SNS COLLEGE OF TECHNOLOGY

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19CEB201 – CONSTRUCTION MATERIALS

II YEAR / III SEMESTER

Unit 3 : Concrete

Topic 3 : Manufacturing Process of Concrete

Manufacturing of Concrete

1. Proportioning of Concrete
2. Batching of Materials
3. Mixing
4. Transporting
5. Placing
6. Compacting
7. Curing

Proportioning of Concrete

- Selection of the proper quantity of cement, coarse aggregate, sand and water to obtain the desired quality is known as proportioning of concrete.
- Concrete is formed by successive filling of voids in aggregate by sand, the voids in the sand by cement and voids in cement by water and undergoing a chemical reaction.

Proportioning of Concrete

The concrete formed by proper proportioning of ingredients should satisfy the following properties:

- The fresh concrete should have adequate workability for uniform placement.
- The hardened concrete after setting should have the desired strength and durability.
- The concrete should be cheap considering the materials and labour.

Batching of Materials

- Batching is the process involves in measuring concrete mix ingredients by either mass or volume and pouring ingredients into the mixer.
- To produce a uniform quality concrete during manufacturing process, the ingredients must be measured accurately for each batch.

Batching of Materials

Types of Batching:

a) Volume Batching

b) Weigh Batching

The factors affecting the choice of batching method are the size of job, required production rate, and required standards of batching performance. For most important works weigh batching is recommended.

Batching of Materials

Volume Batching:

This batching method involves measuring the materials depending upon their volume. This is nowadays very less used in different construction projects, due to Superior advantages of Weigh Batching over it, which includes the aspect of time.

Weigh Batching:

This is the most common and accurate method of Batching which involves measuring the materials depending upon their weight.

Mixing

- After Batching, the mixing phase takes place which is the actual production of the material Concrete.
- In this phase, the necessity of different construction equipment is immense, which will as well determine the quality of concrete produced.
- The mixing phase can be defined as the phase involving, actual physical mixing of different raw material in the provided proportion along with the controlled operation, which produces the material concrete.

Mixing

There are widely two types of mixing procedure adopted, which are:

Hand Mixing:

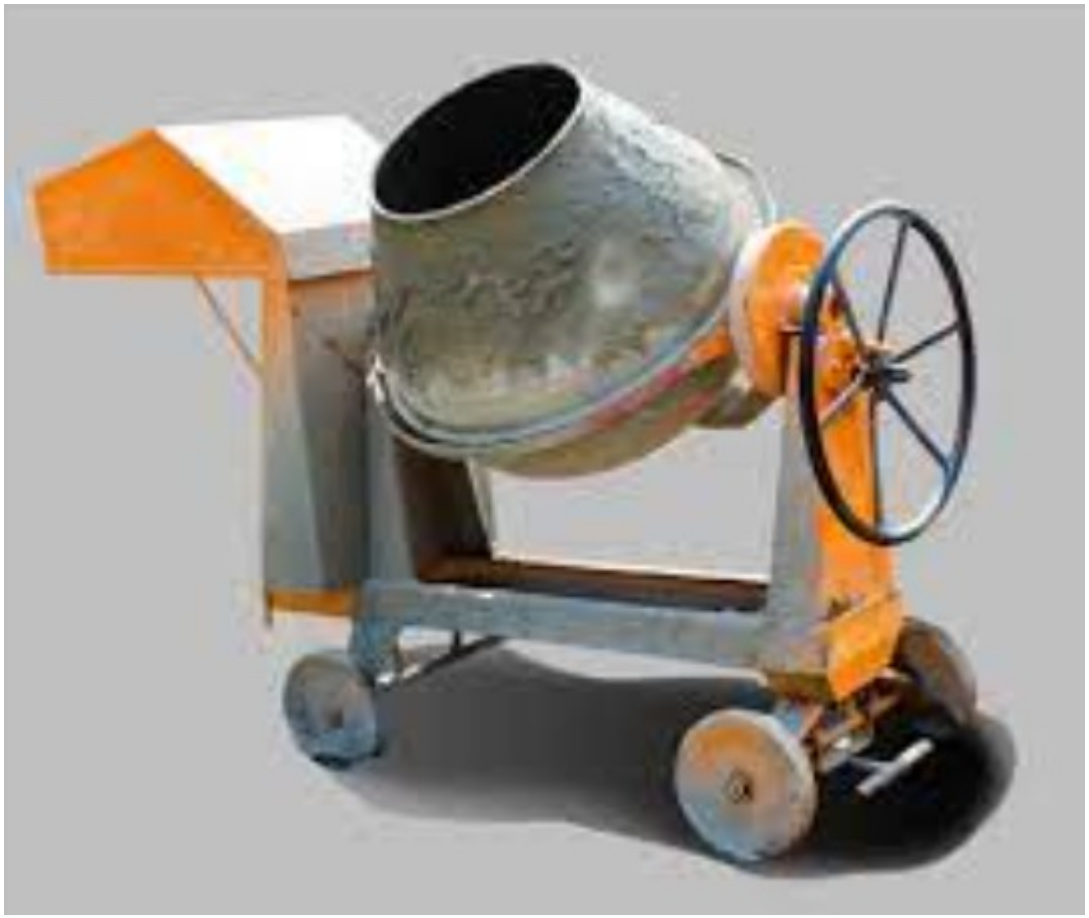
- Though the name indicates hand Mixing, it is not actually Mixed through the hand.
- It is generally done using a mixer that is manually operated.
- It is not very popular because of the great amount of effort to be used for the mixing and the mixing speed varies greatly if it is done using human operation.
- It is generally adopted for petty concreting works.

Mixing

Machine Mixing:

- It is the preparation of Concrete, using a Mechanically or electrically operated mixture machine.
- It is the most widely used method, used for large to medium construction projects all over the world.
- The popularity of these methods may be due to the fact that less amount of effort is to be applied in the mixing process and it will yield higher results, resulting in the production of good Concrete.

