

SIGNIFICANCE AND USE

This test method is suitable as a field test to evaluate the surface drainage, and in some cases, the internal drainage of the surface course of a pavement. When used with other tests, the outflow time may be used to evaluate the texture produced by an asphalt pavement mix, a finishing method used on Portland Cement Pavement, and refinishing operations on an old pavement surface. Test results will correlate with other methods such as the CTMeter (Test Method E 2157), MPD (Practice E 1845) and MTD (Test Method E 965).

Note 1—The reciprocal of the outflow time is highly correlated with the MPD except when the surface is highly porous since the MPD is a measure of the surface texture and does not account for the water flowing through the surface pores.

The outflow times measured by this method are an indication only, and are not meant to provide a complete assessment of the pavement surface friction, or wet weather safety characteristics.

This test method does not necessarily correlate or agree with other methods of measuring pavement surface characteristics. It is up to the operator to determine the correlation of each method considered.

PROCEDURE

Test Area

Inspect the pavement surface to be measured, and select a homogenous area that contains no unique localized features such as paint, holes, bumps, cracks, or joints. If there is any loose or semi-adhered dirt, debris, or deteriorated surface material, thoroughly clean the pavement surface in the area where the test is to be taken using a broom or stiff wire brush. On pavements that have just been under traffic, tests performed without cleaning will give actual drainage capability.

Measurement

Place the Outflow Meter on the pavement, making sure that it is stable and uniformly contacts the rubber sealing ring to the pavement. On the first test, wet the plunger sealing ring by holding it close to the seat and pour in a little water. Set the plunger by pushing down on the handle until the plunger seal enters the seat, and fill the cylinder with water. For accurate measurement, the water level must extend over the top float switch sufficiently to allow air bubbles trapped between the pavement surface and the plunger to escape, and the surface water must have a chance to settle down before the water level reaches the top float switch. Make sure the timer is reset to zero. Carefully pull the plunger up while applying an equal counter force downward on the handle. When the plunger seal is released from the seat, this becomes a hands-off operation. A spring will return the plunger to its most upright position. From this point, the Outflow Meter works automatically and should not be touched until the test is over. When the lower float switch is activated and the timer stops, the plunger may be reset to save water and be ready to be filled with water for the next test. After each test, the outflow meter timer reading and the location of the test should be recorded.

Number of Measurements

The more test that are performed, the better the average pavement drainage information will be. In any case, a minimum of four randomly spaced tests shall be performed and the arithmetic average of the test times shall be reported as the average time for the section of the pavement being evaluated.

For each pavement test section, the arithmetic average of all outflow meter test times will be determined and recorded to the 0.01s. The following equation will be used to estimate the Mean Texture Depth:

$MTD = 3.114/OFT + 0.636$ where:

MTD = volumetric texture depth defined in Terminology E 867.

Faulty Tests

Tests that are manifestly faulty, or that give outflow times differing by more than 10 s from the average of all tests on the same pavement surface, shall be treated in accordance with practice E 178 on outlying observations.

Report

The report for each pavement test surface shall contain data on the following items:

1. Location and identification of test pavement surface.
2. Date
3. Ambient air temperature
4. Pavement temperatures (optional)
5. Number of measurements, and
6. Outflow times recorded

OPERATOR'S MANUAL

HYDROTIMER

**READ THIS MANUAL IN ITS ENTIRETY BEFORE
OPERATING THE HYDROTIMER OUTFLOW METER.**

PRODUCT SUMMARY

The Hydrotimer is a patented and self contained outflow meter. Its operation is simply a leak-down test with the primary purpose of checking water drainage through texture voids in pavement surfaces. A rubber sealing ring mounted on its base for contacting the surface insures zero outflow when a test is conducted on a glass smooth surface. Therefore, a test conducted on a surface with inter-connected texture voids will result in an incomplete seal and an outflow of water. The measured volume of water is timed by on-board electronics with an LCD display. Averaging the tests indicates the water flow characteristics of a given surface only, with no allowance for tire tread contribution. The shorter the test times, the better the drainage. The Hydrotimer is not operator sensitive, is designed for a one person operation, and is accurate and repeatable.

