldn’t be yours. If you use your supplier’s MSDS and there is an error or omission, the liability is theirs.

November 2006 and June 2007

**Q:** We received some data from an overseas supplier with compressive strengths and bending strengths listed, and behind the numbers was an abbreviation “MPa”. What does this stand for? We used to get some numbers listed as kg/cm². Is this the same thing?

**A:** No, they are not the same thing. The correct unit for pressure (or stress or elastic moduli) in the metric (SI) system is the Pascal (Pa). A Pascal is a very small unit of pressure, which is equal to one Newton of force per one square meter of area (a Newton is a unit of force, defined as the force required to accelerate one kilogram of mass at one meter per second per second, or kg·m/s²). As with any metric unit, prefixes are used to adjust units to a more practical magnitude for what we are measuring. For example, tire pressure in your car’s tires would commonly be expressed in kilopascals (kPa), or “thousands of Pascals”). Stress, as in the bending strength or compressive strength of a natural stone, is commonly expressed in MegaPascals (MPa), or “millions of Pascals”. If you are converting these values to pounds per square inch (psi, or lbs/in²), the conversion is 1.000 MPa = 145.04 lbs/in². If you are converting from lbs/in² to MPa, the conversion is 1.00 lbs/in² = 0.00689 MPa). Earlier data that you received with the unit abbreviated as kg/cm², was in “kilograms of force per square centimeter”. While this expression was commonly used in many countries as a unit of pressure or stress, it is technically incorrect, because a pressure or stress is defined as a force divided by an area, and the kilogram is not a unit of force – it is a unit of mass. A kgf/cm² would be equal to 98,067 Pascals or 0.098 MegaPascals, or 14.22 lbs/in². There are several websites available that will convert SI units easily and accurately.

November 2007

www.marble-institute.com
Q: What does the $H_a$ number really mean in the ASTM C 241 Test? Is it a direct comparison? For instance, does a stone with an $H_a$ of 20.0 have twice the abrasion resistance of a stone with an $H_a$ of 10.0?

A: The $H_a$ value is calculated as follows: $H_a = 10 \times G \times (2000 + W_s) / 2000 \times W_a$, where: $G =$ the bulk specific gravity of the stone, $W_s =$ the average weight of the specimen (initial weight plus final weight divided by 2), and $W_a =$ the weight lost during grinding.

Since the weight lost during grinding ($W_a$) also affects the average weight factor ($W_s$), and the bulk specific gravity varies from one stone to another, the comparison isn’t exactly linear. Yet for practical purposes one could say that yes, a stone with an $H_a$ of 10.0 lost roughly twice as much material due to abrasion during the test as a stone with an $H_a$ of 20.0. Compared to actual abrasive exposure in flooring application service, this is an aggressive accelerated test procedure, so a direct correlation to service life in application may or may not be valid. December 2007

Q: Can you explain the term “implied warranty” as used in residential stone installations?

A: An implied warranty means that the item(s) “are fit for the ordinary purposes for which [these type of] goods are used.” (UCC 2-314.2c). Further: The buyer is relying on the seller’s skill or judgment to furnish suitable goods fit for their particular purpose (UCC -315). 2002

Q: Can you explain “hard” and “soft” grouts, and advise when each type should be used?

A: There are many cement and resin based grouts. Normally a “hard” grout should be used in exterior joints and any interior joints where water could be an issue. Hard grouts are more dense than soft grouts, and thus do not allow water to penetrate the stone joint as easily as softer ones. The problem is that when you have stones that are subject to expansion, such as limestone, and the grout is hard — at least harder than the stone — the expansion of the stone can be retarded by the hard grout, and the stone may chip at the edges or crown. In these instances it is absolutely necessary to use expansion joints, and we recommend that the edges be chamfered, since chamfered edges do not chip as rapidly as straight edges. Expansion joints should be placed every 400-450 sq. ft. Many “designer” grouts are soft and thus unsuitable for use in wet areas, as soft grouts will absorb moisture at a higher rate than hard joints. 2002

Finishes

Q: What defines honed vs. polished finish in a limestone, or any stone for that matter? Where does one draw the line between the two finishes?

