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Subject: COLORANTS, STAINS & ENHANCERS

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Introduction:

Advances in technology have improved the quality, affordability and variety of tile and natural stone available, making tile and natural stone installations more popular and common than ever before. Grout, the filler used between tiles, has also advanced in structural quality and in the variety of colors available. With an amazing assortment of colors to choose from, grout is not only used as a structural element but as a decorative device to accent the tile and coordinate with over all design schemes.

Because of its use as a decorative element the major area of dissatisfaction in new and old tile installations is the color and shade of the grout. Many things can go wrong with a new installation from improper grouting techniques to uncontrollable weather situations. Time and use also contribute to grout color problems in the forms of staining and fading of color. Whether the grout color was wrong at the time of installation or needs to be changed due to redecorating, epoxy, sanded and non-sanded grout can be colored or stained to improve appearance and ease in maintenance.

Before attempting to color grout it is important to determine what is the cause of the grout problem, what grout defects allow for coloring, how to prepare the grout for coloring and which grout coloring procedure will best fit the situation.

Note on the Term's "Colorant", "Stain" and "Enhancer":

Unfortunately the makers of grout coloring products use the term's "colorant" and "stain" indiscriminately. For the purposes of this research paper we will define the term "colorant" to denote those coloring product that are topical in nature such as epoxies and acrylic urethanes. The term "stain" will be used to denote coloring products that penetrate the grout to impart color but do not cover the surface. The term "enhancer" is applied to those products that penetrate the grout without covering the surface and enrich and darken the grouts color without physically changing the color. Carefully read package to determine which type of product is contained within.

Common Grout Problems: Is coloring the proper solution?

Grout colorants, stains and enhancer's are intended to be used over structurally sound grout, free from sealers or contaminants, which may cause bonding and penetrating issues. Although most grout coloring products double as sealers, protecting grout from water damage and staining, they are not intended to improve the structural integrity of the grout. If grout has structural defects it must be repaired before use of stains, enhancer's and colorants. Following are examples of common situations when grout coloring must be preceded by grout repair and cleaning or where grout coloring may not be the correct solution.

- **Shading or Mottling** - The most common grout problem associated with new tile installations is color and shading variations. The demands and expectations placed on the use of colored grouts especially as design elements are often unrealistic. Shade variation to some degree is unavoidable due to the nature of the grouting process. Excessive color and shade variations are mainly due to uneven drying and hydration of the grout. Other common causes are too much water used during clean up, uneven grout depth, highly absorbent tiles and the use of different batches of grout. A gentle cleaning with a neutral pH cleaner is usually all that is necessary to prepare grout for coloring.
- **Stains** - The most common grout problem associated with older grout installations is staining due to normal use. Stained and soiled grout joints can become an eye sore for most people but are considered great candidates for the coloring process. Oil, grease, paint, sealers, dust and dirt are bond breakers for grout colorants and will color unevenly when penetrating stains are used. It is important to determine what contaminants have caused the stain so that the appropriate cleaning method can be used. Recommended cleaning solutions will be discussed further in the section "preparing the grout for coloring."

