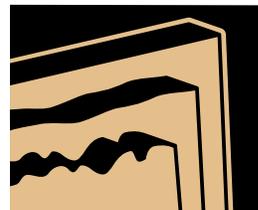


MIA Technical Module

Residential Stone Countertop Installation

Completely Updated
Countertop Specifications
PLUS
New Outdoor
Kitchen Guidelines



MARBLE
INSTITUTE
of America

15.0 REINFORCEMENT TECHNIQUES

As products of nature, stones have varying strength and behavioral properties. Stones of lesser soundness or stones that have had substantial areas removed from the slab (e.g. sink cutouts) will benefit from reinforcement by a variety of techniques.

15.1 Fiberglass Mesh. A common reinforcement for stone slabs of limited soundness is to adhere a fiberglass mesh to the back surface of the slab. The party doing the sawing of the slabs normally completes this process. The adhesive used in this application is commonly an epoxy or polyester resin.

15.2 Liner Blocks. Although not frequently used in stone countertop construction, a liner block of stone material can be adhered to the underside of the stone slabs (when no subtop is used) to reinforce seams or other vulnerable areas. The liner block need not be of the same type of stone material as the countertop.

15.3 Splines. Seams, particularly those between narrow stone pieces, are often splined together with a steel or stainless steel key. Commonly, a large washer is used as the spline key. The metal is fully encapsulated with polyester or epoxy resin and fitted to closely cut slots in the stone, similar to the “biscuit” joint reinforcements used in wood-working.

15.4 RODDING. A commonly seen method of countertop reinforcement is the technique referred to as “rodding.” Rodding may be beneficial to narrow strips of stone material, such as those in front or behind sink or cook top cutouts. This technique requires a shallow kerf in the underside of the stone slab (See details on drawing 17-D-5). The kerf is then closely fitted with a metal or fiberglass rod, which is then fully embedded in epoxy. The rod, having greater tensile strength than the stone, helps prevent concave flexure of the stone surface. Closely matching the rod size to the kerf size and careful preparation of the rod, including cleaning or abrading the bonding surface, are required to get the maximum benefit from this technique. A strip of fiberglass mesh backing is often adhered over the rodded region for additional reinforcement. See detail on drawing 17-D-5.

16.0 ALLOWABLE REPAIR

Repair of stone countertops must be performed by competent, experienced artisans to achieve the desired results. Repair of the stone is permitted when the repaired region is not in a structurally significant area of the countertop, and when it can be accomplished skillfully so that the repair is consistent in color and texture with unrepaired regions of the slab.

16.1 Fissures occur naturally in many stone types. A fissure is defined by the American Geological Institute as, “An extensive crack, break, or fracture in the rock, which may contain mineral-bearing material.” The term “fissure” is used commercially in the stone industry to describe a visible separation along intercrystalline boundaries. This separation may start and stop within the field of the stone or extend through an edge. A fissure differs from a crack in that it is a naturally occurring feature in the stone that may be found in other areas of the same slab or other slabs of the same material.

16.2 Cracks occur in stones as a result of manmade mechanically induced stresses during handling, fabrication, transport, or installation. When cracks are detected in slab material prior to fabrication, the best method is to simply avoid including them in the product through culling during the layout process. In stones with lesser soundness properties, this option may not be practical, or possible. When working with such stones it is common practice to repair cracks by cementing them together with epoxy or polyester resin, either with or without dowel reinforcement. Cracks that occur as a result of handling-induced stresses are often more difficult to repair, as they commonly include chipping in addition to the crack. Repair is frequently performed by injection of a penetrating resin adhesive, which may be dyed to match the stone, and then rebuffing the area after curing of the resin. In many cases, the entire stone must be repolished to make the repair unnoticeable. If the repair is attempted but unsuccessful, the stone is to be replaced with a new piece.

16.3 Chips can occur in stones either as a result of sawing operations or handling and restraint devices. Particularly in the igneous stone varieties, the exiting portion of the diamond blade will create many small chips. A small chamfer, called an “arris,” of approximately 1/16" x 1/16" (1.5 x 1.5 mm) can be used to eliminate most of these small chips. The use of an arris will make the seam appear wider than its actual dimension when filled (see section 11.2, above). Larger chips may be repaired with epoxy or polyester resin if the completed repair is consistent in color and texture with unrepaired areas of the slab. In many materials, the resin used in the repair will appear more natural if it is not dyed.

