DESIGN ECONOMICS AND MANAGEMENT
OF
INTERIOR FIT-OUTS OF IT OFFICE SPACES

A DISSERTATION

Submitted in partial fulfillment of the
requirements for the award of the degree
of
MASTER OF ARCHITECTURE

By

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CANDIDATE'S DECLARATION

I hereby certify that the work, which is being presented in the dissertation entitled "**DESIGN ECONOMIES AND MANAGEMENT OF INTERIOR-FITOUTS OF IT OFFICE SPACE**" in partial fulfillment of the requirement for the award of the degree of **MASTERS OF ARCHITECTURE** submitted in the Department Of Architecture And Planning of Indian Institute Of Technology, Roorkee is an authentic record of my own work carried out during the period from August 2005 to June 2006 under the supervision of **Prof P.K Patel.**

The matter embodied in this dissertation has not been submitted by me for the award of any other degree.

(M.P.Avinash)

CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Dated : 29.06.06.

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Sandeep – For all the support you gave and for the discussions we held.

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And

My Parents for having faith in me.

M.P.Avinash

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INTRODUCTION

'Good Design is Good Economics'

Sir Norman Foster

The work is an attempt to understand the relationship between Design and Economics.

There are, in practice, frequent and bitter conflicts between those whose major concern is design and those whose major concern is obtaining buildings as cheaply as possible; and it certainly is the case that there are cost limits below which good building is hardly feasible. The reasons for conflict and failure are partly due to misunderstanding between the clients, builders and architects on what good building is, but there are also genuine difficulties, aggravated by the industry's methods of working, in translating design concepts into actual buildings which can be built within some realistic cost limits.

The aim of this work is not to elaborate on cost estimation techniques, cost control or valuation but is an attempt to understand some basic principles and current practices and through which explore the interrelationships between design and costs and provide an understanding on how design decisions affect the economics of a building process and how economic realities affect design.

Simple concepts of economics; concepts such as technological advances, economics of scale, competition cost and price can be employed without any need to trot through the conventional analysis.

The central idea is the link between design and cost. Inevitably all design decisions have cost implications; the shape of a proposed construction, the materials from which it is to be made and the method by which it is to be built will ultimately determine its cost – and its expected cost may determine whether it will be built at all. Furthermore, when it is completed and in use its design will have important, perhaps predominating, effects on the costs incurred in using it, as well as the effectiveness with which it can fulfill the purpose of its users.

The architect is not solely responsible for either the costs of producing the building or for the costs of using it; nevertheless, he bears a very large part of the responsibility for the building's cost and for many aspects of the economy of its construction.

The dissertation attempts to understand this relationship between design and cost by considering the case of **IT Office Fit-Outs.**

CHAPTER 1

1.1 Need for Study

1.2 Aims and Objectives

1.3 Scope and Limitations

1.4 Methodology

<u>**Chapter – 1**</u>

1.1 NEED FOR THE STUDY:

According to the 11th Quarterly Survey of Projects Investments (30 June 2004) conducted by Projects Today, the IT industry had 93 Information Technology park projects worth Rs.26,392 crores in various stages of planning and implementation.

These large amounts of capital commitment, by the companies in IT facilities, is because, a modern IT office space is not just another office space, instead, it is a sophisticated intercommunication system distributed across global digital networks, requiring global standards in infrastructure, design and office Fit-Outs.

The cost of infrastructure in these highly serviced buildings, i.e., the plant and equipment required for IT, air conditioning, fire fighting, building management and maintenance systems and water and power supply, etc. amount to more than two-third's of the total *initial cost* of an IT office building.

The Fit-Outs in the IT Office building are second major *initial cost* components, and, the costliest component in the *life cycle* of an IT office building.

<u>By definition an IT Office Fit-Out:</u>

Relates to the interior permanent furnishings required in an office space including HVAC ducting, light fittings, fire protection system implementation, security systems, establishment of workstations, overhead and underfloor service distribution networks and telephone/computer cabling among others, in order to make the space fit for usage.

The fit-outs exclude the items connected to a service and not used directly, but, may be required for regulatory, safety or climatic reasons and loose furniture and equipment.

The energy needed to ensure a comfortable environment for the building's occupiers and to enable the building's functions effectively accounts for a high proportion of the building's total running costs. For example the long term using of air conditioning system will certainly outweigh its initial costs.

Since, the IT Office Fit-Outs are the costliest components in an IT Office Building, people committing large amounts of capital in these Fit-Outs expect value for money. But,

- What is value for money?
- How is one supposed to know what Fit-Outs ought to cost?

To answer these questions one needs, however, some answers to other underlying questions such as:

- Why do they cost what they do?
- What contribution do those involved with procuring, designing and producing Fit-Outs make, separately and collectively to the determination of costs?
- How are effectiveness and value for money to be defined and achieved?
- Do architectural and economic values necessarily conflict?

The answers to some of these questions are simple: a Fit-Out's cost, that is, the total resources it is going to require, depend upon:

- Size, shape and construction systems
- Amount, type and cost of materials used (the specifications)

- Effectiveness of the design in life cycle costing

- Cost of services

- Cost of human resource involved in design and construction

- Management in implementing the design

- Integration of design, procurement and construction management

Most of these issues involve design and management:

- The overall design - size & shape of the Fit-Out, determines the quantity of material, labour and plant required.

- Although different construction methods may result in different costs, the design function and its effectiveness remain crucial.

- Though the long term efficiency of a building depends on the way it is used and the quality of maintenance but it is again the initial design which determines whether the long term efficiency can infact be achieved.

- The management of the design implementation is what integrates functions of design, construction and cost control and efficiently execute the project within the stipulated constraints of time and cost.

Therefore it is imperative to understand cost implications of design decisions and thı management practices to achieve cost optimization (value for money) in interior Fit-Outs o: IT office spaces.

1.2 AIMS AND OBJECTIVES

1.2.1 Aim:

The aim of the dissertation is to frame considerations for cost optimization through design and management for interior FIT-OUTS in IT office spaces.

1.2.2 Objectives:

- Understanding and identifying the current nature and needs of interior Fit-Outs of IT office spaces.
- Understanding and identifying the cost implications of design decisions of interior Fit-Outs of IT office spaces.
- Relating design choices to the construction of interior Fit-Outs of IT offices spaces and its management.
- Understanding and identifying the management principles in effective and efficient implementation of the design of interior Fit-Outs in IT office spaces.

1.3 SCOPE AND LIMITATION

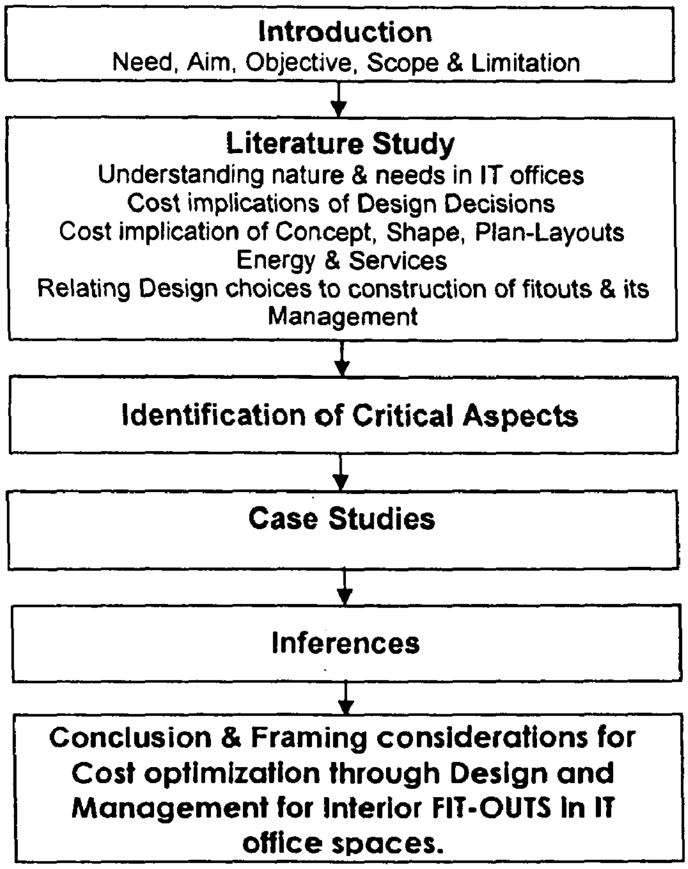
1.3.1 Scope:

The dissertation attempts to provide understanding of basic principles, describe current practices and explore interrelationships of design decisions and management practices in ways that can help clarify how they affect the total economics of interior Fit-Outs of IT office spaces.

1.3.2 Limitations:

The dissertation limits its discussion to functional suitability and cost.

1.4 METHODOLOGY:



CHAPTER 2

IT OFFICE FIT-OUTS

Chapter – 2 IT OFFICE FITOUTS:

A fit-out relates to the interior permanent furnishings required in an office space in order to make the space fit for usage.

Fit-out includes

- HVAC ducting
- Light fittings
- Fire protection system implementation
- Security systems
- Establishment of workstations
- Overhead and underfloor service distribution networks
- Telephone and computer cabling

Fit-Outs excludes

- The items connected to a service and not used directly, but, may be required for regulatory, safety or climatic reasons
- Loose furniture and equipment

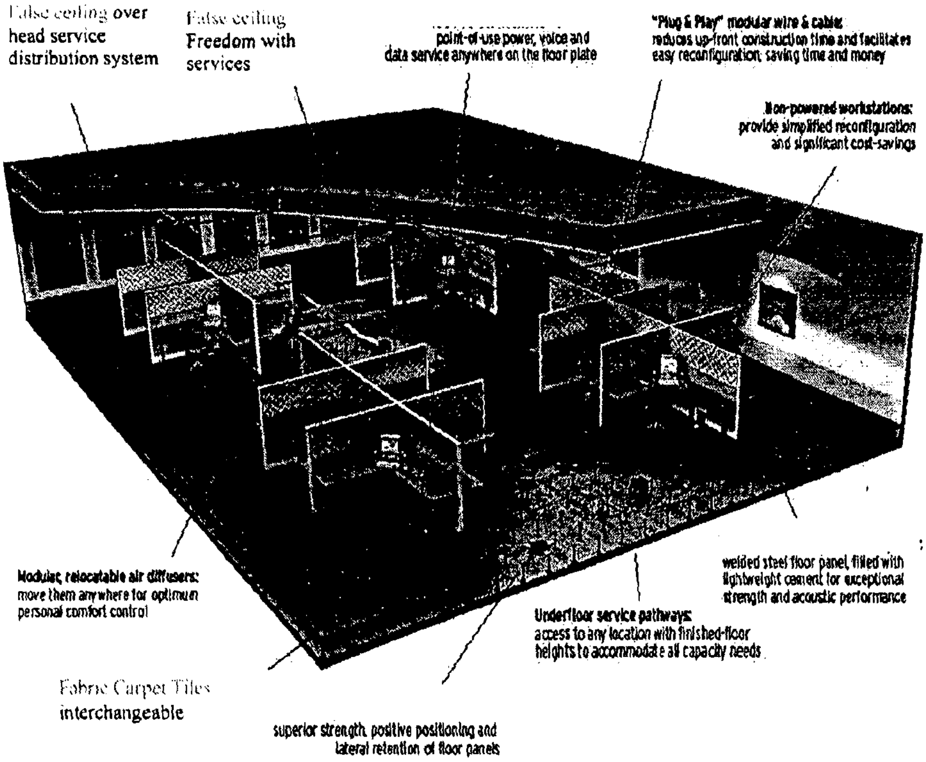


Figure 2.1 sectional view of an interior fit-out showing the various elements of a fit-out

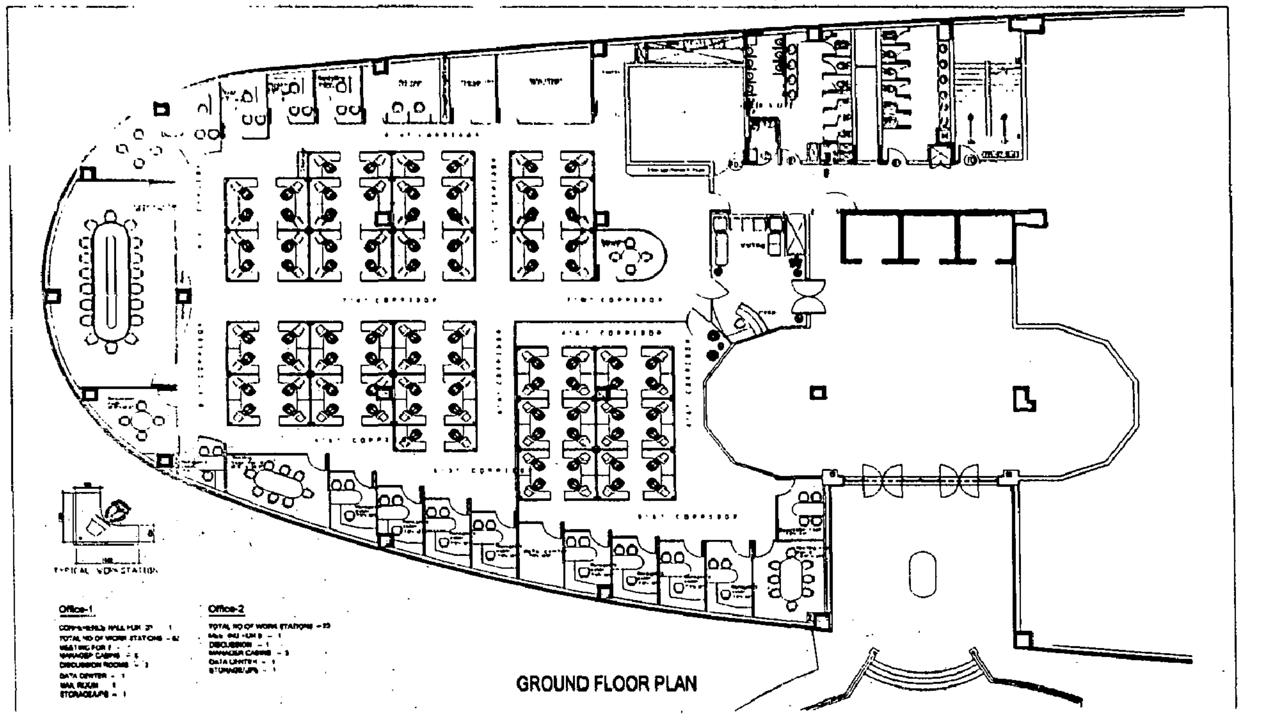


Figure 2.2 Interior Fit-Out layout Cibernet, I-Labs, Hyderabad.

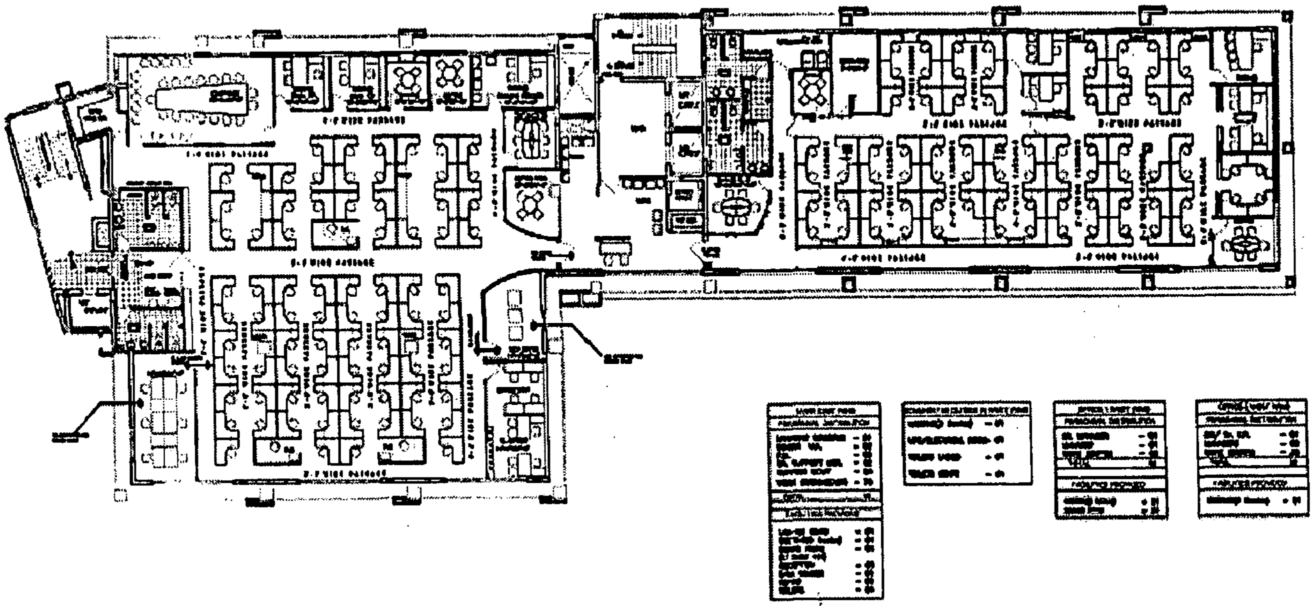


Figure 2.3 Interior fit-out layout of Mars Tele, Hyderabad

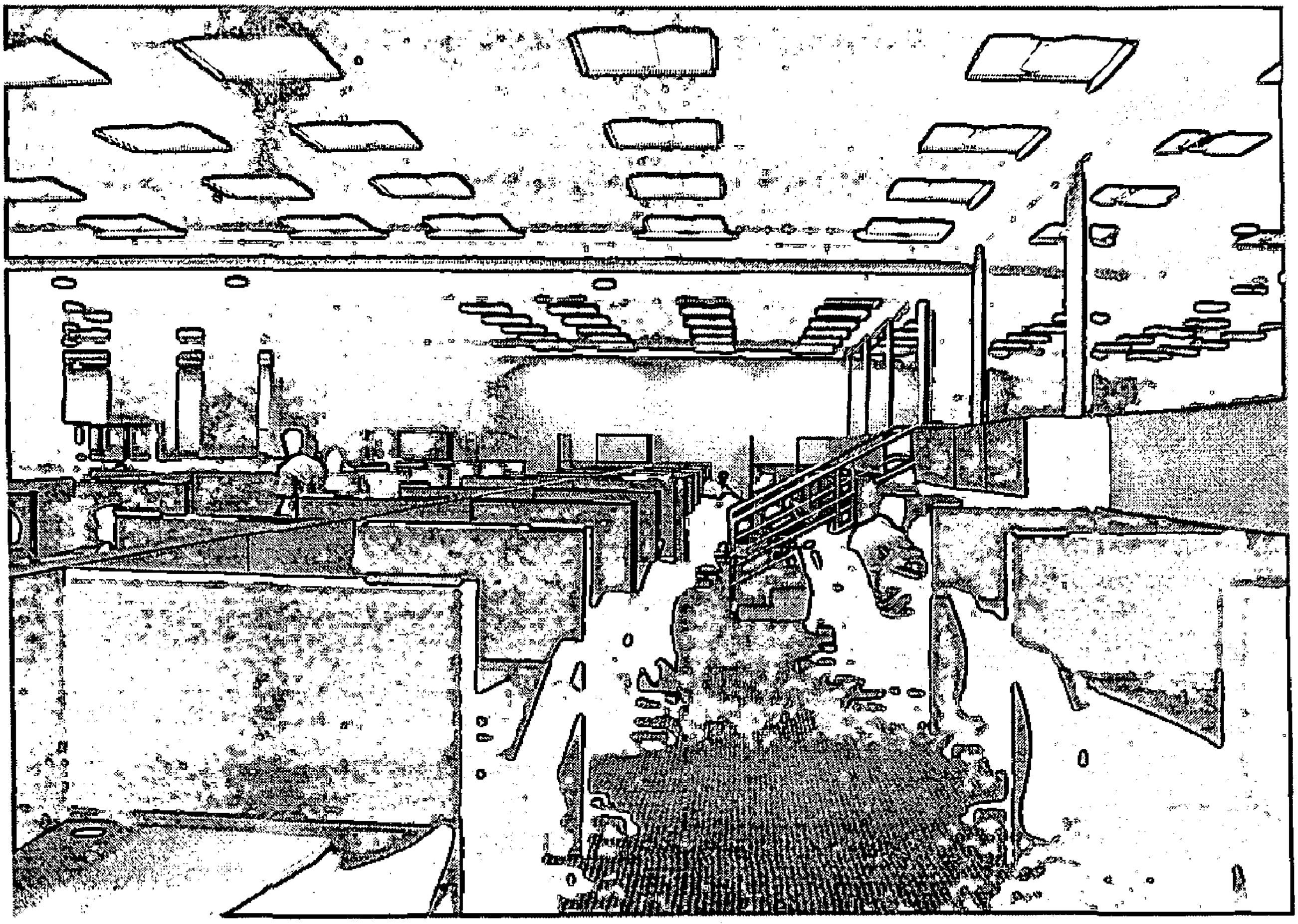
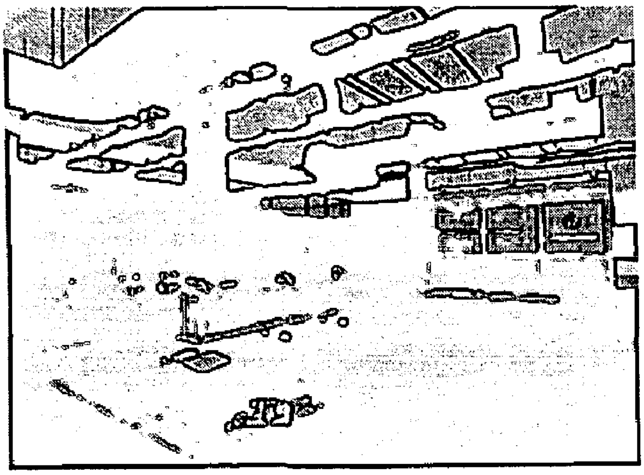
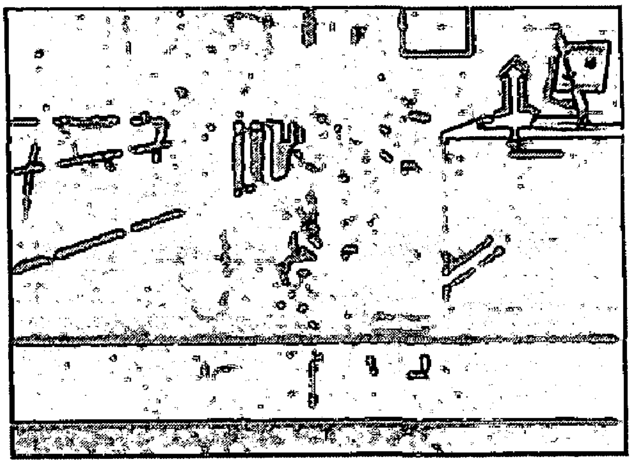


