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Item No. 21077

Standard
Recommended Practice

Galvanic Anode Cathodic Protection of Internal Submerged Surfaces of Steel Water Storage Tanks

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Foreword

The purpose of this standard recommended practice is to present the procedures and practices used in providing galvanic anode cathodic protection (CP) to the normally submerged steel surfaces inside water storage tanks. This standard provides owners, engineers, and contractors with specific guidelines for the design and installation of these CP systems; methods for determining the effectiveness of these systems; and recommendations for the operation and maintenance of these systems. This standard is applicable to water storage tanks of various sizes used in municipal water supply and fire protection, including elevated tanks and flat-bottom tanks at ground level. Although the general principles outlined in this standard are applicable to all such tanks, the galvanic anode CP system described in this standard may not be practical for relatively large tanks.

This standard was originally prepared in 1996 by NACE Task Group (TG) T-7L-1, a component of Unit Committee T-7L on Cathodic Protection. It was revised in 2004 by TG 284 on Cathodic Protection, Galvanic Anode for Internal Submerged Surfaces of Steel Water Storage Tanks—Review of NACE Standard RP0196, "Galvanic Anode Cathodic Protection of Internal Submerged Surfaces of Steel Water Storage Tanks." TG 284 is administered by Specific Technology Group (STG) 05 on Cathodic/Anodic Protection. It is sponsored by STG 11 on Water Treatment and STG 35 on Pipelines, Tanks, and Well Casings. This standard is issued by NACE under the auspices of STG 05.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual*, 4th ed., Paragraph 7.4.1.9. *Shall* and *must* are used to state mandatory requirements. The term *should* is used to state something good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

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Contents

Section 1: General

1.1 This standard presents recommended procedures for using galvanic anodes to apply CP to the internal submerged surfaces of steel tanks used for the storage of potable and nonpotable fresh waters.

1.2 It is recognized that impressed current systems are used extensively for CP of the internal surfaces of water storage tanks; however, this standard addresses only galvanic anode systems. For a description of impressed CP current systems, refer to NACE Standard RP0388.[1]

1.3 Natural waters, as used in this standard, include both potable and nonpotable fresh water—including reclaimed water—associated with water supply, irrigation, and fire protection systems.

1.4 The ground level and elevated storage tanks considered in this standard are of welded, bolted, or riveted-steel construction, and include many shapes and sizes.

1.5 CP as described in this standard may be used alone to control corrosion of submerged steel surfaces or may be used as a complement to the protection provided by protective coatings or other procedures.[2] CP cannot protect surfaces that are not submerged; these surfaces must be protected by coatings alone.

1.6 CP may be installed to control corrosion in both newly constructed and existing tanks. When CP is used on existing tanks, it may be necessary to drain the tank during installation.

1.7 It is recognized that the tanks under consideration are often associated with potable water and fire protection systems that may be subject to public health and safety regulations.[3] This standard shall not infringe on those regulations. Proper disinfection of the tanks may be required after installation.

1.8 The provisions of this standard should be applied under the direction of a competent corrosion engineer. The term “corrosion engineer,” as used in this standard, refers to a person who, by reason of knowledge of the physical sciences and the principles of engineering and mathematics as acquired by professional education and related practical experience, is qualified to practice corrosion control, including CP, for water storage tanks. Such persons may be Registered Professional Engineers or persons recognized as being qualified or certified as Corrosion Specialists or CP Specialists by NACE if their professional activities include suitable experience in corrosion control and CP.

1.9 This standard may not be applicable in all situations. The corrosion engineer may consider alternative corrosion control methods.

Section 2: Definitions

Anode: The electrode of an electrochemical cell at which oxidation occurs. Electrons flow away from the anode in the external circuit. Corrosion usually occurs and metal ions enter the solution at the anode.

Anode Circuit: The path from a single anode or multiple anodes connected through a shunt, a resistor, and the connection to the tank.

Calcareous Coating: A layer consisting of calcium carbonate and other salts deposited on the surface. When the surface is cathodically polarized as in CP, this layer is the result of the increased pH adjacent to the protected surface.

Cathode: The electrode of an electrochemical cell at which reduction is the principal reaction. Electrons flow toward the cathode in the external circuit.

Cathodic Protection (CP): A technique to reduce the corrosion of a metal surface by making that surface the cathode of an electrochemical cell.

Cathodic Protection (CP) Coupon: A metal specimen made of similar material as the structure under investigation, which is connected to the external surface of, and immersed in, the electrolyte adjacent to the structure being protected by CP.

Coating: A liquid, liquefiable, or mastic composition that, after application to a surface, is converted into a solid protective, decorative, or functional adherent film.

Conductivity: (1) A measure of the ability of a material to conduct an electric charge. It is the reciprocal of resistivity. (2) The current transferred across a material (e.g., coating) per unit potential gradient.

Corrosion: The deterioration of a material, usually a metal, that results from a reaction with its environment.

Current Density: The current to or from a unit area of an electrode surface.