



fabrication manual

revision date 05-01-06

introduction

Environ Biocomposites Manufacturing, LLC (Environ) has developed this manual to assist you in choosing support products and fabrication techniques required to successfully complete your creations using our decorative product line of materials: Dakota Burl® and BIOFIBER™ Decorative Wheat.

Dakota Burl® is a revolutionary product, the first of our “Decorative Fiber Series” line, manufactured by Environ. Dakota Burl® is a decorative material, which exhibits the beauty and elegance of traditional buried woods. Dakota Burl® is created from an abundant agricultural fiber, rapidly renewable resource, intended for non-structural, interior applications. The material is available in 4 foot by 8 foot sheets and various thickness'. Dakota Burl® can be stained with conventional wood stains to achieve a wide variety of distinctive colors. When matching Dakota Burl® to Dakota Burl®, inspect pattern prior to joining. Dakota Burl® is a random pattern product, which gives the material its distinct look.

BIOFIBER™ Decorative Wheat is another product from our “Decorative Fiber Series” line manufactured by Environ. This unique decorative fiber material offers a detailed fiber pattern with golden-yellow hues, which distinguishes this material from other fiber and composite panels. The material is available in 4 foot by 8 foot sheets and various thickness". BIOFIBER™ Wheat can be stained with-conventional wood stains for a wide range of color options. When matching BIOFIBER™ Wheat to BIOFIBER™ Wheat, inspect pattern prior to joining. BIOFIBER™ Wheat is a random pattern product, which gives this material its unique look.

New training methods, support products, specifications and applications, are generated with the input of our customers. If you find techniques and materials that are uniquely suited for Dakota Burl® and/or BIOFIBER™ Wheat please contact our Technical Service Department for inclusion into future Fabrication Manuals. When working with Dakota Burl® and/or BIOFIBER™ Wheat please make sure that you are utilizing the most recent Fabrication Manual.

If you should have any questions regarding any of the information contained in this booklet, please contact our technical support representatives at 1.800.324.8187 Monday-Friday from 8:00 a.m. to 5:00 p.m. Central time.

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INCOMING SHIPMENTS

sheet stock packaging

Conventional Pallet - The Dakota Burl® and the BIOFIBER™ Wheat utilize 4' x 8' conventional pallets. Pallets will have protective corners and a cover sheet. The sheet stock and cover sheet will be banded to a slightly oversize 4' x 8' pallet and protected with plastic. **It is important that the material remain banded to the pallet and, if possible, weighted with a top sheet while in storage.**

unloading sheet stock

Unload Dakota Burl® and/or BIOFIBER™ Wheat under protective cover. Avoid unloading outdoors in inclement weather. Provide enough space for storage in a dry and humidity- controlled environment.

inspection

All incoming shipments should be checked immediately upon arrival to ensure that units were not exposed to moisture, contamination, or physical damage. If problems are found, contact your delivery carrier **immediately**.

handling

Conventional Pallet - A forklift or hand truck may be used to handle pallets. Aisles should be of proper width and be kept clear to avoid damage to sheet stock.

STORAGE ENVIRONMENT

procedures

Dakota Burl® and BIOFIBER™ Wheat should never be stored outdoors. The indoor storage should be kept clean, dry and well ventilated. It is important to store pallets on a hard, level surface. If multiple pallets are to be stacked, ensure that pallet bolsters line up vertically to provide ample support. The weight of a pallet stacked on sheet stock with misaligned or missing support will cause warping or sheet breakage.

atmospheric control

Dakota Burl® and BIOFIBER™ Wheat, hygroscopic materials, are susceptible to change in dimensions, surface smoothness and flatness as it gains or loses moisture. These variations can be minimized and held within desired limits by controlling the temperature, relative humidity and air movement in the storage area. A storage environment of 70 degrees Fahrenheit and 50 percent relative humidity is recommended. If it is impractical to establish these controls in a main storage area, a separate, smaller storage or "conditioning" area should be designated. Extreme atmospheric changes should be avoided. If too high or low, the moisture content of Dakota Burl® and/or BIOFIBER™ Wheat can have adverse effects on panel gluing, finishing and dimensional stability. **An acclimation period of two to three weeks is recommended if moving the material to a substantially different atmosphere.**

warranty

Using non-approved fabrication techniques or storage and handling methods will void product warranty unless approved in writing by the Environ Technical Service Department.

