



Standard Guide for Measuring Matric Potential in Vadose Zone Using Tensiometers¹

This standard is issued under the fixed designation D3404; 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 guide covers the measurement of matric potential in the vadose zone using tensiometers. The theoretical and practical considerations pertaining to successful onsite use of commercial and fabricated tensiometers are described. Measurement theory and onsite objectives are used to develop guidelines for tensiometer selection, installation, and operation.

1.2 *Units*—The values stated in SI units are to be regarded as the standard.

1.3 *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. The use of a mercury manometer has inherent safety concerns regarding the handling of and potential exposure to mercury. Mercury metal vapor poisoning has long been recognized as a hazard. When using equipment containing or requiring the use of mercury, take all precautions and care to avoid the escape of mercury vapor or the spillage of mercury. Maximum limits for mercury concentrations in industrial atmospheres are set by governmental agencies. These limits are usually based upon recommendations made by the American Conference of Governmental Industrial Hygienists*. It is possible for the concentration of mercury vapors accompanying spills from broken thermometers, barometers, and other instruments using mercury to exceed these limits. Mercury, being a heavy liquid with high surface tension, readily disperses into small droplets after spills, lodging in cracks and crevices. Resultant increased surface area of the mercury due to this dispersion promotes higher mercury concentrations in the surrounding air. Mercury vapor concentrations are readily measured using commercially available instrumentation. To monitor environmental hazards it is advisable to make periodic checks for mercury content at*

*locations where mercury is exposed to the atmosphere. Use a spill kit for clean-up whenever spillage occurs. After spills and clean-up, make thorough checks for mercury vapor concentrations in the atmosphere. *In 1993, this Conference had headquarters located in Building D-7 at 6500 Glenway Drive, Cincinnati, Ohio 45211.*

1.4 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the 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.*

2. Referenced Documents

2.1 ASTM Standards:²

D653 Terminology Relating to Soil, Rock, and Contained Fluids

3. Terminology

3.1 For definitions of common technical terms in this standard, refer to Terminology **D653**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *accuracy of measurement*—the difference between the value of the measurement and the true value.

3.2.2 *hysteresis*—that part of inaccuracy attributable to the tendency of a measurement device to lag in its response to environmental changes; parameters affecting pressure-sensor hysteresis are temperature and measured pressure.

3.2.3 *precision (repeatability)*—the variability among numerous measurements of the same quantity.

¹ This guide is under the jurisdiction of ASTM Committee **D18** on Soil and Rock and is the direct responsibility of Subcommittee **D18.21** on Groundwater and Vadose Zone Investigations.

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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.