

LECTURE NOTE

on

CIVIL ENGINEERING MATERIALS & CONSTRUCTION

COURSE CODE: BCE 203

SYLLABUS

Module Number	Chapter Number	Title	Lecture hours (3-1-0)
1	1	Brick	3
	2	Cement	4
	3	Concrete	3
Total			10
2	4	Arches	3
	5	Cavity Wall	2
	6	Stairs	3
Total			8
3	7	Fire Resistive Construction	2
	8	Plastering	2
	9	Damp prevention	2
Total			6
4	10	Types of doors and windows	3
	11	Painting and decoration	2
	12	Glazing	2
	13	Repair of Building	2
	14	Stone	1
	15	Timber	4
	16	Foundation	2
Total			16
Total lecture hours			40

Text books

1. A Text book of Building Construction, S.P. Arora and S.P. Bindra, Dhanpat Rai & Sons.

Reference books

- 1 A Text Book of Building Materials, C.J. Kulkarni
- 2 Building Materials, P. C. Varghese, PHI, Pvt. Ltd.
- 3 Building Construction, P. C. Varghese, PHI, Pvt. Ltd.

Workability tests:

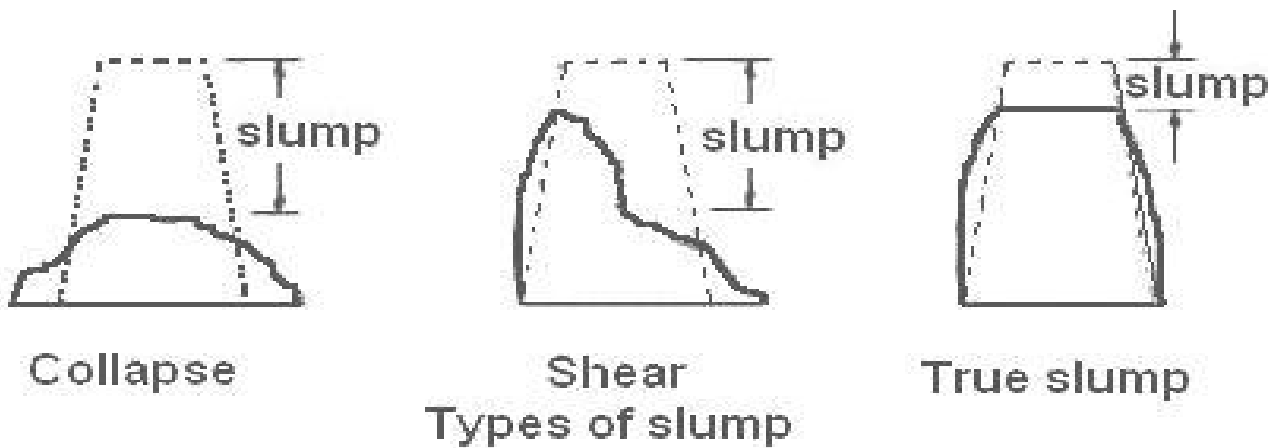
There are 4 types of tests for workability. They are slump test, compacting factor test, flow test, and vee bee test

Slump test

The slump test result is a slump of the behavior of a compacted inverted cone of concrete under the action of gravity. It measures the consistency or the wetness of concrete. Metal mould, in the shape of the frustum of a cone, open at both ends, and provided with the handle, top internal diameter 4 in (102 mm), and bottom internal diameter 8 in (203 mm) with a height of 1 ft (305 mm). A 2 ft (610 mm) long bullet nosed metal rod, (16 mm) in diameter. Apparatus Required: Compacting Factor apparatus, Trowels, Graduated cylinder, Balance and Tamping rod and iron bucket

