# EQUIPMENT USED FOR COMPACTION, BATCHING, MIXING AND CONCRETING

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01

# Equipments used for Compaction

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# Compaction Equipments Use for Building Projects

# Compaction Equipment

Compaction is a process of improving or increasing the density of soil by a manual or mechanical method. It is employed to make the soil more stable and increase the bearing capacity of the soil layer on the construction site.

There are different types of compaction equipment used on construction sites such as Smooth-Wheeled Rollers, Multi-Tyre, Pneumatic-Tyre Rollers, Heavy Pneumatic-Tyre Rollers, Sheep-foot Rollers, Tamping-foot Rollers Grid Rollers, etc.

Compaction equipment is often got by using a vibrating or non-vibrating steel drum roller, a grid or cleated roller, or a sheep-foot roller. Each is top-suited to specific applications.

# Types of Compaction Equipment used on Construction Sites

1. **Smooth-Wheeled Rollers**

It is used for the compaction of crushed rock, sand, gravel, and other granular materials. In general, they're not suited to silts or clays but they can be used for the compaction of these materials.

The performance of smooth-wheeled rollers compaction equipment depends on the mass of the roller, width, and diameter of the rolls. Safety issues need to be considered when using these rollers on wet roads with cross-fall.

## 2. Multi-tyre, Pneumatic-Tire Rollers

This type of roller compaction equipment is usually self-propelled, with smooth tires on two axles in an offset arrangement, so that the wheels on one axle tracks are within the gaps between the wheels on the other axle.

The mass of the roller is often increased by attaching ballast, and therefore tire pressure is usually variable. Very thin soils with little or no cohesion, for example, silt, sandy silt, and clayey soil, compact well when using these rollers.

### 3. Heavy Pneumatic-Tyre Rollers

These rollers have four equally spaced independently suspended tires and should be ballast loaded up to an entire mass of fifty tonnes. They're usually towed and are suitable for similar soils to the multi-tire pneumatic-tire rollers, also as for gravels and finer silts.
The difference between these and multi-tire pneumatic-tire rollers is that the heavy pneumatic-tire rollers can compact deeper layers, and therefore the surface density achieved is bigger.

**4. Sheep-foot Rollers**

This type of roller is used for compacting fine-grained soils such as silty clays and heavy clays. They are generally used for the compaction of soils in dams, embankments, pavements, and railroad construction projects. Sheepsfoot rollers compaction equipment also have two types static and vibratory. Vibratory types of rollers are for compaction of fine-grained soils and also soil with sand-gravel mixes. Generally, this type of roller is used for the compaction of subgrade layers of road and rail projects.

It consists of steel drums, on which the projecting lungs are fixed and may apply 14 kg / sq. Cm. Or so much pressure. A variety of leg types are broad bases of a spindle shape, prismatic, and clubfoot types.

## 5. Tamping-foot Rollers

These are similar to sheep-foot rollers, although the legs are wider, shorter, and closer than the sheep's feet. They are also often diamond-shaped.

These types of compaction equipment can be self-propelled or towed and will compress a wider range of soils than sheep-leg rollers, including silt and rock fragments, but not uniform sand.

## 6. Grid Rollers

The rolls on the grid rollers are usually made of a mesh of 20 mm diameter bars spaced 100 to 150 mm in both directions. Alternatively, they may be smooth drums with a pattern of square holes shaped into the surface.
They are mainly useful for scoria-type fills (random mixtures of large and small particles, usually angular and fairly soft). Their special use is in breaking oversized stones and forcing them under compact surfaces.

## 7. Vibratory Compactors

These rollers have a rotational unconventional weight to produce a vertical acceleration for the compaction of the material.

They have different types of drums, such as smooth wheels and sheep-leg. The force applied to the soil is proportional to the acceleration in the vertical direction, so they have better performance than stationary rollers.

Vibrating rollers type compaction equipment is suitable for compacting non-adhesive clay, compacting from the base towards the surface, always leaving a layer of loose material on the surface.

