

Construction of Private Residence for Middle-income People

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Abstract

This paper presents the construction and management process of private residence in Ethiopia. The process of designing, contracting, constructing and managing of the project are the main points covered in this paper.

The paper considers inefficiency in the field of construction management affecting the quality of structures, which is followed by unnecessary high expenses. Experiences are pointed out to be used in the future so that proper way of construction management process will be followed to be in a good environment with reasonable expenses.

Introduction

The construction industry plays a significant role in the development of economy. It is one of the largest industries in the whole world, In the case of my country perhaps second to agriculture. Therefore, it is important for the owners, contractors and designers to know all aspects of construction.

Knowledge on construction management will certainly help the owners, who are increasingly concerned with delay, incompletion, cost overruns and poor quality workmanship and so on. It also makes the actors to realise these problems before they reach the production stage.

The need for learning in construction management also has special significance to insure that the huge resource invested in the construction industry are put efficiently for the benefit of the society as a whole.

In this paper I will try to describe a construction process of a specific private residential building that is going to be built in my home country. Although this building is not constructed, I use the idea in which people usually do when they build similar type of houses with the one I chose. I will also try to show the comparison of construction process of my country with the international construction process by checking whether the main objectives of construction management are fulfilled which are

- To complete the work with in estimated budget and specific time
- To get high quality workmanship
- To provide safe and satisfactory working conditions for all personnel and workers
- To motivate people to give their best with in their capacity.
- To create an organisation that works as a team

The Project

It is located at the outskirts of the city of Addis Ababa which is called Lafto area 155m² of built up area and plot area of 175m². The cost of the building is estimated to around 32,000 dollar excluding the maintainance cost, rate of interest, running costs, and taxes.

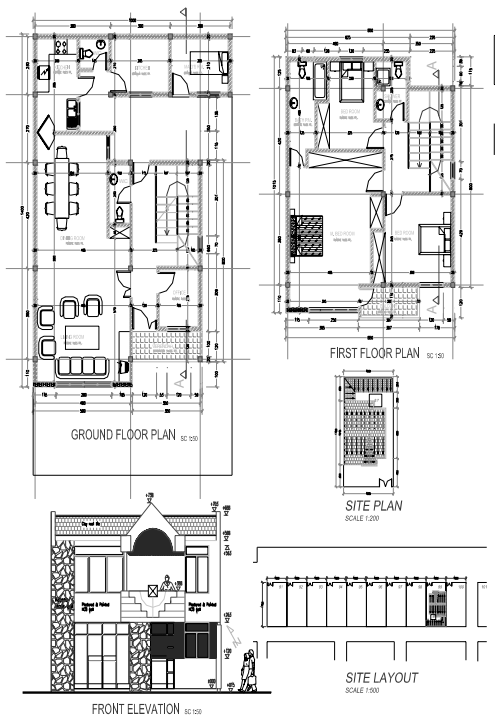


Figure 1: Plans, Elevation, Site plan, and Site layout

The Actors

The main actors who were involved in this process are the owner, the designers and contractor. The owner formed the construction team to serve his interests through the services of both the contractor and designers. The objective of forming this team is to co-operatively plan, design and execute the owner's project in the best and the most economical manner with the estimated time.

Owner

The owner is an individual, who has an ultimate authority over the project. He is the final holder of the major decision-making power regarding managerial, financial, administrative aspects. He approves changes in the project scope or schedules.

Designers

This includes structural, electrical, sanitary engineers, architects, quantity surveyors and soil investigators etc.

Architect

The role of the architect was to assess the client's functional requirement, to design for pleasing, ecstatic and quality appearance and to assist the engineers.

Structural Engineer

The role of the structural engineer is to prepare structural design of structure and to prepare working drawings based on the architect's plan.

Electrical Engineer

The role of electrical engineer is mainly concerned with design and preparation of drawings for electrical power and distribution system during and after construction system during and after construction system.

Quantity Surveyor

The role of the quantity surveyor was to

- Estimate the work to be done and actually carried out.
- Prepare the bill of quantities and tender documents before tendering
- Asses extra costs due to special features

Contractor

The contractor is an individual under taking small contracts. The engineer employed by the contractor deals with the office work such as designing tendering and scheduling etc. and concerned with the actual execution of work such as surveying, levelling, and construction work.

The contractor has to execute various types of works and has to make all the necessary arrangements for labour, machinery, materials etc., in order to finish the project with in the estimated times and cost.

