Introduction to Construction Management

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.

Introduction to Construction Management

This unit presents a brief introduction about the construction industry. Construction is indeed one of the most important Industries on earth dating backing to the beginning of civilizations. The evidence is all around us, serving as witnesses to the ingenuity of man. Relics of the construction prowess of ancient civilizations are dotted all across the modern world in Asia, America, Europe, Africa, South America, and many other regions. Some famous examples of these include the Pyramids of Egypt, the Taj Mahal of India, Roman Amphitheatres of Italy, and the Great Wall of China.

Modern construction has evolved from simple manual techniques into a complex maze of highly mechanised and orchestrated symphony of activities, which requires billions of dollars in investment and serving as the second biggest source of employment in the world. Construction involves many field activities requiring the use of resources such as land, construction materials, labour, equipment, and energy, etc., to achieve a pre-defined object of putting up structures such as roads, buildings, dams, and just about any imaginable structure you find around you.

Due to limited and very costly resources, construction has to be managed productively and efficiently using innovation, creativity and sound organisational and economic principles. When construction projects are properly managed, the result is lower costs, completion of projects on time, and higher quality structures.

In order to construct a successful organisational model for a successful construction project, it is important to study and understand the various components that make up a successful model. Construction activities must be cost-effective using high quality material and performed within a limited time frame to achieve quality end products.

The face of the construction industry has been changing rapidly in recent times. These advancements in modern construction methodologies and techniques, as well as, the emergence of more productive equipment means that industry players must remain on their toes to keep up with the latest construction technology. In order to remain relevant, companies must adopt new approaches to managing and building projects. Growth in technology means that there are new and better materials to use, newer techniques of accomplishing tasks at lower costs and better time management skills, and newer equipment for more productive work, etc. Therefore, the human resource capacity must constantly update or upgrade their knowledge and skills.

Market Size and its Importance

The achievements within the construction industry spanning thousands of years and involving a diversity of civilization have been quite enormous. Construction has produced different types of infrastructure ranging from small residential building to the mega sports complexes and industrial buildings. It is no surprise that it remains one of the biggest businesses on the planet having market capitalization running into trillions of dollars.

Construction has contributed to most advance economies of the world through provision of critical infrastructures of economic significance most especially in recent times. Investment in construction activities contribute a sizeable portion to a country's GDP, in terms of making available employment opportunities for workers to earn decent income and contribute to the economy.

Some established countries in Asia, such as Hong Kong and South Korea, rode on the benefits of construction to attain their present level of economic success. China and Malaysia are also following in the same footsteps by investing heavily in mega construction projects and having been doing so for the last 50 years or so. It is a very powerful tool for development and economic progress.

Features of Construction Industry

Some of the important features of the construction industry have been described below:

Complexity

The modern construction industry is highly mechanised and complex; it involves complex interactions between a vast array of resources, such as thousands, who are skilled in labour, equipment, such as, cranes, earth movers, logistics etc., all interconnected into thousands of activities. Activities may overlap simultaneously or in sequential discrete steps or even randomly – a phenomenon more complex than found in ordinary factory or manufacturing context.

Uniqueness

One way in which construction differs from other industries is that no two projects are ever the same. . In other words each project is unique. This uniqueness of each project is defined by the nature of the site of construction and is also influenced by the weather, as well as, the ground conditions due to various site locations.

The construction supervisor and management team are critical to the success of every construction project. They are responsible for ensuring plans and specifications are adhered to and also, for managing the limited resources available within budget and deliver the complete project on time. Since there is little room for costly mistakes, it is incumbent on the supervisory team to be vigilant to ensure that mistakes are detected instantly and corrected immediately.

Mobility of Facilities

One major difference between the construction and mainstream manufacturing industries is that products resulting from construction are stationary, while those, which results from manufacturing, tend to be mobile during value addition. Construction industry requires moving resources such as labour, equipment etc., from one place to the other to create products under dynamic and hazardous working conditions. Manufacturing industries on the other hand require products at various stages of product lifecycle to move from one facility to the next for value to be added. Products are standardized and easy to control unlike

construction where new techniques or modifications to existing techniques have to be developed to deal with the constantly changing working environment.

