




Quality care is only fair...



Concrete Testing

 Website : mattestlab.com

 E-mail : rvmattest@gmail.com

Vishal Raiyani
(M.Tech)

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COMPRESSIVE STRENGTH OF CONCRETE

STANDARD: IS: 516 – 1959 (RA 2013)

- This standard covers the procedure for determining the compressive strength of cement concrete.

APPARATUS

1. Batch mixer
2. Vibrating table
3. Cube moulds
4. Tamping rod 16mm diameter, 6m long and with bullet point at lower end
5. Standard compression testing machine
6. Steel scale with an accuracy of 1mm
7. Balance of capacity 10kgs and sensitivity 1gram



PROCEDURE

- Test specimens shall be either from Laboratory mix or from mix produced by Batching plant.

PREPARATION OF MIX IN THE LABORATORY

- Collect representative samples of the materials for use in the particular concrete design by careful sampling.
- Bring all the materials to room temperature, preferably $27 \pm 3^{\circ}\text{C}$ before the

mixing.

- Store the cement in a dry place, preferably in airtight metal containers.
- Samples of aggregates for each batch of concrete shall be of the desired grading and in air dried condition.
- Weigh the portion of materials including water as required for specified mix design to an accuracy of 0.1% of the total weight of the batch.
- Each batch of concrete shall be of such a quantity as to give about 10% excess after casting the described no of test specimens.
- When mixing is done by machine introduce all the mixing water in to the drum before the solid materials.
- Load the drum with one half of the coarse aggregate, then with the fine aggregate, then with the cement and finally with the remaining coarse aggregates.
- The period of mixing shall not be less than 2 minutes after all the materials are placed in the drum and shall continue till the resulting concreting is uniform in appearance.
- After thoroughly mixing pour the concrete on a watertight non-absorbent plat form and fill in to the moulds before segregation occurs.

CASTING OF SPECIMENS:

- Fill the concrete in to the mould in layers approximately 5cm deep.
- When compacting by hand use standard tamping rod and each layer is subjected to 35 strokes uniformly distributed.
- When compacting by means of table vibrator each layer shall be vibrated until the specified vibration is obtained.
- In both the cases after the top layer has been compacted finish the surface of the concrete in level with the top of the mould using a trowel and cover with a glass or metal plate to prevent evaporation.
- Store the test specimens in a place free from vibration, in moist air of at least 90 percent relative humidity and at a temperature of $27 \pm 20^{\circ}\text{C}$ for $24 \pm 1/2$ hours from the addition of water to the dry ingredients.
- After this period, mark the specimens and remove from the moulds and unless required for test within 24 hours.

CURING

- Immediately submerge the cubes in a clean, fresh water or saturated lime solution and keep there until taken out just prior to test.
- Renew the water or solution in which the specimens are submerged for every seven days, and the temperature of water is maintained with the specified limits.
- Conduct testing at recognized ages of the specimens, the most usual being 7 and 28 days.
- When it may be necessary to obtain the early strength, conduct tests at the ages of $24 \pm 1/2$ hours and 72 ± 2 hours.
- Calculate the ages from the addition of water to the dry ingredients.
- Test at least three specimens preferably from different batches at each selected age.

TESTING

- Test the specimens stored in water immediately on removal from water and while they are still in wet condition.
- Wipe off surface water, grit and any projecting fins removed.
- Record the weight and dimensions of the specimens to the nearest 0.20mm.
- Wipe the bearing surface of the testing machine clean and dry.
- Place the cube specimens in the machine in such a manner that the load is applied to opposite sides of the cubes as cast, that is, not to the top and bottom.
- Carefully align the axis of specimen carefully with the center of the thrust of the spherically seated platen.
- Do not use any packing between the faces of the test specimen and the platens of the testing machine.
- Apply the load without shock and increase continuously at a rate of approximately $140 \text{ kg/cm}^2/\text{min}$ or $340\text{KN}/\text{min}$ until the resistance of the specimen of the increasing load breaks down and no further load can be sustained.
- The maximum load applied to the specimen shall then be recorded and the appearance of the concrete and any unusual features shall be noted.

CALCULATIONS

$$\text{Compressive strength} = \frac{\text{Load}}{\text{Cross sectional area}} \quad \text{N/mm}^2$$

REPORT

- Report the individual and average of three values to the nearest second decimal.
- The individual variation of the specimens shall not be more than ± 15 percent of the average.

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FLEXURAL STRENGTH OF CONCRETE USING PORTIONS OF BEAMS BROKEN IN FLEXURE

STANDARD: IS: 516 – 1959 (RA 2013)

- This standard covers the procedure for determining compressive strength of concrete using portions of beams broken in flexure.

APPARATUS

1. Testing Machine
2. Bearing Plates



TEST SPECIMENS

- The length of the broken portions of the beams selected for the compression test shall be at least 5 cm greater than the depth of the beam.
- The broken portions shall be free from cracks, chipped surfaces or other obvious defects within the length to be tested.

PROCEDURE

- During the interval between testing the specimens as beams and testing the broken portions as cubes, the specimens shall be stored in water at a temperature of 24° to 30°C and shall be tested immediately on removal from the water and while still in the wet condition.
- The bearing surfaces of the testing machine and the bearing plates shall be wiped clean and any loose sand or other material shall be removed from the surfaces of the specimen which are to be in contact with the bearing plates.

