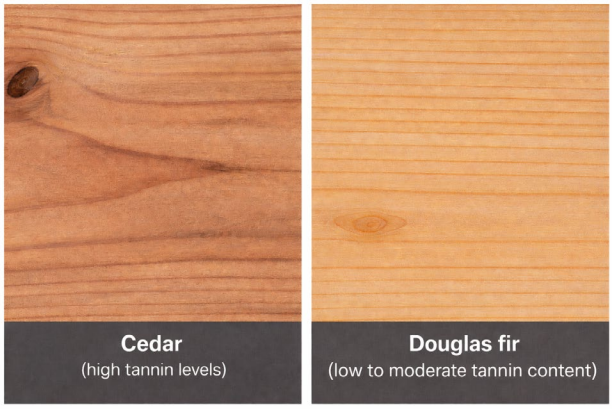
PAINTING WOOD AND ENGINEERED WOOD

Wood has been used as a building material for centuries because of its strength, availability, and natural appearance. Today, wood remains widely used in residential and commercial construction, along with a growing range of engineered and composite wood products designed for improved dimensional stability and manufacturing efficiency. While these materials provide many structural and aesthetic advantages, they can present unique challenges when painting or coating.

Unlike many other building materials, wood is a natural, porous, and moisture-responsive substrate. Its physical structure, moisture movement, and natural extractives can influence coating adhesion and long-term performance. Engineered and composite wood products may introduce additional factors such as factory-applied treatments, waxes, or resins that affect coating compatibility. Understanding these characteristics is essential for diagnosing coating issues and selecting appropriate surface preparation and coating systems.

Characteristics of Natural Wood

Wood is composed of long cellular fibers that readily absorb and release moisture depending on environmental conditions. This moisture movement can cause the wood to expand and contract, placing stress on the paint film. Over time, repeated dimensional movement may lead to cracking, peeling, or loss of adhesion.



Several characteristics of natural wood can influence coating performance:

- **Porosity and absorption:** Wood is highly porous, particularly on end grain surfaces. This can lead to uneven coating absorption, which may cause inconsistent film build, staining, or premature coating failure if not properly sealed.

- **Moisture movement:** Wood continually exchanges moisture with the surrounding environment. Elevated moisture content at the time of painting or excessive moisture exposure after painting can contribute to blistering, peeling, or mildew growth.

- **Natural extractives and tannins:** Certain wood species—such as cedar and redwood—contain water-soluble extractives that may migrate through the paint film and cause tannin staining. Proper priming is typically required to block these stains.

- **Mill glaze and surface smoothness:** Freshly milled wood can develop a condition known as mill glaze, where the surface becomes compressed and smooth during planing. This can reduce coating penetration and adhesion unless the surface is lightly sanded before painting.

Lignin Degradation from Weather Exposure

Wood contains lignin, a natural polymer that acts as a binding agent holding the wood fibers together. When bare wood is exposed to sunlight and weathering, ultraviolet (UV) radiation gradually breaks down the lignin at the surface. As lignin degrades, the wood fibers become weakened and begin to separate, often producing a gray, fuzzy, or powdery surface.

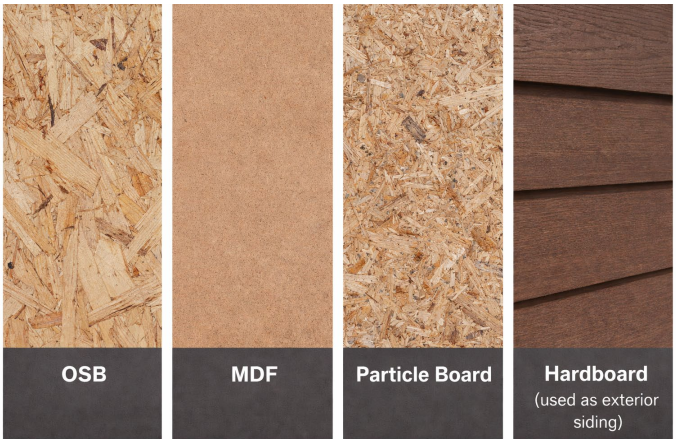
This degraded layer can significantly reduce coating adhesion. If paint is applied directly over weathered wood without proper preparation, the coating may adhere to the weakened fiber layer rather than to sound wood, increasing the likelihood of premature failure.

