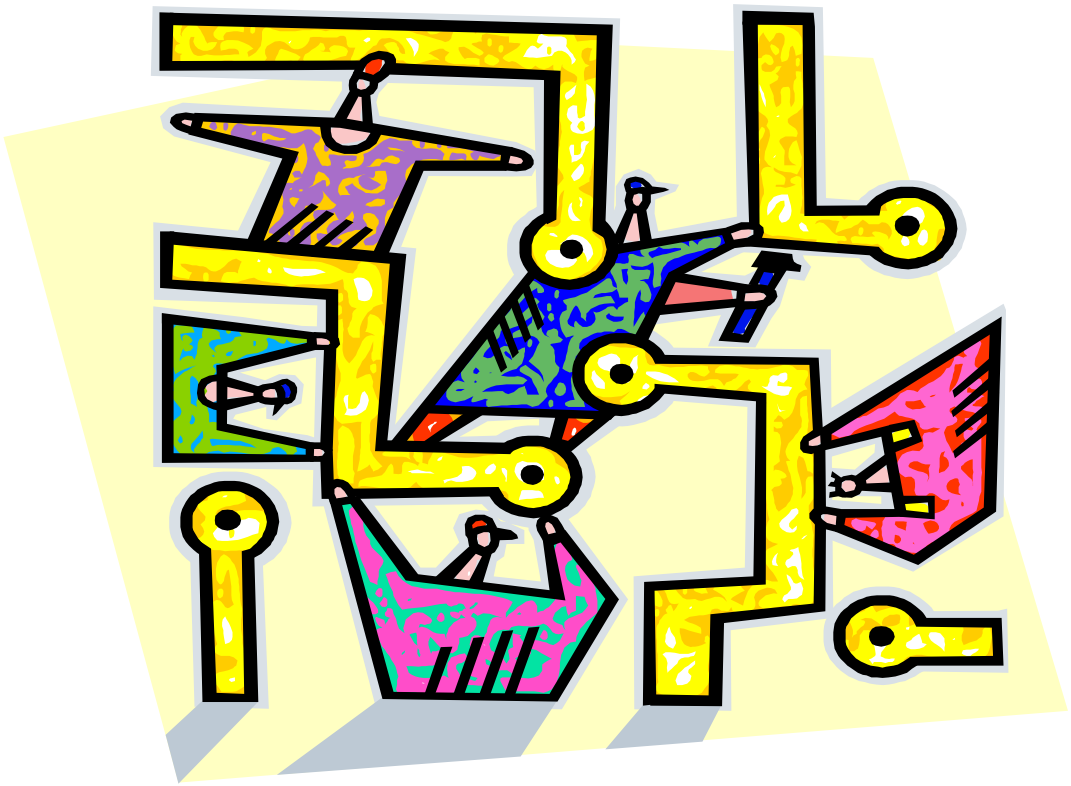
TRAINING MODULE ON PROJECT MANAGEMENT



REGIONAL CENTRE FOR URBAN & ENVIRONMENTAL STUDIES, LUCKNOW

(Established by Ministry of Urban Development, Govt. of India)

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FOREWORD

Over the last few years lot of emphasis is being laid on enhancing the technical capacity of urban functionaries so that they can better understand and implement the projects for delivering improved services to its citizens. With increased level of urbanization the local governments are unable to fulfill the rising demands of the citizens. Lack of funds and expertise to meet the rising demand are some of the major constraints being faced by the urban local governments in India. The condition of urban poor is even worse as they do not have access to even the basic services and the urban local governments are able to due little to meet the demands of the urban poor.

One of the major constraints is lack of expertise and technical know-how with the urban functionaries. With the launch of JNNURM the need for technical knowledge becomes all the more important as better implementation of projects is directly related to better understanding and management of projects. Any projects which are conceived would delivery results only when it is well planned, well initiated and well implemented. All the phases of project planning & implementation require management skills for delivering better results. There is urgent need to enhance the technical capacities of the urban functionaries in order to enable them to serve the unserved community in a better way. The present module focuses on project management which would help the urban functionaries and stakeholder in better implementation of projects

The RCUES is thankful to the Ministry of Housing & Urban Poverty Alleviation, Govt. of India for entrusting the task of module preparation on such an important aspect. We hope that the present module will help the urban functionaries and other stakeholders in understanding the concept of project management and its role in better implementation of projects for the urban poor.

With best wishes,

25th July, 2008

Nishith Rai
Director
RCUES, Lucknow

PREFACE

Urban Local Bodies are increasingly constrained in mobilizing the required financial and technical resources and the executive capacity to cope with the rising demand for urban services like water supply, sewerage, drainage, electricity supply, and solid-waste management. Rapid economic growth, growing urban population, increasing rural–urban migration, and all-round social and economic development have compounded the pressure on the existing infrastructure, and increased the demand–supply gap. Local governments are experiencing increasing pressure from their citizens and civil society organizations to provide accessible and affordable infrastructure and basic services.

While the infrastructure gap is rising, government budgetary resources are increasingly constrained in financing this deficit. Rising costs of maintaining and operating existing assets, inability to increase revenue and cut costs and waste, and rising constraints on budgets and borrowing, do not allow governments to make the required investments in upgrading or rehabilitating the existing infrastructure or creating new infrastructure.

Any project conceived would deliver good results only when the project has been well planned and executed as per the project management norms.

The urban local bodies have limited technical expertise and institutional capacities available for implementing projects under JNNURM schemes, urgent need is being felt to enhance the capabilities of the urban functionary and other stakeholder for better implementation of projects and better delivery of services to the citizens. With regards to urban poor the better planning and management of projects keeping in view the requirements of the unserved community becomes even more important.

Keeping in view the above the present Module focuses on the most important aspect of Project Planning and Implementation. The aim of the Module is to provide requisite technical and managerial support to the urban functionaries for effective implementation of projects. We hope that the present module will provide better insight

project planning & management to the functionaries & stakeholders involved in the implementation of urban poor projects.

We are thankful to the Ministry of Housing & Urban Poverty Alleviation, Govt. of India for encouraging us in taking up the above assignment. We express our special gratitude to Dr. H.S Anand, Secretary, Ministry of Housing & Urban Poverty Alleviation, Govt. of India. Our special thanks are also to Dr. P.K Mohanty, & Shri S.K.Singh, Joint Secretary, Ministry of Housing & Urban Poverty Alleviation, Govt. of India for their constant support and encouragement to our Centre. Lastly I express my gratitude to our Director, Prof. Nishith Rai for his motivation & support in all my endeavors.

25th July, 2008

Dr. Rajeev Narayan,
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SUB MODULE-1

PROJECT PLANNING

1.1. Introduction

Project management is an activity to ensure smooth implementation of any project as per its laid down specification. The key concept project planning and management is as under:

1.1.1 Project Life Cycle

The Project Life Cycle refers to a logical sequence of activities to achieve project's goals or objectives. Regardless of scope or complexity, any project passes through a series of stages during its life. The first is Initiation stage, in which the outputs and critical success factors are defined, followed by a Planning Phase, wherein the project broken down into smaller tasks, then Execution Phase, in which the project plan is executed, and the Closure phase, that marks the completion of the project.

Project activities are grouped into phases to enable, the project manager and the core team to efficiently plan and organize resources (material ,labour & finances) for each activity at appropriate time , and also objectively measure achievement of goals and justify their decisions to move ahead, correct, or terminate. Each project phase has to be studied in great details.

Diverse project management tools and methodologies prevail in the different project cycle phases. Let's take a closer look at what's important in each one of these stages:

1.1.3 The Project Initiation Phase

The project initation phase is the first Project Phase and is usually represented by the conceptualization of the project. The purpose of this phase is to specify what the project should achieve.

The basic processes of the Project Initiation Phase are: Creation of a Product / Project Description Document. This is an informal, high-level statement describing the characteristics of the project / process to be created.

A. Project Feasibility Document

This identifies project constraints, alternatives and related assumptions made to prepare the project. Project feasibility is characterized by four basic components:

- Problem Description. (of the project)
- Approach Overview to be used to develop/prepare the project.
- Potential Solutions of the problem.
- Preliminary Recommendations.

B. Development of Project Concept Document

It determines what is to be done? How will it be done? & why is it to be done? Thus determining the goals achieved after project completion.

C. Creation of Project Charter

Project Charter formally communicates the initiation of the project. It consists of Project Scope, Project Authority and Critical Success Factors.

1.1.3 The Project Planning Phase

The Project Planning Phase follows the Project Initiation Phase and is the most important phase in project management. The effort spent in planning can save countless hours of confusion and rework in the subsequent phases.

A. Purpose of the Project Planning Phase

- Establish Project Requirements.
- Establish Cost, Schedule, List of Deliverables and Delivery Dates.
- Establish Resource Plan.
- Get Management Approval and proceed to next phases.

B. The basic processes of the Project Planning Phase are:

- **Scope Planning:** This specifies the in-scope requirements for the project as per scope in line with the identified needs and priorities.
- **Preparing the Work Breakdown Structure:** This specifies the break down of the project into small projects / tasks and sub-tasks.
- **Organizational Breakdown Structure:** This specifies who all in the organization need to be involved and referred for Project Completion.
- **Resource Planning:** This specifies who will do what work at which time of the project.
- **Project Schedule Development:** This specifies the entire schedule of the activities detailing their sequence of execution.
- **Budget Planning:** This specifies the budgeted cost to be incurred during the execution and completion of the Project.

Project Initiation Phase defines a few facilitating processes required for successful Project Completion. These can be:

- **Procurement Planning: Planning for procurement of all resources (equipment and materials).**
- **Communication Planning:** Planning on the communication strategy with all project stakeholders.
- **Quality Planning:** Planning for Quality Assurance /quality control measures to be applied to the Project during its execution.
- **Risk Management Planning:** Identifying the risks, contingency plan and mitigation strategies.
- **Configuration Management Planning:** Defines how the various project artifacts will get stored.

Both the basic processes and facilitating processes produce a Project Plan.

1.1.5 Project Implementation Phase

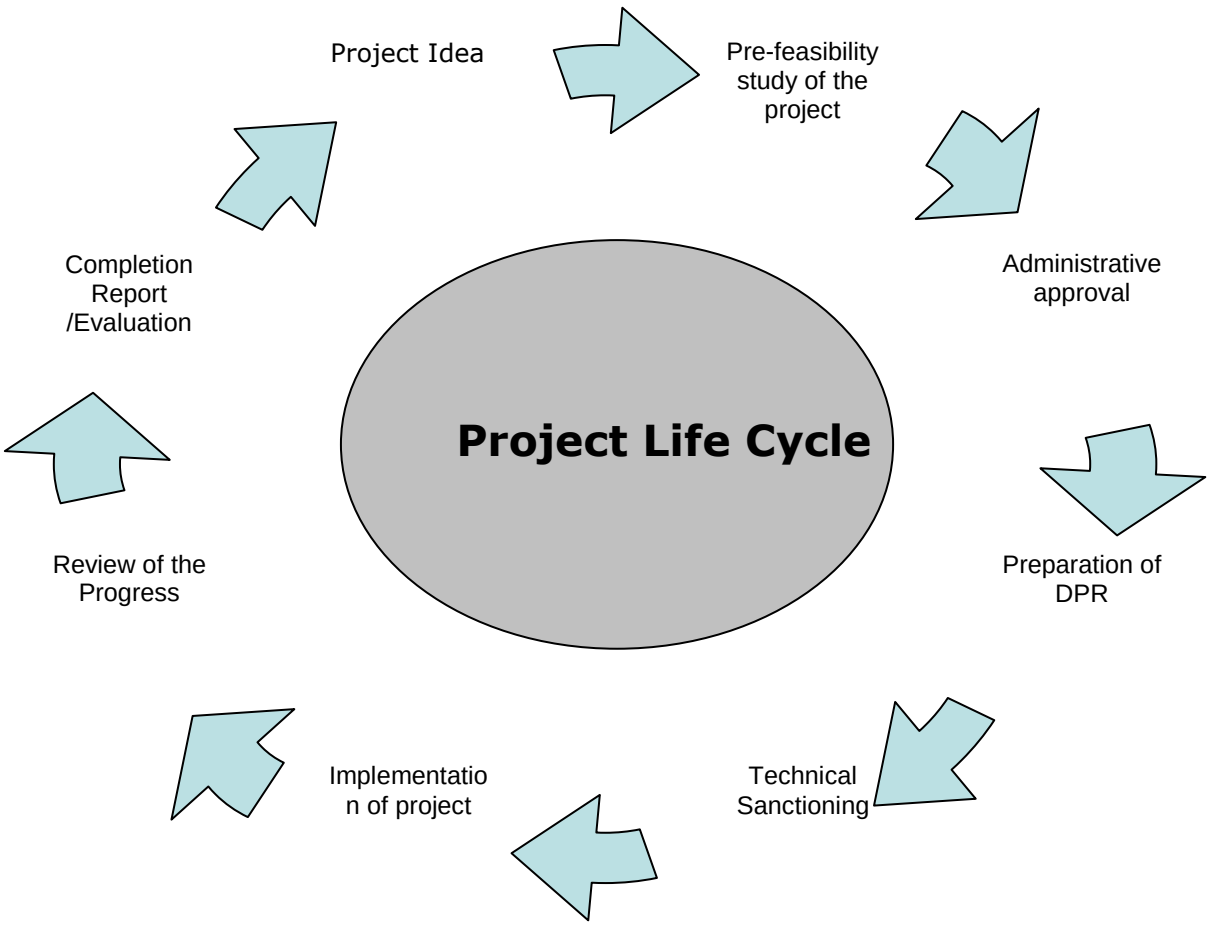
The most important issue in this phase is to ensure project activities are properly executed and controlled. During the execution phase, the planned solution is implemented to solve the problem specified in the project's requirements. In project and system development, a design resulting in a specific set of product requirements is created. This convergence is measured by prototypes, testing, and reviews. As the execution phase progresses, groups across the organization become more deeply involved in planning for the final testing, production, and support. The most common tools or methodologies used in the execution phase are an update of Risk Analysis and Score Cards, in addition to Business Plan and Milestones Reviews.

1.2 Closure

The project manager must ensure that the project is brought to its proper completion. The closure phase is characterized by a written formal project review report containing the following components:

- a formal acceptance of the completed project by the client.
- Weighted Critical Measurements (matching the initial requirements specified by the client with the final completed projects).
- rewarding the team, a list of lessons learned.
- releasing project resources,
- and a formal project closure notification to higher authorities.

1.3 Project Life Cycle



1.4 PROJECT DEVELOPMENT PHASE

1.4.1 Overview of the Project Development Phase

The project development phase/ cycle comprises a number of steps. Since the JNNURM envisages acceptance of a reform-driven approach to access financial assistance for infrastructure development by ULBs, the process of undertaking reforms has to be dovetailed with the project development process. The aim is to prepare a proposal, which fulfills all the conditions for the sanction of funds. The project development cycle for a project or a group of infrastructure projects proposed to be undertaken with assistance from JNNURM shall include the process from the project concept up to the point of achieving financial closure.

The project development cycle shall comprise the following:

(a) Identification of urban infrastructure/ basic services to urban poor projects and their prioritization.

(b) Project scoping.

(c) Preparation of a detailed project report.

(d) Finalization of the arrangements for implementation.

(e) Sanction of JNNURM assistance.

(f) Achievement of financial closure.

(g) Execution of a Memorandum of understanding (MoA) and other agreements for implementation.

1.4.2 Identification of Urban Infrastructure Projects and their Prioritization

1.4.2.1 Origin of Proposals

The origin of project concepts is expected to be done by the concerned urban local body (ULB) governing the eligible city. The proposal for every such city is to be prepared by the concerned local body or the State government and through a consultative or participatory process with community participation.

1.4.2.2 Identification of Projects in the Urban Sector

The ULB shall identify the infrastructure needs of the city. The delineation of such infrastructure requirements shall be done through a process that sets forth the stage for participatory development. The project identification and prioritization should emerge through public consultation depending upon the needs of the city

(a) Preparation of a strategy / plan:

The ULB shall map out a city-level development plan through public consultation The consultative process shall include the involvement of citizens. The process itself shall

include an assessment of population growth, infrastructure needs and resource requirements in the short-term, medium-term and long-term horizons.

(b) Delineation of needs and priorities with public involvement:

Citizens may be informed about the existing status of infrastructure, the broad investment requirements for augmentation and new development, and consulted on the prioritization of projects. A public consultation shall include a broad assessment of municipal resources, possible or likely impact on the municipal budget, and the proposal for reforms to support development. Such an assessment shall take due cognizance of the existing infrastructure and its usefulness over the planning horizon in the long term. Such a rapid assessment reviews the city's economic development, physical planning and growth management, physical infrastructure status, social infrastructure status, and municipal fiscal status. The objective of the same is to provide insight into the infrastructure needs of the city and assist in identifying capital investments (CIs) in consultation with local stakeholders.

(c) Prioritization of infrastructure and investment requirements:

The willingness to accept reforms and impact on the municipal budget are expected to lead to prioritization. Any alternative consultative process may also be considered leading to delineation of infrastructure priorities and consequent investment requirements that are necessary for financial planning.

(d) Documenting the CDP:

The summary of assessment of broad infrastructure requirements and their phasing shall be documented in the CDP. This would include the willingness of the public and elected representatives to accept in-principle implementation of reforms to support the proposed development.

1.4.2.3 Project Scoping

Project scoping includes defining the scope of the project in terms of demand, components, capacity, phasing and sizing etc. The scoping stage shall provide an outline of the nature and extent of the project and a broad sustainable option for its implementation. Project scoping could also form part of the CDP or master plan study in which case such documents should include an assessment for sustainability and a strategy for implementation.

1. Approach to Project Scoping

Typically, project scoping is carried out through a pre-feasibility / feasibility studies and detailed feasibility studies. Most ULBs have been conducting a feasibility or pre-feasibility assessment to define the technical feasibility for infrastructure projects but in the case of the JNNURM proposals, however, scoping of the project would be limited to as outlined in CDP and shall include a techno-commercial assessment of the project with a broad technical scope. The scoping would also include an

indicative financial assessment of feasibility and sustainability and an indicative plan for implementation over and above an indicative technical outline.

Such an assessment shall also include identification of issues and risks associated with the project which may have been identified during the process of preparation of the CDP, and assess ways of mitigating them.

2. Pre-feasibility Analysis

The reason for conducting a pre-feasibility analysis is to identify projects that could be implemented with the support available from JNNURM and additional support (including reforms), if any, required to make them sustainable. The purpose of this analysis is also to categorize projects which could be implemented within a suitable public-partnership partnership (PPP) framework (as PPP projects) and those which could be implemented otherwise (as non-PPP projects). Pre-feasibility assessment shall be carried out for every infrastructure project identified in the CDP proposed to be undertaken.

3. Dovetailing any Equivalent Assessment

Any other project scoping exercise may be considered equivalent to a pre-feasibility analysis, so long as the document provides the intended analysis. For projects where scoping is dovetailed as a part of a detailed feasibility exercise (wherein the detailed feasibility assessment is proposed to be undertaken), the pre-feasibility stage may be eliminated.

4. Preparation of Detailed Project Report (DPR)

Detailed Project Report (DPR) is a very important document prepared for each infrastructure service based on the CDP. Project preparation is a stepwise process wherein an identified project is detailed in specific terms and readied as a project that can be implemented. Towards this end, the entire project preparation and detailing exercise needs to be undertaken to ensure that it can be implemented by evolving an option based on its:

(a) Technical feasibility
(b) Financial sustainability
(c) Commercial viability
(d) Environmental compatibility
(e) Social and political acceptability
(f) Legal and regulatory feasibility

Step for preparation of Detailed Project Report are as under:

1. Detailed topographical survey of town including leveling of the project area and preparation of layout plan with GL's at at least 30meters c/c.

2. Mapping of existing infrastructure on the layout plan.

3. Population projections for design period and design demand.

4. Working out need assessment and extent of augmentation required.

5. Working out design requirements and selection of appropriate technologies.

6. Detailed engineering design and drawings for all the components of the project the gap area, mentioning design criteria and technical specifications.

7. Preparation of Bill of Qty's and cost estimates and implementation schedule.

8. Activity planning and scheduling

9. Year wise physical and financial breakup of the project

10. Economics of the project to attain self sustainability.

The objective of project preparation- is to structure a project with the target grant assistance from JNNURM. In doing so, it is also envisaged that the grant from JNNURM is leveraged to attract private investment and private sector participation. This can be done by ensuring durable long-term use of the assets created, efficient service delivery and management of resources through a framework that allows cost recovery. To meet this objective, an integrated process of project preparation is envisaged which would lead to successful disbursement from JNNURM and project implementation.

1.4.2.4 Demand Assessment

The analysis of infrastructure needs is an important step in developing policies. The manner in which needs are defined and the nature of the needs have a direct impact not only on what will be built, but on the investments that will be made. The demand assessment is of great relevance to planners, who are responsible for making investment and management decisions about what services to provide the households. Information on the extent to which project beneficiaries demand and are willing to pay for project outputs is necessary to design better projects during the early stages of the project cycle, and to manage and evaluate the performance of projects.

As all the designs, estimates, implementation system, financial provisions are made based on the projected population, for the success of any projects existing situation and future demand assessment is very important. Although the task is complex, there are various methods for assessing infrastructure needs and highlighting the principles and standards on which needs analyses.

