Field Test Procedure & Specification Manual

Dinesh Agarwal

Managing Director

FIELD TESTS

A : AGGREGATES

B : SOILS

C : CEMENT, CONCRETE & BRICKS

A) AGGREGATES

1) SIEVE ANALYSIS (COARSE AND FINE AGGREGATE)

(I.S : 2386 (Part I) – 1963 and I.S 383 : 1970)

OBJECT

To determine particle size distribution of fine, coarse and all – in – aggregate by sieving or screening

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

1. I.S Sieves :

Type		Sieve Designation
Square hole, perforated plate		80 mm, 63mm, 50mm, 40 mm, 31.5mm, 20mm, 16mm, 12.5mm, 10mm, 6.3 mm, 4.75mm
Fine mesh, Wire cloth		3.35mm, 2.36mm, 1.18 mm, 600 microns, 300 microns 150 microns & 75 microns

2. Balance

The balance or scale shall be such that it is readable and accurate to 0.1% of the weight of the test sample.

Sample:

The weight of sample available shall be not less than the weight given below. The sample for Sieving (See below given table) shall be prepared from the larger sample either by quartering or by means of a sample divider.

Minimum weights for sampling

Maximum size present in Substantial propositions mm	Minimum weight of sample Dispatched for testing Kg
63	100
50	100
40	50
25	50
20	25
16	25
12.5	12
10.0	6
6.3	3

Test procedure for coarse or fine aggregates

The sample shall be brought to an air – dry condition before weighing and sieving. This may be achieved either by drying at room temperature or by heating at a temperature of 100^0C to 110^0C. The air – dry sample shall be weighed and sieved successfully on the appropriate sieve starting with the largest. Care shall be taken to ensure that the sieve are clean before use.

Each sieve shall be shaken separately over a clean tray until not more than a trace passes, but in any case for a period of not less than two minutes. The shaking shall be done with a varied motion, backwards and forwards, left to right, circular clockwise and anticlockwise, and with frequent jarring. So that the material is kept moving over the sieve surface in frequently changing directions. Material shall not be forced through the sieve by hand pressure, but on sieves coarse than 20 mm, placing of particles is permitted. Lumps of fine material, if present may be broken by gentle pressure with fingers against the side of the sieve. Light brushing with a soft brush on the under side of the sieve may be used to clear the sieve openings. Light brushing with a fine camel hair brush may be used in the 150 microns and 75 microns 15 sieves to prevent aggregation of powder and blinding of apparatus. Stiff or worn out brushes shall not be used for this purpose and pressure shall not be applied at the surface of the sieve to force particles through the mesh.

On completion of sieving, the material retained on each sieve together with any material cleaned from the mesh, shall be weighed.

In order to prevent binding of the sieve apertures by overloading, the amount of aggregate placed on each sieve shall be such that the weight of the aggregate retained on sieve at completion of the operation is not greater than the values given for that sieve in table (B). Sample weights given in table (C) will be thus normally require several operations on each sieve.

Note:-

1. For many routine purposes mechanical sieving is advantageous, but if this method is used, care should be taken to ensure that the sieving is complete.

2. If sieving is carried out with a nest of sieve on a machine, not less than 10 minutes sieving will be required for each test.

SIZE OF GRADING OF AGGREGATES
(I.S: 2386 (Part – I) 1963 & IS: 383)

Coarse aggregate:

The grading of single sized coarse aggregate and graded coarse aggregate, when determined as described in I.S 2386 (part I) 1963 shall be within limits given in Table – 1

Fine aggregate:-

The grading of final aggregates, when determined as described in I.S 2386 (Part I) 1963, shall be within limits given in Table – II.

All – in – aggregates:

The grading of all – in aggregates when determined as described in IS: 2386 (Part I) 1963 shall be in accordance with Table – III.

