Basic Knowledge of Stones

INTRODUcTION:

Many people who associate with stone assume that it is a permanent material that does not need maintenance or care. After new stone is installed, permanent damage often occurs from neglect, incorrect cleaning methods, and using chemicals that are not formulated for stone care.
When stone is purchased, it proceeds thought a four stage process. The process begins when the architect selects and designs the stone. The second stage is completed when the stone supplier fabricates and delivers the material. The third stage is accomplished when the stone is properly installed, protected, and then grouted. The final stage entails selecting a proper stone maintenance system.
Understanding stone and the products that are available for stone care are vital elements for a successful stone maintenance system.
The objective is to establish a customized and long-term stone maintenance system that covers the stone maintenance cycle. The cycle includes preventive maintenance, daily maintenance, and restoration.
Stone needs conditioning, cleaning, protection, and restoration. Understanding stone and stone care products are the most important features in development a successful maintenance program.
How much training and education do employees receive on stone care maintenance? The answer is usually none.
Today most stone floors as if they are resilient tile. Most stone vanity and counter tops are cleaned with harsh chemicals as if they were made of Formica.
A through inspection of the facility will be provided to establish special stone care techniques for problem areas. Example, how to maintain stone in an elevator?

HISTORY:

Stone is a natural solid formation of one or many minerals. There are thousand types of stone that have been quarried thought the centuries. Quarries are located all around the world. A majority of natural stone comes from Italy, Spain, Turkey, United States, Mexico, china, Taiwan, India, Greece, canada, France, and Brazil.
The minerals in stone came from the same liquid and gas minerals that formed the earth. The Earth developed as a massive body of gas and liquid minerals that slowly cooled and condensed to a solid care. Through pressure, the Earth's crust began to from and heavy minerals were forced down to the core of the Earth, where they were trapped. As the crust got thicker, it squeezed around the inner core, which created intense pressure and heat from within the Earth. crystals and other solid forms began to grow from the mineral vapors that were being released. As the Earth's crust began to expand and erode, heat and pressure pushed the solid minerals up to the Earth's surface, which formed colossal rock beds. It took up to a hundred million years to from some of these beds. Many of the beds are now used as quarries where the stone is mined.
Most of these minerals can be identified by their color, hardness, and crystal formation. crystals come in a variety of shapes and sizes. The wide arrays of minerals are often difficult to identify. Many stones look very similar to each other; however, they are all different.
It is imperative to know the exact type of stone that is to be maintained. Stone is natural and may have adverse reaction to certain cleaning chemicals and procedures. Most stones are also natural alkalis and so are dirt and soil; therefore, stone and dirt are attracted to each other often making cleaning very difficult. This makes the proper selections of cleaning procedures and chemicals for stone very complex.

TYPES OF STONE:

The familiar stone types that are used today are identified through four categories:
Sedimentary, Metamorphic, Igneous and Man-made stone.
I. Sedimentary stone came from organic elements such as glaciers, rivers, wind, oceans, and plants. Tiny sedimentary pieces broke off form these elements and accumulated to from rock beds. They were bonded through millions of years of heat and pressure.
Limestone: Mainly consists of calcite. It does not show such graining or crystalline structure. It has a smooth granular surface. Varies in hardness. Some dense limestone can be polished. common colors are black, grey, white, yellow or brown. It is more likely to stain than marble. Limestone is known to contain lime form sea water.
Sandstone: Is a very durable formation of quartz grains (sand). Usually formed in light brown or red colors. categorized by the most popular sandstone bonding agents such as silica, calcium, clay, and iron oxide.
Soapstone: A very soft stone made of a variety of talc. It is a dense mineral that wears well and is often resistant to oxide.
Fossilstone: considered a limestone that contains natural fossils such as sea-shells and plants.
Travertine: Usually a cream or reddish color. It is formed through the accumulation of calcite from hot springs. It contains lots of holes that were formed from water flowing through the stone. These holes are often filled with synthetic resins or cements. Requires lots of maintenance if the holds are not filled. classified as a limestone and a marble.

II. Metamorphic stone originates from a natural from one type of stone to another type through the mixture of heat, pressure, and minerals. The change may be a development of a crystalline formation, a texture change, or a color change.

