

Tensile st small
compressive st greater

CONCRETE

Concrete is the mixture of cement, coarse aggregate, fine aggregate and water in specific proportions. Concrete is relatively a brittle material ----- its tensile strength is very small as compared with its compressive strength. This disadvantage can be offset by reinforcing or pre-stressing concrete with steel reinforcement.

Reinforced concrete (RC) possesses many of the best properties and is used in variety of construction including building frames, floors, slabs, walls; bridges; pavements; piles; dams; water retaining structures etc.

VARIOUS TERMS USED / STEPS FOR CONCRETING OPERATION

a) Batching arrange things in set or groups -

The process of proper and accurate measurement of concrete ingredients to ensure uniformity of proportions and aggregate grading as per mix design proportions is called batching. Batching may be by volume or by weight.

Batching by Volume ⇒ wooden or steel boxes -

Batching by volume is generally adopted for general construction works and it is carried out by using wooden or steel boxes, wheel barrows, etc. In volume batching, bulking effect of sand has to be taken into account.

Batching by Weight

Batching by weight is adopted for large and important projects and batching plants are used for this purpose. Weight batching is more accurate than volume batching.

b) Mixing

After correct batching all the ingredients of concrete are thoroughly mixed until the concrete of uniform color and required consistency is obtained. Mixing of concrete may be done manually or mechanically.

Manual Mixing

Manual mixing is adopted for small and unimportant construction activities. Concrete is less efficient and requires more cement than that required in machine mixing to obtain the same strength.

Machine Mixing

Machine mixing is adopted for general construction works and in this batch mixers or continuous mixers are used. Batch mixers are either with tilting drum or with non-tilting drum. Batch mixers are available in various capacities. Batch mixers with tilting drum are most commonly used. For general works 10/7 or 1/4 cubic yard capacity mixers are used. 10/7 means 10 cubic feet of dry material yields 7 cubic feet of wet concrete. 1-cement bag capacity mixers are convenient and generally used. Mixing time shall not be less than 90 seconds.

sticking
out

surface moisture

10/7

10
7

or 1/4 cubic yards

wet concrete

Ready-mixed concrete is batched in central batching plants and delivered to various job-sites in trucks, usually mixer mounted. The concrete may be mixed en route or after arrival at the site. Concrete may be kept plastic and workable for as long as 1.5 hours by slowly revolving the mixer. However, better control of mixing time can be maintained if water is added and mixing started after arrival of the truck at the job, site where the operation can be inspected.

c) Transportation

The process of carrying the concrete from the place of mixing to the place of final position of its deposition is known as transportation. Transportation may be manual or mechanical.

Manual Transportation

Manual transportation is adopted for small construction activities and when the place of deposition is closed to the place of mixing.

Mechanical Transportation

Mechanical transportation through pumps or lifts and is adopted for large construction activities or when the place of deposition is away from the place of mixing. Minimum time should be consumed in transportation. Horizontal & Vertical transportation.

d) Placing of Concrete

The process of depositing the concrete in its required position is called placing of concrete. Concrete should be placed carefully in position and should not be thrown from heights to avoid segregation.

When working is to be suspended / stopped for some time, grooves should be made in the finish work for joining the next concrete work before its initial setting.

e) Compaction & Finishing

The process of consolidating the concrete after placing in its position is known as compaction of concrete. With the presence of air bubbles / voids in the concrete, its strength reduces considerably. 5% air voids in concrete may reduce its strength up to 30%. Compaction may be manual or by mechanical means.

Manual Compaction

Manual compaction through tempering and rodding is adopted for small and less important concrete works.

Mechanical Compaction

Mechanical compaction through vibrators is done for large, massive and general concrete works. Vibrators may be external or internal types.

f) Curing

The process of keeping the concrete moist or wet for certain time period after finishing & setting is called curing.

disperse
→

8% voids
↓
30% st
reduce

lift places

Concrete is cured for minimum 7-10 days normally in order to: _____

1- Complete the hydration process.

