The Construction Industry

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Discuss the key features of Construction industry
- ✓ Understand the Role of Construction Supervisor
- ✓ Describe the importance of Construction Supervision, Inspecting and Testing Procedures.

The Construction Industry

Introduction

Construction is the oldest and one of the largest industries in the world with its market size of about ten trillion US dollars. Construction is a field activity where resources like materials, labour, equipment, time and money are utilised to create structure such as a building, road, culvert or a bridge. The resources being very scarce, it is necessary to ensure their optimum utilisation. The structure has to be completed in the set time and cost as well as to the specified quality standard. The most important need to achieve this is effective supervision of the construction activity. Apart from giving introduction to construction industry this unit also focuses on different aspects of construction supervision. In this unit we shall also study the role of a construction supervisor and his position in the management team.

In international market, construction has now" become a high-tech, mechanised and complex industry. Twenty first century will be the century of liberal economy and global marketing. The key words for progress and even for existence will be "QUALITY" and "EXCELLENCE". With knowledge explosion, the technology is changing and new technologies are emerging at even faster rates with greatly reducing productive life spans. The technologies and skills of human resources are becoming obsolete rapidly. It is now essential that even the professionals in the field must continuously upgrade and update their knowledge base and managerial skills. The focus on twenty first century will be on learning organisations. Construction projects require huge investment of resources. The productive and effective management requires a very innovative, creative and efficient organisational structure to manage the financial, technological and human resources within the constraints of time, cost, quality and availability. The construction industry has certain specific characteristics, vastly different from other industries. These must be studied and analysed before any attempt is made to develop the organisational model for it.

In this unit, a broad overview of construction industry has been presented along with its characteristics and other functional aspects.

Market Size and its Importance

From the architect's dream and the engineer's endeavour to final satisfaction of user, construction represents many of our civilisation's noblest achievements. Construction is as old as history. Builders from history have left lot many structural wonders for us.

Amongst the classics of the past may be mentioned the pyramids of Egypt, Taj Mahal, Temples of Konark, Mohan-Ja-Daros, and China's Great Wall. The construction industry has laid down the physical and technological foundations upon which the modem civilisation has developed. It envelops a very large canvas of human activities, from huts to skyscrapers, from cart routes to super express highways, from culverts to multi span multilane flyovers, , from chopals to stadiums, from village shops to super markets and large industrial complexes, refineries and fertilizer's plants, from observation posts in high Himalayas to off-shore drilling plate forms in deep seas. There is no aspect of human life and civilisation, upon which the construction does not have a profound influence, not only spanning physical spaces but also spanning

hearts, by bringing people together in their social, cultural, political, recreational and economic endeavours. For better or worse, the construction is the most pervasive factor in our life.
Construction plays a essential role in growth of economy as a basic infrastructure facility.
An increase in the level of construction activity will increase the GDM and will have positive influence on employment, and public income. Any budgetary squeeze on construction will reduce the construction activity and after a time lag, reflect with decreased GDP and slowing down the economic growth. Any change in the level of construction output will have a great corresponding effect on the country's economy as a whole. Backward linkage also will have a widespread influence as much of the construction inputs in the form of raw, semi-processed and processed material, e.g. aggregate, bricks, cement, steel etc., is provided by relatively labour intensive domestic vendors and basic industries.
Throughout the world, construction is a leading industry in all market economies. It is the first indicator of health of the economy. Its acceleration starts a floating economic growth and vice-versa. Korea, Taiwan and Hongkong, have used construction sector to lift themselves into vibrant economies. Malaysia and China are using the same strategy, by rebuilding their cities and highways etc. to become major players in global economy.

Features of Construction Industry

Construction projects (activities) have some unique features with respect to other industrial projects. Some of the important features have been described below:

Complexity

The conventional image of construction is merger of a series of manual and semi-manual activities. This concept is highly misleading. Construction projects, today, are high-tech, highly mechanised and complex. A typical construction project is characterised by consumption of numerous types of materials, variety of tools, equipment, plants and machinery, several different contracting agencies, big and small, sub-contractors, petty contractors, vendors and suppliers, area specialists, consultants, supervisors and managers, each with independent organizational set ups, participating with complex interactions, working in cooperation, sometimes even at cross purposes. In addition to these highly interactive and complex environment at construction sites, thousands of activities; each of different nature are arranged simultaneously, many of them, in sequence or at random. Thus, the construction project today is much more complex than any other production process, manufacturing or service industry.

