Concrete

Lecture - 5

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Content

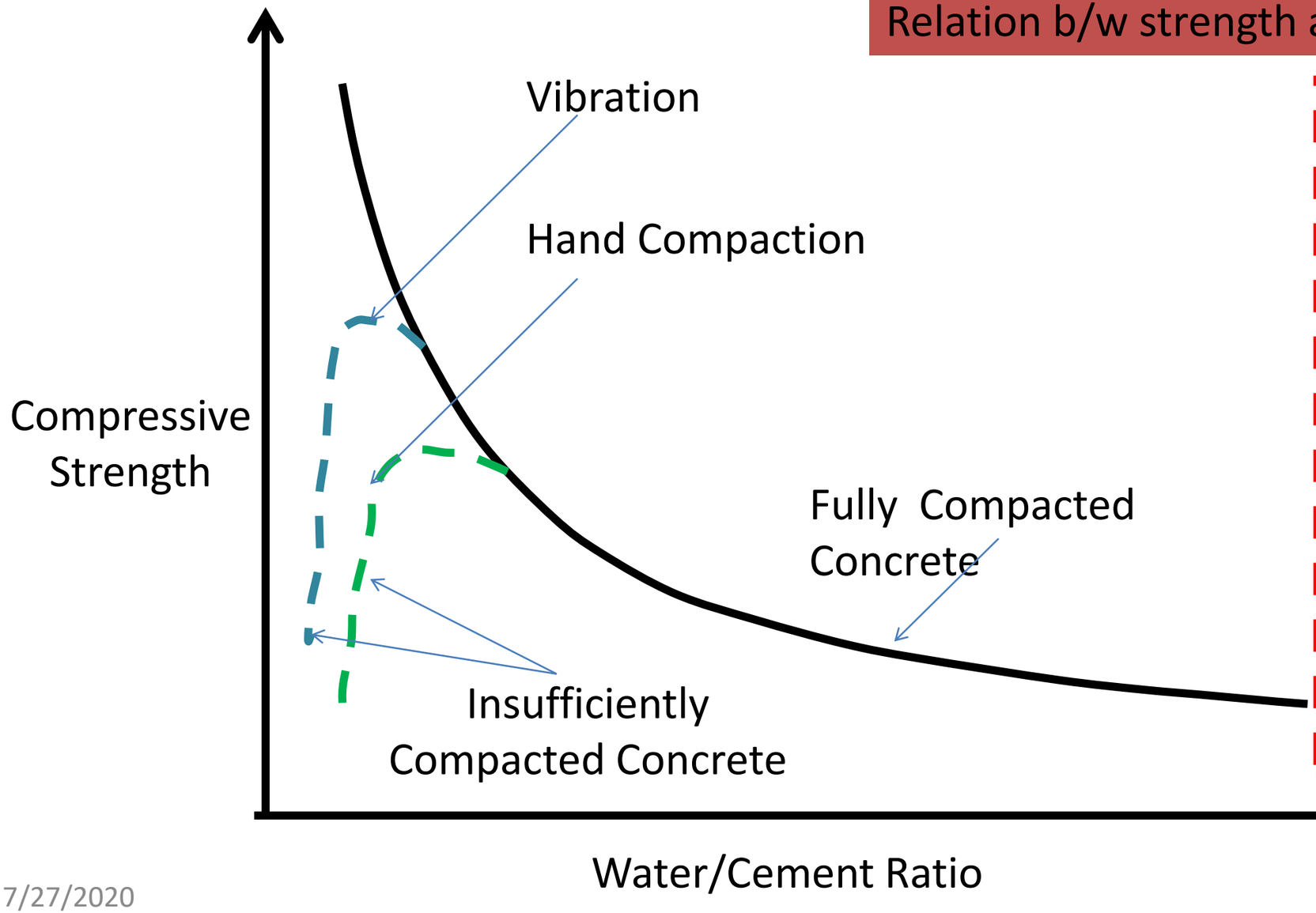
Water/cement Ratio

☞*it is the ratio of weight of water in concrete mix (exclusive of water absorbed by the aggregates) to the weight of cement.*

