
Polypropylene (PP) Sheet – Technical Material Specification

1.0 Material Overview & Common Uses

Polypropylene (PP) sheet is a semi-crystalline thermoplastic polymer produced via extrusion or compression molding. It is characterized by its low density, high chemical resistance, excellent fatigue resistance, and good electrical insulating properties. PP sheet is widely used in the fabrication of chemical tanks, laboratory equipment, battery boxes, automotive components, packaging, and food processing machinery due to its non-toxic nature and resistance to moisture and solvents.

- Common grades: Homopolymer (PP-H) for rigidity and chemical resistance; Copolymer (PP-C) for impact strength and low-temperature performance.
- Typical applications include: chemical storage tanks, fume hoods, plating barrels, cleanroom panels, and cutting boards.
- Available in natural (translucent white), grey, black, and custom UV-stabilized colors.

2.0 Core Technical Properties & Sizing

- Density: 0.905 – 0.915 g/cm³ (ASTM D792)
- Melting point: 160 – 170 °C (320 – 338 °F)
- Tensile strength at yield: 30 – 38 MPa (ASTM D638)
- Elongation at break: 100 – 600% (ASTM D638)
- Flexural modulus: 1.2 – 1.8 GPa (ASTM D790)
- Izod impact strength (notched): 2 – 10 kJ/m² (ASTM D256)
- Hardness: Shore D 70 – 80 (ASTM D2240)
- Coefficient of linear thermal expansion: 100 – 150 x 10⁻⁶ /°C (ASTM D696)
- Continuous service temperature: -10 °C to +90 °C (14 °F to 194 °F); short-term up to 120 °C (248 °F)
- Standard sheet sizes: 48" x 96" (1220 mm x 2440 mm) and 60" x 120" (1525 mm x 3050 mm)
- Thickness range: 1/16" (1.5 mm) to 2" (50 mm) with tolerance ±10% for standard grade, ±5% for precision grade
- Flatness tolerance: 0.010 inch per linear foot (0.83 mm/m) for sheets up to 1/2" thick; 0.005 inch per foot for thicker sheets
- Water absorption: < 0.01% (24 hours at 23 °C, ASTM D570)

3.0 Processing, Machinability & Application

PP sheet is readily machinable using conventional metalworking equipment, but requires sharp tooling and adequate chip clearance due to its low melting point and tendency to gum. For best results, use high-speed steel (HSS) or carbide tools with polished flutes. Cooling with compressed air or a mild water mist is recommended to prevent localized melting. The material is also weldable using hot gas, extrusion, or ultrasonic methods, and can be bonded with solvent cements or two-part acrylic adhesives.

- Cutting: Use a fine-tooth blade (10–14 teeth per inch) on a table saw or band saw at moderate feed rates. For CNC routing, use a single-flute upcut spiral bit at 12,000–18,000 RPM with a feed rate of 100–200 IPM.

- **Drilling:** Use standard twist drills with a 118° point angle, peck feed to clear chips, and a spindle speed of 500–1000 RPM. Avoid dwell to prevent heat buildup.
- **Turning:** Use carbide inserts with a positive rake angle, cutting speed 200–400 SFM, feed 0.005–0.015 IPR, and depth of cut 0.020–0.080 inches.
- **Welding:** Hot gas welding requires a welding temperature of 260–290 °C (500–554 °F) with a 3–5 mm diameter PP filler rod. Extrusion welding uses a 200–230 °C barrel temperature. Preheat the joint area to 80–100 °C.
- **Bonding:** Use solvent cement (e.g., cyclohexane or methyl ethyl ketone) or two-part acrylic adhesives. Surface preparation with isopropyl alcohol is essential. Allow 24 hours for full cure at 23 °C.
- **Thermoforming:** Heat sheet to 150–170 °C (302–338 °F) in a convection oven. Use a male or female mold at 60–80 °C. Cooling rate should be controlled to minimize warpage.

4.0 Common Defects & Quality Control

- Reject if surface has visible scratches deeper than 0.1 mm (0.004 inch) or gouges that compromise chemical resistance.
- Reject if there are bubbles, voids, or inclusions larger than 0.5 mm in diameter within the sheet.
- Reject if thickness variation exceeds $\pm 10\%$ of nominal thickness for standard grade or $\pm 5\%$ for precision grade.
- Reject if sheet is warped more than 0.010 inch per linear foot (0.83 mm/m) in any direction.
- Reject if there are signs of delamination or internal cracking when viewed under transmitted light.
- Reject if color is non-uniform or if there are streaks, specks, or discoloration exceeding 2 mm in any dimension.
- Reject if edges are not square within 0.5° of 90° or if cut length/width tolerance exceeds ± 1.5 mm (1/16 inch).
- Acceptable surface finish: smooth, matte or gloss as specified, free of die lines or chatter marks visible to the naked eye.

5.0 Storage, Handling & WHMIS Guidelines

- Store PP sheets flat on a clean, dry surface away from direct sunlight and UV sources to prevent degradation. Ideal storage temperature: 15–25 °C (59–77 °F).
- Relative humidity should be kept below 60% to minimize static charge buildup and dust attraction.
- Shelf life is indefinite under proper storage conditions; however, FIFO (First In, First Out) rotation is recommended to avoid prolonged exposure to environmental factors.
- Handle with clean, dry gloves to avoid oil contamination. Use suction cups or padded clamps for large sheets to prevent surface damage.
- WHMIS Classification: Polypropylene sheet is not classified as a hazardous material under WHMIS 2015. However, dust generated from machining may be a combustible dust hazard. Use local exhaust ventilation and avoid accumulation of fines.
- Mandatory PPE during machining: Safety glasses with side shields, hearing protection, and cut-resistant gloves. When sanding or generating dust, wear a NIOSH-approved N95 respirator.
- In case of thermal decomposition (burning), PP emits carbon monoxide and acetaldehyde. Use self-contained breathing apparatus in confined spaces. Extinguish with dry chemical, CO₂, or water fog.
- Dispose of scrap PP via recycling programs (resin code #5) or as non-hazardous industrial waste per local regulations.

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