CALIBRATION

The Hydrotimer is calibrated to ASTM E 2380-05 specifications at the factory. It is not field serviceable and in order to maintain calibration status the adjustments should never be tampered with. If the tamper proof seals become broken or damaged, do not use the instrument for a certified test until it is returned to the factory for recalibration and resealing.

Factory calibration and resealing should be performed **every two years** in order to maintain current calibration status.

For service center information:
www.hydrotimer.com



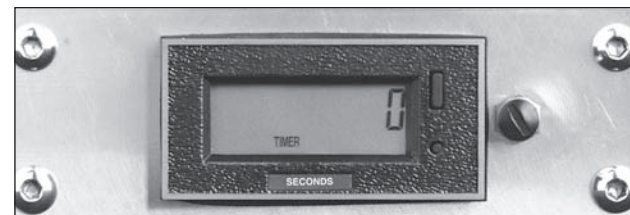
The **Hydrotimer** is a delicate instrument that does not react well to abuse. It is pressure tested for leaks at the factory, so normal usage around water will not affect its performance, however it is only water resistant, not waterproof or submersible.

WARNING: Storage in a damp or unventilated environment will allow condensation to form in the internal passages that contain the electronic components. Condensation or internal moisture will cause accelerated deterioration of these components, and can result in their immediate or premature failure. Do not disassemble. There are no user serviceable parts inside.

To avoid this unnecessary expense and inconvenience, treat it as the delicate instrument it is. Dry it out as quickly as possible after each use, and store it in a dry, climate controlled and vented environment.

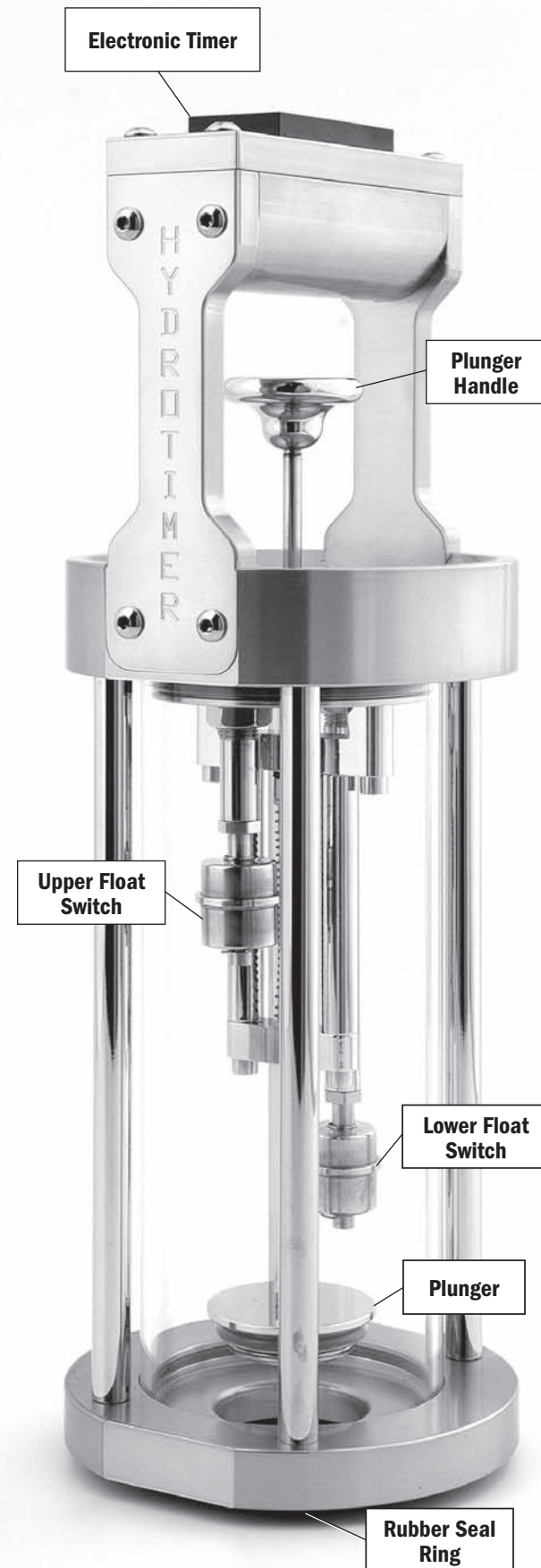
The **Shipping Case** is internally cushioned and airtight, and should be used for shipping purposes only. Upon arrival, the Hydrotimer is to be removed from the case, and each stored separately in a dry, climate controlled environment. The handle and wheels provided allow it to be towed as luggage, and is the right size carry-on for air travel.

