

# Estimates Importance in Building Construction Projects

Ajay Singh<sup>1</sup>, Rahul Saini<sup>2</sup>, Ayush Sangal<sup>3</sup>

<sup>1</sup>Head of Department, Department of Civil Engineering, Roorkee Institute of Technology, Roorkee

<sup>2,3</sup>Assistant Professor, Department of Civil Engineering, Roorkee Institute of Technology, Roorkee

\*\*\*

**Abstract** - The estimates are very important part of preconstruction activities of building projects. Many approvals are based on project estimates such as; administrative approval, financial approval, technical sanction, insurance value and its premium cost. Estimate plays a vital role at every level starting from notice inviting tenders to completion of work like; phasing of project, issue of tender documents, tenders cost comparison, finding abnormally low rate (ALR) or abnormally high rate (AHR) items in the bid, selection of execution agencies, agreement between client department and execution agencies, approval of deviated or additional item quantities during execution. The work execution will be as easy and smooth, as accurate the estimate will be.

If the estimate prepared is inaccurate or inflated, during execution of works the quantities of agreement are bound to deviate from their original quantities. Sometimes, these deviations may be quite large i.e. beyond the permissible limits. On the other hand the missing items are to be executed as additional items. These additional and deviated items are root cause of project delay and major disputes between client department and construction agencies which give rise to arbitration and litigation cases between them. Apart from this various other complications are also associated with inaccurate estimates such as; loss of considerable time in sorting out the problems and needs extra efforts for maintaining the progress of works. A few causes responsible for inaccurate estimate may be as follows:

- Non availability of complete drawings, details, data and specifications with estimators.
- Drawings and details sometimes do not match with each other for example structural and architectural drawings are mismatched.
- Lack of skill and experience of estimators.
- Poor coordination between interdisciplinary estimators.
- Lack of awareness about future planning
- Allowing very short duration for preparation of estimates to estimators.

It is obvious that accurate estimates are backbone of any project execution and management. This paper will highlight the points needed to consider for preparation of an accurate estimates, in order to minimize the deviations and need of additional items.

## Types of Estimates

Mainly estimates are of two types

1. Preliminary Estimates
2. Detailed or item wise estimates

Both needed different prerequisites, which require many details, drawings and information's in order to prepare proper estimate of the project.

## Prerequisites of Preliminary Estimates

Preliminary estimates are normally based on plinth area rates prevailing in that area for a set of specifications. Any additional provision, change in specifications or deletion of items are adjusted in it. These estimates are initially prepared for allocation of funds and obtaining the administrative approvals from competent authorities. So, it needs to include all necessary provisions in the estimate. The estimators should be provided all possible drawing and details required for preparation of authentic estimate of project. Each additional provision needs extra cost. A few drawings, details and specifications needed to estimators are being listed below for reference:

- Contour map, road map, drainage line and other service line drawings
- Plan, elevations and sections of the proposed structures
- Brief specifications of materials to be used in construction
- Type of roof and details of water proofing treatment
- Type of foundations, like strip, pile, raft and grillage
- Type of structure framed or load bearing
- Type of soil, level of ground water below foundation depth
- Details of existing services and structures
- Extra depth of foundation, if needed
- Earth quake provisions, if needed based on earthquake zones
- Details of earth cutting or filling for area development
- Provision of internal and external electrifications
- Extra height of floor in building, if any
- Provision of ant-termite treatment (if needed)