16.4 Pitting of the countertop surface, particularly in granite material, is a commonly seen characteristic on natural stone. Granites are made up of several different minerals, each mineral having a different hardness. Granites contain quartz, feldspars, biotite, amphibole, ferrous titanium oxides, and other mineral combinations. On the Mohs Scale (see chart above), diamonds are the hardest mineral, with a rating of 10. Quartz and feldspar have a

hardness of 6.5 to 7 and are very durable. Biotite (small, black minerals throughout the slab) on the other hand is very soft (2.5) and flakes easily. All true granites have biotite in their composition. Because biotite is relatively soft and flaky, the first few layers are often removed during the polishing process, causing pits throughout the slab. Some granites have more biotite throughout their composition than others. The higher the biotite content of the stone, the more pits it will have. Most polished igneous rocks will have varying degrees of pits, depending on the amount of biotite, muscovite, and phlogopite in their composition.

The pits do not make the granite less durable or otherwise inferior, and do not in themselves qualify the slab for replacement. Pits are common in all granites and should be expected when dealing with a natural, polished stone containing several types of minerals with different hardnesses. It is usually best to not attempt repair of pits, as most repair techniques will not cosmetically improve the countertop.

17.0 MAINTENANCE

17.1 Application of Sealers. The application of a topical sealer or impregnator is a common step in decreasing the vulnerability of the stone to stains.

17.2 Topical sealers cure as a film on the stone surface. Since the material is actually covering the stone, the appearance of the stone surface may be altered by the application of this type of product. This material will provide somewhat of a sacrificial layer over the stone, and will absorb most of the wear on the countertop. Since the sealer is softer than the stone, normal use of the countertop will result in abrasion of the sealer surface and dictate reapplication to maintain the original luster of the surface. A properly applied topical sealer will normally reduce, although not eliminate, the vulnerability of calcareous stones to attack from mildly acidic solutions.

17.3 Impregnators will penetrate the stone and cure a few millimeters below the surface, residing in the intercrystalline boundary areas and pores of the stone. These products do not actually “seal” the stone, and are more correctly referred to as a repellent rather than a sealer. As such, they are formulated to prevent transmission of liquids, while allowing transmission of vapor. Since they reside below the actual surface of the stone, the change to the appearance of the stone surface is minimal. Impregnators will be either hydrophobic, in that they repel water-based fluids only, or oleophobic, repelling both oil and water-based fluids. The manufacturer of the impregnator product will recommend a reapplication interval.

17.4 General Precautions. When any surface protection product is used, care must be taken to read and follow

the manufacturer’s written instructions accurately. This will provide the greatest benefit from the application and will guarantee safe handling of the product.

17.5 Care and cleaning practices of the stone countertop are to be thoroughly discussed with the client upon completion of the installation. Refer to the MIA brochure *Care & Cleaning for Natural Stone Surfaces* for more information.

18.0 OUTDOOR KITCHENS

18.1 General Precautions. An increasingly popular area for stone countertops is in outdoor kitchens. The installation of natural stone countertops in these areas creates additional challenges from the installation of indoor countertops for suppliers and installers. Due to extreme temperature changes, UV exposure and varying moisture levels, typical installation methods along with certain materials cannot be used.