- **Exposed Silica Particles** – Sanded grout is mainly comprised of two materials called surface fines and silica sand. Surface fines are small fine grains of the Portland cement that form the visible surface layer of the grout. Surface fines give grout its smooth finish and contain the grout color. Silica sand is comprised of larger particles of aggregate or inert filler, which give strength to the body of the grout. Using too much water during installation clean up, harsh acid or alkaline cleaners, and age can remove the surface fines revealing the silica sand beneath. The visible silica sand will look like gray or brownish areas often mistaken as stains. These areas of the grout will also have a rougher texture than the surrounding grout. Because of the physical properties of the silica sand, topical colorants will not adhere to it and penetrating stains will usually not mask these areas. Replacing the affected areas is necessary before the grout can be colored.
- **Efflorescence** - Soluble salts contained in the grout, mortar setting bed or slab are often brought to the surface during the drying process by moisture migration. These mineral salts appear on the surface of the grout as a white crystalline powdery substance. This is known as efflorescence and can be caused by excess water in the grout or setting materials. Coloring the grout will not stop this process. The efflorescence must be allowed to run its course and then be properly cleaned before coloring can proceed.
- **Powdery Grout Joints** - Powdery grout joints are usually the result of improper curing of the grout joints. Hot or dry weather, highly absorptive tile and improper grout mixing can cause the water in the grout to evaporate too quickly stopping the hydration process necessary for the grout to harden. Powdery grout joints can only be repaired by replacement.
- **Cracking** - Improper curing of the grout, deflection in the substrate or improperly mixed grout can cause cracking of the grout joints. Colorants, enhancer's and stains take the shape of the grout joints and will not cover or fill the cracks. Cracked joints must be removed and re-grouted.
- **Latex Migration** - Latex migration appears on the surface of the grout as a whitish rubbery-like substance often mistaken as efflorescence. Where as efflorescence is powdery in nature and will come off when brushed, latex migration will feel smooth and cannot be removed by brushing. Using too much latex additive in the grout or setting bed mix are the principal reasons for this condition. Colorants, enhancer's and stains will not adhere to the latex on the surface of the grout. Latex migration can typically be removed using solvent-based strippers and in most cases will restore the grout to its original color. Grout colorants would be recommended if discoloration or stains are still visible after a thorough stripping.

- **Organic Contamination** - Mildew, mold and algae can grow in grout joints causing staining, grout decay and even health problems. These organic contaminants thrive on the moisture present in the grout. The sealing ability of grout coloring products can prevent moisture from penetrating the grout joint in structurally sound installations. Unfortunately there are many other ways moisture may be entering the system such as defects in the installation substrate, through cracks in the grout and from moisture migration in the slab. Continued organic contamination after coloring will cause the coloring products to fail. Before grout can be colored, organic growth must first be neutralized using disinfectants or biocides, determine how water is entering the system, make necessary repairs to eliminate moisture problems and give the affected areas a thorough cleaning.

Preparing Grout for Coloring:

Following is a general guideline for preparing grout for coloring with either penetrating stains or topical colorants. It is important to carefully read and follow specific manufactures instructions and recommendations.

1. New grout should be cured for at least 48 hours or longer depending on humidity and temperature. Refer to grout manufactures instructions. Grout must be structurally sound and free of defects. Colorants, enhancer's and stains cannot repair cracks, voids, powdery grout and areas where the surface fines have been removed. When replacing grout before coloring, it is important to select a grout color similar to the surrounding grout joint color. Excessive variations in the grout color may cause shading problems in the colorant coat and will show through enhancer's and coloring stains.
2. Grout must be clean, dry and free of contaminants that may prevent proper bonding and shading problems with grout coloring products. Grease, oil, soap scum, body oil, mildew stains, algae, acrylic waxes and floor finishes are common contaminants which will adversely affect the coloring process. These types of contaminants can be removed using heavy-duty, high alkaline cleaners and strippers. Urethane coatings, paint, adhesives, synthetic finishes and sealers that have been applied to the grout must also be removed. These contaminants can be removed using readily available solvent-based strippers. When a sealer must be removed consult the manufacturer of the sealer applied, if possible, for the proper stripper to use. After cleaning or stripping the grout must be well rinsed to avoid leaving residues that may also cause bonding issues. New grout installations should be given a gentle cleaning using a neutral pH cleaner.
3. For installations that have been subjected to heavy traffic, a cleaning with sulfamic or phosphoric acid is recommended socially when

using colorants. This will open the pores of the grout allowing for deeper penetration of the colorant, enhancer or stain. The acid cleaning will also remove hard water deposits, efflorescence and lime deposits which can adversely affect coloring. It is very important to note that acids of all kinds can etch or lighten natural stone and acid sensitive glazes. For grout around these types of surfaces use high alkaline cleaners only. After acid cleaning the grout must be well rinsed. Acid cleaning is generally not necessary for new tile installations

4. The coloring process may also stain porous tile or natural stone, making it necessary to seal these surfaces using a penetrating type sealer prior to coloring. It is important to note that not all colorants and stains are compatible with sealers. Consult with the product manufacturer for their recommendation when applying over these types of installations. Solvent based stains and enhancer's cannot be used to color the grout unless they are being used over the entire installation including the stone or porous tile.