Figure 2.4 IT Office Interior Fit-Out





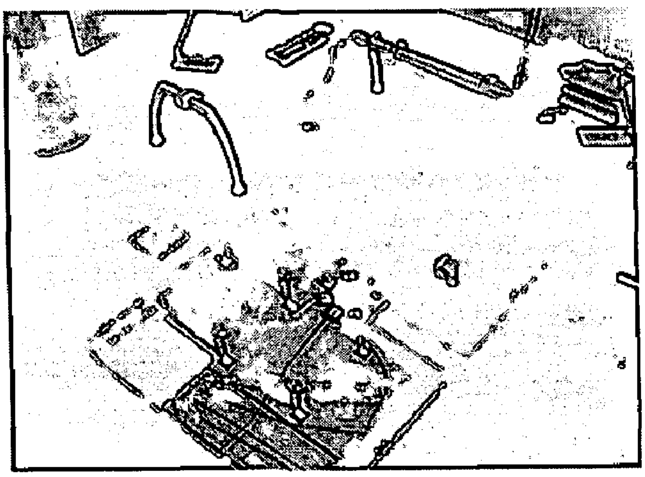


Figure 2.5 Different Services that are a part of the fit-out

CHAPTER 3

THE DESIGN FUNCTION AND COST

Chapter – 3 THE DESIGN FUNCTION AND COST

One of the most damaging misunderstandings, common even among people in the industry, is about design. In particular there is a widely held view, outside architecture itself "that" design is solely" concerned with appearance, that the aesthetics of form or even worse, of facade, are the architect's chief concern. Architects, in fact, have to be concerned with every aspect of a building's function, structure and appearance. To take one objective as an example, the effective planning of internal spaces. Designers need to assess the probable movements between parts of a building: which rooms need to be near which others? Which further away? There are a virtually infinite number of ways of arranging and designing spaces for specific functions even in a relatively simple building so the planning problem itself can quickly become complex. But, in making decisions about internal spaces, the architect will also be concerned with the quality of the internal environment, the effective use of daylight and artificial light, thermal comfort, efficient ventilation, the need to minimize energy use, problems of sound transmission where some activities will be quiet and some noisy. All these aspects require thought about the size, shape, position: and design of windows building envelope and internal partitions. The designer will need to assess the most appropriate materials in terms of performance, look, and feel, for every part of the building. The list of issues to be considered can become very long and they have to be related to each other. Even the design of a window raises all sorts of issues which need resolution in relationship to many other aspects of the design. But, even these only address a part of the problem – there are issues of cost, long-term, and short term, material availability, buildabilty, etc.

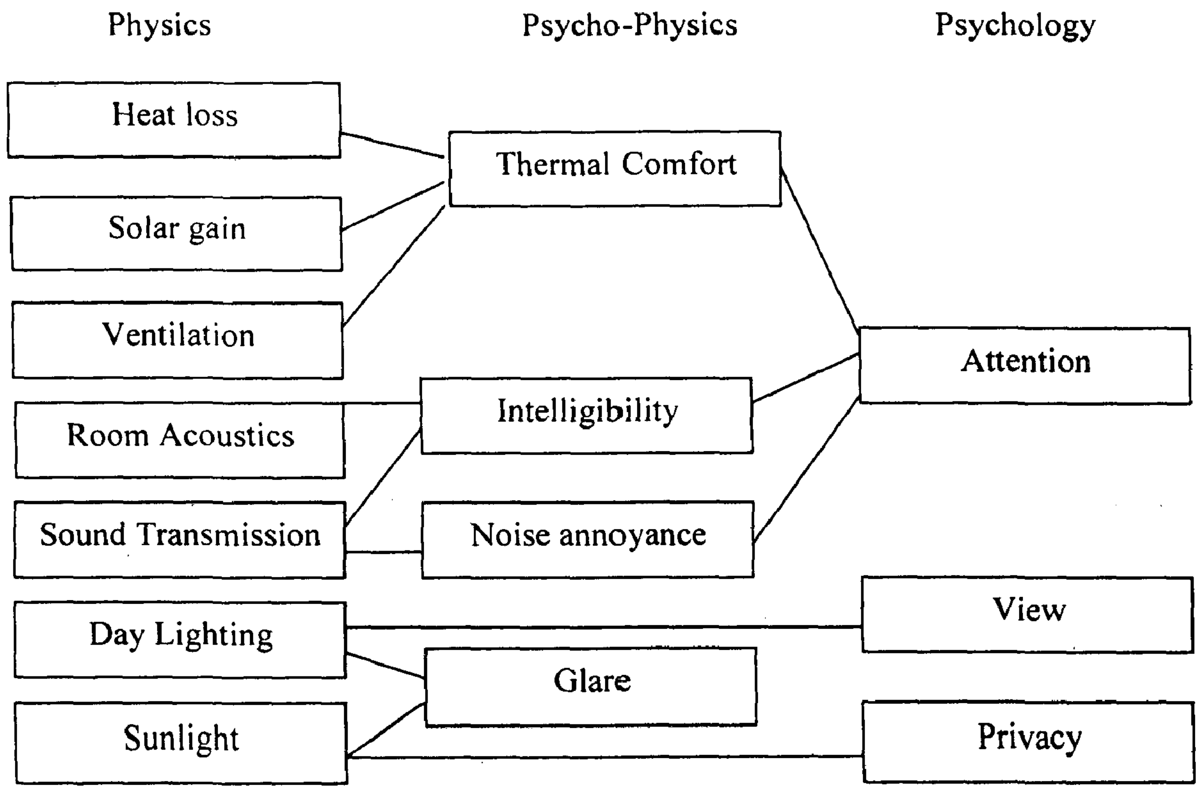


Figure 3.1 Factors to be considered in designing a window (this excludes the problems of construction, cost, availability of materials etc.)

Source: Lawson (1980)

Function: concept clearly related to function; relationship of spaces, internal external, satisfies functional requirements

Circulation of people and things efficient;

Space provision adequate for each function;

Growth and change allowed for;

Internal environment comfortable, thermally, aurally, visually

Form: relationship to site and surrounding carefully consider

Imaginative and relevant expression of function and its location

structure, services, spaces well integrated

creates positive psychological reponse

Economy: planning economical yet able to meet functional requirement

Choices of material and components maximize value for money in short and the long term

Future operation and maintenance considered

Relationship of design to construct programme carefully considered

Figure 3.2 Some fundamental requirements of effective design

Source: Draper (1984).

The above Figure reflects how a large modern practice specified the characteristics of a successful building, without suggesting that simply by following the guidelines, a 'good' fit-out would result. To get it all right, to design a building which not only fulfils its function, but gives pleasure and satisfaction and to achieve all this within a tight budget is no easy task. It requires a great deal of knowledge, judgement and experience.

So how is it done? What is the activity of designing that the architect undertakes? What is design as the architect perceives it? What relationship does that activity have to economics of the fit-out?

The designer is fundamentally responsible for determining the general level of a fit-out's cost. If, as is usually the case a client has a budget limit. It is the basic design which determines whether the fit-out can in fact be built to that limit.

CHAPTER 4

THE STRUCTURE OF A FIT-OUT'S COST

Chapter - 4 THE STRUCTURE OF A FIT-OUT'S COST

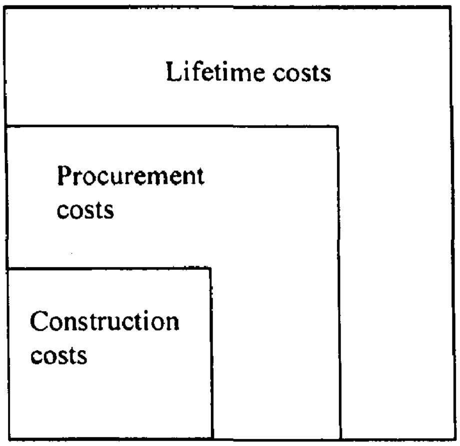
4.1 Introduction

Costs can be simply assumed to be the sums of money paid out by clients or purchasers and are assumed to be attributable to specific building elements and a range of over heads or 'Preliminaries'.

However, one has to be aware that there are many possible meanings of the phrase 'cost of a Fit-out', for example, Fit-out costs and Tender costs.

There are other level of costs to be considered for example, the cost to a client of actually acquiring a fit-out will include more than the tender price such of the cost of the office space and fees paid to the professional advisors including architects.

Also, any assessment of the true costs of the of a fit-out must include the costs incurred in its whole life, usually referred as 'life cycle costs'. These will include the costs of maintenance, of climate control, of lighting, security and may also include the property taxes, etc.



Procurement costs = Construction costs
+Cost of Office Space
+Consultants Fees
+Cost of finance
+Any Excess Builder's Profit

Construction Costs = Cost of Materials
+Cost of labour
+Costs of plant
+Costs of management
+Builder's finance
+Normal Profit

Figure 4.1 Hierarchy of costs levels

4.1.1 Size, Type and Cost

The two most obvious determinants of the overall cost of:l building arc' Its (unction and its size ; indeed a very crude and simple way of estimating what a fit-out is going to cost, often used by Architects as a first guess - and sometimes surprisingly accurate - is to take the proposed size of the fit-out (in terms of floor area) and multiply by the average current costs per unit for fit-outs of that type in that region.

4.1.2 The elements of a Fit-Out

The practice of analyzing Fit-outs costs by elements, that is by considering total cost as the sum of the costs of individual so-called elements such as walls/partitions, ceilings, fixtures and fittings, is very popular. Since long architects have based their predictions during the design stage on this technique because elements provide a useful and meaningful base of cost comparison between different projects. An element is defined as 'that part of a building/fit-out which performs a specific function independently of quantity or quality'.

Using this method it is possible to derive reasonable estimates of likely costs but with making adjustments of mainly two sorts: one, the rates are adjusted to reflect the current market and, two, the specifications are similar to the ones being referred to.

4.1.3 Fit-Outs as the conversion of resources

The fact that it is difficult or even logically impossible to identify separate elemental costs accurately is not a problem if we are interested merely in a rough estimate of how costs are distributed. But if we wish to understand why a fit-out costs a certain amount, we need to know more about the resources which go into it. Some of the information requires to assess resource costs - and the costs of materials and manpower for example - is exactly the same as that required for building up the costs of elements in a bill of quantities, but it needs to be looked at in a different way, With, emphasis placed on the process by which these resources are converted into the final fit-out rather than on their separate contribution to somewhat randomly defined elements.

In fact, a contractor responsible for construction has to think in resource terms: the notional cost of a square metre of partition wall, for example, is less important than the requirements for the labour and materials required to build a partition wall at a particular stage in the whole construction programme If labour are hired specifically for that wall, this may be more expensive than if there is continuity of work from an earlier and to a later stage. Even the cost of the Partition wall material may be very much influenced by the total material to be purchased for the complete building and the times of their delivery.

4.2 MATERIALS: MARKETS AND PRICES

New materials as well as new uses for old materials are continually becoming available. This wealth of material gives today's architects a breadth of choice which their predecessors did not have, but it also brings many new problems: there are more comparisons to be made, new material characteristics to be investigated and understood, new' risks involved.

Obviously, given the great number and variety of the materials used in construction it is not possible to understand all their different economic characteristics. But materials represent some 5O-60%, of total building costs and all designers, and contractors need to understand at least a little about the underlying forces which determine their availability and their prices. It is particularly important to be aware of how and why relative prices change over time and also why prices can change very rapidly over short periods.

4.2.1 Technical Innovation

Technical innovation as not only improved methods of production, quality and variety of standard materials but has led to the development of completely new materials, sometimes specifically developed for construction but more often adapted from original uses in other industries.

The driving force behind product innovation is the constant search by the companies to retain or increase their market share, enabling them to grow or survive – and to enhance profitability. To be successful they must produce something cheaper better or to offer attractive combination of cost and quality compared to the other materials. But it is not easy to assess the actual consequences on ultimate prices and qualities of so much change and innovation. Architects have to keep up with innovations; constantly estimating their relative costs and values in particular uses.

4.2.2 Economies of scale

Economies of scale are well established and needs no detailed discussion, but, scale economies not only bring down the costs of production but also with the available technology mass production with variety can also be achieved as is the case with the tiles and pavers segment of the building materials

Other important aspects influencing the costs of building materials are:

- **The structure of the industry and the nature of competition**
- **Competition and prices**

CHAPTER 5

ECONOMIC ASPECTS OF DESIGN DECISIONS

5.1 Costs and Choices – Short Term and Long Term

5.2 Long Term Costs – Techniques of Assessments

5.3 Life Cycle Cost Comparisons

5.4 Plan Shape and Costs

5.5 Energy and Services

5.6 Passive Paths to Energy Savings

5.7 Active Control of the Environment: The Input of Energy

Chapter - 5 ECONOMIC ASPECTS OF DESIGN DESICIONS

5.1 COSTS AND CHOICES – SHORT TERM AND LONG TERM

Designing Fit-Outs is very much about opening up possibilities, a creative process of imagining and defining many possible forms through which a client's requirements might be met and objectives expressed.

BUT…..

Design is also about making straight choices from existing options

Example

✓ Selecting a form of flooring material from those which are actually available

✓ Deciding what type of ceiling or wall cladding to use, Etc

Achieving the best possible quality within the budget must be a major objective.

PROBLEMS OF CHOICE

Two economic aspects of achieving the best possible quality within the budget are:

- Making selections on the basis of relative prices – initial or short term costs
- Taking explicit and formal account of total costs in use - or life-cycle costs - of a material or component.

5.1.1 The Initial Costs of Alternative Materials and Components

Today there is a bewildering range of possibilities, in terms of different materials which can perform similar functions

One element of analysis of possibilities is Comparison of Current or Initial Prices for materials or components which meet the performance requirements. This simply does not mean the price of the material itself.

- ✓ The cost per unit of material multiplied by the number of units
- ✓ The cost of transport
- ✓ The cost of labour
- ✓ Equipment used
- ✓ Furthermore, the full costs of using a particular material may depend on the ramifications for the use of others

5.1.2 Long-Term Costs

It has become increasingly accepted over the past few years that design decisions should explicitly take time - and particularly the expected lifetime of a building and its many parts - into account.

(a) size of each segment is in relation to the cost of each item

(b) data relate to the full expected life of the building of 50 years;

(c) operating costs are discounted by 2% net of inflation;

(d) site cost and design fees not included;

(e)fixtures and fittings included with superstructure.

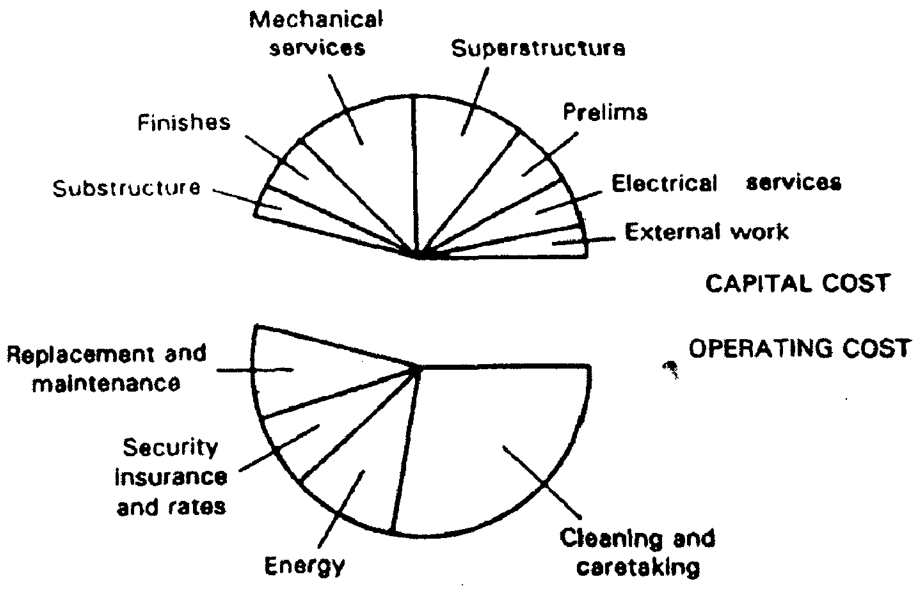


Fig 5.1 Comparison of the capital (initial) costs of the building with the present value of its running costs

5.2 LONG-TERM COST: TECHNIQUES OF ASSESSMENTS

5.2.1 The Present Value (PV) Method

- The general idea underlying life-cycle costing of any design choice is that, we should be aware of and if possible calculate both the immediate and future costs.

- Only by doing that can the relative merits of different alternatives be assessed.

- The objective is to relate the short-term to the long-term costs - in the context of the Fit-Out.

- In trying to make comparisons of this sort the difficulty arises because it is not sensible to treat future and immediate costs as equivalent.

- There is a considerable difference between knowing one has to spend Rs1000 tomorrow and knowing one has to spend Rs1000 in a year's time; or between knowing one is going to receive money tomorrow or the same amount in a year's time.

Example

If Mr. X wants to sell a non- interest bearing bond worth Rs10,000 maturing in 5 yrs from now – how much should you pay him to buy the bond now?

Obviously you should pay much less now to get to get Rs10,000 after 5 yrs.

How much less depends n the rate of interest… for argument sake let us assume a fixed rate of interest of 5% per annum.

Then you should only pay Mr. X Rs7,835.

That is Rs10,000 in 5 yrs is only worth Rs7,835 Today!

or

The present value of Rs10,000 at a discount rate of 5% p.a. received after 5 yrs from now is RS7,835.

