

## Working with Highwood Products

### GENERAL

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highwood® materials can be handled and machined in a similar fashion to natural wood. Most methods used for storing, fabricating, and cleaning wood can be used with highwood® products, making it an extremely versatile material. Please note the recommendations for cutting tools/blades for optimal results.

### STORAGE

As with wood, highwood® materials should be properly supported and protected from the elements in storage. Avoid prolonged exposure to direct sunlight or excessive temperatures (>100°F or 38°C) during storage. Usually, storing the products as packaged will provide the necessary support. The best practice is to store highwood® profiles inside on a clean, flat surface and covered to protect from dirt and dust. highwood® products expand and contract with temperature therefore the product should be at room temperature before fabricating to ensure proper measurements.

### MACHINING

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It is important that all saw blades, cutters, and drill bits used for highwood® material be kept sharp. Dull tools increase the heat generated while machining, which may soften or melt the material and result in a poorly machined surface. Any build-up of 'sawdust' may melt around the tool and cause a poor surface.

### CUTTING

highwood® materials can easily be cut with circular blades (table saw, radial arm saw, miter saw) and band saws. Use caution with reciprocating saws (e.g., jig saws) as heat generation can melt the material; use low RPM and high 'orbital' setting when using reciprocating saws. Circular saw blades should be carbide-tipped with no more than one tooth per inch (maximum: 20T for 7-1/4", 30T for 10"). Blades designed for 'fast ripping' work well. Alternating tooth bevel (ATB) designs work best. Saw speed must be between 2,000 and 4,000 RPM and a fast feed rate should be used.

A blade lubricant such as silicone spray can be used to help reduce friction. Saw blades must be in good condition: flat and sharp. Blade wobble or diameter run-out will create friction and soften the product. Select a blade with the thinnest possible kerf that provides adequate stiffness. Using blade collars to reduce blade wobble is advisable. ATB-alternating tooth bevel-style blades with a 6° to 12° rake is a good selection. As with wood, the material should always be cut from the 'show side' to the back face to avoid chipping of the finished surface.

### DRILLING

highwood® materials can be drilled using all types of drills (e.g., brad point, split point, step drills). For larger diameter holes, Forstner bits work exceptionally well. Care must be taken to frequently remove the waste to avoid heat build-up and melting of the 'sawdust'. Coated drills (titanium nitride) reduce friction, and are highly recommended. Drill speeds should be 400 to 900 RPM to minimize heat generation.

### PLANING & JOINTING

highwood® material can be planed or jointed just like wood. Planing the product surface exposes the foam's cell structure which should be sealed. A high-quality sanding sealer works well. Removal of the exterior 'skin' of the product should be done evenly on both sides to minimize any induced stresses, bows or twists which may occur when the product expands or contracts.

## ROUTING

A router can be used to create dados, rabbets, round-overs, and other design elements. Carbide tipped tools should be used, and spiral up-cut style bits are best. Straight flute bits create friction and cause melting of the material. High bit speed and feed rates are recommended. For cutting depths greater than 3/4" (20mm), an air knife should be used to continually remove the waste material from the bit. Routing on CNC equipment is ideal and produces furniture grade cuts.

## JOINING & FASTENING

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The type of joining method used will depend on the final application and strength requirement of the joint. More than one method of joining may be used in a joint (glue and screw). Most standard woodworking joints (e.g., mortise and tenon, lap joint) are effective for joining highwood® material.

### SCREWING

A variety of screw types are suitable for highwood® materials. The greatest holding strength is achieved with parallel thread, coarse pitch screws. Pre-drilling is recommended, particularly for thin profiles and within 1" of board edges. Torque-limiting drivers are suggested to avoid stripping the threads, particularly when driving screws in along the axis of the extrusion.

For exterior use, select a proper corrosion-resistant fastener. Stainless steel is superior for corrosion, but are quite soft. Pre-drilling is particularly recommended for SS screws. Ceramic-coated screws are strong and provide good corrosion resistance.

Joining with pocket screws is an ideal method of making butt joints. Using a jig, such as supplied by Kreg Tools ([www.kregtool.com](http://www.kregtool.com)), to create the pocket holes and subsequently gluing and screwing creates a strong butt joint.

### NAILING/STAPLING

Nailing is not effective for fastening thick profiles of highwood® material; screwing or stapling is preferred. When nailing, the material should be pre-drilled to avoid splitting the product. Nails should not be closer than 1" from the edge of any profile. Pneumatic nailers can be used for finish nails and brads.

Stapling is an effective method for fastening and is preferred over nailing. Medium and wide crown staples used with pneumatic staplers are best. Corrugated staples should not be used with highwood® materials. Pneumatic tools should be fitted with an air regulator and operated at no greater than 75 PSI.

### GLUING

A wide range of adhesives are suitable for gluing highwood® material, including solvent-based and solvent-free products. Water-based adhesives (standard woodworking glues) will NOT bond highwood® material. Care must be taken when using solvent-based adhesives, as the solvent will alter the appearance of the material if it gets on the finished surface. Adhesives produced by Testors (#3501GA, #3503GA, #3521GA), GOOP, and IPS Weld On (#16) are recommended. Other solvent-based adhesives can be used, but may not develop comparable bond strength. Solvent-free adhesives, such as Gorilla Glue, 3M's Scotch Weld (#TE-031), 3M's Jet-Melt (#3764), and Titebond (#5492) work well with highwood® materials. These products yield strong bonds and excess glue can be removed by sanding. Other solvent-free adhesives made by 3M, namely Super 77 and Super 90 are available in a spray can and provide an excellent structural bond with highwood® materials.