Uniqueness

As stated earlier, construction is basically different from other industries. One important characteristic of this difference is its "one-off' nature. Each construction project is a "unique" project, vastly different in nature and type from each other. For example, if two identical bridges are to be constructed at two different sites, the site characteristic and soil and sub-soil properties will introduce many variations, so as to make each project very much different from the other.

It is a now universally realized that each construction project is UNIQUE. This "One-off' characteristic of construction project coupled with large changes in working climate, conditions and environment, different technology levels and multiplicity of input resources makes it virtually impossible to examine what would have happened if an alternative decision was taken. Like life, construction does not permit any second chance to improve upon. This makes optimal utilisation of resources at construction site a highly complicated exercise.

Hence, the level and quality of supervision has to be of a very high order on construction site. A very efficient and fast management information system is essential to be installed at a construction project site. Any small deviation in basic parameters of time, cost and quality is required to be detected almost instantly as it occurs and communicated to concerning decision maker almost instantaneously so that corrective measures can be undertaken before it is too late.

Mobility of Facilities

In product, process and manufacturing industries, the work environment and value adding facilities are stationary. Hence, the work environment and facility layout can be optimally designed, provided and controlled. The raw material in the form of job moves from one facility to another adding value at each stage of operation.

On the contrary, on a construction site, the product is stationary, while value is added at each stage of operation by moving the faculty from one construction stage to another; from place to place, from site to site and from level to level, all these operations are undertaken under different uncontrolled environmental conditions. The temperature, visibility, humidity, air current speed and other climatic parameters are constantly changing on a minute to minute basis. Most of the time, the work is to be carried out from a highly unsatisfactory condition of partially completed unfinished structures and temporarily assembled, hazardous working platforms. For both horizontal and vertical movements of input materials, human resources, equipment etc., the conditions are continuously changing.

Thus, managerial techniques developed and perfected for other industries cannot as such be used on construction sites. These are required to be modified or new techniques developed to satisfy the constraints of construction sites.

Multiplicity of Agencies

Another typical characteristic of construction industry is the presence of multiple regulatory agencies controlling the constructional site. Every one of these regulatory agency is independent of other and often working at crossheads. Many Government, and Semi-government agencies local councils, Corporations, Area Development Authorities, Urban and Rural Planning and Development Agencies, Town and Country Planning Boards, Mining Department, Forest Department, Safety Inspectors, Fire Department, Labour Department, Director of Industries, local Police and Administration, Sales Tax, Income Tax and Excise Department, various other Public Departments and similar never ending plethora of controlling authorities are required to issuing clearance certificates, controlling various aspects of construction at each project site. It is estimated that at a typical construction site, the construction manager is expected to deal with a

minimum of twenty two different inspectors and fill at least two dozen different returns quarter yearly and to attend to the whims of large number of agencies.

Organisation

Construction is traditionally a contracting business right from the good old days. Most of the work on construction is carried out with mobilisation and other advances given by the owner.

A typical large construction project will have a prime contractor or a group of prime contractors, who bid for the work and secure it. Then, this corporation of prime contractors selects several subcontractors, for different work packages. A subcontractor in turn, will engage his own group of minor and petty contractors and vendors for various work elements, activities, jobs and trades. Thus, on a typical construction project site, there will be a network of thousands of contracting firms, carrying out contractual activities in a time bound framework. The short term employment with job tenure lasting only for the period of particular contract duration and piece rate payments are main features of construction contracts. Management and labour relations are also contractual in nature and last only for the period of contract duration.

In general, there are three groups of stakeholders involved in a construction project, each group contributing a specific component, namely the owner group, the engineering group and the construction group.

a) The owner group supplies the "need" of the project and the finances required to fulfil this need.
b) The engineering group consists of area experts like architects, structural designers, and construction managers. These area experts supply the specifications, method statements, designs and schedules of the project and perform supervision and quality control functions.
c) The construction group consists of a matrix of contractors executing the various work packages.

