

P. Janaki Ramudu

Asst professor

Civil Dept

Construction Management  
notes

## Unit - 1

①

management:-

management is an art of getting things done through and with the people in formally organized groups. It is an art of creating an environment in which people can perform and individuals and can co-operate towards attainment of group goal.

management personnel may be described as the people who design an organization's structure and determine how different aspects of the organization will interact.

management process is a process of setting goals, planning and/or controlling the organizing and leading the execution of any type of activity, such as a project. In general an organization's senior management is responsible for carrying out its management process.

Management roles:-

A well-known researcher by the name of Henry Mintzberg identified three general management roles. They are

- ① interpersonal roles
- ② informational roles
- ③ decisional roles

## Interpersonal Role:-

management is largely about interpersonal relations between the management and people both inside and outside the organization, such as employees, superiors, suppliers and customers. As a supervisor, Alexander will serve in his interpersonal role while acting as a figurehead, leader and liaison.

As a figurehead, he represents the face of the company when interacting with people. He also serves as a leader to his team and acts as a liaison between his team members and upper management. He may occasionally act as a liaison between the company and suppliers or customers.

## Informational Role:-

management is also about managing information. A manager's informational role includes collecting information, receiving information and disseminating information. For ex; A manager will receive production goals from his boss and will disseminate, or communicate them to his team. He will also collect information on current production and send it to his boss for review.

Decisional Role:-

managers are decision makers. In fact, failure to make decisions will often lead to failure. Alexander's decisional role includes being an entrepreneur, disturbance handler, resource allocator and a negotiator. For example, manager must often seek creative solutions to problems just like an entrepreneur. He is also responsible for managing and allocating resources to accomplish his production goals. In addition he must handle unanticipated complications that disrupt his team and its goals, known as disturbance handling

Management theories:-

It is a collection of ideas which set forth general rules on how to manage a business or organization management theory addresses how managers and supervisors relate to their organizations in the knowledge of its goals, the implementation of effective means to get the goals accomplished and how to motivate employees to perform to the highest standard

management theories are implemented to help increase organizational productivity and service quality. not many managers use a singular theory

or concept when implementing strategies in the workplace

### Contingency theory:-

This theory asserts that managers make decisions based on the situation at hand rather than a "one size fits all" method. A manager takes appropriate action based on aspects most important to the current situation. Managers in a university may want to utilize a leadership approach that includes participation from workers, while a leader in the ~~mat~~ army may want to use an autocratic approach.

### Systems theory:-

Managers who understand systems theory recognize how different systems affect a worker and how a worker affects the systems around them. A system is made up of a variety of parts that work together to achieve a goal. Systems theory is a broad perspective that allows managers to examine patterns and events in the workplace, this helps managers to co-ordinate programs to work as a collective whole for the overall goal or mission of

the organization rather than for isolated departments

(3)

### Chaos theory

change is constant. Although certain events and circumstances in an organization can be controlled, others can't. chaos theory recognizes that change is inevitable and is rarely controlled. while organizations grow, complexity and the possibility for susceptible events increase. organizations increase energy to maintain the new level of complexity, and as organizations spend more energy, more structure is needed for stability. the system continues to evolve and change

### Theory 'x' and Theory 'y'

The management theory an individual chooses to utilize is strongly influenced by beliefs about worker attitudes. managers who believe workers naturally lack ambition and need incentives to increase driven and take responsibility. while managers, who believe in theory x values often use an authoritarian style of leadership, theory x leaders

encourage participation from workers.

### planning:-

planning is the most important technique of the management. it determines the whole success of the project.

planning is a process requiring the use of intellectual faculties, imagination, foresight and sound judgement, to decide in advance as to what is to be done, how and where it is to be done, who will do it and how the results are to be evaluated.

planning is a course of action to achieve the desired results.