Grout Stains:

Stains are the least common of the grout-coloring products. They are usually solvent based and penetrate the surface of the grout covering the aggregate with pigment. Stains do not coat the surface of the grout and maintain the grouts granular surface texture unlike colorants, which tend to look painted. Because they do not cover the surface of the grout they are not as effective as colorants for changing grout colors. They work best when changing light colors to darker colors. When changing dark colors to light they will look more like a wash and give an uneven coloring effect. They can be applied over sanded and non-sanded grout but will not work over epoxy grout. Solvent-based stains should not be used with natural stone and porous tile, as they will stain it. Sealing the stone will not prevent this because solvents will break down sealers.

Grout stains are usually also sealers and provide excellent protection against water and water damage but lack the chemical and oil resistance of grout colorants. The sealing and coloring effects of stains will generally last up to five years before needing reapplication. Stains can be used for interior and exterior applications but will fade rapidly when exposed to constant sunlight and exterior weather conditions.

Although not generally recommended, concrete stains, Saltillo stains and acrylic paints are sometimes used to stain grout with varying degrees of success. When using these types of stains, sealing is usually required.

Enhancer's:

Enhancer's are very similar to grout stains. They are typically solvent-

based, penetrating products, and do not cover the grout's surface, maintaining the granular aspect of the grout joint. The main difference between stains and enhancers is that they do not use pigments to change the color of the grout, but instead, darken and enrich the existing color. This effect is generally called "the wet look."

Enhancers work best on grout that is of uniform color, the main complaint being that the grout has dried too light. If the grout has large variations in color, shading or mottling this effect will usually be enhanced as well. The best test to determine if this is the proper product for a given application is to apply water onto the grout joint and observe whether the grout color darkens evenly and to the desired shade. Although enhancers can be water based, solvent-based enhancers work more effectively for darkening and enriching the color.

Enhancers should not be used over grout in natural stone and porous tile installations, unless the stone and tile are to be enhanced as well.

Enhancing the grout joint only, may result in a picture framing effect or staining. Epoxy grout cannot be enhanced due to its low porosity and in most cases solvent-based enhancers may damage the epoxy grout.

Enhancers, much like stains, provide sealing protection but not to the degree afforded by epoxy colorants. Enhancers can be used for interior and exterior applications but will also fade rapidly when exposed to constant sunlight and exterior weather conditions. The life expectancy of most enhancers is up to three years but in exterior installations may need reapplication as often as every six months.

General Application Instructions for Grout Stains and Enhancers:

The advantage of using stains and enhancers is their ease of application. Removal of the existing enhancer or stain is not necessary for reapplication. Reapply in the same manner as original application.

1. Clean and prepare existing grout joints as described in the section "Preparing the Grout for Coloring."
2. Read entire label before using the product. Follow manufacturer's instructions.
3. Always test stains and enhancers on a small inconspicuous area of the grout joint to determine desired results. Special consideration should be given to the difficulty of removing stains and enhancers after application. On porous material removal may be impossible.
4. If using more than one container of grout stain, mix all products to be used in a large container to ensure uniform color.
5. Apply using cotton towels or solvent resistant brush if needed and rub into surface.

6. One to three coats may be necessary to give an even and consistent appearance.
7. Second and third coats may need to be scrubbed into surface using a white nylon scrub pad.
8. Allow recommended drying times between coats.
9. All product that has not penetrated surface should be removed from the grout and tile generally within five to ten minutes after application
10. Allow for recommended curing time.

Grout Stain and Enhancer Maintenance:

The use of neutral pH cleaners is recommended for routine cleaning and maintenance.