The interrelationship between these stakeholders is contractual in nature. Thus, there is no supreme authority at construction project site over all the interacting stakeholders. There are only relative power and dependence between different contracting organisations. Construction is therefore a typical example of complex inter-organisational interactions, It involves several participating organisations, both direct and indirect, which influence the overall quality and productivity at site, yet are not responsible or answerable to anyone, Each particular organisation view the project from its own narrow and specific perspective. The owner would emphasise the strict financial control to achieve optimum quality with least expenditure. The priority of construction manager would be the strict adherence to cost, time and quality schedules, architect's main concern will be on aesthetics and beauty while structural designer will stress on safety, simplicity and constructability. The construction contractor will like to push up his output and productivity. These complete and conflicting interactions of so many different and independent organisations will have a far reaching and profound influence on the quality, productivity and work environment at a construction project site.

Broadly speaking, the basic activities at a construction project can be grouped into three main categories, i.e.

- ✓ Designing and Planning,
- ✓ Construction Execution, and
- ✓ Inspection and Supervision.

Each agency associated with the above sub-group of activities has their own particular organisational set up compatible with the nature of its work load. The detailing will depend upon size, geography of area of interest, nature of activities and complexity of the problems faced by it.

It, however, can be concluded that the construction industry with all its uncertainties, high risks, and complexities, will always remain the most demanding on construction organisations. It is a challenging as well as hazardous profession. It is an unforgiving enterprise demanding highly creative and innovative human resource with experience, sometimes acquired at a great cost.

Finance

The financial structure of construction industry is also different from other industries. The capital requirement on a construction project can be classified into following sub-headings:

a) Investments in permanent assets, e.g. tools, plant & equipment, form work, machinery, cantering & shuttering etc.
b) Short-term finances to meet the cash flow requirements at construction sites; earnest money and security deposits.
c) Investment in future, i.e, education, training, research and development of human resource and technologies.
d) Overheads in salaries and establishment expenditures, advertisement and public relation expenditures essentially required for procuring contracts, legal expenditures and similar such specified and unspecified fund requirements.

More often than not, the construction is carried out on credit and mobilisation advances, bank loans against securities. Some capital is always blocked in form of earnest money, security deposits, delayed payments of bills etc., putting financial strains on cash flow requirements.

Management

Majority of construction projects are situated far from the head office and from one another. It is, therefore, almost impossible to provide a continuous supervision or control over the routine and day-to-day activities and problems of project sites. The physical distance itself will decrease the degree of management controls and hence, increase the work force autonomy. Improvisations have to play an important part in many "here and now)' decisions at construction sites.

It is very important that at a construction project site there is a widespread delegation of decision making powers through all levels of organisation right up to operative level.

This contrasts markedly with the manufacturing industries where rules, procedures and method statements can be formed and applied more rigorously to the job tasks. Thus, the availability of trained

and skilled human resource at all levels of management is much more important in construction sector than any other sector of industry.

Productivity and Labour Quality

Productivity

The productivity of construction industry is at a very low level as compared to other industries. Statistics show that in decade of 70s, the increase in construction productivity was minimum at 0.8% as compared to 5.4% for public utilities, 4.6% for transportation and 2.4% of all industries taken as an average.
Several reasons can be assigned to the cause of low productivity in construction sector;
Haber and Levinson in their study have categorised them into following two broad categories:

a) Supply characteristics.
b) Demand characteristics.

The supply characteristic includes the immobility of construction projects, less than optimal working conditions and diversity of product. On the demand side, the construction industry is subjected to heavy fluctuations in demand (seasonal and cyclic). But the single most important reason of low productivity is scarcity of trained and skilled human resource at a level of management from CEO to operatives.
The need for better level of technology and practice, systematic planning and work programming and effective management is therefore self evident. Higher quality human resource is needed for wide ranging aspects to be taken into account, e.g. site investigation, market survey, bidding for works, mode of construction, supervision and control of man, maternal, equipment and finance, monitoring the progress of execution, providing necessary controls of time, cost and quality, designing, implementing and maintaining an effective management information system from conceptualisation to completion of project and its subsequent maintenance during the stipulated period, settlement of contractual obligations and disputes and the realisation of outstanding dues.
The system productivity of construction industry can thus be considered as a complex interaction of following three productivity factors:

a) planning,
b) designing, and
c) Performance (execution).