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design criteria

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Dakota Burl® and BIOFIBER™ Wheat are panel products of variable thickness' and/or colors. Dakota Burl® resembles the beauty of traditional buried wood. BIOFIBER™ Wheat offers a rich golden alternative to traditional panel products.

Dakota Burl® and BIOFIBER™ Wheat should be specified for interior, non-structural uses only, in applications that avoid continuous and/or direct contact with moisture. **These materials are not recommended for kitchen and/or bath countertop applications.** Storage and handling instructions must be followed. All testing is performed to ASTM standards in Environ Biocomposites Mfg., LLC's laboratories as well as in our subcontracted external independent laboratories. (See Table 1 below)

span & support for horizontal applications

Dakota Burl® and BIOFIBER™ Wheat meet M3 particleboard standards, which defines its design criteria.

balanced construction

Improper or unbalanced construction in fabricating Dakota Burl® and/or BIOFIBER™ Wheat may cause warping or cupping. **Finishes or seal coats are required on both sides of the product and edges for proper balance.**

See the "General Finishing" section in this, manual for further information.

building techniques

Dakota Burl® and BIOFIBER™ Wheat offer unique opportunities for showcasing edge building techniques. Each of the above materials can be glued directly to itself or to wood. As with wood, the use of mechanical fasteners will greatly enhance the performance of any joint. For examples and for further information on gluing see the "gluing" section in this manual.

fastening

Although Dakota Burl® and BIOFIBER™ Wheat properties differ from wood products; they are designed to mimic the attributes of hardwood. Dakota Burl® and BIOFIBER™ Wheat's uniform panel densities make fastening through the face or on edge similar to wood. Mechanical fasteners should always be used in conjunction with a recommended adhesive when edge building Dakota Burl® and/or BIOFIBER™ Wheat to achieve the best quality and highest strength joint. When edge gluing Dakota Burl® and/or BIOFIBER™ Wheat, it is recommended that biscuit, screwing, or dowel jointing techniques are followed.

TABLE 1. PROPERTIES

description	3/4" Dakota Burl®	3/4" BIOFIBER™ Wheat	test description
modulus of rupture	2400 psi	3500 psi	ASTM D1037-93, secs. 11-20
modulus of elasticity	400,000 psi	420,000 psi	ASTM D1037-93, secs. 11-20
screw holding			
- perpendicular to plane	300 lbs.	230 lbs.	ASTM D1037-93, secs. 61-67
- withdrawal from edge	280 lbs.	180 lbs.	ASTM D1037-93, secs. 61-67
impact resistance	--	--	ASTM D1037-93, secs. 91-95
abrasion resistance	--	--	ASTM D4060-90, Tabor abrader test
hardness	1000 lbs.	700 lbs.	ASTM D1037-93, secs. 68-73
internal bond	100 psi	70 psi	ASTM D1037-93, secs. 28-33
edge swell (24 hour immersion)	less than 15%	less than 10%	ASTM D1037-93, secs. 100-106
water absorption (24 hour immersion)	less than 20%	less than 25%	ASTM D1037-93, secs. 100-106
flame spread	class 3	class 3	ASTM E84-91

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inlays

Because of Dakota Burl® and BIOFIBER™ Wheat's three-dimensional properties, inlays can easily be fabricated. A router can be used to make various surface designs and edge effects, which can be filled with colored wood filler, or colored polyester. Sanding and finishing the completed product provides a smooth interface between the Dakota Burl® and/or BIOFIBER™ Wheat and the inlay.

machining

Equipment and tooling requirements for fabricating Dakota Burl® and/or BIOFIBER™ Wheat are similar to those of hardwoods or high-density wood composites. **Sharp carbide tooling is recommended for cutting, shaping and other machining techniques.**

finishing

Dakota Burl® and BIOFIBER™ Wheat are open-grained materials, a characteristic similar to wood. **Dakota Burl® and BIOFIBER™ Wheat must be finished to enhance the full natural color and to provide proper product performance.**

humidity and water

Raw Dakota Burl® and BIOFIBER™ Wheat are highly water-resistant and have similar humidity and water absorption of a hardwood, which allows for standard woodworking techniques.