Background

Generalities on Ethiopia, Addis Ababa

Ethiopia, which covers an area as large as France and Spain combined situated in the north –eastern horn of Africa, equi-distant between equator and the tropic Capricorn. It is a country of immense geographical contrasts and many variations in altitude, temperature, rainfall and vegetation.

The Ethiopian economy is typically agrarian. More than forty-eight per cent of the country's GP originates from agriculture. Modern manufacturing accounts for no more than six per cent. Small-scale industry and handcrafts make up about four per cent. Service of all types, including distribution, public administration, defence and financial services have a significant share more than thirty seven per cent of the gross product.

The total area of the country is 1,112 million km². Only about 15% of it is under cultivation, although it is estimated that close to 65% of the total area is arable. Including Addis Ababa the capital city of Ethiopia, there are 11 administrative regions in the country. The estimated number of population in Ethiopia is around 61 million including urban and rural dwellers. More than 85 per cent of the population are rural dwellers.

Addis Ababa

Addis Ababa is the capital city of Ethiopia. Around 2.6 million of people live in the city. Despite proximity to the equator, it's lofty altitude makes it the third highest city in the world –means it has amild temperature of av. 16°C.

The total area of the city is around 51,000 ha. The centre of the city covers 21,000 ha., and the outskirts of the city covers 30,000 ha. The city is divided in six administrative zones; each zone has its own residential area, business area, and industrial area, green area and public services in different proportion.

Urban Land development

The municipality of Addis Ababa has different strategies in developing the urban land. One of it addresses mostly the middle income and low-income people which is in the 5-year development programme. There was an aim to prepare and give around 35,000 plots of land for industry, business, different services and other purposes including for residential purposes. So 35,000 plots have been prepared for the last three years and around 15,000 are given out to the people. The location that was chosen to accommodate these much number of plots was the outskirts of the city because suitable area with in the central municipal boundary was not sufficient for settling population and activities foreseen for the whole plan of implementation period. So the city is divided in to two main parts.

- The core area (centre of the city)
- The expansion area (outskirts of the city)

The core area is already developed area, which means all kinds of services are more or less there. Its central sections are similar in nature and character to many central areas of other cities. There is a concentration of government, administrative, business and commercial activities mixed with residential uses which strongly differentiate these sections from other parts of the city where productive and residential uses prevail. On the other hand the expansion area is a newly developing area with less services and infrastructure provision.

The expansion area is divided in to 5 parts.

1. Kotobe Area
2. Mekanissa Area

3. Keranyo Area
4. Bole bulbula Area
5. Lafto Area

The detail plans for developing those areas are prepared by the municipality. These plans are prepared in order to address people who live in different standard of living. The proportion of the plots prepared for the for the middle income group is much higher than the others are.

The municipality of Addis Ababa gives land to the people using lease system.

Urban Lands Lease Holdings Regulations

On the basis of the Economic Policy of the transitional period and related laws, the Ethiopian Transitional Government Council of the Representatives has enacted a proclamation on the Lease Holding of Urban Lands.

“5.The size and mode of urban land leasing for the construction of private dwelling houses.

1. The lease holding of private dwelling houses that shall be constructed in accordance with the master plan and with a view to contain urban sprawl shall be as follows:
 - The minimum 73m²
 - The maximum 175m²
2. Lands of private dwelling houses as provided for in sub article 1 above, shall be leased out with out tender by casting plots.
3. Request for lands of private dwelling houses, in excess of the maximum limit as mentioned under sub article 1 above. Shall be affected by tender.”

The project I chose is located in one of the expansion areas called Lafto Area where there are around 4000 newly built residences. Most middle-income people, almost 65 per cent of them, use similar construction process with the one I chose.

So on these paper what I would like to show is very essential to achieve development goals of my country.

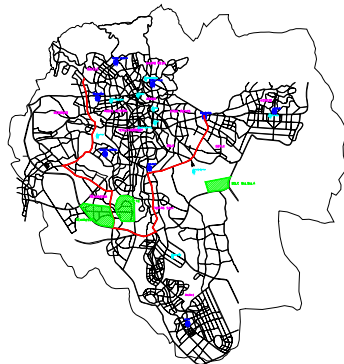


Figure 2: Plan of Addis Ababa

Briefing Stage

I would like to go through the briefing stage, which could have enabled the client to specify the project functions and permissible costs so that architects, engineers and other members of the construction team, can correctly interpret his wishes providing a likely estimate of costs.

