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Standard Practice

Impressed Current Cathodic Protection of Internal Submerged Surfaces of Carbon Steel Water Storage Tanks

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Foreword

The purpose of this NACE standard is to present the recommended practices for providing impressed current cathodic protection (CP) to the normally submerged steel surfaces inside water storage tanks. It contains recommendations for the design and installation of these cathodic protection systems and methods for determining the effectiveness of these systems. Recommendations for the operation and maintenance of both automatic and manual systems are provided. This standard is applicable to relatively large water storage tanks used in municipal water supply and fire protection, including elevated and on-grade tanks. Although the general principles outlined in this standard are applicable to all such tanks, the impressed current cathodic protection system described in this standard may not be practical for smaller tanks. This standard is intended for use by engineers, water utilities, tank erectors and other contractors, and owner operators of steel water storage tanks.

This standard was originally prepared in 1988 by Task Group T-7L-1, a component of Unit Committee T-7L, “Cathodic Protection.” The task group was composed of corrosion engineers and others experienced in the design, installation, and maintenance of impressed current cathodic protection systems for water storage tanks. It was reaffirmed by T-7L in 1990 and 1995, revised in 2001 by Task Group (TG) 167 (formerly T-7L-14), and reaffirmed by Specific Technology Group (STG) 05 in 2007 and 2014. TG 167 is administered by STG 05, “Cathodic/Anodic Protection.” This standard is issued by NACE International 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.* 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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Contents

Section 1: General

1.1 This standard presents recommended practices for applying impressed current cathodic protection to the internal submerged surfaces of steel tanks used for the storage of natural waters. These tanks may be provided with an interior barrier coating. This standard is not intended for use with metallic coatings or linings, such as zinc or aluminum.

1.2 It is recognized that galvanic anode systems can, at times, be used for cathodic protection of the internal surfaces of water storage tanks;[(1)] however, this standard addresses only impressed current systems.

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

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 Cathodic protection, as described in this standard, may be used alone to control corrosion of submerged steel surfaces or used as a complement to the protection afforded by protective coatings. Cathodic protection cannot protect surfaces that are not submerged. Non-submerged surfaces must be protected by coatings alone. Cathodic protection does not reverse structural damage already caused by corrosion.

1.6 Cathodic protection may be installed to control corrosion in both newly constructed and existing tanks. When cathodic protection is used on existing tanks, it is not necessary to prepare the surfaces to be protected; however, 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, which may be subject to public health and safety regulations. This standard should not infringe upon those regulations. Proper disinfection of the tanks may be required after installation. Any applicable regulations such as those from the U.S. Environmental Protection Agency (EPA)[(2)] and ANSI[(3)]/NSF[(4)]-61[2] should be checked. In the United States, all materials in contact with potable water or exposed to the interior of potable water tanks must be classified in accordance with ANSI/NSF-61.

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 and cathodic protection for water storage tanks. Such persons may be registered professional engineers or persons certified by NACE International as Cathodic Protection or Corrosion Specialists, if their professional activities include suitable experience in corrosion control and cathodic protection.

1.9 This standard may not be applicable in all situations. The responsible corrosion engineer may consider alternate 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. It is usually the electrode where corrosion occurs and metal ions enter solution.)

Calcareous Coating: A layer consisting of calcium carbonate and other salts deposited on the surface. When the surface is cathodically polarized as in cathodic protection, 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 Disbondment: The destruction of adhesion between a coating and the coated surface caused by products of a cathodic reaction.

(1) Information regarding galvanic cathodic protection of water storage tanks may be found in NACE SP0196.[1]
(2) U.S. Environmental Protection Agency (EPA), 401 M Street SW, Washington, DC 20460.
(3) American National Standards Institute (ANSI), 25 W 43rd St., Fourth Floor, New York, NY 10036.
(4) NSF International, P.O. Box 130140, Ann Arbor, MI 48113-0140.