Demand assessment involves four main tasks: (1) selecting households to study, (2) data collection, (3) data analysis, and (4) checks for validity. The selection of households to listen to or consult with can be based on rigorous random sampling procedures, or more informal or purposive sampling. Data collection can involve a review or use of secondary data sources, or primary data collection in the project area. Primary data can be collected through house hold questionnaire survey, participant observation, structured or open-ended interviews, focus groups, or participatory community meetings. Data analysis can range from qualitative interpretation of participant observations, to simple tabular presentations of raw data from structured interviews, to sophisticated econometric estimation of household demand relationships. The accuracy and reliability of the results can be crosschecked by the use of multiple methods or repeated investigations.

Approaches to demand assessment

Infrastructure demand assessment can be classified in two broad categories (1) Engineering Demand Assessment and (2) Social Demand Assessment.

Engineering Demand Assessment

Engineering Demand Assessment is a supply-driven process in which households or citizens have few choices or virtually no say in the process. It determines infrastructure quality and quantity norms and standards set by international, national or state departments. Engineering needs assessment is a technical method based on engineering studies of the conditions and needs for development and investment. Engineering needs studies attempt to meet technical engineering and quality of service standards. The condition of the existing infrastructure stock is determined and future infrastructure needs are identified. The gaps between the existing stock and future needs are identified.

Social Demand Assessment

Social Demand Assessment is an iterative, demand-driven process in which planners or decision makers use information on household preferences to structure the "menu of service options" for households. In particular, demand information can reduce the risks of building facilities that people do not want and for which they are not willing to pay for. Regular, periodic demand assessments can provide utility managers with the information needed to respond to changing customer circumstances, and regulators with useful information to assess the performance of service providers. Public consultations use varying mechanisms for gaining feedback including polls, mail or phone surveys, open houses and focus groups.

The public is the primary stakeholder in planning and prioritization, they use, own and pay for infrastructure thus they have a major influence in decision making for infrastructure. Also public participation in the decision making is becoming inevitable in the current era of globalization and privatization because the local authorities are becoming a facilitator rather than provider and citizens are becoming customers rather than beneficiaries. Citizens should be involved at all the stages of plan preparation starting from visioning, conceptualizing, actual plan preparation and resource management and implementation. This minimises confrontation and miscommunications while preparing and implementing projects and policies and also gives sense of ownership to the citizen.

1.4.2.5 Consultation Processes

Experience points to certain characteristics which foster a successful public participation or consultation process, and which help to ensure outcomes that reflect the interests and concerns of potentially affected people and parties.

These include the following:

- The process seeks out and facilitates the involvement of those potentially affected (identification of key stakeholders)
- The process provides participants with the information they need to participate in a meaningful way
- The process makes all reasonable efforts to identify the interests of, and meet the process needs of, participants
- Participants are provided opportunities for meaningful input and public issues/concerns are considered in developing the project design and making project approval decisions

- The process incorporates feedback and can evolve in response to the input and needs (access, format, etc.) of participants
- The public participation process communicates to participants how their input affected outcomes (i.e., project design and review/approval decisions)

1.4.3 Identification of stakeholders

Stakeholders are the group of individuals, communities or organizations who are directly or indirectly effected by the project, plan or policy and who has a right to say for the betterment of the same. The stakeholders can include NGOs, government organisations (like Police Department, Administration, line departments GPCB etc.), commercial organisations, elected representatives, eminent citizens, technocrats and social workers.

1.4.3.1 Stakeholder Analysis

The stakeholder analysis shall help identify primary, secondary and key stakeholders, map the stakeholders, showing their degree of importance and influence and provide clear information on the concerns and interests of each stakeholder group.

Steps in stakeholder analysis include:

Listing of all persons / groups connected with or influenced by the project

Categorising them (e.g. beneficiaries, actors, influencers etc.)

Characterising and analysing each stakeholder group's role and interest (openly expressed/hidden/vested) in the project, strengths (resources, rights, monopolies, etc.), importance of stakeholder groups for the success of the project and their degree of influence; and identifying the potential for contribution by important stakeholders to the project and what they can receive from it.

Identifying consensus for project work.

Identification of the development sectors for consultation:

Key development sector should be identified for the consultation with categorised sector specific stakeholders. They can be:

- Urban Spatial Growth
- Urban Poverty
- Urban Environment
- Water Supply
- Sewerage and Sanitation
- Storm Water Drainage
- Solid Waste Management
- Roads, Traffic and Transport
- Municipal Finance
- Institutional Development
- Urban Governance

1.4.3.2 SWOT analysis

The SWOT Analysis is to identify Strengths, Weaknesses, Opportunities and Threats for each identified sector/area of focus. SWOT analysis should be undertaken with the

sectoral working groups. The SWOT analysis should be focused the following parameters:

- Resource Availability
- Geographical and Topographical Conditions
- Political and institutional framework
- Regulatory Framework
- Financial Framework
- Participatory Approach in the planning process
- Private Participation in the Development Process
- Availability of Technical know-how

The following describes the steps involved in the SWOT Analysis with each Working Group:

Identification of the vision, goals and objectives for the sector

- Identifying current and upcoming strengths and obstacles aiding / preventing the city from achieving the identified sectoral goals
- Analyse and listing of key issues to be addressed in each sector and develop consensus on the vision, goals and objectives for the sector, that contribute to achievement of the overall goals and objectives defined by stakeholders for the city

Illustration: SWOT for the Pune City

Strengths • ***Strong and diverse economic base Connectivity to Mumbai and rest of Maharashtra Cultural capital Active and involved citizens.***	Weaknesses • ***Large slum population Inability to meet demands for housing and traffic Rising pollution levels.***
Opportunities • ***IT, ITES, Automobiles, chemicals, Manufacturing Education and research Strong inflow of talent*** • ***Spill over of economic opportunities from Mumbai***	Threats • ***Dominance of Bangalore and Chennai in IT and Automobiles*** • ***Demands of economic growth*** • ***Impact of population growth***

1.4.3.3 House hold survey

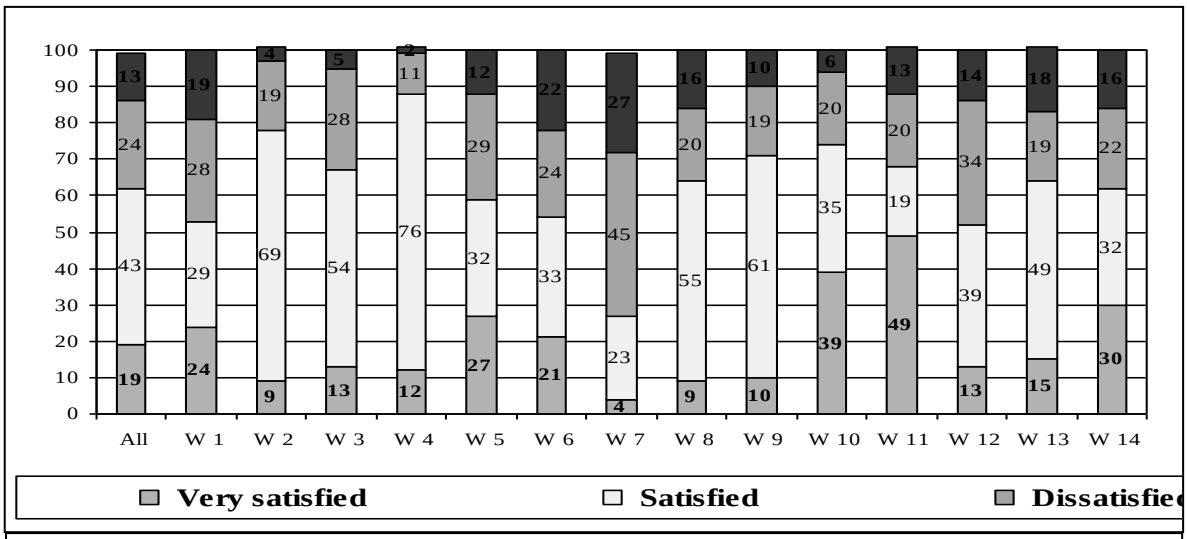
Household survey is the other method for assessing and acquiring public perceptions and demand for different sectors and overall city development at large. The key aspects to be taken care are selection of sample and sample size. Sample should represent the total spatial area as well as population size, class, economic groups and vulnerable groups (women, children, senior citizens, disabled etc).

Questionnaire should include questions on qualitative as well as quantitative information and perception of the respondent for specific sectors as well as overall city development at large. The questionnaire should also provide space and platform to the respondents to express their concerns and vision for specific sectors as well as overall city development at large.

1.4.3.4 Demand mapping

Based on the household survey and SWOT analysis a ward or zone level infrastructure status mapping should be done. Ward or zone level demand mapping is very important as it gives clear indication of level of satisfaction, quality of service available and identify service gap in the ward or zone, and decision makers can plan for specific service in specific ward.

Illustration: Ward level service mapping



Ward 7 is highly dissatisfied, followed by Ward 12 & 14. Ward 2 is satisfied

1.4.3.5 Visioning process

Developing a vision for the sector or city is very crucial to understand where the project or city wishes to go, within a given time frame, and is often expressed in terms of clear expectations. It defines the potential of the city and reflects its unique attributes in terms of comparative and competitive advantages, values and preferences of the city residents. A vision aligns stakeholders' energies to work cohesively for the development of the city. All objectives, strategies, programmes and projects must be aligned with the vision of the city.

Essentially the vision addresses following questions:

- ***Where do we stand now?***
- ***Where do we want to go?***
- ***What do we need to address on priority basis?***
- ***What interventions are required in order to attain the vision?***

Views and priorities of stakeholders should be sought, which gives an idea of people's perception, views and expectations, the role they can play, how they can contribute and benefit from the project. Developing a common vision requires a significant effort of consensus building in order to balance the competing demands arising from different economic infrastructure sectors, as also from different interest groups within the city. In order to achieve an understanding on a common vision, it is useful to choose indicators and targets such as provision of a minimum level of services to all.

- It should also be noted that the design of project components must also address the sustainability criteria. For identified projects, individual components should be designed so as to allow cost optimization in the long term. In other words, long-term sustainability must be ensured through the design of components that are economical, considering the life cycle costs including capital as well as recurring costs.

- **Selection of a techno-commercial option:** Every project could be implemented with a range of technologies and commercial options. Usually an option analysis would be required in such instances to ensure selection of the most technically feasible and commercially viable option. An analysis of options would involve delineation of different options and a simulation analysis based on life cycle costs for implementation. Life cycle costing shall be an integrated cost duly considering environmental, social, legal and regulatory costs that would be associated with a project. This will enable selection of the most suitable option.

- **Financial analysis for viability and sustainability:** The analysis for financial viability and sustainability shall be undertaken with regard to meeting funding requirements. Depending on the means of finance proposed by the ULB and identified for implementation, the financial analysis shall be undertaken to meet such criteria.

1.4.4 Steps in outsourcing the Project Preparation

The steps involved in project preparation are:

i. Preparing Terms of Reference (ToR): The ToR should clearly be defined in terms of (i) the information or method by which the study needs to be conducted; (ii) the tasks required to be undertaken; and (iii) the indicative timeframe within which outputs are expected. Importantly, the ToR should define the minimum required man month inputs or staffing requirements, output details including an indicative Table of Contents (ToC), etc.

ii. Procurement and appointment of consultants: The appointment of consultants by the ULB shall depend on the type of consultancy to be outsourced.

- **Fair and transparent process**
  It is expected that a fair and transparent process will be followed for appointment of consultants.
- **Options for appointment of consultants**

Different options for the appointment of consultants could be considered depending on the consultancy requirements for the identified project. For example, fixed budget selection, quality and cost-based selection, quality-based selection or cost-based selections are different contracts for the appointment of consultants followed as a standard or best practice, which could be considered.

- **Prequalification**
  As a best practice, ULBs seeking to implement a bundle of projects with JNNURM assistance, may prefer to have a database and pre-qualify consultants for various tasks. The qualifications of pre-qualified shortlist of consultants could be validated at least every two years. These consultants may be asked to submit technical and financial bids

iii. **Design of project components:** The design of project components of an identified project should be dovetailed into the Detailed Project Report as a part of the project preparatory phase. The requirements for design could however vary depending on the transaction. For instance, where the ULB contracts out the construction and design, the requirement could be for the design of components up to the preliminary engineering level (costs + 10%) at the pre-contracting stage. Where the ULB proposes to contract out the construction only, it could undertake detailed design of project components.

1.4.5 Preparation of a Detailed Project Report

The detailed feasibility undertaken as above must be documented in the form of a Detailed Project Report accompanied by other documents for availing of JNNURM assistance.

1.4.5.1 Technical Assistance for Project Preparation

Advisory support available under the JNNURM could be used for this purpose. This assistance could be used in a packaged manner for the entire guidance and advisory support required for managing the process and ensuring documentation that would effect readiness for project implementation.

Publicly financed projects usually go through a prolonged project cycle prior to implementation. The JNNURM foresees facilitation of an expeditious preparatory phase and extends support for this purpose

1.4.5.2 Finalizing the Arrangements for Implementation

(1) This phase starts when the project has been sufficiently detailed and structured for implementation. This could also be undertaken in parallel with meeting statutory approvals and internal approval process that a ULB must follow as a part of the project preparation.

(2) **ULB Approval:** For accessing JNNURM assistance, all necessary decisions required to implement the project shall be based on approvals. The process of ULB approval takes two stages:

(a) **In-principle approval:** The ULB shall obtain necessary approval to be taken for proceeding with the project for implementation in a public financed mode

or with private sector involvement on completion of CDP at the pre-feasibility report stage.

(b) **Approval for implementation:** The proposal shall be approved by the ULB for implementation with regard to:

(i) its proposed plan for implementation and institutional arrangements for the same;
(ii) its commitment for funds to be invested in the project;
(iii) the reforms it proposes to undertake to support infrastructure development as required
for availing of JNNURM assistance, including the project-specific reforms proposed
for financial viability and sustainability; and
(iv) any changes in the legal and constitutional framework governing the ULB.

(3) **Resolutions:** The above approvals shall be documented in the form of appropriate council resolutions.

(4) **State government approval:** The ULB shall obtain the necessary State government approval. In case of State government approval to back the project, evidence of appropriate approvals (government order, policy, cabinet approval, enactment of laws and amendments etc.) should be provided along with the project documents to demonstrate its commitment to provide investment support to the project as well as its commitment to reforms.

(5) **Other arrangements for implementation:** The ULB shall take the following necessary steps to ensure implementation:

(i) Provision of land required for the project and its availability on pre-decided and approved terms and set aside necessary funds for the same.

(ii) Statutory approvals required from other agencies or government bodies and obtain such approvals and permissions, NOC's and clearances on a project-specific basis.

1.4.6 Financial Closures

Financial closure is a stage in in the project development cycle when all the stake holders viz: ULB's, State Govt.'s, Govt. of India sponsors and lenders if any reach a formal agreement on fundamental business structure of the project and underlying terms and conditions of project financing plan.

Financial closure under JNNURM is important step as the project is ready to move into implementation stage. It implies tying up of all the sanctions for financing and compliances therein prior to disbursement of funds.

The closure is much faster for smaller cities with prior experience with PPP or relatively higher credit worthiness. It also depends on commitment of ULB , state Govt. , leanders appetite for investment, investors experience and risk management frame work.

JNNURM shall be the catalyst for achieving financial closure of identified projects. The assistance from JNNURM can be leveraged to attract other investments from institutional investors and State governments.

Delays could result from difficulties in resolving issues of risk allocation, changing priorities, and lack of adequate experience in project preparation.

1.4.7 Execution of MoA and other Agreements for Implementation

(1) State governments and ULBs including parastatal agencies, where necessary, would execute a Memorandum of Agreement (MoA) with GoI indicating commitment to implement identified reforms.

(2) The MoA would spell out specific milestones to be achieved. Signing of the MoA will be necessary to access Central assistance

1.4.8 Sanction of JNNURM assistance

The detailed project reports would be submitted to the JNNURM directorate through the State Govt. and state level nodal agency for consideration for assistance under JNNURM. The detailed project report is apprised from techno-economic angle by the technical cells of the Ministry of urban development before it is considered by the **Central Sanctioning Committee**.

Once the project is approved by the Central Sanctioning Committee, the first installment of 25% of the central share funds are released to the state level nodal agency only after the signing of MoA's by the ULB and the State Govt. with Govt. of India on the manner of implementation of reforms and other covenants included in the MoA's

SUB MODULE-2

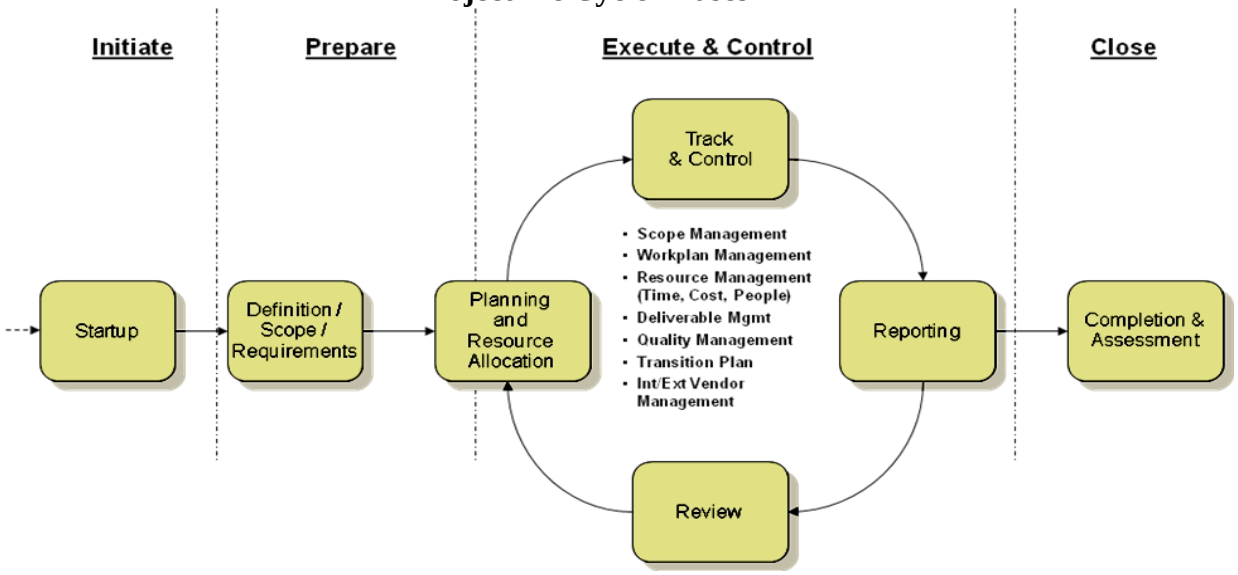
PROJECT IMPLEMENTATION CYCLE
(OPERATIONALISING THE DPR)

This sub-module basically deals with operations, which a project implementation team (PIT) has to do while implementing of a project. This module is designed to make the Project Implementation Team understand the steps of project Implementation Cycle. The important phases of project implementation cycle such as Project Planning, Scheduling, Human Resources, Supply Chain Management, Time & cost Management etc. have been discussed in this chapter. Whereas other important aspects of project implementation viz. Procurement Management has been discussed in details in subsequent sub modules 3**.**

2.1 PROJECT LIFE CYCLE (IMPLEMENTATION STAGE)

The Project Life Cycle refers to a logical sequence of activities to accomplish the project goals or objectives. Regardless of scope or complexity, any project goes through a series of stages during its life. There is first an **Initiation phase**, in which the outputs and critical success factors are defined, followed by a Planning phase, characterized by breaking down the project into smaller parts/tasks, an Execution phase, in which the project plan is executed, and lastly a **Closure or Exit phase**, that marks the completion of the project. The schematic diagram below depicts the project life cycle.

Project life Cycle Phases



Project activities are grouped into phases to enable, the project manager and the core team to efficiently plan and organize resources for each activity, and also objectively measure achievement of goals and justify their decisions to move ahead, correct, or terminate.

2.1.7 Project Management

Project Management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives.

Project management mainly comprises of Planning, Scheduling and Controlling. The first step towards implementation is to develop the work breakdown structure. This involves identifying the activities that must be performed in the project. Each detail and each activity may be broken into its most basic components. The time, cost and resource requirements are identified. The project controlling involves monitoring the flow of resources, cost and quality including the budget sometimes shifting of resources is likely to meet the demand based on the revised/ changed plans viz. mid course correction during execution.

i. Essential elements of Project Management

i) Planning - Setting Execution goal, defining the project, Constituting project management team

ii) Scheduling - relates people, money, and supplies to specific activities and activities to each other

iii) Controlling - monitors resources, costs, quality, and budgets; revises plans and shifts resources to meet time and cost demand.

ii. Importance of Project Management

i) Project management offers a means for dealing with dramatically reduced product cycle time.

ii) Project management helps cross-functional teams to be more effective

iii. Suggested Steps in Project Management

i) Generate a formal definition of the project, with goals, constraints, assumptions

ii) Identify project start/end dates, any mandatory milestones, including reports, signoffs, deliverables, etc.

iii) List constraints – money, equipment availability, holidays, etc.

iv) Identify tasks to be accomplished–high level (i.e., by categories), then details within each, using brainstorming method – green light

v) Refine detailed task list, dropping/ combining, adding things omitted

vi) Then, for each task in list, estimate time (person hours, calendar period)

vii) Identify dependencies among tasks.

viii) Identify resources (people, money, parts, etc.)

iv. Project Management Process Groups

There are several processes within each project management process and are therefore referred to as a process groups. There are five process groups:

i) Initiation Process Group - Defines and authorize the project or a Project Phase

ii) Planning Process Groups- Defines and refines objectives and plans the course of action required to attain the objective and the scope the project was undertaken to address.

iii) Executing Process Groups- Integrates people and other resources to carry out the plan.

iv) Monitoring and Controlling Process groups- Regularly measure and monitors progress to identify variance from project management plans so that corrective action can be taken when necessary to meet objectives

v) Closing Process Groups- formalize acceptance of the product, service or result and brings the project or project phase to an orderly end.