Mixing

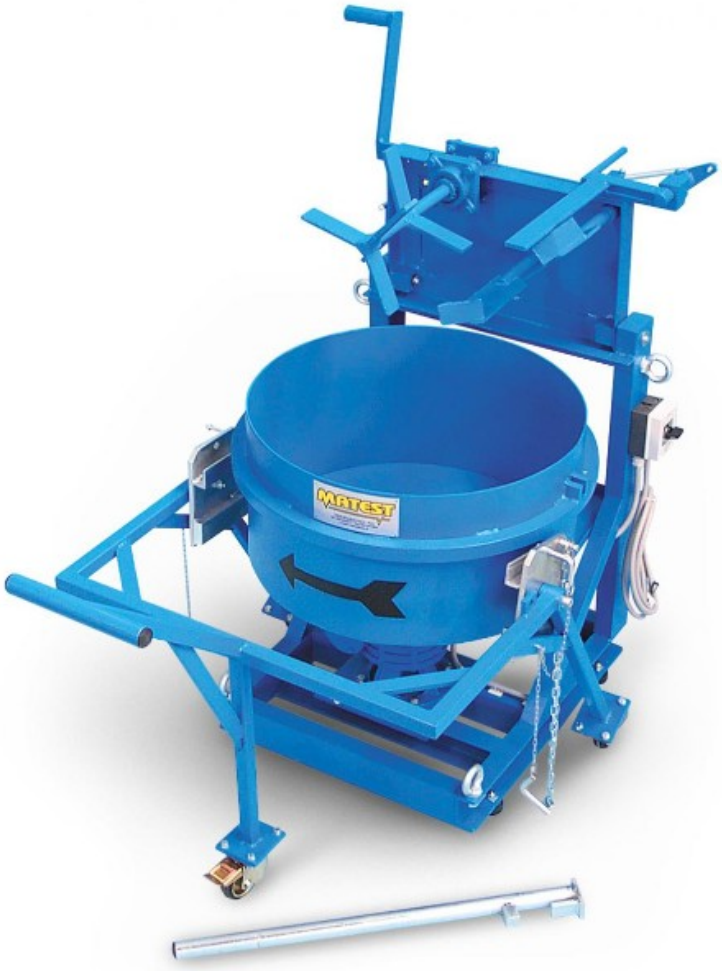


Mixing

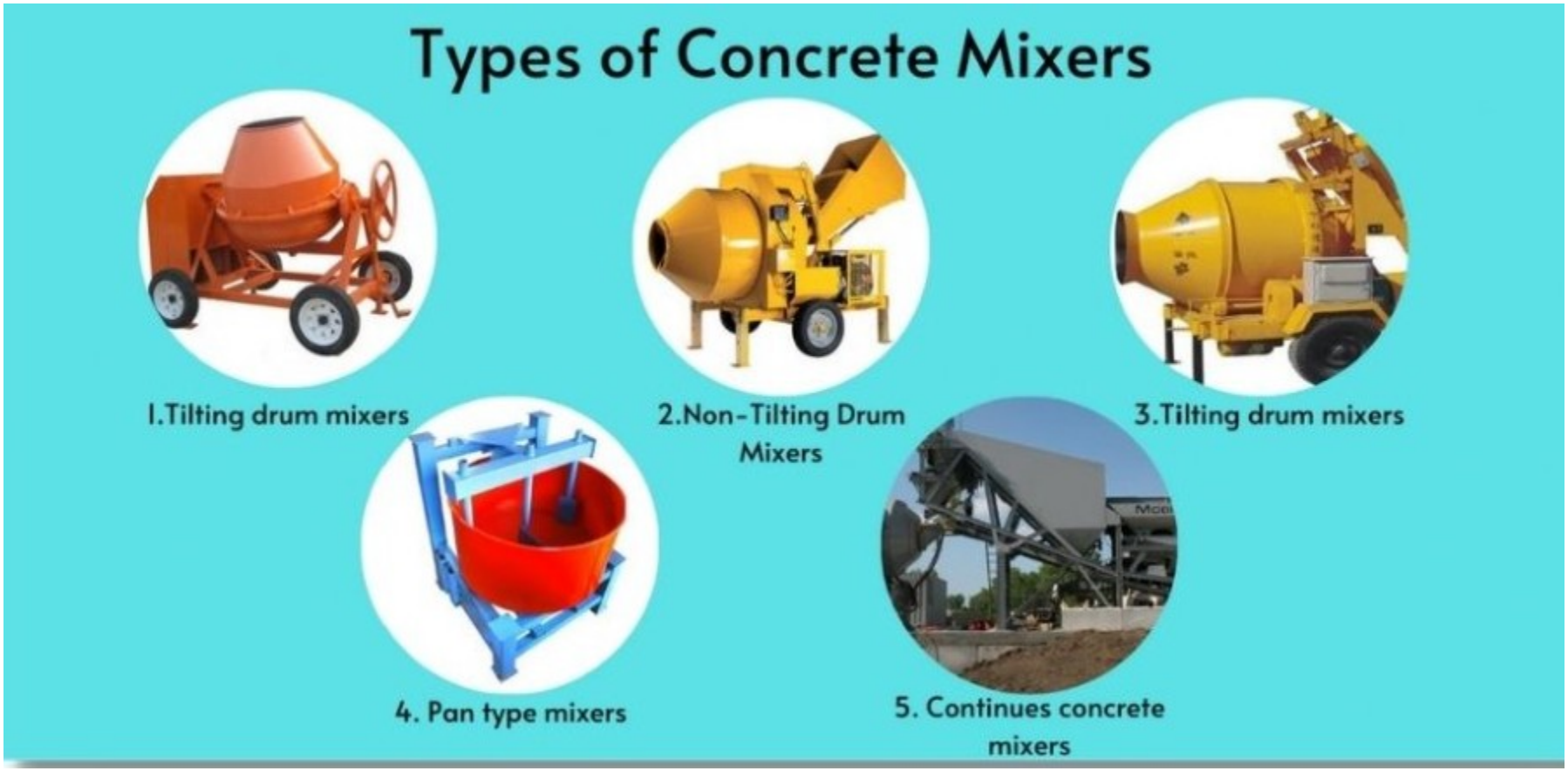
- There are two types of Mixture machines generally used which are, Drum Type and Pan Type.
- The Drum Type mixture machine can further be classified as:

1. Tilting
2. Non Tilting
3. Reversing, and
4. Force action type.

Mixing



Mixing


Types of Concrete Mixers
1.Tilting drum mixers
2.Non-Tilting Drum Mixers
3.Tilting drum mixers
4. Pan type mixers
5. Continues concrete mixers

