

**Bureau of Materials and Physical Research**

Illinois Laboratory Test Procedure

Effective Date: December 15, 2003

Revised: January 1, 2007

Revised: March 30, 2012

**Load-Deflection Test for Geocomposite Drains  
(Sand Box Method)**

This test procedure applies to Article 1040.07 of the Standard Specifications for Road and Bridge Construction ([current year issued](#)).

**1.0 SCOPE**

- 1.1 The purpose of this procedure is to evaluate geocomposite drains for use on the soil side of abutment walls, wing walls, retaining walls and culvert sidewalls.
- 1.2 Article 591.02 (a) and 1040.07 of the *Illinois Department of Transportation Standard Specification for Road and Bridge Construction* allows the use of geocomposite wall drains.

**2.0 REFERENCED DOCUMENTS**

- 2.1 ASTM E 4
- 2.2 ASTM C 109
- 2.3 ASTM C 778
- 2.4 ASTM D 3350

**3.0 TEST EQUIPMENT**

- 3.1 A compression testing machine with a constant-rate-of crosshead-movement calibrated to ASTM E 4.
- 3.2 Four dial indicators with clamp on bases which are capable of reading to the nearest 0.001- inch.
- 3.3 A winged tower type loading plate measuring 12 x 12 x 1 in. (304.8 x 304.8 x 25.4 mm), and a steel sand box. (Figure 1a. and 1b.)
- 3.4 A Large quantity of graded standard sand (Ottawa Sand ASTM C 109) that meets the gradation requirement for ASTM C 778.

**4.0 PROCEDURE**

- 4.1 The Bureau of Materials and Physical Research will evaluate the effectiveness of geocomposite drains.
- 4.2 The Manufacture/District shall provide a sample measuring 3.3 x 3.3 ft (1 x 1 m) by the width of the roll to be considered for approval.

## SAMPLE PREPARATION

- 4.2.1 For the purpose of testing, cut one 12 × 12 in. (304.8 × 304.8 mm) representative specimens of the geocomposite drain.
- 4.2.2 Unless otherwise specified, conduct the test in the Standard Laboratory Atmosphere of 73.4 ± 3.6 °F (23 ± 1 °C) and 50 ± 5% relative humidity. Condition the specimens in the laboratory environment for at least 48 hours prior to testing.
- 4.2.3 Measure and record the thickness of the drain to the nearest 0.001 in. (0.01 mm). This is accomplished by measuring the material under a dial indicator with a leveling plate. Several readings shall be taken over the area of the mat, and the average of those measurements less the thickness of the plate will be used for the overall thickness. (Figure 2)

