

Project Management

Construction project management is a technique used for the proper management of a project. Proper management includes planning, scheduling, and controlling processes. Based on the type of project, Project management techniques can be classified into many types.

Critical Path Method (CPM): It is the project management technique used to manage a repetitive project. It has only one-time estimate associated with an activity.

Program Evaluation Review Technique (PERT): This project management technique is used for research-oriented projects. It has three-time estimates of an activity: Optimistic time, Most likely time, and Pessimistic time.

Types of Construction Project Management

The Civil Engineer Project manager or construction manager has to interact with various fields of specialization depending upon the type of the project. A project manager involved in a hospital's construction must interact with a medical professional. Similarly, constructing a petroleum refinery involves complex interactions with the chemical engineer, mechanical engineer, and electrical engineer. Project management techniques also depend on the different construction projects.

Civil engineering projects can be grouped based on the intersection of knowledge and interaction with other disciplines.

- Building Projects
- Heavy engineering Project
- Industrial Projects

Building construction projects are classified into commercial buildings and residential buildings.

Building Construction Projects

During the design phase, building design is coordinated by an architect who works with other engineering disciplines, such as structure engineer, and electrical engineering, whereas civil engineers coordinate the construction phase. But the group leader in the building projects is generally the architect. A building project is further categorized into

- Residential Building
- Commercial and other buildings.

Residential buildings generally can be single or double-story buildings in India. Multi-storied residential buildings are also getting constructed. Another building project produces a variety of buildings ranging from hospitals, temples, and small stores to commercial office towers, theatres and cinema halls, government buildings, recreational facilities, and small schools.

Economically building project accounts for around 60 to 70 percent of the construction project in a country. But many of the constructions are not carried out in an organized way. Construction projects in India are fragmented, and most construction in rural and semi-urban areas is done in non-engineering ways. Building construction in India is highly labor-intensive. Most of the laborers employed for building projects are semi-skilled and untrained. Uses of heavy equipment are very rare. Building construction projects are governed by many local regulations and general laws, such as municipal laws, building laws, etc. Construction of building projects comes under the repetitive kind of project. So, the CPM project management technique can be used for this purpose.

Heavy Engineering Construction

Heavy engineering construction includes primary infrastructural facilities such as transportation systems, railways, roads, bridges, mass transit systems, hydraulic structures (dam, barrage, flood control system, hydroelectric power, irrigation system), water treatment and water supply systems, wastewater treatment and its disposal, power line transmission.

Heavy engineering construction generally accounts for around 25 to 30 percent of total construction.

A reputed big company carries out construction.

The government mostly finances heavy engineering projects. These are primarily infrastructure projects.

Industrial Project

Industrial Projects are highly specialized projects dominated by large construction firms.

These projects include power plants(fossil fuel, nuclear power), petroleum refineries and petrochemical plants, fertilizer plants, large steel plants, heavy manufacturing plants, and the aircraft industry.

Industrial projects account for only 10 percent of the total construction projects, but it requires the highest level of engineering expertise from various engineering disciplines, such as chemical, mechanical, and electrical engineering.

Industrial constructions are very specialized and involve complex mechanical, electrical, and instrumentation work.

Construction is dominated by skilled labor and is quite labor-intensive compared to heavy engineering, but large equipment is also used.

Tenders and Contracts

A contract is an agreement enforceable by the government's law, and tender is the execution of a project authorized by a responsible person. It has the following basic terms, which are explained below. After finalizing the tenders and contracts, different construction project management technique is used for further execution of the project.

- **Tendering:** Tendering is the process by which bids are invited from interested contractors to carry out specific construction work packages. An agreement between the contractor and the department is executed, and fixation is the main clause for completing the job through the tendering process.
- **Tender notice:** The Tender Notice is a brief description of the job being tendered to be published in Newspapers and on the Internet.
- **Tender Form:** It is a printed standard form of contract giving standard conditions of the contract, general rules, and directions for the guidance of contractors.
- **Quotation:** The rates quoted by a contractor in response to a tender call are called “quotations”.
- **Earnest money:** This is the money deposited by the contractor with the tenders, which indicates the willingness of the contractor to work for the department. Generally, the earnest money is 2% of the project's total estimated cost. This money is refunded back if the tender of that contractor is not accepted.
- **Security money:** This is the money that the contractor has to deposit with the department when the contract is allotted to him. It is 10% of the total estimate. The earnest money deposited by the contractor is also included in this amount. This deposit is kept as a check so that the conditions of the contract agreed upon are fulfilled, the work is the progress, and the quality of the work is not satisfactory.
- **Contract:** A contract is an agreement between two or more parties who promise to exchange money, goods, or services according to a specified schedule and are legally enforceable.

Type of Tenders and Contracts in Project Management

Based on certain parameters, tenders and contracts can be classified into the following types.

There are three types of tendering methods in construction management:

- **Open tendering:** Under open tendering, the employer advertises his proposed project and permits as many contractors as interested in applying for tender documents. The contractor is chosen based on price and quality bids by them.
- **Selective Tendering:** Under selective tendering, the employer advertises his project and invites selected contractors to place a bid for the project. The contractor for which the total project cost is lowest is generally awarded for the construction.
- **Negotiated Tendering:** In Negotiated tendering, only one contractor is invited to submit prices for a project. Usually, this is for specialized work, when particular equipment is needed to extend existing works, or for further work following a previous contract.

The major type of contracts that are used in construction management are as follows:

- **Item Rate contract:** The project's total price in the item rate contract is based on each item's unit price. The contractor is paid per the rates of items specified in the bill of quantity.
- **Lump-Sum Contract:** Such type of contract gives an overview of the cost required to complete the project. This is required only in the initial stages.
- **Percentage rate contract:** In this contract, the contractor agrees to take the construction work for a fixed percentage over the actual construction cost. The

contractor arranges for the labor and materials required to complete the work and maintains a proper account of the construction costs.

- **Material supply contract:** In this form of contract, the contractors have to offer their rates for the supply of the required quantity of materials, inclusive of all local taxes, carriage, and delivery charges of materials to the specified site within the time fixed in the tenders.

