Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

Advanced Concrete Technology

1. Vicat Apparatus

The basic aim is to find out the amount of water content required to produce a cement paste of standard consistency as specified by the IScode and also to check the setting time of cement i.e., both initial and final setting times. Initial setting time test is important for transportation, placing and compaction of cement concrete. Final setting time is the time when the cement paste completely loses its plasticity. It is the time taken for the cement paste or cement concrete to harden sufficiently and attain the shape of the mould in which it is cast.

2. Lechatlier Apparatus Set

The main aim of this test is to determine the expansion of cement because cement after setting shall not undergo any appreciable change in volume because change in volume after setting causes cracks, undue expansion and as a result disintegration of concrete. In the soundness test a specimen of hardened cement paste is boiled for a fixed time so that any tendency to expand is speeded up and can be detected.

3. Compression Testing Machine

The main objective of this equipment is to determine compressive strength of cement mortar, concrete. Compressive strength results are primarily used to determine that the concrete mixture as delivered on site meets the requirements of the specified strength, fc', in the job specification. Compression strength is the capacity of a material or structure to withstand loads tending to reduce size. Strength of the hardened cement is most important for structural use. This strength depends upon the cohesion of the cement paste on its adhesion to the aggregate particles. Several forms of this test are direct tension, Compression and flexure.

4 Test Sieves

The main objective of this test is to determine the gradation like distribution of aggregate particles, by size, within a given sample in order to determine compliance with design, production control requirements, and verification specifications. Gradation is usually specified for each engineering application it is used for. For example, foundations might only call for coarse aggregates, and therefore an open gradation is needed.

5 Measuring jars

The main objective of measuring jars is to find the percentage of bulking and also to measure amount of water for different tests. Due to bulking, fine aggregate shows completely unrealistic volume. Therefore, it is absolutely necessary that consideration must be given to the effect of bulking in proportioning the concrete by volume. If care is not given to the effect of bulking, in the case of volume batching, the resulting concrete is likely to be under sanded and harsh. It will also affect the yield of concrete for given cement content.

6 Impact testing machine

The aggregate impact value indicates a relative measure of resistance of aggregate to sudden shock or an impact, which in some aggregates differs from its resistance to a slope compressive load in crushing test. Toughness is the property of a material to easiest impact. Due to the moving loads the aggregates are subjected to pounding action are impact and there is possibility of stones breaking into smaller pieces. Therefore a test design to evaluate the the resistance of the stones to fracture under repeated impacts.

7 Crushing cylinder

The test evaluates the ability of aggregates used in road construction to with stand the stresses induced by moving vehicles in the form of crushing. With this the aggregates should also provide sufficient resistance to crushing under the roller during construction and under rigid tyre rings of heavily loaded animal drawn vehicles. The aggregate crushing value provides a relative measure of resistance to crushing under a gradually applied compressive load. To achieve a high quality of pavement aggregate possessing low aggregate crushing value should be preferred.

8. L box Apparatus

The main objective of this apparatus is to investigate the passing ability of Self Compacting Concrete. It measures the reached height of fresh SCC after passing through the specified gaps of steel bars and flowing within a defined flow distance. With this reached height, the passing or blocking behavior of SCC can be estimated. Two types of gates can be used, one with 3 smooth bars and one with 2 smooth bars. The gaps are 41 and 59 mm, respectively.

Suitable tool for ensuring that the box is level i.e. a spirit level and buckets for taking concrete sample

9. U box Apparatus

The main objective of U Box test is used to measure the filing ability of self-compacting concrete. The apparatus consists of a vessel that is divided by a middle wall into two compartments; an opening with a sliding gate is fitted between the two sections. Reinforcing bar with nominal diameter of 134 mm are installed at the gate with centre to centre spacing of 50 mm. this create a clear spacing of 35 mm between bars. The left hand section is filled with about 20 liter of concrete then the gate is lifted and the concrete flows upwards into the other section. The height of the concrete in both sections is measured.

10. V funnel Apparatus

The main objective of V-funnel flow time is the period a defined volume of Self Compacting Concrete needs to pass through a narrow opening and gives an indication of the filling ability of SCC provided that blocking and/or segregation do not take place; the flow time of the V-funnel test is to test degree related to the plastic viscosity. The V-funnel flow time T_V is the period from releasing the gate until first light enters the opening, expressed to the nearest 0.1 second

11. Flow table Apparatus

The main objective of slump flow test aims at investigating the filling ability of SCC. It measures two parameters: flow spread and flow time T50. The former indicates the free, unrestricted deformability and the latter indicates the rate of deformation within a defined flow distance. This apparatus consists of base plate of size at least 900 × 900 mm, Abrams cone with the internal upper/lower diameter equal to 100/200 mm and the height of 300 mm and Weight ring (>9 kg) for keeping Abrams cone in place during sample filling.

12. J-Ring Apparatus

The J-ring test aims at investigating both the filling ability and the passing ability of SCC. It can also be used to investigate the resistance of SCC to segregation by comparing test results from two different portions of sample. The J-ring test measures three parameters: flow spread, flow time T50J (optional) and blocking step. The J-ring flow spread indicates the restricted deformability of SCC due to blocking effect of reinforcement bars and the flow time T50J indicates the rate of deformation within a defined flow distance. The blocking step quantifies the effect of blocking.