This is due to the bouncing effect between the particles of that layer as the vibration effect is shifted downward. This can be easily overcome by using medium to low weight and low amplitude compactors or by turning off vibrations.

## 8. Large Dual Drum Rollers

Granular materials up to 250 mm can be successfully deposited with these rollers in four to 10 passes, provided that they are properly calibrated to obtain the most appropriate weight, frequency, and dimensions.

To complete condensation, it is usually necessary to operate the roller without vibration for two to four passes to strengthen the surface.

## 9. Powered Static Rollers

Static rollers are compact materials driven by pressure only. The thickness of a loose layer of material of 100 to 150 mm is compacted at any time, and a large number of passes are required to achieve full-depth condensation.

These rollers are compact from top to bottom. Only the first 50 mm of material is usually narrower than the first four or five passes, and a further 20 or 30 passes may be necessary to complete condensation.

## 10. Vibrating Plate Compactors

These compacts are available in weights reaching from 50 to 150 kg and have an operating frequency of 400 to 10,000 vibrations per minute with reduced amplitude.
Vibration plate compactors are used to compress layers of 75 mm – 100 mm, the thickness of materials, and are ideal for small areas (up to 20 m), with 4–4 passes for the finest compaction required.

## 11. Single Drum Vibratory Rollers

These compactors are hand-operated and are ideal for granular materials with compact layer depths of up to 120 mm with four to six passes.

# Different methods of Compaction of concrete

- Compaction of concrete can be done in two ways

  1. Hand compaction

  2. Machine compaction (by vibrators)

- **Hand compaction**

Hand compaction is obtained for small quantities of concrete. We use hand compaction when Vibrators are not available on site. It results in inefficient compaction. Hand compaction requires high water content. It can be done by Tamping, Ramming and Rodding.

- **Methods Of Hand Compaction :-**

1. RODDING
2. RAMMING
3. TAMPING

**1. Rodding :-**

It is a method of poking with 2m long, 16 mm diameter rod at sharp corners and edges. The thickness of layers for rodding should be 15 to 20 cm.

A piece of bamboo maybe used for rodding the concrete.

**2. Ramming:-**

It is generally used for compaction on ground in plain concrete. It is not used either in RCC or on upper floors.

**3. Tamping:-**

It is adopting in compacting roof or floor or road pavements where the thickness of concrete is comparatively less and surface to be finished smooth and level.

For Tamping concrete a wooden beam of cross section 10cm*10cm is used.

- **Machine compaction (by Vibrators)**

**1. Formwork Vibrator:-**

Formwork vibrator is used for the concreting columns , thin walls or in the casting of precast units. The machine is clamped onto the external walls surface of the formwork. The vibration is given to the formwork so that the concrete in the vicinity of the shutter gets vibrated. This method of vibrating concrete is particularly useful and adopted where reinforcement, lateral ties and spaces interfere too much with the internal vibrator.

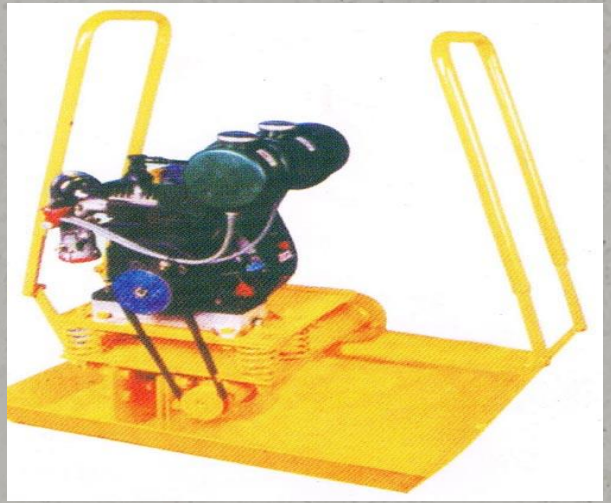
Use of formwork vibrator will produce a good finish to the concrete surface. Since the vibration is given to the concrete indirectly through the formwork, they consume more power and the efficiency of internal vibrator.

