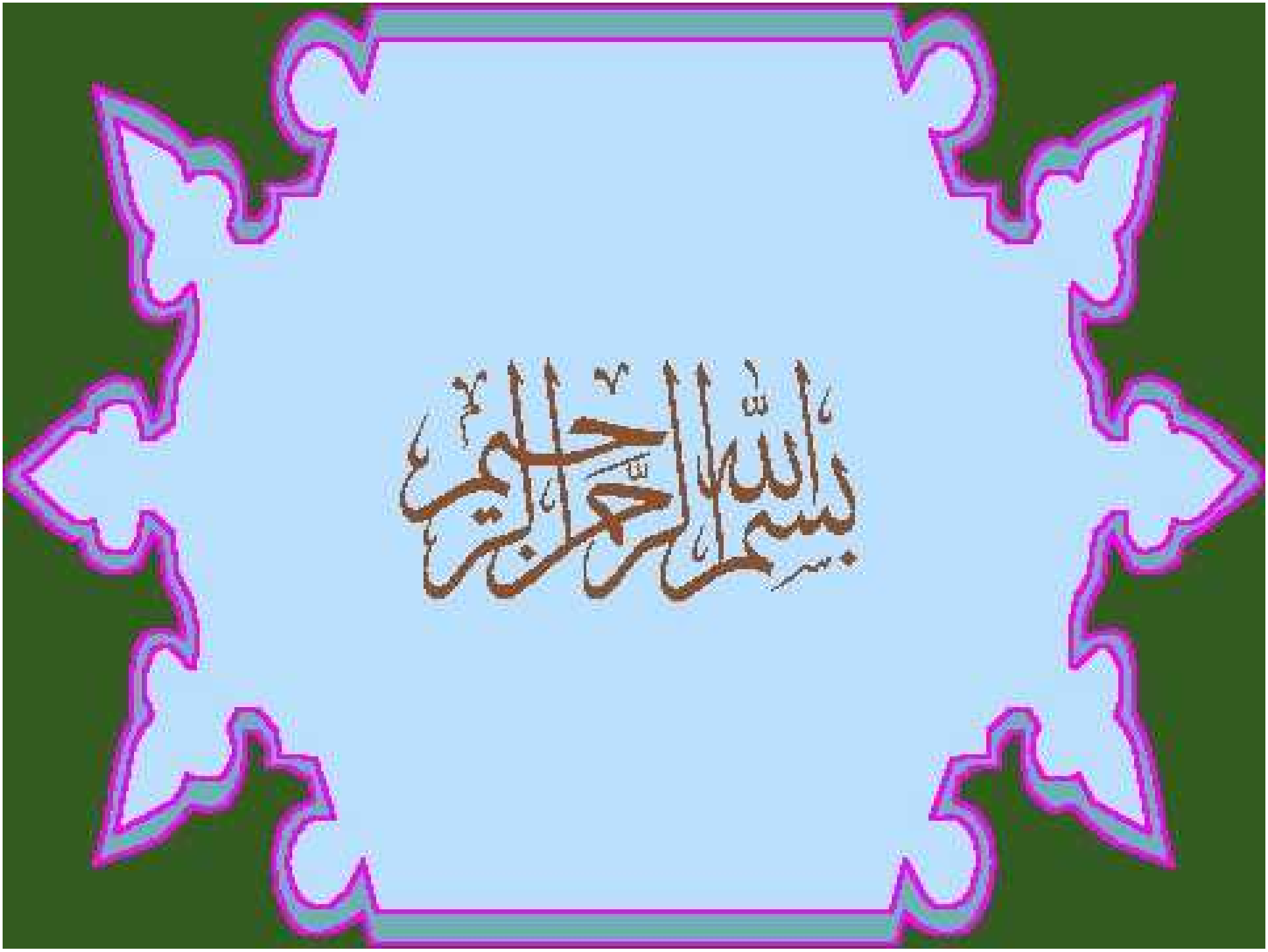
بسم الله الرحمن الرحيم

Lecture # 2

Civil Engineering Practice

Labor vs Machinery

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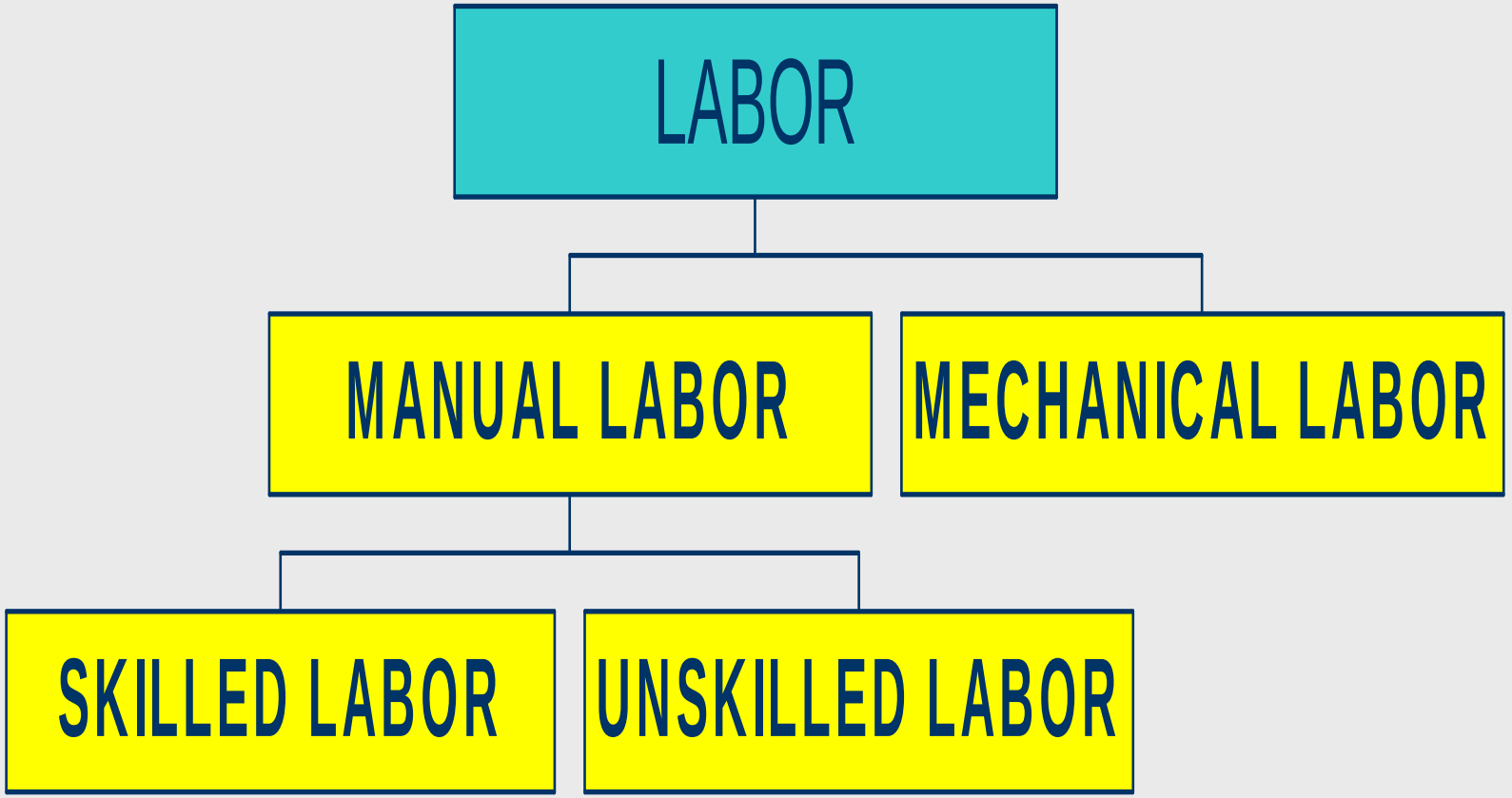
MANUAL LABOR
VS
CONSTRUCTION MACHINERY

