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Subject Name: **Transportation Engineering**

Subject Code: **CE-5001**

Semester: **5th**



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UNIT I Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

INTRODUCTION

1. ESTIMATE

An estimate is the anticipated or probable cost of work and is usually prepared before the construction is taken up. It is indeed calculations or computations of various items of an engineering work.

2. QUANTITY SURVEY

It is the schedule of all items of work in a building. These quantities are calculated from the drawing of the building. Thus quantity survey gives quantities of work done in case of each items, when priced gives the total cost. In short, quantity survey means calculations of quantities of materials required to complete the work concerned

3. SPECIFICATIONS

Detailed specifications gives the nature, quality and class of work, materials to be used in the various parts of work , quality of the material, their proportions, method of preparation, workmanship and description of execution of work are required.

4. RATES

The rates of various items of works, materials to be used in the construction and the wages of different categories of labor (skilled and unskilled) should be available for preparing an estimate. The cost of transportation charges should also be known. As far as possible sanctioned "Schedule of Rates" shall be followed or the rates may be worked out by the "Analysis of Rates" method.

5. SITE PLAN

It is the plan drawn for a particular construction showing its position with respect to approaching roads, main bazars, markets and other permanent features in a populated area. It shows the location of the area under construction with respect to the other areas and on it generally the names of the owners of areas or property holders adjoining to it are also denoted. North line is also clearly marked on it.

6. LINE PLAN

Line plan can be defined as the plan of a particular construction simply showing main features with the help of the single lines of different portions of the constructions. Details of constructions are not generally shown on this plan. This inside and outside dimensions shown on this plan should necessarily be corresponding to actual dimensions.

7. INDEX PLAN

This is the plan of a particular colony showing the positions of different houses in single lines their number if any position of roads, schools, market, hospitals and other features etc. this plan is generally fixed on the entrance, or at exit or in the central place of the colony, for the guidance of the inhabitants and outsiders.

8. DETAILED PLAN

This plan indicates a plan of a construction drawn to a definite scale, showing all detailed information required for its execution. Various sections and elevations are clearly drawn on this plan.

9. CENTRE LINE PLAN

This is actually a layout plan drawn to facilitate the laying out of foundation lines and other features. It is generally fixed on the entrance or at exit in the central place of the colony for the guidance of the inhabitants and outsiders.

10. SUPPLEMENTARY ESTIMATE

When some additions are done in the original work, a fresh detailed estimate is prepared to supplement the original work. This estimate is called supplementary estimate. It is also accompanied by all the papers as required in thru detailed estimate.

11. ADMINISTRATIVE APPROVAL

For any project required by the department an approval so sanction of the competent authority with respect to the cost and work is necessary at the first instance. Thus administrative approval denotes the formal acceptance by the administrative department concerned of the proposals for incurring expenditure.

12. TECHNICAL SANCTION

It means the sanction and order by the competent authority of the department for the detailed estimate design calculations quantities of work rates and cost of work. After the technical sanction of the estimate is received the work is then taken up for construction. COMPETENT AUTHORITY

An officer or any other authority in the department to whom relevant powers are delegated by the government (Financial Department).

13. ORDINARY MEASUREMENT BOOK

It is measured book in which entries regarding the work done or supplies made and services performed are recorded for the purpose of making payments to the contractors or the labor. Entries in the M.B are generally recorded by the sectional officers or by any other officers deputed for the purpose

14. LUMP SUM ITEMS

Sometimes while preparing estimate for the certain small items like front architecture or decoration work of a building it is not possible to workout detailed quantities so far such lump sum items a lump sum rate is provided.

15. PLINTH AREA

The built up covered area of a building measured at floor level of any storey is called plinth area.

16. CIRCULATION AREA

The total cost of construction including all expenditures incurred plus the cost of external services up to the end of the completion of the work is called capital cost. It also includes the cost of preliminary works, miscellaneous items and supervision charges etc.

1.1 GENERAL

Estimating is the technique of calculating or computing the various quantities and the expected Expenditure to be incurred on a particular work or project. In case the funds available are less than the estimated cost the work is done in part or by reducing it or specifications are altered, the following requirement are necessary for preparing an estimate.

1. Drawings like plan, elevation and sections of important points.
2. Detailed specifications about workmanship & properties of materials etc.
3. Standard schedule of rates of the current year.