### objectives:-

1. provides direction
2. provides unifying frame work
3. provides performance standards
4. Ensure proper utilization of resources
5. proper design of each element of the project
6. proper selection of equipment and machinery
7. To provide proper safety measures

## Strategic management:-

strategic management involves the formulation and implementation of the major goals and initiatives taken by a company's top management on behalf owners, based on consideration of resources and an assessment of the internal and external environments in which the organization competes.

formulation of strategy involves analyzing the environment in which the organization operates, then making a series of strategic decisions about how the organization will compete. formulation ends with a series of goals or objectives and measures for the organization to pursue.

Environmental analysis includes the:

- \* Remote external environment, including the political, economic, social, technological, legal and environmental ~~in~~ landscape
- \* Industry environment, such as the competitive behavior of rival organizations, the bargaining power of buyers/customers and suppliers, threats from new entrants to the industry, and the ability



of buyers to substitute products and

\* Internal environment, regarding the strengths and weaknesses of the organization's resources (i.e. its people; processes and IT systems)

### (\*) Decision making Tools and techniques :-

When running a business, making the right decision can lead to success, while making the wrongs can result to failure. With so much riding on each decision, it's important that thoughtful consideration is put into each one that needs to be made. To help them, many business leaders go through a thoughtful decision-making process.

While there are a wide variety of decision-making techniques tools, many tend to revolve around the same key principles of figuring out the decision that needs to be made, considering and researching the options and reviewing the decision once it's been made.

The university of Massachusetts - Dartmouth outlines seven basic steps in effective decision making.

- 5
- Identify the decision to be made:- After realizing that a decision must be made, you then go through an internal process of trying to clearly define the nature of the decision you must make.
  - Identify the decision to be made:-  
Gather relevant information: most decisions require collecting pertinent information. Some information must be sought from within yourself through a process of self-assessment, while other information must be sought from outside books, people and a variety of other sources.
  - Identify alternatives:- Through the process of collecting information you will probably identify several possible paths of action, or alternatives. In this step of the decision making process, you will list all possible and desirable alternatives.
  - weigh evidence:- In this step, you draw on your information and emotions to imagine what it would be like if you carried out each of the alternatives to the end. you must evaluate whether the need identified in step 1 would be helped or solved

through the use of each alternative.

- choose among alternatives:- once you have weighed all the evidence, you are ready to select the choice that seems to be best suited to you.
- Take action:- you now take some positive action, which begins to implement the alternative you chose
- Review decision and consequences:- In the last step you experience the results of your decision and evaluate whether or not it has "solved" the need you identified in step 1. If it has you may stay with this decision for some period of time. If the decision has not resolved the identified need, you may repeat certain steps of the process in order to make a new decision

### organizational structure:-

An organizational structure defines how activities such as task allocation, coordination and supervision are directed toward the achievement of organizational aims. It can also be considered as the viewing glass or perspective through which individuals

see their organization and its environment. (6)

### Line organization :-

Line organisation is the simplest and the oldest type of organization. It is also known as scalar organization or military type of organization. In the words of J. M. Lundy, it is characterized by direct lines of authority flowing the top to the bottom of the organizational hierarchy and lines of responsibility flowing in an opposite but equally direct manner.

An important characteristic of such type of organization is superior-subordinate relationship. Superior delegates authority to another subordinate and so on, forming a line from the very top of the bottom of the organization structure. The line of authority so established is referred as "line authority". Under this type of organization authority flows downwards, responsibility moves upwards in a straight line. scalar principle and unity of command are strictly followed in line organization.

This type of organization resembles with the army administration or military type of organization.

As in case of military, commander-in-chief holds the top most of position and has the entire control over army of the country, which in turn is developed into main area commands under major-generals

Each area has brigade under brigadier-generals, each brigade is fabricated into regiments under its colonels, each regiment into battalions under majors, each battalion into companies under captains, each company sub-divided under its alternate lieutenants and so on down to corporal with his squad.

### functional organization:-

F.W. Taylor, who is better known as the father of scientific management developed the concept of "functional organization". As the very name suggests functional organization implies that the organization should be based on various functions. Taylor's functional approach is mainly based on principle of specialization and tries to bring about organizational balance.