A: There are a variety of documents that offer definitions of the two finishes. The National Building Granite Quarries Association (NBGQA) defines honed finish as a “dull sheen, without reflections,” and a polished finish as a “mirror gloss, with high reflections.” The MIA Dimension Stone Design Manual VII offers a variety of definitions based on stone type, but the definitions of honed all indicate the presence of gloss while the definitions of polished all reference the absence of gloss. The Indiana Limestone Institute Handbook does not offer definitions for these terms, as these are not finishes commonly marketed in their stone varieties. ASTM C 119 Standard Terminology Relating to Dimension Stone defines honed as “a non-reflective to semi-reflective superfine satin-like surface with no surface pattern, produced by mechanical abrasion”, and polished as “a highly-reflective surface, produced by mechanical abrasion and buffing”. ASTM C 1528 Standard Guide for Selection of Dimension Stone for Exterior Use defines honed as “a smooth, non-reflective finish produced by varying degrees of mechanical abrasion” and polished as “a smooth, glossy and highly reflective finish produced by mechanical abrasion and buffing”.

The common thread here is that all definitions of polish indicate that it is to have a “mirror-like” gloss with sharp reflections. All definitions of honed indicate the absence of gloss or reflection, with the exception of ASTM C 119 which allows a range of “non-reflective to semi-reflective”. None of the definitions offer a truly measurable property to determine how bright or fine the honed finish can be before it is considered to be polished. There are two instruments available for measuring the surface roughness of a material. One would be a profilometer, which would measure the step height of surface regularities. I’ve never heard of a profilometer being used for natural stone surfaces expect in a few industrial or precision flatness applications. The other instrument would be a gloss meter, which would measure the amount of light reflected from the surface at various angles of incidence. Gloss meters are readily available, and I am aware of a number of manufacturers that use them for internal quality control purposes to verify lot to lot consistency, or product consistency between different fabrication sites. Restoration contractors also use them to assess pre- and post-restoration conditions of stones. Currently, there is no standard for gloss meter measurement adopted within the industry, likely because it would be a stone specific value. As different stones polish to different levels of gloss, a standard would be required for each stone on the market, which would be an incredible task. January 2006

Q: We specified a honed 12 x 12 Crema Marfil tile for a residential bathroom. The homeowner prefers polished finish, but we’re reluctant to change our specification due to the slipperiness of the polished finish. How significant is the difference between the two finishes?

A: The difference is negligible. There are some “coarse” honed surfaces specifically manufactured for improved
frictional properties, but the majority of what is on the market is a very fine, or “bright” honed finish. Static coefficient of friction of these honed surfaces is, for all practical purposes, the same as polished. April 2007

Q: How does light affect a honed finish?
A: Natural light is the harshest environment in which to view stone. Even the most minute marks and variations become serious problems to owners. When working on projects that contain large expanses of natural light, advise the client before the installation that inspection will have to be conducted under artificial light, as precious few honed stone projects will appear properly honed or installed under direct sunlight. 2002

Q: How many different types of hone finish are there?
A: The answer is “almost unlimited.” A hone finish is the stage of finish achieved after a stone is ground flat, but before it is polished. So any grit size that does not remove a substantial amount of surface material, while not yielding a gloss finish, is a hone finish. 2002

Lippage

Q: On page 29 of my ANSI book, I found lippage allowances for ceramic installations. It doesn’t specify if these are applicable to marble as well as ceramic. Is the lippage allowance the same for marble, or is there a different standard?
A: The ANSI standard is limited to ceramic tile, so the lippage chart that you are referencing does not govern installations of natural stone. If you open your “Great Big Book of Everything”, a.k.a. the MIA Dimension Stone Design Manual to page 14-3 (3.1.5), you will find lippage tolerances for stone. It simply reads 1/32” maximum for smooth finished stones. When in the field, I use a digital caliper to document actual lippage measurement. For a quick field check when no calibrated measurement instruments are available, a standard plastic credit card works well. Credit cards are nearly exactly 1/32” in thickness. Since you are familiar with the ceramic standard, one thing you will note is that while the ceramic tile lippage allowances are variable depending on the tile unit size and the joint width, the natural stone lippage tolerance does not take these factors into account. Given the increased popularity of large format stone tile, this will be a topic of study as we are currently updating the horizontal surfaces section of the manual. A lippage tolerance of 1/32” may be difficult, if not impossible, to achieve with large stones. For instance, if the fabricator is allowed a 1/16” warpage tolerance in 4’-0”, how is the installer expected set it with half that amount in lippage? June 2007