## SAMPLE TESTING

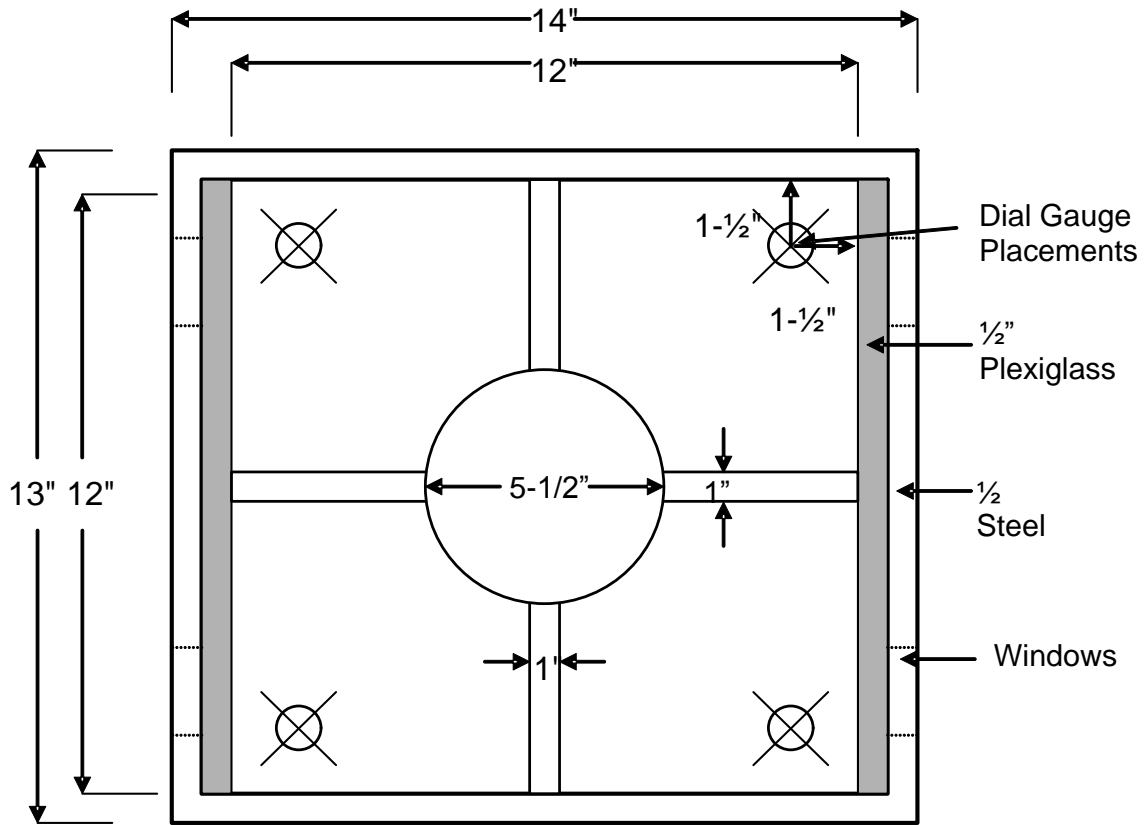
- 4.3.1 Geocomposite drains shall be a flexible geocomposite consisting of a supporting structure of core bonded to an approved geotextile fabric. The geotextile shall not weigh less than 3.5 oz./yd<sup>2</sup> (120 g/m<sup>2</sup>). The core shall be fabricated of polyethylene with a minimum cell classification of PE 112110 in accordance with ASTM D 3350 or other approved polymeric material.
- 4.3.2 The drain should be tested with the filter fabric side-up, and the edges prepared (taped) to prevent sand infiltration. (Figure 3)
- 4.3.3 The drain shall be covered with a level 3-1/2 in. (88.9 mm) layer of graded standard sand, and the loading plate is set on top on the sand. (Figure 4)
- 4.3.4 The sand box assembly will be placed into the compressing testing machine, and the dial indicators are to be clamped to the wings of the loading plate 1-1/2 in. (38.1 mm) from each edge. These gauges are used to measure the average load-deflection. (Figures 5 and 6)
- 4.3.5 An initial preload of 50 lbs (222 N) is used to seat the loading plate on the bed of sand and the gauges are then adjusted to zero. (Figure 7)
- 4.3.6 A load of 6000 lbs (26689 N) shall be applied to the plate at a rate of 0.05 in. (1.27 mm) per minute.
- 4.3.7 To obtain the total deflection of the geocomposite drain, average the four readings from the indicators. The readings shall be taken upon reaching the 6000 lbs (26689 N) load.
- 4.3.8 Calculate the deflection by the following formula. The deflection of the drain shall not exceed 20 percent of the drain thickness.

$$\left(\frac{\Delta}{T}\right) \times 100$$

Where:  $\Delta$  = Average deflection reading of the four dial indicators.  
T = Original thickness measurement.

## **5.0 SAMPLE ACCEPTANCE**

- 5.1 Contract acceptance samples shall pass the first test. If the material fails, two additional retests shall be performed with both samples passing.
- 5.2 For new product/producer evaluation the number of test required will be based on the performance of the specimen relative to specification requirements.



TOP  
VIEW

FIGURE 1. (a) This is the view of the sand box with the compression plate installed.