The formula:

$$PV = A/(1+i)^n \quad or \quad A(1+i)^{-n}$$

Where : 'PV' is the Present Value
'I' is the interest rate
'A' is the cost incurred in 'n' years from the present

The principle of comparing present & future costs can be extended to consider stream of future payments.

For example if the electricity bills are expected to be Rs1,500 per year for the next five years, then to calculate then present value of the total, we have to make the following calculation:

	Payment	*Present Value @5%*
Year 1	*Rs* 1,500	*Rs* 1,428.45
Year 2	*Rs 1,500*	*Rs 1,360.53*
Year 3	*Rs 1,500*	*Rs 1,295.75*
Year 4	*Rs 1,500*	*Rs 1,234.05*
Year 5	*Rs 1,500*	*Rs 1,175.28*
		Rs 6,494.06

If we simply multiply 1,500 by 5, that is by not discounting at all we would get Rs7,500, a considerable difference.

Derivations:

If you have Rs 'P' in an account paying (i xl00)% interest compounded yearly (for example, if the interest is 5% ,(i = .05), then at the end of year 1, the sum in the account will be 'A' where

$$A= P + iP$$

(if the interest is 5% and P=Rs200, then A will be 200 +(.05 x 200)= Rs210)

At the end of the second year

$$A= (P+iP) + i\ (P+iP)$$

(in the example A will now be £210+ 5% Of 210 = £220.5)

This can be written as:

$$A=P(1+i)(1+i)$$

At the end of the third year

$$P(1 +i)^3$$

In fact each year one is multiplying by (1 +i)

So for n years the general formula when A is the amount to which P accumulates over n years at (i.l00)% interest is

But if $A = P(1 +i)^n$ then obviously $P = A/(1+i)^n$

i.e. the present value of an amount A receivable or payable after 'n' years, discounted at (i X 100)%is equal to

$$A/(1+i)^n \text{ or } A(1+i)^{-n}$$

Present Value Interest Factor Tables

Present Values of $1 Due at the End of n Periods:

$$PVIF_{k,n} = \frac{1}{(1+k)^n} = \left[\frac{1}{(1+k)}\right]^n$$

Period (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%
1	.9901	.9804	.9709	9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696
2	.9803	.9612	.9426	.9246	9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561
3	.9706	.9423	.9151	.8890	8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718
5	.9515	.9057	.8626	.8219	.7835	7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759
8	.9235	8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843
10	.9053	8203	.7441	.6756	.6139	.5584	.5083	4632	.4224	.3855	.3220	.2697	.2472

Table 5.1 Present value Interest Factor Tables

5.3 LIFE CYCLE COST COMPARISONS

Life Cycle Costs Comparisons of Two Alternate Floor Coverings

Assumptions:

Building life: 50 years

Initial costs:

ABC Tiles: Rs 150 — Replacement after every 10 years

XYZ Tiles: Rs 200 — Replacement after every 15 years

Cleaning costs

ABC Tiles: Rs 25 per year

XYZ Tiles: Rs 20 per year

Discounting Rate: 5%

Assume (for simplicity) costs of cleaning are incurred at the end each year.

Initial costs:

ABC: Rs 150

XYZ: Rs 200

Cleaning costs:

(Using P.V of Rs 1 p.a. table @ 5% for 50 yrs - PVIF = 18.2559)

The present values of cleaning costs are:

ABC Tiles: 25 X 18.2559 = Rs 456.40

XYZ Tiles: 20 X 18.2559 = Rs 365.12

Replacement costs:

ABC tiles require replacement at the end of 10th, 20th, 30th and 40th year.

XYZ tiles require replacement at the end of 15th, 30th and 45th year.

Present Values of the replacement costs for ABC Tiles:

At the end of 10th year *(PVIF = 0.613)*:	150 X 0.613 = Rs 91.95
At the end of 20th year *(PVIF = 0.377)*:	150 X 0.377 = Rs 56.55
At the end of 30th year *(PVIF = 0.229)*:	150 X 0.229 = Rs 34.41
At the end of 40th year *(PVIF = 0.141)*:	150 X 0.141 = Rs 21.18
	Rs 204.09

Present Values of the replacement costs for XYZ Tiles:

At the end of 15th year *(PVIF = 0.481):* 200 X 0.481 = Rs 96.2

At the end of 30th year *(PVIF = 0.231):* 200 X 0.231 = Rs 46.2

At the end of 45th year *(PVIF = 0.111):* 200 X 0.111 = Rs 22.2

Rs 164.6

Total life cycle cost comparisons of the two alternate floor coverings:

Description	ABC Tiles	XYZ Tiles
Initial Costs	Rs 150	Rs 200
Maintenance Costs	RS 456	Rs 365
Replacement Costs	Rs 204	Rs 165
Total Life Cycle Costs	Rs 810	Rs 730

It would wiser to choose XYZ tiles as they are cheaper in the life cycle costs.

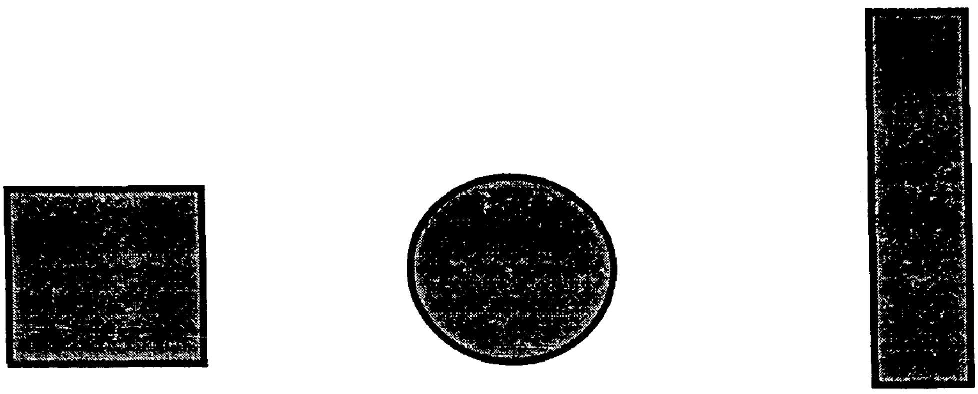
5.4 Plan Shape and Cost

5.4.1 Areas, perimeters and cost

- The perimeter of Fit-Out of a given area will be a different length depending on the plan shape.

- Consequently the cost of those elements which are directly related to perimeter length such as walls will also vary with plan shape.

- The costs of many building elements are directly related to the length of the perimeter, these costs will rise as the length increases.



(a) Perimeter = 200 m (b) Perimeter = approx. 177m (c) Perimeter = 250 m

(a) Perimeter = 250 m (a) Perimeter = 200 m; Area = 1875 sq m

Figure 5.2 Plan shapes of similar area – 2500 sqm

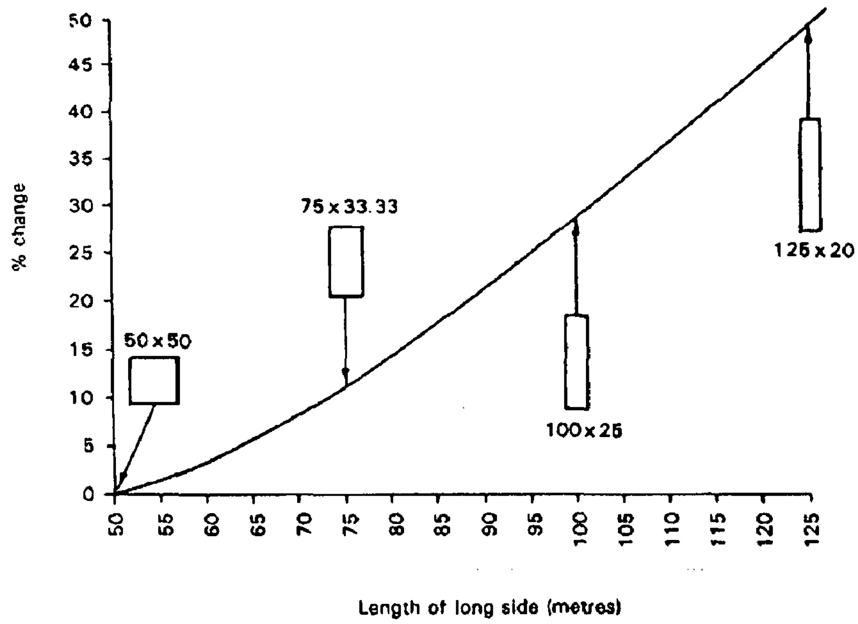


Figure 5.3 Increase in perimeter length with change in shape of a rectangular space of fixed area

- Circular shapes enclose an area with the least perimeter length followed by square then a rectangle and then modifications of these forms.

  ✓ But circular spaces pose some problems, particularly problems of internal planning, fixtures and fittings. In a circular space fitting standard furniture and bathroom units is hardly a possibility without wasting considerable space; even hanging pictures on the wall becomes a challenge.

- Square corners and straight walls have obvious advantages.

- In terms of perimeter costs alone, square spaces should be cheaper than rectangular ones.

- As a rectangle becomes longer and thinner the percentage increase in perimeter is quite rapid.

- Furthermore it is likely that more window area will be required in the longer walls and the provision of windows can cost up to three times that of equivalent area of the wall material.

- This of course represents the capital costs only. There is also a clear relationship between wall length on one hand and long term running and maintenance costs on the other. For example, the heat losses and gains will increase, as will the costs of cleaning and cladding and painting.

- In case of the ceiling, the length of the wall angles, the number of supports, the length of the channels would all increase with the increase in perimeter length of the ceiling.

- It has been observed that generally there is an increase in the circulation space as the layout of the fit-out becomes more rectilinear than square.

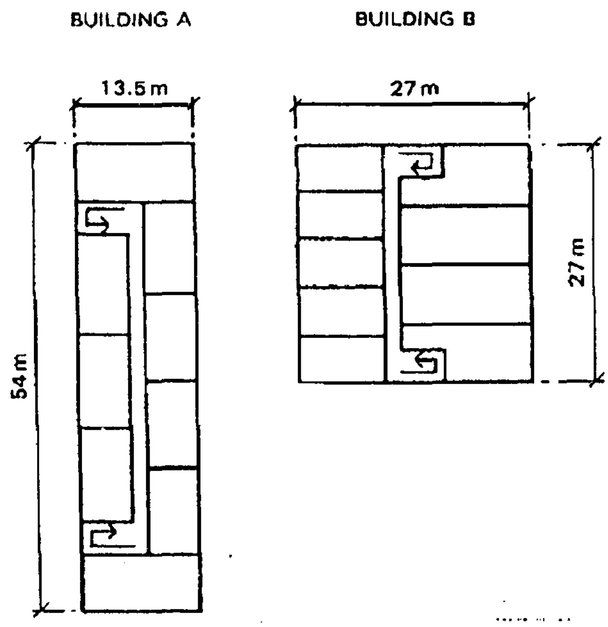


Figure 5.4 Long, narrow (rectangular) versus short wide layout (square)

5.5 ENERGY AND SERVICES

The costs of the equipment needed to provide heating, lighting, ventilation, water and power supply are today a very significant part of total initial costs of a building; in the case of highly serviced buildings such as the IT building, they can amount to almost half the total costs of the project.

Furthermore, the energy needed to ensure a comfortable environment for the building's occupiers and to enable a building's functions to be carried out effectively is to account for a high proportion of a building's total running costs.

The long-term costs of using a heating system will certainly outweigh its initial costs. Perhaps more than for any other element, it is necessary to consider the costs of building services in life-cycle terms it we are to make any realistic assessment of the relative benefits of different systems.

5.5.1 Energy use: Objectives

The primary objective which designers and those responsible for the management of building are continually being exhorted to achieve is to minimize the use of energy in buildings.

But, setting such an objective raises a number of questions.

- Is the minimum possible use of energy in buildings an overriding priority?
- How does that aim relate to other aspects of building economically?

- How is it compatible with the need for comfort and efficiency?

- What are the priorities and whose priorities are they?

- Is it more important — and more cost-effective — to save some forms of energy than others?

Owners and users of buildings are interested in being warm and comfortable; in being able to operate machinery efficiently, in having adequate lighting and hot water.
But, they are also interested in costs.
It is expecting too much of human nature to imagine that people are going to make major financial sacrifices to reduce global warming or global pollution. If they are-responsible for paying the bills and are therefore keenly interested in the cost of energy to them. Here again there are many different issues involved. Often the interests of owners and users might conflict or at least reflect different priorities.

The critical questions are

- Whether the measures taken to save energy can actually be afforded and financed? and

- Whether they can be shown to be economically worth while **for those incurring the costs.**

5.5.2 Comparing costs and Benefits:

The conditions under which an energy-saving features of design is economically worth while for an individual building owner can be set out very simply. On the one hand there are the extra costs involved in providing features which save energy and on the other are the savings resulting from the lower energy use and other benefits such as increased comfort.

It might be helpful for the following discussion to set the conditions out in the form of a very simple equation (or rather an inequality),

where C = the costs of energy saving measures and B = the benefits derived from it.

An energy-saving measure is worth while, then, if

$C < B$ (C is less than B)

But C consists of:

- The capital costs of the measure (for example the cost of insulation, or a more efficient boiler);
- The costs of maintenance;
- The costs of replacement;
- Any associated costs (e.g. loss of rentable space, increased cost of energy management).

B consists of:

- The saving in the costs of fuel;
- Increased levels of comfort;
- Other benefits (e.g. lower levels of sickness in offices, fewer tenant complaints in rented homes)

Some benefits may not be measurable at all:

- The increased comfort of the user of the Fit-Out
- The increase in work efficiency which might result
- The better use of the space possible
- The reduction in sickness

Applying the basic principle of Present Value to the energy-saving measures means redefining C and B above as follows:

C — the cost of the improvement plus the discounted future costs of maintenance and repair

B — the discounted value of the future, savings in fuel, and any other quantifiable benefits (i.e. their net present value).

The expenditure is still, as before, worth while if B is greater than C. The non-quantifiable benefits simply have to be considered as a separate but highly relevant issue. For example if on the basis of this sort of net present value calculation, a heating system appears to be only barely worthwhile but it is expected to increase the level of comfort considerably, then this could sway the decision in favour of making the expenditure.

5.6 PASSIVE PATHS TO ENERGY SAVINGS:

Passive methods of control is the use of the building's form and materials to provide optimum comfort with a minimum use of fossil-manufactured fuels such as coal, electricity, gas and oil.

The methods can be classified as:

- High levels of insulation;

- Reduction of unwanted air flows - in or out.

- Use of the building's thermal capacity to retain or absorb heat and thus provide warmth or cooling as required

- Use of glazing, shutters, shades etc., to optimize the balance between heat loss and heat gain, adequate natural light and glare

- Use of the Fit-Out's **orientation** to optimize heat and light conditions for the occupants.

- In effect most of the environmental control is provided without using expensive fuels, the sources of heat, light and cooling are free - simply the sun and fresh air.

But, there are always costs to be incurred in harnessing or disposing of energy.

'There is no such thing as a free lunch'

Much of the actual material needed to improve energy efficiency by passive design methods will almost certainly involve cost over and above what would be incurred in a conventional Fit-Out, such as:

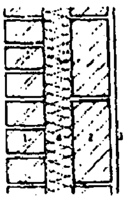
- Extra insulation
- The use of denser materials
- Double and triple glazing
- Extra shutters
- Blinds and canopies

Whether there will be in fact tangible benefits depends on the costs of the insulation or other passive technique adopted and the consequent savings in energy costs.

To take first, the cost of the insulation itself. There are two basic ways of ensuring low levels of heat loss: first, the building envelope itself may he made or partly made of material with low U values - such as lightweight concrete blocks, various cladding materials; secondly, special insulating material can be added, internally, externally or in cavity walls. There is a wide range of such materials and, on economic grounds alone, the best choice will be the one with the lowest installed cost for its insulation value.

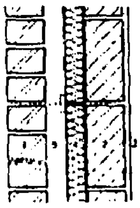
Cost of insulation. *Source: Architects Journal*, Focus, Jan. 1994.

FULL CAVITY FILL



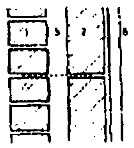
outer leaf	cavity	blockwork inner leaf	inner finish	U-value W/m²K	£/m²
Clay facing bricks (1700kg/m³) £275/1000	70mm blown fibre	125mm dense, (1950kg/m³)	13mm lightweight plaster with bonding undercoat	0.45	52.70
ditto	50mm blown fibre	100mm aerated, (650kg/m³)	13mm lightweight plaster	0.44	49.45
ditto	65mm mineral fibre slabs	140mm dense, (1950kg/m³)	13mm lightweight plaster with bonding undercoat	0.44	57.00
ditto	50mm mineral fibre slabs	100mm aerated, (650kg/m³)	13mm lightweight plaster	0.40	52.30
ditto	65mm mineral fibre slabs	100mm lightweight aggregate, (1100kg/m³)	ditto	0.40	53.90
ditto	50mm mineral fibre slabs	125mm aerated, (650kg/m³)	ditto	0.38	54.55
ditto	ditto	100mm aerated, (480kg/m³)	ditto	0.36	52.80

PARTIAL CAVITY FILL



outer leaf	cavity	blockwork inner leaf	inner finish	U-value W/m²K	£/m²
ditto	40mm extruded polystyrene foam 25mm clear cavity	100mm dense, (1950kg/m³)	13mm lightweight plaster with bonding undercoat	0.45	57.15
ditto	30mm foil-faced rigid urethane foam insulation board 50mm clear cavity	100mm medium density, (1350kg/m³)	ditto	0.44	51.05
ditto	40mm mineral fibre slab, 25mm clear cavity	100mm aerated (650kg/m³)	13mm lightweight plaster	0.42	[illegible]
ditto	30mm extruded polystyrene foam, 25mm clear cavity	ditto	ditto	0.42	[illegible]
ditto	30mm foil-faced rigid urethane foam board, 50mm clear cavity	140mm medium density, (1350kg/m³)	13mm lightweight plaster with bonding undercoat	0.42	[illegible]
ditto	25mm foil-faced rigid urethane foam board, 50mm clear cavity	100mm aerated, (650kg/m³)	13mm lightweight plaster	0.41	[illegible]
ditto	30mm foil-faced rigid urethane foam board, 50mm clear cavity	ditto	ditto	0.37	[illegible]
ditto	50mm expanded polystyrene board (standard duty), t&g edges 50mm clear cavity	100mm aerated, (480kg/m³)	ditto	0.36	53.10

INTERNAL INSULATION



outer leaf	cavity	blockwork inner leaf	inner finish	U-value W/m²K	£/m²
ditto	clear	100mm medium density, (1350kg/m³)	39.5mm plasterboard laminate (30mm urethane board bonded to 9.5mm plasterboard)	0.43	[illegible]
ditto	clear	125mm aerated, (650kg/m³)	29.5mm plasterboard laminate (20mm urethane board bonded to 9.5mm plasterboard)	0.42	[illegible]
ditto	clear	140mm medium density, (1350kg/m³)	39.5mm plasterboard laminate (see 1 above)	0.41	[illegible]
ditto	clear	100mm aerated, (480kg/m³)	29.5mm plasterboard laminate (see 2 above)	0.40	[illegible]
ditto	clear	ditto	ditto	0.38	[illegible]

Key
1 facing brick
2 block inner leaf
3 plaster
4 cavity insulation
5 unfilled cavity
6 insulating plasterboard

Figure 5.5 Cost of Insulation, Source Architects Journal 1994

- Passive design not only accounts for lower life cycle fuel costs but also on the size and type of the mechanical systems to be installed.

5.7 ACTIVE CONTROL OF THE ENVIRONMENT: THE INPUT OF ENERGY

Energy input is necessary in most circumstances, for powering equipment obviously but also for some environmental control purposes.

There are therefore again economic choices to be made, taking into consideration the costs and benefits.

Two main types of decisions are to be taken, one on the type of energy source to be used and another on equipment required to deliver the energy usefully

Fuel costs. For some uses there are no serious alternatives; electricity is essential for lighting, the running of machinery and electronic equipment. There are of course still questions as to how electricity can be most economically used for those purposes. For other uses, and particularly space conditioning which absorbs most energy used in buildings, there are alternatives - oil, gas, solid fuel and electricity.

