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# INSTALLATION GUIDELINES

## Panels + Veneer



FINE BAMBOO FLOORING, PANELS & WORKTOPS

The following information applies to Teragren Traditional and Strand bamboo panels and veneer.

It has been compiled to assist with understanding how basic wood installation, storage and finishing techniques apply to installing and finishing bamboo as cabinetry, furniture, interior paneling, countertops, tabletops and other interior applications where hardwood products have traditionally been used.

Bamboo, although a grass, reacts like a hardwood, and may be affected by environmental changes. The following basic steps in handling, fabrication and installation are recommended to help avoid or minimize some of the problems associated with wood movement.

### DEFINITIONS

**Traditional Bamboo:** Defined in this document as Vertical, Flat or End Grain panels, countertops or tabletops.

**Strand Bamboo with Xcora™ technology:** Defined in this document as a patented construction method in which fibers of semi-shredded bamboo are intertwined in a pressure-treated adhesive base to form a high-density, homogenous bamboo panel without internal voids. Applies to Strand panels, 1/8" veneer and worktops. This proprietary process results in products 154% harder than red oak.

### HANDLING

**Minimize Handling**—This is the best way to reduce damage. Plan warehousing and process flow operations accordingly to eliminate excessive handling.

**Support panels when transporting** - Carry light weight panels on edge or support horizontally to prevent material strains and potential cracking along the grain.

### STORAGE

**Proper stacking** - Panels should be stored flat on raised runners of equal thickness. Keep similar lengths of similar products together and maintain proper alignment to avoid bending or flexing panels.

**Temperature** - Avoid extremes of heat and cold. Panels should be stored indoors. Ideal temperatures fall between 65°F to 75°F.

**Moisture** - Avoid extremes of humidity. Store away from water and off of concrete flooring. Humidity controls should be installed and maintained to a constant 35% to 55% relative humidity. The storage environment's relative humidity should mimic the anticipated installation environment. Extreme dry climates or environments that are not able to maintain a constant 35% to 55% year-round relative humidity are not appropriate environments. Very damp environments where material will come in contact with extreme moisture or water are also not appropriate for storage. For more detailed information on relative humidity, see the AWI quality standards document following these guidelines.

**Light** - As with most natural materials, exposure to sunlight may affect the color.

**Packaging** - In keeping with our high environmental standards, Teragren's packaging utilizes 70 percent recycled content cardboard, recyclable slip sheets, recyclable plastic and water-based ink. The packaging meets strict California environmental standards as stated within the 2006 Toxics in Packaging Prevention Act. Our furniture-grade panels and veneer come individually packaged with a 10 mil wrapping. This recyclable packaging protects material surfaces and maintains the products at delivered moisture content between 6% and 8%.

### ACCLIMATION

**Acclimation Goal** - To bring the moisture content and temperature of the product into harmony with the fabrication and installation environment.



Note: fabrication of product in an environment with a different relative humidity level than that of the installation environment may result in undesired material dimensional change. Extreme dry climates or environments that are not able to maintain a constant 35% to 55% year-round relative humidity are not appropriate environments.

**Length of Acclimation** - Just as with hardwoods of other species, acclimation time of bamboo will vary with site conditions as well as the width and thickness of the bamboo. Acclimation should match the installation environment or allowances should be made for acclimation to the installed site. 72 hours is considered a minimum. Additional acclimation may be necessary if products have newly exposed edges due to cutting and shaping. In extremely dry climates without relative humidity controls, acclimation of thick material such as a 1.5" counter or table top, may take longer than expected. Material may change dimensionally or warp especially if acclimation is uneven and exposed to extreme humidity or temperature changes. If left to acclimate too long, material may dry and crack.

**Acclimation Tips** - Some users in extreme dry climates have reduced the potential of surface cracking by applying a penetrating sealer equally to all exposed surfaces immediately upon removal of unfinished products from their protective packaging. The finish "locks in" the existing moisture, slowing the loss of moisture. If using this method, please note that finish coats must be applied to the newly exposed surface of any new cut.

**Acclimation Methods** - Packaging must be completely removed. Keep material off of concrete flooring, away from the elements, open doors, or windows. Material should be acclimated off the floor and stacked flat, with equal-size stickers being placed between each additional sheet to allow for even air-flow and temperature over both the top and bottom surface of the product. Stickers should be placed in sufficient quantity to ensure all products are evenly supported. Note: Place a sheet of MDF or other material equal to or larger than the product acclimating as the final stickered layer.