The system management can thus be looked upon as a process of coordinating and communicating the entire project process of feasibility, design, planning, scheduling, contracting, executing and controlling with the objects of maximizing system productivity (e.g, minimising cost and duration):

Labour Quality

The basic necessity of work quality is the quality of its human resource particularly at the operative level. The labour productivity is largely dependent on the quality of labour force available in given geographical area. Widely scattered and varied construction projects undertaken by a construction firm makes it necessary to employ the local labour to a very large extent barring some much specialised trades. Workers, thus, follow the availability of job opportunities in the area and constantly change their employment. Their loyalty and commitment is more towards their team leader and labour contractor as compared to their employer.

Another important aspect in labour quality in construction is "learning by doing" process of training and acquirement of skills. The different methods of doing the same work and different methods of achieving the same goal are learned either by imitation or trial and error techniques at actual construction sites. One's perceptions of work methodology are changed, modified, reinforced or defined by subsequent experiences.

Safety Hazards

The construction, at project site, is highly accident prone. The accident rate in construction industry is at least four times higher than that in any other industries. The construction consists of work executed from temporary structures and semi-finished stages, e.g. scaffoldings, staging and false work attached to and supported by permanent structures that are at various stages of erection and completion. The progress of execution of these operations is continuously transforming the machinery and equipment (facility) layout, and working environment. None of the safety precautions and safeguards adopted in permanent and "long-term" factories can be applied on construction sites. The working environment at the construction sites (temporary factories) is much more hazardous and straining due to rapidly changing character of worksites, uncertainties of the natural environment and fluctuating levels of heat, light and sound. This is in complete contrast with the working conditions and controlled environment of manufacturing and other industries.

According to a survey in Ontario, Canada, the loss due to accidents in a particular year to construction industry in Canada was more than the total profit of all the contractors in Canada in that year. It is, therefore, imperative that safety environment and hence, the safety precautions and safe guards must be very carefully and exhaustively studied, researched and strictly enforced at construction site.

Role of Construction Supervisor

On a construction site supervisor is responsible for getting the work done from workers. Supervisor constitutes the first line of management. The details of their jobs differ from others in the construction organisation: The supervisors are the grass roots level representatives of management of the organisation to the non managerial employees' i.e. skilled and unskilled workers. They get the work done through the efforts of the others. The Supervisors' task is a difficult one and complex too. They have to channelise the energies of the workers to accomplish the job entrusted to them. In this effort a supervisor has no doubt,

to concentrate on the individual efforts, but his focus ought to be the predetermined goals which have been assigned to him.

Position of the Construction Supervisor

Like in most other organisations, in a construction organisation too there are many levels of management which are in effect the levels of authority and responsibility. Generally, three levels of management are identified which are briefly discussed below:

Top Level Management

This is generally concerned with the formulations of goals and, policies of the organisation.

Mid Level Management

This comprises people who report to the top management. They interpret the policies and objectives laid down by the top management in terms of the areas of their specialisation or operation. A few examples of the areas where the middle level managers operate could be procurement of materials, equipment management, labour management etc. On a construction site middle level management may be concerned with specialisation like concreting work; installation of lifts or air-conditioning systems. On large works spread over wider area middle level management may deal with independent portions of work like head works; spillways, canals etc. In some organisation middle level management itself may be made up of more than one level.

First-Line Management

This is the lowest level of the management and has to deal with non-managerial employees' i.e. workers. First line managers obtain instructions from and report to the middle level management. The nature of the organisation and the nature and magnitude of the work carried out by the organization determine the nature of work which the supervisor has to get accomplished from the workers.

Responsibilities of the Construction Supervisor

Supervisor has the responsibility of ensuring that the work entrusted to him is completed on schedule; specified quality standards are met and the costs are controlled.

Supervisor's main concern is the individual as well as group productivity of workers he is controlling, environmental protection and safety and health of the employees.