All these fuels are processed in one way or another before finally delivering energy as heat into the space of a building and their costs depend on the efficiency and cost of those conversion processes.

It is possible to measure or estimate those 'costs' in different ways.

One way which is relevant to the economics of a system for the building users is simply to use the market price of the fuel and calculate how much heat is delivered per Rupee.

CASE STUDY

Case study: Mars Tele, an IT office Space in I-Labs, Madhapur, Hyderabad.

Total carpet Area: **1300 Sqm**

Lease Term: **10 Yrs**

Total Cost of the Project: **Rs 1,35,68,540**

Life Cycle Cost Analysis:

Factors Considered:

- Discounting factor taken: 11% p.a.
- Warranty Period
- Defect Liability Period
- Replacement costs
- Taxes & Duties as applicable on construction materials
- Discounts
- Payment schedules

Tables used: NPV table

Present Values of $1 Due at the End of n Periods:

$$PVIF_{k,n} = \frac{1}{(1+k)^n} = \left[\frac{1}{(1+k)}\right]^n$$

Period (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%
1	.9901	.9804	.9709	.9615	9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696
2	.9803	.9612	.9426	.9246	.9070	8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	6830	6355	.5921	.5718
5	9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972
6	9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323
7	9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759
8	.9235	8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269
9	.9143	.8368	7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843
10	9053	.8203	7441	6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472

Total cost of the project (as built)/Initial costs	=	**Rs 1,35,68,540**
Total Life cycle costs of the building	=	**Rs 6,78,69,598**
Total Initial costs of the alternatives suggested by LCC Analysis	=	**RS 1,57,94,780**
Total LCC Cost of the Alternatives Suggested by LCC Analysis	=	**Rs 6,31,29,650**

An additional expenditure of Rs 22,26,240 in the initial costs would have saved the client an amount worth 47,39,948 on the total life cycle costs of the fit-out.

Exclusions:

- Energy consumptions and costs
- Loans taken by the client and the repayment schedule
- Cost of capital for the client
- Overheads and contingencies as applicable to the client
- Contract and Agreements between the clients and the contractors.

Designer.WEB

New Designer Web Pvt. Ltd.

5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel: 5550 3413, 2323 3351 Fax: 040-2321 0366

APGST: ABS/06/01/4010/02-03 CST : ABS/06/01/3077/02-03

19-Dec.-2005

COMPARITIVE FOR AIR CONDITIONING FOR MARS TELECOM

H				VOLTAS		LG		HITACHI		BLUESTAR		CARRIER	
S.no	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT
1	8.5 TR Nominal capacity aircooled Ductable split units	Nos	8	105,000	840,000	124,000	992,000	125,000	1,000,000	129,500	1,036,000	125,125	1,001,000
2	2 TR High wall mounted cordless split Airconditioners	Nos	4	30,000	120,000	26,000	104,000	29,500	118,000	29,000	116,000	30,000	120,000
3	1.5 TR High wall mounted cordless split Airconditioners	Nos	3	27,000	81,000	22,000	66,000	25,500	76,500	24,500	73,500	26,000	78,000
4	Copper refrigerant piping												
A	**Hard drawn piping**												
	21.9 mm dia	Rmt	100	420	42,000	425	42,500	390	39,000	290	29,000	340	34,000
	15.6 mm dia	Rmt	100	310	31,000	330	33,000	240	24,000	220	22,000	180	18,000
B	**Soft drawn piping**												
a	51.6 mm dia	Rmt	50	200	10,000	330	16,500	150	7,500	170	8,500	180	9,000
	9.5 mmdia	Rmt	50	175	8,750	150	7,500	120	6,000	130	6,500	110	5,500
5	GSS Ducting	Sqmt											
a	22 G	Sqmt	150	450	67,500	425	63,750	410	61,500	415	62,250	475	71,250
b	24 G	Sqmt	360	350	126,000	395	142,200	360	129,600	390	140,400	390	140,400
6	Acoustic lining with 12.5 mm crown	Sqmt	100	425	42,500	390	39,000	380	38,000	390	39,000	380	38,000
7	Powder coated extruded aluminum supply / Return air grill / Diffusers	Sqmt	40	4,500	180,000	3,500	140,000	5,000	200,000	425	17,000	4,200	168,000
8	MS Powder coated Collar dampers		8	1,100	8,800	1,500	12,000	1,500	12,000	1,600	12,800	1,500	12,000
9	Condensate drain pipe												
a	32 mm dia	Rmt	50	100	5,000	140	7,000	300	15,000	35	1,750	60	3,000
b	25 mm dia	Rmt	50	90	4,500	90	4,500	200	10,000	30	1,500	25	1,250
10	Power and control cabling												
a	3C x 2.5 sqmm	Rmt	200	125	25,000	120	24,000	45	9,000	130	26,000	42	8,400
b	3C x 1.5 sqmm	Rmt	400	100	40,000	90	36,000	35	14,000	100	40,000	30	12,000
11	Thermal insulation for ducts	Sqmt	150	250	37,500	200	30,000	260	39,000	225	33,750	210	31,500
12	Fire dampers with fusible link	Sqmt	3	2,500	7,500	3,750	11,250	2,500	7,500	4,750	14,250	4,000	12,000
13	GI Volume control dampers	Sqmt	3	2,000	6,000	1,000	3,000	2,600	7,800	2,600	7,800	3,000	9,000
14	Black draft dampers	Sqmt	2	2,500	5,000	1,000	2,000	2,200	4,400	2,650	5,300	3,000	6,000
15	Fresh air package	Nos	8	1,000	8,000	750	6,000	1,500	12,000	1,300	10,400	860	6,880
16	GI Earthing with 8 SWG GI wire	Lot		3,000	3,000	2,000	2,000	500	500	1,300	1,300	680	680
17	Condenser supports and civil works	Lot		10,000	10,000	5,000	5,000	20,000	20,000	19,500	19,500	5,000	5,000

18	Under deck insulation	Sqm	1100	250	275,000	330	363,000	270	297,000	265	291,500	280	308,000
	TOTAL				1,984,050		2,152,200		2,148,300		2,016,000		2,098,860
					L1		L5		L4		L2		L3

				VOLTAS		LG		HITACHI		BLUE STAR		CARRIER	
S.no	Description of Item	Unit	Qty	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount
D	**Air-Conditioning** Including machines and ancillary works with provision for 24/7 AC in switch and UPS room	TR	85		1,984,050		2,152,200		2148300		2,016,000		2,098,860
E	**Internal Electricals** *Including light point wiring,* UPS wiring, Circuits,Distribution Boards, Switches and sockets, cables and conduits.	Sft	11700										

	Initial Costs	LCC	Contractor
Contracted awarded to	1,98,050	4,32,684	Voltas
Lowest on Lcc	2,09,860	3,93,658	Carrier
difference in costs	(11,810)	39,026	

Designer.WEB

New Designer Web Pvt. Ltd.

5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel 5550 3413, 2323 3351 Fax 040-2

APGST: ABS/06/01/4010/02-03 CST : ABS/06/01/3077/02-03

19-Dec.-2005

Com[paritive of Chairs for Mars-Telecom

				VISHAL		GARNIER		FEATHERLITE	
S.no	Description of item	Unit	Qty	Rate	Amount	Rate	Amount	Rate	Amount
C	Chairs			$1 = 46 Rs					
1	**Office Chairs** - Medium back,Moulded Foam, Revolving Base, Synchro tilting, Height adjustment and armrests.	Nos.	194	3036	588,984	3100	601,400	4788	923,872
2	**Board Room Chairs** - Medium back in net,Moulded Foam, Revolving Base, Synchro tilting, Height adjustment and armrests, leather finish	Nos.	31	3128	96,968	3200	99,200	3855	119,505
3	**Meeting Room Chairs** - Low back,Moulded Foam, Revolving Base, Height adjustment and armrests. Compact version of office chair.	Nos.	32	2760	88,320	2400	76,800	4788	153,216
	TOTAL				774,272		777,400		1,201,593
	cst @ 12.5%						97,175		Including
	VAT @ 12.5%								
	Grand total				774,272		874,575		1,201,593

The contract awarded has both lowest Initial cost ans LCC

COMPARITIVE FOR FALSE CEILING FOR M/S MARS TELECOM

New Designer Web Pvt. Ltd.
5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel: 5550 3413, 2323 3351 Fax: 040-2321 0366

	LIGHT FIXTURES			(Srinivasa Enterprises) THORN		GE LIGHTING		(Jyothi Electricals) WIPRO		(Shrey Electro sales) PHILIPS		PIERLITE	
S.no	Description of Item	Unit	Qty	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount
1	1X36W FTL Tube(For Cove)	Nos.	40	260.00	10400.00	200.00	8000.00	209.00	8360.00	335.00	13400.00	367.00	14680.00
2	2x18W CFL Downlighter	Nos.	165	865.00	142725.00	830.00	136950.00	784.00	129360.00	724.00	119460.00	870.00	143550.00
4	2X36W CFL(2'X2'Direct/Indirect)	Nos.	160	2595.00	415200.00	2195.00	351200.00	2337.00	373920.00	2100.00	336000.00	1581.00	252960.00
	TOTAL				568325.00		496150.00		511640.00		468860.00		411190.00
	Taxes 12.5%				71040.63		62018.75		63955.00		58607.50		51398.75
	GRAND TOTAL				639365.63		558168.75		575595.00		527467.50		462588.75
					H-2		L-3		H-1		L-2		L-1
	Payment			100% advance		30 % advance		25% advance					
	Delivery			2 to 3 weeks		3 weeks		2 to 3 weeks					
	Validity					30 days		15 days					

BILL OF QUANTITES

MARS TELECOM, I-Labs, Madhapur, hyderabad

SCHEDULE FOR ELECTRICAL WORKS

DESCRIPTION

1 INTERNAL ELECTRIFICATION.
2 UPS WIRING FROM ABOVE FALSE CEILING
3

RACE WAYS WITH JUNCTION BOXES FOR VOICE AND DATA CABLES.

4 INSTALLATION FOR FIXTURES.
5 EXTERNAL MAINS SUPPLY .
6 EXTERNAL DEDICATED EARTHING FOR UPS .
7 COMPLETE INSTALLATION COMMISSIONING.
8 CO-ORDINATION WITH ALL WORKING AGENCIES AT SITE.

TOTAL

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Listen Lights		IES		NASEER		VRVS		CONSULT ESTIMATE	
				Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount		
1	Supply,Laying,Wiring,Technical commissioning of primary light point with 3runs of 1.5Sq.mm 650V grade ISI marked FR.PVC insulated copper multistrand conductor wires to be laid in 25mm dia Heavy gauge PVC conduits along with PVC accessories concealed in walls /columns/false ceiling,under floor including supply and fixing of 6A modular switches,in GI modular boxes,3 plate ceilingrose batton holder ,angular holder,connectors and interconnection complete as required at site.												
		40	Pts	575	23000			422	16880	[illegible]50	22000	610	24400
2	Supply and wiring generally same as item No:1 above but without control switch as this light point is required to be looped from primary light points.Maximum no of looped points will be 4 complete as required and per detailed instructions at site.												
		160	Pts	300	48000			190	30400	225	36000	250	40000
3	Supply and fixing of flush type modular 6A ,5PIN combined switch socket outlets in the lighting control switch boards including interconnection complete as required at site.												
		46	Nos	250	11500			250	11500	250	11500	275	12650
4	Supply fixing Testing and commissioning of 16A/6A Universal modular type Sockets Outlets including Suly and fixinf of 1no 16A/6A ,5PIN modular type combine switch socket fixing in GI modular boxes of suitable size used for general power.	86	Nos	335	28810			363	31218	450	38700	500	43000
5	Supply fixing testing and commissioning of 6A,5PIN combined switch socket outlets in the modular type GI boxes the switch socket shall be of different colour Black/Grey .	86	Nos	280	24080			277	23822	405	34830	450	38700
6	Supply wiring with the following size 650 V,grade FR.PVC,insulated multistrand copper conductor wires conforming to IS in suitable size of heavy gauge PVC conduits with accessories in concealed, in wall / ceiling ,under floor ,along with copper earth wire of specified size computer from outgoing position to incoming position as required at site.												
	a)3 Core of 2.5 Sq.mm Copper un armoured cable in existing conduits (RAW POWER)	1200	Rmtrs	53	63600			65	78000	76	91200	85	102000
	b)3 Core of 4 Sq.mm Copper un armoured cable in existing conduits for 6/16A,sockets.	800	Rmtrs	77	61600			92	73600	107	85600	120	88000
	c)3 Core of 6 Sq.mm Copper un armoured cable in existing conduits for AC Units.	600	Rmtrs	117	70200			135	81000	168.5	101100	186	111000
7	Supply , installation, Testing and Commissioning of Double Door TPN MCB Distribution boards rated to 415V Three phase application including of ELCB MCB as per specifications and capacity Neutral bar and earth terminal complete as required and to be installed in flush with wall above 5'5" FFL bottom of board including all fixing materials required.All MCB's shall be 'C' curve conform to IS specifications and ELCB/RCCB shall conform to IS : 12640 specifications.												

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount		
	a) 8WAY,TPN MCB DB with 63A,4P,ELCB 100mA,MCB as incomer and 4A to 10A,SP,MCB 24nos as outgoers for LDB.	2	Nos	7676	15352			8684	17368	8350	16700	9200	18400
	b) 8WAY,TPN MCB DB with 63A Isolator as incomer and 10A to 16A,SP,MCB 24nos as outgoers for RDB.	2	Nos	5725	11450			6441	12882	6650	13300	7350	14700
	c) 8WAY,SPN MCB DB with 32A DP MCB as incomer and 8nos 6A /10A SP,MCB as outgoers for EMERGENCY LDB.	2	Nos	2375	4750			2569	5138	2800	5600	3100	6200
	d) 8WAY,TPN MCB DB with 63A Isolator as incomer and 16A SP,MCB 24nos as outgoers for UPS DB	2	Nos	5725	11450			6441	12882	6650	13300	7350	14700
	e) 63A /40A TPN MCB DB with MCB and enclosure.	10	sets	1350	13500			1712	17120	1490	14900	1650	16500
	f) 20A / 32A D MCB, DB with MCB and encloser	16	Nos	625	10000			723	11568	660	10560	730	11680
8	UPS WIRING												
8.1	Supply and fixing of 4 Nos of flush type 6A 5Pin combined switch socket out lets in the modular type GI boxes including 1 no 16A switch and front plates including inter connections (4 NO 6A socket shall 2 of Round pin and 2 of Flat pin) complete as required at site.	220	sets	720	158400			932	205040	980	215600	1100	242000
8.2	Supply and fixing of 1 No of flush type 16A 5Pin combined switch socket out lets in the modular type GI modular boxes including 16A 5pin socket , 16A switch, front plate including inter connections as required at site under false flooring in labs and otherareas.	60	sets	335	20100			363	21780	500	30000	550	33000
8.3	Supply and fixing of 1 way 20/32A metal clad socket with 20/32A SP . MCB in MS box including all fixing accessories complete as required.	10	Nos	800	8000			985	9850	875	8750	985	9850
8.4	Supply and laying of 1.6mm thick Aluminum OR powder coated GI 14 SWG floor Race ways of the following sizes in the floors including providing of clamps and accessories complete as required for voice and data.												
	a)150 mm x44mm Box section as Raceway.	60	mtrs	352	21120			426	25560	420	25200	465	27900
	b)100mmx44mm Box section as Raceway	50	mtrs	280	14000			280	14000	255	12750	280	14000
	c)80mmx40mm Box section as Raceway	115	mtrs	236	27140			274	31510	22[illegible]	23300	245	28175
	d)50mmx25mm Box section as Raceway	100	mtrs	153	15300			176	17600	160	16000	180	18000
	d)25mmx25mm Box section as Raceway	50	mtrs	110	5500			137	6850	110	5500	125	6250
8.5	Supply and fixing of Junction boxes for Raceways made out of 2mm thick MS sheet powder coated as cr required to be fixed under floor.The Junction box shall be provided with removable type 3mm thick powder coated cover as per Site conditions if required to fix the available vertified tiles sope shall be included.				0								
	a) 450x450x50mm Junction box	4	Nos	950	3800			1014	4056	55[illegible]	2200	605	2420
	b)300x300x50mm Junction box	15	Nos	510	7650			509	7635	35[illegible]	5250	385	5775
	c)125x125x50mm Junction box	60	Nos	165	9900			296	17760	20[illegible]	12000	220	13200
8.6	Supply wiring with the following size 650 V,grade FR,PVC,insulated multistrand copper conductor wires conforming to IS in suitable size of heavy guage PVC conduits with accessories in concealed, in wall / ceiling ,under floor ,along with copper earth wire of specified size computer from outgoing position to incoming position as required at site.												
	a)3 Core of 2.5 Sq.mm Copper un armoured cable through existing Race way / conduits (above false ceiling)	800	mtrs	53	42400			65	52000	56	44800	62	49600
	a)3 Core of 4Sq.mm Copper un armoured cable through existing conduits /Raceways.	600	mtrs	77	46200			92	55200	82	49200	91	54600
8.7	Supply and laying of the following size MS conduits including conduits accessories												
	a)25mm - Rate only per metr		mtrs	75				77	0	[illegible]4		48	
	b)32mm - Rate only per metr		mtrs	110				117	0	[illegible]8		66	
8.8	Supply and laying of following size 1.1KV grade PVC sheathed ,unarmoured Copper Conductor Cable to be used for Neutral and Phase of UPS as required at site.												