$$\text{Water/Cement ratio} = \frac{weight\ of\ water}{weight\ of\ cement}$$

Water/cement Ratio

Relation b/w strength and water/cement ratio of concrete



https://www.ccaa.com.au/imis_prod/documents/ConcreteBasics.pdf

Production of Concrete

Batching of Material

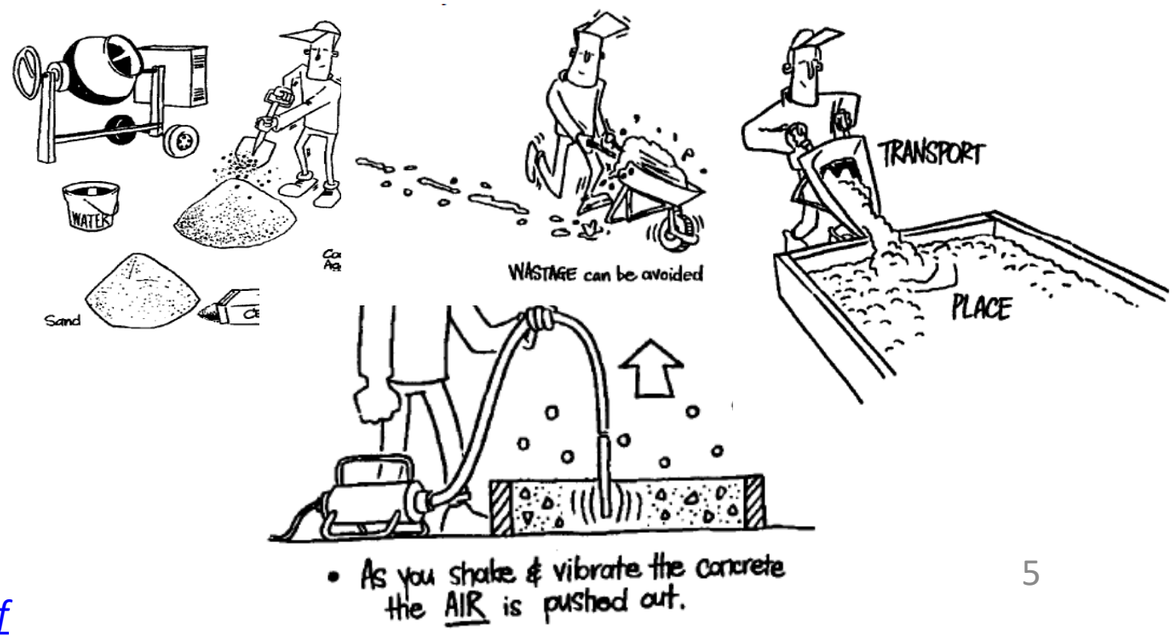
Mixing of various Ingredients

Transportation of concrete mix

Placing of Concrete

Compaction of Concrete

Curing of Concrete



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Production of Concrete

Batching of Material

The process of measurement of ingredients (cement, coarse aggregate, fine aggregate and water) for making concrete is called batching. Batching is done in two ways:

- Volume Batching
- Weight Batching

Volume Batching

Cement is always batched by weight. It is never be batched by volume. Cement should never be batched by volume because its weight per unit volume values varies according to the way container is filled.

Batching of Material

Batching of Aggregate by Volume

Wooden batch boxes are used for batching of fine and coarse aggregate by volume. No compaction should be allowed while filling the batch box. Volume of moist sand in a loose condition weighs much less than the same volume of dry compacted sand. The amount of solid granular material in a cubic meter is an indefinite quantity. Because of this, for quality concrete material have to be measured by weight only.

Batching of Material

Batching of Water by Volume

It is a practice in the field to add water by tin cans or buckets. It is not an accurate method. It results is variable strength of concrete.

The water is usually measured by volume since this can be done quite accurately.

Weight Batching

Batching of Cement

It is always batched by weight. Mostly, it is batched is terms of 50 kg bags.