1.2 UNITS OF MEASUREMENTS

The units of measurements are mainly categorized for their nature, shape and size and for making payments to the contractor and also. The principle of units of measurements normally consists the following:-

- a) Single units work like doors, windows, trusses etc., is expressed in numbers.
- b) Works consists linear measurements involve length like cornice, fencing, hand rail, bands of specified width etc., are expressed in running meters (RM)
- c) Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness etc., and are expressed in square meters (m²)
- d) Works consists cubical contents which involve volume like earth work, cement concrete, Masonry etc. are expressed in Cubic meters.

[BASED ON IS 1200 REVISED]

Sl. No.	Particulars of item	Units of Measurement	Units of payment
I	Earth work:		
	1. Earth work in Excavation	cum	Per%cum
	2. Earthwork in filling in foundation trenches	cum	Per%cum
II	3. Earth work in filling in plinth	cum	Per%cum
	Concrete:		
	1. Lime concrete in foundation	cum	percum
	2. Cement concrete in Lintels	cum	percum
	3. R.C.C. in slab	cum	percum
4. C.C. or R.C.C. Chajja, Sunshade	cum	percum	
5. L.C. in roof terracing (thickness specified)	sqm	persqm	

III	6. Cement concrete bed	cum	per cum
	7. R.C. Sunshade (Specified Width & Hight)	cum	lm
III	Damp Proof Course (D.P.C) (Thickness should be mentioned)	sqm	persqm
IV	Brick work:		
	1. Brickwork in foundation	cum	percum
	2. Brick work in plinth	cum	percum
	3. Brick work in super structure	cum	percum
	4. Thin partition walls	sqm	percum
	5. Brick work in arches	cum	percum
V	6. Reinforced brick work (R.B. Work)	cum	percum
	Stone Work: Stone masonry	cum	percum
VI	Wood work:		
	1. Door sand windows frames or chowkhats, rafters beams	cum	percum
	2. Shutters of doors and windows (thickness specified)	sqm	persqm
VII	3. Doors and windows fittings (like hinges, tower bolts, sliding bolts, handles)	Number	per number
	Steel work		
	1. Steel reinforcement bars etc in R.C.C. and R.B. work. quintal	Quintal	per quintal
	2. Bending, binding of steel	Quintal	per quintal



VIII	Roofing		
	1. R.C.C. and R.B.Slab roof (excluding steel)	cum	per cum
	2. L.C. roof over and inclusive of tiles or brick or stone slab etc (thickness specified)	sqm	per sqm
	3. Centering and shuttering form work	sqm	per sqm
	4. A.C. Sheet roofing	sqm	per sqm
IX	Plastering, points & finishing		
	1. Plastering-Cement or Lime Mortar (thickness and proportion specified)	sqm	per sqm
	2. Pointing	sqm	per sqm
	3. White washing, colour washing, cement wash (number of coats specified)	sqm	per sqm
	4. Distempering (number of coats specified)	sqm	per sqm
	5. Painting, varnishing (number of coats specified)	sqm	per sqm
X	Flooring		
	1. 25mm cement concrete over 75mm lime concrete floor (including L.C.)	sqm	per sqm
	2. 25mm or 40mm C.C. floor	sqm	per sqm
	3. Doors and window sills (C.C. or cement mortar plain)	sqm	per sqm
XI	Rain water pipe /Plain pipe	1RM	per RM
XII	Steel wooden trusses	1No	per 1No
XIII	Glass pannels(supply)	sqm	per sqm
XIV	Fixing of glass panels or cleaning	No	per no.

RULES FOR MEASUREMENT

The rules for measurement of each item are invariably described in IS- 1200.

However some of the general rules are listed below.

1. Measurement shall be made for finished item of work and description of each item shall include materials, transport, labor, fabrication tools and plant and all types of overheads for finishing the work in required shape, size and specification.
2. In booking, the order shall be in sequence of length, breadth and height or thickness.
3. All works shall be measured subject to the following tolerances.
 - i) linear measurement shall be measured to the nearest 0.01m.
 - ii) Areas shall be measured to the nearest 0.01 sq.m
 - iii) Cubic contents shall be worked-out to the nearest 0.01 cum
4. Same type of work under different conditions and nature shall be measured separately under separate items.
5. The bill of quantities shall fully describe the materials, proportions, workmanships and accurately represent the work to be executed.
6. In case of masonry (stone or brick) or structural concrete, the categories shall be measured separately and the heights shall be described:-
 - a) From foundation to plinth level
 - b) From plinth level to first floor level
 - c) From First floor to second floor level and so on.