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount		
	b) 1 Core x16 Sqmm copper unarmoured cable	QRO		84				96		94		106	
	c) 1 Core 25 Sqmm copper unarmoured cable	QRO		133				155		155		171	
9	Supply, providing plate earth station with 600x 600mmx3.15mm thick Copper plate including construction of C.C. Chamber with 50mm GI pipe 3.0 metre long and safe earthing compound of any approved make and measured earthing shall be less than One Ohms complete as per requirements. Asholon OR Errico	2	sets	6800	13600			17738	35476	6500	13000	7160	14300
10	Supply , providing of enfaticatitions earth stations copper stripe of Size 25x4mm copper a length of 600mm with 10 nos 8mm tapped holes and 8mm brace screws with washers to be fixed on Smc Dmc insulators as shown and directed by site inchange in all labs electrical rooms etc. Approvals clints / consultants shall be taken before fixed to the systems.	4	Nos	950	3800			633	2532	300	1200	330	1320
11	Supply, laying,termination of wire strips wires as earthing conductros for the system.												
	a)25 x 6mm GI strip	45	Rmtrs	70	3150			86	3870	110	4950	121	5445
	b)8 SWG copper wire	50	Rmtrs	44	2200			54	2700	38	1900	42	2100
	c)14 SWG copper wire	50	Rmtrs	26	1300			41	2050	32	1600	38	1800
12	Design, fabricate , installation, Testing and commising of 3phase 415Volts ,4wire Free standing floor mounting MV Panel made out of 14/16 SWG CRCA sheet steel with powder coating including all bellow mentioned switchgears.The panel shall consisting of given rated busbar for TPN supported with DMC / SMC support barriers and colour coad sleeves.The metering shall be provided as specified.The ancl shall have a short circuit withstand capacity of minimum 50KA.The panel shall be got fabricated from manufacturers with CPRI Test Certificate only.All the panels shall have atleast Two spare cubicals.	1	Set	215000	215000			174986	174986	225000	225000	248000	248000
	Incoming												
	a) 400A 4P MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltagemeter (Enercon)- 1 set.												
	(c) 0-400A Digital Amperemeter with CTS- 1Set.												
	(d) Digital KWH meter (Enercon)-1set.												
	Busbars :												
	phase 1 Run x 60 mm x 10 mm												
	Neutral 1 Run x 60 mm x 10 mm												
	3 mm colour sleeve												
	Outgoings:												
	a.) 100A 3P MCCB -1No.												
	b.) 125A 3P MCCB -2Nos with KWH meters.												
	c.) 160A 4P SFU-1No.												
	d.) 63A 3P MCCB-2Nos												
	e.) 63A 4P MCCB-2Nos												
	f.) 63A 3P MCB-3Nos												
	g.)32A 3P MCB -3Nos												
	c)14 SWG copper wire												
13	Design, fabricate , installation, Testing and commising of UPS Distribution panel,floor / mounting made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears.The panel shall consisting of given rated busbar only. The panel shall be got fabricated from manufactures with CPRI Test Certificate only.	1	Set	43200	43200			30709	30709	38000	38000	41800	41000
	Incoming												
	a) 100A 3P MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltagemeter (Enercon)- 1 set.												
	(c) 0-100A Digital Amperemeter with CTS- 1Set.												
	Busbars :												
	phase 1 Run x 30 mm x 5 mm Cu. Bus.												
	Neutral 1 Run x 30 mm x 5 mm cu bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A 3P MCB -5Nos.												
	b.) 32A 3P MCB -1No												
	NOTE: Throught Neutral bus shall be 2times of phase bus bar.												
14	Design, fabricate , installation, Testing and commising of Automatic Power Factor Improvement panels,floor / wall mounted made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears.The panel shall consisting of given rated busbar only. The panel shall be got fabricated from manufactures with CPRI Test Certificate only.	1	set					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount		
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltagemeter (Enercon)- 1 set.												
	(c) 0-160A Digital Amperemeter with CTS- 1Set.												
	(d) Digital Frequency meter (Enercon)-1set.												
	(e) 4Stage Auto PF Relay -1set.												
	Busbars :												
	phase 1 Run x 50 mm x 5 mm AL. Bus.												
	Neutral 1 Run x 50 mm x 5 mm AL.bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A,TPN, SFU -4Nos												
	b.) 25KVAR power capacitor 3phase -1No fixed.												
	h.) 20KVAR power capacitor 3phase -3Nos on relay with suitable contactors.												
	d) ON/OFF Indication on all feeders of Cap bank.												
	e) START/STOP Push buttons for Cap.bank												
15	Design, fabricate , installation, Testing and commissioning of 3PHASE ,415V,4Wire,wall mounted AC Distribution panel made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears	2	sets	49000	98000			32956	65912	40000	80000	44000	88000
	Incoming												
	a) 125A,3P,MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltagemeter (Enercon)- 1 set.												
	(c) 0-125A Digital Amperemeter with CTS- 1Set.												
	Busbars :												
	phase 1 Run x 30 mm x 5 mm Cu. Bus.												
	Neutral 1 Run x 50 mm x 5 mm cu.bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A,3P,MCB -4Nos.												
	b.) 32A,3P,MCB -2Nos												
	c) 20A ,3P,MCB-2Nos												
16	Labour for fixing of given light fitting in false ceiling using connectors ,PVC flexible fasteners complete as required at site.												
	a) 4x18W Mirror optic fittings	160	nos	125	20000			100	16000	120	19200	132	21120
	b) 1x18 W Down light -	112	nos	75	8400			67	7504	80	8960	88	9856
	c) Cove lights-rope/strips	48	mtrs	55	2640			56	2688	10	480	11	528
	d) Scalcors	36	nos	55	1980			67	2412	80	2880	88	3168
	e) Picture lights / Dichroic spot lights.	10	nos	50	500			67	670	60	600	88	880
17	Supply, laying, Testing and commissioning of following size 1.1kv grade, PVC insulated PVC sheathed steel strip/wire armoured aluminium conductor for use of under ground cable , above ground with the help for saddles, clits, complete from ground panel room to 9th floor electrical room for incoming for cutting trays . At floor Panel above falseceiling using GI rodil bars and saddles . All the cables shall conform to IS 1554/ PART 1 with latest amendments.												
	a) 3.5 core x 150 sqmm AL(2RUNS)included	160	Rmts	590	94400			595	95200	607	97120	670	107200
	b) 3.5 core x 95 sqmm AL (capacitor panel)	15	Rmts	412	6180			422	6330	410	6150	450	6750
	c) 4 core x 16 sqmm copper(PDB)	20	Rmts	389	7780			394	7880	392	7840	440	8800
	d) 4 core x 10 sqmm copper(LDB)	20	Rmts	285	5700			291	5820	280	5600	410	8200
	e) 4 core x 6 sqmm copper (AC UNITS)	200	Rmts	199	39800			202	40400	200	40000	220	44000
	a) 3.5 core x 150 sqmm (2RUNS)included	20	Rmts	590	11800			595	11900	607	12140	670	13400
18	Supply and fixing of the following Eletrical Room accessories at site.				0								
	a) Supply and laying of Rubber mats of size 1000mmx 200mm x 12mm thick	2	Nos.	1350	2700			2093	4186	1100	2200	1250	2500
	b) supply and fixing of CO2 fire Extinguisher 4.5 kg capacitity fixed on wall	2	Nos.	5300	10600			8464	16928	2500	5000	2750	5500
	c) Supply and fixing of shock treatment and first Aid laminated chart in hindi, English and local language	1	Nos.	650	650			671	671	250	250	275	275
	e) laminated coloured SLD	1	Nos.	350	350			734	734	250	250	275	275
	f) 440 volts Danger Notice boards	4	Nos.	65	260			354	1416	65	260	70	280
19	Supply and fixing of the following size GI perforated cable trays made out of 2mm thick MS sheet and the tray covered with 2mm thick cover including MS Supports for fixinf the tray anchor fasteners etc as required.												
	a) 450mm x50mm	QRO	RMT	870				1121		800		880	
	b) 300mm x50mm	QRO	RMT	700				936		600		660	
	c) 150mm x50mm	QRO	RMT	510				626		400		440	
20	If the Tenderer feel to submit additional requirement any use the deviation form provided in this document.												
	TOTAL RS												
	DISCOUNT IF ANY												
	TOTAL AMOUNT				1490792				1559685		1597420		1763257

COMPARITIVE FOR INTERIOR WORKS FOR M/S MARS TELECOM

New Designer Web Pvt. Ltd.						
5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel: 5550 3413, 2323 3351 Fax: 040-2321 0366						
	WEST WING		Shapoorji Pallonji & Co. Ltd.	Kwality Interiors	Brig Interiors	Spandrel
S.no	Description of item	Unit	Amount	Amount	Amount	Amount
	CRITICAL ITEMS					
1	Partitions	Sft.	114547.5	113512.5	109687.5	98100
2	Glass	Sft.	242257.5	142256.25	152212.5	119475
3	Paneling on partition framework	Sft.	118766.25	106065	86670	107775
4	Paneling on wall	Sft.	82417.5	81562.5	74250	79200
5	Skirting	Rft.	59535	80325	56700	70875
6	False Flooring	Sft.	64766.25	74812.5	61987.5	68400
7	Painting	Sft.	74475	61875	91125	47925
8	Door frames	Nos.	67128.75	23085		42525
9	Doors	Nos.	397530	254790	319950	247500
10	Vertical Blinds	Sft.	22612.5	21937.5	20250	15188
	TOTAL		**1244036.25**	**960221.25**	**972832.5**	**896963**
	discount 7.5%			72016.59375		
	GRAND TOTAL		**1244036.25**	**888204.6563**	**972832.5**	**896963**
	NON-CRITICAL ITEMS					
1	Loose Furniture	Nos.	431715.15	380783.25	558483.75	383832
2	Pinup boards	Sft.	31680	35550		28125
3	Miscelleneous items	Nos.	18190.8	22500		36000
4	White Boards	Sft.	38925	16313		30937
	TOTAL		**520510.95**	**455146.25**	**558483.75**	**478894**
5	On-site House keeping					
	discount 7.5%			34135.96875		
	GRAND TOTAL		**520510.95**	**421010.2813**	**558483.75**	**478894**
	Terms & Conditions					
a	Validity				1 month	
b	Payment			30% advance	20% advance	
c	Completion			7 weeks	60 days	
d	Taxes			Incl. of all Taxes	Incl. of all Taxes & Levies	

COMPARATIVE FOR FIRE ALARM SYSTEM FOR M/S MARS TELECOM

New Designer Web Pvt. Ltd.
5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel: 5550 3413, 2323 3351 Fax: 040-2321 0366

				TYCO		DATS		ZICOM		EUREKA FORBES		ADTECH SYSTEMS	
S.no	Description of item	Unit	Qty	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount
1	8 Zone Microprocessor Based Fire Alarm Control Panel	nos	1	30150	30150	17500	17500	16000	16000	16100	16100	20500	20500
2	Photo Electric Smoke Detectors	nos	74	1600	118400	1250	92500	1000	74000	1375	101750	1400	103600
3	Response Indicators	nos	49	100	4900	90	4410	80	3920	125	6125	105	5145
4	Manual call point	nos	5	850	4250	550	2750	500	2500	350	1750	500	2500
5	Hooters(Dixi)	nos	4	900	3600	600	2400	800	3200	700	2800	500	2000
	subTOTAL				161300		119560		99620		128525		133745
	Discounts									d=@10%	12852.5		
											115672.5		
	Work Contract Tax @4%				all inclusive		all inclusive						
	Sales Tax/ VAT @12.5%				all inclusive		all inclusive	0.125	12452.5			0.125	16718.125
	Supervision testing & commissioning charges								5000				5000
	Service Tax @ 10.2% on Supervision charges				30000		all inclusive	0.102	510		all inclusive	0.102	510
	GRAND TOTAL				191300		119560		117582.5		115672.5		155973.125
					H-1		L-3		L-2		L-1		H-2
	WIRING												
1	Suply and fixing 2x1.5 sqmm Armoured Cable with conduiet and all other accessories	Rmt	1200	80	96000	80	96000	55	66000	60	72000	73.13	87756
	Terms & Conditions												
a	Validity				60 days		?		80 Days				
b	Payment				25% advance, 50% at delivery, 15% at installation, 10% after commisioning		?		30% Advance, 60% At Delivery, 10% After Certification		50% Advance, 40% at Delivery, 10% after commissioning		40% Advance, 50% at Delivery, 10% after commissioning
c	Delivery				8 weeks		?		4-6 weeks		2-6 weeks		2-6 weeks
d	Completion				2 weeks		?						
e	Warrantee				6 months(date of supply)		?		12 Months After installation		18 Months From Dispatch or 12 Months after Commessioning		12months from date of invoice

BILL OF QUANTITIES

MARS TELECOM, I-Labs, Madhapur, Hyderabad

SCHEDULE FOR ELECTRICAL WORKS

DESCRIPTION
1 INTERNAL ELECTRIFICATION.
2 UPS WIRING FROM ABOVE FALSE CEILING
3 RACE WAYS WITH JUNCTION BOXES FOR VOICE AND DATA CABLES
4 INSTALLATION FOR FIXTURES.
5 EXTERNAL MAINS SUPPLY .
6 EXTERNAL DEDICATED EARTHING FOR UPS .
7 COMPLETE INSTALLATION COMMISSIONING.
8 CO-ORDINATION WITH ALL WORKING AGENCIES AT SITE.

TOTAL

				Listen Lights		IES		NASEER		VRVS		CONSULT. ESTIMATE	
S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	RATE	Amount
I	Supply,Laying, Wiring,Technical commissioning of primary light point with 3runs of 1.5Sq.mm 650V grade ISI marked FR,PVC insulated copper multistrand conductor wires to be laid in 25mm dia Heavy gauge PVC conduits along with PVC accessories concealed in walls /columns/false ceiling, under floor including supply and fixing of 6A modular switches, in GI modular boxes,3 plate ceilingrose batten holder ,angular holder, connectors and interconnection complete as required at site.												
		40	Pts	575	23000	950	38000	422	16880	550	22000	610	24400
2	Supply and wiring generally same as item No:1 above but without control switch as this light point is required to be looped from primary light points. Maximum no of looped points will be 4 complete as required and per detailed instructions at site.												
		160	Pts	300	48000	200	32000	190	30400	225	36000	250	40000
3	Supply and fixing of flush type modular 6A ,5PIN combined switch socket outlets in the lighting control switch boards including interconnection complete as required at site.												
		46	Nos	250	11500	247	11362	250	11500	250	11500	275	12650
4	Supply fixing Testing and commissioning of 16A/6A Universal modular type Sockets Outlets including Supply and fixing of 1no 16A/6A ,5PIN modular type combine switch socket fixing in GI modular boxes of suitable size used for general power.	86	Nos	335	28810	380	32680	363	31218	450	38700	500	43000
5	Supply fixing testing and commissioning of 6A,5PIN combined switch socket outlets in the modular type GI boxes the switch socket shall be of different colour Black/Grey .	86	Nos	280	24080	282	24252	277	23822	405	34830	450	38700
6	Supply wiring with the following size 650 V, grade FR, PVC, insulated multistrand copper conductor wires conforming to IS in suitable size of heavy gauge PVC conduits with accessories in concealed, in wall / ceiling ,under floor ,along with copper earth wire of specified size complete from outgoing position to incoming position as required at site.												
	a)3 Core of 2.5 Sq.mm Copper un armoured cable in existing conduits (RAW POWER)	1200	Rmts	53	63600	53	63600	65	78000	76	91200	85	102000
	b)3 Core of 4 Sq.mm Copper un armoured cable in existing conduits for 6/16A sockets.	800	Rmts	77	61600	76	60800	92	73600	107	85600	120	88000
	c)3 Core of 6 Sq.mm Copper un armoured cable in existing conduits for AC Units.	600	Rmts	117	70200	114	68400	135	81000	168.5	101100	185	111000
7	Supply , installation, Testing and Commissioning of Double Door TPN MCB Distribution boards rated to 415V Three phase application including of ELCB MCB as per specifications and capacity Neutral bar and earth terminal complete as required and to be installed in flush with wall above 5'5" FFL bottom of board including all fixing materials required. All MCB's shall be 'C' curve conform to IS specifications and ELCB/RCCB shall conform to IS : 12640 specifications.												

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	RATE	Amount
	a) 8WAY,TPN MCB DB with 63A,4P,ELCB 100mA,MCB as incomer and 4A to 10A,SP,MCB 24nos as out goers for LDB.	2	Nos	7676	15352	7933	15866	8684	17368	8350	16700	9200	18400
	b) 8WAY,TPN MCB DB with 63A Isolator as incomer and 10A to 16A,SP,MCB 24nos as out goers for RDB.	2	Nos	5725	11450	5013	10026	6441	12882	6650	13300	7360	14700
	c) 8WAY,SPN MCB DB with 32A DP MCB as incomer and 8nos 6A 10A SP,MCB as out goers for EMERGENCY LDB.	2	Nos	2375	4750	2450	4900	2569	5138	2800	5600	3100	8200
	d) 8WAY,TPN MCB DB with 63A Isolator as incomer and 16A SP,MCB 24nos as out goers for UPS DB.	2	Nos	5725	11450	6013	12026	6441	12882	6650	13300	7360	14700
	e) 63A /40A TPN MCB DB with MCB and enclosure.	10	sets	1350	13500	1515	15150	1712	17120	1490	14900	1850	18500
	f) 20A 32A D MCB. DB with MCB and enclosure	16	Nos	625	10000	743	11888	723	11568	660	10560	730	11680
8	UPS WIRING												
8.1	Supply and fixing of 4 Nos of flush type 6A 5Pin combined switch socket out lets in the modular type GI boxes including 1 no 16A switch and front plates including inter connections (4 NO 6A socket shall 2 of Round pin and 2 of Flat pin) complete as required at site.	220	sets	720	158400	810	178200	932	205040	980	215600	1100	242000
8.2	Supply and fixing of 1 No of flush type 16A 5Pin combined switch socket out lets in the modular type GI modular boxes including 16A 5pin socket , 16A switch, front plate including inter connections as required at site under false flooring in labs and other areas.	60	sets	335	20100	380	22800	363	21780	500	30000	550	33000
8.3	Supply and fixing of 1 way 20/32A metal clad socket with 20/32A SP , MCB in MS box including all fixing accessories complete as required.	10	Nos	800	8000	910	9100	985	9850	875	8750	985	9850
8.4	Supply and laying of 1.6mm thick Aluminum OR powder coated GI 14 SWG floor Race ways of the following sizes in the floors including providing of clamps and accessories complete as required for voice and data.												
	a)150 mm x44mm Box section as Raceway.	0	mtrs	352	0	445	0	426	0	420	0	465	0
	b)100mmx44mm Box section as Raceway	50	mtrs	280	14000	280	14000	280	14000	255	12750	280	14000
	c)80mmx40mm Box section as Raceway	115	mtrs	236	27140	220	25300	274	31510	220	25300	245	28175
	d)50mmx25mm Box section as Raceway	100	mtrs	153	15300	135	13500	176	17600	160	16000	180	18000
	d)25mmx25mm Box section as Raceway	50	mtrs	110	5500	110	5500	137	6850	110	5500	125	6250
8.5	Supply and fixing of Junction boxes for Raceways made out of 2mm thick MS sheet powder coated as required to be fixed under floor. The Junction box shall be provided with removable type 3mm thick powder coated cover as per Site conditions if required to fix the available vitrified tiles slope shall be included.												
	a) 450x450x50mm Junction box	4	Nos	950	3800	920	3680	1014	4056	550	2200	605	2420
	b)300x300x50mm Junction box	15	Nos	510	7650	509	7635	509	7635	350	5250	385	5775
	c)125x125x50mm Junction box	60	Nos	165	9900	175	10500	296	17760	200	12000	220	13200
8.6	Supply wiring with the following size 650 V, grade FR, PVC, insulated multistrand copper conductor wires conforming to IS in suitable size of heavy gauge PVC conduits with accessories in concealed, in wall / ceiling ,under floor ,along with copper earth wire of specified size computer from outgoing position to incoming position as required at site.												
	a)3 Core of 2.5 Sq.mm Copper un armoured cable through existing Race way / conduits (above false ceiling)	800	mtrs	53	42400	53	42400	65	52000	56	44800	62	49600
	a)3 Core of 4Sq.mm Copper un armoured cable through existing conduits /Raceways.	600	mtrs	77	46200	76	45600	92	55200	82	49200	91	54600
8.7	Supply and laying of the following size MS conduits including conduit accessories												
	a)25mm -	50	mtrs	75	3750	82	4100	77	3850	44	2200	[illegible]	4900
	b)32mm -	20	mtrs	110	2200	[illegible]	2300	117	2340	60	1200	[illegible]	3300
8.8	Supply and laying of following size 1.1KV grade PVC sheathed ,unarmoured Copper Conductor Cable to be used for Neutral and Phase of UPS as required at site.												
	a) 1 Core x10 Sq.mm copper unarmoured cable (Quote Rate Only)	50											

