PVC Type 1 Rigid Sheet – Technical Material Specification

1.0 Material Overview & Common Uses

PVC Type 1 Rigid Sheet (also known as PVC Type I or unplasticized PVC) is a high-impact, corrosion-resistant thermoplastic sheet manufactured from polyvinyl chloride resin without plasticizers. It offers excellent chemical resistance, dimensional stability, and self-extinguishing flammability characteristics. Common industrial applications include chemical tank linings, fume hoods, ductwork, semiconductor wet benches, plating barrels, signage, and architectural cladding where resistance to acids, alkalis, and industrial atmospheres is required.

2.0 Core Technical Properties & Sizing

- Density: 1.40 – 1.45 g/cm³ (ASTM D792)
- Tensile Strength: 6,500 – 8,000 psi (45 – 55 MPa) (ASTM D638)
- Flexural Modulus: 400,000 – 500,000 psi (2.8 – 3.4 GPa) (ASTM D790)
- Izod Impact (notched): 1.0 – 2.0 ft-lb/in (53 – 107 J/m) (ASTM D256)
- Heat Deflection Temperature (HDT) @ 264 psi: 155 – 170°F (68 – 77°C) (ASTM D648)
- Coefficient of Linear Thermal Expansion: 3.0 – 4.0 × 10^{-5} in/in/°F (5.4 – 7.2 × 10^{-5} mm/mm/°C)
- Flammability Rating: UL 94 V-0 (self-extinguishing)
- Water Absorption (24 hr): < 0.10% (ASTM D570)
- Standard Sheet Sizes: 48" × 96" (1220 mm × 2440 mm) and 48" × 120" (1220 mm × 3050 mm)
- Standard Thickness Range: 1/16" (1.5 mm) to 2" (50.8 mm)
- Thickness Tolerance (per ASTM D1784): ±10% for sheets up to 1/4" (6.35 mm); ±8% for sheets 1/4" to 1" (25.4 mm); ±6% for sheets over 1"
- Flatness Tolerance: Maximum warp of 1/8" over 48" length (3 mm over 1220 mm) when measured on a flat surface
- Surface Finish: Glossy on one side, matte on the reverse (standard); both sides gloss available on premium grades
- Hardness: Shore D 80 – 85 (ASTM D2240)

3.0 Processing, Machinability & Application

PVC Type 1 Rigid Sheet can be machined using conventional woodworking and metalworking equipment. It is generally considered to have good machinability, but care must be taken to avoid overheating, which can cause material degradation and release of hydrogen chloride gas. Carbide-tipped tooling is recommended for extended tool life. For sawing, use a carbide-tipped blade with a triple-chip grind geometry, 10–14 teeth per inch, and a cutting speed of 3,000–4,000 SFPM. For drilling, use standard high-speed steel or carbide drills with a point angle of 118° and a feed rate of 0.005–0.010 inches per revolution. For routing, use single-flute or two-flute carbide cutters at 15,000–20,000 RPM with a chip load of 0.005–0.015 inches per tooth. For welding, hot gas welding with PVC filler rod (matching grade) is standard; weld temperature should be 500–550°F (260–288°C) with a welding speed of 6–12 inches per minute. Solvent cementing using a PVC-specific solvent cement (e.g., IPS Weld-On 705 or 711) is also common for joining sheets; allow 24-hour cure at 70°F (21°C) before handling. For bending, heat the sheet uniformly to 250–300°F (121–149°C) using a strip heater or oven; avoid exceeding 350°F (177°C)

to prevent decomposition. For threading, use standard NPT taps and dies; apply cutting oil to reduce friction. For sanding, use 120–220 grit sandpaper; avoid excessive pressure to prevent melting.

4.0 Common Defects & Quality Control

- Reject if surface pits, voids, or bubbles exceed 0.5 mm (0.020") in diameter or depth when viewed under 5x magnification.
- Reject if scratches or gouges are deeper than 10% of the nominal sheet thickness.
- Reject if the sheet exhibits a wavy or bowed surface with a deviation greater than 1/8" (3 mm) over a 48" (1220 mm) span when placed on a flat reference surface.
- Reject if the sheet is out-of-square by more than 1/16" (1.6 mm) over the diagonal of a 48" × 96" (1220 mm × 2440 mm) sheet.
- Reject if there are any signs of delamination, blistering, or internal voids visible on cut edges or under transmitted light.
- Reject if the sheet has a discoloration (yellowing, browning, or black specks) covering more than 2% of the surface area, indicating thermal degradation or contamination.
- Reject if the sheet fails to meet the specified thickness tolerance per ASTM D1784 for the ordered thickness.
- Reject if the sheet has a Shore D hardness reading below 78 or above 87, indicating improper formulation or processing.
- Reject if the sheet has a tensile strength below 6,000 psi (41 MPa) when tested per ASTM D638.
- Reject if the sheet has a water absorption value exceeding 0.15% after 24-hour immersion per ASTM D570.

5.0 Storage, Handling & WHMIS Guidelines

- Store PVC Type 1 Rigid Sheet in a cool, dry, indoor environment with temperatures between 50°F and 90°F (10°C to 32°C) and relative humidity below 60%.
- Sheets must be stored flat on a level surface, fully supported, to prevent warping. Do not lean sheets against walls or store on edge.
- Protect sheets from direct sunlight and UV exposure; prolonged UV exposure causes surface degradation and discoloration.
- Shelf life is indefinite under proper storage conditions; however, FIFO (First-In, First-Out) inventory rotation is recommended to minimize risk of surface contamination or static charge buildup.
- WHMIS Classification: PVC Type 1 Rigid Sheet is not classified as a hazardous material under WHMIS 2015 when in solid form. However, during machining, welding, or thermal processing, it may produce hazardous decomposition products.
- Hazardous Decomposition Products: Hydrogen chloride (HCl) gas, carbon monoxide, and trace amounts of vinyl chloride monomer (VCM) may be released when PVC is heated above 350°F (177°C). HCl is corrosive and toxic.
- Mandatory PPE during machining/welding: Safety glasses with side shields, cut-resistant gloves (e.g., Kevlar or nitrile-coated), and hearing protection if using power tools. For welding or hot processing, use a NIOSH-approved respirator with acid gas cartridges (e.g., 3M 6001) and ensure local exhaust ventilation is in place.
- Do not eat, drink, or smoke in areas where PVC dust or fumes are present. Wash hands thoroughly after handling.
- In case of thermal decomposition (burning or overheating), evacuate the area, ventilate, and use a self-contained breathing apparatus (SCBA) for firefighting. Use dry chemical, CO2, or water fog to extinguish fires involving PVC.
- Dispose of PVC scrap and dust in accordance with local, provincial, and federal regulations. PVC is not biodegradable; mechanical recycling is preferred where facilities exist.