It should be noted that constituent processes of process groups has interaction both within the Process Groups and among Process Groups.

2.1.8 Project Management Process

All infrastructure projects involve a number of activities such as investigation, planning, scheduling, and control at every stage. Besides, it might need the involvement of a number of specialized agencies and failure of even one to deliver goods in due time might cripple the activity of others or stall the entire project. A close co-ordination is necessary between these agencies and in case of the failure of one, pre-planned alternative routes are to be chosen or new routes are to be evolved such that other activities may continue.

Modern techniques of project management are made use of by managers for planning, scheduling and control of the projects. Planning involves the listing of jobs or activities that have to be done to complete the project. The requirement of men, material, equipment, estimates of cost as also the duration of each of the activities are part of planning. Scheduling, on the other hand, deals with the time order in which these activities are to take place, as also the manpower, material, etc. required at every stage of implementation should be shown in the scheduling. It is a common experience that even after a lot of exercises on project planning and scheduling, no project follows the programme exactly as chalked out due to unforeseen reasons. An efficient technique helps the management to control the progress of work as close as possible to the original schedule by reviewing and reprogramming under the changed condition in order to adhere to the target time of completion. The analysis and correction of this difference form the basic aspects of control.

Every project constitutes a group of activities having interrelation, which may require the role of specialists and specialized work using latest knowledge and skills available to execute the project in a systematic manner, failing which there is likelihood of hampered progress or the project may be stalled. The most commonly used project management techniques are CPM and PERT for Project planning, Project scheduling and Project control.

Project team comprises of individuals from various areas and departments within a company. Project Manager is the most important member of project team. A project team should be selected based on the organizational structure that best suites their needs. There are three different types of organizational

structures, Traditional Structures, Divisional Structures and Matrix Structures. Traditional Structures are those that are based on functional division and departments which follow the organization's rules and procedures with precise authority lines for all management levels. It consists of Line Structure, Line and Staff Structure, & Functional structure. The Division Structure on the other hand is based on the different divisions in the organization. It consists of Product structure, Market Structure & Geographic structure. Whlie the Matrix Structures is a combination of function, and product structures which combines best of both for making an efficient organizational structure. This structure is the most complex organizational structure.

The organizational structure that works best for the organization should be selected, as the wrong set up could hamper proper functioning in the organization.

2.1.9 Project Planning

Planning involves making decisions with the objective of influencing the future. Defining activities, their logical sequence, and their relationship to each other are all planning functions. The planning answers the following questions:

i) What will be performed? - This question is answered by determining the final project product necessary for achieving project success. This is done in the initiation phase before the development of your WBS.

ii) How will it be performed? - This question is answered by determining the processes, procedures, and methodologies used to complete the project

iii) Where will it be performed? - This answer varies for each type of project. For example, if it's a construction project, the "where" will be the physical location of the building or road etc. If the project is a software development project, the answer could be the physical location of the project team or the final location of the project software, and;

iv) Who will perform the work? - This question is answered by determining if the work will be contracted or will use in-house resources. Then, the question will be examined in even more detail: if a contractor, what type of contractor, and if company resource, what department and who in each department?

2.1.10 Project Scheduling

There are multiple ways of defining scheduling. Scheduling is forming a network of activities and event relationships that portrays the sequential relations between the tasks in a project. It Plans completion of a project based on the logical arrangement of activities, resources, placing the project and its activities in a workable sequenced timetable and detailing the outline of activities/tasks with respect to time.

While scheduling is all of these things, the main thing to remember is that scheduling is the development of planned dates for performing project activities and meeting milestones. Project Scheduling steps involve, defining the activities, sequencing the activities, estimating the time, developing the

schedule, deciding the techniques to be adopted, use of Gantt/Bar charts, using the techniques of CPM & PERT and using software's like Microsoft Project etc. Hence scheduling will answer the following questions:

- In what sequence?
- When will the work be performed?

i. Important Criteria in Project Scheduling

Project cost and schedule performance measurements should be managed as integrated elements and not as separate entities. Earned Value Management (EVM) is a project management system that combines schedule performance and cost performance for measuring project progress in an objective manner. EVM combines measurements of technical performance (i.e., accomplishment of planned work), schedule performance (i.e., behind/ahead of schedule), and cost performance (i.e., under/over budget) within a single integrated methodology. When properly applied, EVM provides an early warning of performance problems. Additionally, EVM promises to improve the definition of project scope, prevent scope creep, communicate objective progress to stakeholders, and keep the project team focused on achieving progress.
The essential features of any EVM implementation includes, a project plan that identifies work to be accomplished, a valuation of planned work, called planned value (PV) and pre-defined "earning rules" (also called metrics) to quantify the accomplishment of work, called Earned Value (EV). EVM implementations for large or complex projects include many more features, such as indicators and forecasts of cost performance (over/under budget) and schedule performance (behind/ahead of schedule). The most basic requirement of an EVM system, however, is that it quantifies progress using PV and EV.

To satisfy the Earned Value Management System (EVMS) criteria, the schedule must include logical ties with all the above features. Hence project scheduling in the earned value management system involves a clear, five-step process. The process steps are:

i) Develop the list of project activities

ii) Sequence the list of project activities

iii) Determine the relationships between activities

iv) Establish the duration for each activities

v) Determine the project duration (start and completion dates)

EVM is being used in a wider variety of government contracts, and is spreading through the private sector as a valuable tool for project managers.

Whatever technique is adopted for the presentation of plan, programme and schedule, graphic representation of the activities through diagrams is found to be helpful to maneuver the project. In this connection, the following four methods are used for presentation of project management:

i) Grant / Bar chart method
ii) Line of balance
iii) Critical path method (CPM)
iv) Programme evaluation and review technique (PERT)

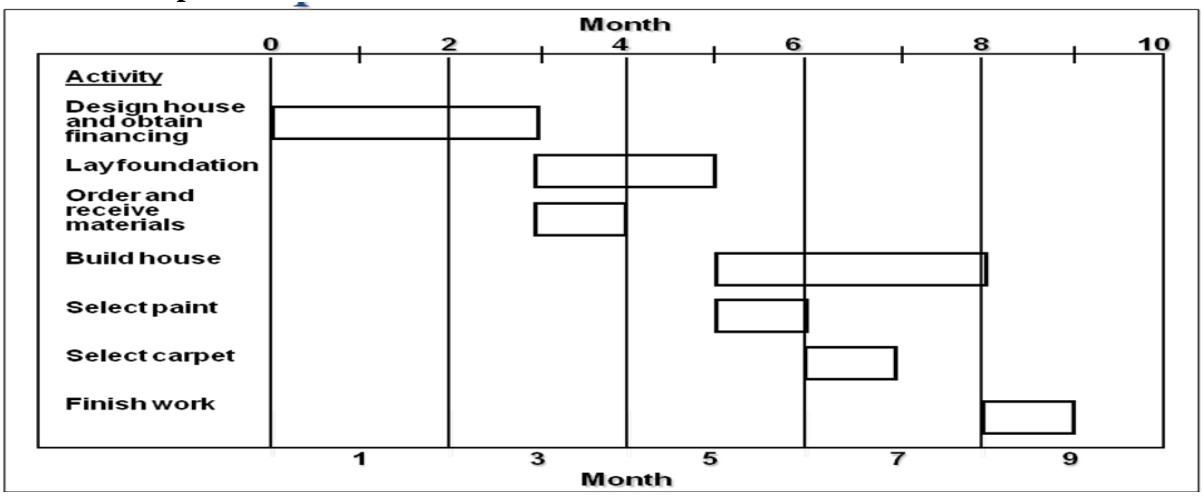
ii. Bar Chart /Grant chart

In any construction project, men, material and machines are generally arranged by the contractor in a manner that there is steady progress of work according to the programme. The original programme of construction made by the consultant or the client might not be adhered to in to during construction, since the contractor could not participate in drafting the programme as he was not selected at that time. After the job is awarded, the contractor is asked to submit a work programme, and he then submits it taking into consideration his own problems and difficulties. This programme may be submitted in tune with the original one suggested by the consultant or he may modify it in a manner he thinks best for the smooth progress of the project keeping in view his own constraints. The form, in which these commitments are made, consists of certain dates by which certain jobs or activities are to be finished. More detailed work would translate these dates into a bar chart which presents the programme of work in a graphical form and this gives the date of starting and date of finishing of each of the items of work, overlapping of these items, chronological order of each item, etc. A variety of forms of such charts are available. The choice of the most suitable one depends on the type of the project work. Judgment is required to be exercised to choose the correct one.

Graph or bar chart with a bar for each project activity that shows passage of time provides visual display of project schedule, slack amount of time an activity can be delayed without delaying the project.
The bar chart gives the following information:

- The date of actual start and proposed one.
- The proportion compared to the total job completed.
- The period of time (may be expressed in days, weeks, or months) by which the activity is moving in advance or lagging behind.
- The time by which the remaining work is to be done.

Example of Grant Chart:



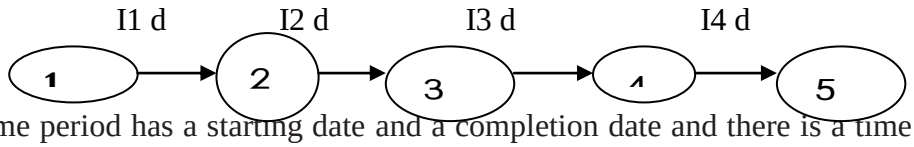
The bar chart, though very helpful and popular for small projects, it has got the following inherent limitations:

- Bar chart does not depict the inter-relationship among the activities showing their interdependence.

- It does not consider the cost since it is a project controlling method which considers only time.

iii. Line of Balance

Line of balance is a planning technique particularly suited for repetitive works like pipelines, multi-storeyed building or row housings. Line of balance is basically a graph in which the progress of works is plotted in the vertical axis and the passage of time is plotted in the horizontal axis. A sample example clarifies the method. A sewer line can be divided into four basic operations, namely,(1) earth excavation,(2) laying lines,(3) constructing manholes and(4) restoring the ground (5) Completion. And 'I' signifies the activity and the 'D' signifies the day.



Each time period has a starting date and a completion date and there is a time buffer between the starting and the completion of each activity. This information may be plotted in the line of balance diagram as shown in Fig. above.

At any given date (say at the end of the 5th day) one may draw a vertical line and estimate the proposed progress of work from the intersection of the vertical line and the starting or completion date of the activities. The steps for preparing the line of balance diagram are presented here:

i) Preparing a logic diagram like above
ii) Estimating the minimum time requirement for each activity.
iii) Estimating the proposed time requirement for each activity to achieve the schedule.
iv) Drawing the schedule
v) Reviewing the line of balance diagram to assess the possibility of improvements.

iv. Critical Path Method (CPM)

The bar chart method was developed by DuPont & Remington-Rand (1956) and is suitable for small projects where the manager has a clear idea about the mode of execution of each operation or activity. But when it concerns a number of technical trades the bar chart method becomes inadequate and needs a more rational and scientific method of project planning and this is represented in a graphical form. The graphical representation of the activities is called a network diagram or simply network. This deals with events and activities and considers both time and cost.

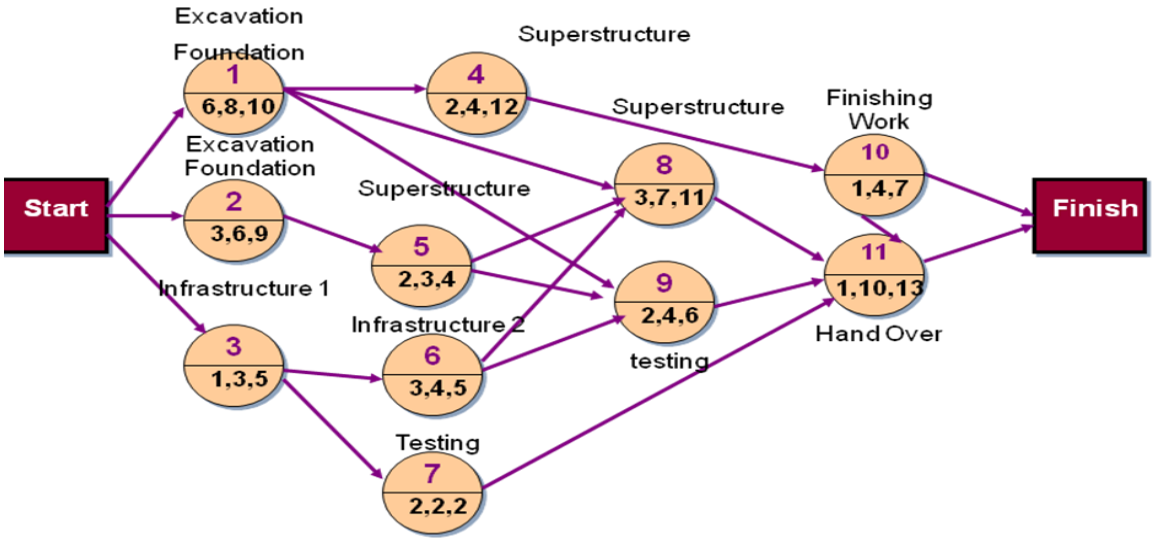
A network depicts the relationship between different activities by means of arrows in a logical sequence. Events are denoted by nodal points, which indicate the start or finish of an activity or a group of activities. Events are denoted by circles. These are numbered for easy identification. An event has no time dimension of its own since it gives the starting or finishing of an activity.

An activity is the actual work to be done in a project, so it must indicate time and resources by arrows. This arrow has two functions: it indicates the passage of time, and it gives the sequence of activity in an orderly manner.

The following example introduces and explains the ideas of events, nodal points, arrows, activities, etc. The inter-relation of activities are presented as "preceded by" and "followed by" and the duration of each activity is given in terms of days.

Example: Project under BSUP Housing

Project Network with Probabilistic Time Estimates: (Example of Project under BSUP Housing)



Time Cost Trade Off

Under the CPM system, two estimates, namely normal and crash, are made for the time associated costs for each activity. For many activities, cost per unit increases if attempted to be executed in shorter time period.

The rate of increase could take various forms. Assuming a linear time-cost relationship between normal and crash estimate, one may represent a network through a set of equations of linear relationship with time-cost constraints and thereby obtain an optimal solution with the application of linear programming.

v. PERT

The Programme Evaluation and Review Technique is a type of network diagram which was developed by Booz, Allen & Hamilton of US Navy. PERT is preferred when there is a methodology, availability of materials, whereas CPM is applied in the case of a contractor finalized and where there is little doubt about men the time when these are required. PERT and CPM were time oriented when originally developed. Cost was not a major consideration for early projects launched by NASA or Du Pont.

However, cost is an important factor which cannot be ignored and soon became an integral part of network analysis.

Questions answered by PERT

i) When will the entire project be completed?

ii) What are the *critical* activities or tasks in the project, that is, the ones that will delay the entire project if they are late?

iii) Which are the *non-critical* activities, that is, the ones that can run late without delaying the entire project's completion?

iv) What is the probability that the project will be completed by a specific date?

v) At any particular date, is the project on schedule, behind schedule, or ahead of schedule?

vi) On any given date, is the money spent equal to, less than, or greater than the budgeted amount?

vii) Are there enough resources available to finish the project on time?

viii) If the project is to be finished in a shorter amount of time, what is the best way to accomplish this at the least cost?

Uncertain Durations

The common approach to incorporate uncertainty in the scheduling process is to apply the critical path scheduling process with a probabilistic time period. The process is usually referred as PERT.

Although the PERT method is widely in circulation it has two major problems. Firstly, the procedure calculates the probabilistic time period of the critical path only while it is entirely possible that other activities might be so delayed that a new critical path is created through the delayed activities. PERT does not address to such problems.

Secondly, PERT assumes that durations are independent random variables having a beta probability distribution. The durations are correlated with one another. For example, difficulties in obtaining cement delays a number of activities in a site. The assumption of beta probability distribution for activity durations may not be true in practice. In many projects, the network is already crashed. Therefore, the difference between optimistic and most likely time is very small if any, whereas the pessimistic time is long due to the risk and uncertainty of the construction activities. In other words, the probability distribution of the activity durations is skewed as opposed to an evenly distributed beta distribution assumed in PERT. Sometimes the probability distribution of activity duration is a function of the season. For example, the pessimistic time of an earthwork may be two months if started in winter, whereas the pessimistic time of the same earthwork might be three months if started in the rainy season. Beta distribution for activity durations are not applicable in these cases: PERT typically underestimates the project duration.

As an alternative to PERT, a method to estimate the probability distribution of the time duration and other information like cost for a network can be obtained from the Monte Carlo simulation. This technique calculates the project duration number of times from the artificial but realistic data randomly chosen from a given distribution for each activity duration and applying a critical path scheduling to the resulting network and finally calculates the mean and standard deviation of the project duration to obtain a better insight about the risk of the project duration.

2.1.11 Project Control (Progress Report)

Project control is major activity achieved through progress reports. Project execution time control is a difficult, time-consuming and an arduous management function. A high percentage of the projects in India both in

private and public sectors are not finished in time. The situation is a testimony of the difficulties of the project time control.

Truly, the project analyst only monitors and guides other site managers about the time frame of the project. Therefore, communicating the project schedule is the vital ingredient in successful project management. Numerous parties like contractors, sub-contractors, consultants, owners and suppliers are involved. Even an individual party like a contractor's firm is in reality mixture of different layers of decision makers like directors, managers, foremen and supervisors. All of these parties are required to be within the communication link for the successful implementation of the project schedule.

Early softwares produced technical information like floats, early start dates and late start dates in tabular forms. Such numbers in quantities created confusion and the lack of appreciation among the parties involved resulting in non-cooperation and subsequent failure of the time management programmes. Manual drafting of graphics was tedious and delayed the decision making. Present software's in microcomputers generate graphics for an easy understanding of the situation. Whereas graphics are better suited for explaining the inter-relationship among the factors, tables and chart are required to pass information in a detailed level. The project analyst arranges a plan so that project personnel receive only the appropriate information required by him. For example, a site manager receives the macro scope information about the present status of a project including financial and other resources position. Detailed dates of the work plan are not important to him. An electrical supervisor on the other hand receives only the proposed electrical work schedule with detailed dates that is expected to be delivered by the supervisor. Network diagrams for projects have already been discussed. It is a visualization of the precedence and relationships among various project activities. It is a common tool of communicating the project plan among the concerned parties. One difficulty with network diagram is that the presentation tends to be crowded if all information is included. A practical solution is to summarise the network by defining a set of activities by a single macro activity and presenting the basic network only with the macro activities. Each of the macro activities can later be elaborated with other network diagrams.

Another variation of a network diagram is to produce a time-scaled network. Activities are plotted in a horizontal axis measuring the time. The time frame of a particular activity can be immediately determined from such a diagram.

Bar chart is not an adequate planning and scheduling tool because it does not provide information about the critical activity, floats and resource planning. 'However, bar chart has a visual clarity to explain the job schedule to various parties. It is a convenient way to record both the job progress and the job schedule. A number of variations have been proposed in bar charts to accommodate further information.

i. Resource Constraints

In the network analysis presented so far, it is assumed that any activity can begin as soon as the preceding activities are completed. In practical applications, the assumption hardly prevails. The planner probably has resource limitations to start all possible activities at anyone time. The planner

finds that the short supply of material, machine, labour, finance or other resources may create a bottleneck so that an activity has to be delayed. Such adjustments ate made in network analysis with resource constraints.

ii. Progress Analysis

The network diagram and the critical path are generally determined before the commencement of the job. In the execution phase, schedules are prepared from the existing critical path and the actual progress is monitored through the progress reports collected from the site. Estimated activity durations used in the development of the critical path may vary in the actual execution stage.

Numerous factors may alter the estimated activity durations. Apart from major reasons like change of plans, paucity of funds, labour unrest and scarcity of materials, there might be delays for power shortage, machine availability, statutory inspection, technical investigations and numerous other unavoidable reasons.

The project analyst first determines the status of the project from the progress reports received from the site. As long as the critical activities are accomplished by their scheduled finish times, there is no problem with the project time goal in so far as the current critical path is concerned. If a critical activity is delayed, the completion date is delayed commensurately.

In such a situation, a new critical path is created. There might be a number of ways for corrective actions. The activities can be crashed. Portions of the critical activities can be assigned to the subcontractors to enlarge the resources committed to the project. Critical activities can be re-studied to create if possible an alternative path. For example, critical activities can be sub-divided and run in parallel. A change in specification or relaxation of a standard may allow to shorten the critical path. The reduction of critical duration invariably increases the associated cost that is required to be shared according to the provisions of the contract.

Once the corrective action is proposed after the analysis of the delay a new schedule is prepared and passed to the site personnel as a revised schedule and thus the cycle of progress reports and schedules are continued till the completion of the project.

2.1.12 Computer Applications For Project Management

Network analysis involves much iteration and is particularly suited for the use of computers. Since its early development and applications, computer techniques were an integral part for operation research methods like linear programming, Monte Carlo's simulation and network analysis. Although manual methods are successfully used, network analysis in practice is almost impossible without computer aids.

The present-day revolution of information technology has reduced the price of personal or micro computers within the reach of most firms in the construction industry. A situation is created to use project management techniques widely.

Therefore, project management involves a lot of computer work. A project analyst is required to spend a considerable amount of time in evaluation, maintenance and management of software systems. Numerous commercial programs are also available for construction project management. Such

commercial programs along with a few tailor-made Support programs are sufficient for most project analysis.

The scenario in computer programs are rapidly changing and information about commercial computer programs is bound to be dated within a short time. However, a few of the commercial programs in the field of project management are presented in list below as reference.