The principle of specialisation embodies the concept that both the workers and the supervisors

can develop a higher degree of proficiency by <sup>(7)</sup> separating the manual from the mental requirements. Taylor recommended that there should be functionalisation even at the shop level where workers have to produce goods. He felt that the usual practice of putting one foreman in charge of some 40 to 50 workers should be avoided.

### Human resources management:-

Human resources management is the management of human resources. It is a function in the organizations designed to maximize employee performance in service of an employer's strategic objectives.

HR is primarily concerned with the management of people within organizations, focusing on policies and on systems.

HR departments and units in organizations typically undertake a number of activities, including employee benefits design, employee recruitment, "training and development", performance appraisal,

rewarding (e.g. managing pay and benefits systems)

HR also concerns itself with organizational change and industrial relations, that is, the balancing of organizational practices with requirements arising from collective bargaining and from governmental laws

### Human resource management core functions:-

According to Mondy, human resource management has five core functions which are

- Staffing
- Human resource development
- Compensation and benefits
- Safety and health
- Employee and labor relations

### Human resources management activities:-

A human resources manager has several functions in an organization.

- determine needs of the staff.
- determine to use temporary staff or hire employees to fill these needs.
- recruit and train the best employees

- supervise the work.
- Harmonize relationship between company and workers.
- manage employee relations, unions and collective bargaining
- prepare employee records and personal policies
- ensure high performance.
- manage employee payroll, benefits and compensation
- ensure equal opportunities
- deal with discrimination
- deal with performance issues.
- ensure that human resources practices conform to various regulations
- push the employee's motivation

∴ Leadership :-

Leadership is both a research area and a practical skill encompassing the ability of an individual or organization to "lead" or guide other individuals, teams, or entire organizations.



An effective leader is a person who does the following.

1. creates an inspiring vision of the future
2. motivates and inspires people to engage with that vision
3. manages delivery of the vision
4. coaches and builds a team, so that is more effective at achieving the vision

Leadership brings together the skills needed to do these things. we'll look at each element in more detail.

Different construction projects!

Generally speaking, however, you can separate construction project types into three categories.

- (i) private construction
- (ii) state construction
- (iii) Federal construction.

(1) private construction projects:-

The first type of construction projects is the private construction project. put simply, private projects are projects of every type that are owned, controlled or commissioned by a private party. private parties include individuals, homeowners, corporations, other business entities, non-profit associations, privately funded schools, hospitals, publicly traded companies, etc. Anything, in other words, that is not the government

private construction projects come in all different shapes and sizes, and this is when it's useful to look at the character of the work performed

to segment private construction into different subcategories. These subcategories would include

### Residential construction:-

Whenever construction work is being performed to a single-family residence or a residential facility with (usually) less than 3 or 4 units. If you are working on an apartment complex this would more likely be considered a commercial project instead of a residential project, similarly, if you are working at a condominium, the work would be residential if upon a single unit, but if on the entire complex or the common elements, the work would more likely be considered commercial.

Commercial construction:- commercial construction is the construction of any buildings or similar structures for commercial purposes. commercial construction includes a huge variety of projects including building restaurants, grocery stores, skyscrapers, shopping centers, sports facilities, hospitals, private schools and universities etc.

Industrial construction:- This is a relatively small segment of the construction industry. These projects include power plants, manufacturing plants, solar wind farms, refineries, etc. while termed "industrial construction" it is pretty interchangeable with commercial construction.

## 2) state construction project:-

some people get confused by the term "state" when talking about state construction projects because the term "state" can refer to projects commissioned by a county, city, municipality, government board, public school board or any other state-funded entity. The term "state construction" means, therefore, any government funded construction that is not "federal" which is discussed in the next section.

they can be pretty traditional projects like the construction of a public school or government building (like a court room). These projects can also be pretty sophisticated, such as the construction of a bridge, sewer line, highways, etc.

### 3) Federal construction projects:-

Federal construction projects are very similar to state projects they can taken on a variety of forms: very simple and traditional, and very complex. And the stuff being constructed can be pretty similar to the stuff constructed by state authority courthouses, government buildings, flood control projects etc.

