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Large Gauged [Porcelain Panels](#)



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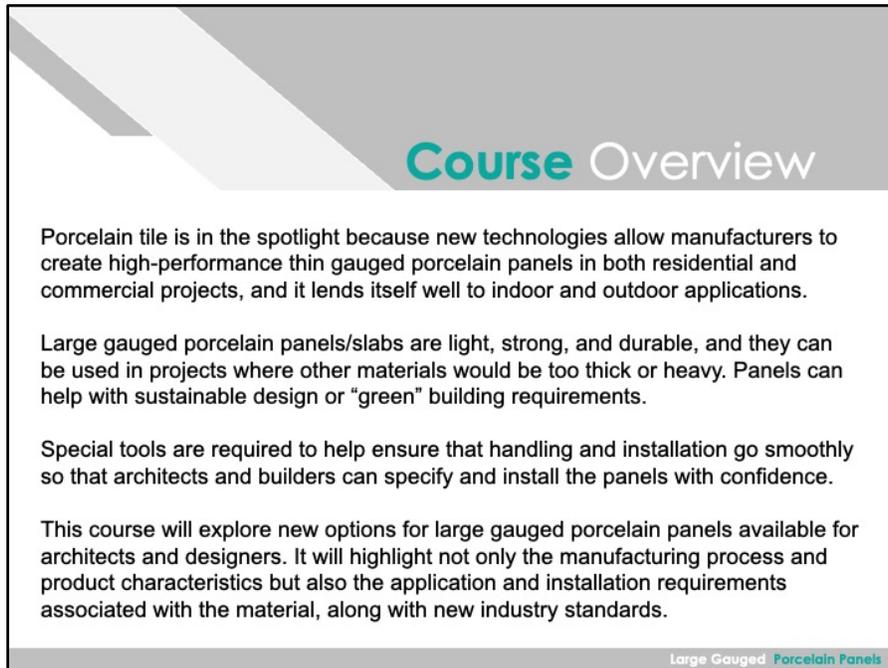
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The slide features a grey header with the text "Course Overview" in teal and white. Below the header, there are four paragraphs of text. At the bottom right of the slide, there is a small teal text label "Large Gauged Porcelain Panels".

Course Overview

Porcelain tile is in the spotlight because new technologies allow manufacturers to create high-performance thin gauged porcelain panels in both residential and commercial projects, and it lends itself well to indoor and outdoor applications.

Large gauged porcelain panels/slabs are light, strong, and durable, and they can be used in projects where other materials would be too thick or heavy. Panels can help with sustainable design or “green” building requirements.

Special tools are required to help ensure that handling and installation go smoothly so that architects and builders can specify and install the panels with confidence.

This course will explore new options for large gauged porcelain panels available for architects and designers. It will highlight not only the manufacturing process and product characteristics but also the application and installation requirements associated with the material, along with new industry standards.

Large Gauged Porcelain Panels

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Learning Objectives

- 01**
Define the qualities and benefits of large gauged porcelain panels/slabs, its characteristics, and how it's different
- 02**
Explain the manufacturing process involved in producing thin large gauged porcelain panels/slabs
- 03**
Recognize the appropriate applications for large gauged porcelain panel/slabs
- 04**
Explain the transportation and installation requirements with the specialized tools required to handle and fabricate large gauged porcelain panels/slabs

Large Gauged Porcelain Panels

By the end of this learning unit, you should be able to:

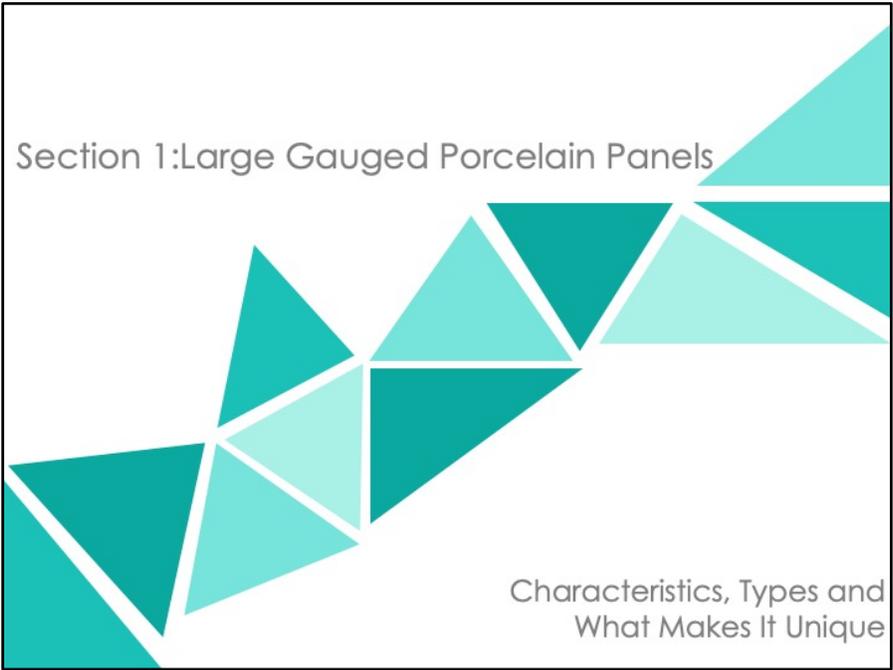
Define the qualities and benefits of large gauged porcelain panels/slabs, its characteristics, and how it's different

Explain the manufacturing process involved in producing thin large gauged porcelain panels/slabs

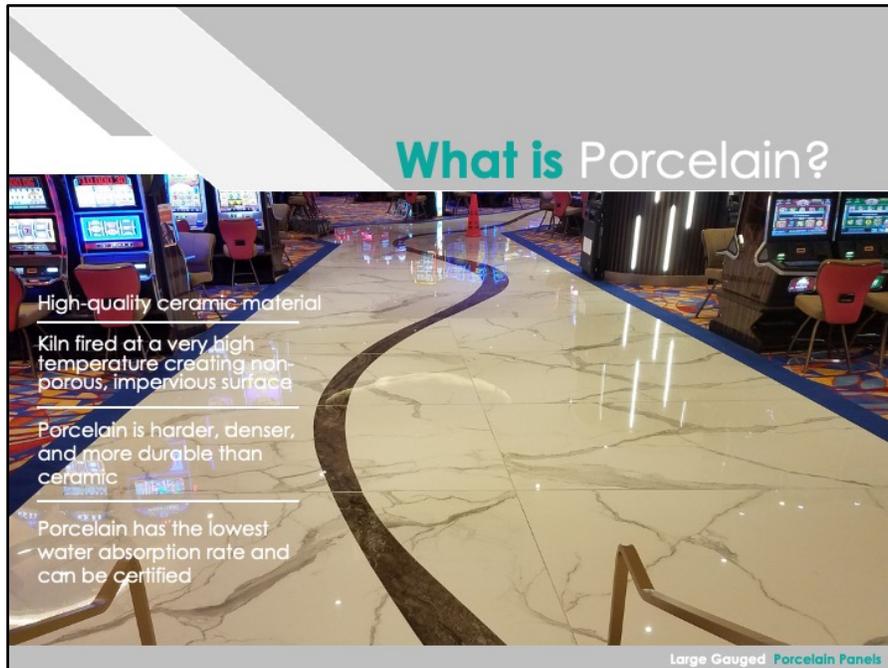
Recognize the appropriate applications for large gauged porcelain panel/slabs, and

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Section 1: Large Gauged Porcelain Panels