The briefing stage also leads to an objective decision on the scope and feasibility of the project. At this stage many factors may not be clearly defined but some of the activities could have been performed like-

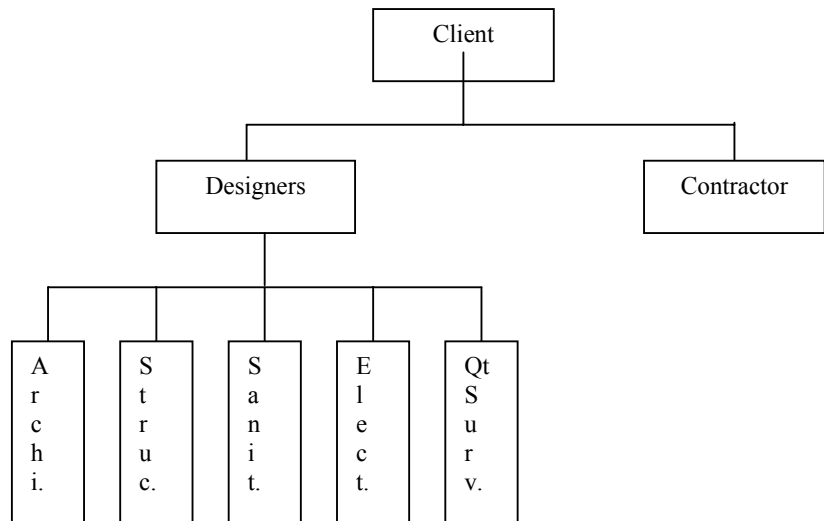
- Appointing a construction manager who will have a continuing responsibility to him throughout the construction process.
- Performing technical investigations such as land and geological survey including site investigation like soil sample.

Although engineering project should begin with thorough investigation of its scope and economic feasibility. The client did not go through the stage properly. He has performed the process of getting land from municipality, investigating economical factors such as market survey for resource identification by himself.

Design Stage

Project Organisation

Organising of a project is concerned with division of the total construction process in to manageable departments \ sections and arranging various works by assigning individuals. Although the project organisation chart was not prepared by the time because there was no project manager appointed by the client, the work structure was as shown below.



Organisation chart

Communication means sharing of ideas in a condition of mutual understanding. In the absence of proper communication between the various groups and with in-group members working in a construction process, the desired progress of work would not take place. There will be cost overruns and poor quality work. As shown on the organisational chart the communication between the designers was very poor because the communication was through the client. The client did not have a technical knowledge to be a construction manager but he was the only to communicate to each other. The communication was time taking and costly too.

Procurement-Contracting

It is a very important stage in the field of construction because any modification in the project after this stage would prove expensive. A realistic and detailed cost estimate has done at this stage.

Contracting of designers was done to carry out technical investigations such as soil investigation, material, topographic investigation, material supply and market survey; to prepare detailed design, working drawings, specifications, bill of quantities, final cost estimate and preliminary construction programme including time schedule; to obtain the owners final approval of the project summary.

The contracting of designers was done in such a way that professional designers were hired individually for specific design work. The client did not want to go to consultants because comparatively this way of contracting is cheaper than contracting a consultant. The consultancy service cost for such kind of construction can be six per cent of the total construction cost, ofcourse this cost differs from

consultant to consultant. Usually the consultancy service cost percentage increases as the complexity of the project decreases.

Most of the time the client have been using other persons' experience of construction process. By those informations, he assessed qualified professional designers and proceeded with the ones who had good reputation. First the architect tries to assess the client's functional requirements and then tries design accordingly. Then other designers, with a good reputation, do the rest of the design work. After the design work is finished, the client was responsible to get the construction permit from the concerned government authority that is Addis Ababa Administration and Urban Development and Works Bureau. For every correction that was commented by building permit section, the designers were the ones who were responsible.

The quantity surveyor in this case was a building engineer who did estimate the work to be done and actually carried out; prepare bill of quantities and tender documents.

The total design stage included out line proposal, preliminary design, detailed design and construction information as shown below.

- Carry out non-technical investigations.
- Carry out technical investigations.
- Prepare preliminary and detailed designs.
- Prepare working drawings and specifications
- Prepare bill of quantities.
- Prepare tender document.

