

## Process of Manufacture of Concrete

**The various stages of manufacture of concrete are:**

1. Batching
2. Mixing
3. Transporting
4. Placing
5. Compacting
6. Finishing
7. Curing

### Concrete Batching

- The process of measuring ingredients or materials to prepare concrete mix is known as batching of concrete. Batching can be done by two methods, volume batching and weight batching.
- Volume batching is not a good method for proportioning the material because of the difficulty it offers to measure granular material in terms of volume.
- Volume of moist sand in a loose condition weighs much less than the same volume of dry compacted sand.

### Mixing of concrete

The concrete constituents are properly mixed so as to produce fresh concrete in which the surface of all aggregate particles must be covered by the cement paste at the end of mixing process.

## Mixing types of concrete:

**1- Hand mixing:** This is used for small and unimportant businesses. The mixture in this method is not homogeneous and need a lot of care and work. Mixing process contains mixing aggregate on a clean plane then cement will be added and these elements have to be combined for at least 3 times. After that, a hole has to be made in the center of the mixture and addition of water. The water must not be allowed to go out of the mixture.



**2- Mechanical mixing:** this one is public in big projects. It uses mechanical mixtures to mix concrete, and the homogeneity of the mix depends on the way of deflation and the mixing time.

The most important mixers are:

- a) Drum mixers
- b) Pan mixers
- c) Dual drum mixers
- d) tilting mixers
- e) non-tilting mixers



**Pan mixer**



**Tilting mixers**



**Dual drum mixer**

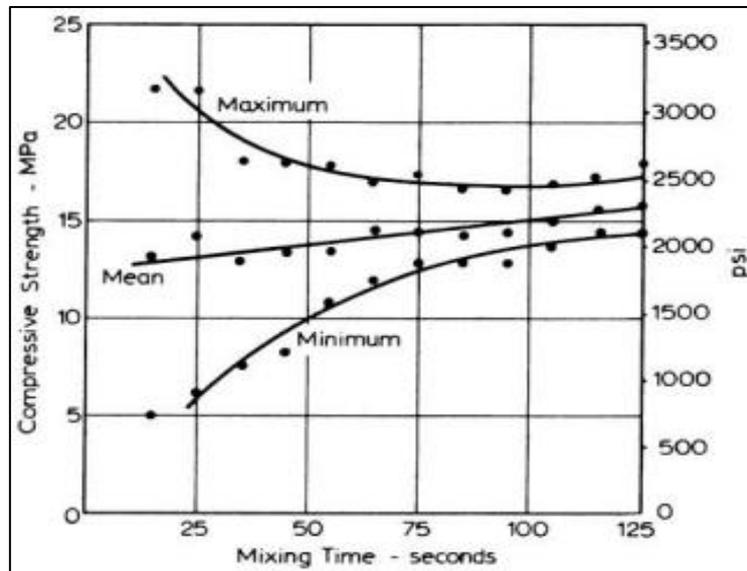
## Mixing time

It is the minimum mixing time necessary to produce a homogenous concrete with a suitable strength. The mixing time depends on:

- 1- Type of mixer
- 2- Size of the mixer

This time varies with the type of mixer and, strictly speaking, it is not the mixing time but the number of revolutions of the mixer that is the criterion of adequate mixing. Generally, about 20 revolutions are sufficient. Because there is an optimum

speed of rotation recommended by the manufacturer of the mixer, the number of revolutions and the time of mixing are interdependent. For a given mixer, there exists a relation between mixing time and uniformity of the mix.



### Relation between compressive strength and mixing time

The average strength of concrete increases with an increase in mixing time. The rate of increase falls rapidly beyond about one minute and is not significant beyond two minutes; sometimes, even a slight decrease in strength has been observed.

Within the first minute, however, the influence of mixing time on strength is of considerable importance.

The exact value of the minimum mixing time, which is given by the mixer manufacturer, varies with the type of mixer and depends also on its size. What is essential is to ensure uniformity of mixing, which generally can be achieved by a minimum mixing time.

In high-speed pan mixers, the mixing time can be as short as 35 seconds. On the other hand, when lightweight aggregate is used, the mixing time should be not less than 5 minutes, sometimes divided into 2 minutes of mixing the aggregate with water, followed by 3 minutes with cement added.

## **The disadvantages of concrete mixing for a long time:**

- 1- Evaporation of water from the mix takes place, with a consequent decrease in workability.
- 2- Grinding of the aggregate, particularly if soft: the grading of the aggregate thus becomes finer, and the workability lower.
- 3- The friction effect also produces an increase in the temperature of the mix.