Most commercial packages have the following parts. The main portion consists of the algorithm similar to those discussed in the chapter that does the basic calculations. The second part deals with the interaction with the user. These programs are menu-driven and user-friendly. A user can answer a set of questions asked by the program to solve the problem.

The Examples of commercial computer software for project management are given below:

i) MS Projects – Microsoft.

ii) PRISM Main frame Tata Consultancy Services.

iii) COMDACE Main frame Davy Computing, U.K./Technova I Information, N. Delhi.

iv) Harvard Project Manager Micro NUT (HPM).

v) Qwiknet Professional Mini PSDI, USA/Integrated Project I Management, N. Delhi.

vi) PROMIS Micro -do6. Business Planned Micro Tata Consultancy Services.

vii) Instaplan Micro WIPRO.

viii) Proman Micro M.N. Dastur & Co.

ix) PROWARE EX Micro Computer Home, Calcutta.

At any time, the program helps the user with further tips and comments if asked by the user. Therefore, a user with relatively little effort can master and use the programs without any special knowledge about computer programming. Lastly, these programs have various presentation capabilities.

The output can be prepared in different forms including graphical representations. For example, an output might consist of a bar diagram, a network diagram, a histogram and graphs. No separate effort is necessary to present the output. Apart from the hard copy reports, the output can be stored electronically for future use. The output in some cases can also interface with other programs like PROWARE EX forming an integrated system.

The primary input for the programs are activity duration and its dependence over other activities. The other inputs are crash time, time-cost relations and essential resources.

The programs primarily generate end events, project duration, erroneous input like forming dead loops, floats, critical path, early and late start dates, etc. With appropriate inputs, the program generates the time-cost trade-off, the risk of time duration, the resource requirement and leveling.

The output may consist of a bar diagram, a network diagram, cash flow curves, and various reviews about time and resources in order to monitor and guide the project.

2.2 QUALITY MANAGEMENT AND SAFETY

What is Quality? - Quality Means 'Zero defects' and 'Consumer satisfaction'. It is synthesis of conformance, adaptability, innovation and continuous improvement. Quality control, though a crucial part of project management, is generally given less importance as compared to other aspects of construction or project execution.

Through quality control, the probability of finding a substandard product is estimated, thereby providing an index on the quality of the product. For the effective management of a quality control programme, a realistic and workable quality control design is required. To attain the quality criteria during the construction process, the specification of quality requirements in the design and contract documentation becomes extremely important.

After evaluating the owner's need, the designer has to plan a facility that meets the requirements giving due consideration to time and cost constraints. The owner's needs are expressed in the form of specific criteria that guide the engineering and design process. Once the quality of design is established, it is the construction manager's responsibility to adhere to the standards fixed by the designer. The project manager is required to evaluate the trade-offs between the quality of conformance and the cost of achieving the standards.

The quality of conformance is also influenced 'by number of factors "namely, (i) methods of field construction, (ii) equipment capabilities, (ill) skills of the workmen, (iv) supervision standards, (v) quality of raw materials, and (v) quality control plan. Quality control is the responsibility of the designer during the design phase and that of the construction manager during the construction phase. Thus the quality of design and the quality of conformance are complementary to each other, and the combined plan, determines the quality of the constructed facility.

A number of organization charts can be made for ensuring quality and safety at construction sites. In the case of small sites, the project engineer undertakes this responsibility. In most cases, independent groups are primarily responsible for quality and safety aspects.

Personnel from different organizations are involved in ensuring quality and safety standards. Each of the parties directly concerned with the project have their own quality and safety inspectors. They may include representatives from the owners, the architects, the prime contractors, the subcontractors, other contracting firms and various government agencies.

In developed countries, the main responsibility to adhere to quality conformance is generally assumed by the contract manager.

For large projects, the contractor may maintain an in-house department to ensure quality control. Such a department normally reports directly to the project manager or other senior management staff so that immediate corrective action could be taken if necessary. In addition to the on site inspections, samples of materials are commonly tested by specialised laboratories like the

National Test House for compliance. Sometimes specialised firms like the x-ray weld tester, the remotely operated pipeline tester and the nondestructive concrete tester are contracted to ensure proper quality control.

It is also important to monitor quality control parameters. The collection of accurate and useful information is important for maintaining quality standards. Preservation of documents like change orders, 'as built' drawings and accounting records are important for maintenance, modifications of plans and disputes that may arise.

i. Quality Control By Statistical Methods

In an ideal situation both raw materials and finished goods require inspection and approval. Exhaustive or 100% testing of all materials can be time consuming and exceedingly expensive. Moreover, many major items like concrete testing require the destruction of a material sample, and hence exhaustive testing may not even be feasible. Thus, a small sample is exhaustively tested and inference on the production can be drawn using statistical methods. These are called statistical sampling techniques and have been developed particularly for the manufacturing industries. In recent years, statistical sampling is increasingly used in the construction industry.

For example, IS Code for concrete (IS: 456-1978) has specified the use of, statistical sampling techniques to assess concrete strength', To interpret results from the testing of small samples one would require sound statistical methods. Over the years, such methods have been developed and tuned to the manufacturing process.

ii. Sampling Plan

Sometimes the quality characteristics of a product have a quantified or measurable value, e.g., the compressive strength of concrete or the tensile strength of the steel reinforcement. Such variables having continuous values and the frequency distribution, would follow a Gaussian distribution. Control charts like the X-chart and R-chart are applicable here. The characteristic representing the quality of certain products cannot be quantitatively measured. These products are either acceptable or not acceptable. For example, the quality of a terrazo floor or french polish in a timber door is judged qualitatively by a trained professional. Statistically, the characteristics are discrete in nature and a Poisson distribution is applicable, Charts like the C, P and np are applicable.

Whichever sampling plan is used, the assumption that the samples tend to represent the entire population remains unchanged. Samples are chosen at random so that each member of the population has an equal chance of being chosen. Convenient sampling plans like weighing every 15th dump truck or picking the top piece of marble from each of the delivery trucks are ' suitable only if the population is randomly mixed. Otherwise, care is taken to choose the samples at random.

iii. Control Charts

The statistical control charts can be used for a number of purposes. A few, examples are described here:

i) A control chart describes the performance of a process system. It indicates when the process should be left alone or when corrective actions need to be initiated.

ii) A control chart is used to detect the shifts in the average process from the desired level. Control charts are used to make future predictions of the performance of a system.

iii) Since a sample is actually tested, the control chart saves cost.

iv) The concept of control charts can be extended to budgets and estimates. Estimated figures and actual values can be compared.

2.2.1 QUALITY MANAGEMENT AND BENCH MARKING

The quality management is an essential part of project management. The quality control requirements would be identified based on the types of project, its size, timeframe and quality of the product desirable as per the project needs. During the project planning phase the quality control requirements for construction equipment machinery and material for construction would be laid down by the planners and the structural designers as per the project requirements based on the standards specifications.

Types of quality control test to be conducted, frequency of testing during the project implementation phase as per the laid down standards would be clearly specified. Quality assurance checklist should be prepared before starting the implementation phase for testing of construction material, equipment and machinery to be used during construction and various process and construction methodologies to be adopted during the execution to ensure the desired quality of construction. The methodology of testing should be laid down during the planning stage and the quality control requirements have to be clearly brought out in the tender and contract documents also.

A benchmark is a point of reference against which something may be measured. Glossary defines benchmark as "a process that enables comparison of inputs, processes or outputs between institutions (or parts of institutions) or within a single institution over time".

2.3 RESOURCE MANAGEMENT AND INVENTORY

The progress of a project at optimal cost requires a judicious allocation of available resources like finance, labour, material and equipment.

Finance is the basic resource that is required to procure the other three. The financial management is treated in sub module-4. In this part the arrangements for labour, material and equipment are discussed. Particularly for large jobs and remote sites, the supply and availability of these resources are crucial and must be overcome for the success of the project. Even for small jobs or urban sites, the optimal cost for procuring the resources are vitally important for the profitability of the project.

The basic objective of resource management is to supply and support the field operations so that a planned time schedule can be met and cost can be optimally controlled. The project manager is responsible to identify and

schedule future requirements so that field managers may obtain the resources at an appropriate time and place to employ these in the project.

The scheduling and allocation of manpower, equipment, materials, finance and time frames are all interrelated. Resource management is devised to take the appropriate decision among these interrelating options.

2.3.2 Basic Concepts Of Resource Management

The planning and network diagram dictates the quantum of the work that is required to be achieved within the given time period. The quantum of work in turn necessitates the amount of resources. For example, the network diagram of a housing project may show that 300 cubic metres of concreting and 100 cubic metres of brick work is required in the next month to complete the network activities. This would mean that a requisite amount of resources like materials (cement, sand, stone chips, bricks, etc.), equipment and facilities (mixture machines, vibrators, pumps, electricity, water, storage space, etc.) have to be mobilized at the site. There could be a number of constraints in mobilizing these resources within the given time period. Limited storage spaces, absenteeism among workers during the festive season, inadequate equipment available in the site are only a few examples of the constraints.

In addition, a limited fund may also create a constraint for the mobilization of the resources. The constraints may impose a ceiling limit of the accumulation of the resources and the project manager may be forced to revise the network diagram.

2.3.2 Human Resources Requirements

The management of project manpower begins with the tabulation of Human Resources requirements by trade for each project activity. Normally, an activity shown in a network can be further divided into a number of sub-activities to facilitate a Human Resources estimate. References like the All India Standard Schedule of Rates by National Building Organization can also be used to estimate the manpower.

The time and Human Resources requirements to complete each sub-activity are estimated by experienced persons. The time and manpower requirement of the network is thereafter arithmetically calculated.

i. Organizational Influences

Projects are influenced by the performing organization. The key aspects of the organization which influence the project are:

i) Organizational System – There are two types of organizations viz. project based and non-project based. Project-based organizations are those whose operations consist primarily of projects. These organizations fall into two categories:

- Organizations that derive their revenue primarily from performing projects for others under contract – architectural firms, engineering firms, consultants, construction contractors, and government contractors.
- Organizations that have adopted management by projects. These organizations tend to have management systems in place to facilitate

project management. For example, their financial systems are often specifically designed for accounting, tracking, and reporting on multiple, simultaneous projects.

Non-project-based organizations often may lack management systems designed to support project needs efficiently and effectively. The absence of project-oriented systems usually makes project management more difficult. In some cases, non-project-based organizations will have departments or other subunits that operate as project-based organizations with systems to support them. The project management team should be aware of how its organization's structure and systems affect the project.

ii) Organizational Cultures and Styles- Culture, values and norms within the organization influences how projects are managed. To be most effective the project manager should understand, identify, and operate within the expectation dictated by the organization culture and norms.

iii) Additionally, a deep understanding of the values of organization should allow the project manager to identify the most important factors that the organization perceives as its success criteria. Corporate culture is visible in policies, procedures, and views of authority. It influences the degree of difficulty to managing projects

iv) Organizational Structure - The relationship of a project manager to the team is determined by the firm's organizational structure.

v) Functional Structure: The team is housed in a specific functional area. Assistance from other areas must be negotiated.

vi) Pure Project: Team members work exclusively for the project manager, which is best for large projects. Matrix Structure: A compromise between the functional and project structures. Members remain in various functional areas and the project manager coordinates across functional areas. Dual authority can cause problems.

HR Responsibility Matrix Principals:

- No overlap of responsibility.
- Interaction Understood by all.
- Change of key personnel to be avoided Midstream.
- Good coordination and inter personal relations important.

In this context, particular attention should be given to the following:

- Use of modern technology (computer database).
- Social indicators for monitoring.
- Gender-sensitive concerns and,
- Construction Organization and Superintendence.

2.3.3 Material Management and Supply Chain Management

i. Supply Chain Management/ Planning

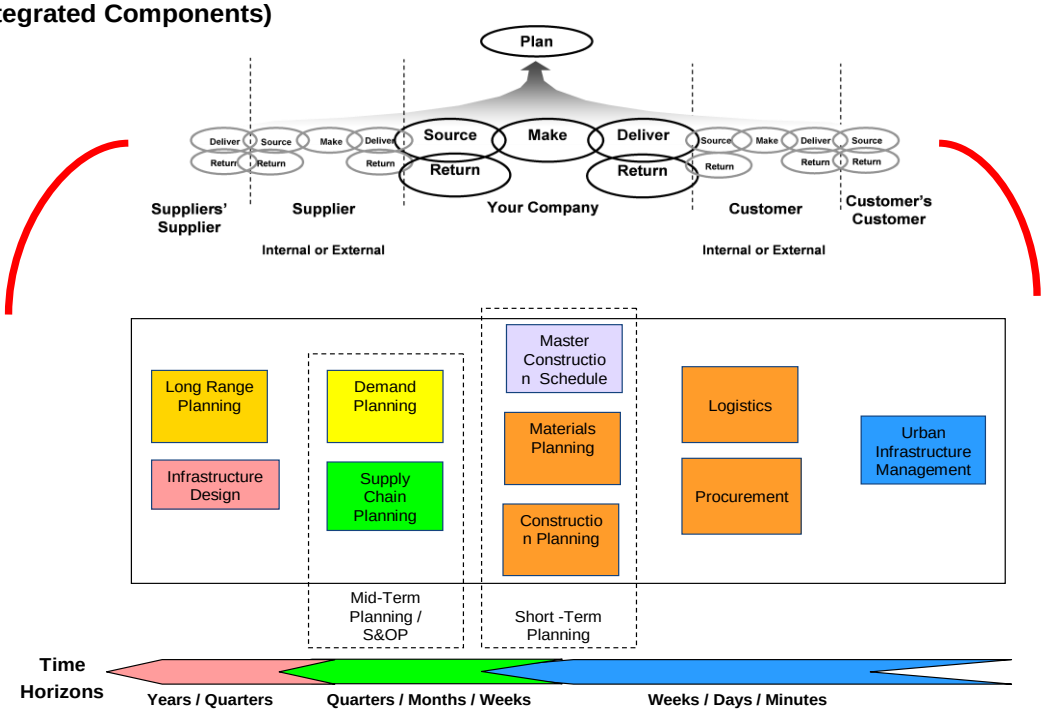
Supply chain is a set of activities (e.g. purchasing, manufacturing, logistics, distribution, marketing) that perform the function of delivering value to end customer.

There is no single plan to carry out supply chain activities. There is need for a mechanism through which the execution of various activities along a supply chain can be planned in an integrated fashion.

The supply chain planning is an effort to achieve the primary goal of "producing and distributing the merchandise at the right quantity, to the right locations, and at the right time with minimum system wide cost" in the presence of conflicting goals of various business units.

ii. **Benefits of Supply Chain Management:** The supply chain management helps in reducing inventory levels, reducing markdown & scrap, efficient use of resources, improved delivery and reliability, reducing outages, reduction in cycle time and transportation cost.

Supply Chain Management
(Integrated Components)



Example: Supply Chain Management

Suppose in a state the demand of Structural steel used for building is increased for a specific period of time but the current production of steel does not match with the requirement under the prevailing condition of the production of structural steel. The production cannot be suddenly increased; if it is possible to increase the production then the question of consumption of this increased capacity will come in future. So in most of the cases the steel manufacturers will either increase the price to meet their production cost, leading to increase in the cost of project. This aspect is explained in the schematic diagram on Supply Chain Management (Integrated Component) given below. The steel manufacturer's concept is of production in years whereas that of the contractor is of using steel in months. The SCM will be a compromising formula for these two concepts.

2.4 COST MANAGEMENT

Estimating cost is one of the most important aspects of construction management. Several types of estimates depending upon the objectives and resources of the

decision maker can be prepared. As expected, the accuracy of a cost estimate is proportional to the time and funds deployed. A few types of the cost estimates are the production function, order of magnitude, unit cost for the bill of quantities, and control estimates.

i. Production Function

In economics, the production function is defined as the relationship among the quantity of an output Q and the quantum of various inputs namely, xI, x2, . . . , xn to achieve it.

Q = r. f (xl, X2, . . . , Xn)

The most simple and common example in construction is the estimate of a building based upon the covered area. In this case, an input of money (say, Rs 200/ - in 1990) is found to be required on an average to produce an output of a unit square foot of covered area of standard specification of a residential building. The value of such estimates change with time mainly because of inflation, i.e. price increase. It also assumes that the scope of work and the specification is fully known. In common problems like the estimate of a residential building such information is generally known.

In other cases, the -individual production functions for the various

ii. Control Estimates

During the actual execution of the construction, a detailed analysis of costs is required to be made. The cost estimates prepared during the design or bidding stage may not be sufficient or applicable during the execution stage.

During the execution stage, the control estimate system serves two useful purposes. First, it develops the production information for materials, Human Resources the equipment that can be used as input for future estimates. Secondly, it generates information so that one may study, to take corrective measures to minimize the cost at any step.

iii. Indirect Costs

Apart from the direct material, equipment and Human Resources, the unit cost method generally combines all other costs into overheads. In case of control estimates, overheads may be divided into a number of indirect cost estimates for monitoring purposes. A checklist for such indirect costs are provided here.

i) **Temporary Utility:** This includes the cost of production and management of water, electricity and sewage disposal system. In a city area, these utilities may be purchased directly from the public utility system. In many instances, these may be generated within the site.

ii) **Consumables:** Consumables include implements, special clothings, hand tools etc. Hard hats, boots, goggles for welding, shovels, spades, baskets, tumbler'lock5, rags, stationery, medical supplies, fuses, electric bulbs, hammers, wrenches, etc.

iii) Many of the items can be estimated as a percentage of Human Resources costs.

iv) **Cleaning:** The cost of cleaning the site and disposal of rubbish is required to be estimated. It can be calculated as a percentage of Human Resources hours and the number of hauling trucks.

v) **Unloading:** The cost of unloading materials is required to be estimated. Bulky items like transformers, large diameter pipes, and prefabricated structural items may require special on site roads and unloading docks. If the railhead or ports are involved the cost of demurrage in case of delay in material handling may be substantial.

vi) **Transportation within the Job Site:** The material handling cost within the site is required to be estimated: Bulky items like the roof truss or precast piles that is required to be transported within the site may be time-consuming and costly. Special access roads may be required. In a labour-oriented construction site, material handling is time-consuming. Any mistake in planning may become time-consuming and costly. Transportation facilities within a job site may be taken as percentage of material cost or a part of the transportation may be directly estimated.

vii) **Warehousing:** A large amount of construction materials are required to be stored in site. Special facilities are required to be made for this. The cost of a cement godown, equipment storage godown, etc. is directly estimated. The cost of devices for safety and anti-pilferage are required to be estimated.

viii) **Workshop:** In a large site, a number of construction machinery is deployed. In most sites machines are not used and maintained well. The machines operate through extreme conditions and in an environment containing dust and mud. Machines require continuous maintenance and replacement. A workshop having minimum facilities is required in a site, the cost of which should be estimated. Laboratory Construction materials are required to be routinely checked for quality control. The cost of establishing and operating a laboratory is required to be estimated.

ix) **Construction Office:** For some sites, temporary or mobile structure is sufficient for the construction office. In most situations, a semi-permanent office is required for a construction office. The size depends upon the number of people that must be accommodated. Sufficient storage for files is required for safe keeping. In an extreme climate, the office is required to be temperature-controlled.

x) Communication Communications with outside and inside the site are very important. The cost may not be much while the public systems are used. In many cases, private wireless systems are required to be established and maintained. In remote sites, considerable expenses may be involved for the construction of microwave towers, dish antenna, etc.

xi) **Safety and Medical:** Safety and medical costs will depend upon the labour force, and the type of construction. Medical costs and supplies are to be included.

xii) **Quality Assurance:** Quality assurance programme is an important factor for any construction site. Routine tests for aggregates, concrete and welding are required to be made. In addition, incoming supplies are required to be checked routinely.

xiii) The cost of a quality assurance programme depends upon manpower and consumables deployed.

xiv) **Catering:** As construction work is continued for long hours, the arrangement for catering is made in many sites. For remote sites, catering is very important and expensive. Catering cost depends upon the manpower deployed.

xv) **Hospitality Cost:** Various forms of hospitality costs are incurred. Visits from the corporate office, architects or owners are the common cause of expenses. Visits from the regulatory agencies are also very common. For large sites, public relation and communication with the press are also very important for the positive projection of corporate images. The cost of hospitality depends upon the duration of the project.

xvi) **Indirect Human Resources Cost:** This is an important factor that is required to be estimated. Non-productive such as Human Resources cost arises for several reasons like bad weather, sick pay, employment benefits, holiday pays, delay for test checking and measurements.

xvii) **Project Management Cost:** This is also an important source of expenditure to be controlled. The design and management costs for shop drawings, scheduling, bill preparations, material reconciliations and project management are required to be estimated. The cost can be derived from an estimate of the manpower proposed to be deployed.

xviii) **Insurance:** Insurance is a safeguard against risk. For an individual firm, the insurance is the most cost-effective and probably the only method to deal with the risk of industrial accident. Insurance covers are generally available in a basic policy with add-on facilities. The basic policy could be on natural hazards like fire and earthquake, with add-on facilities like riot, strike and flood.

There are also tailor-made all risk cover policy offered by the insurance firms for construction sites. Separate policies are also available for the compensation of workmen or third party risk. Insurance covers are to be included as the indirect cost of a project.

iv. Contingency

Contingency is a cushion of cost to deal with the uncertainties. It has become complicated because of the different definitions assumed by the various parties. To the top management, contingency is the money, which would not be expended and would be returned as profit at the end of the project. To engineers, contingency is a savings account that can be drawn on to cover the additional costs of add-on features to the project. To construction managers, contingency is an indirect cost like a social party and gifts that cannot be charged directly to the project.

