

## **C. Moulding and Millwork**

### **Technical Bulletin C-1**

### **Working with VERSATEX**

The uses of VERSATEX are only limited by your imagination. VERSATEX can be easily and quickly worked with the same standard tools used to process wood and metal. All tools should be sharp. In general, use a high cutting speed, a slow, continuous feed rate and good dust extraction. The following guidelines were designed to help you understand how to cut, drill, rout and mill VERSATEX.

#### **Cutting**

VERSATEX can be cut utilizing circular saws, reciprocating/saber saws, band saws, table saws, multiple blade gang rip saws, or any other saw commonly used to process wood. Best results are achieved when using blades that are designed for cutting wood or plastic. Care should be taken to not allow excessive frictional heat build up while cutting. Finer tooth band or hacksaw blades generally do not work well, because the tooth spacing will create excessive heat causing the PVC to fuse together along the cut line. When cutting VERSATEX the same safety guidelines used for cutting wood should be followed. The material should be cut at the proper feed rate, well supported, and the tooling should be sharp. Rough cut edges can result from excessive friction causing heat build up while cutting, poor support of product during cutting or worn tooling or blades. Power shears and guillotine cutters are not an acceptable method of cutting, as they tend to crush the edges.

#### **Saw Blades**

**Circular Saws:** Carbide tipped blades are recommended (32 -tooth blade optimal). Standard carbon steel blades will work, but must be kept sharp. Rough cuts can result from dulled blades. Best results will be achieved with a triple chip ground blade. Cutting speed 8,000 to 12,000 RPM, feed rate 90 to 120 FPM, rake angle 0 degree to 15 degree, clearance angle 10 degree to 20 degree, tooth pitch .080" to .400". **Band Saws:** Blades that are normally recommended for wood or plastic should work. High speed steel, hook type, cutting speed 3,000 to 5,000 RPM, 4 to 8 teeth per inch, feed rate up to 40 FPM. **Reciprocating/Saber Saws:** Rough cut blades for wood or plastic are recommended. Finer tooth blades are generally unacceptable, as they allow excessive frictional heat build up causing the material to fuse together when cut.

#### **Drilling**

VERSATEX can be drilled using most twist type drill bits recommended for metal drilling. Cutting speed of 150 to 1,300 rpm, point angle 90 degree to 110 degree, spiral angle 30 degree, relief angle 10 degree. Feed rate should not exceed .01 to .020 in/rev. In deeper holes, bit may need to be removed to facilitate waste discharge and to reduce heat build-up. Care should be taken to avoid excess frictional heat build up in the fabricated piece. Best results will be achieved if bit is kept sharp at all times. Drill bits for rigid PVC are not recommended.

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#### **Milling (CNC)**

VERSATEX can be milled utilizing most standard milling machinery. Speeds of 15,000 - 20,000 RPM's or greater are recommended. The higher the RPM the smoother the finished surface of the milled core. Maintain feed rates between 20 and 30 FPM, rate is dependent upon the thickness of the profile, the contours in the profile and the tooling wear. Too fast a feed rate can lead to surface chatter. Use a single-edge up-cut spiral bit made from plastic. Use the biggest cutter your CNC can carry. The mass of a larger cutter will help dissipate frictional heat build-up, preventing "weld-back". Consider an O-flute cutter design. The idea is to create a true chip rather than dust off the cutter. Use a bit that pulls the shavings out rather than down. This removes the shavings from the cut, reducing heat buildup at the point of the cut, which reduces or eliminates tearout in the core. Carbide steel should be used instead of high speed tool steel for all CNC cutters. The Vortex Tool Company recommends a 5600 series cutter with a single edge up cut spiral. Good results will be achieved at a chip load of 0.016" to 0.018".

#### **Moulding**

VERSATEX can be moulded using most standard moulding machinery. Speeds of 6,000 RPMS or greater are recommended. The higher the RPM, the smoother the surface of the core. Feed rates vary between 25 and 55 FPM depending upon the thickness of the profile, the contours of the profile and the tooling wear. Too fast a feed rate will lead to surface chatter. Acceptable rake angles vary with equipment. We have found a rake angle of 25 degrees to work the best on VERSATEX. Using a steep rake angle on the inserts is much like using a dull blade since the sharpest part of the tool is not in contact with the PVC piece being milled. If the angle is too steep you are basically cutting with a dull knife, which can lead to excessive heat build up at the point where the piece is being milled and eventual tearing and ripping of the cellular core. It is important the board be held in place during milling to prevent board vibration which can lead to chatter marks. Use either a high speed tool steel or carbide tooling to prolong tool life. Any woodworking equipment must have an optimum dust extraction and collection system. PVC dust or chip build up around the tooling will generate heat, which could lead to softening of the PVC core.

#### **Routing**

VERSATEX can be routed with virtually any piece of equipment that is used to fabricate wood. The consistent density and cell structure allows VERSATEX to shape better and hold tighter tolerances than most woods. Multi-flute carbide-tipped bits are recommended. Machinery that allows for multiple cutting speeds will allow you to optimize the process and obtain a smoother finished part. Sharp inside corners, that could possibly lead to stress cracking, should be avoided. One example of a sharp inside corner would be a dovetail joint. To help prevent stress cracking, tooling that creates a small radius, rather than a sharp angle is preferred. **Spray router with Static Guard to keep dust off you and your equipment.**

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#### **Edge Finishing**

VERSATEX can be finished by machine edging, sanding, grinding, or filing. Care must be taken not to allow excess frictional heat to build up during any machining. If desired, a smoother edge can be obtained by sanding with a fine grit paper (320) or by painting. You can also semi-seal the exposed edges by wiping them with a solvent such as toluene or acetone. These edges can also be painted.

#### **Important Points**

VERSATEX has been developed to have a density similar to wood, and will show the effects of being compressed. When using hold down to secure the material, care should be taken to distribute the force evenly over a large area to eliminate the chance of marking. Tooling sharpness and operating speeds will determine the quality of finished surfaces of machined work. In most cases, sanding should not be required to achieve a smooth finish. When machining VERSATEX you may want to examine the edges to determine what machine setups give you the best finished edges.