

Porcelain Tile Installation Guide

ESSENTIALS FOR PRODUCT SELECTION, JOB SITE CONDITIONS, SUBSTRATE PREPERATION, INSTALLATION AND MAINTENANCE.

The Mannington program is comprised exclusively of Porcelain tile. Our tile has been independently certified as porcelain tile by the Porcelain Tile Certification Agency which guarantees its performance characteristics. Made with special clays and minerals that are kiln-fired at temperatures exceeding 2400° Fahrenheit, porcelain ceramic tile is harder, denser and more durable than other ceramic tile products. It is frost proof and highly stain, scratch and water resistant. Extremely low water absorption precludes normal stains and makes cleaning quicker and easier. Porcelain tiles can be installed in both interior or exterior application and performs well in heavy traffic areas. In addition to performance, porcelain tiles are aesthetically pleasing and have become one of the most widely specified and selected products for flooring and wall surfaces. They offer a wide selection of sizes and colors to satisfy the needs for most residential and commercial installations. Porcelain tiles are beautiful in any color, are water resistant and when properly installed will last a lifetime. Porcelain tile, made from all natural products, is environmentally friendly.

There are essentially three **types of porcelain tile**. First, there is **glazed porcelain** tile in which the body of the tile is fully covered by glaze. Usually the body of the tile is a different color than the surface and you can tell that by looking at the face of the tile and then turning it over. If the body is a different color there is a high likelihood that it is a glazed porcelain tile. Another type of porcelain tile is **Color-Core™** tile. This is where the body is an integral part of the overall color of the tile. If you see the body color on the face of the tile you are most likely looking at Color-Core porcelain. Thirdly, there is **Tru-Color™** porcelain tile which is the same color all the way through the body of the tile. While some manufacturing techniques can become very complicated and proprietary, most if not all porcelain tile falls into one of these three categories.

Product selection is one of the most important and critical requirements for a high performance and aesthetically pleasing tile installation. The process for selecting your tile can seem daunting and confusing but Mannington offers a tile selection process that can alleviate some of the confusion. The process is as follows:

1. Choose Your Color and Texture
2. Choose Your Size and Layout
3. Choose Your Mosaics, Trim and Decorative Accents
4. Choose Your Grout

If you follow this strategy while selecting your porcelain tile it may overcome some of your concerns. Regardless of your requirements you will find a variety of sizes and colors, some with border and accents, allowing virtually unlimited decoration options. Additionally, Mannington offers a myriad of pattern options on our website at www.mannington.com. The pattern that you select can significantly enhance the aesthetic and visual appearance of you tile. Just by changing the pattern you can change the look of the tile.

All ceramic or porcelain tiles are not suitable for all areas. Color-Core and Tru-Color porcelain features coloration throughout the tile, is less likely to show scratches and minor wear and is usually more slip resistant than glazed tile. Most porcelain tiles are wear-rated and most manufacturers worldwide meet international standards. Since all tiles are not rated for floor traffic it's important that you consult your Mannington Distributor or Retail Dealer representative to determine that your selection is appropriate for your particular job requirements. While selecting your tile please pay attention to several key porcelain tile characteristics. Pay attention to the shade rating which is classified by a "V" rating, V1, V2, V3, or V4.

Porcelain Tile Installation Guide (continued)

| | |
|----------------------------|---|
| V1 – Uniform Appearance | Differences among pieces of tile from the same production run are minimal |
| V2 – Slight Variation | Clearly distinguishable texture and/or pattern differences within the same pattern |
| V3 – Moderate Variation | While the colors present on a single piece of tile will be indicative of the colors to be expected on the other tiles, the amount of colors on each piece may vary significantly. |
| V4 – Substantial Variation | Random color differences from tile to tile so that one tile may have totally different colors than on other tiles. Thus, the final installation will be unique. |

The shade rating is available for all Mannington porcelain tiles. It is extremely important to know what range of color your final installation will have after installation and it may require that you view several pieces of tile in order to ascertain the range. If slip resistance is a concern, check the Coefficient of Friction (COF). A tile with a COF ≥ 0.60 both wet and dry is considered slip resistant. There is a trade off between slip resistance and cleanability in some instances. Choose the tile that meets your aesthetic and performance requirements.