Contingency, in principle, is intended to reduce the risk of an over-run for a project executed under expected conditions. A few of the factors that belong to contingency are minor design changes, underestimate of cost and quantities, lack of experience, unanticipated price changes, corrections of minor erroneous assumptions, items not identified fully in the estimating stage and some unforeseen regulations and safety problems.

Contingency may or may not include escalation and allowances. Escalation is a provision in the estimated cost for inflation or continuing price level increase over time. Allowance is a fund included in the estimate for items that are known but cannot be defined to the extent to estimate the cost. The method for developing contingency depends on the organization, the type and duration of the project, the type of estimate and the phase of the project.

v. Cost-Volume Relationship

As the name suggests, the cost-volume relationship examines the relationship among cost, volume and profit. The cost is divided into fixed and variable components. The revenue per unit exceeds the variable cost per unit and is able to make some contribution towards recovering fixed cost. The volume at which all of the fixed costs as well as the variable costs are recovered is the breakeven point.

vi. Cost Control System

The ability to estimate construction costs accurately is a key element for the success of any contracting firm. A workable and reliable cost reporting system plays a vital role in the proper management of a construction project.

A large complex job requires a detailed complex reporting and information system whereas a simpler system is sufficient for smaller projects. At any event, the control must produce timely information. If the information is dated or unsuitable for practical use, the purpose of the control system is defeated.

Project cost accounting is the key ingredient in the project cost system. Cost accounting differs substantially from financial accounting. Cost accounting relates solely to determining the detailed requirements and the associated cost of a product. Financial accounting is normally made in terms of monetary units. Cost accounting is concerned with the quantity of materials, labour productivity in addition to the money value. The systematic and regular checking of cost is a necessary part of obtaining reliable production information. Occasional spot checks may not always provide a true picture of the productivity. The project cost accounting system supplements field supervision. Field supervisors can be alerted in case of a cost over-run. Site supervisors are the key members of the cost control team and without their support and cooperation the job cost system cannot and will not perform satisfactorily.

MODULE-3

PROCUREMENT MANAGEMENT

Procurement management is a process of acquiring goods, services, works or a combination thereof. The objective of procurement management is to procure goods or services of specified quality within stipulated time frame, at most competitive prices in fair and free manner. This is achieved through a process known as tendering / bidding.

Tendering/bidding is a process to select a suitable delivery partner/consultant/ contractor for any activity of a project or project as a whole. This is one of the most important aspects of project life cycle. The quality of out put solely depends on selection of appropriate consultant/contractor. Some of the aspects covered under this chapter are, procurement of consultant & contractor and process involved, bid process management and contract management.

3.1 THE KEY PARTNERS IN IMPLEMENTATION

The key partners responsible for the successful implementation of the project are the owner, the consultant and the contractor.

3.4 THE OWNER

The owner may be a person or a group of persons acting as a corporate body such as a local government authority or a government department, Govt. Company, a corporation or joint board or any other authority possessing adequate powers. The owner or the promoter decides to undertake the work after a detailed analysis of the costs and the payment schedule for the project. The payment to be made by the owner has to be regular and in line with the progress of the work. To maintain the flow of money the owner may utilize his own resources or borrow money from other sources, the money arranged and spent for the job is known as the "capital investment'.

3.5 THE CONSULTANT

The consultant/ engineer or architect is a person or a group of persons or a company who gives the owner the technical advice for the project. The primary function of the engineer is to design, do the necessary research work for the design, provide the calculation for the cost, and appraise the owner about the pros and cons of the project. He must be well trained in quality and workmanship requirements, and must supervise the construction daily or periodically as the case may be. In respect of all the duties and related technical matters the engineer must exercise realistic, thoroughly professional and entirely independent judgments.

An owner or a promoter may engage a consultant for the job in one of the following ways:

i) He may engage a single consultant for the entire job.

ii) He may engage one competent engineer from his own employment to do the job. Many local authorities and government departments employ their chief engineer as the consultant particularly for specialized jobs like bridges and tunnels where they have got their own expertise and the chief engineer gets the design work done by his junior engineers under his own guidance.

iii) He may engage a consultant for a portion of the job in which his own men are not expert but the remaining portion may be awarded to his own men, e.g., in a building project he may get the architectural design from an architect consultant but the structural design may be done by his own engineers. This is quite common when the owner is a government department or agency.

The payment made by the owner to the consultant is known as the "consultancy fees". This may vary depending on the volume of work to be done and whether daily or periodic supervision is to be carried out by the consultant. In case, the owner or promoter decides to employ his chief engineer as the consultant engineer then the chief engineer enjoys all the powers of a consultant for design and also works as an administrator for the construction.

A consultant is generally employed because he has every freedom to exercise his knowledge and experience for the new design and construction. He could give ample thought to the project problem, as this is his main job, work out the various alternatives based on his knowledge and experience and could finally select the one which has the most suitable form considering feasibility and economy. He has to keep abreast of the new materials and products available in the market. In addition a number of different problems are tackled by a consultant which is substantially more compared to that of a chief engineer in a government department who has specialized in problems of design and construction of his own department and may not be as good as the consultant for other problems. Thus employment of a consultant may be essential in some cases while it may be optional in others.

3.3.1 When and how to engage a Consultant?

The specific purpose and the specific rules and procedures to be followed for employing Consultants depend on the circumstances of the particular case.

However, following main considerations would guide the need and the selection process:-

- Absence of required expertise in-house;
- The need for high quality services;
- The need for economy and efficiency;
- The need to have qualified Consultants for providing the specific services;
- The importance of transparency in the selection process;
- The identification of scope of work and the time frame for which services are to be availed of.

3.5.1.1 Selection Process of Consultant

i. Preparation of Expression of Interest

The Employer/ULB (Government Ministry /ULB/ Department's) shall prepare an EOI document. The EOI document shall contain following information:

i) Invitation to EOI: It shall include a copy of the advertisement whereby consultants are invited to submit their EOI.

ii) Brief about objectives and scope of work: This may include brief description about objective of carrying out the assignment, broad scope of work and expected deliverables of the assignment. This may also include the place of execution of the assignment.

iii) Instructions to the Consultants: It may include instructions regarding nature of job; submission requirement; requirement of bid processing fees; if any; last date of submission; place of submission; and any related instruction;

iv) Pre-qualification Criteria; this may clearly lay down the prequalification criteria which shall be applied by the employer/ULB for short listing the consultants.

v) Formats for submission. This section shall specify the format in which the consultants are expected to submit their EOI.

ii. Selection Methods of Consultant

The selection of consultant shall follow any of the following methods; as considered appropriate:

i) **Quality and Cost Based Selection (QCBS):** Under normal circumstances, this method of evaluation shall be used.

ii) **Combined Quality cum Cost Based System (CQCCBS):** This method of selection shall be used for highly technical projects where weightage needs to be given to higher technical standards, while finalizing the prices.

Under CQCCBS, the technical proposals will be allotted weightage of 70% while the financial proposals will be allotted weightages of 30%. Proposal with the lowest cost may be given a financial score of 100 and other proposals given financial scores that are inversely proportional to their prices. The total score, both technical and financial, shall be obtained by weighing the quality and cost scores and adding them up. The proposed weightages for quality and cost shall be specified in the RFP.

iii) **Quality Based Selection (QBS):** This method of selection may be used under the following circumstances:

- The outcome of the assignment will have high impact and hence it is essential to engage most qualified consultant. Examples are national policy formulation; capacity building program etc.
- The assignment is very complex or highly specialized where it is difficult to define scope of work with accuracy. Examples are country specific study; reforms related studies, high precision scientific work etc.

iv) **Cost Based Selection (CBS):** This method of selection may be used for the assignments of following nature: (i) assignment where any experienced consultant can deliver the services without requirement of specific expertise. Examples are traffic surveys,

market surveys etc. and (ii) Cost of which shall not exceed Rs. Ten lakh. For small assignments, where the employer/ULB decides to select the consultant based on CBS method, the consultant shall be selected following single stage bidding procedure. Under single stage bidding procedure, the employer/ULB shall invite financial proposals along with the EOI in two separate envelopes. The financial proposals of all the consultants who have been short listed, and shall be opened in the presence of the short listed consultants who choose to remain present. The consultant, who has submitted the lowest financial bid, shall be selected as the L1 and shall be called for further negotiation.

v) **Selection through Direct Negotiations (Single Source Selection):** Selection of consultants through direct negotiations does not provide the benefits of competition in regard to quality and cost, lacks transparency in selection, and could encourage unacceptable practices. Therefore, single-source selection shall be used only in exceptional cases. This method of selection may be adopted only if it presents a clear advantage over competition and under circumstances as mentioned.

When continuity for downstream work is essential, the initial RFP shall outline this prospect, and, if practical, the factors used for the selection of the consultant should take the likelihood of continuation into account. Continuity in the technical approach, experience acquired, and continued professional liability of the same consultant may make continuation with the initial consultant preferable to a new competition subject to satisfactory performance in the initial assignment. For such downstream assignments, the Ministry or Department shall ask the initially selected consultant to prepare technical and financial proposals on the basis of TOR furnished by the Ministry or Department, which shall then be negotiated.

If the initial assignment was not awarded on a competitive basis or was awarded under tied financing or reserved procurement or if the downstream assignment is substantially larger in value, a competitive process shall normally be followed in which the consultant carrying out the initial work is not excluded from consideration if it expresses interest. For selecting a consultant under this method, the employer/ULB should prepare a full justification and take the approval of the competent authority, which normally should not be below the rank of a head of department.

While selecting the consultant under this method, the employer/ULB shall ensure that the consultant has the requisite qualification and experience to undertake the assignment. Normally the employer/ULB shall adopt the same short listing criteria as applied to similar assignments while evaluating the EOI.

Selection of Service Providers: Government and ULB/ Departments are also often engaging various service providers such as, for upkeep and maintenance

of office (other than Civil & Electrical Works etc.), transport services etc. In such cases, which are generally low value contracts, it may not be necessary to invite separate technical and financial proposals. In such case CBS method of selection can be used, after stating the minimum qualifying criteria (such as past experiences etc.).

Procurement Agents (PAs): When a Govt. department/ULB lacks the necessary organization, resources or experience, it may be efficient and effective for it to employ, as its agent, a firm that specializes in handling procurement. When PAs provide only advisory services for procurement and do not act as "agents" and are not paid a percentage fee at all, they shall be selected following the appropriate procedures as for other consulting assignments, specified in these Guidelines.

Inspection Agents: Government /ULB / Departments may wish to employ inspection agencies to inspect and certify goods prior to shipment or on arrival in the Government Ministry / Department country. The inspection by such agencies usually covers the quality and quantity of the goods concerned. Inspection agencies may be selected using two bid system procedures and using a contract format with payments based on a percentage of the value of goods inspected and certified.

Financial Advisors: Investment and commercial banks, financial firms, and fund managers hired by the Govt. or Department for the sale of assets, issuance of financial instruments, and other corporate financial transactions, notably in the context of privatization operations, shall be selected under two bid systems.

The RFP shall specify selection criteria relevant to the activity-for example, experience in similar assignments or network of potential purchasers-and the cost of the services. In addition to the conventional remuneration (called a "retainer fee"), the compensation includes a "success fee"; this fee can be fixed, but is usually expressed as a percentage of the value of the assets or other financial instruments to be sold. The RFP shall indicate that the cost evaluation will take into account the success fee in combination with the retainer fee. The financial scores shall be based on the retainer fee and success fee as a percentage of a pre-disclosed notional value of the assets. The RFP shall specify clearly how proposals will be presented and how they will be compared.

Auditors: Auditors typically carry out auditing tasks under well defined TOR and professional standards. They shall be selected according to two bid system, with cost as a selection factor.

iii. Standard formats for technical and financial proposals

The standard formats for technical proposal include:

i) Format for Letter of Proposal submission

ii) Format for Consultant's organization and experience

iii) Format for Comments and suggestions on TOR

iv) Format for Approach and methodology

v) Format for Team Composition

vi) Format for Curriculum Vitae of key professionals

vii) Format for Staffing Schedule

viii) Format for Work Schedule

ix) Format for Comments / modifications suggested on draft contract.

x) Format for information regarding any conflicting activities and declaration thereof. The standard formats for financial proposal include:

- A summary sheet of the cost estimate to be quoted by the consultant.
- Remuneration payable.
- Reimbursables.

Indicative Marks to be given for selection

1.	Relevant Experience of the firm	20
2.	Methodology, work plan and understanding of TOR	25
3.	Suitability of the Key personnel for the assignment	45
4.	Capability for Transfer of knowledge training	10
	TOTAL	**100**

Highest points basis: On the basis of the combined weighted score for quality and cost, the consultant shall be ranked in terms of the total score obtained. The proposal obtaining the highest total combined score in evaluation of quality and cost will be ranked as H-1 followed by the proposals securing lesser marks as H-2, H-3 etc. The proposal securing the highest combined marks and ranked H-1 will be invited for negotiations, if required and shall be recommended for award of contract.

As an example, the following procedure can be followed.

In a particular case of selection of consultant, It was decided to have minimum qualifying marks for technical qualifications as 75 and the weightage of the technical bids and financial bids was kept as 70: 30. In response to the RFP, 3 proposals, A,B & C were received. The technical evaluation committee awarded them 75, 80 and 90 marks respectively. The minimum qualifying marks were 75. All the 3 proposals were, therefore, found technically suitable and their financial proposals were opened after notifying the date and time of bid opening to the successful participants. The price evaluation committee examined the financial proposals and evaluated the quoted prices.

Under QBS method, the consultant who has secured first rank in technical evaluation shall be called for further negotiation after opening and evaluation of its financial proposals. The Name of the successful bidder along with details of cost etc. shall be posted on the departmental website after the award to the successful bidder has been made and communicated to him in writing.

iv. Negotiations and Award of Contract

Negotiations are not an essential part of the selection process. In many cases, however, it is felt necessary to conduct negotiations with the selected

consultant. Negotiations shall include discussions of the TOR, the methodology, staffing, Government Ministry /ULB/ Department's inputs, and special conditions of the contract. These discussions shall not substantially alter the original TOR or the terms of the contract, lest the quality of the final product, its cost, and the relevance of the initial evaluation be affected. The final TOR and the agreed methodology shall be incorporated in "Description of Services," which shall form part of the contract. Financial negotiations shall only be carried out if due to negotiations there is any change in scope of work which has any financial bearing on the final prices or of the costs/cost elements quoted are not found to be reasonable. In such negotiations, the selected firm may also be asked to justify and demonstrate that the prices proposed in the contract are not out of line with the rates being charged by the consultant for other similar assignments. However, in no case such financial negotiation should result into increase in the financial cost as originally quoted by the consultant and on which basis the consultant has been called for the negotiations. If the negotiations with the selected consultant fail, the employer/ULB shall cancel the bidding procedure and re-invite the bids.

v. Rejection of All Proposals, and re-invitation

The Government /ULB/ Department will have the right to reject all proposals. However, such rejections should be well considered and normally be in cases where all the bids are either substantially in deviation to the TOR or considered unreasonably high in cost and in latter case, the lowest qualified bidder during negotiations fails to reduce the costs to a reasonable level. If it is decided to reinvite the bids, the terms of reference should be critically reviewed /modified so as to address the reasons of not getting any acceptable bid in the earlier Invitation for Bids.

vi. Confidentiality

Information relating to evaluation of proposals and recommendations concerning awards shall not be disclosed to the consultants who submitted the proposals or to other persons not officially concerned with the process, until the award of contract is notified to the successful firm.

3.3.1.2 Selecting the Right Type of Contract

The Government/Department/ ULB has to decide on the suitable type of contract for the work. The various types of contracts have been dealt under:

i. **Lump Sum (Firm Fixed Price) Contract:** Lump sum consultancy contracts are used mainly for assignments in which the content and the duration of the services and the required output of the consultants are clearly defined. They are widely used for simple planning and feasibility studies, environmental studies, detailed design of standard or common structures, preparation of data processing systems, and so forth. Payments are linked to outputs (deliverables), such as reports, drawings, bills of quantities, bidding documents, and software programs. While lump sum consultancy contracts are easy to administer because payments are due on clearly specified outputs, it is essential that the terms of payments for these consultancy contracts are linked with the output and the time frame within which each of the defined activities are to be completed.

This type of contracts shall normally be used by all Government / Departments for hiring services of the consultants under this guideline.

ii. **Time-Based Contract:** This type of contract is appropriate when it is difficult to define the scope and the length of services, either because the services are related to activities by others for which the completion period may vary, or because the input of the consultants required to attain the objectives of the assignment is difficult to assess. This type of contract is widely used for complex studies, supervision of construction, advisory services, etc. Payments are based on agreed hourly, daily, weekly, or monthly rates for staff (who are normally named in the contract) and on reimbursable items using actual expenses and/or agreed unit prices. The rates for staff include salary, social costs, overhead, fee (or profit), and, where appropriate, special allowances. This type of contract shall include a maximum amount of total payments to be made to the consultants. This ceiling amount should include a contingency allowance for unforeseen work and duration, and provision for price adjustments, where appropriate. Time-based contracts need to be closely monitored and administered by ULB or Department to ensure that the assignment is progressing satisfactorily and that payments claimed by the consultants are appropriate.

iii. **Retainer and/or Contingency (Success) Fee Contract:** Retainer and contingency fee contracts are widely used when consultants (banks or financial firms) are preparing companies for sales or mergers of firms, notably in privatization operations. The remuneration of the consultant includes a retainer and a success fee, the latter being normally expressed as a percentage of the sale price of the assets.

iv. **Percentage Contract:** These contracts are commonly used for architectural services. They may be also used for procurement and inspection agents. Percentage contracts directly relate the fees paid to the consultant to the estimated or actual project construction cost, or the cost of the goods procured or inspected. The selections made based on two stage bidding. The final selection is made among the technically qualified consultants who have quoted the lowest percentage while the notional value of assets is fixed. It should be borne in mind that in the case of architectural or engineering services, percentage contracts implicitly lack incentive or economic design and are hence discouraged. Therefore, the use of such a contract for architectural services is recommended only if it is based on a fixed target cost and covers precisely defined services.

v. **Indefinite Delivery Contract (Price Agreement):** These contracts are used when Government or ULB or Department need to have "on call" specialized services to provide advice on a particular activity, the extent and timing of which cannot be defined in advance. These are commonly used to retain "advisers" for implementation of complex projects (for example, dam panel), expert adjudicators for dispute resolution panels, institutional reforms, procurement advice, technical troubleshooting, and so forth, normally for a period of a year or more. The Government /ULB / Department and the firm agree on the unit rates to be paid for the experts, and payments are made on the basis of the time actually used. The consultant shall be selected based on the unit rate quoted by them for providing the services.

