



## WSDOT Test Method T 413

### Method of Test for Evaluating Waterproofing Effectiveness of Membrane and Membrane-Pavement Systems

#### 1. Scope

- a. This method describes a procedure for evaluating the waterproofing effectiveness of membranes and membrane-pavement systems as applied to bridge decks. The tests can be performed on the membrane alone or on the membrane-pavement combination.

#### 2. Apparatus

- a. Ohmmeter – Simpson VOM Model 313 or equal; driving voltage for the range of “R × 10K” should be  $1.56 \pm 0.05$  V.; the range of “R × 100K” should be  $1.43 \pm 0.05$  V.
- b. No. 18 Insulated Wire – Belden test probe wire or equivalent, two spools, 250 ft. (76.2 m) each, with connectors.
- c. Metal Contact Plate –  $12 \times 12 \times \frac{1}{8}$  in. (304.8 mm × 304.8 mm × 3.175 mm), with a connection for the ohmmeter and a 36-in. (914.4 mm) nonmetallic handle (see Figure 1, below).
- d. Polyurethane Sponge –  $12 \times 12 \times 1$  in. (304.8 mm × 304.8 mm × 25.4 mm), medium density (see Figure 1, below).

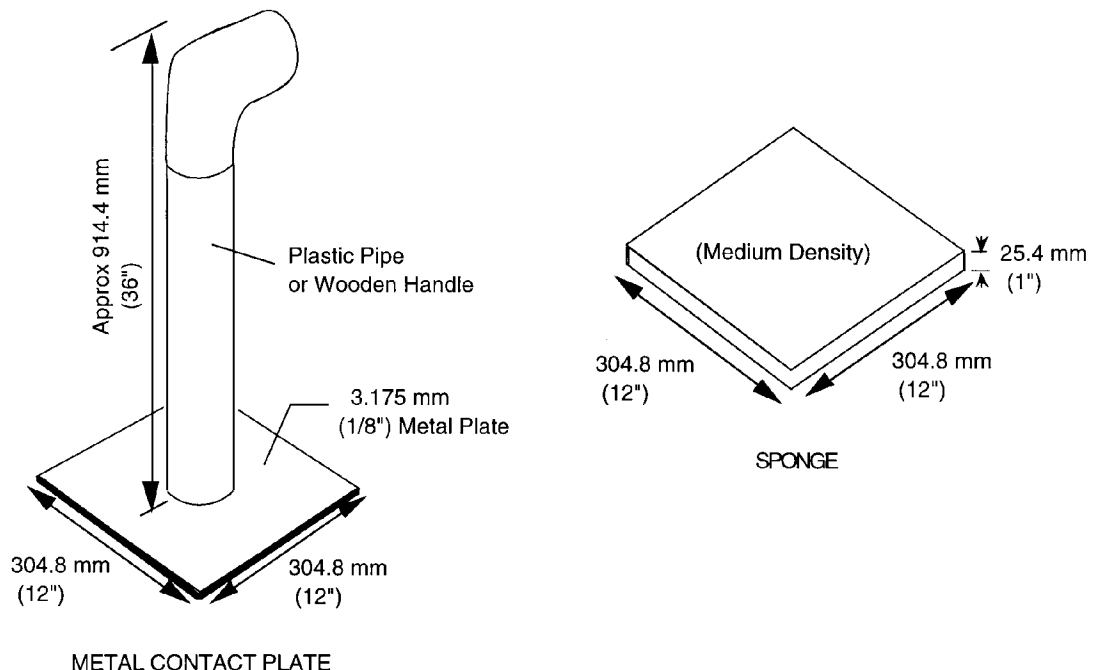


Figure 1

- e. Wetting Agent – Aerosol OT (10 percent solution as manufactured by the American Cyanamid Company) or equal; mix 0.4 cup (100 ml) of wetting agent with 5 gal. (18.9 L) of water to make up wetting solution.
- f. Pressure Spray Can – 3 gal. (11.4 L) capacity.
- g. ¾-in. Stone Cutter’s Chisel.
- h. Hammer.
- i. Eye Protection.

**Note:** Items g, h, and i are used for connection to reinforcing steel in deck (negative pole).

### 3. Procedure

The following procedures shall be used **only** when the surface of the membrane-only system is dry or when the membrane-pavement system is judged to be dry internally. The latter condition is an important consideration since moisture will conduct electricity throughout an entire asphalt concrete overlay producing erroneous results at the individual test locations.

