A STUDY ON PROJECT MANAGEMENT AND APPRAISAL WITH REFERENCE TO CONSTRUCTION OF A RESIDENTIAL APARTMENT IN COIMBATORE

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A PROJECT REPORT

Submitted to the

FACULTY OF MANAGEMENT SCIENCES

in partial fulfillment for the award of the degree

of

MASTER OF BUSINESS ADMINISTRATION

CENTRE FOR DISTANCE EDUCATION

ANNA UNIVERSITY CHENNAI

CHENNAI 600 025

AUGUST, 2013

BONAFIDE CERTIFICATE

Certified that the Project report titled "**A study on Project Management and Appraisal with reference to construction of a Residential Apartment in Coimbatore** " is the bonafide work of **Mr.R.GANGESH** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ACKNOWLEDGMENT

With immense pleasure I thank the almighty for his grace and blessings, which drove me to the successful completion of this project.

It is really a matter of pleasure for me to get an opportunity to thank all who have contributed directly or indirectly for the successful completion of the project report." **A study on Project Management and Appraisal with reference to construction of a Residential Apartment in Coimbatore".** First of all I am extremely thankful to our college **KUMARAGURU COLLEGE OF TECHNOLOGY** for providing us with this opportunity and for all its cooperation and contribution. I also express my gratitude to our director and I am highly thankful to him and my respected project guide Mr. V.Kaarthiekheyan, **Associate Professor in Management, Kumaraguru College of Technology** for giving me the encouragement and freedom to carry out my project.

My sincere thanks to my parents, who entrusted me to meet the problems cropping up in the wake of my study and solve them judiciously.

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INTRODUCTION

1.1 Need for the Study

Increased competition, customer demands, and higher quality requirements in the global environment have all forced the construction industry to pay much more attention to the concept of "performance" over the last two decades. Hence it was inclined to acquire a thorough knowledge in project and construction management of a Residential Apartment. Hence the study on "A study on Project Management and Appraisal with reference to construction of a Residential Apartment in Coimbatore" was carried out.

1.2 Primary Objective

- To study and understand about Project Management and its appraisal with reference to construction of a Residential Apartment in Coimbatore

Secondary Objectives

- To study about estimation of the various cost components, resource requirement and time frame required to expedite the construction of a residential apartment.
- To explore the significance of various methods and techniques used during different project phases.
- To examine the various external & internal variables and attributed associated with civil construction projects.

CHAPTER 2

LITERATURE SURVEY

2.1Review Of Literature:

The construction industry plays significant role in the economy of developing countries. For example, in many developing countries, major construction activities account for about 80% of the total capital assets, 10 % of their GDP, and more than 50% of the wealth invested in fixed assets. In addition, the industry provides high employment opportunity, probably next after agriculture [**(Ofori, 2006), (Jekale, 2004)**]1.Despite the construction industry's significant contribution to the economy of developing countries and the critical role it plays in those countries development, the performance of the industry still remains generally low.

As shown in a financial analysis textbook by **Fisher** and **Jordan(1996)**, one way of pricing a product to meet expected profit is to quantify risk and build a required rate of return that comprises riskless rate plus compensation for individual risk factors. Based on several years' working experience, **Connolly (2006)** explained that risk has cost, which can sometimes be catastrophic. However, it is not easy to predict or to price risk, as shown in a survey of the top400 US contractors, which revealed that pricing is a complex and difficult task for entrepreneurs **(Mochtar and Arditi, 2001)**

Several studies have referred to construction as a riskier sector in comparison to others (see for example, **Baloi** and Price, **2003 andAhmedetal, 2002**). A study by **Hugheset al. (1998)** proved this based on secondary data provided by Dun and Bradstreet (DB) on more than 3,000 UK construction companies. It showed that the risk of insolvency is higher in construction compared to other industries, but not enormously different. Out of 3,126 analyzed firms who hada DB rating in 1994, 207 (7%) of them were out of business by1997. However, during periods of market growth, the business failure rate in the construction sector was only marginally higher than the average for all sector.

CHAPTER 3
METHODOLOGY

Methodology

Construction project management is a relatively young field. However, its impact has been quite remarkable. It has become an important practice for improving the efficiency of construction operations around the world. This deals with some topics and tools of the large field of project management.

3.1 Type of the Project:

The study incorporates itself to a Literature module. It studies the various tools, techniques and methodology adopted in the construction industry. Hence the aspects involved in the study donot confine to the regular requirements and the following tools and techniques adopted are herewith explained

3.2 Analysis And Tools

- CPM
- PERT
- MS PROJECT

Using Ms Project:

- The details of Process and Resources can be known using the tool, when the resources is needed? and what is the next process? ,when it can be executed with exact start and finish date can be known with this analysis and tool.
- Using the MS Project (MSP), baseline of project ,when the project is started .how many days is need to finish the event and activities is update. The deal of project or the event is identified using the tools MSP , hence the necessary action and fast tracking strategy were used to rectify the deal.
- Cost Management is the main thing in the project,they only decide the growth of project and wealth of organization.cost needed at each stage and how much is needed ,all the details can be taken from the tool.
- Variance between the actual coat and estimated is calculated easily. Time deal in each stage is identified and how much cost is spent on the work is noted using the tool.

CHAPTER 4

PHASE OF PROJECT MANAGEMENT & APPRAISAL

4.1 The Need for Project Management

The construction industry is the largest industry in the world. It is more of a service than a manufacturing industry. Growth in this industry in fact is an indicator of the economic conditions of a country. This is because the construction industry consumes a wide employment circle of labor. While the manufacturing industry exhibit high-quality products, timelines of service delivery, reasonable cost of service, and low failure rates, the construction industry, on the other hand, is generally the opposite. Most projects exhibit cost overruns, time extensions, and conflicts among parties.

4.2 The Construction Project

A project is defined, whether it is in construction or not, by the following characteristics:

- A defined goal or objective.
- Specific tasks to be performed.
- A defined beginning and end.
- Resources being consumed.

Projects begin with a stated goal established by the owner and accomplished by the project team. As the team begins to design, estimate, and plan out the project, the members learn more about the project than was known when the goal was first established. This often leads to a redefinition of the stated project goals.

4.4 The Project Life-Cycle

The acquisition of a constructed facility usually represents a major capital investment, whether its owner happens to be an individual, a private corporation or a public agency. Since the commitment of resources for such an investment is motivated by market demands or perceived needs, the facility is expected to satisfy certain objectives within the constraints specified by the owner and relevant regulations.

From the perspective of an owner, the project life cycle for a constructed facility may be illustrated schematically in Figure 1.2. A project is expected to meet market demands or needs in a timely fashion. Various possibilities may be considered in the conceptual

planning stage, and the technological and economic feasibility of each alternative will be assessed and compared in order to select the best possible project. The financing schemes for the proposed alternatives must also be examined, and the project will be programmed with respect to the timing for its completion and for available cash flows. After the scope of the project is clearly defined, detailed engineering design will provide the blueprint for construction, and the definitive cost estimate will serve as the baseline for cost control. In the procurement and construction stage, the delivery of materials and the erection of the project on site must be carefully planned and controlled. After the construction is completed, there is usually a brief period of start-up of the constructed facility when it is first occupied. Finally, the management of the facility is turned over to the owner for full occupancy until the facility lives out its useful life and is designated for demolition or conversion.

The project life cycle may be viewed as a process through which a project is implemented from beginning to end. This process is often very complex; however, it can be decomposed into several stages as indicated by the general outline in Figure 1.2. The solutions at various stages are then integrated to obtain the final outcome. Although each stage requires different expertise, it usually includes both technical and managerial activities in the knowledge domain of the specialist.

All stages from conceptual planning and feasibility studies to the acceptance of a facility for occupancy may be broadly lumped together and referred to as the Design/Construct process, while the procurement and construction alone are traditionally regarded as the province of the construction industry.

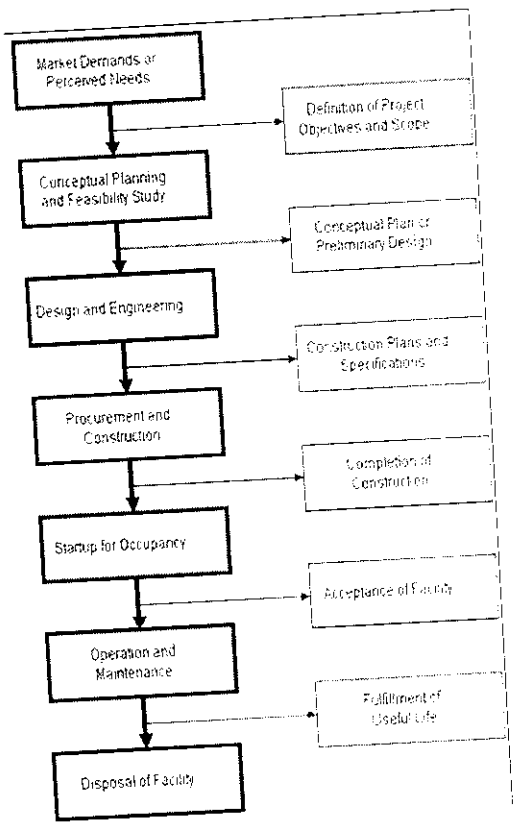


Figure 1.2: Project life cycle

There is no single best approach in organizing project management throughout a project's life cycle. All organizational approaches have advantages and disadvantages, depending on the knowledge of the owner in construction management as well as the type, size and location of the project. It is important for the owner to be aware of the approach which is most appropriate and beneficial for a particular project. Saving small amounts of money during construction may not be worthwhile if the result is much larger operating costs or not meeting the functional requirements for the new facility satisfactorily. Thus, owners must be very concerned with the quality of the finished product as well as the cost of construction itself. Since facility operation and maintenance is a part of the project life cycle, the owners' expectation to satisfy investment objectives during the project life cycle will require consideration of the cost of operation and maintenance.

CONSTRUCTION MANAGING PROCESS

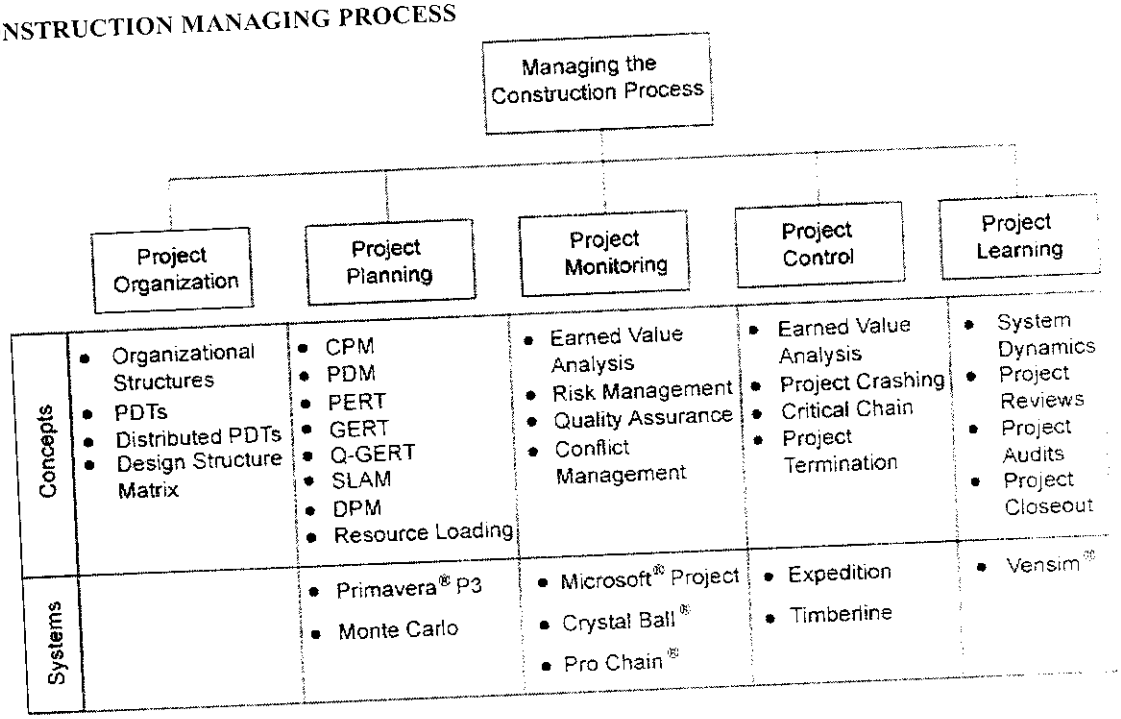


Figure 1: The organization framework: concepts & tools for the course

4.4.1 Preconstruction phase

The preconstruction phase of a project can be broken into conceptual planning, schematic design, design development, and contract documents.

Conceptual design:

- Very important for the owner.
- During this stage the owner hires key consultants including the designer and project manager, selects the project site, and establish a conceptual estimate, schedule, and program.
- The owner must gather as much information as possible about the project.
- The most important decision is to proceed with the project or not.

Schematic design:

- During this phase, the project team investigates alternate design solutions, materials and systems.
- Completion of this stage represents about 30% of the design completion for the project.

Design development:

- Designing the main systems and components of the project.
- Good communication between owner, designer, and construction manager is critical during this stage because selections during this design stage affect project appearance, construction and cost.
- This stage takes the project from 30% design to 60% design.

Contract documents:

- Final preparation of the documents necessary for the bid package such as the drawings, specifications, general conditions, and bill of quantities.
- All documents need to be closely reviewed by the construction manager and appropriate owner personnel to decrease conflicts, and changes.
- With the contract documents are almost complete; a detailed and complete cost estimate for the project can be done.

4.4.2 Procurement phase (Bidding and award phase)

- The project formally transits from design into construction.
- This stage begins with a public advertisement for all interested bidders or an invitation for specific bidders.
- In fast-track projects, this phase overlaps with the design phase.
- If the project is phased, each work package will be advertised and bid out individually.
- It is very important stage to select highly qualified contractors. It is not wise to select the under-bid contractors.

4.4.3 Construction phase

- The actual physical construction of the project stage.
- This stage takes the project from procurement through the final completion.
- It is the time where the bulk of the owner's funds will be spent.
- It is the outcome of all previous stages (i.e., good preparation means smooth construction).
- The consultant will be deployed for contract administration and construction supervision.
- Changes during construction may hinder the progress of the project.

4.4.4 *Closeout phase*

- Transition from design and construction to the actual use of the constructed facility.
- In this stage, the management team must provide documentation, shop drawings, as-built drawings, and operation manuals to the owner organization.
- The as-built drawings are the original contract drawings adjusted to reflect all the changes that occurred.
- Assessment of the project team's performance is crucial in this stage for avoiding mistakes in the future.
- Actual activity costs and durations should be recorded and compared with that was planned. This updated costs and durations will serve as the basis for the estimating and scheduling of future projects.

Figure 1.3 shows the increasing cumulative cost as the projects progresses while the influence in the project cost and scope decreases.

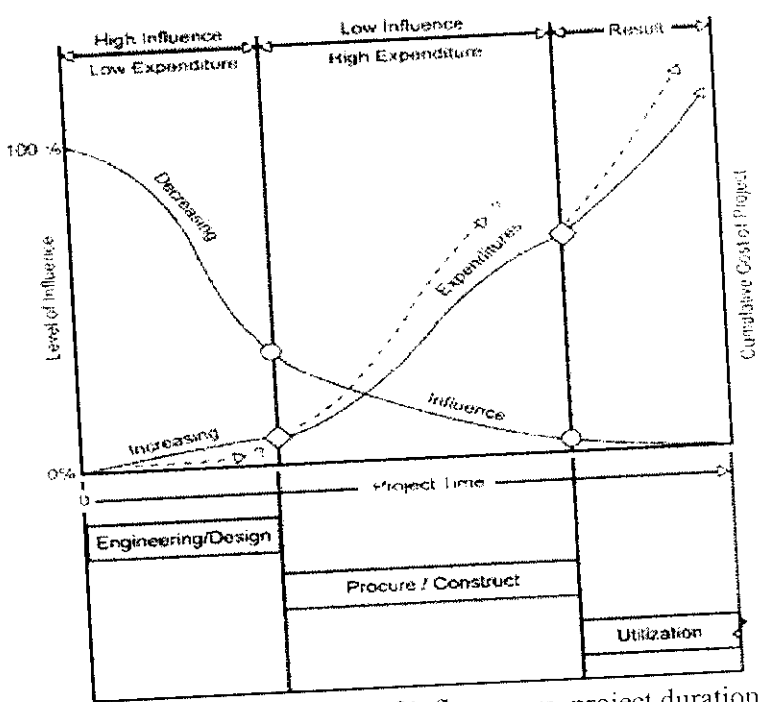


Figure 1.3: Level of influence vs. project duration

4.5 Major Types of Construction Projects

In planning for various types of construction, the methods of procuring professional services, awarding construction contracts, and financing the constructed facility can be quite different. The broad spectrum of constructed facilities may be classified into four major categories, each with its own characteristics.

4.5.1 Residential Housing Construction

Residential housing construction includes houses and high-rise apartments. During the development and construction of such projects, the developers usually serve as surrogate owners for design and and take charge, making necessary contractual agreement construction, and arranging the financing and sale of the completed structures. Residential housing designs are usually performed by architects and engineers, and the construction executed by builders who hire subcontractors for the structural, mechanical, electrical and other specialty work.

4.5.2 Institutional and Commercial Building Construction

Institutional and commercial building encompasses a great variety of project types and sizes, such as schools and universities, medical centers and hospitals, sports facilities, shopping centers, warehouses and light manufacturing plants, and skyscrapers for offices and hotels. The owners of such buildings may or may not be familiar with construction industry practices, but they usually are able to select competent professional consultants and arrange the financing of the constructed facilities themselves. Specialty architects and engineers are often engaged for designing a specific type of building, while the builders or general contractors undertaking such projects may also be specialized in only that type of building

4.5.3 Specialized Industrial Construction

Specialized industrial construction usually involves very large scale projects with a high degree of technological complexity, such as oil refineries, steel mills, chemical processing plants and coal-fired or nuclear power plants. The owners usually are deeply involved in the development of a project, and prefer to work with designers-builders such that the total time for the completion of the project can be shortened. They also want to pick a team of designers and builders with whom the owner has developed good working relations over the years.

4.5.4 *Infrastructure and Heavy Construction*

Infrastructure and heavy construction includes projects such as highways, tunnels, bridges, pipelines, drainage systems and sewage treatment plants. Most of these projects are publicly owned and therefore financed either through bonds or taxes. The engineers and builders engaged in infrastructure construction are usually highly specialized since each segment of the market requires different types of skills. However, demands for different segments of infrastructure and heavy construction may shift with saturation in some segments.

4.6 Construction Projects Participants

4.6.1 *The Owner (The Client)*

The owner is the individual or organization for whom a project is to be built under a contract. The owner owns and finances the project. Depending on the owners' capabilities, they may handle all or portions of planning, project management, design, engineering, procurement, and construction. The owner engages architects, engineering firms, and contractors as necessary to accomplish the desired work.

Public owners are public bodies of some kind ranging from agencies from the country level to the municipal level. Most public projects or facilities are built for public use and not sold to others. Private owners may be individuals, partnerships, corporations. Most private owners have facilities or projects built for their own use or to be sold, operated, leased, or rented to others.

4.6.2 *The Design Professionals*

Design professionals are architects, engineers, and design consultants. The major role of the design professional is to interpret or assist the owner in developing the project's scope, budget, and schedule and to prepare construction documents.

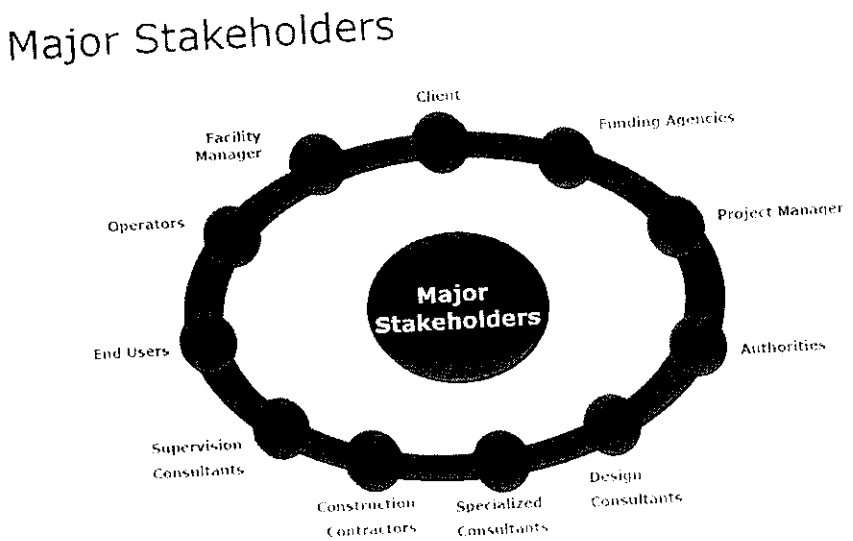
Architect: An architect is an individual who plans and design buildings and their associated landscaping. Architects mostly rely on consulting engineers for structural, electrical, and mechanical work.

***Engineer*:** The term engineer usually refers to an individual or a firm engaged in the design or other work associated with the design or construction. Design engineers are usually classified as civil, electrical, mechanical depending upon their specialty. There are also scheduling, estimating, cost, and construction engineers.

***Engineering-Construction Firm*:** An engineering-construction firm is a type of organization the combines both architect/engineering and construction contracting. This type of company has the ability of executing a complete design-build sequence.