TYPES OF LABOR



MECHANICAL LABOR

- MAY BE DESCRIBED AS HEAVY MACHINERY OPERATED BY FUEL AND ELECTRICITY.

MANUAL LABOUR

- HUMAN AND ANIMAL POWER ASSISTED BY SIMPLE IMPLEMENTS LIKE WHEEL BARROWS, NORMAL PICK AXE AND SPADE ETC.

SKILLED LABOR

- Includes persons having training in performing jobs needing skill e.g: operators of mechanical and electrical equipments, drivers of all kinds , masons , carpenters, electricians, blacksmiths etc.

UNSKILLED LABOUR

- not requiring any particular skill e.g., laborers, helpers, mates, cleaners, oilmen, greasers, etc.

ADVANTAGES OF MANUAL LABOUR

- Improves the economic conditions of common people of the project area.
- Increases the circulation of the money and the per capita income of the people.
- Earthwork rates for machines are invariably higher than the corresponding rates through manual labor.

MANUAL LABOUR VS CONSTRUCTION MACHINERY

- Here we will discuss the interaction between manual labor and construction machinery for different construction works separately.

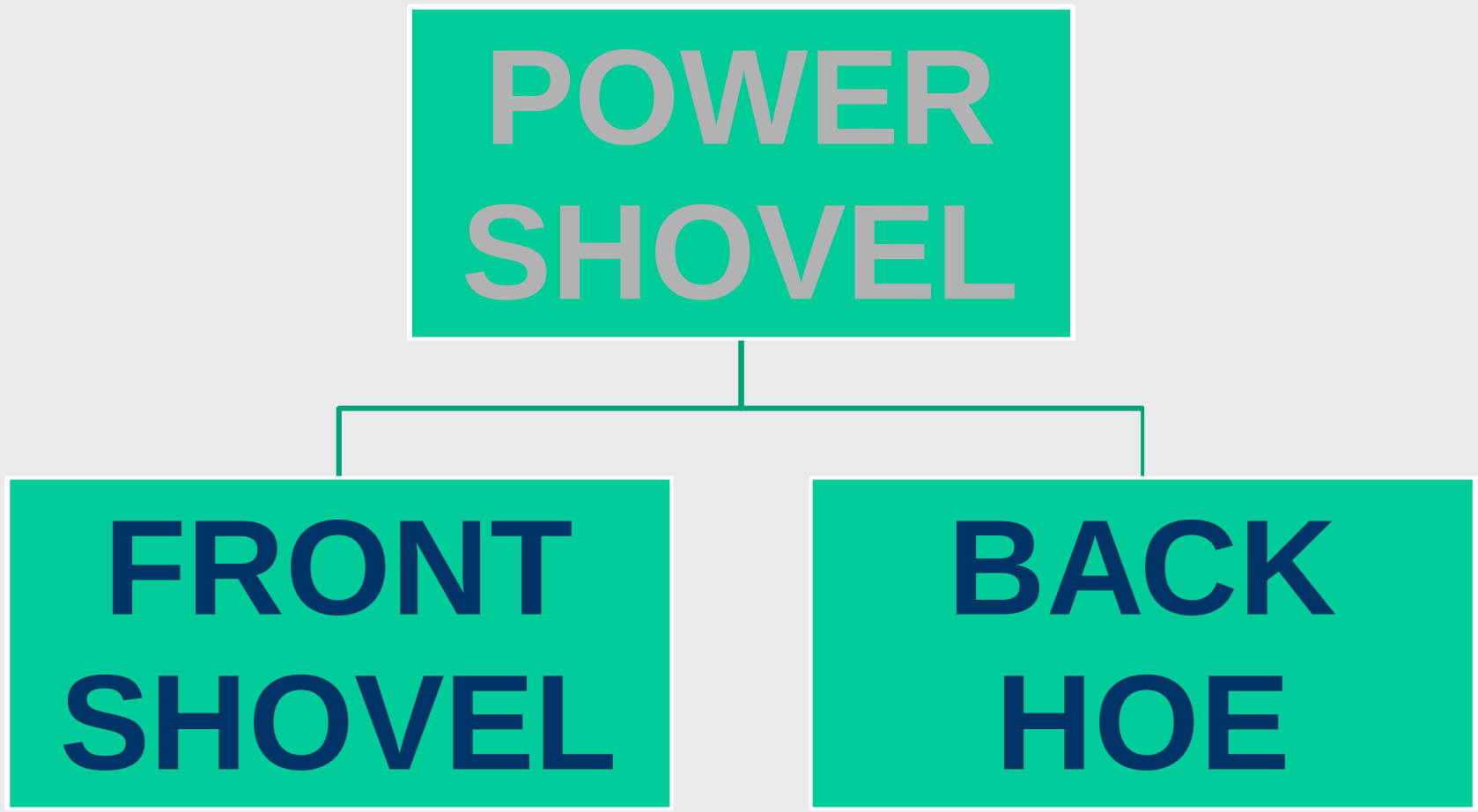
EXCAVATION

MACHINERY

POWER SHOVEL

- used primarily to excavate earth and land it into trucks or tractor-pulled wagons or on the conveyer belts.
- may be mounted on crawler trucks and rubber tired wheels. But power shovels mounted on rubber tired wheels have high speed w.r.t. crawler mounted units.

CLASSIFICATION



FRONT SHOVEL

- A front shovels bucket excavates in upward direction. It develops excavation breakout force by crowding material away from the machine. It is used to excavate about the earth surface.

BACK HOE

