

Interior Design
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Lecture - 18
Interior Design: Materials - Tiles

Namaste. Hello, everyone. Welcome to my NPTEL course on Interior Design. We are discussing a few materials, and today we will be talking about tiles. This is our lecture number 18. And these are the contents for today's discussion.

So, there is tile treatment, different kinds or types of tiles, their finish and performance, some rules for working with tiles, tile installation, and references. So, let's see the tile treatment. First, to begin with, what is a tile? A tile is a manufactured piece of hard-wearing material. It could be ceramic, stone, metal, or even glass. Tiles are very important in the field of interior architecture. They could be used for covering roofs, floors, walls, showers, or even countertops and tabletops. And, you know, we can also have tiles made out of perlite, wood, or mineral wool. These are sort of alternate lightweight materials, and they could be used for wall and ceiling applications. Today's lecture will focus on the varieties available, their applications, and some points or terms to keep in mind while working with tiles.

Tiles are available in varying sizes and shapes. They could be small or large, rectangular, hexagonal, square, or a mix and match of different shapes. We could also create a sort of tile mosaic and different kinds of patterns by permutation and combination of these tiles, small or large, and the varying shapes that we see on the screen. They could also be custom-made. So, basic tile sizes, which are standard and found within standard industry practices, are 4 inches by 4 inches and 8 inches by 8 inches.

They could be 12 inches by 12 inches, 18 by 18, or 24 by 24. And, as I said, they could be customized. Eco-friendly tiles, which are made up of 70% recycled content, are highly in demand. So, we could also talk about recyclability, circularity, and custom-designed tiles based on that. Now, tiles could be single-fired or double-fired.

They could be glazed or unglazed. Depending on where we are using them, the taste of our clientele, and the kind of project, we could select from these available options. Now,

double-fired tiles are fired in the kiln twice and are generally harder than single-fired tiles. And when we talk about glazed tiles, they are often of the double-fired sort, but they are more slippery. Compared to unglazed tiles, they are more slippery and not recommended for wet areas such as bathrooms. Now, when we talk about the types of tiles, there is a lot of variety, but the major ones found in the market—and which are popular—we could start by understanding ceramic tiles. They have closed surfaces fired at very high temperatures.

And, you know, substances like mites and dust can hardly settle or develop on such surfaces. With appropriate ventilation, ceramic coverings prevent the formation of mold in rooms with high humidity, such as bathrooms, kitchens, and toilets. Ceramic tiles are odorless. They neither absorb nor store odors, vapors, or smoke. And they are particularly suitable for underfloor heating due to their ability to store and conduct heat.

And the even heat distribution saves heating costs. And owing to low air circulation, less dust rises when we work with ceramic tiles. As a result, the air in the room is less polluted by circulating dust. And these tiles are also known for their durability, resistance to dampness, affordability, and ease of cleaning, which is very important when working with tiles. They are also safe to walk on when slightly wet.

So that's why they are in demand. And they require the application of sealant, typically every four years or so. Also, continuing with ceramic tiles, it is important to understand that the term 'ceramic tile' is often used as a generic name for all types of tiles. But the composition of a true ceramic tile, which is technically approved, is very different from other types of tiles. These are some images of ceramic tiles.

Now, there is also natural stone, which is used for tiling. Natural stones such as quarried slate, limestone, flagstone, granite, and marble can be cut into tiles and used for tiling purposes, as well as for countertop materials. Marble is quite well known for its beauty, but it is expensive. It requires a lot of maintenance and can crack, stain, or mark easily. So it depends on the kind of project, the client's choice, and the purpose for which we are selecting a certain material. But yes, natural stone tiles look quite timeless and aesthetic.

Slate is noted for its beauty and long life. It is very soft so it can split easily. Now, granite is quite durable, it is dense, it is strong, but is mainly formed into basic tiles,

you know. So, we have very few basic patterns and options for which granite is used. Natural stone is also one of the most expensive types of tiles and some of them actually require a lot of care and sealant due to natural permeability.

So these aspects have to be understood and it comes over a period of time with experience and while working on ground doing some you know research studies on all of these types of tiles. So continuing with the natural stone, in the past most of the times the quarry tiles were used which came directly from the quarries. But now the manufacturers are using the extrusion method. And you know that method is used for making a vitreous clay tile which is almost as hard as natural stone. So that option is also being practiced.

Quarry tile has a rough surface which means that it is perfect for flooring because it provides a very good grip. So that is why it was used in the past and it is still sort of sought after. But because of, you know, a lot of environmental concerns and due to other reasons of, you know, ease of manufacturing and laying, it's also in practice that the extrusion method is being used. So it also means that quarry tile is not good for kitchen countertops as it is very, very porous. So one has to, you know, select and see where the application has to happen.