Q: In the MIA’s Dimension Stone Design Manual it states that lippage for smooth finished tiles cannot exceed 1/32”, but it doesn’t say how many tiles in the project can have this amount of lippage. What is the maximum percentage of tiles in a given project than can have 1/32” lippage?
A: There is no limit prescribed for how many tiles can have lippage in a single floor. As long as the maximum lippage between any two adjacent tiles does not exceed 1/32”, the floor would be compliant, even if 100% of the tiles had the maximum allowable lippage. August 2007

Q: What are the lippage requirements for a natural cleft finish floor?
A: There are no established numerical requirements for floors other than a smooth finish stone floor, which is ± 1/32” (1 mm). However, there is a requirement that all floors be able to be walked on without tripping or fear of tripping. The litmus test used is how much difficulty a handicapped individual would have walking on the floor. Contractors have the responsibility to deliver a floor that can be safely walked on by a handicapped individual. This will often mean hand selecting stone by stone to insure that the lippage from one stone to another is not so great that a shoe’s sole cannot easily slide over the joint. 2002

VI. Troubleshooting

Q: We have an architectural casework client providing various pieces to a grocery chain. We recently provided a 35” x 72” piece of 3cm Verde Ubatuba which was set in direct contact with a heated metallic plate. Upon testing, the plate was raised to an operating temperature of 190° Fahrenheit. It is reported that the Ubatuba cracked in several areas. The client is now asking that we provide them with a testing reference as to why this stone is unsuitable in this application, and what similar colored stone may be more suitable.
A: The problem is not the absolute temperature. A temperature of 190° F is not going to damage any granite or similar rock type. Studies conducted by Simmons & Richter many years ago concluded that igneous rocks would show some level of permanent strain, or a hysteretic behavior, after experiencing temps exceeding 250° C (±480°F), and you are obviously not approaching this range of temperature. What is most likely the problem here is the thermal gradient in the stone, or the unevenness of heating. In my previous roles in the stone industry, I was involved in the supply of granite liners for pickle tanks in the steel industry. We used a granite slab to cover the vats, which ironically, had an operating temp of ±190°F. The ends of the cover hung over the edges of the tanks, and cooled like a big radiator fin due to the ventilated condition. We would drive cracks into the cold edges of the stones, simply because the warm portion was expanding, and the cold portion wasn’t expanding with it. This put a significant tensile stress in the stone within the cold regions, and once the stresses equaled the tensile strength of the stone, the crack initiated. The same thing is likely occurring in your countertop application, where the stone is not being heated uniformly. A possible solution
would be to modify the installation to include more mass between the plate and the stone, which would dissipate the heat energy and provide a more uniform temperature through the stone. Another solution is to use smaller pieces of stone, in which the stresses can be relieved at the seam locations. July 2005

Q: We have a motor oil stain on our new granite patio. How can we remove this?
A: Oil is generally an easy stain to remove from granite. It will usually require a poultice. The poultice powder will come with instructions that normally tell you to mix it with water. In this case, because you are working with an oil-based stain, use either acetone or mineral spirits in lieu of the water. The stain should come out completely, but it may take several iterations of the poultice until complete removal is achieved. August 2005

Q: We've got black granite with white marble accents in a façade in Eastern Europe. There are black streaks staining across the white marble. Can the color from the granite bleed from normal weathering?
A: No, not normally. Occasionally we see a see a stone that includes a corroding mineral which may bleed a stain on the façade, but a black stain would not likely be from the stone. Since the stone is black, my suspicion is that someone in the supply chain applied a synthetic dye to the stone to make it a darker black. It is the dye that is bleeding stains across the marble. September 2006

Q: We did a countertop job about 3 or 4 years ago. The customer had a large toaster oven on the countertop, which they've now moved. They're complaining because the stone is darker under the toaster oven than the surrounding area – can this be caused by heat from the oven?
A: Not likely. What is much more likely is that you used resin-treated slabs for the project, and there is an abundance of natural light in this kitchen. We have no control over the type of resin used on these slabs, and the type of resin is seldom disclosed by the producers. The different resins used have varying reactions to UV exposure. None of them are fully UV resistant, and some of them can undergo significant color change, often yellowing, with repeated exposure to UV. In most cases this is not noticeable, as there is seldom enough natural light in a kitchen setting to create a substantial change. Without an unexposed control sample for comparison, one wouldn't likely notice that there had been a color change. With your customer's appliance setting in one place for several years, they have inadvertently created an unexposed control sample. I would suggest they just be patient, and eventually the area will blend into the color of the surrounding stone. February 2007

