FREEZE-THAW TEST FOR SOIL-CEMENT MIXTURES

1.0 SCOPE

1.1 These test methods cover the procedures for determining the soil-cement losses, moisture changes, and volume changes (swell and shrinkage) produced by repeated freezing and thawing of hardened soil-cement specimens. The specimens are compacted in the mold, before cement hydration, to maximum density at optimum moisture content using the compaction procedure described in the Test for Moisture-Density Relations of Soil-Cement Mixtures.

1.2 Method A - This method shall be used when 100 percent of the soil sample passes the 5000 μm sieve.

1.3 Method B - This method shall be used when part of the soil sample is retained on the 5000 μm sieve and 100 percent passes the 20000 μm sieve.

2.0 APPLICABLE DOCUMENTS

2.1 Portland Cement Association, Soil-Cement Laboratory Handbook

2.2 ASTM D560 Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures

2.3 AASHTO T136 Standard Method of Test for Freezing-and-Thawing Compacted Soil-Cement Mixtures

2.4 TLT-501 Mix Design Method for Soil-Cement Mixtures

2.5 TLT-502 Moisture-Density Relations for Soil-Cement Mixtures

2.6 TLT-503 Wet-Dry Test for Soil-Cement Mixtures

3.0 OUTLINE OF METHOD

3.1 These test methods are used to determine the resistance of compacted soil-cement specimens to repeated freezing and thawing. These test methods were developed to be used in conjunction with Test Methods TLT-503 and criteria given in the (PCA) Soil-Cement Laboratory Handbook to determine the minimum amount of cement required in soil-cement to achieve a degree of hardness adequate to resist field weathering.

4.0 APPARATUS

4.1 The equipment used are similar to those listed in the above mentioned publications.

5.0 PROCEDURE

5.1 The procedures used are similar to those used in the above mentioned publications.

5.2 The specimens are placed in the moisture room immediately after forming and allowed to cure for seven (7) days.

5.3 The specimens are weighed and measured, then placed on saturated felt pads in a pan of water.

5.4 The pans containing the specimens are placed in the freezer at -23◦C for 24 hours.

5.5 After 24 hours, they are moved from the freezer to the moisture room and left there for 24 hours.

5.6 The transfer from freezer to moisture room and back to freezer (one cycle) is repeated for 12 cycles. The specimens are periodically visually inspected throughout the cycles, and any deterioration noted. Also, before being returned to the freezer each time, the samples are turned end for end.

5.7 At the end of the 12th cycle, in the thawed condition, the specimens are surface-dried and weighed.

5.8 Each specimen is placed on a scale and brushed at 5 kg pressure using a wire brush, so that the total surface area is brushed twice, (total of 18 strokes on the sides and four (4) on each end).

5.9 After brushing, the specimens are weighed, measured, and their condition evaluated and recorded.

5.10 The samples are then tested for compressive strength, similar to the others, except that they are not soaked prior to testing. The moisture content of the broken sample is determined.

5.11 The dry weight after brushing is calculated using the weight after brushing and the corrected moisture content of the sample. Moisture contents after testing are corrected for loss due to hydration by adding ¼ of the cement content to the moisture content.

5.12 The difference between the dry weight after brushing and the original dry formed weight is determined, and the % weight loss calculated, based on the original dry weight.

6.0 REPORT

6.1 Test results are recorded and summarized.

6.2 The % weight loss versus cement content is presented graphically to show durability patterns and trends.