

adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.4 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~~ safety, health, and health environmental practices and determine the applicability of regulatory limitations prior to use.

1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D1193 Specification for Reagent Water](#)

[D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)

[D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing](#)

[D4972 Test Methods for pH of Soils](#)

[D6026 Practice for Using Significant Digits and Data Records in Geotechnical Data](#)

[G51 Test Method for Measuring pH of Soil for Use in Corrosion Testing](#)

3. Terminology

3.1 Definitions:

3.1.1 For definitions of common technical terms used in this standard, refer to Terminology [D653](#).

4. Summary of Test Method

~~4.1 The electrometric measurement of the pH of peat in suspensions of water and calcium chloride solutions is made with a potentiometer using an electrode system, calibrated with buffers of known pH. Two similar test specimens are obtained from a representative sample. One specimen is mixed with test water and one is mixed with a calcium chloride solution. They are then thoroughly stirred and both are allowed to stand for 30 min prior to testing with a pH meter.~~

5. Significance and Use

~~5.1 pH~~ The pH of peat is a useful variable in determining the solubility of minerals, the mobility of ions in the peat, and assessing the viability of the peat-plant environment. pH measurements are made in both test water and in a calcium chloride solution because the pH readings in test water can be modified by salts, such as fertilizer material, whereas the observed pH in calcium chloride solution is virtually independent of the initial amount of salts present in the soil/peat. pH values obtained in a calcium chloride solution are usually ~~run~~ about a 0.5 to 0.8 pH unit lower than measurements in test water due to release of more hydrogen ions by cation exchange. Both measurements are needed to fully define the character of the peat's pH.

~~5.2 All water used for this test method must be ASTM Type III or better. Type III water is defined by Specification~~ pH measurements are used in the agricultural, environmental, geotechnical, and natural resources fields. The pH of peat materials is helpful when evaluating ~~D1193~~ a peat as a topsoil or growing medium for plants.

NOTE 2—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice [D3740](#) are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice [D3740](#) does not in itself assure reliable results. Reliable results depend on many factors; Practice [D3740](#) provides a means of evaluating some of those factors.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

6. Interferences

6.1 A pH probe has possible interferences due to a suspension effect or sedimentation potential. This effect is the main reason Test Method **G51** cannot be used for general measurement of pH outside of that for corrosion analysis. Test Method **G51** measures pH, an aqueous parameter, without adding any aqueous phase to the soil. This lack of aqueous phase results in excessive soil particle-pH probe contact that overestimates the activity of the hydrogen ions in solution and is therefore unacceptable for general soil analysis.

6.2 The suspension effect can be mitigated by careful attention to inserting the probe into the aqueous phase of the slurry. The aqueous phase consists of the partially settled suspension

7. Apparatus

7.1 *pH Meter*—Potentiometer equipped with an electrode system, system with a readability to the nearest 0.1 pH unit or better and an accuracy of ± 0.1 pH unit or better. Follow the manufacturer's instructions for the pH meter used. A silver/silver chloride electrode system or similar is also acceptable.

7.2 *Balance*—Balances shall conform to the requirements of Guide **D4753**.

7.2.1 The balance shall have readability without estimation of 0.1 g or better. The capacity of this balance will need to exceed the mass of the container plus peat. In general, a balance with a minimum capacity of 100 g is sufficient.

7.3 *Specimen Mixing Container*—A glass beaker or equivalent inert container with enough capacity to hold the specimen and the test water or calcium chloride solution. Usually, a 100 mL glass beaker is large enough.

7.4 *Thermometric Device*—A thermometric device capable of measuring the temperature range within which the test is being performed readable to 0.5°C or better and having an accuracy of at least $\pm 0.5^\circ\text{C}$.

7.5 *Miscellaneous Items*—Items such as a wash/rinse bottle (squirt bottle), trays, spatulas, plastic or glass containers to hold reagents, and stirring rod may be useful.

8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents should conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.2 *Purity of Test Water*—Water shall be ASTM Type III—Type III water in accordance with Specification **D1193** or better. Use distilled/deionized water with a pH of not less than 6.5 nor more than 7.5, obtained by boiling distilled water between 6.5 and 7.5. De-air distilled/deionized test water by boiling for 15 min and cooling under carbon dioxide-free conditions; then seal the container during cooling until it has reached room temperature.