#### a. Membrane Only

- (1) When the membrane has cured sufficiently to allow foot traffic on it, divide the bridge deck into a grid pattern similar to that illustrated in Figure 2. The grid spacing shall be as ordered by the Engineer, but it is suggested that the grid lines be spaced at 5 ft. (1.5 m) intervals to provide adequate test coverage. A definite connection to the top mat of reinforcing steel in the bridge deck is desirable; however, if this is not feasible, the bridge railing, expansion joints, light standards, drainage scoupers, or other exposed steel should provide the necessary connection. New bridges are supplied with connection to the reinforcing steel along each edge of the bridge via a junction box.
- (2) Uncoil an ample length of wire to reach the areas to be tested and attach the negative (–) connection of the ohmmeter to the reinforcing steel and the positive (+) connection to the 12 in. × 12 in. by ¼ in. (304.8 mm × 304.8 mm × 3.175 mm) metal contact plate. Check ohmmeter battery for satisfactory charge, then zero the ohmmeter dial indicator.
- (3) Attach the polyurethane sponge to the metal plate with heavy-duty rubber bands and saturate the sponge with the wetting solution.
- (4) In order to check for proper electrical connections and overall equipment operation, prewet two or three areas along the exposed concrete curb and place the measuring device at each location; read and record the resistance readings displayed on the ohmmeter. These readings will normally range from 500 to 8,000 ohms, if the connection to the reinforcing steel is good.
- (5) Once the connections and equipment show proper operation, continue testing at each grid intersection and record the resistance values on photocopies of Figure 3, using blank sheets where additional space is needed.

b. Membrane-Pavement

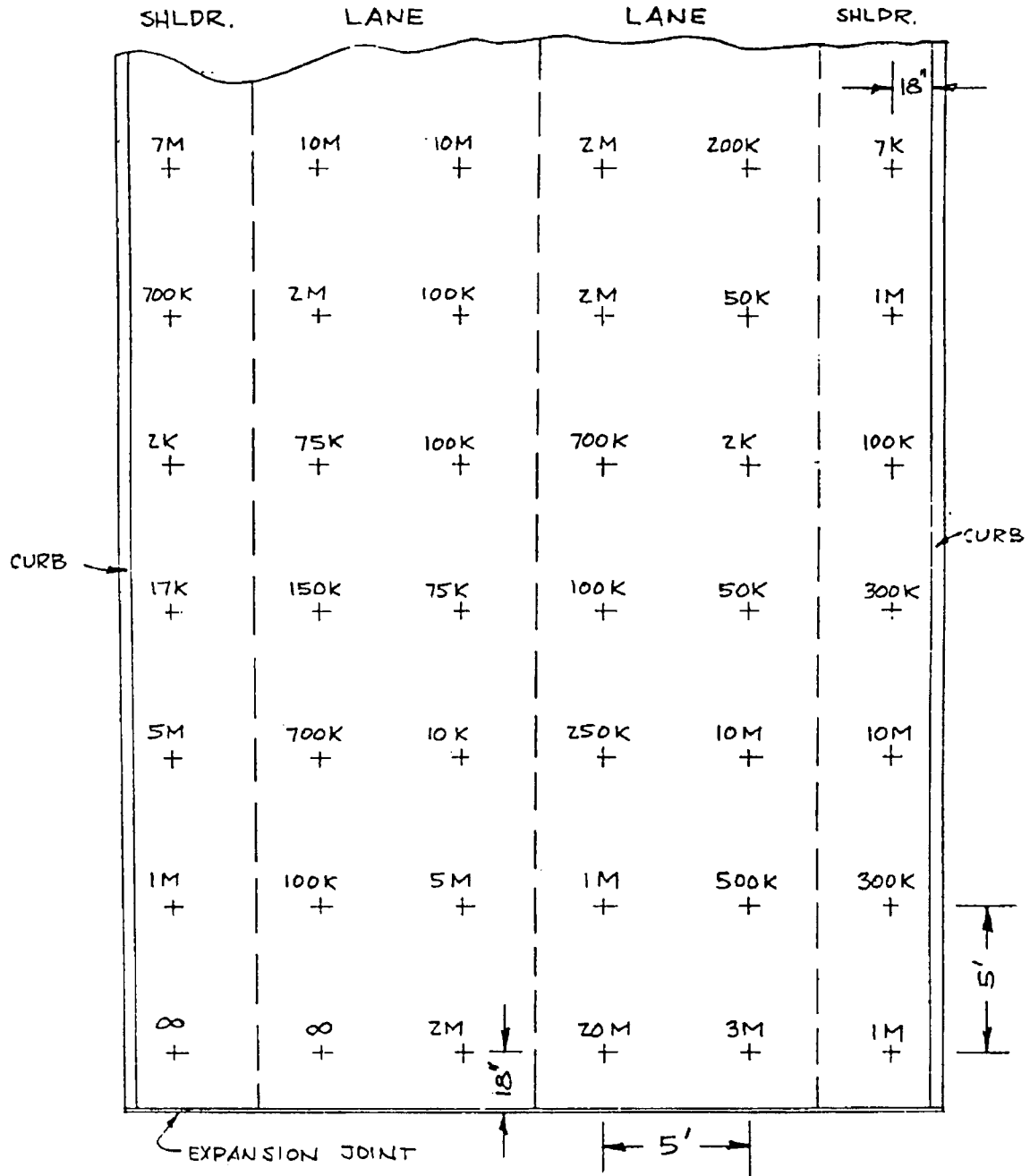
- (1) New pavement – Procedure steps 3.a.(1) through 3.a.(5) may be used in measuring the resistance of the membrane-pavement system, except that in step 3.a.(5) the test locations should be prewetted with the wetting solution. Only enough wetting solution should be used to saturate the test zone. Surface runoff should be kept to a minimum to prevent interconnecting the test zones electrically.
- (2) Old Pavement – Procedure steps 3.a.(1) through 3.a.(5) may be used in measuring the resistance of the membrane-pavement system, except that in step 3.a.(5) a checkpoint should be selected at a grid intersection that appears dense-graded and well compacted. Saturate the check point with the wetting solution. Keep surface runoff to a minimum to prevent interconnecting the test zones electrically. Take resistance readings at the checkpoint until the value has stabilized at its lowest point. The penetration process should not required more than 15 to 20 minutes. If its takes more than 20 minutes, select a reasonable penetration time and saturate each grid intersection thereafter for that length of time.