4.6.3 The Construction Professionals

The constructions Professional are the parties that responsible for constructing the project. In traditional management where the owner, design professional, and contractors are separate companies, the contractor would be termed a prime contractor



4.6.4.The Project Manager

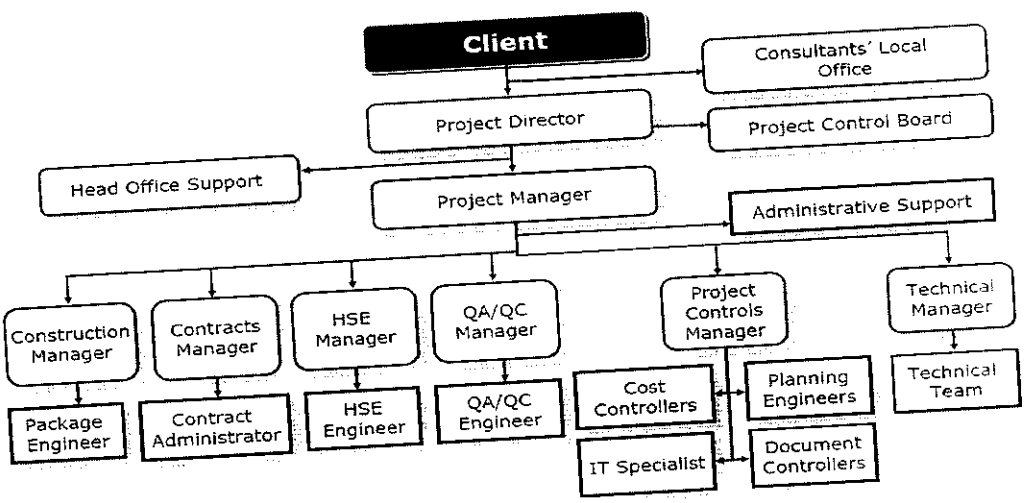
The project manager is the individual charged with the overall coordination of the entire construction program for the owner. These include planning, design, procurement, and construction. Among his/her duties:

- Clear definitions of the goals of the project.
- Investigate alternative solutions for the problems.
- Develop a detailed plan to make the selected program reality.
- Implement the plan and control the project.

Construction Manager: The construction manager is a specialized firm or organization

which administrates the on-site erection activities and the consulting services required by the owner from planning through design and construction to commissioning. The construction manager is responsible for design coordination, proper selection of materials and methods of construction, contracts preparation for award, cost and scheduling information and control.

Project Manager's Organisation Chart



4.7CONTRACT STRATEGY

Contract strategy means selecting organizational and contractual policies required for the execution of a specific project. The development of the contract strategy comprises a complete assessment of the choices available for the management of design and construction to maximize the likelihood of achieving project objectives

4.7.1 Contract

A contract is defined as: "***an agreement made between two or more parties which is enforceable by law to provide something in return for something else from a second party***". Contracts can be very simple or they may be very long and complicated legal documents. When a contract is properly set-up it is legally binding upon. The two parties are expected to perform the various obligations they have undertaken, as expressed in a mutually agreed set of contract documents.

- **Competent Parties**
- **Proper Subject Matter**

- **Consideration**
- **Agreement** enforceable by law
- **Proper Form**
- **Consent of the**

4.7.2 Selection of Contract Type

The selection of contract type to be used for a construction project is made by the owner, acting upon the advice of his Engineer and his legal advisor. The selection must meet the owner Objectives and takes into account the constraints that might relate to the project. Consultants and contractors should be fully informed by the project objectives and constraints. The scope and the nature of the project will primarily affect the selection of type of contract

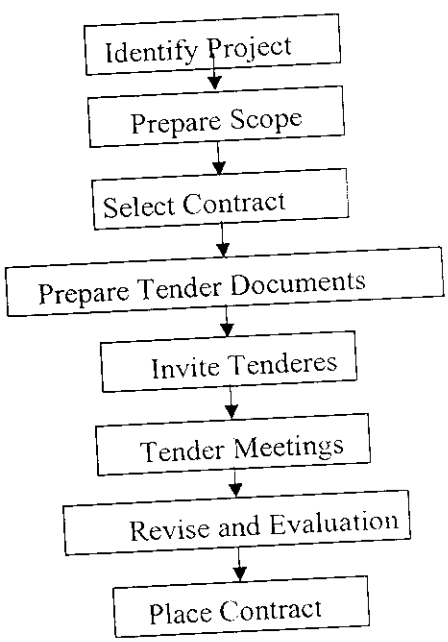


Fig. 2.1: Steps of contracting process

4.7.2.1 Project objectives

The client will have a number of overall objectives. These objectives may be of primary and/or secondary importance. Primary objectives include functional performance, time objectives, and cost objectives.

a. Project Scope (performance): The project scope defines the extent or the area that the contract covers. Any additions or omissions during the life of the project will increase or decrease the quantity of work involved. Likewise, any changes in design must be

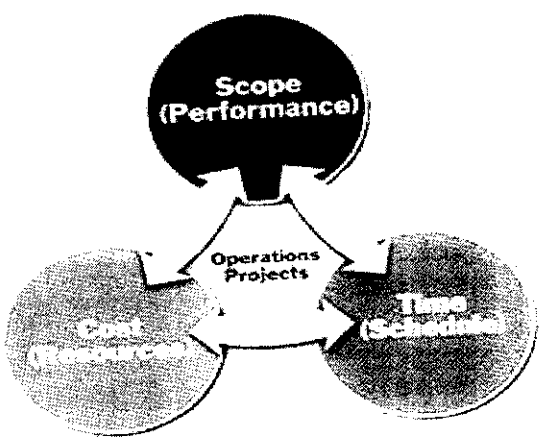
discussed carefully to establish whether or not they are likely to affect the scope of the project.

b. **Time:** The scope and time are closely interrelated. Decisions must often be made on the effect of increasing or decreasing scope on time. If the completion date of a project is critical, then increasing scope will call for an accelerated program. The extra cost associated with this acceleration must be quantified.

c. **Price:** The cost of a project is closely related to scope and time. The effect of the contract on price, and the various incentives and penalties that can help to keep price steady must be discussed and clearly defined.

On the other hand, secondary objectives could arise on a construction project and would exert a major influence over contract strategy decisions. Examples of secondary objectives are:

- Allocation and payment for risk.
- Training of the client's staff.
- Transfer of technology.
- Involvement of contractor in design.
- Involvement of client in contract management.
- Choice of labor-incentive construction.
- Use of local material and resources.
- Protection of the environment.



4.7.2.2 Project constraints

All construction projects have constraints that influence the achievement of the project objectives. These constraints should therefore, be considered when choosing an appropriate contract strategy. There are a variety of constraints and these are examples:

- Availability of funds.
- Availability of contractual incentives.
- Method of tendering.
- Project location.
- Target dates of the project.
- Possibility of design changes.
- Availability of resources.
- Seasonal working.
- Number of contractors willing or able to tender.
- Inflation.

Factors influencing contract choice

Three main factors influence the choice of a given contract including: the incentive, risk sharing and the flexibility.

4.7.3 Project Delivery Methods

The project delivery method translates what project parties are involved in the project and how they interact with each other and called also project organizational structure. The choice of an organizational structure should be related to project objectives and constraints. It can be facilitated considering the following factors:

- Size and nature of the work packages within the project.
- Selection of the design team form in-house resources external consultants or contractors.
- Process of supervision of construction.
- Restrictions upon using combination of organizational structures within the project.
- Expertise which the client wishes to commit to the project.

The various project delivery methods are summarized as follows:

4.7.3.1 Traditional approach

This is the most common approach in civil engineering projects in which the design has to be completed before construction can start. Design and construction are usually performed by two different parties who interact directly and separately with the owner. The pros and cons of this approach are summarized as follow:

Advantages:

- Price competition
- Total cost is known before construction starts
- Well documented approach used in most government projects.

Disadvantages

- Long time
- Design does not benefit from construction expertise
- Conflict between owner, contractor and A/E

Therefore, this method is fine in many cases where the project is clearly definable. design is completed, time need not be shortened, and changes are unlikely to occur during construction.

4.7.3.2 Direct labor

In this approach, owner organization performs both the design and construction using its in-house labor force.

- Used by large authorities
- The owner performs both the design and the construction
- May use consultants for some specialized designs
- Most suitable for small projects
- Can be used when expertise are available
- Low risk projects
- Inadequate scope definition

4.7.3.3 Design-build

In this approach, a single organization is responsible for performing both design and construction and, in some cases, providing certain "know-how" for the project. The pros and cons of this approach are summarized as follow:

Advantages:

- One contract that may include know-how
- Minimum owner involvement
- Used for fast-track projects in order to reduce time
- Co-ordination between design and construction and easier in implementing the changes

Disadvantages

- Cost may not be known until end of the construction
- High risk to contractor and more cost to owner
- Design-build company may reduce quality to save cost

4.7.3.4 Turnkey

This approach is similar to the design-build approach but with the organization being responsible for performing both design, construction, know-how (if any), and project financing. Owner payment is then made at the completion (when the contractor turns over the "key"). An example is franchise projects in which a new branch of a restaurant chain needs to maintain the same design, construction quality, and food service quality.

4.7.3.5 Build-operate-transfer (BOT)

In this approach, a business entity is responsible for performing the design, construction, long-term financing, and temporary operation of the project. At the end of the operation period, which can be many years, operation of the project is transferred to the owner. This approach has been extensively used in recent years and is expected to continue

4.7.3.6 Professional construction management (PCM)

In this approach, the owner appoints a PCM organization (also known as Construction Management organization) to manage and coordinate the design and construction phases of a project using a Teamwork approach. The design may be provided by specialist design firms and in some cases by the PCM organization. With high level of coordination between the participants, innovative approaches of overlapping design and construction (i.e., fast tracking) can be adopted. The PCM organization aims at holding a friendly position similar to that of the consultants in the traditional approach.

4.7.3.7 *Contractual relationships*

Within each project delivery method, the contractual relationships among the project participants can take various arrangements and the owner needs to make a decision regarding the proper arrangement that suits the project and the parties involved. The different contractual relationships associated with various project delivery methods are illustrated in Figs. 2.2 (A represents services and $ contractual relationships).

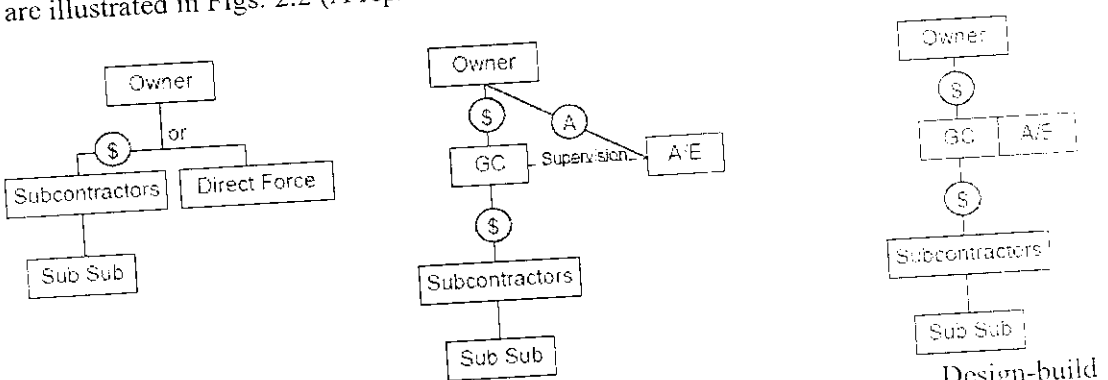


Fig.2.2. Contractual relationships

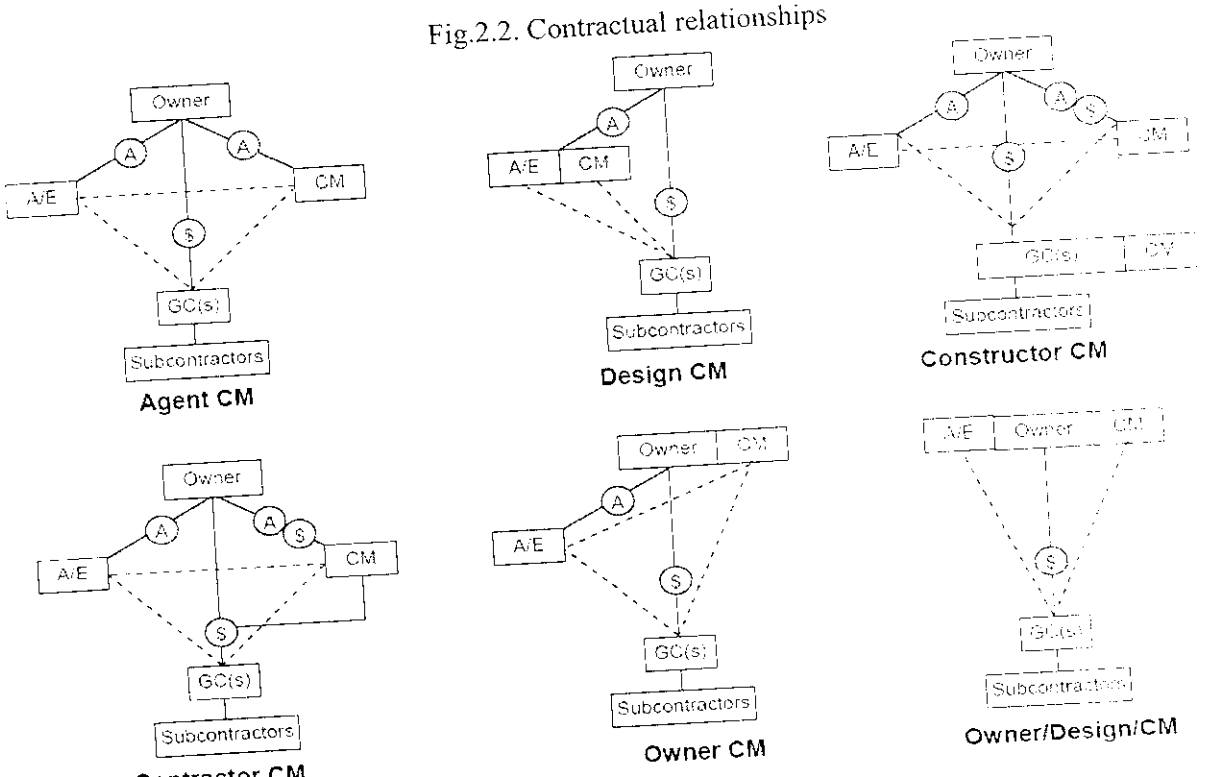


Fig. 1.11: Various Forms of Construction Management (CM) Contracts

4.7.4 Types of Contracts

There are many types of contracts that may be used in the construction industry. Construction contracts are classified according to different aspects. They may be classified according to the method of payment to the contractor. When payment is based on prices which submitted by the contractor in his tender, they are called cost-based contracts. Examples are cost-reimbursable and target cost contracts.

4.7.4.1 Lump-sum contract

A single tendered price is given for the completion of specified work to the satisfaction of the client by a certain date. Payment may be staged at intervals on the completion. The contract has a very limited flexibility for design changes. The tendered price may include high level of financing and high risk contingency. Where considerable risk has been places with the contractor, this contract may lead to cost cutting, trivia claims, or bankruptcy. Contract final price is known at tender.

4.7.4.2 Admeasurements contract

In this type of contracting, items of work are specified in Bills of Quantities or Schedule of Rates. The contractor then specifies rates against each item. The rates include risk contingency. Payment is paid monthly for all work completed during the month. The contract offers a facility for the client to introduce changes in the work defined in the tender documents. The contractor can claim additional payment for any changes in the work content of the contract. Claims resolution is very difficult because the client has no knowledge of actual cost or hidden contingency. Tender price is usually increased by variations and claims. Two forms of admeasurement contract are usually used: bill of quantities and schedule of rates.

Bill of Quantities Contract: Tenderers enter rates against each item of the estimated quantities of work. The quantities are re-measured during the course of the contract, valued at the tendered rates and the contract price adjusted accordingly.

Schedule of Rates Contract: It contains inaccurate quantities of work, possibly with upper and lower probable limits. Therefore, it is common for separate rates to be quoted for labour, plant, and materials. The contract price is derived by measuring the man-hours, plant-hours and the quantities of materials actually consumed, and then pricing them at the tendered price. This contract is best suitable for repetitive works.

4.7.4.3 *Cost-reimbursable contract (cost-plus contract)*

The contractor is reimbursed for actual cost plus a special fee for head office overheads and profit, no special payment for risk. Payment may be made monthly in advance. The contract involves a high level of flexibility for design changes. Final price depends on changes and extent to which risks materialize. The contractor must make all his records and accounts available for inspection by the client or by some agreed third party. The fee may be a fixed amount or a percentage of actual costs.

4.7.4.4 *Target cost contract*

Cost targets may be introduced into cost-reimbursable contracts. In addition to the reimbursement of actual cost plus percentage fee, the contractor will be paid a share for any saving between target and actual cost, while the fee will be reduced if actual cost exceeds the target. The target figure should be realistic and the incentive must be sufficient to generate the desired motivation.

A brief summary of the level of risk exposed by each of the discussed contract forms is illustrated in Fig. 2.3. As shown in the figure, competitive bidding contracts (Lump Sum and Unit Price) are among the top risky contracts to contracts and thus present a challenge in estimating their cost and schedule at the bidding stage and before a commitment is made.

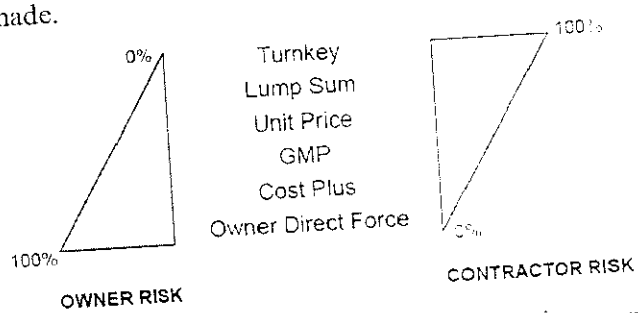
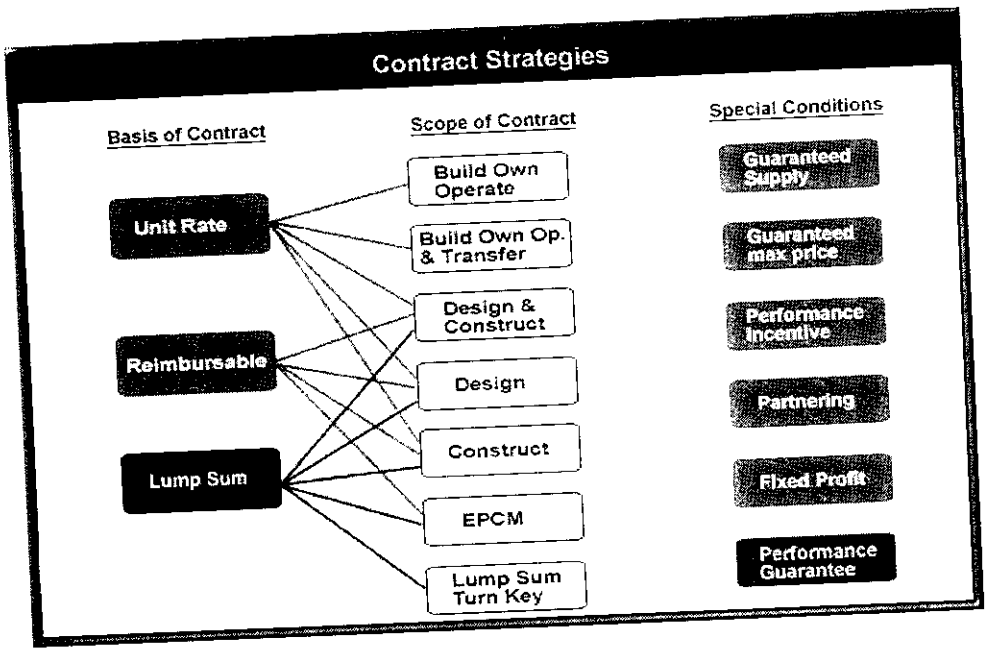


Fig. 2.3: Level of risk associated with various contracts

4.7.4.5 *Time and material (T&M) contracts*

T&M contracts are a hybrid type of contractual arrangement that contains aspects of both cost-reimbursable and fixed-price-type arrangements. T&M contracts resemble cost-type arrangements in that they are open ended, because the full value of the arrangement is not defined at the time of the award. Thus, T&M contracts can grow in contract value as if they were cost-reimbursable-type arrangements.



4.7.5 Contract Administration

As it was discussed in the previous sections, there is variety of types of contracts used in civil engineering projects. Each type has its specific characteristics. Contracts may be prepared under the heading of one type but could include characteristics of more than a single type.

The contract is defined by the contract documents, which are developed from the tender documents. In a logical order, these documents refer to the following subjects:

- Input from the client (task description).
- Output of the contract (specifications, results to be achieved).
- Prices for the contractor's contribution.
- Responsibilities and procedures (liability, resources provided, time schedule. payment conditions, change procedures, etc).

Contract documents are usually arranged according to the following sequence:

- General (for any project).
- Special (for a specialty area of the project).
- Supplementary (unique to a given project).
- Additional (during bidding or negotiation).
- Agreement form (for singing very important and particular clauses).
- Modifications (during contract fulfillment).

The complete contract agreement usually consists of the following documents:

- Conditions (general, special, supplementary).
- Drawing and specifications.
- Addenda.
- Agreement form.
- Modifications.

Information usually included in the agreement are of three parts. The first part is a short introductory paragraph which defines the parties, gives the date of the agreement, and state that each party agrees to what follows. The second part contains the elements of contract and defines the work to be undertaken. The final paragraph confirms the agreement and provides space for signatures of the parties. Thus, the agreement usually composed of the following articles:

1. A short introductory paragraph.
2. Scope of the work.
3. Time of completion.
4. Contract documents.
5. Performance bond.
6. Contractor's insurance.
7. Owner's insurance.
8. Laws, regulations and permits.
9. Payments.
10. Extensions of time.
11. Changes in the work.
12. Owner's right to terminate the work.
13. Contractor's right to terminate the work.
14. Confirmation and signatures.

4.7.5.2 Conditions of contract

The conditions of a contract are rules by which the execution of the contract is to be governed. They set-out the responsibilities, rights, and liabilities of the two parties. They also set-out the actions to be taken by the parties if and when certain eventualities should

arise. No two civil engineering contracts are similar. Probably, no two construction contracts are truly the same.