Multiplicity of Agencies

Many agencies are involved in construction projects, from the conception of the product through to the completion of the project. Each agency is expected to play a specific role in the course to the project lifecycle. These agencies may include governmental agencies, land authorities, planning agencies, fire department, and Town and Country Planning Councils, etc. Their roles may differ but basically, they ensure that the project complies with the laws of the land. They carry out inspections and provide certifications for various activities on site.

Organisation

The owner of the construction project normally advertises the project and invites tenders from prospective contractors to undertake the project. The contract is awarded to a successful bidder after a competitive bid process. The winning contractor then engages the services of sub-contractors on contracts to execute various planned activities within a specified time frame. Sub-contractors may also employ hundreds skilled workers to work on specialise aspects of the project. During the construction of larger - scale projects, it very common to have thousands of employees working on diverse aspects of the project site. The complexity of large scale projects means that there is the need of a great deal of organisation and management of a large group of people who interact with each other in many ways to produce the final product within a limited time period.

Three groups of people are normally involved in a typical construction project:

- The owner
- The engineering group which is made up of managers, architects, structural engineers, and civil engineers etc.
- The construction group consisting of a number of contractors and workers who perform the actual work.

These 3 groups interact in a well-organised way with no particular group having absolute control. Each group has a set of unique functions to perform at specific moments and their activities may overlap or occur sequentially. The owner is expected to exercise control of the finance and quality control, the engineering group ensures structural and aesthetic integrity while the contractor motivates the workforce to execute the work professionally and to a very high standard to meet the deadline.

The main categories of activities of a construction project include:

i. Design and planning
ii. Executing construction work
iii. Supervision and inspection

Finance

Financial activities involved in construction can be classified into the following categories:

1. Investments in fixed assets, such as, tools, equipment, machinery, cantering, and shuttering, etc.
2. Short-term finances, such as, earnest money and security deposits to meet the cash flow requirements at construction sites
3. Investment in future through education, training, research, and development of human resource and technologies
4. Overheads in salaries and establishment other expenses relating to advertisement and public relations, legal expenses and other related expenses required for the project to run smoothly

Funding sources include credit facilities, loans, and securities. Most times, the construction industry experiences cash flow issues due to the blockage of security deposits, earnest money, and delayed payment of bills, among many other impediments.

Management

Since most companies HQs are far from the project site, it becomes difficult for the management to provide direct supervision and control of activities. This makes most projects workforce autonomous in tackling their responsibilities. This makes it imperative to have available well-trained personnel who would executive their mandated activities professionally and on time to achieve satisfactorily high quality products.

Productivity and Labour Quality

Productivity

The construction industry is not as productive as other industries according to several studies. Historically, productivity in the construction industry has not been as high as one would have expected given the large number of people employed in this sector. Two main reasons may account for this low productivity:

- Supply issues
- Demand issues

Supply is hampered by the immobile nature of projects and the harsh conditions prevailing during the construction process. With regards to demand issues, one find that demand for construction products tend to be seasonal or cyclic, making it a highly unpredictable market.

The lack of adequately-trained personnel is the single most important factor for low productivity records. The availability of well-trained personnel to carry out good decisions in executing activities becomes very important to produce high quality products. Highly trained human resource is lacking in areas that would

substantially improve construction productivity. Areas, such as, effective information management systems and design and equipment management are both in dire need of high quality personnel.

Better productivity can be achieved through systematic planning and management of all aspects of construction projects using highly trained human resource at all levels as well as the best available techniques and equipment to produce quality product at lower cost and shorter durations. Management and organisation of projects will entail coordination of interactions between planning, design and execution stages of projects.

Labour Quality

Labour for construction work mostly depends upon the location of the project site. This means that the local workforce is normally employed to carry out various aspects of the construction. The quality of the labour employed will determine the quality of the final product. Workers may improve on their skills through on-the-job learning by trial and error or by imitation.

Safety Hazards

A typical construction project is inherently dangerous because of the high propensity of an accident occurring. The wide range of varying working conditions involving supported structures, moving equipment and labour make the site highly unpredictable environment. Consequently, there is the need to put in place safety measures to prevent accidents from occurring. Unfortunately, due to the rapidly changing conditions, it is not adequate to adopt safety procedures from the static manufacturing environment for implementation on construction projects sites.