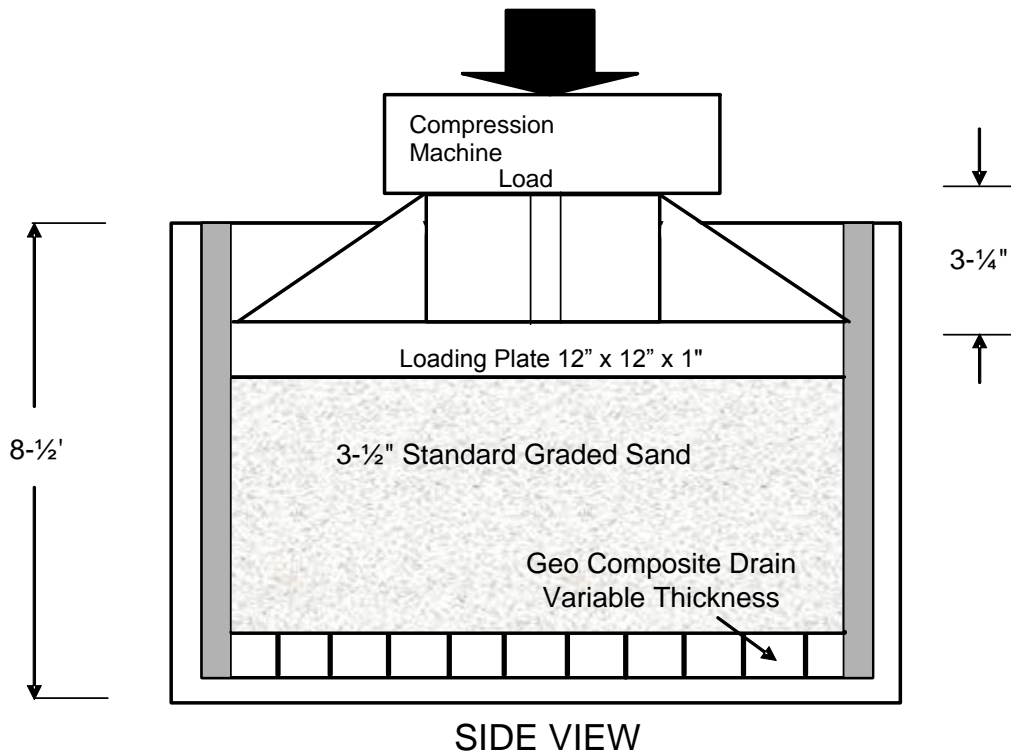


FIGURE 1. (b) Side view of the Sand Box with the drainage mat and sand installed.