4.7.5.3 The standard (general) forms of conditions of contract

Standard forms are prepared jointly by professional bodies and organizations representing contractors or by large organizations and public bodies to suit their own circumstances. The intention is that a common approach by the parties to all contracts will be achieved and standard interpretations of risks and responsibilities involved.

- Definitions and interpretations.
- Engineer and Engineer's representative.
- Assignment and sub-contracting.
- Contract documents.
- General obligations.
- Labor, Materials, plant, and workmanship.
- Suspension.
- Commencement and delays.
- Defects liability.
- Alternations, Additions and Omissions.
- Procedure of claims.
- Contractors' equipment, temporary works and materials.
- Provisional sums.
- Certificates and payments.
- Remedies.
- Special risks.
- Release for performance.
- Settlement of disputes.
- Notices.
- Default of Employer.
- Changes in cost and legislation.
- Currency and rates of exchange.

- Delays in approval and examining work.
- Work acceleration by the client.
- Late delivery of materials supplied by the client.
- Different ground and/or site conditions.
- Unforeseen events and disasters.

4.7.6 Selecting the Contractor

Selecting key personnel and organizations that will participate in a project is a major step for the owner and can mean the success or failure of a project. By large, the competitive bidding process has been the main vehicle for contractors to obtain jobs. The process is required by law for public projects, which has been the largest percentage of all projects, except in emergencies such as war or natural disasters.

4.7.7 Sub-Contracting

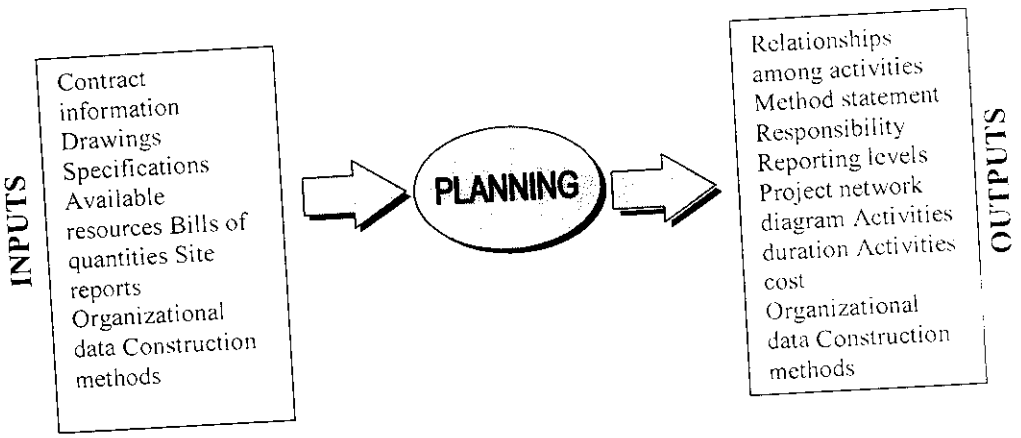
On almost all construction projects, some of the work is sub-contracted to *specialty* contractors, known as sub-contractors. The greatest part of the work is sub-contracted on building projects, with a lesser amount usually sub-contracted on heavy construction projects.The contractor who employs sub-contractors to carryout part of the works must be totally responsible for their workmanship, performance, and general behavior on the contract. Any communication on these aspects should be made between the main contractor and the client.

4.8 PROJECT PLANNING

4.8.1 Introduction

Planning is a general term that sets a clear road map that should be followed to reach a destination. The term, therefore, has been used at different levels to mean different things. Planning involves the breakdown of the project into definable, measurable, and identifiable tasks/activities, and then establishes the logical interdependences among them.

Detailed planning for tendering purposes and the preparation of construction needs to be conducted through brainstorming sessions among the planning team. The inputs and outputs of the planning process are shown in Figure 4.8.



4.8.2 Project Planning Steps

The following steps may be used as a guideline, or checklist to develop a project plan:

1. Define the scope of work, method statement, and sequence of work.
2. Generate the work breakdown structure (WBS) to produce a complete list of activities.
3. Develop the organization breakdown structure (OBS) and link it with work breakdown structure o identify responsibilities.
4. Determine the relationship between activities.
5. Estimate activities time duration, cost expenditure, and resource requirement.
6. Develop the project network.

4.8.2.1 Work Breakdown Structure (WBS)

The WBS is described as a hierarchical structure which is designed to logically sub- divide all the work-elements of the project into a graphical presentation. The full scope of work for the project is placed at the top of the diagram, and then sub-divided smaller elements of work at each lower level of the breakdown. At the lowest level of the WBS the elements of work is called a work package. A list of project's activities is developed from the work packages. To visualizethe WBS, consider Figure 1.2 which shows a house construction project.

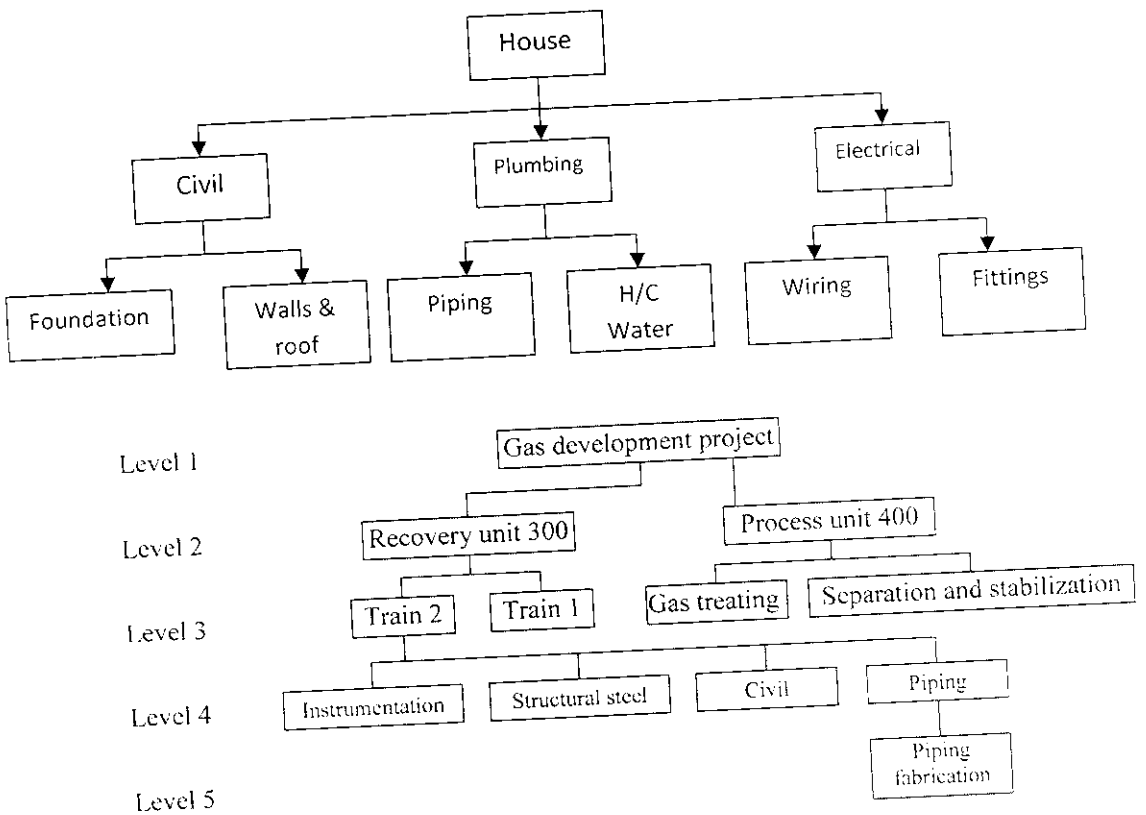


Figure 1.3: Five levels WBS

4.8.2.2 WBS and organizational breakdown structure (OBS)

The WBS elements at various levels can be related to the contractor's organizational breakdown structure (OBS), which defines the different responsibility levels and their appropriate reporting needs as shown in Figure 1.5

Production activities: activities that involve the use of resources such as labor, equipment, material, or subcontractor. This type of activities can be easily identified by reading the project's drawings and specifications. Examples are: excavation, formwork, reinforcement, concreting, etc. each production activity can have a certain quantity of work, resource needs, costs, and duration.

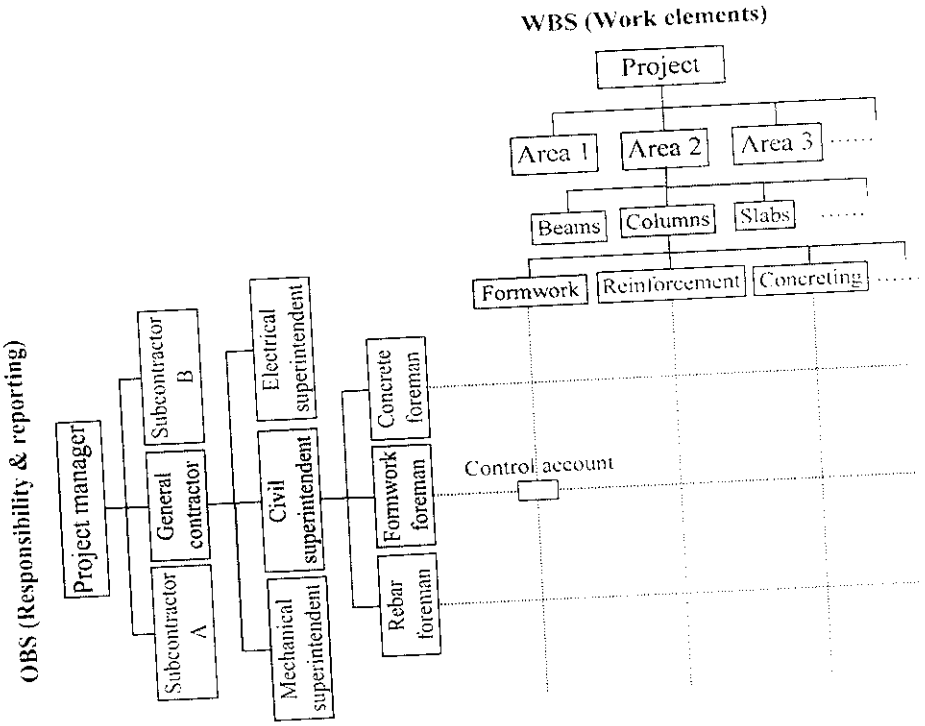


Figure 1.5: WBS linked to the OBS

Procurement activities: activities that specify the time for procuring materials or equipment that are needed for a production activity. Examples are: brick procurement, boiler manufacturing and delivery, etc.

Management activities: activities that are related to management decisions such as approvals, vacations, etc.

4.8.2.3 Activities Relationships

In order to identify the relationships among activities, the planning team needs to answer the following questions for each activity in the project:

- Which activities must be finished before the current one can start?
- What activity(ies) may be constructed concurrently with the current one?
- What activity(ies) must follow the current one?

A circle of activity precedence will result in an impossible plan. For example, if activity A precedes activity B, activity B precedes activity C, and activity C precedes activity A, then the project can never be started or completed. Figure 1.9 illustrates the resulting activity network.

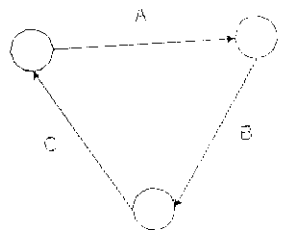


Figure 1.9: Example of a circle of activity precedence

Logical relationship considering resource constraints

For efficient use of resources or in case of constrained resources, it might be beneficial to consider the resources when determining the logical relationship among the activities that use the same resources.

Overlap or lag

Overlap between activities (negative lag) is defined as how much a particular activity must be completed before a succeeding activity may start. The absence of overlap means that the first activity must finish before the second may start. A negative overlap (lag) means a delay is required between the two activities (Figure 1.10)

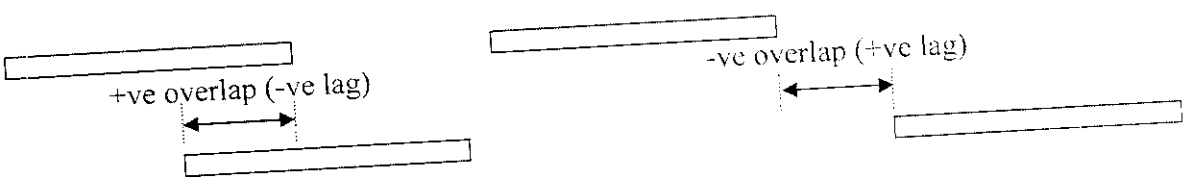


Figure 1.10: Overlap among activities

Types of activities relationships

Four types of relationships among activities can be defined as described and illustrated below (Figure 1.12). Typically, relationships are defined from the predecessor to the successor activity.

a) Finish to start (FS). The successor activity can begin only when the current activity completes.
b) Finish to finish (FF). The finish of the successor activity depends on the finish of the current activity.
c) Start to start (SS). The start of the successor activity depends on the start of the current activity.
d) Start to finish (SF). The successor activity cannot finish until the current activity starts.

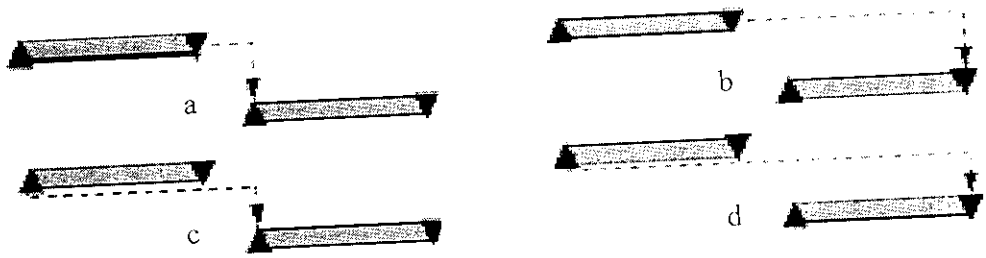


Figure 1.12: Types of relationships

4.8.2.4 Drawing Project Network

A network is a graphical representation of the project activities and their relationships. A project network is a set of arrows and nodes. Before drawing the network, it is necessary to ensure that the project has a unified starting and ending point. The need for this start activity arises when there is more than one activity in the project that has no predecessors and the end activity is needed when there is more than one activity that has no successors.

There are two ways that are commonly used to draw a network diagram for a project:

1. Activity on Arrow (AOA) representation.
2. Activity on Node (AON) representation

Activity on arrow network (AOA)

In this method, the arrows represent activities while the nodes represent the start and the end of an activity (usually named as events) (Figure 1.13). The length of the arrow connecting the nodes has no significance and may be straight, curved, or bent. When one activity depends upon another, both appear on the diagram as two arrows having a common node.

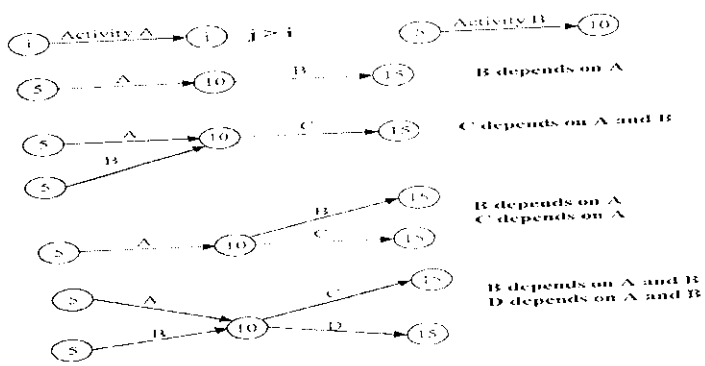


Figure 1.13: Basic patterns of AOA diagrams

Activity on node network (AON)

This method is also called the precedence diagram method. In this method. the nodes represent activities and the arrows represent logical relationships among the activities. If the arrow starts from the end side of an activity (activity A) and ends at the start side of another activity (activity B), then A is a predecessor of B (Figure 1.15). AON representation allows the overlap or lag representation on the relationship arrows

Connecting activities.

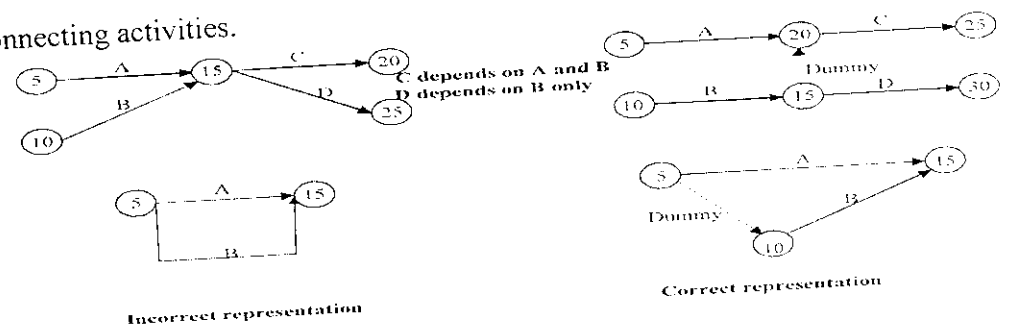


Figure 1.14: Use of dummy activity

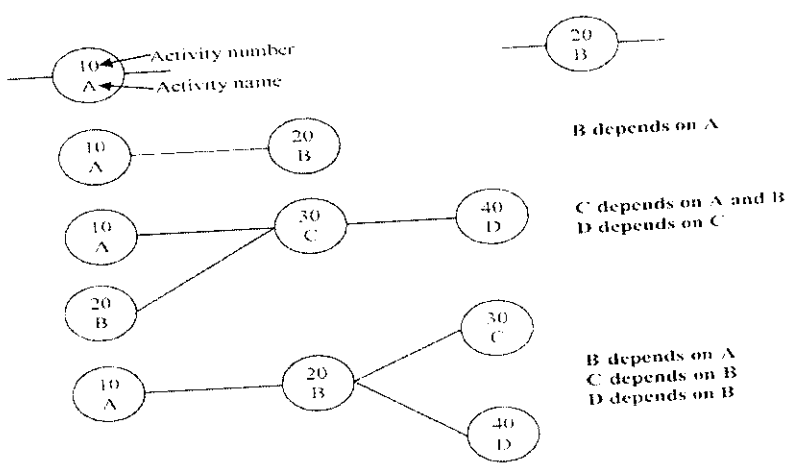


Figure 1.15: Basic patterns of AON diagrams

4.9RESOURCES MANAGEMENT

4.9.1 Resource Definition

The first step in resource management is to decide exactly what resources are considered important enough to be managed. While the most resource used is people or workers(such as welders or carpenters), it may also include other resources such as

machines(such as an excavator or loader), space on a project where space is restricted and where this restriction limits the amount of other resources which can be deployed at any one time, financial resources (money) that are needed to perform the required work, or materials needed to accomplish different activities

4.9.2 Resource Management

The most important resources that project managers have to plan and manage on day-to- day basis are people, machines, materials, and money. Obviously, if these resources areavailable in abundance then the project could be accelerated to achieve shorter project duration. On the other hand, if these resources are severely limited, then the result more likely will be a delay in the project completion time. In general, from a scheduling perspective, projects can be classified as either time constrained or resource constrained.

Resource leveling (smoothing)

A project is classified as time constrained in situations where the project completion time can not be delayed even if additional resources are required. However, the additional resource usage should be no more than what is absolutely necessary. Accordingly, the primary focus, for purposes of scheduling, in time constrained projects is to improve resource utilization. This process is called resource leveling or smoothing.

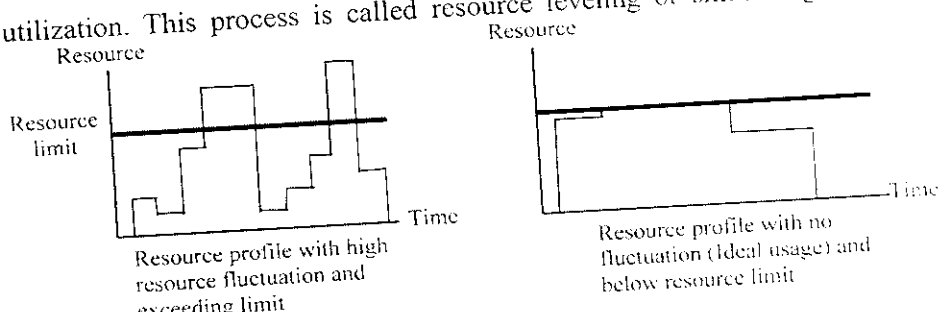


Figure 7.1: Resource leveling (smoothing)

Resource scheduling

On the other hand, a project is resource constrained if the level of resource availability cannot be exceeded. In those situations where resources are inadequate, project delay is acceptable, but the delay should be minimal. The focus of scheduling in these situations is to prioritize and allocate resources in such a manner that there is minimal project delay.

4.9.3 Resource Allocation

Resource allocation, also called resource loading, is concerned with assigning the required number of resources identified for each activity in the plan. More than one type of resource may be assigned to a specific activity.