- A backhoe is in the form of a downward are unit. It develops exaction breakout force by pulling the bucket toward the machine and curling the bucket inward. It is used to excavate below the earth surface.

FRONT SHOVEL

FRONT SHOVEL

BACK HOE

BACK HOE

SIZE OF A POWER SHOVEL

The size of a power shovel is indicated by the size of the bucket, expressed in cubic yards. Power shovels are commonly available in the following sizes: 3/8, 0.5, 0.75, 1, 1.25, 1.5, 2 and 2.5 cub. Yds.

APPLICATIONS

1. Embankment Digging
2. Loading into Haul Units
3. Side Casting
4. Dressing Slopes
5. Dumping on Soil Banks
6. Digging Shallow Trenches

DRAG LINES

- It is a excavating unit to excavate earth and load it into hauling units, such as trucks or wagons or to deposit it in levees, dams and spoil banks near the pits from which it is excavated.

sbs1034 www.fotosearch.com

u20205503 fotosearch.com

aus061 www.fotosearch.com

TYPES OF DRAG LINE

- Draglines may be divided into the following types:

1. Crawler–mounted
2. Wheel–mounted

DRAG LINE

ADVANTAGE

- it can be used over soft soil, when water for handling loose, dry sands and gravel and occurs at some distance below the surface.

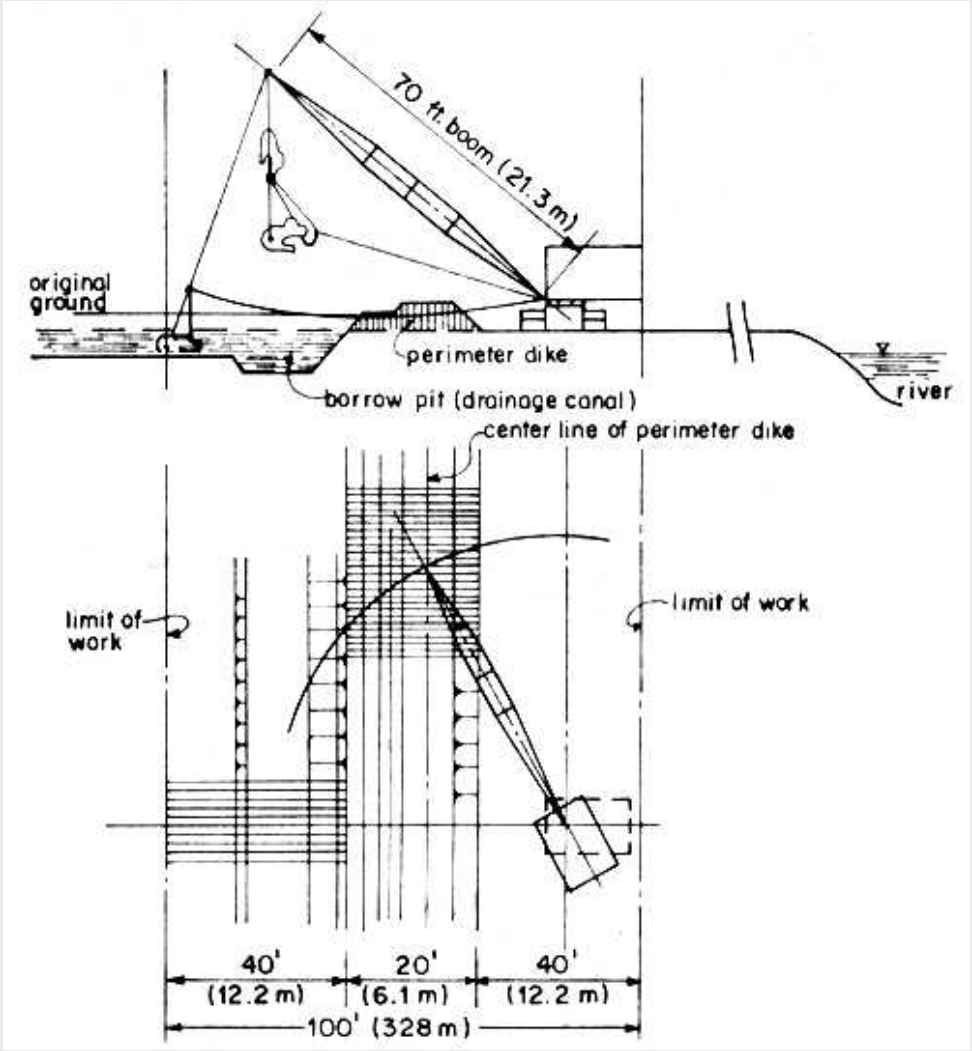
DISADVANTAGE

- its output is lower than power shovel.

APPLICATIONS

1. Bulk Pit Excavation
2. Digging Canal or a Ditch or near a pit

DRAG LINE


70 ft. boom (21.3 m)
original ground
perimeter dike
river
borrow pit (drainage canal)
center line of perimeter dike
limit of work
limit of work
40'
(12.2 m)
20'
(6.1 m)
40'
(12.2 m)
100' (328 m)

TRACTOR PULLED SCRAPERS

It is a excavating as well as carrying units. Tractor-pulled scrapers have established an important position in the earth moving field.

