



PRODUCT FEATURES

ALUMINIZED STEEL TYPE 2

• **ENHANCED SERVICE LIFE WITH A LIGHTER GAGE MATERIAL**

Aluminized Type 2 Steel pipe offers service life competitive with non-metallic pipe.

• **HIGH ACCURACY IN ESTIMATING GAGE REQUIREMENTS FOR 50-YEAR MINIMUM SERVICE LIFE**

Within the recommended ranges for Aluminized Steel Type 2, a 50-year minimum service life requirement can be met with a very high degree of confidence.

EFFECTS OF GAGE ON PIPE DURABILITY: Based on 75 Years Minimum Service Life at 16 Gage – For Worst-Case Conditions Within The Recommended pH/Resistivity Ranges

Gage:	20	18	16	14	12	10
Nominal wall thickness, mils	40	52	64	79	109	138
Nominal coating thickness, mils (one side)	~2	~2	~2	~2	~2	~2
Nominal substrate thickness, mils	36	48	60	75	105	134
AK projected minimum pipe perforation time in years, based on worst-case substrate pitting rate, 0.85 mils/yr. and one-side coating penetration time, 10 years over the recommended environmental ranges	52	66.5	81	98	>100	>100
Suggested DOT minimum pipe perforation times in years, based on 75 years at 16 gage and on linear effects of gage changes	50	62.5	75	85	>100	>100
Suggested DOT gage factors, 16 ga. std., based on minimum pipe perforation times	.67X	.83X	1.0X	1.13X	1.33X (min.)	1.33X (min.)

Because Aluminized Type 2 develops a stable long-term pit-penetration rate in the steel substrate under the influence of coating galvanic retardation, the effect of gage thickness on penetration of a pipe wall can be estimated rather well. A conservative estimate is derived using the worst-case substrate pit-penetration rate observed in 30-year field exposures over the recommended pH/resistivity ranges. The worst-case rate was low, about 0.85 mils per year, and it was observed near the lower limits of recommended pH/resistivity ranges where average pit penetration of the ~2.0 mil Aluminized Type 2 coating on one side is about 10 years.

ACCURACY IN THE ESTIMATION OF SERVICE LIFE AT WALL THICKNESSES OF 16 GAGE AND GREATER

Long-term pit penetration rates in the substrate can be used to project pipe wall penetration times to periods as long as the time of duration of coating galvanic retardation. The substrate penetration rate changes once galvanic retardation is gone. AK field studies show no evidence of a limit on the duration of galvanic retardation at 42–43 years exposure in the field, so an assumed 75-year duration is quite reasonable. Thus substrate penetration times up to 75 years can be estimated with reasonable confidence, and the worst-case pit-penetration rate applies to service-life projections up to 75 years. Projections to times beyond 75 years must be based largely on effects of increased wall thickness. Because the worst-case penetration rate projects to 81 years pipe-perforation time at 16 gage, a 75-year minimum service life applies to 16 gage; it is primarily additional wall thickness that determines how much additional service life is possible. AK limits service life projections to 100 years; it is quite reasonable to extrapolate from 75 years at 16 gage (.064") out to >100 years at 12 gage (.109") and 10 gage (.138") largely on the basis of wall thickness. And an interpolated value proportionate with wall thickness is easily and credibly assigned to 14 gage material.

ACCURACY IN THE ESTIMATION OF SERVICE LIFE AT WALL THICKNESSES BELOW 16 GAGE

California has a 50 year design life policy for drainage structures. The CALTRANS Highway Design Manual states that 16 gage Aluminized Type 2 provides the required 50



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The product, engineering and research information in this literature is applicable exclusively to AK Steel Aluminized Steel Type 2.

year service life throughout their recommended pH/resistivity ranges. Since field studies indicate that 16 gage Aluminized Type 2 has a minimum 75-year service life throughout wider AK recommended pH/resistivity ranges, the CALTRANS 50-year minimum service life requirement can be met with a very high degree of certainty.

Obviously, 16 gage Aluminized Steel Type 2 is not needed to achieve 50-year service life. The minimum gage needed can be determined with maximal accuracy. There should be no doubt at all about 50-year longevity of good galvanic action; at 42–43 years field service, no limit on galvanic action is evident. It is certain that low substrate pit-penetration rates associated with full galvanic retardation would endure for at least 50 years within recommended pH/resistivity ranges. Clearly, gage requirements for meeting a 50-year perforation-time criterion can be determined with high confidence on the basis of worst-case pit-penetration rates determined from field studies. Thus, over a 50-year exposure time, worst-case pitting would penetrate the 2 mil coating on one side in 10 years and 34 mils of substrate in 40 years ($34 \text{ mils} \div 0.85 \text{ mils/yr.}$). Clearly, 20 gage Aluminized Type 2 (40 mils, that is, 4 mils coating + 36 mils substrate) would resist pit perforation for more than 50 years. It should be evident that, even if a additionally conservative 50-year limit on normal coating galvanic action were utilized, 20 gage material would still meet a 50-year service-life requirement with high confidence.

ENVIRONMENTAL FACTORS

All gage recommendations apply only to the recommended 5–9 pH and $\geq 1500 \text{ ohm}\cdot\text{cm}$ resistivity environmental limits, since the corrosion behavior of Aluminized Type 2 can change notably outside these limits.