## FABRICATION + INSTALLATION

Every project is unique and considerations for fabrication should be made based on the region(s) in which the project is both being built and installed. The following are guidelines to consider:

**Environment** - The fabrication environment should match the installation environment. Do not deliver, fabricate, or install product until Heating, Ventilation, and Cooling (HVAC) systems are on-line and functioning. Extreme dry climates or environments that are not able to maintain a constant 35% to 55% year-round relative humidity are not appropriate environments.

**Expansion and contraction precautions** - Like hardwoods, Teragren Traditional bamboo and Strand products are kiln-dried and manufactured to achieve a moisture content of 6% to 8%. Bamboo, like hardwood, will undergo dimensional changes when exposed to high or low relative humidity. The wider the panel, the greater the change. Allowance for expansion and contraction must be incorporated into the design and installation of the product. When laminating bamboo materials to a substrate of a different material such as MDF, the expansion and contraction properties of the substrate must be considered. Substrates need to acclimate in the same fabrication environment as the bamboo prior to laminating.



Important Note: Without a means to expand and contract, bamboo, like hardwood, will crack under the stress. Oversized expansion slots, panel clips and floating panel construction applications are the most appropriate installation methods. In installations abutting ceramic or stone tiles, using a flexible caulk to allow for expansion is recommended. Because bamboo is very strong, unforeseen expansion could damage surrounding material. When appropriate, vapor and or heat barriers should be incorporated into the design to avoid temperature or moisture extremes that can affect the panels adversely.

**Lamination** - Veneer may be cold molded, vacuum pressed or hot pressed. Veneer and substrate must both have the same moisture content prior to laminating.

Hot Press notes: let panels cool down slowly prior to stacking together.

1/42" veneer: the best temperature is 120 degrees Celsius. PSI pressure should not be higher than 20 kg/cm<sup>2</sup>.

Traditional panels 1/8" and thicker: it is best to use temperatures under 100 degrees Celsius.

Strand panels: press should not be above 40 kg/cm<sup>2</sup> or 568.80 psi for either a hot or cold press.

To achieve a balanced laminated construction with unrestrained components, the same that is being applied to the front must also be done to the backside. Apply bamboo to the back as was used on the front. The dimensional stability of another hardwood will be different.

**Moisture Permeability** - Even when the two pieces of bamboo on each face are similar, the way they are mounted or finished may have the same effect as an unbalanced lamination. The best practice is to finish one side just like the other. Stain and topcoat systems change the surface permeability just like paint. Unequal treatments can cause for one side to absorb or lose more moisture.



The application of wall paneling directly over concrete, masonry walls or dry wall that is wet or unfinished, (especially when combined with nailing, screwing or gluing the panels in place) may lead to failure. The panel is unbalanced and constrained. Application to drywall requires the drywall to be sealed prior to hanging panels. An oil base paint is best. Latex breathes, and therefore is not an effective sealer. Also, it does not accept an oil base over it.

The rule - Whatever is chosen as a sealer or finish for the top to monitor moisture permeability, the same treatment and number of coats needs to be applied to the underside to provide for a balanced panel.

**Radius applications** - 1/42" and 2-ply veneer are best used for a radius application when laminated to a kerfed or flexible substrate. 1/8" Traditional and Strand bamboo panels may also be considered for moderate radius applications. These may be cold molded in layers to achieve a desired thickness. Traditional and Strand 1/8" panels will take a radius of 16" along the grain running the length.

**Cutting and Tooling** - Bamboo cuts and tools well with standard woodworking tools. Sharp carbide tipped tools are recommended to help prevent tear-outs. When cross-cutting, the higher the saw tooth count the better, especially with Teragren's Strand bamboo products. A very high ATB blade works best. Bamboo machines easily with the grain. Just as plywood, bamboo can splinter when crosscutting, coping and tenoning across the end grain. Due to the linear fibrous nature of bamboo, do not try to snap off small pieces - cut them or sand off. Pulling bamboo fibers could cause them to 'run' along the length of the grain. Profiles can be easily routed. Bamboo sands well with any standard woodworking sander.



**Fastening** - Pilot holes, pre-drilling, oversized slots for screw inserts, panel clips or other methods that allow for expansion and contraction are necessary for unrestrained applications and countertops. Nailing, screwing down tightly or gluing panels in place are methods which do not allow inherent movement and have a high risk of failure.

**Adhesives** - Most common woodworking adhesives suitable to the cabinet and furniture manufacturing industry have been used successfully and can be recommended such as polyvinyl acetates (PVA) glue and aliphatic resin glue (yellow glue). Contact cement is not a preferred adhesive for wood or bamboo products of thickness other than veneer. High water content in some adhesives may introduce moisture imbalances that react with finish applications.