13. Air entrainment apparatus

The main objective of this test is to find the excess air entrapped within the mix.The excess water eventually evaporates and leaves behind porous cavities. These pores create weaknesses in the concrete or mortar during freeze-thaw cycles. An air entrainment meter is used to measure the amount of **air** that is trapped within the mix.

14. Marsh cone

The main objective of this test is to study cement super plasticizer compatibility and to determine optimum super plasticizer dosage of a specific cement super plasticizer combination. This test can be done for different water cement ratios, temperatures and admixtures. The saturation dosage of super plasticizer can be defined as that point beyond which there is no significant decrease in the flow time. Saturation point can be taken as the maximum super plasticizer content to be used in concrete. Flow time of

Cement/Mortar through marsh cone is indicator of viscosity which depends upon cement super plasticizer compatibility

15. Permeability Apparatus

The main objective of this test is to check whether structures which are intended to retain water. Besides functional considerations, permeability is also intimately related to durability, resistance against progressive deterioration under exposure to severe climate and leaching due to prolonged seepage of water particularly when it contains aggressive gases or minerals in solution. The test consists in subjecting the concrete specimen of known dimensions contained in a specially designed cell to a known hydrostatic pressure from one side measuring the quantity of water percolating through it during a given interval of time and computing the coefficient of permeability. The test permits measurement of water entering the specimen as well as that leaving

16. Rebound Hammer

The main objective of this apparatus is to assess the likely compressive strength of concrete with the help of suitable co-relations between rebound index and compressive strength, uniformity of concrete, assess the quality of concrete in relation to standard requirements, assess the quality of one element of concrete in relation to another. This is a simple, handy tool, which can be used to provide a convenient and rapid indication of the compressive strength of concrete. It consists of a spring-controlled mass that slides on a plunger within a tubular housing.

17. Ultrasonic pulse velocity

Ultrasonic pulse velocity test on concrete is a non-destructive test to assess the homogeneity and integrity of concrete. With this ultrasonic test, we can assess qualitative assessment of strength of concrete, its gradation in different locations of structural members and plotting the same, any discontinuity in cross section like cracks, cover concrete, delamination and depth of surface cracks. Ultrasonic pulse velocity test consists of measuring travel time, T of ultrasonic pulse of 50 to 54 kHz, produced by an electro-acoustical transducer, held in contact with one surface of the concrete member under test and receiving the same by a similar transducer in contact with the surface at the other end. With the path length L and time of travel T, the pulse velocity (V=L/T) is calculated.

18. Accelerated curing tank

Accelerated Curing Method is used to get early high compressive strength in concrete. This method is also used to find out 28 days compressive strength of concrete in 28 hours. Curing is the process of maintaining satisfactory moisture content and temperature in freshly cast concrete for a definite period of time immediately following placement. This serves two major purposes: it prevents or replenishes the loss of moisture from the concrete and maintains a favorable temperature for hydration to occur for a definite period.

19. Flexural Testing Machine

The main objective of this test is to find the modulus of rupture. Flexural strength defined as the stress in a material just before it yields in a flexure test. The transverse bending test is most frequently employed, in which a specimen having either a circular or rectangular cross-section is bent until fracture or yielding using a three point flexural test technique. The flexural strength represents the highest stress experienced within the material at its moment of yield. It is measured in terms of stress

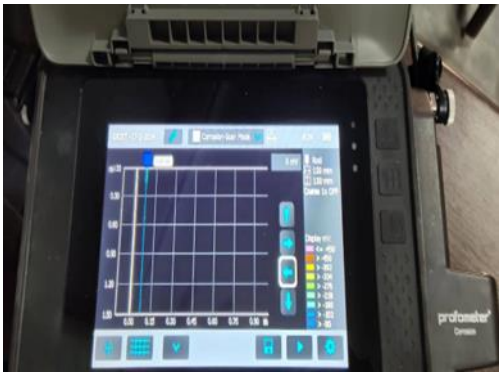
20 Extensometer

An extensometer is a device that is used to measure changes in the length of an object.[1] It is useful for stress-strain measurements and tensile tests. Its name comes from "extension-meter". Measurement of strain is a fundamental tool used by engineers in both research and design. Strain measurements are often used in systems where force or pressure measurements are required. In addition, in some application the strain (and associated stress) of a part can only be determined by measurement, as calculation is either too complicated or not accurate enough.

21. Profometer PM 600

Profometer PM 600 is equipment is used for NDT. This equipment visualizes the diameter of rod, spacing of bars and covers provided in RCC Sections. This equipment is well deserved to identify the reinforcement details at any time after casting.

22. Profometer Corrosion:



Profometer Corrosion is equipment is used for NDT. This equipment visualizes the RCC structure distressed under corrosion. This equipment will be useful to study the sustainability of RCC structures. This equipment will identify the corrosion level of reinforcement when any structure subjected environmentally distressed.

23. **Other Accessories**: Cube Moulds, Cylindrical Moulds, Beam Moulds

Cube moulds are used for cube testing purpose to find compressive strength of concrete.

Cylindrical moulds are used for testing cylinders to find split tensile strength of concrete.

Beam moulds are used for testing beam moulds to find flexure strength of concrete specimens