METHOD B19

THE DETERMINATION OF THE SAND EQUIVALENT OF AGGREGATES

1 **SCOPE**

This method is intended to serve as a rapid test to show the presence or absence of detrimental fines or clay-like materials in soils or mineral aggregates. The relative proportion is measured on a volume basis in the fraction passing the 4,75 mm sieve.

The procedure described in SABS Method 838 is used.

2 **APPARATUS**

As in SABS Method 838.

3 **METHOD**

Use SABS Method 838.

4 **CALCULATIONS**

Calculate and report the results as in SABS Method 838

S A BUREAU OF STANDARDS **STANDARD METHODS**

SABS Method 838

Sand equivalent value of fine aggregates

SECTION 1. APPARATUS (see Fig. 1)[1]

a) **Measuring cylinder**.
A transparent, graduated measuring cylinder of internal diameter 31,75 mm and height about 430 mm, and graduated (from the bottom) up to at least 381 mm in divisions of not more than 2,54 mm .

b) **Irrigator tube**.
Brass or copper tubing of nominal outside diameter 6,35 mm and length at least 500 mm, the lower end of which is so flattened and sealed as to form a wedge with a watertight base. The wedge has, near the bottom of each flat face, a hole of nominal diameter 1 mm .

c) **Reservoir**.

[1] Further details of the apparatus are given in ASTM D2419 " Sand equivalent value os soils and fine aggregate".

A glass container of capacity at least 4 L and fitted with a siphon assembly consisting of a stopper with two holes, one of which is fitted with a blow tube and the other with a bent copper tube to which is attached a length of 5 mm diameter rubber tubing with a pinch clamp (to stop the flow when 80 required). The reservoir shall be located on a shelf that is at such a height as to maintain the liquid level at a height of between 0,915 m and 1,170 m above the work surface.

d) Weighted foot assembly.

A brass rod of diameter 6,35 mm and length 450 mm and having, at the lower end, a 25,4 mm diameter conical bronze foot that has three small centring screws that enable the foot to be centred loosely in the measuring cylinder. An acrylic, plastic, or nylon indicator, of the shape and dimensions shown in Fig. 1 and provided with a filing screw, shall be fired to the brass rod in such a position that the distance between the upper end of the indicator and the lower end of the weighted foot is 200 mm . The brass rod moves freely through a hole in a guide which fits the top of the cylinder. A mild steel mass-piece, of diameter 50 mm and length about 53 mm, is screwed to the top end of the brass rod to provide a total mass of the assembly (excluding the guide) of 1000 ± 5g.

e) Measure.

A measure of internal diameter approximately 55 mm and capacity 85 ± 5 ml and provided with a cover. The measure may be of any suitable material which will not deform during normal usage.

f) Stop-watch

SECTION 2. STOCK AND WORKING SOLUTSIONS

2.1 Stock solution.

Dissolve 454 g of technical grade anhydrous calcium chloride in about 2 L distilled or demineralized water. Cool the solution and filter it through a medium-textured, smooth-surface filter paper. Add to the filtered solution, 2,05 g of glycerine (3P grade) and 47 g of a 40 % (m/v) solution of formaldehyde, mix well, and dilute to 3,78 L with distilled or demineralized water.

2.2 Working solution.

Prepare a working solution by diluting one measure (85 ± 5 ml) of the stock solution to 3,78 L with distilled or demineralized water, and maintain the temperature of the solution at 22-25 °C throughout the test.

