Test Procedure for

MEASURING THE RESISTIVITY OF SOIL MATERIALS

TxDOT Designation: Tex-129-E

Effective Date: August 1999 – March 2022

1. SCOPE

1.1 This method determines the resistivity of soil and aggregate materials.

1.2 Resistivity is an important factor in considering the corrosion potential of soils and aggregates to metal pipe, earth-reinforcing strips, and other metal items in earthwork.

1.3 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

2. DEFINITIONS

2.1 *Resistivity*—Resistivity decreases with an increase in moisture content of the material until the minimum resistivity is obtained. This minimum resistivity value is the resistivity of the material.

3. APPARATUS

3.1 *Portable resistivity meter*, Vibroground Model 293 or equal.

3.2 Small box with inside dimensions of 102 × 152 × 45 mm (4 × 6 × 1-3/4 in.) (See Figure 1.)

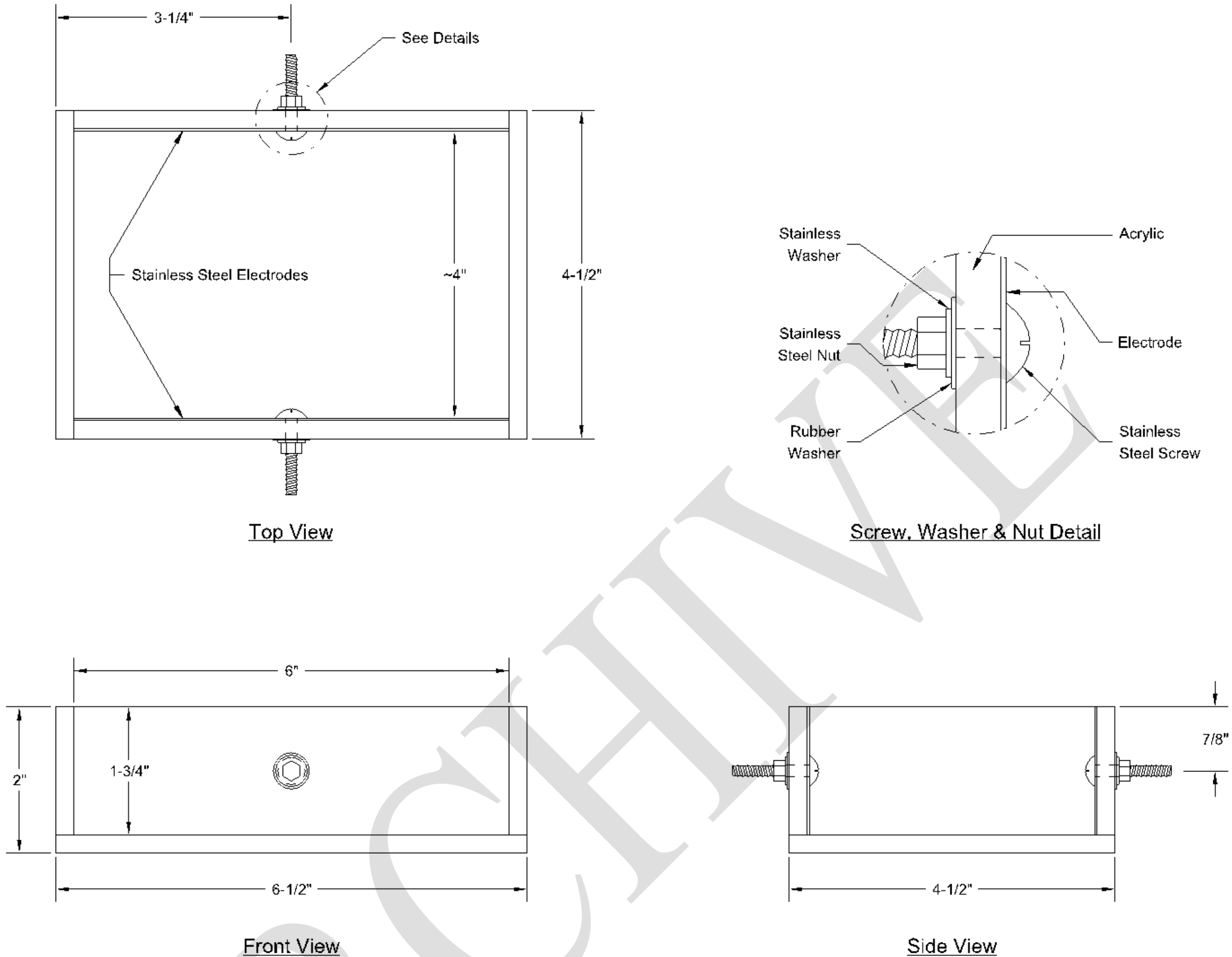
3.3 *Straightedge.*

3.4 *Drying pans, mixing pans, trowel, and small scoop.*

3.5 *Standard U.S. Sieve*, 2.36 mm (No. 8), meeting the requirements of Tex-907-K.