Marble: A recrystallized limestone that formed when the limestone softened from heat and pressure and recrystallized into marble where mineral change occurred. The main consistency is calcium and dolomite. Ranges in many colors and is usually heavily veined and shows lots of grains. Hardness rates from 2.5 to 5 on the MOH Scale.
Marble is classified into three categories:

1. Dolomite: If it has more than 40% magnesium carbonates.
2. Magnesium: If it has between 5% and 40% magnesium
3. calcite: If it has less than 5% magnesium carbonate.

Slate: Fine grained metamorphic stone that is formed from clay, sedimentary rock shale, and sometimes quartz. Very thin and can break easily. Usually in black, gray or green.
Serpentine: Identified by its marks, which look like the skin of a serpent. Most popular colors are green and brown. Hardness rates from 2.5 to 4 on the MOH scale. contains serpentine minerals has lots of magnesium, and has an igneous origin. Does not always react well to recrystallization or diamond polishing.

III. Igneous stones are mainly formed through volcanic material such as magma. Underneath the Earth's surface, liquid magma cooled and solidified. Mineral gases and liquids penetrated into the stone and created new crystalline formations with various colors.
Granite: Primarily made of Quartz (35%), Feldspar (45%) and Potassium. Usually in dark colors. contains very little calcite, if any. Provide a heavy crystalline and granular appearance with mineral grains. It is very hard material and easier to maintain than marble. Yet, it is still porous and will stain. There are different types of granite depending on the percentage mix of quartz, mica and feldspar. Black granite is known as an Anorthosite. It contains very little quartz and feldspar and has a different composition than true granite.

IV. Man Made Stones are derived of unnatural mixtures such resin or cement with the additive of stone chips.

Terrazzo: Marble and granite chips embedded in a cement composition.
Agglomerate or conglomerate: Marble chips embedded in a colored resin composition.
cultured or Faux Marble: A mix of resins that are painted or mixed with a paint to looks like marble.

STONE NAMES

currently, there are many companies around the world that use generic names to identify different types of stone. This has created a problem for the stone maintenance industry. The original names were in Italian. Usually the name consists of two parts. The first part describes the color and second part describes the name from where the stone was quarried.

ITALIAN NAME	ENGLISH cOLOR
Azzuro	Blue
Breccia	Broken Pieces
Dorato / D'oro	Gold
Fiore	Flower
Giallo	Yellow
Negro/ Nero	Black
Perla/ Perlato	Pearl
Rosa	Pink
Rosso	Red
Verde	Green
Bianco	White

Example:
Negro Marquina is a black limestone from Marquina, Spain.
Bianco carrara is a white marble from carrara, Italy.

TYPES OF SURFAcE TEXTURES

There are many different types of stone available today. When stone is ordered, it is fabricated with a particular type of surface. There are six main type of surfaces that are selected:
Honed: Provides a flat to low sheen gloss. Different levels of gloss can be selected. This surface is very smooth, but often very porous. This texture is common in high traffic buildings. Honed floors should always be protected with Penetrating Sealer because it has wide-open pores. Honed stone colors are not as vibrant as polished stone.
Polished: A glossy surfaces that wears away with time due to heavy foot traffic and using improper maintenance procedure. This surface is very smooth and not porous. The reflectively of polished crystals brings out the brilliant colors and grains of natural stone. The shine comes from the natural reflection of the stone's crystals. The shine is due to polishing bricks and polishing powders used during fabrication. The Shine is not from a coating.
Flamed: A rough surface that is developed through heat. During fabrication, the stone is heated up and the crystals begin to pop, thus forming a rough surface. This surface is very porous and must be treated with an impregnator.
Sand Blasted: This surface is the result of a pressurized flow of sand water that provides a textured surface with a matte gloss.
Sawn: A Process performed by using a gang saw.
Bush Hammered: A pounding action that develops a textured surface. The degree of roughness can be selected.
Regardless of the type of surface to be maintained, all stone should be protected with sealers.

COLORS

As discussed previously, stone was formed from different types of natural minerals. Marble's main consistency is calcium. calcium carbonate is the natural source that bonds the stone. certain additive minerals blended into during formation to customize these brilliant colors. The additive minerals are also color developers present in granite and other natural stones.