Transportation

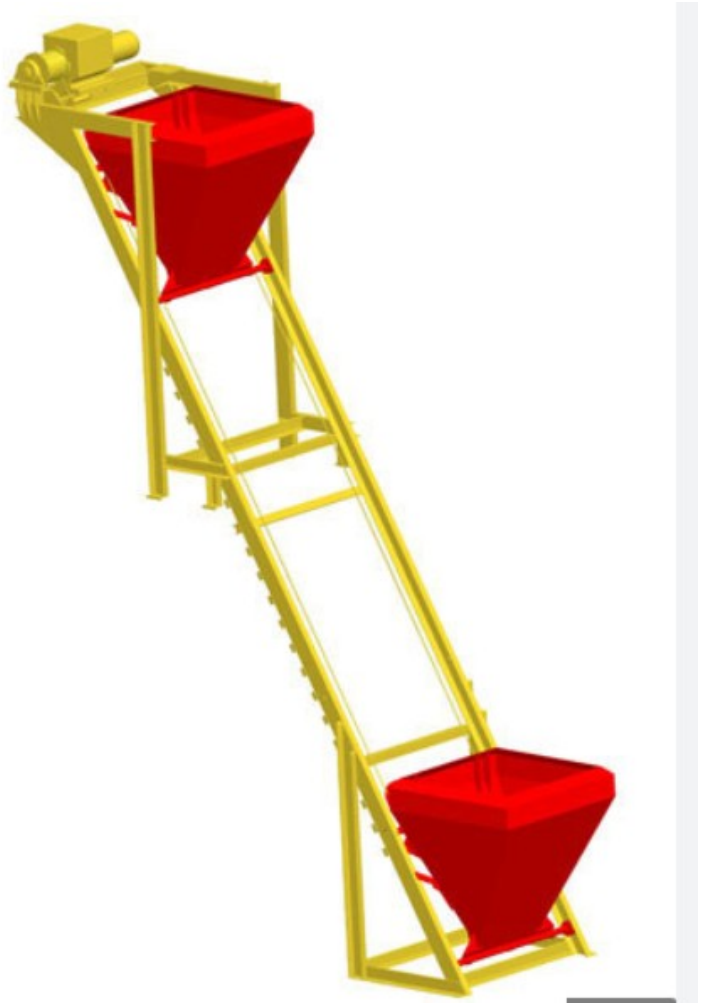
- Just as the name indicates, it is the transportation of the Concrete from the mixing site to the placing site.
- Most of the time, the place of mixing and the place, where the concrete is to be poured, are not the same.
- So the concrete is needed to be conveyed for some distance, is ordered to pour it in the actual place.
- There are a number of methods and types of equipment used for the purpose of conveying concrete, within which, some are less famous and some are very popular and used in almost all construction projects.

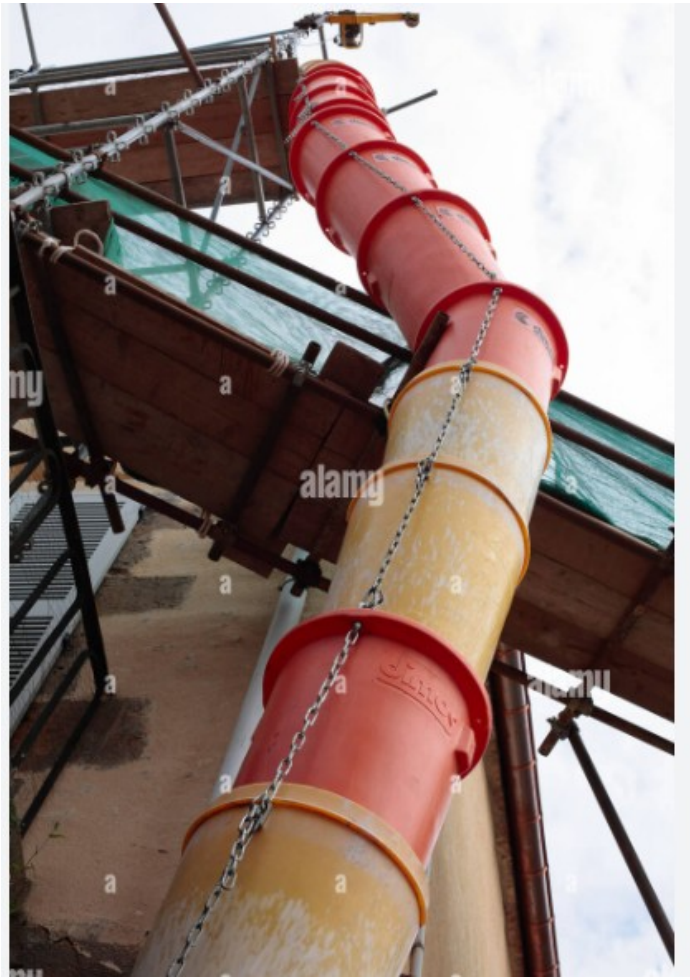
Transportation

Vertical Transportation:

- This is the transportation of concrete to be used in the upper storey of the building or of underground construction and needed to be transported in a vertical direction. For this transportation, some of the equipment used are—
  - Skip and Hoist
  - Chute
  - Crane, Bucket, Ropeway
  - Helicopters

