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Standard Practice

Corrosion Control of Submerged Areas of Permanently Installed Steel Offshore Structures Associated with Petroleum Production

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NACE International
1440 South Creek Dr.
Houston, TX 77084-4906
+1 (281)228-6200

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Foreword

Offshore structures represent large capital investments. Structures are being placed in offshore areas worldwide and are being designed to withstand forces resulting from hurricanes, arctic storms, tidal currents, earthquakes, and ice floes. Moreover, platform structures are currently being placed in deeper waters and, therefore, have become larger, more complex, and more expensive. Control of corrosion on structures is necessary for the economic development of oil and gas production, to provide safe support for working and living areas, and to avoid potential harm to the environment. For the purposes of this standard, offshore structures are considered to be stationary structures (platforms or subsea facilities) that are fixed to the sea floor by gravity, pilings, or mooring cables.

This NACE standard is intended for use by corrosion control personnel concerned with the corrosion of steel fixed offshore platforms associated with petroleum production. It outlines materials, practices, and methods for control of corrosion for steel fixed structures associated with petroleum production located in offshore areas. The purpose is to facilitate more effective corrosion protection of structures by the presentation of reliable information. Corrosion on offshore structures can be divided into three major areas: the submerged zone, the splash zone, and the atmospheric zone. The submerged zone also includes that portion of the structure below the mudline. This standard does not include procedures for the control of internal corrosion of wells, piping, and associated equipment that may be in use on the structure, but does include external protection of these items in the atmospheric zone on the structure.

This standard was originally issued in 1976 and revised in 1983 by Task Group (TG) T-1-2 on North Sea Corrosion Problems. It was revised in 1994 by TG T-1-5, and in 2003 and 2007 by TG 170 on Offshore Steel Platforms—Corrosion Control: Review of NACE Standard RP0176, which is administered by Specific Technology Group (STG) 30 on Oil and Gas Production—Cathodic Protection. All editions of this standard prior to 2007 included a section on coatings on offshore platforms. However, it was determined this subject would be more appropriately covered in another standard. Therefore, NACE TG 313 was formed to develop the standard on coatings.[1] TG 170 is sponsored by STG 02 on Protective Coatings and Linings—Atmospheric and STG 05 on Cathodic/Anodic Protection. This standard is issued by NACE under the auspices of STG 30.

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 considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

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Section 1: General

1.1 This standard provides guidelines for establishing minimum requirements for the control of corrosion on steel fixed offshore structures associated with petroleum production, and on the external portions of associated oil and gas handling equipment. Fixed structures include platforms, tension leg platforms (TLP), and subsea templates. This standard does not include guidelines for corrosion control of temporarily moored mobile vessels used in petroleum production.

1.2 For this standard, corrosion on structures is divided into three zones: the submerged, splash, and atmospheric zones. However, only the submerged zone is addressed in this standard. The atmospheric and splash zones are addressed in a standard that is currently a work in progress by NACE TG 313.

1.3 This standard does not designate guidelines for every specific situation because of the complexity of environmental conditions. In many instances, the problem may have several solutions and, when appropriate, meritorious alternative solutions have been included.

1.4 This standard does not include guidelines for corrosion control of the internal portions of wells, piping, and associated equipment that may be installed on or attached to structures.

1.5 Underwater pipelines and pipeline risers are specifically excluded from this standard.

1.6 Alternative methods are acceptable to achieve a protected potential over an adequate design life; however, deviation should be made only if, in the opinion of a competent corrosion specialist, the objectives expressed in the standard have been achieved.

Section 2: Definitions

NOTE: Additional definitions for cathodic protection (CP) and coatings technology may be found in NACE SP0169,[2] the *NACE Corrosion Engineer's Reference Book,*[3] and the NACE International *Glossary of Corrosion-Related Terms.*[4]

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.

Atmospheric Zone: The zone of the structure that extends upward from the splash zone and is exposed to sun, wind, spray, and rain.

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

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

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

Corrosion Specialist: A person who, by reason of education and experience, is qualified to evaluate and solve problems related to the corrosion of materials. In this standard, corrosion specialist refers to one who is qualified in the control of corrosion in marine environments.

Current: (1) A flow of electric charge. (2) The amount of electric charge flowing past a specified circuit point per unit time, measured in the direction of net transport of positive charges. (In a metallic conductor, this is the opposite direction of the electron flow.)

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

Depolarization: The removal of factors resisting the current in an electrochemical cell.

Dielectric Shield: An electrically nonconductive material, such as a coating, sheet, or pipe, that is placed between an anode and an adjacent cathode, usually on the cathode, to improve current distribution in a cathodic protection system.