

CONSTRUCTION MANAGEMENT

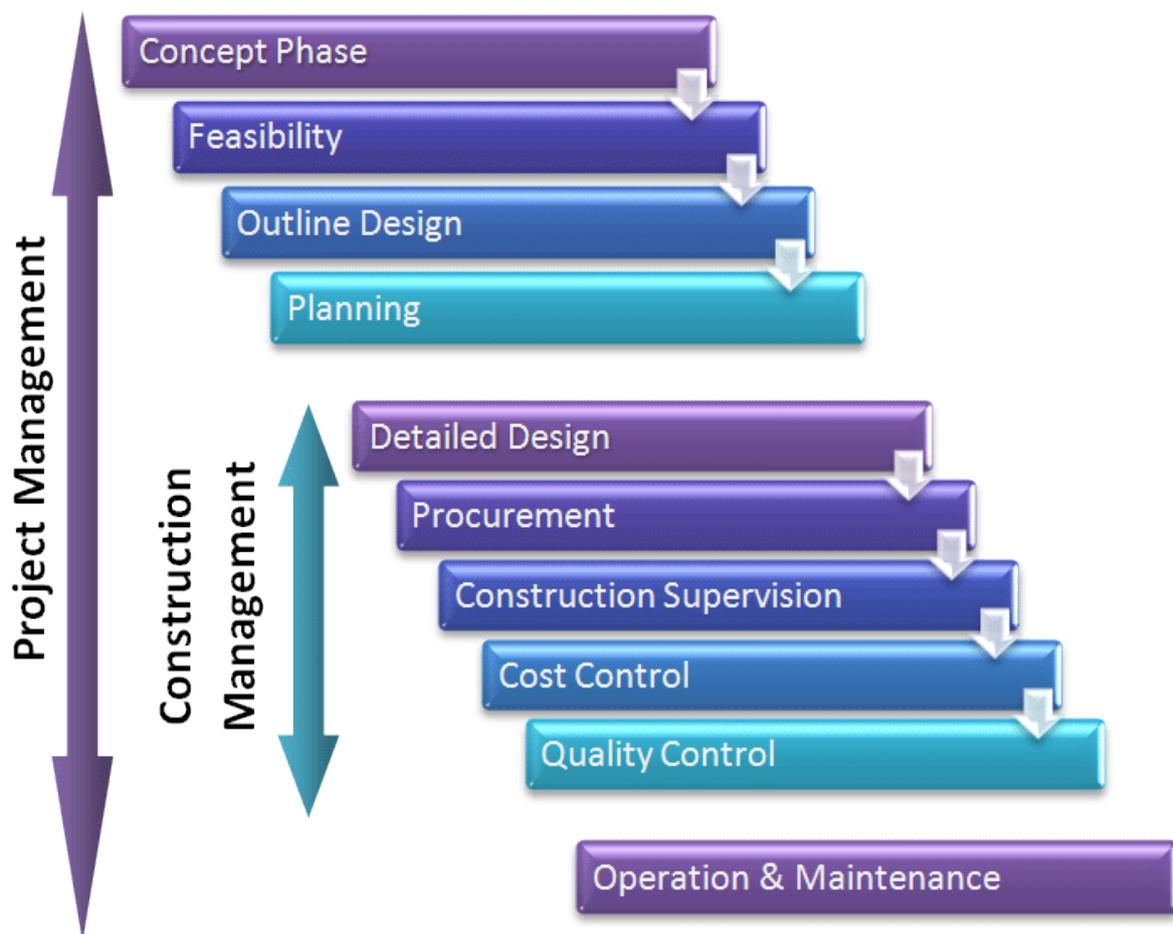
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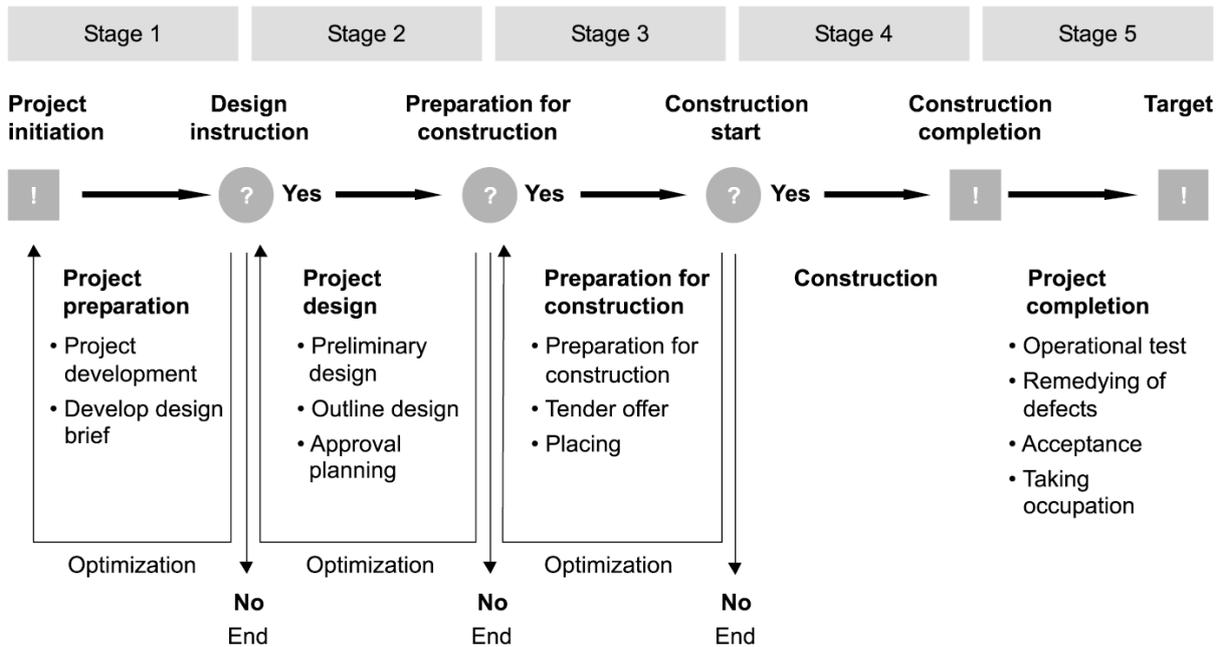
WHAT IS CONSTRUCTION ?