### construction stage:-

To save time and money, it is necessary to divide the entire project into number of stages known as construction stages. After listing out the various stages, it becomes easy to identify the independent activities and thus they can be taken up simultaneously.

Advantage: we can determine

(a) magnitude and nature of work

(b) manner of execution

(c) duration of the job

(d) quantities of the different materials required

(e) quantities of plant equipment and machinery.

preliminary planning:-1. minor irrigation project:-

- (a) river / stream discharge particulars
- (b) Amount of water that can be utilized for irrigation
- (c) study of topographic maps
- (d) selection of site for dam construction
- (e) dam construction
- (f) canal excavation
- (g) cross drainage works
- (h) ayacut development
- (i) land acquisition
- (j) compensation to be paid
- (k) Availability of transportation facilities
- (l) Availability of power facilities
- (m) Availability of housing facilities
- (n) cost benefit analysis

(2) Road project:-

- (a) study of topographic maps
- (b) selection of alternate routes
- (c) length of road along each route
- (d) possibility of connecting as many villages as possible

(e) site conditions

(f) nature of ground

(g) land acquisition

(h) drainage facilities along each route

(i) Returns expected to the government

### 3. Rural water supply project;

(a) population of the area

(b) Rate of growth of population

(c) possibilities of abnormal increase of population

(d) design period

(e) per capita demand

(g) quantity of water to be treated

(h) type of storage tank

(i) pumping units required

(j) distribution of pipes

(k) probable number of private and public taps

(l) water tax

(m) total cost of the project.

### 4. Housing colony project;

(a) selection of site

(b) Acquisition of private land

II (4)

(c) compensation to be paid to private property

(d) nature of soil

(e) cost of levelling

(f) Type of occupants - LIG, MIG, HIG, etc.

(g) minimum plinth area required

(h) Amenities to be provided

(i) Recreation facilities to be provided

(j) public buildings to be provided

(k) Availability of labour

(l) Availability of materials

(m) Availability of transportation facilities, etc

(n) Total cost of the project

5. Rural Hospital project

(a) selection of site

(b) number of beds that are to be accommodated

(c) Acquisition of private land, if the site is on  
~~pro~~ private land

(d) compensation to be paid

(e) cost of levelling



- (f) water supply arrangements to be made
- (g) Availability of transportation facilities
- (h) Availability of power facilities
- (i) Availability of materials facilities
- (j) Availability of labour facilities
- (k) Total plinth area of the hospital
- (l) Total cost of the project.

### contract planning

It is the planning after the acceptance of a tender and award after a contract. It includes following

1. preparation of labour requirement
2. materials statement chart
3. master plan for carrying the work
4. detailed drawings
5. dates are decided for making orders for supply of material
6. sequence of operations and their inter-relationship to be planned.

## methods of construction management:

# (5)

1. critical path method
2. program evaluation and review techniques
3. lean construction method
4. Line of balance method

Among the above first two are mostly followed

### CRITICAL PATH METHOD

The critical path method (CPM) is a project modeling technique developed in the late 1950s by Morgan R. Walker of Dupont and James E. Kelley Jr. of Remington Rand.

CPM is commonly used with all forms of projects including construction, aerospace and defense, software development, research projects, product development, engineering, and plant maintenance, among others. Any project with interdependent activities can apply this method of mathematical analysis.

The essential technique for using CPM is to construct a model of the project that includes

the following.

1. A list of all activities required to complete the project (typically categorized within a work breakdown structure).
2. The time (duration) that each activity will take to complete
3. The dependencies between the activities and
4. Logical end points such as milestones or deliverable items.

### PROGRAM EVALUATION REVIEW TECHNIQUE

The program (or project) evaluation and review technique, commonly abbreviated PERT, is a statistical tool, used in project management, which was designed to analyze and represent the tasks involved in completing a given project. First developed by the United States Navy in the 1950s

PERT is a method to analyze the involved tasks in completing a given project, especially the time needed to complete each task, and to identify the minimum time needed to complete the total project.