Each of these adhesive products set in 1 to 7 minutes, and therefore require pressure to be applied during this time. In all cases, the parts to be bonded must be clean and free of dirt and dust to achieve a good bond. Clamps or assembly jigs are the best method for forming good joints. After the adhesive sets, a cure time of 1 to 2 hours is required to build sufficient bond strength before working with the material. Whatever type or grade of adhesive is selected, the usage and safety instructions supplied by the adhesive manufacturer must be followed.

Product #	Type	Form	Est. Cost/oz. (volume)	Advantages	Disadvantages
Testors #3501 GA	Solvent Based	5 gallon pail Squeeze Tube	\$0.180/oz.	Quick Dry, Very Strong Bond	VOCs, Odor, Drips and Runs will Mark Surface
Testors #3503 GA	Solvent Based	5 gallon pail Squeeze Tube	\$0.180/oz.	Extra Fast Dry, Very Strong Bond	VOCs, Odor, Drips and Runs will Mark Surface
Testors #3521 GA	Solvent Based	5 gallon pail Squeeze Tube	\$0.180/oz.	Non Toxic, Low VOC's, Very Strong Bond	Drips and Runs will Mark Surface
IPS Weld On #16	Solvent Based	5 gallon pail Squeeze Tube	\$0.750/oz.	Readily Available, Strong Bond	VOCs, Odor, Drips and Runs will Mark Surface
3M Scotch Weld #TE- 031	Solvent Free	Cartridge	\$0.981/oz.	No VOC's, High Early Strength, Strong Bond	Requires Special Applicator, High Cost
3M Jet Melt #3764	Solvent Free	Cartridge	\$0.784/oz.	No VOC's, High Early Strength, Strong Bond	Requires Special Applicator, High Cost
Tite Bond #5492	Solvent Free	Caulk tube	\$0.160/oz.	Strong Initial Tack, Readily Available, Low Cost, Easy Application	Moderate Bond Strength
3M Super 77	Solvent Free	Spray Can	\$0.962/oz.	Readily Available, Easy Application, Versatile, Fast Setting, Good Bond	High Cost
3M Hi-Strength 90	Solvent Free	Spray Can	\$1.230/oz.	Clean Application, Strong Bond, One Minute Dry Time	High Cost

## WELDING

Ultrasonic and vibration welding can be used to tack or seam highwood® materials less than 1/4" thick. Consult the welding equipment manufacturer's instructions and recommendations for all settings.

## BENDING

To produce curved products, highwood® profiles can be bent using a jig or form. To bend, heat the profile to 210 to 250°F (100 to 120°C) in a convection oven, hot box, or hot liquid bath. Heat only long enough to make the profile pliable (time varies with profile thickness: typical 7 to 15 minutes). Overheating will cause the foam to expand and the profile will become misshapen. If the profile is too cool (not hot enough), it may wrinkle when bending. Trials are required to define the amount of time and specific temperature for your equipment and each profile. Remove from the oven and shape in the jig; allow to cool. The ends of the profile will 'mushroom' so be certain to allow approximately 2" (50mm) to be trimmed on each end.

## FINISHING

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Unlike wood, highwood® materials are supplied with a finished surface. Therefore, care should always be taken to protect the surface during manufacturing and shipping of finished goods. However, if the surface is scratched or marred, it can be repaired.

## SANDING

Machine or hand sanding can be used to remove scratches or tool marks (after machining). Disc or orbital sanders should not be used, as they generate heat and can soften the material. Belt sanders, pad (palm) sanders, drum sanders all work well, as does hand sanding. highwood® material can be wet or dry sanded. To remove fine scratches, use #0000 steel wool and a soft wax such as bee's wax or carnauba wax.

## SKIVING

Nicks and scratches can be removed from highwood® material using a sharp knife blade (X-Acto blade, single edge razor blade, utility knife blade). Simply hold the blade perpendicular to the material surface and skive off the nick or scratch. Make several passes to gradually shave the material surface.

## STAINING & PAINTING

highwood® material does not require any staining, painting or preservative treatment to maintain its appearance. However, stains can be used on the material to alter the color of the product. Water-based acrylic stains, such as made by Cabot Stains, work very well. Alkyd-based stains or varnishes also work well. Gel-type stains provide more uniform staining and are recommended. Avoid any stain with aromatic solvents (e.g., toluene, xylene). To paint the material, use a high-quality oil-based primer followed by either oil-based or latex exterior grade paint.

## SEALING

Surface sealers, such as urethanes, sanding sealers, or waxes, can be used to seal highwood® products. Do not use sealers with aromatic solvents. Be certain to test a small area first before applying the sealer to the entire surface. IPS Weld-On P-70 pipe joint primer and carnauba wax both provide excellent results.

## FILLING

Large holes from drilling or other fabrication processes can be filled by doweling the hole or filled with plastic wood products, such as Minwax High-Performance Wood Filler and ZAR Latex Wood Patch. Dowels can be sanded smooth to blend with the surrounding product. Plastic wood fillers can be stained to blend with the Highwood color.