Storage and Handling

Porcelain tile does not require special consideration regarding temperature or humidity and in certain climates it can be stored outdoors. Prior to beginning installation, check the materials to ensure that you have the correct pattern, style and color. Check your quantities to make sure you have the required amounts to complete your job. Inspect the tiles before installation for any visible defects. Mannington products are manufactured to high-quality standards and are carefully inspected prior to shipment. Occasionally, however, defects are not detected. If visible defects in the product are detected, stop the installation and contact your local Mannington Distributor immediately. Consideration should always be given to security and protection from incidental damage from other construction trades.

Job Site Conditions

The environment where tile is installed is critically important to successful installation and continued performance. The area should be free of all construction debris, dirt and surface contaminants. Unobstructed access to the job site should be provided and provisions must be made for handling the product from storage to the installation area. Prior to installation, permanent lighting or temporary lighting representative of permanent lighting, must be provided. Always consider the potential adverse effects of extreme temperatures and humidity on mortar and grout with exterior installations of Porcelain tile. Adequate ventilation, heating and/or air conditioning should be available to sustain an environment required for the installation of bonding and grouting materials. The type and methods of construction, grade level and flooring system components all impact the final installation. Some minimal code requirements for flatness, levelness and deflection may not provide a suitable system for the installation of Porcelain tile.

Substrates:

Concrete and Masonry – When tile is directly bonded to an existing concrete or masonry substrate, the tile installation is greatly affected by the suitability and condition of the concrete or masonry supporting the installation and providing the bonding surface. Flatness of the substrate must be checked to meet industry methods and specifications. The Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation requires that tile substrates have no more than ¼" variation in 10 feet and no more than 1/16" variation in 1 foot from the required plane.

Porcelain Tile Installation Guide (continued)

If substrates do not meet the flatness requirements and remedial corrections are not made, the installation will likely have lippage or flatness issues, a leading cause of complaints. When correcting concrete or masonry substrates use only products specifically designated for this purpose. Bonding materials like cement mortars (thin-sets) are not designed for patching or other thick applications. If the tile is 15"x15" or larger, it is strongly suggested that a medium bed thinset mortar be selected, allowing for the spreading of more mortar underneath the tile. Follow closely all manufacturers recommendations and directions.

In some instances grinding down high spots on floors will be necessary. Concrete and substrates must be clean and free from dust, paint, or drywall compounds that can act as bond breakers. It is important to check for cracks in concrete substrates. Bonding over cracks can lead to loss of bond or the crack telegraphing through the tile. Crack isolation, self leveling underlayments and uncoupling membranes are available to address problems of this type. Since there are many different methods of installation over concrete and masonry substrates the TCNA Handbook and the American National Standard (ANSI) Specifications for Ceramic Tile should be followed.

Wood Substrates – Unlike a concrete substrate, a wood subfloor only provides the support for tile installation, not the bonding surface. When wood is the substrate, it's important to be aware that wood expands and contracts when its moisture content changes. Wood substrates deflect, or bend, under loads more than concrete substrates. Tile installations require a rigid substrate that will not deflect, or bend when loads are applied. The greatest deflection will occur in the wood panels fastened to joists at the midway point between the joists particularly under point or concentrated loads. Too much deflection causes cracked and/or powdered grout joints, cracked and debonded tiles. Subfloor panel thickness and joist spacing determine subfloor panel deflection. Smaller joist spacing and thicker subfloor panes allow less deflection. Most floor installation methods in the TCNA Handbook limit joist spacing to 16" on center. However, there are methods in the Handbook that allows for a wider joist spacing, (19.2" on center and 24" on center) if certain requirements to prepare the substrate are met. All methods require the subfloor to be at least 19/32" (5/8"). Many methods require the subfloor to be 23/32" (3/4").

Some methods require a second layer of plywood for greater rigidity to reduce deflection. Since there are many different methods of installation over wood substrates the TCNA Handbook and the ANSI Specifications for Ceramic Tile should be followed. Further subfloor placement and fastening requirements can be obtained from the American Plywood Association (APA). Follow all applicable industry methods and specifications and individual manufacturers recommendations and directions. Backerboards and some types of plywood panels are suitable underlayments to install over a wood subfloor to receive ceramic tile. There are several types, each having different application suitability and some unique installation requirements for different applications. Because of their significant differences the TCNA Handbook contains separate installation methods and standards for the various board types. To ascertain proper use and installation methods review the TCNA Handbook and the specific board manufacturer's instructions.