3.3.1.3 Important Provisions in RFP / Contract to Be Considered

i. **Currency:** Under normal circumstances, all the contracts should be based on Indian Rupees only. However, for exceptional case, contracts in foreign currency may be permitted with prior approval of competent authority. RFPs shall clearly state that firms may express the price for their services, in the currency specified in RFP. If RFP allows proposals in any other currency, the date and the exchange date for converting all the bid prices to Indian Rupees shall be indicated in RFP.

ii. **Payment Provisions:** Payment provisions, including amounts to be paid, schedule of payments, and payment procedures, shall be agreed upon during negotiations vis-a-vis RFP and also indicated in the draft contract. Payments may be made at regular intervals (as under time-based contracts) or for agreed outputs (as under lump sum contracts). Payments for advances if any should normally be backed by Bank Guarantee. The limit for advance payment will be as prescribed by GFR. Normally, it should not exceed 10% of the cost of the contract. Any advance payment should be backed by a bank guarantee.

iii. **Bid Securities and bid processing fees**: The consultants submitting the proposals shall provide bid security along with their proposal. The amount, form and mode of submission of bid security and the method of refund of the bid security shall be specified in the RFP document. The employer/ULB/ may also charge an appropriate bid processing fees, which is not refundable. However, for smaller assignment, the employer/ULB/ may waive the requirement of bid security.

iv. **Conflict of Interest:** The consultant shall not receive any remuneration in connection with the assignment except as provided in the contract. The consultant and its affiliates shall not engage in consulting activities that conflict with the interest of the client under the contract and shall be excluded from downstream supply of goods or construction of works or purchase of any asset or provision of any other service related to the assignment other than a continuation of the "Services" under the ongoing contract. It should be the requirement of the consultancy contract that the consultants should provide professional, objective and impartial advice and at all times hold the client's interests paramount, without any consideration for future work, and that in providing advice they avoid conflicts with other assignments and their own corporate interests. Consultants shall not be hired for any assignment that would be in conflict with their prior or current obligations to other clients, or that may place them in a position of being unable to carry out the assignment in the best interest of the Employer/ULB/. Without limitation on the generality of the foregoing, consultants shall not be hired, under the circumstances set forth below:

    i) ***Conflict between consulting activities and procurement of goods, works or services:*** A firm that has been engaged to provide goods, works, or services for a project, and each of its affiliates, shall be disqualified from providing consulting services related to those goods, works or services. Conversely, a firm hired to provide consulting services for the preparation or implementation of a project, and each of its affiliates, shall be disqualified from

subsequently providing goods, works or services for such preparation or implementation.

ii) ***Conflict among consulting assignments:*** Neither consultants (including their personnel and sub-consultants) nor any of their affiliates shall be hired for any assignment that, by its nature, may be in conflict with another assignment of the consultants. As an example, consultants hired to prepare engineering design for an infrastructure project shall not be engaged to prepare an independent environmental assessment for the same project, and consultants assisting a client in the privatization on public assets shall neither purchase nor advise purchasers of, such assets. Similarly, consultants hired to prepare Terms of Reference (TOR) for an assignment shall not be hired for the assignment in question.

iii) ***Relationship with Government /ULB/ Department's staff:*** Consultants (including their personnel and sub-consultants) that have a business or family relationship with such member(s) of the Ministry or Department's staff or with the staff of the project implementing agency, who are directly or indirectly involved in any part of;

- The preparation of the TOR of the contract,
- The selection process for such contract, or
- Supervision of such contract; may not be awarded a contract unless it is established to the complete satisfaction of the employing authority, for the reason to be recorded in writing, that such relationship would not affect the aspects of fairness and transparency in the selection process and monitoring of consultant's work.

v. **Unfair Competitive Advantage:** Fairness and transparency in the selection process require that consultants or their affiliates competing for a specific assignment do not derive a competitive advantage from having provided consulting services related to the assignment in question. To that end, the request for proposals and all information would be made available to all short listed consultants together.

vi. **Professional Liability:** The consultant is expected to carry out its assignment with due diligence and in accordance with prevailing standards of the profession. As the consultant's liability to the employer/ULB/ will be governed by the applicable law, the contract need not deal with this matter unless the parties wish to limit this liability. If they do so, they should ensure that:

i) there must be no such limitation in case of the consultant's gross negligence or willful misconduct;

ii) the consultant's liability to the employer/ULB may in no case be limited to less than the total payments expected to be made under the consultant's contract, or the proceeds the consultant is entitled to receive under its insurance, whichever is higher; and

iii) any such limitation may deal only with the consultant's liability toward the employer/ULB and not with the consultant's liability toward third parties.

vii. **Staff Substitution**: During an assignment, if substitution is necessary (for example, because of ill health or because a staff member proves to be unsuitable, or the member is no longer working with the consultant), the consultant shall propose other staff of at least the same level of qualifications for approval by the Employer/ULB. The contract must specifically make provision for terms and conditions under which the staff can be replaced, about the remuneration to be paid etc.

viii. **Applicable Law and Settlement of Disputes:** The contract shall include provisions dealing with the applicable law, which should be the law applicable in India and the forum for the settlement of disputes.

ix. **Training or Transfer of Knowledge:** If the assignment includes an important component of training or transfer of knowledge to Government/Project staff, the Terms of Reference (TOR) shall indicate the objectives, nature, scope, and goals of the training program, including details on trainers and trainees, skills to be transferred, time frame, and monitoring and evaluation arrangements. The cost for the training program shall be included in the consultant's contract and in the budget for the assignment.

x. **Standards of Ethics:** Government / Department/ ULB as well as consultants should observe the highest standard of ethics during the selection and execution of such contracts.

i) In pursuance of the above objective, this policy defines, the terms set forth below as follows: "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value to influence the action of a public official in the selection process or in contract execution; and "fraudulent practice" means a misrepresentation or omission of facts in order to influence a selection process or the execution of a contract, "Collusive practice" means a scheme or arrangement between two or more consultants, with or without the knowledge of the employer/ULB, designed to establish prices at artificial noncompetitive levels. "Coercive practice' means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract.

ii) It is further provided that:-

- Employer/ULB will reject a proposal for award if it determines that the consultant recommended for award has engaged in corrupt or fraudulent activities in competing for the contract in question;
- The Government will declare a consultant ineligible, either indefinitely or for a stated period of time, to be awarded a Government contract if it at any time determines that the consultant has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract; and The employer/ULB has the right to require that, in contracts, a

provision be included requiring consultants to permit the employer/ULB to inspect their accounts and records relating to the performance of the contract and to have them audited by auditors appointed by the employer/ULB.

xi. **Monitoring of the Contract:** The Government / Department /ULB awarding the consultancy contract should be involved throughout in monitoring the progress of the assignment. Suitable provision for this should be made in the contracts which should also take care of the need to terminate / penalize the contractor or to suspend payments till satisfactory progress has not been achieved. CMC shall be formed by the employer/ULB to monitor the progress.

Individual consultants are normally employed on assignments for which:

i) Teams of personnel is not required,

ii) No additional outside professional support is required, and

iii) The experience and qualifications of the individual are the paramount requirement. Selection of Individual consultants shall be carried out by advertising the requirement in at least one national newspaper of repute. Selection shall be based on their qualifications for the assignment. They shall be selected through comparison of qualifications of at least three candidates among those who have expressed interest in the assignment or have been approached directly by the Employer/ULB. Individuals employed shall meet all relevant qualifications and shall be fully capable of carrying out the assignment. Capability is judged on the basis of academic background, experience, and, as appropriate, knowledge of the local conditions, such as local language, culture, administrative system, and government organization.

Selection will be carried out by the Evaluation Committee (EC) which will award marks for the educational qualifications and experience and select the most suitable candidate for the assignment. The EC may also interview the candidates and award marks for their performance in the interview and recommend the remuneration to be paid.

From time to time, permanent staff or associates of a consulting firm may be available as individual consultants. In such cases, the conflict of interest provisions described in these Guidelines shall apply to the parent firm. Individual consultants may be selected on a direct negotiation basis with due justification in exceptional cases such as, the tasks that are a continuation of previous work that the consultant has carried out and for which the consultant was selected competitively; assignments lasting less than six months; emergency situations resulting from natural disasters; and when the individual is the only consultant qualified for the assignment.

3.4 THE CONTRACTOR

A civil engineering contractor is a person, or a group of persons or a company who undertakes the construction. He offers to do the job for a given sum of money and in case the tender is accepted he signs a contract with the owner or promoter to undertake the construction. He must have the skill and

competence to execute the work exactly as the owner wants and the engineer advises. He is to do the construction work as per the drawings, specifications and instructions issued to him by the engineer and as per the details given in the contract signed by him.

For the construction work, the owner has got several choices for selecting contractors:

i. The whole job may be awarded to a construction company, or

ii. If the promoter is a government department having a full-fledged maintenance wing, the new construction could also be entrusted with the maintenance division depending on the size of the new construction and the supervision of construction could be done by the departmental engineer in addition to the design work.

Sometimes the promoter may employ the contractor to do both the design -and the construction on contract. This arrangement is known as the **"package deal"** or **"turn key"**.

The owner is supposed to reimburse the cost of construction to the contractor as per the advice of the consultant and there should not be any dispute.

The arrangement that is made between the owner, consultant and contractor should be such that there is no chance of misunderstanding among them.

There is no direct contract between the engineer and the contractor. The engineer has no power to accept or reject a tender. The engineer calls upon construction firms to tender. After receiving the tenders or quotations he is to refer them to the employer/ULB/ to seek the employer's/ULB's acceptance. But the engineer has to guide and advise the employer/ULB to select the tenderer. In order to make the contract binding between the owner and the contractor, an agreement has to be signed between the two parties. This document is normally sealed in case of government or quasi-government departments.

For sanctioning any extra work to the contractor for genuine reasons, the owner is to be consulted first. The contract may have the provision for a "provisional sum" and provision for contingencies which act as buffers for accommodating extra work to be done which are not included in the tender document. For example, local weakness or character of the soil exposed after excavation may call upon changes in the size or the type of foundation, which may involve extra cost. This extra cost is made available from the above sums of money. But changes in specification in the items of work should not be encouraged, e.g. white wash on walls should not be changed into lime punning, or plaster of paris or Indian patent stone should not be changed to marble floor. In case similar changes are required, prior permission from the owner should be obtained and the owner should be informed about the financial involvement for the specified change before the item is actually undertaken.

Similarly, there may be inadvertent omission of important things while the tender was prepared, e.g. the contractor might have thought of using cranes, hoists, etc. during construction but while preparing the tenders these may not have been mentioned. Under these circumstances, the permission as well as

the sanction of the owner are necessary before the equipment is actually used at site.

3.4.1 Selection of Contractor

The selection of a contractor is done through inviting a tender / bid. Bid is means of securing goods and services on best possible terms from techno economic angle.

Main objectives of bidding are:

(i) To choose suitable contractor /consultant on best possible terms for service delivery.

(ii) To choose contractor / consultant with skills, experience and resource.

(iii) To secure desired service requirement and efficiency

The objective is to choose a contractor who has adequate experience in execution of similar type of job and has sufficient financial resources to execute the job within the stipulated time frame. The contractor should have sufficient in house human resources with technical skills and required equipment, machinery and T&P to execute the job in systematic manner.

3.4.1.1 Types of Bids

i. NIT's - Notice Inviting Tenders

The invitation of bids is normally issued as an advertisement in at least a National news paper of general circulation as **Notice Inviting** Tender and official notification in form of a circular is issued to pre-qualified contractors if any who had expressed interest in bidding for works.

ii. LCB -- Local Competitive Bids (Procurement at local level)

Local competitive bids are invited when the department intends to procure the services from the contractors / consultants within the city/ district level in such cases the cost of the projects may not be very high. The NIT may be advertised in the local newspaper and through circular put on the official notice board.

iii. NCB -- National Competitive Bids (Invitation to National players)

National Competitive Bids are invited through tender notice in more than one National newspaper for projects requiring high technical and managerial expertise and to ensure the availability of best possible terms for service delivery including technical skills from the service provider.

iv. ICB -- International Competitive Bids

The International Competitive Bids are invited through invitation in the international market when the goods and services have to be procured internationally or in case of the projects seeking funding from international agencies.

3.4.1.2 Types of Bidding / Tendering Process

i. Single sealed Bid:

The single sealed bid is invited from the bidders, which are in the form of fill in the blanks, which the bidders are supposed to fill up and submit for consideration.

ii. Sealed single bid:

Sealed single bid is invited from the bidders seeking details of the technical capability of the bidders as well as the financial bid for undertaking the job.

iii. Two stage bidding (RFQ+RFP)/ RFP (T&F):

The bidding process is in two stages and is of the following two types:

The first type of bidding process involves "Request for Qualifications" (RFQ) in the first stage containing qualifying criteria for selection of bidders to participate in the second stage. Under the second stage the qualified bidders are requested to submit their financial bids which are further evaluated.

The second type of two stage bidding invites "Request for Proposal" which includes Technical proposals as well as financial proposal in two separate sealed envelopes. To start with the Technical proposals are evaluated and bidders are technically qualified based on the pre decided criteria. The financial bids of technically qualified bidders are evaluated for seeking the best possible terms of services delivery.

In both types of two stage bidding process mentioned above, the evaluation criteria for technical bids and financial bids is pre decided by the department and notified as part of the bid document.

Such type of bidding process is suitable to JNNURM Projects with high capital cost which require highly skilled and competent contractors for execution.

iv. Three Stage Bidding:

First stage involves 'Request for Qualification / Capability statement- The first stage primarily involves seeking technical & financial capability of the bidder including its financial strength to pre qualify/ shortlist the contractors/ consultants for seeking goods and services.

Second stage involves 'Request for proposal' i.e. Technical Bid- wherein the technical expertise available with the contractor/ bidder to execute the project including experience on similar projects is requested. The bidder is also supposed to give his methodology / action plan for executing the project to sensitize the authorities about its capabilities in executing the projects.

Third stage seeks Financial Bid from only technically qualified bidders- in this stage normally the financial bids is sort from the bidder who ahs been rated as technically one, two and three but only the financial bid of the first technically qualified bidder is opened.

v. Swiss Challenge System in Bidding Process

It is an offer made by an entrepreneur for project to the government ensuring his process to be the best (in terms of effectiveness including both the factors cost and time) by his initiative as a result of his own innovative approach or on the demand of the government to perform certain task.

The Swiss challenge system, like the bonus system, further allows third parties to make better offers for a project during a designated period.

Then accordingly, the original proponent gets the right to counter-match any superior offers given by the third party. Countries like Philippines, South Korea, Chile have strong experience of this mode. In India, Gujarat has adopted the above process for the Sabarmati River Front Development Project at Ahmedabad.

Under the above method the government can either purchase the intellectual property rights for a Project Concept from the proponent or then award the project through a competitive bidding process in which no bidder has a pre-defined advantage, or the government can offer the original proponent an advantage in a competitive bidding process. In this case the government should create rewards that satisfy the original proponent while still allowing a truly competitive process.

3.4.1.3 Contents of Request for proposal (RFP)

A typical RFP document may include the following:

i. Section 1 -- Letter of Invitation

The letter of invitation contains invitation form the department to eligible bidders/ contractors for seeking specific goods and services.

ii. Section 2 -- Instructions to consultants/bidder

This section contains the general instructions to the contractors including the guidelines for eligibility, security deposit and other terms and conditions.

iii. Section3 -- Technical proposal --standard forms

The Technical proposal should include:

- Bidders' eligibility/ capability Statement should include the following- Over view of bidders' business with details of in-house manpower, infrastructure, equipment etc. along with the following documents- Audited balance sheet (3-5Yrs), Solvency certificate, Other registration details, Documentary proof of the similar services rendered along with completion certificates.
- The technical proposal should also include the following details- Consultants organization and experience, Comments and suggestions on TOR, Approach and Methodology and work plan for performing the assignment, Team composition and task assigned, CV's of proposed professional staff, Staffing schedule, Work schedule.

iv. Section 4 -- Financial proposal --standard forms

There are different options for structuring financial proposals. Some of the most common options include seeking bids on:

- The highest price or the highest concession fee paid to the Govt. for e.g. in case of running of Slaughter House, whichever party pays the highest slaughtering fee to the local body.
- The lowest cost to the Govt. for constructing or operating facilities or services. For e.g. lowest operation & maintenance cost (O&M) offered or quoted by a party to be charged from the local body in case of operation & maintenance of Landfill site.
- The largest amount of investment to be undertaken by the operator. For e.g. in case of construction and commissioning of composting plant under Solid Waste Management.
- The lowest tariff to be charged to the consumer. In case of door-to-door collection of solid waste by a private party and charges thereof.
- The lowest net present value of the future revenue stream to the developer from the services or the project.
- The lowest subsidy the Govt. may provide to the winning bidder to operate a loss making service for e.g. failed projects of waste to energy
- Maximum extent of new service coverage promised or minimum length of concession period for e.g. in case of construction of flyovers, BRTS etc.

The options for seeking the financial proposal have to be decided and approved by the competent authority well before initiating the tendering process keeping in view the type of contract. The option for seeking the financial bid should be clearly brought out in the tender document to enable the contractor to provide the best possible deal.

v. Section 5 -- Terms of reference

vi. **Section 6 -- General & Special conditions of contract**

(* Format *of General terms & Conditions of RFP Document attached as annexure-I)*

3.4.1.4 Evaluation Of RFP

i. Technical Evaluation criteria for two and three stage bidding process: (RFP)

While initiating the two and three stage bidding process the technical and financial evaluation criteria is decided by the department and indicated in the Tender document/ Request for proposal document.

Over the years projects funded by external funding agencies have been executed in India wherein the evaluation criteria for evaluating technical and financial bids has been laid down to select best contractors and consultants undertaking the job. Specific scores have been earmarked for experience of the

contractor, methodology and work plan, organization and staffing and key professional staff competent to handle the assignment. The evaluation committee evaluates the technical proposal applying the evaluation criteria wherein the minimum technical score is also earmarked and the proposals getting less than the minimum technical score are rejected.

An indicative sample of technical evaluation criteria is given below:

- Specific experience of consultant relevant to assignment (10)
- Approach & methodology (20)
- Organization and staffing (05)
- Work plan (05)
- Key professional staff (10)
- Team leader (5)
- Environmental Eng. specialist (10)
- Social development specialist (05)
- Infrastructure special (10)
- Quality Control Specialist (10)
- Contract Management specialist (10)

The bidder who secures a minimum score of 75% is normally considered technically qualified.

ii. Financial Evaluation criteria:

Financial bids are evaluated based on the rates quoted for different categories of activities and the weightage is given in respect of the maximum scores laid down for financial bid.

iii. Final Ranking

The formula for financial scores (Sf):

Sf =100 x Fm / F, Fm is the lowest price quoted

F is the price of proposal under consideration.

Weight age for Technical: T=0.8

Financial: F=0.2

While arriving at the final scores of the bidders the scores obtained after giving the Weight age of technical and financial as per the above formula the highest scorer is taken as the successful bidder.

3.4.2 BID MANAGEMENT

3.4.2.1 Bid Process

i. Preparation Of Bid Document: Bid document should contain the following:

- Instructions to Bidders
- Brief of Project & Detailed Scope of Work
- Technical specifications
- General & Specific Conditions of Contract

- Forms of Bid, bid security, appendix to the bid, Qualification Information and Letter of Acceptance
- Bill of Quantities
- Forms of Agreement
- Forms of performance, Securities, Bank Guarantees for Mobilization advance if required
- Drawings

ii. Inviting Tenders

A tender notice, usually drafted by an engineer containing a brief description of the required work, is publicly advertised in the newspaper calling attention of tenders and giving the name of the employer/ULB/ on the top of the notice. Further, it may be mentioned in that notice that no reimbursement will be made for the expenses incurred for submitting tenders and the employer/ULB has the liberty to choose any tender he thinks best without giving, any explanation to any body and he is not bound to select the lowest tender. The contractors are required to purchase the tenders and are not free of cost.

The price depends on the volume of the document and approximate estimated cost of the job as evaluated by the employer/ULB consultant. This is done in order to make sure that only genuinely interested parties quote for the job.

Alternatively, sometimes jobs are awarded on the basis of the quotations received from "selected tenderers", which means tenders are invited from a group of known reputed contractors who are considered suitable for the job. This method is known as "pre-qualification" and saves a lot of time on the part of the employer/ULB, consultant and the contractor. Sometimes, for special types of jobs it may be mentioned in the advertisement that specialist contractors having considerable experience alone apply. In order to judge the credibility and capacity of the contractor the employer/ULB may like to know the names of the previous employer/ULB, present labour force, plant and equipment possessed or any other details considered necessary by the employer/ULB and the contractor is to oblige the employer/ULB with this information.

iii. Issue of tenders to bidder

Tender documents are issued to only those bidders who are eligible as per the laid down eligibility criteria, on payment of prescribed tender fee.

iv. Pre-bid Meeting

Pre-bid meeting is organized by the owner department to clarify the doubts and any query raised by the bidders. This meeting is generally held 10-15 days before closing date for submission of bid. The department has to clarify the doubts and the queries raised by the bidders in the pre bid meeting or any addition information sought by the bidders well before the last day of the submission of the bid, so as to enable the contractors to understand the requirements of the department and the expectations from them.

v. Receipt, Opening of Bids

Bid document shall clearly mention the date and time of receipt of dully filled bid document to be submitted by the bidder. Tender document shall be opened in presence of bidders who intend to be there at prescribed date and time.

3.4.2.2 Bid Design

Apart from structure of Bid, Bidding rules and procedures should be designed to ensure transparency. This includes:

i) Whether to use reserve price or to announce Estt. Cost.

ii) Whether & when to use sealed bids or open bid.

iii) Whether to have single or multiple rounds of bidding.

iv) Whether to have bid bonds or activity rules.

v) Whether bidder be remunerated for portion of the bid cost (Strength of the bidder in particular area)

3.4.2.3 Bid structure and Evaluation

Before inviting bids the Bid Process and Bid Evaluation Process should be planned and designed.

i) Whether to have Two-Stage process involving sequential evaluation of Technical & Financial proposal

ii) How to assess weather technical proposal is fully responsive to specified requirements.

3.4.2.4 Scrutiny of Bids

Each of the offers received from each contractor are studied in detail with an eye to judge whether the quotes are approximately similar. Some may have quoted with reservation, while others may insist on provisions not covered in the document prepared. And some others may suggest their own specifications for some of the items of work, which may be inferior or may be even better than what are suggested in the specifications. There may be mistakes in arithmetic, or even in interpretation. .

The time of completion is another important aspect. Sometimes the consultant may propose the name of a relatively high-priced tenderer whose time of completion is relatively lesser because any structure completed earlier will yield returns earlier. In addition, the price of materials, even those scheduled under government's supply, increases with time and hence early completion is preferable.

All the above parameters are studied vis-a-vis a standard offer, thereby making a fair comparison of all the tenders.

From this comparison the lowest 3 or 4 tenders are meticulously examined. When the tenders are based on the bill of quantities, the detailed price submitted by different contractors for the same portion of work could be compared well. It becomes easy to judge whether the price quoted are on the higher side and therefore unworkable. As far as the contractors are concerned, it may be their strategy to under quote some of the items and to over quote others. It is the consultant's job to be vigilant to note that the quotes do not go to the extreme.

Supposing a contractor quotes quite a high price for the items of work which are done at the beginning of the construction while low price are quoted for the following items and the contractor after finishing the initial items of work

stops construction on any plea and finally leaves the job, then the employer/ULB has to suffer a lot as he has really overpaid the contractor, even the contractor may have a tendency to give less attention for the loosing items which will indirectly result in bad workmanship and items below specifications. With hundreds of items of work it is found that there are few, items which cost 70 to 90% of the total value of work. These are the most important items, which should be studied carefully. The unit price quoted for the provisional items should also be given proper attention. In case the price is high and the quantity of the item is larger than planned, the employer/ULB has to pay a higher price, which may even exceed the price of the next lowest contractor.

The bids are briefly scrutinize to ensure:

i) Earnest money has been deposited by the bidder in proper shape along with tender.

ii) Pre-qualification criteria met or not

iii) Financial status (Projects of say Rs100 Cr)

iv) Validity of offer (Accepted or not)

v) Whether the NIT conditions are adhered to

Pre-qualification & Short listing

i) Govt. wants to ensure that winning bidder has the technical and financial capacity to implement the project.

ii) Govt. does not want to award work to operator who offers best deal on paper but later fails to deliver.

One way to reduce this problem is to design the concession contract so that it is attractive only to operators who are confident to operate the business.