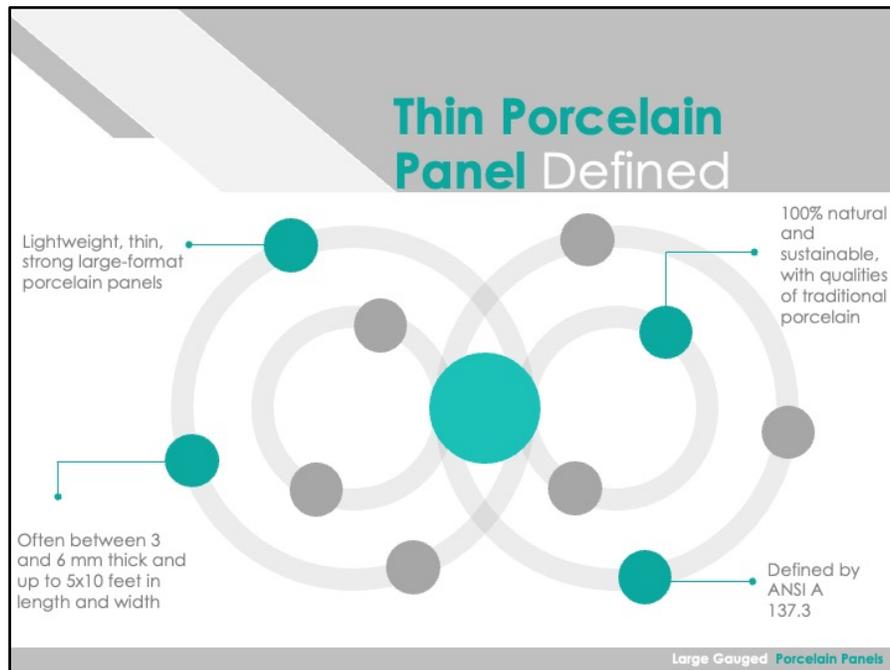
Characteristics, Types and
What Makes It Unique



By definition, porcelain is a ceramic material. It is made from high-quality, low-impurity, raw materials, and kiln fired at very high temperatures (2,200 - 2,500 degrees Fahrenheit). This high heat transforms the body into a dense, non-porous material.

The high quality of the raw materials results in a very uniform material that can be glazed or unglazed. Porcelain has been used for centuries for everything from cookware to tiles because of its strength, hardness, and low water absorption, among other qualities.

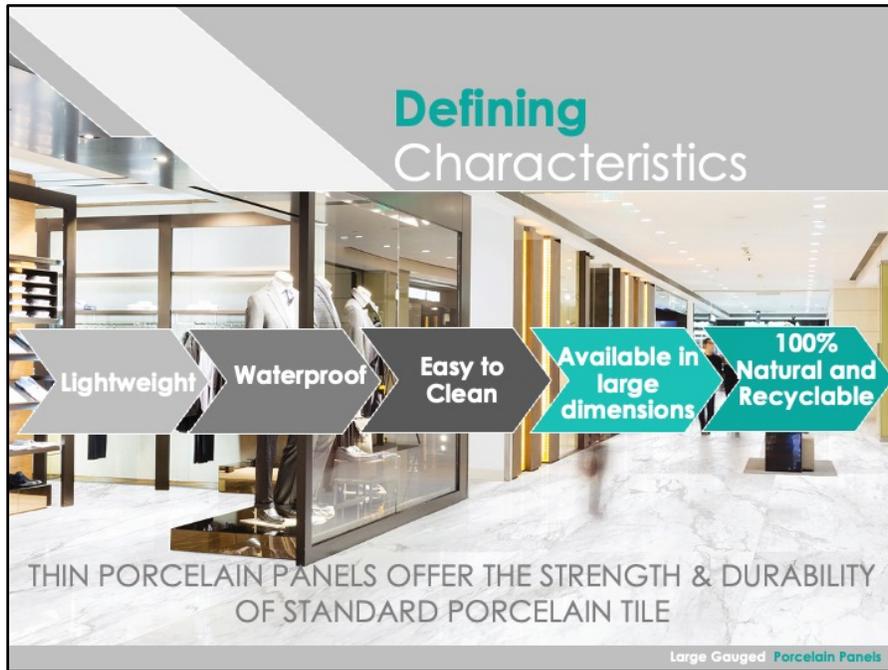
According to the American Society of Testing and Materials (ASTM) C373, porcelain's water absorption rate is <0.5 percent. This rate is one of the defining characteristics of porcelain



Thin gauged porcelain panels/slabs are large-format, very thin, lightweight panels made of porcelain that are currently used in both interior and exterior applications for residential and commercial projects.

A 5x10-foot-wide, 6mm-thick panel weighs less than 3 pounds per square foot. In comparison, standard-body porcelain tiles and panels are typically greater than 9mm thick and weigh 5 pounds per square foot.

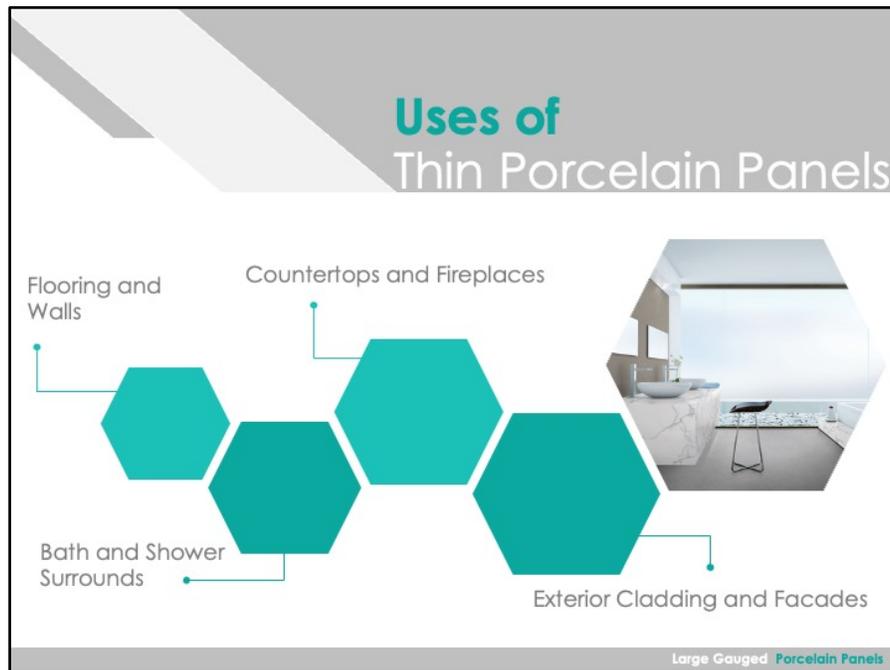
Thin porcelain panels are 100 percent natural and a sustainable product made with less material and produced with less energy than standard porcelain. They maintain the strength, durability, and low water absorption rate of porcelain.



Thin gauged porcelain slabs have the qualities of traditional porcelain, but are exceptionally thin, usually between 3mm and 6mm (less than ¼ inch), lightweight, and comparatively large in dimension. These qualities allow their use in situations where traditional bulkier or heavier materials would be unacceptable or require additional structural support.

