Standard
Test Method

Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Tank Systems

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Foreword

This NACE International standard test method provides descriptions of the measurement techniques and cautionary measures most commonly used on underground tanks to determine whether a specific criterion has been complied with at a test site. This standard includes only those measurement techniques that relate to the criteria or special conditions contained in NACE Standard RP0285.[1]

The measurement techniques described in this standard require that measurements be made in the field. Because these measurements are obtained under widely varying circumstances of field conditions and tank design, this standard is not as prescriptive as those NACE standard test methods that use laboratory measurements. Instead, this standard gives the user latitude to make testing decisions in the field based on the technical facts available.

This standard is intended for use by corrosion-control personnel concerned with the corrosion of buried, underground, or submerged tank systems or similar structures, including those used to contain oil, gas, and water. It was prepared by Task Group 209 (formerly Work Group T-10A-14b, a subcommittee of Task Group T-10A-14 on Test Methods and Measurement Techniques Related to Cathodic Protection Criteria). Task Group 209 is administered by Specific Technology Group (STG) 35 on Pipelines, Tanks, and Well Casings, and is sponsored by STG 05 on Cathodic/Anodic Protection. The measurement techniques provided in this standard were compiled from information submitted by committee members and others with expertise on the subject. Variations or other techniques not included may be equally effective. This standard is issued by NACE under the auspices of STG 35 on Pipelines, Tanks, and Well Casings.

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

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Section 1: General

1.1 This standard provides procedures to test compliance with the cathodic protection (CP) criteria presented in NACE Standard RP0285[1] on buried or submerged steel tank systems, including galvanized steel components. Included are instrumentation and general measurement guidelines, procedures for three commonly used testing methods, recommendations on taking voltage drops into consideration and preventing incorrect data from being collected and used, and procedures for testing for electrical continuity between tanks and other metallic equipment. A method of testing cathodic protection using coupons is described in Appendix A.

1.2 The provisions of this test method shall be applied by personnel who have acquired, by education and related practical experience, knowledge of the principles of cathodic protection of buried and submerged metallic tank systems.

1.3 Sometimes a given test technique is ineffective or only partially effective. Conditions that may cause this to occur include elevated temperatures, disbonded dielectric or thermally insulating coatings, shielding, bacterial attack, and unusual contaminants in the electrolyte.

1.4 Deviation from this test method may be warranted in specific situations if corrosion-control personnel can demonstrate that adequate cathodic protection has been achieved.

Section 2: Definitions[1]

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.

Cable: A bound or sheathed group of insulated conductors.

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

Cathodic Disbondment: The destruction of adhesion between a coating and the coated surface caused by products of a cathodic reaction.

Cathodic Polarization: The change of electrode potential in the active (negative) direction caused by current across the electrode/electrolyte interface. See also *Polarization.*

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

Cathodic Protection Coupon: A metal sample representing the tank at the test site, used for cathodic protection testing, and having a chemical composition approximating that of the tank. The coupon size should be small to avoid excessive current drain on the cathodic protection system.

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

Conductor: A bare or insulated material suitable for carrying electric current.

Contact Resistance: The resistance in the measurement circuit present in the interface between a reference electrode and an electrolyte.

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

Corrosion Potential (E_{corr}): The potential of a corroding surface in an electrolyte relative to a reference electrode under open-circuit conditions (also known as rest potential, open-circuit potential, or freely corroding potential).

Criterion: A standard for assessment of the effectiveness of a cathodic protection system.

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

Electrical Isolation: The condition of being electrically separated from other metallic structures or the environment.

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[1] Definitions in this section reflect common usage among practicing corrosion-control personnel and apply specifically to how terms are used in this standard. As much as possible, these definitions are in accord with those in the "NACE International Glossary of Corrosion-Related Terms."