SELECTION OF EQUIPMENT FOR EARTHWORK
&
EARTH MOVING OPERATIONS

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BASIC EARTHMOVING OPERATIONS

Basic Steps of Earthmoving Operation

01 Loosening the material so that it can be excavated.

02 Digging the material from cut or excavation.

03 Hauling the material to final destination.

04 Dumping and finishing.

Understanding Earthmoving Equipment

- Every earthmoving operation is a combination of digging, scooping, and pushing the material.
- The earthmoving equipment is used to perform any of these operations.
- A contractor or engineer chooses the earthmoving equipment based on the utility and the tasks that need to be completed.
- The selection of the right earthmoving equipment improves the production and profit.

Three Crucial Factors Affecting Selection

Material

Total quantity of material.

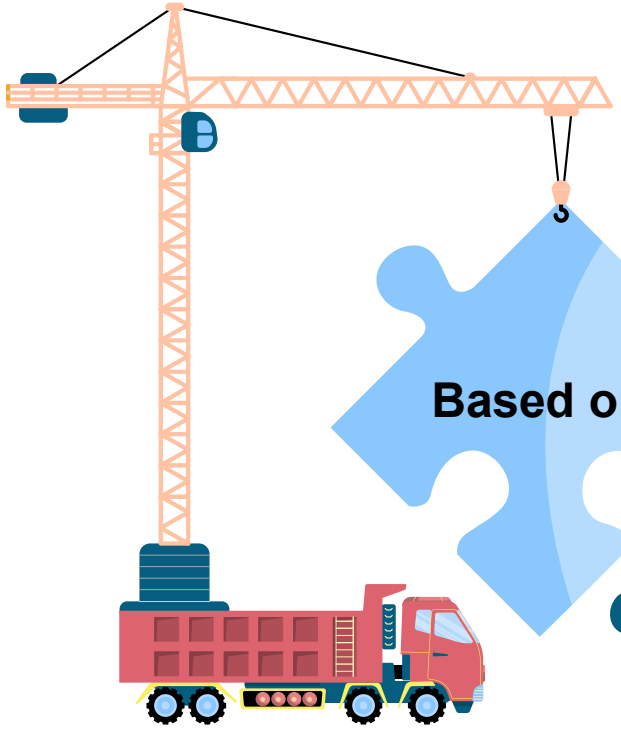
Rate

Rate at which it must be moved.

Size

Size of individual piecies. (Rock vs Common Earth)

Machine Performance



Based on

Required Power

Power to overcome the resulting forces and make the machine move.

Available Power

Available power determine by horsepower.
Affected by- Temp. of 25 c
- Dry air pressure 99 kPa

Usable Power

Available power prescribed by the manufacturer how much amount of power becomes usable to us.
Depends upon- Project condition
-Attitude
-Temperature

Commonly Used Earthmoving Equipments

Bull Dozer

HAUL DISTANCE
100 m

Loader

HAUL DISTANCE
200 m

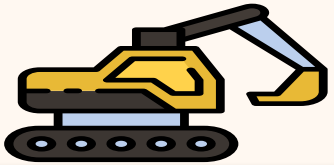
Scraper

HAUL DISTANCE
1000 m

Backhoe

HAUL DISTANCE
20 m

The three common types of earthmoving equipment used are excavators, loaders, and bulldozers.



Features	Excavators	Loaders	Bulldozers
Objective	Digging the earth or site material	Scooping the earth or site material	Pushing and smoothening the earth or site material
Task	Dredging, demolition, pile driving, material handling, mining	Used to move sand, gravel, snow. Used for small projects	The self-weight of the machine traverses the soil and level it.
Machine Components	Booms and Buckets that can drill and break hard strata	Scooping is performed using a bucket	A giant blade pushes the large quantities. A ripper is attached to tear rock and soil. Without blade and ripper, a bulldozer can fine grade the soil.