Membranes – Membranes are flexile sheets that are bonded to concrete, wood and poured underlayments. They have a broad range of uses and come in many forms. Some are pre-manufactured sheet goods that are simply bonded to the substrate. Others are applied as a wet material that becomes the bonded membrane once it has dried in place. Some mortars used as the tile adhesive now possess the flexibility and meet the performance requirements of a crack isolation membrane. Crack isolation membranes, full and partial coverage, and uncoupling membranes are unique products. The proper methods and specifications for their use can be found in the TCA Handbook and the ANSI Specifications for Ceramic tile. Manufacturer recommendations and directions must be carefully followed.

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Layout – Layout is critical to an aesthetically pleasing tile installation. Tile layouts should be centered and balanced as much as possible with respect to the tiled area and any specific focal points. Usually, a space offers more than one acceptable layout, making the final selection a matter of personal preference. The ANSI Specification for Ceramic Tile says: “an excessive amount of cuts shall not be made. Usually, no cuts smaller than half size should be made. Make all cuts on the outer edges of the field.” When multi-room layouts necessitate cuts smaller than ½ tile the best possible layout will place smaller cuts in the least obvious places. Movement joint requirements must be considered also. See the TCNA Handbook for Ceramic Tile Installation section EJ-171 for complete recommendations.

Bonding Materials – Innovative technology has produced a plethora of bonding materials for the installation of tile products. Careful consideration must be given to the type of substrate and type of tile selected in choosing the proper bonding material. Common tilesetter terms such as “thin-set” and “mastic” are not specifically defined meanings. The term “thin-set” is used interchangeably to describe a cement-based mortar and a method that encompasses all bonding materials that facilitates thin-bed installations. Therefore mastics (organic adhesives) and epoxies could be called “thin-set” Industry standardized terms for cement mortars are “dry-set mortar” or “latex/polymer modified mortar” instead of “thin-set”. Dry-set Portland cement mortar does not contain polymers and is often referred to as “unmodified mortar”. Cement based mortars that contain polymers additives are called “latex/polymer modified portland cement mortar” or “modified mortar”. Both perform dramatically better than organic adhesive (mastic) and are generally preferred for most jobs. Modified and unmodified mortars are sometimes interchangeable, however, many applications require the specific use of one or the other.

All bonding materials have minimum and maximum thicknesses that should not be ignored. Too little reduces bond strength and too much provides inadequate compressive strength and may shrink causing lippage and cracked tiles. Minimum bond coat thickness after proper bedding is 3/32” for cement mortars and 1/32” for organic adhesives. While cement mortars thickness varies by product generally about ¼” is standard. For thicker applications, use a medium-bed mortar which will maintain compressive strength and minimize the potential for shrinkage.

Organic adhesives (mastic) are ready to use products sometimes referred to as mastic or glue. They are categorized as Type I or Type II based on suitability for use in wet areas. Organic adhesives and cement-based mortars differ in composition and application suitability. Organic adhesives have considerably more limitations and should not be used interchangeably with cement mortars. Organic adhesive is not the best choice for bonding floor tile, even in dry areas its low compressive strength, as compared to cement mortar, will not withstand impact or loading. Epoxy bonding materials are available and should be used with the express manufacturers recommendations and directions.

Tools – Your Mannington Distributor can recommend a wide variety of tools for proper tile installation. The single most important tool is the notched trowel. They come in a variety of sizes and notch configuration and the proper selection is vital to the performance of the finished installation. There are square notches and rounded notches in a variety of widths and depths. The tile industry is one of a few industries that use notched trowels. They are designed specifically to apply a gauged amount of bonding material to the substrate. The National Tile Contractors Association, Inc. (NTCA) recommends the following Trowel Guidelines:

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- Adhesives – 4-1/4 wall tile and ceramic mosaics on dry wall – V-notch $\frac{3}{16}'' \times \frac{5}{32}''$.
6'' X 6'' to 9'' X 9'' on dry wall – Square notch $\frac{1}{4}'' \times \frac{1}{4}'' \times \frac{1}{4}''$
- Dry-Set Mortars – 4-1/4 wall tile and ceramic mosaics on masonry and concrete :
U-notch $\frac{1}{4}'' \times \frac{1}{4}'' \times \frac{5}{16}''$
6'' X 6'' to 9'' X 9'' on masonry walls and concrete:
U-notch $\frac{1}{4}'' \times \frac{1}{4}'' \times \frac{3}{8}''$
- Medium Bed Mortars - 12'' X 12'' and larger size tiles on masonry or concrete & tiles
with thickness variation: $\frac{3}{8}'' \times \frac{3}{4}'' \times \frac{9}{16}''$ - $\frac{25}{64}'' \times \frac{3}{4}'' \times \frac{19}{32}''$