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	RATE	Amount
	c) 1 Core 25 Sq.mm copper unarmoured cable	50	mtrs	133	6650	133	6650	155	7750	155	7750	171	8840
9	Supply, providing plate earth station with 600x 600mmx3.15mm thick Copper plate including construction of C.C. Chamber with 50mm GI pipe 3.0 meter long and safe EARTHING compound of any approved make and measured EARTHING shall be less than One Ohm complete as per requirements. Ashoka OR Errico	2	sets	6800	13600	13500	27000	17738	35476	6500	13000	7150	14300
10	Supply , providing of sophistications earth stations copper stripe of Size 25x4mm copper a length of 600mm with 10 nos 6mm tapped holes and 8mm brace screws with washers to be fixed on Smc Dmc insulators as shown and directed by site incharge in all labs electrical rooms etc.Approvals clients / consultants shall be taken before fixed to the systems	4	Nos	950	3800	700	2800	633	2532	300	1200	330	1320
11	Supply, laying, termination of size strips wires as EARTHING conductors for the system.												
	a)25 x 6mm GI strips	45	Rmtrs	70	3150	125	5625	86	3870	110	4950	121	5445
	b)8 SWG copper wire	50	Rmtrs	44	2200	36	1800	54	2700	38	1900	42	2100
	c)14 SWG copper wire	50	Rmtrs	26	1300	22	1100	41	2050	32	1600	36	1800
12	Design, fabricate , installation, Testing and commissioning of 3phase 415Volts ,4wire Free standing floor mounting MV Panel made out of 14/16 SWG CRCA sheet steel with powder coating including all bellow mentioned switchgears. The panel shall consisting of given rated bus bar for TPN supported with DMC / SMC support barriers and colour coad sleeves. The metering shall be provided as specified. The ancl shall have a short circuit withstand capacity of minimum 50KA.The panel shall be got fabricated from manufactures with CPRI Test Certificate only. All the panels shall have at least Two spare cubical.	1	Set	215000	215000	169200	169200	174986	174986	225000	225000	248000	248000
	Incoming												
	a) 400A,4P,MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltage meter (Enercon)- 1 set.												
	(c) 0-400A Digital Amperemeter with CTS- 1Set.												
	(d) Digital KWH meter (Enercon)-1set.												
	Bus bars :												
	phase 1 Run x 60 mm x 10 mm												
	Neutral 1 Run x 60 mm x 10 mm												
	3 mm colour sleeve												
	Outgoings:												
	a.) 100A,3P,MCCB -1No.												
	b.) 125A,3P,MCCB -2Nos with KWH meters.												
	c.) 160A,4P,SFU-1No.												
	d.) 63A,3P,MCCB-2Nos												
	e.) 63A,4P,MCCB-2Nos												
	f.) 63A,3P,MCB-3Nos												
	g.)32A,3P,MCB -3Nos												
	c)14 SWG copper wire												
13	Design, fabricate , installation, Testing and commission of UPS Distribution panel, floor / mounting made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears. The panel shall consisting of given rated bus bar only. The panel shall be got fabricated from manufactures with CPRI Test Certificate only.	2	Set	43200	86400	32886	65772	30709	61418	38000	76000	41000	82000
	Incoming												
	a) 100A,3P,MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltage meter (Enercon)- 1 set.												
	(c) 0-100A Digital Amperemeter with CTS- 1Set.												
	Bus bars :												
	phase 1 Run x 30 mm x 5 mm.Cu. Bus.												
	Neutral 1 Run x 50 mm x 5 mm.cu.bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A,3P,MCB -5Nos.												
	b.) 32A,3P,MCB -1No												
	NOTE: Thought Neutral bus shall be 2mm of phase bus bar.												
14	Design, fabricate , installation, Testing and commission of Automatic Power Factor Improvement panels, floor / wall mounted made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears. The panel shall consisting of given rated bus bar only. The panel shall be got fabricated from manufactures with CPRI Test Certificate only.	1	set	120000	120000	129151	129151	128492	128492	75000	75000	82500	82500
	Incoming												
	a) 160A,TPN,SFU -1No												
	Metering Unit:												

S.No.	DESCRIPTION OF ITEMS	Qty	Unit	Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount	RATE	Amount
	(e) 4Stage Auto PF Relay -1set.												
	Bus bars :												
	phase 1 Run x 50 mm x 5 mm. AL. Bus.												
	Neutral 1 Run x 50 mm x 5 mm. AL.bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A,TPN, SFU -4Nos.												
	b.) 25KVAR power capacitor 3phase -1No fixed.												
	b.) 20KVAR power capacitor 3phase -3Nos on relay with suitable contactors.												
	d) ON/OFF Indication on all feeders of Cap. bank.												
	e) START/STOP Push buttons for Cap. bank												
15	Design, fabricate, installation, Testing and commissioning of 3PHASE ,415V,4Wire,wall mounted AC Distribution panel made out of good quality 14/16 SWG CRCA sheet steel with enclosure with powder coating including all bellow mentioned switchgears	2	sets	49000	98000	37520	75040	32956	65912	40000	80000	44000	88000
	Incoming												
	a) 125A,3P,MCCB -1No												
	Metering Unit:												
	(a) indicating lamp LED type with fuse - 1 set												
	(b) 0-500V Digital Voltage meter (Enercon)- 1 set.												
	(c) 0-125A Digital Ampermeter with CTS- 1Set.												
	Bus bars :												
	phase 1 Run x 30 mm x 5 mm.Cu. Bus.												
	Neutral 1 Run x 50 mm x 5 mm.cu.bus.												
	3 mm colour sleeve												
	Outgoings:												
	a.) 63A,3P,MCB -4Nos.												
	b.) 32A,3P,MCB -2Nos												
	c) 20A ,3P,MCB-2Nos												
16	Labour for fixing of given light fitting in false ceiling using connectors ,PVC flexible fasteners complete as required at site.												
	a) 4x18W Mirror optic. fittings-	160	nos	125	20000	125	20000	100	16000	120	19200	132	21120
	b) 1x18 W Down light -	112	nos	75	8400	60	6720	67	7504	80	8960	88	9856
	c) Cove lights-rope/strips-	48	mtrs	55	2640	40	1920	56	2688	10	480	11	528
	d) Speakers	36	nos	55	1980	75	2700	67	2412	80	2880	88	3168
	e) Picture lights / Dichroit spot lights.	10	nos	50	500	75	750	67	670	60	600	86	860
17	Supply, laying, Testing and commissioning of following size 1.1kv grade, PVC insulted PVC sheathed steel strip/wire armoured aluminum conductor for use of under ground cable , above ground with the help for saddles, clits, complete from ground panel room to 9th floor electrical room for incoming for existing trays . At floor Panel above false ceiling using GI solid base and saddles . All the cables shall conform to IS 1554/ PART 1 with latest amendments.												
	a) 3.5 core x 150 Sq.mm AL(2RUNS)included	0	Rmts	590	0	575	0	595	0	607	0	670	0
	b) 3.5 core x 95 Sq.mm AL (capacitor panel)	15	Rmts	412	6180	436	6540	422	6330	410	6150	450	6750
	c) 4 core x 16 Sq.mm copper(PDB)	20	Rmts	389	7780	363	7260	394	7880	392	7840	430	8600
	d) 4 core x 10 Sq.mm copper(LDB)	20	Rmts	285	5700	271	5420	291	5820	280	5600	310	6200
	e) 4 core x 6 Sq.mm copper (AC UNITS)	200	Rmts	199	39800	196	39200	202	40400	200	40000	220	44000
	a) 3.5 core x 150 Sq.mm (2RUNS)included	0	Rmts	590	0	575	0	595	0	607	0	670	0
18	Supply and fixing of the following Electrical Room accessories at room.												
	a) Supply and laying of Rubber mats of size 1000mmx 200mm x 12mm thick	2	Nos.	1350	2700	1475	2950	2093	4186	1100	2200	1250	2500
	b) supply and fixing of CO2 fire Extinguisher 4.5 kg capacity fixed on wall	2	Nos.	5300	10600	6900	13800	8464	16928	2500	5000	2750	5500
	c) Supply and fixing of shock treatment and first Aid laminated chart in Hindi, English and local language	1	Nos.	650	650	275	275	671	671	250	250	275	275
	e) laminated coloured SLD	1	Nos.	350	350	900	900	734	734	250	250	275	275
	f) 440 volts Danger Notice boards	4	Nos.	65	260	65	260	354	1416	65	260	65	260
19	Supply and fixing of the following size GI perforated cable trays made out of 2mm thick MS sheet and the tray covered with 2mm thick cover including MS Supports for fixing the tray anchor fasteners etc as required.												
	a) 450mm x50mm	10	RMT	870	8700	800	8000	1121	11210	800	8000	880	8800
	b) 300mm x50mm	10	RMT	700	7000	600	6000	936	9360	600	6000	680	6800
	c) 150mm x50mm	10	RMT	510	5100	400	4000	626	6260	400	4000	440	4400
20	If the Tenderer feel to submit additional requirement may use the deviation form provided in this document.												
	TOTAL RS												
	DISCOUNT IF ANY			7.50%		3%		2%		3%			
	TOTAL AMOUNT				1446972		1403578		1506504		1537560		1707777
	TOTAL AFTER DISCOUNT				1338449.1		1361470.66		1476373.92		1491433.2		

COMPARITIVE FOR FALSE CEILING FOR M/S MARS TELECOM

New Designer Web Pvt. Ltd.

5-9-22/4, Adarsh Nagar, Hyderabad 500 063 Tel: 5550 3413, 2323 3351 Fax: 040-2321 0366

Total carpet area: **1,300 Sqm**

Lease Term: **10 yrs**

	FALSE CEILING			Kwality (Armstrong)			Rivera(Diken)			Rangoli(Nittobo)	
S.no	Description of item	Unit	Qty	Rate	Amount	Warranty/ Defect Liability period in yrs	Rate	Amount	Warranty/ Defect Liability period in yrs	Rate	Amount
1	**15 mm Mineral board -2' X 2' Grid** with 24mm grid,with 'J' Bolt including all necessary cutting of lights,louvers etc. Fine fissured Tegular,Equivalent RH-99	Sft	7200	46	331,200	10	43.5	313,200	10	45	324,000
2	**GYPSUM Ceiling** : Plain and Designer: with India Gypsum Board of 12.5mm thick,IGL Channels,IGL Jointing powder. With lappam and 2 coats of Plastic emulsion	Sft	5900	46	271,400	2	46	271,400	1	43	253,700
	TOTAL				602,600			584,600			577,700
	Taxes			Incl.of Taxes			Incl.of Taxes			WCT 4% extra	
	4% Tax										23108
	GRAND TOTAL				602,600			584,600			600,808

CHAPTER 6

RELATING DESIGN CHOICES TO FIT-OUT AND ITS MANAGEMENT

Chapter – 6 RELATING DESIGN CHOICES TO FIT-OUT AND ITS MANAGEMENT

6.1 PROGRAMME, CASH FLOW AND BUILDABILITY

- One extremely significant aspect of the link between design and cost is the influence of design on the actual process of production.
- The drawings produced by the design team are essentially descriptions of the final product itself- the Fit-Out.
- Even the 'working drawings' of details are of representations of what will be there when the assembly is finished.
- Design drawings themselves do not indicate the procedures by which the building is to be built - the process.
- It is the architect's job to show what is to be built.
- It is the builder's job to work out how to build it.
- However if the divide between the two is too great the consequences may well be serious - and costly.

A design which is developed without sufficient consideration for the construction process may simply pose the builder with unnecessary problems; the builder may well be able to cope with the problem, but at a cost.
This is often referred to as the problem of buildabilty.

- It includes the failure of designers occasionally to appreciate fully the complexities of managing a building programme, particularly a large one;

- And it includes lack of appreciation by builders in some circumstances of what the designer's intentions are and of why particular design decisions have been made.

- It can indeed happen that the architect has designed or specified an element which is unnecessarily difficult or expensive to construct or produced a design which makes it very difficult for labour and plant to be used efficiently.

- It may on the other hand be that the builder has failed to understand the design requirements and created inefficiencies unnecessarily.

- Both do occur and both can often be avoided through more effective communication and understanding.

One should concentrate on three aspects of the construction programme

1. The construction programme

2. the problems of overall programming

3. The problems of organizing specific resources and the problem of maintaining positive cash flow.

6.1.1 The construction programme

Every project needs a programme, a plan identifying the resources, time and cost implications of the project.

However a plan alone is insufficient; there has to be a project control mechanism to review how well the project is progressing and allow managers to judge whether the original plan is still realistic or not, and what adjustments are necessary.

Almost inevitably the plan will need correcting, probably for one of three main reasons:

1. Changes due to alterations or omissions in the design;

2. Changes in the contractor's available resources, unavailability of plant etc.

3. Problems created by external factor such as bad weather and the unavailability of materials.

There are many techniques used and advocated for planning and controlling construction effectively, they range from

- Setting out on paper the sequences of operations and their probable time spans

- Complex computer-based systems such as PERT and Superproject

- Simple bar charts

- Complex network analysis.

These techniques have been developed to help builders to organize the flow of construction work so as to complete the job in the optimum time and to deploy the various resources most effectively.

Whatever the techniques used, the aims are the same and require four sets of decisions to be made:

1. Identification of the various activities needed to carry out the project

2. Determination of the sequence of activities

3. Determination of the duration of each activity

4. Allocation of resources to each activity

6.1.2 Identifying the activities

The content and scope of activities depends very much on the size and complexity of the project.

An activity is work that can be carried out by one gang without interruption by another: the carrying out of work of one kind requiring certain resources and time.

Examples of activities include:

- A/C Duct Work
- Fixing Cable Distribution Trays
- Installing Sprinkler System
- Electrical Wiring
- Light points

- False Ceiling Grid Work
- Laying False Ceiling Tiles

6.1.3 The sequence of activities

To decide on the sequence of the activities defined. In a simple project the sequence will be very obvious and straightforward.

For example

The sequence of the ones described above would be

Activity A Activity B Activity C.

In complex projects there will be many activities and probably a number or options for their sequence.

It is also likely that some activities can be carried out simultaneously (in parallel) rather than one after the other (sequentially).

6.1.4 Duration of activities and the critical path

Having identified the activities and their relationship the next stage is to work out the duration of each.

This is normally identified in weeks and days, often with probabilities attached showing

- Most likely
- Optimistic and
- Pessimistic time scales

Critical path

- Once the durations and sequences have been assigned, it is possible to determine the 'critical path' which is defined as the longest route through the project.
- This is 'critical' because if any activity on that path is delayed, the whole project will be delayed
- It is the longest path but it represents the shortest time in which the project can be completed.

6.1.5 Allocating the resources

In allocating resources to each activity, certain conditions will have to met:

- First check to see that there are no 'upper limit violations' of each resource. i.e, if there are 25 men on their labour force and 30 are required, according to a proposed programme on a particular day, then the duration assigned to that activity cannot be satisfied.

- Secondly resource utilization should be as smooth as possible: a programme which required 5 labourers on Monday, 25 on Tuesday and 15 on Wednesday would be highly inefficient.

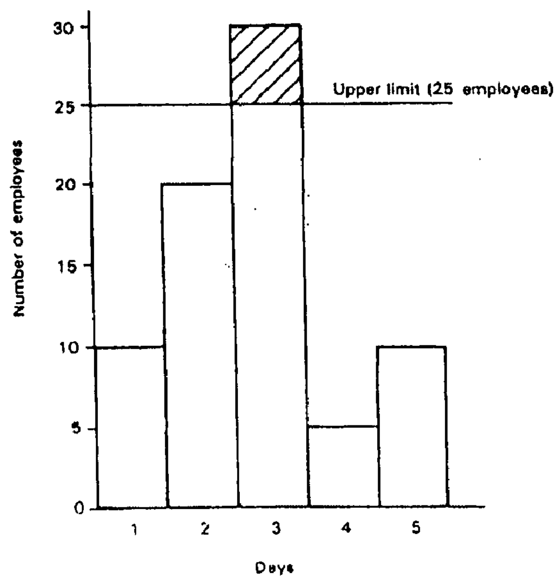


Figure 6.1 Upper Limit Violation

6.2 PROGRAMMING TECHNIQUES

6.2.1 Bar or Gantt charts

- A comprehensive and detailed program for the complete project of the facility is fundamental to the successful and timely completion of the Project

- Bar or Gantt Charts are used to carry out this planning process and are easy to understand.

- They show clearly the tasks or activities to be performed; when each task can be performed and how long each takes.

Generally these charts are classified under four heads depending on the level of detail the programme is planned.

- **Level 1 Program**

An overall strategic program on one sheet showing the major elements of work and the overall direction of the project.

- **Level 2 Program**

A further expansion of the above program and would include such things as letting the main contacts for the Works.

- **Level 3 program**

This would comprise several programs and would include the working programs for all of the main elements of the work i.e., procurement, construction & commissioning.

- **Level 4 Program**

These would comprise the manufacturing, construction and installation programs and would be generated by participating contractors.

