

**GOVERNMENT POLYTECHNIC FOR GIRL'S
AHMEDABAD**

CIVIL ENGINEERING DEPARTMENT

“CONSTRUCTION PROJECT MANAGEMENT”

(3360603)

EQUIPMENT MANAGEMENT

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IMPORTANCE OF CONSTRUCTION EQUIPMENT

- ❑ In case of major construction projects, the speed of work and the timely completion of work is very important. Due to the reason, the mechanization of most of the construction work is required. In which the construction equipment play the most important role. The proper use of the appropriate equipment contribute to economy, quality, safety, speedy and timely completion of the project.
- ❑ The cost of construction is a major factor in all the project. The factors that influence construction costs mainly are materials, labour, construction equipment, overhead and profit.
- ❑ The selection of the appropriate type and size of construction equipment often affects the required amount of time and effort and thus the job-site productivity of a project.
- ❑ It is therefore important for site managers and construction planners to be familiar with the characteristics of the major types of equipment most commonly used in construction.

PREPARATION OF EQUIPMENT SCHEDULE

- This schedule is prepared before the project is started to establish the types, quantities and dates on which equipment will be needed, so that it may be arranged as and when required. This is also prepared with the help of construction schedule. Aim of this schedule is also prepared is to derive maximum advantage of the equipment when at site and remove it from the site when its job is over .this will be save money.

Equipment schedule

Job no. :

Project no. :

Date. :

Month equipment	Jan.	Feb	March	April	May	June	July
Concrete mixer	2	2	2	3	3	2	2
Bulldozer	3	4	3	-	-	-	-
Road rollers	-	2	4	2	2	-	-
Crane	-	-	2	2	2	2	3
Power shovel	2	1	2	-	-	-	-
	-	-	-	-	-	-	-

Classification of construction equipments

❖ Excavating equipments:

- Bulldozer
- Grader
- Roller compactor
- front shovel
- Dragline
- Back hoe
- Clam shells
- dumper

❖ Hosting equipments:

- Hoists
- cranes

❖ concreting equipments:

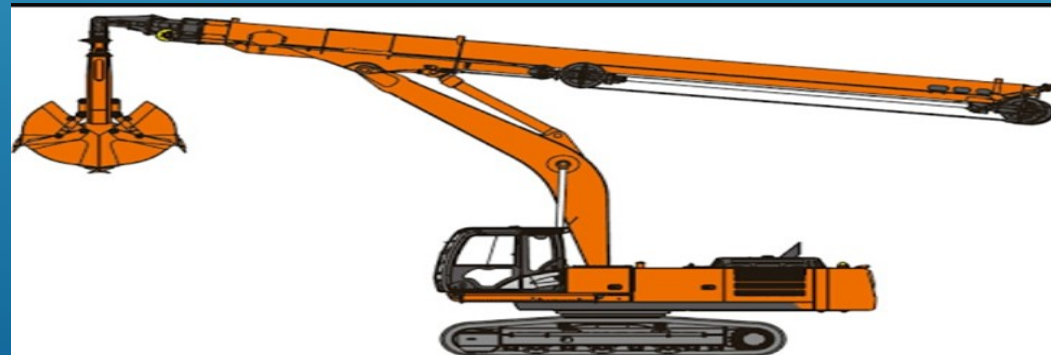
- concrete batching and mixing plant
- concrete mixers
- concrete transit mixer
- concrete pumps

Excavation and earthmoving equipments:

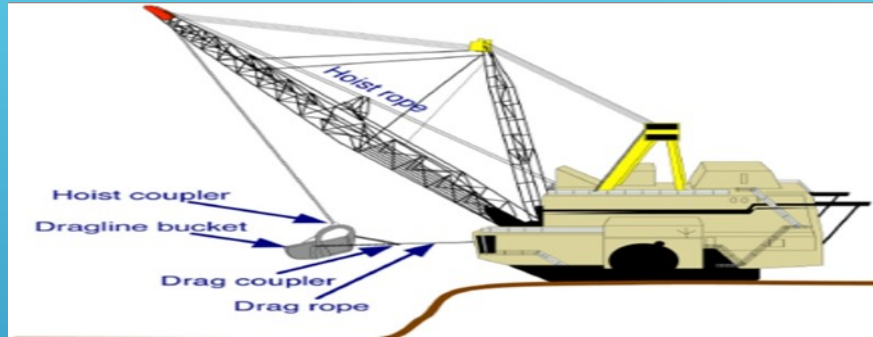
1. **Bulldozer**: they are used for moving earth up to a distance of about 100m and act as a towing tractor and pusher to scraper machines. They can be track-mounted or wheel-mounted.



2. **Clamshell**: it consists of a hydraulically controlled bucket suspended from lifting arm. It is mainly used for deep confine cutting in pits and trenches.



3. Dragline: they are used for bulk excavation below its track level in loose soils, marshy land and areas containing water.



4. Front shovel: front shovel are mainly used for excavation purpose above its own track or own wheel level. They are suitable for heavy positive cutting in all types of dry soils.