4.9.4 Resource Aggregation (Loading)

After each activity has been assigned its resources, the next step is to aggregate the resources used by all activities. Resource aggregation is simply the summation, on a period-by-period basis, of the resources required to complete all activities based on the resource allocation carried out previously. The results are usually shown graphically as a histogram. Such aggregation may be done on an hourly, daily, or weekly basis. depending on the time unit used to allocate resourcesn example is shown in Figure 7.2, where, for a particular resource, the required resource units for each time period are written on the bar chart

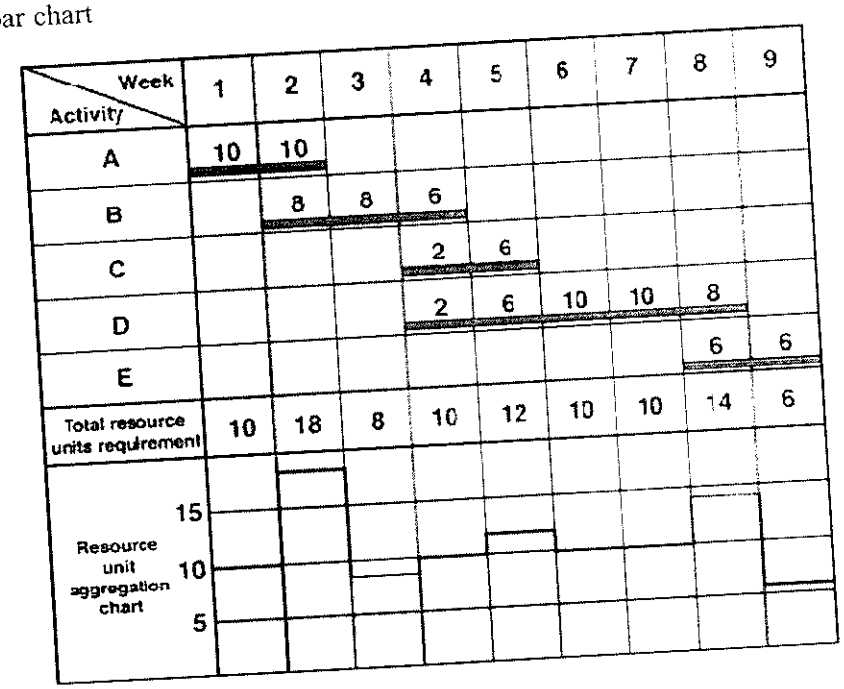


Figure 7.2: Resource aggregation

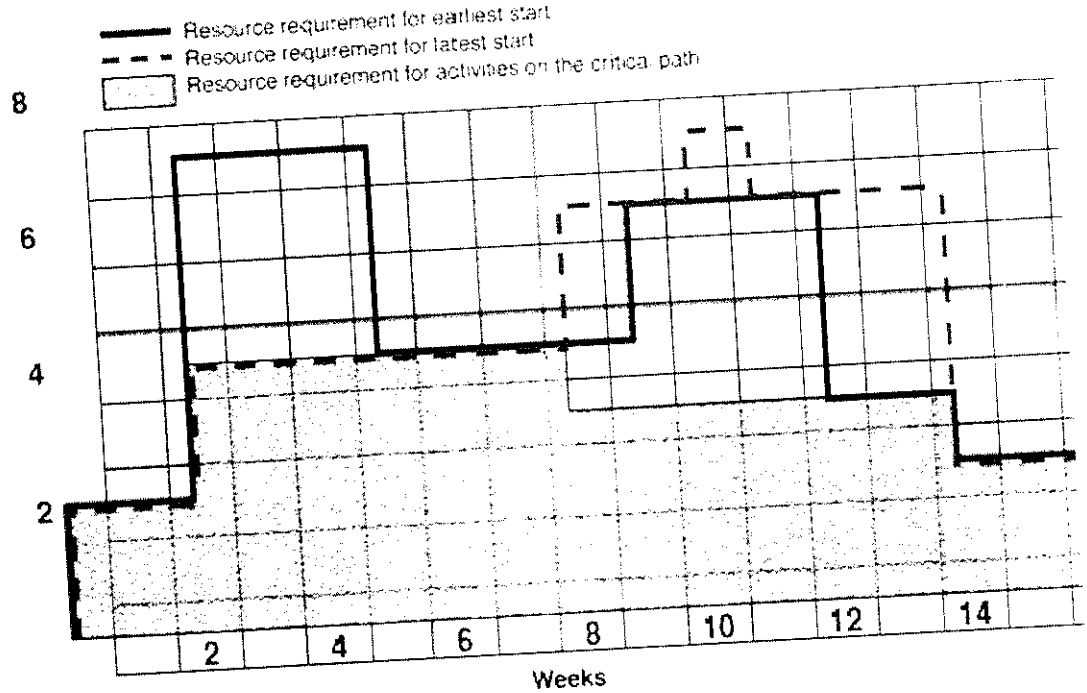


Figure 7.3: Resource aggregation chart showing resource requirements associated with earliest and latest times along with highlighted resource requirements for critical activities

The non critical activities, activities which are not on the critical path, do not have fixed starting and finishing times but are constrained by the earliest and latest starting and finishing times. This situation offers the planner chance for adjusting the demand for resources. Figure 7.3 illustrates such situation, which shows the resource aggregation when the activities scheduled on their early times and late times. It can be seen that the resource requirements that arise when both earliest and latest start times are considered are different. The shaded area represents the resources required by the critical activities, as these activities have a fixed position because their early times equal their late time.

4.9.5 Resource Leveling (Smoothing)

As shown in Figure 7.3, the problem of resource fluctuation appears after the initial scheduling of the project without considering the resources. The peaks and valleys in the resource profile indicate high day-to-day variation in the resource demand. Resource smoothing is the process that attempts to determine a resource requirement that is "smooth" and where peaks and valleys are eliminated. For example, even if 7 units of a given resource are available at any one time, utilizing 5 of these units each week is

preferable than using 4 units for the first week, 7 the next, 2 the next and so on.

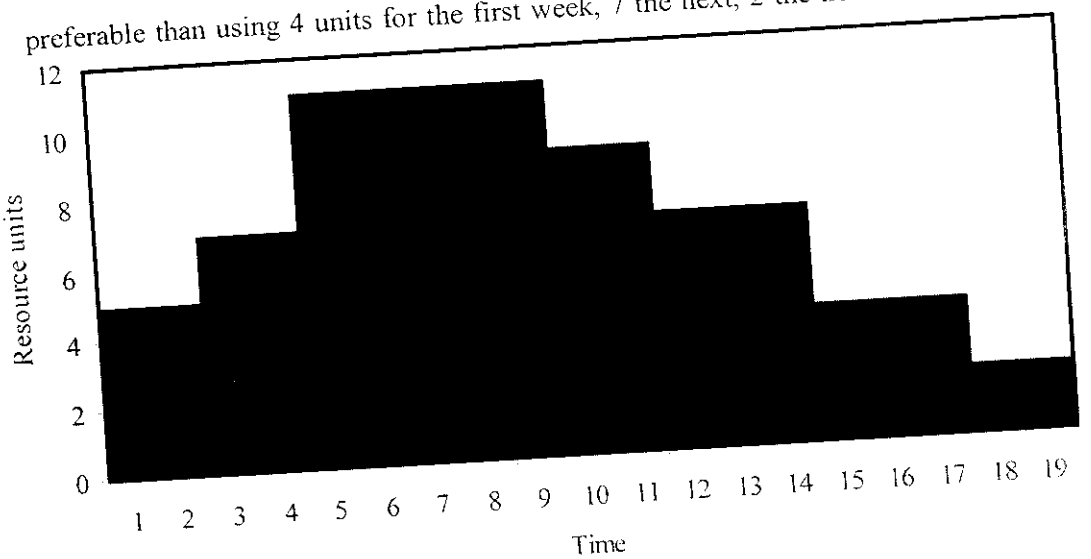


Figure 7.4: Preferred resource usage

4.9.6 Scheduling with Limited Resource

Shortage of resources is a major challenge for construction projects. Often, the number of skilled labor is limited, related equipment has to be returned as soon as possible, and / or a limited require our special consideration. Scheduling under these resource constraints becomes a complex problem, particularly when more than one resource is limited.

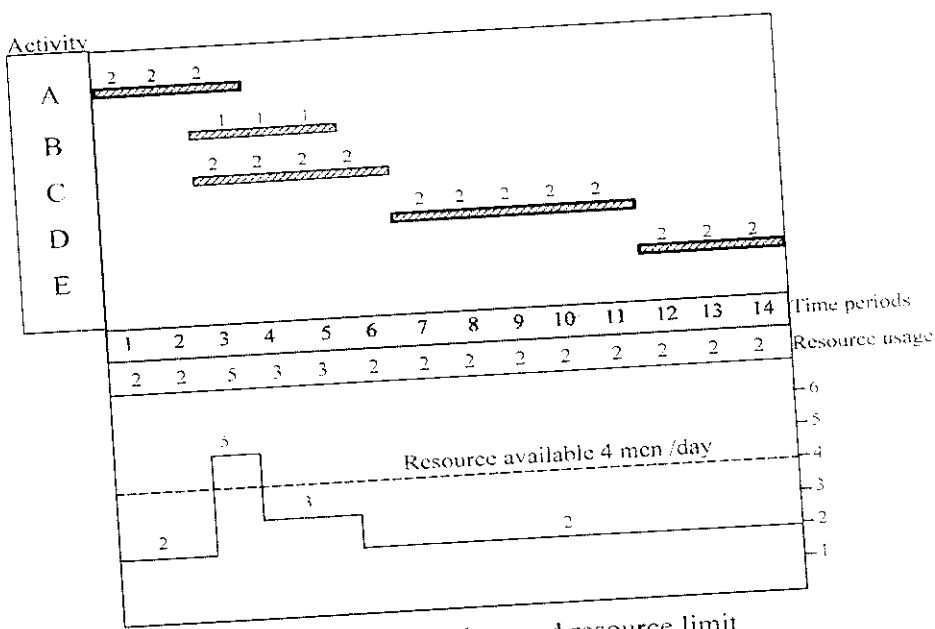


Figure 7.13: Resource needed exceed resource limit

The technique that deals with limited resources has been referred to as "resource-scheduling" or "resource-constrained scheduling".

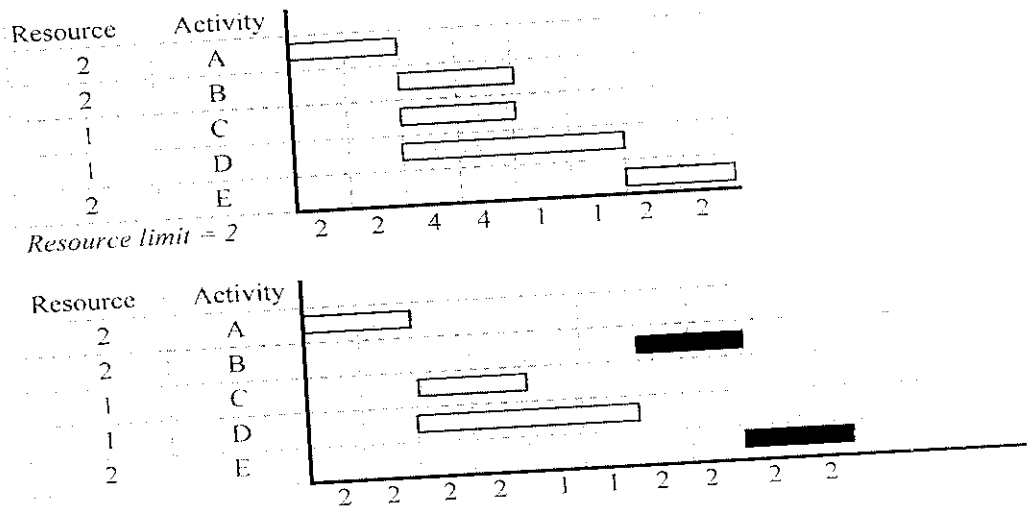


Figure 7.14: Resource scheduling using least TF rule

These heuristic rules are based mainly on activity characteristics. The two most effective and commonly used heuristic rules are the least total-float (LTF) and the earliest late-start (ELS). These two rules have been proven to provide identical results, with the ELS rule being advantageous compared to the LTF rule. This is because the value of the late-start derived from the original CPM calculations.

4.10 PROJECT TIME-COST TRADE-OFF

4.10.1 Time-Cost Trade-off

The objective of the time-cost trade-off analysis is to reduce the original project duration, determined form the critical path analysis, to meet a specific deadline, with the least cost. In addition to that it might be necessary to finish the project in a specific time to:

- Finish the project in a predefined deadline date.
- Recover early delays.
- Avoid liquidated damages.
- Free key resources early for other projects.
- Avoid adverse weather conditions that might affect productivity.
- Receive an early completion-bonus.
- Improve project cash flow

Reducing project duration can be done by adjusting overlaps between activities or by reducing activities' duration. The activity duration can be reduced by one of the following actions:

- Applying multiple-shifts work.
- Working extended hours (over time).
- Offering incentive payments to increase the productivity.
- Working on week ends and holidays.
- Using additional resources.
- Using materials with faster installation methods.
- Using alternate construction methods or sequence.

4.10.2 Activity Time-Cost Relationship

In general, there is a trade-off between the time and the direct cost to complete an activity; the less expensive the resources, the larger duration they take to complete an activity. Shortening the duration on an activity will normally increase its direct cost which comprises: the cost of labor, equipment, and material. It should never be assumed that the quantity of resources deployed and the task duration are inversely related. Thus one should never automatically assume that the work that can be done by one man in 16 weeks can actually be done by 16 men in one week.

A simple representation of the possible relationship between the duration of an activity and its direct costs appears in Figure 8.1

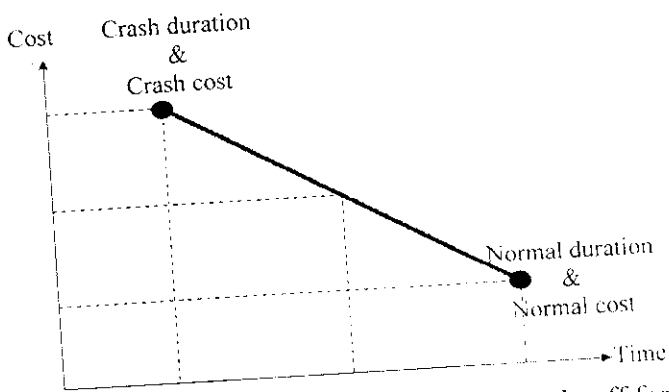


Figure 8.1: Illustration of linear time/cost trade-off for an activity

The linear relationship shown in the Figure 8.1 between these two points implies that any intermediate duration could also be chosen. It is possible that some intermediate point may represent the ideal or optimal trade-off between time and cost for this activity. The slope of the line connecting the normal point (lower point) and the crash point (upper point) is called the cost slope of the activity. The slope of this line can be calculated mathematically by knowing the coordinates of the normal and crash points.

Cost slope = crash cost – normal cost / normal duration – crash duration

As shown in Figures 8.1, 8.2, and 8.3, the least direct cost required to complete an activity is called the normal cost (minimum cost), and the corresponding duration is called the normal duration. The shortest possible duration required for completing the activity is called the crash duration, and the corresponding cost is called the crash cost. Normally, a planner start his/her estimation and scheduling process by assuming the least costly option

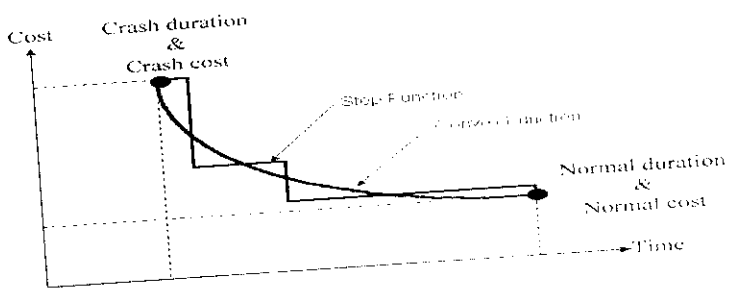


Figure 8.2: Illustration of non-linear time/cost trade-off for an activity

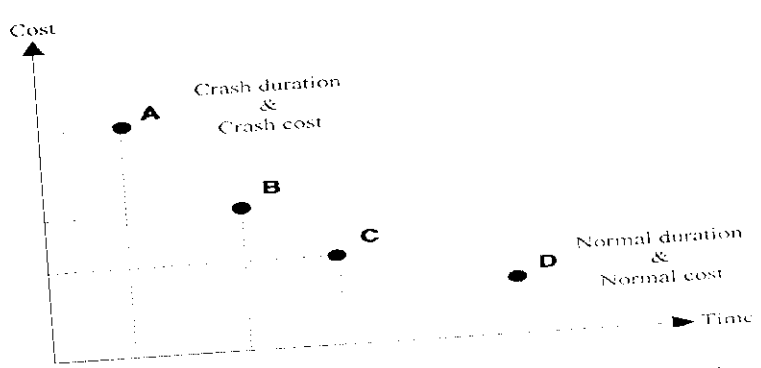


Figure 8.3: Illustration of discrete time/cost trade-off for an activity

4.10.3 Project Time-Cost Relationship

Total project costs include both direct costs and indirect costs of performing the activities of the project. Direct costs for the project include the costs of materials, labor, equipment, and subcontractors. Indirect costs, on the other hand, are the necessary costs of doing work which can not be related to a particular activity, and in some cases can not be related to a specific project.

As the direct cost for the project equals the sum of the direct costs of its activities, then the project direct cost will increase by decreasing its duration. On the other hand, the indirect cost will decrease by decreasing the project duration, as the indirect cost are almost a linear function with the project duration. Figure 8.5 illustrates the direct and indirect cost relationships with the project duration.

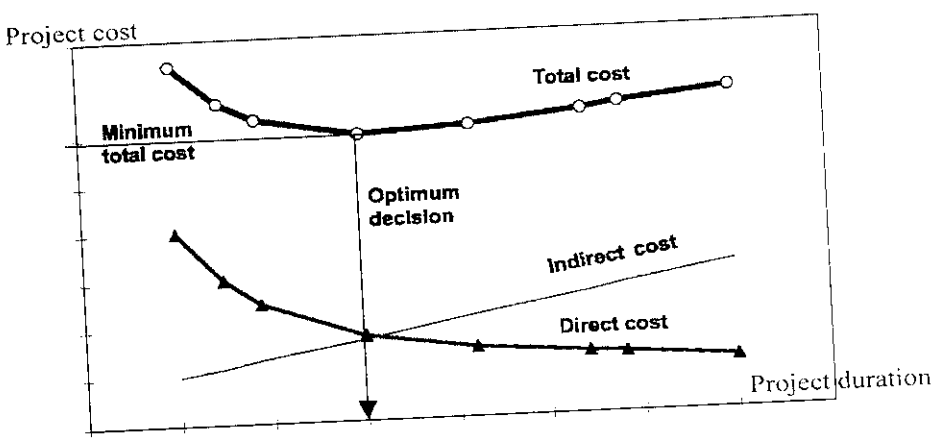


Figure 8.5: Project time-cost relationship

The project total time-cost relationship can be determined by adding up the direct cost and indirect cost values together as shown in Figure 8.5. The optimum project duration can be determined as the project duration that results in the least project total cost.

4.10.4 Shortening Project Duration

The procedure for shortening project duration can be summarized in the following steps:

1. Draw the project network.
2. Perform CPM calculations and identify the critical path, use normal durations and costs for all activities.

3. Compute the cost slope for each activity from the following equation:

   cost slope = crash cost – normal cost / normal duration – crash duration

4. Start by shortening the activity duration on the critical path which has the least cost slope and not been shortened to its crash duration.

5. Reduce the duration of the critical activities with least cost slope until its crash duration is reached or until the critical path changes.

6. When multiple critical paths are involved, the activity(ies) to shorten is determined by comparing the cost slope of the activity which lies on all critical paths (if any), with the sum of cost slope for a group of activities, each one of them lies on one of the critical paths.

7. Having shortened a critical path, you should adjust activities timings, and floats.

8. The cost increase due to activity shortening is calculated as the cost slope multiplied by the time of time units shortened.

9. Continue until no further shortening is possible, and then the crash point is reached.

10. The results may be represented graphically by plotting project completion time against cumulative cost increase. This is the project direct-cost / time relationship. By adding the project indirect cost to this curve to obtain the project time / cost curve. This curve gives the optimum duration and the corresponding minimum cost.

4.11 PROJECT FINANCE AND CONTRACT PRICING

4.11.1 Contract Cash Flow

At the project level, a project's cash flow is the difference between the project's expense and income. At the construction company level, the difference between company's total expense and its total income over a period of time is the company's cash flow.

Cash flow = Cash in – Cash out = Income – Expense

Forecasting cash flow is necessary for a construction company for the following reasons:

- To ensure that sufficient cash is available to meet the demands.
- It shows the contractor the maximum amount of cash required and when it will be required. Thus, the contractor can made arrangements to secure the required cash.
- It provides a reliable indicator to lending institutions that loans made can be repaid according to an agreed program.
- It ensures that cash resources are fully utilized to the benefit of the owner and investors in the company.

The three main ingredients in determination of cash flow are:

- Expenses (cash out) which represents the aggregate of the payments which the contractor will make over a period of time for all resources used in the project such as labor, equipment, material, and subcontractors.
- Income (cash in) that represents the receipts a contractor will receive over a period of time for the work he/she has completed.
- Timing of payments: in cash flow analysis, we are interested in the timing of payments related to the work done by the contractor.

4.11.1.1 Construction Project Costs

In preparing the cash flow for a project, it is necessary to compute the costs that must be expended in executing the works using activities durations and their direct and indirect costs. The principal components of a contractor's costs and expenses result from the use of labors, materials, equipment, and subcontractors. Additional general overhead cost components include taxes, premiums on bonds and insurance, and interest on loans. The sum of a project's direct costs and its allocated indirect costs is termed the project cost.

The costs that spent on a specific activity or project can be classified as;

- *Fixed cost*: costs that spent once at specific point of time (e.g., the cost of purchasing equipment, etc.)
- *Time-related cost*: costs spent along the activity duration (e.g., labor wages, equipment rental costs, etc.)
- *Quantity-proportional cost*: costs changes with the quantities (e.g., material cost)

Project direct costs

The costs and expenses that are incurred for a specific activity are termed direct costs. These costs are estimates based on detailed analysis of contract activities, the site conditions, resources productivity data, and the method of construction being used for each activity. A breakdown of direct costs includes labor costs, material costs, equipment costs, and subcontractor costs. Activities' direct costs are estimated as presented previously in chapter 3.

Project indirect costs

Other costs such as the overhead costs are termed indirect costs. Part of the company's indirect costs is allocated to each of the company's projects. The indirect costs always classified to: project (site) overhead; and General (head-office) overhead.

