UNIT 3

Resources of construction work

The resources needed for the construction industry are:

1) Men, skilled and unskilled.

2) Material such as cement, steel, bricks, aggregates, etc.

3) Machines such as trucks, cranes, etc. to facilitate construction.

Limited resources have to be utilised with in a given time to get maximum benefit in terms of construction output.

The five categories of resource planning techniques include

1. Resource Loading
2. Resource Aggregation
3. Resource Availability Analysis
4. Resource-Constrained Scheduling
5. Resource Leveling

Resource Loading

• Resource loading allows the planner to assign resources such as labor, equipment and materials to each activity in the project schedule.

• These units might be craftsmen, pieces of equipment or quantities of construction materials.

• Craftsmen or equipment the norm.

Resource Aggregation

• Resource aggregation totals each type of resource used in the schedule for each time unit between scheduled project start and finish.

• Look at the early and late start and finish dates.

• Remember your resource requirements for the critical path doesn't change only the float activities

• You like to see a bell curve on your resource aggregation always keeping in mind the early and late dates on the items with float.

• EX-Average daily manpower per week graph

Resource Availability Analysis

• Simply compares the amount of resources required to the maximum amount of resources that are available for use.

• In the real world can we get more resources.

Time-and-Resource-Constrained Scheduling

• Time constrained or resource constrained.

• Time use an end date.

• Resources schedule the project on available resources.

Resource Availability Analysis

• Simply compares the amount of resources required to the maximum amount of resources that are available for use

• In the real world can we get more resources.

• When the assigned resources exceed those available:

– Shift non-critical activities within the schedule

– Obtain more resources

– Extend the schedule to lower the demand during the original schedule.

Time and Resource Constrained Scheduling

• Schedules can be time constrained or resource constrained but not both.

– Time use an end date

– Resource schedules the project on available resources

• Time- get more resources

• Resource- a shortage extend the time

Resource Leveling

• Attempts to keep the requirements for a construction resource as constant as possible over the duration of the project.

• Non-critical activities are shifted within the schedule using the available total float in order to level resource usage and the planned project completion date is unchanged as a result of the leveling process.

• This techniques are used when the project duration is fixed.

• Maximizing the effects of resource leveling requires performing both a backward and forward pass again through the network.

• The primary objective is to reduce the peaks and valleys without increasing the duration.

• Delaying those activities to the last available space.

• Use of algorithms and the software program for this class.

Stores

A wide variety of stores and equipment is utilized for construction work. This includes building materials like bricks, stone, aggregates, cement, lime, steel bars, structural steel, sanitary fittings, water supply, electrical stores and fittings as well as a variety of machinery and equipment ranging from survey and drawing instruments to transport and special purpose vehicles like dumpers, bulldozers and other earthmoving equipment, batching and mixing plants for concrete, vibrators, drilling and pumping equipment, air compressors, pile drivers and a host of other items. Special types of equipment may be necessary for some works like bridge construction and for large works it may be necessary to provide material handling equipment like cranes, lifts, conveyors etc.

Issue of Stores Material

Materials are issued from stock for the following purposes.

1. for use on works either by contractors or departmentally.
2. for dispatch to other subdivisions or departments.
3. for sale to contractors, employees and other outside parties.

Materials are issued only on receipt of an indent, FormNo.7, signed by the divisional or sub divisional officer. Five copies of the indent are prepared, using carbon paper. One copy is retained by the indenter and the other copies sent to the supplying authority. The storekeeper of the stores finds out from the stock balances if the quantities indented can be issued. If it is not possible to issue the whole quantity, he records the quantities that are actually issued on all the four copies of the indents and puts his signatures on them. At the same time he makes corresponding entries of issues on the 'bin cards'. He also obtains the signature of the indenter on one copy, which is retained as a voucher in support of the transaction. One copy is returned to the indenter and the remaining two are sent to the divisional office for further record.

Issue of Material to Contractors

Sometimes it is desirable to retain the supply of the certain materials in the hands of the Government. The use of items of good quality can be ensured by supply is made by the Government from its stock. Items like cement, steel, bricks, asphalt material etc., are therefore generally issued to contractors even though the contract may be for completed items of work.

When the supply of certain items from the stock is envisaged, the contract should specify the following.

1. The full description of the materials to be supplied by the Government for use on works.
2. The place of delivery.
3. The rate including the storage rate, to be charged to the contractor for each item.
4. The contractor shall be responsible for obtaining the items and making payment there of at the rates specified, by deduction from bills.
5. No carriage or incidental charges are to be borne by the government beyond the place of delivery. The cost of material issued to the contractor for use on a work should ordinarily be recovered by deduction from the first bill authorising payment for the work. The divisional officer may, however, permit recovery in phases to the extent the material is actually used in the construction at the time of payment. Moreover stores should not be issued to contractors in bulk long before they are actually required due to the risk of pilferage and misuse. The issue of stores to the contractors should therefore, be regulated and restricted to the actual requirements over a reasonable period of time.

