NEW ZEALAND STANDARD

METHODS OF TESTING SOILS FOR CIVIL ENGINEERING PURPOSES

Part 2
Soil classification tests

2.8
DETERMINATION OF THE PARTICLE-SIZE DISTRIBUTION

TEST 2.8.2
Subsidiary method by dry sieving

2.8.2.1
Scope
This method covers the quantitative determination of the particle-size distribution in a soil down to the fine sand size (see Note (1)). Do not use this method unless it has been shown that for the type of material under test it gives the same results as the method of analysis by wet sieving. In case of doubt use Test 2.8.1.

2.8.2.2
Related documents

2.8.2.2.1
The provisions of Part 1 of this Standard are applicable to, and shall be read in conjunction with, this method of test. Reference is made to Test 2.8.1 of this Standard.

2.8.2.2.2
Reference is made in this method of test to the following British Standard:

BS 1796 : 1976 Method for test sieving.

2.8.2.3
Apparatus
(a) An appropriate range of test sieves and appropriate receivers (see Note (1)).
(b) A balance readable and accurate to 10 g.
(c) A balance readable and accurate to 0.5 g.
(d) A balance readable and accurate to 0.01 g.
(e) Sample dividers, for example the multiple slot type (riffle) similar to that shown in fig. 1.2 of Part 1.
(f) A drying-oven complying with the requirements of 1.4.2 of Part 1.
(g) At least 6 evaporating dishes (a convenient size is about 150 mm in diameter).
(h) At least 6 metal trays (a convenient size is about 300 mm square and 40 mm deep).
(j) A mortar and a rubber pestle of appropriate size.
(k) A scoop (a convenient size is about 200 mm long and 100 mm wide).
(m) Sieve brushes.
(n) A mechanical sieve shaker (optional).

2.8.2.4
Procedure
(a) Oven-dry the sub-sample obtained in accordance with the method specified in 1.6.7 of Part 1. Weigh to 0.1 % of its total mass and record.
(b) Take the largest size test sieve appropriate to the maximum size of material present, fit to the receiver, and place the sub-sample on the sieve (see Notes (1) and (3)).
(c) Agitate the test sieve so that the sample rolls in an irregular motion over the test sieve for at least 2 min. During this time continually vary the motion – backwards and forwards, left to right, circular clockwise and anticlockwise – with frequent jarring. Do not attempt to force material through the mesh, but on sieves coarser than 19 mm, testing individual particles to see if they will fall through is permitted. Inspect the material on the sieve and if there is any aggregation of particles transfer the material retained on the sieve to the mortar and rub with the rubber pestle. Re-sieve as above and continue until only individual particles are retained, taking care with weak materials that the treatment is not degrading larger material.
(d) Transfer the material retained in the receiver to a metal tray and fit the receiver to the next largest sized test sieve. Place the contents of the metal tray on the sieve and repeat step (c) (see Note (4)).

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(d) Transfer the material retained in the receiver to a metal tray and fit the receiver to the next largest sized test sieve. Place the contents of the metal tray on the sieve and repeat step (c) (see Note (4)).
(e) Repeat step (c) and step (d) through all the test sieve sizes used. Note that if a mechanical shaker is available these steps can be performed in one operation provided the test sieves are all of the same diameter. Continue sieving until the amount passing any individual sieve during a further one min of vigorous hand agitation is not more than 0.1 % of the test sample mass. Unless the material is weak and subject to degradation during sieving use a minimum period of 10 min mechanical shaking (see BS 1796).
(f) If the mass retained on any individual sieve is greater than the value given in Table 2.8.1, recombine the material on the overloaded sieve and those below it and resieve in two or more approximately equal portions. Even a small degree of over-loading will increase the required sieving time considerably.
(g) Weigh and record the mass retained on each sieve.

2.8.2.5
Calculations
(See Form 2.8.1, 2.8.2):
(a) Calculate the percentage (by mass of the total sample) of material retained on each test sieve and that passing the finest sieve used. Sum these percentages and subtract from 100. This is the loss which should not exceed 1 %.
(b) For each sieve calculate the cumulative percentage (by mass of the total sample) passing that sieve.

