Standard
Test Method

Measurement Techniques Related to Criteria for Cathodic Protection of Underground Storage Tank Systems

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Foreword

This NACE International standard test method provides descriptions of the measurement techniques most commonly used on underground storage tank (UST) systems to determine whether a specific cathodic protection (CP) 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 SP0285.[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 external corrosion of UST systems or similar structures, including those used to contain oil, gas, and water.

This standard was prepared by Task Group (TG) 209 (formerly Work Group T-10A-14b), and was revised by TG 364, "Testing of Cathodic Protection Systems of Underground Storage Tanks," in 2012. TG 364 is administered by Specific Technology Group (STG) 35, "Pipelines, Tanks, and Well Casings," and is sponsored by STG 05, "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.

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.* The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term *should* is used to state something good and is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

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Section 1: General

1.1 This standard provides procedures to test compliance with the CP criteria presented in NACE SP0285[1] on UST systems. Included are instrumentation and general measurement guidelines, procedures for three commonly used test methods, practices for taking voltage drops into consideration and preventing incorrect data from being collected and used, and procedures for testing for electrical continuity between USTs and other metallic equipment. The use of CP coupons to determine the adequacy of CP is described in Appendix A (Nonmandatory).

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 CP of UST systems. Such individuals, at a minimum, must either be NACE International certified CP Testers, NACE International CP Specialists, or individuals qualified by professional education and related practical experience.

1.3 A given test technique may be 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 CP has been achieved.

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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. It is usually the electrode where corrosion occurs and metal ions enter solution.)

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 Polarization: (1) The change of electrode potential caused by a cathodic current flowing across the electrode/electrolyte interface; (2) a forced active (negative) shift in electrode potential. (See *Polarization*.)

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

Coating: (1) A liquid, liquefiable, or mastic composition that, after application to a surface, is converted into a solid protective, decorative, or functional adherent film; (2) (in a more general sense) a thin layer of solid material on a surface that provides improved protective, decorative, or functional properties.

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 chemical or electrochemical reaction with its environment.

Corrosion Potential (E_{corr}): The potential of a corroding surface in an electrolyte measured under open-circuit conditions relative to a reference electrode. (Also known as *Electrochemical Corrosion Potential, Free Corrosion Potential,* and *Open-Circuit Potential.*)

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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 accordance with those in NACE/ASTM G 193 (latest revision).[2]