**2. Table Vibrator:-**

This is the special case of formwork vibrator, where the vibrator is clamped to the table or table is mounted on springs which are vibrated transferring the vibration to the table. They are commonly used for vibrating concrete cubes. Any article kept on the table gets vibrated. This is adopted mostly in the laboratories and in making small but precise prefabricated R.C.C. members.

**3. Platform Vibrator:-**

Platform vibrator is nothing but a table vibrator, but it is larger in size. This is used in the manufacture of large prefabricated concrete elements such as electric pole ,railway sleepers, prefabricated roofing elements etc. Sometimes, the platform vibrator is also coupled with jerking or shock giving arrangement such that a through compaction is given to the concrete.



**4. Surface Vibrator:-**

Surface vibrator is sometimes knows as, “Screed Board Vibrator”. A small vibrator is placed on the screed board gives an effective method of compacting and levelling of thin concrete members, such as floor slab , roof slab and road surface. Mostly , floor slabs and roof slabs are so thin that vibrator or any other type of vibrator cannot be easily employed. In such cases , surface vibrator can be effectively used. In general, surface vibrator are not effective beyond about 15 cm.

02

# Equipments used for Batching

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# BATCHING

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## Batching



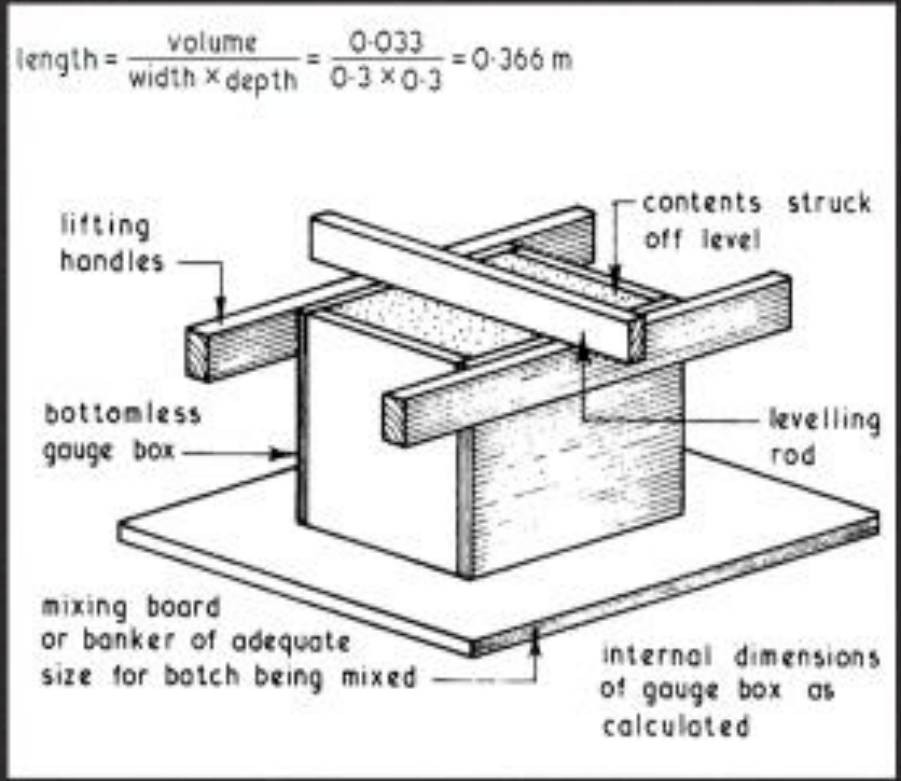
# BATCHING

Batching is the process in which the quantity or proportion of materials like cement, aggregates, water, etc. are measured on the basis of either weigh or volume to prepare the concrete mix. Proper Batching improves the workability of concrete by reducing the segregation or bleeding in concrete.