To ensure a stable surface for painting, the weathered layer should be removed through light sanding or abrasion before priming and coating. Sanding exposes fresh, intact wood fibers that provide a stronger and more paint-friendly surface for proper coating adhesion.

Engineered and Composite Wood Products

In addition to natural wood, many modern buildings incorporate engineered wood products such as:

- Oriented strand board (OSB)
- Medium-density fiberboard (MDF)
- Particle board
- Wood–plastic composites
- Engineered siding products



These materials are manufactured using combinations of wood fibers, resins, waxes, or binders. While they may provide greater dimensional consistency than natural wood, their manufactured surfaces can create coating challenges. Potential issues include:

- **Factory-applied surface treatments:** Some engineered wood products contain waxes, release agents, or manufacturing additives that may reduce coating adhesion.
- **Surface density variations:** Composite materials may have dense outer surfaces that limit coating penetration while exposing porous edges that absorb coatings excessively.
- **Edge swelling:** Products such as MDF or particle board can swell when exposed to moisture, which may cause paint films to crack or lift.
- **Compatibility with coatings:** Certain resin systems or additives used in engineered wood products may require specific primers to ensure proper adhesion.

Because these materials vary widely in composition, it is important to follow the manufacturer's recommendations for surface preparation and coating selection.

Diagnosing Coating Problems on Wood

When coating issues occur on wood or engineered wood substrates, identifying the root cause is critical before attempting repairs. Common coating problems include peeling or flaking, blistering, tannin or extractive staining, mildew or fungal growth, cracking caused by substrate movement, and uneven sheen or absorption.

Diagnosis often begins with evaluating several key factors:

- **Moisture content of the wood:** Wood that is too wet at the time of painting can lead to adhesion failures. Moisture meters can help determine whether the substrate is within acceptable limits before painting.
- **Condition of the existing coating:** If the surface has been previously painted, determine whether the existing coating is well adhered. Adhesion testing and visual inspection can help determine whether spot preparation or full removal is necessary.
- **Surface contamination:** Dirt, chalk, mildew, or extractive buildup can interfere with coating adhesion and must be addressed during surface preparation.
- **Substrate defects:** Cracks, knots, sap pockets, and end grain exposure can create localized coating failures if not properly sealed or primed.

Surface Preparation and Corrective Actions

Proper surface preparation is critical when coating wood substrates, and the specific methods required will depend on both the type of wood and the condition of the existing surface. In general, preparation may include cleaning to remove dirt, mildew, chalk, and other contaminants using appropriate cleaning solutions or, where suitable, pressure washing. Light sanding is often needed to remove mill glaze, weathered lignin, or other weak surface layers and to improve adhesion by exposing sound wood fibers. Damaged or deteriorated areas should be repaired or replaced using suitable fillers or patching materials. Priming is also an important step, particularly with wood, because a high-quality wood primer helps seal porous areas and block tannin or extractive staining. Special attention should be given to edges and end grain, as these highly absorbent areas can take up moisture rapidly and should be properly sealed. For engineered or composite wood products, it is especially important to follow the manufacturer’s guidance regarding surface preparation and coating compatibility.

Coating Selection

Selecting the appropriate coating system is equally important for achieving long-term performance on wood substrates. Exterior coatings should provide good adhesion and flexibility to accommodate the natural movement of wood, along with resistance to moisture intrusion and protection against ultraviolet degradation. At the same time, the coating should allow a degree of breathability so moisture vapor can escape rather than becoming trapped within the wood. High-quality exterior acrylic coatings are commonly used because they offer a good balance of flexibility, durability, and weather resistance.

Key Takeaways

Wood and engineered wood substrates present unique challenges due to their natural variability, moisture responsiveness, and sensitivity to environmental exposure. Weathering effects such as lignin

degradation, moisture movement, and extractive staining can all influence coating performance if not properly addressed.

Successful coating applications depend on recognizing these characteristics, preparing the surface appropriately, and selecting coating systems designed to perform under the conditions typical of wood substrates. With proper diagnosis, preparation, and coating selection, durable and attractive paint finishes can be achieved while extending the service life of wood and engineered wood building components.