Project overhead

Project overhead are site-related costs and includes the cost of items that can not be directly charged to a specific work element and it can be a fixed or time-related costs. These include the costs of site utilities, supervisors, housing and feeding of project staff, parking facilities, offices, workshops, stores, and first aid facility. Also, it includes plants required to support working crews in different activities.Site overhead costs are estimated to be between 5% - 15% of project total direct cost.

General overhead

The costs that cannot be directly attributed a specific project called general overhead. These are the costs that used to support the overall company activities. They represent the cost of the head-office expenses, mangers, directors, design engineers, schedulers, etc. Continuous observations of the company expenses will give a good idea of estimating reasonable values for the general overhead expenses. Generally, the general overhead for a specific contract can be estimated to be between 2% - 5% of the contract direct cost. The amount of the general overhead that should be allocated to a specific project equals:

$$\frac{\text{Project direct cost x general overhead of the company in a year}}{\text{Expected sum of direct costs of all projects during the year}}$$

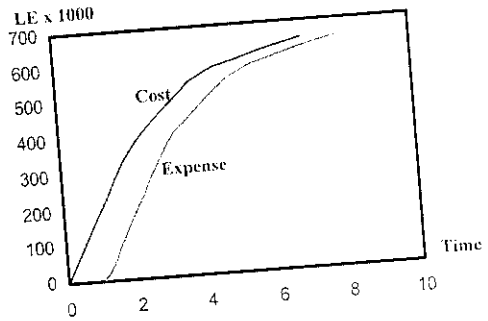


Figure 9.1: Project cost and expense curves

4.11.1.2 The S-Curve

The curve represents the cumulative expenditures of a project direct and indirect costs over time is called the S-curve as it take the S-shape as shown in Figure 9.2. In many contracts, the owner requires the contractor to provide an S-curve of his estimated progress and costs across the life of the project. This S-shaped of the curve results because early in the project, activities are mobilizing and the expenditure curve is relatively flat. As many other activities come on-line, the level of expenditures increases and the curve has a steeper middle setion.

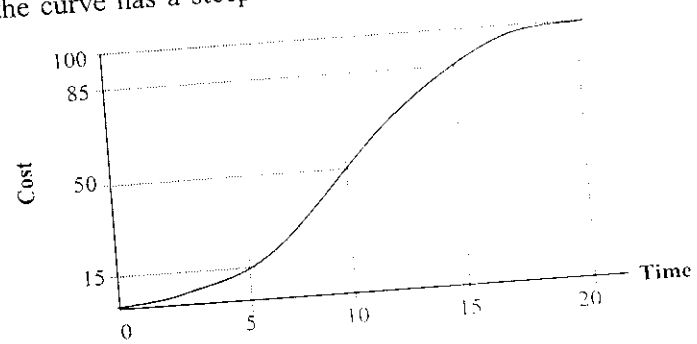


Figure 9.2: A sample S-curve

An S-curve for a project can be developed using the following steps:

- Constructing a simple bar chart for all the tasks of the project.
- Assigning costs to each task using task duration.
- Plotting the cumulative amounts of expenditures versus time by smoothly connecting the projected amounts of expenditures over time.

4.11.1.3 Project Income (Cash-in)

The flow of money from the owner to the contractor is in the form of progress payments. Estimates of work completed are made by the contractors periodically (usually monthly), and are verified by the owner's representative. Depending on the type of contract (e.g., lump sum, unit price, etc.), these estimates are based on evaluations of the percentage of total contract completion or actual field measurements of quantities placed. Owners usually retain 10% of all validated progress payment claims submitted by contractors.

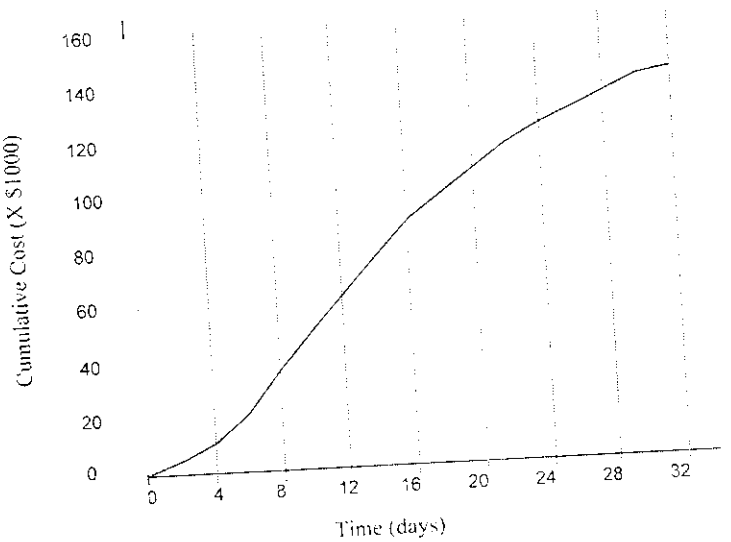


Figure 9.5: The S-Curve for the Example Project

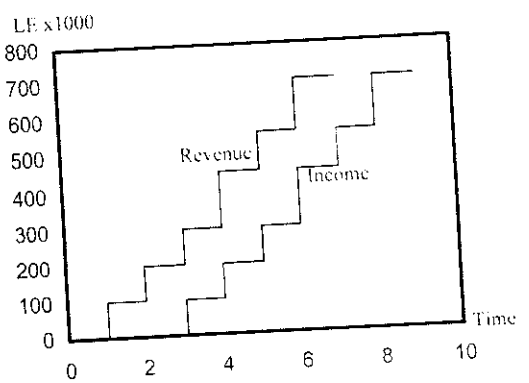


Figure 9.6: Project revenue and income curves

Retention

Retention is the amount of money retained by the owner from every invoice, before a payment is made to the contractor. This is to ensure that the contractor will continue the work and that no problems will arise after completion. This retainage amount ranges from 5% to 10% and hold by the owner from every invoice till the end of the contract. The whole amount will be paid to the contractor at the end of the contract.

Advanced payment

This is amount of money paid to the contractor for mobilization purposes. Then, it is deducted from contract progress payment. Applying this strategy improves the contractor cash flow and prevents him/her from loading the prices at the beginning of the contract. This strategy, however, may be used only in projects that require expensive site preparation, temporary facilities on site, and storage of expensive materials at the beginning of the project.

4.11.1.4 Calculating Contract Cash Flow

Having determined the contract expenses and income as presented in the previous section, it is possible to calculate the contract cash flow. If we plotted the contract expense and income curves against each other, then the cash flow is the difference between the points of both curves. Figure 9.7 shows the cash flow of a specific contract. The hatched area represents the difference between the contractor's expense and income curves, i.e., the amount that the contractor will need to finance. The larger this area, the more money to be financed and the more interest charges are expected to cost the contractor.

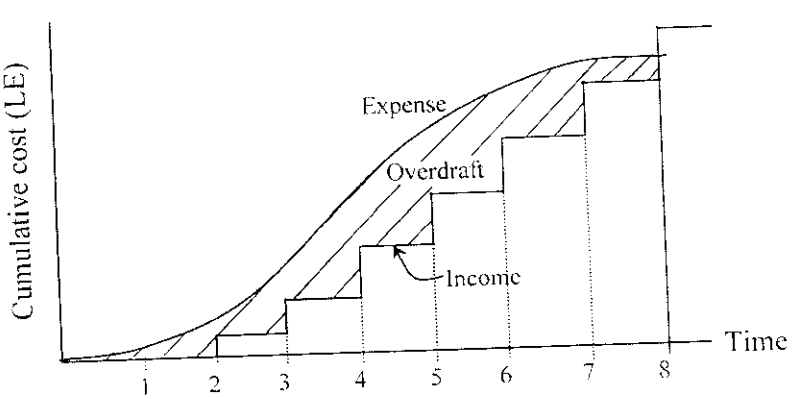


Figure 9.7: Cash flow based on monthly payments

contractor may request an advanced or mobilization payment from the owner. This shifts the position of the income profile so that no overdraft occurs as shown in Figure

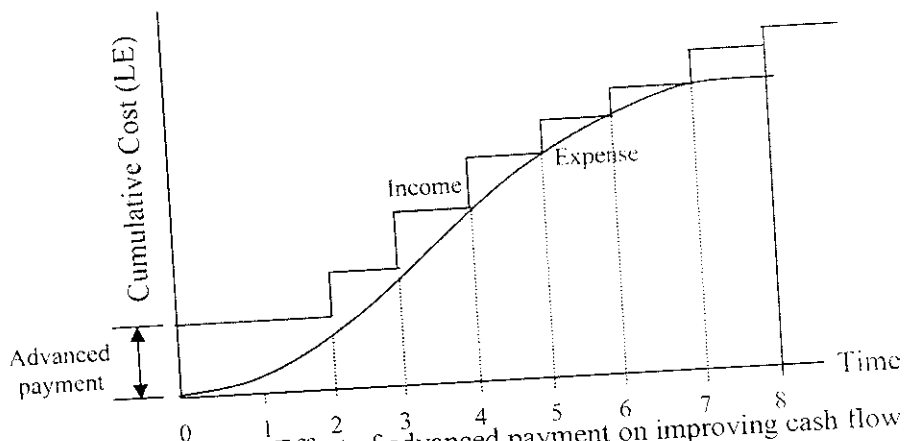


Figure 9.8: Effect of advanced payment on improving cash flow

In case of less number of payments (two or three payments) along the contract period, this will lead to increase the overdraft as shown in Figure 9.9. From the previous study, the factors that affect the project finance (cash flow) should be considered when calculating the cash flow:

- The project bar chart (project schedule).
- Activities` direct and indirect cost.
- Contractor method of paying his/her expenses.
- Contractor`s markup (mainly the profit margin).
- Retention amount and its payback time.
- Time of payment delay by owner.
- Advanced or mobilization payment.

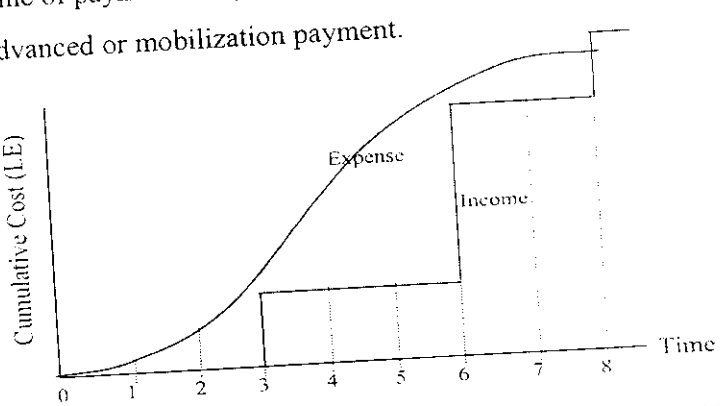


Figure 9.9: Effect of receiving two payments on cash flow

The cash flow calculations are made as described in the following steps:

- Perform project schedule and determine project and activities timing.
- Draw bar chart based on early or late timings.
- Calculate the cost per time period.
- Calculate the cumulative cost.
- Adjust the cost according the method of paying it to produce the expenses.
- Calculate the cumulative revenue (revenue = cost x (1 + markup)).
- Adjust the revenue based on the retention and delay of owner payment to determine the income.
- Calculate the cash flow (cash flow = income – expense) at the contract different times.

4.11.1.6 Cost of Borrowing (Return on Investment)

Cash requirements (negative cash flows) during a project result in a contractor either having to borrow money to meet his/her obligation or using funds from the company reserves, which my have been more profitably if employed elsewhere. Accordingly, there should be a charge against the project for the use of these funds.

One of the methods to determine the amount of interest to be charged during a contract is to calculate the area between the expenses and income curves. To simplify the calculations, the area is calculated in terms of units of LE x time period (money x time). The time may be in days, weeks, months, etc.

Cost of borrowing = net area x interest rate(9.1)

4.11.2 Project Cash Flow

The project cash flow deals with the whole life of the project not the construction period only. Thus, project cash flow studies the project finance from the feasibility studies phase till the operation phase. In this case, the time is much longer than that of the contract. At the early stage of a project, the project experience negative cash flow as there is no income in these stages. In the operation stage, the revenue will increase than the expenses

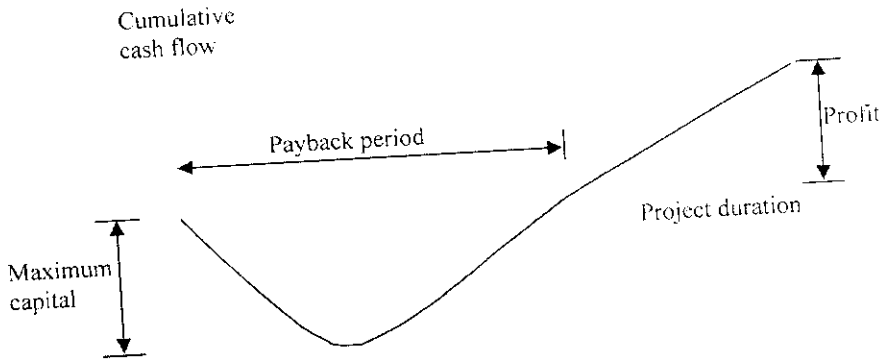


Figure 9.15: Typical project cash flow

4.11.2.1 Project Profitability Indicators

Profit

It is the difference between total payments and total revenue without the effect of time on the value of money. When comparing alternatives, the project with the maximum profit is ranked the best.

Maximum capital

It is the maximum demand of money, i.e., the summation of all negative cash (expenditures). The project with minimum capital required is ranked the best.

Payback period

It is the length of time that it takes for a capital budgeting project to recover its initial cost, where the summation of both cash out and cash in equals zero. When comparing alternatives, the project with the shortest payback period is ranked the best.

4.11.3 Discounted Cash Flow

The value of money is dependent on the time at which it is received. A sum of money on hand today is worth more than the same sum of money to be received in the future because the money on hand today can be invested to earn interest to gain more than the same money in the future. Thus, studying the present value of money (or the discounted value) that will be received in the future is very important. This concept will be demonstrated in the following subsections.

4.11.3.1 Present Value

Present value (PV) describes the process of determining what a cash flow to be received in the future is worth in today's pounds. Therefore, the Present Value of a future cash flow represents the amount of money today which, if invested at a particular interest rate, will grow to the amount of the future cash flow at that time in the future. The process of finding present values is called Discounting and the interest rate used to calculate present values is called the discount rate.

- Construction: limited work space;
  Changes in soil condition than the soil report;
  Construction method used;
  Availability of skilled labor;
  Equipment breakdown; and
  Effect of varied weather and environmental conditions on construction.
- Physical: Periods of high tides, temperature, etc;
  Placing fill in dry season; and
  Diverting water canals in time of low flow.
- Design: Design incomplete; Design changes;
  and Design errors.
- Financial: Inflation which results in reducing the purchasing power of the currency; New restrictions applied on importing materials and equipments; Exchange rate fluctuation;
  Changes in taxes;
  Availability of funds; and
  Delay payments by client.
- Political: Change of local laws and regulations;
  Inflation which result in reducing the purchasing power of the currency;
  Effect of wars and revolutions; and
  Necessity to use local resources.

- Management: Scheduling errors;

Space congestion;

Errors in bill of quantities; and

4.11.3.2 Net Present Value (NPV)

Net present value (NPV) is the summation of all PV of cash flows of the project, where expenses are considered negative and incomes are considered positive. A project will be considered profitable and acceptable if it gives a positive NPV. When comparing projects, the project with the largest (positive) NPV should be selected.

4.11.3.3 Internal Rate of Return (IRR)

The internal rate of return (IRR) of a capital budgeting project is the discount rate (r) at which the NPV of a project equals zero. The IRR decision rule specifies that a project with an IRR greater than the minimum return on capital should be accepted. When choosing among alternative projects, the project with the highest IRR should be selected (as long as the IRR is greater than the minimum acceptable return of capital). The IRR is assumed to be constant over the project life.

4.11.4 Finalizing a Tender Price

The total price of a tender comprises the cost and the markup. The cost includes direct and indirect costs. The markup, on the other hand, includes profit margin, financial charges (cost of borrowing), and a risk allowance margin (Figure 9.17)

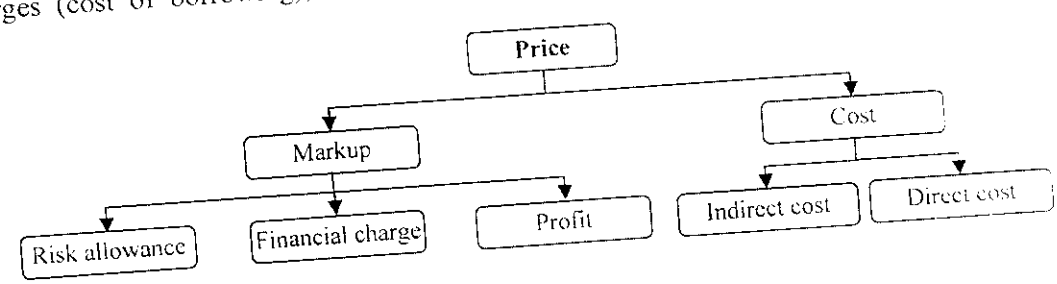


Figure 9.17: Components of a tender price

4.11.4.1 Estimating Profit Margin

Profit is the reward the contractor expecting to gain form performing a specific contract in retune of his efforts and skills. Also, profit is the part of money that the contractor will

retain after paying every thing including the taxes, the insurance, etc. Estimating a value for the profit margin is usually depends on the market conditions. However, the factors that might affect choosing a profit margin values are summarized as follows:

- The contactors' competition to win a project;
- A contractor's desirability for work;
- Volume of work that the contractor has at a certain time;
- Size of the project and it complexity;
- Location of the project; and
- Identity of the client and the engineer.

4.11.4.2 Risk Management

Uncertainty and risks usually leads to project completion delays and cost overruns. Uncertainty is the gap between the information required to estimate an outcome and the information already possessed by the decision maker. Thus, the early assessment of the risks and uncertainties which would affect the construction of a project may improve the performance in terms of time and money

Risk management is defined as the process for systematically identifying, analyzing, and responding to risk events throughout the life of a project to obtain the optimum or acceptable degree of risk elimination or control. Accordingly, the major steps of risk management are:

- Identification of risks;
- Responses to avoid, reduce, or transfer risk;
- Analysis and assessment of residual risks after the risk responses; and
- Adding time and /or cost contingency for residual risks in the project estimates.

Main categories of sources of risks are listed along with some examples of each category as follow:

- Administrative: Delay in possesses of site;
  Limited working hours;
  Limited access to the site; and
  Troubles with public services

- Logistical: Shortage or late supply of different resources;
Site remoteness problems; and
Difficulties in communications with different parties involved.

- Construction: limited work space;
Changes in soil condition than the soil report;
Construction method used;
Availability of skilled labor;
Equipment breakdown; and
Effect of varied weather and environmental conditions on construction.

- Physical: Periods of high tides, temperature, etc;
Placing fill in dry season; and
Diverting water canals in time of low flow.

- Design: Design incomplete;
Design changes; and
Design errors.

- Financial: Inflation which results in reducing the purchasing power of the currency;
New restrictions applied on importing materials and equipments;
Exchange rate fluctuation;
Changes in taxes;
Availability of funds; and
Delay payments by client.

- Political: Change of local laws and regulations;
Inflation which result in reducing the purchasing power of the currency;
Effect of wars and revolutions; and
Necessity to use local resources.

- Management: Scheduling errors;
Space congestion;
Errors in bill of quantities; and

Estimating of cost and duration based on standard figures.

- Contractual: Contract type and its suitability for undertaken work;
  Co-ordination of work; and
  Liability towards others.
- Disasters: Floods and storms;
  Fires; Earthquakes;
  Accidents; Diseases;
  and Other acts of
  OD.

4.11.5 Pricing Policy

Having all contract costs (direct and indirect), and markup components (profit margin, risk allowance and financial charge), it is time to finalize the bid price. While, the direct cost are associated directly to the contract activities, indirect cost and markup are not associated with specific activities but with the whole contract. Accordingly, pricing policy is the method by which the indirect costs and markup will be distributed among the items of the bill of quantities, so that the bid price is ready to be submitted to the client.

4.11.5.1 Balanced bid (straight forward method)

In this method the indirect cost and the markup will be distributed among different items based on their direct cost; i.e., the more the direct cost of an item, the more its share from indirect cost and markup. The resulting bid price is called a balance d bid.

$$\text{The share of specific item} \quad \frac{\text{Direct cost of this item}}{\text{Total contract direct cost}}$$

4.11.5.2 Unbalanced bid (Loading of Rates)

The contract price is said to be unbalanced if the contractor raises the prices on certain bid items (usually the early items on the bill of quantities) and decreases the prices on other items so that the tender price remain the same. This process is also called the loading of rates. The contractor usually loads the prices of the first items to ensure more cash at the beginning of the contract and to reduce the negative cash flow and accordingly reduces borrowing of money.

4.11.5.3 Method Related Charge

The prices entered in the conventional bill of quantities might not represent the real cost of the work defined in the individual items. This is because not all costs are directly related to the quantity of work completed. Therefore, adjustment of the price due to a change in quantity of a particular item may not represent the real variation in cost. This is usually produces unnecessary amount of uncertainty and financial problems in many contracts.

The main advantages of using the method related charges are:

- Allows a system evaluation of changes.
- It realistically reflects the cost of construction which reduces the effect of inflation.
- No need for loading of rates (unbalanced bidding).
- Improves cash flow.