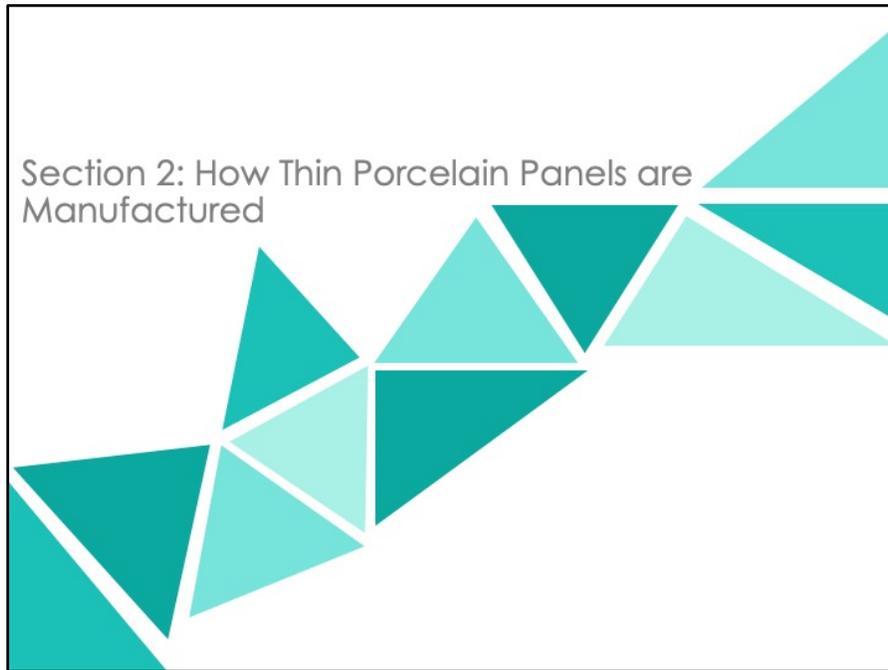
The large panel size – often 5 by 10 feet – can be used at full size for interior and exterior walls and flooring, or cut to size for countertops and backsplashes or other decorative elements.

And, because the material is so thin, it can be installed on top of existing materials. This can prove a game changer for commercial properties that can avoid shutting down for construction, and it can be highly advantageous for residential projects as a way to avoid tear-outs and waste removal.



Thin gauged porcelain slabs are increasingly incorporated as flooring, walls, countertops and fireplaces, bath and shower surrounds, and exterior facades. Their defining characteristics and mechanical properties, as discussed in the next two slides, make them an excellent material for projects where surfaces may be exposed to fluctuating temperatures and moisture levels, and where easy-to-clean surfaces are required.

We will discuss more detailed applications in Section 4, but these four areas are where the material is often being used in place of smaller ceramic tiles or heavier materials such as stone.



Thin gauged porcelain panels/slabs are manufactured using innovative technology that produces their indispensable characteristics in an efficient manner. While stone slabs must be quarried, cut, and finished, and wood has to be harvested, cut, and cured, thin gauged porcelain panels/slabs can be custom manufactured for projects.

This section will discuss the manufacturing process and materials used to make thin gauged porcelain slabs, including, atomized porcelain powders (feldspar, granite, kaolin, and silica), continuous process and conventional pressing the innovative technology for large panels, stratification to produce color and designs, and surface finishes.

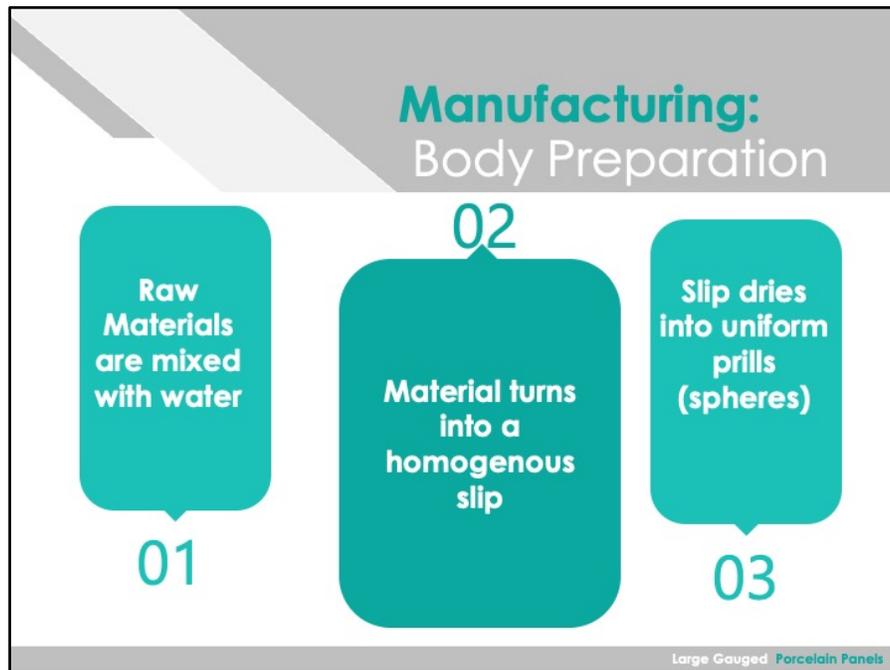


Seven main processes are involved in the manufacturing of thin porcelain panels:

- Atomized ceramic mass is held in large silos and a conveyor belt to the press or
- The ceramic mass is sent through a rolling process where it is compacted into panels
- The panels are sent to the dryer and then from the dryer, the panels are sent to the decoration line
- At this point decoration would be applied – for example, to make the panel appear like a stone, fabric, etc.
- The panel is then fired in the kiln
- The dry panel has uneven edges, so each panel is cut & rectified
- Finally it is packaged either into crates or on A-frames depending on size, for transport



The raw materials used for thin porcelain panels must be very high quality, clean, and free of contaminants. Clay, silica, kaolin, and feldspar are the most commonly used raw materials, and they all must be properly sized and milled so that the finished product has uniform consistency.

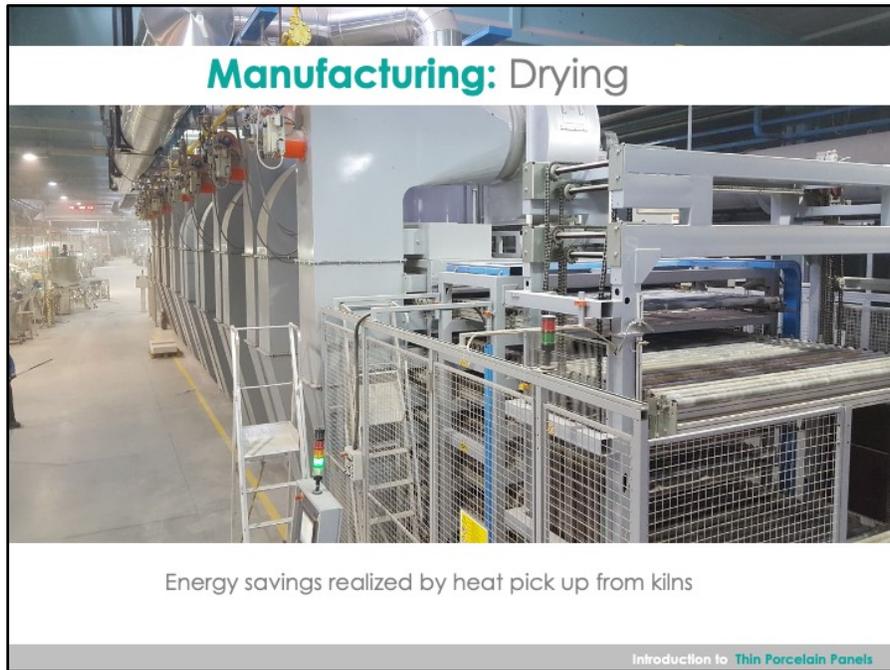


The first step in the process of manufacturing porcelain tiles is to combine the raw materials listed in the previous slide with water. The standard “recipe” includes about 30% water, which is combined with the raw milled materials in a mixing machine, and processed until a homogenous mixture, known as a slip, is produced. Once the slip is of the right consistence, it is dried into small prills.



Large, thin porcelain slabs only can be produced through a roll compaction line or a pressing process that compacts the still pliable raw material into a form that will eventually be used for many different purposes. The first step in this compaction/pressing process is for the mostly dried (prills) powder to be fed into the roll compaction line or pressing machine on a feeder belt. At this stage, no molds are used, and the focus is primarily on compacting the raw materials.

The machine then exerts a uniform, extremely high load onto the prills, compacting them at extremely high pressure. This process can create tile panels in the 3mm – 6mm range, and the pressure helps create the strong, dense properties that characterize the panels.



Larger multilevel dryers are used to dry the large panels.