Transportation





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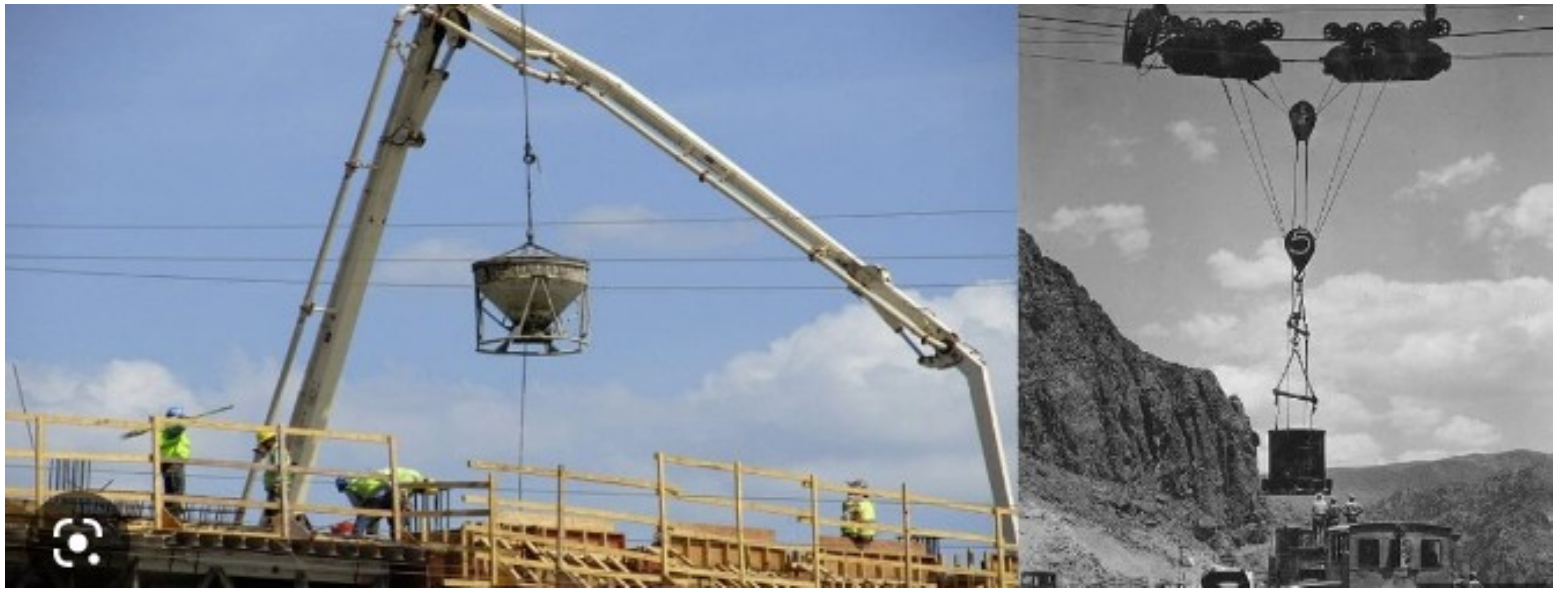
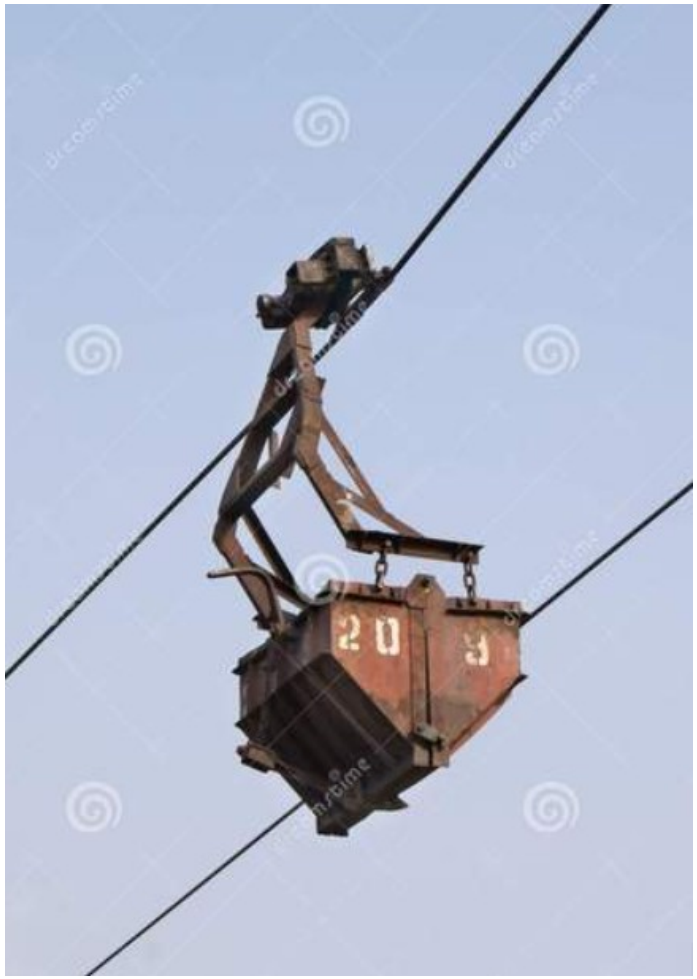