# PERT vs CPM

IT (6)

meaning	PERT	CPM
meaning	PERT is a project management technique, used to manage un-certain activities of a project	CPM is a statistical technique of project management that manages well defined activities of a project
what is it?	A technique of planning and control of time	A method to control cost and time
focus on	Event	Activity
model	probabilistic model	deterministic model
Estimates	Three time estimates	one time estimate
Appropriate for	High precision time estimate	Reasonable time estimate
management of	unpredictable activities	predictable activities
nature of jobs	non-repetitive nature	Repetitive nature
critical and non-critical activities	no differentiation	differentiated
suitable for	Research and development project	non-research projects like civil construction, ship building etc.

## COST OPTIMIZATION

cost optimization optimizes cost and or more responses at the same time to determine the factor settings that are both cost-effective and produce acceptable values for the responses. often the factor settings that produce the best results are the most expensive to do. cost optimization determines a compromise between minimizing cost and optimizing the responses.

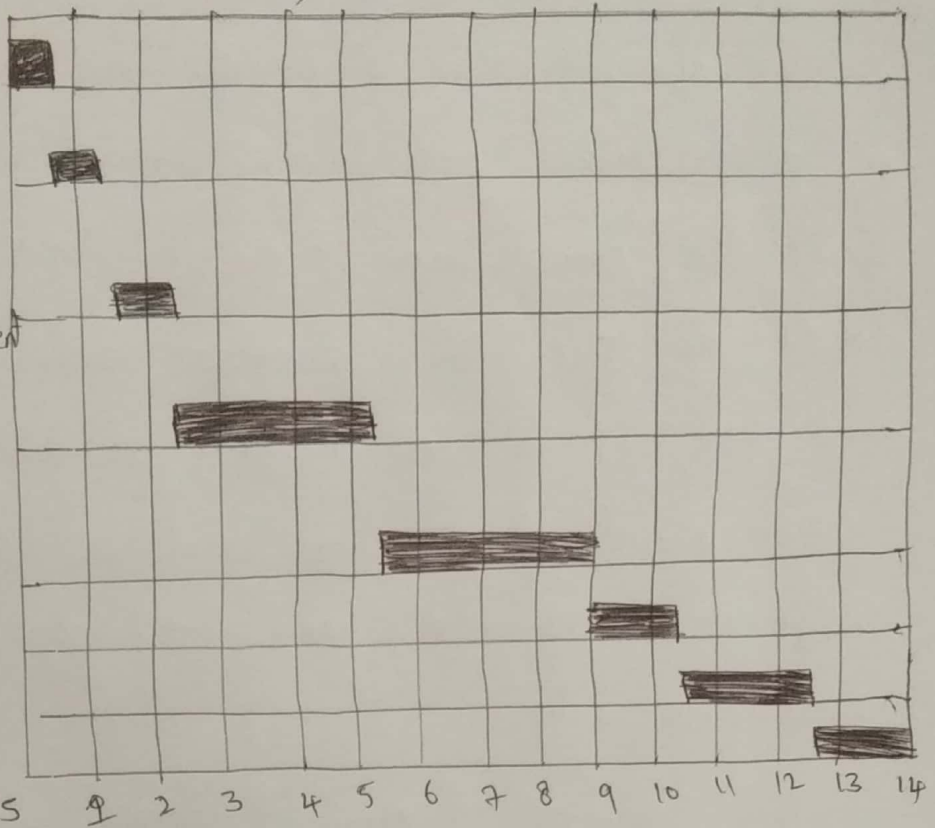
### Gantt - Bar chart'-

The first to show the position of various works during the execution was developed by Henry Gantt around 1900. This chart mainly consists of two co-ordinate axes. one co-ordinate represents the name of the work, activity or job performed and other represents the time elapsed. This chart is known as Gantt - Bar chart on the name of its developer.

1. Excavation in foundation.
2. Laying of concrete in foundation
3. Brick work in foundation & basement
4. Laying D.P.C & B.W in super
5. Laying of roof
6. Fixing of doors & windows
7. Finishing works
8. Electrical fittings

→ Time in weeks

(4) (7)



Gantt - Bar chart.