# TYPES 02

# VOLUME BATCHING

Volumetric batching of concrete is done by using measurement boxes, locally known as "farmas" or "gauge boxes". In an ideal case, the volume of the farma is made equal to the volume of one bag of cement i.e., 35 litres or multiple thereof.



# VOLUME BATCHING

- In volume batching, materials are measured on the basis of volume. It is less precise method of batching Measurement boxes or gauge boxes of known volume are used to measure materials.
- Cement is taken in the form of bags, where volume of one bag of cement (50 kg) is taken as 35 liters.
- Volume of Gauge box used is made equal to the volume of one bag of cement which is 35 liters or multiple thereof.
- Gauge boxes are generally deeper and contains narrow top surface and they are made of timber or steel or iron.
- Volumes of different sized fine aggregate and coarse aggregate are measured individually by these gauge boxes. Water is measured using water meter or water cans of known volume are used.
- To make 1:1:2 ratio concrete mix according to volume batching, one should take one bag of cement (35 liters) , 1 gauge box of fine aggregate (35 liters) and 2 gauge boxes of fine aggregate (70 liters). If the water-cement ratio is 0.5, then half of the volume of cement which is 25 liters of water should be taken

# WEIGH BATCHING

- In this method, Materials are measured on the basis of weight.
- It is accurate method of batching. Weigh batchers or other types of weighing equipment are used to measure weight of materials.
- Cement, fine aggregate, coarse aggregate and water are taken by weighing. Weigh batchers used are available in two types namely mechanical weigh batcher and electronic weigh batchers.
- In mechanical weigh batchers, weights are measured using spring and dial gauge arrangement and it is widely used equipment in weigh batching.
- In electronic weigh batchers, electronic scales and load cells supported by hoppers are used to measure the weight of ingredients of concrete.
- Weigh batchers available are may be Manual or semi-automatic or fully automatic . Manual type is used for small concrete production job while other two types are used for large concrete production.

# TYPES OF WEIGH BATCHING

## 1. MANUAL BATCHING

- In case of manual batching all weighing and batching of concrete are done manually. It is used for small jobs.

# TYPES OF WEIGH BATCHING

## 2. SEMI AUTOMATIC BATCHING

- In it, the aggregate bin gates are opened by manually operated switches and gates are closed automatically when the material has been delivered.
- Contains interlock which prevents charging and discharging.