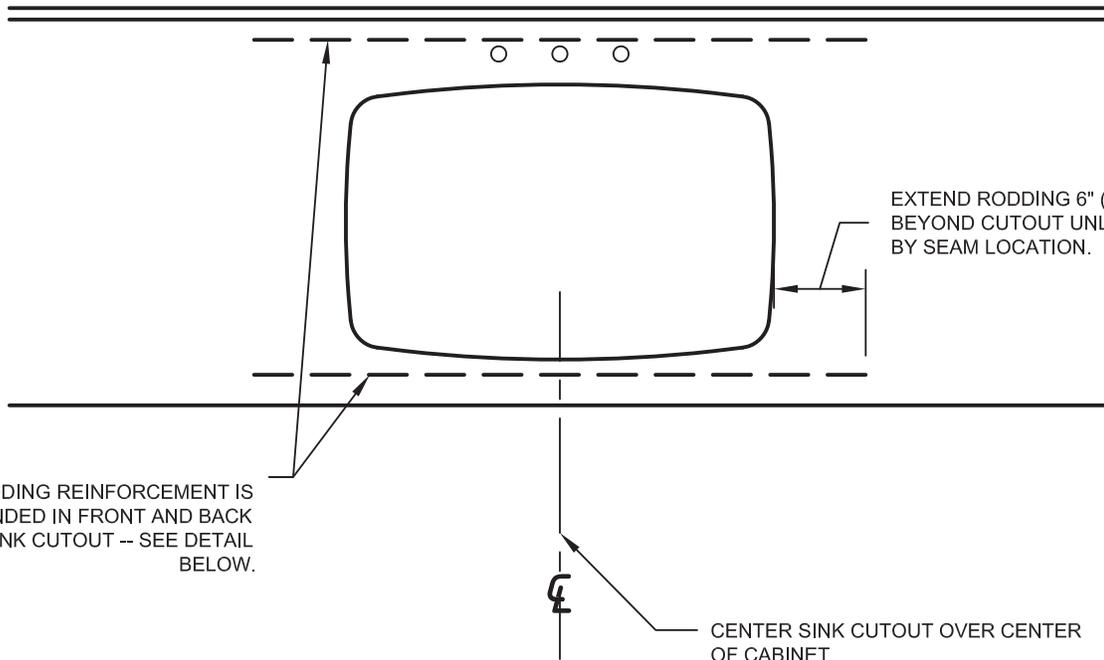
18.2 Customer Communication. In addition to the prescriptions state earlier in this chapter, customers should be made aware that due to the use of resins in the finishing process of natural stone, they will most likely experience some fading in their countertops. Nearly all resins used in the fabrication process are subject to color change and surface degradation when exposed to UV light See section 14.2.4.

18.3 Materials. It is recommended that only sound stones with minimal geological flaws or voids be used for these areas. Stones that contain these voids or fissures may experience the growth of mold and mildew, the loosening of filler materials and in some cases, cracking and separating due to extreme temperature changes.

18.4 Subtops. All areas that are to receive stone countertops should have a sub top or auxiliary frame made of cement board or mortar bed. The subtop or auxiliary framing should be rated for exterior use.

18.5 Adhesives. All adhesives to be used must be suitable for exterior installations. Since silicone is frequently used on outdoor kitchens, care must be taken to insure that staining does not result from plasticizer migration of some silicone products. Polyester adhesives should be avoided in an exterior environment.

18.6 Seam Filler Materials. All materials that are to be used for seam filler must be suitable for exterior installations and allow for some movement. Joint widths between two stone units should be nominal 1/16” ±1/16”. Undermount sinks can be anchored to the underside of the stone countertop or carried by a subtop or auxiliary frame. A subtop or auxiliary framing may be required and should be rated for exterior use.

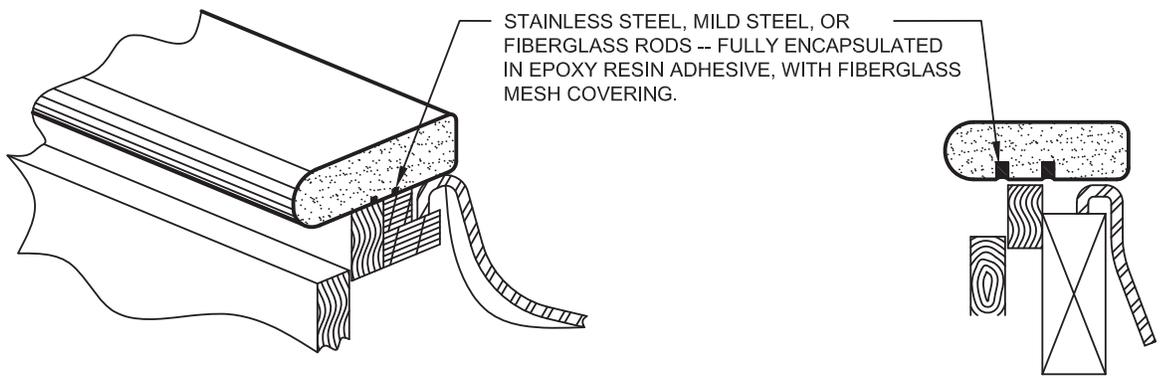


EXTEND RODDING 6" (150 MM) BEYOND CUTOUT UNLESS LIMITED BY SEAM LOCATION.

