PRODUCT DATA BULLETIN

# Aluminized Type 1 TUBING

AK Tube LLC
A Subsidiary of
AK Steel Corporation

AK Tube LLC's aluminized tubing is manufactured from hot dip aluminized steel with either a T1-13, T1-25 or T1-40 aluminized coating weight.

Due to its strong resistance to moisture and salt corrosion, aluminized tubing is an excellent choice for such applications as: Exposed Automotive Parts; Exposed Frame Tubes; Fuel Filler Tubes; Exhaust Systems, Radiant Heating, Fencing; High Temperature Applications; Dog Kennels; Greenhouses; Outdoor Furniture; Playground Equipment. Aluminized is also an excellent substrate for painted applications.

AK Tube manufactures tubing from high quality Type 1 Aluminized Steel from AK Steel's Middletown, Ohio Number 4 Aluminizing line, the most versatile and productive aluminizing line in the world. The primary features of this line include a ceramic coreless induction coating pot, the ability to finish with either air or nitrogen, closed-loop computer controlled X-ray gauges for coating weights, and in-line surface conditions.

## PRODUCT FEATURES

- **Corrosion Resistance**
  Aluminized Type 1 has superior performance compared to zinc coated materials for resistance to atmospheric, salt spray and muffler condensate corrosion.

- **Formability**
  Aluminized Type 1 can be used to produce parts containing simple bends to parts with extreme deep drawing requirements.

- **Heat Reflectivity**
  Aluminized Type 1 has excellent heat reflectivity during exposures to temperatures below 800°F (427°C), reflecting up to 80% of the radiant heat that impinges upon it.

- **High Temperature Properties**
  Aluminized Type 1 is an excellent heat resistant material effective to at least 1250°F (677°C). For applications above 800°F (427°C) where alloying of the coating can be a problem, AK Tube's DQHT grade has been specially formulated to resist alloying at temperatures up to 1000°F (538°C).

# ALUMINIZED TYPE 1

## COATING

The coating is Type 1 Aluminized, containing approximately 91% aluminum and 9% silicon, that is metallurgically bonded to the steel substrate. The hot dip coating process assures a tightly adherent, uniform coating on both sides of the product. A thin alloy layer readily permits normal forming practices without incurring significant damage to the coating. A schematic of a cross section is shown in Figure 1. Thickness of a typical T1-25 coating is about 13-15 microns each side.

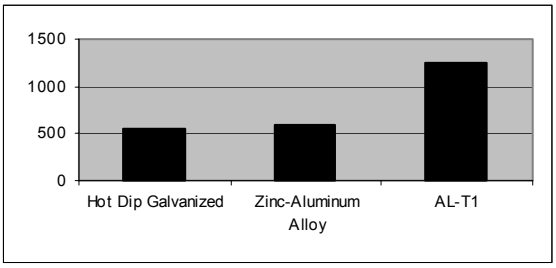
FIGURE 1– COATING CROSS SECTION*


*Layers not shown to actual size

## HIGH TEMPERATURE PROPERTIES

- At temperatures above 800°F, the diffused aluminum coating provides high emmisivity for radiant heating tubes and continues to provide corrosion protection to the steel substrate.
- Creep and fatigue strength equal to the steel substrate.

FIGURE 2– MAXIMUM SERVICE TEMPERATURE




## CORROSION RESISTANCE

The hot dip aluminum-silicon coating (See Figure 3) forms a tightly adherent aluminum oxide surface film, which is highly resistant to moisture and chloride (e.g. marine or road salt). Although aluminum will provide galvanic protection in a strong chloride atmosphere, it is generally considered a barrier coating due to the oxide film. Table 1 shows the benefits of this type of coating in both

FIGURE 3*

* ASTM B117 Salt Spray results comparing aluminized T1-25 (Fig. 3 on left) and a tube which was continuously galvanized on the outside surface and painted on the inside surface (Fig 3. on right) . The galvanized coating weight was equivalent to a G90. The first sign of red rust on aluminized tube appeared after 312 hours as compared to 192 hours for the continuously galvanized tube.

## TABLE 1– ATMOSPHERIC CORROSION 10 YEAR WEIGHT LOSS

| | | Weight Loss g/m² | |
|---|---|---|---|
| | Minimum Coating Weight g/m² | Mild Industrial | Marine Coastal |
| G90 Galvanized | 275 | 174 | 168 |
| T1-40 Aluminized | 122 | 10 | 21 |

## TABLE 2– SALT FOG TESTING (ASTM B117)*

| | Hours to First Red Rust | |
|---|---|---|
| | Flat Coupon (Avg.) | Welded Tube (Typical**) |
| G90 Galvanized | 200 | 190 |
| T1-25 Aluminized | 500 | 350 |
| T1-40 Aluminized | 700 | 600 |

*Because uncoated areas are subject to cosmetic red rust in a moist, non-salt environment, external seam welds on tubing are remetallized after weld scarfing. Likewise, cut edges can exhibit red rust in a moist environment, but the rust is not progressive and does not undercut the coating. Cut edges are therefore typically covered or hidden by design. Results can vary by diameter to thickness ratio of the tubing. First sign of red rust, appeared at the remetallized weld seam on the aluminized samples.
**Typical salt spray results may vary and it is best to run test many times to obtain a broad average.

## TABLE 3– COATING WEIGHT

| Coating Designation | Min. Coating Weight oz/ft² (Inch-Pound) | Min. Coating Weight g/m² (SI) | Avg. Coating Thickness per side (Mils) |
|---|---|---|---|
| T1 13 | 0.13 | 40 | 0.25 |
| T1 25 | 0.25 | 76 | 0.50 |
| T1 40 | 0.40 | 122 | 0.80 |
| T1 60 | 0.60 | 183 | 1.25 |

Coating Weight is the total of both sides and is determined according to ASTM A 463. 1 oz/ Sq. Ft. Coating– 0.00398 inches coating thickness total both sides.

## Mill Limits

Aluminized Type 1 Tubing is generally available in outside diameters of 0.750" through 6.0" and wall thickness of .035" to 0.120"

## Steel Grades Available

CS– Commercial Steel
DS– Drawing Steel
DDS– Deep Drawing Steel
EDDS– Extra Deep Drawing Steel
HSLAS– High Strength Low Alloy Steels

## Technical Assistance Information

For additional information or to obtain samples of this product, contact our Technical Service Department, at (800) 955-8031 or e-mail

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