Transportation

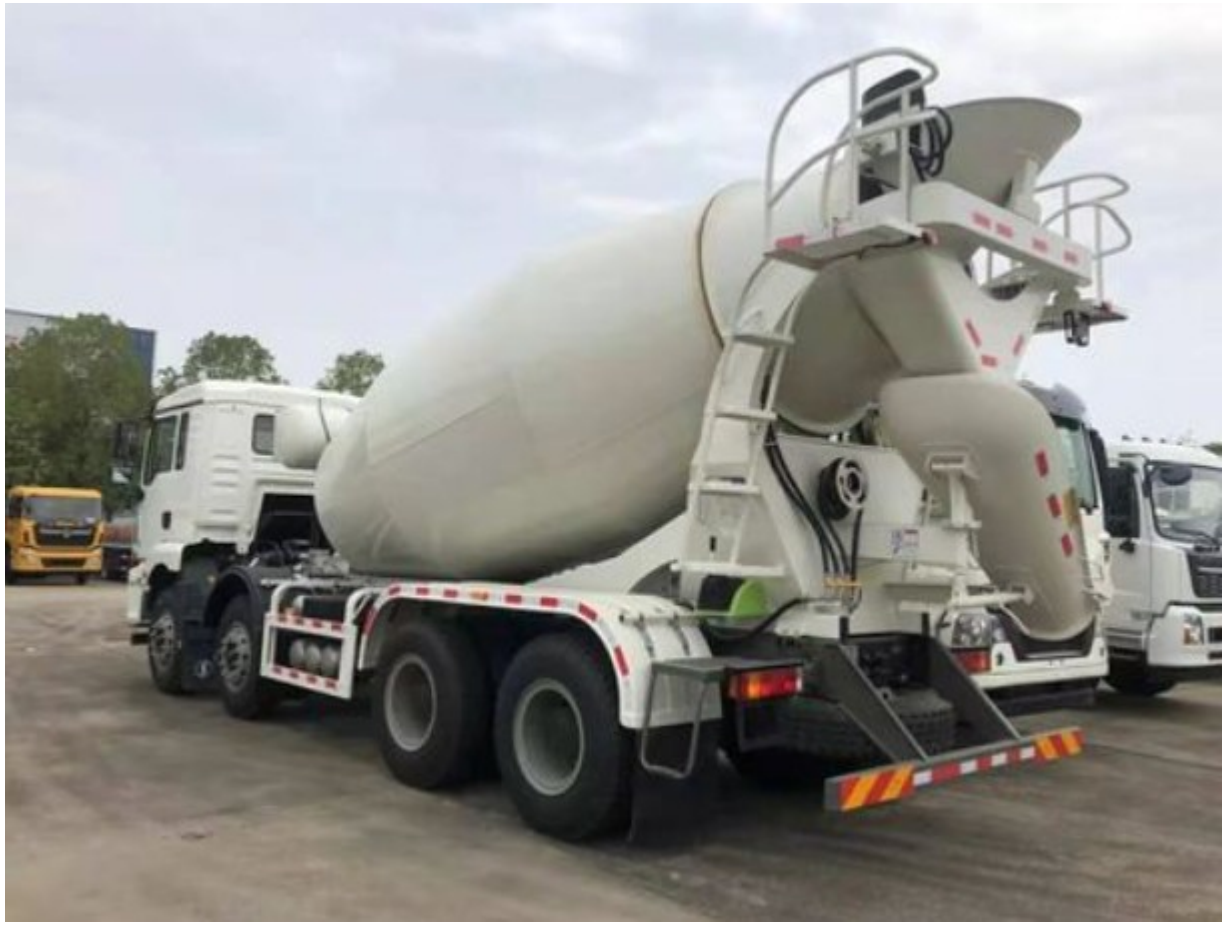


Transportation

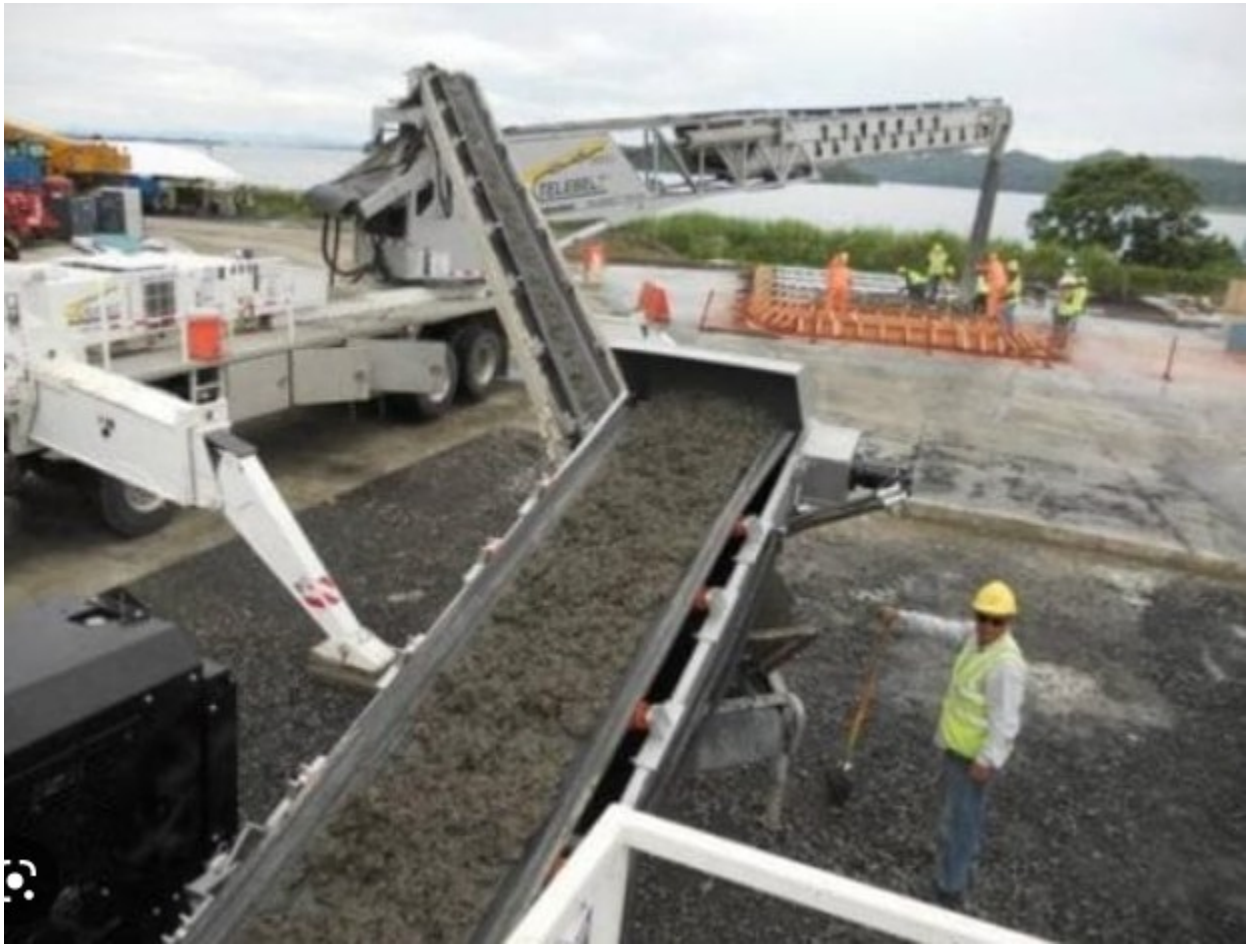
Horizontal Transportation:

- This is the transportation of concrete to be conveyed horizontally, that is, from one place to another. Some of the equipment used for this purpose includes-
  - Mortar Plan
  - Truck Mixer
  - Conveyors belt
  - Transit Mixer