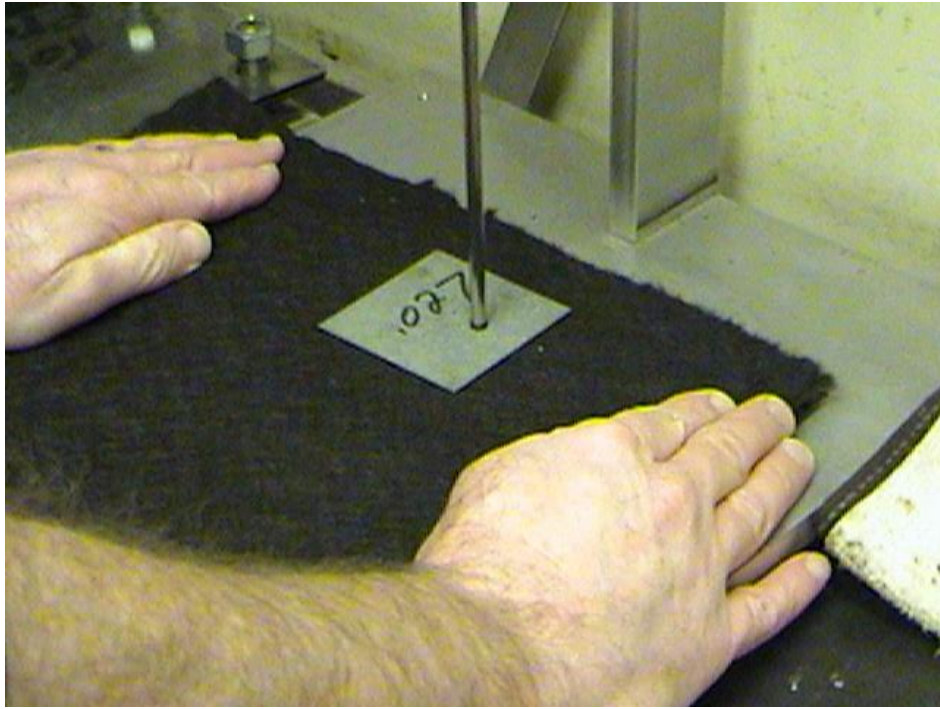


FIGURE 2. Measuring the thickness of the Drainage mat using a dial indicator gauge.

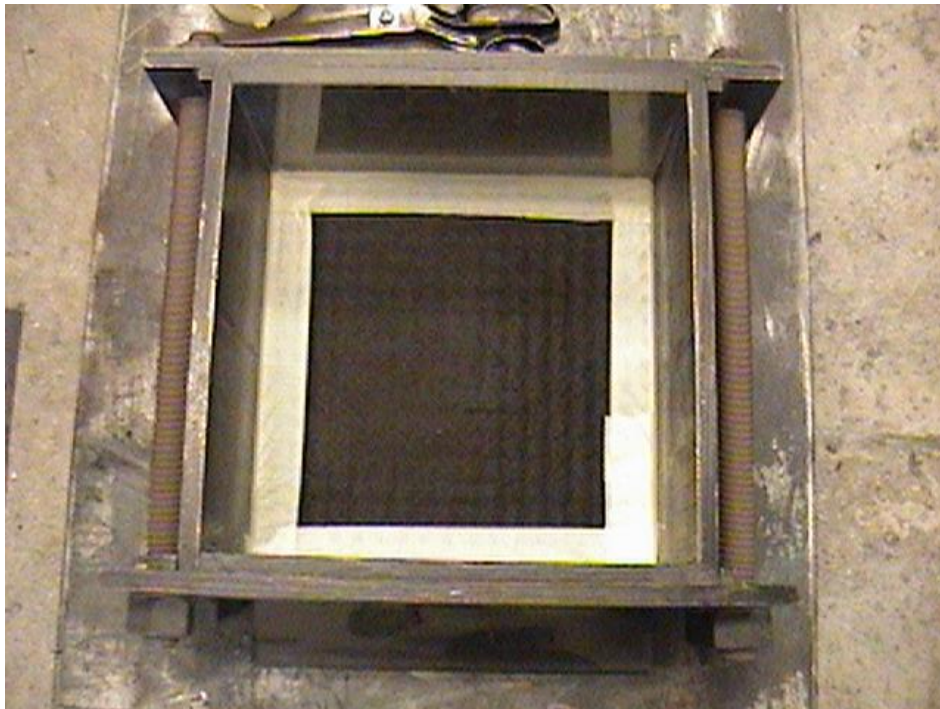


FIGURE 3. Drainage mat with edges sealed with 2-1/2" masking tape to prevent sand infiltration..

