

55% Aluminum-Zinc Alloy Coated Steel

TECHNICAL BULLETIN #7

Guidelines for Welding

7.0 Introduction.

55% Aluminum-Zinc Alloy Coated Steel can be readily welded using resistance and arc welding techniques. Utilizing conventional welding techniques along with the guidelines given below, 55% Aluminum-Zinc Alloy Coated Steel can be as easily welded as other coated sheet products. In general, the Al/Zn coating is soft and conductive compared to uncoated sheet steel and, therefore, requires higher welding currents, welding times and electrode forces for resistance welding. The parameters used for successfully welding 55% Aluminum-Zinc Alloy Coated Steel sheet are very similar to those for galvanized sheet.

7.1 Spot Welding.

The optimum tip geometry which provides the longest electrode tip life when spot welding 55% Aluminum-Zinc Alloy Coated Steel sheet is the truncated cone with either a 90° or 120° included angle. Pointed, domed or radius electrodes should be used only where necessary for reasons of access or alignment.

Testing has shown that a dispersion-strengthened copper alloy electrode will provide superior electrode life and welding characteristics when compared to RWMA Class 2 Cu-Cr or Cu-Zr alloys. Typical spot welding schedules for 55% Aluminum-Zinc Alloy Coated Steel sheet are given below:

| Material Thickness (in.) | Welding Current (amperes) | Electrode Force (lb.) | Welding Time, Cycles (1/60 second) | Electrode Face Diameter (in.) |
|--------------------------|---------------------------|-----------------------|------------------------------------|-------------------------------|
| 0.022 | 11,000 | 350 | 10 | 0.187 |
| 0.028 | 11,300 | 400 | 12 | 0.187 |
| 0.036 | 12,500 | 500 | 14 | 0.250 |
| 0.040 | 12,800 | 500 | 14 | 0.250 |
| 0.053 | 13,000 | 550 | 14 | 0.250 |
| 0.065 | 13,400 | 650 | 18 | 0.250 |

Actual requirements will vary depending on the job conditions.

Electrode maintenance is also important in spot welding coated sheet steels. The parameters given above will cause gradual deformation of the contact surfaces as well as the coating alloying with the electrode material. These factors require the electrodes be redressed more frequently than is the case with uncoated steel. The electrode tips should be redressed periodically, but the time between re-dressings depends on the sheet thickness and conditions of use. Additional factors influencing electrode life are proper tip alignment and sufficient water cooling (minimum 2 gal/min) to the electrode.

The peel test, which is commonly used as a measure of nugget size and weld soundness, can be used to test the quality of spot welds on 55% Aluminum-Zinc Alloy Coated Steel sheet. Test specifications vary among manufacturers, but in general, two coupons are welded together and then peeled apart. Under proper welding conditions, failure should occur around the weld, not through the weld. The nugget diameter should approximate the diameter of the electrodes.

7.2 Seam Welding.

The conditions for seam welding 55% Aluminum-Zinc Alloy Coated Steel sheet are similar to those for galvanized steel in that higher currents and closer control of welding schedules are required than for uncoated sheet steel. Intermittent current feed is preferred over continuous current and 0.5-inch radius faced electrodes can be used for all sheet thicknesses if desired. Schedules for seam welding 55% Aluminum-Zinc Alloy Coated Steel sheet are suggested in the table below. As with the spot welding schedules, the conditions below may need alteration depending on the job.

Seam welding wheels should be RWMA Class 2 copper alloy. Knurled wheels are preferred because the knurled drive rollers continuously remove pick-up from the sheet coating and maintain a constant face width, thus eliminating the need for redressing. The electrode wheels in the weld area should be flushed with water during welding to provide adequate cooling.

| Material Thickness | Electrode Face | Electrode Thickness | Electrode Force | Welding Current | Weld Time Cycles | Weld Time Cycles | Welding Speeds |
|--------------------|----------------|---------------------|-----------------|-----------------|------------------|------------------|----------------|
| (in.) | Type | (in.) | (lb.) | (amperes) | Heat | Cool | (in./min) |
| 0.017 | 1/2" Radius | 3/8 | 700 | 14,500 | 2 | 2 | 60 |
| 0.022 | 1/2" Radius | 3/8 | 850 | 16,000 | 3 | 2 | 60 |
| 0.034 | 1/4" Flat | 1/2 | 1,000 | 21,500 | 4 | 2 | 60 |
| 0.049 | 1/4" Flat | 1/2 | 1,100 | 22,000 | 4 | 2 | 60 |
| | 1/4" Flat | 1/2 | 1,100 | 23,000 | 4 | 1 | 90 |
| 0.083 | 5/16" Flat | 5/8 | 1,600 | 27,000 | 10 | 6 | 30 |

7.3 High/Low-Frequency Welding.

55% Aluminum-Zinc Alloy Coated Steel has been fabricated into products such as tubing using both high-frequency and low frequency welding techniques. Standard procedures similar to those employed for galvanized or aluminum coated steels are used. Since the coating may smear at sheared or slit edges, it may be necessary to scrape the sheet edges prior to welding.

7.4 Arc Welding.

Gas tungsten-arc (TIG) welding of 55% Aluminum-Zinc Alloy Coated Steel is not recommended because, as with galvanized sheet steel, fumes generated during welding tend to contaminate the tungsten electrode and cause instability of the arc. Shielded metal-arc welding is best accomplished using E60XX electrodes, such as E6010, E6011 or E6012. A whipping technique is often used to burn off the coating ahead of the puddle. For gas metal-arc (MIG) welding, a mild steel wire should be used with Ar/1% O₂ or Ar/CO₂ shielding gas. Gas containing Ar provides a more stable arc resulting in better bead appearance and significantly less weld spatter. When a backup plate is used, the plate should be grooved under the weld to provide better penetration and venting of fumes from the underside of the weld.

7.5 Fuming.

In arc welding, the total weight of evolved fumes per unit weld area for 55% Aluminum-Zinc Alloy Coated Steel sheet is 25 percent of the amount for galvanized. The ratio of the amount of zinc oxide released from 55% Aluminum-Zinc Alloy Coated Steel is only 20 percent of the amount released from galvanized sheet. The decreased fuming of 55% Aluminum-Zinc Alloy Coated Steel represents a reduced fume hazard to welders, but the extent of fuming is still sufficient to require the use of fume hoods and/or forced exhaust systems. Fuming during resistance welding is very slight and special exhaust systems should not be needed.

7.6 Corrosion Resistance of Welds.

As is the case with other coated sheet steels, spot and seam welding may remove the coating from 55% Aluminum-Zinc Alloy Coated Steel sheet exposing the base steel. These areas may be too large to be galvanically protected by the adjacent coating and should be covered with metal-sprayed zinc or aluminum, zinc-rich paint or organic coating. Covering the weld area of arc welds is especially important because the damage to the coating is even more severe.



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