METHOD B12

THE DETERMINATION OF THE EFFECT OF SOLUBLE DELETERIOUS MATERIAL IN FINE AGGREGATE FOR CONCRETE

SCOPE

This test method covers the procedure for measuring the effect of soluble deleterious materials in fine aggregate by comparing the compressive strength of mortar cubes made from the fine aggregate in its natural state with the compressive strength of mortar cubes made from a washed sample of the fine aggregate. The method described in SABS Method 834 is followed.

2 APPARATUS

As in SABS Method 834.

3 METHOD

Follow SABS Method 834.

4 CALCULATIONS

Calculate the results as in SABS Method 834 and report the following:

4.1 The average strength of the cubes made with the unwashed aggregate as a percentage of the average strength of the cubes made with washed aggregate, to the nearest whole number.

4.2 Any significant features revealed by examination of the aggregate and specimens.

4.3 The quantity of mixing water used, expressed as a percentage by mass of cement.

5 NOTE

This method may also be used to compare the structural strength of a fine aggregate for concrete with that of a fine aggregate of known quality.

REFERENCE

SABS Method 834

S A BUREAU OF STANDARDS **STANDARD METHODS**

SABS Method 834

Soluble deleterious impurities in fine aggregates (limit test)

SECTION 1. APPARATUS

1.1 Trowels.
Two suitable gau6ing trowels of length approximately 200 mm .

1.2 Cube moulds.
Moulds, each of which is equipped with a base plate and a suitable cover plate, of a metal that is not attacked by cement mortar. The moulds shall be rigidly constructed in such a manner as to facilitate the removal of a moulded specimen without it becoming damaged, and shall be so machined that, when assembled and ready for use, the dimensions and internal faces of a mould are as follows:

a) Nominal height of mould and distance between opposite faces .....not less than 70,7 mm
b) Height of mould and distance between opposite faces equal to within ..... ± 0,15 mm
c) Each angle between adjacent interior faces and planes of top and bottom surfaces .....90 ± 0,5 E
d) Interior faces and base plate plane to within .....0,03 mm

Base plates shall be of such size that, during filling and compaction, the moulds are adequately supported and that leakage will not occur.

1.3 Curing cabinet.
A curing cabinet (or curing room) maintained at a temperature of 22-25 EC and a relative humidity of at least 90 %

1.4 Steam cabinet.
A steam cabinet of such dimensions that it will hold at least six cube moulds simultaneously. It shall be equipped with means to supply (continuously for 24 h) steam at a temperature of 85-90 EC and at normal atmospheric pressure. The cabinet shall be so insulated as to ensure that the temperature of the steam in the cabinet does not vary by more than 1 EC, and shall be provided with a steam outlet that ensures that the steam pressure does not exceed atmospheric pressure.

1-5 Compression testing machine
A suitable compression testing machine of sufficient capacity and having
a) an accuracy and repeatability that comply with the requirements for Grade A machines of BS 1610 "Methods for the load verification of testing machines"
b) bearing platens as described in the relevant clause of BS 1891 : Part 4 "Methods of testing concrete for strength" and
c) a rate of loading of 35 ± 5 MPa/min (as calculated from the test area of the

specimen).

SECTION 2. MATERIAL

2.l Portland Cement

Complying with the requirements of SA3S 471 “Portland cement and rapid-hardening portland cement”

SECTION 3. PREPARATION OF TEST SPECIMENS

3.1 Unwashed sand

3.1.1 Mixing.

From the unwashed sand in the relevant test sample (see SABS Method 828) prepare, as follows :

a mortar m which the sand : cement ratio is 3:1 by mass, preparing enough mortar for three cubes:

Mix, using the two trowels, the dry ingredients for 1 min on a clean dry, non-absorbent surface, and then add enough water to produce a mortar of a consistency judged to be suitable for brick-laying purposes. The water may be added at intervals during the miring, and mixing shall be continued for not less than 3 min and not more than 5 min after the final quantity of water has been added.

NOTE : A suitable mechanical mixer may be used provided that the above mixing sequence is followed and that material adhering to parts of the miser is scraped off at least once during the wet mixing process.

3.1.2 Moulding

Fill the moulds with the mortar and compact thoroughly by any means found suitable. Ensure that all ¨moulds are filled and compacted in exactly the same manner. Cut off the excess mortar flush with the top of the mould, using a straight-edge drawn with a sawing mnotion accros the top of the mould. Ensure that the top edge of the mould is free from loose sand grains, and place the cover plate in position.

3.1.3 Curing.

Unless the use of Method 3 is necessary use either Method 1 or Method 2.

a) Method 1.

Immediately after filling them place the moulds in the curing cabinet for 2 h . Then transfer the specimens (in the covered moulas) to the steam cabinet, close the cabinet, raise the temperature at a uniform rate such that a ,steam temperature of 85-95 EC is reached in 2 h, and maintain this temperature for 24 h . Then decrease the temperature (at a n~iform rate) over a period of 2 h until a temperature of 22-25 EC is obtained. Remove the specimens from the mould,s and determine their compressive strength immediately.

b) Method 2.

Immediately after filling them, place the moulds in the curing cabinet for 24 ± ½ h . Then remove the specimens from their moulds and immerse them in clean water in a

curing bath maintained at 22-25 EC. Seven days ± 1 h after completion of moulding, remove the cubes from the curing bath and determine their compressive strength immediately.

c) Method 3.
As in (b) above except that the cube, are removed from the curing bath 28 days ± 2 h after completion of moulding.

3.2 Washed sand.
Make and cure as in 3.1, three cubes, using exactly the same mix proportions, cement and water : cement ratio as were used in 3.1 but using some of the sand from the same test sample that has been washed as follows:

Add to the sand enough water to cover it completely, stir well, and allow to stand for 24 h. Then add more water until the water level is about 150 mm above that of the sand, stir well, allow to stand for 30 min (but if clay or fines remain in suspension for longer th n 30 min, prolong the settling period to not more than 60 min), and then siphon off the water to a depth of about 25 mn above the sand ensuring that no solids are removed during the process. Carry out the above proceaure of washing and siphoning off the water at least three times. Finally dry the sand at 100-110 EC.

NOTE : The colour of the supernatant water above the sand is not necessarily and indication of the presence of clay or fines as certain soluble matter may produce the same effect. If the washing is done in a glass vessel and the vessel is heId against the light, the presence or absence of fine so1ids can readily be detected.

SECTION 4. PROCEDURE

4.1 Immediately after removal of the cube under test from the curing bath or steam cabinet (as relevant), remove any loose particles, etc. by wiping the sides of the cube, then place it (on a side and without packing) in the compression testinB machine, apply the load at a steady rate of 35 ± 5 MPa/min until the cube collapses, and record the minimum pressure withstood by the cube. Repeat the test on the remaining cubes.

SECTION 5. CALCULATIONS

5.1 a) Calculate the average compressive strength, in mega pascals, of each set of three cubes by dividing the avarage crushing force, in newtons, of the three cubes by the area of the side to which the force was applied.

b) Record, to the nearest 0,5 MPa, the average compressive strength of each set of three cubes, and calculate the average strength of the three cubes made with the unwashed sand as a percentage of the average strength of the three cubes made with the washed sand.

c) If, when curing Method 1 or 2 is used, this percentage is less than the value specified in the relevant specification or agreed upon between purchaser and supplier, discard the result and repeat the test using curing Method 3.

May 1976

Approved by the
COUNCIL OF THE SOUTH AFRICAN BUREAU OF STANDARDS

ISBN 0-626-03885-5