Project Planning

The planning of this project involved exact explanation of similar realistic work plans for achieving specified objectives. Selecting a plan that was best suited from the stand- point of available resources and constraints imposed up on a project were actually the most important part of the planning.

Even though planning the whole construction process is very essential for the effective project management, planning for this project had given emphasis only on the production stage. Moreover, planning covering all the construction process should also include sufficient details to enable proper consideration of the timing and duration of operations, types and quality of materials and equipment, delivery dates and manpower requirements.

When we think of planning, at least essential requirements should have to be fulfilled such as:

- It must be suitable for use as a control tool against which progress can be measured;
- It must be sufficiently accurate to enable its use for forecasting requirements of material, manpower, machinery and money.
- It must provide for difficulties likely to be encountered in future in respect of quality, scope, process etc. and taking remedial measures.

But in my project all the above essential requirements of planning were not properly fulfilled that is why in most similar projects delays were created. For effective planning, preparation of work breakdown of the total project in to sub sections and activities is also essential.

Work breakdown structure of the project

- A- Briefing stage
 - The process of getting land
- B- Designing stage
 - Organising the project
 - Procuring (contracting) designers
 - Preliminary design
 - Detail design
 - Building permit
 - Working drawings and specifications
 - Bills of quantities
 - Preliminary production programme
 - Tender document preparation
- C- Production stage
 - Preparation of time schedule with manpower planning

- Site organisation
- Work breakdown of the construction stage
 - Sub – structure
 - Excavation and earth work
 - Concrete work
 - Masonry work
 - Super structure
 - Concrete work
 - Block work
 - Roofing and waterproofing
 - Carpentry and joinery
 - Metal works
 - Finishing Work
 - Glazing
 - Painting
 - Sanitary installation
 - Electrical installation
 - Site Work
 - Road and Fence construction
 - External Sanitary work
 - External Electrical work

The work break down structure of this project included all the above activities.

Project Financing

For any given work, the resources required are materials, manpower, equipment and money. These resources have to be utilised in planned and efficient manner in order to derive the maximum benefit.

The financing of this project has two parts. One of it is the client's own money and the other is loan from the bank. Loan is usually given for the production process only. There are requirements to be fulfilled to get loan from bank, which are:

- One has to own the land
- There must be building permit for all of the designs
 - Architectural design
 - Structural design
 - Electrical installations design
 - Sanitary installations design
 - Bill of quantity and specification

After fulfilling these conditions there are two ways of getting loan with fixed interest rate of 12% per year.

1. One has to construct 30 per cent of the total construction and Show the amount of his salary as a mortgage bond.
2. One has to have other investments to give as a mortgage bond, so as to get the loan.

Most people who are in the middle income group, including the client of this project use the first way of getting the loan.

Further there may be many uncertainties in the availability of resources; the right type of labour or equipment may not be available at the required time, so schedules of various project resources need to be prepared.

Finance schedules are essential both for pre- tender and construction stages. A finance schedule shows the amount of cash required at different stages of construction project. It enables long term financial planning for the entire project to be carried out in an efficient manner although financial schedules are important for the pre- tender stages, in this type of projects do not have finance schedules that shows the amount of cash required at different stages.

Budget and Budget Control

When we prepare the project budget every cost should be included

- Registration fee to get the land
- Taxes to be paid during and after construction

- To connect the new line with the line of water supply, sewerage and water supply, telephone
- Building design cost
- Building construction cost
- Project financing- interest during and after the construction process
- Maintenance cost
- Running cost

The preparation of the project budget should include all the above activities but in the case of my project, there are activities which was not considered like taxes, cost of maintenance, the financing - interest during and after construction and running costs.

Conclusion

Construction work is an integral part of development projects in every sector of our economy. In view of limited available resources for achieving national development goals, efficient construction management is one of important things to do.

The design stage is the most important stage of a construction process because every mistake done at this stage will be reflected on the production stage followed by high expenses and delay of the project.

Starting from the briefing stage the construction manager could have been appointed so that the construction process would follow the proper procedure. There was no consultant hired who was responsible for the design and construction supervision as a whole. Instead, the client hired individual designers, which was very hard to create co-ordination between them. The lack of co-ordination created also lack of information between them. Even if it is there, it was time taking. The whole design process could have been finished with in the limited time but it took a long time more than expected.

