LECTURE NOTES
ON
Estimation and Cost Evaluation-I
(Th.4)

Diploma 3rd Semester

DEPARTMENT OF CIVIL ENGINEERING
Govt. Polytechnic, Nayagarh

SYLLABUS

1.0 Introduction

1.1 Types of estimates – Plinth area, floor area / carpet area

1.2 Units and modes of measurements as per IS 1200

1.3 Accuracy of measurement for different item of work

2.0 Quantity Estimate of Building

2.1 Short wall long wall method and centre line method, deductions in masonry, plastering, white washing, painting etc., multiplying factor (paint coefficients) for painting of doors and windows (paneled/glazed), grills etc.

2.2 Detailed estimate of single storied flat roof building with shallow foundation and RCC roof slab with leak proof treatment over it including staircase and mumty room.

3.0 Analysis of Rates and Valuation

3.1 Analysis of rates for cement concrete, brick masonry in Cement Mortar, laterite stone masonry in Cement Mortar, cement plaster, white washing, Artificial Stone flooring, Tile flooring, concrete flooring, R.C.C. with centering and shuttering, reinforcing steel, Painting of doors and windows etc. as per OPWD.

3.2 Calculation of lead, lift, conveyance charges, royalty of materials, etc. as per Orissa P.W.D. system (Concept of C.P.W.D./Railways provisions)

3.3 Abstract of cost of estimate.

3.4 Valuation- Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolesce, methods of valuation.

4.0 Administrative Set-Up of Engineering Organisations:

4.1 Administrative set-up and hierarchy of Engineering department in State Govt./Central Govt./PSUs/Private Sectors etc. Duties and responsibilities of Engineers at different positions /levels.

INTRODUCTION

ESTIMATION

- Estimation is the scientific way of working out the approximate cost of an engineering project before execution of the work.
- It is totally different from calculation of the exact cost after completion of the project.
- Estimation requires a thorough Knowledge of the construction procedures and cost of materials & labour in addition to the skill, experience, foresight and good judgment.

ESTIMATE

- An estimate of the cost of a construction job is the probable cost of that job as computed from plans and specifications.
- For a good estimate the, actual cost of the proposed work after completion should not differ by more than 5 to 10 % from its approximate cost estimate, provided there are no unusual, unforeseen circumstances.

DEFINITION OF ESTIMATING AND COSTING

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.

a) Drawings like plan, elevation and sections of important points.
b) Detailed specifications about workmanship & properties of materials etc.
c) Standard schedule of rates of the current year.

NEED FOR ESTIMATE:

1. It help to work out the approximate cost of the project in order to decide its feasibility with respect to the cost and to ensure the financial resources, it the proposal is approved.
2. Requirements of controlled materials, such as cement and steel can be estimated for making applications to the controlling authorities.
3. It is used for framing the tenders for the works and to check contractor's work during and after the its execution for the purpose of making payments to the contractor.
4. From quantities of different items of work calculated in detailed estimation, resources are allocated to different activities of the project and ultimately their durations and whole planning and scheduling of the project is carried out.

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 wok. It helps no form a general idea of building.

b) Detailed Specifications:

These gives 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 labour, skilled or unskilled of masons, carpenters, Mazdoor, etc.,

SITE CONDITIONS AFFECTING THE OVERALL COST

- Each type of work requires a different method of construction. Construction may be of an ordinary house or office and it may also be of a Dam, Tunnel, Multistorey building, Airport, Bridge, or a Road, already in operation. Each of these works requires totally different construction techniques, type of machinery, and formwork.
- Quality of labour and labour output varies in different localities.
- Weather conditions greatly affect the output and, hence, the overall cost.
- Ground conditions vary and change the method of construction. For example, excavation may be dry, wet, hard, soft, shallow or deep requiring different efforts.
- The work may be in open ground such as fields or it may be in congested areas such as near or on the public roads, necessitating extensive watching, lightening, and controlling efforts, etc.
- The source of availability of a sufficient supply of materials of good quality is also a factor.
- The availability of construction machinery also affects the method of construction.
- Access to the site must be reasonable. If the access is poor, temporary roads may be constructed.