Materials at Site Account

In the case of minor works in which transactions relating to the materials at site are not likely to be heavy, an account in form P.W.D VI-83 should be maintained of all departmental materials brought on to the site of a work. This should clearly show the sources and quantities of all receipts and of their issues to the work as the transactions occur.

The detailed account of the material issued to the work is known as the 'materials-at-site account'.

All departmental materials brought on to the site of work for use on that work, from any source, should be entered as receipts in the 'Materials-at-site accounts', immediately on their receipts giving a reference to the measurement book.

The register of material-at-site account should show separately for each material:

(i) The estimated requirement.
(ii) The issue rate.
(iii) Receipts, issues and balances, month to month
(iv) Net issues at the end of each month.

After completion of work, a theoretical calculation of the quantities of materials used on each subhead is made on the basis of the magnitude of work executed. These are recorded in Part I and Part II indicating the surplus or deficit as per actual consumption and the theoretical calculations, together with an explanation of the difference. Part III of the form is a statement showing the disposal of material remaining unused as per 'Material-at-site accounts'. The unused material is disposed off in the following manner.

(i) Transfer to stock, provided the items are serviceable and are likely to be required for other works.

(ii) Transfer to other works in progress, if required.

(iii) Sale of the items those are no longer required.

Indent

Material should issue only on receipt of an indent, form 7 signed by the divisional or the sub-divisional officer. These indents on stores are demands on store keeper signed by authorized persons to issue to bearer to be charged to a particular job or department and signified there in.

Invoice

The store keeper will prepare and sign the form of the invoice attached to the indent according to the supply as actually made. Simultaneously an entry should be made in the register of stock issues Form 8.

Bin Card

This is a card, which is attached to each Bin, or the container for stores a record of all materials entering or leaving the bin and the balance of materials in hand is kept in this card.

Scheduling

Scheduling means the preparation in advance of a list of different activities and their order of sequence to carry out any work as per the planned programmme.

For completing a project as per the plan, scheduling should be known to not only to the project managers, but also to all the links in the system namely engineers, supervisors, contractors and other coordinating agencies.

Scheduling includes the following:

1. Determination of the amount of work to be done.

2. The order in which the work is to be performed at each stage
3. The time when each part of the work will start.
4. Allocation of the quantity and rate of output of departments.
5. The date of starting of each unit of work at each stage along the route to be followed.

Need for scheduling

A project usually is a one-time effort. Every project will have its own features and they are of non-repetitive nature. In order to complete a project efficiently, the project manager must plan and schedule. During the course of project he will have to re plan and schedule due to unexpected progress, delay or due to technical conditions. The main aspect of project management will be scheduling different activities in an acceptable time span and finally with controlling the progress of scheduled work.

Advantages of Scheduling

For construction work of any importance, planning and scheduling is indispensable the following advantages are obtained thereby.

1. Alternative methods of construction and the effects of likely constraints can be examined at the planning stage and the most economical methods identified.
2. The time of starting each activity is known and therefore prior and adequate arrangements for the provision of resources, such as men, material, machines and money at each stage of construction can be made.
3. Resource utilisation can be optimised and the available resources directed towards various activities to the best advantage.
4. The actual progress of each activity can be monitored with reference action in speeding up the work taken up, before it causes a hindrance in other related activities.
5. The effect of any changes that takes place due to variations in productivity errors, whether geological conditions or modifications made in the original plans can be properly evaluated and the program suitably amended.
6. The inter-relationship of various activities and the relative importance of each at any stage of construction are known and this help in fixing priorities properly.

7. The ultimate advantage to be gained by scheduling is that the construction work can be executed in an efficient manner without wastage of any of the inputs, resulting in maximum possible economy.

A construction project consists of a sequence of various activities like preparation of the site, foundation, substructure, super structure, fittings, finishing, and other activities. Some of the activities may be of critical nature and if the activity is not completed in estimated time, it delays the entire project. The sequence of activities in the construction of a building is given below.

1. Earth work in excavation.	6. BW in super structure	11.Flooring
2. P.C.C bed and BW in foundation	7. Sanitary work	12.Electricalworks
3. D.P.C	8. RCC	13.Sanitary works
4. Precasting RCC lintels	9. Door panels	14.White washing
5. Casting RCC columns	10.Plastering	15.Sanitary fittings

SCHEDULING BY BAR CHARTS

The bar chart lists various activities involved in a construction project and the period of time that each activity takes for completion. Indicate in the form of a horizontal bar plotted to a suitable time scale against each activity.

Bar charts are suitable for determining the resources, such as materials, labour, machinery and finance, required for construction work Bar chart is simple, easily understandable and widely used method of scheduling. However it has certain limitations, firstly it is difficult to depict complicated interdependencies of various items of work. It does not give actual progress of the work. It is not possible to know the peak rate of work necessary for timely completion of a project. The bar chart, therefore, is a static representation and does not respond to the dynamic happening son the construction site of a complex project.