RODDING REINFORCEMENT IS RECOMMENDED IN FRONT AND BACK OF SINK CUTOUT -- SEE DETAIL BELOW.

CENTER SINK CUTOUT OVER CENTER OF CABINET.

PARTIAL PLAN WITH NO JOINTS AT SINK



STAINLESS STEEL, MILD STEEL, OR FIBERGLASS RODS -- FULLY ENCAPSULATED IN EPOXY RESIN ADHESIVE, WITH FIBERGLASS MESH COVERING.

DETAIL OF RODDING REINFORCEMENT



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REV	DATE
0	Jan 2005
1	Oct 2006

DETAIL OF RODDING REINFORCEMENT

MIA DIMENSION STONE DESIGN MANUAL VII

DRWG NO: 17-D-5

SCALE:
1" = 1'-0"

About the MIA

For over sixty-five years, the Marble Institute of America has served as the authoritative source of information on standards of natural stone workmanship and practice and the suitable application of natural stone products.

Membership in the association is worldwide and includes natural stone producers, exporters/importers, distributors/wholesalers, fabricators, finishers, installers, and industry suppliers — all committed to the highest standards of workmanship and ethics.

MIA publishes a monthly newsletter for members, markets a range of technical publications and consumer pamphlets on natural stone, sponsors business and technical meetings and seminars on industry-related topics, provides educational programming for architects and construction specification professionals, and conducts the annual Pinnacle Awards competitions recognizing outstanding natural stone projects worldwide. And new in 2009, the MIA Natural Stone Craftsman of the Year award will recognize one craftsman who has physically performed outstanding stone fabrication and/or installation over a period of many years. MIA also sponsors an industry accreditation program for high quality fabricators and commercial installers.

MIA is also a leading promoter of stone usage in the commercial and residential marketplaces. MIA produces a number of consumer education materials on the use of natural stone and its proper care and maintenance and hosts an informative website for consumers at www.usenaturalstone.com.



MARBLE
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Natural Stone Industry*

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!!! IMPORTANT !!! MUST READ !!!

INSTALLATION INTO STONE + GRANITE

!!! WARNING !!!

**READ + INSTALL APPLIANCE ACCORDING TO THE
INSTALL SHEETS OR YOU MIGHT ENCOUNTER DAMAGE !!!**

!!! Given Cut-out dimensions are mandatory !!!

DO NOT MAKE THE CUT OUT SMALLER OR APPLIANCE WILL SELF-DESTRUCT OVER TIME.

Please be reminded that the CND stainless steel grill surface will flex slightly when switched on, thus developing a shallow dip in the cooking center. This motion is intended and is counteracted by the studs - secured with nuts + washers - which hold it down. **!!! IMPORTANT: DO NOT CUT OFF THE STUDS !!!**

A stone professional will be able to advise you on any aspect to watch out for, e.g. on how much counter-top "meat" is necessary at the narrowest point for your particular stone of choice; min. 6 INCHES are advised. PLEASE NOTE: COUNTER TOP THICKNESS OF 1.5" (40 mm) IS MANUFACTURER RECOMMENDED.

If you have purchased model MO-80, talk to your counter top supplier about **RODDING** which is a professional business practice to secure fissured or "brittle" Natural Stone. The narrow areas/strips of material surrounding large cutouts (e.g. for sinks, stoves, cook tops) are therewith professionally reinforced ("RODDED") on the underside. This will support and strengthen those narrow material areas and is intended to prevent possible damage.

For further reference, see MARBLE INSTITUTE OF AMERICA excerpt or download online at www.cookndine.com/pdf.html

Alternatively, custom-made pre-punched angle brackets (model MO-80 only; pls. specify) can be installed (see page 2 install sheet). The "torque" (uplift at the edges) applied to the counter material during operation of the appliance should thus be more evenly distributed.