# TYPES OF WEIGH BATCHING

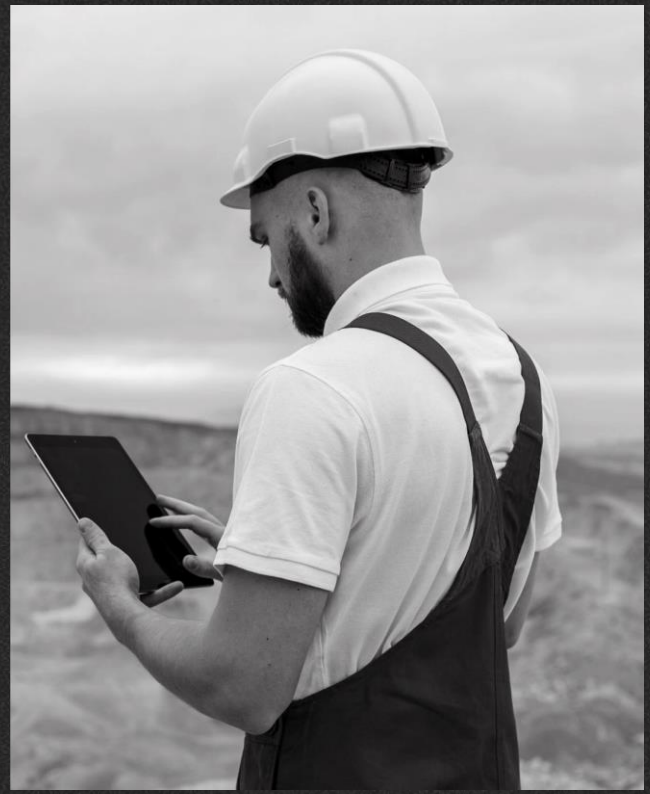
## 3. FULLY AUTOMATIC BATCHING

- • In it, the material are electrically activates by a single switch and complete autographic record are made of the weight of each material.
- The batching plant comprises 2,3,4 or 6 compartment bins of several capacities.
- Over the conveyer belt ,the weigh batchers and discharging are provided below the bins.

# 3. ADVANTAGES/DISADVANTAGES

# ADVANTAGES

Weigh batching has a great advantage as it gives good quality of concrete and providing more accurate and consistent mixture. Sometimes errors occurred due to imperfect calibration of weigh batcher which leads to inconsistencies in quality so calibration of the plant is always required



# DISADVANTAGES

- Poor batching of concrete ingredients directly impacts the strength of concrete.
- Because of poorly batching, concrete ingredients never mix homogeneously and therefore workability will suffer.
- Poorly batched concrete ingredients may result in the formation of voids in the concrete which leads to honeycombing.
- Poor batching also results into porous concrete which becomes the reason of leakages in the house.
- The porous concrete may be the reason of corrosion and will ultimately reduce the life of the structure and increase the cost of repairs

03

# Equipments used for Mixing

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Reversing Drum Mixer


Non-Tilting Drum
Mixer


Tilting Drum
Mixer


Pan Mixer


Continuous
Mixers

A concrete mixer is a machine that combines cement, aggregate such as sand or gravel, and water to form concrete. A typical concrete mixer uses a revolving drum to mix the components. Concrete mixers are often used so that the concrete can be made at the construction site, giving the workers ample time to use the concrete before it hardens. An alternative to a machine is mixing concrete by hand. These machines are utilized across various sectors so that the concrete can be prepared at the construction site which gives the workers sufficient time to use the mixture before it hardens. On the other hand, the utilization of cement mixers at construction sites not only saves time and labor but also minimizes the formation of cement lumps. Using these mixers enhances the output of the workers and results in a relatively economical and productive process.

- **Batch mixers**

This type of mixer produces concrete one batch at a time. Batch mixers either have a drum or a pan, consisting of blades, which when rotated prepares the concrete mix. The speed of rotation, angle of the blades and in some cases the angle of inclination of the drum can be controlled. These are the most commonly used concrete mixers and are highly preferable to be used in small and medium-sized construction sites. Each batch can be precisely adjusted, batch mixing is often preferred for products that must undergo strict quality testing. This flexibility also makes batch mixing ideal for powdery ingredients that are chemically sensitive and prone to changing over time. Batch mixers make it possible to first blend a portion of the ingredients before loading additional ingredients. In this way, batch mixers can perform multiple mixing processes. The new series comes with a discharging door with big radius and additional discharging blade permit a more fast discharge operation respecting the actual mixers present in the market. The high simplicity of the secondary gearbox and the employ of a commercial type primary gearbox permit very simple maintenance operations and highest operational reliability. Bath mixers are categorized as drum mixer type and pan mixer type.


Nitas Equipments

- **Drum mixer type**

This type of mixers consist of a double conical frustum shaped drum. Depending on its type, the drum either has a single set of blades or multiple sets of blades which are used to mix, prepare and discharge the concrete mixture. Drum mixers are available in a variety of configurations to suit many different needs and applications. The drum mixer uses a paddle with numerous blades curving in different directions; this is called a swing-blade paddle. The swing-blade design allows the drum mixer to maximize liquid movement within the rotating drum, which cuts down on time spent mixing.


