

CONCRETE TECHNOLOGY LABORATORY

Normal Consistency of cement:

The knowledge of standard consistency is required while performing other test such as setting time of cement, soundness of cement, compressive strength. 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 IS: 4031 (Part 4) – 1988.

Initial & Final setting time of cement:

It is essential that cement set neither too rapidly nor too slowly. There might be insufficient time to transport and place the concrete before it becomes too rigid. Hence Initial setting time gives the time when the cement paste starts losing its plasticity. Initial setting time test is important for transportation, placing and compaction of cement concrete. In the second case too long a setting period tends to slow up the work unduly, also it might postpone the actual use of the structure because of inadequate strength at the desired age. 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.



Vicat Apparatus

Fineness test on cement:

This experiment is carried out to check the proper grinding of cement. The ability to provide strength of a certain type of cement is checked by finding the fineness of that cement, because the fineness of cement is responsible for the rate of hydration and hence the rate of gain of strength and also the rate of evolution of heat.

If the cement is fine then greater is its cohesiveness, which is the property, required in the concrete because it gives compactness to the concrete.



90 micron Sieve

Specific gravity of cement:

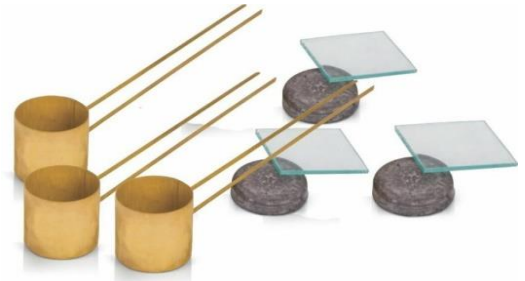
If the cement has exposed to extreme moisture content then, the specific gravity of cement will differ because of the moisture content present in the pores. Normally our nominal mix design is based on the value of specific gravity of cement as 3.15. If the specific gravity of cement is greater than 3.15 then, the cement is either not minced finely as per the industry standard or it has more moisture content which will affect the mix, workability and bonding. This is why we find lots of chunks while mixing old stock cement for concrete.



Specific Gravity Bottle

Soundness test on cement:

It is essential that the cement after setting shall not undergo any appreciable change in volume because change in volume after setting of cement 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



Le Chatelier Apparatus

Compressive strength of cement:

Owing to strength, nature of cement, both mortar and concrete contain high strength against compression and less strength against tension. Therefore, testing of cement for compressive strength is very crucial. Cement is examined for compressive strength so that the strength and stability of the structure is retained.

Compressive strength of concrete:

Compressive strength results are primarily used to determine that the concrete mixture as delivered on site meets the requirements of the specified strength, f_c' , in the job specification. Strength test results quality control, acceptance of concrete, in place concrete strength.



Compression Testing Machine

Sieve analysis of Fine & Coarse aggregates:

Sieve analysis is one of the important practices in civil engineering as it is used for finding particle size distribution of particular aggregate. It is also used for finding the fineness modulus of aggregate. Particle size distribution helps in finding the different sizes of aggregates and helps in classification i.e either fine or coarse.

Fineness modulus(which is generally measured in percentage) helps in finding maximum amount of aggregates lying in one particular size of sieve of given total aggregate.

As the size of the aggregate has its influence in strength of concrete the desired size should be known to mix to get desired characteristic strength of concrete.



Sieves for Fine aggregate

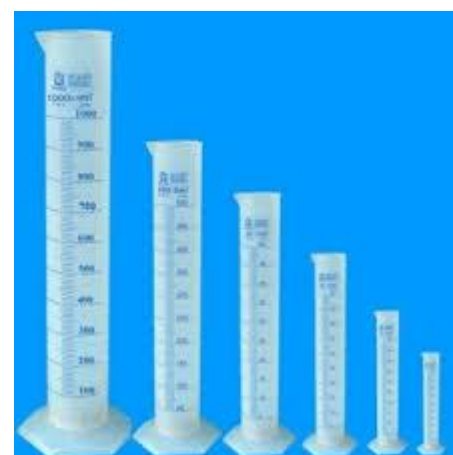


Sieves for Coarse aggregate

Bulking of sand:

The volume increase of fine aggregate due to presence of moisture content is known as bulking. 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.



Workability tests are necessary because if the concrete mixture is too wet, coarse aggregates settle at the bottom of concrete mass and as a result concrete becomes non-uniform composition. If the concrete mixture is too dry, it will be difficult to handle and place it in position.

Workability test on concrete by Slump cone:

Concrete slump test or slump cone test is to determine the workability or consistency of concrete mix prepared at the laboratory or the construction site during the progress of the work. Concrete slump test is carried out from batch to batch to check the uniform quality of concrete during construction. The slump test is the most simple workability test for concrete, involves low cost and provides immediate results. Generally **concrete slump value** is used to find the workability, which indicates water-cement ratio, but there are various factors including properties of materials, mixing methods, dosage, admixtures etc. also affect the concrete slump value.



Slump cone Apparatus

Workability test on concrete by Compaction Factor :

Compaction factor test is the workability test for concrete conducted in laboratory. The compaction factor is the ratio of weights of partially compacted to fully compacted concrete. It was developed by Road Research Laboratory in United Kingdom and is used to determine the workability of concrete. The compaction factor test is used for concrete which have low workability for which slump test is not suitable.



Compaction Factor Apparatus

Workability test on concrete by Vee-Bee

Consistometer :

Vee bee test is used to determine the consistency of concrete. The test determines the consistency of concrete using a Vee-Bee consistometer. This is achieved by measuring the time required for transforming by vibration, a concrete specimen in the shape of conical frustum into a cylinder. This is a good laboratory test, particularly for very dry mixes.



Vee-Bee consistometer