High alkaline and solvent-based cleaners may fade stains and enhancer's and neutralize sealing abilities. The use of bleach, vinegar or ammonia will shorten the life expectancy of both stains and enhancer's. Because the grout joints are usually recessed below the level of the tile, dirty mop water will settle into the joints and over time cause build up. Rinsing after mopping will help prevent this build up and reduce the need and frequency of heavy-duty cleaning. When necessary, use heavy duty or high alkaline cleaners designed for tile and grout care.

Health Considerations Concerning Stains and Enhancer's:

Most enhancer's and stains are solvent based and generally considered to be toxic as well as combustible. Special consideration must be given to these limitations before use. Manufactures warnings and use recommendations must be followed at all times. Most manufactures suggest the use of respirators as well as solvent resistant gloves, safety goggles and protective clothing. Use only in well ventilated surroundings if possible. The solvent odor may linger for some time until the curing process is complete.

Grout Colorants:

Grout colorants are commonly found in two types of formulas, epoxy and acrylic urethanes. Both types are applied topical and are generally water-based which allow for ease of clean up during application. Grout colorants provide excellent sealing capabilities that work exceptionally well in keeping moisture and stains at the surface were they can easily be removed, in most cases by simply wiping away contaminate. They are also very fade-resistant, which is something to consider when using in an exterior or sun drenched area. The life expectancies of most grout colorants vary from product to product and range from up to 10 to 15 years; the way the surface is maintained and the location of the installation will also

determine the overall life expectancy.

The use of grout colorants are not limited to floor and wall applications only, they are commonly used in exterior and interior locations, bathrooms, shower areas, countertops and over other cementitious grout installations such as glass block set with mortar. Grout colorants can also be used over a variety of installations, most commonly over ceramic and porcelain but can also be applied over natural stone and porous tiles, extreme care during application and pre-sealing using a penetrating sealer is required when applying over these types of materials.

The most popular colorants are the water-borne epoxy type known in the industry to be more chemical resistant than the acrylic type. The epoxy-based colorants can also be applied over epoxy grout installations, which is an advantage when dealing with commercial installations in food prep and manufacturing facilities.

In order to meet modern customer demand most manufacturers offer a large pallet of designer colors, both of their own creation and also matching grout manufacturers stock colors. Some manufacturers will also create special batches for customers and designers looking for a certain color or shade. When choosing a color, one should always consider applying a small amount onto a test area to determine final results. Most grout colorants will usually dry to a lighter color than how they appear in liquid or wet form.

General Application Instructions for Grout Colorants:

1. Clean and prepare existing grout joints as described in section “Preparing the Grout for Coloring”
Note: Grout colorants approved for use over epoxy grout joints can normally be applied directly to clean grout surface. In the event that bonding does not occur properly, the softening of the epoxy grout joint surface layer can be achieved using a solvent-based stripper. This process will allow for a greater bond of the grout colorant. Always consult with the colorant manufacturer for specific recommendations.
2. Read entire label before using the grout colorant. Not all colorants are alike and may have special application instructions. The following application instructions should be used as a guideline for applying most grout colorants.
3. Always test the grout colorant on a small inconspicuous area of grout joint to determine desired results. You can also determine the drying time needed and clean-up process required for your particular installation.
4. Shake grout colorant bottle well, assuring color is evenly mixed.
5. If using more than one container of grout colorant, mix all products

to be used in a large container to ensure uniform color over installation.

