MEETING NEW DURABILITY STANDARDS AND EXPANDING ENVIRONMENTAL LIMITS WITH CORRUGATED STEEL PIPE

The use of Aluminized Steel Type 2 with its bi-layer Al/Al-Fe protective metallic coating in drainage pipe service increases the range of environmental conditions and the Corrugated Steel Pipe (CSP) service life attained within those conditions. The application of Type 2 within the recommended 5 – 9 pH range and the ≥ 1500 ohm·cm resistivity range, indicated below, covers most pipe environments. Based on field studies of 43 years, 16 gauge Type 2 service life in these ranges is estimated at 75 years. Based on the 50 year durability assessment, 16 gauge Type 2 has a service life of 100 years for pH 5 – 9 and resistivity ≥ 5000 ohm·cm. In the narrower pH range 6 – 8 with resistivity ≥ 1500 ohm·cm a 100 year service life is also expected. Estimated service life of 75 years for pH between 4.5 – 5.0 if resistivity ≥ 5000 ohm·cm. The duplex Type 2 coating exhibits spontaneous passive film corrosion protection in the aluminum layer and inherent corrosion/abrasion protection in the Al-Fe intermetallic alloy layer.

The Al-Fe alloy layer provides a major portion of coating protection.

**ALUMINIZED STEEL TYPE 2 APPLICATION GUIDELINES**

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<th>Soil/Water pH</th>
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Water and Soil Resistivity
Min. 1,500 ohm·cm

- May Require Protective/Invert Treatments
- All Cementitious Fills Are Compatible With Aluminized Type 2
- 75 Years For pH 4.5 – 5.0 If Resistivity ≥ 5000 ohm·cm
ALUMINIZED STEEL TYPE 2

Each of the layers of the duplex Type 2 coating contributes unique protective features. The protection of the two layers combined affords several advantages.

**Advantages**

- Performance of either coating layer independent of water scaling; immunity of both layers to the effects of soft water.
- Enhanced resistance of both coating layers to CO$_2$ corrosive effects.
- Enhanced resistance of both coating layers to erosion corrosion.
- Enhanced resistance of the Al-Fe layer to more common mild-to-moderate abrasive effects.
- Resistance to chloride/sulfate salts down to at least 1500 ohm-cm, oftentimes lower. Additional water/soil testing is advisable to determine suitability at resistivities below 1500 ohm-cm.
- Resistance to dry climate soils down to at least 1000 ohm-cm.
- Although 5 – 9 pH is the recommended environmental guideline, there actually is no upper pH limit for Type 2, as there is with aluminum, for the Al-Fe layer and the steel substrate are fully resistant to high pH.
- Type 2 is fully compatible with concrete headwalls and with cementitious backfills such as flowable fill and cement stabilized sand since the Al-Fe alloy layer alone is adequately resistant to high-pH cement alkalinity and to corrosive soil effects.
- Can be used where pH is between 4.5 – 5.0 if resistivity is over 5000 ohm-cm.

**Application Limits**

- Severe corrosive environments such as seawater, acid minewater or sanitary sewage are incompatible with Type 2.
- Gray, olive or blue clay soil portions of a highly acidic nature (pH = 2.5 – 3.5, typically) found in some heterogeneous soils of certain small geographical regions necessitate precautionary measures for various pipe materials. In these regions, an asphalt coating or a select granular fill is sometimes required to prevent direct contact with the highly acidic clay portions.
- Severe abrasive conditions necessitate use of supplemental invert pavement.
- De-icing salts are normally not a problem. Under certain conditions salt concentration can build up and cause problems for various pipe materials. If water/soil testing indicates a problem, protective measures are available.