ESSENTIAL QUALITIES OF A GOOD ESTIMATOR

- In preparing an estimate, the Estimator must have good knowledge regarding the important rules of quantity surveying.
- He must thoroughly understand the drawings of the structure, for which he is going to prepare an estimate.
- He must also be clearly informed about the specifications showing nature and classes of works and the materials to be used because the rates at which various types of works can be executed depend upon its specifications.
- A good estimator of construction costs should possess the following capabilities, also:-
  a. A knowledge of the details of construction work.
  b. Experience in construction work.

c. Having information regarding the materials required, machinery needed, overhead problems, and costs of all kinds.
d. Good judgment with regard to different localities, different jobs and different workmen.
e. Selection of a good method for preparing an estimate.
f. Ability to be careful, thorough, hard working and accurate.
g. Ability to collect, classify and evaluate data relating to estimation.
h. Ability to visualize all the steps during the process of construction.

- Before preparing the estimate, the estimator should visit the site and make a study of conditions, there. For example, if the construction of a large building is planned, the estimator or his representative should visit the site and:
  - Note the location of the proposed building.
  - Get all data available regarding the soil.
  - Make a sketch of the site showing all important details.
  - Obtain information concerning light, power, and water.
  - Secure information concerning banking facilities.
  - Note conditions of streets leading to railway yards and to material dealers, and
  - Investigate general efficiency of local workman.

Types of Estimates :

Types of estimates are as follows.

1.Approximate estimate:–

It is also called budget, preliminary estimate. This type of estimate is prepared in the initial stage of a project. To give a clear idea to the owner (client) about the amount of cost needed for the project and to get the approval from necessary sanctioning bodies (eg: from banks to get loan). Documents such as project drawing plans, details about the land including electricity & water supply and a full clear report are necessary to carry out the estimate. Commonly the approximate estimate is calculated with relevant to the previous experience.eg: To calculate the estimate for a house, a previously (& also recently) completed similar house will be considered. Here the estimator already knows the rate for $1m^2$ area & with that he/she calculates the cost estimate for the newly proposed area (of similar house).

Approximate estimate = Rate of $1m^2$ (already known value) X proposed area (m^2)

2.Plinth area estimate: –

Plinth area estimate can be achieved by multiplying the values of plinth length, plinth width & plinth area rate. Here the plinth area is referred as, external plinth area of the building at floor level. Simply it can be also stated as the roof covered area of a building. Plinth area rate is derived by dividing the total cost of a previously constructed building by plinth area of the previously constructed building.

Plinth area estimate = Plinth area X plinth area rate.

Plinth area = plinth length X plinth width

Plinth area rate = Total cost of a previously built building / Total plinth area of that building.

There are some restrictions in calculating the plinth area of a building and some area have to include or exclude when calculating. Among that, areas which can include are, Floor area with area of walls at floor level excluding the offsets of the building, internal shafts of sanitary fittings within $2m^2$, lifts, air conditioning ducts, area of porch at floor level (cantilever part can't be included), area of barsati – a room on the terrace or roof top with veranda outside.

Areas which can't include are,

Area of lofts, open balconies / unenclosed balconies, fascia, towers which project above terrace level, louvers & vertical sun breakers.

Documents such as line plan with complete specifications & costs for services such as water, electricity should be attached with estimate.

How to calculate Rough Estimate:

- The rough cost estimate may be prepared on the following basis for different types of projects:
  1. Cost per square foot of covered area (plinth area) is the most commonly adopted criterion for preparing rough cost estimate for most of the residential buildings.
  2. For public buildings, cost. Per person (cost per capita) is used. For example,
     i. Students hostel————————-—cost per student
     ii. Hospitals————————————Cost per bed
     iii. Hotel————————————————Cost per Guest
  3. Cost per cubic foot is particularly suitable for commercial offices, shopping centers, and factory buildings, etc.
  4. For water tank/reservoir, cost may be worked out on the basis of capacity in gallons of water stored.
  5. For roads and railways, cost may be found out per mile/kilometre of length.
  6. For streets, cost may be per hundred feet/meters of length.
  7. In case of bridges, cost per foot/meter of clear span may be calculated.