The important activities which a supervisor has to perform are briefly outlined below:

i) To give instruction to workers under his control by explaining the assignment and rendering necessary assistance in the performance of the work.
ii) To motivate the workers to contribute their best to the jobs assigned to them.
iii) To ensure that the workers under his control function as a group with proper team spirit.
iv) To maintain discipline among the workers.

v) To resolve the differences or conflicts arising amongst workers, to the satisfaction of all concerned.
vi) To maintain good relations with workers, unions if any and also with the general public.
vii) To plan the work, organise the resources and ensure that the time schedules are met, costs are controlled and the quality requirements are adhered to.
viii) To develop the employees so that they can do their present work more efficiently and to train them for the new jobs and higher responsibilities which they will have to perform as and when the organisation grows.

Construction Supervisor and the Phases of Construction Project

The ultimate goal of a construction project is creation of a structure/service. Construction project usually passes through the following phases.

i) Concept of the structure on the basis of the need felt by user
ii) Preliminary phase where feasibility of the project is established; alternatives are compared and final proposal is selected.
iii) Detailed surveys, design, drawings and estimates where the proposed structure is created on paper.
iv) Construction where the proposal created on paper is brought into reality through the field activity by using various resources.

Supervision in the Construction phase is very important. Construction can be done by user/owner himself by creating suitable organisation or he can entrust the construction to a contractor. If the construction is done by the owner/user-method known as departmental method of construction or in-house construction, the construction supervision will be done on behalf of the owner/user. When the construction is done through contractor, supervision has to be done on behalf of both the owner who is known as client and also on behalf of the contractor who actually constitute the construction agency.
Supervision for the client (owner/consultant) and the supervision for contractor are discussed in the following paragraphs.

Supervision for the Owner/Consultant

When the construction is entrusted to contractor; the owner may appoint a supervisor who will ensure that construction is done strictly according to the contract drawings, specifications and conditions of contract. Alternatively, he may have an agreement with a consultant who in turn appoints a supervisor to supervise contractor's construction works. This supervision is done on behalf of the owner. Such a supervisor is not in the true sense of the term fist line manager directing and co-ordinating the efforts of the field workers. This is the responsibility of the contractor's supervisor. Owner's supervisor has to mainly ensure that the work is being done- according to the conditions of the contract. He has to strictly ensure that:

i) construction is done according to the contract drawings, specifications,
ii) contractor adheres to the agreed schedule, and
iii) Quality standards as regards materials, processes and workmanship are adhered to.

Owner's supervisor assists the engineer in execution of work. He has also a few more responsibilities. He should:

i) Ensure that the reports of day to day progress are submitted to the owner's engineer. He should obtain instructions from the engineer and report his problems/difficulties to him,
ii) deal with responsible member of the contractor's staff,
iii) explain to the contractor accurately any aspect of the work which the latter may not understand,
iv) insist on strict adherence to the quality standards so that contractor realises that only high standard of workmanship will be accepted,
v) be fair but firm in dealing with members of contractor's staff,
vi) whenever there is any problem, take prompt action in solving it if it is in his jurisdiction or he should promptly report it to the engineer,
vii) not wait till the contractor completes a job to reject it on the ground that it does not meet the contractual requirements. He should take timely actions to bring to notice any defective work or a departure from specifications,
viii) report serious matters needing dismantling any portion of work or stopping the work to the engineer,
ix) generally follow the contract document in their spirit and not in the letter but he should remember the limitations of his authority and always seek guidance from his engineer,
x) be tactful while dealing with the contractor's staff and other concerned people, avert a state of aggression and see that an atmosphere of affection is maintained on the site,
xi) maintain all work diaries, registers, reports on the materials arriving on site, their consumption in the construction, labour employed, equipment deployed etc.,
xii) Maintain a work order book wherein instructions are given to the contractor by the engineer and other authorities.
xiii) report stages of work requiring the inspection and approval of the engineer or any other authority to the engineer so as to ensure timely action and avoid any delay,
xiv) assist the engineer in preparing or scrutinising the periodical bills to be paid to the contractor, and
xv) he should maintain a set of contract documents as well as a register containing the details of documents (drawings, instructions, specifications) that may be introduced from time to time.