Observation sheet

Weight Table

Sr. No.	IS Sieve No.	Weight retained	% weight retained	Cumulative % retained	% passing
1	2	3	4	5	6

I.S 383 / 1970 Table – 1
COARSE AGGREGATE

i.s sieve Designation	Percentage passing for single sized aggregate of normal size					Percentage passing for graded aggregate of normal size				
	63mm	40mm	20mm	16mm	12.5mm	10mm	40mm	20mm	16mm	12.5mm
1	2	3	4	5	6	7	8	9	10	11
80 mm	100	-	-	-	-	-	100	-	-	-
63 mm	85-100	-	-	-	-	-	-	-	-	-
40 mm	00-30	85-100	100	-	-	-	95-100	100	-	-
20 mm	0-5	0-20	85-100	100	-	-	30-70	95-100	100	100
16 mm	-	-	-	85-100	100	-	-	-	90-100	-
12.5 mm	-	-	-	-	85-100	100	-	-	-	90-100
10 mm	0-5	0-5	0-20	0-30	0-45	85-100	10-35	15-55	30-70	40-85
4.75 mm	0	0	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10
2.36 mm	-	-	-	-	-	0-5	-	-	-	-

TABLE – II : FINE AGGREGATE

I.S Sieve Designation	Percent Passing for			
	Grading Zone – I	Grading Zone – II	Grading Zone – III	Grading Zone – IV
10.00 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600.00 microns	15-34	35-59	60-79	80-100
300.00 microns	5-20	8-30	12-40	15-50
150.00 microns	0-10	0-10	0-10	0-10

TABLE – III: ALL IN AGGREGATE GRADING

I.S Sieve Designation	Percentage passing for all –in – aggregate of	
	40 mm nominal size	20 mm nominal size
80.00 mm	100	-
40.00 mm	95-100	95-100
20.00 mm	45-75	30-50
4.75 mm	25-45	10-35
600.00 microns	8-30	0-6
150.00 microns	0-6	-

Report of results to Quality-In-charge.

Records : TES –F-01 : Test format for Sieve Analysis (Coarse and Fine aggregates)

2) DETERMINATION OF FLAKINESS INDEX VALUE (I.S.: 2386 (part-1) 1963)

Object:

To determine the Flakiness Index of coarse aggregate sample.

Responsibility :

Lab Technician is responsible for carrying the test

Note:

Flakiness Index of an aggregate is the percentage by weight of particles in it whose least dimension (thickness) is less than three fifths (3/5) of their mean dimension. The test is not applicable to sizes smaller than 6.3 mm.

Apparatus:

The following apparatus are required:

a) A balance of enough capacity and sensitivity. It should have an accuracy of 0.1% of the weight of test sample.

b) Metal Gauge confirming to I.S. 2336 (part-I) 1977.

c) I.S. Sieves – 63mm, 50mm, 40mm, 31.5mm, 25mm, 20mm, 16mm, 12,5mm, 10mm and 6.3mm.

Sample:

Sufficient quantity of sample is needed so that it consists of at least 200 pieces of any fraction to be tested.

Test Procedure:

1. The sample has to be carefully and properly sieved.
2. Nine fractions are to be collected with the following specifications :

Passing through I.S. Sieve	Retained on I.S. Sieve
63mm	50mm
50mm	40mm
40mm	31.5mm
31.5mm	25mm
25mm	20mm
20mm	16mm
16mm	12.5mm
12.5mm	10mm
10mm	6.3mm

3. Every piece of each fractional sieve shall be gauged for the minimum thickness with help of the ISI gauge or in bulk using a set of sieves having standard elongated slots.

4. Thus, each fraction is to be separated in to two part; One consisting of pieces which pass through the corresponding slot in the standard gauge and the other consisting of pieces which do not pass through the corresponding slot in the standard gauge.

5. Weight of each part is separately weighted. Sum of both the weights gives the total weight of each fraction.

Calculations

a) The sum of weight of portion of all fractions; in which pieces pass through the corresponding slots (W.1) and the sum of the weights of all fractions (W.2) are to be calculated.

Observation Sheet

Sl. No	Sieve size in mm	Weight of passing	Weight retained	Remaining Sample weight
1	2	3	4	5

$$\% \text{ Flakiness Index} = \frac{\text{Weight of passing}}{\text{Total Weight}} \times 100$$

Application of Flakiness Index

In pavement construction Flaky and elongated particles are to be avoided, particularly in surface course. If flaky and elongated

aggregates are present in appreciable proportions, the strength of the pavement layer would be adversely effected due to possibility of breaking down under loads. In Cement Concrete depends on Cement content.