Transportation



Transportation



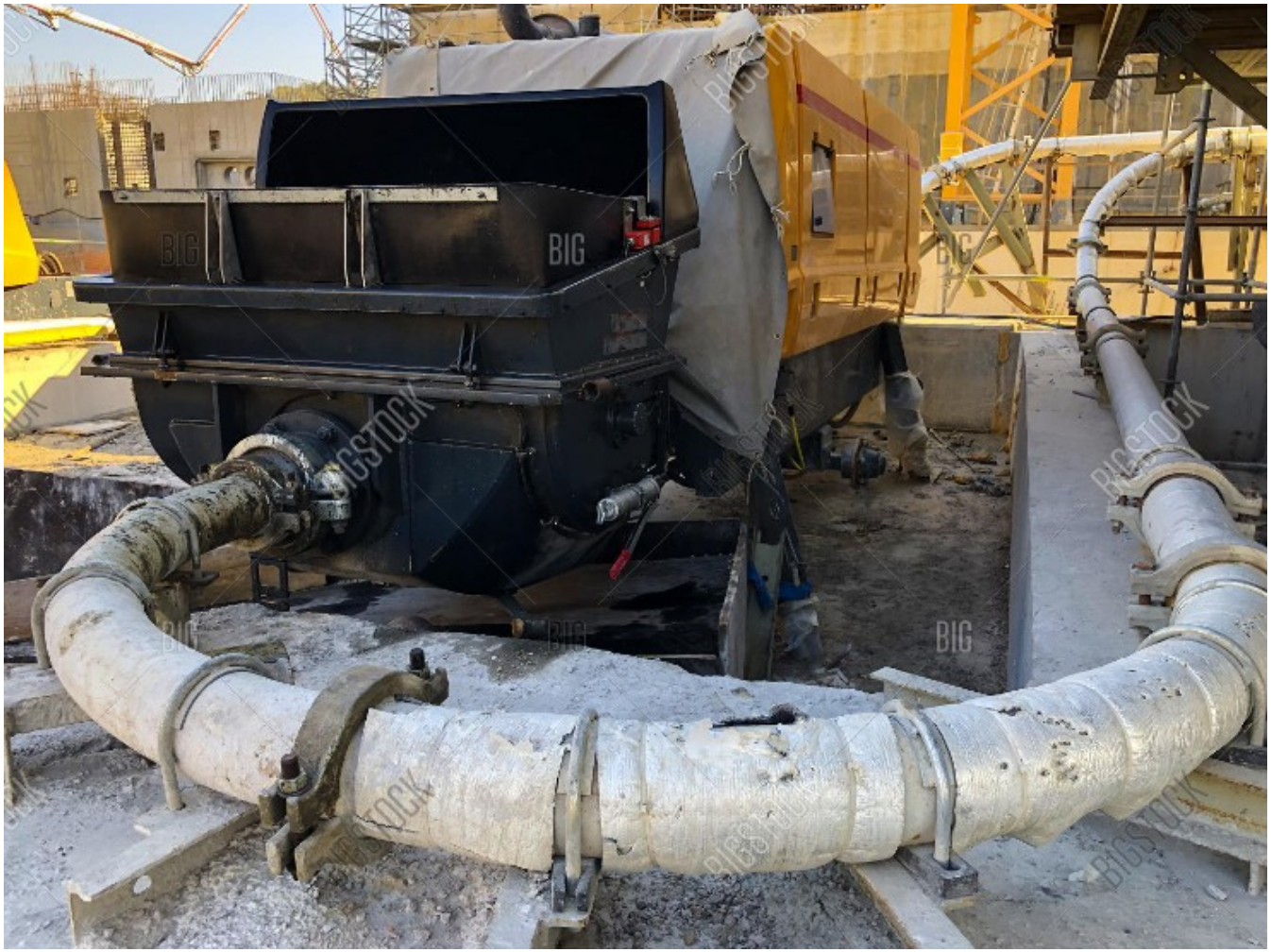
Transportation

- There is another common type of equipment, which is nowadays used for every large construction project and can be operated in both vertical and horizontal directions. The Equipment used is **Pump.**

Concrete Pump:

- It is a very common Equipment nowadays.
- The size of the pump depends upon the maximum size of the aggregates used and the distance to which the concrete is to be transported.
- Though there are several Disadvantages of pumps such as blockages, the amount of advantage far exceeds those in number and quality.

Transportation



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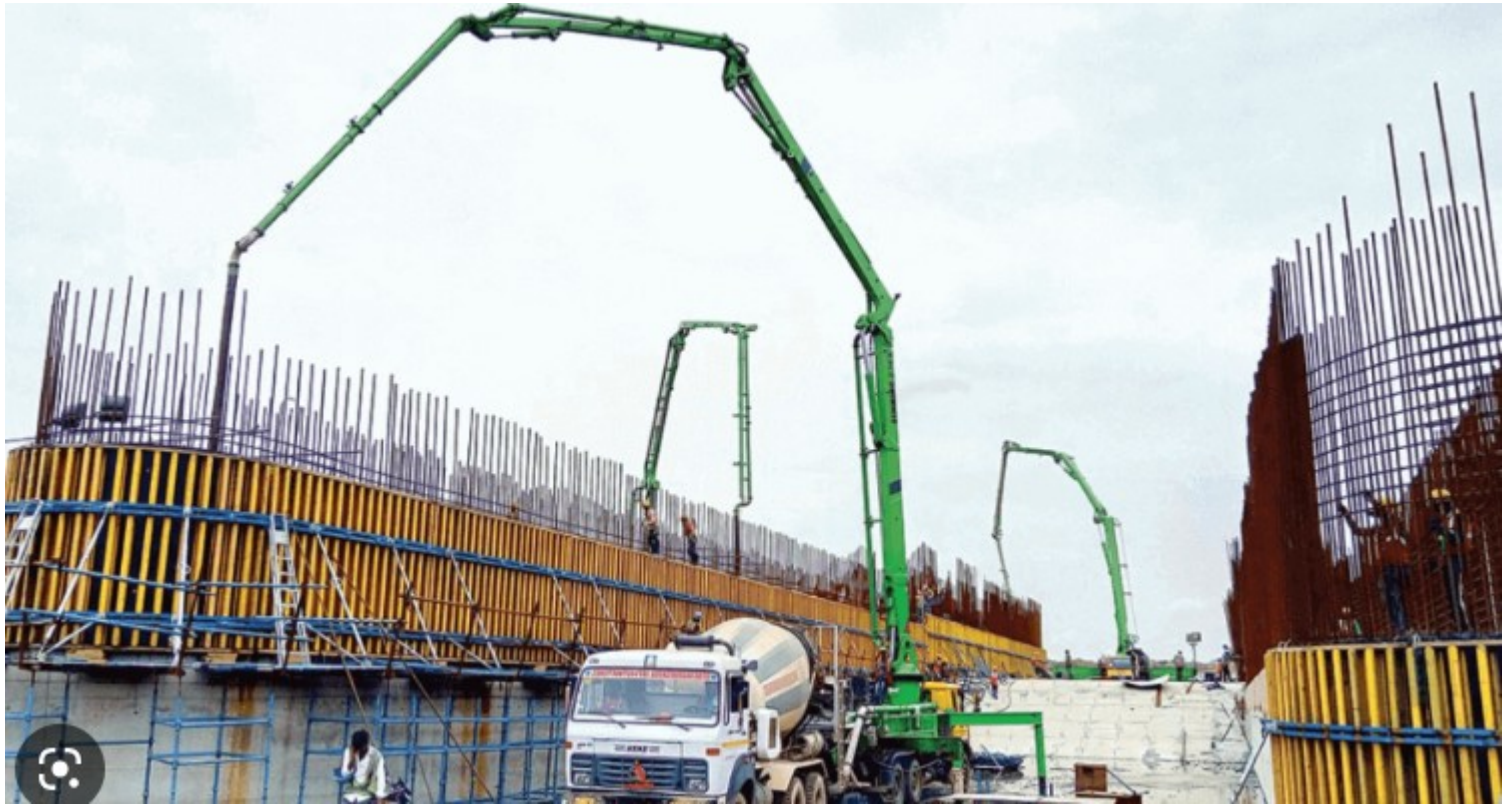


Placing

- It is the process of placing of produced concrete, on the required place, according to the position of the structural member in the Drawing.
- The placing can be of different types, depending upon the methods used, such as placing of concrete for foundation and walls, placing of concrete for Underwater works, etc.
- The placing operation largely involves the Formwork fixing operation.
- Before placing concrete to the required place, the Formworks, planks that can be manufactured of different materials, such as Timber and steel and whose depth and thickness depending upon the depth of the structural member and a number of other factors, are fixed on the four sides.

Compacting

- It is a method of eliminating air voids on the surface of the concrete.
- Whenever concrete is placed, many times, different sizes of air voids already exist in the concrete.
- If the concrete is not subjected to the Compacting efforts, this air voids remain, which on a later stage results in the reduction of the strength of concrete as well as other different faults.
- So in order to attain full strength so that it can perform safely as per it's pre-decided lifespan, Compacting is necessary.

