

## Edge Finishing

This step generally takes place either once the face of the panel has been finished, or concurrently with the face in a three-dimensional wet coating or lamination process.

### Preparation

Weyerhaeuser Super-Refined MDF<sup>2®</sup> requires less edge preparation than do many other MDF products because of its dense, homogeneous core. Some customers have reported successfully skipping this step altogether. Nevertheless, MDF edges are by nature somewhat more porous than the surface, and some additional preparation may be required to achieve a balanced appearance between the face and core.

The amount of preparation required for a desired finished appearance may vary by board thickness and density profile. For exceptional results once the edge has been profiled, sand it with a 120 grit (or finer) abrasive. This may then be followed with a coating compatible sealer or filler, and then lightly sanded with a 220 or 320 grit abrasive.

### Filling

It is important to consult your coatings vendor to insure that fillers, base, color and top-coats are formulated for compatibility. Burnishing wet conventional filler into the edge will reduce the need for sanding. This is best accomplished on automated finishing lines (downstream of the fill spray) where the contoured burnishing wheel rotates counter to the movement of the substrate. With hand-sprayed applications, a burnishing wheel mounted on a hand-held power tool also works well.

### Sanding

In automated finishing lines, sanding of shaped edges is best achieved with abrasive tapes backed by contoured pressure rolls. Abrasive-impregnated profile wheels also work well in both automated and manual situations. Flapper sanders – made with short strips of wheel-mounted stiff-backed abrasive – are acceptable for simple radius contours. Careful sanding with a block or power tool can also yield good results.

### Finishing

Two of the more popular edge treatments are wet-coat finishing (either solid or patterned) and heat-transferred foils. Additional methods include veneers, tapes, films, treated papers, and low- pressure laminates. These alternatives are differentiated by cost, ease of application, appearance, durability and dimensional flexibility. Consult your coatings vendor for help in selecting the right product for your needs. In the meantime, the various edge treatment materials are referenced in the glossary.

## Edge Fastening

Many different fastening systems are currently used for assembling MDF components into finished products. The excellent machinability and uniform density of Weyerhaeuser Super-Refined MDF<sup>2®</sup> allows for the use of many conventional wood joinery techniques as well as a variety of mechanical fasteners:

### Dowels

Common in quality furniture construction, dowels are easy to use with only drilling and gluing required producing strong, efficient joinery. Dowels are self-aligning and allow for quick assembly without the use of jigs. When properly used, they often provide sufficient initial strength to permit careful handling without clamps.

### Selection

For maximum effectiveness, use dowels made from species with high shear strength such as Yellow Birch, Beech or Sugar Maple. Spiral grooved or multi-grooved dowels are preferred over smooth-surfaced ones since they allow for trapped air to escape from the holes. Dowel moisture content at the time of use should average 7%.

### Holding Strength

This is proportional to dowel diameter and depth of penetration. The force required to pull a dowel out of the face of an MDF panel is closely related to the internal bond strength of the panel itself. Edge strength is related to internal bond only in the tendency of the panel to split along the edge if the hole and dowel diameters are improperly matched. Whenever possible, glue should be applied to both the dowel and the hole.

### Dowel Hole Fit

Holes in the face of the board should be drilled to the same diameter, or slightly less, than that of the dowel. Holes in the edge should be .005 inches oversize to prevent splitting. Depth should be 1/16" to 1/32" more than the dowel length.

### Dowel Diameter

Strength increases with dowel diameter, but caution must be exercised to avoid dowels larger than 50% of the panel's thickness.

### Staples

The primary purpose of a staple is to hold the joint tight and square until the glue has set. Use of staples without glue is not recommended for high-strength joinery, as staples tend to loosen over time.

In general, proper air pressure on the gun is important to control penetration and holding power. Tools should be adjusted to drive the staple just flush with the surface. Excessive pressure produces objectionable tool marks or splitting.

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## Stapling Into Edges

A common problem is splitting the panel in a plane parallel to the face. To avoid this, wire diameters no larger than 14 gauge are recommended. Legs should be aligned at an angle to the face (about 15 degrees) and not inserted along the same horizontal plane. Staples should not be placed within 3/4" of the panel corner.

## Stapling Into Faces

Wire diameters greater than 14 gauge are recommended. Staples should not be driven closer than 1/2" from an edge, or 1" from a corner.

## Screws

Among mechanical fasteners, screws provide the most effective way to fasten parts and panels together to form permanent or demountable joints.

## Types

Do not use wood screws. Because of relatively high driving forces, heat-treated parallel-thread screws that have been designed specifically for composite panels are recommended. Drywall or sheet metal screws of similar design can also be used with good results.