Batching of aggregate

Batching of aggregate by weight is preferable. In weight batching no correction is made for bulking of sand but only correction made is for weight of water contained by wet aggregate

Mixing of Concrete

The process of mixing of various ingredients of concrete in specified proportions is termed as mixing of concrete.

Objective of Mixing

The quality and strength of concrete depends upon proper mixing. The object of mixing is to coat the surface of all aggregate particles with cement paste and to obtain concrete of uniform color and required consistency.

Production of Concrete

Method of Concrete Mixing

Hand Mixing

it is done by manual labour and adopt for unimportant work. it require more cement than machine mixing for obtaining the same strength of concrete

- A platform of non absorbent water is constructed
- Spread out a measured sand evenly on the mixing platform
- Spread the cement uniformly on this sand and mix it till the color of mixture is uniform
- Spread the mixture evenly on plateform and than spread the coarse aggregate evenly on the mixing plateform. Mix the material dry
- Make a hollow in the center of the mixed material. After this 75% of the required quantity of water based on water cement ratio is added and then start remixing taking care that no water escapes the mixture
- The remaining water is added with the continuation of mixing process. Normally mixing time should not exceed 3 minutes.
- The platform should be cleaned at the end of the day's work so that it is ready for use on the next day.

Machine Mixing

The process of mixing the ingredients of concrete by a machine is called machine mixing. It is mandatory if the concrete production required on a large scale. Concrete can be produced at a faster rate and at a lesser cost. In addition, quality of concrete is also better.

The machine used for mixing of concrete is known as a concrete mixer. There are two types of mixers:

- Batch Mixer
- Continuous Mixer

Production of Concrete

Mixing of Concrete

Batch Mixer

This mixer mix and discharge each load of materials separately. Batch mixers can be any one of the following types:

Non Tilting Type Mixer or Rotary Type Mixer

- ≈ cylindrical in shape, revolve about horizontal axis
- ≈ Suitable for small construction work.
- ≈ Suitable for small material sizes less than 75 mm.
- ≈ In this type of mixture material is lifted, roller then dropped.

Tilting Type Mixer

It consist conical drum which rotates about an inclination (40°). Mixer has only one opening. The rotating drum is tilted with an opening downward in order to discharge the mixed concrete. Commonly used on large projects Bigger size of aggregate can be used Material is rolled down with the minimum of segregation It can be cleaned more easily. It is more efficient as it enables concrete to be discharged in a short time

Mixing of Concrete

Continuous Mixer

These produce a steady stream of concrete as long as it is in operation. Such mixers are not in common use. The selection of size of mixers depends upon its output/day.

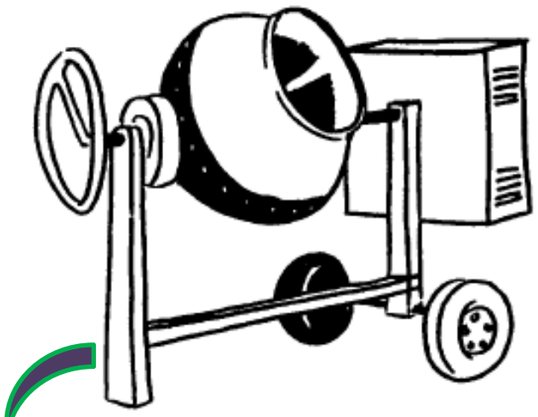
Capacity of Mixers

S. No.	Type of Mixture	Capacity in liters
1	Tilting (T)	100,140,200
2	Non- Tilting (NT)	140, 200, 280, 400, 800
3	Continuous	1600

