

# Welding Process

## Shielded Metal-Arc Welding

The shielded metal-arc welding process (SMAW) is a long-standing favorite in the industry. Probably one of the most familiar of the processes, SMAW is a first choice for many welders involved with maintenance and repair applications. The process is portable and the equipment necessary is commonly available. Preheating is often recommended with this welding process, especially on heavy section thicknesses, or when welding on cast iron. The presence of moisture may introduce porosity. Use dcep and maintain a short arc length.

Good preparation of the base metal to clean and remove surface oxidation and contamination is necessary to obtain best weld results. Do not weld on a scaly or greasy surface.

Either stringer or weave beads may be used in joining with equal success. However, weave beads are preferred because slag entrapment is minimized. To deposit a weave bead, oscillate the electrode approximately three times the electrode diameter, hesitating at the sidewalls to fill undercutting. Upon completion of depositing a weld, thoroughly remove all slag before applying successive layers. For overlays, apply the first layer using a low amperage to minimize base metal dilution. Best results are obtained when three layers are deposited.

As with any welding process, optimum results are obtained when good welding practices are observed.

### PREHEATING RECOMMENDATIONS

1. Low carbon and mild steels up to 0.29 C— none required.
2. Medium carbon steels 0.30 C to 0.59 C— 300°F to 600°F (149°C to 315°C), depending on carbon content.
3. Low alloy steels—same as low carbon and mild steel.
4. Gray cast iron 400°F to 600°F (204°C to 315°C), slow cool.
5. Nodular and malleable cast iron—300°F to 400°F (149°C to 204°C), post weld annealing is advisable.
6. Cupro-nickel and silicon bronze—no preheat, interpass temperature—200°F (93°C) maximum.
7. Aluminum bronze—alloys up to 10% aluminum—no preheat, 300°F (149°C) maximum interpass. Alloys exceeding 10% aluminum -300°F and 600°F (149°C and 315°C) maximum interpass.
8. Manganese bronze—300°F (149°C) for inert gas and 500°F (260°C) for shielded metal-arc.
9. Copper-1000°F (538°C).

### RECOMMENDED WELDING AMPERAGE

Shielded Metal-arc (dcep)-Positive	Electrode Diameter	Amperes*
	3/32"	50-110
	1/8"	90-160
	5/32"	130-180
	3/16"	150-225

\* Use low side of range for iron- or nickel-base alloys; middle of range for bronze alloys; high side for copper.