

Thermally Fused Melamine

Where ecology, economy, aesthetics and performance meet

This CEU provides an introduction to thermally fused melamine (TFM), a decorative surfacing material that is sometimes called melamine or low pressure laminate.

In addition to addressing the definition of TFM and how it is made, this unit will explore the history of the surface treatment as well as design and end-use considerations.



TFM is a decorative surface and a building material that requires no additional substrate, adhesive or laminating equipment prior to processing into a finished product. The panel's durability, design versatility and ease of use make it a common specification across many market segments, including case goods, furniture, store fixtures, home organization, flooring and institutional applications. It is often used in conjunction with other materials to value engineer projects by reducing costs while maintaining design integrity.





TFM is made from three primary ingredients: décor paper, melamine based resin system and a substrate, typically medium density fiberboard (MDF) or particleboard. An additional overlay may also be used for performance or aesthetic characteristics. The décor paper is impregnated with a melamine resin then laminated directly to the substrate without the need for additional adhesive. When pressed under heat and pressure the melamine resin creates a cross-linked thermoset bond between the décor paper and the substrate resulting in a homogenous decorative panel.

HISTORY/TECHNICAL DEFINITION

The TFM story is about refining the use of wood for machinability, conservation, economic and aesthetic precision. Wood has always played an important role as a building material in solid and plank form, however in its natural form, wood varies dramatically in terms of species, availability, performance and aesthetics. Craftsmen have compensated for these variations in many cases by hand-cutting veneers from rare species and using them as a decorative layer on top of more stable or readily available species. This practice uses resources efficiently and reduces materials costs. Yet it still leaves wood susceptible to scratching and warping, especially in moist environments.



The capacity for improving the performance of wood products while conserving resources grew exponentially in the 20th century due in large part to the development of two seemingly unrelated technologies. The first is synthetic plastics, which advanced around the turn of the century. The resulting artificial resins were defined as thermoplastic (which turn to liquid when heated, then solidify when sufficiently cooled) and thermosets (which irreversibly cure under heat and pressure to make a material that is resistant to heat, water, chemicals and electrical current). The second is high speed printing technology, which also advanced in the early part of the century, making it possible to print large rolls of décor paper with high-fidelity photorealistic designs such as wood grains. Generally a décor paper is printed with water-based pigments. The use of décor papers allows designers to achieve any visual effect, such as rare stone or endangered wood species without negatively impacting the environment.

These two technologies became increasingly important when resources became more



scarce during World War II. Innovative manufacturers began combining resins with wood waste (sawdust, wood chips and refined cellulose) and pressing the mix to make composite panels. The resulting panel substrates (including hardboard, MDF and particleboard) were not only structurally sound and predictable in their performance, but also valuable for their ecological contribution to making optimal use of wood residuals.

FACING PAGE: TFM IS A DECORATIVE PANEL THAT REQUIRES NO FURTHER LAMINATING BEFORE PROCESSING.

THIS PAGE: BECAUSE OF THEIR BEAUTY, DURABILITY AND EASE OF USE, TFM DECORATIVE PANELS ARE USED IN A WIDE VARIETY OF APPLICATIONS.





The classic laminating process, developed in the first third of the 20th century, uses heat and pressure to press a layer of décor paper onto a stack of layered kraft paper (similar to brown bag paper). The kraft paper layers are saturated with an inexpensive, dark phenolic resin, while the decorative layer is saturated with melamine resin, which produces a clear surface. The resulting high pressure laminate (HPL) material is then glued to the substrate using a contact adhesive and pressing equipment.

By the middle of the last century a whole new generation of high-performance wood-based products, created from rapidly renewable wood species, readily available materials and pre-consumer recycled waste was born. Some years later manufacturers in Europe realized that by eliminating the kraft paper layers, melamine impregnated décor paper could be pressed directly to the substrate. The resulting TFM material is a homogenous, ready-to-use decorative panel that requires no further laminating prior processing. TFM offers excellent aesthetics, as well as scratch and wear resistance. Today, TFM is manufactured in state-of-the-art facilities throughout North America.