TYPE OF TRACTOR PULLED SCRAPERS

There are two types of tractor – pulled scrapers

1. Crawler - Tractor Scrapers

2. Wheel - Tractor Scrapers

1. CRAWLER - TRACTOR SCRAPERS

It is used for short haul distances, the crawler type tractor, pulling a rubber typed self loading scraper can move earth economically.

DISADVANTAGE

It has low speed w.r.t. wheel tractor scraper.

WHEEL TRACTOR SCRAPERS

- It is used for long haul distances; the higher speed of a wheel type tractor pulled scraper will permit it to move earth more economically than with the crawler type tractor. Its loading speed is lower w.r.t. crawler tractors but higher travel speed, will offset this disadvantage.

ADVANTAGES OF USE OF EXCAVATORS OVER MANUAL LABOURS

ADVANTAGES & DISADVANTAGE

- Excavators can excavate earth over surface as well as below the earth surface
- Their excavation speed is high as compared to use of manual labor.
- They can excavate soft soil, hard rocky strata canals, tunnels etc.

Disadvantage

- Its use increase the cost factor. This disadvantage is not so prominent because its use decrease the time of completion of a project.

EXCAVATION BY HAND

EXCAVATION BY HAND

- Generally, it is desirable to use excavating equipment instead of excavation by laborers, however, at some jobsites the space is not sufficient for equipment to operate.

BULLDOZER

The term Bulldozer may be used in a broad sense to include both a bulldozer and an angle dozer. Bulldozers are mounted with the blades perpendicular to the direction of travel, while Angle dozers are mounted with the blades set an angle with the duration of travel.

BULLDOZER

CLASSIFICATION

- On the basis of their mountings:

1. Crawler Tractor mounted
2. Wheel – Tractor mounted.

On the basis of lowering and rising their blade, Bulldozer may be classified as cable or hydraulic controlled.

APPLICATIONS/USES

1. Clearing land from timber and stumps.
2. Opening up pilot roads through mountains and rocky terrain.
3. Moving earth for haul distances up to approximately 300 feet.
4. Spreading earth fills

APPLICATIONS/USES

5. Back filling trenches.
6. Clearing construction sties off debris.
7. Maintaining haul roads.
8. Clearing the floors of borrow and quarry pits.
9. Excavating ponds for stock water.

COMPACTION

MACHINERY

COMPACTION TECHNIQUES

Compaction is attained by applying energy to a soil by one of the following methods:

1- Kneading

2- Static Weight.

3- Vibration

4- Impact

5- Explosives

TYPES OF COMPACTING ROLLERS

1 - PLAIN/FLAT WHEALED ROLLER

TYPES OF COMPACTING ROLLERS

1 - PLAIN/FLAT WHEALED ROLLER

TYPES OF COMPACTING ROLLERS

2- TAMPING ROLLER / SHEEP'S FOOT ROLLER

Tandem Rollers

MANUAL COMPACTION

LABOUR

MANUAL COMPACTION

If necessary, soil compaction can also be done manually.

- THE RATE OF COMPACTION AND THE CHOICE OF LABOR DEPENDS UPON
- TYPE OF SOIL
- NUMBER OF LABORERS AVAILABLE
- TYPE OF EQUIPMENT USED

HAULING

MACHINERY

TRUCKS AND WAGONS

INTRO.

Hauling is the transportation of material by mobile units over highways or country roads. Transportation includes movement over rail, road or water; but hauling is a term confined to the movement over roads such as with trucks, trailers or wagons.