Q: We supplied a one-piece granite “hoop” surround for a fireplace and it cracked. Do you think it might have to do with heat?
A: Yes, particularly if they actually used the fireplace. The stone withstands heat very well, and studies have been done documenting that permanent strain doesn’t occur until the stone is heated to temperatures in excess of about 250°C (±480°F). What causes the problem is rapid temperature increase, or non-uniform temperature increase. When there is a thermal gradient in the stone, the warm portion expands and the cold portion doesn’t, and this creates stress within the stone. I’ve seen stones crack with a little as 100°F temperature difference. By making the fireplace surround in a one piece “hoop”, you have drastically different temperatures from top to bottom. The resultant thermal gradient will produce the stresses causing the cracks. June 2007

Q: We’re rather new to the countertop business. We have recently had a problem with a couple of our kitchen sinks where the silicon failed and the sinks fell into the cabinet. Are there specs for what type of adhesive to use here?
A: If you’re new to the countertop business, let me first encourage you to join the MIA to take advantage of the technical materials and education opportunities available through the organization. If the knowledge gained through membership had prevented you from having to remedy this one problem, you would have saved more than your first several years’ dues. Chapter 17 of the MIA’s Dimension Stone Design Manual VII, covers countertop installation. Detail pages 17-D-8 through 17-D-10 show some generic sketches of how to anchor sinks below stone countertops. In all cases, a mechanical anchor or support is required, and the silicon is used only as a fluid seal and not as an adhesive attachment. With sound stones, the sink can oftentimes be anchored to the underside of the stone countertop. When using stones of lesser strength or installing heavy cast sinks, the preferred method would be to use rails under the sink rim that carry the load back to the cabinet frame. Rail systems like this can be purchased through several companies that specialize in the design and supply of accessory components. July 2007

Q: We have a travertine shower with some problems at the shower seat. The seat slopes back toward the wall and the water puddles there and has left some stains. There even appears to be some mold-like growth. What can we clean it with?
A: It makes no sense to invest time, energy, and money to treat a symptom without addressing the root cause of the problem. The MIA video “Basics of Design and Installation of Natural Stone in Wet Areas” talks at length about the necessity of avoiding negative slopes in shower construction, and that is exactly what you have in your existing shower. Ponding of water in a shower is not acceptable. The seat needs to be removed and the substrate and frame components inspected for water damage before it can be properly reinstalled. This could be a substantial repair or even a complete replacement project, but it is the only way to correct the problem for the long term. July 2007
Q: How can I correct a natural cleft finish floor that has excessive lippage?
A: Short of removing a portion or all of the affected stones, there is little remedial work that can be performed while maintaining the natural cleft finish. Where a hammer and chisel won’t get the job done, we have had some limited success in grinding the high area, and then lightly going over it with a low heat propane torch. The heat causes the top layers to flake off, and the appearance is not too noticeable. 2002

Q: We installed interior marble facing in an elevator lobby where they have washed the walls with down-lighting. The owner is complaining about the shadow lines created by some rather minimal lippage in the stone panels.
A: Down-lighting over stone panel joints is simply a very unforgiving condition. Setting the panels as carefully as one can, there are times due to panel warpage where a slight lippage will occur with one panel being slightly proud relative to the panel below it. Down-lighting can strike the panels at very slight angles of 2 or 3 degrees. At a 3° lighting angle, a lippage of only 1/32” will cast a shadow over 1/2” long! We address this situation on page 15-12 of the Dimension Stone Design Manual VII and suggest that the down washed illumination be turned off for inspection and acceptance of these walls. July 2007

Q: We installed a Verde Butterfly raised bar about 1-1/2 years ago. It now has a crack in it which the homeowner tells us simply “appeared” one day on its own. Would this be normal for a stone to just simply crack after 18 months in service?
A: No, it would be very uncommon, unless there was some kind of major structural movement in the home. The likely scenario is that they use the bar area for 2 to 3 hours per day, which after 1-1/2 years is about 1,000 to 1,500 total hours of use. This time frame would be a plausible lifetime for the bulb in the flood lamp above the counter, and someone probably stepped on the stone counter while replacing the light bulb. December 2007