- Firefighting system details along with layout and specifications
- HVAC (heating, ventilation and air conditioning) system details
- Provision of solar power and solar water heater, if any
- Provision of lifts, ramps, escalators with details
- Provision for safety and accessibility for differently able persons
- Landscaping and its drawings with details
- Provisions of developing parks, play grounds and other amenities, their details with shape and size
- Details of swimming pools
- Use of fire resistant materials
- Details of escape stair case and gates
- Details of artificial intelligence to be used, if any
- Details of acoustic provisions with location and specifications
- Details of face cladding and wall lining
- Details of steps in class rooms, stadium and cinema halls
- Details of cold water and hot water lines
- Details of slope stability measures, if needed
- Details of soil strengthening measures, if needed
- Details of single or double or multiple basement in building
- Details of false ceiling with location and specifications, if any
- Road, parking, garages, parks, swimming pools light provisions
- Vehicle parking shades details
- Lightning conductor details for high rise buildings
- Any provision of extra plinth height
- Details of fire alarm system, if any
- Details of mechanical ventilation system in the basement, if any
- Details of CCTV cameras with locations
- Centralized call bell system, if any
- Details of intercom system
- Details of overhead tank, its capacity, type and staging
- Details of rain water harvesting system, if any
- Details of underground sump well with necessary pumping arrangements
- Plan of horticulture development
- Details of outdoor fountains
- Details of ornamental doors and windows, if any
- Details of flooring material and its pattern
- Provision of modular kitchen, if any
- Details of water purifier, geysers, exhaust fans with locations
- Details of centralized AC and its ducts provision, if any
- Provision of making building barrier free, if any
- Details of heat insulation of building, if required

- Provision of low height partitions, magic eye or vision panel on doors
- Use of wood substitute, if any

Similarly, there may be many other provisions which should be included in the preliminary estimate to minimize the affect of missing items instead of making error due to random selection of items. Otherwise, there will be many complications, which have to face during preparation of detailed estimate including imbalance in the financial allocations.

### Prerequisites of Detailed Estimates

The most important part of the estimate is the accuracy in evaluation of quantities item wise, describing proper description of items, selecting appropriate specifications and inclusion of all necessary items. It is generally observed that for major building projects, estimates are prepared by different estimators of different divisions. For example;

- Civil engineering divisions for civil construction works including buildings, service roads, drains, overhead tanks and other miscellaneous civil works.
- Electrical division for electrical items required for different locations and activities.
- Public health engineering division for water supply, sanitary works, necessary accessories, fixtures and installations.
- Horticulture division for landscaping and horticulture works

The coordination amongst all the estimators is extremely essential, in order to prepare taking off of all related items of inter divisional activities. Estimators should have a clear vision and enough experience for taking all required items for smooth running of project works. All the specifications are generally not provided at the time of estimate preparation, so most of the time estimator has to use his own wisdom in taking up the many items in the estimates. It is advisable that estimators should be in regular contact of design architects, structural engineers, geotechnical engineers, electrical and public health engineers and horticulture persons, who are responsible for preparation of design and drawings of the projects. This will help them in clarifying the doubts, if any. They should collect all the necessary data like; available sources of materials, distance, mode of transport of material, rates, quality, approach road to site, available storage space at site etc. to consider related aspects in the estimates. All the detailed drawings and specifications should be available to the estimators. A few drawings and details required are listed below;

**i) Architectural Drawings and Details**

- Location and layout plan
- Contour map of the site
- Terrace development plan
- Plan, elevation and sections of all structures
- Trench plan of buildings
- Foundation plan and foundation details
- Joinery work details of doors, windows, ventilators and gates with type, size and specifications
- Details of grills, railings and safety bars
- Details of fittings, fixtures along with their size, shape and specifications
- Floor types, pattern, colour, location and specifications
- Interior wall finishes with details
- Details of dado, skirting, lining with height and specifications
- Details of external wall cladding and finishes with specifications
- Details of special features to be provided for elegant esthetic look
- Details of ornamental finishes
- Detailed drawings of approach road, parks and parking
- Landscaping and horticulture activities
- Drawing and details of fountains, swimming pools
- Details of drainage system
- Layout of internal and external water supply and fixtures
- Details of ramps and pathways
- Area details for conversion in green fields
- Details of rain water harvesting system
- Details of utility ducts
- Specifications of green building materials to be used
- Provision of fire fighting arrangements along with sketch and specifications
- Escape staircase and exit detaild
- Details of huts for watch and ward
- Details of boundary walls
- Details for use of recycled materials, if any
- Reuse of materials , if any
- Design and layout of firefighting pipeline and water storage tank
- Provision of separate overhead tank for potable and flushing water supply
- Provision of recycling of water, if needed with location and capacity
- Type of water supply and rain water pipes along with diameter including layout drawings
- Specifications of materials like stones, paints etc.