Always check trowel for excessive wear before use. Use the flat side of the trowel to key mortar or adhesive into substrate to achieve the best possible mechanical bond. Comb in one direction with the notched side of the trowel, holding at a 45 degree angle. Specifications require no less than $\frac{3}{32}$ inch (2mm) mortar and $\frac{1}{32}$ inch (1mm) adhesive between tile and substrate after proper bedding. Set tile with a sliding motion perpendicular to the mortar ridges. The 80 – 95 % coverage shall be sufficiently distributed to give full support to the tile with particular attention to support under all corners and edges of the tile. Periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.

Grouting – A bad grout job can ruin a perfect installation. In addition to the aesthetic value of a quality grout job, it can affect the longevity and maintenance requirement of the tiled area. Properly mixed and applied polymer-modified cementitious grouts withstand the heavy service and maintenance conditions of commercial areas. Poorly-installed grout can show signs of wear under lighter conditions of a residential bathroom. Grout joint width and type of tile determine the grout product selection. A Grout Guide is provided in the TNCA Handbook covering suggested joint widths and tile type and use for the following grouts: Jobsite Mix (Sanded), Standard Unsanded Cement Grout, Standard Sanded Cement Grout, Polymer Modified Unsanded Tile Grout, Polymer Sanded Tile Grout, Modified Epoxy Emulsion, 100% Solid Epoxy, Furan, Silicone Urethane and Mastic Grout. Grout manufacturers provide printed instructions for proper mixing, cleaning and curing of each type of grout. These instructions must be carefully followed. A variety of sealers are available to enhance and protect certain types of grouts. Careful attention must be given to selection, application and clean-up of all sealers. Follow manufacturers' instructions explicitly. Top finishes and waxes affect the appearance of the tile and therefore are not recommended.

Clean Up – A final rinse of the grouted area should leave the surface clean and free of grout haze. Most grout haze can be removed from Porcelain tile with warm water and a mild detergent using a nylon pad or soft bristle brush. Acid cleaning is rarely recommended and should be done only by qualified personnel. When necessary, a solution of Sulfamic Acid is recommended with strict adherence to the manufacturers' instructions. All acid or acid based cleaners can adversely affect most grouts. Thorough rinsing to neutralize the acid is mandatory. Restrict traffic and use of freshly – grouted areas for at least 12 to 24 hours in residential applications and up to 72 hours in commercial installations. Exposure to water and freezing temperatures must be avoided. Temperature and humidity affect the curing time of all cementitious materials. Allow for extended cure times for temperatures below 60 degrees F and/or when relative humidity is above 70%. Check individual data sheets and closely follow manufacturers recommendations and directions.

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Maintenance – Porcelain tiles require a minimum of maintenance. Sweep thoroughly and mop with a clean damp mop. If necessary a mild household detergent can be used. Do not use abrasive cleaners or brushes with hard bristles. Clean up spills immediately, use detergent in strengths recommended by their manufacturer, allow the detergent to remain on the surface of the tile as recommended and rinse thoroughly with clean water to remove the detergent and the emulsified residue. Choose a product compatible for cleaning the tile and grout at the same time. It is strongly recommended that a small test area be used prior to usage of installation, tile, cleaning and maintenance products to determine if the product selected will serve its intended purpose.

Suggested Cleaners for Porcelain Tile – Most household cleaners are sufficient to clean common stains so long as the problem is addressed immediately. Where stain removal becomes a problem, contact a cleaning and maintenance product supplier or your local Mannington distributor for professional suggestions.

Technical & Packaging Information – Mannington Porcelain Tile

Warranties

Mannington (Mannington Mills Inc.) warrants that its first choice production porcelain tile (tile) is manufactured in accordance with ANSI A137.1-1988 standards. In the event that it is established that the tile has a manufacturing defect resulting from it not being manufactured in accordance with the said standards, Mannington will furnish, free of charge, material for replacement of the defective tile of compatible color and shade as determined by Mannington. Mannington shall not be responsible for labor charges incurred for installing replacement material and such charges are excluded from this warranty.