EXAMPLE

1. Prepare a Rough-cost Estimate of a residential building project with a total plinth area of all building of 1500 sq.m. given that:

Plinth Area Rate = Rs: 950.00 / sq. ft.
Extra for special architectural treatment = 1.5 % of the building cost.
Extra for water supply and sanitary installations = 5 % of the building cost. Extra for internal installations = 14 % of the building cost
Extra for Electric & Sui gas services = 16 % of building cost
Contigencies 3 % overall
Supervision charges = 8 % overall
Design charges = 2 % overall

2. Prepare a Rough-cost Estimate based on unit costs of per unit plinth area basis of a four storeyed office building having a carpet area of 2000 sq.m. for obtaining the administrative approval of the Government. It may be assumed that 30 % of the built up

area will be taken by the corridors, verandas, lavatories, staircase, etc. and 10 % of built up area will be occupied by walls. The following data is given:

- Plinth Area Rate = Rs: 1100.00 / sq. ft.
- Extra for special architectural treatment = 0.5 % of the building cost.
- Extra for water supply and sanitary installations = 6 % of the building cost.
- Extra for internal installations = 14 % of the building cost
- Extra for electric services = 12.5 % of building cost
- Extra for sui gas services = 6 % of building cost
- Extra due to deep foundations at site = 1.0 % of building cost
- Contigencies = 2.5 % overall
- Supervision charges = 8 % overall
- Design charges = 2.5 % overall

3. Prepare a Rough-cost Estimate for obtaining the administrative approval of the Government for a hospital project to serve both indoor and outdoor patients in an important rural area. The hospital will consist of the following:

- Main administrative office with dispensing operations, etc.
- Two general wards, each of 20 general beds.
- Superintendent Doctor's Residence.
- Two Assistant Doctor's Residences.
- Eight single Nurses Quarters.
- Four Compounder's Quarters.
- Twelve lower staff's Quarters.

3.Cubic content estimate: –

This type of estimate done by multiplying the volume of the building by the unit cubic rate achieved from the previously (also recent) estimate. This type of estimate is a little bit more accurate than above mentioned methods and mostly suitable for multi storied buildings. Here the cost of corbelling (corbel – a piece of stone, wood, brick, or other building material, projecting from the face of a wall and generally used to support a cornice or arch), cornice and other works like that are neglected.

Cubic content estimate = Volume of the building X unit cubic rate (known value)

volume of the building = plinth area (length X breadth of the proposed building) X height of the building (floor to roof top)

unit cubic rate = total cost of the previously built building / total volume of that building.

4.Annual repair estimate and special repair estimate :–

These estimates are prepared in order to maintain the constructed element in good condition. Works that attached when consider repair works, white washing, painting, plastering works, patching works & etc. Special repair estimate is prepared in situations where the costs of materials increased when compare to annual repair estimate cost.

5.Revised estimate:-

This estimate is prepared when the rate of previously submitted estimate increases by 5% or more than that. But here the reason for the preparation of estimate must have a strong & valid reason like sudden increase in cost of materials. The reason and comparative statement between 2 estimates should be annexed with the revised estimate.

6.Supplementary estimate: –

This type of estimate is prepared when there is a necessary situation of supplementary work, to progress out the original work. The annexure of originally prepared estimate & supplementary estimated amount of the originally prepared estimate when submitting for requesting approve.

7.Detailed estimate:-

- The whole project is sub-divided into different items of work or activities. The quantity for each item is then calculated separately from the drawings as accurately as possible. The procedure is known as "taking out of quantities".
- The quantities for each item may be estimated and shown in the pattern which is called "Bill of quantities."
- The unit, in which each item of the wok is to be calculated, should be according to the prevailing practice as followed in various departments of the country.
- Each item of the work is then multiplied by its estimated current rate calculated by a fixed procedure to find out cost of the item.
- At the end, a total of all items of the work are made to get the total estimated cost.
- The rates are usually as per Schedule of Rates for the locality plus a premium to allow for rise in labour and material rates over and above the schedule of rates.
- A percentage, usually 5% is also provided on the total estimated cost for the work to allow for the possible contingencies due to unforeseen items or expenditure or other causes, besides 2% establishment charges.

