Cutting Routing and Milling PVC

Safety First – No job, little or large, is worth getting injured

Disclaimer: The information below has been compiled through internal and external testing and trials, for general setups, feed rates, RPM, tooling, and other generalities for milling cellular PVC. The intent is to provide basic data and starting points for milling operations. We take no responsibility for any harm or damage that may occur when milling PVC. Always follow machine & tooling manufacture instructions and safety protocol. *

Can you use standard woodworking material to cut PVC?

Yes – Typical wood working machinery, blades, bits, and cutter heads are perfect for fabricating PVC. All blades, cutter heads and bits must be sharp and undamaged for best results. Machinery must be in good working condition.

- Using a robust dust collection system will result in better milling and a cleaner workspace
- It is critical that products are held down to the machine fence or secured during the cutting or milling process. The use of feather boards, vacuum, or powered hold down wheels can ensure proper handling during fabrication.

Cutting with a miter saw:

For finished end cuts and miter joints - use a 10" or 12", 60-80 tooth Miter saw with Carbide tipped blade. 12" Blade recommendation – CMT 96 tooth fine finish.

For ripping – Use a 40 – 80 tooth carbide tips on a 10" blade

Rake angle – 0-5°. Clearance angle – 10-20°.

Cutting with a Jig Saw (*for cutting decorative shapes or notches around obstacles and protrusions (i.e. columns, posts)*

Use minimum 10 TPI (teeth per inch) blade with board positioned face down.

Cutting with a Circular Saw/Table Saw

Minimum blade requirements – Carbide tooth required. 24 teeth on a 7-¼" blade and 60 teeth on a 10" blade. *Recommended blades* - (7-1/4") 60 Tooth Skill Saw Carbide finishing (10") CMT 80 tooth fine finish.

Can PVC be routed in the same manner as wood products?

Yes – PVC can be routed using standard woodworking routing equipment and/or with a CNC router. For best results use multiple flute carbide-tipped bits. Additional best practices/recommendations for routing PVC below:

Minimum required PVC Moulder spindle speed: 6,000 RPM. 8,000 RPM's recommended.

Recommended Feed rate: typically, 60 FPM. Tool wear and geometry will play a role in determining proper feed speeds – can run from 45 to 80 FPM depending on part, thickness, and amount of material being removed.

Hold downs: Proper hold downs will reduce excessive vibration. Excessive vibration will present as chatter on the finished part.

- Steel knurled rollers should be replaced with rubber feed rollers to mitigate damage to the product. Follow equipment manufacturers instructions.

Tooling: Carbide recommended, with minimum requirement of high-speed steel. We have had success with Diamond coated tooling for increased longevity.

- Tool rake angle recommendation:
    - 25° for smoothest surface, 10-15° for rougher surface

- **Additional notes on critical aspects of milling PVC**
    - Use sharp, balanced and well-maintained cutter knives and cutter heads.
    - Use cutter heads with a minimum of 6,000 RPM to 8,000 RPM. In most cases, the greater the RPMs the finer the milled surface will be.
    - Typical feed rates are between 45 and 80FPM. For intricate designs you may need to slow down the feed rate. Trialing will help you determine the optimum feed rate – start on the lower end and then speed up until you reach the best feed rate. Another way to perfect the moulding process is to watch your amps on the motors. If you are drawing excessive amps you will need to slow the feed rate.
        - The thinner the product the higher the feed rate. The thicker the product the slower the feed rate.
        - The more substrate that is being milled off, the slower the feed rate.
        - Tool wear will also negatively affect the feed rates.
    - *Alignment*: The inbound feed and out bound exit tables must be in alignment with the moulder tables and fences. Moulder tables and fences need to be level and plumb. The knives must be perfectly aligned on the cutter heads
    - *Dust collection:* A robust dust collection system will keep debris off the product as it travels through the moulder. It is not uncommon to have saw dust embed on the feed rollers. This can dent the product as it is moving through the moulder. Properly positioned air knives can help keep the milling surface and machinery clean from debris. The better the dust collection system the better the process.

For CNC router milling:

Spindle Speed: 12,000 to 19,000 RPMs – product thickness and amount being milled off will dictate rates.

Feed rates: 250 IPM to 450 IPM – product thickness and desired finish quality will determine proper speeds.

Tooling: 1 flute – helical required, 1 flute high helical recommended (LMT-Onsrud65-025 Super O)

Dust extraction: Dust extraction is critical for tool life and cut quality. Dust build-up will cause overheating of the tool and premature wear. Excessive chips and debris will interfere with part alignment and will imbed in the rolls causing imperfections on the face of the product.