TYPES OF TRUCKS

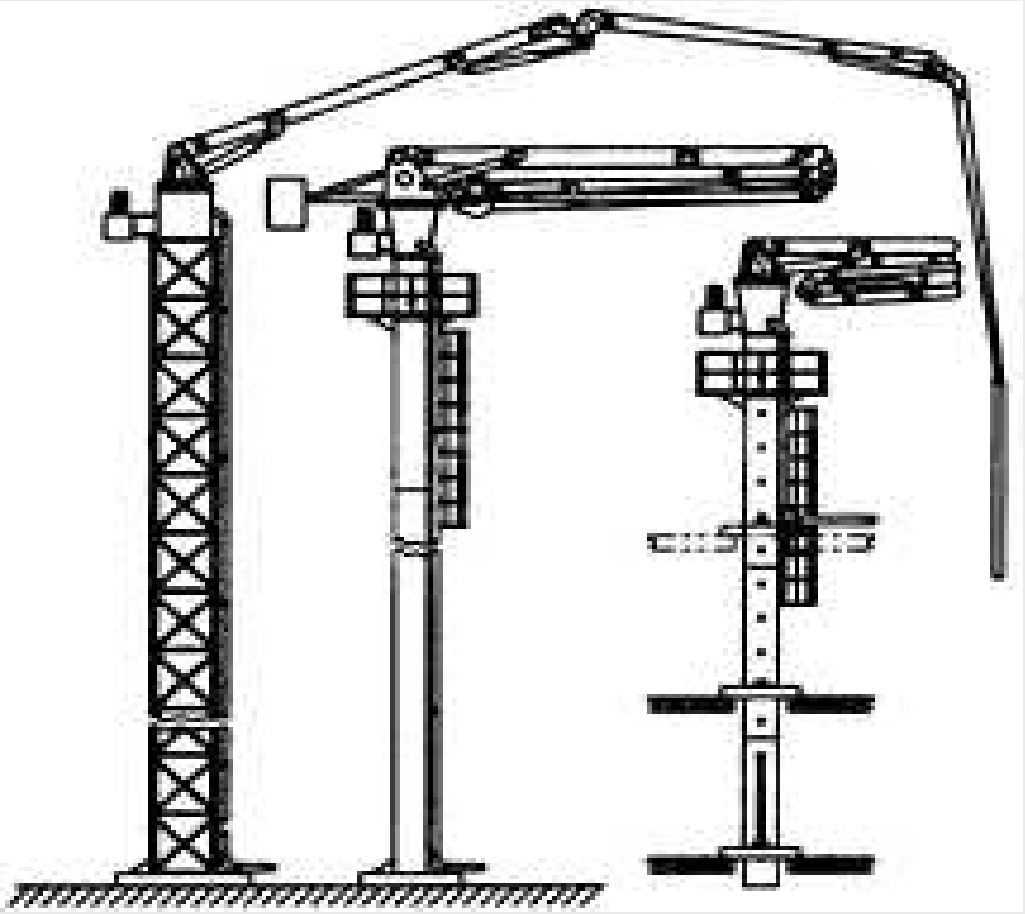
Trucks may be classified according to

- Size and type of engine, gasoline, diesel, butane, propane etc
- Number of gears.
- Kind of drive, two wheel, four wheel, six wheels etc.
- Number of wheels and axles
- Method of dumping the load, rear dump, side dump
- Class of material hauled, earth, rock etc.
- Capacity in tons or cubic yards.