Indian Roads Congress has recommended the maximum allowable limits of flakiness index values for various types of construction, as give below:

Sl. No.	Type of Construction	Maximum Limit of Flakiness Index per cent
1.	Water bound macadam	15
2.	Bituminous surface dressing, penetration macadam carpet	25
3.	Bituminous bound macadam bituminous concrete	15

Records:TES-F-02 : DETERMINATION OF FLAKINESS INDEX VALUE

3) DETERMINATION OF BULKING OF SAND

As per IS-2386 (Part-III) 1963 Reaffirmed-1997

Object

To determine the bulking of sand.

Responsibility :

Lab Technician is responsible for carrying the test

The standard test for bulking is based on the fact that while damp sand bulks the volume of standard sand completely soaked with water is the same as if the sand were dry.

To make a filed test one needs a measuring jar or in its absence any straight sided container and a rule, a steel rod to rod sand with and a second container to tip it into.

Fill the container about two third full with the sand to be test. Drop it loosely, do not pack it down. Level off the top and pushing a steel rule down through it to the bottom, measure the height of the sand. Suppose it is 15 cm.

Empty the sand into another container (taking care that none of it is lost in the process) and half fill the first container with water, put back the sand into the water bit by bit and keep Roding to remove the air when the entire sand is fully saturated push the rule through the sand as before and measure the height. Say it measure 12.5 cm.

The bulking is calculated from the volume of dry sand or saturated sand and hence in this case bulking is 2.5 cm, i.e.:

$$\text{Bulking} = \frac{2.5 \times 100}{12.5} \times = 20\%$$

The volume used should therefore be 20% more than quoted in the specification.

RECORDES : TES-F-03 : DETERMINATION OF BULKING OF SAND

B) SOILS

1) WATER CONTENT OF SOIL

(I.S: 2720 – 11)

Determine moisture content by rapid moisture meter (Using calcium carbide)

Object

To determine moisture content by rapid moisture meter (Using calcium carbide)

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

a) Metallic pressure vessels with clamp for ceiling cum gauge calibrated in percent water content.
b) Counter poised balance for weighing samples.
C) Scoop for measuring calcium carbide.
d) Bottle of calcium carbide
e) One cleaning brush
f) Three steel balls of about 10.5 mm diameter and one steel ball of 25 gm

Soil Specimen

Sand requires no special preparation. Course power may be ground and pulverized. Cohesive and plastic soils are tested with addition of balls in the pressure vessels. This test requires 6 gm of specimen.

Procedure

In this method, a weighed quantity of wet solid is mixed with calcium carbide in an airtight container. The pressure of the acetylene gas produced by the reaction of calcium carbide with water present in soil is read on a dial gauge located on one end of the container (moisture tester), the dial gauge being calibrated to read in percentage of water based on the wet weight of the sample. The moisture testers are usually available in two sized, one for a 6 gm sample and the other for a 26 gm sample. It is preferable to use a larger – size tester. The instrument can be calibrated for converting the moisture tester readings to the equivalent of water contents obtained by oven drying. The method is quick, taking less than 5 minutes, are fairly accurate. Difficulty is experienced in proper pulverization and mixing of clay soils inside the tester. Two steel balls of about 30 mm diameter can be put inside the larger size tester for proper pulverization.

Calculation

From the water content (m) as obtained on the moisture balance scale, the water content (w) on the dry weight basis shall be calculated as follows :-

$$W = \frac{m}{100 - m} \times 100$$

RECORDES : TES-F-04 : WATER CONTENT OF SOIL

2) DETERMINATION OF FIELD DENSITY BY CORE CUTTER METHOD

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

Cylindrical core cutter with dolly, hammer, trowel, tray, balance, straight edge, crow bar, moisture can.

Procedure

1. Clean the core cutter and dolly. Weight the core cutter (W1), and determine its volume (V). Apply grease inside the core cutter.
2. Clear a small area of ground where the field density of soil is to be found out and make it level.
3. Drive the core cutter (with dolly fitted on top) with hammer to its full depth). Avoid over driving by seeing the top level of the soil in the cutter through the air vent provided in the dolly.
4. Dig out the core cutter with the help of crow bar and lift it carefully from the ground with the help of a trowel placed at the bottom of the cutter. Trim the top and bottom surface of the sample with a straight edge.
5. Determine the weight of the core cutter with soil (W2).

Calculation

Calculate the field density (γ w), water content (w %) dry density (γ d) and void ratio

$$e = \frac{G\,\gamma\,W}{\gamma\,d} - 1$$

Observation-cum-computations

Soil Type: Location : Tested by :
Date :

Internal dia of core cutter
Weight of core cutter.

