Hard Maple Acer Saccharum Solid Wood Machining Technical Material Specification

1.0 Material Overview & Common Uses

Hard Maple, scientifically known as Acer saccharum, is a dense, closed-grain hardwood native to eastern North America, including Canada. It is prized for its exceptional hardness, wear resistance, and uniform texture, making it a premier choice for high-stress industrial and commercial applications.

- Primary applications include: flooring (gymnasium, bowling alley, dance), butcher blocks, cutting boards, kitchen countertops, furniture (tables, chairs, cabinets), musical instruments (drum shells, guitar necks, piano actions), tool handles, sports equipment (baseball bats, bowling pins), and industrial workbenches.
- Common grades: FAS (First and Second), Select, #1 Common, #2 Common, and #3A Common as per NHLA (National Hardwood Lumber Association) rules.
- Sustainability: Sourced from sustainably managed Canadian forests; certified under SFI, FSC, or CSA standards where specified.

2.0 Core Technical Properties & Sizing

- Density: 0.65–0.75 g/cm³ (40.6–46.8 lb/ft³) at 12% moisture content (MC).
- Janka Hardness: 6,400 N (1,450 lbf) – among the hardest domestic hardwoods.
- Modulus of Rupture (MOR): 109 MPa (15,800 psi) at 12% MC.
- Modulus of Elasticity (MOE): 12.6 GPa (1,830,000 psi) at 12% MC.
- Crushing Strength (parallel to grain): 54 MPa (7,830 psi) at 12% MC.
- Radial Shrinkage: 4.8% (green to oven-dry).
- Tangential Shrinkage: 9.9% (green to oven-dry).
- Volumetric Shrinkage: 14.7% (green to oven-dry).
- Standard Sizes: Thicknesses: 4/4 (1 inch), 5/4 (1.25 inches), 6/4 (1.5 inches), 8/4 (2 inches), 12/4 (3 inches); Widths: 3–12 inches (random widths); Lengths: 4–16 feet (random lengths).
- Moisture Content: Kiln-dried to 6–8% MC for interior applications; 8–12% MC for exterior or semi-exposed uses.
- Tolerances: Thickness: ±1/32 inch (0.8 mm) for surfaced lumber; Width: ±1/16 inch (1.6 mm) for ripped stock; Length: ±1/8 inch (3.2 mm) for cut-to-size blanks.

3.0 Processing, Machinability & Application

Hard Maple machines well with sharp tooling due to its high density and closed grain. It has a moderate blunting effect on cutters, requiring carbide-tipped or high-speed steel (HSS) tools with frequent sharpening. The wood is prone to burning if feed rates are too slow or tooling is dull.

- Sawing: Use carbide-tipped saw blades with 40–60 teeth for ripping, 60–80 teeth for crosscutting. Feed rate: 10–20 m/min for ripping, 5–10 m/min for crosscutting. Avoid overheating; use a sharp blade to prevent tear-out.

- Planing: Use carbide knives with a 20–25° bevel angle. Feed rate: 8–15 m/min. Depth of cut: 0.5–1.5 mm per pass. Ensure grain direction is consistent to minimize tear-out.
- Routing/Shaping: Use carbide-tipped bits with a 30–40° helix angle. Spindle speed: 12,000–18,000 RPM. Feed rate: 3–6 m/min. Use climb cutting for cleaner edges on end grain.
- Drilling: Use brad-point or Forstner bits for clean holes. Spindle speed: 1,500–3,000 RPM. Feed rate: 0.1–0.3 mm/rev. Pre-drill for screws to prevent splitting.
- Sanding: Use 80–120 grit for initial sanding, progressing to 180–220 grit for finish. Avoid over-sanding as it can burnish the surface, reducing stain absorption.
- Gluing: Use PVA (polyvinyl acetate) or polyurethane adhesives. Clamp pressure: 100–150 psi. Open time: 5–10 minutes at 20°C. Cure time: 24 hours at 20°C and 50% RH.
- Finishing: Accepts stains, oils, lacquers, and varnishes well. Use a sanding sealer to prevent blotching. For food-contact surfaces (cutting boards), use food-safe mineral oil or beeswax.
- Steam Bending: Requires careful preparation; steam for 1 hour per inch of thickness. Bend radius: minimum 10:1 ratio (radius to thickness). Allow to cool in form for 24 hours.

4.0 Common Defects & Quality Control

- Reject if knots are loose, open, or exceed 1 inch in diameter on FAS grade; for #1 Common, reject if knots exceed 2 inches or are in clusters.
- Reject if checks (cracks) exceed 1/8 inch in depth or length greater than 6 inches on any face.
- Reject if warp (bow, crook, twist, cup) exceeds 1/8 inch over a 4-foot span for surfaced lumber.
- Reject if wane (bark or missing wood) exceeds 1/3 of the thickness or width on any edge.
- Reject if decay (rot, fungal stain) is present in any form; discoloration from blue stain is acceptable only if it does not affect structural integrity.
- Reject if moisture content exceeds 10% for interior applications or 14% for exterior uses, measured with a pin-type moisture meter at 1/4 inch depth.
- Reject if surface pitting, machine burn marks, or chatter marks exceed 0.005 inch (0.13 mm) depth on finished surfaces.
- Reject if grain deviation (slope of grain) exceeds 1:10 (rise:run) for structural components.
- Acceptable defects: Small sound knots under 1/2 inch, mineral streaks, and light color variation are permissible in lower grades.

5.0 Storage, Handling & WHMIS Guidelines

Hard Maple is a natural wood product and does not have a WHMIS classification as a hazardous material in solid form. However, dust generated during machining is classified as a combustible dust and a respiratory hazard. Follow all applicable provincial and federal regulations.

- Storage: Store in a dry, well-ventilated area with relative humidity between 35–55% and temperature 15–25°C. Keep lumber off the floor on stickers (1 inch thick) spaced 16 inches apart to allow air circulation.
- Shelf Life: Indefinite if stored properly; however, use within 6 months of receipt to minimize moisture content drift. Follow FIFO (First-In, First-Out) protocol to avoid age-related degradation.
- Handling: Use cut-resistant gloves (ANSI A4 or higher) and steel-toed boots when moving lumber. For heavy bundles, use mechanical lifting equipment (forklift, pallet jack). Avoid dragging lumber to prevent splintering.
- WHMIS Hazard Classification: Not classified as a hazardous product under WHMIS 2015 in solid form. Wood dust (CAS 9004-34-6) is classified as a combustible dust (Hazard Category: Combustible Dust) and a respiratory sensitizer (H334).
- PPE Requirements: Safety glasses with side shields (ANSI Z87.1) during all machining. Use N95 or P100 respirators when sanding or machining to avoid inhalation of wood dust. Hearing protection (NRR 25 dB or higher) for loud machinery.
- Fire Safety: Wood dust is combustible; maintain dust collection systems with spark detection and suppression. Keep dust

accumulation below 1/8 inch on surfaces. Use Class A fire extinguishers (water, foam, or dry chemical) for solid wood fires.
• First Aid: For skin contact with dust, wash with soap and water. For eye contact, flush with water for 15 minutes. If inhaled, move to fresh air. Seek medical attention if irritation persists.
• Disposal: Wood waste can be recycled as mulch, compost, or biomass fuel. Dispose of treated or contaminated wood according to local regulations. Do not burn in open fires due to potential chemical residues.