Compacting

Compacting may be broadly classified into two types,

Hand Compaction:

- Hand Compaction is done by a steel tamping rod.
- By equally distributing the strokes as per the number specified in the design documents(generally 25 times for a layer of 10 cm), the concrete is Compacted.
- This method is used for petty and small concreting works

Compacting

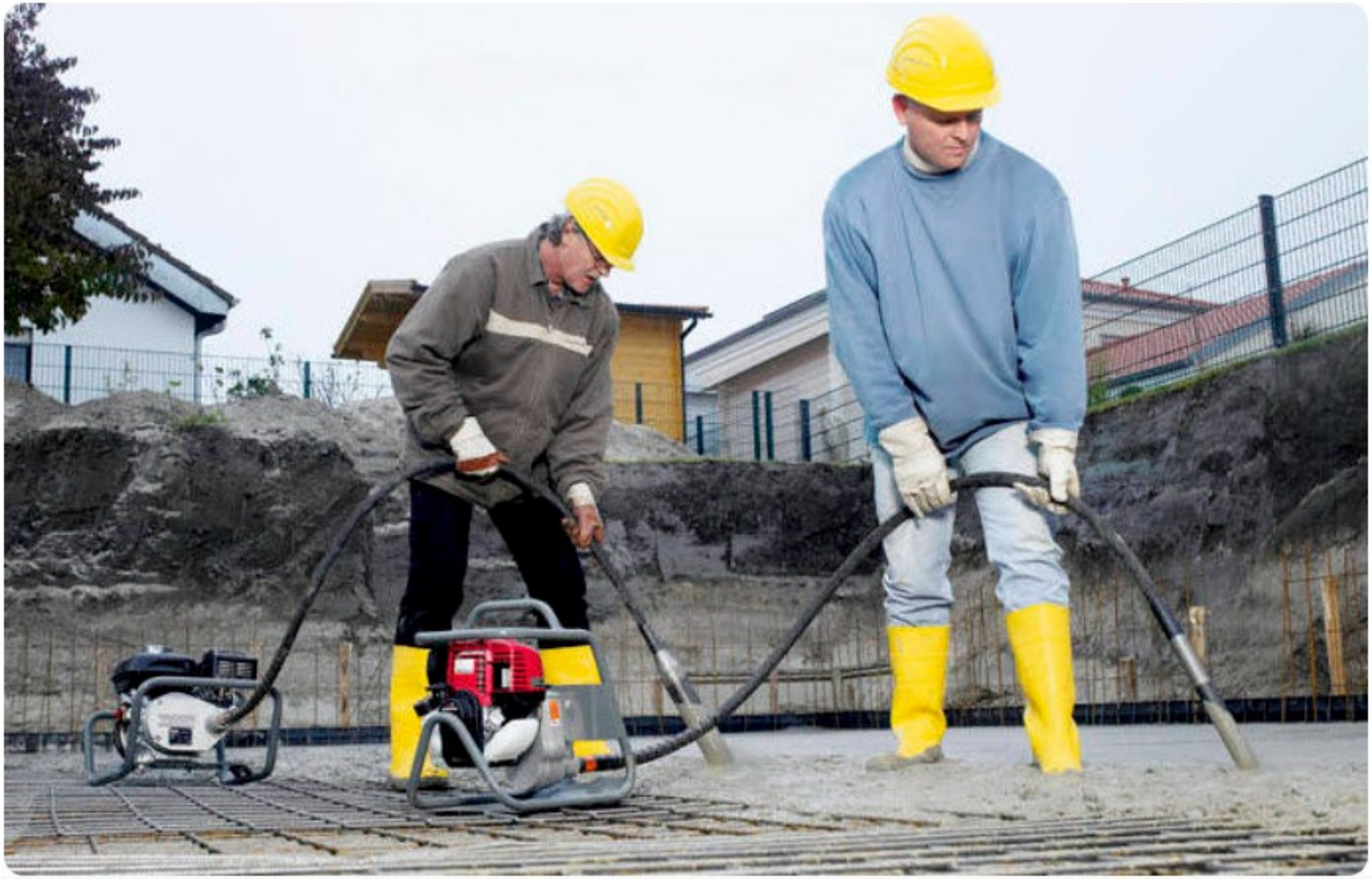
Vibration:

- It is the most popular method which involves Compaction of the concrete using electrically or mechanically operated tools, commonly known as vibrators.
- It is used in every large construction projects, as it provides complete precision.
- There are various types of vibrators depending upon the type of concrete it is to be constructed and the concrete components.

Compacting

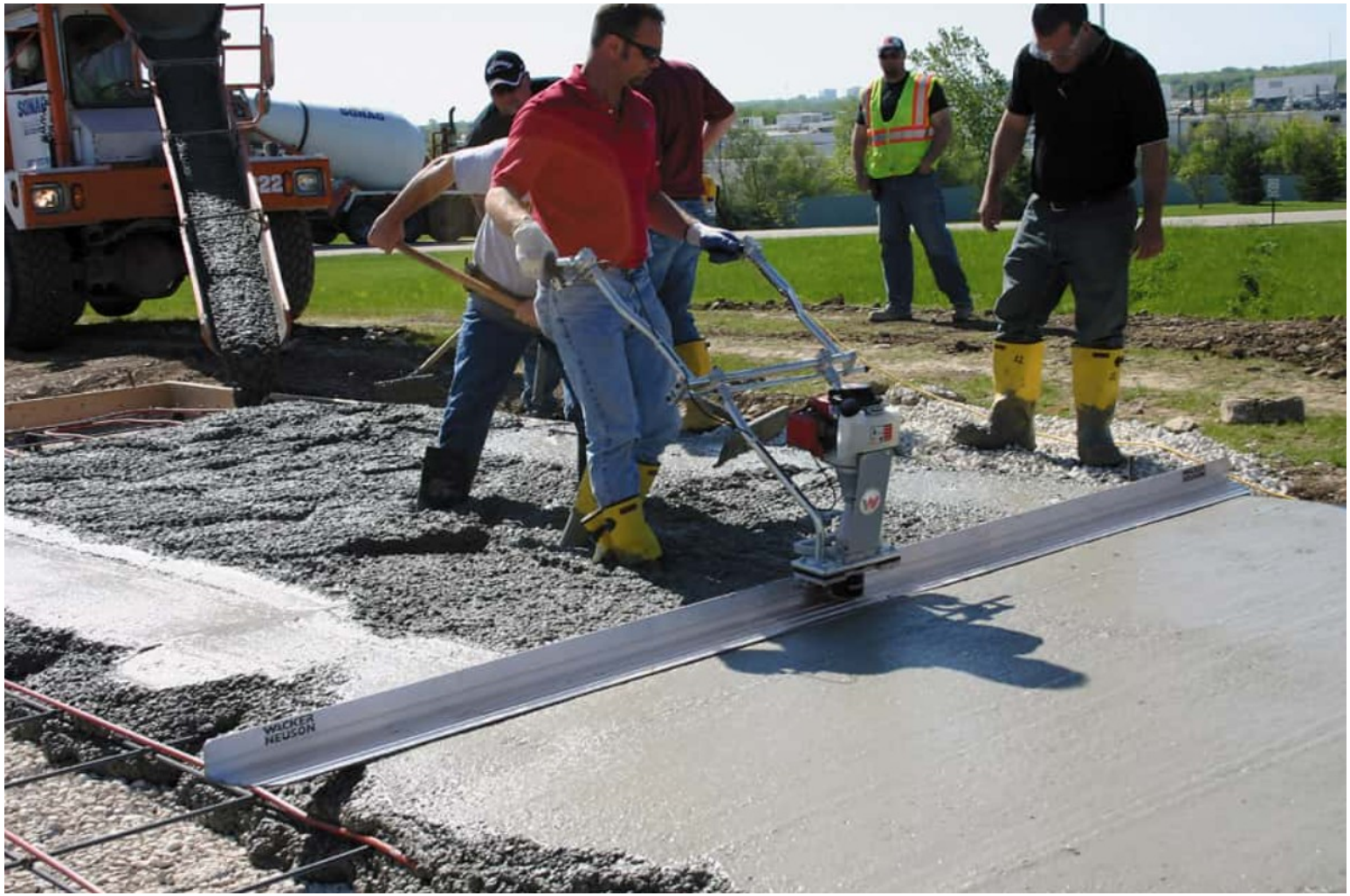
- Some of these are
  - Internal Vibrator
  - External Vibrator
  - Table vibrator
  - Surface vibrator
  - Platform Vibrator, etc.