4.12 PROJECT CONTROL

4.12.1 Problems that may Arise During Construction

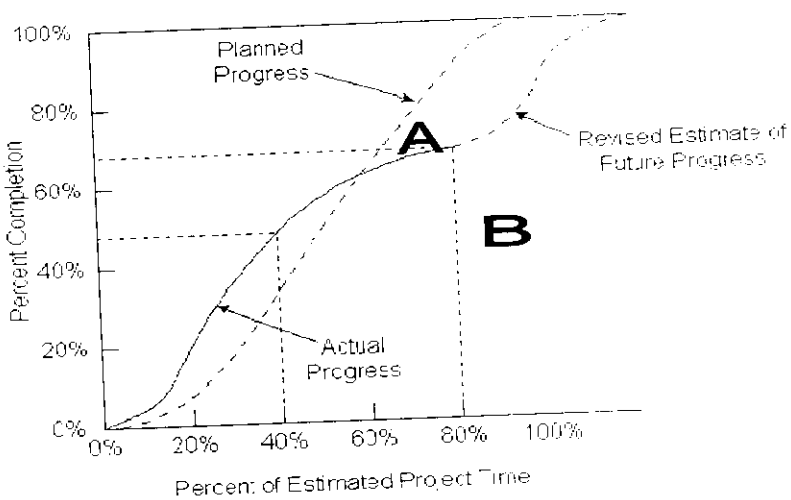
In construction, no project, almost, is executed as planned. Control needs to be carried- out due to the dynamic nature of the construction process. Controlling after project finish is trivial and updates are usually done periodically. The following is a list of the factors that may cause such problems:

- Change in activity durations and quantities.
- Sudden changes of the availability of resources.
- Change orders.
- Accidents.
- Procurement delays.

4.12.2 Schedule Updating

Construction typically involves a deadline for work completion, so contractual agreements will force attention to schedules. More generally, delays in construction represent additional costs due to late facility occupancy or other factors. Just as costs incurred are compared to budgeted costs, actual activity durations may be compared to expected durations. In this process, forecasting the time to complete particular activities may be required.

For example, Figure 10.1 shows the originally scheduled project progress versus the actual progress on a project. This figure is constructed by summing up the percentage of each activity which is complete at different points in time; this summation can be weighted by the magnitude of effort associated with each activity. In Figure 10.1, the project was ahead of the original schedule for a period including point A, but is now late at point B by an amount equal to the horizontal distance between the planned progress and the actual progress observed to date.



4.12.3 Delays Analysis

Work changes mean changes in the volume and duration of work to be performed from that envisaged at the start of the contract. Variation in the form of addition and deduction result in more or less cost and time to execute the varied item. On the other hand, omissions mean less cost but not necessarily less time. It might result in wasting resources. For instance, if the quantity of work in a critical activity is increased by x% then the duration of the activity will be extended by x%. The direct cost of the activity should be increased by the same ratio while the indirect cost of the contract might be increased for the extended period.

4.12.3.1 Types of Delays

Delays can be divided into the following categories:

- Those over which the client has control; compensable delays;

- Those over which the contractor has control; non-excusable delays;
- Those over which the neither party has any control; excusable delays; and
- Concurrent delays.

A brief description of each category is given below.

Compensable delays

A delay is deemed compensable to the contractor when its within the control of. is the fault of, or is due to the negligence of the client. Examples include:

- late possession of site;
- faulty design;
- incomplete drawings and specification;
- changes in scope;
- suspension of work;
- differing site conditions;
- late delivery of client-supplied materials; and
- client's failure to disclose information vital to the contractor.

For this type of delays, the conditions of contract should allow the contractor to be entitled to a time extension and to monetary recompense for extra costs associated with the delay.

Non-excusable delays

In this category, the contractor's own actions or inactions have caused the delay. The contractor is entitled neither time extensions nor monetary recompense from the client. He may pay liquidated damages according to the contract.

Excusable delays

These are occurrences over which neither the client nor the contractor has any control. Example includes:

- unforeseen future events which the contractor has not been aware;
- impracticable things which the contractor can only do at an excessive cost;
- events in which the contractor is blameless, such as material shortage beyond what was expected at the time of bidding.

The contractor should declare the excusable delays. The sole relife for these delays is a time extension.

Concurrent delays

Concurrent delays are two or more delays that occur at the same time, either of which, if it occurred alone, would have affected contract completion date. They can be classified as follows:

- excusable delays and non-excusable delays;
- excusable delays and compensable delays;
- excusable delays and compensable delays and non-excusable delays; and
- compensable delays and non-excusable delays.

Concurrent delays with an excusable delay will generally be considered as excusable delays. For these delays, the contractor is entitled to time extension if the delays are on the critical path.

4.12.3.2 The As-Built Schedule

The as-planned schedule of a contract is its initial schedule. The as-built schedule will show the time status of the contract and the causes of all the time changes that happen. Both schedules will be drawn as time-scaled diagrams.

The as-built schedule provides a complete record of the work as-built. It shows all delays encountered and the actual starting and finishing dates of every activity. When compared with the initial schedule, it gives the date for the evaluation of each time delays encountered during construction

4.12.4 Earned Value Management

For cost control on a project, the construction plan and the associated cash flow estimates can provide the baseline reference for subsequent project monitoring and control. The final or detailed cost estimate provides a baseline for the assessment of financial performance during the project. To the extent that costs are within the detailed cost estimate, then the project is thought to be under *financial control*.

The key to a profitable project is to keep construction costs within the budget and to know when and where job costs are deviating. The budget determines the amount of cash that will be required over the various periods of the project. Various techniques are usually used for cost control such as S-curve method and earned value technique. These measures include:

Budgeted Cost of Work Scheduled (BCWS)

BCWS measures what is planned in terms of budget cost of the work that should to place (i.e., according to the baseline schedule of the project). BCWS curve can be plotted by accumulating the budget cost of the initial schedule.

Budgeted Cost of Work Performed (BCWP) (Earned value – EV)

BCWP measures what is done in terms of the budget cost of work that has actually had been accomplished to date. BCWP curve can be plotted point by point after each reporting period. Here we accumulate the budget cost on the schedule that shows the actual percent complete.

Actual Cost of Work Performed (ACWP)

ACWP measures what is paid in terms of the actual cost of work that has actually been accomplished to date. BCWS curve can also be plotted point by point after each reporting period. Here we accumulate the actual expenditures on the schedule that shows the actual percent complete.

Schedule Variance (SV)

It is the difference between the earned value (BCWP) and the planned budget cost BCWS).

$SV = BCWP - BCWS$; SV > 0 indicates ahead of schedule

Cost Variance (CV)

It is the difference between the actual cost (ACWP) and the earned value or the budget cost (BCWP).

$CV = BCWP - ACWP$; CV > 0 indicates cost saving

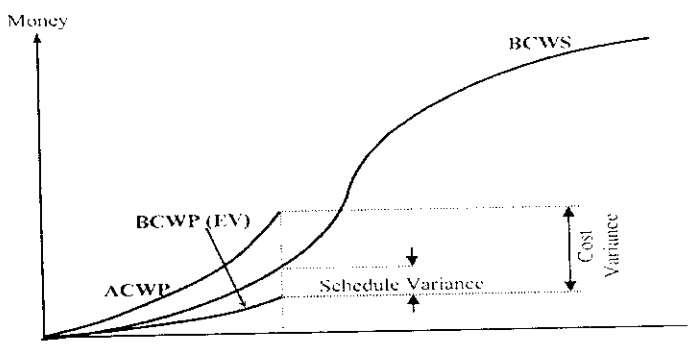


Figure 10.5: Earned value measures and indictors

CHAPTER 5

CONCLUSION

5.1 Summary of Findings

Contract strategy

A proper contract strategy for a project involves five key decisions:

- Setting the project objectives and constraints
- Selecting a proper project delivery method
- Selecting a proper contract form / type
- Contract administration practices

Project Planning

- Performing breakdown of work items involved in the project into activities.
- Identifying the proper sequence by which the activities should be executed.
- Activities representation.
- Estimating the resources, time, and cost of individual activities.

Resource Management

When a project plan is first devised it is likely that the plan will identify peaks of resource requirements. However, given the finite nature of resource availability, it may be impractical to meet such peak resource needs. Ideally, there should be an even demand for resources over the entire project duration, with a smooth increase at the beginning of a project and a smooth decrease at the end. Given the limited nature of resources, consideration should be given to the project resource requirements; the project plan should be refined when necessary so that it is practical.

Project Time-Cost Trade-Off

Reducing both construction projects' cost and time is critical in today's market-driven economy. This relationship between construction projects' time and cost is called time- cost trade-off decisions, which has been investigated extensively in the construction management literature. Time-cost trade-off decisions are complex and require selection of appropriate construction method for each project task. Time-cost trade-off, in fact, is an important management tool of overcoming one of the critical path method limitations of being unable to bring the project schedule to a specified duration.

Project Finance And Contract Pricing

A project's cash flow is basically the difference between the project's income and its expense. The difference between a company's total income and its total expense over a period of time is the company cash flow.

Project Control

The limited objective of project control deserves emphasis. Project control procedures are primarily intended to identify deviations from the project plan rather than to suggest possible areas for cost savings. This characteristic reflects the advanced stage at which project control becomes important. The time at which major cost savings can be achieved is during planning and design for the project.

5.2 Conclusion

This study had attempted to study the nuances of a project management and appraisal with reference to a construction industry in Coimbatore. The construction industry is thus an emerging industry significantly in Coimbatore. It is more of a service than a manufacturing industry. Growth in this industry in fact is an indicator of the economic conditions of Coimbatore. This is because the construction industry consumes a wide employment circle of labor and commitment . While the manufacturing industry exhibit high-quality products, timelines of service delivery, reasonable cost of service, and low failure rates, the construction industry, on the other hand, is generally the opposite. Most projects exhibit cost overruns, time extensions, and conflicts among parties.

ANNEXURE-I

ANALYSIS AND REPORTS
USING
MS PROJECT

MASTER CONTRUCTION PROGRAM OF A RESIDENTIAL APARTMENT IN SINGANALLUR, COIMBATORE. (USING MS PROJECT)

Project client: XYZ

Project contractor: ABC engineers & contractor

Project site area: 22 acres (which consist of phase 1& phase 2).

Phase1 land area: 7 acres

Phase1 built-up area: 6, 26,436 sft

Phase1 saleable area: 8, 14,329 sft

Project value of phase1: 100 crs.

Contract Start Date : 12-Sep-2011

Planned Finish Date : 31-Mar-2013 (18 Months)

Planned Finish Date (R1) : 30-Sep-2013 (25 Months)

Planned Finish Date (R2) : 31-Dec-2013 (28 Months)

Planned Finish Date (R3) : 30-June-2014 (34 Months)

- Phase1 consist of 7 Tower, Each tower has 72 Flats & each floor has 8 Flats. Total flats in phase1 are 486 Flats.

TASK NAME	% COMPLETE	DURATION	BASELINE START	BASELINE FINISH	ACTUAL START	ACTUAL FINISH	TOTAL VALUE	PLANNED VALUE	ACHIEVED VALUE
LOI No: 201/PPL/PBLM/Civil/KECPL	0%	0 days?	NA	NA	NA	NA	INR 0.00	INR 0.00	INR 0.00
PURVA BLUEMONT-PHASE 1	**62%**	**708 days**	**12-Sep-11**	**14-Dec-13**	**12-Sep-11**	**NA**	**INR 982,349,587.92**	**INR 879,546,904.73**	**INR 345,107,814.58**
TOWER L	71%	597 days	15-Sep-11	10-Aug-13	15-Sep-11	NA	INR 142,548,848.11	INR 137,758,520.63	INR 65,665,259.99
SUBSTRUCTURE	100%	217 days	15-Sep-11	24-May-12	15-Sep-11	12-Jun-12	INR 8,285,390.86	INR 8,285,390.86	INR 8,285,390.86
FOOTING	100%	160 days	15-Sep-11	19-Mar-12	15-Sep-11	19-Mar-12	INR 4,704,806.50	INR 4,704,806.50	INR 4,704,806.50
ATT	100%	40 days	15-Sep-11	31-Oct-11	15-Sep-11	12-Mar-12	INR 224,865.00	INR 224,865.00	INR 224,865.00
PCC	100%	69 days	15-Sep-11	3-Dec-11	15-Sep-11	12-Mar-12	INR 425,520.00	INR 425,520.00	INR 425,520.00
STEEL FIX	100%	121 days	17-Oct-11	5-Mar-12	14-Oct-11	17-Mar-12	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
SHUTTERING	100%	121 days	20-Oct-11	8-Mar-12	15-Oct-11	17-Mar-12	INR 135,720.00	INR 135,720.00	INR 135,720.00
RFI	100%	122 days	24-Oct-11	13-Mar-12	17-Oct-11	19-Mar-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	123 days	28-Oct-11	19-Mar-12	17-Oct-11	19-Mar-12	INR 2,667,070.00	INR 2,667,070.00	INR 2,667,070.00
COLUMN UPTO PB	100%	84 days	3-Jan-12	9-Apr-12	30-Nov-11	30-Mar-12	INR 605,697.12	INR 605,697.12	INR 605,697.12
STEEL FIX	100%	75 days	3-Jan-12	29-Mar-12	30-Nov-11	20-Mar-12	INR 89,913.12	INR 89,913.12	INR 89,913.12
SHUTTERING	100%	73 days	10-Jan-12	3-Apr-12	30-Nov-11	28-Mar-12	INR 95,352.00	INR 95,352.00	INR 95,352.00
RFI	100%	71 days	14-Jan-12	5-Apr-12	1-Dec-11	30-Mar-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	71 days	18-Jan-12	9-Apr-12	1-Dec-11	30-Mar-12	INR 420,432.00	INR 420,432.00	INR 420,432.00
PLINTH BEAM	100%	98 days	1-Feb-12	24-May-12	5-Nov-11	12-Jun-12	INR 2,974,887.24	INR 2,974,887.24	INR 2,974,887.24
FILLING AND CONSOLIDATION	100%	90 days	1-Feb-12	15-May-12	5-Nov-11	1-Jun-12	INR 1,449,723.00	INR 1,449,723.00	INR 1,449,723.00
PCC	100%	74 days	11-Feb-12	7-May-12	16-Dec-11	6-Jun-12	INR 685,560.00	INR 685,560.00	INR 685,560.00
STEEL FIX	100%	76 days	13-Feb-12	10-May-12	21-Dec-11	9-Jun-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
SHUTTERING	100%	79 days	16-Feb-12	17-May-12	22-Dec-11	11-Jun-12	INR 237,798.84	INR 237,798.84	INR 237,798.84
RFI	100%	84 days	17-Feb-12	24-May-12	11-Jan-12	12-Jun-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	84 days	17-Feb-12	24-May-12	11-Jan-12	12-Jun-12	INR 387,240.00	INR 387,240.00	INR 387,240.00
SUPER STRUCTURE	86%	287 days	15-May-12	13-Apr-13	30-Jan-12	NA	INR 56,226,341.14	INR 56,226,341.14	INR 46,786,841.72
SLAB 1	100%	24 days	15-May-12	11-Jun-12	30-Jan-12	27-Jul-12	INR 5,589,586.25	INR 5,589,586.25	INR 5,589,586.25
SLAB 2	100%	115 days	21-May-12	1-Oct-12	2-Jul-12	8-Oct-12	INR 5,312,093.80	INR 5,312,093.80	INR 5,312,093.80
SLAB 3	100%	34 days	21-Sep-12	30-Oct-12	13-Aug-12	17-Nov-12	INR 5,334,003.80	INR 5,334,003.80	INR 5,334,003.80
SLAB 4	100%	34 days	12-Oct-12	20-Nov-12	12-Oct-12	21-Jan-13	INR 5,355,913.80	INR 5,355,913.80	INR 5,355,913.80
SLAB 5	100%	34 days	30-Oct-12	7-Dec-12	7-Jan-13	1-Mar-13	INR 5,377,823.80	INR 5,377,823.80	INR 5,377,823.80
SLAB 6	100%	34 days	15-Nov-12	24-Dec-12	12-Feb-13	8-Apr-13	INR 5,399,420.80	INR 5,399,420.80	INR 5,399,420.80
SLAB 7	100%	36 days	29-Nov-12	9-Jan-13	1-Mar-13	25-May-13	INR 5,421,330.80	INR 5,421,330.80	INR 5,421,330.80
SLAB 8	100%	40 days	10-Dec-12	24-Jan-13	17-May-13	29-Jun-13	INR 5,443,240.80	INR 5,443,240.80	INR 5,443,240.80
SLAB 9	60%	40 days	28-Dec-12	12-Feb-13	21-Jun-13	NA	INR 5,465,150.80	INR 5,465,150.80	INR 3,279,090.48
SLAB 10	5%	37 days	22-Jan-13	5-Mar-13	22-Jul-13	NA	INR 5,486,747.80	INR 5,486,747.80	INR 274,337.39
LMR OHT	0%	51 days	14-Feb-13	13-Apr-13	NA	NA	INR 2,041,028.69	INR 2,041,028.69	INR 0.00
ARCHITECTURAL WORKS	16%	270 days	1-Oct-12	10-Aug-13	1-Oct-12	NA	INR 78,037,116.11	INR 73,246,788.63	INR 10,593,027.41
CEILING PLASTERING	69%	149 days	1-Oct-12	22-Mar-13	1-Oct-12	NA	INR 1,765,490.40	INR 1,765,490.40	INR 1,218,188.38
BLOCK WORK	58%	145 days	10-Oct-12	27-Mar-13	6-Oct-12	NA	INR 11,664,309.00	INR 11,664,309.00	INR 6,765,299.22
DOORFRAME FIX	0%	155 days	19-Oct-12	17 Apr-13	NA	NA	INR 9,027,744.00	INR 9,027,744.00	INR 0.00
PLASTERING & WATER PROOFING	22%	155 days	1 Nov-12	30-Apr-13	15-Feb 13	NA	INR 11,861,544.60	INR 11,861,544.60	INR 2,609,539.81
TILING & FLOORING	0%	139 days	31-Dec-12	10-Jun-13	NA	NA	INR 22,625,017.51	INR 21,973,937.87	INR 0.00

DOOR SHUTTER FIXING	0%	118 days	14-Jan-13	30-May-13	NA	NA	INR 7,151,520.00	INR 7,151,520.00	INR 0.00
INTERNAL PAINTING	0%	130 days	14-Feb-13	15-Jul-13	NA	NA	INR 3,282,406.60	INR 2,423,931.03	INR 0.00
MISCELLANEOUS WORKS	0%	132 days	28-Feb-13	31-Jul-13	NA	NA	INR 4,023,306.00	INR 2,560,285.64	INR 0.00
EXTERNAL PLASTERING	0%	124 days	6-Feb-13	29-Jun-13	NA	NA	INR 4,537,000.00	INR 3,768,637.10	INR 0.00
EXTERNAL PAINTING	0%	114 days	1-Apr-13	10-Aug-13	NA	NA	INR 2,098,778.00	INR 1,049,389.00	INR 0.00
TOWER M	58%	625 days	13-Sep-11	10-Sep-13	13-Sep-11	NA	INR 142,548,848.11	INR 131,140,873.11	INR 41,619,045.32
SUBSTRUCTURE	100%	238 days	13-Sep-11	15-Jun-12	13-Sep-11	7-Jul-12	INR 8,285,390.86	INR 8,285,390.86	INR 8,285,390.86
FOOTING	100%	70 days	13-Sep-11	2-Dec-11	13-Sep-11	27-Jan-12	INR 4,704,806.50	INR 4,704,806.50	INR 4,704,806.50
ATT	100%	56 days	13-Sep-11	16-Nov-11	13-Sep-11	23-Jan-12	INR 224,865.00	INR 224,865.00	INR 224,865.00
PCC	100%	57 days	13-Sep-11	17-Nov-11	13-Sep-11	23-Jan-12	INR 425,520.00	INR 425,520.00	INR 425,520.00
STEEL FIX	100%	40 days	30-Sep-11	15-Nov-11	15-Oct-11	24-Jan-12	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
SHUTTERING	100%	45 days	4-Oct-11	24-Nov-11	17-Oct-11	25-Jan-12	INR 135,720.00	INR 135,720.00	INR 135,720.00
RFI	100%	45 days	7-Oct-11	28-Nov-11	18-Oct-11	27-Jan-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	45 days	12-Oct-11	2-Dec-11	19-Oct-11	27-Jan-12	INR 2,667,070.00	INR 2,667,070.00	INR 2,667,070.00
COLUMN UPTO PB	100%	153 days	29-Nov-11	24-May-12	19-Dec-11	4-Apr-12	INR 605,697.12	INR 605,697.12	INR 605,697.12
STEEL FIX	100%	130 days	29-Nov-11	27-Apr-12	19-Dec-11	2-Apr-12	INR 89,913.12	INR 89,913.12	INR 89,913.12
SHUTTERING	100%	120 days	6-Dec-11	23-Apr-12	20-Dec-11	3-Apr-12	INR 95,352.00	INR 95,352.00	INR 95,352.00
RFI	100%	125 days	10-Dec-11	3-May-12	22-Dec-11	4-Apr-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	140 days	14-Dec-11	24-May-12	22-Dec-11	4-Apr-12	INR 420,432.00	INR 420,432.00	INR 420,432.00
PLINTH BEAM	100%	111 days	8-Feb-12	15-Jun-12	4-Nov-11	7-Jul-12	INR 2,974,887.24	INR 2,974,887.24	INR 2,974,887.24
FILLING AND CONSOLIDATION	100%	97 days	8-Feb-12	30-May-12	4-Nov-11	29-Jun-12	INR 1,449,723.00	INR 1,449,723.00	INR 1,449,723.00
PCC	100%	88 days	18-Feb-12	30-May-12	2-Mar-12	2-Jul-12	INR 685,560.00	INR 685,560.00	INR 685,560.00
STEEL FIX	100%	85 days	20-Feb-12	28-May-12	4-Mar-12	4-Jul-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
SHUTTERING	100%	89 days	23-Feb-12	5-Jun-12	14-May-12	6-Jul-12	INR 237,798.84	INR 237,798.84	INR 237,798.84
RFI	100%	94 days	24-Feb-12	12-Jun-12	18-May-12	7-Jul-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	96 days	25-Feb-12	15-Jun-12	18-May-12	7-Jul-12	INR 387,240.00	INR 387,240.00	INR 387,240.00
SUPER STRUCTURE	67%	300 days	15-May-12	29-Apr-13	4-Jun-12	NA	INR 56,226,341.14	INR 56,226,341.14	INR 29,129,189.77
SLAB 1	100%	120 days	15-May-12	1-Oct-12	4-Jun-12	16-Nov-12	INR 5,589,586.25	INR 5,589,586.25	INR 5,589,586.25
SLAB 2	100%	33 days	27-Sep-12	3-Nov-12	13-Aug-12	12-Jan-13	INR 5,312,093.80	INR 5,312,093.80	INR 5,312,093.80
SLAB 3	100%	34 days	17-Oct-12	24-Nov-12	2-Jan-13	9-Feb-13	INR 5,334,003.80	INR 5,334,003.80	INR 5,334,003.80
SLAB 4	100%	33 days	3-Nov-12	11-Dec-12	5-Feb-13	6-May-13	INR 5,355,913.80	INR 5,355,913.80	INR 5,355,913.80
SLAB 5	100%	33 days	19-Nov-12	26-Dec-12	9-May-13	15-Jul-13	INR 5,377,823.80	INR 5,377,823.80	INR 5,377,823.80
SLAB 6	40%	33 days	5-Dec-12	11-Jan-13	9-Jul-13	NA	INR 5,399,420.80	INR 5,399,420.80	INR 2,159,768.32
SLAB 7	0%	33 days	17-Dec-12	23-Jan-13	NA	NA	INR 5,421,330.80	INR 5,421,330.80	INR 0.00
SLAB 8	0%	33 days	4-Jan-13	11-Feb-13	NA	NA	INR 5,443,240.80	INR 5,443,240.80	INR 0.00
SLAB 9	0%	33 days	28-Jan-13	6-Mar-13	NA	NA	INR 5,465,150.80	INR 5,465,150.80	INR 0.00
SLAB 10	0%	33 days	16-Feb-13	26-Mar-13	NA	NA	INR 5,486,747.80	INR 5,486,747.80	INR 0.00
LMR OHT	0%	51 days	1-Mar-13	29-Apr-13	NA	NA	INR 2,041,028.69	INR 2,041,028.69	INR 0.00
ARCHITECTURAL WORKS	7%	260 days	12-Nov-12	10-Sep-13	18-Dec-12	NA	INR 78,037,116.11	INR 66,629,141.11	INR 4,204,464.69
CEILING PLASTERING	33%	144 days	12-Nov-12	27-Apr-13	18-Dec-12	NA	INR 1,765,490.40	INR 1,765,490.40	INR 582,611.83
BLOCK WORK	28%	140 days	21-Nov-12	2-May-13	7-Feb-13	NA	INR 11,664,309.00	INR 11,664,309.00	INR 3,266,006.52
DOORFRAME FIX	0%	150 days	27-Nov-12	20-May-13	NA	NA	INR 9,027,744.00	INR 9,027,744.00	INR 0.00
PLASTERING & WATER PROOFING	3%	150 days	13-Dec-12	5-Jun-13	1-Mar-13	NA	INR 11,861,544.60	INR 11,861,544.60	INR 355,846.34
TILING & FLOORING	0%	135 days	30-Jan-13	5-Jul-13	NA	NA	INR 22,625,017.51	INR 18,267,606.73	INR 0.00
DOOR SHUTTER FIXING	0%	114 days	1-Feb-13	13-Jun-13	NA	NA	INR 7,151,520.00	INR 6,712,391.58	INR 0.00