- Roof terrace plan showing slope, location of rain water pipes along with fixing details
- Architectural details of roof truss, coverings, false ceilings with specifications
- Details of waterproofing, parapets, copings
- Drawing of porch, projections, facia
- Detailed drawings of pools and fountains
- Layout of sewer line and their connection details with main sewer lines
- Water proofing details of sunken floors and filler materials
- Details of retaining walls
- Grade of anodizing on aluminum sections and grade of stainless steel works
- Details of sewage treatment plant, if needed
- Details of service ducts
- Space for solid waste collection and disposal

**ii) Structural Drawings and Details**

- Drawings and details of all structural components such as beams, columns, slabs, projections, cantilevers, facia, sunshades, louvers, lintels, bands etc.
- Foundation design and details
- Structural details of retaining walls, pools, overhead tanks, drains
- Grade of steel and concrete to be used in different structural members
- Details of reinforcement and concrete covers in structural members
- Structural design and details of trusses, purlins, rafters, brackets, joints and connections
- Covers of manholes, ground water tanks, drains etc.

**iii) Electrical Drawings and Details**

- Installation details of solar energy, solar water heater and solar lights
- Electrical connections and line layout for escalators and lifts
- Smart lighting system with artificial intelligence (AI) based sensors, if any
- Smart electric meter details, if provided
- Location plan of installing CCTV cameras, monitors and servers
- Lighting details for roads, parks, pools, buildings, shades, porches, lawns, boundary, entry and exit gates
- High mast lights location and details with specifications
- Cables and wiring details with specifications
- Transformers, DG set, control panel details along with layout and specifications
- Earthing layout and specifications
- Underground cable details and marking system
- Layout of communication system with details

A few essential items are listed above which are needed to include in the estimates. Apart from this there may be many small-small items those are taken by the estimator by his experience and judgment in the estimate. These items some time creates problems, if not found suitable during execution and need replacement with other substitute items. It will be better to decide every item with the consent of designers along with specifications before or during estimation. If possible, a detailed list of such items may be prepared and get approve with designers. This approach will certainly avoid the risk of delay of works execution, disputes, litigations and arbitration between client and executing agencies. Add additional provisions for electrical power, water supply and other services, keeping in view the future possibilities of extension of project (horizontally or vertically) in order to avoid the risk of redoing or relaying of service lines. Otherwise these will be time consuming, costly and will disturb the various functions associated with them.

## CONCLUSION

Accuracy of estimates is of prime importance for smooth execution of any project. It will be appreciable, if the estimators are well trained, experienced and acquainted with field works and related problems. It is very essential to provide all possible drawings, details, notes and specifications to estimators for preparation of an authentic estimate. Arbitrary inclusion of items should be avoided and decided by mutual discussion with designers. Budget allocations and phasing of projects are mainly dependant on estimates, so every effort should be done towards preparation of realistic estimate considering all possible aspects. Normally, sufficient time is allowed to planner and designer of the project for preparing drawings and details, but a very short time is allowed to estimators, resulting the chances of missing the items are enhanced. So a reasonable time should be allotted to the estimators for preparing estimate. This will certainly help in smooth progress of projects.

## REFERENCES

1. CPWD Works Manual 2019, Published under the Authority of Director General, CPWD, New Delhi (a government of India publication).
2. CPWD Plinth Area Rates 2007, Published under the Authority of Director General, CPWD, New Delhi (a government of India publication).
3. Engineering Construction Planning and Management by P.S. Gahlot and B. M. Dhir, of New Age International Publication.
4. Building Construction by B. C. Punamia, Laxmi Publication, Edition 2016
5. Construction Project Management by K K chitra of Tata Mcgraw Hills, Edition 2014.

## BIOGRAPHIES



Prof Ajay Singh is working as Head of Department in civil Engineering in Roorkee Institute of Technology, Roorkee. He has vast experience of R & D and landslide control measures, construction, cost economics and analysis of buildings and roads during his services in CBRI Roorkee.



Mr. Ayush Sangal is studying in M.tech branch (Structure and Construction Engineering) in Civil Engineering dept in Roorkee Institute of Technology, Roorkee.



Mr. Rahul Saini is working as Lecturer in Civil Engineering dept In Roorkee Institute of Technology, Roorkee