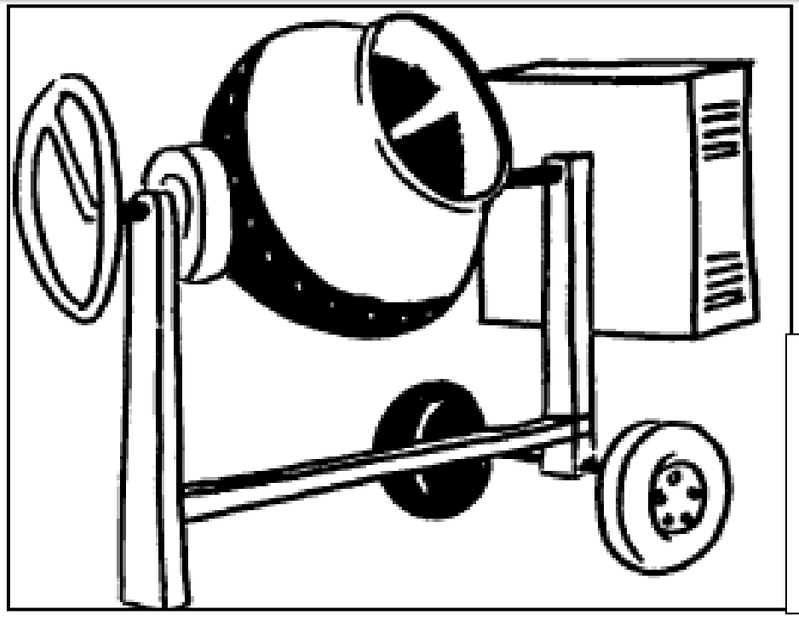
Production of Concrete

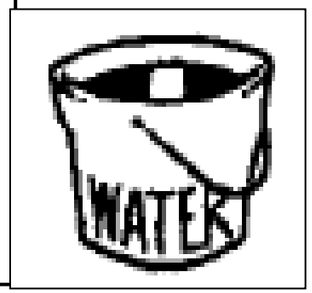
Mixing of Concrete

Operation of Mixer



Mixer should be placed near to the site





10% of water should be placed in a rotating drum before adding dry material.

Water than should be added uniformly with dry materials leaving 10% to be added after all other materials are placed in the drum. Generally speed of mixer drum varies between 15 to 20 revolution per minute. Normally mixing time is 2 minutes. The time is measured from the moment all the materials are fed into the mixer. Cleaning is done by putting some dry aggregates and water into the drum and rotating it for 2 minutes.

The aggregate will help to loosen the sticking mortar. Clean the remaining portion by forcing the water under pressure.

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Production of Concrete

Transportation of concrete mix

Equipment	T ype and range of work for which the equipment is best suited	Merits	Points to watch for
Cutes	For conveying concrete to lower level, usually below ground level, on all types of concrete construction	Low cost and easy to manoeuvre. No power required, gravity does most of the work	Slope range from 1 to 2 and 1 to 3
Truck Agitator	Used to transport concrete for all uses in pavements, structures and building.	Usually operate from mixing plants where quality concrete is produced under controlled condition. Discharge from agitator is well controlled.	Timing of deliveries to suit job organisation. Concrete equipment and crew must be ready onsite to handle large concrete batches
Truck Mixer	Used to mix and transport concrete to job site over short and long hauls. Hauls can be any distance.	No central mixing plant needed. Only a batching plant since concrete is completely mixed in truck mixer. D	Control of concrete quality is not as good as with central mixing. Slump tests of concrete consistency are needed on discharge.

Production of Concrete

Transportation of concrete mix

Non agitating truck	Use to transport concrete on short haults	Capital cost of this equipment is lower than that of truck agitators or mixers.	Concrete slump should be limitted. Possibility of segregation.
Crane	The right tool for work above ground level.	Can handle concrete. Reinforcing, steel, formwork in high rise buildings.	Has only one hook. Careful scheduling between trades and opetrations are needed to kept it busy
Bucket	Used on cranes and cable ways for construction of building and dams. Convey concrete directs from central discharge point to formwork or to secondary discharge points	Enable full versatility of cranes and cableways to be exploited. Clean discharge. Wide range of capacities	Select bucket capacity to conform with size of the concrete batch and capacity of the placing equipment. Discharge should be controlled.