Manufacturing: Glazing

The process to add colors, patterns, or both

Often utilizing inkjet technology

Glazes can be made from different materials and metals



Large Gauged Porcelain Panels

Glazes are key part of the tile production process, used primarily to add in decorative colors, patterns, or both. During the glazing stage, glazes are most often added by a high-definition inkjet process to the compacted panels.



Earlier in this course we looked at some of the characteristics that made porcelain tiles and panels different from ceramic, including the Porcelain Tile Certification Agency (PTCA) “porcelain” status. The firing process is critical to achieve this status. It is the phase when the raw material is vitrified and changes to its dense, non-porous form. This form gives porcelain its desirable low < 0.5 percent water absorption rate, allowing it to be considered “porcelain.”

The kilns used to fire large-format thin porcelain panels are often energy efficient and low-emission models, compared to kilns used for other tile types. Regardless of the type of kiln, it needs to be able to accommodate the typical 5 foot by 10 foot dimension of the panels/slabs, and to heat them to roughly 2,400 degrees Fahrenheit for at least 45 minutes depending on material thickness.



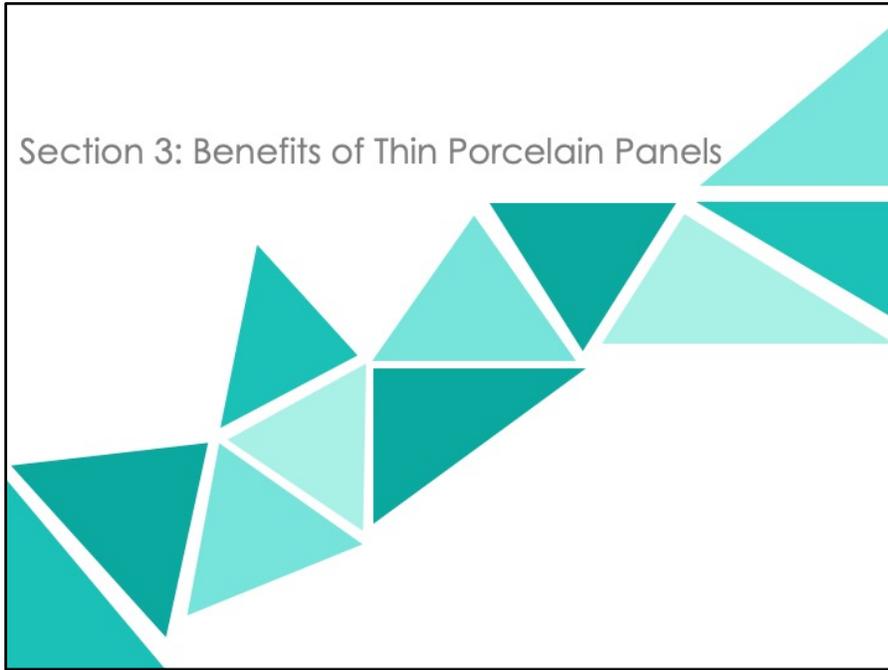
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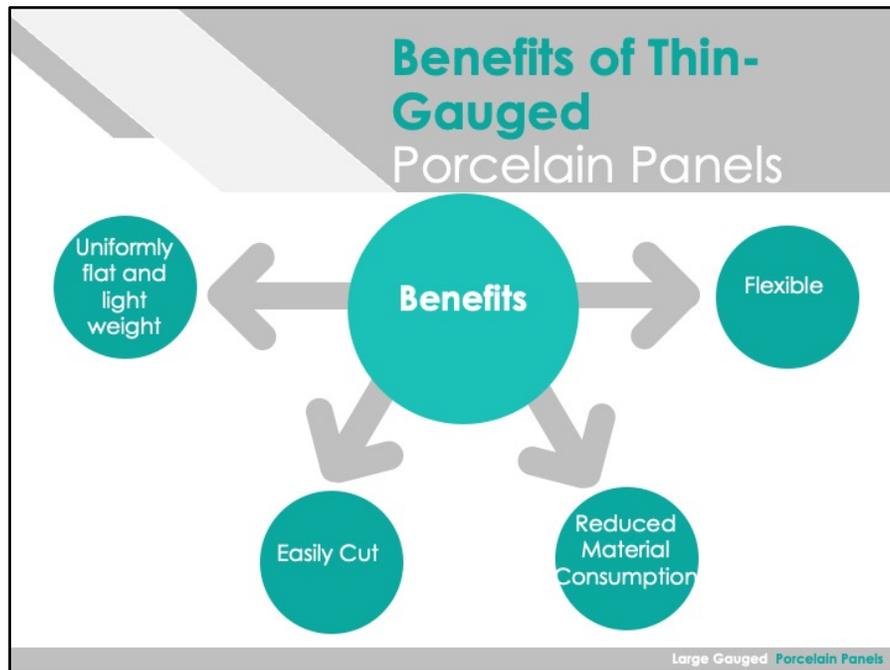
Before panels/slabs can be packaged and shipped, they first need to be finished. Finishing can mean different things for different products. For example, panels 5.5 mm or thinner must have an added fiberglass back mesh, which needs to happen during this final phase. Other products may require treatments such as a rectified edge. Here the tile is mechanically cut or ground down to a precise size, and a 90-degree angle is cut for the edge.

Rectified tiles are preferred for projects that call for grout lines less than 1/8 inch or simply for a very precise, clean grout line. Once the products are finished, they can be sorted, packaged, and shipped.

Section 3: Benefits of Thin Porcelain Panels



Traditional materials used for slabs are often limited by thickness and weight, which can affect every aspect of a project from design, material transportation, and installation. Thin gauged porcelain panels/slabs, however, have all of the benefits of natural stone but are flat, lightweight, flexible, and easy to install. These characteristics benefit the architects, designers, installation contractors, and building occupants.



Even with their average 3mm-6mm thickness, thin gauged porcelain panels are exceptionally strong and durable, while proving uniformly flat and very light for their size/weight ratio. The panels are also rectified, which means they are predictable and controllable when it comes to joining them with adjacent materials.

As a lightweight product, they are less costly to ship and can be easier to handle and install. Their thinness also means they are relatively easy to cut. All 3mm to 6mm porcelain slabs – including those with reinforced backing – are most often cut with rail cutters.

Some panels are also flexible – because they can bend a bit, they can be used in situations such as to cover a wall with a slight curve to it (existing tile, such as on countertops). These areas are always flat.

By their very nature, as thin gauged porcelain panels/slabs simply require fewer raw materials than thicker, more traditional tiles or panels, which are often more than 7mm thick. This aspect helps make them an environmentally friendly building product.



The mechanical properties briefly mentioned in Section 1 also provide some of the benefits of thin porcelain panel products, with the highly resistant surface at the top of the list. The surface is able to withstand extreme temperatures, and that includes fire and frost. Fire-resistant panels as either floors or walls improve the safety of the space, as well as ensuring that the material itself doesn't crack with temperature shifts (freeze-thaw cycles) when used on exteriors walls.

The panel surface also can resist harsh chemicals, which makes it an excellent choice for countertop, flooring and walls in health-care facilities and for projects where chemicals may be used such as labs or workshops. In residential applications, the easy-to-clean characteristic makes porcelain ideal for high-use areas such as kitchens and bathrooms.