Q: We have a 10-month-old marble floor. The floor has been diagnosed as having a fungus growth on it. We have been treating the marble with acid baths and bleach but they seem to damage the finish. Any other ideas on how to solve this problem?
A: Fungus will grow on any surface that is cool, damp, and has a relatively small amount of natural light. The fungus will not penetrate the stone, and a chlorine product will normally remove the growth with no damage to the stone, unless the stone has been sealed. If it has been sealed, contact the sealant manufacturer to determine if the sealer could react with the chlorine to cause calcite digestion. As you noted, the acid you washed the floor with severely damaged the finish. The floor will have to be refinished in order to restore the original polish. Environments that permit fungus growth could also be adverse to human health. I recommend that you have an environmental examination of the area to determine the root cause of the fungus and make the changes necessary to discourage such growth in the future. 2002

Q: Several marble tiles have been damaged in the floor of our bathroom. We have heard that it will be necessary to refinish the entire floor in order to restore the floor. Is this so?
A: Although not possible in all instances, your Crema Marfil marble can easily be spot refinished and the resultant polish should blend with the existing without any appearance difference. This work will have to be performed by hand, and by an experienced stone polisher in order to blend the work unobtrusively. 2002

Q: The bluestone installed in my steam shower is changing color. Why and what can I do to bring the color back to its original appearance?
A: Steam will react with the elements in natural stone and cause a chemical reaction. Color change is a normal reaction of the stone to heat. There is no cure, as the elements in the stone have changed. 2002

Q: Our vanity top was stained by “plumber’s putty.” Can we use a poultice to remove the stain?
A: Yes, but the poultice should be placed at the point where the stain originated, and not specifically on the top surface. You want to pull the stain out of the stone, not pull it through the stone. 2002

Q: Why am I getting so many call backs when installing group C & D marbles in wet areas?
A: Many of the stones in these groups have voids and lines of separation that have been filled with silt. An easy way to identify these stones is to note that the silt will not polish. When used in wet areas, moisture penetrates the silt and it will expand, gradually freeing itself from the balance of the stone. This action will undermine the strength of the stone and slight building vibrations will cause the failed stone to require replacement. In fabrication, remove the silt with a high-pressure hose and fill the void with epoxy or polyester resin tinted to the desired color(s). 2002
# VII. Appendix

## Inches to Millimeters

<table>
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<tr>
<th>Inch</th>
<th>Millimeter</th>
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<tr>
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## Feet to Millimeters

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## Centimeters to Inches

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## Square Feet to Square Meters

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## Square Meter to Square Feet

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## Conversion Ratios

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</tr>
<tr>
<td>kg/m²</td>
<td>pascals (pa)</td>
<td>9.807</td>
</tr>
</tbody>
</table>

Note: Some of the SI International System of Units (metric) conversions listed in these tables are rounded numbers at the third decimal place.
Mohs Scale

In 1812, the Mohs Scale of mineral hardness was devised by the German mineralogist Frederich Mohs (1773-1839), who selected the ten minerals because they were common or readily available. The scale is not a linear scale, but somewhat arbitrary.

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Talc or mica</td>
</tr>
<tr>
<td>2</td>
<td>Gypsum</td>
</tr>
<tr>
<td>3</td>
<td>Calcite</td>
</tr>
<tr>
<td>4</td>
<td>Fluorite</td>
</tr>
<tr>
<td>5</td>
<td>Apatite</td>
</tr>
<tr>
<td>6</td>
<td>Orthoclase</td>
</tr>
<tr>
<td>7</td>
<td>Quartz</td>
</tr>
<tr>
<td>8</td>
<td>Topaz</td>
</tr>
<tr>
<td>9</td>
<td>Corundum</td>
</tr>
<tr>
<td>10</td>
<td>Diamond</td>
</tr>
</tbody>
</table>

Source: American Federation of Mineralogical Societies, Inc.

Slab Production Table

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Slabs/Foot</th>
<th>Slab Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cu ft</td>
<td>10</td>
<td>3/4”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>8</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>7</td>
<td>1-1/2”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>5</td>
<td>2”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>4</td>
<td>2-1/2”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>3-1/2</td>
<td>3”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>3</td>
<td>3-1/2”</td>
</tr>
<tr>
<td>1 cu ft</td>
<td>2-1/2</td>
<td>4”</td>
</tr>
</tbody>
</table>

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*Information contained in these technical publications was taken directly from the Dimension Stone Design Manual. Additional illustrations and pictures have been added in these stand-alone publications.