

WORKABILITY OF CONCRETE BY SLUMP CONE TEST

1. Objective

The word –workability or workable concrete signifies much wider and deeper meaning than the other terminology –consistency often used loosely for workability. Consistency is a general term to indicate the degree of fluidity or the degree of mobility. The factors helping concrete to have more lubricating effect to reduce internal friction for helping easy compaction are : (a) Water Content (b) Mix Proportions (c) Size of Aggregates (d) Shape of Aggregates (e) Surface Texture of Aggregate (f) Grading of Aggregate (g) Use of Admixtures.

Slump test is the most commonly used method of measuring consistency of concrete which can be employed either in laboratory or at site of work. It is not a suitable method for very wet or very dry concrete. It does not measure all factors contributing to workability, nor is it always representative of the place ability of the concrete.

It indicates the characteristic of concrete in addition to the slump value. If the concrete slumps evenly it is called true slump. If one half of the cone slides down, it is called shear slump. In case of a shear slump, the slump value is measured as the difference in height between the height of the mould and the average value of the subsidence.

2. Apparatus Required

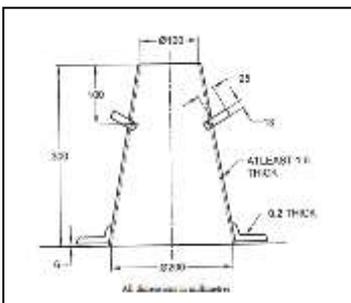


Fig. 1: Schematic Slump Cone Apparatus

The Slump Cone apparatus for conducting the slump test essentially consists of a metallic mould in the form of a frustum of a cone having the internal dimensions as: Bottom diameter: 200 mm, Top diameter : 100 mm, Height : 300 mm and the thickness of the metallic sheet for the mould should not be thinner than 1.6 mm.



Fig. 2: Slump Cone Apparatus

The Slump Cone apparatus along with Tamper (16 mm in diameter and 600 mm length and with rounded ends), Ruler, Scoop etc. Conforming to IS 7320:1974 (Fourth revision) (Reaffirmed- 2018) Specifications for Concrete Slump Test Apparatus

3. Reference

IS 1199 (Part 2): (First revision) 2018 Fresh Concrete— Methods of Sampling, Testing and Analysis - Part 2 Determination of Consistency of Fresh Concrete

4. Procedure

- If this test is being carried out in the field, the sample mixed concrete shall be obtained.
- The internal surface of the mould shall be thoroughly cleaned and freed from superfluous moisture and any set concrete before commencing the test. The mould shall be placed on a smooth, horizontal, rigid and non-absorbent surface, such as a carefully levelled metal plate, the mould being firmly held in place while it is being filled.
- Immediately after obtaining the sample, fill the mould in three layers, each approximately one-third of the height of the mould when compacted. During filling, clamp or hold the mould firmly in place by standing on the two foot pieces.
- Tamp each layer with 25 strokes of the tamping rod.
- Tamp the second layer and top layer each throughout its depth, so that the strokes just penetrate into the underlying layer.
- In filling and tamping the top layer, heap the concrete above the mould before the tamping is started.
- The bottom layer shall be tamped throughout its depth. After the top layer has been tamped, the concrete shall be struck off level with a trowel or the tamping rod, so that the mould is exactly filled.

- h. After the top layer has been rodded tamped, strike off the surface of the concrete by means of screeding and rolling motion of the tamping rod. After the top layer has been tamped, scrap off the surface of the concrete level with the top of the mould by means of a sawing and rolling motion of the tamping rod. Remove spilled concrete from the base plate/surface.
- i. Any mortar which may have leaked out between the mould and the base plate shall be cleaned away. The mould shall be removed from the concrete immediately by raising it slowly and carefully in a vertical direction.
- j. Immediately after removal of the mould, determine the slump, h, by measuring the difference between the height of the mould and the highest point of the slumped concrete.
- k. The above operations shall be carried out at a place free from vibration or shock. The entire operation from the start of the filling to the removal of the mould shall be carried out without interruption and shall be completed within 180 s.
- l. Measure slump to the nearest 5mm.

5. Observation and Recording

The vertical difference between top of the mould and the displaced original center of the top surface of the specimen mm

Workability	Compaction Factor	Slump (mm)
Very Low	0.78	0 - 25
Low	0.85	25 - 50
Medium	0.92	50 - 100
High	0.95	100 - 175

Table 1: Relation between Workability and Slump

The pattern of slump is shown True Slump/Shear Slump/ Collapse Slump.

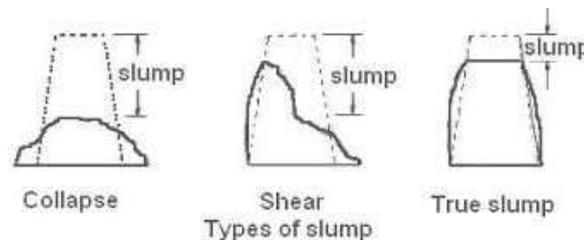


Fig. 3: Type of Slump

The slump measured shall be recorded in terms of millimeters, by measuring the difference between the height of the mould and the highest point of the slumped concrete. Any slump specimen which collapses or shears off laterally gives incorrect result and if this occurs the test shall be repeated with another sample. If, in the repeat test also, the specimen should shear, the slump shall be measured and the fact that the specimen sheared, shall be recorded. If two consecutive test show portion of concrete shearing or from the mass of the test specimen or collapsing, report the test as being invalid as the concrete lacks the necessary plasticity and cohesiveness for the slump test to be suitable.

6. Test Result

In addition to the specifics required for each test method, the report shall include the following information:

- a) Identification of the test sample;
- b) Location of performance of test;
- c) Date and time of performance of test;
- d) Ambient temperature;
- e) Method of compaction (wherever required to be mentioned):
 - 1) For mechanical compaction, the duration,
 - 2) For hand compaction, the number of strokes;

- f) Name of person carrying out the test or part of the test;
- g) Any deviation from standard test method; and
- h) Declaration by the person carrying out the test that it was carried out in accordance with this standard, except as noted in (g).

7. Conclusion

- i. Slump, if there is a true slump, measured to the nearest 5 mm; or
- ii. A notation that the test gave a sheared/collapsed slump.