1. Weight of core cutter (W1) Gms.
2. Weight of pan + excavated soil (W2) Gms.
3. Weight of wet soil (W2 – W1)
4. Volume of core cutter (V) cc
5. Bulk density $YB = \frac{W2 - W1}{V}$ gm/cm^3
6. M.C. container No.
7. Weight of container + wet soil (W2)
8. Weight of container + dry soil (W3)

9. Weight of Water (W2 – W3)
10. Weight of container (W1)
11. Weight of dry soil (W3 – W1)
12. Moisture content in % (W) $= \frac{W2 - W3}{W3 - W1}$
13. Dry density dry $= \frac{YB}{1+w/100}$ gms/cm^3

RECORDES : TES-F-05 : DETERMINATION OF FIELD DENSITY BY CORE CUTTER METHOD

C)CEMENT, CONCRETE & BRICKS

PHYSICAL TESTS

1) DETERMINATION OF NORMAL CONSISTENCY : INITIAL AND FINAL SETTING TIMES OF CEMENT

(I.S : 269 – 1976 and IS : 4031 – 1968)

(A) Normal Consistency

Object

Determination of the quantity of water required to produce a cement paste of standard consistency.

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

Vicat apparatus (Conforming to IS: 5513 – 1968) with plunger (10 mm in dia)

Theory

The standard consistency of a cement paste is defined as that consistency which will permit the vicat plunger to penetrate to a point of 5 to 7 mm from the bottom of the vicat mould, when the cement paste is tested as described in the following procedure.

Procedure

Prepare a paste of weighed quantity of cement (350 gms) with a weighed quantity of water, start with 30% water of 350 gms of cement taking care that the time of gauging is not less than 3 minutes and not more than 5 minutes and the gauging shall be completed before any sign of setting occurs. The gauging time shall be counted from the time of adding the water to the dry cement until commencing to fill the mould. Fill the vicat mould with this paste, the mould resting upon a non – porous plate. After completely filling the mould, trim off the surface of the paste, making it in level with the top of the mould. The mould may slightly be shaken to expel the air.

Place the test block with the mould, together with the non – porous resting plate, under the rod bearing the plunger (1 cm dia) lower the plunger gently to touch the surface of the test block and quickly release, allowing it to penetrate into the paste. This operation shall be carried out immediately after filling the mould.

Prepare trial pastes with varying percentages of water and test as described above until the amount of water necessary for making the standard consistency as defined above is obtained. Express the amount of water as a percentage by weight of the dry cement. The observations will be tabulated as shown below:-

Sr. No.	Wt. Of cement taken in (Gms) (a	Wt. Of water taken (in gms) (b)	Plunger penetration (in mm)	Time taken from the adding of water to cement	Consistency of cement in % by weight $\frac{b}{c}$ x 100
1	2	3	4	5	6

Precautions

Use clean appliances for gauging. The temperature of cement and water and that of test room, at the time when the above operations are being performed, shall be 27 ± 2^0C. The room temperature , shall be maintained at 27^0C ± 2^0C.

(B) Initial and Final Setting Times

Object

Determination of the Initial and Final setting times of cement.

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

The vicat apparatus (conforming to IS: 5513 – 1969)

Sample

350 Gms of cement is taken.

Procedure

Preparation of Test Block

Prepare a neat cement paste by gauging 350 gms of cement with 0.85 times the water required to give a paste of standard consistency. The paste shall be gauged in the manner and under the conditions prescribed in determination of consistency of standard cement paste. Start a stop watch at the instant when water is added to the cement. Fill the mould with the cement paste gauged as above, the mould resting on a non-porous plate, fill the mould completely and smooth off the surface of the paste making it level with the top of the mould. The cement block thus prepared in the mould is the test block.

Use clean appliances for gauging. The temperature of water and that of the test room, at the time of gauging, shall be $27^0C \pm 2^0c$.

During the test, the block shall be kept at a temperature of $27^0C \pm 2^0c$ and at not less than 90% relative humidity.

Determination of Initial Setting Time

Place the test block confined in the mould and resting on the non – porous plate, under the rod bearing initial setting needle, lower the needle gently in contact with the surface of the test block and quickly release, allowing it to penetrate into the test block. In the beginning the needle will completely pierce the test block. Repeat this procedure until the needle, when brought in contact with the test block and released as described above, fails to pierce the block for 5 ± 0.5 mm measure from the bottom of the mould. The period lapsing between the time of water is added to the cement and the time at which the needle fails to pierce the test block by 5 ± 0.5 mm shall be the initial setting time.