3.6 *Graduated beaker*, 200 mL (7 fl. oz.)

3.7 *Balance,* Class G2 in accordance with Tex-901-K, minimum capacity of 1500 g.



ITEM	QTY.	LENGTH	WIDTH	THICK.
The following items are to be made of plastic (acrylic/plexiglass).				
Bottom	1	6-1/2"	4-1/2"	1/4"
Ends	2	4-1/2"	1-3/4"	1/4"
Sides	2	6"	1-3/4"	1/4"
The following item is to be made of stainless steel.				
Electrodes	2	6"	1-3/4"	20 Gauge
Two of each of the following items are required.				
No. 8-32 x 3/4" Machine Screws, Round Head, Stainless Steel				
Washers, Rubber				
Washer & Nut Set, Stainless Steel or Brass				

Figure 1—Soil Box for Laboratory Resistivity Determination

4. MATERIAL

4.1 *Distilled or deionized water.*

5. PROCEDURE

5.1 Follow Tex-100-E to secure a representative sample of sufficient size to yield approximately 1300 g of material passing the 2.36 mm (No. 8) sieve.

5.2 Dry the sample to constant mass in an oven at a temperature of 60 ± 5°C (140 ± 9°F) and allow it to cool at room temperature.

5.3 Pass the sample over a 2.36 mm (No. 8) sieve.

5.3.1 When there is 1300 g or more passing the sieve, proceed to Section 5.4.

5.3.2 When there is less than 1300 g passing the sieve, crush to pass the sieve, then proceed to Section 5.4.

5.4 Reduce the sample using a sample splitter or quartering cloth to make a soil sample of approximately 1300 g.

5.5 Weigh sample to nearest 0.5 g.

5.6 Clip one set of wires on the left side of the soil box and plug into the left of the meter dial. Clip the other set of wires on the right side of the soil box and plug into the right side of the meter dial.

Note 1—The dial reads resistance in ohms, measured between electrodes separated by 102 mm (4 in.) of soil.

5.7 Add 100 mL of distilled or deionized water to dry soil at room temperature.

5.8 Mix until water is dispersed uniformly throughout soil.

5.9 Fill soil box by lightly hand-compacting wet soil, making sure soil completely fills box.

5.10 Level top with a straightedge.

5.11 Move power switch to the adjust position to make a preliminary adjustment.

Note 2—If dial is below 0.1 after adjustment, switch the multiplier to the next power down. If dial is above 0.9 after adjustment, switch the multiplier to the next power up.

5.12 Next, place power switch in a read position, read and record the resistance, in ohms, on Form 1961, "Resistivity of Soils Material." Resistivity varies with temperature; therefore, it is important that the soil and added moisture be at uniform room temperature when mixed and tested.

Note 3—Click on ex1961 to see an example of a completed Resistivity worksheet.

5.13 Repeat above procedure, using the same sample, adding distilled or de-mineralized water in increments of 50 mL for sandy soils and 100 mL for clay soils.

5.14 Ensure that each addition of water is dispersed evenly throughout the sample.

5.14.1 The resistivity readings should decrease for several readings before an increase is noted.

5.14.2 The lowest resistivity reading before an increase will be the reading to use for calculating the resistivity of the soil, as shown on the data sheet.

5.14.3 The resistivity for sandy soils is generally higher than for clay soils. The sandy soils may contain higher levels of soluble salts and not always increase after decreasing readings.

5.14.4 For sandy soils, the reading used to calculate the resistivity value will be the point at which total saturation occurs. This happens when water is observed rising to the surface during compaction of the sample.

6. CALCULATIONS

6.1 Calculate the Soil Box Factor (SBF):

$$SBF = A / D$$

Where:

A = Area of one electrode, cm^2

D = Distance between electrodes, cm.

6.2 Calculate the Resistivity, in ohm-cm = SBF x Resistance using resistivity meter:

$$R = SBF(R_{OHM})$$