BILL OF QUANTITY								
Sl. No.	Description of Item	No.	Measurements			Quantity	Total Quantity	Remarks
			Length	Breadth	Height			

PRICED BILL OF QUANTITIES						
Sl. No.	Description of Item	Unit	Quantity	Rate	Cost	Remarks

- Besides drawings and details of measurements and calculation of quantities (Bill of Quantities), the following documents are also usually submitted with the detailed estimate for obtaining Technical Sanction:
  1. A report explaining History, necessity, scope and main features of the project, its design, and estimate, etc.
  2. Specifications lying down the nature and class of work and material to be used in various parts of the work.
  3. The abstract of cost (priced Bill of Quantities) showing the total quantities under each sub-head, rate per unit of measurement, and cost.
  4. Calculation sheets showing calculations for important parts of the structure.

In fact, in estimating the art and skill lies only in the computation of details without any omissions, of all parts of the building or work.

Note: The rate used to estimate should check with current standard schedule of rates & in case of quantity, it should check with standard data book.

Units and modes of measurements as per IS 1200 :

The units of measurements are mainly categorised 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 metres (RM)
c) Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness etc., 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 metres.

Sl. No.	Particulars of item	Units of Measurement	Units of payment
I	Earth work: i. Earth work in Excavation ii. Earthwork in filling in foundation trenches iii. Earth work in filling in plinth	 Cum Cum Cum	 Per %cum Per %cum Per %cum
II	Concrete: 1. Lime concrete in foundation	Cum	Per cum

	2. Cement concrete in Lintels 3. R.C.C.in slab 4. C.C. or R.C.C. Chajja, Sunshade 5. L.C. in roof terracing (thickness specified) 6. Cement concrete bed 7. R.C. Sunshade (Specified Width & Height	Cum Cum Cum Sqm Cum Cum	Per cum Per cum Per cum Per Sqm Per cum 1m
III	Damp Proof Course (D.P.C) (Thickness should be mentioned)	Sqm	Per sqm
IV	Brick work: 1. Brickwork in foundation 2. Brick work in plinth 3. Brick work in super structure 4. Thin partition walls 5. Brick work in arches 6. Reinforced brick work (R.B.Work)	 Cum Cum Cum Sqm Cum Cum	 Per cum Per cum Per cum Per sqm Per cum Per cum
V	Stone Work: Stone masonry	 Cum	 Per cum
VI	Roofing 1. R.C.C. and R.B. Slab roof (excluding steel) 2. L.C. roof over and inclusive of tiles or brick or stone slab etc (thickness specified) 3. Centering and shuttering form work 4. A.C.Sheet roofing	 Cum Sqm Sqm Sqm	 Per cum Per sqm Per sqm Per sqm
VII	Plastering, points &finishing 1. Plastering-Cement or Lime Mortar (thickness and proportion specified) 2. Pointing 3. White washing, colour washing, cement wash (number of coats specified) 4. Distempering (number of coats specified)	 Sqm Sqm Sqm Sqm	 Per sqm Per sqm Per sqm Per sqm

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, labour, 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.

Plinth Area:-

Plinth area and carpet area of a building is measured for estimation and calculation of building cost. It is also a measure of usable space of building. **Plinth area** is the covered built-up area measured at the floor level of any storey or at the floor level of the basement. Plinth area is also called as built-up area and is the entire area occupied by the building including internal and external walls. Plinth area is generally 10-20% more than carpet area.

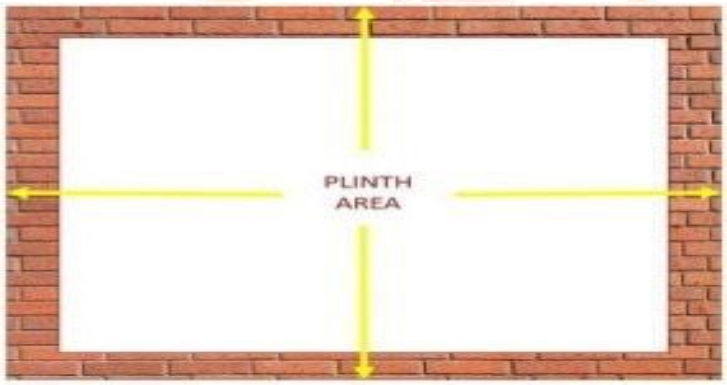


Fig: Plinth Area of Building

Measurement of Plinth Area

Following areas are included during measurement of plinth area:

1. Area of the wall at the floor level, excluding plinth offsets. If there are any common walls between two buildings, half of the area of such walls shall be considered in the plinth area. When building consists of columns projecting beyond the cladding, the plinth area is measured upto the external face of the cladding (in case of corrugated sheet, cladding outer edge of the corrugation is considered).
2. Areas of the internal shaft for sanitary installations and garbage chute, electrical, telecom and firefighting services provided these do not exceed 2 m^2 in area.
3. Vertical duct for air conditioning and lift well including landing.
4. Staircase room or head room other than terrace level
5. Machine room
6. Porch
7. Open projections of veranda, balconies and parapets, if the area is protected by projections, full area is included in plinth area, if the area is un-protected by projections, 50% of the area is included.
8. Recess by cantilevering beyond external walls, bay window is the best example. If the recess height is up to 1.0 meter, 25% of such area shall be included. If the recess height is 1.0 to 2.0 meters, 50% of such area shall be included. If the recess height is above 2.0 meters, 100% of such area shall be included.

The following is not to be included in the calculation of plinth area:

1. Additional floor for seating in assembly buildings, theatres, auditoriums
2. Cantilevered porch
3. Balcony
4. Area of loft
5. Internal sanitary shaft and garbage chute, provided these are more than 2 m^2 in area
6. Area of architectural band, cornice, etc.
7. Area of vertical sun breaker or box louver projecting out and other architectural features such as slab projection for keeping flower pots
8. Open platform
9. Terrace at first floor
10. Spiral staircase including landing
11. Towers, turrets, domes projecting above the terrace level at terrace.

Carpet Area:-

Carpet area the covered area of the usable spaces of rooms at any floor. It is measured between walls to walls within the building and is the sum of the actual areas of the rooms where you can carpet.

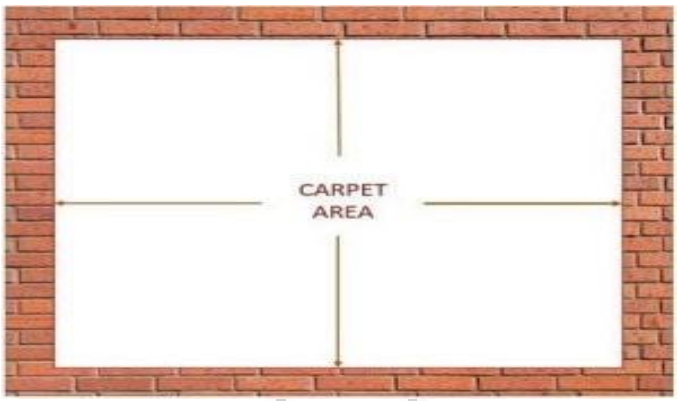


Fig: Carpet Area

Difference between Plinth Area and Carpet Area:-

Plinth Area	Carpet Area
The covered built-up area of a building is estimated at the floor level of any storey or at the floor level of the basement.	Measured from wall to wall within the structure, this term refers to the covered area of the usable areas of rooms on any floor.
Commonly referred to as the built-up area.	Popularly known as the usable area or livable area.
Plinth area = building carpet area + wall area (both internal and exterior walls) + parasitic area + elevator openings, etc.	Calculated by subtracting the area of the outer and inner walls of the building from the total floor area of the building. Carpet Area = Built-up area – Area of walls
The plinth area is the space between the building's exterior and outer bounds or its walls.	The carpet area is the sum of the actual areas of the rooms that you can carpet.
The plinth area is 10 to 20% greater than the carpet area.	The carpet area is smaller than the plinth area by 10 to 20%.

Difference Between Plinth Area and Built-Up Area

As far as the difference between plinth area and built-up area is concerned, the former refers to the area covered by a structure, measured out of external wall finishes and multiplied by the number of floors, provided that the feet have the identical plan. In contrast, a plinth area is covered by the plinth of a structure, measured likewise out to out of wall finishes.

