SalierGeotechnical Limited

Determination of Particle Size Distribution - Nominal Size of Aggregate < 40mm

Lab Test Reference 002
British Standard Reference
BS812 : Part 103 : 1985

Principal Apparatus as follows:-

(i.) Riffle Boxes, 63mm, 50mm, 40m, 14mm gaps should be at hand and available for use depending on the nominal size of aggregate being tested. Type as shown in BS812 : Part 102 : 1985. Inventory nos. 161, 218, 81, 246.

(ii.) A ventilated drying oven controlled to maintain a temperature of 105 +/- 5 deg. C. Inventory nos. 324/3 and 324/4.

(iii.) Electronic Balance to weight at least 30kg to .1 grm.

The Sartorius Electronic Balance no. 3808/MP, 30 kg to .1 grm. on the bench in the Aggregate Testing Area. Inventory no. 309.

(iv.) The BS Test Sieves with a yellow label will be signed out from the sieve store on request and will be selected from the following list, depending on the type of material being tested.

Sieves to be used in Particle Size Analysis (BS410)

Nominal Aperture Size

Square Hole Perf. Plate 450 or 300mm Diameter	Wire Cloth, 300 or 200mm
mm	mm
75.0	3.35
63.0	2.36
50.0	1.70
37.5	1.18
28.0	
20.0	um
14.0	600
10.0	425
6.3	300
5.0	150
	75*

* For some applications a 63 um may be used

(v.) A Mechanical Sieve Shaker.
In the sound proof cupboard.

(vi.) Clean Square Trays sufficiently large to completely contain the sample.
A stiff bristle sieve brush.

General laboratory ware.

(vii.) Washing Apparatus.

Retained in the Washing Area of the Aggregate Laboratory.

1. Preliminaries

1.1 A designated area will be used to perform this test and a clear area of bench must first be allotted before this test proceeds.

1.2 Ensure that the sample number and test schedule correspond.

1.3 Obtain a test worksheet from the Cabinet.

1.4 All equipment to be used in this test must first be checked.

1.5 Check the calibration status of the oven and balance.

1.6 Check the sieves as required on receipt. If any marks, dents or splits are present on the mesh, they will be taken out of service, this includes the washing sieves.

2. Standard Test Method

2.1 The aggregate used in this test will have been obtained from a bulk sample that was initially taken and prepared in the manner described in BS812 : 1985, Part 102.

2.2 The test portion should have the minimum mass as shown below.

Minimum Mass of Test Portion for Sieve Analysis

Nominal Size of Material	Minimum Mass of Test Portion
mm	kg
28	5
20	2
14	1
10	0.5
6	0.2
5	0.2
3	0.2
<3	0.1

2.3 The sample will be recorded to the nearest 0.1g and the weight recorded on the test sheet as W_1 in Box 1.

2.4 Dry the sample in the oven at a temperature of 105 +/- 5 deg C to achieve a constant mass to within 0.1%. This is usually overnight and for a period of at least 16 hours. Record the Time in the oven in Box 2 and the Time out in Box 3.

2.5 The sample shall be allowed to cool and weighed to the nearest 0.1g and the weight recorded on the test sheet as M_1 in Box 4.

2.6 In order to avoid over loading the sieves, the test portion shall be separated on a 5mm test sieve and the masses retained (A) and passing (B) this sieve recorded on the worksheet. Record in Boxes 5 and 6 respectively.

2.7 The two sub portions are placed into separate trays and the sieve analysis carried out on each separately. Riffle boxes can be used to further breakdown the sub portions to prevent overloading. The riffled sub portion is weighed and the mass recorded as C. The Riffle Factor is calculated as B/C.

2.8 The overall particle size distribution is eventually calculated by using the individual weights retained for both portions, and the weight M_1.

Wet Sieve Analysis

2.9 A calibrated 75 micron sieve protected by nesting guard sieve eg. 1.18mm or 2.36mm is first wetted and then set up over the waste outlet in the washing area.

2.10 Taking the dried retained 5mm portion first, place this in a bucket or other suitable container and add sufficient water to half fill the container. Agitate the mixture by stirring until the water is cloudy and most of the clay and silt particles have been loosened off the larger aggregate.

2.11 Using a plastic jug, remove a litre or so at a time of the cloudy water from the bucket and pour this through the two sieves over the waste outlet. Continue doing this until most of the liquid is removed from the bucket.

2.12 Add further quantities of fresh water to the bucket, agitate and decant through the sieves a number of times until the washings passing through the 75 micron sieve are clear. Any particles captured on the protection sieve and 75 micron sieve are back washed into a tray. Transfer all the washed aggregate from the bucket into the same tray, again back washing to capture adhering fines.

2.13 Excess clear water in the tray can be carefully decanted through the 75 micron sieve and then the tray placed in the oven to dry at 105 +/-^{0}C until constant mass is achieved. The mass is recorded as D in Box 8.

2.14 The processes described above are repeated for the second portion passing 5mm retained in the second tray and after drying to constant mass, the mass is recorded as E in Box 9.

2.15 The remaining procedures for completion of the test are continued starting at paragraph 2.17.

Dry Sieve Analysis

2.16 Where a dry sieve analysis only is required the process described in the preceding paragraphs 2.9 to 2.14 will not be carried out.

2.17 After cooling a nest of 300mm sieves is set up down to 3.35mm with a receiver, the dried material from both trays combined and placed into the top sieve and after fitting the lid the whole nest is placed into the sieve shaker until the sample has been reduced into its size fractions.

2.18 The nest is removed from the shaker, and the sieves separated in turn over a spare tray to catch any particles which may pass through. These are placed into the next mesh sieve down in size.

2.19 A further period of hand sieving will be carried out over another tray for at least 2 mins and though flatter pieces may be passed through the aperture by hand no effort must be used to force any of the material through the aperture. Any agglomerated material will be broken by gentle pressure with the finger against the sides of the sieve.

2.20 When it is certain that all the material has passed that aperture then the aggregate retained on the sieve will be weighed to the nearest 0.1g and the weight recorded on the test sheet appropriate to the sieve size.

2.21 This is repeated for the other mesh sizes in the nest , the material remaining in the receiver is now transferred to a nest of 200mm diameter fine sieves transferred to the shaker and sieved and weighed as described for the 300mm diameter nest. A sieve brush is used to clean the meshes between weighings with dislodged particles transferred to the bulk of that sieve size.

2.22 The material will then be recombined into a tray where the accumulated aggregate will be retained for check weighing.

2.23 Record any extraneous material not representative of the bulk that will not readily break down eg clay lumps and remove from the sieve for separate weighing.

3. Calculations

3.01 Calculate the mass retained on each sieve as a percentage of the original dry mass M_1 after factoring up if a riffle factor is used. F is E times the Riffle Factor.

3.02 The amount washed through the 75 micron sieve is $M_1 – (D+F)$ where

3.03 The mass passing each sieve as a cumulative percentage of the total sample mass is also calculated.

4. Test Report

4.01 The report shall indicate that the test was determined in accordance with BS 812 Part 103 1985 and whether a sampling certificate is available.

4.02 Also included in the report shall be:-

i) Sample identification
ii) Percentage passing each sieve
iii) Whether the sample was dry sieved or wet sieved
iv) whether non representative lumps were present