Determination of Final Setting Time

Replace the needle of the vicat apparatus by the needle with an annular ring. The cement shall be considered as finally set when, upon applying the needle gentle to the surface of the test block, the needle makes an impression thereon, while the outer ring fails to do so. The period elapsing between the time when water is added to the cement and the time at which the needle makes an impression on the surface of the test block while the attachment fails to do so, shall be final setting time.

Limits

Initial setting time minimum	-	30 minutes
Final setting time maximum	-	600 minutes

RECORDES: TES-F-06: DETERMINATION OF NORMAL CONSISTENCY: INITIAL AND FINAL SETTING TIMES OF CEMENT

2) TEST FOR COMPRESSIVE STRENGTH OF CEMENT CONCRETE

(IS: 516 – 1959)

Object

Determination of the compressive strength of cement concrete specimens.

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

Testing machine, two steel bearing platens with hardened faces (As per IS: 516 – 1959)

Theory

Tests shall be made at recognized ages of the test specimen, the most usual being 7 and 28 days, ages of 13 weeks and one year are recommended if tests at greater ages are required. Where it may be necessary to obtain the early strengths, tests may be made at the ages of 24 hours ± ½ hour and 12 hours ± 2 hours. The ages shall be calculated from the time of the addition of water to the dry ingredients.

Number of Specimens

At least three specimens, preferably from different batches, shall be made for testing at each selected age.

Procedure

Specimens stored in water shall be tested immediately on removal from water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fines removed. Specimen when received dry shall be kept in water for 24 hours before they are taken for testing. The dimensions of the specimens to the nearest 0.2 mm and their weight shall be noted before testing.

Placing the specimen in the Testing Machine

The bearing surface of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimen which are to be in contact with the compression platens. In the case of the cubes, the specimen shall be placed in the machine in such a manner that the load shall be applied to opposite sides of the cubes as cast, that is not the top and bottom. The axis of the specimen shall be carefully aligned with the center of thrust of the spherically seated platen. No packing shall be used between the faces of the test specimen and the steel platen of the testing machine. As the spherically seated block is brought to bear on the specimen, that movable portion shall be rotated gently by hand so that uniform seating may be obtained. The load shall be applied without shock and increased continuously at a rate of approximately 140 kg / sq cm / min. Until the resistance of the specimen to the increasing load breaks down and no greater loan can be sustained. The maximum load applied to the specimen shall then be recorded and the appearance of the concrete and any unusual features in the type of failure shall be noted.

Calculation

The measured compressive strength of the specimen shall be calculated by dividing the maximum load applied to the specimen during the test, by the cross sectional area, calculated from the mean dimensions of section and shall be expressed to the nearest kg / sq.cm. Average of three values shall be taken as the representative of the batch provided the individual variation is not more than ± 15 of the average. Otherwise, repeat tests shall be made.

In case of cylinders, a correction factor according to the height to diameter ratio of specimen after capping shall be obtained from the curve shown in Fig. 1 to IS: 516 – 1959. The produce of correction factor and the measured compressive strength shall be known as the corrected compressive strength, this being the equivalent strength of a cylinder having a height / diameter ratio of two. The equivalent cube strength of the concrete shall be determined by multiplying the corrected cylinder strength by 5/4.

Reporting of Results

The following information shall be included in the reports on each test specimen:-

a) Identification mark b) Date of test c) Age of specimen
d) Curing conditions including date of manufacture of specimen in the field
e) Weight of specimen f) Dimensions of specimen,
g) Compressive strength h) Maximum load and i) Appearance of fractured faces of concrete and type of fractures if these are unusual.

RECORDES: TES-F-07: TEST FOR COMPRESSIVE STRENGTH OF CEMENT CONCRETE

3) DETERMINATION OF CONSISTENCY OF CONCRETE (BY SLUMP TEST)

Object
To find out the slump of the course mix (Method for measuring workability)
Responsibility :

Lab Technician is responsible for carrying out the test

Apparatus
Mould for test specimen (Frustam of a cone 20cm in diameter at bottom, 10 cm at the top and 30 cm in height, tamping rod 16mm dia and 60 mm long.

