METHOD OF TEST FOR LINEAR SHRINKAGE OF CONCRETE

1. SCOPE

1.1 This method of test covers the procedure for determining linear shrinkage of concrete with a maximum nominal aggregate size of 19mm or less, for specimens prepared in the laboratory or in the field.

2. RELEVANT DOCUMENTS

2.1 ASTM C 157/C157M-04 Standard Test Method For Length Change of Hardened Hydraulic Cement Mortar and Concrete.

3. PROCEDURE

3.1 Procedures of ASTM C 157 shall be followed, except as noted below.

4. EXCEPTIONS

4.1 TEST SPECIMEN

Specimen size shall be 75mm x 75mm x 285mm.

4.2 APPARATUS

4.2.1 Moulds

4.2.1.1 Releasing agent: Only light oil shall be used as releasing agent. Releasing agent shall be applied before installing the gauge studs.

4.2.2 Gauge length reference bar: A metal bar with a nominal length of 250mm to be used as a standard reference for setting the gauge length immediately before casting the specimens.

Note: The gauge length is the distance between the two inner ends of the gauge studs. The actual length of the gauge length reference bar shall be measured to the nearest 0.001 mm. This length shall be recorded and be used as the gauge length in calculation of length change. When the shrinkage measurement is carried out by a laboratory other than the one casting the specimens, the actual length measurement of the gauge length reference bar shall be reported to the testing laboratory to be used as the gauge length in the calculation of length change.

4.3 PROCEDURES

4.3.1 Casting specimens: When placing both bottom and top layers of concrete into the moulds, use fingers to work concrete thoroughly into the space around the gauge studs, to avoid any voids being left around the gauge studs.

4.3.2 Consolidation of specimens: The concrete shall be consolidated by rodding. For each layer, rod the concrete 30 times with a 10mm metal bar with a hemispherical tip. After rodding, tap the outside of the moulds lightly 15 times with a rubber mallet.

4.3.3 Initial curing: Immediately after finishing the specimens, cover the surface of the specimen with a nonabsorptive, nonreactive plate or a strong, impervious plastic sheet. Keep the specimens in an environment of 20 ± 5 ^{o}C.

4.3.4 Demoulding the specimens: The specimens shall be demoulded 24 ± 2 hours after the addition of water to the cement. When demoulding the specimen, care shall be given not to damage the gauge studs and to avoid standing the specimen on the gauge studs.

Specimens made in the field can be demoulded either in the field or be transported, in accordance with Section 4.3.5.1, to the testing laboratory for demoulding. If specimens cannot be transported to the testing laboratory for demoulding within the specified time limit, the specimen shall be demoulded in the field then be transported to the testing laboratory after demoulding as instructed in Section 4.3.5.

4.3.5 Transporting the specimens:

4.3.5.1 Transporting specimens before demoulding: Specimen may be transported to the testing laboratory after 20 hours. During transportation, the specimen shall be kept in the same condition as specified in Section 4.3.3 of this standard.

4.3.5.2 Transporting specimens after demoulding: Immediately after demoulding the specimens shall be placed in a water tight container filled with lime-saturated water. The lime-saturated water shall be maintained at a temperature of 20 ± 5^{o}C during transportation. The specimens shall be properly secured in the container to protect the gauge studs and to prevent movement of the specimens. The specimens shall be delivered to the testing laboratory in the container within 24 hours of demoulding.

4.3.6 Examining the specimens at the laboratory: After demoulding the specimens or after receiving the demoulded specimens from the field, the testing laboratory shall examine all the specimens for damage to the concrete and to the gauge studs. The condition of the specimens shall be recorded. If the gauge stud is loose, the specimen shall be discarded. If one specimen is discarded, then the test shall continue with the remaining two specimens. If more than one specimen from a set of three have loose gauge studs, the test shall be stopped, and the testing laboratory shall inform the owner immediately.

The specimen shall then be measured on the comparator for the first length reading. This reading shall take place one hour after the specimens' arrival at the testing laboratory to allow temperature of the specimen be stabilized. After the measurement, the specimens shall be stored in the lime-

saturated water or in a moisture room with temperature maintained at 23 ± 2^{o}C. This reading is for information purposes only, not to be used in drying shrinkage calculation..

4.3.7 Initial length measurement: At 7 days of age the specimens shall be removed from the lime-saturated water and the initial comparator reading shall be taken. This reading shall be used as the initial reading for calculation of linear shrinkage.

4.3.8 Drying the specimens: Following the initial reading, the specimens shall be placed in a drying room until the age of 35 days. The humidity of the drying room shall be monitored with the beaker method according to ASTM 157.

4.3.9 Reading of reference bar: If the readings of reference bar before and after measuring the specimens are different, the reading with a shorter length shall be used as the reading of the reference bar.

4.3.10 Final length measurement: The final comparator reading shall be taken at 35 days of age.

4.3.11 Calculation of linear shrinkage: The linear shrinkage at 35 days of age shall be calculated using the initial and final readings as defined in this test method, and using the actual length of the gauge length reference bar, as defined in 4.2.2, as the gauge length.

4.4 REPORTING

4.4.1 Length change data, reported as percent decrease or increase in linear dimension, to the nearest 0.001% of the gauge length based on the initial measurement made at 7 days of age at the time of removal from lime-saturated water storage.

4.4.2 Records of the rate of evaporation of the drying room. A minimum of one result shall be reported for each business day of the drying period.

4.4.3 Records of the temperature and humidity of the drying room. A minimum of two sets of measurements shall be reported for each business day of the drying period.

4.4.4 Mix Design Number, if applicable.

4.3.5 Contract Number, if applicable.

4.3.6 Where the specimen was demoulded.