## Pilot Holes

Especially critical for edge applications, the pilot hole should be at least 90% of the root diameter and equal to the length of the screw. Smaller pilot holes may result in splitting and loss of holding power. A slight countersink may also be necessary to prevent "pyramiding" under flush-mounted hardware. Screws should not be over-driven to avoid "stripping".

## Position

Screws should not be located too closely to the corners of panels. In general, screws driven through the face of a panel should be at least one inch from the corners. Those driven into the edge should be at least three inches from the corners.

## Holding Strength

The force required to pull screws out increases more rapidly with the depth than with the diameter of the screw shank. For example, increasing the depth of insertion in the face of a panel from .75" to 1" will increase holding strength by about 30%.

## Glues

Many different adhesives are being used in MDF component assembly including epoxy, urea- formaldehyde (UF), "hot melt", polyvinyl acetate (PVA) and modified PVA's. Except in vinyl- overlays, epoxy resins have found limited use with MDF, mainly because of the relatively high cost. Among "hot melts," the polyamides work well, but should be selected carefully for board and laminate compatibility. Studies of PVA butt joints have shown that the cured glueline can be stronger than the board itself.

Continuing research by adhesive manufacturers is producing new and improved glues. The urethane-modified PVA glues are especially good with MDF, and so are the casein-latex types. Isocyanate-based adhesive manufacturers are also developing cold-set formulas for component assembly.

Whatever adhesive is used, board moisture content should be between 5% and 8% for most durable bonding.

## Finishing

Super-Refined MDF<sup>2®</sup> has four distinct characteristics which provide for significant finishing advantages over other MDF products:

- A homogeneous construction, which allows for uniform paint and adhesive absorption across the panel face and core.
- A light and consistent color, which is easily covered with relatively thin coatings/laminates.
- Western softwood furnish, which is less prone to swelling (fiber raise) than are other species when exposed to moisture in wet coating applications. This is a critical advantage, especially if secondary-finishing steps such as sanding and filling may be reduced or eliminated altogether.
- An ultra-smooth machined surface relatively free of pits, holes and other irregularities that would otherwise create a rough finished appearance.

### Laminates

As their costs go up, laminates have become thinner, which makes substrate quality very important. Numerous laminating materials are available for industrial finishing of both the face and core of MDF. These include treated papers, foil, vinyl, and veneer – to name a few. While many of these are referred to in our glossary, application techniques vary by laminate type and are best represented by manufacturers of laminating materials and equipment. For more general information, you may wish to visit the Decorative Surfaces page of the Composite Panel Association's website.

### Wet Coatings

Here are some basic steps, which will help optimize this finishing process:

#### Preparation

Weyerhaeuser Super-Refined MDF<sup>2®</sup> is sanded to a fine 150 grit finish (180 grit for panel thicknesses < 0.354'), and for many applications requires no further preparation. For an even smoother surface finish, lightly touch-sand with 180 grit silicon carbide belts and inspect. If a slight nap is noticeable, reverse the panel and feed it back through the sander.

Filler can be used, if necessary, to help insure the smoothest finished results while reducing the amount of base-coat required. Fillers used on flat finishing lines for MDF are usually high-solids, high-viscosity and fast-drying by conventional methods. Unlike some other MDF products, the smooth, hard surface of Weyerhaeuser Super-Refined MDF<sup>2®</sup> can often be directly base-coated without preparation.

#### Base-coating

This is the foundation for a grain-printed design or the first coat of a solid color. Apply a high- solids base-coat either by flow coater or airless spray. Inspect the surface for smoothness, and if necessary, touch-sand with 320 grit. Try the finish coat at this point. If this does not provide desired results, apply a subsequent low-solids base-coat.

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## Finish Formulation

It is very important to consult your coatings vendor to insure that fillers, base-coats and top-coats are chemically compatible in order to produce the desired appearance and performance. It's often safest to purchase all these materials from the same coatings supplier. Some of the more common wet coating formulations include lacquer or vinyl-based, UV-cured polyester, water emulsion and urea-alkyd.

There are environmental concerns with some wet finishing processes. One issue relates to the emission of volatile organic components (VOC) during application and curing. For this reason, low VOC water-based coatings have largely replaced solvent-based formulations. A second issue is the disposal of waste solids. VOC and solid disposal standards vary by state. Contact your local regulatory agency for further information.

## Application and Curing

Primary methods of applying wet finishes include the airless sprayer, direct printer, and flow, vacuum and curtain coaters. These are differentiated by cost, transfer efficiency, complexity and emission properties. The airless sprayer, for example, is a relatively low cost piece of equipment and is easy to operate. On the other hand, it is relatively inefficient in transferring coating material to the surface.

Common methods of curing wet coating material include air drying, "gas oven," ultra-violet light and electron beam. These vary primarily by cost, complexity, energy consumption, speed and performance properties for the cured surface. A gas oven, for instance, provides high throughput, a hard finished surface and simple operation. Disadvantages are the relative expense to operate, and the possible need to sand between coats.