MISCELLANEOUS WORKS	0%	132 days	28-Mar-13	23-Jul-13	NA	NA	INR 4,537,000.00	INR 3,036,862.90	INR 0.00
EXTERNAL PLASTERING	0%	124 days	1-Mar-13	10-Sep-13	NA	NA	INR 2,098,778.00	INR 570,720.33	INR 0.00
EXTERNAL PAINTING	0%	114 days	1-May-13	10-Aug-13	12-Sep-11	NA	INR 142,548,848.11	INR 137,758,520.63	INR 57,034,367.47
TOWER N	58%	600 days	12-Sep-11	31-May-12	12-Sep-11	28-May-12	INR 8,285,390.86	INR 8,285,390.86	INR 8,285,390.86
SUBSTRUCTURE	100%	226 days	12-Sep-11	23-Nov-11	12-Sep-11	28-Nov-11	INR 4,704,806.50	INR 4,704,806.50	INR 4,704,806.50
FOOTING	100%	63 days	12-Sep-11	14-Oct-11	12-Sep-11	31-Oct-11	INR 224,865.00	INR 224,865.00	INR 224,865.00
ATT	100%	29 days	12-Sep-11	9-Nov-11	12-Sep-11	16-Nov-11	INR 425,520.00	INR 425,520.00	INR 425,520.00
PCC	100%	36 days	29-Sep-11	1-Nov-11	26-Sep-11	7-Nov-11	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
STEEL FIX	100%	26 days	3-Oct-11	7-Nov-11	27-Sep-11	8-Nov-11	INR 135,720.00	INR 135,720.00	INR 135,720.00
SHUTTERING	100%	22 days	13-Oct-11	8-Nov-11	28-Sep-11	28-Nov-11	INR 0.00	INR 0.00	INR 0.00
RFI	100%	23 days	13-Oct-11	23-Nov-11	29-Sep-11	9-Nov-11	INR 2,667,070.00	INR 2,667,070.00	INR 2,667,070.00
CONCRETE	100%	36 days	13-Oct-11	31-May-12	15-Nov-11	17-Dec-11	INR 605,697.12	INR 605,697.12	INR 605,697.12
COLUMN UPTO PB	100%	196 days	17-Oct-11	19-Nov-11	15-Nov-11	16-Dec-11	INR 89,913.12	INR 89,913.12	INR 89,913.12
STEEL FIX	100%	30 days	17-Oct-11	22-Nov-11	15-Nov-11	16-Dec-11	INR 95,352.00	INR 95,352.00	INR 95,352.00
SHUTTERING	100%	30 days	19-Oct-11	31-May-12	15-Nov-11	17-Dec-11	INR 0.00	INR 0.00	INR 0.00
RFI	100%	192 days	21-Oct-11	31-May-12	15-Nov-11	17-Dec-11	INR 420,432.00	INR 420,432.00	INR 420,432.00
CONCRETE	100%	192 days	21-Oct-11	29-May-12	10-Oct-11	28-May-12	INR 2,974,887.24	INR 2,974,887.24	INR 2,974,887.24
PLINTH BEAM	100%	163 days	22-Nov-11	18-May-12	10-Oct-11	7-Dec-11	INR 1,449,723.00	INR 1,449,723.00	INR 1,449,723.00
FILLING AND CONSOLIDATION	100%	154 days	22-Nov-11	25-May-12	1-Dec-11	23-May-12	INR 685,560.00	INR 685,560.00	INR 685,560.00
PCC	100%	144 days	10-Dec-11	26-May-12	5-Dec-11	25-May-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
STEEL FIX	100%	140 days	16-Dec-11	25-May-12	6-Dec-11	26-May-12	INR 237,798.84	INR 237,798.84	INR 237,798.84
SHUTTERING	100%	128 days	29-Dec-11	29-May-12	29-Dec-11	28-May-12	INR 0.00	INR 0.00	INR 0.00
RFI	100%	128 days	2-Jan-12	29-May-12	29-Dec-11	28-May-12	INR 387,240.00	INR 387,240.00	INR 387,240.00
CONCRETE	100%	128 days	2-Jan-12	26-Apr-13	30-Jan-12	NA	INR 56,226,341.14	INR 56,226,341.14	INR 42,418,023.23
SUPER STRUCTURE	81%	388 days	31-Jan-12	16-Jun-12	30-Jan-12	26-Jul-12	INR 5,589,586.25	INR 5,589,586.25	INR 5,589,586.25
SLAB 1	100%	119 days	31-Jan-12	2-Jul-12	2-Jul-12	29-Sep-12	INR 5,312,093.80	INR 5,312,093.80	INR 5,312,093.80
SLAB 2	100%	35 days	23-May-12	24-Oct-12	10-Sep-12	19-Dec-12	INR 5,334,003.80	INR 5,334,003.80	INR 5,334,003.80
SLAB 3	100%	120 days	7-Jun-12	14-Nov-12	22-Nov-12	16-Feb-13	INR 5,355,913.80	INR 5,355,913.80	INR 5,355,913.80
SLAB 4	100%	36 days	4-Oct-12	1-Dec-12	11-Feb-13	27-Mar-13	INR 5,377,823.80	INR 5,377,823.80	INR 5,377,823.80
SLAB 5	100%	34 days	24-Oct-12	18-Dec-12	4-Mar-13	24-May-13	INR 5,399,420.80	INR 5,399,420.80	INR 5,399,420.80
SLAB 6	100%	35 days	8-Nov-12	2-Jan-13	14-May-13	29-Jun-13	INR 5,421,330.80	INR 5,421,330.80	INR 5,421,330.80
SLAB 7	100%	34 days	24-Nov-12	18-Jan-13	19-Jun-13	NA	INR 5,443,240.80	INR 5,443,240.80	INR 4,354,592.64
SLAB 8	80%	37 days	7-Dec-12	5-Feb-13	17-Jul-13	NA	INR 5,465,150.80	INR 5,465,150.80	INR 273,257.54
SLAB 9	5%	40 days	21-Dec-12	26-Feb-13	NA	NA	INR 5,486,747.80	INR 5,486,747.80	INR 0.00
SLAB 10	0%	40 days	11-Jan-13	26-Apr-13	NA	NA	INR 2,041,028.69	INR 2,041,028.69	INR 0.00
LMR OHT	0%	51 days	27-Feb-13	10-Aug-13	1-Oct-12	NA	INR 78,037,116.11	INR 73,246,788.63	INR 6,330,953.38
ARCHITECTURAL WORKS	12%	270 days	1-Oct-12	22-Mar-13	1-Oct-12	NA	INR 1,765,490.40	INR 1,765,490.40	INR 1,182,878.57
CEILING PLASTERING	67%	149 days	1-Oct-12	27-Mar-13	15-Oct-12	NA	INR 11,664,309.00	INR 11,664,309.00	INR 4,199,151.24
BLOCK WORK	36%	145 days	10-Oct-12	17-Apr-13	NA	NA	INR 9,027,744.00	INR 9,027,744.00	INR 0.00
DOORFRAME FIX	0%	155 days	19-Oct-12	30-Apr-13	6-Nov-12	NA	INR 11,861,544.60	INR 11,861,544.60	INR 948,923.57
PLASTERING & WATER PROOFING	8%	155 days	1-Nov-12	10-Jun-13	NA	NA	INR 22,625,017.51	INR 21,973,937.87	INR 0.00
TILING & FLOORING	0%	139 days	31-Dec-12	30-May-13	NA	NA	INR 7,151,520.00	INR 7,151,520.00	INR 0.00
DOOR SHUTTER FIXING	0%	118 days	14-Jan-13	15-Jul-13	NA	NA	INR 3,282,406.60	INR 2,423,931.03	INR 0.00
INTERNAL PAINTING	0%	130 days	14-Feb-13						

EXTERNAL PLASTERING	0%	124 days	6-Feb-13	29-Jun-13	NA	NA	INR 4,537,000.00	INR 3,768,637.10	INR 0.00
EXTERNAL PAINTING	0%	114 days	1-Apr-13	10-Aug-13	NA	NA	INR 2,098,778.00	INR 1,049,389.00	INR 0.00
TOWER A	64%	585 days	29-Sep-11	10-Aug-13	29-Sep-11	NA	INR 124,607,597.30	INR 120,389,298.39	INR 67,359,922.73
SUBSTRUCTURE	100%	198 days	29-Sep-11	16-May-12	29-Sep-11	18-Jun-12	INR 6,977,876.02	INR 6,977,876.02	INR 6,977,876.02
FOOTING	100%	50 days	29-Sep-11	25-Nov-11	29-Sep-11	18-Nov-11	INR 3,946,277.50	INR 3,946,277.50	INR 3,946,277.50
ATT	100%	31 days	29-Sep-11	3-Nov-11	29-Sep-11	10-Nov-11	INR 186,770.00	INR 186,770.00	INR 186,770.00
PCC	100%	33 days	29-Sep-11	5-Nov-11	29-Sep-11	10-Nov-11	INR 330,960.00	INR 330,960.00	INR 330,960.00
STEEL FIX	100%	28 days	10-Oct-11	10-Nov-11	10-Oct-11	15-Nov-11	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
SHUTTERING	100%	28 days	13-Oct-11	14-Nov-11	12-Oct-11	16-Nov-11	INR 108,576.00	INR 108,576.00	INR 108,576.00
RFI	100%	28 days	17-Oct-11	17-Nov-11	13-Oct-11	17-Nov-11	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	31 days	21-Oct-11	25-Nov-11	14-Oct-11	18-Nov-11	INR 2,068,340.00	INR 2,068,340.00	INR 2,068,340.00
COLUMN UPTO PB	100%	84 days	27-Dec-11	2-Apr-12	25-Nov-11	16-Feb-12	INR 503,925.12	INR 503,925.12	INR 503,925.12
STEEL FIX	100%	75 days	27-Dec-11	22-Mar-12	25-Nov-11	14-Feb-12	INR 89,913.12	INR 89,913.12	INR 89,913.12
SHUTTERING	100%	73 days	3-Jan-12	27-Mar-12	25-Nov-11	15-Feb-12	INR 76,560.00	INR 76,560.00	INR 76,560.00
RFI	100%	71 days	7-Jan-12	29-Mar-12	26-Nov-11	16-Feb-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	71 days	11-Jan-12	2-Apr-12	26-Nov-11	16-Feb-12	INR 337,452.00	INR 337,452.00	INR 337,452.00
PLINTH BEAM	100%	97 days	25-Jan-12	16-May-12	4-Nov-11	18-Jun-12	INR 2,527,673.40	INR 2,527,673.40	INR 2,527,673.40
FILLING AND CONSOLIDATION	100%	90 days	25-Jan-12	8-May-12	4-Nov-11	1-Jun-12	INR 1,204,200.00	INR 1,204,200.00	INR 1,204,200.00
PCC	100%	74 days	4-Feb-12	30-Apr-12	16-Dec-11	6-Jun-12	INR 614,640.00	INR 614,640.00	INR 614,640.00
STEEL FIX	100%	76 days	6-Feb-12	3-May-12	16-Feb-12	14-Jun-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
SHUTTERING	100%	79 days	9-Feb-12	10-May-12	21-Feb-12	16-Jun-12	INR 190,008.00	INR 190,008.00	INR 190,008.00
RFI	100%	83 days	10-Feb-12	16-May-12	29-Feb-12	18-Jun-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	83 days	10-Feb-12	16-May-12	29-Feb-12	18-Jun-12	INR 304,260.00	INR 304,260.00	INR 304,260.00
SUPER STRUCTURE	96%	284 days	28-May-12	23-Apr-13	9-Feb-12	NA	INR 51,843,008.14	INR 51,843,008.14	INR 50,822,493.80
SLAB 1	100%	75 days	28-May-12	22-Aug-12	9-Feb-12	16-Jul-12	INR 5,162,776.25	INR 5,162,776.25	INR 5,162,776.25
SLAB 2	100%	46 days	27-Jul-12	18-Sep-12	3-Jul-12	5-Sep-12	INR 4,885,608.80	INR 4,885,608.80	INR 4,885,608.80
SLAB 3	100%	44 days	31-Aug-12	20-Oct-12	13-Aug-12	30-Oct-12	INR 4,904,228.80	INR 4,904,228.80	INR 4,904,228.80
SLAB 4	100%	43 days	22-Sep-12	10-Nov-12	1-Nov-12	11-Jan-13	INR 4,922,848.80	INR 4,922,848.80	INR 4,922,848.80
SLAB 5	100%	43 days	9-Oct-12	27-Nov-12	3-Jan-13	14-Feb-13	INR 4,941,468.80	INR 4,941,468.80	INR 4,941,468.80
SLAB 6	100%	43 days	26-Oct-12	14-Dec-12	11-Feb-13	13-Mar-13	INR 4,959,822.80	INR 4,959,822.80	INR 4,959,822.80
SLAB 7	100%	45 days	9-Nov-12	31-Dec-12	25-Feb-13	11-Apr-13	INR 4,978,442.80	INR 4,978,442.80	INR 4,978,442.80
SLAB 8	100%	48 days	24-Nov-12	18-Jan-13	14-Mar-13	6-May-13	INR 4,997,062.80	INR 4,997,062.80	INR 4,997,062.80
SLAB 9	100%	50 days	8-Dec-12	4-Feb-13	29-Apr-13	31-May-13	INR 5,015,682.80	INR 5,015,682.80	INR 5,015,682.80
SLAB 10	100%	49 days	29-Dec-12	23-Feb-13	29-May-13	28-Jun-13	INR 5,034,036.80	INR 5,034,036.80	INR 5,034,036.80
LMR OHT	50%	51 days	23-Feb-13	23-Apr-13	29-Jun-13	NA	INR 2,041,028.69	INR 2,041,028.69	INR 1,020,514.35
ARCHITECTURAL WORKS	19%	270 days	1-Oct-12	10-Aug-13	1-Oct-12	NA	INR 65,786,713.14	INR 61,568,414.23	INR 9,559,552.92
CEILING PLASTERING	78%	149 days	1-Oct-12	22-Mar-13	1-Oct-12	NA	INR 1,500,666.84	INR 1,500,666.84	INR 1,170,520.14
BLOCK WORK	70%	145 days	10-Oct-12	27-Mar-13	6-Oct-12	NA	INR 8,747,619.00	INR 8,747,619.00	INR 6,123,333.30
DOORFRAME FIX	0%	155 days	19-Oct-12	17-Apr-13	NA	NA	INR 7,681,740.00	INR 7,681,740.00	INR 0.00
PLASTERING & WATER PROOFING	22%	155 days	1-Nov-12	30-Apr-13	29-Oct-12	NA	INR 10,298,634.00	INR 10,298,634.00	INR 2,265,699.48
TILING & FLOORING	0%	139 days	31-Dec-12	10-Jun-13	NA	NA	INR 19,231,119.00	INR 18,677,705.50	INR 0.00
DOOR SHUTTER FIXING	0%	118 days	14-Jan-13	30-May-13	NA	NA	INR 6,073,720.00	INR 6,073,720.00	INR 0.00
INTERNAL PAINTING	0%	130 days	14-Feb-13	15-Jul-13	NA	NA	INR 2,790,004.80	INR 2,060,311.24	INR 0.00
MISCELLANEOUS WORKS	0%	132 days	28-Feb-13	31-Jul-13	NA	NA	INR 3,822,840.00	INR 2,432,716.36	INR 0.00