Thinking of minimising the construction process this way created all the above problems. But following proper way of construction process will certainly help the owner to be with in the budget and time, to get good quality work with the reasonable price.

When we come to project planning, the planning work for the whole process of construction should have to be prepared so that the project management and also property management will be effective and implementation of them will be easier. Preparation of early cost estimation is also important at this stage

Information technology is the basic tool to use in the construction process, although we do not have much of it. We use Autocad 2000 for architectural works and SAP.90 and SAP.2000 for structural works for the design works. The Microsoft planning and Archicad programs would have made the design and planning works simple and precise. In the future it will be essential to use planning software as a tool and to be up to date for the benefit of not only us but also the society at large.

Production Stage

Tendering and Contract

After the completion of preparation of detailed design works construction permit is obtained from the concerned government body, which is Urban Development and Works Bureau. Then bidders were usually invited for the construction work, by public announcement under the title of Invitation to bid describing the category of the contractor and validity of his licence; about the client; the place where the bid documents are purchased and the time; the date where the bids will be opened.

The tendering stage is important to appoint a contractor who will undertake the construction work on the most suitable terms and conditions of quality, cost and completion time.

Then usually the bids are opened and read in the presence of the bidders and their legal representatives. Tender then will be awarded to the winner. Usually the list bidder is selected. The client always takes in to account the contractors' previous

performance and his capacity also. After evaluation all points letter of acceptance will be given to the winner.

It is necessary that contract documents be prepared with extreme care and by experienced persons because the contract forms are the basis on which the project construction team control the project during construction phase. The contract itself is defined as a legal document which describes the terms and conditions of executing the project. For construction work standard forms of contract have been developed which are used with minor modifications to suit circumstances of a particular project.

The Contract Document

The contract document describes the work and defines the right and obligation of the parties (the client and the contractor). The document followed a standard format for construction contracts of other buildings. The contract document consists of the contract agreement and the following set of documents, each page of which is signed both the client and contractor.

- A- Cover Title page: contains the name of the work, name of the owner, name of contractor, contract agreement number etc.
- B- Contents page: contains the contents of the agreement with page references.
- C- Notice inviting tender: contains a brief description of work, estimated cost of work, date, time for receiving the tender, time of completion for receiving money etc.
- D- Tender Form: comprises bill of quantities, contractor's rate, total cost of work, time of completion, security money to be deposited and penalty clauses etc.
- E- Drawings: This comprises a complete set of fully dimensioned drawings.
- F- Specification: It is not practicable to include detailed information of each item of work in the limited space of description in the bill of quantities. As such detailed specifications form a part of a contract agreement. Specifications should be clear and precise covering all items of the bill of quantities. Following specifications are normally included in the contract document
 - 1 General specification: This specifies the class and type of work, quality of materials etc. general for the work as a whole
 - 2 Detailed specification. This give detailed description of each item of work including material and method to be used along with quality of workmanship required.
- G- Conditions of contract: the terms and conditions of contract specify the following.
 - 1 Rates of each item of work inclusive of materials, labour, transport, equipment and other arrangements required for completion of work.
 - 2 Amount and form of earnest and security money to be deposited.
 - 3 Manner of payment to contractor including running payment final payment, refund of security money etc.
 - 4 Time of completion of the work.
 - 5 Penalty for poor quality and unsatisfactory work, lack of proportionate progress and for delay in completion.
 - 6 Extension of time for completion of the work.
 - 7 Termination of the contract.
 - 8 Changes in design \ drawings etc. and evaluation of variations.
 - 9 Arbitration for settlement of dispute.

In addition to this performance bond is considered as part of the contract document. The contractor submits performance bond, 10 percent of the total contract cost in the security of an insurance and local bank along with schedule of construction.

Production Planning

For good implementation of project activities, planning is important at various stages

Planning for construction is usually done in the following two stages.

- Pre-tender stage
- Contract stage

Pre-tender Stage

The contractor carries out pre-tender stage. It is in this stage that the contractor usually does his best method of construction for the future contract and best realistic programme for carrying out the work. He also uses this planning to get proper bid and to be prepared for completing the work to estimated time. During this stage, his main aim is to see the contract whether it is profitable or not.

Pre tender planning usually includes the following steps if the new construction site is far from where he mostly other similar constructions.

