3.4 Test on concrete:

- Fresh concrete
    1. Slump cone test
    2. Compaction factor test
    3. Vee bee test
    4. Flow table test
- Hardened concrete
    1. Compressive strength test
    2. Tensile strength test
    3. Flexural strength test

1. Slump cone test:

Apparatus:

Mould for slump test i.e. slump cone, non porous base plate, measuring scale, temping rod. The mold for the test is in the form of the frustum of a cone having height 30 cm, bottom diameter 20 cm and top diameter 10 cm. The tamping rod is of steel 16 mm diameter and 60cm long and rounded at one end.

Procedure:

- This test is performed to check the consistency of fresh made concrete.
- Clean the cone. The slump plate should be clean, firm, level and non-absorbent. Collect a sample of concrete to perform the slum test.
- Fill 1/3 the volume of the cone with the sample. Compact the concrete by rodding 25 times.
- Now fill to 2/3 and again rod 25 times, just into the top of the first layer.
- Fill to overflowing, rodding again this time just into the top of the second layer. Top up the cone till it overflows.
- Level off the surface with the steel rod using a rolling action. Clean any concrete from around the base and top of the cone, push down on the handles and step off the foot pieces.
- Carefully lift the cone straight up making sure not to move the sample.
- Turn the cone upside down and place the rod across the up-turned cone.

- Take several measurements and report the average distance to the top of the sample.

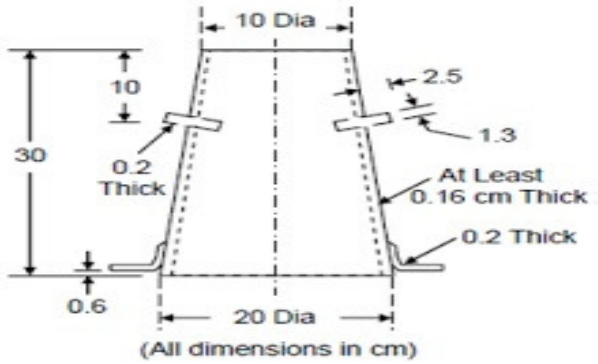

Fig 2.Slump cone

2. Compaction factor test

Apparatus:

Compaction factor apparatus consists of trowels, hand scoop (15.2 cm long), a rod of steel or other suitable material (1.6 cm diameter, 61 cm long rounded at one end) and a balance.

Procedure:

- The test equipment consists of two hoppers and a cylinder fixed to a stand, the dimensions and the distances between the three vessels being standardized.
- Vessel A and B are having hinged bottoms whereas cylinder C is having fixed bottom.
- Top vessel A is filled with the concrete to be tested. As soon as it is filled, the hinged door is opened. Concrete is collected in vessel B. Then the hinged door of B is opened to collect concrete in cylinder C.
- The concrete in cylinder C is weighted. Weight the cylinder with concrete to the nearest 10 g. This weight is known as the weight of partially compacted concrete (W1).
- Now cylinder is again filled with the sample of concrete in 50 mm layers, which is compacted by ramming and vibrating. Then the weight of compacted concrete is determined. Weigh the cylinder with fully compacted. This weight is known as the weight of fully compacted concrete (W2). The ratio W1/W2 is termed as compaction factor.

- It is to determine the workability of concrete.

$$\text{compaction factor} = \frac{\text{Weight of partially compacted concrete}}{\text{Weight of fully compacted concrete}}$$