Careful and adequate research needs to be conducted to determine the most effective types of safety procedure to implement on the site because losses resulting from construction accidents may be significant to the extent that they may even wipe out profits.

Role of Construction Supervisor

The main duty of the construction supervisor is to motivate and coordinate activities of other workers to get the job done on time. Supervisors serve as the link between workers and top management levels of the organisation. They operate at the first line of management. There are three levels of management namely, the top - level, the mid – level, and the first-line level.

Top - Level Management

They formulate objective and policies of the company.

Mid - Level Management

They are mostly involved in the procurement of materials, labour and equipment management. They may also be responsible for highly specialised duties such as lift installation and HVAC.

First-Line Management

This level is usually comprised of the construction supervisors. It is the lowest level of management which takes instruction from the mid-level and report back to them during the course of construction.

Responsibilities of the Construction Supervisor

The responsibilities of the construction supervisor include making sure that all work meet the right quality, cost does not overrun budget due to mistakes and the work is completed on time.

Duties of Construction Supervisor

- The supervisor instructs workers on what to do
- Motivates workers to accomplish all objectives
- Encourages teamwork spirit
- Ensure workers are disciplined
- Deal with all manner of conflicts arising at the work site
- Promote a good relationship between the workers and the general public
- Ensure plans and schedules are adhered to by regular inspection and quality control
- Trains and develops the workforce to meet new challenge

Construction Supervisor and the Phases of Construction Project

The construction supervisor should be familiar with the various phases of the project. The following phases are normally devised for construction projects:

- Conception of the building based on requirements of the owner or user
- Determining the feasibility of the project and comparing alternatives
- Preparing detailed design, drawings, and resource cost estimates
- Translating construction ideas from paper into reality using resources.

Project construction sites can be executed by the owner or by a contractor. Construction by the owner is termed departmental construction. It requires that the owner from his own company and engage the services of an engineer and contractor. The second method is to employ the services of contractors. The contractor-type construction involves both the owner and the contractor appointing their individual supervisor to oversee the project.

The owner's supervisor has to ensure that all specification and plans are being followed by undertaking regular planned or unplanned inspections of activities on the site. His responsibilities include the following:

i) Ensure that construction is done according to the contract drawings, specifications
ii) Make sure the contractor follows the agreed schedule
iii) Ensure quality standards of materials, processes and workmanship are maintained

Supervision for the Owner/Consultant

Here is how the owner's supervisor can obtain success on the field -

- He must submit daily progress report to the owner's engineer
- Work with contractor's team frequently
- Clarify any aspects of work which the contractor does not understand or is unsure about
- Demand the highest quality standards from contractor
- Deal discretely and fairly but resolutely with contractor's staff on the field on all aspects of work to ensure high quality work
- Solve problems commensurate with his expertise and escalate to the site engineer when problems are beyond his ability or would require supervision of more senior personnel
- Taking timely actions to correct deviations from plans
- Report serious problems to the site engineer immediately
- He should use discretion and professionalism when implementing contract specifications, but, he should also receive occasional advice from the site's engineer and work within the limits of his responsibility and authority
- Must be tactful or diplomatic when dealing with field staff
- Maintaining proper documentation including registers, equipment documents, and labour documents, etc.
- Keeping work order book containing instructions from management to the contractor
- Requesting for early inspection and approval of completed portions of work to avoid delays
- Helping engineer to prepare account and issue payments to contractor
- Maintaining all contract documents such as drawings and specifications at each phase of the project

Supervision for the Construction Agency

If the owner decides to secure the services of a construction agency to undertake the project with the assistance of a constructions supervisor, then the construction agency must ensure that the structure is completed on time, at the agreed cost and to the specified quality standard.