Truck and Asphalt Paver

TRUCKS

Concrete Placing Booms



MANUAL TRANSPORTATION

LABOUR

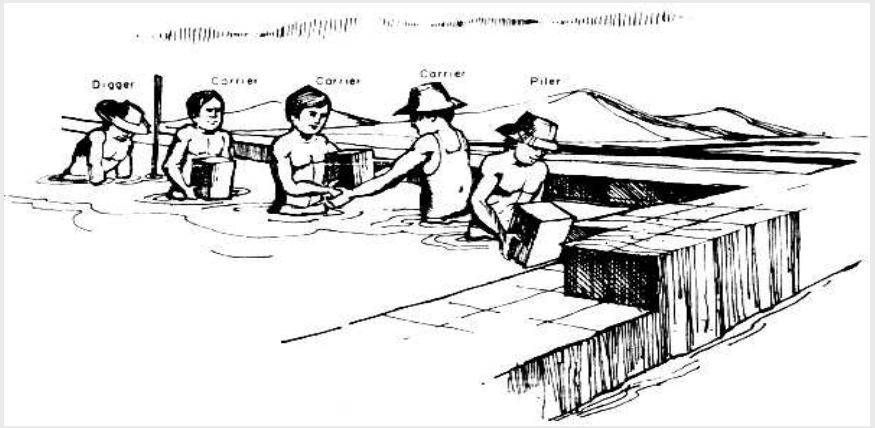
MANUAL TRANSPORTATION

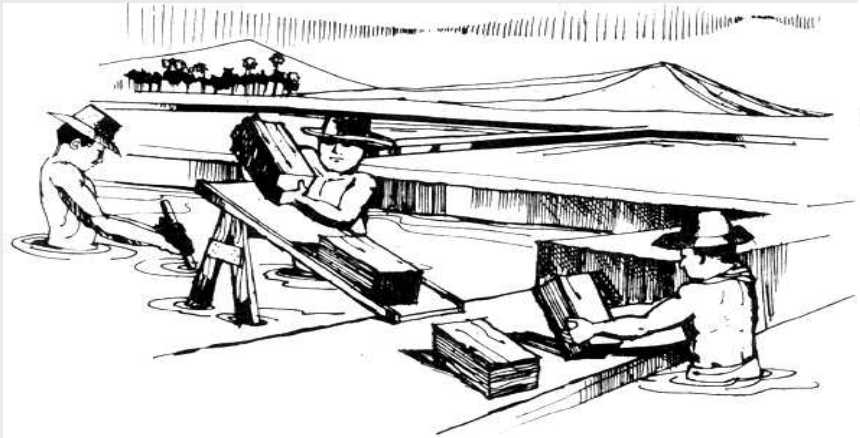
FOR MANUAL TRANSPORTATION OF MATERIALS, LABOR CAN ALSO BE USED

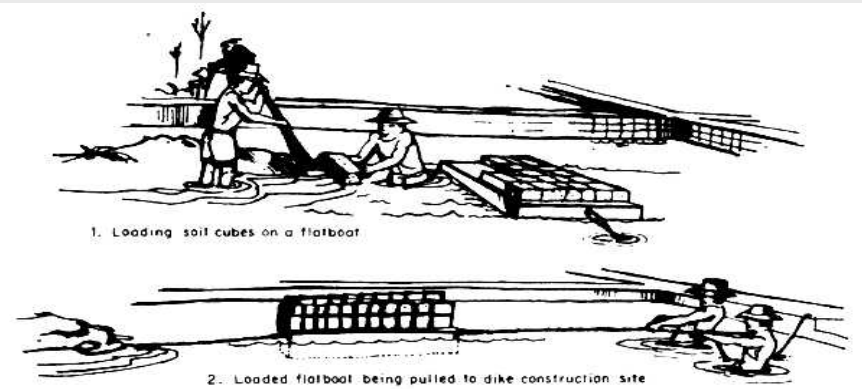
THE RATE OF TRANSPORTATION MAILNLY DEPENDS UPON

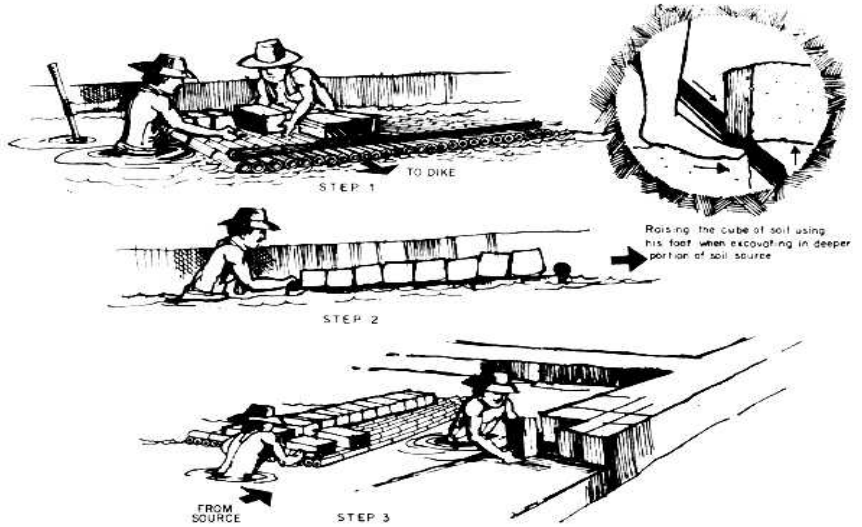
- TYPE OF EQUIPMENT USED AND
- NUMBER OF LABORER AVAILABLE

MANUAL TRANSPORTATION









CONCRETE MIXING

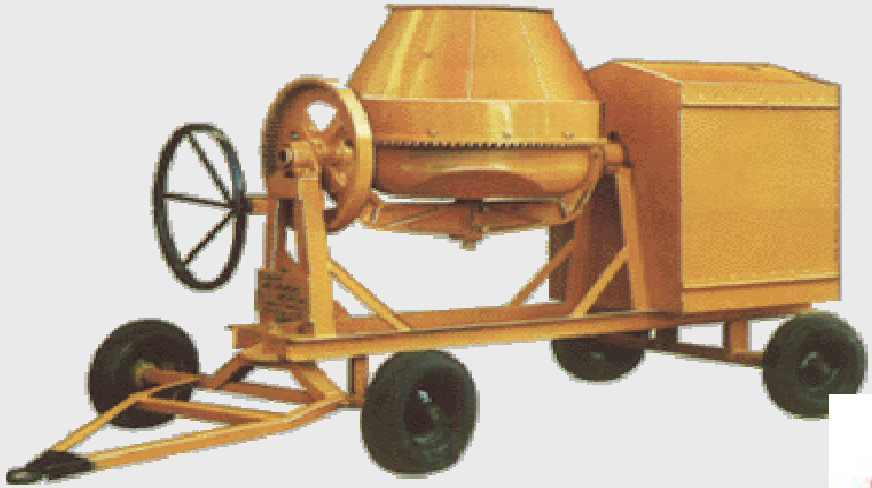
MACHINERY

CONCRETE MIXERS

INTRODUCTION.

Concrete mixers are used for mixing all the ingredients of concrete to make a mix of specified consistency

CONCRETE MIXERS



MIXER SIZES

- B.S. 1305 specifies the following standard sizes for batch type mixers:
- Tilting mixers: 3.5 T, 5T, and 7T,
- Non-tilting mixers: 5NT. 7NT.10NT.14HNT 28NT. 56NT.

  (The numbers indicate the mixed batch capacity in cubic feet.)

CONCRETE MIXING TRUCK

Portable Concrete Batching Plant & Fixed Concrete Batching Plants

MANUAL MIXING OF CONCRETE

DISADVANTAGES

DISADVANTAGES OF MANUAL MIXING OF CONCRETE ARE

- IN MOST OF OUR SMALL PROJECTS THE MIXING OF CONCRETE IS MAINLY DONE MANUALLY.
- REDUCTION IN STRENGTH
- SEGREGATION OF COARSE AND FINE AGGREGATES
- INCOMPLETE MIXING CAUSES NON UNIFORMITY OF CEMENT IN CONCRETE.
- FALSE SET OF CEMENT
- WAISTAGE OF CEMENT SAND SLURRY
- REDUCTION IN WORKABILITY OF CONCRETE