Construction is a very general term meaning the art and science to form material or immaterial objects, systems or organizations. It comes from Latin *constructionem* (from *com-* "together" and *struere* "to pile up") and Old French *construction*. Construction is used as a verb: the act of building, and a noun: how a building was built, the nature of its structure. Construction is often used as a synonym with *building* in its verb tense. word construction as meaning built using scientific principles in a highly skilful way. The distinction between a building and a non-building structure is not always clear but is sometimes determined if the structure has walls or by its size or use. The Oxford English Dictionary includes that *structure* may be used for a large or imposing building.

CONSTRUCTION MANAGEMENT:

CM is the overall planning, coordination, and control of a project from beginning to completion. CM is aimed at meeting a client's requirement in order to produce a functionally and financially viable project. It is a part of Project Management.





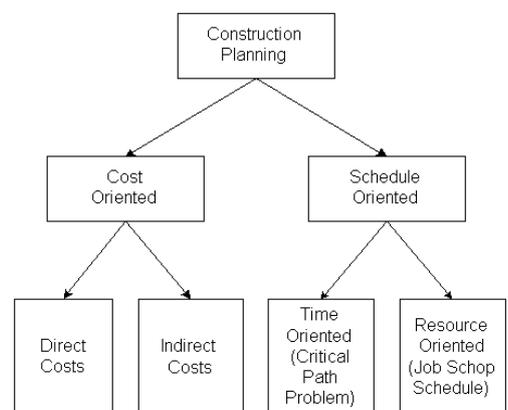
Stages in construction work : Following are the stages in construction -(i) Conception (ii) Study and Evaluation(iii) Design (iv) Contract (v) Construction and (vi) Utilisation and Maintenance

Construction team : The construction team includes the owner, engineers and builders. The owner is an individual, group, private or public body that promotes the work and provides finances and facilities for its execution. The engineer is responsible for the economical and safe design and construction of the work under his supervision. The builder may be any one from a small contractor to a large construction company undertaking projects worth crores of rupees.

Resources of construction work : The resources needed for the construction work 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

Functions of construction management : The aims of management in construction work are to execute the construction work in a planned and efficient manner. Following are the functions of management to achieve its aims. (i) Planning. (ii) Organising. (iii) Directing. (iv) Controlling (v) Coordinating

Planning: In execution of construction works, deciding what to do, when and how to do, is known as planning. In planning of a construction work, various alternative methods of executing the work are studied and decisions are taken regarding the time of starting and completion, labour, materials, machines and finance needed for the provision of construction facilities from time to time.