MATEST

- **Tilting Drum mixer**

Tilting drum concrete mixer mixes the ingredients while forward rotating, and discharges while reversing the concrete mixer drum. Tilt drum concrete mixer is often used to blend plastic and semi dry concrete. Latest models come with many advantages such as low noise, stable operation, convenient movement, high working efficiency, high quality and high productivity, tilting drum type concrete mixer is especially suitable for the construction of roads, bridges, water and electric engineering. Our tilting drum concrete mixer totally conforms to national standard, and it has distinguished features of small footprint, easy installation and portable transferring, which has easier movement than stationary concrete mixer. In these tilting drum mixers, the mixer of concrete will be discharged from the drum by tilting it towards down. It could quickly discharge the process and it is used for the huge projects. The efficiency of mixing in this mixer mainly depends on the following factors:, angle of blades, blades size and shape of the drum. Tilting drum mixers are suited for preparing concrete with low workability and large size of aggregates. These mixers are highly preferable for large construction sites or applications where construction work is carried out intensively.


Motor cover
Drum
Gear drive
Ring gear box
Adjusting plate
Frame assembly
Wheel cover
Draw bar
Wheel
Landing leg

- **Non-Tilting Drum mixer**

In this type of mixer  the mixture of concrete does not get tilted and in this methodology, the drum of the mixer rotates itself about its horizontal axis. Finally, for discharge, the chute is placed in an inclined position that will get the mix of the concrete from the drum that then discharges out. These drum mixers come with a non-tilting drum which rotates on its horizontal axis to produce concrete. They have openings at both the ends. The ingredients required to produce the mix are fed from one end and the mix is collected from the other. The mix is collected by attaching a chute to the opening of the drum. The blades in these mixers also help in the extraction process. Non-tilting drum mixers. It is used in small construction sites.

- **Reversing Drum mixer**

A reversing drum mixer is a type of concrete mixer that produces concrete in single batches. The entire drum rotates around its axis as materials are loaded through a charge chute at one end of the drum and exit through a discharge chute at the opposite end of the drum. Each facet unload and the end-dump models provide the power for concrete or different blending material to be loaded manually within the drum, as well as newer fashions that are self-loading. In reversing drum concrete mixers rotation reversal takes place for the various actions. The drum consists of 2 openings, one opening is for ingredients keeping and other opening is for mix discharging.

- **Pan mixer type**

This type of mixer has a cylindrical pan instead of a drum in which concrete is prepared. Just like drum mixers, these mixers also have blades which facilitate the process of mixing. These blades are generally shaped like a star to ensure optimum efficiency. In this pan, concrete mixing is done by a series of bladed arrangements in the shape of a star inside the pan. These mixers also have blades which facilitate the process of mixing. These blades are generally shaped like a star to ensure optimum efficiency. Pan mixers are also erect rotating shaft concrete mixers, which is perfect for getting an extremely complex mix completely combined together, as well as keeping a solid, continuous momentum going through the combining procedure. Concrete mixers that are pan can be very big really – even capable of holding up to 1000 gallons for large-scale, industrial use. They also have scrapers attached to avoid sticking of mortar to the surface of the pan. The pan type concrete mixers are further divided into two types.

The first type is the one in which the circular pan type concrete mixer is constant while just blades arranged in a star manner rotate about the vertical axis of the pan.

Second type is the one in which the circular pan rotates and star blades stay in static position. However, in these two cases, the mixing is done efficiently and the mixture is taken through the hole present in the center of the pan.

- **Continuous mixers**

This type of mixer's primary function is mainly to mix, load and to discharge the mix continuously until the entire work is done or until the work break occurs. In this machine, materials loading is done continuously by the screw feeders. Continuous mixtures are mainly used for large projects such as bridges, dams and construction of high rise buildings to name a few. A continuous mixer is often the best choice for high volume projects where speed and efficiency is a priority. It should only be used when mix ratios can differ between batches. When more specific ratios are required, batch mixing is typically the better option. Some manufacturers may even use continuous mixing to smooth out many different batch mixes to make the finished product more homogeneous. In this scenario, each batch is removed from the batch mixing equipment and fed into the continuous mixer along with all other batches. Continuous mix is associated with a number of benefits that are not found with batch mixing. Continuous mixing is much faster, and requires a smaller number of staff. The process of feeding ingredients is automated, and the batches are fed out automatically without the need for refilling or removal.