Difference Between Plinth Area and Floor Area

Carpet area, floor area and plinth area are the terms that are quite frequently used in the real estate sector. As far as the difference between plinth and floor areas is concerned, floor area refers to the total area of floors between walls. It comprises the foundations of all rooms, including kitchens, storerooms, entrance halls, staircase rooms, verandahs, etc.

Therefore, the floor area is equivalent to the plinth area minus the area covered by the walls.

Floor Area= Plinth area – Area covered by walls

The plinth area is the area that lies within the outer-to-outer dimensions of the walls of the building and is obtained by multiplying the out-to-out dimensions of the building at any floor level.

Note, space covered by pillars, pilasters, and other intermediate support are not calculated in the floor area.

Difference Between Plinth Area and Covered Area

Covered area: The actual area under the roof plus the walls, pillars, and balconies. It is approximately 8 to 10% more than the carpet area.

Plinth area: It is the covered built-up area measured at the floor level of any storey or the floor level of the basement of a building and is approximately 10 to 20% more than the carpet area.

QUANTITY ESTIMATE OF BUILDING

METHODS OF TAKING OUT QUANTITIES:

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

a) Long wall - short wall method
b) Centre line method.
c) Partly centre line and short wall method.

a) 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.

b) Centre line method:

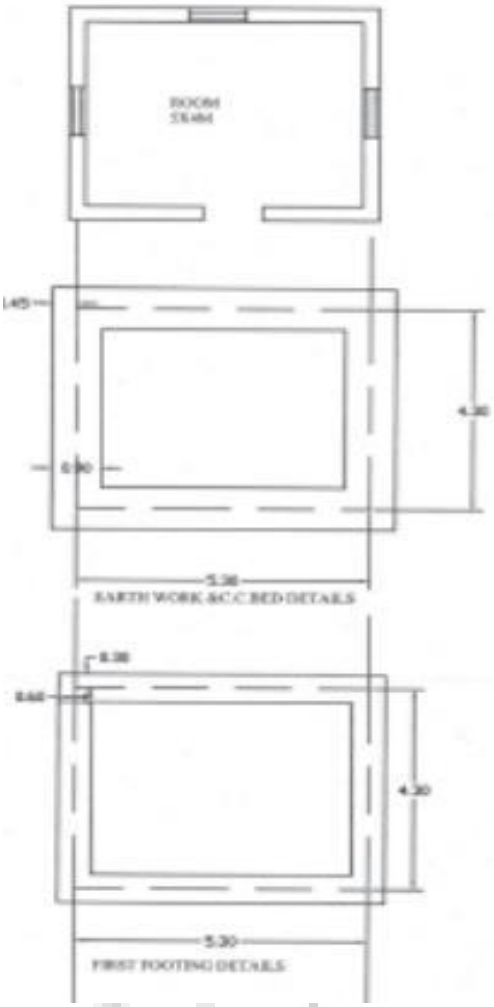
This method is suitable for walls of similar cross sections. Here the total centre line length is multiplied by breadth and depth of respective item to get the total quantity at a time. When cross walls or partitions or verandah walls join with main wall, the centre line length gets reduced by half of breadth for each junction. Such junction or joints are studied caefully while calculating total centre line length. The estimates prepared by this method are most accurate and quick.

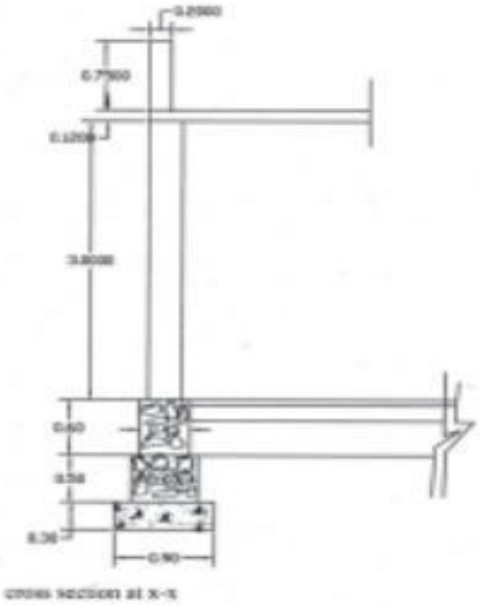
c) Partly centre line and partly cross wall method:

This method is adopted when external (i.e., alround 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 is used 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.