REQUIREMENTS OF ESTIMATION AND COSTING

1. Estimate gives an idea of the cost of the work and hence its feasibility can be determined i.e. whether the project could be taken up with in the funds available or not.
2. Estimate gives an idea of time required for the completion of the work.
3. Estimate is required to invite the tenders and Quotations and to arrange contract.
4. Estimate is also required to control the expenditure during the execution of work.
5. Estimate decides whether the proposed plan matches the funds available or not.

PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING.

Estimating involves the following operations

1. Preparing detailed Estimate.

2. Calculating the rate of each unit of work
3. Preparing abstract of estimate

DATA REQUIRED TO PREPARE AN ESTIMATE

1. Drawings i.e. plans, elevations, sections etc.
2. Specifications.
3. Rates.

DRAWINGS

If the drawings are not clear and without complete dimensions the preparation of Estimation become very difficult. So, it is very essential before preparing an estimate.

SPECIFICATIONS

- a) General Specifications:- This gives the nature, quality, class and work and materials in general terms to be used in various parts of work. It helps to form a general idea of building.
- b) Detailed Specifications:- These give the detailed description of the various items of work laying down the Quantities and qualities of materials, their proportions, the method of preparation workmanship and execution of work.



RATES

For preparing the estimate the unit rates of each item of work are required.

1. For arriving at the unit rates of each item.
2. The rates of various materials to be used in the construction.
3. The cost of transport materials.
4. The wages of labor, skilled or unskilled of masons, carpenters, Amador, etc.,

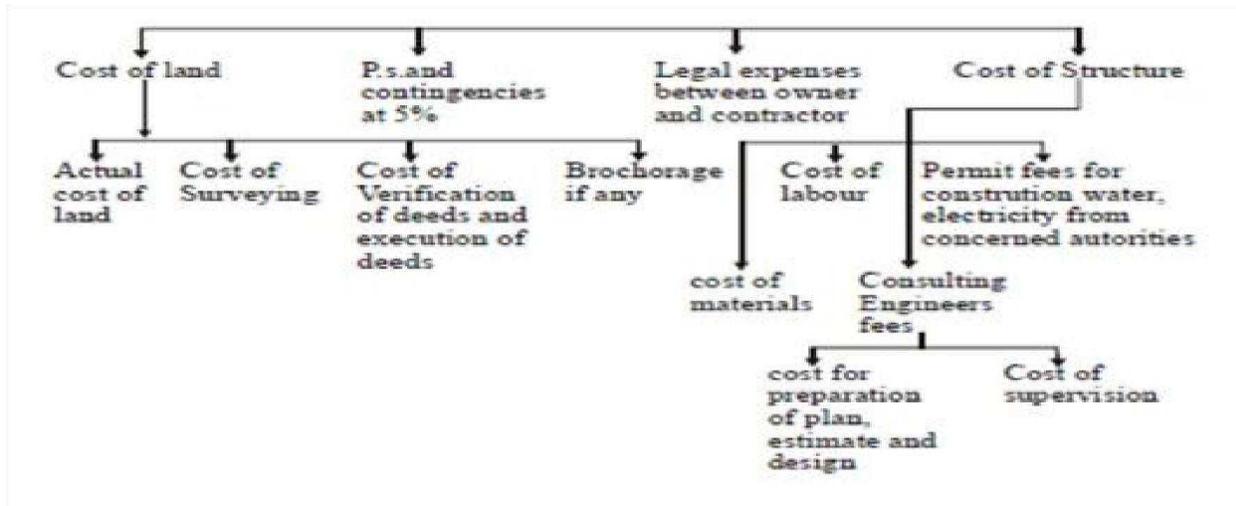
COMPLETE ESTIMATE

Most of people think that the estimate of a structure includes cost of land, cost of Materials and labor, but many other direct and indirect costs included and are shown below.

1. Water supply and sanitary arrangements.
2. Electrical installations like meter, motor, etc.,
3. Architectural features.
4. Contingencies and unforeseen items.

In general, certain percentage on the cost of estimation is allotted for the above L.