Organising: This function relates to the creation of an organisational set up capable of execution of planned activity. The type of organisation depends on the type of work, volume of work as well as the method of execution of work.

Directing: Directing involves motivating, guiding, supervising and leading the employees of an organisation. The function can be achieved by establishing good communication between the employees and the management.

Controlling: Controlling is the function of monitoring the progress achieved in comparison with the planned program and identifying areas of deficiency, if any, so that remedial steps can be taken.

Coordinating: Coordinating is the management function of harmonising the action, approach of various employees, and groups of employees to achieve a common goal

Scientific Methods of Construction Management :Scientific methods are adopted in construction management to carry out the construction work in a systematic and economical manner. Scientific management is an approach to management, where in procedures followed are not based on traditional thumb rules but are carefully planned and analysed. The aim of scientific management is to organise and execute the work, results in maximum productivity out of each worker. Scientific methods of management are depends on network techniques which involves graphical representation of inter-relationship among the elements of a project.

Uses of network techniques: (a) Helps the management in planning, scheduling, and controlling the activities. (b) Helps in guiding and directing the team more effectively. (c) Permits advance planning, indicates current progress, and warns trouble spots when there may still be time to avoid them. (d) Helps in handling uncertainties regarding time schedules, co-ordination of different activities .

Scientific methods of management are 1. CPM 2. PERT

- **Critical Path method:** CPM is a network technique used for the planning and controlling the most logical sequence of operations for completing a project. The project is analysed in to different activities whose relationships are shown on the network diagram. The network then utilised for optimising the use of resources and, progress of the management project.
- **Program Evaluation and Review Technique:** PERT is a network technique used for scheduling and controlling the management projects, whose activities are subjected to considerable degree of uncertainties in the performance time. The method of start and finish, critical path and project time are similar to CPM method. *CPM is an activity-oriented method and PERT is the event-oriented method.*

CONSTRUCTION PLANNING : Construction Planning has 4 stages -

1. Job Planning 2. Technical Planning 3. Pretender Planning 4. Contract Planning

Job Planning : While planning a construction project usually it is needed to divide the entire project for phasing out the sequence of construction, and for dividing the operation of one phase into number of jobs. Each job has to be planned with respect to the following: 1. Method of execution of the work: Whether the work is executed departmentally or through contract. 2. Duration of the job: This depends upon the urgency of the work and availability of the resources of the construction

work. 3. Planning of resources: The job should be planned such that the resources of construction i.e. man power and material should be used economically.

Technical Planning Technical planning is done by the engineers for economical execution of the construction work. Objects of the Technical planning (i) Preparation of layout plan.(ii) Finalisation of design and specifications.(iii) Preparation of detailed drawings.(iv) Preparation of detailed estimates.(v) Finalising method of execution of work and initiating procurement action.

Pretender planning : The contractor does pretender planning after receipt of tender notice and before submitting a bid. This helps the contractor in making a proper bid for the contract. Pretender plan includes the following steps.(i) Careful study of the drawings, time limit and other conditions of the work(ii) Working out the quantities of required material, labour, equipment and their availability etc.(iii) Studying the bidding trends of other competitors.(iv) Considering the profit margin and limits of risks that could be taken.

Contract planning: After the tender has been accepted and the work is allotted to the contractor for execution of the work, the contractor has to undertake further intensive planning. This planning at this stage is known as contract planning. Contract planning involves the following steps

- i) Studying alternatives to the construction methods decided at pretender stage to arrive at the most economical method and deciding about the sub contracting.
- ii) Working out the quantities of material, labour, equipments at various stages of work and locating the sources of supply of material, equipments etc. And comparative cost from the various sources
- iii) Planning location of camp offices, layout of the site, service roads, facilities for labour and their accommodation and other related matters.
- iv) Studying inter dependencies of the different items of work.
- v) Finalising the work program for each item of work and fixing dates for the start and completion of each item of work.

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 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 stage3. 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.

Procurement of labour, material and equipment:In any construction project, it is necessary to estimate the required labour, material and equipment required for completion of the project. This can be done with the help of construction schedules. Separate schedules are prepared for labour, material and equipment.These schedules help in procurement of labour, material and equipment at proper time and their efficient usage and storage.

- **Labour:** Labour schedule, helps in providing future labour requirements and efficient and optimum deployment of labour force where ever necessary.

