



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

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ABSTRACT

Presents procedures and practices used in providing impressed current cathodic protection to the normally submerged steel surfaces inside water storage tanks. Provides recommendations for the design and installation of cathodic protection systems and methods for determining the effectiveness of these systems.

KEYWORDS

anode, cathodic protection, impressed current cathodic protection, ICCP, coatings, reference electrode, storage tanks, water storage tanks, TG 167

Foreword

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.

The purpose of this NACE standard is to present the recommended practices for providing impressed current cathodic protection (ICCP) to the submerged steel surfaces inside water storage tanks. It contains recommendations for the design and installation of these cathodic protection (CP) 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 ICCP system described in this standard may not be practical for smaller tanks. It may be more economical to protect these tanks with galvanic anode cathodic protection. 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), then titled “Revision of NACE SP0388-1995,” reaffirmed by Specific Technology Group (STG) 05 “Cathodic/Anodic Protection” in 2007 and 2014, and revised by TG 167, “ICCP of Internal Submerged Surfaces of Steel Water Storage Tanks,” in 2018. TG 167 is administered by STG 05. This standard is issued by NACE International under the auspices of STG 05.

NACE International Standard Practice (SP0388-2018)

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Section 1: General

- 1.1 This standard presents recommended practices for applying ICCP to the internal submerged surfaces of steel tanks used for the storage of potable and reclaimed water, drinking water, irrigation water and fire protection water (natural waters). These tanks may be provided with an interior barrier coating. Appendix A (non-mandatory) provides guidance for the use of impressed current cathodic protection for the internal surfaces of tanks and vessels containing other waters.
- 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 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.
- 1.4 Cathodic protection, as described in this standard, may be used alone to control corrosion of submerged steel surfaces or used in conjunction with protective coatings compatible with cathodic protection. 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.
- 1.5 Cathodic protection may be installed to control corrosion in both newly constructed and existing tanks. When installing cathodic protection 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.
- 1.6 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⁾-61² 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. In other countries, ensure conformance with applicable standards and regulations.
- 1.7 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.
- 1.8 This standard may not be applicable in all situations. The responsible corrosion engineer may consider alternate corrosion control methods.

⁽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, 789 N. Dixboro Road, Ann Arbor, MI 48105.