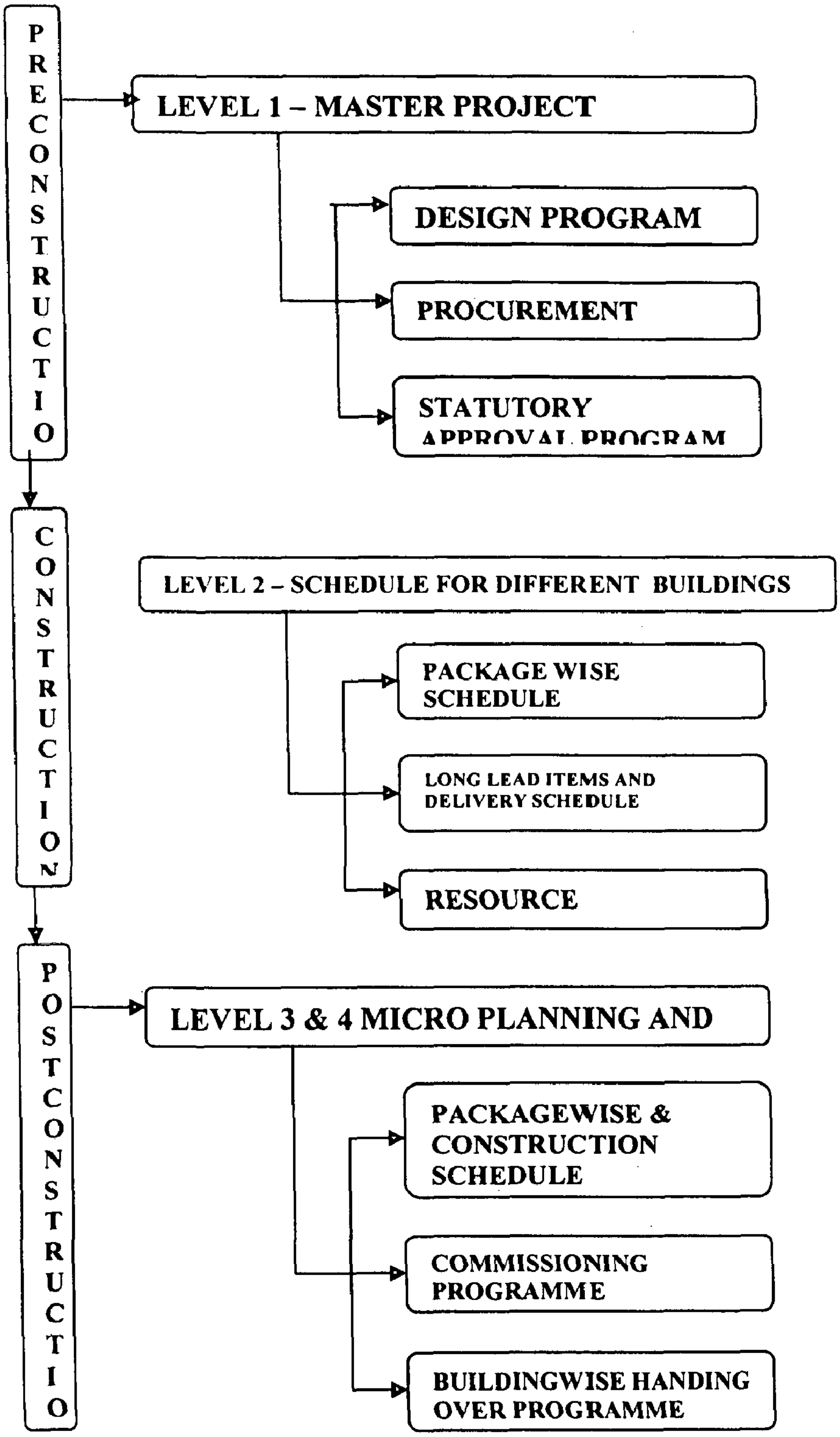


Figure 6.2 Levels of construction programmes

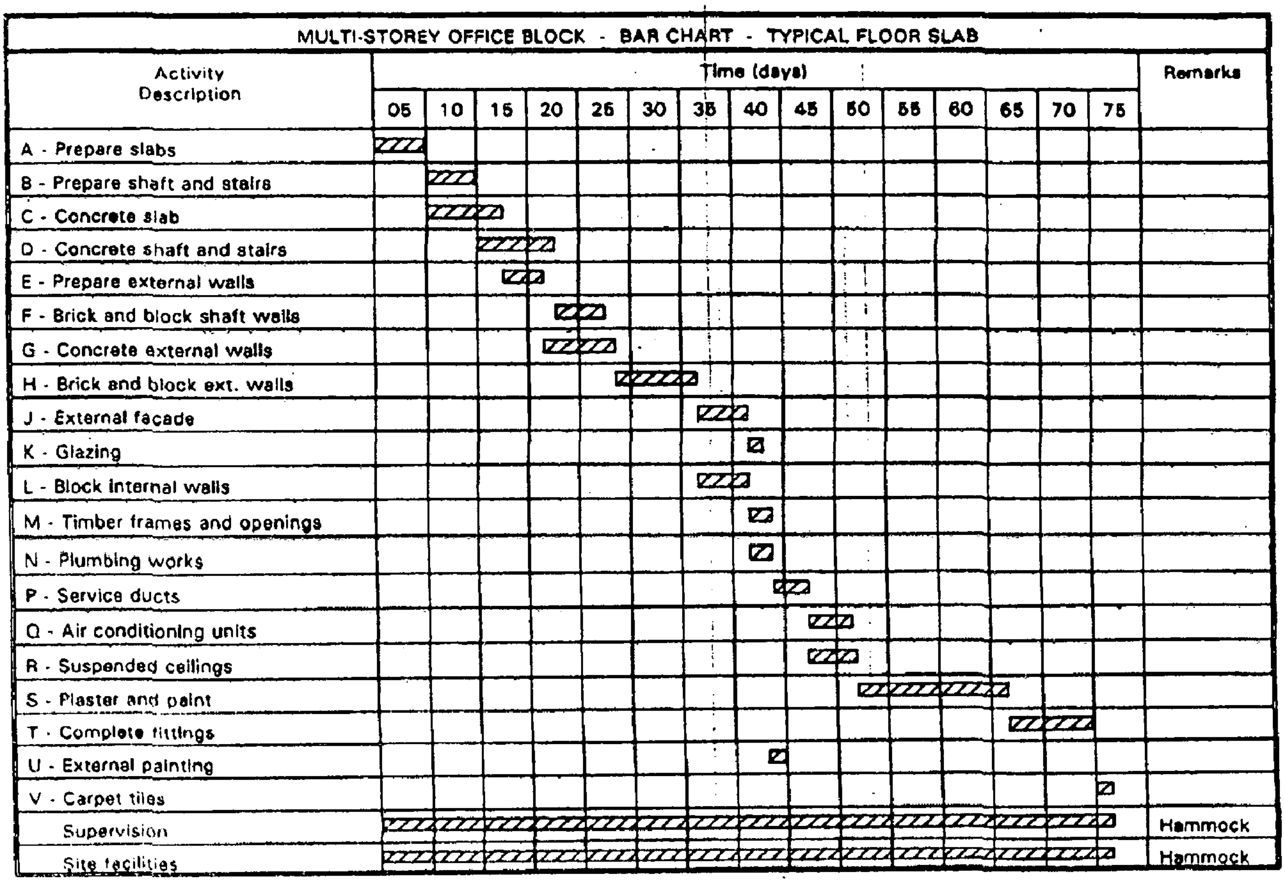
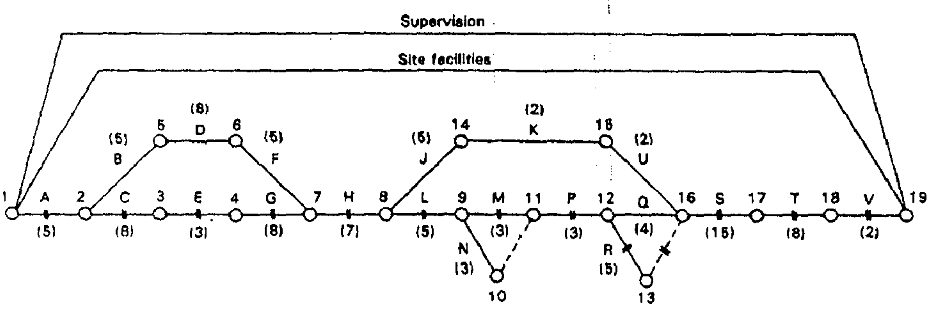


Figure 6.3 Example of a Bar chart

6.2.2 Network Analysis

- Network analysis is a generic term for a number of techniques such as precedence diagrams and critical path analysis, which show lime relationships between activities.

- The key to using critical path methods is the preparation of a network diagram where each line or arrow shows the activities to be performed and their relationship with each other, expressed by the linking nodes or circles.



Note: 20 activities — critical path 72 days

ACTIVITY	DURATION (days)	ACTIVITY	DURATION (days)
A - Prepare slab	5	L - Internal walls	5
B - Prepare shaft and stairs	5	M - Timber frames and openings	3
C - Concrete slab	8	N - Plumbing works	3
D - Concrete shaft and stairs	8	P - Service ducts	3
E - Prepare external walls	3	Q - Air-conditioning units	4
F - Brick and block shaft	5	R - False ceilings	5
G - Concrete external walls	8	S - Plaster and paint	15
H - Brick and block ext. walls	7	T - Complete fittings	8
J - External facade	5	U - External painting	2
K - Glazing	2	V - Carpet tiles	2

Key:
- Critical path
- Logic (2)
- Activity with duration (days) (5)
- Dummy

NB:
1 - A dummy is added to prove the logic
2 - Float on activity Q = 1 day
3 - Float on activities J, K, and L = 7 days
4 - Hammock activities required for 72 days (supervision and site facilities)

Figure 6.4 Network diagram: construction of concrete floor slab

6.3 ORGANIZING THE MATERIALS

The materials, components and pre-assembled parts of the Fit-Out have to be acquired, delivered to site, possibly stored, formed or mixed and then incorporated appropriately into the building.

- All the materials could simply not be acquired at the beginning and used when needed the whole construction project.

- There is simply not room on many sites to store the materials required

- Some materials will deteriorate if left exposed to the weather.

- All materials are vulnerable to theft and vandalism,

- There is a financing problem.

Therefore, materials cannot be simply acquired at the beginning and stored, their purchase and delivery has to be matched with the Fit-Out's building progress.

- For some materials this may not be a problem, for others there may be varying, 'lead times', i.e, periods required between order and delivery.

- For specially designed components the lead times may be very long.

- Further materials may not be easily or cheaply available at all in the form that the designers request.

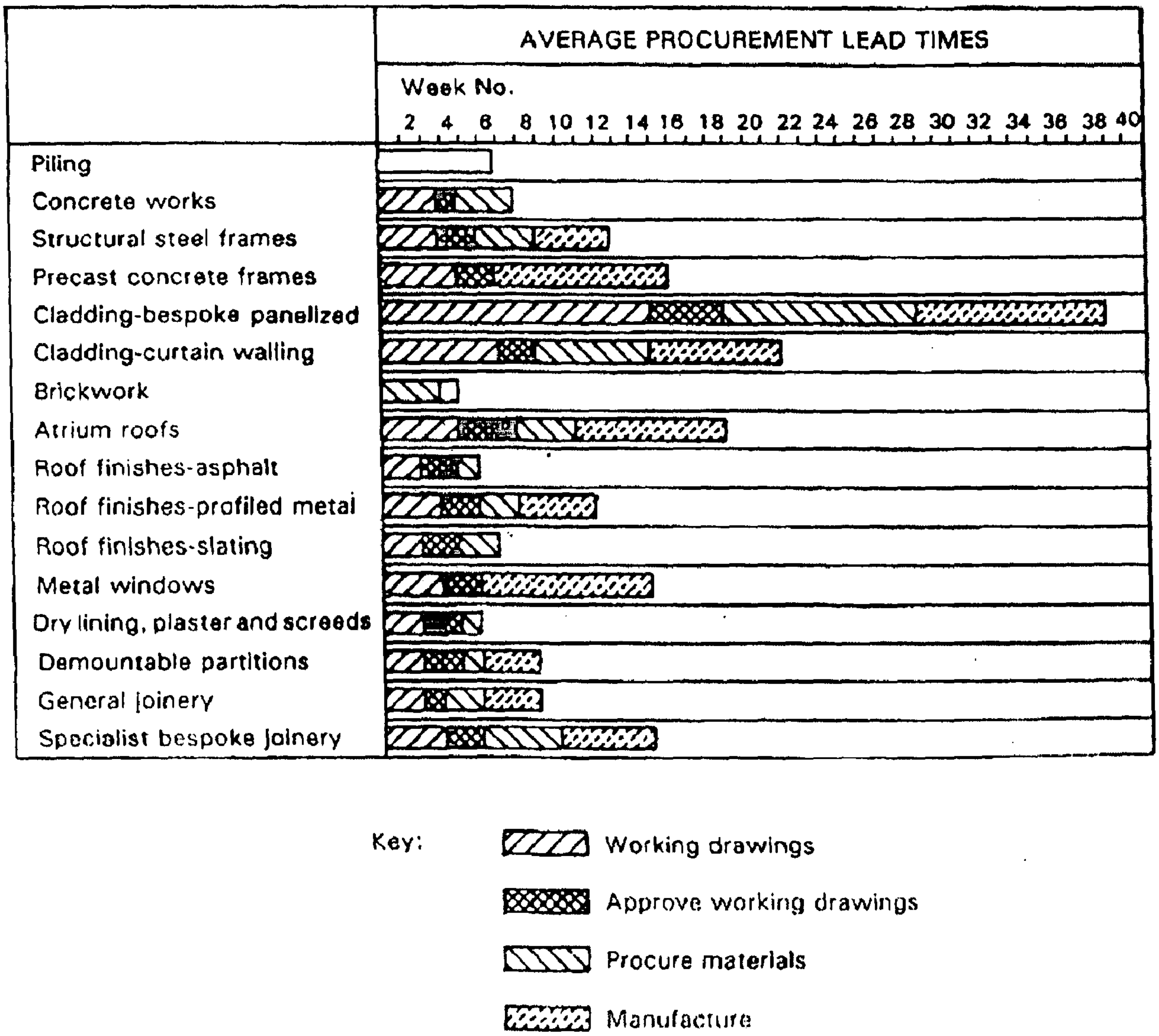


Figure 6.5 An Example of a chart showing the Lead times of various materials

6.4 CASH FLOW

So far, the argument has been that one source of unnecessary cost, the mismatch between the design's requirements and the actual possible deployment of men, machines and materials, can be reduced if these issues are considered at the design stage.

But, there is another aspect of the contractor's programme that the architect and quantity surveyor need to appreciate, if only to understand that a contractor's hostile response to requests for changes may not simply be the result of cussedness, but the consequence of the fact that often they can seriously affect his or her cash position, even if in the end he or she will be fully compensated.

Contractors are usually paid on the basis of monthly certification of the value of work completed or after one item of work is completed. They themselves however are incurring expenditure continually.

Contracting firms, particularly the smaller and medium-sized, which are the majority, generally do not have substantial cash reserves, or working capital. They are seldom in a position to finance a great deal of work from their own resources until they receive payment from the building owner or client.

They have instead frequently to rely on some form of credit, loans, overdrafts, credit from builders' merchants and materials suppliers. It they are continually spending more than they are receiving, that is their cash flow is negative, they will be incurring interest charges on top of the actual cost of paying for materials, labour and plant.

And if they are forced into deep and continuous debt, the survival of the business can soon be threatened; more contractors fail through high levels of current debt than through inability to achieve a profit.

'Cash-flow' can be defined as the net difference between the construction expenditure and income relating to the project at any point in time during the construction.

The build-up of costs incurred by a contractor during a project can be represented by a simple graph (expenditure against time) such as those shown in Figure 6.6a. The curve is shown as S-shaped because the value of work completed tends to be relatively small during the first stages, then work accumulates much more quickly as more tasks can be performed simultaneously; finally there is a tapering off towards the end.

However the curve may be steep or shallow, depending on whether the contractor starts all the non-critical activities as soon as possible or as late as possible; the two extremes are shown in Fig. 6.6a as forming an 'envelope'; provided the contractor keeps within the two, the project will be completed on time and within total budget; he will select a particular profile as the basis of his plan. For the sake of the present discussion assume the relevant curve is C1.

The rate at which contractors actually spend may not follow the same profile as the rate at which they incur costs. For example labour will be paid daily/weekly in arrears, supervisory staff, monthly; material and plant usually 15/30 days in arrears or maybe more. A second S curve can therefore be drawn representing the accumulation of actual expenditure. In Figure 6.6b, curve Cl is reproduced from 6.5a (representing the costs incurred) and curve E represents the contractor's expenditure.

To complicate matters further, two more S curves can be drawn representing the build up of 'value' of the work completed; one represents the full cost of the work including overheads and profit (curve V1); the difference between the costs curve and this value curve represents the contractor's mark-up; at the end of the contract V1 will be equal to the contract price.

However there is another definition of value during .the contract, the valuation made monthly by the client's QS, which is based on the contract bill of quantities (V2 in Figure 6.6d). This is particularly important, for on it are based the stage payments made to the contractor. As the bill does not represent accurately the cost of real resources used over time; contractors well aware of this may have 'front-loaded" the bill that is claimed that early stages cost more, than they actually do, to ensure they get their money as soon as possible. There will therefore be a discrepancy between the actual value of the work done and the value as represented by the bill, during construction.

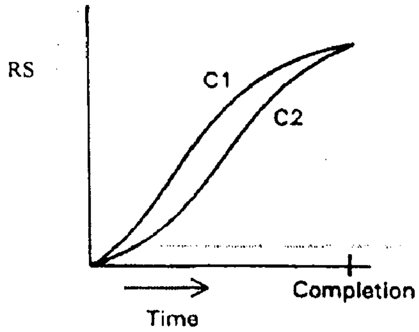
There are therefore four possible S curves which show the build-up of costs, value of work done and contractor's expenditure. As **payments** to the contractor are made in monthly stages, these can be shown on a cumulative graph as a stepped line, Y in Figure 6.6d.

Putting all the curves on one graph leads to contusion so Figure 6.6e includes only three:

V2 - the S curve representing **cumulative values** as derived from the bill; this is the basis on which payments to the contractor are calculated;

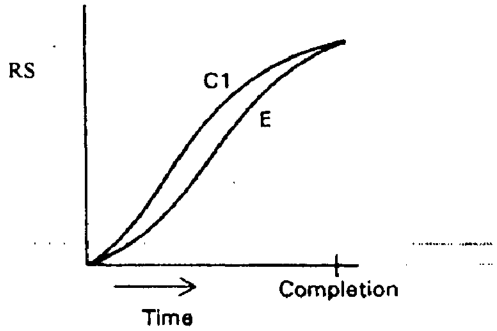
E - The S curve representing **the actual expenditure** by the contractor;

Y - The stepped line shows the actual payments **made to** the contractor



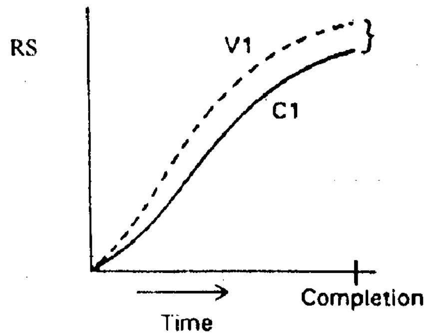
Curve C1 : Costs incurred if all activities started at earliest possible time
Curve C2 : Costs incurred if all activities started at latest possible time

(a) Costs incurred 'S' curve envelope



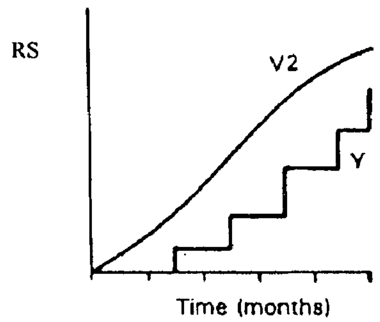
Curve C1 : Costs incurred
Curve E : Contractors' expenditure

(b) Costs incurred and contractors' expenditure 'S' curves



Curve V1 : Value of work completed
Curve C1 : Costs incurred

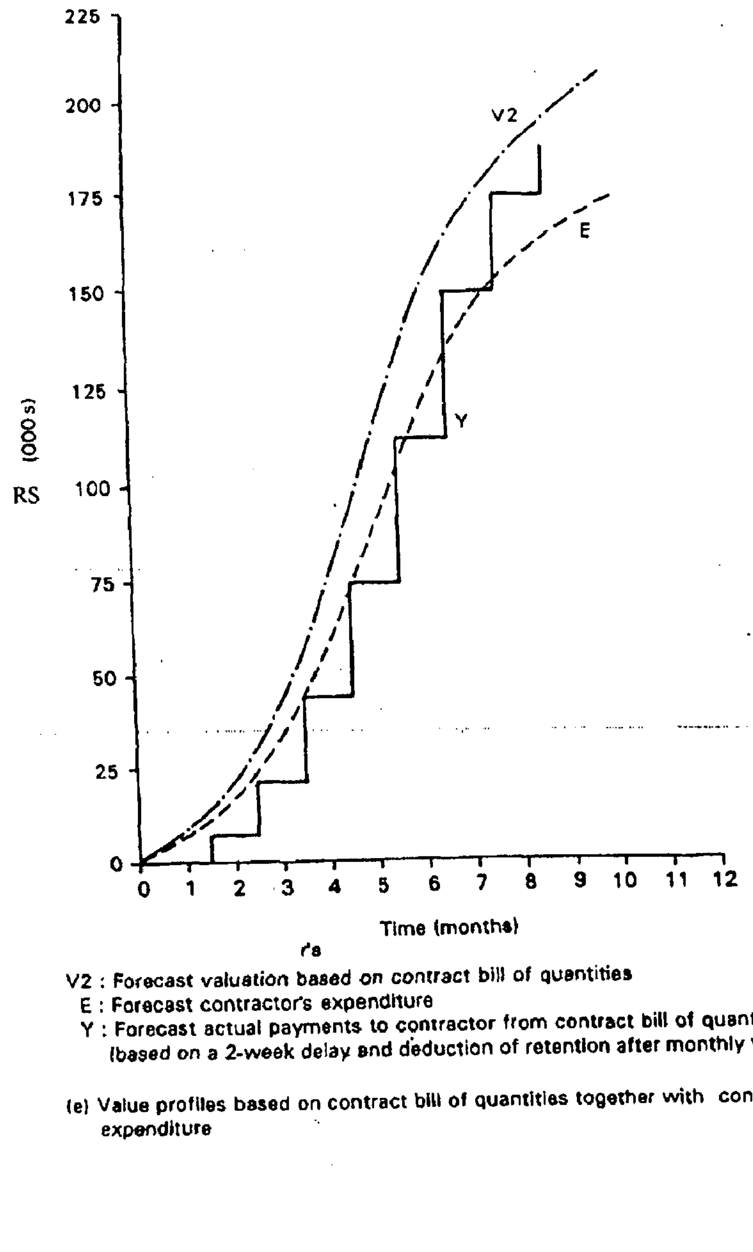
(c) Value of work completed and cost incurred 'S' curves



V2 : Valuation based on contract bill of quantities
Y : Actual payments to contractor from contract bill of quantities

(d) Value profile based on contract bill of quantities, early stage only

Figure 6.6



V2 : Forecast valuation based on contract bill of quantities
E : Forecast contractor's expenditure
Y : Forecast actual payments to contractor from contract bill of quantities (based on a 2-week delay and deduction of retention after monthly valuation)

(e) Value profiles based on contract bill of quantities together with contractor's expenditure

Figure 6.6

The figure on the vertical axis assumes a contract worth Rs 2,10,000, completed over 10 months. (Fig. 6.6f shows an enlarged section 6.6e.) So after 4 months for example, the estimated value of the work done is approximately Rs75,000, the contractor has spent Rs6,01,100, but hi' has received only Rs45 000 (which represents the amount of work completed earlier as valued according to the BQ). He therefore received Rs15,000 less than he has spent; this money, his working capital, has to be found from his own resources or borrowed.

Now consider the graph as a whole (Figure 6.6e) it can be seen that the contractor remains in this position right through to month 8; throughout the whole period his cash flow is negative; and if he has had to borrow, he is also incurring interest charges (even if using his own resources, there is an opportunity cost — the cost of interest he could have been earning).

What is striking is that even if everything goes well and no unforeseen expenditure is incurred, the contractor is continually" in the red (or more formally has a negative cash now) - until the end of the project and this is through no fault of his own; if clients fail to pay on time, the contractor's position can rapidly become serious. This constant pressure on the contractor is something which quantity surveyors and architects need to understand and have some sympathy with; they are employed as consultants to act in the client's interest, which may appear to be to delay payment as long as possible. But if this leads to or contributes to a contractor's financial failure, everybody loses; and the ultimate cost ot the project will almost certainly escalate.