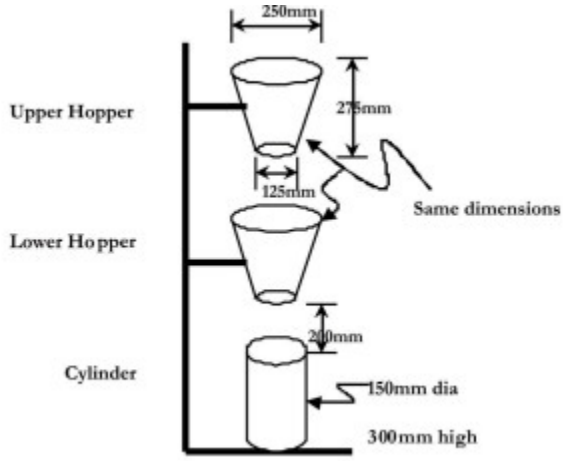

Fig 3compaction factor apparatus

Table 1Values and application of concrete test

S.No	Application	Slump	Compaction factor	Time in Vee-Bee
1.	Concreting of shallow section with vibration	-	0.75-0.80	10-20
2.	Concreting of light reinforced section with vibrator	-	0.80-0.85	5-10
3.	Concreting of lightly reinforced section without vibration and heavily reinforced section with vibration	25-75mm	0.85-0.92	2-5
4.	Concreting heavily reinforced section without vibration	75-125mm	More than 0.92	-

4. Vee bee test

Apparatus:

The Vee-Bee test apparatus consist of a Vee-Bee consistometer as per IS: 119 – 1959, as shown in the figure-4. The apparatus consists of a vibrating table which is

supported and mounted on elastic supports. It also consists of a sheet metal slump cone, a weighing balance, cylindrical container, a standard iron tamping rod and trowels.Consistometer Used in Vee-Bee Test for Concrete Workability

The vibrating table as shown in figure-4 has a dimension of 380mm length and a width of 260mm. At a height of 305mm, it is supported on a rubber shock absorber above the level of floor. A vibrator is provided under the table. This vibrator is operated electrically. The whole mentioned assembly is mounted on a base as shown above which is in turn resting on rubber supports three in number.

The sheet metal slump cone mould has opening at both ends and is placed in a cylindrical container as shown in figure-4. The cylinder container is mounted over the vibration table with the help of wing nuts. The cone used in the arrangement has height equal to 300mm, the top and the bottom diameters as 200 and 100mm respectively. Base consists of a swivel arm holder. There is another swivel arm that is fixed into it that consists of a funnel and a guide sleeve. The detachment from the vibrating table is possible for the swivel arm. A graduated rod is fixed to the swivel arm through the guide sleeve. The graduated rod has the provision for screwing the transparent disc.

The slump of the concrete cone is measured through the divisions on the scale marked on the rod. A 20mm diameter standard iron tamping rod is used that have a length of 500mm.

Procedure:

- Placing the slump cone inside the sheet metal cylindrical pot of the consistometer.
- The glass disc attached to the swivel arm shall be moved and placed just on the top of the slump cone in the pot and before the cone is lifted up, the position of the concrete cone shall be noted by adjusting the glass disc attached to the swivel arm. The cone shall then be lifted up and the slump noted on the graduated rod by lowering the glass disc on top of the concrete cone. The electrical vibrator shall then be switched on and the concrete shall be allowed to spread out in the pot.
- The vibration is continued till such a time as the conical shape of the concrete disappears and the concrete assumes a cylindrical shape. This can be judged

by observing the glass disc from the top for disappearance of transparency.

- Immediately when the concrete fully assumes a cylindrical shape, the stop watch is switched off. The time required for the shape of concrete to change from slump cone shape to cylindrical shape in seconds is known as Vee Bee Degree.
- This method is very suitable for very dry concrete whose slump value cannot be measured by Slump Test, but the vibration is too vigorous for concrete with a slump greater than about 50 mm.