2.8.2.6
Reporting of results

2.8.2.6.1
Report the following values:
(a) The results in the form of a table showing to the nearest 1 % the percentage by mass passing each of the sieves used.
(b) If required the results obtained on a semi-logarithmic chart of the type shown in fig. 2.8.1 of Test 2.8.1.
(c) The percentage loss, or that the percentage passing the finest sieve was obtained by difference.

2.8.2.6.2
State that dry sieving only was used.

2.8.2.6.3
State that the result was obtained in accordance with this Standard Test Method.

NOTES ON TEST 2.8.2

(1) BS 1796 discusses the main factors affecting test sieving and the results obtained, and specifies general principles to be followed concerning apparatus and procedure.
(2) *Choice of test sieve sizes.* The sizes of test sieves used for the test should adquately cover the range for the particular soil used, but it will not generally be necessary to use every size for every test.
(3) If the assembly is not too heavy to handle, several sieves (in order of size) may be fitted together and used at the same time.
(4) If the mass of the sample passing the 19.0 mm test sieve is substantially greater than 2 kg, the sample shall be reduced, for example by riffling, to obtain a sample of about 2 kg and care shall be taken to make due allowance in the calculation for the subdivision of the original sample.

Table 2.8.1
MAXIMUM MASS OF MATERIAL TO BE RETAINED ON EACH TEST SIEVE AT THE COMPLETION OF SIEVING

Test sieve	*Maximum mass retained on sieve of diameter shown*			
	450 mm diameter	*300 mm diameter*	*200 mm diameter*	*100 mm diameter*
53.0 mm	10 kg	4.5 kg	–	–
37.5	8	3.5	–	–
26.5	6	2.5	–	–
19.0	4	2	1000 g	–
13.2	3	1.5	600	–
9.50	2	1	450	–
6.70	1.5	0.7	300	–
4.75	1	0.5	250	–
3.35	0.7	0.4	200	–
2.00	0.5	0.3	150	40 g
1.18	–	0.2	100	25
600 μm	–	175 g	80	20
425	–	150	70	17
300	–	125	60	15
212	–	100	50	12
150	–	100	40	10
90	–	75	30	7
63	–	50	20	5
Column 1	2	3	4	5

Form 2.8.1, 2.8.2
DETERMINATION OF THE PARTICLE-SIZE DISTRIBUTION
(Tests 2.8.1, 2.8.2)

Job:
Location:
Depth:
Test details:* Wet/dry sieving method
Test performed on fraction passing/retained on ..... test sieve
History: Natural/air-dried/oven-dried/unknown

Sample no.:
Tested by:
Date:
Checked by:
Date:

Determination of water content of material passing 19 mm test sieve

Container number				
Mass of container and wet soil	g			
Mass of container and dried soil	g			
Mass of container	g			
Mass of water	g			
Mass of dried soil	g			w ..... %
Water content	%			

Mass of dry sample retained on 19 mm test sieve M_1 ..... g
Mass of sample passing 19 mm test sieve M_2 ..... g

Total mass of dry sample $M_T = M_1 + \dfrac{100\ M_2}{100 + w}$ ..... g

Test sieve	*Mass retained*	*Corrected mass*	*Percentage retained* $\frac{Mass}{M_T} \times 100$	*Total percentage passing*	*Maximum sieve load†*	*Sieve diameter used*
75 mm	g	g	%	%	g	
63 mm						
53 mm						
37.5 mm						
26.5 mm						
19 mm						
9.5 mm						
6.7 mm						
Passing 19 mm (M_2)						
Sample fraction passing 19 mm (M_3)						
Riffling correction, C_1 $C_1 = \frac{M_2}{M_3} =$		*Corrected values* C_1 x mass retained				
13.2 mm						
9.0 mm						
7.0 mm						
4.75 mm						
Passing 4.75 mm (M_4)						
Sample fraction passing 4.75 mm (M_5)						
Riffling correction, C_2 $C_2 = \frac{M_2}{M_3} \times \frac{M_4}{M_5} =$		*Corrected values* C_2 x mass retained				
3.35 mm						
2 mm						
1.18 mm						
600 μm						
425 μm						
300 μm						
212 μm						
150 μm						
90 μm						
63 μm						
Passing 63 μm						
Total:						

* Delete inappropriate words.
† Enter figures from table 2.8.1. If the mass exceeds the permitted maximum, the result is invalid; in this case, a smaller sample should be used or the sample sieved a part at a time.

NOTES