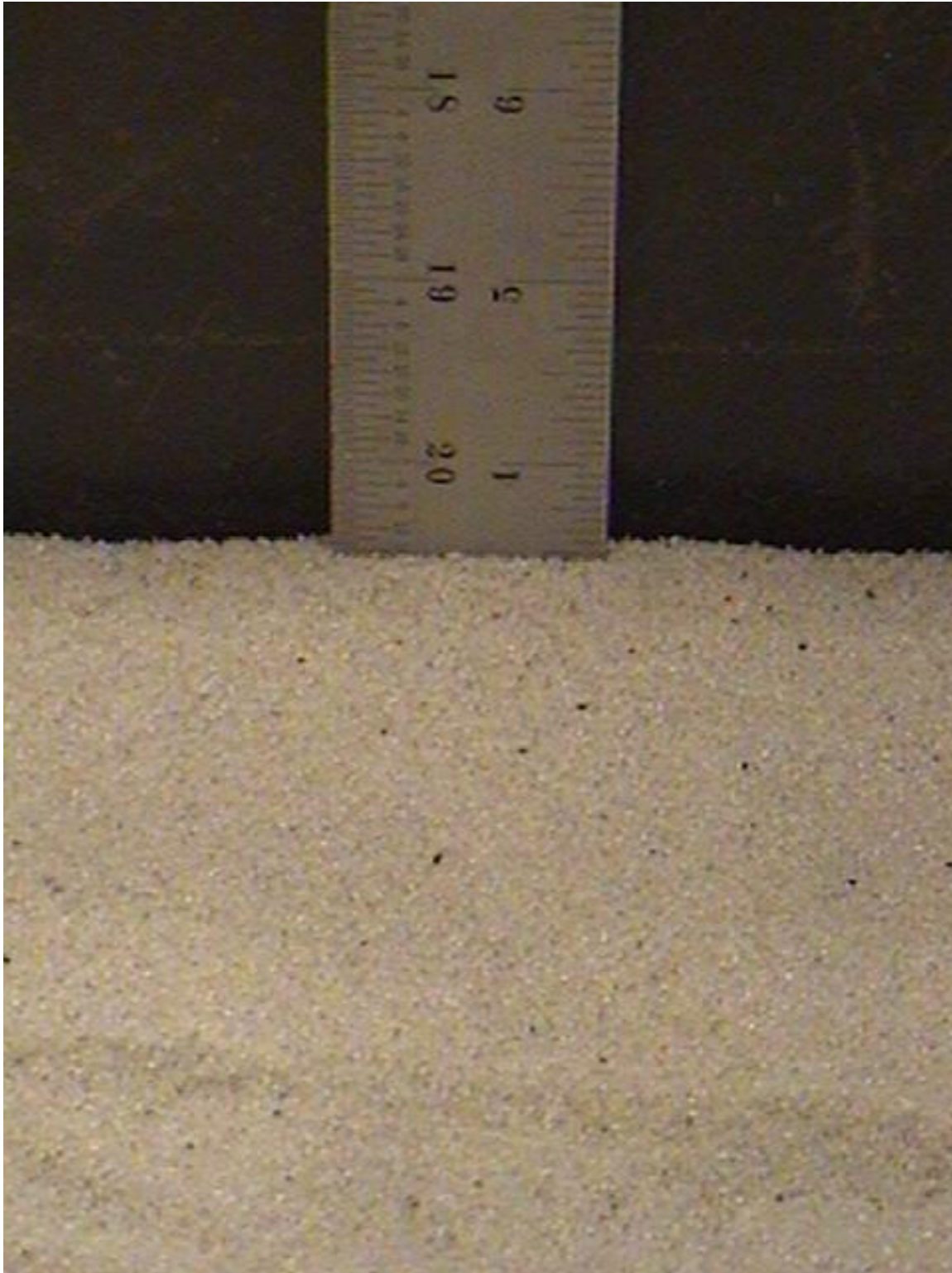


FIGURE 4. A level layer of 3-1/2" of graded standard sand (ASTM C 109) placed on the mat.

