Pipe Fabrication and Corrosion Behavior

In the fabrication of corrugated metal pipe, some mechanical effects of the manufacturing process on the metallic coatings can be expected. The resultant potential impact on corrosion of the substrate must be addressed by the metallic coating. In the case of the Aluminized Steel Type 2 coating, the steel substrate is protected in service over the long term due to the electrochemical behavior of the bi-layer, duplex coating. The aluminum layer of the coating provides low-level galvanic protection that directly retards long-term substrate corrosion. This also modifies the corrosion process to produce a partially protective corrosion-product scale that hinders the advance of corrosion. Additionally, substrate corrosion is further retarded due to insulating films that form naturally on the Al and Al-Fe coating layers and suppress the electrochemical action that powers substrate corrosion. All of these electrochemical mechanisms combine to protect against corrosion problems.
**Product Description**

**PIPE WELD SEAMS AND RE-ROLLED ENDS**

The effectiveness of electrochemical corrosion protection for exposed steel substrate was demonstrated in field exposures. Weld seams exhibit good protection by the coating in extended field tests.

During pipe manufacturing, re-rolled ends show a few small spots of spalled coating around the pipe circumference. This is due to reverse double bending of pipe material at these spots. Coating electrochemical behavior provides corrosion protection at re-rolled ends, as it does at weld seams. Actually, there is further protection in that the spots retain a skin of protective intermetallic alloy layer. Re-rolled ends can be painted for cosmetic purposes. The full extent of substrate protection was demonstrated by the minimal corrosion at original cut edges on riveted pipe exposed in the field for times up to 50 years.

**LOCKSEAMS AND SPIRAL RIBS**

Minor crazing of the coating can occur at lockseams on helically corrugated pipe and also at the ribs of the spiral rib product. The substrate is exposed at coating fissures but is protected by coating galvanic interaction. Additionally, on lockseams and ribs the coating electrochemical factors quickly render the initial substrate corrosion product insoluble and adherent, which causes plugging and sealing of fissures. Thus coating continuity is restored by fissure plugging after a short time in service. Some early, temporary staining accompanies the plugging process. This is simply indicative of the plugging process at work.

The effectiveness of the fissure-plugging tendency was demonstrated in 30 and 50 year field investigations of corrugated and bolted pipe. Plugging is an added benefit of the tendency of the Aluminized Type 2 steel substrate to form protective corrosion product scales under the influence of galvanic interaction.

AK Steel is a leading producer of flat rolled carbon, stainless and electrical steel products, primarily for the automotive, infrastructure and manufacturing, including electrical power, and distributors and converters markets. Through its subsidiaries, the company also provides customer solutions with carbon and stainless steel tubing products, die design and tooling, and hot- and cold-stamped components. Headquartered in West Chester, Ohio (Greater Cincinnati), the company has approximately 9,500 employees at manufacturing operations in the United States, Canada and Mexico, and facilities in Western Europe. Additional information about AK Steel is available at www.aksteel.com.

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