Before beginning construction activities, the supervisor for the construction agency should ensure that:

- All drawings are ready including detail working drawings
- Detail bill of quantities are available
- Information on all resources required are available and ready
- Suppliers and workers are ready for take off
- Execution plans for activities are developed, milestones and completion dates also finalised

- Project manager and his team of engineers have been selected to oversee technical aspects of the project

For a supervisor to really succeed in a project, he has to make sure he studies and understand all contracts requirements, designs, drawings and specifications and any other relevant document. He also needs to study the programme of construction prepared by the project engineer and his team and come up with realistic schedules for activities for each day of the week or a weekly schedule to keep up with overall project plan

Sample for a Supervisor's schedule for a typical day

Table 1.1

Supervisor's Schedule For A Typical Day

1. Brick masonry for the superstructure of Building 1 to be continued
2. Excavation for the foundation of Building 2 to be started today. Labour team to be organised, instructions to be given to them, necessary tools to be issued
3. Excavation work should he completed by tomorrow evening; make request to the field engineer to inspect the work tomorrow and approve the foundation so that laying the concrete bed for the foundation can be commenced in 2 days time
4. 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.
5. Request the project office to supply the working drawings of RCC slab to help estimate resource requirements
6. Send a note to the accounts department to arrange for the payment of wages to labour at the end of the week
7. Submit reports to the project office

The above list of activities is not exhaustive and should be considered in an indicative nature only.

Supervisor should see to it that the following facilities are available on the site:

i. Site offices, site stores, workshops, and canteens, etc. along with the necessary furniture, ventilation, and lighting, etc.
ii. Access to the site, as well as, various units such as site office, stores, and 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) Promoting safe stacking of material
b) Encouraging safe handling of material
c) Insisting on the use of protective wears like helmets, gloves, gum-boots, goggles where necessary
d) Providing fencing around excavated trenches
e) Ensuring good housekeeping on site
f) Providing first-aid box
g) Employing trained workers and operators
h) Ensuring proper maintenance of equipment
i) Providing training to workers and creating an awareness of safety amongst workers

The supervisor should maintain documents containing the following:

- File containing list of contact details of all persons connected to the project including details of the owner(s), officials of local authorities, Government officials, suppliers, police department etc.
- Folder for approved drawings and specifications
- Contract documents
- Construction programme (e.g. in the form of 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 and works
- A general plan of work showing all work completed each day

Daily diary containing the following:

- Details of works in progress
- Notes on weather conditions
- Names of visitors
- Number of hours worked
- Details of work carried out by sub-contractors, labour contractors,
- Workers employed on work site
- Materials arrived; issued to sub-contractors, consumed on works
- Equipment details such as hours worked, fuel or power used, repairs and maintenance output etc.
- Any other relevant details.

Construction Supervision and Inspection and Testing

Inspection and testing are expected to be performed by the supervisor continuously from the beginning of the project right up to the end.

Inspection

This is done for the purpose of checking the quality. Construction materials may be inspected to ensure they meet quality specifications in terms of colour, size and composition. Inspection may be carried out while work is in progress to ensure that:

i. The correct quantities of materials are used
ii. Follow sequence specified by the activities schedule plan
iii. Correct procedure are applied during activities to ensure high quality standard
iv. Final output of activities meet the desired specification in dimension and content

The right person (at the right time) should be chosen to carry out the inspection in order for the inspection program to become successful.

Supervisors are required to perform regular inspection of construction work. For contract jobs, the owner may ask his engineer to inspect the work to ensure everything is going on according to plan and within budget. Inspection is done on material and can be carried out at any stage of the work. If the contract stipulated that certain phases have to be inspected by the engineer, then the supervisor needs to arrange for this well in advance and record details of the inspection in the work order book. To avoid rework or rejection of work, the supervisor has to be pre-emptive to spot mistakes quite early and report to the necessary authority to correct them immediately. Such prompt actions will prevent unnecessary delays due to rework or rejection and save extra costs.

Construction Supervisor's Role in Ensuring Progress

The construction supervisor is directly responsible for ensuring progress and is made according to schedules or work. It is his duty to ensure that progress is consistently maintained by following this list:

- Studying the construction programme prepared by the project manager or project engineer.
- Preparing detailed programmes to expand on the schedules and also preparing schedules for organising the resources required for your work.
- Having in place a systematic approach to writing daily progress reports.
- Ensuring all specifications and requirements of the projects are being followed.
- The supervisor must also regularly check the quality of work and compared with quality control specifications to see whether the project is on the right track or not. He should correct any deviations promptly if he is in a position to do so, otherwise, deviations should be reported to the site engineer immediately for prompt corrective measures to be implemented.

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*