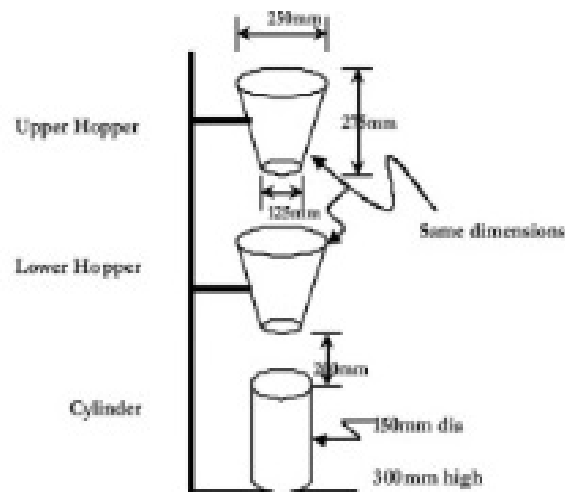
The test is carried out using a mould known as a slump cone or Abrams **cone**. The cone is placed on a hard non-absorbent surface. This cone is filled with fresh concrete in three stages, each time it is tamped using a rod of standard dimensions. At the end of the third stage, concrete is struck off flush to the top of the mould. The mould is carefully lifted vertically upwards, so as not to disturb the concrete cone. Concrete subsides. This subsidence is termed as slump, and is measured in to the nearest 5 mm if the slump is <100 mm and measured to the nearest 10 mm if the slump is >100 mm.

The slumped concrete takes various shapes, and according to the profile of slumped concrete, the slump is termed as true slump, shear slump or collapse slump. If a shear or collapse slump is achieved, a fresh sample should be taken and the test repeated. A collapse slump is an indication of too wet a mix. Only a true slump is of any use in the test. A collapse slump will generally mean that the mix is too wet or that it is a high workability mix, for which slump test is not appropriate. Very dry mixes; having slump 0 – 25 mm are used in road making, low workability mixes; having slump 10 – 40 mm are used for foundations with light reinforcement, medium workability mixes; 50 - 90 for normal reinforced concrete placed with vibration, high workability concrete; > 100 mm.



This test is usually used in laboratory and determines the workability of fresh concrete when size is about 40 mm maximum. The test is carried out as per specification of IS: 1199-1959.

Compacting factor test:



Steps for performing the experiment:

- keep the apparatus on the ground and apply grease on the inner surface of the cylinders.
- Measure the mass as w_1 kg by weighing the cylinder accurately and fix the cylinder on the base in such a way that the central points of hoppers and cylinder lie on one vertical line and cover the cylinder with a plate.
- For each 5 kg of aggregate mixes are to be prepared with water-cement ratio by weight with 2.5 kg sand and 1.25 kg of cement and then add required amount of water thoroughly until and unless concrete appears to be homogeneous.

- With the help of hand scoop without compacting fill the freshly mixed concrete in upper hopper part gently and carefully and within two minutes release the trap door so that the concrete may fall into the lower hopper such that it bring the concrete into standard compaction.
- Fall the concrete to into the cylinder by bringing the concrete into standard Compaction immediately after the concrete has come to rest and open the trap door of lower hopper and then remove the excess concrete above the top of the cylinder by a pair of trowels, one in each hand will blades horizontal slide them from the opposite edges of the mould inward to the center with a sawing motion.
- Clean the cylinder from all sides properly. Find the mass of partially compacted concrete thus filled in the cylinder and say it W2 kg. After this refill the cylinder with the same sample of concrete in approximately 50 mm layers, by vibrating each layer heavily so as to expel all the air and obtain full compaction of the Concrete.
- Struck off level the concrete and weigh and cylinder filled with fully compacted concrete. Let the mass be W3 kg.
- Calculate compaction factor by using the formula: $C.F = \frac{W2 - W1}{W3 - W1}$

Flow Table Test:

The flow table test or flow test is a method to determine the consistence of fresh concrete.

Flow table with a grip and a hinge, 70 centimetres (28 in) square. Abrams cone, open at the top and at the bottom - 30 centimetres (12 in) high, 17 centimetres (6.7 in) top diameter, 25 centimetres (9.8 in) base diameter. Water bucket and broom for wetting the flow table. Tamping rod, 60 centimetres (24 in) long Conducting the test The flow table is wetted. The cone is placed in the center of the flow table and filled with fresh concrete in two equal layers. Each layer is tamped 10 times with tamping rod. Wait 30 seconds before lifting the cone. The cone is lifted, allowing the concrete to flow. The flow table is then lifted up 40mm and then dropped 15 times, causing the concrete to flow. After this the diameter of the concrete is measured.

Vee-Bee Test:

This test is useful for concrete having low and very low workability. In this test the concrete is moulded into a cone in a cylinder container and the entire set up is mounted on a vibrating table. When vibrator starts, concrete placed on the cone starts to occupy the cylindrical

container by the way of getting remoulded. Remoulding is complete when the concrete surface becomes horizontal. The time required for completion of remoulding since start of vibrator is measured and denoted as vee-bee seconds. This provides a measure for workability. Lesser is the vee-bee seconds more is the workability