# Comparison or features

**BATCH MIXER**

**1.**Has extremely high capacity (batches of up to 1 thousand gallons or 3785 liters).
**2.**Consists of drum mixers, pan mixers, and open-top mixers.
**3**.Many types of batch mixers (e.g. Gravity, revolving drum, cube, etc).
**4.**Gravity mixers are made stationary.
**5**.Revolving mixers contain shelves and projections on the inside and drum is revolved to mix the materials

**TILTING MIXTURE**

**1**.Mixes the ingredients while forward rotating and discharge downwards rapidly using gravity reversing the mixer drum.
Used to blend plastic and semi-dry concrete.
**2**.Low noise, stable operation, and convenient movement.
**3**.Mixing efficiency depends on the shape of the drum, angle of the drum, size, and angle of blades.

**Drum Mixer**

**1.** This is a self-loading concrete mixer

**CONTINOUS MIXER**

**1**.Productivity higher is than the batch mixer.
**2**.Material proportion and mixing time are difficult to control.
**3**.Feeding, mixing, and discharging processes go on in a longer mixing drum continuously.

**NON-TILTING MIXTURE**

**1**.The drum is opened at two ends where one end is for pouring and another end is for discharge.
**2.**Rapid discharge is not possible which may result in the segregation of concrete sometimes.

# 04

# Equipments used for Concreting

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# EQUIPMENT USED FOR CONCRETING

Concreting Equipment is significant for construction companies. With great quality concrete equipment machinery, construction organizations can complete quality construction work in a lesser measure of time. We will let you know about the types of concrete equipment used in the Industry.

It can hence eliminate its work expenses and increment benefits by giving the quality construction service to its customers in a quicker manner. With the headway in advancements, today various construction equipment types of gear have come up for the utilization of construction companies for improved construction processes.

- **Concrete Batching Plant**

A concrete batching plant is a significant gear for the concreting equipment. The concrete batching plant utilized for the is created by the appropriate blending of the considerable number of fixings like sand, rock, water, and cement and after that moved to concern building site prepared to be poured for use. Concrete batching plants can be of two structures either the stationary heavy production units or the well-known mobile batching plants which can be utilized to both produce and transport the solid blend from site to site. One can likewise get a batching plant according to their creation necessities. Since today group plants are accessible in different generation limits as well. 20 cum/hr. batching plant, 30 cum/hr concrete plant, 45 cum/hr, 60 cum/hr, 90 cum/hr, 120 cum/hr batching plant are a portion of the famous types of cement grouping plants utilized by the construction organizations.


- **Concrete Mixer**

A concrete mixer is the best source for the construction that wants to save their precious raw material from waste that cannot be tolerated. Mixers used to mix all the elements like cement, gravel, and water for better mixing and it also saves time because of its high efficiency while they working.

There are too many varieties available in concrete mixers like Self-loading concrete mixer, Transit mixer that mounted on a truck, Stationary concrete mixer, Electric Concrete Mixer, Concrete mixer enables with lift, reversible concrete mixer is the types of Concrete mixer.

- **Concrete Vibrator**

Concrete vibratory is the mechanical device used to create vibration in wet material. This machinery alien with the motor and connected with pipes that create the vibration inside the concrete mix.

And remove the all air in between the concrete mix. So gives more strength and life to concrete. This concrete equipment almost used by the entire civil contractor from small civil work to bridge construction.

- **Concrete paver**

Concrete paver has advanced the construction technology by securing the concrete from unexpected wastage. Paver is a kind of moveable construction machine that consists of a paving area used to store the material while working on busy roads, highways, and other public places where traffic or pedestrians can cause the deficiencies while they working.