6. Pour grout colorant into a small open dish or container.
7. Apply colorant using a soft to medium grade toothbrush or a grout colorant applicator brush. Dip brush into colorant and apply directly to the grout joint.
8. Spread the grout colorant evenly, working it into grout joint using a back-and-forth motion. Avoid build-up and puddling by applying thin, even coats.
9. Work carefully to limit the amount of grout colorant that gets onto tile. You may mask grout joints using masking tape to alleviate clean up. The use of blue painters tape is recommended for this process.
10. When applying a lighter colorant over a dark grout joint it may be necessary to apply more than one coat, as the lighter color may appear translucent with only one coat. Allow a minimum of 2-hours drying time between coats.
11. After grout colorant has dried for 45-minutes to 2-hours (varies depending on product used and ambient temperature), apply a light mist of clean water and let sit for 5-minutes.
12. Remove grout colorant residue off of tile surface using a white nylon scrub pad. Hold the nylon scrub pad flat on the palm of your hand, concentrating the scrubbing action on the tile face only.
13. Wipe up residue and water using dry cotton cloth or paper towels. A shop-vac may be used for clean up using a flat bar attachment.
14. Avoid scrubbing directly onto grout joints a minimum of 20 days to allow for a full cure.

General Re-application Instructions for Grout Colorant:

NOTE: Most grout colorants can be applied directly over themselves. This process is normally done when excessive traffic or harsh cleaning methods have eroded or worn colorants away from installation. Consult the grout colorant manufacturer to determine if this procedure is recommended with their product.

1. Thoroughly clean affected areas using a heavy-duty or high alkaline cleaner making sure to remove any contaminants that may cause bonding issues with grout colorant.
2. Rinse well using clean water and allow to dry for a minimum of 2-hours.
3. Re-apply grout colorant as described in section “General Application Instructions for Grout Colorants.”

Grout Colorant Maintenance:

When maintaining your grout colorant installation a neutral pH cleaner

should be used. Most grout colorant manufacturers provide cleaners that are recommended as a system to help prolong the life of their product. The use of solvent-based cleaners should be avoided as they may adversely affect the grout colorant or decrease its life expectancy. In the case of a severely neglected installation a heavy-duty or high alkaline cleaner can be used, but should then follow with a routine maintenance program using a neutral pH cleaner.

Health Considerations Concerning Grout Colorants:

Most grout colorants are considered to be non-toxic. Some contain a caution warning against certain colors (Carbon Black – CAS#1333-86-4), which has been identified by the State of California as a carcinogen. Extreme care should always be taken when using these types of products, wearing rubber gloves and protective eyewear will decrease the chance of any job site mishaps. If products do come into contact with eyes or skin it is always recommended to flush with clean water, completely removing product from area. Grout colorant products are not intended to be taken internally or digested. If digested do not induce vomiting, instead flush system with clean water. And as always keep grout colorant products away from the reach of children.

Summary:

Whether grout color has been compromised due to improper installation, age or the need to redecorate, grout color can be changed or enhanced using a variety of methods. The three main types of products designed to color or enhance grout are: “colorants” that coat the grout surface, “stains” that penetrate the surface and impart pigment and “enhancer's” that penetrate the surface, darkening and enriching the color with out changing it.

Epoxy colorants are considered to be the most resistant to stains and the longest lasting coloring method. Epoxy colorants are also the only coloring product that can be used over epoxy grout joints. An advantage of using stains and enhancer's as compared to colorants is their ease of application. Solvent-based coloring methods are not recommended for use on grout joints around natural stone or porous tile unless the tile or stone is to be colored or enhanced as well.

Coloring products will neither reinforce grout nor repair structural defects present in grout joints. Coloring products are intended to be used over structurally sound and clean grout, free of sealers and contaminants that may cause bonding or shading issues. Proper grout preparation procedures must be followed for successful coloring. Users are to determine if coloring is appropriate for their installation.

Whatever coloring method is used, proper maintenance is required to obtain the full benefit of the products coloring and sealing properties. General cleaning should be done with neutral pH cleaners and rinse mopping is highly recommended. Products designed for use with tile and grout should be used as compared to household product such as ammonia, bleach and vinegar that can damage or lighten the coloring product. With proper use and care, coloring grout can add to the beauty and longevity of a tile installation.

The preceding article was researched and written by Michael Diaz and Albert Gutierrez as a requirement for the Ceramic Tile consultant Course. We wish to thank Mr. Diaz and Mr. Gutierrez for their excellent report.

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