
Natural Granite Slab – Technical Material Specification for Industrial Fabrication

1.0 Material Overview & Common Uses

Natural granite is an igneous rock composed primarily of quartz, feldspar, and mica, formed through the slow crystallization of magma deep within the Earth's crust. Its dense, non-porous structure and high compressive strength make it a preferred material for applications requiring dimensional stability, wear resistance, and aesthetic appeal. In industrial and commercial fabrication, granite is commonly used for kitchen and bathroom countertops, flooring tiles, monuments, memorials, precision surface plates, and laboratory benchtops. The material is sourced from quarries worldwide, with colour and veining patterns varying by deposit. For procurement purposes, slabs are typically classified by thickness, finish (polished, honed, flamed, or leathered), and grade based on consistency of colour and absence of natural fissures.

2.0 Core Technical Properties & Sizing

- Density: 2.63 – 2.75 g/cm³ (varies by mineral composition)
- Compressive strength: 130 – 250 MPa (typical range for commercial grades)
- Modulus of rupture: 10 – 20 MPa
- Water absorption: < 0.5% by weight (ASTM C97)
- Hardness: 6 – 7 on Mohs scale
- Standard slab dimensions: 120" x 60" (3050 mm x 1525 mm) or 108" x 54" (2745 mm x 1370 mm)
- Common thicknesses: 2 cm (3/4") and 3 cm (1-1/4"), tolerance ± 1.5 mm
- Flatness tolerance: ≤ 0.5 mm over 1 m for polished slabs (ASTM C485)
- Coefficient of thermal expansion: 5 – 8 x 10⁻⁶ /°C
- Thermal conductivity: 2.5 – 3.5 W/m·K

3.0 Processing, Machinability & Application

Granite is a hard, abrasive material that requires diamond tooling for all cutting, shaping, and finishing operations. Water cooling is mandatory to prevent thermal cracking and to control silica dust. Fabrication typically involves bridge saws, CNC routers, and hand-held angle grinders equipped with diamond blades or cup wheels. For edge profiling, a sequence of diamond grits (50 to 3000) is used to achieve a polished finish. Drilling for faucet holes or sink cutouts must be performed with diamond core bits at low feed rates to avoid chipping. Adhesive bonding of seams is done with colour-matched polyester or epoxy resins; cure time at 20°C is 24 hours for full strength. Granite is not weldable. For precision surface plates, lapping with loose abrasive (silicon carbide or alumina) on cast iron plates is standard to achieve flatness within 0.0025 mm per 300 mm.

- Cutting: Use diamond-segmented blades, blade speed 25–35 m/s, feed rate 1–3 m/min for 3 cm slabs.
- Edge profiling: Diamond polishing pads, grit sequence 50, 100, 200, 400, 800, 1500, 3000; water flow 4–6 L/min.
- Drilling: Diamond core bits, rotational speed 2000–3000 RPM, feed pressure 10–20 N.
- Seaming: Use two-part epoxy or polyester resin, clamp with 0.1 mm gap, cure 24 hours at 20°C.

- Surface finishing: Honed finish achieved with 400 grit; polished finish with 3000 grit; flamed finish via oxyacetylene torch at 2000°C.
- Precision lapping: Loose abrasive (SiC or Al₂O₃), particle size 5–20 µm, on cast iron lapping plate.

4.0 Common Defects & Quality Control

- Reject if visible fissures (hairline cracks) exceed 2 mm in length on the finished face.
- Reject if surface pits or voids are deeper than 0.5 mm or wider than 1 mm after polishing.
- Reject if colour variation between adjacent slabs exceeds 10% of the approved sample (visual comparison under D65 lighting).
- Reject if slab is out-of-square by more than 1.5 mm over 1 m edge length.
- Reject if thickness variation across the slab exceeds ± 1.5 mm from nominal.
- Reject if polished gloss reading (at 60° glossmeter) is below 85 units for polished finish.
- Reject if water absorption exceeds 0.5% by weight (ASTM C97).
- Reject if any repair (epoxy fill, colour match) is visible under normal viewing conditions at 1 m distance.

5.0 Storage, Handling & WHMIS Guidelines

- Store slabs vertically in A-frame racks with rubber or felt contact points to prevent chipping; maximum lean angle 10° from vertical.
- Indoor storage only; maintain temperature between 10°C and 30°C, relative humidity below 70% to prevent efflorescence.
- Shelf life: indefinite if stored properly; no FIFO rotation required due to non-perishable nature.
- WHMIS classification: Not classified as a hazardous material in solid form. However, respirable crystalline silica (quartz) dust generated during cutting, grinding, or polishing is a known carcinogen (IARC Group 1) and is classified under WHMIS as a hazardous product (CAS 14808-60-7).
- Mandatory PPE during fabrication: N95 or P100 respirator (or half-face respirator with HEPA filters), safety glasses with side shields, cut-resistant gloves (ANSI A4 or higher), hearing protection (earplugs or earmuffs, NRR ≥ 25 dB), and steel-toed boots.
- Engineering controls: Use wet cutting methods to suppress dust; local exhaust ventilation (LEV) with HEPA filtration required for dry operations; silica dust exposure must be kept below Ontario OEL of 0.025 mg/m³ (8-hour TWA).
- Spill procedure for dust: Use wet mop or HEPA vacuum; do not dry sweep. For large debris, use mechanical lifting equipment; manual lifting limited to 23 kg per person per CSA Z1004.
- First aid: For eye contact with dust, flush with water for 15 minutes; for skin contact, wash with soap and water; if inhaled, move to fresh air and seek medical attention if respiratory irritation persists.

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