**4. Reporting**

- a. Report the resistance values for the exposed membrane and the membrane-pavement system on photostatic copies of Figure 3, using blank sheets where additional space is needed.
- b. Copies of the report are to be submitted to the following offices:
  - (1) Project Engineer (for final records).
  - (2) FOSSC Materials Laboratory (master file).

**5. Acceptance Level**

Refer to the Contract Special Provisions under the section entitled “Membrane Waterproofing (Deck Seal).”



7K = 7,000 OHMS  
 2M = 2,000,000 OHMS  
 ∞ = INFINITE RESISTANCE

Example of Test Grid and Resistance Tabulation  
 Figure 2

**ELECTRICAL RESISTIVITY MEASUREMENTS**  
(WDOT Test Method No. 413)

SR \_\_\_\_\_ CONTRACT \_\_\_\_\_ BRIDGE \_\_\_\_\_ BR. NO. \_\_\_\_ / \_\_\_\_

TEST PHASE: (Check one) DATE \_\_\_\_ / \_\_\_\_ / \_\_\_\_

\_\_\_\_\_ MEMBRANE ONLY; TYPE \_\_\_\_\_

\_\_\_\_\_ MEMBRANE-PAVEMENT; PAVT. TYPE \_\_\_\_\_ THCK \_\_\_\_\_ ft.

GROUND CHECK RDG. \_\_\_\_\_ ohms (avg.) OHMMETER RANGE USED R x \_\_\_\_\_

GRID SPACING \_\_\_\_\_ ft. CREW \_\_\_\_\_

\*\*\*BRIDGE & GRID LAYOUT AND MEASUREMENTS\*\*\*

SCALE: VERT. \_\_\_\_\_ in. = \_\_\_\_\_ ft.; HORIZ. \_\_\_\_\_ in. = \_\_\_\_\_ ft. NOTE: Use additional sheets  
(blank) if necessary.

**Example of Electrical Resistivity Measurements**  
*Figure 3*