Whichever process is chosen, it is critical to keep the entire coating line free of contaminants such as dust, wood particles, lubricants, or hydraulic fluid.

## Powder Coating

This is a three-dimensional finishing process in which dry coating particulate is electrostatically attached to the panel's surface and then cured in an oven. Under these conditions, the coating material is fused to the panel surface in a smooth, uniform fashion. Advantages of this process include control of volatile emission and waste disposal issues associated with some wet-coating techniques. Caution must be exercised to insure compatibility of the panel's physical properties with the powder coating process.

## Machining

Weyerhaeuser Super-Refined MDF<sup>2®</sup> is made from high quality western softwoods known for their low abrasive content. With tooling designed specifically for MDF, this helps provide for:

- Clean, sharp reproduction of designs resistant to fuzzing or chip-out
- Extended tool life
- Faster throughput speeds

In addition to the type of MDF selected, there are other factors that may affect the quality of a machined surface, such as:

- Heat build-up
- Tool geometry
- Tool maintenance
- Support of the material being cut
- Material feed rate; and so-forth

It's best to seek advice from knowledgeable tool manufacturers when selecting the design that's best for your application.

Four types of cutting surfaces are generally used when machining MDF:

### High Speed Steel

The advantage is low tool cost. However, the relatively rapid rate of tool edge wear lends itself better to small projects, than to large production runs where multiple replications of a crisp, sharp profile are required.

### Tungsten Carbide Steel

While the cost is higher, run times are longer between re-sharpening. Be sure to select the most wear-resistant grade of carbide that will perform at high speeds without the tool edge chipping or flaking away.

### Diamond

Several times more wear-resistant than carbide, diamond tooling is often used for long runs of mass-produced parts with intricate designs. They require less frequent sharpening, allow for faster speeds, maintain original contour shapes and generally provide a finer, smoother finish than carbide tools. However, diamond surfaces are more costly than carbide, and are more brittle as well.

### Ceramic

Developments in ceramic technology permit the shaping of router bits from solid blocks of this composite. It's claimed that ceramic tools offer longer life than carbide, and may be sharpened using conventional grinding equipment.

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## GENERAL CONSIDERATIONS

For smooth saw cuts with little chip-out and good blade life:

- Alternate top bevel teeth set at 15 degrees
- Positive hook of 10 degrees
- Side clearance of 5 degrees
- Outside diameter clearance of 10 degrees
- Low approach angle with the blade projecting 1/2" or less through the top of the material

For smoother cuts and less chip-out, but decreased saw life and/or higher initial costs, use a 15 degree top bevel blade and:

- Alternate face bevel of 10 degrees
- Increased positive hook of 15 degrees
- Increased side clearance of 7 degrees
- Increased number of teeth per inch (80)

For smoother cuts with less chip-out without increasing maintenance costs, but with decreased productivity:

- Increased RPM
- Decreased feed speed
- Greater tooth approach with the blade barely projecting through the surface of the work

For longer saw life, but rougher cuts and more chip-out:

- Flat-top teeth (longest life) or triple chip teeth
- Negative hook or reduced positive hook
- Low outside diameter clearance
- Decreased tooth approach angle with the blade raised to its highest position

In all instances, the following are important:

- Elimination of vibration due to inadequate hold-downs, loose nuts, worn bearings or sleeves, and worn throat plates
- Clean collars
- Smooth steady "run-out" (no wobble)
- Sharp, properly ground teeth

## Molding

Weyerhaeuser Super-Refined MDF<sup>2®</sup> is well suited for many interior paint grade molding and millwork applications. It is easily coated and resists denting and scrapes, which may easily damage pine or other solid wood moldings. Be sure to avoid storing or installing Weyerhaeuser Super-Refined MDF<sup>2®</sup> moldings in areas where unpainted or unsealed surfaces come into contact with moisture.

### Cutting

Carbide-tipped tools are recommended for the best results. Refer to the section on Machining for further information on how saw blade design relates to cut quality and speed.

### Acclimation

Like all wood products, Weyerhaeuser Super-Refined MDF<sup>2®</sup> will expand or contract somewhat with changes of atmospheric relative humidity. For best results, it is recommended that moldings be laid-out indoors at the application site for two or three days before installation, so that they may reach equilibrium prior to fastening.

### Fastening

Pneumatic fastening systems work well. Air pressure should be kept at the setting at which the heads of fasteners are driven level with the surface of the molding – generally 90 to 110 psi. Gently butt sections of molding together prior to fastening – do not force them in place.

### Staples

Staples should be a crowned, coated type with a blunted point. Finer gauged staples are preferable to heavy ones.