Mannington makes no warranty as to the suitability of its tile for installation for any particular purpose or location and it does not warrant that its tile will not scratch, chip or show signs of wear.

Mannington specifically excludes liability for consequential or incidental damages resulting from breach of its warranty except where exclusion of consequential damages is not permitted by applicable State law.

This warranty is a limited warranty and shall constitute the full extent of Mannington's liability on its warranty. This warranty is in place of all other warranties, expressed or implied, including the implied warranty of merchantability and the implied warranty of fitness for a particular purpose.

To make claim under this warranty, Mannington must receive notification of the claim as soon as reasonably possible but in no event later than one year after the tile has been installed. Claims must be made by calling-1-800-FLOOR-US or in writing and sent by certified mail to Mannington addressed to: Mannington Mills, Inc., Customer Care Department, 75 Mannington Mills Road, Salem, New Jersey 08079.

Claims concerning shade, appearance, caliber, finish or obvious defects in the tile must be communicated before the tile is installed. **No such claims will be accepted for tile that has been installed before Mannington receives a written claim sent by certified mail to Mannington addressed to: Mannington Mills, Inc., Customer Care Department, 75 Mannington Mills Road, Salem, New Jersey 08079.**

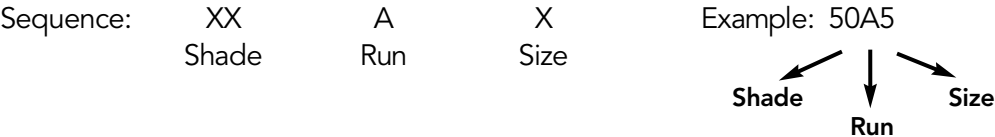
Porcelain Tile Installation Guide (continued)

Carton Labeling

Shade: Two-digit code; maximum of 5 shades; target shade is 50.

| | | |
|----------------|---------------|----------------|
| 48 – 49 | 50 | 51 – 52 |
| Lighter | Target | Darker |

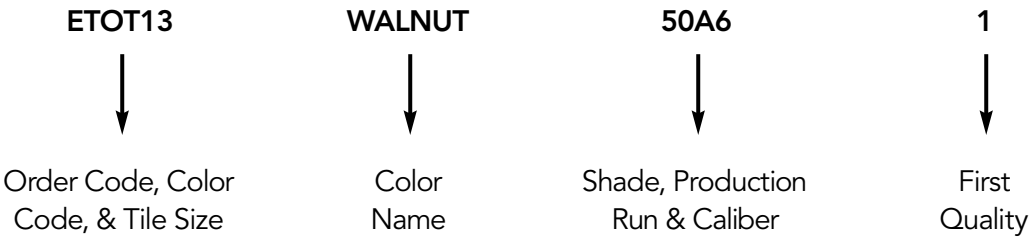
Production Run Identification: Alpha character (A – Z) represents this.



Size: One digit code; maximum of 5 calibrations per size; target caliber is 5.

| | | |
|----------------|---------------|---------------|
| 3 – 4 | 5 | 6 – 7 |
| Lighter | Target | Darker |

How To Read Full Carton Label:



NOTE: Rectified tiles are all one size due to manufacturing process and will not have a caliber listing.

NOTE: Some lot listing methods on cartons will vary. Please contact customer service in Salem, NJ with any questions. Need to add contact information

Trim Shapes Available



3" x 12" or 3" x 13"
Bullnose



5" x 5", 6" x 6", OR
6 1/2" x 6 1/2"
Bullnose



5" x 5", 6" x 6", OR
6 1/2" x 6 1/2"
Bullnose Corner



2 1/4" x 5", 2 1/4" x 6",
OR 2 1/4" x 6 1/2"
V-Cap Countertop



Quarter Round
Beak

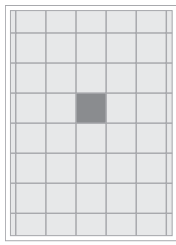


1" x 5", 1" x 6",
OR 1" x 6 1/2"
Quarter Round

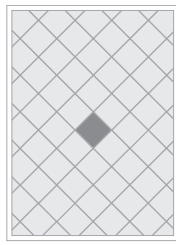


V-Cap
Corner

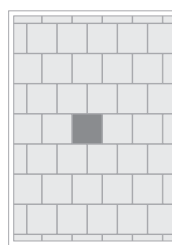
Installation Patterns



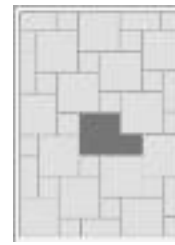
Pattern 100
6" x 6"
12" x 12"
13" x 13"
18" x 18"
20" x 20" (100%)