2- Gain the strength of concrete.

Any one of the following methods is normally adopted for curing:

i) By wet jute bags

ii) By ponding

iii) By sprinkling water

iv) By immersing in water pond

v) By steam

vi) By adding construction chemicals

Concrete made with ordinary and sulphate resistant cements should be cured for at least 08 days, while that made with ~~low-heat cement~~ for at least 14 days. Concrete made with high-early-strength cement should be kept moist until sufficient strength has been attained, as indicated by test cylinders.

i) Curing by wet JuteBags

In this method, the concrete surface to be cured is covered with wet jute bags and upon drying of these bags sprinkling of water is done to keep them moist. This process is continued till the curing period is over. This method is suitable for small horizontal as well as vertical surfaces.

ii) By Ponding

In this method, the concrete surface to be cured is filled (ponding is done) with the water till the curing period is over. This method is suitable for horizontal surfaces.

iii) By Sprinkling Water

In this method, water is continuously sprinkled on the vertical surfaces till the curing time is over.

iv) By Immersing in Water Pond

This is adopted for pre-cast concrete members. In this method, the precast members are immersed in water till the curing period is over.

v) By Steam

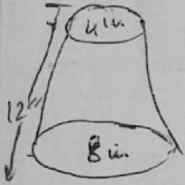
This method is used for pre-cast concrete members and steam under pressure is sprayed over the concrete structure. Steam curing quickens the hardening of concrete and reduces the time period of curing.

vi) By Adding Construction Chemicals

In this method, certain construction chemicals are added to stop / reduce the evaporation of water from the concrete. No typical curing is required.

IMPORTANT PROPERTIES OF CONCRETE

For a specific type of structure, certain characteristics of concrete to be used may be more important than others. For example, concrete for a multistory building or bridge should have high compressive strength, whereas concrete for a dam should be more durable and watertight whereas strength can be relatively small.



1) Workability

It is the ease with which concrete can be placed & finished. It is an important property for many applications of concrete. One characteristic of workability is consistency or fluidity which can be measured using slump test. (ASTM C143).

In the slump test, a specimen of concrete mix is placed in a mould shaped as the frustum of a cone, 12 in high, with 8-in diameter at base and 4-in diameter at top. When the mould is lifted up the change in height of specimen is measured. This change in height is taken as the slump value. Higher is the water content larger is the slump value.

2) Durability

Concrete should be capable of withstanding the weathering effects, chemical action and should be able to resist load to which it will be subjected in service life. Much of the weather damage sustained by concrete is attributable through freezing and thawing cycles. Resistance of concrete to such damage can be improved by increasing the water tightness.

3) Water Tightness

It is an important property of concrete that can be improved by reducing the amount of water in the mix. Excess water leaves voids and cavities after evaporation, and if they are interconnected, water can penetrate or pass through the concrete. Prolonged thorough curing as well as entrained-air (minute bubbles) usually increases water tightness. Water tightness can be increased by improving effective compaction of concrete, controlling aggregate grading, using construction chemicals etc.

4) Strength

This property is usually of main concern. Normally it is determined by knowing the ultimate strength of a specimen in compression tested in the lab but sometimes flexural or tensile capacity is also important which can also be determined through lab tests. Since concrete usually gains strength over a long period, (90 days) the compressive strength at 28 days is commonly used as a measure of this property. Concrete strength is influenced mainly by the water cement ratio, mix proportions and other factors.

Concrete Strength May Be Improved By

1. Decreasing water cement (W/C) ratio → (Reduction in water content)
2. Using higher strength aggregates

- 3 • Using well graded aggregate resulting lesser voids
- 4 • Proper moist curing of concrete.
- 5 • Adding a pozzolanic material, such as fly ash
- 6 • Effective compaction of the concrete.
- 7 • Sucktion of excess water with a vacuum from the concrete in the form work.

Shamsi Photo Copy
Girls Cafe (U.E.T)