- **Concrete Pump**

A concrete pump is one of the fastest concrete equipment that gets fame in the construction market because of its reliability and cost-effectiveness. Pumps save the labor cost, time, and material with high power consumption are used for pumping the concrete from the mixer and send it directly to the construction site.

- **Concrete Crusher**

Concrete crushers have two types: One is a mobile concrete crusher similar to a bulldozer but has an attachment with its boom arm use to crush the big rock pieces into small gravels. The second type mostly can be seen in the industrial used for crushing medium-sized rocked into power or gravels form. Concrete crushers are the best source for saving labor costs and time.

- **Concrete Conveyor**

A concrete conveyor system is usually to use a mobilized construction site. They are based on a conveyor belt by which transfers the gravels, cement, and other concrete material directly on the mixer and they are also used for filtration of Concrete material.

- **Concrete Boom Placer**

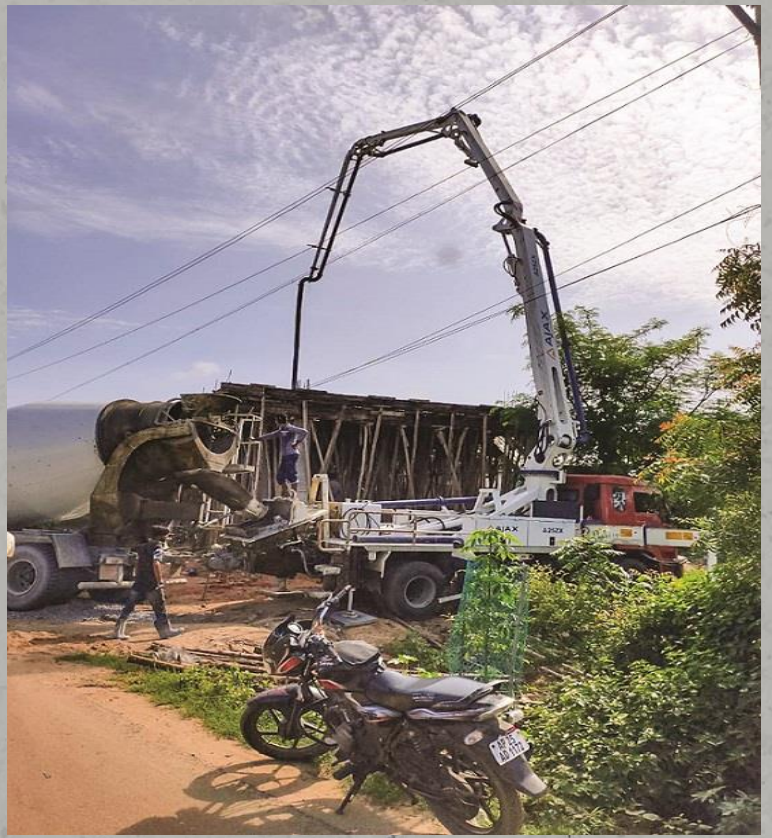
Boom Placer is one of the most used concrete machinery used in the construction of the site. Many construction sites don’t have such facilities that other mixers or men can reach and concrete mix can pour at the site.

Where Boom placer comes in the picture it can do the concrete from 36 meters to 100-meter distance far away. If your site in an underground or heightened location than a concrete boom placer machine will be much benefitted to you.

Many of the international construction equipment manufacturers and company or concrete solution providing company can serve this machine.

Two varieties are available in boom placer first stationary boom placer and another one truck-mounted concrete boom placer.


HAMAC



# QUESTIONS

Q- Give any three types of compaction equipment.
Q- Difference between Multi-tyre and heavy – pneumatic tyre roller.
Q- Classify different types of concrete mixers.
Q- Different types of Concreting equipment.
Q- What are the different types of concrete boom placer.

# THANKS!