S.Items Even if sub estimates prepared or at the end of execution of work, the actual cost should not exceed the L.S.amounts provided in the main estimate.



WORK CHARGED ESTABLISHMENT:-

During the construction of a project considerable number of skilled supervisors, work assistance, watch men etc., are employed on temporary basis. The salaries of these persons are drawn from the L.S. amount allotted towards the work charged establishment. That is, establishment which is charged directly to work. An L.S. amount of 1½ to 2% of the estimated cost is provided towards the work charged establishment.

METHODS OF TAKING OUT QUANTITIES

The quantities like earth work, foundation concrete, brickwork in plinth and super structure etc., can be worked out by any of following two methods:-

- Long wall - short wall method
- Centre line method.
- Partly centre line and short wall method.

LONG WALL-SHORT WALL METHOD

In this method, the wall along the length of room is considered to be long wall while the wall perpendicular to long wall is said to be short wall. To get the length of long wall or short wall, calculate first the centre line lengths of individual walls. Then the length of long wall, (out to out) may be calculated after adding half breadth at each end to its centre line length.

Thus the length of short wall

Measured into in and may be found by deducting half breadth from its centre line length at each end. The length of long wall usually decreases from earth work to brick work in super structure while the short wall increases. These lengths are multiplied by breadth and depth to get quantities.

CENTRE LINE METHOD

This method is suitable for walls of similar cross sections. Here the total centre line length is multiplied by breadth and depth of respective item to get the total quantity at a time.

When cross walls or partitions or verandah walls join with main all, the centre line length gets reduced by half of breadth for each junction. Such junction or joints are studied carefully while calculating total centre line length. The estimates prepared by this method are most accurate and quick.

PARTLY CENTRE LINE AND PARTLY CROSS WALL METHOD

This method is adopted when external (i.e., around the building) wall is of one thickness and the internal walls having different thicknesses. In such cases, centre line method is applied to external walls and long wall-short wall method issued to internal walls. This method suits for different thicknesses walls and different level of foundations. Because of this reason, all engineering departments are practicing this method.

DETAILED ESTIMATE

The preparation of detailed estimate consists of working out quantities of various items of work and then determines the cost of each item. This is prepared in two stages.

I) DETAILS OF MEASUREMENTS AND CALCULATION OF QUANTITIES

The complete work is divided into various items of work such as earth work concreting, brick work, R.C.C. Plastering etc., The details of measurements are taken from drawings and entered in respective columns of prescribed preformed. The quantities are calculated by multiplying the values that are in numbers column to Depth column as shown below:-

Details of measurements form

S.No	Description of Item	No	Length (L) m	Breadth (B) m	Depth/Height (D/H)m	Quantity	Explanatory Notes

ii) Abstract of Estimated Cost :-

The cost of each item of work is worked out from the quantities that already computed in the details measurement form at workable rate. But the total cost is worked out in the prescribed form is known as abstract of estimated form. 4% of estimated Cost is allowed for Petty Supervision, contingencies and Unforeseen items.



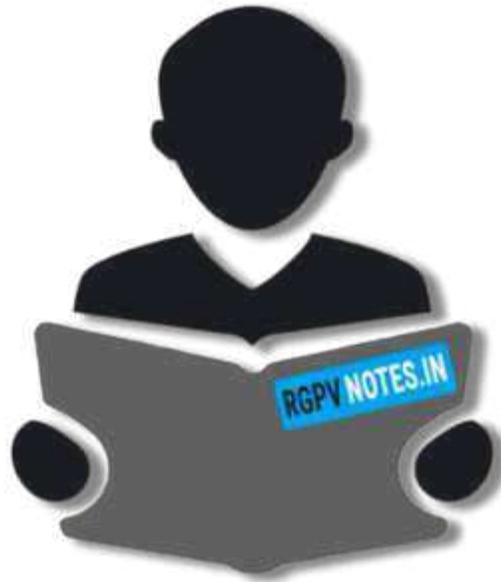
Types of Estimates

ABSTRACT OF ESTIMATE FORM

Item No.	Description/Particulars	Quantity	Unit	Rate	Per (Unit)	Amount

The detailed estimate should accompanied with

- i) Report
- ii) Specification
- iii) Drawings (plans, elevation, sections) iv) Design charts and calculations v) Standard schedule of rates.



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