### Nails

MDF<sup>2®</sup> moldings are generally nailed with a pneumatic system. Narrow “needle” nails with small heads work best. Nail at least 1/4” in from edges and 1” in from ends. When nailing manually, ring shank nails will provide extra holding strength while controlling “puckering” or fiber raise around the nail head.

### Screws

Use pilot holes sized to 90% of the diameter of the screw shank. Wood screws are not recommended. Straight-shanked screws with a small root diameter and widely spaced threads are recommended. Most drywall screws work well.

### Finishing

Most commercially manufactured moldings made from Weyerhaeuser Super-Refined MDF<sup>2®</sup> are pre-primed. In this case, many grades of paint work well for finish coating. Light touch sanding prior to a second coat may enhance the finished appearance. For raw moldings, refer to the “Application, Use and Care Instructions” section on Finishing.



## Proper Care Prior To Use

Weyerhaeuser takes as much care in the packaging and shipping of its Super-Refined MDF<sup>2®</sup> as it does in manufacturing it. A typical unit of 3/4" 4' x 8' is about 27" high, and weighs roughly 3500 pounds. At the customer's request, the unit may be covered with a protective cardboard shroud. Each unit is banded with plastic straps wrapped around bottom bolsters for easy forklift manipulation.

To help ensure that Weyerhaeuser Super-Refined MDF<sup>2®</sup> performs as expected, follow proper handling and storage procedures from the time the shipment arrives, through every phase of the fabrication process, until the finished product is packaged. Physical damage to the panel edges and faces and exposure to water, dust, dirt, oil and so-forth can be prevented by following some simple practices:

### Handling

Bolsters permit forklift movement of units for transfer to storage and fabrication areas. Drivers must use caution to avoid abrading surfaces, raking or jabbing sides of units with forks, and otherwise damaging corners, edges or ends of units.

Automated equipment such as conveyors, power-driven feed rolls, machining equipment, scissor lifts, transfers and so-forth must be kept free of metallic burrs, dirt and liquid contaminants – such as oil and hydraulic fluid – that could damage or contaminate panel surfaces. Transfer rolls used to move units of board should always have eased or rounded edges. Panels moved manually with hand trucks should be stacked and aligned carefully for safe and stable transport.

### Storage

Weyerhaeuser Super-Refined MDF<sup>2®</sup> should never be stored outdoors. The indoor storage area should be kept clean, dry, well-ventilated and isolated from operations that create dust, dirt or airborne contaminants.

Proper bolstering is essential to prevent warping and panel breakage. Bolsters and top protectors within a unit must be of the same thickness and should span the complete width of the unit. When bundles are stacked on top of one another, the bolsters should be vertically aligned between bundles. Missing or unaligned bolsters should be replaced or repositioned. Spacer strips used between units or individual panels should be kept clean and dry to avoid wetting and possible contamination of the adjacent panels.

### Moisture Content and Dimensional Stability

Like all wood-based products, Weyerhaeuser Super-Refined MDF<sup>2®</sup> is susceptible to change in dimension, surface smoothness and flatness as it gains or loses moisture.

Temperature and relative humidity conditions largely determine the equilibrium moisture content of the panel, which will either be picking up or losing moisture until it reaches a stable state. Depending on ambient temperature and humidity, it may take up to 7 days for unitized panels to acclimate – and even longer under adverse conditions.

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Ideally, Weyerhaeuser Super-Refined MDF<sup>2®</sup> should be stored or conditioned in a temperature range of 60 to 80 degrees Fahrenheit. Extreme changes in temperature and humidity should be avoided.

The rate of air movement has a strong influence on the rate of change in board moisture content, so be sure to store material away from windy, exposed areas. If bundles get wet, either from a direct source or from moisture condensation on the surface, the fiber will swell and rise, rendering the surface unsuitable for some applications.

### **Inventory Control**

It is a good practice to use material on a first-in / first-out basis to minimize the potential for contamination, changes in dimensional stability and physical damage that could result from prolonged storage.

## Using Super-Refined MDF<sup>2®</sup> Shelving

Weyerhaeuser Super-Refined MDF<sup>2®</sup> makes an excellent choice for either decorative or more basic shelving applications. Its smooth surface and edge resist splitting, chipping and warping, which may be issues with other shelving materials. It is easily painted, clear coated or surfaced with self-adhesive shelf paper.

### Installation

Attach metal standards or supporting cleats to wall studs with screws, or to sheet rock with “molly” or toggle bolts. For 3/4” shelving, space standards no more than 24” apart to minimize deflection or sagging when the shelf is under loads up to 40 lbs. For more detailed span / load information consult the Composite Panel Association Technical Bulletin on shelving.

### Finishing

For best results when finishing raw shelving, first remove any dust from the surface using a clean dry cloth, then use a solvent-based primer or enamel undercoat prior to top coating. A polyurethane varnish will provide a protective coating to prevent moisture spotting of unpainted shelving.