- The specimen shall be placed between the bearing plates in such a manner that the upper bearing plate is directly over the lower plate and the bearing plates extend at least 25 mm from each end of the specimen.
- A device which ensures the proper location of the upper plate with reference to the lower plate.
- No packing shall be used between the faces of the specimen and the bearing plates.
- The specimens shall be tested with the moulded sides in contact with the plates.
- 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 load 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 equivalent cube strength of the specimen shall be calculated by dividing the maximum load by the area of contact of the bearing plates and shall be expressed to the nearest kg/sq cm.

REPORT

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

1. Date of test,
2. Age of specimen,
3. Curing conditions,
4. Appearance of the concrete and type of fracture, if these are unusual
5. Maximum load
6. Equivalent cube strength
7. Nominal size of specimen

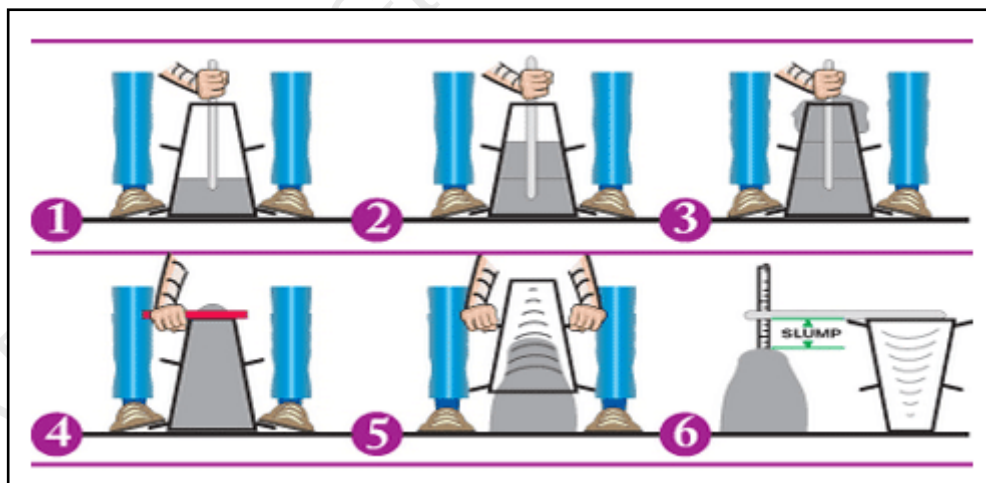
CONCRETE SLUMP TEST

STANDARD: IS: 1199 – 1959 (RA 2013)

- This standard covers the procedure for determining the workability of concrete

APPARATUS

- Mould for the test shall be in the form of the frustum of a cone having the following internal dimensions bottom diameter-20 cm, top diameter-10 cm, height-30 cm.
- The mould shall be made of metal (Brass or Aluminum shall not be used) of at least 1.6 mm thickness and the top and bottom shall be open and at right angles to the axis of the cone.
- The mould shall have a smooth surface.
- It shall be provided with suitable foot pieces and also handles to facilitate lifting it during the test in a vertical direction as required.
- Tamping rod shall be of steel or other suitable material, 16mm diameter, 0.6 m long rounded at one end with graduations of least count 1mm.



SAMPLING IN THE FIELD

- If the test is to be conducted in the fields collect the true representative sample of the batch not less than 0.02 m^3 in volume.
- Mix the sample on a non-absorbent base either with a trowel or by other suitable implements to ensure uniformity.

- Use the sample immediately for the purpose of carrying out the test.
- In the case of concrete containing aggregate of maximum size more than 38 mm wet sieve the concrete through 1½ inch screen to exclude aggregate particles bigger than 38 mm.

SAMPLING FROM LABORATORY MIX

- If the slump is to be checked in the laboratory mix the sample homogeneously and take the representative sample.

PREPARATION OF THE MOULD

- Thoroughly clean the internal surface of the mould free from superfluous moisture and any set concrete.
- Place the mould on a smooth, horizontal rigid and non-absorbent surface such as a carefully leveled metal plate and held the mould firmly in the place while it is being filled.

PROCEDURE

- Fill the mould in four layers each approximately one quarter of the height of the mould.
- Prod each layer with twenty five strokes of the rounded end of the tamping rod.
- Distribute the strokes uniformly over the cross section of the mould such that the second and subsequent layers shall penetrate into underlying layer.
- Prod the bottom layer through out its depth.
- After the top layer has been prodded, struck off the concrete in level with the slump cone with a trowel or with the tamping rod, so that the mould is exactly filled.
- Clean the mortar if any, which has been leaked out between the mould and base plate.
- Remove the mould from concrete immediately by raising it slowly and carefully in a vertical direction.
- Measure the slump immediately by determining the difference between the height of the mould and that of the highest point of the specimen.
- Complete the whole process within a period of 2 minutes after sampling.

REPORT

- Record the slump measured in terms of millimeters of subsidence of the specimen during the test.
- Any slump specimen, which collapses or shears off laterally gives incorrect result and if this occurs repeat the test with another sample
- If in the repeated test also the specimen collapses or shears off laterally measure the slump and record the fact.

PRECAUTION

- Carry out the slump test at a place free from vibration or shock and within a period of 2 minutes after sampling.