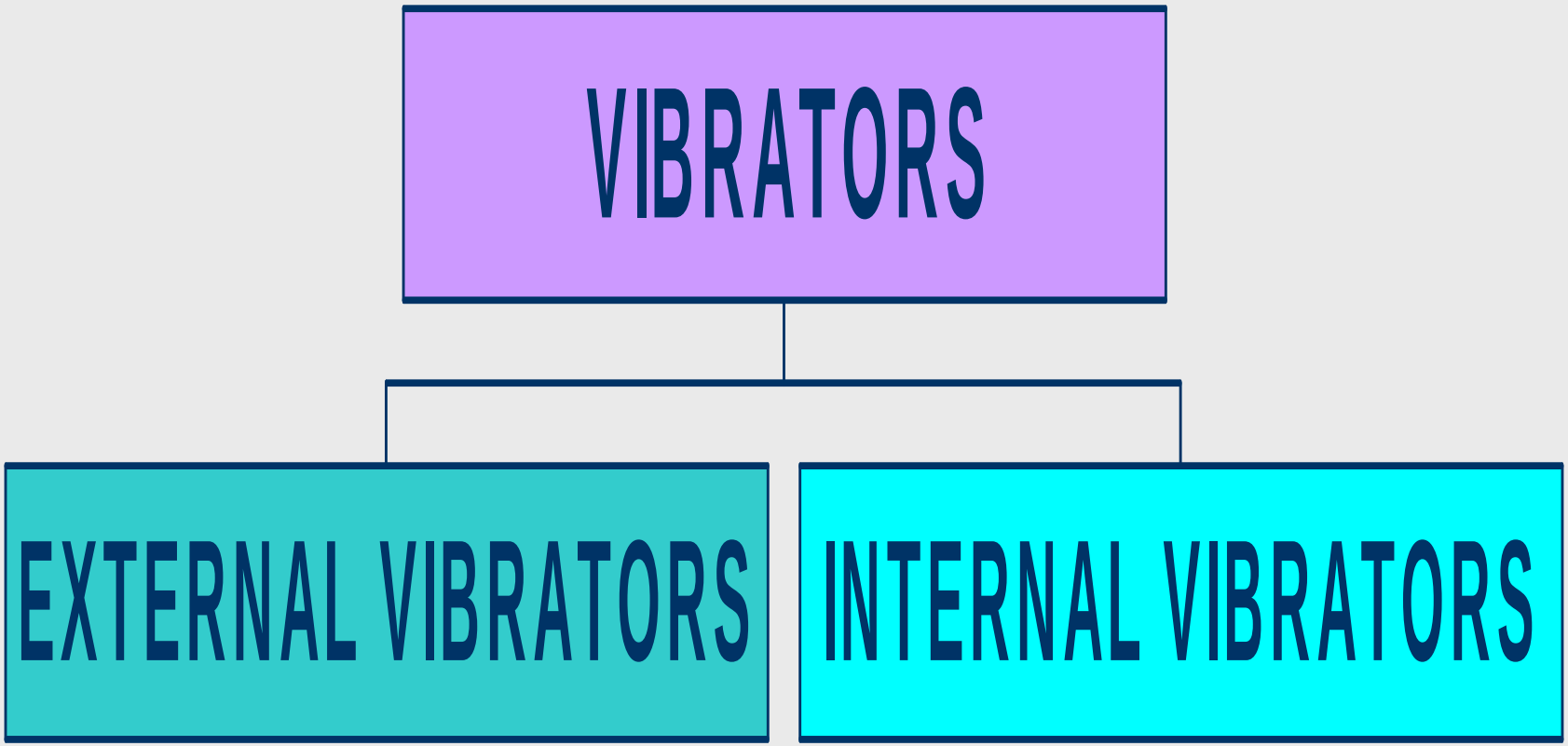
VIBERATORS

MACHINERY

VIBERATORS

Vibration is generally accepted as an economical, labour saving and quality improving method of compaction, which is used in most of concrete jobs. It is especially adapted to the stiffer consistencies associated with high quality conceit.

VIBERATORS



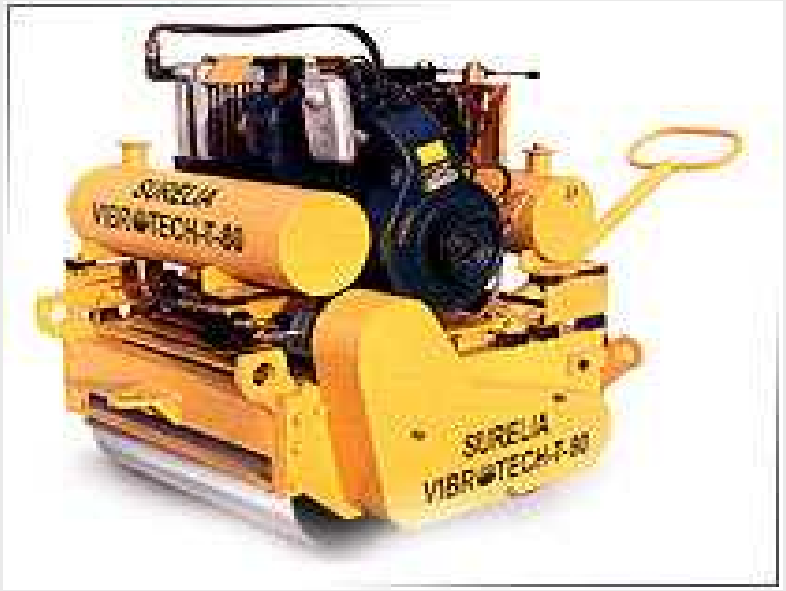
INTERNAL BIBERATORS

These are portable machines driven by compressed air, petrol or electric motors are most commonly used for compaction of concrete on various "in-situ" construction works

INTERNAL VIBERATORS

INTERNAL VIBERATORS

EXTERNAL VIBERATORS



MANUAL COMPACTION

THE PURPOSE OF VIBERATION IS TO REMOVE THE AIR VOIDS IN FRESH CONCRETE, THIS CAN ALSO BE DONE MANUALLY.

- **THE RATE OF COMPACTION DEPENDS UPON TYPE OF EQUIPMENT USED AND DEPTH OF CONCRETE LAYER.**

LABOR LAYING CONCRETE MASONRY UNITS

LABOUR

LABOR LAYING CONCRETE MASONRY UNITS

- **CONCRETE MASONRY UNITS ARE LAID BY MASONS**

- **JOINTS ARE MADE BY SPREADING MORTAR ALONG THE INSIDE AND OUTSIDE HORIZONTAL AND VERTICLE EDGES**

LABOR LAYING CONCRETE MASONRY UNITS

- **JOINTS MAY BE CUT SMOOTH WITH A STEEL TROWEL, OR THEY MAY BE TOOLED AS FOR BRICKS.**

- **THE JOINTS ARE MORE RESISTANT TO THE INFILTRATION OF MOISTURE WHEN THEY ARE TOOLED, BECAUSE THE TOOLING INCREASES THE DENSITY OF THE MORTAR.**

LABOR REQUIRED TO BUILD FORMS

LABOR

LABOR REQUIRED TO BUILD FORMS

THE FACTORS THAT DETERMINE THE AMOUNT OF LABOR REQUIRED TO BUILD FORMS FOR COCRETE STRUCTURES INCLUDE

- **SIZE OF THE FORMS**
- **KIND OF MATERIALS USED**
- **SHAPE OF THE STRUCTURE**
- **LOCATION OF THE FORMS**
- **RIGIDITY OF THE DIMENSIONS REQUIRED**