Properly finished Dakota Burl® and/or BIOFIBER™ Wheat surfaces can be water impervious when finished properly. Linear expansion is similar to that of traditional hardwoods.

warranty

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gluing

Most wood adhesives will adhere to Dakota Burl® and BIOFIBER™ Wheat, but satisfactory performance depends on careful consideration of physical and chemical compatibility of the adhesive and the adherents, processing requirements, mechanical properties, durability, ease of use, color, and cost. Other factors in adhesion performance are: quality of adhesive, surface quality and preparation, bonding process, type of joint, and service environment.

Adhesives typically used in the wood industry may be used to bond Dakota Burl® to Dakota Burl®, BIOFIBER™ Wheat to BIOFIBER™ Wheat or Dakota Burl® and/or BIOFIBER™ Wheat to wood. The following classes of adhesives are recommended for edge builds and seams:

PREFERRED - Polyurethane (such as Gorilla Glue or Franklin International Titebond Polyurethane Glue) - Amber liquid resin having great versatility. Excellent adhesion to Dakota Burl® and/or BIOFIBER™ Wheat and wood. These types of adhesives are highly resistant to moisture and elevated temperatures and have excellent chemical aging resistance.

ACCEPTABLE - Crosslinkable PVA emulsions - Similar to PVA's, but improved performance in moisture and elevated temperatures. Better performance than standard PVA glues.

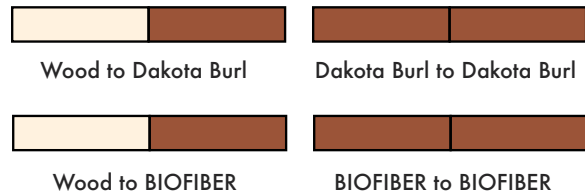
ACCEPTABLE - PVA - Poly vinyl acetates "white glues" are easy to use, high in dry strength, have low resistance to moisture and high temperatures, and joints tend to yield under continued stress.

The above three types of glues are highly recommended when bonding Dakota Burl® and/or BIOFIBER Wheat™.

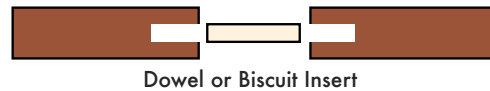
Testing of all glues, using an actual material sample piece, is recommended before final fabrication.

applications

The following represent standard edge gluing applications. Dakota Burl® and BIOFIBER™ Wheat have the unique ability to be bonded to various wood species.



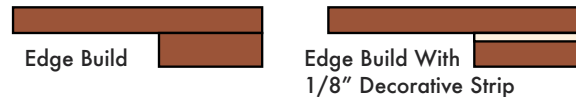
In edge-to-edge bonding, it is recommended to use dowels or biscuit techniques for improved mechanical strength of the bond and overall part strength. Edge gluing pieces that are greater than 3 inches in width requires dowels or biscuits.



Follow manufacturer's application instructions.

edge building techniques

The following represent standard edge building techniques for transaction ledges, furniture, and other table top applications.



In edge building techniques, screws should be inserted in pre-drilled holes on the underside of the edge. This allows shortened clamp time and increases holding performance of the edge system. Screw placement should be every 6 to 12 inches.

warranty

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general finishing- Dakota Burl® and BIOFIBER™ Wheat

Dakota Burl® and BIOFIBER™ Wheat must be finished to enhance the full natural color/pattern and to provide proper product performance. The product is highly water resistant but not waterproof or stain-proof in the raw, unfinished form.