Test Procedure
The mould is filled with concrete in 7.5cm layers and each layer is compacted with 25 strokes of 16mm diameter tamping rod. The strokes should be applied uniformly over the entire area and with such a force that the rod just penetrates the full depth of the layer being compacted. The mould is then removed just after filling, care being taken not to disturb concrete and the concrete is allowed to settle the vertical settlement is know as slump.

RECORDES: TES-F-08: DETERMINATION OF CONSISTENCY OF CONCRETE (BY SLUMP TEST)

4) DETERMINATION OF COMPRESSIVE STERNGTH OF BRICKS (IS: 3495 Part – 1976)

Object
To determine compressive strength of bricks
Responsibility :

Lab Technician is responsible for carrying the test

A. Solid Bricks
Apparatus
A compressive testing machine, the compression plate of which shall have a ball seating in the form of portion of a sphere the center to which coincides with the center of the plate, shall be used.

Preconditioning
Remove unevenness observed in the bed faces to provide tow smooth a parallel faces by grinding. Immerse in water at room temperature for 24 hours. Remove the specimen and drain out any surplus moisture at room temperature. Fill the frog (where provided) and all voids in the bed face flush the cement mortar of grade 1 Cement , 1 clean Course Sand. Then cover it with wet jute bags for 24 hours followed by immersion in clean water for 3 days. Remove and wipe out any traces of moisture.

Procedure
Place the specimen with flat faces horizontal and mortar filled face, facing upwards between two 3 – ply plywood sheets each of 3 thickness and carefully centered between plates of the testing machine. Apply load axially at a uniform rate of 14 N / mm² (140 KG 1 / cm²) per minute till the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.
Note: - In place of plywood sheets plaster of Paris may be used to ensure a uniform surface for application of load.

Report
The report shall be given below:-0

$$\text{Compressive strength in N / mm}^2 \text{ (Kg f / cm}^2\text{)} = \frac{\text{Max load at failure in N (Kg.f)}}{\text{Average area of the bed faces in mm}^2 \text{ (cm}^2\text{)}}$$

The average of results shall be reported.
For Perforated Bricks

Apparatus

Name as per solid bricks

Preconditioning

Immerse the specimen in water at normal room temperature for 24 hours. Remove the specimen from water and drain out any surplus water. No mortar shall be filled in perforations and mortar capping shall be provided.

Procedure

Place the perforated faces of the brick between 3 – ply plywood sheets each of 3 mm thickness and carefully centered between the plates of the testing machine. Apply the load at uniform rate of 13 N /mm² per minute till the failure occurs and note the maximum load at failure. The load at failure shall be the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.

Note :- In place of plywood sheets plaster of Paris may be used to ensure a uniform surface for application of load.

Reporting of results

The report shall be as given below

Compressive strength (N/ mm² (KG F/ CM²) = Max. Load at failure in N (Kg.f) / Average net area of the two faces under compression In mm² (cm²)

The average of result shall be reported.

RECORDES: TES-F-08: DETERMINATION OF COMPRESSIVE STERNGTH OF BRICKS

05) DETERMINATIONB OF WATER ASBORPTION OF BRICKS

(IS: 3495 – PART II 1976)

Object
To determine water absorption of bricks
Responsibility :

Lab Technician is responsible for carrying the test

Method
24 hour Immersion cold water test.

Apparatus
A sensitive balance capable of weighing within 0.1 per cent of the mass of the specimen and a ventilated oven.

Pre conditioning
Immerse completely dried specimen in clean water at a temperature of $27^0C \pm 2^0c$ for 24 hours. Remove the specimen and wipe out any traces of water with a damp cloth and weigh the specimen. Complete the weighing 3 minutes after the specimen has been removed from water (M2).

Water Absorption
Percent by mass, after 24 hour immersion in cold water is given by the following formulas

$$\frac{MS - M1}{M1} X\ 100$$

The average of results shall be reported.

Apparatus
Same as above.

Pre conditioning
Fresh samples shall be preconditioned as in (a) above. For samples obtained after 24 hour immersion test, no preconditioning is required.

Procedure

Immerse the specimen immediately into a tank, and place it in such a way that water can circulate freely on all sides on the specimen. Stir the water occasionally to ensure complete expulsion of air.