Bid Design, bid structure & Evaluation Criteria, Pre-qualification & short listing of contractors has to be decided with the approval of the competent authority before inviting the bids through notice inviting the tender and evaluation criteria included in the tender document. Any change in criteria after issuing the tenders may invite judicial scrutiny and may vitiate transparency.

3.4.2.5 Methods for Awarding Of Bids:

Any process for award of bid to be selected by the department should incorporate elements of competition and negotiations at various stages of bidding process. The awarding of bids can be classified into three categories:

i. Competitive bidding

ii. Competitive Negotiations

iii. Direct Negotiations & Unsolicited bids

i. Competitive Bidding:

The Competitive Bidding generally includes request for expression of interest for award of concession for a private infrastructure project or service. A formal process of pre qualifying the potential bidders and distribution of information bidding documents etc. is initiated. A formal process for presenting, evaluating proposals and selecting the successful bidder is in public domain.

Advantages of Competitive Bidding:

i) Transparency- liable to public scrutiny avoiding accusations of corruption

ii) Lower Tariffs- Better information

iii) Curbing monopolies

Disadvantages of Competitive Bidding:

i) High cost of bid preparation

ii) Not suitable for small contract

iii) Restricts innovation unless the project is properly structured

iv) Lower bidder may default after award

Competitive bidding is easiest to design and implement when:

- **The product and service is fairly standard**
- **The technical parameters can be defined with reasonable certainty in bidding document**
- **There is limited scope for innovation and creativity by the bidder**

ii. Competitive Negotiations

Some times it may be possible to combine the competitive bidding with direct Negotiations to promote transparency while preserving the innovative proprietary rights of the proposals developer. The negotiations may be undertaken directly with one or more developers and competition could be used to reduce the number of potential developers and negotiations used to work out the detailed terms and conditions of the contract. Under such conditions government may have atleast a bidder to fall back upon in case the preferred bidder fails to come up to the government's expectations.

Competitive Negotiations are well suited to the project where:

i) There is a scope of innovation and different approaches by developers and authorities hope to get imaginative proposals

ii) It is difficult to secure financing on the basis of standardized contract document

iii. Direct Negotiations & Unsolicited bids

The project idea generally originates from a private developer who seeks to negotiate directly with the government on terms and conditions of infrastructure projects. It is likely that the competitive bidding process may not yield desired result such as:

i) The competitive bidding process for the projects in smaller municipalities may be costly and it may be difficult to attract the project developers.

ii) In case of natural disasters and emergencies major projects related to repairs and restoration to be completed rapidly.

iii) The projects involving innovating technologies proposed by a private sponsor.

However to ensure some degree of competitiveness transparency and efficient outcomes, the following methodologies could be adopted:

i) Benchmarking against the cost of similar projects

ii) Establishing an independent advisory panel to review the proposed transaction.

iii) Announcing the proposed terms and conditions.

iv) Allowing other developers to better the terms within the specified project.

3.4.3 CONTRACT MANAGEMENT

A contract is a legally binding agreement between the parties identified in the agreement to fulfill all the terms and conditions outlined in the agreement. The word contract is defined in short as an agreement between the parties which is forcible under the law. the person in charge of the project is known as employer and the one who agrees to execute or perform as per the contract is known as the contractor. The prerequisite for the enforcement of the contract among other things is the condition that all the parties to the contract agree to the terms and condition of the contract.

The International Federation of Consulting Engineers (FIDIC) document provides for General Conditions of the Contract and Conditions for Particular Application (COPA).

The main aim of the contract management is to obtain a service/ product as agreed in the contract and achieve desirable value for money. The contract management may also aim at improvement in performance through the life of the contract. The key to the efficient contract management is the terms and conditions of the contract which should include detailed specifications, bill of quantities, contractor's bonus, liquidated damages, procedure to measure the items executed, price adjustment procedure, change control procedure, time period, fore closure, termination etc. and all formal mechanism that would enable a contract to be implemented.

It is vital to formulate a contract that clearly identifies the obligations of the contractor and the employer and should be built on a firm formal and legal foundation with flexibility clause to accommodate changes.

The key factors for the success in contract management/ administration are:

- Mutual trust between employer and contractor
- Communication
- Recognition of mutual aims

A good contract manager should be proactive and should aim to anticipate and respond to the project needs. An ill managed contract from employer side may result into the following:

- Contractor is likely to neglect the quality in execution and the product may not be structurally safe or durable.
- Decisions are not taken at right time or not taken at all. This may lead to time and cost overruns and delay in payment approvals-claims.

Structure for the contract should be designed to facilitate effective implementation. Information flows and proper communication should be stipulated in the beginning of the process and continue right through the contract period. Staff involved in contract administration should be committed and set procedure for raising the issues and resolving the disputes has to be laid down so that they could be dealt with at the earliest. The contract administration that is formal governance of the contract includes the tasks such as cost monitoring, payment procedures, funding procedures, variation ordering procedures, resource management and planning, contract document, maintenance and variation, project asset management and management reporting.

3.4.3.1 Elements of Contract Management

Some important elements of the contract management/administration which have to be given due importance are:

i) Supervision
ii) Contract monitoring
iii) Quality assurance systems
iv) Construction programme
v) Effective control
vi) Extension of time
vii) Liquidated damages
viii) Change control
ix) Performance security/ security deposit
x) Advance payment
xi) Payment of running and final bills
xii) Dispute resolution
xiii) Arbitration clause
xiv) Price escalation and adjustments
xv) Suspension of work
xvi) Termination of contract

All the above elements have to be brought in with elaborate details in the contract document as it will have direct bearing on the project to be executed under the contract agreement.

3.4.4 TYPES OF CONTRACT

A contract is agreement between two or more parties for certain acts to be performed or refrained from which has been arrived at in such a manner, set forth in such a form, and is of such content that it has enforceable legal effect.

In a civil engineering construction contract, an agreement is signed between the owner and the contractor, which ensures the completion of the job within the scheduled time, following drawings, designs, specifications and workmanship as given by the consultant and at a price as quoted by the contractor. Civil engineering contracts are basically of following types:

3.4.4.2 Public financed projects

All risks are taken by the ULB and no role is envisaged for the private sector (except contractual delivery of construction as per routine tendering process), the detailing should preferably include detailed design as part of project development. These contracts can be of the following types:

i) **Contract at a Fixed Price-**This is the oldest and the most common method of letting out a work under contract when bids are received at fixed prices. These may be based on quoting unit prices for each of the items of work and the total sum stands for the total cost of the project or sometimes a lump sum, i.e. a single total sum may be quoted for the job.

ii) **Contract other than Fixed Price-** Here the actual cost of the project is first derived and the contract is made in a manner that the contractor would receive a profit over the actual cost as a fixed' fee or fixed percentage etc. Contract at a fixed price may be divided as follows: bill of quantities contract, schedule of rate contract, and lump sum contract.

In a similar manner contract other than fixed price may be classified as follows: cost plus percentage contract, and cost plus fixed fee contract. All these above contracts are discussed in a nut shell below.

iii) **Bill of Quantities Contract-** In this contract the total cost is derived from the sum of the individual items as priced in the bill plus lump sum, provisional sum and prime cost for some of the items as quoted. The quantities are measured from the contract drawings. It comes under the fixed price contract since the unit rates quoted by the contractor for the individual items in the bill are fixed. The total quantities of work measured in the field may somewhat vary from the quantities measured from the design drawings therefore, it does not give a fixed total sum. But since the construction closely follows the design, the total price paid by the employer/ULB will be more or less equal to the total sum tendered. It has the following advantages:

- Payment is made to the contractor as per the work done. The price quoted for individual items are fixed. Therefore the total

cost is more or less 'fixed as derived from the measurement obtained from the drawings.

- Though alterations and deviations from the original drawings could be accepted during construction but even then the unit price does not change.
- Comparison of a tender becomes easier since the basis of tendering is same for all the bidders and the price quoted are very much competitive.
- The bill submitted gives a clear picture of the cost of construction, type of construction and details of the works to be done.

iv) **Schedule of Rate Contract**- There are some jobs where it becomes difficult to visualize the quantities in advance. For example, in case of a R.C.C. piled foundation the designer may not decide upon the diameter, the length and the number of piles, before the load rest is done on the test piles, or in the case of a tube well, the length of the well to be sunk may not be determined before the discharge available is measured at site, or it may also be necessary to start the job urgently before all the, working drawings are not prepared, so that the measurement of quantities becomes difficult. Under these circumstances the schedule is clearly headed as "schedule of rates" so that the contractor would only quote the price of items. In this contract, there may be some items which would not be done at all or in some other items the volume may increase or decrease when compared to the volume expected for such jobs as visualized by the tenderer from his experience. Here the tenderer is to quote very intelligently so that even if all the above unforeseen things happen, he is not at a loss.

The special features of the contract are the following:

- The quantities are not generally inserted, but sometimes even if inserted those are rounded off.
- More items than actually needed might have to be scheduled since it may be difficult to foretell exactly the items required.
- No guarantee is given that all or any of the items of work will be carried out hence, the bidder has to fix up rates so that each of the items carry its own overhead.

v) **Lump Sum Contract**- In this contract a single lump sum is quoted for the job and is accepted as a fixed price. This will be possible only when all the details of the work are presented in the drawings so that the contractor may work out the exact price of the structure. Sometimes a bill of quantity is also attached to help the contractor to have a better picture of the job and sometimes a schedule of rate is also presented which may be used in pricing the variations in quantities. This contract is better suited for over ground jobs and not so much for structures below ground as over ground structures are always visible and quantities could be measured at any time. This is found to be very effective when the job is comparatively small, the job is precisely and

exactly described in all details, there is not much risk attached to its construction, i.e. there may not be any hazard which could not be visualized beforehand and when alterations are kept to the minimum

The major advantages of this contract are:

- It avoids a lot of detailing and accounting thereby making the job easy.
- It offers the owner a fixed total price and the owner is happy with it.
- The contractor gets a chance to do the work without much hindrance.

The disadvantages may be stated as

- It becomes difficult to accommodate additions, alterations of design and specifications.
- In case of unforeseen hazards during construction, the contractor is put to unlimited hardship.

vi) **Cost plus Percentage Contract-** In this contract the contractor is paid the actual expenditure he incurs for purchasing the materials, the installation of plants and machinery and the cost of labour. In addition he is paid a certain percentage to cover his overhead expenses and profit. Under the circumstances there is every possibility that if the contractor is less efficient he will spend more money on the project, and his income or fees being directly proportional to the overall cost of the project he will earn more. Thus inefficiency on the part of the contractor becomes more rewarding. Such a system is neither liked by the owner, nor does the engineer prefer it because to ensure quality the engineer has to pay more attention for each and every item of the work. The contractor also has to get a sanction for even a small amount and has to maintain books showing every detail of the expenses made and these are to be sanctioned by the employer/ULB's auditor before any payment is obtained.

Over and above, the process encourages misunderstanding and mistrust between the owner, the engineer and the contractor. The above contract has no other advantage except that it is suitable for temporary use in case of an emergency until one switches over to some better contract.

vii) **Costs plus Fixed Fee Contract-** In this contract also the payment is made to the contractor on the basis of the actual expenses incurred plus a fee which is a fixed sum of money unrelated to the amount of expenses made to cover overheads and profits.

Thus the tendency to spend more in order to earn more as in the case of cost plus percentage contract is absent in this contractual arrangement. The fixed fee may be decided on the basis of a competition with other contractors while tenders are accepted, or this fee may be negotiated between the owner and the contractor. In this contract, the engineer and the contractor could work together for attaining the best quality. Since they have got full freedom to adopt any method or the best method of construction, they can change the specifications, or the

materials used in the construction to a limited extent with the consent of the owner. With efficient contractors this contract works very well.

3.4.4.2 Public Private Partnership Project Contracts

The detailing would be governed by the level of risk sharing envisaged apart from the nature and size of the project. In such a case, detailing would be necessary of not only the physical components but also parameters and commercial issues associated with the project. Detailing could be need-based subject to the different PPP transactions proposed for implementation. Some of these are briefly explained below:

i) **Build Operate Transfer (BOT)/ and Concession projects**- The contractor builds (possibly designs) the facility, operates it for a specified period and hands it over to Govt. in good condition. If the contractor provides finance it becomes BOOT contract. For e.g. Sewage Treatment Plants

ii) **Build Operate Own Transfer (BOOT)-** The contractor partially or fully finances the project, builds (possibly designs) the facility, operates it for a specified period (15-20 years) till he recovers the amount invested by the contractor and hands it over to Govt. in good condition. For e.g. Solid Waste Treatment Plants (Compost Plants), Toll Roads/Bridges.

iii) **Design Build Operate (DBO) and Design Build Finance Operate (DBFO)-** The contractor designs, builds and operates the facility with or without partial finance for capital works. The risk of design is passed onto the contractor. For e.g. Projects with Patent Rights with the Private promoter e.g. Plastic Waste to Hydro Carbon Projects.

iv) **Build Own Operate (BOO)**- This contract has a specified duration, but the assets are not transferred to Govt. Either the current arrangement could be renewed or responsibility is passed on to the new operator. In a BOO contract, the facility would remain with the private sector although the ownership could change. The BOO contract is used where the finance comes entirely from the private sector. For e.g. Slaughter House.

The contracts can also be classified as under:

i) **Service Contract:** is awarded to private organizations to assist in running certain aspects of a utility. These are normally awarded for specialist activities (professional service) for which the Govt. does not have in house facility. The Govt. organization retains the full control of the main operation.

E.g.: Preparation of electricity and water bills and their delivery to the consumer and revenue collection or door-to-door collection of waste, maintenance of street light etc.

ii) **Management Contract:** The private company is given the contract for operation and maintenance of a particular part of the system. e.g: Water treatment works, distribution of water supply from zonal reservoirs, Water supply pumping stations, Sewage pumping stations etc. for e.g.Chandigarh W/S- The company operates to meet agreed

standard of performance and efficiency. The Govt. retains the responsibility of the overall system. The company does not share any profit on the Govt. body.

iii) **Lease Contract:** Lease contract is an agreement wherein rights to enjoy the property for certain fixed period are given at a standard consideration know as Lease Rent as per the terms and conditions of the agreement. E.g. It is an arrangement for running a water utility by a Private Operator wherein the private organization is involved in the management of the utility for a fixed period on some agreed payment of the services rendered where as Govt. is responsible for overall capital investment for rehabilitation and expansion if required.

iv) **Divestiture:** is the sale of an asset by the Government/ULB which is not performing well and is not vital to company's business as a whole. For e.g. some of the projects taken up earlier under waste to energy.

v) **Sales Contract:** it is contract between the seller/ company/government and a customer to whom you are promising to sell the product / services in return for an agreed sum of money to pay for the product and services bought. For e.g. Sale of Compost from the compost plant of the ULB.

vi) **Multi Party (Consortia)/ Contracts:** Consortium is group of different companies formed to execute a project. The consortium shall have MOU detailing the role, share of responsibilities of different members.

Companies in the group one of the companies would be a lead member, a technical and other members. Though the number of members in the consortium varies typically these are restricted to four members normally.

In case of a Joint venture or Consortium firm, each partner holding the power of attorney on behalf of the firm must sign the tender. A copy of the power of attorney duly attested by a Gazetted Officer must accompany the tender.

vii) **Contracts by Negotiations**- The contracts are awarded by negotiations and not by bidding but following precautions are required:

- Goods and service contract procured through competitive bidding.
- Scrutinize the project: Project sponsor must agree to rigorous technical and economic review by the lender.
- Review the negotiated tariff: Submit the negotiated tariff to rigorous independent review.

3.4.5 CONTRACT DOCUMENTS

The contract for construction is a legal agreement between the owner and the contractor. It is a very important document, which binds the contractor to construct, and the owner to pay. It describes the details of the works, the specifications to be followed, mode of payments to be made, the duty and authority of the owner or contractor, etc. It comprises a number of documents, which are:

i) Contract drawings: which show the plan, elevation, sections of relevant structural and architectural elements in scale, the levels, perspective view, etc. according to which the construction will be done.

ii) Specifications: which describes in words the construction to be done, the quality of materials and workmanship to be used, the method of construction to be adopted, plant and machinery and equipment to be used, the method of testing, etc?

iii) Bill of quantities: which furnishes the measure of each of the items of work to be done as calculated from drawings (this is verified as per actuals and differences if any are noted and cause of difference beyond certain percentage has to be investigated after the construction) and classified according to the trade, location and materials used for the particular item of work.

iv) General conditions of contract: which define the liabilities, responsibilities and powers of the employer/ULB, contractor and engineer, covers the methods of payment, insurance, liabilities of parties to the contract, etc.

v) Tender: This is the signed financial offer of the contractor to construct the work according to the drawings, specifications, bill of quantities and general conditions of contract.

vi) Letters of explanation: which are given for the explanation or elaboration of any of the items stated

vii) Legal agreement: which is signed by both the parties in contract confirming their respective intention as defined in the above documents.

In order to materialize a contract, the contractor is to make an offer, known as submitting a tender. A number of contractors submit tenders for a particular job and the selection of a contractor is based on certain norms and principles. Once accepted no amendment could be made by the owner. In case an amendment becomes necessary the tender ceases to exist unless the contractor agrees to the amendment and a fresh document is prepared.

The contract document for large projects which are called for international bidding known as global tendering are quite bulky which may run to several volumes. They are made specifically for a particular job designed by a group or several groups of specialist requiring several years. A typical contract may contain the following matters:

i) Instruction to tenderers: This will tell the contractor how he is supposed to prepare the tender, when and where to send it, the sources of major materials, guarantee and bond required, tax and import position, various schedules to be filled in, etc.

ii) Appendices to instructions which give the terms and abbreviations used, items for which import license will be or will not be granted, etc.

iii) Tender bond and schedules for completion: The schedule giving tenderer's estimate for local and foreign currency for labour and materials, etc.

iv) General conditions of contract: Generally it takes the usual form but may also include some special conditions which exist in the country of construction, special duties, risks and liabilities, etc.

v) The specification: It starts with the description of the land, geography, communications, climate, rainfall, topography, geology river flow, etc. of the project site. The specifications to be adopted for the materials of construction and the details of construction are furnished under this heading and these are drawn group by group according to the items of work of similar nature. Separate groups may also be made for the items of work to be subcontracted or temporary works to be undertaken.

vi) Bill of quantities: Normally a separate volume is made for this. It gives the quantities for each of the items of work. The number of such items should be made as less as possible.

vii) Bill schedule: This is a part where the contractor sets out the unit rates required to supply labour and material for special jobs or may be even ordinary jobs.

viii) Contract drawing are the drawings prepared in a reduced scale from the working drawings for sending them anywhere in the world easily.

Information of level, geology, hydrology, soil mechanics or foundation, grades of concrete, steel or other materials, and some of the required construction details not shown in any other place or document are presented in these drawings.

The original tender signed by the contractor, together with all correspondences relating to the negotiations of the tender, a set of contract drawings, general conditions, etc. will form the legal agreement between the owner and the contractor and this is signed by both the parties which then forms the contract between both the parties.

The engineer should provide all the important information required for tendering and present them in the tender document in a manner such that there is no chance on the part of the contractor to miss any such important thing before tendering. The tenderer should always be asked to visit the site before preparing the tender. Sometimes a visit to the site may not give sufficient information for tendering if the job deals with the construction of a highway passing through, different parts and terrains of the country or laying of pipe lines for a water supply scheme in a hilly area or laying of pipe line, several visits may be required. This is because the soil characteristics, geological features and contours for these long stretches may vary from place to place. It may not be possible for the contractor to do the preliminary work to ascertain these features; neither is he expected to undertake steps for knowing them at this stage. So the tender document should be so worded that there should be enough scope to make proper payments to the contractor for the said jobs. In general a visit to the site would always lead to a realistic tendering and hence should be insisted upon by the contractors. Three to four weeks should be regarded as the minimum time required for tendering for even small jobs, six weeks is considered as the minimum time to quote for bigger jobs, and for projects outside the country three months or more may be required. The

engineer should allow the completion period in order to receive tenders, which have been prepared with adequate effort.

3.4.5.1 Important General Condition of Contracts

i. **Payments of works:** Payment shall be made as per the mode of payment mentioned in contract agreement.

ii. **Dispute resolutions:** In case of any dispute, the bidder shall bring into knowledge of higher officer within the prescribed time limit for resolving the issue. If higher authority is unable to resolve the case, the contractor may request for appointment of an **arbitrator** as per the clause given in tender document.

iii. **Commitments:** The contractor shall give in writing the performance guarantee and commitment to fulfill the contract agreement.

iv. **Minimum Manpower for execution:** Contractor should provide with the minimum manpower requirement with their qualifications and experience at the each site of construction which contractor would depute at the site during execution.

v. **Risk Allocation**: Construction work is inherently a risky venture. The risk in this discussion is assumed as the business risk, which is defined as the variability of the outcome and is sometimes quantitatively measured as the standard deviation of an outcome. A quantitative estimate of a risk and the subsequent pricing for it is a difficult task particularly in developing countries for want of a large database for such as statistical analysis.

There is a tendency among owners to force the contractor to assume all risks that may arise in the project. As a result, in many construction contracts, the project risk is heavily directed towards the contractor. On the other hand, the under-prepared contractor is forced for an arbitrary pricing to deduce the financial implication of a risk. This causes delays and legal battles in the future. Therefore, a judicial allocation of the project risk among the contracting parties is essential.