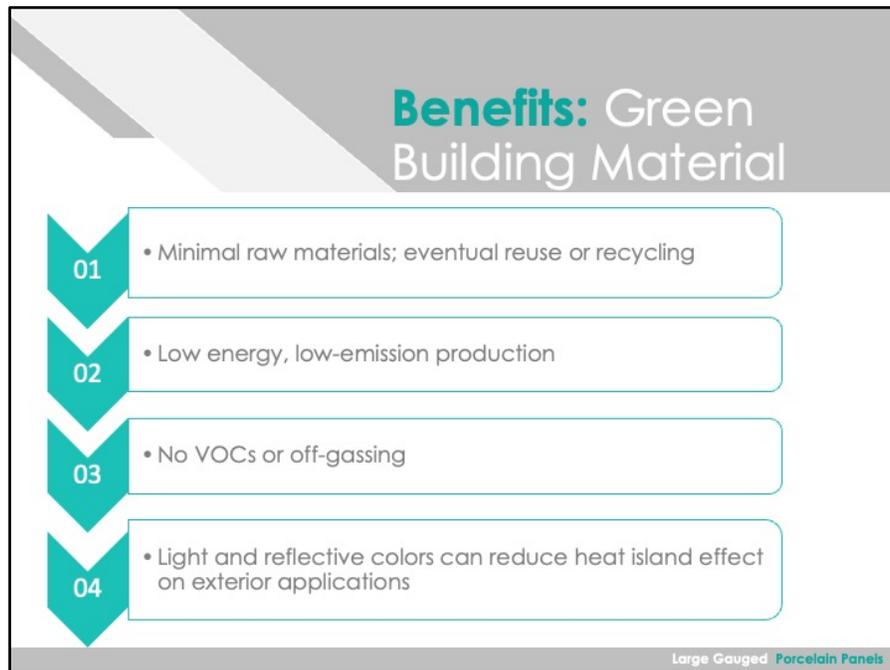
Finally, the scratch-resistant nature of the surface means that as a countertop or floor, it can maintain its like-new appearance for years. Countertops should be at least 5.6mm thick and have backer attached.



Thin gauged porcelain panels are waterproof, so water or humidity changes will not cause warping. The material often has a highly polished finish added, and manufacturers often suggest using a penetrating water-based sealer to fill the micro-pores created by the polishing process. This makes the panels ideal for both indoor and outdoor applications, residential kitchens or bathrooms, a poolside feature or an exterior facade. The polished surface is not acceptable for floors because they are a slip risk when they are wet.



As an all-natural material, thin porcelain panels offer several benefits in terms of recyclability. For example, the porcelain bisque can contain recycled content. In addition, panels can be installed on top of existing surfaces, achieving a double benefit of not sending old materials to a landfill paired with a product that can be recycled into other porcelain products at the end of its lifespan. Finally, green benefits can add to achieving LEED credits.



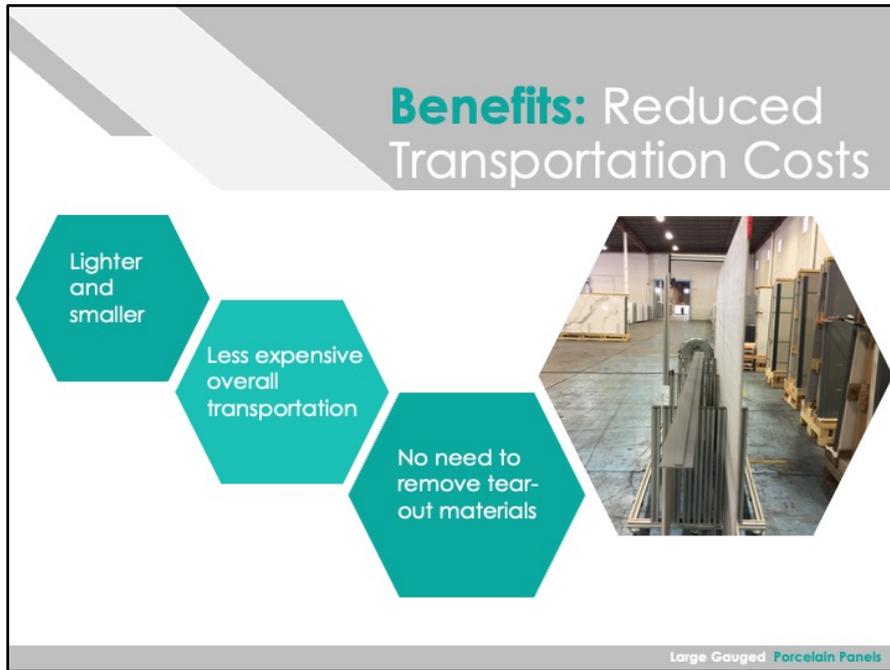
When compared to more traditional materials used for similar applications, whether natural dimension stone or thicker ceramic tiles, thin porcelain panels/slabs offer the characteristics of a green building material. The product's life cycle, for example, includes minimal use of natural raw materials, and once the product is at the end of its life, it either can be reused or recycled into new porcelain products.

Many of the kilns used in its production are also low energy and low emission, often employing a hybrid of gas and electricity for power.

Interior applications benefit from the natural product avoidance of off-gassing volatile organic compounds (VOCs). They also do not need coatings or paints that may have VOCs. The material itself is easy to clean with mild cleaners as opposed to harsh chemicals. Exterior applications can benefit from light or reflective color panels, which can reduce the heat island effect and improve the building's energy efficiency.



One of the primary benefits of thin porcelain panels/slabs is that they can be installed directly on top of existing surface materials. This results in a relatively quick and easy installation, depending on the original surface, and that can result in reduced overall project time and costs. For most commercial projects, at least three trained installers are required to properly handle the large slabs.



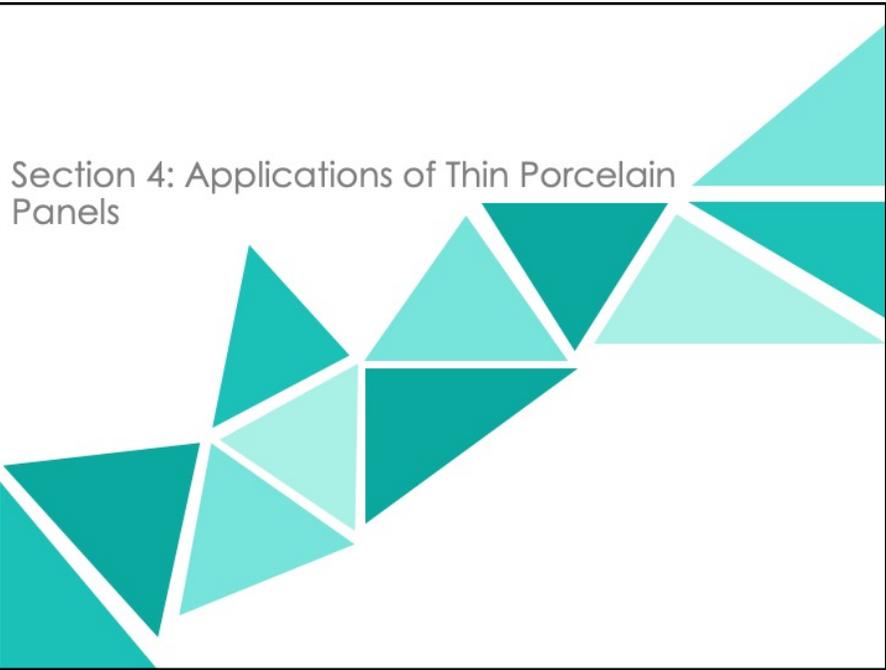
The transportation costs of thin porcelain panels is also relatively low, based on overall square footage.



