

E71T-1 Flux Cored Arc Welding (FCAW) Wire – Technical Material Specification

1.0 Material Overview & Common Uses

E71T-1 is a carbon steel flux cored arc welding (FCAW) wire classified under AWS A5.20 / ASME SFA-5.20. It is a gas-shielded, rutile-based flux cored electrode designed for single- and multi-pass welding of carbon and low-alloy steels. The flux core provides slag protection, deoxidation, and alloying elements, enabling high deposition rates and excellent weld bead appearance.

Common applications include structural steel fabrication, shipbuilding, heavy equipment repair, pressure vessel welding, and general manufacturing where high productivity and all-position welding capability are required. It is typically used with CO₂ or 75% Ar/25% CO₂ shielding gas.

2.0 Core Technical Properties & Sizing

- AWS Classification: E71T-1 (per AWS A5.20 / ASME SFA-5.20)
- Wire diameter options: 0.035 in (0.9 mm), 0.045 in (1.2 mm), 0.052 in (1.4 mm), 1/16 in (1.6 mm)
- Diameter tolerance: ± 0.0015 in (0.038 mm) for diameters up to 0.045 in; ± 0.002 in (0.05 mm) for larger diameters
- Core wire composition: Carbon 0.05–0.15%, Manganese 1.0–1.6%, Silicon 0.3–0.6%, Phosphorus $\leq 0.03\%$, Sulfur $\leq 0.03\%$
- Flux core type: Rutile (TiO₂-based) with arc stabilizers and deoxidizers
- Deposited weld metal tensile strength: Minimum 70,000 psi (483 MPa)
- Deposited weld metal yield strength: Minimum 58,000 psi (400 MPa)
- Elongation in 2 in (50 mm): Minimum 22%
- Charpy V-notch impact toughness: Minimum 20 ft-lbf (27 J) at -20°F (-29°C)
- Packaging: 10 lb (4.5 kg) spools, 25 lb (11.3 kg) spools, 60 lb (27.2 kg) coils, or 500 lb (227 kg) drums
- Spool dimensions: 4 in (102 mm) or 12 in (305 mm) diameter, with 2 in (51 mm) or 1.125 in (28.6 mm) arbor hole

3.0 Processing, Machinability & Application

E71T-1 wire is designed for automatic or semi-automatic FCAW using a constant voltage (CV) power source with direct current electrode positive (DCEP). The wire feeds continuously through a welding gun, and shielding gas is supplied externally. Proper gun angle, stick-out, and travel speed are critical for consistent weld quality.

- Shielding gas: 100% CO₂ (recommended for cost) or 75% Ar / 25% CO₂ (for improved arc stability and reduced spatter)
- Gas flow rate: 35–50 CFH (16–24 L/min) for indoor use; increase to 50–60 CFH (24–28 L/min) in drafty conditions
- Wire stick-out (electrode extension): 3/4 in (19 mm) to 1 in (25 mm) for 0.045 in wire; adjust $\pm 1/4$ in for other diameters
- Welding parameters for 0.045 in (1.2 mm) wire with CO₂: 200–300 A, 24–30 V, wire feed speed 250–450 ipm (6.4–11.4 m/min)
- Welding parameters for 1/16 in (1.6 mm) wire with CO₂: 250–400 A, 26–32 V, wire feed speed 150–300 ipm (3.8–7.6 m/min)

- Travel speed: 10–25 ipm (4–10 mm/s) depending on plate thickness and joint design
- Preheat and interpass temperature: 50–150°F (10–65°C) for carbon steel; consult WPS for thicker sections or high-restraint joints
- Post-weld heat treatment: Not typically required for E71T-1 deposits, but may be specified for stress relief in heavy sections
- Slag removal: Slag is self-peeling in many positions; use chipping hammer and wire brush for complete removal between passes
- All-position capability: Flat, horizontal, vertical-up, and overhead (vertical-down not recommended for E71T-1)

4.0 Common Defects & Quality Control

- Reject wire if surface rust, pitting, or corrosion is visible on the outer wraps or inner layers of the spool/coil
- Reject if wire exhibits kinking, bird-nesting, or inconsistent cast (cast diameter must be 15–30 in (380–760 mm) for 0.045 in wire)
- Reject if helix (helical twist) exceeds 1 in (25 mm) when a 10 ft (3 m) sample is laid flat
- Reject if flux core is exposed or missing in more than 2% of a 12 in (300 mm) sample length
- Reject if weld deposit shows excessive porosity (>3 pores per linear inch) or wormhole porosity
- Reject if slag inclusions are visible on radiograph or cross-section in more than 1% of weld length
- Reject if weld metal hardness exceeds 250 HV (Rockwell B 100) for standard carbon steel applications
- Reject if wire feedability causes erratic arc or stubbing during qualification test at 300 ipm (7.6 m/min) feed speed
- Reject if packaging is damaged (crushed spool, torn bag, broken seal) exposing wire to moisture

5.0 Storage, Handling & WHMIS Guidelines

- Store in original, unopened packaging in a dry, climate-controlled environment at 40–80°F (4–27°C) and below 60% relative humidity
- Shelf life: 2 years from date of manufacture when stored in sealed packaging under recommended conditions
- Once opened, use wire within 30 days; reseal partially used spools in a plastic bag with desiccant
- FIFO (First-In, First-Out) protocol: Rotate stock by manufacturing date; label incoming spools with receipt date
- Do not store near acids, solvents, or oxidizing agents; keep away from open flames and high-temperature sources
- WHMIS 2015 classification: Not classified as hazardous under GHS for solid wire; welding fumes are classified as hazardous (see below)
- Welding fume components: Manganese, iron oxide, chromium (trace), and fluorides; exposure limits: Mn 0.02 mg/m³ (ACGIH TLV), Fe₂O₃ 5 mg/m³
- Mandatory PPE during welding: Welding helmet with appropriate shade (10–13), flame-resistant gloves, leather apron, and hearing protection
- Respiratory protection: Use NIOSH-approved N95 or P100 respirator when welding in confined spaces or without local exhaust ventilation
- Local exhaust ventilation: Maintain capture velocity of 100 ft/min (0.5 m/s) at the weld zone; use fume extractor gun or hood
- Spill/leak procedure: Sweep up solid wire; for damaged spools with loose flux, avoid inhalation of dust; dispose in sealed container per local regulations
- First aid: For fume inhalation, move to fresh air; for eye contact with slag or spatter, flush with water for 15 minutes and seek medical attention

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