5. Backhoe: backhoes are mainly used to clean up construction areas, to dig holes in the ground, to smooth uneven ground, to make trenches, ditches and to help remove deep roots from trees.



6. Roller compactor: roller compactor is mainly used for compaction of earth and other materials in large works of highways, canals, and airports.



7.Scraper: they are used for site levelling, loading, hauling over distances varying between 150m-900m. they may be towed, two-axial type.



8.Dumper: it is used for horizontal transportation of materials on and off sites. Large capacity dumpers are used in mines and quarries.



CONCRETING EQUIPMENT

1. Concrete batching and mixing plant: they are mainly used for weighing and mixing large quantity of concrete. Constituents.

Capacity: 20cum/hour.



2. Concrete transit mixers: they are mainly used for transporting concrete from batching point.

Capacity: 3 cum-9cum.



3. Concrete mixers: they are mainly used for mixing small quantities of concrete constituents.

Capacity: 200lt/batch (small mixes)
200-750/batch (large mixers)



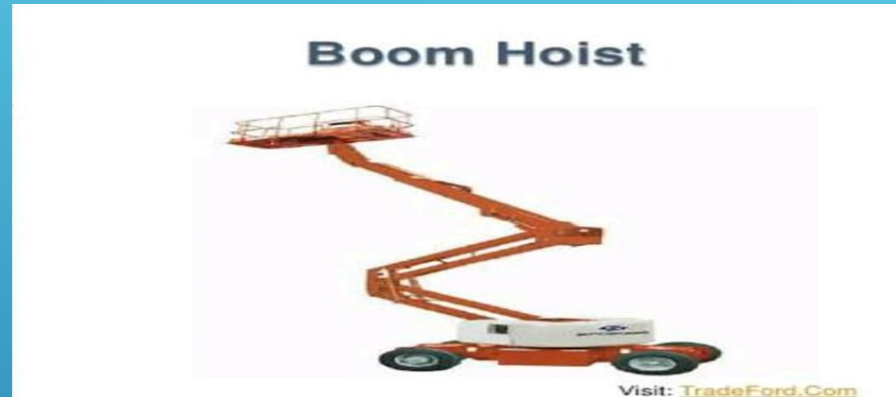
4. Concrete pumps: they are used for horizontal and vertical transportation of large volumes of concrete in short duration.

Capacity: 300cum/hour (ordinary construction)
120cum/hour (specialized construction).



HOISTING EQUIPMENTS

1.Boom hoist: boom hoists are used to lift weights on the hooks that are attached to the special metal ropes designed to bear max. loads. Boom hoist is mostly used as industrial machine where it loads the weight on containers.



2.Chain hoist: chain hoist are quite common example of hoist system it can be seen at most of the construction and industrial purposes. Basically, chain hoist consists of chain rope and pulley that is used to move the load from up to down.



3.Electric hoist: electric hoist is modernized form of chain and boom hoist mostly used in the industries for fast working. It is very much popular in material handling industries because it saves labour costs by handling max. loads at a time with no damage threats.



Factors affecting selection of construction equipment:

- ❑ **Economic consideration:** The economic considerations such as owning costs, operating labour costs and operating fuel costs of equipment are most important in selection of equipment.
- ❑ **Site-specific:** site conditions both ground conditions as well as climatic conditions may affect the equipment selection decision. For example, soil and profile of a site may dictate whether to go for a crawler mounted equipment or a wheel mounted equipment. If there is a power line at or in the vicinity of site, one may go for a fixed-base kind of equipment rather than a mobile kind of equipment.
- ❑ **Equipment-specific:** construction equipment come with high price tags. While it may be tempting to go for the equipment with low initial cost. It is preferable to opt for standard equipment.
- ❑ Such equipments are manufactured in large numbers by the manufactures, and their spare parts are easily available, which would ensure minimum downtime. Besides, they can also fetch good salvage money at the time of their disposal.
- ❑ **Manufacturer- specific:** a construction company may prefer to buy equipment from the same manufacturer again and again, and that too from a specific dealer.
- ❑ this may be to bring in uniformity in the equipment fleet possessed by the company or because the company is familiar with the working style of the manufacturer and the dealer.
- ❑ **Labour consideration:** shortage of manpower in some situation may lead to a decision in favour of procuring equipment that is highly automated.
- ❑ Further, the selection of equipment may be governed by the availability or on-availability of trained manpower.

TYPES OF EQUIPMENTS BASED ON USE

- ❑ Depending upon their availability, commercial size and specifications, the equipment can be classified into following types:
 1. Standard equipment
 2. Special equipment

1. Standard equipment:

- The standard equipments are commonly manufactured and are easily available to the prospective purchasers.
- They can be used for variety of construction operations without any difficulty and they are available in standard commercial sizes. The initial investment is less as compared to a special equipment.
- The delivery of standard equipment is very quick, as it is readily available in the market.
- The repair parts for standard equipment can be obtained more quickly in short period.
- If the contractor no longer needs a unit of standard equipment, he can usually dispose of it more easily and at a more favourable price than a piece of special equipment.