Heat the water to boiling in one hour, and boil it continuously for 5 hours. Then allow it to cool to $27^0C \pm 5^0$ by natural loss of heat for 16 to 19 hours. Remove, drain out any surplus moisture and rub with damp cloth. Weigh the specimen, completing the same in 3 minutes (M3).

Reporting of Results

Water absorption, percent by mass, after 5 hours of immersion in boiling water is given by the following formula.

$$\frac{M3 - M1}{M1} \times 100$$

The average of results shall be reported

RECORDES: TES-F-09: DETERMINATIONB OF WATER ASBORPTION OF BRICKS

06) TEST FOR WORKABILITY OF CONCRETE TEST FOR COMPACTION FACTOR

Object

Determination of the workability of concrete, where the nominal maximum size of the aggregate exceeds 38mm.

This determination is a precise and sensitive than the slump test and is particularly useful for concrete mixes of very low workability as are normally used when concrete is to be compacted by vibration.

Responsibility :

Lab Technician is responsible for carrying the test

Apparatus

Compaction factor apparatus which consists of two conical hoppers; one above the other mounted above a cylindrical mould; two ordinary brick laying trowels, one hand scoop, a rod of steel and balance.

Sampling

When the test is due in the field, for obtaining the representative samples of fresh concrete from the mixture at least 3 approximately equal sample increments totaling 0.02 cm shall be taken from a batch during its discharge and each sample shall be collected by passing a clean and dry metalling receptable across the stream of concrete, like wise, the representative samples from concrete at the time and place of deposition may be taken while a bath of concrete is discharged on the site. The sample shall be collected from not less than five well disturbed positions, avoiding the edge of the mass where segregation may have occurred.

The composite sample obtained by either of the methods said above shall be mixed on a non absorbent base either with a shovel or by other suitable implement in such a manner as to ensure uniformity. The date, time and method of sampling mix proportions, the mixture from which delivered, the location of the sample bath after placing and the temperature and weather conditions shall be recorded.

Procedure

The sample of concrete to be tested shall be placed gently in the upper hopper using the hand scoop. The hopper shall be filled level with its brim and the trap door at the lower end of the hopper shall be opened so that the concrete falls into the lower hopper. The cylinder shall be covered by the towels during the above process.

Immediately after the concrete has come to rest, the cylinder shall be uncovered, the trap door of the lower hopper opened and the concrete allowed to fall in to the cylinder. The excess of concrete remaining above the level of the top of the cylinder shall then be cut off by holding a trowel in each hand. The outside of the cylinder shall then be wiped clean the weight of the concrete in the cylinder shall then be determined to the nearest 10 gms. This weight shall be known as the weight of partially compacted concrete. The cylinder shall be refilled with concrete from the sample in layers approximately 5 cm deep, the layers being heavily rammed or preferably vibrated so as to obtain full compaction. The top surface of the fully compacted surface shall be carefully stuck off level with the top of the cylinder. The outside of the cylinder shall then be wiped clean.

Calculation

The compaction factor is defined as the ratio of the weight of partially compacted concrete to the weight of fully compacted concrete. It shall be stated to the nearest second decimal place.

$$\text{Compacting Factor} = \frac{\text{Weight of partially compacted concrete}}{\text{Weight of fully compacted concrete}}$$

RECORDES: TES-S-10: TEST FOR WORKABILITY OF CONCRETE TEST FOR COMPACTION FACTOR

Sieve Analysis for Coarse and Fine Aggregate

(as per IS 2386 (Part-1)-1963)

Client :

Name of project

Date of Testing:

Type of Material:

Weight of Sample Taken:

Sr. No.	Sieve Size (mm)	Wt. Retained (gms)	Cumulative weight retained	% Retained	% Passing

Tested By

Checked By

TES-F-01

Determination of Elongation and Flakiness Index Value
(As per I.S.: 2386 (part-1) 1963)

: Customer ID:

Name of project:

Testing date:

Type of material:

Sieve size in mm		FLAKINESS INDEX		ELONGATION INDEX	
Passing	Retained	Weight of the fraction gauged (gms)	Wt of the Material Passing Through Flakiness gauge(gms)	Wt of the fraction Gauged(gms)	Wt of the Material Returned through Elongation Gauge(gms)
	Total	A	B	C	D

Note: minimum 200Pcs should be taken on each fraction for Test

Flakiness Index: = A/B =
Elongation Index: =C/D =
Combined (FI+EI): =(A/B)+(C/D) =