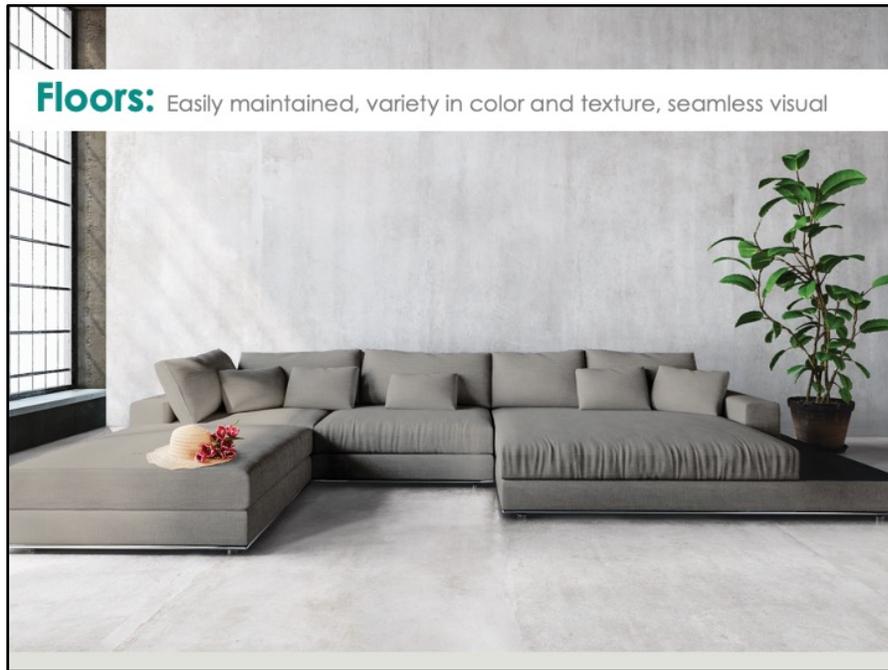
Thin porcelain panels are a bit different from other tiles when it comes to securing them. A benefit is that because the panels are so thin, projects require minimal grout between adjacent tiles. This design provides a clean, flat surface, and the minimal grout also means that the installation is generally easier to keep clean. According to ANSI A 108.19, lippage control devices must be used on all tiles/panel/slabs 39"x39" and larger.



Over the past several years, available colors and designs for thin gauged porcelain panels have grown. Originally only available in matte finishes, most manufacturers now include polished finish panels as an option.



Thin porcelain panels are a versatile material that can be used in both residential and commercial projects, as well as indoors and outdoors. When other materials are limited by weight restrictions or grouted and seamed edges, thin porcelain panels offer much more flexibility along with fewer and cleaner joints and mitered edges. This section will discuss applications such as floors, walls, countertops, and exterior cladding.



Thin porcelain panels used for flooring can combine easy maintenance with a wide range of different looks and offer seamless installation. A small area could be installed with one slab, however most floors will have 1/8-inch caulk or grout joints. Floors easily can be maintained in part because of the resilient surface, which resists scratches and stains, and in part because of the rectified edges, which provide a narrow grout or 100 percent silicone joint.

The new American National Standard Specifications for Gauged Porcelain Panels/Slabs ANSI A 137.3 states that panels for flooring must be a minimum of 5.0 millimeters in order to ensure the performance of the product.



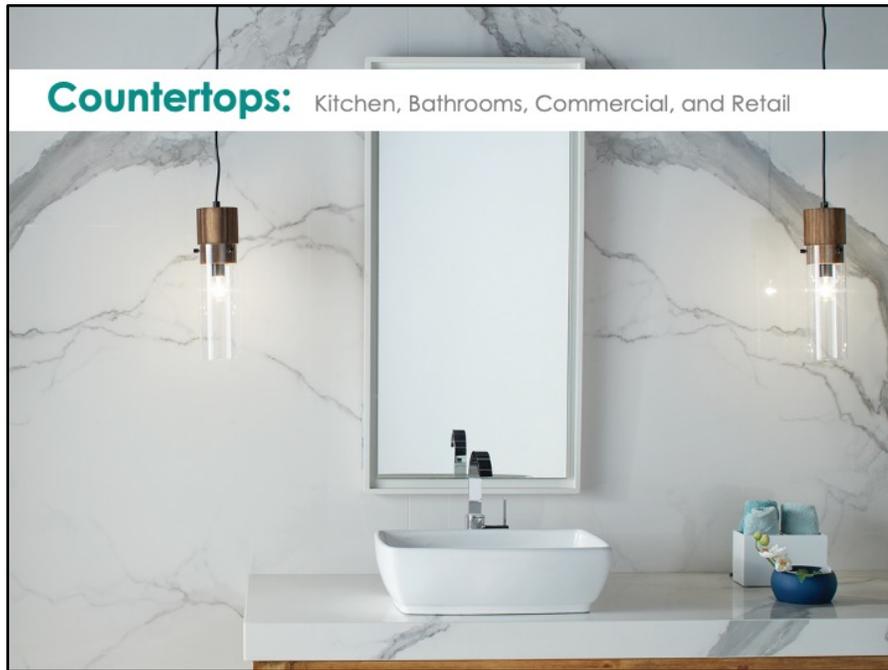
Interior walls, whether in residential or commercial spaces, can benefit from the decorative and durable nature of thin porcelain panels. Interior uses can range from focal points in a space to backsplashes in kitchens and bathrooms. As with flooring, finishes can mimic other materials such as natural stone, but without the weight. Moreover, the mitered edges for countertops and islands result in minimal grout lines, thus offering a cleaner finish.



Exterior wall surfaces lend themselves well to thin porcelain panels as well. Again, the large panel size means that installation can be quick and relatively easy when done by trained installers, and the result is a stylized facade designed to enhance a project. Moreover, the panels require minimal maintenance while staying strong and durable.



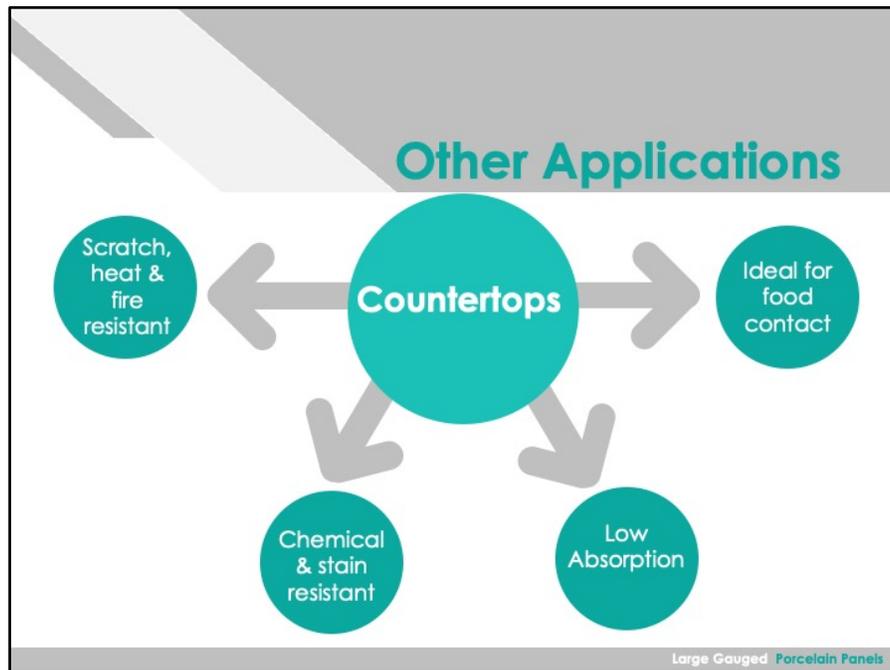
With matte and gloss finishes, thin porcelain panels are an excellent choice for bathroom surfaces in both residential and commercial settings. Matte slabs and tiles can be used as flooring to provide a beautiful, safe, and slip-resistant surface that can be coordinated with glossed panels and tiles for shower walls, sink countertops, and backsplashes. All materials are easy to clean and maintain, and because the product can be installed on top of existing surfaces, bathroom renovation projects can be completed in much less time and for a lower cost than in cases that require tear-outs.



The large format of thin gauge porcelain slabs makes them an exceptional material for situations where less is more, such as for countertops when grout lines are best avoided. In a kitchen, for example, a large slab of porcelain panel with a natural stone finish can be cut to size for an island or traditional countertop. It can be installed on top of an existing tile, or it can be installed over existing countertop surface, installed with a backer board of high-density foam, or cement board, directly to exterior grade plywood.