VERY IMPORTANT: The use of these brackets, however strong, cannot guarantee the prevention of damage. Everything strictly depends on the natural properties of the stone/ counter top material of choice. Therefore Cook-N-Dine Inc. cannot be held responsible for any type of damage to any counter top due to the installation of a CND Teppanyaki Grill Built-in Cook Top.

RODDING OF GRANITE



kitchen and bath gallery

4650 N 124th Street Wauwatosa, WI 53225

P (414) 727-6166 www.artisankbg.com

How we do it:



We cut a slot for a steel rod or flat bar to sit in..
in this case - it's 3CM stone that will receive a 1/8" x 1/2" flat bar
stood up on it's side for more strength.

for 2CM - 1/4" round rod is used... I like stainless in case
the rod ever comes in contact with moisture - it WON'T rust...
better peace of mind for me and my customers..... ;-)

The rod is set down into the slot, then flowing epoxy is
poured into the void to "lock" the rod in place...excess
epoxy is ground off when it's dry, and the top is aprox
600% stonger (I saw a test that threw that figure out - It
may be more or less - but rodding works!!!)

Rodding Granite Countertops Test Results

All test performance results listed in order of lowest (1) to highest (24) strengths.

Test No.	Piece No.	Description	Load (pounds) Upon Visible Crack	Deflection (inch) at Load Establishing Crack (for visible changes in planes)
1	9A	Polyester Only	4	0.140
2	9B	Polyester Only	N/A	N/A
3	10A	Epoxy Only	0	0.125
4	10B	Epoxy Only	0	0.180
5	1A	No Reinforcement	139	0.049
6	1B	No Reinforcement	140	0.055
7	2A	Rectangle Rod/Polyester	119	0.090
8	2B	Rectangle Rod/Polyester	N/A	N/A
9	4A	Rectangle Rod/Epoxy	114	0.300
10	4B	Rectangle Rod/Epoxy	165	0.490
11	11A	1/8" x 3/8" Rod/Polyester	157	0.497
12	11B	1/8" x 3/8" Rod/Polyester	190	0.650
13	5A	Round Rod/Epoxy	244	0.790
14	5B	Round Rod/Epoxy	144	0.550
15	6A	Fiberglass	220	1.000
16	6B	Fiberglass	192	1.125
17	3A	Round Rod/Polyester	225	0.375
18	3B	Round Rod/Polyester	230	0.450
19	8A	Fiberglass/Rectangle Rod	400	0.920
20	8B	Fiberglass/Rectangle Rod	380	0.940
21	7A	Fiberglass/Round Rod	450	1.100
22	7B	Fiberglass/Round Rod	475	1.170
23	VA	Vanity Top Unreinforced	62	0.328
24	VB	Vanity Top/Square Rods Polyester Reinforced	202	0.425

- Test # 1, 2, 3, 4 Inserting only polyester resin or epoxy into the cut groove weakens the stone.
- Test # 5, 6 The stone is not reinforced. This is the base point of comparison with the other tests. The stone fails at 139–140 lb. psi and 1/16" deflection.
- Test # 7, 8, 9, 10 Rectangular rods tend to strengthen the stone and increase deflection before ultimate failure. Stones thus reinforced are able to withstand loads comparable with unreinforced stone and the stone's deflection range is enhanced.
- Test # 11, 12, 13, 14 Round rods increase average deflection before failure from 0.07175" to 0.7475" (900%), and will accept higher loads than other shape rods.
- Test # 15, 16 Fiberglass reinforcement increases the load tolerance by 50% and the deflection before failure by about 1600%.
- Test # 17, 18 Round rods significantly strengthen the stone by 50% in load and 600% in deflection.
- Test # 19, 20 Round rods with fiberglass on the bottom face produce the highest values, with an increase in ability to withstand load by 300% and deflection over unreinforced stone increased 1600%.

The MIA thanks Vincent Migliore, Richard Booms, and the staff at Booms Stone Company, Redford, MI, for their guidance and consultation.



Blog » **Rodding granite...avoid the cracks**

Posted on March 6, 2012 at 8:09 pm

Why is rodding granite so important for your countertops?