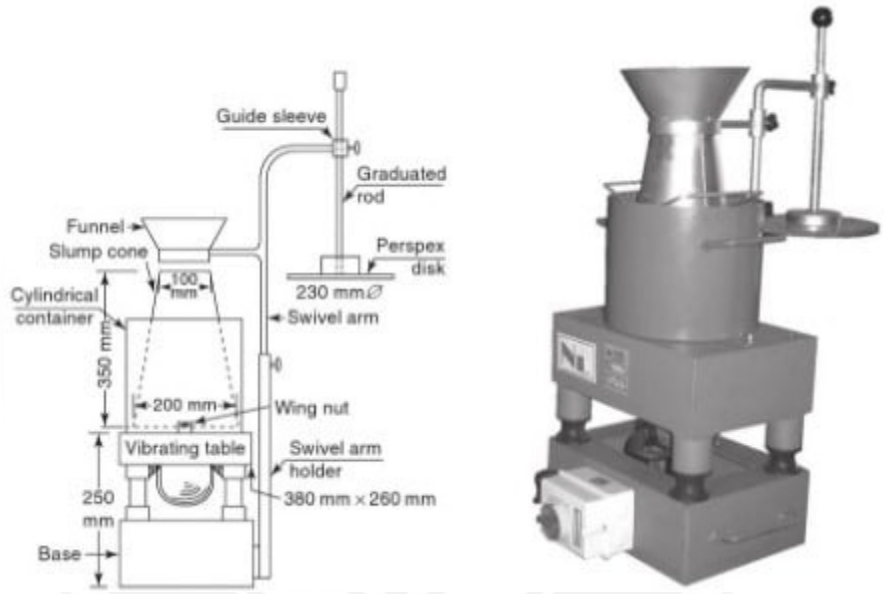

Fig 4 vee bee consistometer

Table 2.workability values

Work Description	Workability Measurement		Vee-Bee time (seconds)
	Slump (mm)	Compaction Factor	
Moist earth	-	-	40 to 25-20
Very Dry	-	0.70	20 to 15-10
Dry	0 - 25	0.75	10 to 7-5
Plastic	25 - 50	0.85	5 to 4-3
Semi Fluid	75 - 100	0.90	3 to 2-1
Fluid	150 - 175	0.95	More Fluid than 1

4. FLOW TABLE TEST

Apparatus:

- Flow table made of metal having thickness 1.5mm
- dimensions 750mmx 750mm,
- tamping rod made of hardwood, Scoop, Centimeter Scale
- Metal Cone or mould (Lower Dia = 20cm, upper Dia = 13 cm, Height of Cone = 20cm). The middle portion of flow table is marked with a concentric circle of dia

200mm to place a metal cone on it. A lift handle

Procedure:

- Before commencing test, the table top and inside of the mould is to be wetted and cleaned of all gritty material and the excess water is to be removed with a rubber squeezer.
- The mould is to be firmly held on the centre of the table and filled with concrete in two layers, each approximately one-half the volume of the mould and rodded with 25 strokes with a tamping rod, in a uniform manner over the cross section of the mould.
- After the top layer has been rodded, the surface of the concrete is to be struck off with a trowel so that the mould is exactly filled.
- The mould is then removed from the concrete by a steady upward pull.
- The table is then raised and dropped from a height of 12.5 mm, 15 times in about 15 seconds.
- The diameter of the spread concrete is the average of six symmetrically distributed caliper measurements read to the nearest 5 mm.

Calculation

- The flow of the concrete is the percentage increase in diameter of spread concrete over the base diameter of the moulded concrete, calculated from the following formula.

$$\text{Flow\%} = \frac{\text{Spread dia(cm)} - 25}{25} \text{x}100$$

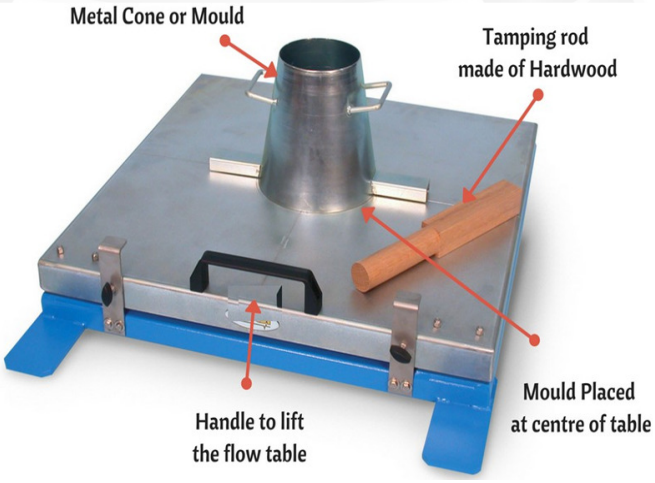

Fig 5 Flow table