Even though quarry tile can be sealed to make it less porous, it is still not appropriate for food preparation surfaces. So, at least for kitchen design and food preparation areas, granite has become a big winner and is highly recommended. It should be noted, though, that while granite looks great, it does have its own problems. It cracks easily. Also, like quarry tile, granite is porous and must be sealed and polished regularly.

Granite is also like that. Granite and marble are easily scratched and are not always resistant to high temperatures. So, it is risky to place hot kitchen pots and utensils on them. Now, talking about cement tiles, they are created by pouring cement into molds and then finished by firing or natural drying. Color may be added to give it a different appearance.

A strong sealant must be applied to cement tile to resist stains, and this type of tile is not very common or popular. Some of the images could be plain cement tiles, patterns, or different colors and designs within the cement tile family. Then there are terrazzo

tiles. In terrazzo tiles, a cement or epoxy base is used, and stone or marble chips are embedded, as we see here. The surface is then highly polished.

Terrazzo tiles are known for their unique beauty, style and performance and they are also sort of known for their permanence. They are expensive but for all the reasons that is stated in terms of aesthetic and unique appearance, they are still in demand. Then there are, you know, Saltillo tiles or the Mexican tiles. They are generally handmade and air dried and they are softer and less durable, but they provide such a unique look that, you know, sometimes there is a demand for these kinds of tiles. And when they are used in indoors, these tiles must be sealed.

Some of the tiles are already sealed, you know, when they come from the manufacturers, but for the others, some care has to be taken care of. There is also terracotta tile you know which is like the earth material category and terracotta tiles are absorbent. They are most often used in patios. They must also be sealed for indoor use. Then there is a category of agglomerate tiles.

So these tiles are created by mixing, you know, the graded marble or granite chips with Portland cement, polyester, resin or epoxy. And then by mixing all of these sort of agglomerates, this sort of a composition is achieved, which can be used, you know, for the flooring and walling. Then there is glass mosaic tile. The glass mosaics are becoming quite popular these days and it's very common to find them in shades of blue, green, brown or they could also be some custom made color pigments. They are also available in clear translucent appearances and they provide a very unique look if not natural.

So they are still in demand. These tiles are usually three-fourths of an inch by three-fourths of an inch and they come in sheets roughly 12 inches by 12 inches for application. And this could be an expensive look to achieve. So it's not a very common or frequently used tile. But yes, when there is a specific taste or demand, glass mosaic tiles are used in projects.

So the ninth category is non-vitreous tiles, which absorb 7% or more of their weight because they are porous, and they are suitable for dry indoor areas. Then there are semi-vitreous tiles, which absorb 3% to 7% of their weight, and they are also suitable for dry indoor areas. When we talk about vitreous tiles, they absorb 0.5% to 3% of their weight

and are suitable for both dry and wet indoor areas, depending on the percentage they absorb. There are also impervious tiles. They absorb between 0% and 0.5% of their weight and are suitable for both indoor and outdoor use, again depending on where they are applied and the percentage of absorption by weight.

So when it comes to variety, the following kinds of tiles stand out and are mostly used for flooring. So there are encaustic tiles. They are available in both glazed and unglazed appearances. And some of them are very beautiful because they are inlaid with beautiful designs, patterns, and colors. Then there are marble tiles.

They are very attractive. They are very commonly used in household areas and other types of projects. Now the problem is that polished marble can be very slippery and therefore it is not recommended for high-traffic areas. Then there are ceramic tiles. They are made by firing clay, talc, and other materials at very high temperatures inside a kiln.

They also come in both glazed and unglazed varieties and can be made with recycled materials. For example, glass bottles. So they are also quite in use. Then we have porcelain tiles. Now porcelain is also a type of ceramic, and porcelain tiles are made by firing clay and other materials again at very high temperatures.

The result is a tile that is very dense and, most importantly, moisture-resistant. Porcelain tiles are ideal for bathrooms and kitchens and are quite sought after for areas where there is a lot of water. Then there are glass tiles. They come in a wide variety of colors, shapes, and sizes, and we can mix and match to create patterns. They can be textured to increase their slip resistance.

That's very interesting. Now, what could be the considerations when we are flooring tiles or putting tiles on the floor? These could be some very important considerations, and we must try to understand these terms or terminologies while learning about laying tiles. So, there is abrasion resistance. Basically, a floor surface's ability to resist scratching and scuffing upon contact with abrasive materials.

