Teak (Tectona Grandis) Solid Wood – Technical Material Specification for Machining & Fabrication

1.0 Material Overview & Common Uses

Teak (Tectona grandis) is a tropical hardwood species native to South and Southeast Asia, prized for its exceptional dimensional stability, natural oil content, and resistance to rot, decay, and marine borers. The heartwood is golden-brown to dark brown with a straight to slightly interlocked grain and a coarse, uneven texture. Its high silica content (up to 1.5%) contributes to rapid tool wear but also provides outstanding weather resistance.

Teak is the premier material for marine decking, outdoor furniture, boat building, architectural millwork, and high-end joinery. In Canadian industrial contexts, it is commonly specified for custom yacht interiors, exterior cladding, and premium decking where longevity and aesthetic appeal are critical. The material is typically sourced as kiln-dried, FAS (First and Second) grade lumber or as S4S (Surfaced Four Sides) blanks.

2.0 Core Technical Properties & Sizing

- Density (kiln-dried at 12% MC): 0.65–0.75 g/cm³ (40–47 lb/ft³)
- Janka Hardness: 1,000–1,155 lbf (4,450–5,140 N)
- Modulus of Rupture (MOR): 96–110 MPa (14,000–16,000 psi)
- Modulus of Elasticity (MOE): 10.3–12.4 GPa (1.5–1.8 × 10⁶ psi)
- Crushing Strength (parallel to grain): 48–55 MPa (7,000–8,000 psi)
- Radial Shrinkage (green to 12% MC): 2.2–2.5%
- Tangential Shrinkage (green to 12% MC): 4.0–5.0%
- Volumetric Shrinkage (green to 12% MC): 6.5–7.5%
- Standard Lumber Sizes: 4/4, 5/4, 6/4, 8/4 thickness (nominal); widths 4″–12″; lengths 6′–16′
- Moisture Content (at delivery): 8–12% for interior use; 12–16% for exterior applications
- Dimensional Tolerance (S4S): Thickness ±0.5 mm, Width ±1.0 mm, Length ±3.0 mm
- Natural Oil Content: 5–10% (extractable with solvents)
- Silica Content: 0.5–1.5% by weight (accelerates carbide tool wear)

3.0 Processing, Machinability & Application

Teak machines moderately well despite its high density and silica content. The natural oils can cause gumming on cutting edges and interfere with adhesive bonding if not properly prepared. Carbide-tipped tooling is mandatory; high-speed steel (HSS) tools dull rapidly and produce poor surface finishes. Feed rates should be moderate to avoid burning, and dust extraction is critical due to the fine, irritating nature of teak dust.

- Sawing: Use carbide-tipped blades with 40–60 teeth for ripping; 60–80 teeth for crosscutting. Feed rate: 10–15 m/min for ripping, 8–12 m/min for crosscutting.
- Planing & Moulding: Carbide knives with 15–20° hook angle; depth of cut 0.5–1.5 mm per pass. Feed rate: 8–12 m/min. Reduce feed if tear-out occurs on figured grain.

- Routing: Use compression spiral bits (up-cut/down-cut) to minimize tear-out on both faces. Spindle speed: 18,000–22,000 RPM; feed rate: 3–5 m/min.
- Drilling: Brad-point or Forstner bits with carbide tips; peck drilling recommended for depths > 3× diameter to clear chips and reduce heat buildup.
- Sanding: Begin with 80-grit, progress to 220-grit. Use open-coat stearated paper to prevent clogging from natural oils. Final sanding with 320-grit for marine-grade finishes.
- Gluing: Wipe surfaces with acetone or mineral spirits to remove surface oils before bonding. Use epoxy or polyurethane adhesives; PVA (yellow glue) is not recommended for exterior applications.
- Fastening: Pre-drill for all screws (pilot hole 1 mm smaller than screw diameter). Use stainless steel (316) or silicon bronze fasteners to prevent galvanic corrosion.
- Finishing: Teak oil, varnish, or epoxy-based marine finishes. Apply thin coats; allow 24-hour cure between coats. For exterior use, maintain with UV-protective sealants every 6–12 months.

4.0 Common Defects & Quality Control

- Reject if moisture content exceeds 16% for interior applications or 20% for exterior applications (measured with pin-type moisture meter at 25 mm depth).
- Reject if surface checks (cracks) exceed 0.5 mm width or 50 mm length on any face.
- Reject if wane (bark edge) exceeds 10% of width on any edge for FAS grade.
- Reject if bow exceeds 3 mm over 2 m length; crook exceeds 2 mm over 2 m; twist exceeds 5 mm over 2 m.
- Reject if knot size exceeds 12 mm diameter for FAS grade; knots must be sound (tight) and not loose or decaying.
- Reject if mineral streaks or fungal staining cover more than 15% of surface area.
- Reject if insect damage (pinholes, galleries) is visible on any surface.
- Acceptable: Small sound knots (< 6 mm), slight color variation, and natural oil pockets (if not weeping).
- Inspection method: Visual inspection under 500 lux lighting; caliper measurement for dimensions; straightedge for flatness; moisture meter for MC.

5.0 Storage, Handling & WHMIS Guidelines

• Store in a climate-controlled environment at 18–24°C and 40–55% relative humidity. Avoid direct sunlight and heat sources.
• Stack lumber flat on 19 mm stickers spaced 600 mm apart; allow air circulation on all sides. Do not store directly on concrete floors.
• Shelf life: Indefinite when stored under proper conditions; re-check moisture content every 30 days if stored longer than 6 months.
• FIFO protocol: Rotate stock by date of receipt; use older stock first to minimize moisture variation.
• WHMIS Classification: Teak wood dust is classified as a hazardous substance under WHMIS 2015 (CAS 8006-87-9 for wood dust, not otherwise specified).
• Hazards: Wood dust is a respiratory irritant and suspected carcinogen (Group 1 IARC for hardwood dust). Natural oils may cause skin sensitization.
• Mandatory PPE: NIOSH-approved N95 or P100 respirator during machining; safety glasses with side shields; cut-resistant gloves (ANSI A2 or higher) for handling; long sleeves and pants to prevent skin contact.
• Engineering Controls: Use local exhaust ventilation (LEV) with minimum 1.5 m/s capture velocity at source; maintain dust collection system with HEPA filtration.
• First Aid: For skin contact, wash with mild soap and water; for eye contact, flush with water for 15 minutes; for inhalation, move to fresh air and seek medical attention if symptoms persist.
• Spill/Disposal: Sweep or vacuum dust (do not dry sweep); dispose as non-hazardous solid waste in sealed bags. Follow

provincial regulations for wood waste.

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