SELECTION OF EQUIPMENT FOR EARTHWORK

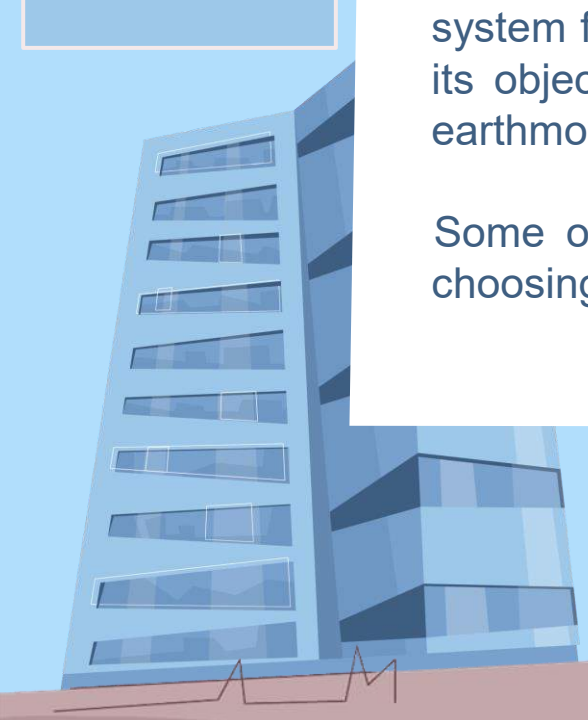
Presentation Delivered By– KHUSHI

01

INTRODUCTION

Every earthmoving task at a construction site is different. It is, therefore, hard to choose a single earthmoving system for all the tasks. Each earthmoving operation has its objectives and complexity, based on which the best earthmoving system is chosen.

Some of the essential points to be kept in mind while choosing the right earthmoving equipment.



What is earthwork equipment?

Earthwork equipment generally refers to any piece of heavy machinery that can move and grade soil and rock. In addition to construction work, they are also used for materials handling, demolition, mining, and any other industry that requires more power than can be provided by humans.

Essential points to be kept in mind

01

Identify the Job of Equipment

The first important factor to consider while selecting an earthmoving equipment is defining the equipment's role. Some machines perform excavation alone, while some perform site preparation jobs.

02

Study the Site Soil Type

For example, for smooth soil and soils that spread quickly, a scraper is recommended by engineers. Wheel tractor scrapers are the best choice for sandy, loamy soil areas. The decision would be articulated truck for a construction site with hard and rocky soils or wet soils or wet clay material.

Study the Hauling Distance

For smaller hauling distances, small equipment is right. When the hauling distance is higher, and the quantity of earth to be moved is high, it requires heavy and more robust equipment. This is because small equipment cannot sustain the load or pressure for a longer hauling distance. When a small equipment is made to work for larger hauling distance, it results in the machine's breakdown.

Study the Versatility and Flexibility of the equipment

The equipment used to work with the soil must be flexible and versatile enough to adapt to different soil conditions. This is a parameter considered while choosing earthmoving equipment.
Articulated hauler is one such earthmoving equipment that possesses excellent flexibility and versatility property. This equipment works best in limited traction. An articulated hauler is the right choice if the site is subjected to big weather changes.

Determine the Cutting Work

The depth and length of earth cutting also influence the type of earthmoving equipment. A scraper finds it difficult to load the earth if the length of the cut is less than 100 ft. But this case is easily moved by articulated haulers.
In construction areas, where there is enough space for outlining, a scraper works best. For digging a borrow pit, an articulated truck is the right choice.

FACTORS BEHIND THE SELECTION OF CONSTRUCTION EQUIPMENT

01

Economic Consideration:

The economic consideration such as owning costs and operating fuel costs of equipment are most important in selection of equipment.

02

Site – Specific:

Site condition, both ground conditions as well as climatic conditions may affect the equipment selection decision.

03

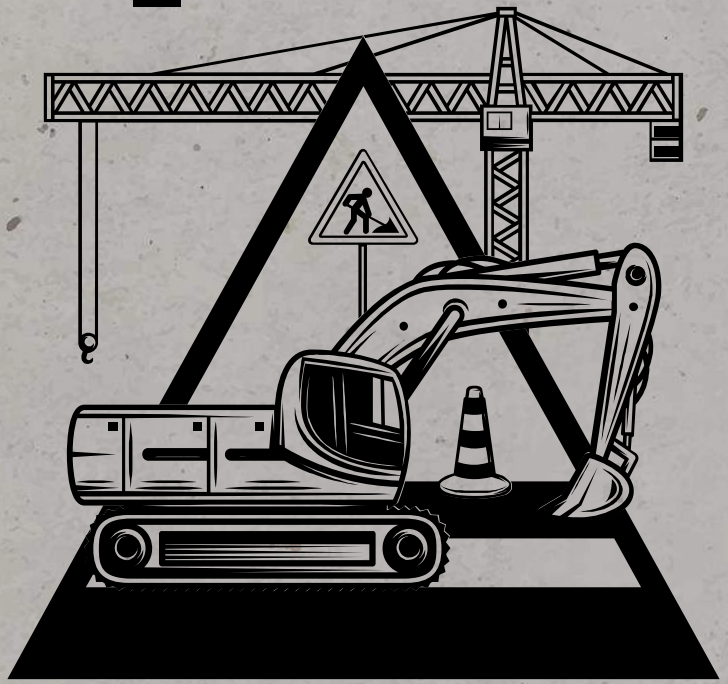
Company – Specific:

The selection of equipment by a company may be governed by its policy on ‘owning’ or renting’. While emphasis on ‘owning’ may result in purchase of equipment keeping in mind, the future requirement of projects, the emphasis on renting may lead to putting too much focus on short term benefits.

04

Equipment – Specific:

Construction equipment come with high price tags. While it may be tempting to go for the equipment with low initial price, it is preferable to optimize for standard equipment. Such equipment are manufactured in large numbers by the manufacturers, and their spare parts are easily available, which would ensure minimum downtime.



05

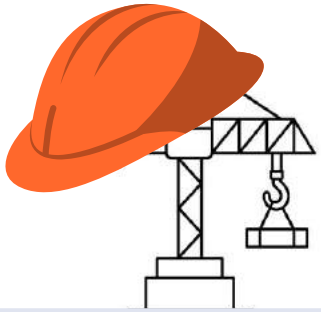
Manufacturer – Specific:

A construction company may prefer to buy equipment from the same manufacturer again and again, and that too from a specific dealer.

06

Labour Consideration:

Shortage of manpower in some situations may lead to decision in favor of procuring equipment that is highly automated. Further, the selection of equipment may be governed by the availability or nonavailability of trained manpower.



02

BRIEFING OUT THE MAIN PARTS OF THE EARTHMOVING EQUIPMENTS

MAIN PARTS OF A BULLDOZER

ENGINE

A bulldozer has an engine that gives it the strength to lift and move heavy things. It is diesel-powered to allow the engine torque to move through rough terrain

BLADE

The blade is a heavy piece of metal which is located at the front of the tractor. It can lift heavy materials through its hydraulic arms.

CAB

These control the left and the right track, as well as the lifting and movements of the blade and the ripper.

RIPPER

The ripper enables the bulldozer to create tears in the ground by clawing itself across the ground.

TRACKS

The tracks are heavy metal links located on either side of the body that create powerful traction. The tracks are very wide, allowing the bulldozer to move through rough terrain.

MAIN PARTS OF A TRUCK CRANE

CAB

These control the left and the right track, as well as the lifting and movements of the boom.

BOOM

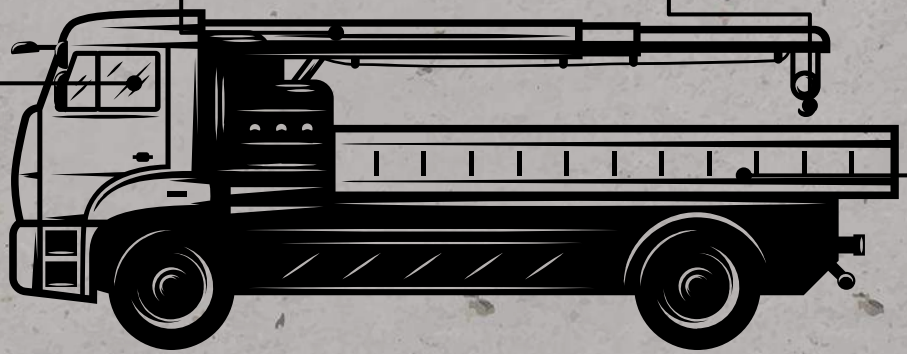
The long steel arm that spans the length of the machine.

HOOK

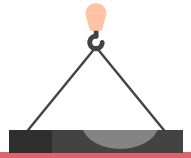
The main point of connection between the load and the crane, the hook grasps and holds items needing transport.

HOIST

The hoist consists of a cranking mechanism, or winding drum, and a wire that raises and lowers the hook.



HEAVY MACHINERY CATEGORIZATION



01

TRACK-TYPE

02

HEAVY MACHINERY LOADERS

03

ARTICULATED

03

TRACK-TYPE HEAVY MACHINERY

Strong, heavy duty equipment mainly used for pushing, excavating, digging, and leveling soil, and debris at work sites.