Dakota Burl® and BIOFIBER™ Wheat were designed as durable, decorative materials and will accept a variety of finishes that are designed for use with wood. Both of these decorative fiber panel products have a grain or porosity similar to an open grain hardwood. **All finishes must be tested on an actual product sample and evaluated with the final application in mind.**

Dakota Burl® and BIOFIBER™ Wheat samples are supplied with a high solid Ultra-Violet (UV) cured finish. UV finishes offer a level, ultra-smooth surface on Dakota Burl® and BIOFIBER™ Wheat. This look will take several coats to achieve with conventional finishing methods. **Environ Biocomposites Mfg., LLC recommends spray applied catalyzed systems for most horizontal surface applications (see "Transaction Surface" section).** These finishes are designed for their ability to resist scratching, achieve good adhesion, and have a high solids content. **Our testing on Dakota Burl® and BIOFIBER™ Wheat indicates that some lacquers and varnishes will achieve acceptable adhesion levels required provided a good quality sealer (sanding or vinyl) is used to seal and fill the surfaces prior to top coating.**

If your finish supplier would like to work with us on testing a finishing system for Dakota Burl® and/or BIOFIBER™ Wheat have them call our Technical Service Department at 1-800-324- 8187.

preparation for finishing

Dakota Burl® and BIOFIBER™ Wheat are open-grained materials with a porosity consistent with its appearance. The sheet stock leaves the factory straight line. sanded to 120 grit on both faces. Before finishing, sand with a random orbital sander to remove straight line sanding marks. Begin with lower grits (100 to 120) for removal of sanding marks, or blending of seams. Move up in sanding grit as needed until the desired smoothness and adhesion is achieved.

balanced construction & finishing

Dakota Burl® and BIOFIBER™ Wheat, like wood, expands and contracts with changes in the atmosphere. Balanced construction (similar finishing on both faces of the panel) of the Dakota Burl® and/or BIOFIBER™ Wheat is necessary to prevent warping.

colors and matching

Because Dakota Burl® and BIOFIBER™ Wheat are comprised of natural rapidly renewable products; there will be some variation in color and pattern.

Before fabrication and final installation, the fabricator and end user should verify color/pattern coordination developed from an actual sample. When seam matching; inspect pattern and color prior to joining to ensure best match.

warranty

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transaction surfaces

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definition

A transaction surface is a horizontal surface used in commercial applications such as reception surfaces, bar tops, displays, transaction surfaces and other horizontal areas where some activity is performed. Tabletops may be considered a type of transaction surface. (Commercial food preparation areas usually require that the finish be NSF approved. Local codes may vary.)

kitchen/bath countertops

In the future, kitchen/bath countertops may be a good market for Environ Biocomposites Mfg., LLC's (Environ) Decorative Product Line with an appropriate finishing system. At this time, Environ is testing this application but is focusing on other mainstream commercial and residential applications. **Environ does not currently warranty any residential and/or commercial kitchen/bath applications.**

sealing

Dakota Burl® and BIOFIBER™ Wheat work similar to wood and thus need to be sealed and finished like wood. For most horizontal applications a full-filled look with superior hardness and scratch resistance is desirable. A sanding sealer or past filler should be used to achieve a smooth surface. Sand the sealer or filler with a 220-grit paper until smooth. Multiple coats of sealer may reduce the amount of top-coats or build coats needed.

finishing

Dakota Burl® and BIOFIBER™ Wheat work similar to wood and thus need to be finished similar to wood. For transaction surfaces there are a limited number of finishes that yield acceptable performance. Catalyzed polyurethane and catalyzed polyesters have exhibited the best performance due to their high degree of hardness, durability and stain resistance. These catalyzed finishes are available through your finish distributor or through other wood

finishing companies. **Other wood finishes, such as lacquers, are not recommended for transaction surfaces because they do not have appropriate hardness, stain resistance, protection from water and can chip easily.**

The recommended finishes are high solids, high build finishes that, when applied correctly, can be easily repaired and maintained. These finishes are resistant to most standard cleaners and polishes. If the surface becomes lightly scratched, the surface can be wet-sanded or Scotchbrite can be used to take out the scratches.

