Designation: G 51 – 95 (Reapproved 2000)

Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing[1]

This standard is issued under the fixed designation G 51; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a procedure for determining the pH of a soil in corrosion testing. The principle use of the test is to supplement soil resistivity measurements and thereby identify conditions under which the corrosion of metals in soil may be accentuated (see G 57 – 78 (1984)).

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods[2]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[2]

G 57 Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method[3]

3. Significance and Use

3.1 Information on pH of soil is used as an aid in evaluating the corrosivity of a soil environment. Some metals are more sensitive to the pH of their environment than others, and information on the stability of a metal as a function of pH and potential is available in the literature.[4]

4. Apparatus

4.1 *pH Meters*—A portable, battery-powered pH meter is necessary for field measurements. Most instruments can also function as a high-impedance voltmeter. An LCD display is preferred for its readability in a bright, outdoor environment.

4.2 *Calomel and Glass Electrodes*:

4.2.1 Use a saturated calomel reference electrode or its equivalent in the pH determination. A few crystals of solid potassium chloride should always be present within the chamber surrounding the calomel to assure that the solution is saturated under the conditions of use. The design of the electrode must permit the formation of a fresh liquid junction between the solution of potassium chloride and the buffer or test soil for each test and allow traces of soil to be readily removed by washing.

4.2.2 A glass electrode of rugged construction is required. The performance of the glass electrode is satisfactory if it furnishes the correct pH value (±0.1 pH unit) for standard buffered solutions.

4.2.3 A combination electrode consisting of a saturated calomel reference electrode and a glass electrode (4.2.1 and 4.2.2) combined as a single electrode is acceptable. However, the requirements outlined above are equally applicable to the electrodes used in this combination unit.

4.3 *Subsurface Probe*—When pH measurements below the surface of the soil are required, it is necessary to use a probe of suitable length which will allow measurements to be made at the depth of interest. This probe consists of a glass electrode or a combination electrode in a rubber housing at the end of a plastic tube. One type of probe is illustrated in Fig. 1.

4.4 *Soil Thermometer*—Some pH electrodes have temperature compensation built in as part of the pH electrode, but most do not (see manufacturers' specifications). A thermometer of rugged construction is required for soil use, and a stainless steel sheathed thermometer is preferred. Metal sheathed thermometers come in different lengths, and a length appropriate for the depth of interest should be chosen.

5. Reagents and Materials

5.1 During the calibration procedure for the pH meter, standard buffered solutions of known pH are necessary. These solutions, or tablets to make up these solutions, can be purchased from chemical supply companies or pH equipment manufacturers.

6. Sampling

6.1 By the nature of the measurement, pH is determined for a small volume of soil at each reading, and it is important that at least three measurements at different locations be made and

[1] This test method is under the jurisdiction of ASTM Committee G-1 on Corrosion of Metals, and is the direct responsibility of Subcommittee G01.10 on Corrosion in Soils.

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

[3] *Annual Book of ASTM Standards*, Vol 03.02.

[4] Pourbaix, M., "Atlas of Electrochemical Equilibria in Aqueous Solutions," Pergamon Press, 1966.