The adhesive used to adhere the paper-fleece backing on our 1/42" and 2-ply veneer meets specifications as a D-4 waterproof glue.

Please note: the adhesive used to manufacture most of our products, other than the parquet end grain butcher block and Vertical Grain Countertops are not food grade. If the surface is to be used for food preparation, a food grade sealer is recommended. Or ask which of our panels and veneer are available or may be special ordered with formaldehyde-free, food-safe adhesive.

**Tabletops and Worktops** - please visit our Worktop Installation Guidelines for specific installation notes for this application or call Teragren 800.929.6333.

**Cut-Outs and Cut-Offs** - If acclimation has not been completed, cut-outs and cut-offs may release material stress causing warping or cracking. Additional acclimation may be required should this occur. Cut edges need to have a finish applied to prevent possible cracking.

**Heat Tolerance** - As with any hardwood, bamboo can be damaged by sudden and rapid temperature changes. Applying an aluminum heat reflective tape with attached insulation will help dissipate heat and allow for a more even expansion and contraction to areas subject to this exposure such as cook tops. Hot pots and pans should never be directly placed on the surface. A hot pad or trivet should be placed on the surface under cooking units which radiate heat.

**Cuts and Scratches** - As with standard wood countertops, the surface may be sanded and re-finished. The choice of finish applied will provide various qualities of protection and durability. Tabletops or countertops intended to be used as cutting surfaces should be finished with a food safe finish, such as a mineral oil. This type of finish will, over time, show cuts, scratches and stains and may be sanded and re-finished. Hard surface finishes are optimum for ease of care, such as wiping up spills, however care needs to be taken to protect against cuts and scratches. Surface protection such as cutting boards, coasters, trivets or pads will protect and extend the beauty of a finish.

**Use Around Sinks and Tubs** - Give extra care and attention to sealing edges when panels and countertops are to be used around sinks or tubs. Prolonged or constant exposure to water can cause darkening of the wood and over-saturation that in turn causes warping. Teragren recommends installing a non-porous material such as stainless steel or tile as a transition to the bamboo.

**Checking** - This condition is caused by the contraction of the butt ends and not that of the center part of the panel. It could be a sign that your environment is too dry or the panel was not properly sealed. Determine what the relative humidity is and make proper adjustments. These cracks should be filled promptly with wood filler, sanded smooth, and finished with a protective finish. Checking and cracking can also be caused by not allowing for expansion and contraction when attaching items to a countertop or panel. Relieve tension at once by removing screws and repair splits as suggested above.

## FINISHING

Finishes enhance the beauty and extend the useful life of bamboo as with hardwood. Bamboo takes a sealer and finish very well. Finishes and adhesives suitable to the cabinet and furniture manufacturing industries have been used successfully with bamboo. Teragren furniture grade panels are unfinished, sanded to 180 grit on both front and back faces. Additional sanding prior to finishing is always recommended. All panel surfaces should be inspected for any fissures or imperfections prior to applying finish applications. Strand bamboo has a wood-like grain with natural fissures. The application of a finish will highlight fissures or imperfections that were not previously apparent. Additional sanding and/or filling between finish coats will result in a higher level of finish quality.

All Surfaces should receive a finish, including edges, ends, cutouts and bottom side. End grain absorbs sealers and needs to be applied multiple times to seal thoroughly and be effective. Equal applications of sealer and finish are recommended to allow for slow balancing. For example, if two full coats are applied to a top face, two full coats of the same finish should be applied to the back face. Left unfinished, the panels can either absorb moisture or dry out. Moisture imbalance will cause cracking. Any new cuts need to be re-sealed. Sealers and finishes need to dry thoroughly between applications and where the relative humidity of 35% to 55% year-round is present. The longer a panel remains unfinished and the greater the environmental extremes, the greater the chance the panel will develop problems. This is natural and site condition material response and is not considered a manufacturing defect.

### Finish Selection for unfinished panels or countertops

Different finishes offer varying degrees of protection, durability, ease of application, reparability and aesthetics. No single finish excels in all categories. A finish that excels in one may fail in another. In choosing a finish you must accept trade-offs based on the qualities of wood protection and durability for the intended use. Water-repellent finishes will reduce the effects of brief periods of moisture (washing) and liquids, making the material easier to clean. Finished wood countertops are less likely to show stains. For information on the safety and toxicity of any finish, check the label and/or contact the manufacturer of the finish.

