ENGINEERING MATERIALS (SESSIONAL)

CE-204

EXPERIMENT NO.- 9

a) Salinity test of Sand

b) Salinity test of Brick

c) Method for Determination of Aggregate Crushing Value (ACV) – **BS 812-110**

9 (a) Salinity Test of Sand

INTRODUCTION

- Sand used in structural/non-structural elements requires to be free from salinity.
- The test conducted by titration method and the salinity is expressed as %Nacl.
- This can be measured indirectly through conductivity measurement

APPARATUS

- ASTM Test sieve #30 (600 um)
- Balance of sufficient accuracy to measure 0.1 gm
- Grinding apparatus
- Beaker and titration arrangement for NaCl ($AgNO_3$)

TEST SAMPLE PREPARATION

- Take around 200 gm sample and dry it to constant mass
- Grind the sample to sufficient small size to pass all the test portion through #30 (600 um) sieve.
- Take 200 ml distilled water in a beaker, pour 100 gm test portion in it and stir for 2 minutes
- Leave the sample in beaker for next 24 hours
- Carefully separate the liquid from the sample and use the liquid for titration to obtain Nacl content

9 (b) Salinity Test of Brick

INTRODUCTION

- Brick used in structural/non-structural elements requires to be free from salinity.
- The test conducted by titration method and the salinity is expressed as %Nacl.

APPARATUS & PROCEDURE

Same as test for sand

SAMPLE DATA SHEET

Observation No.	1	2
Sample liquid, ml	25	25
Initial Reading of Burette, ml		
Final Reading of Burette, ml		
$AgNO_3$ used, ml		
Salinity of Sand (As Nacl %) =(0.82394/125)*Average AgNO3 used (*up to the forth decimal places*)		

Salinity of Sand (As Nacl %) =

(*up to the forth decimal places***)**

SAMPLE DATA SHEET

Observation No.	1	2
Sample liquid, ml	25	25
Initial Reading of Burette, ml		
Final Reading of Burette, ml		
$AgNO_3$ used, ml		
Salinity of Brick (As Nacl %) =(0.82394/125)*Average $AgNO_3$ used (*up to the forth decimal places*)		

Salinity of Brick (As Nacl %) =

(*up to the forth decimal places*)

CALCULATION

- Calculate the salinity as %Nacl from the following equation:

  Salinity of Brick/Sand (As Nacl %)
  =(0.82394/125)*Average $AgNO_3$ used
  (*up to the forth decimal places*)

- Report this value as the % Nacl up to forth decimal places.

REPORT

The Report shall include the following information:

- Identification of the sand/brick as to source, type
- Salinity of the sample expressed as % Nacl up to the forth decimal places.

2 (b) Method for Determination of Aggregate Crushing Value (ACV)

BS 812-110

INTRODUCTION

- BS 812 part 110 describes a method to determine the aggregate crushing value (ACV)
- Gives a relative measure of the crushing resistance of aggregate under an increasing compressive load.
- The method is applicable to aggregates passing a 14.0 (12.5 mm) mm test sieve and retained on a 10.0 (9.5 mm) mm test sieve.

APPARATUS

- **ASTM test sieves** of aperture size 12.5 mm, 9.5 mm and 2.36 mm, for a standard test.
- **A cylindrical metal mould with plunger**
- **A balance** of capacity not less than 500 g, and accurate to 0.1 g.
- **Compression Testing Machine** of 500/600 kN capacity
- Temping Rod

APPARATUS

Figure: Aggregate Crushing Test Machine

Figure: Aggregate Crushing Process

CRUSHING TESTING APPARATUS

- The aggregate crushing value (ACV) provides relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load.
- Two versions available: 150 (standard) and 75 mm dia. The apparatus comprehend cylinder, plunger, base plate, tamping rod and measure.
- Cylinder, plunger and base plate are made from special alloy steel, hardened to 650 HV (57,8 HRC), and protected against corrosion.
- Weight approx. : 16.5 kg (150 mm dia)

  3.5 kg (75 mm dia)

CRUSHING TESTING PROCEDURE

- An aggregate specimen is compacted into a steel cylinder fitted with a no-friction plunger.
- The specimen is then loaded via the plunger.
- The load crushes the aggregate to an extent depending on the crushing resistance of the material.
- It is measured by a sieving test on the crushed specimen and it is a measure of the aggregate crushing value (ACV).
- A compression testing machine of 500/600 kN capacity, a suitable steel cylinder and plunger are required to perform this type of test .
- A compression machine with a higher capacity also can be used, however, extended calibration assuring Class 1 accuracy from the very beginning of the range is recommended.

CRUSHING TESTING PROCEDURE

- The accuracy of the applied load has a strong influence on the test result: the standard states that the required force of 400 kN has to be reached in 10 min ± 30 s.
- At the very beginning of the test there is significant sample deformation, which affects the loading rate.
- The compression machine control system shall automatically compensate these instabilities and complete the test in an overall time of 10 min ± 30 s.
- Dividing the whole test duration of 600 seconds into 10 intervals of 60 seconds each, each 40 kN load step should be reached in 60 ± 3 seconds.
- The table shows the 10 load steps and corresponding times.

LOADING RATE

Time (s)	Load (kN)
60.30	40.68
120.20	80.43
181.10	120.64
240.21	160.61
300.21	200.00
360.21	240.46
420.22	280.21
480.22	320.36
540.32	360.36
600.30	400.54

PREPARATION OF THE TEST SAMPLE

- Aggregate passing 12.5 mm ASTM test sieve and retained on a 9.5 mm ASTM test sieve
- The quantity of aggregate sieved out shall be sufficient for two tests.
- The aggregate shall be tested in a surface-dry condition.
- If dried by heating, the period of drying shall not exceed 4h, the temperature shall not exceed 110°C and the samples shall be cooled to room temperature before testing.

PREPARATION OF THE TEST SAMPLE

- The measure shall be filled with the aggregate by means of a scoop, the aggregate being discharged from a height not exceeding 50 mm above the top of the container.
- The aggregate shall then be tamped with 25 blows of the rounded end of the tamping rod, each blow being given by allowing the tamping rod to fall freely from a height of about 50 mm above the surface of the aggregate and the blows being evenly distributed over the surface.
- The net mass of aggregate in the measure shall be recorded (mass A) and the same mass used for the second test.

SAMPLE DATA SHEET

Observation No.	1	2
Wt. of Sample, (Dry) A, gm		
Wt. of material retained on 2.36 mm sieve, C, gm		
Wt. of material passing 2.36 mm sieve, B = (A-C), gm		
Aggregate Crushing Value (ACV) = (B/A)x 100% (to the first decimal place)		

Average Aggregate Crushing Value (ACV) =

(To the nearest whole number)

CALCULATION

The ratio of the mass of fines formed to the total sample mass in each test shall be expressed as a percentage, the result being recorded to the first decimal place.

$$\boldsymbol{Aggregate\ Crushing\ Value\ (ACV) = \frac{B}{A} \times 100}$$

Where,

A is the mass of dry sample (g);

B is the mass of fraction passing the sieve (2.36 mm) for separating the fines (g)

The mean of the two results shall be reported to the nearest whole number as the aggregate crushing value

REPORT

The Report shall include the following information:

- Identification of the aggregate as to source, type, and nominal maximum size
- Aggregate crushing value of the sample expressed to the nearest 1% by mass.