Stone color	Mineral
Black	Biotite, Hornblende, carbon
Brown	Limonite
Gray	Variety of minerals
Green	Mica, chloride, Silicate
Red	Hematite
White	Feldspar, calcite, Dolomite
Yellow	Limonite

Mineral	Mineral color
Augite	Brown, Green, Black, Purple
Biotite	Black, Brown, Green
calcite	Pearlenscent and Pale colors
Dolomite	colorless, Pink, Pale Brown
Feldspar	Yellow, White, Pink, Green, Grey
Hematite	Metallic Grey or Black
Hornblende	Green, Yellow, Brown, Black
Limonite	Black, Brown, or Yellow
Sulphur	Pale Gold

Minerals have a variety of crystalline properties. A different has a different color. For instance, Augite (listed above) has different crystalline properties. Each property has its own color. Stones brilliant colors and various crystal formations developed when different mineral properties blended together along with the integration of temperature and pressure.
The veins and color grains of marble were liquid minerals that flowed through the stone when the Earth heated up. The intense heat softened the limestone to allow the liquid to flow through it. When the Earth cooled, the mineral flow stopped and gradually hardened to its state.
The delicate colors of stone often can altered by the improper use of cleaning chemical, mopping with dirty solution, using chemicals that are not designed for stone care, and sunlight can fade the color of natural minerals.

REFLEcTIVITY OF STONE

Stone contains natural crystals. These crystals reflect light to provide a shine on the surface. When the crystal care dull, crushed, or broken, they cannot reflect light evenly. For Example, when the lens of a flashlight breaks, it cannot reflect the light that is being emitted form the bulb.
Polished stone floors become dull when heavy foot traffic along with sediment erodes the crystals. Normal footwear does not cause the main damage, sediment and grit do. The sediment and grit that lies on the stone surface is the main enemy of stones crystal. The damage to the crystals occurs when the pressure from the shoe forces the sediment to abrade or fracture the crystals.
The only safe way to restore and sharpen the crystal is to polish them with diamond abrasives or polishing powders. The life span of crystal can be extended can by administering a through dust mopping program with proper moping and maintenance system. Extensive entrance matting is extremely important because it keeps exterior sediment from entering a building.

THE HARDNESS OF STONE

Marble is a relatively soft stone. On a measurement of hardness of (MOHS), marble is approximately a three out of ten. Marble is made of calcium, just like your teeth. If you eat something to hard you will break your tooth. If you eat a lot of sugar you will get a cavity. Stone reacts the same way. If an improper chemical is applied to the surface, corrosion will begin to from cavities in the stone.
Listed below is the famous Measurement of Hardness (MOHS) Scale for stone. This is a guide developed in the 1800's, which helps evaluate the strengths and weakness of the stone being used. For example, softer stone would require less active chemical and a more frequent dust-mopping program.

MEASUREMENT OF HARDNESS ScALE

10	Diamond
9	corundum
8	Topaz
7	Quartz (Granite)
6	Feldspar (Granite)
5	Apatite
4	Fluorite
3	calcite (Most Marbles)
2	Gypsum
1	Talc

The objective of the MOH's Scale is to measure stone resistance to hardness. When sediment and grit harder than the surface, they will scratch and harm the stone. For example, a piece of hard plastic is about a 2.0. It will not scratch #3 calcite (Marble). However, a piece of sand that measures a 6, will scratch #3 calcite but will not scratch #7 Quartz which is Granite. The harder the stone, the more resistant it is to abrasion. Exterior sediment that is tracked in to buildings approximately measures from 3.0 to 7.0.