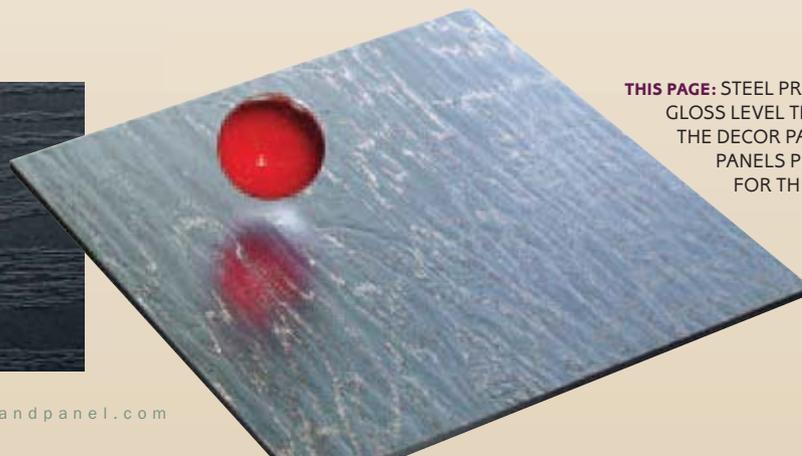
PRODUCT DESCRIPTION, SUSTAINABILITY AND ADHESION TO SUBSTRATE

In addition to visual appeal and performance criteria, contemporary specifiers must respond to client demands for sustainable and environmentally friendly products. So it is important to understand the basic science and technology behind the component parts of TFM: substrate, melamine resin and décor paper.

It is generally accepted that the use of reclaimed wood and paper is good, and that the adhesives used to produce composite panels should be as benign as possible.

North American composite panel manufacturers offer boards produced with different adhesive formulations to meet today's stringent requirements for indoor air quality such as the California Air Resources Board (CARB) formaldehyde emissions rule, the CPA Environmentally Preferable Product (EPP) specification and others. All Composite Panel Association member board manufacturers offer CARB Phase 2 formaldehyde emission compliant products, and many also produce ultra low-emitting formaldehyde (ULEF) and/

or no-added formaldehyde (NAF) products. The CARB emission ceilings are among the most stringent anywhere in the world for composite wood panels, and are complimented by a rigorous third party testing and certification program and extensive chain of custody requirements. Additionally, reclaimed wood sequesters carbon, making composite panels a more ecologically-sound use of fiber than if it's landfilled or burned as biomass.



THIS PAGE: STEEL PRESS PLATES ADD TEXTURE AND GLOSS LEVEL THAT ENHANCE THE FIDELITY OF THE DECOR PAPER DESIGN. TFM DECORATIVE PANELS PROVIDE HIGH-END AESTHETICS FOR THE MODERN KITCHEN AND BATH.



END USE APPLICATIONS AND DESIGN CONSIDERATIONS:

TFM is a cost-effective material that is highly resistant to warping, bowing, moisture, scratching, staining and abrasion due to wear. It is easily fabricated and as a result is widely used in the following applications:

- Flooring
- Case goods
- Store fixtures
- Organization systems and closets
- Kitchen and bath cabinets
- Wood paneling
- Office, residential and healthcare furniture
- Architectural accents

Enhanced performance characteristics, such as microbial resistance and super-durability can also be achieved by increased paper thickness and specialized saturation techniques. Overlays can be added during the pressing process to enhance surface performance or aesthetic appeal. The use of specialized steel

press plates can add dimensional characteristics (matte, gloss, ticking, texture) to the surface finish.

From its early aesthetic roots of white and solid colors, TFM has matured to offer a broad range of designs. Almost any design that can be printed can be made into TFM, and with modern rotogravure and digital printing technologies the possibilities are endless. Popular designs include contemporary wood grains, exotics and abstracts, though whimsical and custom designs are increasingly specified in retail, commercial and hospitality applications.

TFM is often used in conjunction with other decorative surfacing materials to engineer products that precisely meet design criteria. Décor matching programs across engineered materials allow designers to specify panels to the exact requirements of the application with a consistent visual. TFM panels typically require a decorative edge treatment and can be specified with or without edge, and with single or opposite-side face treatments.

LEED CREDITS & FSC CERTIFICATION

TFM is an excellent product to specify for residential, commercial and healthcare interior applications. Non-porous hard surfaces are easy to clean and do not harbor dirt or contaminants. No-added formaldehyde (NAF) substrates support improved indoor air quality. TFM can contribute to as many as six LEED credits depending on sourcing and substrate.

Also, increasingly the décor paper used in the production of TFM is available with FSC-chain of custody certification. To fuse the decorative layer and composite substrate the paper must first be impregnated with a melamine formaldehyde resin system. After saturation the paper is partially cured to a B-stage, at which point it must be stored within specific temperature and moisture parameters to prevent curing. B-stage papers have a finite shelf life. When the saturated paper is pressed to the substrate a complete cross-linked bond is created between the melamine and formaldehyde minimizing potential emissions. Once the décor paper is fused to the substrate it effectively seals the composite panel, reducing substrate emissions by nearly 98 percent.



THIS PAGE: ONCE CURED, TFM IS A HOMOGENOUS DECORATIVE PANEL WITH EXCELLENT SCRATCH, STAIN AND WEAR RESISTANCE. IT IS A POPULAR MATERIAL IN COMMERCIAL, HOSPITALITY AND FURNITURE APPLICATIONS.