Critical path method of scheduling

Critical Path Method is a network method. In CPM the project is analysed into different activities whose relationships are shown on the network diagram. The limitations of the bar charts can be overcome with the Critical Path Method. CPM is widely used in construction industry by a number of private and public organizations.

The concept of CPM is that only a small number of critical activities take most of the estimated project time. Speeding up the rest of the activities has no effect on the completion of work. Only these critical activities need to be speeded up and the rest of the activities can be allowed to proceed normally. The work can then be completed by the target date.

Basic network construction

A network diagram is a graphical representation of the sequence in which various activities of a project are under taken and the relationship among them.

BUDGET

Budgeting has come to be accepted as an efficient method of short-term planning and control. It is employed, no doubt, in large business houses, but even the small businesses are using it at least in some informal manner. Through the budgets, a business wants to know clearly as to what it proposes to do during an accounting period or a part thereof. The technique of budgeting is an important application of Management Accounting. Probably, the greatest aid to good management that has ever been devised is the use of budgets and budgetary control. It is a versatile tool and has helped managers cope with many problems including inflation.

DEFINITION OF BUDGET

The Chartered Institute of Management Accountants, England, defines a 'budget' as under:

“A financial and/or quantitative statement, prepared and approved prior to define period of time, of the policy to be pursued during that period for the purpose of attaining a given objective."

According to Brown and Howard of Management Accountant "a budget is a predetermined statement of managerial policy during the given period which provides a standard for comparison with the results actually achieved."

Essentials of a Budget

An analysis of the above said definitions reveal the following essentials of a budget:

(1) It is prepared for a definite future period.

(2) It is a statement prepared prior to a defined period of time.

(3) The Budget is monetary and *I* or quantitative statement of policy.

(4) The Budget is a predetermined statement and its purpose is to attain a given objective.

A budget, therefore, be taken as a document which is closely related to both the managerial as well as accounting functions of an organization.

BUDGETARY CONTROL

Budgetary Control is the process of establishment of budgets relating to various activities and comparing the budgeted figures with the actual performance for arriving at deviations, if any. Accordingly, there cannot be budgetary control without budgets. Budgetary Control is a system which uses budgets as a means of planning and controlling.

According to I.C.M.A. England Budgetary control is defined by Terminology as the establishment of budgets relating to the responsibilities of executives to the requirements of a policy and the continuous comparison of actual with the budgeted results, either to secure by individual actions the objectives of that policy or to provide a basis for its revision.

Brown and Howard defines budgetary control is "a system of controlling costs which includes the preparation of budgets, co-coordinating the department and establishing responsibilities, comparing actual performance with the budgeted and acting upon results to achieve maximum profitability."

The above definitions reveal the following essentials of budgetary control:

(1) Establishment of objectives for each function and section of the organization.

(2) Comparison of actual performance with budget.

(3) Ascertainment of the causes for such deviations of actual from the budgeted performance.

(4) Taking suitable corrective action from different available alternatives to achieve the desired objectives.

Objectives of Budgetary Control

Budgetary Control is planned to assist the management for policy formulation, planning, controlling and co-coordinating the general objectives of budgetary control and can be stated in the following ways:

(1) Planning: A budget is a plan of action. Budgeting ensures a detailed plan of action for a business over a period of time.

(2) Coordination: Budgetary control co-ordinates the various activities of the entity or organization and secure co-operation of all concerned towards the common goal.

(3) Control: Control is necessary to ensure that plans and objectives are being achieved. Control follows planning and co-ordination. No control performance is possible without predetermined standards. Thus, budgetary control makes control possible by continuous measures against predetermined targets. If there is any variation between the budgeted performance and the actual performance, the same is subject to analysis and corrective action.

Advantages of Budgetary Control

The advantages of budgetary control may be summarized as follows :

(1) It facilitates reduction of cost.

(2) Budgetary control guides the management in planning and formulation of policies.

(3) Budgetary control facilitates effective co-ordination of activities of the various departments and functions by setting their limits and goals.

(4) It ensures maximization of profits through cost control and optimum utilization of resources.

(5) It evaluates for the continuous review of performance of different budget centers.

(6) It helps to the management efficient and economic production control.

(7) It facilitates corrective actions, whenever there is inefficiencies and weaknesses comparing actual performance with budget.

(8) It guides management in research and development.

(9) It ensures economy in working.

(10) It helps to adopt the principles of standard costing.

Limitations of Budgetary Control

Budgetary Control is an effective tool for management control. However, it has certain important limitations which are identified below:

(1) The budget plan is based on estimates and forecasting. Forecasting cannot be considered to be an exact science. If the budget plans are made on the basis of inaccurate forecasts then the budget progamme may not be accurate and ineffective.

(2) For reasons of uncertainty about future, and changing circumstances which may develop later on, budget may prove short or excess of actual requirements.

(3) Effective implementation of budgetary control depends upon willingness, co-operation and understanding among people reasonable for execution. Lack of co-operation leads to inefficient performance.

(4) The system does not substitute for management. It is mere like a management tool.

(5) Budgeting may be cumbersome and time consuming process.