Compacting

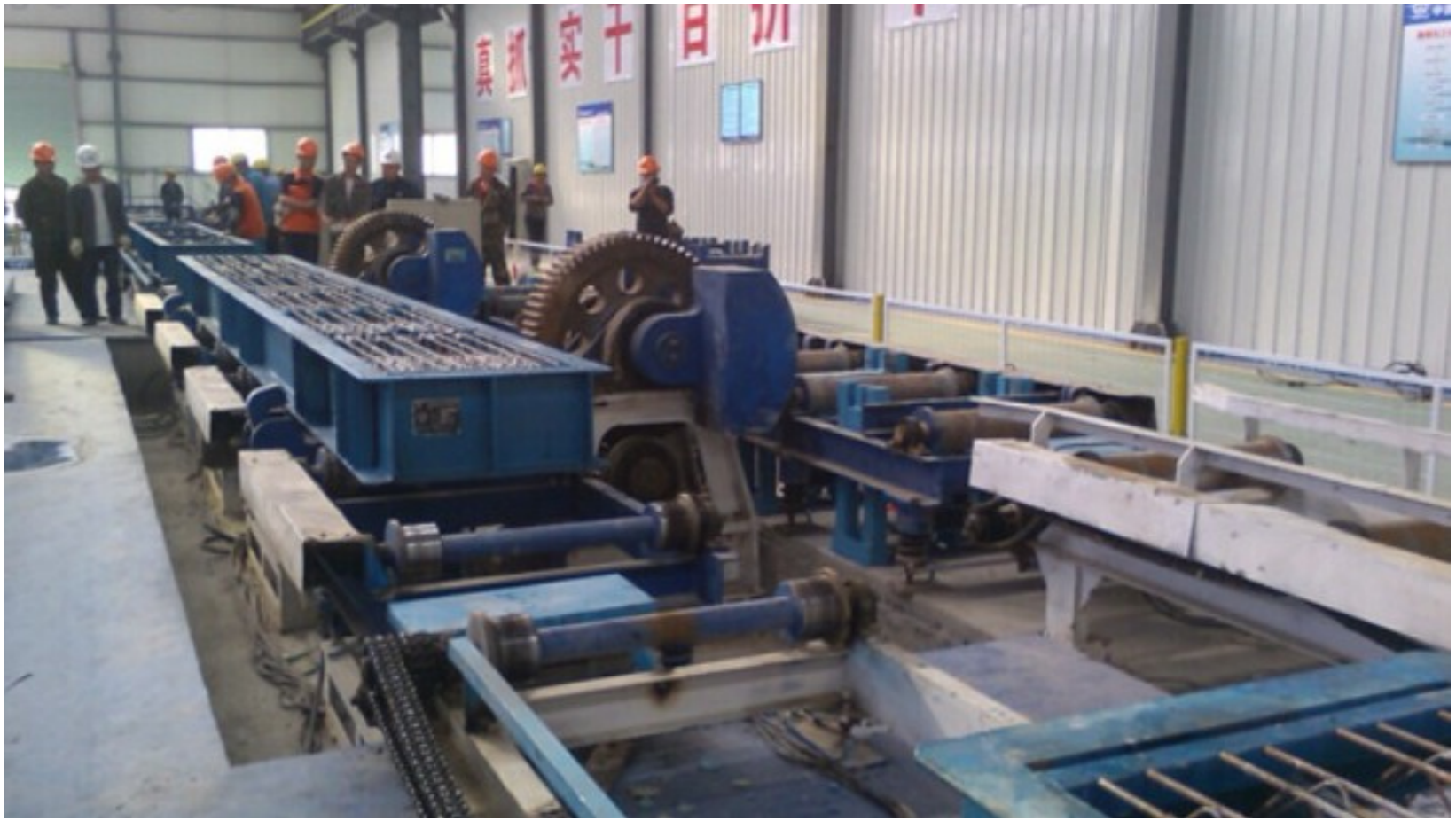


Compacting

Compacting



Compacting



Curing

- As we all know, the reaction between cement and water is exothermic, which evolves a considerable amount of heat.
- Due to the hydration of Cement, a large amount of heat develops on the concrete surface as well the water quantity gets reduced.
- Both occurrences pose a great danger to the structural member from the stability point of view.
- So in order to maintain sufficient temperature, as well as providing adequate moisture to the concrete, Curing is necessary.
- So, in other words, curing is the process of making the concrete warm and moist enough so that hydration of cement can continue.

Curing

Water Curing:

- It is the application of water on the surface of the concrete.
- Again, these may be of several types such as immersion, ponding, spraying, and fogging.
- The types of water curing may be different based on the types of elements, as well method of construction (i.e precast or cast in place). Other types of Curing includes-
    1. Membrane Curing
    2. Stream Curing, etc.
- The time of curing generally depends upon the site and weather conditions. But in Normal condition, a Curing of 7 days may be assumed necessary.

Thank You!!