EXTERNAL PLASTERING	0%		1-Apr-13	10-Aug-13	NA	NA	INR 1,783,919.50	INR 891,959.75	INR 0.00
EXTERNAL PAINTING	0%	114 days	12-Oct-11	30-Sep-13	12-Oct-11	NA	INR 142,548,848.11	INR 124,689,819.58	INR 46,720,141.85
TOWER R	63%	617 days	12-Oct-11	4-Jun-12	12-Oct-11	31-Oct-12	INR 8,285,390.86	INR 8,285,390.86	INR 8,285,390.86
SUBSTRUCTURE	100%	203 days	12-Oct-11	13-Apr-12	12-Oct-11	14-Apr-12	INR 4,704,806.50	INR 4,704,806.50	INR 4,704,806.50
FOOTING	100%	159 days	12-Oct-11	25-Nov-11	12-Oct-11	29-Mar-12	INR 224,865.00	INR 224,865.00	INR 224,865.00
ATT	100%	39 days	12-Oct-11	26-Nov-11	13-Oct-11	30-Mar-12	INR 425,520.00	INR 425,520.00	INR 425,520.00
PCC	100%	39 days	13-Oct-11	2-Mar-12	31-Oct-11	4-Apr-12	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
STEEL FIX	100%	104 days	3-Nov-11	16-Mar-12	1-Nov-11	4-Apr-12	INR 135,720.00	INR 135,720.00	INR 135,720.00
SHUTTERING	100%	108 days	12-Nov-11	30-Mar-12	2-Nov-11	14-Apr-12	INR 0.00	INR 0.00	INR 0.00
RFI	100%	118 days	15-Nov-11	13-Apr-12	3-Nov-11	13-Apr-12	INR 2,667,070.00	INR 2,667,070.00	INR 2,667,070.00
CONCRETE	100%	104 days	15-Dec-11	14-May-12	21-Dec-11	7-Jun-12	INR 605,697.12	INR 605,697.12	INR 605,697.12
COLUMN UPTO PB	100%	83 days	8-Feb-12	2-May-12	21-Dec-11	4-Jun-12	INR 89,913.12	INR 89,913.12	INR 89,913.12
STEEL FIX	100%	73 days	8-Feb-12	5-May-12	22-Dec-11	5-Jun-12	INR 95,352.00	INR 95,352.00	INR 95,352.00
SHUTTERING	100%	72 days	13-Feb-12	14-May-12	4-Jan-12	7-Jun-12	INR 0.00	INR 0.00	INR 0.00
RFI	100%	66 days	28-Feb-12	14-May-12	4-Jan-12	7-Jun-12	INR 420,432.00	INR 420,432.00	INR 420,432.00
CONCRETE	100%	66 days	28-Feb-12	4-Jun-12	18-Nov-11	31-Oct-12	INR 2,974,887.24	INR 2,974,887.24	INR 2,974,887.24
PLINTH BEAM	100%	72 days	13-Mar-12	26-May-12	18-Nov-11	31-Oct-12	INR 1,449,723.00	INR 1,449,723.00	INR 1,449,723.00
FILLING AND CONSOLIDATION	100%	65 days	13-Mar-12	25-May-12	29-Mar-12	7-Jun-12	INR 685,560.00	INR 685,560.00	INR 685,560.00
PCC	100%	55 days	23-Mar-12	26-May-12	2-Apr-12	29-Oct-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
STEEL FIX	100%	55 days	24-Mar-12	4-Jun-12	21-Jun-12	29-Oct-12	INR 237,798.84	INR 237,798.84	INR 237,798.84
SHUTTERING	100%	59 days	28-Mar-12	30-May-12	8-Aug-12	30-Oct-12	INR 0.00	INR 0.00	INR 0.00
RFI	100%	54 days	29-Mar-12	30-May-12	8-Aug-12	30-Oct-12	INR 387,240.00	INR 387,240.00	INR 387,240.00
CONCRETE	100%	54 days	29-Mar-12	29-May-13	27-Aug-12	NA	INR 56,226,341.14	INR 56,226,341.14	INR 35,893,802.77
SUPER STRUCTURE	58%	227 days	7-Sep-12	6-Nov-12	27-Aug-12	13-Oct-12	INR 5,589,586.25	INR 5,589,586.25	INR 5,589,586.25
SLAB 1	100%	52 days	7-Sep-12	5-Dec-12	12-Dec-12	23-Feb-13	INR 5,312,093.80	INR 5,312,093.80	INR 5,312,093.80
SLAB 2	100%	42 days	18-Oct-12	25-Dec-12	18-Mar-13	4-Apr-13	INR 5,334,003.80	INR 5,334,003.80	INR 5,334,003.80
SLAB 3	100%	42 days	7-Nov-12	9-Jan-13	10-Apr-13	7-May-13	INR 5,355,913.80	INR 5,355,913.80	INR 5,355,913.80
SLAB 4	100%	42 days	22-Nov-12	24-Jan-13	24-Apr-13	18-Jun-13	INR 5,377,823.80	INR 5,377,823.80	INR 5,377,823.80
SLAB 5	100%	45 days	4-Dec-12	8-Feb-13	7-May-13	1-Jul-13	INR 5,399,420.80	INR 5,399,420.80	INR 5,399,420.80
SLAB 6	100%	47 days	17-Dec-12	23-Feb-13	28-Jun-13	NA	INR 5,421,330.80	INR 5,421,330.80	INR 3,252,798.48
SLAB 7	60%	46 days	2-Jan-13	11-Mar-13	20-Jul-13	NA	INR 5,443,240.80	INR 5,443,240.80	INR 272,162.04
SLAB 8	5%	40 days	24-Jan-13	26-Mar-13	NA	NA	INR 5,465,150.80	INR 5,465,150.80	INR 0.00
SLAB 9	0%	42 days	6-Feb-13	15-Apr-13	NA	NA	INR 5,486,747.80	INR 5,486,747.80	INR 0.00
SLAB 10	0%	43 days	25-Feb-13	29-May-13	NA	NA	INR 2,041,028.69	INR 2,041,028.69	INR 0.00
LMR OHT	0%	51 days	1-Apr-13	30-Sep-13	11-Dec-12	NA	INR 78,037,116.11	INR 60,178,087.58	INR 2,540,948.22
ARCHITECTURAL WORKS	5%	265 days	26-Nov-12	17-May-13	11-Dec-12	NA	INR 1,765,490.40	INR 1,765,490.40	INR 441,372.60
CEILING PLASTERING	25%	149 days	26-Nov-12	20-May-13	18-Dec-12	NA	INR 11,664,309.00	INR 11,664,309.00	INR 2,099,575.62
BLOCK WORK	18%	145 days	3-Dec-12	8-Jun-13	NA	NA	INR 9,027,744.00	INR 8,853,013.47	INR 0.00
DOORFRAME FIX	0%	155 days	11-Dec-12	29-Jun-13	NA	NA	INR 11,861,544.60	INR 10,244,061.25	INR 0.00
PLASTERING & WATER PROOFING	0%	154 days	2-Jan-13	20-Jul-13	NA	NA	INR 22,625,017.51	INR 16,088,901.34	INR 0.00
TILING & FLOORING	0%	135 days	14-Feb-13	2-Jul-13	NA	NA	INR 7,151,520.00	INR 5,708,669.47	INR 0.00
DOOR SHUTTER FIXING	0%	114 days	20-Feb-13	27-Aug-13	NA	NA	INR 3,282,406.60	INR 1,489,707.61	INR 0.00
INTERNAL PAINTING	0%	130 days	29-Mar-13	29-Aug-13	NA	NA	INR 4,023,306.00	INR 1,654,746.82	INR 0.00
MISCELLANEOUS WORKS	0%	124 days	8-Apr-13	10-Aug-13	NA	NA	INR 4,537,000.00	INR 2,451,443.55	INR 0.00
EXTERNAL PLASTERING	0%	124 days	20-Mar-13						

EXTERNAL PAINTING	0%	114 days	21-May-13	30-Sep-13	NA	NA	INR 2,098,778.00	INR 257,744.67	INR 0.00
TOWER S	75%	596 days	31-Oct-11	24-Sep-13	29-Oct-11	NA	INR 142,548,848.11	INR 127,200,997.72	INR 54,836,213.96
SUBSTRUCTURE	100%	228 days	31-Oct-11	21-Jul-12	29-Oct-11	24-Dec-12	INR 8,285,390.86	INR 8,285,390.86	INR 8,285,390.86
FOOTING	100%	184 days	31-Oct-11	31-May-12	29-Oct-11	3-Oct-12	INR 4,704,806.50	INR 4,704,806.50	INR 4,704,806.50
ATT	100%	31 days	31-Oct-11	5-Dec-11	31-Oct-11	19-Sep-12	INR 224,865.00	INR 224,865.00	INR 224,865.00
PCC	100%	34 days	1-Nov-11	9-Dec-11	29-Oct-11	19-Sep-12	INR 425,520.00	INR 425,520.00	INR 425,520.00
STEEL FIX	100%	166 days	4-Nov-11	15-May-12	7-Nov-11	3-Oct-12	INR 1,251,631.50	INR 1,251,631.50	INR 1,251,631.50
SHUTTERING	100%	169 days	5-Nov-11	19-May-12	8-Nov-11	3-Oct-12	INR 135,720.00	INR 135,720.00	INR 135,720.00
RFI	100%	172 days	7-Nov-11	24-May-12	9-Nov-11	3-Oct-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	176 days	9-Nov-11	31-May-12	9-Nov-11	3-Oct-12	INR 2,667,070.00	INR 2,667,070.00	INR 2,667,070.00
COLUMN UPTO PB	100%	50 days	23-Apr-12	19-Jun-12	16-Dec-11	13-Oct-12	INR 605,697.12	INR 605,697.12	INR 605,697.12
STEEL FIX	100%	42 days	23-Apr-12	9-Jun-12	16-Dec-11	2-Oct-12	INR 89,913.12	INR 89,913.12	INR 89,913.12
SHUTTERING	100%	41 days	27-Apr-12	13-Jun-12	16-Dec-11	11-Oct-12	INR 95,352.00	INR 95,352.00	INR 95,352.00
RFI	100%	39 days	5-May-12	19-Jun-12	17-Dec-11	13-Oct-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	39 days	5-May-12	19-Jun-12	17-Dec-11	13-Oct-12	INR 420,432.00	INR 420,432.00	INR 420,432.00
PLINTH BEAM	100%	52 days	23-May-12	21-Jul-12	14-Nov-11	24-Dec-12	INR 2,974,887.24	INR 2,974,887.24	INR 2,974,887.24
FILLING AND CONSOLIDATION	100%	52 days	23-May-12	21-Jul-12	14-Nov-11	21-Nov-12	INR 1,449,723.00	INR 1,449,723.00	INR 1,449,723.00
PCC	100%	38 days	26-May-12	9-Jul-12	13-Jun-12	22-Nov-12	INR 685,560.00	INR 685,560.00	INR 685,560.00
STEEL FIX	100%	39 days	28-May-12	11-Jul-12	18-Jun-12	24-Dec-12	INR 214,565.40	INR 214,565.40	INR 214,565.40
SHUTTERING	100%	39 days	31-May-12	14-Jul-12	26-Jun-12	24-Dec-12	INR 237,798.84	INR 237,798.84	INR 237,798.84
RFI	100%	40 days	1-Jun-12	17-Jul-12	2-Jul-12	24-Dec-12	INR 0.00	INR 0.00	INR 0.00
CONCRETE	100%	40 days	1-Jun-12	17-Jul-12	2-Jul-12	24-Dec-12	INR 387,240.00	INR 387,240.00	INR 387,240.00
SUPER STRUCTURE	79%	249 days	22-Aug-12	7-Jun-13	19-Jul-12	NA	INR 56,226,341.14	INR 56,146,300.80	INR 44,335,208.01
SLAB 1	100%	60 days	22-Aug-12	30-Oct-12	19-Jul-12	19-Feb-13	INR 5,589,586.25	INR 5,589,586.25	INR 5,589,586.25
SLAB 2	100%	34 days	22-Oct-12	29-Nov-12	26-Sep-12	20-Mar-13	INR 5,312,093.80	INR 5,312,093.80	INR 5,312,093.80
SLAB 3	100%	33 days	13-Nov-12	20-Dec-12	27-Nov-12	12-Apr-13	INR 5,334,003.80	INR 5,334,003.80	INR 5,334,003.80
SLAB 4	100%	33 days	26-Nov-12	2-Jan-13	30-Jan-13	3-May-13	INR 5,355,913.80	INR 5,355,913.80	INR 5,355,913.80
SLAB 5	100%	37 days	7-Dec-12	18-Jan-13	14-Mar-13	23-May-13	INR 5,377,823.80	INR 5,377,823.80	INR 5,377,823.80
SLAB 6	100%	38 days	22-Dec-12	4-Feb-13	23 Apr-13	14-Jun-13	INR 5,399,420.80	INR 5,399,420.80	INR 5,399,420.80
SLAB 7	100%	37 days	7-Jan-13	18-Feb-13	13-May-13	1-Jul-13	INR 5,421,330.80	INR 5,421,330.80	INR 5,421,330.80
SLAB 8	60%	34 days	25-Jan-13	5-Mar-13	11-Jun-13	NA	INR 5,443,240.80	INR 5,443,240.80	INR 3,265,944.48
SLAB 9	60%	34 days	9-Feb-13	20-Mar-13	29 Jun-13	NA	INR 5,465,150.80	INR 5,465,150.80	INR 3,279,090.48
SLAB 10	0%	34 days	1-Mar-13	9-Apr-13	NA	NA	INR 5,486,747.80	INR 5,486,747.80	INR 0.00
LMR OHT	0%	51 days	10-Apr-13	7-Jun-13	NA	NA	INR 2,041,028.69	INR 1,960,988.35	INR 0.00
ARCHITECTURAL WORKS	5%	265 days	20-Nov-12	24-Sep-13	7-Dec-12	NA	INR 78,037,116.11	INR 62,769,306.06	INR 2,215,615.09
CEILING PLASTERING	33%	149 days	20-Nov-12	11-May-13	7 Dec-12	NA	INR 1,765,490.40	INR 1,765,490.40	INR 582,611.83
BLOCK WORK	14%	145 days	26-Nov-12	13-May-13	13-Dec-12	NA	INR 11,664,309.00	INR 11,664,309.00	INR 1,633,003.26
DOORFRAME FIX	0%	155 days	4-Dec-12	1-Jun-13	NA	NA	INR 9,027,744.00	INR 9,027,744.00	INR 0.00
PLASTERING & WATER PROOFING	0%	154 days	26-Dec-12	22-Jun-13	NA	NA	INR 11,861,544.60	INR 10,706,199.35	INR 0.00
TILING & FLOORING	0%	135 days	7-Feb-13	13-Jul-13	NA	NA	INR 22,625,017.51	INR 17,094,457.67	INR 0.00
DOOR SHUTTER FIXING	0%	114 days	13-Feb-13	25-Jun-13	NA	NA	INR 7,151,520.00	INR 6,085,065.26	INR 0.00
INTERNAL PAINTING	0%	130 days	22-Mar-13	20-Aug-13	NA	NA	INR 3,282,406.60	INR 1,641,203.30	INR 0.00
MISCELLANEOUS WORKS	0%	130 days	1-Apr-13	29-Aug-13	NA	NA	INR 4,023,306.00	INR 1,764,064.94	INR 0.00
EXTERNAL PLASTERING	0%	124 days	13-Mar-13	3-Aug-13	NA	NA	INR 4,537,000.00	INR 2,670,975.81	INR 0.00
EXTERNAL PAINTING	0%	114 days	15 May-13	24 Sep-13	NA	NA	INR 2,098,778.00	INR 349,796.33	INR 0.00

MASTER CONSTRUCTION PROGRAM-They briefly explain the stage of work (Event & Activities).Start-finish of work, Target for the month and weeks can be updated .hence the delay of the work can be easy find out and were the project progress stands can be noticed easily.MSP even help in cost management, in which part of the work huge money has to be invested , when are they needed and invested can be calculated earlier. The planned and achieved status help in getting the details of backlog works and what resource is need to solve this backlog can be planned .

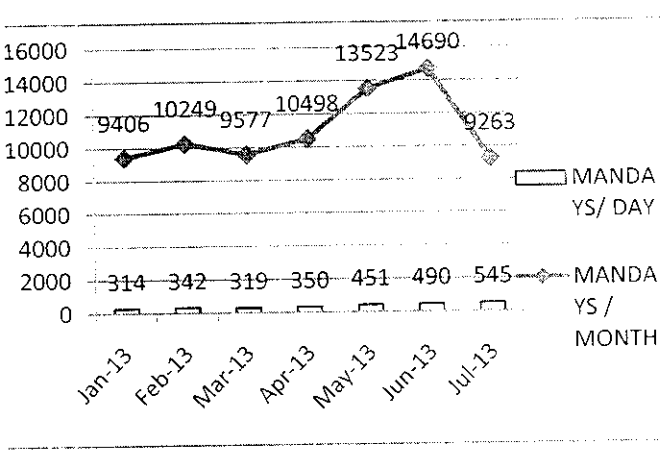
Project Updates – ABC's Past 6 Months Performance

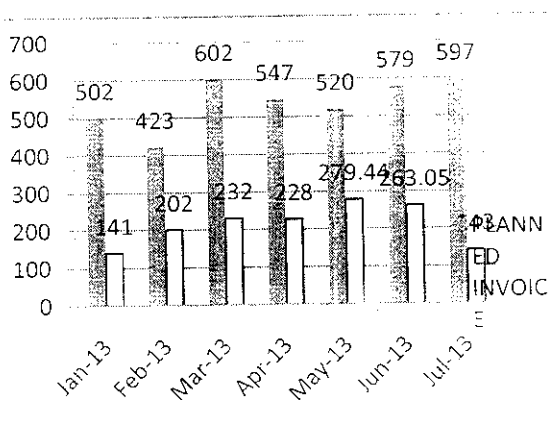
INVOICE PLANNED Vs ACHIEVED

LABOUR HISTOGRAM

LABOUR HISTOGRAM			
SL NO	MONTHS	MANDAYS / MONTH	MANDAYS/ DAY
1	Jan-13	9406	314
2	Feb-13	10249	342
3	Mar-13	9577	319
4	Apr-13	10498	350
5	May-13	13523	451
6	Jun-13	14690	490
7	18-Jul-13	9263	545

INVOICE PLANNED Vs ACHIEVED				
				VALUE IN LAKHS
SL NO	MONTHS	PLANNED INVOICE	ACHIEVED INVOICE	% ACHIEVED
1	Jan-13	502	141	28%
2	Feb-13	423	202	48%
3	Mar-13	602	232	39%
4	Apr-13	547	228	42%
5	May-13	520	279	54%
6	Jun-13	579	263	45%
7	18-Jul-13	597	143	24%





MANDAYS REQUIRED FOR A MONTH & A DAY

L NO	CATEGORY	TARGET MANDAYS	DAILY DEMAND	PREVIOUS WEEK'S AVG	DAY BEFORE Y'DAY	Y'DAY	TODAY	CUMULATIVE ACHIEVED	CUMULATIVE % ACHIEVED
		NOS	NOS	NOS	NOS	NOS	NOS	NOS	
1	MASON	6580	212	98	111	117	114	2942	45%
2	MASON HPR	2833	91	83	86	89	80	2391	84%
3	CARPENTER	4740	153	84	112	108	100	3004	63%
4	CARPENTER HPR	2370	76	56	59	53	48	1460	62%
5	BARBENDER	2560	83	46	45	37	41	1229	48%
6	BARBENDER HPR	1280	41	35	32	28	34	1047	82%
7	MALE COOLIE	2632	85	113	124	128	135	3603	137%
8	FEMALE COOLIE	360	12	0	0	0	0	0	0%
9	OPERATOR/MECH	303	10	28	25	28	27	863	285%
		23658	763	542	565	363	579	16539	70%

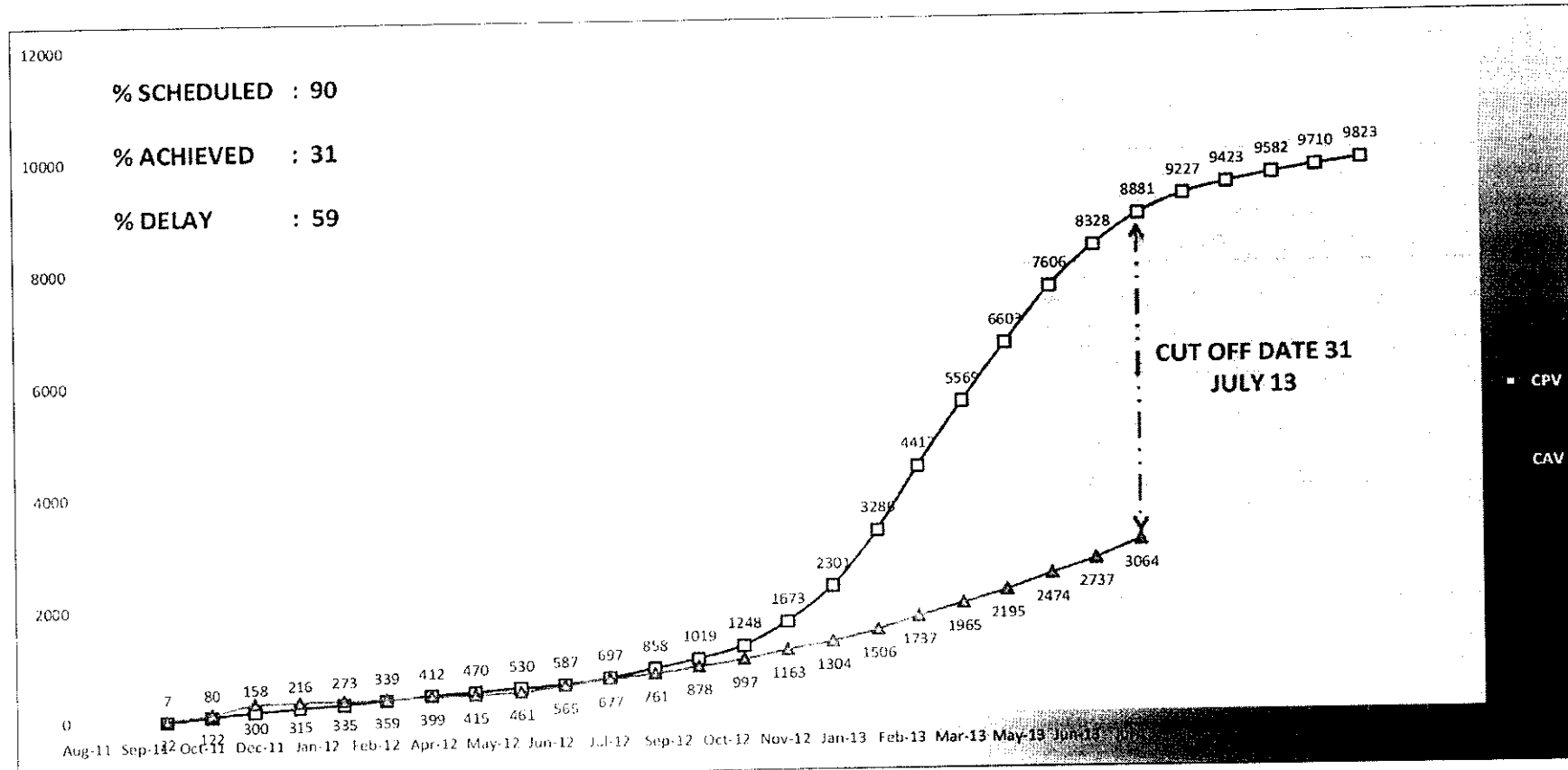
MATERIAL REQUIREMENT FOR THE MONTH JULY'13

SL NO	ITEM	UNIT	TARGET QTY	RECEIVED Y'DAY	CUMULATIVE RECEIPT	CUMULATIVE % ACHIEVED
1	CEMENT	BAGS	27068	0	14920	55%
2	STEEL	MT	320	0	212	66%
3	M SAND	CU.M	3170	32	652	21%
4	12MM AGRREGATE	CU.M	2942	23	360	12%
5	20MM AGRREGATE	CU.M	3309	35	736	22%
6	PLY WOOD	SQ.M	23704	586	586	2%

RESOURCE MANAGEMENT-From MSP, the Resource required for each stages of the project can be calculated..Mandays required in each activity like plastering & shuttering can be calculated according to the monthly target and the Mandays can be allocated to their respective work. The planning of resource and mandays help in bigger project. lack of resource may delay the project. This Resource management largely help in construction project. Resource management helps the project to run without any stop and delay

DATE: 31-Jul-13

MONTHS	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
PV	7	73	78	58	56	67	73	57	60	58	109	161	161	228	426	678	985	1131	1153	1034	1003	722	553	346	196	158	129	113
CPV	7	80	158	216	273	339	412	470	530	587	697	858	1019	1248	1673	2301	3286	4417	5569	6603	7606	8328	8881	9227	9423	9582	9710	9823
AC	22	100	178	15	20	24	40	16	45	104	112	84	117	119	166	141	202	231	228	230	279	263	327					
CAV	22	122	300	315	335	359	399	415	461	565	677	761	878	997	1163	1304	1506	1737	1965	2195	2474	2737	3064					



S-curve- The figure gives the details of planned VS achieved value in cost and time period. The delay in period can be noted with the difference in curve.Hence according to MSP in july the cost should be achieved as 8881 lakhs (cumulative), but the achieved cost till july is 3064 lakhs (cumulative).Hence the delay in project can be solved by effective planning & project management.

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