Here's why... rodding involves inserting steel rods secured with epoxy or polyester resin in the bottom face of granite along both sides where cutouts (sink holes) are required.

In 2000, the Marble Institute of America (MIA) conducted laboratory tests to determine the conditions under which rodding stone countertops may be beneficial.

The laboratory tests measured the flexural strength of reinforced and unreinforced samples of granite. Test results indicated that threaded round steel rods significantly strengthen the stone by 50% in load and 600% in deflection.

THE MIA NOW RECOMMENDS RODDING GRANITE COUNTERTOPS

What does this mean for the granite fabricator/installer? Rodding countertops at the weakest point, i.e., at cutouts, can significantly reduce waste and breakage when moving and installing the countertop. But what does this mean for you, the customer?

Even after the countertop is installed, rodding will help protect weak areas from breakage caused by cabinets settling, or by misuse of your countertops (standing

on them). Caution: It is not appropriate to use a rodding technique for granite repair. To fix granite that has broken by inserting rods is simply a bad idea.

HERE'S THE PROCEDURE FOR RODDING

- After cutting the stone to size, lay out the piece for additional cutouts such as sinks, cooktops, faucets, outlets, notches and other cutouts.
- Once you have completed the layout of any cutouts, then lay out the location(s) for the rod(s). Be sure that the rod(s) will extend beyond the cutout area by at least a couple inches on each side.
- Place the top face down on a smooth, soft, flat and clean surface on a work or saw table.
- Select a blade that is 1/8 inch thicker than the 3/8 inch width of the rod or make two passes on your cut.
- Mark the blade about 1/8 inch deeper than the depth of the rod.
- Cut the rod slot in the marked section on the bottom of the stone. Be sure to extend your cut far enough for the full length of rod to fit in (allowing for the curve of the blade) Cutting granite countertops takes patience.
- Check the rod in the slot to verify the fit.
- Remove the rod with a putty knife or a regular screwdriver.
- Clean the stone and allow it to thoroughly dry.
- Abrade the rod with a course grit abrasive, clean it, and allow it to thoroughly dry.
- Mix a flowing consistency adhesive, and pour it into the slot of the stone (polyester or epoxy).
- Quickly insert the rod fully into the slot. Then wipe the excess adhesive over the slot to completely cover the rod.
- Allow the adhesive to cure completely before moving the stone.

Rodding takes time but adds very little to the granite cost. The value of this form of insurance is priceless and every fabricator should include rodding in their countertops.

Paramount Granite Blog

Granite Countertops And Rodding...

Granite and other natural stones are comprised of a variety of different mineral deposits, which are formed deep in the earth's crust. It is the different mineral make up of the stones that create each stone's unique look and color. While the mineral composition makes each color stand out, it also determines the stone structure. Most granites are very hard and durable, but there are some that are considered more fragile. When a fragile stone is selected, care must be taken during the fabrication process to prevent breakage. Most reputable fabricators use a technique referred to as "rodding" to provide extra countertop reinforcement in more fragile areas, such as those in front of, or behind a sink, or a cooktop cutout. Rodding involves creating a groove in the bottom of the stone and inserting a metal rod and then filling it with resin. The rod offers additional support and provides more resistance to bending to the [countertop](#). Following are a few pictures of stone that has been rodded:



Countertop Rodding

For those of you fortunate enough to have avoided this issue on your jobsites, rodding is a process where a small slit is routed out of the stone countertop underneath the weakest portions, and a rectangular strip of metal is inserted and sealed in place with a polyester resin. The concept is that the metal strip adds rigidity to the stone and prevents the most stress prone areas such as sink and cooktop cutouts from failing.

So when is rodding necessary? And is your countertop not fabricated to the highest standards if it is not rodded? The answer is complicated and must take into account that in the process of rodding, we are removing some of the thickness and strength of the original material. The final decision will be based on a combination of our experience with your particular material and the particular layout of your project.

Our experience with the tens of thousands of rods we have installed is the following. Rodding saves us money in the long term and is not considered an expense but rather a normal part of quality fabrication. Rodding does decrease the likelihood of sudden and catastrophic failures during the transport of and installation of stone countertops. Rodding will not stop a stone from cracking if enough pressure is applied such as a cleaning crew standing on the cooktop bridge areas. It will, however, stop it from separating and allow us to effect a more efficient repair if required.