The simple gantt - Bar chart of a building. The different works have been grouped in eight main works. After completion of one work the next work is started in sequence, the horizontal block against each work shows its proposed time to start and completion in weeks. This chart is prepared in advance before the start of the building work and all measures are taken that work is completed as per proposed schedule.

After completion of one work the next work is started. such cases are found for small works.

But in case of large buildings or other projects, as the quantities of works are more and the work is distributed on large areas, it is not wise to wait for completion of a job, before starting the next job. Thus this process consumes more time and this is to be avoided as far as possible.

The above limitation can be overcome by selecting independent activities and they can be started simultaneously.

For example fixing of doors, windows can be carried out without waiting for laying of roofing.

### Salient features of Bar chart

1. The chart is simple to prepare and interpret.
2. Each item of work (activity) is shown separately.
3. Modification to the chart as on required basis can be carried out easily.
4. Best suitable for simple and small projects.

### Limitations of Gantt Bar chart

- (i) The sequence of activities is not clearly defined
- (ii) The various activities are inter-dependent
- (iii) Non-control on progress of the work.
- (iv) Uncertainties
- (v) The chart is suitable only for simple and small jobs

## scheduling:-

Unit - 3

III (1)

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 programme.

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 data 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:-

1. The type and no. of labour required can be worked out in advance
2. plant, equipment and machinery can effectively be used
3. The cost control study can be made at different stage of work.
4. prediction of requirements of funds at various stages is possible
5. procurement of construction stores can be done in stages
6. Time and progress chart can be prepared.

## Types of scheduling:-

III (2)

1. construction schedule
2. labour "
3. material "
4. Equipment "
5. Time "

## construction schedule:-

construction schedule may be defined as roaster prepared for the execution of different operations in the construction of a certain project. In this schedule the work is subdivided into many operations. The quantity of each operation and time required for its completion is calculated. The amount of work, rate of completing the work the work making allowance for bad weather and other unforeseen items, no. of men required, no. and type of equipment needed and inter relationship of various activities is estimated. The sequence of various operations and the date of completion of each operation is also

maintained in the schedule.

### labour schedule:-

labour schedule is the graphical representation of the labour requirements on certain days or weeks. The labour schedule helps for the arrangement of special type of labour if required for a particular operation in the project.

### material schedule:-

moving and storing of material in any form is known as material schedule. This show the dates of delivery of each type of material at site. A material schedule is useful guide and measure of control of construction materials.

### equipment schedule:-

This schedule is prepared from the construction schedule. This enables the engineer for making proper arrangements. The construction engineer should plan to take maximum use of equipment in shortest period to avoid any financial

loss to the project and make it available <sup>III</sup> (3) for other projects.

### Time schedule:-

The cost of a project is proportional to its completion time. Hence time cost relationships are scheduled properly. It is always advisable to complete the project earlier or atleast in time so that indirect costs are minimised. Hence certain activities are crashed to minimise the completion time.

### 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 ~~an~~ 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

~~Accountants.~~ 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.

i). It is prepared for a definite future period

2) It is a statement prepared prior to a <sup>III</sup> ④ defined period of time

3) The budget is monetary and is 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-ordinating the department and establishing responsibilities, comparing actual performance with the budgeted and acting upon results to achieve maximum profitability.

~~The above~~

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

III (5)

Budgetary control is planned to assist the management for policy formulation, planning, controlling and co-ordinating 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 co-ordination. no control performance is possible without predetermined standards. Thus, budgetary control makes control possible by continuous measures against predetermined targets.



## 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:- III (6)

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 programme 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.

contract:-

contract is an undertaking by a person or a firm to do any work under certain terms and conditions, which should invariably be in writing. The work may be for the construction or maintenance and repairs, for the supply of labour or the transport of materials, etc.

contractor means a person or a firm who undertakes any type of contract. usually this term is confined to the contractors who are engaged in construction or execution of works or repairs.

The system through which the works are carried out by the contractors, who arrange all the materials labour and equipment required for proper completion of the works is known as the contract system. The work should satisfy the specifications with expected quality. It should also be completed within the stipulated time

## Types of contracts:-

They depend upon the nature and the cost of the work. The following are some of the important types of contracts.