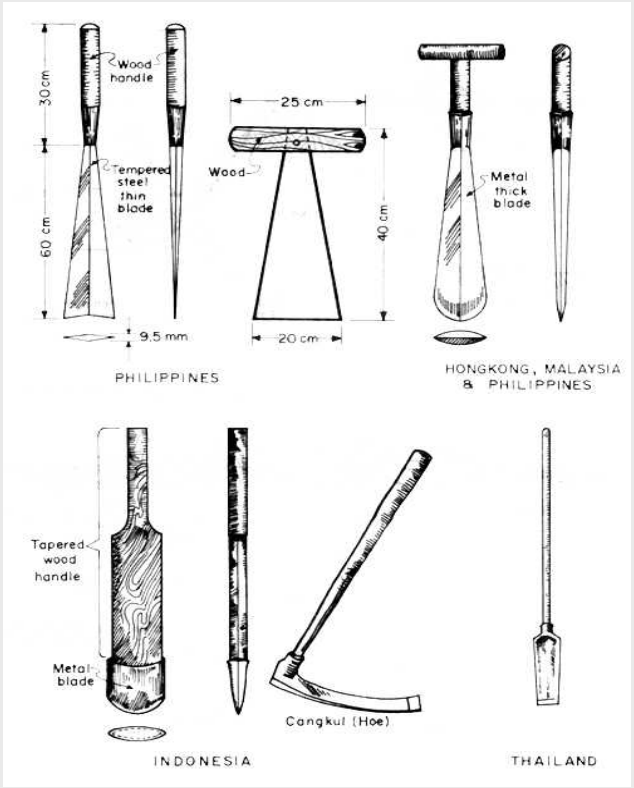
LABOR LAYING BRICKS

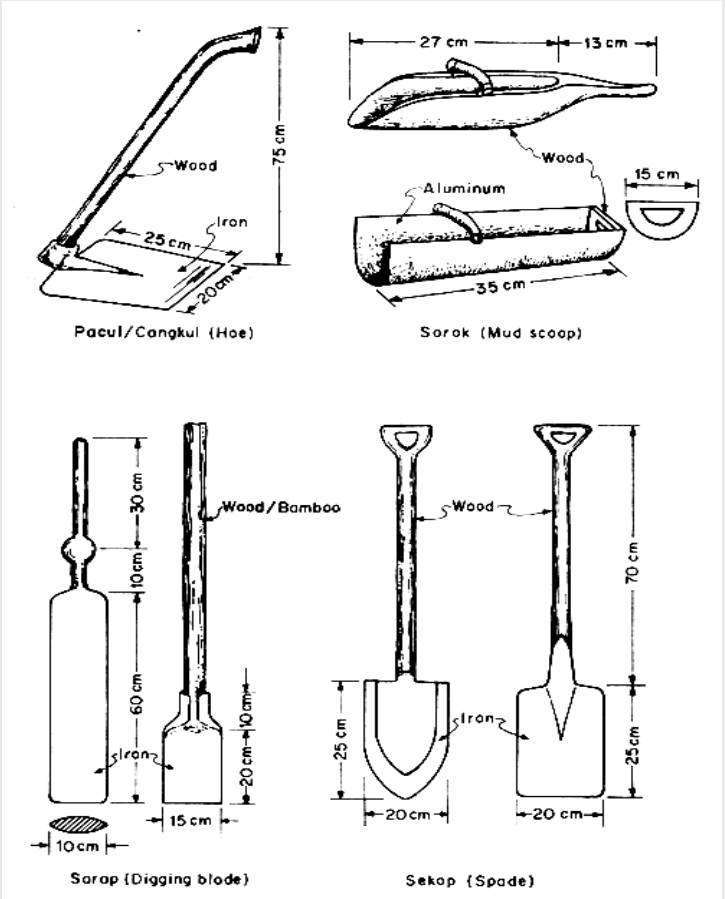
LABOUR

LABOR LAYING BRICKS

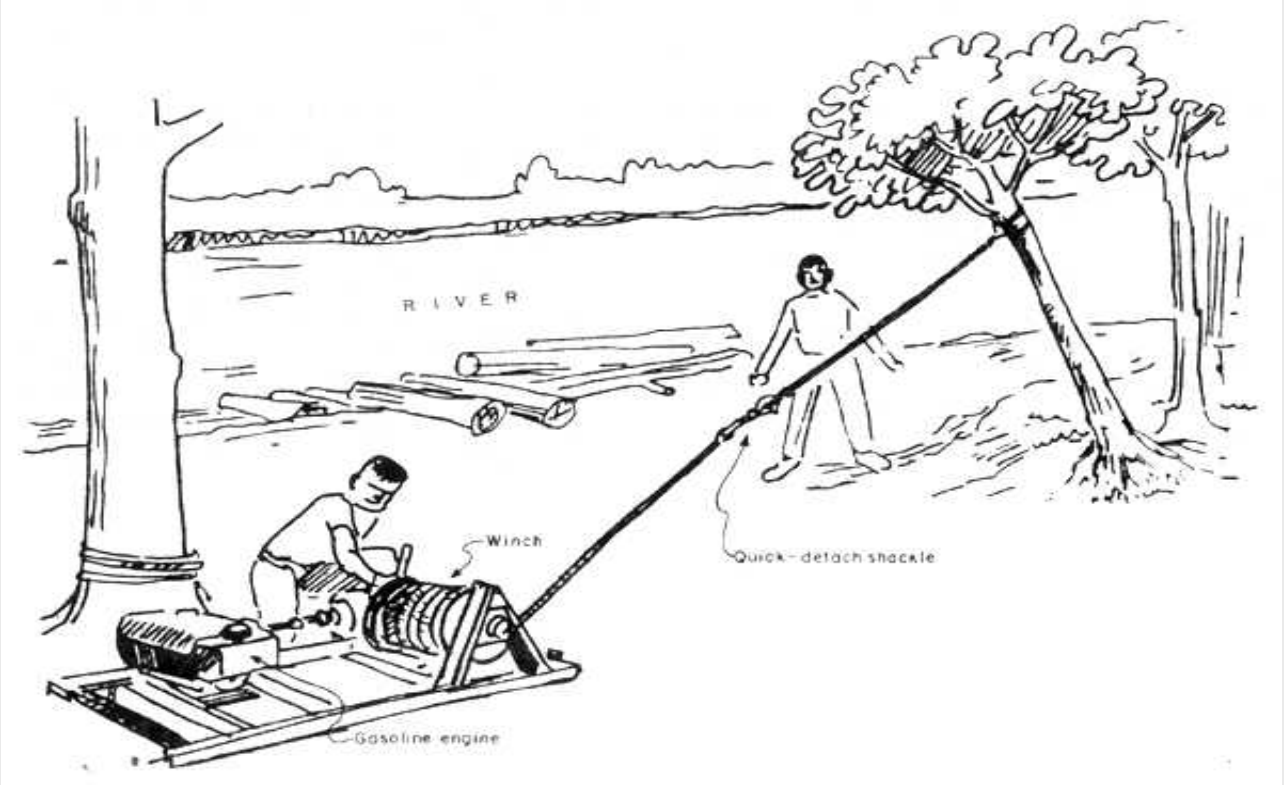
- **THE LABOUR HOURS REQUIRED TO LAY BRICKS VARY WITH A NUMBER OF FACTORS, SUCH AS THE**
- **QUALITY OF WORK**
- **TYPE OF BRICKS KIND OF MORTAR USED**
- **SHAPE OF THE WALLS**
- **KIND OF BOND PATTERN USED**
- **WEATHER CONDITIONS**

LABOUR EQUIPMENT





LABOUR EQUIPMENT



KERB PAVER

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