2. Special equipment:

- The special equipments are those which are manufactured for a specific project or which does not have readily accessible parts.
- The selection of special equipments should be made carefully after proper financial analysis.
- The initial investment in case of special equipment is very high and there is risk of change in design, it cannot, be used economically on the project.

Purchase of equipment

□ a piece of equipment may be employed on a project, in one of the following two ways,

1. Direct purchase
2. Hiring

1. Direct purchasing:

- If the equipments are to be used frequently for many types of jobs for a long duration of time on a project, it will be economical for the construction to purchase the equipments.

2. Hiring:

- If the project is small and if the equipment is to be used for a short duration of time on the project, it will be economical for the contractor to get it by hiring or by renting from other agencies.

Cost of equipment

□ the equipment used in construction operations are priced in the following three categories:

- 1.Small tool and consumables
- 2.Equipment usually shared by number of work activities
- 3.Equipment used for specific tasks

□ **Elements of cost of equipments:**

- owning costs
- operating costs

□ **owning cost:** owning cost are fixed costs. Almost all of costs are annual in nature and include:

- initial cost
- depreciation
- investment cost
- insurance tax and storage cost

1.Initial cost: on average, initial cost make up about 25% of the total cost invested during the equipment's useful life. This cost is incurred for getting equipment into contractor's yard, or construction site and having the equipment ready for operation. Many kinds of ownership and operating costs are calculated using initial cost as a basis, and normally this cost can be calculated accurately. Initial cost consist of the following items:

- Price at factory + extra equipment +sales tax
- Cost of shipping
- Cost of assembly and erection

2.Depreciation: the depreciation in market value of piece of equipment due to age, wear, deterioration and obsolescence. depreciation can result from:

Physical deterioration occurring from wear and tear of the machine

Economic decline or obsolescence occurring over the passage of time.

In the appraisal of depreciation, some factors are explicit while other factors have to be estimated.

Generally the asset costs are known which include:

- Initial cost
- Useful life
- Salvage value

How ever, there is always some uncertainly about the exact length of the useful life of the asset and about the precise amount of salvage value, which will be realized when the asset is disposed. The depreciation methods are

1. Straight line method
2. Sum of year digit method
3. Sinking fund method

1. STRAIGHT LINE METHOD:

it is the simplest to understand as it makes the basis assumption that the equipment will lose the same amount of value in every year of its useful life until it reaches its salvage value. The depreciation in a given year can be expressed by the following equation

$$D_n = (c - s) / N$$

Where D_n = depreciation in year n

C = The initial cost

S = The salvage value

N = The useful life

2.SUM OF YEAR DIGIT METHOD: It tries to model depreciation that actual market value of a piece of equipment after 1 year is less than the amount predicted by SL method. Thus more annual depreciation in the early years of a machine's life less in its later year. The depreciation in a given year can be expressed by the following equation

$$D_n = (\text{Year } n \text{ digit}) * (C - S) / \sum N$$

Where D_n = deprecation in year n

Year n digit = the reverse order

C = the initial cost

S = the salvage value

N = the useful life

3.Sinking fund method: the method works in terms of a 'sinking fund factor,' which is determined on the basis of the initial and salvage values of the asset, the service life and rate of (compound) interest. Factor can be determined using simple interest formula and also special tables developed for purposes.

$$D = (c-s)*f$$

Where, d= depreciation in year n
c= the initial cost
s= the salvage value
f= sinking fund factor
N=the useful life (year)

Operating cost:

- ❑ Ownership costs are also called 'variable' cost. Because they depend on several factors such as the numbers operating hours, the types equipment used, and the location and working condition of the operation.

- Maintenance & repair cost
- Tire cost
- Consumable cost
- Mobilization & demobilization cost
- Equipment operator cost
- Special items

Maintenance of equipment

- ❑ **Objectives:**

- Minimize loss of productive time
- Minimize repair time & cost
- Keep productive assets in working condition
- Minimize accidents
- Minimize total maintenance cost
- Improve quality of product

Importance of maintenance:

- Dependability of service
- Assured quality
- Prevent equipment failure
- Cost control
- Huge investment in equipment

Types of maintenance:

1. Breakdown maintenance or corrective maintenance
2. Preventive maintenance
3. Predictive maintenance
4. Routine maintenance
5. Planned maintenance

1. Breakdown maintenance:

- Occurs when there is a work stoppage due to machine breakdown
- Maintenance becomes repair work
- Seeks to get the equipment back into operation as quickly as possible
- To control the investment in replacement spare machines.

2.Preventive maintenance:

- it is under taken before the need arises and aims to minimize the possibility of unanticipated production interruption or major breakdowns.

3. Predictive maintenance:

- in this, sensitive instruments(e.g. vibration analysers, amplitude meters, audio gauges, optical tooling and resistance gauges) are used to predict trouble. Conditions can be measured on a continuous basis and this enables the maintenance people to plan for an overhaul.

4.Routine maintenance:

- this includes activities such as periodic inspection , cleaning, lubrication and repair of production equipment after their service life.

5. Planned maintenance:

- it involves the inspection of all plant and equipments, machinery, buildings according to a predetermined schedule in order to service overhaul, lubricate or repair, before actual break down or deterioration in service occurs.

Thank you

