

MODULE-II

RESOURCE MANAGEMENT

Construction companies face the challenge of delivering often complex projects to a **schedule**, within a **budget**, and hopefully with a reasonable **profit margin**.

- ❖ **Resource management** is the process of planning the resources necessary to meet the objectives of the project, and to satisfy the client's requirements.

Fundamental to resource management is real-time visibility of

- what resources are needed,
- what resources are available,
- where resources are located, and the
- ability to reschedule those resources accordingly



Construction resources might include

- Products and materials
- Construction plant, tools and equipment
- Human resources
- Space and facilities
- Subcontractors
- Finance



A resource management plan can be used to

- ✓ Ensure resource availability and resolve resource conflicts
- ✓ Optimise time, effort and cost
- ✓ Ensure workers with the right skills are available
- ✓ Identify limitations, such as site access, weather conditions, and so on
- ✓ Reassign resources in response to circumstances
- ✓ Track resources utilisation to avoid excessive resourcing or under-utilisation



List key information about the required resources for each activity

- Type of activity
- Start date and duration of the activity
- Activity owner
- Resource type and quantity required
- Source/supplier of each resource type
- Equipment required
- Cost estimates for each of the resources to be supplied
- Risk mitigation



Successful resource management requires

- Access to up-to-date project plan with clear definition of different phases of work, activity and scheduling
- Understanding the types of resources that are needed
- Understanding the availability and optimum utilisation of resources
- Understanding the potential for developing resources for new uses
- Understanding of the lead time required to ensure that resources are available when needed
- The ability to redeploy resources if works need to be accelerated, or if works are
- Completed

Automated resource management

Systems can improve companies' overall efficiency,

- replacing less efficient data collection methods such as
- paper forms,
- Spreadsheets, and so on.



Some of the features automated resource management can incorporate include

- ✓ Automated calculations
- ✓ Ability for managers to simulate and test different scenarios
- ✓ Re-evaluation and re-calculation as decisions change
- ✓ Real-time resource utilisation tracking
- ✓ Resource allocations can be assessed and approved quickly online



- ✓ Access to real-time information via mobile device
- ✓ Online collaboration between sites, offices, partners, subcontractors, and so on

CONSTRUCTION LABOUR

They are employed in the construction industry and work predominantly on construction sites and are typically engaged in aspects of the industry other than design or finance. The term includes general construction workers, also referred to as labourers and members of specialist trades such as electricians, carpenters and plumbers.



What does a construction worker do?

Construction is an industry that requires working at ever-changing locations and work environments. This profile refers to general construction workers. Others at a construction site include electricians, carpenters and plumbers.

Some of the main duties of a general construction worker are to

- Install various commercial, industrial or residential systems
- Ensure that projects conform to building codes and regulations
- Use, clean and maintain various types of equipment
- Supervise or apprentice other workers



The construction industry is divided into three major segments

- ✓ Construction of buildings contractors, or general contractors, build residential, industrial, commercial, and other buildings.
- ✓ Heavy and civil engineering construction contractors build sewers, roads, highways, bridges, tunnels, and other projects.
- ✓ Specialty trade contractors are engaged in specialized activities such as carpentry, painting, plumbing, and electrical work.

WAGES OF CONSTRUCTION WORKERS

Workers are paid very low wages. Net worth of wages is reduced considerably due to periods of unemployment.



Two methods of making wage payment to labour

- ✓ Time rate system
- ✓ Piece rate system

Time rate system

- Suitable payment fixed **per unit of time** that labour is engaged on the work.
- Unit of time may be hour, day, week, fortnight or month.
- In India, Rate of payment for **casual labour** is determined per day and that of regular employees per month.

Piece rate system

- Payment is based on **output or production** of workers
- Payment is made at the agreed rate for **actual quantum of work done** by each labourer
- **Advantage** of this system is **Good worker** can make more money by increasing his output

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TYPES OF CONSTRUCTION WORKERS

Followings are the different types of construction workers/labours.