SECTION 3. PREPARATION OF TEST SPECIMEN

a) Sieve the test sample (see SABS Method a2s) (which may have been dampened to avoid segregation and loss of fines) through a sieve with square apertures of nominal size 4,75mzm . Remove all fines adhering to the sieve and add to the material passing through the sieve. By means of a sample splitter or by coning and quartering obtain an initial sample of this material.

b) Determine the exact amount of initial sample needed to completely fill the measure by scooping out four successive measures of the initial sample ensuring (at each filling) that the measure is accurately filled with consolidated material by overfilling it, tapping the bottom edge of the measure on a hard surface, jogging the measure slightly, and then striking off the material level with the rim of the measure. Determine the amount (by mass or by volume) of material contained in the four measures, return this material to the initial sample, and mix well.

c) By splitting or coning and quartering as in (a) above (followed, if necessary, by adjusting) obtain a quantity of the initial sample equal to the predetermined amount.

d) Obtain, as in (c) above, the amount of material needed to fill one measure (i.e. the test specimen). Dry the test specimen at 100-110 EC and allow it to cool to room temperature.

SECTION 4. PROCEDURE

a) Siphon the working solution into the measuring cylinder to a depth of 100-102,5 mm and, using a wide-mouth funnel to avoid spillage, add the prepared test specimen. Tap the cylinder on the heel of the hand to release air bubbles and to promote thorough wetting of the material. Allow to stand undisturbed for 10 + 1 min .

b) At the end of the 10 min soaking period, stopper the cylinder, and loosen the material from the bottom by partially inverting the cylinder and simultaneously shaking it. Then shake the cylinder and its contents as follows:

Holding the cylinder in a horizontal position, subject it (during the period of approximately 30 seconds) to 90 shaking cycles, each cycle consisting of a to-and-fro motion over a distance of 230 + 25 mm . (Proper shaking of the cylinder at the required rate is achieved if the operator uses his forearms only, relaxing the body and shoulders.)

NOTE: It is very important that the shaking is done exactly as described because the manner of shaking influences the result of this test.

c) After shaking, place the cylinder upright on the work table and remove the stopper. Connect the irrigator tube to the rubber tubing attached to the siphon, open the pinch clamp, and push the irrigator through the material to the bottom of the cylinder by applying a gentle stabbing and twisting action while the working solution flows from the irrigator tip. This flushes the fine material into suspension above the coarser sand particles. Continue to apply a stabbing and twisting action while flushing the fines upward until the cylinder is filled to the 381 mm mark. Then, without shutting off the flow, raise the irrigator at such a rate that the liquid level is maintained at about 380 mm while the irrigator is being withdrawn. Just before the irrigator is entirely withdrawn decrease the rate of flow and adjust the final level to exactly 381 mm . Allow the cylinder and contents to stand undisturbed for 20 min ± 15 seconds, starting the timing immediately after withdrawing the irrigator tube.

d) At the end of the 20 min sedimentation period, read and record the level of the top

of the fines suspension. This is the "fines reading". If no clear line of demarcation has formed at the end of the specified 20 min sedimentation period, allow the cylinder and contents to stand undisturbed until a fines reading can be obtained, then immediately read and record the level of the top of the fines suspension and the total sedimentation time.

e) If the total sedimentation time exceeds 30 min, repeat the test on a further three test specimens of the same material (prepared from the remainder of the initial sample used in Section 3(d)) and record only the fines column height of the specimen that required the shortest sedimentation period.

f) After the fines reading has been taken, locate the guide of the weighted foot assembly on the top of the cylinder and gently lower the assembly until it comes to rest on the sand. Dot not allow the indicator to knock against the mouth or sides of the cylinder as the assembly is being lowered. When the foot has come to rest on the sand, move the assembly carefully towards the graduations on the cylinder until the indicator just touches the inside of the cylinder. Read the height at the top edge of the indicator and record this value as the "sand reading". (When taking the sand reading, take care not to press down on the weighted foot assembly as this could give an erroneous reading.) If fines or sand reading fall between the graduations of the cylinder, record the level of the higher graduation as the reading.

SECTION 5. CALCULATION

5.1 Calculate the sand equivalent as follows:

$$\textbf{Sand equivalent} = \frac{sand\ \ reading - 200}{fines\ \ reading}\ \ x\ \ 100$$

Record the sand equivalent to the next higher whole number.

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