Testing for stain and finish results is always recommended. When applying finishes, follow manufacturer's suggested temperature and thickness for application. Testing the adhesion or finish to ensure the overall compatibility between the treatment, the panel, and the installed environment is recommended.

Note: Independent U.S. testing was performed to ensure the adhesive between the bamboo slats on Teragren products are compatible with Methyl Alcohol and Methyl Ethyl Ketone-based finishing products.

## COLOR

Color variation is an inherent part of all natural materials, including bamboo. Natural color variations will be apparent, not only from slat to slat, but from panel to panel. As with hardwoods, dark tones (caramelized bamboo) will tend to lighten over time. Lighter tones (such as natural bamboo) tend to darken over time. Exposure and duration of UV light will determine how extreme and how quickly changes may occur.

## SUGGESTED APPLICATIONS

Veneer - 1/42", 2-ply and 1/8" standard veneer must be bonded to a suitable substrate of a reliable quality. Wheat board or MDF (medium density fiberboard) is the most stable substrate, followed by industrial particleboard, veneer-core plywood, and the least stable substrate—hardwood. Direct application to drywall, plaster walls, concrete walls or cardboard products is not recommended as delaminating may occur. Veneer should be applied to a suitable substrate to cover these surfaces. Installation over substrates that have been treated with a fire-retardant agent may need to be tested for compatibility. See Lamination for hot press information.

Best uses: radius applications; laminations to various substrates; edge banding. Less expansion and contraction than solid thicker panels.

1/8" 4' x 8' Traditional - 5-Ply : As with any hardwood thin panel, 1/8" bamboo panels are very susceptible to environmental changes, especially relative humidity. See Lamination for hot press information.

Best uses: edge banding; cold mold multiple laminations; radius applications to about 16" diameter; light weight floating panels for backs of casework.

1/8" 4' x 6' Strand - Solid: As a thin panel, 1/8" is very susceptible to environmental changes, especially relative humidity.

Best uses: edge banding; cold mold multiple laminations; radius applications to about 16" diameter; light weight floating panels for backs of casework.

1/4" 4' x 8' Traditional - Solid: As a thin panel, 1/4" is susceptible to environmental changes, especially relative humidity. Best uses: floating panel for wall treatments; backs, sides and fronts for lightweight cabinets.

1/4" Traditional - 3-ply with a cross-laminated core: More stable than a 1/4" solid construction. Core showcases a decorative edge. No edge banding needed. Best uses: drawer bottoms, floating panel for wall treatments; fronts for frame and panel doors, backs, sides and fronts for lightweight cabinets; small box construction.

1/4" 4' x 6' Strand - Solid: Best uses: drawer bottoms, fronts for frame and panel doors, floating panel for wall treatments; backs, sides and fronts for lightweight cabinets; small box construction.

1/2" 4' x 8' Traditional - 3-ply with a cross laminated core: Offers more stability than 1/4" panels. Core showcases a decorative edge. No edge banding needed. Best uses: drawer boxes, bottoms and sides, casework sides and backs, floating panel for wall treatments; backs, small box construction.

3/4" 4' x 8' Traditional - Solid: Best uses: Cabinet boxes, face frames, smaller doors, furniture, architectural mill work, countertops.

3/4" 4' x 8' Traditional - 3-ply with a cross laminated core: Offers more stability for larger free hanging applications. Core showcases a decorative edge. No edge banding needed. Best uses: Flat front doors, casework, countertops, cabinet boxes, door and drawer faces, furniture and architectural mill work and anywhere S4S lumber is traditionally used.

3/4" 4' x 6' Strand - 3-ply with vertical grain cross laminated core: Stronger than standard bamboo. Core showcases a decorative edge. No edge banding needed. Best uses: Flat front doors, casework, countertops, cabinet boxes, door and drawer faces, furniture and architectural mill work and anywhere S4S lumber is traditionally used.

13/16" 1' x 8' dimensional lumber - Solid: Best uses: furniture, architectural mill work, stiles and rails.

Due to varying application environments and situations, these guidelines do not guarantee results and should be used as a supplemental source of information only. Teragren is not responsible for any costs or expenses incurred during installation or removal of defective pieces due to warping, splitting or any other reasons. Please review our Product Specifications and Material Safety Data Sheets for further information.

For more information about relative humidity and its relationship to moisture content, please reference the Architectural Woodwork Institute (AWI) website at [www.awinet.org](http://www.awinet.org) and the Hardwood Plywood and Veneer Association (HPVA) website at [www.hpva.org](http://www.hpva.org).

Contact your Teragren distributor or retailer for more information or [email tech support](#).