- **Material:** Material schedules helps in providing types of material required along with their quantities and the actual time by which the materials are kept ready so as to avoid any delays in completing a construction project.
- **Equipment:** Equipment schedules are prepared to find the type of equipment required, time and period for which particular equipment is needed. It helps in avoiding the equipment keeping it idle.

Programme of work: Programming is very important and essential for completing a project successfully. It guides and controls the execution of work. Programming involves in 1. Identifying the various outputs.2. Fixing accountability to carry out contribution.3. Preparing detailed schedules for the construction resources.4. Controlling the quality and quantity of work.5. Minimising the time required to complete the project.

Scheduling by Bar charts (Gantt Chart)

	Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12	Wk. 13	Wk. 14
TRANSFORMER FOUNDATION														
excavation and pit digging	■													
cable trench digging	■													
base padding and RCC		■	■											
concreting and curing				■	■	■	■	■						
								■						
Transformer Installation														
Unloading, levelling ,fitting								■						
Assembly of Conservator									■					
Assembling of Radiators									■					
Assembling of Bushings										■				
Oil filling											■			
vaccum and filtration												■		
Commissioning and Testing														
panel wiring , cabling										■	■	■		
Pre-Commisioning Testing													■	
Charging														■

Job layout : A site drawing of the proposed construction showing the location of entry, exit, temporary services, material stores, plant and equipment and site office is known as job lay out. A job layout is prepared to ensure that the work proceed in a smooth and orderly manner that results in maximum efficiency. In order to prepare a job layout, an overall idea of the nature and extent of work and the way in which it is to be carried out must be known from a careful study of the construction plans, specifications and other documents. For preparing a good job layout, knowledge of the storing materials and placing equipments is necessary. A job layout depends upon (i) the nature and type of work, (ii) the topography, location and size of the site (iii) the methods used for its execution.

Principles of storing material at the site : Large quantities of construction material have to be stored at the construction site. Correct methods of storing materials should be known so that the layout of a job at the site can be properly done.

1. Materials should be stored in such a way that they are not affected by impurities or by atmospheric agencies, such as the sun, wind or moisture. Cement and lime must be stored in

covered sheds, Timber, which is affected by the sun and poor ventilation should be stored in a shady place.

2. Inflammable materials must be stocked separately from other combustible material and in an area protected from fire hazard.

3. Explosives should be kept in a safe place.

4. Bricks, tiles and concrete blocks are stocked at ground level limiting the height of the stack to 1.5m, 1m and 2m, respectively.

5. Aggregates are stacked on a clean hard surface in stacks of 2m x 2m x 0.5m.

6. Cement should be stacked in covered sheds on raised platforms at least 30cm. away from walls and in stacks of not more than 12 bags.

7. Reinforcing bars should be stacked in yards away from moisture, oils and lubricants.

8. Heavy items must be kept away from trenches preferably kept near the ramp for easy handling.

9. Cement and lime, which deteriorate with time, must be kept constantly moving by using the earliest arrivals first

CONSTRUCTION LABOUR : Construction labour can broadly divided into two types

1. Casual labour 2. Regular establishment

Casual labour: Casual labour is employed as and when required for the execution of work, payment is made on the basis of the number of days the labour works. There is no provision of leave, except the weekly holidays. This is also known as daily labour.

Regular Establishment: Regular establishment generally includes supervisory personal that are required for more or less continuous period during construction. They are paid monthly wages and entitled to leave and other benefits. The employees may be temporary or permanent. Permanent employees have great security of service and may be entitled to more service benefits than the temporary employee .

Followings regulations are applicable with construction labour:

Minimum Wages Act, 1948

Workmen Compensation Act, 1923

Contract labour act, 1970

INSPECTION AND QUALITY CONTROL : Inspection is the art of comparing the materials, performance or products with the laid down standards. Engineers must inspect construction work of contractors daily .

Functions of Inspection :

- (i) Inspection of pit digging, base padding, RCC, concreting , curing , foundation , grouting , assembly, erection , installation
 - (ii) Inspection of materials used by contractor
 - (iii) Inspection of equipment as per specification , test certificates
 - (iv) Inspection of works at each stage. Safety provisions .
 - (v) labour payment by contractor
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- Major items of quality control are (i) Concrete (ii) Steel structures (iii) Masonry (iv)Water Proofing , muffling (v) Joinery and Timber work (vi) Services
 - Services include electrical, sanitary, water supply, air conditioning etc.
 - Inspection of quantity : Numbers , Km , cubic meter,