
Engineered Quartz Solid Surface – Technical Material Specification

1.0 Material Overview & Common Uses

Engineered quartz solid surface is a non-porous, composite material consisting of approximately 90–93% natural quartz crystals (silicon dioxide) bound with 7–10% polyester or acrylic resins, pigments, and additives. It is manufactured under high pressure and heat to form a dense, homogeneous slab. Unlike natural stone, it is uniform in colour and pattern and does not require sealing. Common industrial applications include laboratory countertops, hospital casework, food service surfaces, architectural cladding, and high-end residential countertops. It is valued for its stain resistance, impact strength, and ease of fabrication compared to natural granite or marble.

2.0 Core Technical Properties & Sizing

- Density: 2.4 – 2.5 g/cm³ (2400–2500 kg/m³)
- Flexural strength: 40–60 MPa (ASTM C880)
- Compressive strength: 200–250 MPa (ASTM C170)
- Modulus of rupture: 45–55 MPa (ASTM C99)
- Water absorption: < 0.05% by weight (ASTM C97)
- Coefficient of thermal expansion: 2.5×10^{-5} /°C (ASTM E831)
- Thermal conductivity: 1.0–1.5 W/m·K
- Hardness: Mohs 7 (quartz component); overall composite Mohs 6–7
- Standard slab dimensions: 3048 mm × 1440 mm (120 in × 56 in) or 3200 mm × 1600 mm (126 in × 63 in)
- Standard thicknesses: 12 mm (1/2 in), 20 mm (3/4 in), 30 mm (1-1/4 in)
- Thickness tolerance: ± 0.5 mm (0.020 in) per slab
- Flatness tolerance: ≤ 1.5 mm over 1 m (0.060 in over 39 in)
- Squareness tolerance: ± 0.5 mm per 300 mm (0.020 in per 12 in) edge
- Colour consistency: $\Delta E \leq 1.5$ between slabs of same batch (CIE Lab)

3.0 Processing, Machinability & Application

Engineered quartz solid surface is machinable with standard woodworking and stone fabrication tools, but requires diamond-tipped or carbide tooling due to the abrasive quartz content. Water cooling is mandatory to prevent thermal cracking and resin degradation. The material can be cut, routed, drilled, and edge-profiled. Adhesive joining uses colour-matched two-part acrylic or polyester adhesives. Heat forming is not recommended; post-forming is limited to acrylic-based solid surfaces (e.g., Corian).

- Cutting: Use a diamond-segmented blade (continuous rim) at 3000–4000 RPM with water feed (minimum 4 L/min). Feed rate: 2–4 m/min for 20 mm slab.
- Routing/edge profiling: Diamond router bits (1/2 in shank) at 10,000–14,000 RPM; water mist cooling. Maximum depth per pass: 3 mm.

- Drilling: Diamond-tipped core bits (dry or wet) at 1500–2000 RPM; peck drilling recommended for holes > 10 mm diameter.
- Sanding/polishing: Use resin-bonded diamond pads (50 to 3000 grit) with water; final polish with cerium oxide or diamond compound.
- Adhesive joining: Apply two-part acrylic adhesive (e.g., Akemi or Tenax) at 20–25°C; clamp for 45 minutes; full cure at 24 hours.
- Seam preparation: Router a 2 mm × 2 mm chamfer on both edges; apply adhesive with no air gaps; cure under vacuum or clamps.
- Not recommended for outdoor use without UV-stable grade; standard grades may yellow or degrade under direct sunlight.

4.0 Common Defects & Quality Control

- Reject if surface pitting exceeds 0.3 mm depth or 2 pits per 100 cm² (visual inspection under 2x magnification).
- Reject if any crack, chip, or fissure is visible on the finished face or edge (including hairline cracks).
- Reject if colour variation between adjacent slabs exceeds ΔE 1.5 (CIE Lab) under D65 illuminant.
- Reject if slab is out-of-flat by more than 1.5 mm over 1 m (0.060 in over 39 in).
- Reject if thickness variation exceeds ± 0.5 mm across the slab length.
- Reject if edge squareness deviation exceeds 0.5 mm per 300 mm (0.020 in per 12 in).
- Reject if any resin-rich or resin-starved areas are visible (glossy or dull patches) under raking light.
- Reject if the slab has a visible warp (bow or twist) exceeding 2 mm over 2 m length.
- Reject if there are any foreign inclusions (metal, wood, plastic) larger than 0.5 mm in diameter.
- Acceptable minor defects: isolated pinholes < 0.2 mm (no more than 3 per 100 cm²) and slight colour mottling within ΔE 0.5.

5.0 Storage, Handling & WHMIS Guidelines

- Store slabs vertically in A-frame racks with padded supports (minimum 10° tilt) to prevent warping and edge damage.
- Storage environment: temperature 10–30°C, relative humidity < 70%. Avoid direct sunlight and heat sources.
- Shelf life: indefinite if stored properly; no degradation under recommended conditions.
- FIFO protocol: Use first-in-first-out based on production date; rotate stock every 6 months to prevent colour drift between batches.
- Handling: Use suction cup lifters (minimum 4 cups for slabs > 2 m²) or mechanical clamps. Two-person lift for slabs > 30 kg.
- WHMIS classification: Not classified as hazardous under WHMIS 2015 (GHS) when in solid form. Dust from cutting/grinding is hazardous.
- Hazardous dust: Respirable crystalline silica (quartz) – GHS hazard category 1A (carcinogen). Use wet cutting methods or HEPA vacuum.
- Mandatory PPE during fabrication: NIOSH-approved N95 or P100 respirator, safety glasses with side shields, cut-resistant gloves (ANSI A4), hearing protection (if noise > 85 dBA).
- First aid: For skin contact with uncured resin – wash with soap and water; for eye contact – flush with water for 15 minutes; for dust inhalation – move to fresh air.
- Spill procedure: Uncured adhesive spills – contain with absorbent material, dispose as hazardous waste. Cured material – sweep or vacuum (HEPA), avoid generating airborne dust.

Regulatory Disclaimer: This document is a generic technical material specification provided for educational purposes. The end-user assumes all liability for reviewing, adapting, and validating all tolerances, properties, and safety protocols against specific OEM data sheets and local regulations before deployment.