Contractors of course have strategies for mitigating the problems caused by this system. The main one as mentioned above is to 'front-load' the costs. Contractors can increase their unit rates for work carried out early in the project such as excavation and foundation work, decreasing unit rates for work occurring later in the construction process, such as finishes and fittings. Therefore it may not always be clear whether the contractor's view of the build-up of costs is in fact a more realistic one that is implied by the bill, or whether it represents some degree of manipulation.

Another strategy adopted by contractors is 'pay when paid', that is, pay subcontractors only when contractors have received payment from the employer; in terms of Figure 6.6e, this in effect means they shift their expenditure curve as tar to the right as possible, or at the extreme convert it into a stepped line following their own income pattern. This practice of course simply puts the problem onto someone else; it does not eliminate it.

Although such strategies as front-loading enable contractors to keep their own costs down and hence able to make more competitive bids, there are dangers in the practice for the building owner. Should the contractor go into liquidation during the construction process it is possible that substantial over-payments will have been made.

Throughout the construction, the builder should be observing very closely the project plan and the selected" S curve to establish whether the work is ahead or behind schedule and is over or under budget compared with the income he or she has received from the building owner. If major variances occur then the contractor should be able to adjust the plan to enable the project programme to be put back on course or if not at least the consequences of the deviations will be known.

It is changes in and interruptions to the original project programme that cause most contractual disputes and claims in the building industry. That is because frequently the contractor will claim that the design team has created the necessity for such changes, through design variations and delays m providing information. The designers on the other hand may argue that it is the contractors own inefficiency that caused the difficulties. Many of these problems can be alienated by very simple measures - which are obvious but ignored with remarkable frequency. For example, if contractors produce a clear programme of what is to be done before they commence on site and it clear records are kept on bad weather, breakdowns of plant, delayed information from the architect, disputes might be more quickly resolved and less frequently incurred. But that is probably a counsel of perfection.

However, it is inevitable that the design solution will have a major influence on the cash flow and how much the contractor will have to borrow in order to finance the project. The contractor is bound to try to create a positive cash flow as early as possible so that the project becomes self-funding. The designers and quantity surveyors are doing their client no real service by making this difficult to achieve.

So, for cash-flow reasons as well as elimination of unnecessary extra costs, the design team should aim to produce a design which commits a gradual build-up of producing a maximum resource commitment over the middle two-thirds of the project construction phase and a gradual reduction of resources towards the end of the project. The design should not demand intermittent resource utilization and should try to facilitate continuous rather than intermittent use of subcontractors, especially those selected by the design team. This is particularly so with subcontractors concerned with mechanical and electrical services. Intermittent use of such specialist subcontractors complicates the programming and makes cash-flow control much more difficult for the main contractor.

CHAPTER 7

THE PROCUREMENT OF FIT-OUTS

7.1 Lump Sum with Approximate Quantities

7.2 Lump Sum without Quantities

7.3 Management Contracts and Contract Management

7.4 Design and Build

7.0 THE PROCUREMENT OF FIT-OUTS

One very significant influence on the total cost of a fit-out is the method of 'Procurement' used. The procurement method is seen as so significant because it determines the efficiency with which the whole process of producing a fit-out, from design through construction can be carried out.

In any procurement strategy there are two distinct components:

- The tendering procedure: that is the process through which a contractor is selected to carry out the work and the basis on which a contract can *be* let, for example a contractor might be selected through limited competition on the basis of a lump sum - or price at which he is prepared to carry out the project;

- The contractual arrangement: that is the legal definition of the obligations rights and liabilities of the parties and the documentation on which those obligations are based such as drawings, bills of quantities etc.

These two components determine between them the degree of competition between contractors and the allocation of financial risk; the contractual arrangements also determine the lines of authority and management responsibility between client, design team and contractor.
There are many variations in procurement systems in the recent years can be divided into two broad categories.

- Those which separate the design and construction phases, precluding any major contribution by the contractor to the design development: the 'traditional' methods;

- Those which attempt to integrate design and construction; these have evolved more recently in attempts to reduce the time from inception to completion, to bring the contractor's expertise in at an early stage and ultimately to reduce construction time and cost.

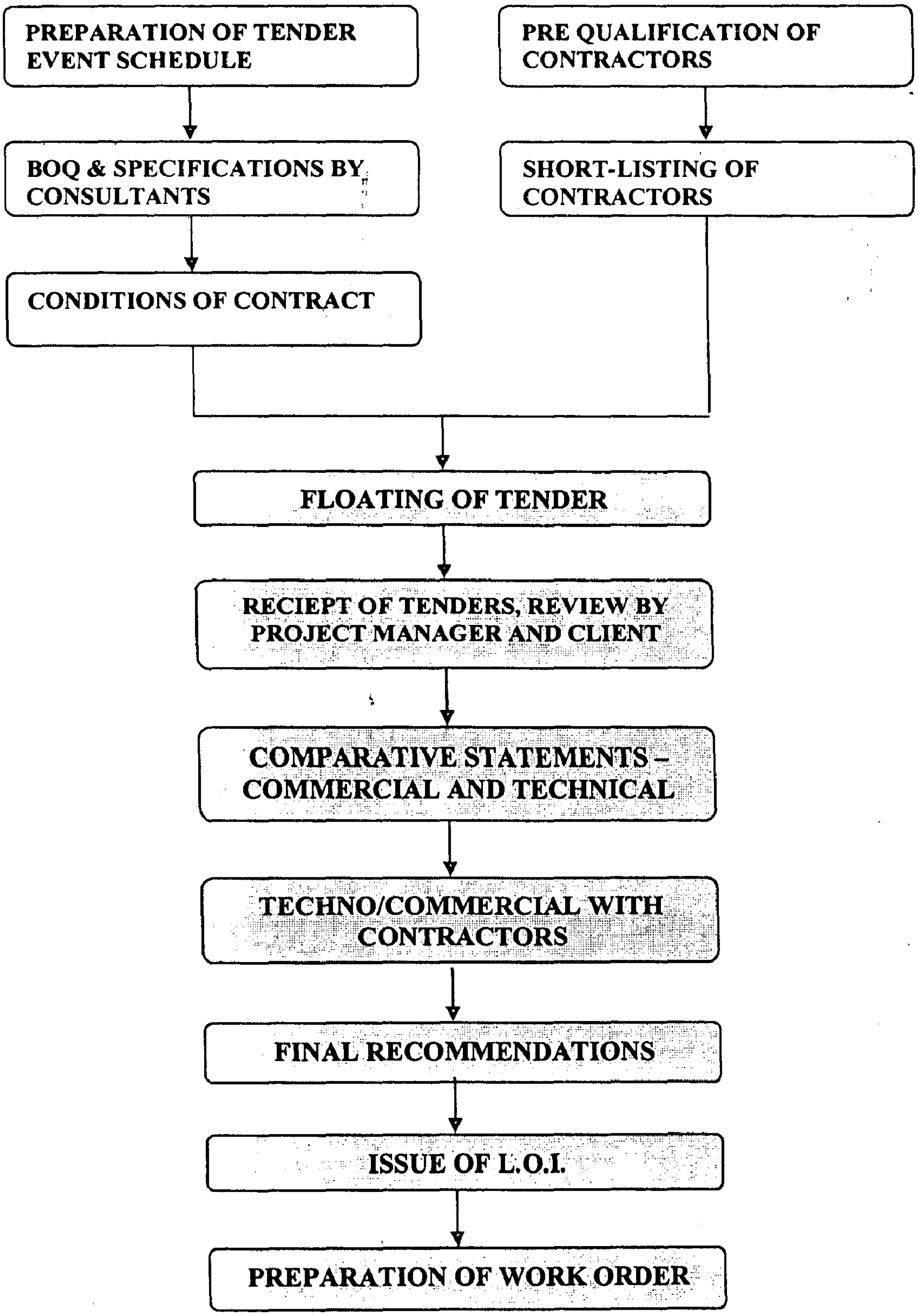


Figure 7.1 Procurement Management System

Communication links

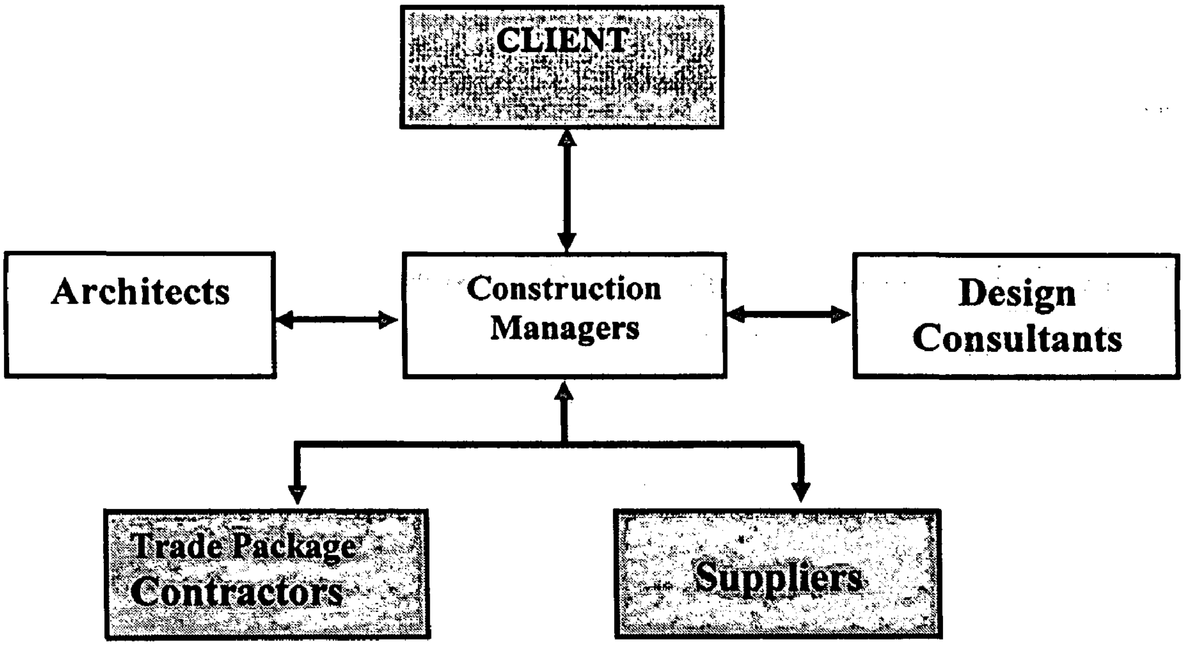


Figure 7.2 **Management Link**

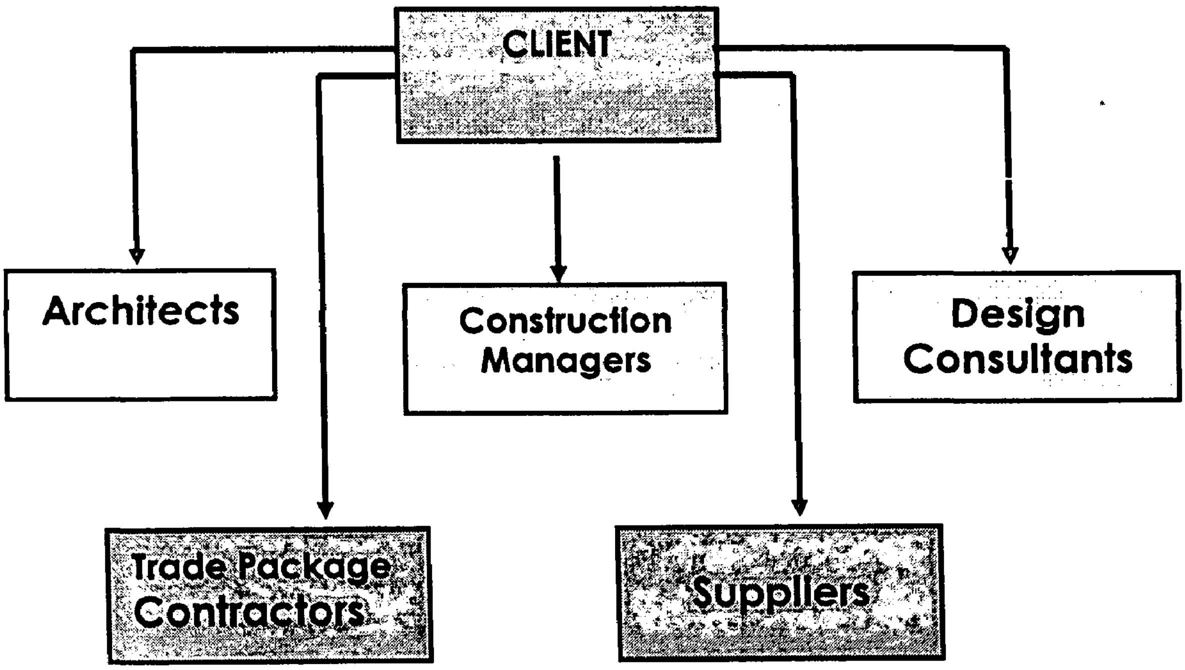


Figure 7.3 Contractual Links

Traditionally Design and construction are seen as the responsibility of separate independent parties – the Design Team and the Contractor. The two are brought together when the design has been fully developed and documented by the design team. Their documents — the drawings and the bills of quantities - form the basis on which contractors tender all contractors are therefore tendering on the same information, ensuring that competition is equitable. Once the contractor is selected, the **formal** contract is signed between client and contractor; but the design team will generally act on the client's behalf in ensuring that the conditions of the contract are fulfilled.

Two critical elements of this system are the forms of contract and the use of the bill of quantities.

The **bill** defines a project in terms of every item of work needed, expressed qualitatively and quantitatively for each element.

Importance/Usefulness of Bill of Quantities:

- They facilitate the process of tendering, eliminating duplication of effort by the contractors thus saving time and money.
- They provide an objective basis for tendering and the subsequent comparison of the tenders. This is because each tenderer is bidding on the same information. Even if there are errors within the bill of quantities, tenders are still based on precisely the same information; the standard forms make provision for the correction of such errors.
- The bill can be used to value the work as it progresses. Contractors are usually paid monthly and the priced bill's quantity is generally used to ascertain the value of the work completed. The bill can be used as a basis to value any changes that might be required. Even in the "best designed and managed project, changes will inevitably be required involving variations to the amount of work required. The bill of quantities containing the various unit rates will provide the basis of valuing such changes.
- The bill is used as a basis to settle the final account. Again because of all the various unit rates contained within it, then once the final quantity and quality of work has been determined and agreed, the unit rates where relevant can be used as a basis of settlement.

- Bills of quantities are a source of cost information and the majority of cost prediction techniques rely on the information contained within them.

Some standard procurement systems

7.1 Lump sum with approximate quantities

This system is used when the design team has not fully determined the detailed solution although the overall design has been established. The use of the word approximate or provisional implying the need for re-measurement where there is a degree of uncertainty. However lump sum with approximate quantities is a contradiction in terms. The contract is really a measured contract where the uncertainty is recognized within the contractual arrangements specific mechanisms are identified to account for this uncertainty. One version of such an approach is the use of schedule of rates where specific unit rates for anticipated parts of work are determined in advance in order that the final settlement can be reached when the true quantities are involved are determined by measurements.

7.2 Lump Sum without Quantities

In cases where projects are relatively standard and uncomplicated or small in size such contract systems are utilized. In such cases a detailed specification is prepared of the work to be carried out and quality of materials and workmanship to be used. However, this method is found to be less advantageous as the contractors have to ascertain the quantities by themselves and any incorrect quantification of work involved may thus lead them to base their tender on incorrect information.

7.3 Management Contracts and Contract Management

The management contract works in its basic form as follows: the client appoints a management contractor who is paid a fee to manage the actual construction on the client's behalf. The management contractor is appointed to manage, programme and supervise rather than build and in essence acts as a member of a design team.

The construction work itself is split into various sub-contracts known as trade packages. these packages relate to various specialist tasks such as Work Stations, HVAC distribution system, Electrical works, Ceiling, etc.. Each package is let usually in limited competition to a number of interested contractors ho submit tenders for the particular package. As well as drawings and bill of quantities are usually prepared for each package. The management contractor can be paid on percentage of the total cost of the project or a fixed amount agreed upon generally with an incentive package to motivate to work as efficiently as possible.

7.4 Design and Build

The most popular method of procurement in the recent times. It is also advantageous as it brings design and construction together:

- It offers a guaranteed price to the client

- It offers speedy and efficient construction

CHAPTER 8

CONSIDERATIONS FOR COST OPTIMIZATION THROUGH DESIGN AND MANAGEMENT FOR INTERIOR FIT-OUTS IN IT OFFICE SPACES

Chapter – 8 CONSIDERATIONS FOR COST OPTIMIZATION THROUGH DESIGN AND MANAGEMENT FOR INTERIOR FIT-OUTS IN IT OFFICE SPACES.

1.0 The design function and cost

- It is the design that implies costs; the designer must therefore accept a large degree of responsibility.

- But construction costs are incurred through the use of resources and it is the contractor that has to manage that use.

- For the whole business to work effectively, each group needs not merely to know what the others do but how and why

2.0 Structure of a fit-out's cost

- Costs can be estimated through element analysis or through resource analysis either ways it is important to arrive at the expected cost of the fit-out.

- Costs of materials and resources are subjected to technical innovations, economies of scale, structure of the industry and nature of competition and the effect of competition on prices, it is important to understand at the fundamental level the nature of costs and work out the most profitable and mutually beneficial way for all the parties involved in the procurement of the fit-out.

3.0 Costs and Choices - the short-term and the Long-term

- The designer has to establish an understanding of the way costs can be incorporated into design choices, first considering initial costs only and then taking into account the longer term.

- Thorough understanding of the simple mathematics of comparing present with future costs

- Examine the economics of the design choices for different elements of the fit-out to help determine design decisions.

4.0 Plan shape and costs

- Simple forms and layouts need not always be dull and unimaginative and complex forms need not always require complex construction techniques; however to create elegant solutions within the constraints of economics requires a high quality of design – and a high quality of detail.

- Understanding and identifying those aspects of form which can be achieved with economy, architects give themselves a better chance of achieving better quality within limited budgets.

5.0 Energy and Services

- The designer's primary objective should be to minimize the use of energy in the fit-out.

- The above objective again cannot be acceptable if it incurs more expenditure than the costs of energy utilization.

- Passive systems of climate control not only accounts for lower life cycle fuel costing, but also on the size and type of mechanical systems to be installed.

- A trade-off between passive systems and active systems should be arrived at, using cost analysis techniques to provide the best possible alternative within the constraints of the budget.

6.0 Relating design choices to fit-out and its management

- The architect has to have an awareness of and response to the problems of effective deployment of resources and the problems of cash flow management.

- Architects also need to consider the technicalities of constructing individual elements of a fit-out and, often a critical area of failure, junctions and interfaces between elements and sub-assemblies.

- The architect, while believing in the feasibility of a particular design feature, and having in fact designed it to be buildable, also has to take into consideration the skills needed for its effective execution and the capacity of the contractor.

- Better and proper consultation and coordination with all the consultants and contractors responsible for the fit-out project prior to or in the earlier stages of design would result in a lot of saving on the cost overruns.

Check list for Buildability Factors

- Investigate thoroughly - site and other conditions which might affect progress
- Consider access at the design stage
- Consider storage at the design stage Design for early enclosure
- Use suitable materials
- Design for the skills available
- Design for simple assembly
- Plan for maximum repetition/standardization
- Maximize the use of plant
- Allow for sensible tolerances
- Allow for practical sequences of operations
- Avoid return visits by trades
- Plan to avoid damage to work by subsequent operations
- Design for safe construction
- Communicate clearly

- Use of advanced techniques of project planning and control

7.0 The procurement of Fit-out

- Good fit-outs at reasonable cost are produced when there is a close and enthusiastic collaboration between well-managed high quality design team of good designers who understand issues of buildability and cost and a well-managed construction team of people who understand and appreciate the architectural aims of the project, and are able to make a creative input.

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