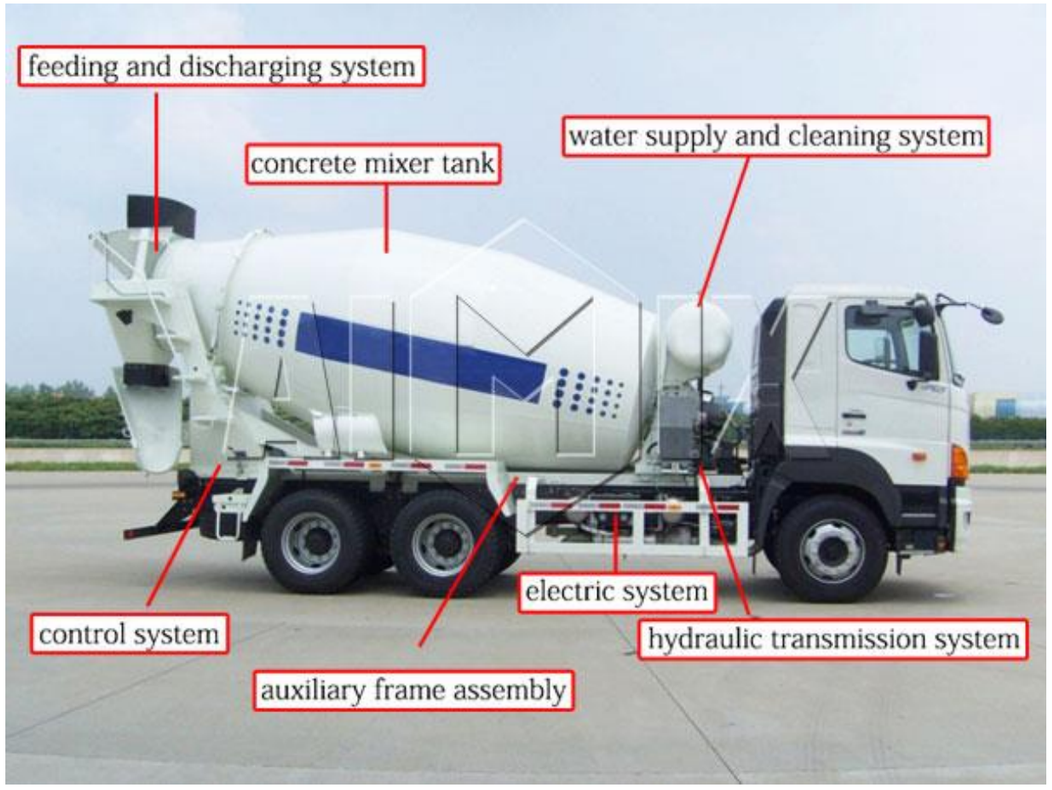
Production of Concrete

Transportation of concrete mix

Pneumatic Guns	Use where concrete to be placed in difficult locations and where thin sections and large areas are needed	Ideal for placing concrete in free form shapes, for repairing and strengthening buildings, for protective coating and thin lining	Quality of work depend on those using equipment. Only experience nozzelman should be employed
Concrete Pump	Used to convey concrete direct from central discharge point to fromwork or to secondary dischage point	Pipelines take up little space and can be readily extended. Boom pump can move concrete both vertically and horizontally.	Constant supply of fresh plastic concrete is needed with average consistancy and without any tendency to segregate.
Tremies	For placing concrete under water	Can be used to funnel concrete down through the water into the foundation or other part of the structure being cast	The discharge end always be buried in fresh concrete so that a seal is preserved between water and concrete mass.

Production of Concrete

Transportation of concrete mix



https://aimixconcretemixertruck.com/concrete-transit-mixer-sale/
http://www.schwing-stetter.co.uk/Pages/ConcretePumpingOverview.aspx
https://www.totalconcrete.co.uk/news/types-concrete-pumps-applications/

Summary

- *Water/cement ratio*
- *Production of Concrete*
  - *Batching*
  - *Mixing*
  - *Transportation*

THANK YOU