- Pipe fitter
- Layers Sheet metal worker
- Steam fitters
- Painters
- Paperhangers
- Drywall installers
- Tile Installers
- Tapers
- Cement Masons
- Concrete finishers
- Segmental pavers
- Brick masons
- Stone masons
- Insulation workers
- Duct workers



LABOUR PRODUCTIVITY

Productivity is the relationship between the outputs generated from a system and the inputs that are used to create those outputs

Mathematically,

$$P = \text{Output/Input}$$

$$P = (\text{Earned hours} / \text{Worked hours})$$

Examples

- Kilograms of rebar fixed per man/day
- Cu.m Concrete poured per man/day
- Sq.m of formwork placed per man/day
- Sq.m of block laid per man/day



Construction Equipment:

Good project management in construction must vigorously pursue the efficient utilization of labour, material and equipment. The use of new equipment and innovative methods has made possible wholesale changes in construction technologies in recent decades. 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.

Classification of construction equipment:

- **EARTHWORK EQUIPMENTS**
- **CONCRETING EQUIPMENTS**
- **HOISTING EQUIPMENTS**

Types of Earthwork Equipment

1. Backhoe
2. Front shovel
3. Dragline
4. Clamshell
5. Dozers
6. Roller compactor
7. Scraper
8. Dumper
9. Grader

1. 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.



2. Front shovel:-

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



3. Dragline:-

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



4. Clamshell:-

It consists of a hydraulically controlled bucket suspended from a lifting arm. It is mainly used for deep confined cutting in pits and trenches.



5. Dozers:-

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.



6. Roller compactor:-

Roller compactor is mainly used to 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-axle or three-axle type.



8. Dumper:-

It is used for horizontal transportation of materials on and off sites. Large capacity dumpers are used in mines and quarries.



9. Grader:-

It is used for grading and finishing the upper surface of the earthen formations and embankments. They usually operate in the forward direction.



Types of Concreting Equipment:-

1. Concrete batching and mixing plant
2. Concrete mixers
3. Concrete transit mixers
4. Concrete pumps

1. Concrete batching and mixing plant:-

They are mainly used for weighing and mixing large quantity of concrete constituents.
Capacity:-20cum/hr-250cum/hr.



2. Concrete mixers:-

They are mainly used for mixing small quantities of concrete constituents.
Capacity:-200lt/batch (small mixers) 200-750l/batch (large mixers).



3. Concrete transit mixers:-

They are mainly used for transporting concrete from batching point.
Capacity: - 3cum-9cum.



4. Concrete pumps:-

They are used for horizontal and vertical transportation of large volumes of concrete in short duration.

Capacity: - 30cum/hr (ordinary construction), 120cum/hr (specialized construction).



Types of Hoisting Equipment:-

It constitutes a group of equipment which are employed mainly for lifting or lowering of unit load and other. This group of equipment's can be further sub classified into:

1. **Hoists:-**

Boom hoists
Chain hoists
Electric hoists

2. **Cranes:-**

Derrick Crane
Mobile Crane
Tower Crane

1. **Boom Hoist:-**

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



2. Chain Hoist:-

Chain hoists are quite common example of hoist system and 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 maximum loads at a time with no damage threats.



4. Tractor Hoist:-

Tractor hoist consist of a boom that is attached with base of tractor and a hook with rope is installed on this boom that can operated through driver controls.



Cranes:-

Cranes are considered to be one of the most important equipment used in construction due to their key role in performing lifting tasks all over the construction site.

Plenty of crane models are available in different shapes and sizes, though, they usually fall into three categories,

1. Derrick Cranes
2. Mobile Cranes
3. Tower Cranes

1. Derrick Cranes:-

- Preferable for high-rise and apartment buildings.
- Can be used for both long term and short term projects.
- Cheaper than mobile and tower cranes.
- Not considered to be safe.
- Used when clearance is inadequate for the other units and sufficient space is unavailable for the erection of a tower foundation.



2. Mobile Cranes:-

- Adequate for all types of structures (up to 107 m)
- Used for shorter projects duration (less than 4 months).
- Not considered to be very safe due to lack of safety devices or limited switches to prevent overloading.
- Can operate in muddy terrain but requires good ground conditions.
- Needs adequate operating clearance.



3. Tower Cranes:-

- Preferable for high-rise (over 107 m).
- Used for longer project duration.
- Considered to be very safe due to the presence of limit switches.
- Can operate where ground conditions are poor.
- Does not need adequate operating clearance.



