



Thermally Modified Wood

Technical Overview

Definition

Thermally Modified (TM) Wood is lumber that has been heated in an oxygen-limited environment to improve its physical properties permanently. The process changes the cell walls at a molecular level, reducing hemicellulose content and increasing cellulose crystallinity.

Process Summary

1. Kiln Drying: Boards are first dried to remove free water.
2. Heat Treatment: Wood is heated to 180–215 °C (355–420 °F) in a low-oxygen chamber using steam or inert gas.
3. Conditioning & Cooling: Material is slowly cooled and re-humidified to a target moisture content of 4–6%.

Key Physical Changes

- Reduced equilibrium moisture content (~50% vs. untreated), yielding significantly higher dimensional stability.
- Cell wall chemistry shift: hemicelluloses depolymerize while cellulose crystallinity increases, reducing shrink/swell.
- Color transformation as sugars/resins caramelize, producing a uniform brown tone (naturally weathers outdoors).
- Lower nutrient availability: fewer simple sugars make the wood less hospitable to decay fungi and insects.

Performance Characteristics

Property	Result of Modification	Typical Improvement
Dimensional Stability	Less swelling/shrinkage in humidity changes	50–70% better
Biological Durability	Resistance to decay fungi (above ground)	Class 2–3 (EN 350)
Thermal Conductivity	Slightly reduced due to lower density	~5–10%
Density	~5–7% reduction vs. original species	—
Mechanical Strength	MOR/MOE may drop 10–20%	Design to adjusted loads

Environmental Profile

- Uses only heat and steam — no chemical preservatives.
- Modified wood can be recycled or disposed of as untreated wood.
- Sourced from renewable, often regionally harvested species.

Use Considerations

- Best for above-ground exterior applications prioritizing stability and decay resistance (e.g., siding, soffits, decking, porch floors, exterior millwork).
- Avoid permanent ground contact or structural uses requiring unmodified bending strength.