TRACTOR

- Most commonly used for pulling and pushing other equipment in construction.
- Tractors are able to work through muddy terrains. However, they operate at much slower speeds.

SNOWCAT

- Snowcats are specialized machines used for **snowy trail maintenance and tackling extreme terrain**

BULLDOZER

- Moving huge amounts of dirt or soil in large and open construction sites.
- can also be used for rough grading, fine grading, crushing or removing rocks.

SKIDDER

- Primarily used to pull up tree stumps, push over small trees, and grade logging roads to make it easier for logging trucks.

HEAVY MACHINERY LOADERS

Strong, heavy duty equipment mainly used for excavating and levelling soil at work site.

LOADER

- Used to load loose materials, such as sand, dirt, or gravel, and take them to another machine, such as a dump truck or conveyor belt.
- Loaders can be track-based or wheel-based, and the selection depends on the terrain to be worked on.

SKID LOADER

- Small-sized machines which can skid on their own axis and therefore, are highly applicable in space-constrained construction sites.
- These machines provide a good grip on snow as well as mud
- can be used for a wide range of applications such as moving mud or snow, excavation works, compacting soil, drilling holes, lifting loads.

WHEEL LOADER

- A wheel loader is a four-wheeled machine used for earthmoving.
- Wheel loaders work with the aid of a mechanized lift-arm that moves that bucket higher or lower, depending on the needs and inputs of the operator.

ARTICULATED HEAVY MACHINERY

Are designed to transport large, rocky and abrasive materials across well maintained roads. Or to handle more adverse conditions.

HAULER

- Used to transport a fleet of equipment (for general, military, or service construction) from one location to another

PAYLOAD CAPACITY
24,000 – 55,000 KG

BODY VOLUME
15 – 33.60 M^3

TRUCK

- Truck has an open-box bed equipped with hydraulic rams that lift the front of the bed
- Truks with large wheels are used on big construction sites
- Can be used in narrower, twisted and steeper roads,

TABLET MOCKUP

04

TYPES OF EARTHWORK EQUIPMENTS

1. Excavator

Usually found on huge construction or industrial sites, excavators are a crucial piece of heavy equipment. With an enclosed cab situated on top of a wheeled or tracked undercarriage, the excavator's most prominent feature is its long, crooked arm protruding from the cab, which has a bucket on the end.

Excavators are brought in for big, messy jobs like demolition or dredging a river. They are, of course, also relied on for excavating foundation, as well as holes and trenches. The excavator is a vital piece of equipment in the mining and metals industry, and is used across industries for tasks such as installing pipes and moving heavy materials.

2. Backhoe Loader

This mighty digger looks like a tractor with a loader (imagine a dustpan the size of a trough) in front, and a backhoe (an arm with a claw-like bucket on the end) on the back. Given their broad range of uses, backhoes are commonly found on both agricultural sites and construction sites. They can dig pits, break up asphalt, move trees, plow everything from dirt to snow, and so much more.

3. Bulldozer

Bulldozers, sometimes simply called dozers, are high-powered, diesel tractors with a continuous track (much like a tank) and equipped with a large, curved, hydraulic blade in front. The track makes it easier for the machine to move across rough and muddy terrain, which is often the domain of earthmoving equipment.

The bulldozer basically has one major function, but it does it very well, and that is to use its sheer brute strength to push mountains of dirt around. It can also be used to move rocks, brush, waste, or whatever else your heart desires. When not pushing, dozers can also use their strength to pull items like trailers, tools, or large and heavy pieces of equipment.

4. Trenchers

This earthmover is designed to—you guessed it—create trenches. Trenchers tear deep into the ground and clear out soil, roots, rocks, and anything else that's getting in your way. Trenchers might be utilized by anyone from an individual homeowner trying to create a trench for drainage, to a utility company needing to lay wires or pipes under the ground.

5. Wheel Tractor-Scrapers

The wheel tractor-scraper is an efficient earthmover with a sharp front edge for cutting and a rear hopper to store materials. wheel tractor-scrapers a great for hauling dirt, coal, and other materials across short distances.

6. Dump Truck

They are really only designed for one purpose: to move large amounts of dirt from one site to another. They are designed to be able to travel on roadways where permitted and come in a variety of sizes and load capacities to meet the needs of the job.

7. Motor Graders

Also known as road graders, motor graders have a long blade in between the cab and front tires used to smooth out surfaces. Graders are utilized for the creation and maintenance of roads, but can also be used to help establish a foundation for buildings and other structures.

Any Question/ Query?