It's very important to understand this. Then, what are balanced cuts? Floor tiles that are cut to fit a certain area when a complete tile cannot be placed there. So, we have to balance those cuts and try to place the tiles in a way that achieves balance. Then, there are conductive tiles.

These are tiles that have the ability to conduct electricity. They must be handled with care, and we need to understand what kinds of tiles they are. Then, what is an epoxy adhesive? This adhesive is used to bond floor tiles directly to the subfloor, and it often contains a hardener and epoxy resin. These are all technical and important terms.

When we go and discuss with the vendors or we look at tiles in the market, it's always important to also understand, you know, the specifications, the technical aspects, these terminologies and discuss these and check with our requirements what kind of tiles finally we want to go for. Then there is flush which is a term used to describe tiles that are completely level with one another. So there is an even surface which is created by putting them flush. Then there is monocottura which is a type of a tile that is fired in temperatures up to 2000 degrees Fahrenheit or even hotter. And then there is grout which is very very important to understand while we are talking about tiles.

So, it is a mixture of cementitious materials which could be a mortar, sand and you know combined with water used to fill in the spaces between each tiles. And this comes in a variety of colors. Then there is mosaic, you know a tile design or pattern consisting of several small pieces of tiles. Then what is non-vitreous? A term that refers to tiles with a moisture absorption rate of 7% or higher.

It is porous. We talked a bit about it, you know, in terms of classification of tiles and the percentage of absorption just a few slides ago. And, you know, these are different kinds of edges and details when we put the tiles on the floor. Now, polished finish. Tiles that have a polished finish are usually glossy in appearance and have the ability to reflect light very well.

Then, what is the difference between terrazzo and mosaic? Because in the world of tiles, you will hear this quite often, and it may be confusing, and we may mistake one for another. So, basically, terrazzo comprises a solid floor. It is Portland cement mixed with marble chips, and it is poured like concrete. While mosaic is a type of tile pattern where different shapes of tiles—either broken pieces or cut pieces—are laid, and then a pattern is formed.

So, that is a mosaic. Now, talking about the finish and performance when we are doing tiling. So, when tile floors are installed and cared for properly, they can really last a lifetime. And unglazed tiles typically show less wear and tear than glazed ones. And,

you know, they perform better—the unglazed ones—in high-traffic areas, for example, the living room.

So, the unglazed ones typically show less wear and tear. And tile floors are versatile and can be installed above and below any grade. Then, some tile types are moisture-, heat-, and frost-resistant, and they can be installed outdoors—also, you know, in pool areas—because they are resistant to moisture, heat, and frost. The floor tiles that are glazed can be very slippery and are not generally recommended for moisture-susceptible areas. Ceramic tiles can be textured and tend to perform well in high-traffic rooms, such as kitchens, living rooms, and entranceways.

Also, ceramic tile floors are not suitable for waxing or refinishing. So these are some thumb rules and important aspects to keep in mind. Working with tiles definitely needs extra care, and it also needs expertise to understand the typology of tiles, various methods of application, and important things such as tile lining, using sealants, choosing the type and color of grout, cleaning and sealing grout, removing grout haze, and polishing and honing tiles. Knowledge regarding alkaline and acidic tile cleaners, restoration and refinishing of tiles, re-grouting, and anti-slip tile treatment is essential. So all of these are very important, in-depth, and require on-ground exposure and some experience to embrace this learning.

Now, again, as a thumb rule, one should buy 15% more tiles than required to fill the space. Keep in mind there may be some damage, such as wrong cuts or broken tiles. So it's always good to have this sort of thumb rule in place. These are some of the images, and again, while laying tiles on the floor, there may be some faucet openings. We may need to cut the tiles because there may not be enough space for a full tile, or there may be some servicing or plumbing.

And then, how do we align them? What kind of spacing do we leave between them? And how do we fill the grout between them? Is it the same color as the tiles, or could it be different? Then how do we use this squeegee to flush these and put them in properly?

So, what kind of pattern do we want to achieve? From which point should we start? Do we start from here and make an arrow indicating that the tile is placed here and then taken in this manner and that manner? So, there is a proper working drawing made to

explain how the tile is laid and how that drawing can be used most effectively on-site. That's very important.

So, it has to be made in that manner. Also, again, these kinds of details—what is the center line, what is the level till which the tiling is done, where the adhesive is required, where the plumb line is—ensure that the tiles are not misaligned and so on. There are some tools that are needed for laying tiles. So, there is an adhesive or mastic that is required. It should be of the right kind, and depending on whether the tiles are being laid in a kitchen or a pool room, the type of adhesive required must be decided.

