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Standard
Recommended Practice

Design, Installation, Operation, and Maintenance of Impressed Current Deep Groundbeds

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Foreword

The purpose of this NACE International standard recommended practice is to present procedures and practices for the design, installation, operation, and maintenance of deep groundbeds used for the control of external corrosion of underground or submerged metallic structures by impressed current cathodic protection. It is intended to be used in conjunction with NACE standards RP0169[1] and RP0177.[2] This standard is intended to be used by corrosion engineers, corrosion consultants, representatives from manufacturers, and others concerned with corrosion control of underground structures.

This standard was originally prepared in 1972 by NACE Task Group T-10A-7, a component of Unit Committee T-10A on Cathodic Protection and was revised in 1985, 1995, and 2001. This 2001 revision was prepared by NACE Task Group 021 on Installation Methods for Deep Anodes. This Task Group is administered by Specific Technology Group (STG) 05 on Cathodic/Anodic Protection and sponsored by STG 35 on Pipelines, Tanks, and Well Casings. Task Group 021 is composed of corrosion engineers from oil and gas transmission companies, gas distribution companies, power companies, and communications companies as well as corrosion consultants, representatives from manufacturers, and others concerned with corrosion control of underground structures. This standard is issued by NACE 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*, 4th ed., Paragraph 7.4.1.9. *Shall* and *must* are used to state mandatory requirements. *Should* is used to state something considered good and is recommended but is not mandatory. *May* is used to state something considered optional.

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Section 1: General

1.1 This standard presents acceptable methods for the design, installation, operation, and maintenance of deep groundbeds that discharge impressed current for cathodic protection of underground or submerged metallic structures.

1.2 This standard is based on the best available technology and methods that have been used successfully by experienced corrosion engineers.

1.3 This standard does not designate methods for every specific situation because the complexity of some environmental conditions precludes standardizing all design and installation procedures.

1.4 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 acquired by education and related practical experience, is qualified to engage in the practice of corrosion control of underground or submerged structures.

1.5 Other types of groundbeds should be investigated before the decision is made to use a deep groundbed, because more economical alternatives may be available.

1.6 Codes, laws, and regulations in a local geographic area may require supplements to or deviation from this standard.

1.7 Necessary precautions must be taken to prevent damage to existing underground structures and deleterious modification of ground water quality.

1.8 Adequate records containing information showing site right-of-way, installation procedures, operation data, maintenance, repair, and test records should be maintained.

Section 2: Definitions

Abandonment: The discontinued use of a deep anode system.

Active Zone: The segment of the deep anode system that is designed to discharge current. In this standard, the active zone refers to that length of deep groundbed that is made up of carbonaceous backfill. In an open-hole installation, the active zone is the aqueous electrolyte.

Annular Space: The space between the well casing and the well bore or the space between two or more strings of well casing.

Anode: The electrode of an electrochemical cell at which oxidation occurs. In this standard, the anode is the positive terminal of the impressed electrical system from which current is discharged.

Anode Cap: An electrical insulating material placed over the end of the anode at the lead wire connection.

Anode Connection Encapsulation: An electrical insulating material placed over the end of the anode or within the interior of the anode body to maintain the electrical integrity of the anode-to-lead-wire connection. For the purposes of this standard, it is understood that some internal anode-to-lead-wire connections do not require the addition of electrical insulating encapsulation.

Aquifer: A water-bearing stratum of permeable rock, sand, or gravel.

Backfill: Material placed in a hole to fill the space around the anodes, vent pipe, and buried components of a cathodic protection system.

Blowdown: Injection of air or water under high pressure through a tube to the anode area for the purpose of purging the annular space and possibly correcting high resistance caused by gas blockage.

Bore Hole: A hole drilled into the earth for the installation of a deep groundbed system.

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

Closed Hole: A groundbed installation in which the anodes have been surrounded by backfill. Typically, in a closed-hole installation, the backfill consists of a conducting carbonaceous backfill around the anodes, and above the active zone is native soil sealing material or other suitable material. Alternately, the top of the anode hole may be sealed with a plastic casing from the surface to the top of the anode backfill and left open.

Conductive Carbon Seal: Conductive seal (nonporous conductive material).

Continuous Anode: A single anode with no electrical discontinuities. For the purposes of this standard, the active zone of the groundbed may be considered a conducting continuous anode.