UNDERTSTANDING STONE MAINTENANCE CHEMICALS

In the stone maintenance industry there are two types of chemicals that are utilized, water-based and solvent-based.
Solvent-based chemicals do not contain any water do not register a PH balance. These ingredients are only soluble in other solvent. Some examples of solvent chemicals are paint thinners, most penetrating sealers (impregnators), D-Limonene, and alcohol.
Water-based chemicals are chemicals that contain water and have a PH balance. chemicals mixed in water are soluble in water. There are a water-based chemical such as neutral cleaners, ammonia, bleach, and most chemicals that have a PH balance.
In order to determine the different between solvent and water based chemicals, read the Material Safety Data Sheet (MSDS). Most solvent have flash point and can ignite. Most water-based chemicals do not have a flash point unless contain a solvent ingredient to add strength to the product. For example, many degreasers contain D-limonene. In most stone care situations, if a stain or coating is water-based, then water-based chemicals are needed to remove it.
Listed below are samples of the two types of chemicals:

WATER-BASED	**SOLVENT-BASED**
Alkalis	D-limonene
Acids	Alcohol
Hydrogen peroxide	Siloxane
All purpose cleaners	Acetone
Glycols	Mineral spirits

It is advisable to use water-based chemicals. The reason is due to the environmental concern that solvent-based chemicals are harmful to our environment. Water based chemical are usually more user friendly. Remember to always wear proper protective gear when using any chemical and them all out of the reach of children.

UNDERSTANDING PH BALANcES

PH is a unit of measure to determine the alkalinity and acidity of a solution. PH has been defined as either the "power of Hydrogen" or "Pre-existing Hydrogen". It is rated on a scale of 0 to 14. 0 to 6.5 being acidic (Hydrogen) and 7.5 to 14 being an alkali (Hydroxide). 7 being neutral.

0__1__2__3__4__5__6___6.5_____7.0_____7.5___8__9__10__11__12__13__14

Acid	**Neutral**	**Alkalis**
Acid Bowl cleaners		Strippers
Vinegar		Degreasers
Most fruit Juices		Ammonia
Alcoholic beverages		Most all purpose & household cleaners.
Many household bathroom cleaners		Dirt and soil Many natural stones

Most stones used today are sensitive to both acidic and alkali cleaners. One reason is due to the fact that most stones are classified as hydroxides, which classifies them as natural alkalis. Acids will burn most stones by dissolving the bonding agent that together. Alkalis usually do not damage stone as quickly, however, they will cause deterioration.
The corrosiveness of acids cannot always be measured with the pH scale. In most instances, the lower the pH number the stronger the acids. A solution with a pH level of 1 is usually stronger than a solution with a pH of 4. However, there are some acids with a higher pH that are stronger than an acid with a lower pH.
On the alkali side, the higher the pH number the stronger the alkali should be. A solution with a pH balance of 12 is usually stronger than a solution with a pH of 9. When using an alkali cleaner, never use hot water because it may create a stronger alkali with adverse affects.
Understanding pH balance will help select the proper chemicals that can be used on stone. However, a main factor to remember when selecting a stone maintenance chemical is the activity level. For example, most neutral cleaners have a pH balance of 7; however, some neutral cleaners are stronger than others because they have higher activity levels. There are many neutral cleaners that are not active enough to thoroughly clean a stone's surface. There are also an abundance of neutral cleaners that are too active for stone to endure.

UNDERSTANDING THE STONE MAINTENANcE cYcLE

Stone is a neutral material. It should be taken care with proper maintenance procedures. Once the stone is installed, it will always go through a natural life cycle, precise maintenance schedules must be developed to care your type of stone.
Two main factors that should be considered when designing a maintenance program are the hardness and absorbency of the stone. These factors will help decide which chemicals, pads, brushes, and equipment are necessary to maintain the stone.

The Stone Maintenance cycle is comprised of three segments:

I. Preventive Maintenance
- Protecting the interior of the stone with a Penetrating Sealer.
- Proper walks-off entrance matting.
- Understanding your stone, chemicals, and procedures.

II. Maintenance
- Dust Mopping with clean rayon mops.
- Properly laundering and caring for maps.
- Wet mopping with a mopping program.

OR

Automatic scrubbing
- Repairing pits and cracks with epoxy or glues.
- Prompt spill pick-ups to prevent etching and staining.
- Powder polishing to receive polished finishes.
- Reabsorbing stains with poultice powders.

III. Restoration
- Resurfacing the stone with a diamond abrasive program to remove scratches, abrasions, and traffic patterns.
- Deep cleaning the pores of honed, flamed, or ground floors.