



# Composite Panels from Start to Finish

## AN INSIDE LOOK AT COMPOSITE PANELS

# TECHSPEC

Composite panels are typically characterized as particleboard, medium density fiberboard (MDF) and hardboard. While similar from a raw material standpoint, the differences are important to know in determining which is best suited for a particular application.

### MANUFACTURING PROCESSES

Composite panels are most-often produced from recycled fiber, also known as raw material or furnish, which is either wood-based or a by-product from other agricultural crops like wheat or rice.

“Recycled” is a general term, and sources can range from discarded pallets and construction waste (post-consumer recycled), to sawdust and shavings from lumber or plywood operations (pre-consumer recycled), to the straw left in the field after harvest (recovered). These raw materials are mixed and screened before being processed in the manufacturing facility.

Composite panels are bonded to impart strength and/or other specific properties, depending on the application. They use common technologies to form them into mats on continuous lines (some over 100 feet long), and large hot presses (some capable of over 600 pounds per square inch) to compress the mats. Modification of these techniques enables composite panel manufacturers to engineer special properties into the panel such as moisture or fire resistance, or increased dimensional stability.

### PARTICLEBOARD

Particleboard requires the least amount of fiber preparation. Once the raw material is mixed and screened, the pieces are mechanically broken down into smaller particles. Adhesive and wax are applied to these particles, which are then deposited onto a continuously moving belt or plate in a series of layers. Finer material is deposited at the initial phase and also at the last phase (which become the top and bottom surfaces);

and the coarser material is deposited in between, which forms the internal core of the board.

When the last layer of particles is deposited, the mat moves to the press where heat and pressure compress the mat and the adhesive cures within a few minutes. After the press cycle is complete, the new “boards” are sanded and cut to individual customers’ size requirements. Most particleboard is 3/8-inch to 2 inches thick, but some plants can produce thinner or thicker panels.

### MDF

MDF requires a different and more intensive method of fiber preparation, to significantly reduce the fiber from particles to individual fiber bundles similar to those used in paper making. Yet while the paper pulping process uses chemical and mechanical methods to break down the wood, the MDF process is entirely mechanical.

The wood is heated in a large steam vessel (digester) which softens the waxy substance (lignin) holding the wood cells together. This hot, softened wood mix is then passed to a refiner that grinds or pulls the wood fibers apart. After drying, the result is a fluffy combination of interwoven wood fiber having a goose down-like density. Like particleboard, a small amount of adhesive binder and other additives are sprayed onto the fiber, which is laid down in layers on a continuously moving belt. Unlike particleboard, the uniformity of the fiber size creates a more homogeneous mat.

After all the layers are deposited, the mat is pressed and moved on to sanding and trimming. The nature of MDF production allows a larger thickness range — from as thin as 1/10 inch to more than three inches.

### HARDBOARD

The hardboard process is similar to MDF, but in some cases the refined fiber is not dried. During “wet process” production, surplus water is removed from the mat during the hot press cycle. This process creates

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the screen impression on one side. Another difference is the type of adhesive used. Exterior adhesive is generally used, particularly for wet process plants. This adhesive is what gives hardboard its trademark chocolate brown color.

Hardboard presses are typically smaller than particleboard and MDF presses, as most applications for this product do not require large panels or thicknesses more than 5/8 inch.

#### **PANEL VERSATILITY**

The decision to specify a particular panel type is largely dependent on cost and performance in specialized uses. The cost of producing particleboard is lower than MDF due to the reduced energy requirements and faster production rates, so it's often considered the most economical option. Popular applications for particleboard include floor underlayment and stair treads, kitchen countertops and shelving.

MDF and particleboard are often used interchangeably, especially when cost is less of an issue. This is seen in casework applications for both products, representing the largest area of use, including cabinetry, furniture and store fixtures.

MDF is usually preferred for painted applications and when detailed edge finishing or other ornamental profiles are required. The homogeneous nature of MDF's fiber consolidation, even on edges, permits it to be machined much like a piece of hardwood lumber. Its smooth, uniform surface is ideal for a variety of surface treatments, from direct printing to ultra-thin laminates.

Hardboard is a more specialized product. Its highly durable resin system makes it strong and stable, key characteristics for the siding and trim on homes. Interior applications include furniture and cabinet backers. The ubiquitous perforated version of hardboard can be found in any hardware store.

Collectively, particleboard, MDF and hardboard offer an array of high-quality, versatile and environmentally-conscious substrates for today's home and office.

#### **FOR MORE INFORMATION**

The Composite Panel Association offers a wide array of educational materials on particleboard, MDF and hardboard. For a complete listing of these materials, visit [www.pbmdf.com](http://www.pbmdf.com) or call 1-866-4COMPOSITES for a free copy of CPA's Resource Directory. **2W**



*Particleboard is consistent, strong and stable, and is the standard for cabinet casework and countertops. You will often find it laminated with decorative foils, vinyls, or with thermally fused melamine (TFM).*

*MDF is often the preferred material for today's cabinet doors. It is easily machined for three-dimensional effects, and is an excellent substrate for powder coating, painting or laminating.*

*Hardboard panels have been used as drawer bottoms and cabinet backs for decades. As a thin substrate, typically 1/4", hardboard is strong and smooth, and is often laminated or coated.*

#### **DID YOU KNOW?**

Some consumers don't consider composite wood to be "real wood" because it doesn't have a visible grain. Composite or engineered woods simply appear in a different form – usually chips or refined fibers that are heated and pressed.

Particleboard and medium-density fiberboard (MDF) are actually about 92 percent "real wood;" and hardboard has nearly 100 percent wood content. Additional resins and special manufacturing processes add dimensional stability and other advantages that are simply not present in untreated wood.