The slabs can be installed as backsplashes as well. The result is a countertop that looks like stone but at a fraction of the weight and cost with easier and less costly installation.

As noted in an earlier slide, this material is also ideal for bathroom countertops and backsplashes. All of the beneficial properties of thin porcelain panels make it an excellent choice for both residential and commercial design projects.



- Tile has been used as a suitable countertop material for many years.
- Thin porcelain panels maintain the same attributes that make traditional thickness tiles a good choice for countertops and food contact – scratch, heat, chemical, and stain resistant.
- The biggest advantage would be the minor or no presence of grout joints that only thin porcelain panels could provide.
- In addition, thicker porcelain slab material intended for countertops is available (12mm thickness)



Thin gauged porcelain panels are still somewhat new in the tile industry, and they require specific installation techniques using specialized tools. Not surprisingly, many architects and designers often have questions about using the material because of the care and skill needed to install. Installers, contractors, and fabricators can answer those questions. Moreover, industry training on the installation methods and techniques are required and can help building professionals specify thin porcelain panels with confidence.



Installation Overview

Installation of a thin porcelain panel is **NOT** any more difficult than a standard-body porcelain tile, it is just **DIFFERENT**

Due to the size and thickness of the panels it requires different installation techniques and tools to prevent breakage during and after installation.

Introduction to [Thin Porcelain Panels](#)



Gauged porcelain tiles and gauged porcelain tile panels/slabs have different physical characteristics and perform differently from traditional ceramic tiles. Many are manufactured by methods other than those used for traditional tiles. As such, they have a unique product standard (A137.3), and they require very specific installation procedures and workmanship standards (as outlined in ANSI A108.19).

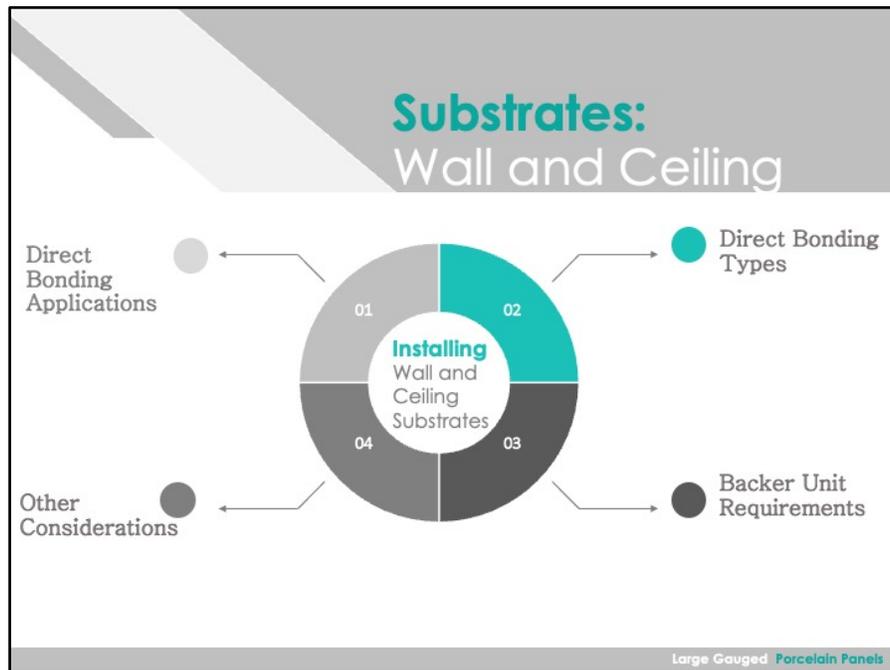
Thin gauged porcelain panels must be installed by contractors and fabricators trained in handling, preparation, and installation. Surface preparation is the first step in the installation process. In some cases, the panels will be installed over new substrate, and in others over existing materials. In either case, installers should examine the condition of the substrate to identify and eliminate any conditions that may negatively impact panel performance. Once the surface is level and clean, the installers can proceed with preparing to install the panels.



The unique material characteristics of gauged porcelain tiles and gauged porcelain tile panels/slabs require some unconventional installation techniques. They also require installers who have the proper tools, and who have completed an Installer Qualification Program.

At a minimum, installers must be certified by the Advanced Certification for Tile Installers (ACT) program for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs. (www.tilecertifications.com) The major tile contractor associations are all involved with ACT, namely: The National Tile Contractors Association (NTCA), the Tile Contractors' Association of America (TCAA), and the International Masonry Institute (IMI).

In addition, installers must complete comprehensive installation programs provided by the gauged porcelain manufacturer, and by the setting material manufacturer.



Gauged porcelain tiles and gauged porcelain tile panels/slabs can be direct bonded to the following wall and ceiling backing board and panel types: cementitious backer units, fiber-cement backer board, glass mat water-resistant gypsum backer board, fiber-reinforced gypsum panel, and gypsum board/drywall installed according to GA 216. (Please refer to ANSI A108.19 for specific substrate and installation guidelines.) Backer units must be installed in accordance with ANSI 108.19 and the manufacturer’s instructions.

Gauged porcelain tiles and gauged porcelain tile panels/slabs can be direct bonded to both concrete walls and concrete ceilings, and to concrete masonry unit (CMU) walls, as long as the surface is clean and dimensionally sound. They can also be direct bonded to cured mortar beds, as long as the beds meet ANSI A108.1B requirements.

The ANSI standards also address issues concerning framed wall construction another project considerations.



Gauged porcelain tiles and gauged porcelain tile panels/slabs can be direct bonded to clean, sound, dimensionally stable concrete floors, cured bonded and unbonded mortar beds, and properly prepared existing surfaces. Mortar beds must conform to mortar bed requirements in ANSI A108.1B.

Gauged porcelain tiles and gauged porcelain tile panels/slabs can be direct bonded in interior floor installations to mortar beds or to a variety of different backing board and panel types. Please refer to ANSI A108.19-2017. Section 2.4 for a full list.)



Building owners, design professionals, or general contractors are responsible for determining the soundness and suitability of the existing surface/substrate. Because the surface preparation process will vary based on the surfaces to be covered, building professionals should consult with the tile installation contractor, tile manufacturer, and setting materials manufacturers for specific recommendations and procedures.

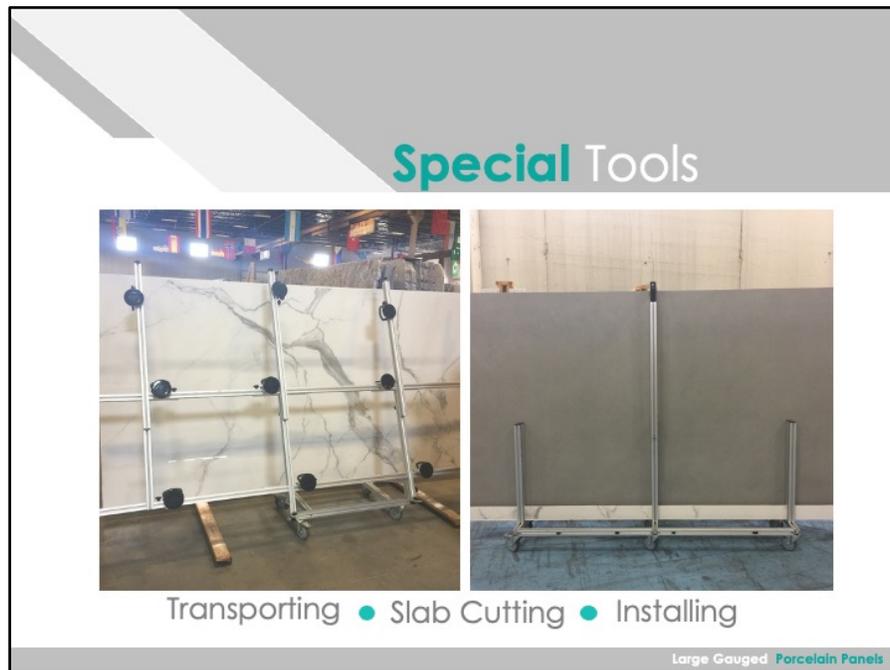
The surfaces are subject to the flatness requirements presented in ANSI A108.19-2017, Section 5.1. Gauged porcelain tiles and gauged porcelain tile panels/slabs should *not* be installed overtop of unstable, compressible surface materials or coating.