Supervision for the Construction Agency

If you have to work as a supervisor for the construction agency, you have a different and more important role to play. Construction agency is responsible for the efficient management of the construction work i.e. to ensure that the structure is completed!

i) within the stipulated time,
ii) within the stipulated cost, and
iii) to the predetermined quality standards.

And as a supervisor of the construction agency it is your responsibility that the above objectives are met with on the site by supervising the field activities. To accomplish this you must understand your precise role in the overall organisation.

Before the construction activities are actually commenced in the field, the construction agency Supervisor for whom you are supervising the work, has

i) Prepared and obtained all the necessary drawings for the structure to be built. These drawings may have to be supplemented by detailed working drawings during the construction.
ii) a bill of quantities listing the items of construction and their quantities
iii) Details of resources-materials, equipment, labour etc., required for the construction.
iv) finalised the sources from which these resources are to be obtained viz. Dealers/suppliers, labour, contractors, sub-contractors etc.,
v) prepared a programme of construction indicating the sequence of items of construction, duration required by them, important milestones and the expected dates by which they are to be achieved, and
vi) Appointed engineer to be in charge of the project. He will be designated as the Project Manager/Project Engineer/Construction Manager. There will he Engineers known as Site Engineers, Field Engineers etc. as well as other members to assist the Project Manager. Actual project team will depend on size and nature of the project.

You as the Supervisor will have to perform the task of instructing and guiding the field workers and get the work done from them.

How will you accomplish this task successfully?

i) You must carefully study all the documents - drawings, specifications, contract documents etc. and understand them thoroughly. In case there are any doubts consult the Engineer to whom you report and get the doubts cleared.
ii) Study the programme of construction prepared by the project in-charge. From this programme prepare a detailed working schedule for a suitable duration, say a week. Such a schedule should show the details of actions to be taken by you on a daily basis.

Sample for a Supervisor's schedule for a typical day

Table 1.1

Supervisor's schedule for a typical day will show the following:

a) Brick masonry for the superstructure of building No.1 to be continued.
b) Excavation for the foundation of building No. 2 to be started today, Labour team to be organised, instructions to be given to them, necessary tools to be issued.
c) Excavation work should he completed by tomorrow evening; the field engineer to be requested to inspect the work tomorrow and approve the foundation so that laying the concrete bed for the foundation can be commenced day after tomorrow.
d) To send a requisition to the store to supply cement, to place an order for supply of sand and aggregates so that these materials will be delivered to site by tomorrow evening.
e) To request the project office to supply the working drawings of RCC slab so that they can be studied and the necessary preliminaries such as method statements, requirement of materials and equipment can be worked out; arrangements for their procurement can be planned and concerned labour contractor can be informed in time to be ready to start the work.
f) To send a note to the accounts department to arrange for the payment ofwages to labour at the end of the week.
g) Reports to be submitted to the project office.

The above list of activities is not exhaustive but is of an indicative nature only.

Supervisor should ensure the following facilities on the construction site:

i) Site offices, site stores, workshops, canteen etc. with necessary furniture, ventilation, lighting etc.
ii) Access to the site as well as various units such as site office, stores, workshops etc.
iii) Adequate parking facilities, unloading platforms for incoming materials.
iv) Toilets suitably located - separate toilets for ladies
v) Adequate supply of water for drinking, washing and construction operations.
vi) Arrangements for regular cleaning of office, stores, canteen etc.
vii) Ensure adequate safety precautions on site by:
    a. safe stacking of material,
    b. safe handling of material,
    c. insisting and the use of protective wears like helmets, gloves, gum-boots, goggles where necessary,
    d. providing fencing around the excavated trenches,
    e. Ensuring good housekeeping on site,
    f. providing first-aid box on site, .
    g. employing trained workers and operators,

h. ensuring proper maintenance of equipment, and
i. providing training to workers and creating an awareness of safety amongst workers.

Supervisor should maintain the necessary documents on the work site. The following is the indicative list of some important documents.