Then there is the notched trowel, which is a very basic but important tool. Then there is a tile saw or a tile scorer. So, these are some of the most crucial tools required while working with tiles. There is also a diamond hole saw to cut out radiator pipes and other holes. And then there is grout, the filler that goes in the spaces between the tiles that we just saw.

There is also something known as the rubber float, a rubber foam rectangle with a metal backing and wooden handle, which is required to, you know, work while laying the tiles. Then, a measuring tape, of course, or it could be a digital laser measuring tape that we use these days. Of course, the level, the chalk line, the tile spacers, silicon sealant—all of these are very, very basic but crucial tools which are required on site while working with tiles. Grouting—we have been talking a bit about it, but here are some more details. It's a very, very important and critical process. The color of the grout could blend with the color of the tile, or it could be completely distinct. So, it is also a part of the design and the call of the designer. Finding an exact match can sometimes be tough, you know, if you want to match the grout with the tile, because it also depends on the environment in which the installation is taking place. It should be kept in mind that, you know, darker grout tends to be easier to maintain.

Also, sometimes it becomes a design vocabulary to, you know, have this contrast between light and dark. Most manufacturers do not recommend walking on tile floors until the adhesive and grout have properly dried. So, it's important that they are dried first, and the drying time will differ depending on the product. So, it is very important to read the instructions. And then, nippers or a rail saw should be used to make curved cuts.

So, it's not always, you know, the linear faces or just the straight cuts. It could sometimes be the curved cuts. So, there are tools for that also. If the grout joints are smaller than one-eighth of an inch, then non-sanded grout could be used. And rough-cut edges can be softened with a smoothing stone.

And if the grout joints are larger than one-eighth of an inch, then sanded grout should be used. Also, a wet or dry tile saw should be used for diagonal and straight cuts. So again, some of the important aspects to understand, some thumb rules to remember, and some of the tools used on site just to have an inventory of that. All of that is what we are trying to understand here. Now, what are some rules for working with tiles?

So bathroom tiles should be smaller, as a thumb rule, since larger tiles are difficult to fit around the many obstacles one could find within a bathroom space. Tile countertops are inexpensive, but the grout lines may be difficult to keep clean. So if we use tiles for countertops, then there is this issue of maintaining the grout. A neutral background with a few splashes of color is advisable rather than using too many colors all at once. Now, as I mentioned a few slides ago, grout can very much become a part of your design vocabulary.

The color of the grout can be changed. I often prefer that, actually. The spacing of the tiles can also be made wider or narrower to emphasize or de-emphasize the grout. That can also be part of the design. The type and size of tiles are as important as the grid pattern created by putting them together.

So by using smaller tiles, the grid pattern is further emphasized. So it could be a choice of the designer to use smaller tiles and have an emphasized pattern. The grout sealer needs to be applied to the seams after the tile is installed. It must be applied periodically to keep the seams waterproof. So these are all important points.

Now, typically, when we talk about tiles—or tiling—what are the laying methods that are part of this important process? So, tiles are only the upper part of a multi-layer system that includes a substrate, bonding and grouting material, expansion joints, etc. So it's like a system in place. So for this reason, the installation is as important as the tiles themselves.

So the laying methods are very important, and the technicalities need to be well understood. So, you know, there are these chromatic choices and the installation plans

for a floor or wall. So, as I was saying, the laying methods are very important. Factors including the size of the space—such as the height, natural or artificial lighting—as well as laying patterns and the style to be achieved. These all become very important.

Spaces of identical dimensions may seem different depending on how they are tiled. Now, that's actually a very important factor or a very important aspect of design that a designer can bring in to create spaces. So, how the tiles are arranged and how they create a certain perception of space is something an interior designer can contribute to by designing in such a manner or arranging tiles accordingly. For example, black and dark colors reduce a space as they absorb light.

White and light colors diffuse light and therefore enlarge a space. So these are also psychological aspects of space-making. Vertical lines or vertical tiling make a space look higher, while horizontal lines make it look wider. Square patterns make a space look both higher and wider. So these are all tools in the kit of an interior designer who understands the science and technique behind creating perceptual spaces by using different methods of laying tiles or selecting tile patterns.

For good tile design, it is necessary to analyze the characteristics of the surface to be tiled. These are critical for establishing the correct design solution and the appropriate laying method. Analyzing the surface to be tiled is very important. This analysis influences and determines the correct project solution. An examination of surfaces helps establish whether cleaning treatments are necessary and aids in selecting the most suitable adhesives.

