

ALUMINIZED STEEL TYPE 2

DURABILITY STANDARDS

Technical Bulletin

INCREASED SERVICE LIFE FOR CORRUGATED STEEL PIPE

Aluminized Type 2 meets durability requirements for most pipe applications in settings where the performance of other metallic pipe is limited.

ALUMINIZED TYPE 2 COATING

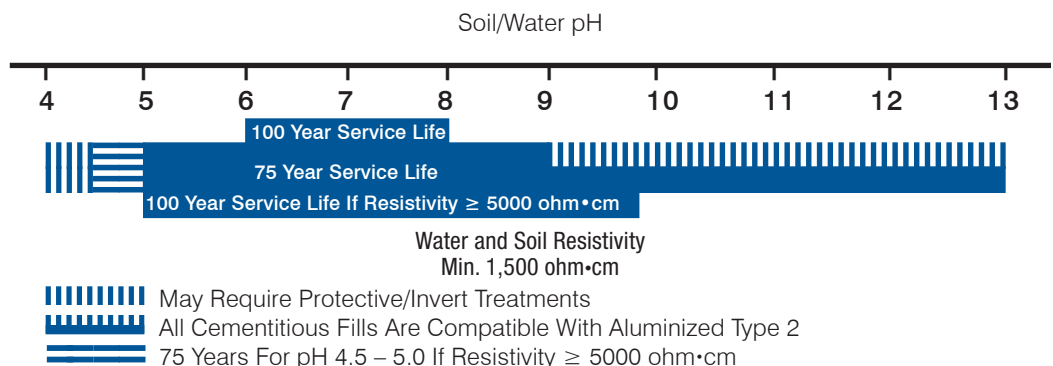
The duplex coating exhibits spontaneous, superior passive film protection in the aluminum layer. The aluminum-iron intermetallic alloy layer provides a second and major part of the coating's enhanced protection mechanism.

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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Product Description

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 CO₂ 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 a minimum of 1500 ohm·cm. Additional water/soil testing is advisable to determine suitability in marginal resistivities near 1500 ohm·cm.
- Resistance to dry climate soils down to a minimum of 1000 ohm·cm.
- 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 imported compliant backfill is 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 most pipe materials. If water/soil testing indicates a problem, protective measures are available.

About Cleveland-Cliffs Inc.

Cleveland-Cliffs is the largest flat-rolled steel producer in North America. Founded in 1847 as a mine operator, Cliffs also is the largest manufacturer of iron ore pellets in North America. The Company is vertically integrated from mined raw materials, direct reduced iron, and ferrous scrap to primary steelmaking and downstream finishing, stamping, tooling, and tubing. The Company serves a diverse range of markets due to its comprehensive offering of flat-rolled steel products and is the largest supplier of steel to the automotive industry in North America. The Company is headquartered in Cleveland, Ohio with mining, steel and downstream manufacturing operations located across the United States and in Canada. For more information, visit www.clevelandcliffs.com.



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