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| Course No. : CE363 | Date of Testing : 28.10.2011 |
| No. And Title of Test : 7(a) Determination of particle size distribution of fine-grained soils by the hydrometer | |
| Year and Section : 2011/5 | Lab Group : 3 |
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**Object**

The object of the experiment is to determine quantitatively the particle size distribution in a soil from largest to the smallest. The test is possible when at least 10% of the sample passes the 63 micron sieve.

**Apparatus**

1. A hydrometer calibrated to read density (g / ml) at 20˚C, (e.g. ASTM 151 H).
2. Two 1000ml graduated glass measuring cylinders about 7cm in diameter and 33cm high, marked at 1000ml volume.
3. A thermometer to cover the range 0-50˚C.
4. An electrically driven stirrer.
5. Test sieve sizes 2.5mm, 630µm, 200µm, 63µm (ASTM No. 8, 30, 70, and 200 respectively), and a receiver.
6. A balance readable and accurate to 0.01g.
7. A thermostatically controlled drying oven, capable of maintaining a temperature of 105-110˚C.
8. A stop watch.
9. A desiccators containing anhydrous silica gel.

**Theory**

Stokes's law is the basis of the falling-sphere viscometer in which the fluid is stationary in a vertical glass tube. A sphere of known size and density is allowed to descend through the liquid. If correctly selected, it reaches terminal velocity, which can be measured by the time it takes to pass two marks on the tube.

**Procedure**

1. Obtain by riffling two sub samples weighing 50-100g approximately. Weigh the other accurately to the nearest 0.01g (ma), and place in an evaporating dish.
2. Add 100ml of sodium hexametaphosphate solution into the soil, and warm for about 10 minutes.
3. Pour the mixture into the dispersing cup of the mixer, by means of a jet of distilled water from a wash-bottle. Then stir the soil suspension for 15 minutes by means of the mechanical mixer.
4. Wash the soil on the sieve to the 63 micron test sieve placed on the receiver. Do not use more than 500ml of water for this operation. Transfer the suspension that has passed through the sieve to the 1000ml measuring cylinder and make up to exactly 1000ml with distilled water.
5. Put the material retained on the 63 micron sieve to an evaporating dish, and dry in the oven at 105-110˚C. After drying, sieve this material on the 2.5mm, 630µm, 200µm, 63µm test sieves. Weigh the material retained on each sieve.
6. Shake the cylinder vigorously until a uniform suspension is formed. Immediately the shaking has ceased, allow the measuring cylinder to stand, and start the stop watch. Immerse the hydrometer to a depth slightly below its floating position, and then allow it to float freely.
7. Read and record the temperature of the suspension once during the first 15 minutes and then after every subsequent reading, with an accuracy of at least ± 0.5˚C.
8. Place exactly 50ml of the dispersing agent solution in a weighed beaker, and place this in the oven at 105-110˚C until the water evaporates. Hence calculate the mass (Md) of dispersing agent. Calculate the dispersing agent correction (x) from the formula:

X = 2Md

**Calculations**

K= 100 (Gs / Mb (Gs-1)( Rh + Mt - x)

Calculated values are in the table added at the end of report.

**Discussion of Results**

The impurity of the water affects the result of the test. Besides, readings must be accurate so readings are a source of error. Lastly, approximations done according to the charts drawn may cause errors.

**Conclusion**

The amount of clays and silts distinguishes by the use of hydrometer test method. The sedimentation velocity of particles principle is used. The particle size distribution graph shows that the soil sample is silt. More than 50 % of the fine soil sample is in the range of the silt.