- (i) piece work system (contract agreement)
- (ii) lumpsum contract
- (iii) item rate contract or k-2 form of agreement
- (iv) cost plus percentage contract
- (v) negotiated rates contract
- (vi) departmental execution of works.

1) piece work system:- small works upto Rs. 2000/- may be carried out through contracts by piece work agreement. The agreement contains different items of works to be carried out with proper description and rates of works to be carried out with proper description and rates for unit quantity of the work, but not with the total quantity of work or time.

These agreements contain only the description of various items of work to be done and the rate to be paid for. neither the quantity of items nor

IV (2)

the time limit to complete the work is given in it. Detailed specifications of work and the total cost of the work are given in the agreement.

2. Lumpsum contract:- This system is adopted for all major works. Here, the contractor agrees to execute the complete work in all respects, within a stipulated time, in accordance with drawings and specifications for an agreed sum. The detailed specifications of all items of works, plans and detailed drawings, penalty for slow progress and other condition of contract are included in the contract agreement. The design, shape and materials are as per the choice of the contractor, but then have to get approved before the start of the work.

3. Item rate contract or K-2 form of Agreement

In item rate contract, the contractor undertakes the execution of the work at the unit rates/item rate basis agreed at time of tender. The payment is done on the basis of quantities of items done and their respective rates. The quantities of various items are worked out by detailed measurements.

This type of contract is also known as unit piece contract. In this type of contract, the contractor can directly quote a percentage above or below the printed schedule of rates of the department.

#### 4. cost plus percentage contract:-

This is also known as cost-plus percentage contract. In this type of contract the contractor agrees to take the work of construction for fixed percentage over the actual cost of construction. This type of contract is given when no contractor is agreeing to do work on other types due to uncertainty and fluctuation in the market rates of materials and labour.

#### 5. negotiated Rates contract or work on nomination:- such a situation arises,

- (a) when the rates quoted by all the tenders are abnormally high
- (b) when accepting the tender, if the tender other than the lowest has to be accepted after negotiation
- (c) when no body tenders for the work
- (d) when the tenders received are rejected for valid reasons

(e) when any further recall of tenders may be <sup>IV (3)</sup> fruitless

### 6.) departmental execution of works:

In certain cases, works are carried out by departmental execution by direct employment of labour. When the works are to be completed immediately, this method is more suitable. All the materials required for the construction are arranged by the department. Department officers shall have to execute the work so as to complete within the expected time. They have to watch that no wastage of material occurs during the progress of work. Details of work done and their measurements are entered in measurement book before making the payment.

### contract document:-

contract document: Before the work is given out contract, an agreement or bond is prepared by the department. This agreement can be termed as "contract document."

The contract documents include the following

1. Tender notice: Giving brief descriptions of the work, estimated cost of work, date and time of tender, amount of E.M.D & security deposit, time of completion etc.
2. Tender forms: Giving the bill of quantities, contractors rates and total cost of work, time for completion etc.
3. schedule of quantities:- Giving quantities and rates of each item of works and total cost of the work.
4. schedule of issue of materials:- Giving list of materials to be issued to the contractor with rates and place of issue.
5. General specifications:- specifying the class and type of work in general
6. detailed specifications:- of each item of work and material to be used in the work.
7. Drawings:- complete set of drawings including plans, elevations, sections, detailed drawings, site plan etc.



IV (4)

8. condition of contract: containing the terms and conditions of contract.

Important conditions of contract:-

The conditions of contracts includes the following

1. Time of completion of work.
2. volume of work
3. specifications of work
4. Rates of payment.
5. penalties for default on the part of the contractor etc.

Tender:-

A tender is the contractor's bid in writing offering to execute the specified work of construction supply of materials etc. at the rates and amounts indicated, within the time limit and under condition specified and agreed to.

necessity of tenders:-

works, which are to be awarded to contractors, are publicised to enable a sufficient number of interested parties to bid. The lowest bid is generally accepted. unless there are good reasons for not doing so

The following tender documents are made available along with the tender forms to enable contractors to bid for the job.