Case Studies:

PREMIUM DESIGN

Technology drives design, and design depends on technology to satisfy the wants and needs of the consumer market. Many firms specializing in premium residential development and retail spaces use TFM decorative panels for kitchen cabinetry as well as built-in furniture and store fixtures. Modern architects design with modern materials, methods and means. TFM is a decorative panel that requires no further laminating before processing, making it a trouble free material for fabricators. Plus it has excellent aesthetics wear and scratch resistance. For any big development project anything that can reduce cost and production time is very beneficial. Beyond ease of use, TFM is recognized for its aesthetic value. TFM designs come from printed décor paper, allowing professionals to provide their clients with the increasingly popular look of exotic or rare minerals and wood species, but without exploiting precious resources or breaking the bank. The consistent visual of TFM designs means professionals can specify for a big job and not worry about panel matching. The other benefit there is of course value-engineering. TFM designs match other materials that have different performance characteristics, so pieces can be built with a uniform look inside and out.

THE FIFTH WALL

Advanced printing technology produces décor paper, the decorative layer of TFM decorative panels, with unprecedented realism. Improved



print fidelity combined with specialized surface treatments and overlay techniques results in a consumer product that designers can stand behind, or rather, on. Ninety-five percent of laminate flooring is made from TFM decorative panels. Laminate flooring is specified for applications where the design calls for a hard surface with the warmth of real wood, that won't scratch, dent or warp. Laminate flooring

is a common specification for both residential and commercial applications. TFM is used in healthcare applications because it is a hard surface that is easy to clean and does not harbor dirt or allergens. It also has excellent scratch, dent and wear-resistance, making it a popular choice for hotel and restaurant environments. Because laminate flooring has limitless design possibilities and low life-time cost of maintenance it is an efficient solution for a wide variety of projects. Professionals working toward sustainable objectives can earn up to six LEED credits by specifying TFM decorative panels. ■

RESOURCES

The Composite Panel Association (CPA) is the trade association representing the North American wood-based composite panel and decorative surfacing industries. Manufacturers and processors of surface materials may reference the Voluntary Compendium of Standards for Decorative Overlays. The standards outline the attributes of each type of decorative overlay, including TFM, decorative foils, 3D overlays, light basis weight papers, oriented polypropylene films (OPP), and vinyl films. The Compendium provides information and industry-accepted test methods to determine the performance and physical characteristics of the different overlays, and allows product identification for a particular application. For more information visit the Composite Panel Association at www.DecorativeSurfaces.org or www.pbmdf.com.





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Circle the letter of the correct answer for each question below.

1. **What two technologies lead to the development of TFM?**
 - A. Synthetic plastics and high speed printing of paper
 - B. Nanotechnology and high speed printing of paper
 - C. High speed printing of paper and hydroelectric power
 - D. Hydroelectric power and nanotechnology
2. **Which of the following is NOT used in making TFM decorative panels?**
 - A. Substrate
 - B. Kraft paper
 - C. Resin
 - D. Décor paper
3. **Specialty overlays give TFM decorative panels certain performance characteristics, including all of the following EXCEPT:**
 - A. Stain resistance
 - B. Moisture resistance
 - C. Impact resistance
 - D. Anti-microbial qualities
4. **Saturated décor paper that is partially cured is referred to as:**
 - A. B-stage
 - B. A-game
 - C. Immature
 - D. Holding
5. **After resin-saturated décor paper is pressed to a substrate to make TFM:**
 - A. It must be adhered to a panel for processing.
 - B. It is ready to use as a decorative panel.
 - C. It must be dried in an oven at low heat for a long period.
 - D. It must be stored at a specific temperature and humidity to fully cure.
6. **TFM designs match other designs available in which of the following:**
 - A. HPL
 - B. 3D Laminates
 - C. Low basis weight papers
 - D. All of the above
7. **The visual design for TFM decorative panels comes from:**
 - A. Kraft paper
 - B. HPL
 - C. Wall paper
 - D. Décor paper
8. **TFM decorative panels can contribute to up to how many LEED credits?**
 - A. 0
 - B. 2
 - C. 4
 - D. 6
9. Circle True or False: **Steel press plates emboss both texture and gloss level to the surface of TFM decorative panels.** TRUE FALSE
10. **TFM decorative panels are routinely specified for all of the following applications EXCEPT:**
 - A. Exterior siding
 - B. Flooring
 - C. Cabinetry
 - D. Case goods
 - E. Furniture

You will earn one (1) Learning Unit by answering at least 80% of the questions on this page correctly and submitting the responses with your contact information below. A certificate of completion will be sent to you upon receipt of a satisfactory submission. There is no fee.

Take this quiz online at www.DecorativeSurfaces.org

MAIL, FAX OR EMAIL COMPLETED QUIZ TO:

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