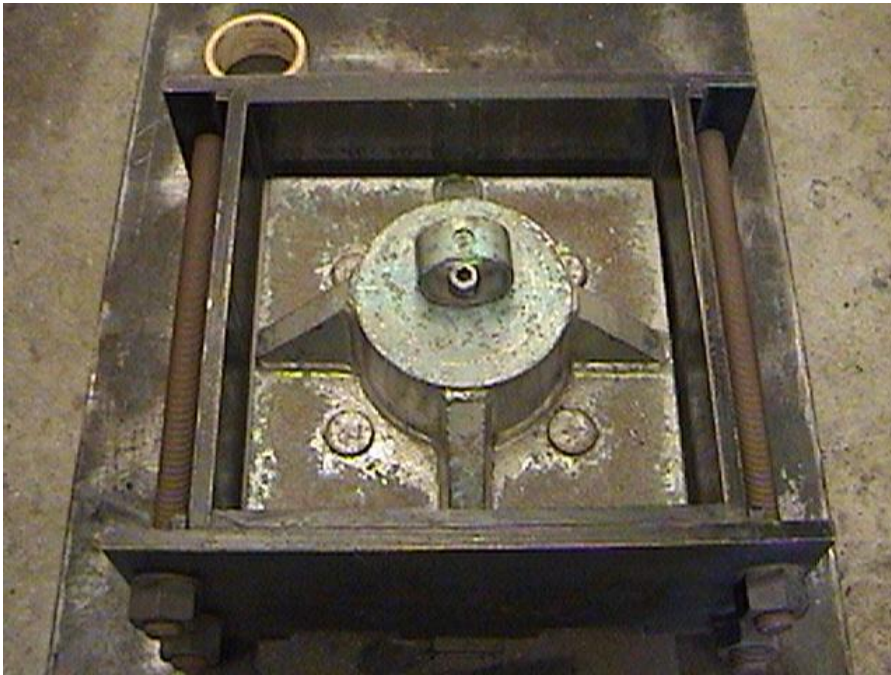


FIGURE 5. Loading plate placed on top of the sand and ready to be placed into the compression machine.

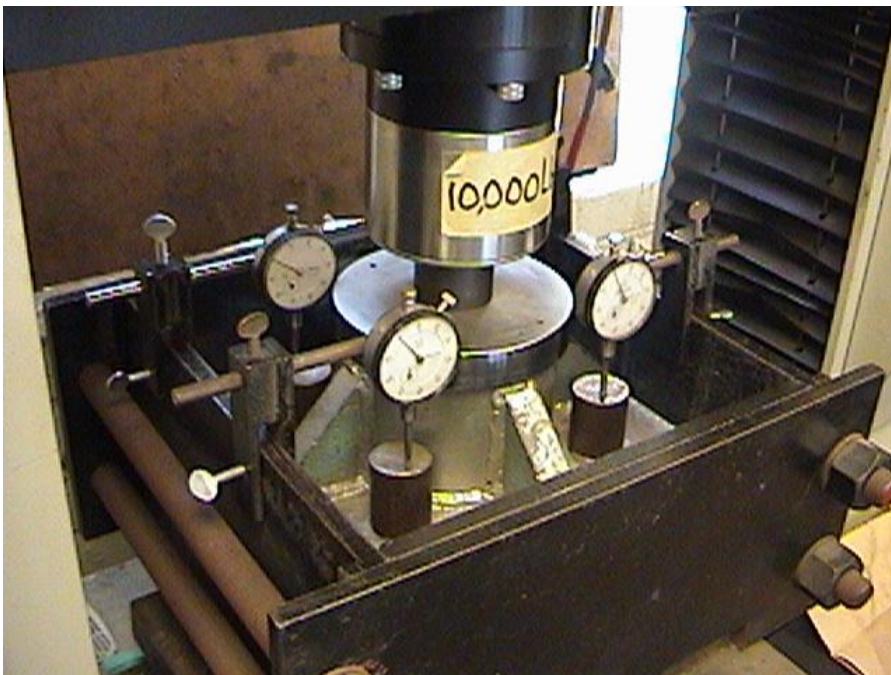


FIGURE 6. Loading assembly in the compression machine with indicator gauges installed.



FIGURE 7. Initial preload is applied and the gauges are adjusted to zero.