
Standard Method of Test for Measurements of Pore Pressures in Soils

AASHTO Designation: T 252-19 (2023)

Technically Revised: 2019

Reviewed but Not Updated: 2023

**Technical Subcommittee: 1b, Geotechnical Exploration,
Instrumentation, Stabilization, and Field Testing**



**American Association of State Highway and Transportation Officials
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INTRODUCTION

The principal reasons for measuring pore pressures in highway construction are:

1. To monitor strength increases during construction;
2. To estimate remaining settlements after construction; and
3. To determine existing pore pressures in landslides.

This method consists of installing the pore water pressure measuring device in a soil layer at a point determined by detailed knowledge of the field conditions and theoretical evaluation of the need required. Pore pressure measurement may be made by determining the total pore pressure at the point or determining the differential pore pressure at that point relative to the surrounding normal groundwater table. The data are usually reduced to “excess” pore pressure, which is the difference between the measured pore pressure and the “normal” pore pressure under the general groundwater table for the area at the time of reading.

Interpretation of pore pressure measurements in the field are complicated by the variability both vertically and horizontally in the soils. Therefore, interpretation of any pore pressure measurement can be misleading if the complete soil profile, loading history, and detailed soil parameters are not adequately known.

1. SCOPE

- 1.1. This method covers procedures for determining field pore pressure measurements in natural soils.
 - 1.1.1. This does not include methods of pore pressure measurement in the laboratory or field installations in dams.
- 1.2. The values stated in SI units are to be regarded as the standard.
- 1.3. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENT

- 2.1. AASHTO Standard:

3. APPARATUS

3.1. *Open System*—The following equipment may be used to obtain pore pressure in soils of relatively high permeability (Note 1):

Note 1—This equipment is also satisfactory for low-permeability soils.

3.1.1. A simple open observation well consisting of an open hole supported by plastic or metal casing, if necessary.

3.1.2. A standard well point installation that consists of a screened well point on the end of standard pipe. Various screen lengths and openings are available for use in different situations.

3.1.3. The open well Casagrande-type (Hydraulic) piezometer that consists of a porous tip connected to a small diameter riser tube surrounded by filter (Ottawa) sand (100 percent passing 0.850-mm (No. 20) sieve, 100 percent retained on 0.425-mm (No. 40) sieve) and sealed in the bottom of a drilled hole. The tips are available in various sizes and porosities and may be made of ceramic filter stone, porous plastic, or porous metals. The riser tube may be plastic and, for convenience in reading, should have an inside diameter no smaller than 6.35 mm ($\frac{1}{4}$ in.).

3.2. *Closed Systems*—The following equipment may be used to obtain pore pressure in soils of low permeability (Note 2):

Note 2—This equipment is also satisfactory for high-permeability soils.

3.2.1. *Closed Casagrande-Type Piezometer*—This consists of a porous tip (as in Section 2.1.3) sealed into a soil layer and connected to the ground surface by a fluid filled tube (or tubes) connected to a gauge. The porous tip is installed at the bottom of a drilled hole and surrounded by filter (Ottawa) sand (100 percent passing 0.850-mm (No. 20) sieve, 100 percent retained on 0.425-mm (No. 40) sieve). The tubing may be 6.35 to 12.7 mm ($\frac{1}{4}$ to $\frac{1}{2}$ in.) or larger-diameter plastic or flexible metal. Clean water should be used to fill the tube. Where freezing is a problem, consider using a pneumatic or electrically operated piezometer. A Bourdon tube-type compound gauge (of sufficient capacity to accommodate the expected pore pressure change) should be used. The gauge should be calibrated for the conditions under which it will be used (position, temperature, etc.). This type system measures the differential water pressure between the surrounding groundwater table and the pressure within the soils system.

3.2.2. *Pneumatic Piezometer*—This consists of a pneumatic pressure transducer in a plastic or stainless steel case with a porous (ceramic, plastic, or metal) opening to allow the pore water to reach the transducer diaphragm. Two small-diameter plastic air leads are connected to the transducer. A supply of compressed air, bottle compressed, or liquified gas (clean and without moisture) is required to operate the transducer. An air pressure gauge of sufficient capacity to record the existing pressure at the depth of the piezometer tip plus the expected pore pressure is needed.

3.2.3. *Electrically Operated Piezometer*—This consists of a calibrated diaphragm (with a strain gauge attached) sealed in a plastic or stainless steel case, with one side open to the pore water through a porous filter. The strain gauge attached to the diaphragm may be resistance type or vibrating wire type. Pore pressure is obtained by use of an electrical readout system compatible with the type of strain gauge used.