

Liquid Limit for Engineering Soils

Laboratory Test Reference 404

British Standard Reference

BS 1377 : 1990 : Part 2

Principal Apparatus

Laboratory Oven, Invent No. xxx Penetrometer: Invent No. xxx

Electronic Balance Lab Invent No.xxx

Desiccator Lab Invent No.xxx

Moisture Content Containers - round aluminium tins

Distilled water to BS1377 Part 1:1990

BS Test Sieve with Green Label

1. Preliminaries
 - 1.1 This test is carried out in the soils laboratory and an area of bench shall first be cleared in readiness.
 - 1.2 The glass plate, palette knife and weighing tins shall be checked to ensure that they have been cleaned.
 - 1.3 The penetrometer and associated apparatus shall be checked to ensure the calibration certificate is valid. The cone and shaft shall be checked to ensure it slides freely in the clamping mechanism under release conditions.
 - 1.4 Obtain a test work sheet from the Cabinet and ensure sample number and test schedule correspond.
 - 1.5 The holed template shall be used to check that the tip of the cone can only just be felt when the tip of the finger is passed over the hole.
2. Standard Test Method
 - 2.1 Material shall be prepared for the test by following the method laid down in BS 1377 Part 1. Notes are summarised on Pages 136-138 in these procedures.
 - 2.2 About 300g of soil paste passing the 425 micron sieve is placed on the glass plate.
 - 2.3 Mixing is now carried out for 10 minutes and extra distilled water can be added if it is thought to be too stiff.
 - 2.4 The re-mixed soil shall be scooped with a palette knife and introduced into the metal cup taking care not to trap air. The excess soil is trimmed level with the rim of the cup to give a smooth surface.
 - 2.5 The penetrometer apparatus is now set up so that the tip of the metal cone can be lowered down to the surface of the soil in the cup. When it just touches, the dial gauge is zeroed and the cone released for a period of 5 ± 1 sec during which time the combined weight of the cone, slider and weights will penetrate the soil under its own weight.

- 2.6 After this period of time the cone is locked into position and the dial gauge reading noted to the nearest 0.1mm. The cone penetration for this specimen is the difference between the initial and final reading.
- 2.7 The cone is now raised clear of the filled metal cup and cleaned. A little more soil from the glass plate is added to the cup and the process repeated. If the difference between the first and second penetration readings is less than 0.5mm the average of the two penetrations shall be recorded.
- 2.8 If the second penetration is more than 0.5mm and less than 1.0mm different from the first, a third test is to be carried out. If the overall range is now not more than 1mm a sample of soil is removed from the cup with the palette knife and placed in a weighing tin. The moisture content of this specimen is determined and the average of the three penetrations noted on the worksheet. The moisture content is carried out in accordance with the procedures described on pages 128 and 129 using about 10g of soil from the area penetrated by the cone.
- 2.9 However if the overall range is more than 1mm, the soil has to be removed from the cup, remixed and the test repeated until consistent results are obtained.
- 2.10 The remaining soil on the glass plate is now wetted up with additional distilled water, thoroughly mixed, and the procedure described in paras 2.4 to 2.9 repeated.
- 2.11 Further determinations are made at varying moisture contents by adding distilled water such that penetrations are between 15 and 25mm. At least four determinations are made and the cup washed and dried between each.
3. Calculations
 - 3.1 The penetrations and respective moisture contents are recorded on the work sheet and the points plotted on the graph. A best fit straight line is plotted through these points and the moisture content corresponding to a cone penetration of 20mm read off the graph. This is the liquid limit of the soil and is expressed as a whole number.
 - 3.2 The test report shall state the method of test used together with the percentage passing 425 micron sieve and its drying history.