WARNING: The Hydrotimer should never be stored in its shipping case. The inside of the case is to be kept completely dry at all times. The case should never be used as a work cradle. Impact damage from rolling around a jobsite vehicle can be prevented by employing a throwaway container lined with a soft absorbent material (an example is a pasteboard box lined with paper or a towel).



Timer (Top View)

The **Electronic Timer** is self-powered and cannot be turned off. It has a lithium battery which is serviced as part of the calibration procedure every two (2) years.



The following operating instructions were taken from the ASTM International Designation E 2380-05 Specification

SCOPE

This test method covers the connectivity of the texture as it relates to the drainage capability of the pavement through its surface and subsurface voids. This is a specific device that times how long it takes for a known quantity of water, under gravitational pull, to escape through voids in the pavement texture of the structure being tested. The technique is intended to provide a measure of the ability of the pavement to relieve pressure from the face of vehicular tires and thus an indication of hydroplaning potential under wet conditions. A faster escape time indicates a thinner film of water may exist between the tire and the pavement, thus more micro-texture could be exposed to indent the face of the tire and more surface friction available to the tire. The lower the number of seconds it takes to evacuate the water, the lower the water pressure under the tire. It will be up to the operator to compare the results of this test to other pertinent factors such as expected rainfall intensity and frequency, aggregate type, consistency of texture, grade, slope, expected vehicular speed, and accident history, to determine the relationship between the outflow meter reading and the likelihood of hydroplaning on a given surface. Comparing the outflow meter reading of a pavement known to have a history of hydroplaning, against one with a good history, with all other factors similar, will give the operator an indication of the outflow meter number that will be necessary to promote wet weather safety.

The results obtained using this method are related to the mean hydraulic radius of a paved surface and may correlate with other methods to measure texture.

The results obtained using this test method are related to the mean texture depth (MTD).

The values stated in SI units are considered standard. 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 limitations prior to use.

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.

SUMMARY OF TEST METHOD OPERATIONS

The main body of the outflow meter is a vertical cylinder for containing water. It has an open top and a rubber ring mounted centrally around an orifice or opening on the bottom of the device to form a seal against the pavement surface. Water discharge is through the opening in the center of the seal and is controlled by a spring-loaded plunger suspended from a cap mounted on the upper end of the cylinder. Upper and lower float switches are suspended from the cap into the cylinder and mounted vertically. An electronic timer is provided and is wired to the float switches.

The outflow meter is placed on the pavement with the plunger sealing the water discharge opening. Sufficient water is then poured into the cylinder to raise the switch floats to their raised or top position, which will prevent the timer from operating. The timer is reset to zero, and the plunger is released to allow discharge of the water. As water flows out of the opening and through the pavement voids, the water level in the cylinder falls past the upper float switch, which activates, causing the electronic timer to begin counting. As the water level continues to fall past the level of the lower float switch, the lower float switch then activates, causing the timer to stop. The time required for the water level in the cylinder to fall from the level of the upper float switch to the level of the lower float switch is indicated on the timer. This is recorded as the outflow time.

Calibrations over a temperature range of 40 to 120 degrees F (4 to 49 degrees C) show no temperature affects.