# MOISTURE-DENSITY RELATION FOR SOIL-CEMENT MIXTURES

## 1.0 SCOPE

1.1 These methods cover the laboratory determination of the relationship between the moisture content and the density of soil-cement mixtures when compacted before cement hydration as prescribed.

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 D558 Standard test methods for moisture-density relations of soil-cement mixtures

2.3 AASHTO T134 Standard method of test for moisture-density relations of soil-cement mixtures

2.4 TLT-501 Mix design method for soil-cement mixtures

2.5 TLT-503 Wet-dry test for soil-cement mixtures

2.6 TLT-504 Freeze-thaw test for soil-cement mixtures

## 3.0 OUTLINE OF METHOD

3.1 These tests determine the optimum moisture content and maximum density to be used for molding soil-cement specimens in accordance with Methods TLT-503 and TLT-504.

## 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 A five (5) point standard moisture-density relation test is carried out at the

starting cement content. To minimize the effect of cement hydration, perform the test expeditiously and continuously to completion.

5.3 All specimens are formed in three (3) lifts, at 25 blows per lift, using standard Moisture-Density Relation test compaction tamper. Each lift is scarified using a hand tool to eliminate compaction planes.

5.4 When all specimens for the set have been formed, they are moved to the moisture room maintained at 21°C $\pm$ 1.5°C and 95 to 100 % humidity for curing.

5.5 Moisture contents for each run are secured from the mix remaining after forming. The dry densities are determined at each moisture content.

5.6 The specimens are cured for seven (7) days, after which their compressive strength is determined.

5.7 The results are plotted and the optimum moisture content and maximum dry density are determined from the standard Moisture-Density Relation curve.

5.8 The compressive strength is also plotted against the moisture content at forming on the same graph to aid in interpreting the moisture-density, moisture-compressive strength relationships.

5.9 Interpretation of Test Data

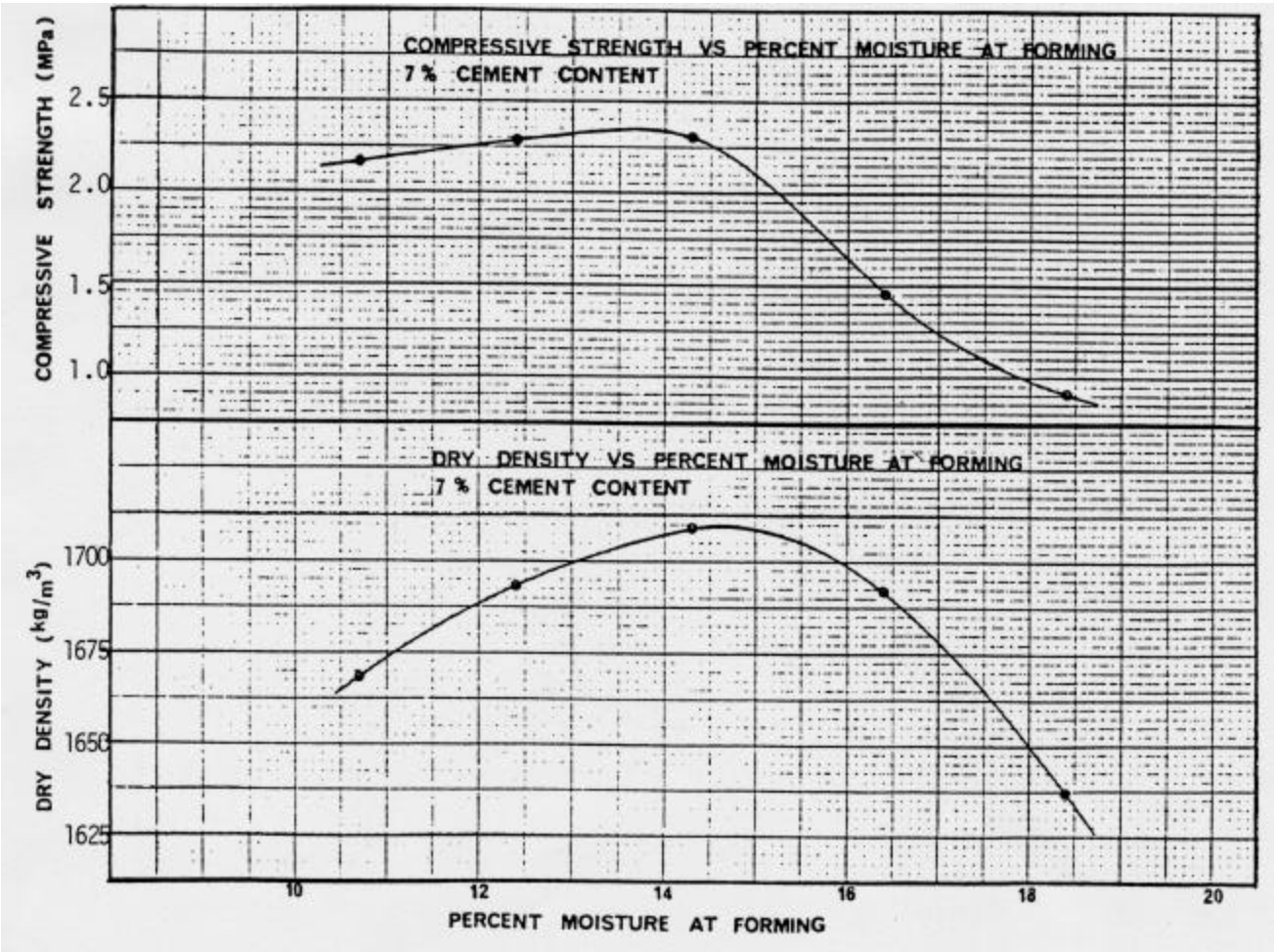
5.9.1 The 7-day compressive strength of the moisture-density relation specimens give some indication of the strength of the mixture under varying conditions of moisture and density which may be encountered during construction.

5.9.2 Typically the compressive strength and dry density increase as the moisture content increases until the optimum moisture content is reached. On the wet side of optimum, the strength and density decrease as the moisture content is increased.

## 6.0 REPORT

6.1 The moisture-density test results are recorded as the specimens are being formed.

6.2 A graphical representation of the maximum density and compressive strength versus moisture content are provided to show moisture content influences (see attached graph).


COMPRESSIVE STRENGTH VS PERCENT MOISTURE AT FORMING
7 % CEMENT CONTENT
COMPRESSIVE STRENGTH (MPa)
2.5
2.0
1.5
1.0
DRY DENSITY VS PERCENT MOISTURE AT FORMING
7 % CEMENT CONTENT
DRY DENSITY (kg/m3)
1700
1675
1650
1625
10
12
14
16
18
20
PERCENT MOISTURE AT FORMING