- A list of names, addresses and telephone numbers of the persons and agencies concerned with project (viz. owners, higher officers, officers of local authorities, Govt. Suppliers, police department etc.).
- A set of approved drawings and specifications.
- Contract documents (in case of contract work).
- Construction programme (network or bar chart).
- Files containing important letters.
- Work order book.
- Progress chart.
- Registers for materials, use of equipment, labour employed.
- Record of tests carried out on materials, works.
- A general plan of work showing thereon work completed every day.
- Daily diary containing

a. Details of works in progress,
b. Notes regarding weather conditions,
c. Names of visitors,
d. Number of hours worked,
e. Details of work carried out by sub-contractors, labour contractors,
f. Workers employed on work site,
g. Materials arrived; issued to sub-contractors, consumed on works,
h. Equipment details such as hours worked, fuel/power used, repairs & maintenance output etc., and
i. Any other relevant details.

Entries in daily diaries form the basis of the reports which the supervisor has to submit in the prescribed form to various offices periodically.

Construction Supervision and Inspection and Testing

Inspection and testing constitute very important features of a construction work from its commencement to completion. Construction Supervisor has to be ready to start the work.

Inspection

Inspection involves checking, with or without the aid of any instruments. This is done with a view to ascertain the predetermined quality parameters. Thus inspection for construction materials is done to ensure that the material is of the specified colour, size, shape, and quantity etc. While the construction work is in progress inspection is carried out to ensure that;

i) the construction materials are used in the specified proportion,
ii) the work is carried out in the correct sequence,
iii) construction activities are carried out by following correct procedure, and
iv) the output of the construction activity satisfies the predetermined/specified requirements in term of physical attributes e.g. dimensions, shape, gradient etc. Or performance e,g. water tightness.

Two factors need to be considered in connection with the inspection. They are

i) who does the inspection, and
ii) when (i.e. at what stage of the construction process) is the inspection carried out?

Inspection is carried out by the Supervisor himself and he has to do this very frequently. The officers (Engineers) at higher level also inspect the work. If the construction is done through contract the owner's Engineer will also inspect the work so will the inspection be carried out of the Engineers at higher level in the client's organisation.

Inspection will be necessary for checking materials, equipment and method of construction used. It is necessary to approve the intermediate stages of work e.g. approval of foundation, formwork placement of reinforcement etc. before further work is proceeded with. Inspection is also required after an item of work is completed to check the dimension, level, plumb etc. as per drawing and specification.

Certain stages have to be inspected by Engineers. The supervisor has to arrange for such inspections in advance by requesting the concerned officers to visit the site, inspect the work and give his approval. The date and time of inspection and the observations made by the Engineer should be recorded in the work order book maintained at the site. When such an inspection has to be carried out by the Engineer of the client's organisation the same procedure is followed, Even though the inspections are carried out by various officers at different occasions. Supervisor should ensure that work is done as per specifications, drawings (and conditions of contract) by being vigilant constantly.

You should identify the important stages of work and the results to be achieved at that stage and inspect the work regularly. Any deviations noticed should be corrected promptly. This is particularly necessary if you are client’s/owner's Supervisor. You should not delay the inspection till such time when defects/deviations if detected can be remedied only by rejecting and redoing the work.

Rejection of works delays the completion of work, adds to the cost of work and embitters the relationship between the client and contractor. All these factors are not conducive to the effective construction management. You should remember in this regard that 'prevention is always better than cure'.

Construction Supervisor's Role in Ensuring Progress

Perhaps no other matter is as important or of concern to the construction supervisor as that of ensuring progress on the work he is supervising, maintaining the progress as scheduled means completing the work in the stipulated time. This further means that the cost overrun due to time overrun is avoided. What have you to do, as a supervisor, to ensure progress on the construction project?

a) Study the construction programme prepared by the project manager / Engineer.
b) Prepare detailed programmes to elaborate this schedules and also prepare schedules for organising the resources required for your work.
c) Make a careful study of the system of compiling and reporting the progress on the work periodically.
d) Implement the programme of construction closely.
e) Check the progress achieved and compare it with planned targets. In case of deviations, report the matter to the supervisors and ask for corrective measures. Introduce the corrective measures promptly.

Further Reading:

- ✓ *Barbara J. Jackson, (2010), Construction Management JumpStart*
- ✓ *Stephen Emmitt, Christopher A. Gorse, (2010), Barry's Introduction to Construction of Buildings*
- ✓ *Frank Harris, Ronald McCaffer, (2013), Modern Construction Management*