In a construction contract, provisions for the allocation of risk may appear in a number of places. These provisions dictate the responsibilities of the respective parties for covering the unforeseen situation. A representative list allocating the risk to different parties is presented here.

i) **Force Majeure-** Any delay in or failure of the performance of either party shall not constitute default to give rise to any claims for damages, if any, to the extent such delay or failure of performance is caused by occurrences such as acts of God or the public enemy, expropriation, compliance with any order or request of Government authorities, acts of war, rebellions, sabotage, fire, floods, illegal strikes, or riots (other than among the contractors employees). Only extension of time shall be considered for Force Majure conditions. No adjustment in contract price shall be granted for reasons of force Majure.

ii) **Indemnification-** It relates to guarantee by the first party to protect the second party from losses or damages claimed by a third party caused by any act of the first party. Many contracts specify that the contractor

shall indemnify the owner from any damage suit filed by any party in connection with an accident or a breach of law.

iii) **Differing Site Condition-** This means that the difficulties and the associated cost that would be encountered in the foundation work which cannot be easily estimated in many situations. In smaller contracts and shall allow foundations the contract specifies that all cost for subsurface work like shoring and dewatering shall be paid by the contractor. In larger works with substantial amount of earthwork the contractor may not be willing to assume the high risk for unforeseen circumstances. In such cases, the contract specifies that the extra work like dewatering, shoring and management of existing underground facilities shall be paid by the owner.

iv) **Delays-** Delay occurs frequently in construction work. Most of the contracts specify that a liquidated damage for each day/week shall be paid to the owner for delay. The contractor may assume the risk of liquidated damage caused by the delay for which he is responsible. However, a substantial part of the delay it is caused by factors for which he has no control. In inclement weather, civil disorder, unavailability of drawings and decisions from the owner are the examples of such delays. To reduce the risk upon the contractor, many contracts specify that an extension of time is to be granted for the delay clause beyond the control of the contractor. The owners naturally demand good quality work within a reasonable cost. At the same time, owners do not want to share the risk of additional expenses that may arise during the course of work. Particularly in India, the contract allocates risks heavily towards the contractor. Competition among the contractors forces them to disregard the pricing for risk. Contracts are so drawn that a contractor during the course of work may find that the representative of the owner is in a position to accept or reject unilateral many risk related claims. The situation provides a strong financial power to the post of the engineer-in-charge and tends to breed corruption, which is not uncommon in construction work. Unfortunately, the quality of construction in the presence of corruption is invariably lowered and the owner suffers in the long run. Therefore, the owner/ULB allocates the risk judiciously during the development of the contract document so that it helps the owner in the long run.

In case of cost over runs due to delays by the contractor in starting and executing the contract or mis-management by the contractors, the cost escalations should be borne by the contractor. (This should not be the brought under arbitration clause)

In case of contractor abandons the works, the equipment and machinery on site belonging to contractor should be confiscated. (A condition should be kept to implement this condition).

v) **Security Bond-** On the contracts for construction it is usually stipulated that the contractor: obtains a security bond. Generally these bonds are issued by the bank against a security of an equal amount to be deposited by the contractor, which he may not sell, encash or

otherwise dispose of without the bank's consent. Normally the bond is obtained for approximately 10% of the value of the work.

Though the employer/ULB holds the contractor in so many other ways like:

(i) Withholding around 10% on all on account bills, (ii) the payment actually made may lag behind the construction by 2/3 months, (iii) the materials dumped at site with advance drawn from the employer/ULB, and (iv) even the employer/ULB, in case of dispute and termination of contract, may legally take possession of all the plants and machineries brought at site until final settlement. But the bond indirectly assesses the financial liquidity of the contractor and psychologically this gives the employer/ULB a sense of extra security.

vi) **Contractual Changes And Termination Of Contract-** Whenever there needs some change in the contract it is better to terminate the same and enter into a fresh one. For large projects continuing for years it may be found that the contract is difficult to work with because of the changes or changed circumstances. Under these circumstances, the owner or the contractor or both may come forward suggesting the termination of the contract. It will be the choice of the owner whether to employ the same contractor or a different one for the unfinished work. Sometimes the contractor may also like to engage a subcontractor for the remaining portion of the work.

Other reasons for the termination may be the following:

i) When the owner may terminate the contract:

- If the contractor becomes bankrupt or insolvent;
- If he refuses or fails to finish on time in spite of all commitments or if the delay is caused only because of his inefficiency;
- If he fails to pay the subcontractors employed;
- If he disregards laws, ordinances or instructions of architects or violates any provision of the contract;
- If there is any breach of contract resulting in an emergency; or
- If he neglects to protect the work from damages.

Under the said circumstances, the owner is advised by the consultant after giving the contractor seven days notice to termination the contract taking possession of the premises and all materials, tools and appliances thereon and get the work finished by whatever method he finds suitable. In such a case the contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance exceeds the cost of the remaining job the difference is to be paid to the contractor. In case such expense exceeds the unpaid balance the contractor should pay the difference to the owner. The expense incurred by the owner and the damage incurred by the contractors default shall be certified by the architect/consultant.

ii) When the contractor attains the right to terminate:

- If the work is stopped by a court order for three months or more for any reason;

- If the architect/consultant fails to issue the certificate of payment after the stipulated period;
- If the owner fails to pay the contractor after the stipulated period of certification for the payment from the consultant or the arbitrator.

The contractor in such cases after serving due notice to the owner and the architect may stop all work and recover from the owner payment for all work executed, any loss sustained upon any plant and material and reasonable profits and damages.

3.4.5.2 Sub Contract

A subcontract is an agreement between the prime or general contractor and one or more subcontractors under which the subcontractors agree to carry out a portion of work of the project. The portion subcontracted may be of very special nature or may be a portion where a small contractor having less overheads could manage to work whereas the general contractor with higher, overheads is bound to lose, e.g. plumbing work or electrical work in I building or excavation in road construction. If the contractor sublets all or portion of the work, he is to do it with the prior consent of the owner and the prime contractor shall be fully responsible for any act of omissions or commissions on the part of the subcontractors and for anyone employed directly or indirectly by them in addition to the liability imposed by law upon the contractor, and in fact there is no direct relationship between the subcontractor and the owner. Generally, all the contractual obligations applicable to the contractor are also applicable to the subcontractor and the prime contractor is to look after this unless a separate deal is made between them with the consent and approval of the owner.

i. Rights Of The Subcontractors

i) To receive copies of specifications, drawings and every other details as given to the prime contractor including a copy of un priced schedule of quantities.

ii) He is not liable for any omission, commission or negligence of the prime contractor.

iii) In case of damages due to any fire hazard or other natural calamity the main contractor is supposed to compensate the damages.

iv) He is supposed to get payment from the main contractor within 15 days after the consultant certifies the payment, less retention money and generally a cash discount to the general contractor. In case the contractor fails to pay he can suspend the work with due notice and go for arbitration. The owner has got the power to pay the subcontractor and deduct the same from the contractor's bill.

v) He is in most cases entitled to get power and water from the prime contractor, could use the scaffolding erected by the main contractor, claim for the allotment of space for huts for his own men and most of the facilities required at site

vi) In case of dispute he has the right to take steps within the provisions of the contract.

ii. Duties Of The Subcontractor

i) He is supposed to execute and complete the work specified including the variations within the conditions of the general contract.

ii) He is not supposed to sublet his work without the prior permission of the owner.

iii) He should not act in a manner which will cause liability to the prime contractor.

iv) He should not charge the main contractor to rectify any defect made in his own work.

v) He should insure his own men and property and produce the certificate in case the contractor wants to see the same.

vi) He is supposed to follow the instructions of the architect.

vii) He should make his own arrangement of power and water from the source provided by the prime contractor.

viii) He should not make wrongful use of or interfere with the contractor's property and should take full responsibility of the plant tools, equipment and indemnify a contractor from claims.

ix) He should not suspend the work without reasonable cause, refuse to remove defective work, commit an act of bankruptcy and in case of any such action the prime contractor has the power to terminate the job.

3.4.6 CONTRACT AND RELEVANT COMMERCIAL LAWS

Like other commercial activities, construction work also operates in a complex legal environment affected by myriad numbers of statutory laws and regulations. One of the most important laws among these is the law of contract which governs the relationship between two parties, namely owner and contractor. Other important laws that frequently interfere in the commercial relationship between two parties in the construction business are the Sales of Goods Act, Insurance, Laws of Arbitration and the Transfer of Property Act.

The acts related to government taxation like the Income Tax Act, the Sales Tax Act, the Stamp Act and the Works Contract Tax Act have a profound influence on the pricing and financial decisions.

3.4.6.1 Laws Of Contract

Law relating to contracts in India is contained in the Indian Contract Act, 172. The act is not intended to be exhaustive and other acts are applicable. For special situations like partnership and the sales of goods. However, unless otherwise specified in any other law, the laws of contract shall govern the contractual relationship among different parties. The first part (sections 1 to 75) of the Indian Contract Act deals with the fundamental principles of the

contract and the second part (sections 124 to 238) governs with the special situations like guarantee, agency and pledge.

3.4.6.2 Relevant Labour and Industrial Laws

Construction works come under the purview of a number of labour and industrial laws. Both central and state legislature have enacted laws to regulate the industries which include construction. The total number of such laws probably exceeds one hundred. The labour and industrial laws can be broadly divided into the following categories: Laws concerning payments to labour, laws relating to working conditions, laws relating to social security and the civil rights of the labour.

i) Payment Of Wages Act, 1936

The payment of wages act regulates the payment of wages to certain classes of persons employed in the industry. The act specifically includes construction activities within its jurisdiction. The act shall not apply to a person whose average wage exceeds Rs. 1,000/- per month.

The term wage is defined as a remuneration payable in respect of the employment including bonus, overtime, holidays, leave and service termination payments but excludes allowances for house rent, medical attendance, traveling and employer contribution to provident fund.

The employer is primarily responsible to pay the wage. In particular, the manager or the supervisor in the work station or site is responsible for the payment of wage. The period of wage can be fixed by the employer.

ii) Contract Labour (Regulation And Abolition) Act, 1970

Sometimes the principal contractor engages labour through an agent or subcontractor. Such a practice that pays the subcontractor according to a contract, is quite common in the construction industry. Such contracts normally stipulate payments commensurate to the quantities of work done measured at site and ignore the amount of labour input.

iii) Minimum Wages Act, 1948

This is an act aimed for social justice. In a labour surplus economy the employer/ULB may find labourers agreeable to work on a starvation wage. The act is directed to prevent such exploitation so that a labourer may get a reasonable wage for his labour. The act is applicable to the industries included in the schedule of the act.

Construction activities, road and building maintenance are included in the schedule. The act itself does not provide any direction to arrive at minimum wages. Minimum wage is the wage below which in the opinion of the Government the wage for a particular class of labour should not fall.

3.4.7 ESTIMATES

Before the commencement of any project, the engineer /consultant should give the owner clear ideas about the approximate volume of different materials,

required for the project and the probable cost of the complete project. In order to have this idea the engineer /consultant is supposed to work out the estimates of materials and money required so that the owner may get prepared for the procurement of the materials in advance and arranges the money for the project. Otherwise, the project might get stalled while running. Estimates are required to be prepared at different time before and after the project is through so that adjustments and minor changes in specification and quantity could be made and the project cost is kept within the budget. There are different types of estimates namely:

i. Rough Cost Estimate

This is also sometimes called the preliminary estimate or rough estimate This is prepared on the basis of the schematic drawings of the project using any of the following methods:

i) **Unit rate estimate**: The cost of an unit is first determined as found from recent experiences. This unit may be a bed for a hospital building or al classroom for a school or a gallon of water for a water storage tank or per kilometer length for a highway. The total cost is determined from the product unit rate and the number of units.

ii) **Plinth area estimate:** This is very much in practice for evaluating the cost of apartment houses or structures having repetitive units. Here the cost of the units is spelt on the basis of the plinth area of the units. This cost includes the cost of land, free space etc. and one may calculate the total space built up against the total cost of the project so that the rate may come out as per square meter of the built-up area which may be termed the plinth area or sometimes on the basis of carpet area or floor area.

iii) **Rate based on volume content or cube rate estimate:** This is a better method as the result is more accurate compared to the plinth area method. The volume of the building is determined first and this is multiplied by the prevailing rate per unit volume of similar buildings under similar situations. The practice is to include half of the depth of foundation in evaluating the volume of the building but normally parapet is excluded from the calculation.

ii. Detailed Estimate

This is based on the actual working drawings and quantities are taken out from these drawings so that there should be practically no variation with the actual values. The detailed estimate should always be accompanied with detailed specifications and the basis of rates adopted in the estimate. This is required for the technical sanction and administrative approval of the project and also for the preparation of the contract document which is to be followed by the contractor during the execution of the project, While preparing the detailed estimate the procedure is to find out first of all the rates per unit work including profits. The cost of each item is found from the product of unit rate and the calculated quantity of the item. For calculating the quantities of the items of work a standard format is used. The said format is very helpful for checking the quantities at any time afterwards.

For determining the estimated cost of the project another format known as the "abstract of estimate" form is used.

In order to arrive at the rate of each item one may follow the Schedule of Rates of the C.P.W.D. or P.W.D. and state "the percentage higher than the schedule". Though this may not be very scientific since the increase in cost of each item of work is not uniform, this is popular because of its simplicity.

One has to work out the actual cost of the items of work based on the prevalent market rates so that if standard schedules are not followed the rate could judge whether the rates are under-quoted or over-priced. While in cost estimating the cost of construction it is important to have clear ideas about the factors such as the quantity of each of the basic materials since the cost' paid is directly proportional to the quantity.

Some such examples are given here to indicate their utilities.

Brick masonry here quantities are expressed in cubic meter (m3) i.e. length x breadth x height. Brick masonry for the foundation and plinth are placed under one item and that for the super structure is separately itemized. But not quantities for each of the storey's are calculated separately. Thin partition walls are measured in square meter (m2). For honeycombed brick wall, the be a Item is separately drawn but deductions for openings are not made. Deductions for door window are made from the quantities considered as, solid first. No deduction is made for openings up to 0.1 m2, or for ends of beams and posts up to 0.05 m2 in area and also for bed plate and wall plate till bearing of chajjahs up to 0.1 m depth. Bearings of floor and roof slab are also not deducted from the brickwork. In the rectangular opening when the top of the opening is made as an arch of small rise is only deducted and not the curved segment for determining the quantity to be deducted.

Plastering and pointing- This item is calculated in m^2. Measurements are taken for the entire face of the wall for both sides and then deductions are I made for the openings as,

(a) No deduction is made for ends of beams, posts, rafters, etc.

(b) For small openings up to 0.5 m2 no deduction is made, neither area of the jambs, soffits and sills of the openings are added.

(c) For openings of size 0.5 m2 to 3 m2 opening is considered on one faced the other face being treated solid and no extra for jambs, soffits and sills are considered.

(d) For openings exceeding 3 m2, area of the opening is deducted on both faces and areas for the jambs, soffits and sills are added.

Reinforced concrete work- All reinforced cement concrete work is measured in cubic meter. Bearings of beams and lintels are added extra to get the dimension. Though the quantity of steel measured in quintals/tonnes are paid as a separate item including bending binding, no deduction is made from the volume of concrete occupied by the steel reinforcement. Form work is also measured separately as a separate item but sometimes for smaller jobs with conventional shuttering work the item may be included in the rate for concreting.

Similar do's and don't for taking measurement of any item of work are available. One may go through any textbook on estimating and calculate as required.

iii. There are other estimates namely revised estimates, supplementary estimate, etc. which could be presented as follows:

i) **Revised Estimate-** This is made when there is a change amounting to more than 5% of the original value due to price hiking or change in specification. But this does not include any major change in structural design. Though the method of preparation is similar to that of a detailed estimate, a revised estimate should be accompanied with a comparative statement showing variations from the original work and also reasons for the changes.

ii) **Supplementary Estimate-** This is required to be prepared when some of the items were overlooked or not foreseen during the preparation of the original estimate. And if it is found that when these supplementary items are included it is going to surpass the sanctioned amount, a supplementary estimate is prepared in the same line as the detailed estimate. This should be accompanied with a statement showing the extra work involved and the reasons for preparing this estimate should be clearly reported.

iii) **Total Estimate-** This is also known as the complete estimate, which furnishes the total cost of the project. This includes cost of land and required land survey, cost of construction of the project, consultants' fees including supervision, visits, etc. cost of water and electricity required during construction, legal expenses like the examination of deeds, the title of land, the agreement for the contract and other legal matters, if any; contingency of 5% over the cost of construction for extra work, if any. Thus the total estimate is the sum of all elements of I expenditure to be made in connection with the project.

3.4.7.1 RATE ANALYSIS

This gives the details of the analysis of rates per unit area or per unit volume or per numbers whichever is applicable for an item of work or supply. The analysis would give as to how a particular rate has been obtained and its justification or the logic behind its determination. This would include the cost of materials or the cost of different ingredients required to prepare the material, the cost of labour to produce the item of work and cost of other petty expenses required for the work. The item should follow certain specifications and the rate should be based on that. It might require the use of tools and plants. A certain weightage is to be given for the use of these tools, plants or machines based on their production capacity and the rate of depreciation or replacement. On the top of the contractor's profits, overhead \ and establishment charges, and incidental charges are also to be included in the rate of work. Broadly, the rates to be charged should be based on the following aspects:

i) **Quantity and Cost of Materials-** The quantity of materials required for an item of work could be ascertained based on experience or on standards available following the required

specifications. The costs of materials are taken as delivered at site inclusive of transport, local taxes, etc.

ii) **Cost of Labour-** For the cost of labour one must know how many labourers are required to produce a certain item of work. There may be a variety of hands required for the job, e.g. artisans, masons, coolies, helpers and bhistis (sprayers or watermen). They have got different wage structures. Therefore, the calculation of numbers and cost of hands are required to be found out. In this connection the All India Standard Schedule of rates prepared by the National Building Organization may be referred. Local prevailing rates should also be enquired.

iii) **Cost of Tools, Plants and Machinery-** Depending on the type of work involved the equipments and plants to be used are selected. In order to rationalize the apportionment of charges to be imposed under this heading especially for jobs which involve big plant and machines, one is to determine the probable total production the machine may give or the total number of hours the machine may run during its lifetime, and cost of. a similar one at the end of its lifetime. From these two figures a basis is formed which will indirectly evaluate the proportion of charges in the form of a percentage of the total cost of the project to be added on the rate of this item of work. There are certain other small tools and plants where the above exercise is difficult to perform. The cost of such equipment may be included under the heading' overhead'.

iv) **Overhead Charges such as Supervision and Visits-** This includes all items for running an office like rent, electric charges, telephone bills, depreciation of office equipment, staff salary, salary of supervisors and engineers, stationeries, perishable materials like ropes, nails, G.I. wires, or tools to be provided. to the masons, artisans, or helpers and labourers and sundries are also included. Cost of traveling, visits of senior personnel, occasional entertainment to concerned people etc. is also to be included under this heading. All these are again expressed as a percentage say 3 to 5%, of the rates to be charged on the items of work. Though for smaller work these may not be substantial and may be ignored but for big jobs these are to be included.

v) **Contractor's Profit-** A contractor will take all the trouble of undertaking a job only when he earns II a reasonable amount out of it. The construction itself is full of hassles and hazards. This has been made more difficult due to certain advantages I demanded from the associated people. In addition, there are factors like I political interferences or interferences of local influential persons and their followers, which have made this profession more difficult. So one will take I this venture only when one is properly rewarded otherwise one might be forced to sacrifice quality. An average profit. After meeting all due and undue - expenses, to the tune of 10% for big jobs and 15% on small jobs depending on the cost of project should be considered reasonable.

The analysis of rates for the three major items of work namely brick work, plastering work and reinforced cement concrete works are presented here to provide some ideas. For more details and other works one may go through standard textbooks on "Rate analysis and estimation".

3.4.8 CODES AND STANDARDS

Bureau of Indian Standards have published (Code No. IS 1200) guidelines and instructions for the measurement of work. These are generally followed in toto for taking measurements and are often referred to avoid disputes.

For constructions to be owned by the government, a schedule of rates is available. If the Central Government is to own that asset after construction the Central Public Work Department's schedule is to be followed. This schedule known as CP.W.D. schedule is adopted throughout the country with provisions for local variations. The schedule once made cannot be changed often. However, the prices of materials, labour and other items involved in construction are always rising almost in every month/year. Therefore, the practice is to declare a reasonable percentage above the schedule to be considered for a particular place at a particular year. This increase above the schedule of rates may not also be sufficient for good and standard work. The contractors are permitted to quote for a percentage higher than the revised schedule of rates and tenders are compared accordingly. The contractor can also quote a percentage lower than the schedule if he has got valid reasons and argument for such quotations. The C.P.W.D. schedule at the beginning has presented the basic rates for the hire charges for plants, labour, materials for building and road work, materials for services and carriage.

Building work and its details are presented next-where one may get the prices for the carriage of materials for various leads, earth work, mortars, concrete work, reinforced cement concrete, brick work, stone work, marble work, wood work, steel work, flooring, roofing, finishing, repairs to buildings, dismantling and demolishing and other miscellaneous building works.

State P.WD. Schedules are to be followed for works belonging to state government. Each and every state government has prepared their own schedule of rates, which also includes building works, carriage, materials and labour. Tenders are accepted on the basis of a percentage higher than the revised schedule or lower than the revised schedule.

The Central Government as also the State Governments have got other books containing general conditions, general specifications, additional condition of contract for departmental materials, standard charts for material consumption, etc. which are part and parcel of the contract and are binding to both the parties.

CONCLUSION

The above module has been designed keeping in mind the technical requirements of the functionaries for urban poor projects. Any project which is conceived would follow the project initiation, project development, project implementation and project completion phase as discussed above. The technical requirements for any project would be similar as the key concepts of planning & management is similar for all projects. The technical management concepts discussed above would be applicable to the urban poor projects as well since any project sanctioned under JNNURM would focus on whole town approach.

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