Rodding is not useful in the more dense materials with less movement.

Overall rodding is here to stay and we encourage your feedback and personal experiences to help us continue to improve the process.

Rodding Granite Countertops - The Pros and Cons

The Stone Shop

Posted: January 12th, 2011 10:30 AM CDT

Before I discuss the pros and cons of rodding, let me define the term. Rodding is the insertion of a metal rod into stone to provide apparent strength and to avoid breaking during transportation. The rod is inserted into a groove that is cut out in the bottom of the stone.

The controversy with rodding is whether it really provides strength or if it actually weakens the stone. I spoke to a number of fabricators and found that some rod every one of their granite countertops while others never rod. I also conducted a phone survey and asked numerous fabricators for their opinions on the matter. The following is a brief list of what I learned.

Pros And Cons Of Rodding

Pros

Provides strength to granite countertops.
Easier transportation.
Difficult to break.

Cons

Weakens the stone.
Provides a weak point leading to cracks.

To find out if rodding provided additional strength I conducted a crude experiment of my own. Two strips of 2 cm granite were cut into a length of 44 inches by 2 inches. A slot was cut in one of these strips and a long 1/8 X 1/4 inch rod was inserted and epoxied. The rod was inserted on edge so that the 1/4 inch side was vertical. The unrodded strip was placed across two 4" x 4"s. A flat, thin metal plate was placed on the center of the granite to serve as a point load. Weight was placed on top of the metal plate until the granite broke. This procedure was repeated with the rodded strip. The results were interesting. The unrodded granite broke at 80 lbs., while the rodded piece never broke, but developed a crack at 120lbs. I repeated this experiment three different times with similar results.

I also spoke with the technical director of the Marble Institute of America and he told me that the MIA is currently conducting tests on rodding and a paper will be published once the study is complete.

It is important if you do rod that you use the proper procedure and the right type of rod. The following procedure was submitted by Keith Graves of HE Saterwhite in Richmond, VA.

Rodding Stone

Considerations. The stone must thick enough to accommodate the rod without requiring a cut more than one half of its thickness. The stone must also be non-translucent, in that a rod and adhesive will not show through the exposed face.

Preparation. Sometimes it may be necessary to lay out and rod a slab before cutting it into the desired pieces. If this is done you must lay out the slab using extreme caution – allowing for blade thickness, cracks or other imperfections you plan to avoid.

Rod. The most widely accepted rod is a 1/8 in. x 1/4 in. stainless steel flat bar. The rod should be inserted on edge (with the 1/4 in. inserted as the depth or the thickness).

Technique

- After cutting the stone to size, layout the piece for additional cutouts such as sinks, cooktops, faucets, outlets, notches, and other cutouts.
- Once you have completed the layout of any cutouts, then layout the location(s) for the rod(s). Be sure the rod(s) will extend beyond the cutout area by at least a couple inches on each side.
- Place the top face down on a smooth, soft, flat, and clean surface on a work or saw table.
- Select a blade that is 1/32 in. to 1/16 in. thicker than the 1/8 in. width of the rod.
- Mark the blade about 1/16 in. to 1/8 in. deeper than the 1/4 in. depth of the rod.
- Cut the rod slot in the marked section on the bottom of the stone. Be sure to extend your cut far enough for the full length of rod to fit in (allowing for the curve of the blade).
- Check the rod in the slot to verify the fit.
- Remove the rod with a putty knife or a regular screwdriver.
- Clean the stone and allow it to thoroughly dry.
- Abrade the rod with a course grit abrasive, clean it, and allow it to thoroughly dry.
- Mix a flowing consistency adhesive and pour it into the slot of the stone.
- Quickly insert the rod fully into the slot. Then wipe the excess adhesive over the slot to completely cover the rod.
- Allow the adhesive to cure completely before moving the stone.

About the Author: Frederick M Hueston, columnist and author, is director of the National Training Center for the Stone & Masonry Trades (NTC) located in Asheville, N.C. NTC offers hands-on training to industry professionals on topics ranging from basic fabrication techniques to on-site repairs. NTC's website can be found at www.ntc-stone.com.