A buffing compound with a buffing wheel or Scotchbrite can be used to bring back the surface gloss level required. For best results, see finish manufacturer's recommendations for repair.

Gloss level is an important part of any surface. Generally, the higher the gloss, the more likely you are to see scratches. It doesn't mean that it physically is easier to scratch, but it is optically enhanced. Also, darker colors tend to show scratches more readily.

For additional information on fabrication and specifications, refer to the "general finishing" sections in this manual.

warranty

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limited warranty

1. Environ Biocomposites Mfg., LLC (Environ), makes the following limited warranty to the initial consumer or purchaser of Dakota Burl® and/or BIOFIBER™ Wheat (product). Environ will at its sole option, repair or replace the (product) purchased by^ the initial consumer or purchaser, without charge if:

- A. The (product) was used in an application approved by Environ for the use of the (product) at the time the (product) in question was manufactured by Environ; and
- B. The (product) cracks, chips, delaminates or others/vise fails during the first five years after initial installation due to a Environ manufacturing defect that makes the (product) unsuitable for its intended use; and
- C. The failure of the (product) in question was not caused by anything other than normal use conditions, such as improper handling; misuse or abuse after installation; excessive heat; impact of falling objects; moisture contact with the (product); failure of any adhesive, caulk, or other accessory, or failure of any caulked or filled joint or seam; vandalism; earthquake; hurricane; tornado; flood; fire; acts of God; or failure or distortion of a wall or the foundation of the structure (including settling of the structure or movement of framing members); and
- D. The (product) in question was put into use and maintained in the manner recommended by Environ in its publications relating to care (copies of which may be obtained free of charge by writing directly to Environ); and
- E. In the event that a finish coat was applied to the (product) in question by anyone other than Environ, then this warranty shall not apply to the finish coat, and this warranty shall apply to the (product) in question only if:
 - a. The finish coat involved was part of a finishing system previously approved by Environ for the use with the (product); and
 - b. The finish coat involved was applied according to the guidelines for its application provided by the manufacturer of the finishing system involved; and

- F. The (product) in question has not been removed from its original place of installation; and
- G. The initial consumer or purchaser follows the claim and inspection procedures set forth below; and
- H. The repair or replacement was authorized in advance in writing by Environ.

Environ's only obligation under this warranty shall be to reimburse the original consumer or purchaser for the cost of repair or replacement, at Environ's option, of the affected (product) panels, up to the amount of the original uninstalled purchase of the affected panels. This warranty is personal to the original purchase and is not assignable or transferable, and Environ's obligation under this warranty shall terminate upon transfer of the structure, furniture, or other object in which the (product) was used or installed.

2. THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE WARRANTY SET FORTH ABOVE. ENVIRON SHALL NOT BE RESPONSIBLE FOR ANY DIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN TORT, CONTRACT, OR OTHERWISE (INCLUDING BUT NOT LIMITED TO PERSONAL INJURIES, DAMAGE TO A STRUCTURE OR ITS CONTENTS OR A PIECE OF FURNITURE OR LOST PROFIT) ARISING OUT OF THE USE OF OR INABILITY TO USE THE (PRODUCT).

3. All claims under this limited warranty must be made in writing within ten (10) days after discovery of the defect directly to: Environ Biocomposites Mfg. LLC, 221 Mohr Drive, Mankato, Minnesota 56001; Attention Customer Service. Environ must be given a reasonable opportunity to inspect the claim.

4. If any provision or clause of this warranty or any application thereof to any person, entity, or circumstances contravenes the laws of any state or jurisdiction or is held invalid by any court of competent jurisdiction, such provision shall be deemed not to be a part of this warranty in that jurisdiction, and such invalidity shall not affect any other provision or application of this warranty. To this end, the provisions of this warranty are severable.