- Examining drawings and specifications to identify various items of work.
- Carry out site investigation and market survey to assess the availability and rates of materials, manpower, machinery and other facilities.
- Identifying alternative methods of executing the work for selecting the most suitable and economical method.
- Estimating the quantities of different items of work and the time required for their completion.
- Preparing tentative construction schedule with reference to the estimated time of completion.
- Deciding the margin of profit and finalising the tender price for completing the work with in estimated time.

Contract Stage

This stage starts with the acceptance of the tender and extends till completion of the contract. After pre- tender stage, the contractor usually undertakes detailed planning to organise various activities of construction work so that the project may be completed with in the scheduled time. He uses this stage to check out specific details for executions of the project because inadequate planning at this stage inevitably results in delays leading to heavier expenditure.

Contract stage planning involves the following steps

- Studying inter- relation ships of various items of work and finalisation of their proper sequence.
- Calculating the phased requirement of construction material such as cement, aggregate, steel etc.
- Preparing details of manpower requirement at various stages of the work.
- Also establishing a good communication system between members of construction team (the client, designers and himself) would have been good at this stage but the condition that the client created doesn't allow him to do so.

After both parties sign the contract agreement, the site handed over by the client to the contractor. The construction work will usually began according to the presented and approved schedule and contract document. Usually 10 per cent advance payment is given to the contractor because mostly they ask for it. But no payment will be made to the contractor for any work executed unless the performance bond is submitted to the client. The supervision and inspection of the construction work is carried out by one of the designers in this case the building engineer. The designers who are hired for the supervision work are needed to give solutions only for design problems. So there is no proper follow up of the work.

Payment is done to the contractor from time to time as the work progress. Payment measurements and certificates are checked by the supervisor before any payments are made. 10 per cent of the gross executed amount of each payment is deducted as a security retention 5% of which will be released upon the provisional acceptance. The remaining 5% will be released up on the final acceptance.

After the whole work is completed as per contract documents provisional acceptance will be made to the contractor. Then the final acceptance of the construction will be performed after a year. During this period defects developed has to be corrected by the contractor.

Quality Management

Quality Management is the overall management that determines the implementation of quality policy. The need for quality control is to achieve sound construction work, which results in structures of good quality at reasonable cost. Following the quality policy or using quality standards are required for all construction projects. This insures that the work is done in accordance with plans, specifications and good

practice to avoid defects. In this type of project quality standards are not used or there is no quality controlling system. This usually led to defective work with possibility of failure of the structure after it is constructed. So it is necessary to inspect the structure during its various construction stages.

As I mentioned it before, this type of projects do not have proper follow up or supervision by the hired designer. So specifications which consist of instructions for guidance of construction are not properly used to achieve sound and stable construction. Generally speaking, this type of project lacks quality control which leads to poor quality work and cost overrun not only on the construction process but also through life time of the project. In any construction project quality control is one of important functions of management. It is primarily required to satisfy the owners stated needs and requirements.

Economic Control – Budget Review and Reconciliation

Economic control is very difficult for this type of projects because the budget of the whole construction process is not calculated. As I tried to express it before, the construction functions are done partly. So one cannot reconcile the total budget starting from the commencement of the works. The client is concerned or really interested to know the expenditure on production process only.

Conclusion

The production stage is the most resource – intensive and difficult stage of any project. During this stage, actual work is executed according to the design prepared earlier. The problems encountered at this stage may have to be referred to the designers for appropriate solutions. So good communication between members of the construction team is very essential to complete the construction with in scheduled time and with a good quality. On this type of projects because of the lack of co-ordination of designers or because of their not being from the same consultant firm on the designing stage, the production process is very much affected.

During contracting stage the client performs all contracting process with the advice of individual designer who sometimes may not be good enough to get the qualified contractor. When we come to the production stage, the client do not take contracting of supervision seriously, almost all the time the construction process do not get proper follow up from the construction supervisor. The individual designer who is hired for the supervision work does not fulfil the requirement because:

- He is an individual with one field of profession and with lack of communication with other designers. So follow up of the work progress may not be according to the design.
- He does not take the full responsibility and power of the supervisor because he usually is less paid. He does his job only whenever he is needed where the contractor encountered by a design problem and when the client undertakes payment.

