Concrete Testing

- **Design mix:**
  This test helps in determining the suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required, strength, durability, and workability as economically as possible, is termed as concrete mix design. It involves studying properties of Aggregate, Cement, water & Admixture (if any) in use to determine the proper Concrete Mix Design.
  Test Method: IS: 10262

- **Cube Compressive Strength:**
  The cube test is the test most commonly used for determining . The value of compressive strength can then be used to assess whether the batch that the concrete cube represents meets the required compressive strength. A cube of concrete in cast is cured for the appropriate time and is then compressed between two parallel faces. The stress at failure is taken to be the compressive strength of the concrete.
  Test Method: IS: 456, IS: 15658-2006, IS: 516-1959

- **Flexural Strength:**
  Flexural Strength is the ability of a beam or slab to resist failure in bending. It is measured by loading un-reinforced 6x6 inch concrete beams with a span three times the depth (usually 18 in.). The flexural strength is expressed as “Modulus of Rupture” (MR) in psi. Flexural MR is about 12 to 20 percent of compressive strength. However, the best correlation for specific materials is obtained by laboratory tests.
  Test Method: IS: 516-1959, ASTMC 494-2010

- **Ad Mixture:**
  Concrete Admixture is a chloride free, high range water-reducing admixture. It disperses the fine particles in the concrete, enabling water content in the concrete to perform more effectively and improving the consistency of the concrete.
  Test Method: IS: 9103 / 1999

- **Pile Integrity Test (PIT):**
  This test is done to measure Pile length, depth to anomalies, Pile head stiffness, Pile shaft mobility – which is dependent on pile section and concrete properties.
  Test Method:

- **Porosity:**
  Concrete durability is related to porosity, which determines the intensity of interactions of the material with aggressive agents. The pores and capillaries inside the structure facilitate the destructive processes that generally begin in the surface. Generally, concrete of a low porosity will afford better protection to reinforcement within it than concrete of high porosity. Porosity can be measured by vacuum saturation of a concrete specimen, measuring its weight gain and expressing this as a percentage of the mass of the sample.
  Test Method:
- **Water Absorption:**
  This test helps in determining the rate of absorption of water by cement concrete by measuring the increase in the mass of a specimen resulting from absorption of water as a function of time when only one surface of the specimen is exposed to water. The exposed surface of the specimen is immersed in water and water ingress of unsaturated concrete dominated by capillary suction during initial contact with water.
  Test Method: ASTM C 1084

- **Drying Shrinkage/ wetting Expansion**:
  A common saying is that there are two guarantees with concrete. One, it will get hard and two, it will not crack. Cracking is a frequent cause of complaints in the concrete industry. Cracking can be the result of one or a combination of factors such as drying shrinkage, thermal contraction, restraint (external or internal) to shortening, subgrade settlement, and applied loads. Values of drying shrinkage and wetting expansion of concrete are often useful to measure at the time of mix design trials to ensure the concrete will exhibit values that are within normal ranges for concrete.
  Test Method: IS: 1199-1959

- **Chloride Content:**
  Measuring the calcium chloride content of concrete is used to determine how dry the concrete is. This test is useful to tell if the concrete is ready for projects such as installing flooring on top of the concrete slab. Though some conditions can alter the results, such as the season of the year, the porosity of the concrete, or the mixture of the concrete, a calcium chloride test usually provides a good determination of the usability of concrete.
  Test Method: IS: 6925-1973

- **Chloride Permeability :**
  The chloride permeability of normal weight concrete subjected to static and repeated compressive loading was evaluated by using this test method. The test results indicated that the chloride permeability of concrete subjected to static and repeated loading increased at an increasing rate with its residual strain. This test covers the determination of the electrical conductance of concrete to provide a rapid indication of its resistance to the penetration of chloride ions.
  Test Method: AASHTO T277

- **Chloride Ponding:**
  This test helps in determining the depth to which chloride ions can ingress into concrete over a period of time in standard conditions. It can be used to assess a concrete for its resistance to chloride attack and thus protection of the reinforcement from corrosion.
  Test Method:

- **Sulphate Content:**
  Measuring the Sulphate content of concrete is used to check that the Sulphate levels are low enough to avoid any later problems with deterioration of the concrete. This test can be used at concrete mix design stage to ensure low sulphate levels have been achieved, or on older concrete structures to measure the level of ingress of Sulphate. The test can be conducted in a variety of chemical means.
  Test Method: BS: 812(P-118)

- **Water penetration:**
  Water penetration used to measure the surface hardness and hence the strength of the surface and near surface layers of the concrete. Water penetration causes the concrete reinforcement to rust and expand which in turn creates stresses on the surrounding concrete which can then
  Test Method: ASTM C 1084