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Standard
Test Method

Evaluating the Accuracy of Field-Grade Reference Electrodes

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Foreword

This standard describes a test method for evaluating the accuracy of field-grade reference electrodes used for obtaining field measurement of structure-to-electrolyte potentials. The test method described in this standard is a relatively quick, simple, and inexpensive way to evaluate the accuracy of a field-grade reference electrode. The test method measures the potential difference between the field-grade electrode and a master reference electrode.

Field-grade reference electrodes are subject to contamination from repeated exposure to electrolytes of varying chemical composition. Contamination can alter the open-circuit potential of the field-grade reference electrode and thus alter the accuracy of structure-to-electrolyte potential measurements in the field.

This standard test method is intended for use by consultants, suppliers, and users of cathodic protection systems to ensure the accuracy of field-grade reference electrodes.

This standard was prepared Task Group (TG) 436, "Electrodes, Field-Grade: Test Methods," which is administered by Specific Technology Group (STG) 62, "Corrosion Monitoring and Measurement—Science and Engineering Applications," and sponsored by STG 05, "Cathodic/Anodic Protection," STG 30, "Oil and Gas Production—Cathodic Protection," and STG 35, "Pipelines, Tanks, and Well Casings." It is published by NACE International under the auspices of STG 62.

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 describes a test method for evaluating the accuracy of copper/copper sulfate and silver/silver chloride reference electrodes used in the field for measurement of structure-to-electrolyte potentials.

1.2 This standard does not apply to the evaluation of reference electrodes used in laboratory work.

1.3 This standard should be used in conjunction with the practices described in the latest revision of NACE Standard TM0101 and NACE Standard TM0497,[2] when appropriate.

Section 2: Definitions

Reference Electrode: An electrode having a stable and reproducible potential, which is used in the measurement of other electrode potentials.

Structure-to-Electrolyte Potential: The potential difference between the surface of a buried or submerged metallic structure and the electrolyte that is measured with reference to an electrode in contact with the electrolyte.

Master Reference Electrode: An electrode of known accuracy that is used in the evaluation of the accuracy of reference electrodes used in field work.

Open Silver/Silver Chloride Electrode: An electrode in which the Ag/AgCl element is in direct contact with the surrounding electrolyte; these electrodes are usually used in full-strength seawater.

Section 3: Test Equipment and Test Solution

3.1 The intent of the following procedure is to establish a low-resistance conductive (ionic) path, free of junction potentials, between the Master Electrode and the the field-grade reference electrode to be tested. Experience has shown that the following test arrangement will accomplish this. Deviations from the arrangement in Section 3 and the procedure in Section 4 are allowed provided that they do not affect the test results.

3.2 Test Equipment

3.2.1 The test equipment used to evaluate the accuracy of the field-grade reference electrode shall be as follows:

3.2.1.1 Voltmeter with a minimum of 10 MΩ of input resistance and appropriate lead wires.

3.2.1.2 A suitably sized nonmetallic container.

3.2.1.3 A sponge large enough to contact both electrodes simultaneously (optional).

3.2.1.4 Field-grade reference electrode to be evaluated in this test.

3.2.1.5 Master reference electrode, which shall be a new or newly rebuilt reference electrode that is the same type as the test reference electrode.

3.2.1.5.1 The electrolyte type and concentration of the master reference electrode shall be the same as the test reference electrode.

3.2.1.5.2 Newly rebuilt reference electrodes shall be rebuilt in accordance with the manufacturer's published instructions.