8.3 *Acid Potassium Phthalate Buffer Solution—Buffer Solutions—(0.05M)*—Dissolve 10.21 g (dried 1 h at $105 \pm 5^\circ\text{C}$) of potassium phthalate (NBS Standard Samples) in water and dilute to 1 L. Protect the solution against evaporation and contamination with molds. Replace the solution when mold is apparent. The effect of temperature is as follows: Buffer solutions are commercially available and providing they meet the purity of reagents as described above, they are an acceptable alternative to making buffer solutions. The following NIST traceable buffer solutions are typically needed: pH of 4.0 and 7.0. When

$^\circ\text{C}$	pH
5 to 24	4.00
25 to 33	4.01
34 to 37	4.02

making buffer solutions, refer to Annex A1 of Test Method **D4972** for the necessary chemicals and instructions.

8.4 *Calcium Chloride—Chloride Hydrate Stock Solution (1.0(CaCl₂·2H₂O)—O)*—Dissolve—Using the 1 L volumetric flask or

cylinder, dissolve 147 g of $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ in distilled water in a 1-L volumetric flask, cool, dilute to volume with distilled water, and mix test water and allow it to come to room temperature. Then, dilute by adding test water to the 1 L mark on the volumetric flask or cylinder. Mix the solution thoroughly. The molarity of this solution is 1.0 M (see [Note 3](#)).

8.5 Calcium Chloride Hydrate Solution (0.01M)—Dilute—Using the 2 L volumetric flask or cylinder, add 20.0 mL of stock 1.0M calcium chloride hydrate stock solution and CaCl₂ solution to 2 L with distilled water. The water by adding test water to the 2 L mark on the volumetric flask or cylinder. Mix the solution thoroughly. Verify the pH of this solution should be is between 5 and 6.5-7. The molarity of this solution is 0.01 M.

NOTE 3—It is acceptable to purchase the calcium chloride solutions provided they have the same molarity and pH as described above.

7.6 Phosphate Buffer Solution (0.025M)—Dissolve 3.40 g of KH_2PO_4 and 3.55 g of Na_2HPO_4 (NBS Standard Samples 186 I and H) in water and dilute to 1 L. Dry salts 2 h at 130°C before use. Effect of temperature on pH is:

°C	pH
0	6.98
10	6.92
20	6.88
30	6.85
40	6.83

9. Hazards

9.1 These solutions may cause eye and skin irritation. Care should be taken to avoid contact with skin and eyes. The use of latex or rubber gloves, and possibly safety glasses, when working with the solutions is recommended. Wipe up spills immediately. Rinse skin coming into contact with the solutions with water quickly.

10. Sampling and Test Specimens

10.1 Sampling—Obtain a representative sample from the bulk sample of peat. The moist mass of the representative sample must be large enough to yield two test specimens.

10.2 Test Specimens—Take care to make sure the test specimens accurately represent the sample. Obtain two similar specimens for testing. Typically a volume of 50 ± 5 mL is adequate, however 100 ± 5 mL may be necessary to allow for the pH electrode to be fully submerged. For each specimen, measure and record the volume of the specimen to the nearest 1 mL.

11. Calibration/Standardization of pH Meter

11.1 Calibrate—Before each use standardize the pH meter using the acid potassium phthalate buffer solutions in [8.3](#) or Annex A1 of Test Method [D4972](#) and phosphate buffer solutions. Suitable commercially available NIST traceable calibration solutions are also acceptable; for pH of 4.0 and 7.0 following the manufacturer’s instructions of the meter. Typically buffers of 4.0 and 7.0 are used to standardize the pH meter for most peat materials; however, in some applications buffers with lower pH values are needed. Follow the manufacturer’s instructions to adjust the pH meter accordingly. Record the date, time, and name or initials of person completing the standardization. If other data in association with the standardization is determined, record this information (see [Note 4](#)).

NOTE 4—Some pH meters output a linearity or other data to indicate the meter is working properly.

11.1.1 After every 10 specimens or at the end of testing, whichever occurs first, verify the pH meter’s standardization by inserting the probe into the pH 4.0 buffer solution. Read and record the pH value to the nearest 0.1 pH unit. If the value is not between 3.9 and 4.1, the pH meter must be re-standardized and the previous specimens must be retested to verify the results.

12. Procedure

12.1 pH in Distilled Water—Preparation—Weigh out about 3 g of air-dried peat or about the equivalent amount of moist material. Place into a 100-mL beaker. Add 50 mL of distilled water. Additional water may be needed. Place one of the test specimens in a specimen mixing container and add the same amount of test water in mL as the specimen volume in mL to make a 1 to 1 slurry. Place the other test specimen into a specimen mixing container and add the same amount of 0.01 M calcium chloride solution in