Material Management

Material management is the Process of management concerned with planning, organizing and controlling of the flow of materials to, through, and out of an organization in an integrated fashion.

MATERIALS

Any commodity used directly or indirectly in producing a product or service considered as the lifeblood and heart of any manufacturing system.

CLASSIFICATIONS OF MATERIALS

1. **PURCHASED MATERIALS:** - These are the raw materials, components, spare parts, and items that are used and usually do not appear in the end product.
2. **WORK-IN PROCESS MATERIALS:** - These are materials that are in the semi-finished stage.
3. **FINISHED GOODS:** - These are the final products which are ready for final delivery or distribution.
4. **SUPPLIES:** - These are the consumable goods.

ACTIVITIES INVOLVED IN MATERIALS MANAGEMENT

- a.) Materials Requirements Planning
- b.) Purchasing
- c.) Inventory Control
- d.) Expediting
- e.) Transportation
- f.) Materials Handling

a.) Materials Requirements planning: - Encompasses the identifying, quantifying and scheduling the acquisition of materials and equipment. Necessary function in any organization as inventory of materials involved about 60% of the total investment of the organization.

b.) Purchasing: - -holds the responsibility for procuring goods for the project in alignment with the specifications, standardization and in compliance with the project schedule and budget.

Functions:

1. To select proper supplier for the materials requisitioned, before placing an order.
2. To negotiate about the price of the materials from the supplier.
3. To assure the quality of materials and should not be compromised with the cost.

4. The materials should be purchased in right quantity and quality at proper time and at cheapest cost as possible.
5. To set proper purchase policy and procedures

Importance:

50% to 60% of sales turnover is spent on the purchase of various materials every 1% saving achieved in purchasing results to about 5% profit for an organization.

c) Inventory Control: - Method where all stocks of goods are properly and promptly issued, accorded and preserved in the best interest of the firm. Monitor the stock of goods used for production, distribution and captive (self) consumption.

INVENTORY - a physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.

Functions:

- To meet anticipated demand
- To smooth production requirements
- Protect against stock outs
- To help hedge against price increase
- To permit operations

IMPORTANCE:-

- Inventory Control can help the business be more profitable by identifying the types of inventory in the warehouse in terms of profitability.
- Liquidating those unwanted inventory, and understanding the carrying cost such as storage, insurance, tax, etc. to minimize the cost incurred.

d. EXPEDITING: - The continuous monitoring as well as ascertaining and maintaining the flow and supply of materials to prevent stock outs and stoppage of production.

Factors affecting expediting:

- * Insufficient or zero inventories
- * Failure of materials handling devices
- * Uncertainty in demand and production quantity.

e. TRANSPORTATION: -Involves the using of the safest and most economical means to transport the materials to the site where they are needed

Modes of Transportation

- ✚ Aviation
- ✚ Land Transport
- ✚ Ship Transport
- ✚ Pipeline

- 1) **INTERMODAL TRANSPORT:** - System of transport where by two or more models are used to transport the same loading unit in an integrated manner.
- 2) **MULTIMODAL TRANSPORT:** - Continuous movement of goods by more than one means of transport.

f. MATERIALS HANDLING: - The movement of materials at the lowest possible cost through the use of proper method and equipment. Applies the movement of raw materials, parts in process, finished goods, packing materials, and disposal of scraps.

Importance:

- ✚ Reduces delays and damage.
- ✚ Promotes safety and improve working conditions.
- ✚ Promotes productivity.
- ✚ Control inventory.
- ✚ Reduces total cost of production as materials handling uses about 20% -25% of total manufacturing cost.

MATERIALS HANDLING EQUIPMENT:-

- ✚ Automated guided vehicles
- ✚ Industrial trucks
- ✚ Monorails and other guided vehicle
- ✚ Conveyors
- ✚ Cranes and hoist

Why firms have implemented Materials Management System?

The Construction Industry Institute concluded that the labour productivity could be improved by 6% and can produce 4-6% in additional savings.

- ✚ Reduces the overall cost of materials
- ✚ Better handling of materials
- ✚ Reduction in duplicated orders
- ✚ Materials will be onsite when needed
- ✚ Improvement in project schedule
- ✚ Quality control
- ✚ Better relationship with suppliers
- ✚ Reduces materials surplus
- ✚ Better cash flow management

END