Construction supervision is a key function of production process where one can get a good quality work with in the specified time and estimated cost with responsibility of construction supervisor, which should be:

- To follow up the work and ascertain its conformity with specifications and drawings of the contractor's material, workmanship and to give approval, advice to the contractor's drawings and specifications.
- To check and verify measurement and payment certificates submitted by the contractor and to assist the client in dispute or differences that may arise between the client and the contractor.
- To submit to the client reports giving a view on the progress and quality of works every month.
- To carry out provisional acceptance, issue certificates with schedule of defects, if any and carry out final acceptance at the end of defect liability period and issue final completion certificate.

So construction supervision should be performed properly to get good quality workmanship and durable structure at reasonable cost. More over, lack of quality workmanship is maximised by the lack of quality management. There should be quality-controlling system for every construction.

Construction planning is also very important to prevent wastage of manpower, material and money and to avoid disruption of project schedules.

Property Management

In this type of project, construction teams are not accustomed to property management. It is also not known as part of construction process. When the total budget of the project cost is estimated, main factors that affect the property management, which are financing, maintenance, running costs and tax regulations were not included. These main factors were not also included in the planning of a project.

The owner of the project is responsible for managing his property. But every aspect of managing the property is he with out a plan and allocation of budget. As I mentioned it before, the client of this project took loan from bank. So he knew the rate of interest and duration of repayment etc. but it was not included in the budget and in the planning of the project construction process.

Although the owners do maintenance work occasionally, it was not planned and included in the budget. Running costs for running property and taxes are also paid regularly but they are also not included in the total budget.

Starting from briefing stage property management should be considered and included in the plan and in the budget so that the client who is the prime user and manager of the property will have good quality living with a good economy.

Connection to the Design Stage

The design stage is a crucial stage that can highly influence the property management in such a way that the type materials chosen and their application on the design, the techniques used in installation of services etc. could create a significant difference between the alternative designs.

Cost estimation is very important at this stage because it is effective tool for comparison of different design proposals so that the future budget of running property management will be known and the economy will be controlled. By using different type of cost estimating techniques, alternative designs can be evaluated.

As I mentioned it before, In my project property management is not included in the construction process and it is not also in the budget. In addition to these, even if the idea of creating a building with a long life span and good quality is their, the proper way of evaluating different building materials' durability, quality, their application on different part of building design, and even their composition on the facade was not studied.

Although information about life span of building materials and different construction techniques is not there the idea of property management can develop by using other buildings as a sample and by creating different design solution in relation to durability, quality and aesthetics.

In general, in design stage every aspect of property management should be taken into consideration to have a building with long life span, best quality and best possible economy.

Experiences to Use in the Future

- Efficient construction management is important to achieve national development goals especially like my country with limited available resources.
- To fulfil the main objective of construction management which is to complete the work with in the estimated budget and time, to get high quality workmanship, teamwork and sound decision-making.
- On the briefing stage, it is important to establish the economic viability which mince preparation of early cost estimate; it is important to appoint a project manager and also to make technical and non technical investigations
- On the designing stage care should be taken on how the procurement is done so that good design work will be gained; and also if there is any modification and

adjustments, it will be under taken by the designers who work in a good team spirit.

- On this stage all design works should be finished such as- working drawings, bill of quantities and specifications, preparation of invitation to tender before production stage started.
- Construction contracts should be formalised in the form of a written document that defines clearly the right and obligation of each party. In the contract, when the contractors offer to execute the work on certain terms and condition, the client needs professional advice so that the client accepts the contractor with high quality performance, not the least bidder.
- The construction stage should involve the actual execution of work as per design that ensures the work has been completed as specified and every thing is done as envisaged in the design.
- The whole construction process should be supervised properly so that the desired quality of work will be obtained.
- Planning should be the starting point of project management functions by including the essential characteristics of a good programme such as suitability for use as a control tool; accuracy for forecasting requirements of material, manpower and machinery.
- Planning is necessary to achieve the whole objective of construction management, which is to complete the prescribed work with the specified time, at the estimated cost.
- Software for designing and planning is important because they are effective tools to get the desired quality work with in best possible time.
- Scientific analysis of project cost for different time period completion assumes great importance in project planning and implementation.
- Quality management is essential for construction work so that the best possible quality could be gained with out loss of money. Quality control is needed at various stages of the work to achieve the desired quality.
- Property management is very important part of construction process. It should be considered as part of construction process so that it should be included in the total budget of the project and in the planning. This will help the owner to be able to manage his house with a best possible economy and best possible quality to be in a good living environment.
- Property management should be highly considered in the design stage so that the necessary remedies will be made at early stage of the construction process.

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