Also, it is very important to study the behavior of the material of the tile and, you know, the expansion caused by changes in temperature, as it may lead to stresses—you know, the expansion of certain layers. Expansion caused by changes in temperature may lead to stresses due to the expansion of certain layers. So, these are all scientific and technical aspects, and understanding this behavior is also important. So, whenever we say, you know, an interior architect or interior designer versus interior decorator, it is also this difference in understanding the science behind selecting a particular material or a particular choice of, you know, tiling—because this kind of research and important knowledge is imparted during the courses or during the practice of, you know, interior design and interior architecture. So, of course, there may be decorators who are well-versed and take interest in knowing about these things, but at least as an institutionalized

way of pedagogy and practice—and the way these degree courses operate—this science, this technology, and all these aspects are also put together for us to learn.

Then there is the modulus of elasticity and sizing—again, you know, some kind of technical aspects. It is very important to understand these because they determine the behavior of the structure under real load conditions. Then the composition and structural arrangement—also right—which indicates the location and dimension of construction joints. So, we need to understand those because, you know, they allow for some movement between closed parts in the structure. The overall geometry of the surface to be tiled may affect the choice of tiles, their layout, the pattern or design we want to achieve, and the tile-laying technique.

So, the geometry again is very, very important. Some images over here. Now, the tile installation designs. So, you know, there can be different kinds of installations—parallel installation, diagonal, something known as herringbone pattern—we can do these kinds of installations. Inconsistent joints can be substantially reduced by using, you know, rectified tiles, which require the additional process of cutting and grinding after kiln firing.

So, of course, there's a method of installation, and also there's a method of rectifying inconsistent joints. Everything put together can produce beautiful patterns. So, there is a straightforward layout where you know there are more rectangular shapes, and typically a 3 mm joint is necessary for this kind of layout. This requires special attention in combining and leveling the single pieces to reduce the differences in flatness that may be present. Then there is a diagonal installation which may have some inset tiles, you know, put diagonally and then some inset or in-between tiles. These are mostly the rectangular shapes and the straightforward layouts that you are seeing.

And this one is the herringbone pattern that we were talking about. Very beautiful and quite sought after in the tile industry. Good dimensional tiles will always aid better consistency in joints. And then, of course, the proper sealings. That can give critical reaction time to save surfaces from staining and damage.

The final hardness of the tile is directly related to the mineral content, the temperature reached within the kiln where they are fired, and the duration of time the tiles are fired. So, these are all very important aspects, and manufacturers have to keep this in mind.

There is something known as measurement of hardness, which is MOH. These are all technical specifications that you will get to see if you take interest and when you do market surveys and try to know more about tiles. So, tiles with low MOH, which is the measurement of hardness rating, are not suitable for heavy traffic areas. So, this has to be kept in mind.

There are also various kinds of tests, you know, which are available for tiles, such as tests for slip resistance, water absorption, breaking strength, impact resistance, abrasive hardness, chemical resistance, etc. And it may be important, you know, to have a sort of overview understanding of these kinds of tests, as they are valuable when choosing tiles for specific applications. It is also advisable to select samples from different production batches for laboratory tests to ensure consistency. And the selection of compatible adhesives and grouting, you know, the correct method of installation and maintenance—they are all important factors to ensure the best or optimal performance. This is like, you know, a typical sort of sheet from a tile company and

This basically sort of lays out details such as the name of the tile. For example, this standard floor tile that we see over here. What is its size in inches? It is 9 by 9. The number of tiles required per square foot for a job that is being anticipated is 1.8. So basically, there is some kind of cutting required.

What is the usage? The usage is meant for both interior and exterior purposes. Some additional comments are given over here. So, like waxing or polishing to be done to get the desired result, square in one production, other shapes against order, etc., etc. And then there is also the material cost per square foot.

So, this category over here that we are studying or discussing particularly is less than rupees 50 per square feet. And then there is production against order which is ticked, and the rest is not applicable. So again, this is like, you know, for one assignment or a project, this kind of scheduler inventory is made. And this really helps, you know, execution on site, procuring material, and trying to also do some kind of cost estimate. Also some, you know, BOQ—how much is the quantity of tiles that would be required.

So these kinds of inventories are always important on site. So I would like to end, like I do every time, with a nice quote. Everything is designed. Few things are designed well. Thank you.

I will be seeing you next time, you know, discussing another material, which is paints. And there are some references. One of the articles was actually written by me for Insight, and some more references over here could help you with images and illustrations. Thank you again. I'll see you.