1. Layout plan.
2. set of drawings, including working drawings.
3. detailed specifications or reference to standard specifications for each item of work.
4. schedule of stores to be issued by the owner indicating the rates and their place and issue.
5. schedule of tools and plant and other facilities to be made available by the owner, indicating the conditions, hire charges and the place of delivery.
6. General conditions of the contract including time limits
7. special conditions of the contract that may have to be highlighted.
8. Amount of security deposits to be paid/deducted.

### Measurement Books (M-Books)

The measurement book, (common form no. 298) is a most important record since it is the

basis of all accounts and quantities IV (5)  
whether the work is done by daily labour, piece work, schedule contract, lump-sum contract or of materials received.

It is the original record of actual measurements or accounts and forms a reliable record as it may have to be produced as evidence in court of law.

All the books belonging to a division should be numbered serially and the pages of each book should be machine numbered.

A register of m-books should be maintained in form PWD VI-20, in the divisional office showing

(a) the serial number of each book,

(b) the names of sub-divisions to which issued,

(c) the date of issue and the date of its return,

so that its eventual return to the divisional office may be watched.

A similar register should be maintained in the sub-divisional office showing the names of the sub-divisional officer and section officers

to whom measurement books are issued.

Books no longer in use would be withdrawn promptly even though not completely written up.

All completed measurement books containing measurements of the works executed by contractors, having running accounts should be sent to the divisional office for final record after final bills have been paid to the contractors.

The following instructions should be observed carefully while recording detailed measurements in the m. Book.

1. Topmost lines under columns 1 to 4 on each of a measurement book should invariably filled in the field.
2. Any lines not required should be carefully scored out in order to prevent additional entries being made later on.
3. Only executive, deputy executive or Ass. Executive engineers should record detailed measurements.

## payment to labour - N.M.R format

IV (6)

Except for the regular and work charged establishments, all persons engaged - departmentally for the execution of works are considered as casual labour. Their wages are drawn on "muster rolls." Muster rolls are prepared in the prescribed form. The nominal muster Roll (N.M.R) form consists of two parts.

part I of N.M.R form consists of necessary columns for entering the names of labour, designation, father's name, their attendance particulars, rates of wages and the total amount payable for each labour. N.M.R form has the provision for entering the total amount of the muster, signature or left hand thumb impression of the labour as a receipt. At the bottom of this form, the person preparing such N.M.R form should sign before submitting to A.E./D.E.E who in turn verifies the details entered and makes the payment.

part-II of the muster roll is used for recording the name of work, amount of work done in cases in which the work is susceptible to measurements. other details like the number of measurement, book, pages in which the measurements are recorded will also be entered in this part. If the work is not susceptible to measurement, a remark to that effect is recorded.

some important instructions regarding the preparation of muster rolls are.

1. Duplicate copies of muster rolls should not be prepared
2. separate muster rolls are prepared for each period of payment. Labour may be paid more than once a month depending upon local conditions and practices.
3. The daily record of attendance and times should be recorded in such a way as to leave no possibility of tampering or making unauthorized entries.

4. After the muster roll has been passed, <sup>IV</sup> (2) payment should be made as early as possible.
5. A record of wages that remains unpaid must be kept in a register of unpaid wages.
6. subsequent payment of unpaid wages is recorded in the hand receipt. A note of the same is recorded in the register of unpaid wages as well
7. as in the muster roll.
7. wages that remain unpaid for three months must be reported to the divisional office.
8. progress of work done by the labour is recorded and is to be compared with departmental rates.
9. muster rolls are checked with reference to entries in the measurement book to the extent of 50% in the sub-divisional and 50% in the division office, when the divisional engineer makes payments

### 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 instrument. To transport and special purpose vehicles like. dampers, bulldozers and other earth moving equipments. batching and mixing plants for concrete vibrators, drilling and pumping equipment. air compressors. file drivers and a host of other items. special type of equipments may be necessary for some works like bridge construction and 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 sub divisions or departments.
- 3) For sale to contractors, employees and other outside parties.