Special Tools

Zipper Trowels Diamond Rail Cutters Work bench Suction Cups
Work bench Suction Cups **MECHANICAL** Diamond Rail Cutter
Right Angle Grinder EDGE **DIAMOND**
Diamond Rail Cutters Suction Cups **LEVELING** **HAND** Work Bench
4" continuous rim diamond blade CLIPS **PAD** Zipper Trowels
Orbital Sander Suction Cups **ORBITAL SANDER** Orbital Sander Diamond Rail Cutters Work bench
Diamond Rail Cutters Suction Cups Work bench



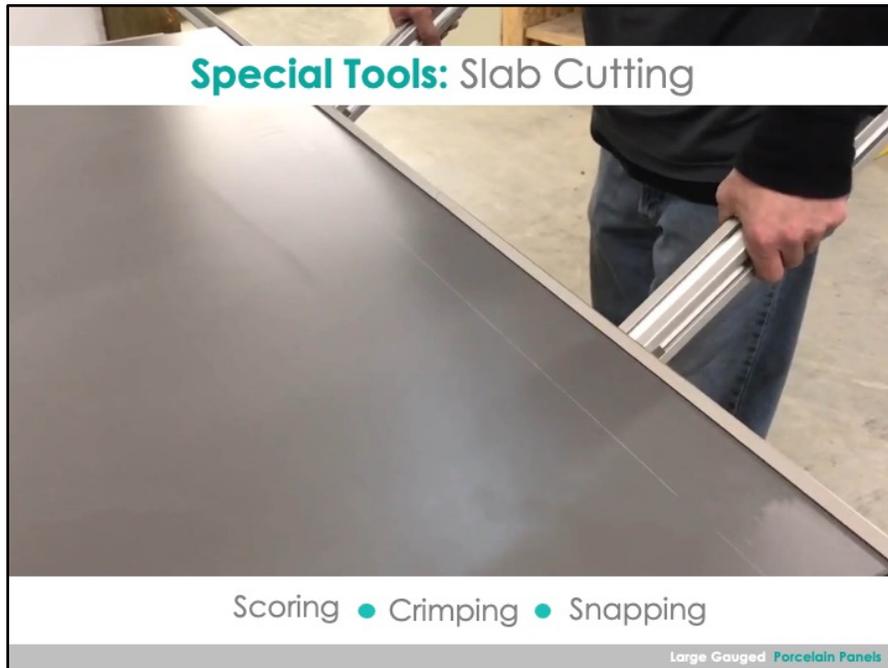
Large Gauged **Porcelain Panels**



The unique material characteristics of gauged porcelain tiles and gauged porcelain tile panels/slabs also means that installers require specialized tools for safe panel/slab transportation, cutting, and installation.

Available tools provide installers with everything they need to do both fabrication and installation in the field, rather than relying on doing tasks in a shop and then transporting materials to the project site. Special trailer frames are available to safely transport large porcelain panels, and once onsite, tiles/panels/slabs can all be cut, finished, and installed with a focused set of specialize tools.

Some of these tools include suction cup racks to accommodate large panels, tables with panel clamps, rail cutters, miter saws, and diamond pads to finish edges. Installation tools include notched trowels and rubber de-airing blocks to help ensure that the panels/tiles/slab lie flat against the substrate or surface.



For contractors and installers, one of the most useful benefits of using gauged porcelain tiles and gauged porcelain tile panels/slabs is that they can be cut on site. The tools and process are similar to glass-cutting but involve several specialized tools. The rail cutter allows installers to precisely score the slabs/panels, the crimping device lightly scores the back, and the breaker helps installers snap the panel, all while holding the panel safely in place. When this process is done, sanding blocks can be used to de-burr the edges to reduce the chance of injuries of installers who need to transport the material.

Recommended Panel Thickness



Facades, Cladding
and Flooring –
typically 6mm

Countertops –
12mm

Furniture
Applications-
12mm

Large Gauged **Porcelain Panels**



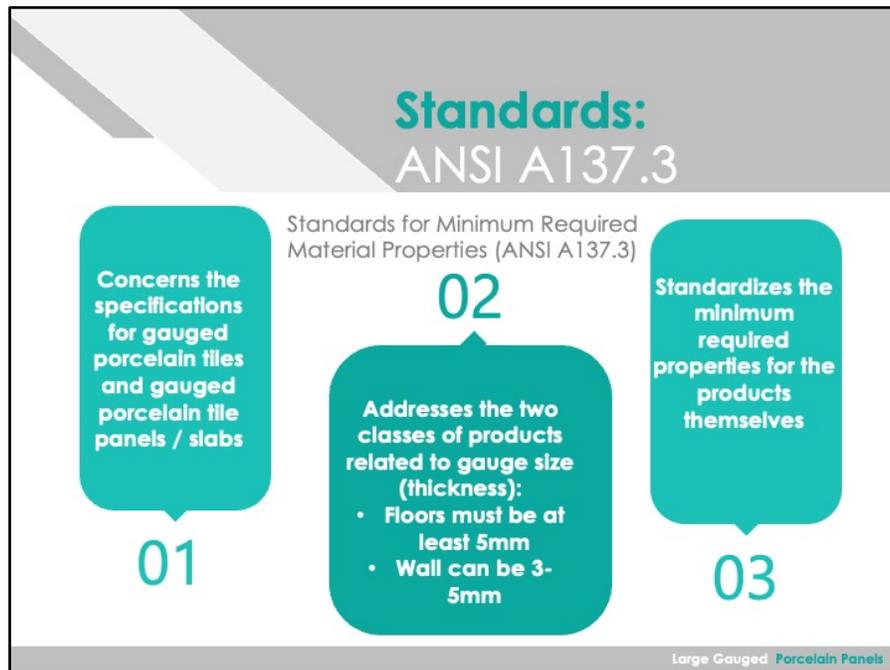
Standards: Floor

Floor Standards for Thickness (Gauge)

- New industry standard -ANSI A137.3
- Joint recommendation for minimum floor thickness
- Not less than 5.5mm

Large Gauged Porcelain Panels

Industry standards for manufacturing or installation of these panels are new. ANSI A137.3 addresses issues concerning the required minimum thickness of the material, and is discussed in more depth in the next slide.



The American National Standard Specifications for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs concerns the specifications of the materials, and standardizes the minimum required properties for the products themselves. The term “gauged” is used in the same way as for wire gauges and sheet metal, and concerns the thickness and load capabilities of the product. The two classes of gauged tile products are for wall applications from 3.5mm to 4.9mm and for floor and wall applications from 5.0mm to 6.5mm.

Standards:
ANSI A108.19

Standards for the Methodologies for Interior Product Installation: ANSI A108.19

Concerns Interior Installation of Thin Porcelain Tiles, Panels, and Slabs

Highlights Include:

- Maximum allowable variation in flatness is 1/8 inch in 10 feet (same as all large format tile)
- Addresses bonding and mortar coverage methods
- Embedding the tile
- Lippage control systems and movement joints

Large Gauged Porcelain Panels

ANSI A108.19 standardizes the methodologies for installing the products in interior installations by the thin bed method with specific mortars. This standard is particularly important for trained installers to be able to provide consistent installation practices based on consistent tile properties.



Introduction to **Large Guaged Porcelain Panels**

Thank You for Your Time!

This concludes the American Institute of Architects Continuing Education Systems Program

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Reminder: ask participants for questions concerning the topic at hand

Large Gauged Porcelain Panels

References

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