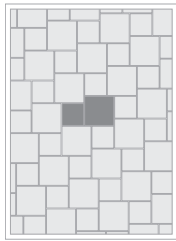
Pattern 101
6" x 6"
12" x 12"
13" x 13"
18" x 18"
20" x 20"
(100%)



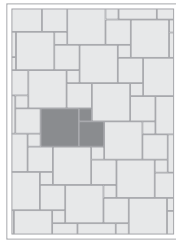
Pattern 102
6" x 6"
12" x 12"
13" x 13"
18" x 18"
20" x 20"
(100%)



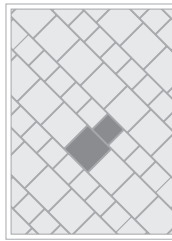
Pattern 103
12" x 12" (80%)
6" x 6" (20%)



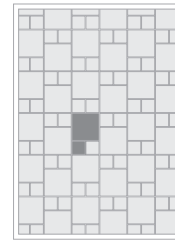
Pattern 104
18" x 18" (69%)
12" x 12" (31%)
or
18" x 18" (66%)
13" x 13" (34%)
or
16" x 16" (60%)
13" x 13" (40%)
or
20" x 20" (70%)
13" x 13" (30%)



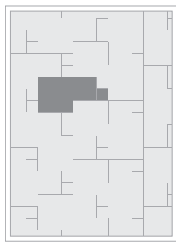
Pattern 105
20" x 20" (65%)
13" x 13" (27%)
6.5" x 6.5" (8%)



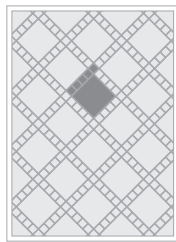
Pattern 106
18" x 18" (70%)
12" x 12" (30%)



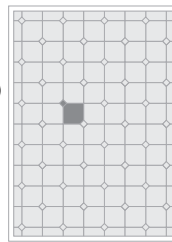
Pattern 107
12" x 12" (66%)
6" x 6" (34%)
or
13" x 13" (66%)
6.5" x 6.5" (34%)



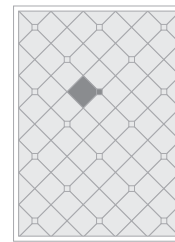
Pattern 108
20" x 20" (61%)
13" x 13" (26%)
6.5" x 6.5" (13%)



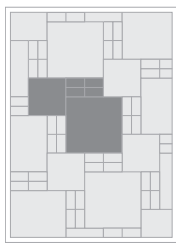
Pattern 109
12" x 12" (57%)
4" x 12"
(Mosaic) Listello (43%)



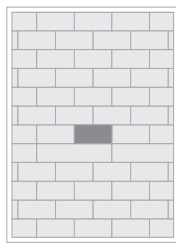
Pattern 110
12" x 12" (95%)
3" x 3" (5%)
or
18" x 18" (98%)
3" x 3" (2%)
or
20" x 20" (92%)
6.5" x 6.5" (8%)



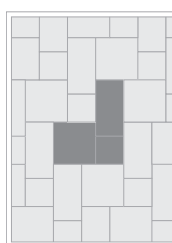
-Pattern 111
12" x 12" (98%)
3" x 3" (2%)
or
18" x 18" (99%)
3" x 3" (1%)
or
20" x 20" (97%)
6.5" x 6.5" (3%)



Pattern 112
18" x 18" (60%)
12" x 12" (27%)
3" x 6" (13%)



Pattern 113
3" x 6" (100%)



Pattern 114
12" x 12" (20%)
12" x 24" (38%)
18" x 18" (42%)



Pattern 115
12" x 12" (11.11%)
12" x 24" (88.8%)

Pattern F or A



Pattern 116
12" x 12" (50%)
12" x 24" (50%)

Pattern F or A



Pattern 117
6" x 6" (33.3%)
12" x 12" (66.6%)



Pattern 118
12" x 12" (50%)
12" x 24" (50%)



Pattern 119
12" x 12" (33%)
12" x 24" (66%)



Pattern 120
12" x 24" (100%)

Pattern C or D



Pattern 121
12" x 24" (100%)

Pattern C or D