Tested By

Checked By

TES-F-02

Determination of Bulking of Sand
(As per IS 2386(Part-3):1963., Reaffirmed 1997)

Customer ID:

Name of project:

Testing date:

Type of material:

Sr. No.	Description	Trial 1	Trial 2	Trial 3
1	**Volume of Bulk Sand (A) ml**			
2	**Volume of fully Saturated Sand (B) ml**			
3	**Bulking of sand = [(A-B)/A] x 100 %**			
4	**Average**			

Tested By **Checked By**

TES-F-03

DETERMINATION OF WATER CONTENT OF SOIL
(As per IS 2720(Part-2))

Customer ID:

Name of project:

Testing date:

Type of material:

Sr.No	Description	Sample		
		1	2	3
1	Container No.			
2	Mass of Container + Wet Soil in gms			
3	Mass of Container + Dry Soil in gms			
4	Mass of Container in gms			
5	Mass of Dry Soil in gms			
6	Mass of Moisture in gms			
7	Moisture Content in %			
8	Avg of Moisture Content in %			

Tested by **checked By**

TES-F-04

DETERMINATION OF FIELD DENSITY BY CORE CUTTER METHOD

(As per IS:1720)

Customer ID:

Name of project:

Testing date:

Type of material:

Sl.No	Description	Trial 1	Trial 2	Trial 3
1	Weight of core cutter + Wet soil in (gms)			
2	Weight of core cutter in (gms)			
3	Weight of Wet Soil in (gms)			
4	Volume of Core Cutter in (cc)			
5	Bulk Density in (gm/cc)			
6	Moisture Content (By R.M.M) in %			
7	Dry Density in (gm/cc)			

Tested by Checked by

TES-F-05

DETERMINATION OF NORMAL CONSISTENCY:INITIAL AND FINAL SETTING TIME OF CEMENT

(As per IS:269 – 1976 & IS:4031 – 1968)

Customer ID:

Name of project:

Testing date:

Type of material:

Sr. no.	Name of Test	Date of Testing	Method of test	Result obtained	Limits As Per (IS :12269) 1987
3	Initial setting time				
4	Final Setting Time				
5	Normal consistency				

Tested by

Checked by

TES-F-06

DETERMINATION OF COMPRESSIVE STRENGTH OF CEMENT CONCRETE

(As per IS:269 – 1976 & IS:4031 – 1968)

Customer ID:

Name of project:

Testing date:

Type of material:

Sl.No	Cube No	Date of Casting	Date of Testing	Weight (Kg)	Dimensions in mxmxm	Volume in(Cum)	Density in (Kg/Cum)	Area of Cube(m2)	Failure Load in (KN)		Comp. Strength of Concrete cube (N/mm2)	Average comp. Strength (N/mm2)
									observed	Correc-ted		

Tested by

Checked by

TES-F-07

DETERMINATION OF COMPRESSIVE STRENGTH OF BRICK

(As per IS:3495)

Client:

Name of project:

Testing date:

Type of material:

Sl. No	Brick No.	Date of Testing	Weight (Kg)	Dimensions in mm x mm x mm	Volume in (m3)	Density in (Kg/m3)	Area of Bricks (m2)	Failure Load in (KN)		Comp. Strength of Bricks (N/mm2)	Average comp. Strength (N/mm2)
								Obser-ved	Corre-cted		
1											
2											
3											
4											
5											

Tested by

Checked by

TES-F-08

DETERMINATION OF WATER ABSORPTION OF BRICKES

(As per IS:3495 – part 2 1976)

Client :

Name of project :

Testing date:

Type of material:

Sl. No.	Brick No.	Date of Testing	Size(in mm) (LxWxT)	Wt. of Dry Bricks(kg)	Wt. of Wet Bricks	Weight of water	Water Absorption(%)	Avg. Water Absorption(%)
1								
2								
3								
4								
5								

Tested by Checked by

TES-F-09

DETERMINATION OF WORKABILITY OF CONCRETE – TEST FOR COMPACTION FACTOR

Client:

Name of project

Testing date:

Type of material:

Empty wt. Of cylinder (A) in Kg. =
Wt. Of cylinder + partially compacted concrete (B) in Kg. =
Wt. Of cylinder + fully compacted concrete (C) in Kg. =
Compacting factor [(B – A)/(C – A)] =

Tested by Checked by

TES-F-10