I. Example 1: From the given figure below calculate the detailed and abstract estimate for the single roomed building (Load bearing type structure) by a) long wall & short wall method (b) Centre Line Method

Single Roomed Building (Load Bearing type structure)





CROSS SECTION AT X-X

Note: All Dimensions are in 'M'

D=1X2.1M

W=1.5X1.2M

Long wall - Short wall Method

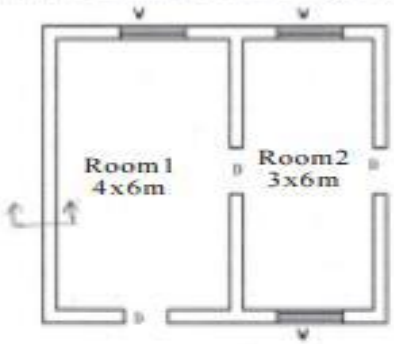
S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation for foundation**						
	a) Long walls	2	6.2	0.9	1.4	15.264	L=5.3+.45+.45=6.2 D=0.3+0.5+0.6=1.4
	b) Short walls	2	3.4	0.9	1.4	8.568	L=4.3-0.45-0.45=3.4
					Total	**24.192**	**m^3**
2.	**C.C.(1:4:8) bed for** foundation						
	a) Long walls	2	6.2	0.9	0.3	3.348	
	b) Short walls	2	3.4	0.9	0.3	1.836	
					Total	**5.184**	**m^3**
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings						
	i) Long walls	2	5.9	0.6	0.5	3.54	L=5.3+0.3+0.3=5.9
	ii) Short walls	2	3.7	0.6	0.5	2.22	L=4.3-0.3-0.3=3.7
					Total	**5.76**	**m^3**
	b) Basement						
	i) Long walls	2	5.75	0.45	0.6	3.105	L=5.3+0.225+0.225=5.75
	ii) Short walls	2	3.85	0.45	0.6	2.079	L=4.3-0.225-0.225=3.85
					Total	**5.184**	**m^3**
	Total R.R. Masonry for footings and Basement = 5.76+5.184 = 10.94 m^3						
4.	**Brick masonary** with CM (1:6) for super structure						
	a) Long Wall	2	5.6	0.30	3.00	10.08	L=5.3+0.15+0.15=5.6
	b) Short walls	2	4.0	0.30	3.00	7.20	L=4.3-0.15-0.15=4.0
					Total	**17.28**	**m^3**

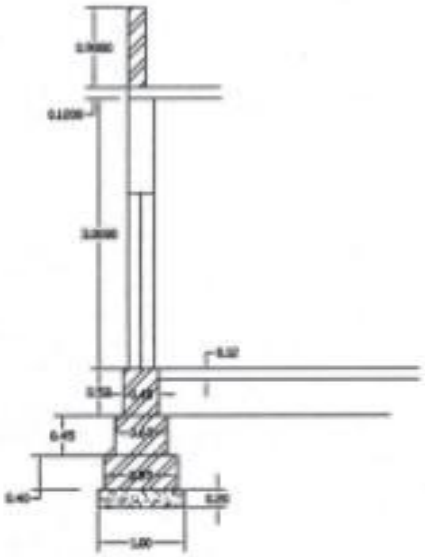
Centre Line Method

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation** for foundation 5.3 4.3	1	19.2	0.9	1.4	24.192	**m³** L=2(5.3+4.3)=19.2
2.	**C.C.(1:4:8) bed for** foundation	1	19.2	0.9	0.3	5.184	**m³**
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings	1	19.2	0.6	0.5	5.76	
	b) Basement	1	19.2	0.45	0.6	5.184	
					Total	**10.944**	**m³**
4.	**Brick masany** with CM(1:6) for superstructure	1	19.2	0.3	0.3	17.28	**m³**

Example :2 :-From the given figure below calculate the details and abstract estimate for the double roomed building (Load bearing type structure) by a) long wall & short wall method (b) Centre Line Method

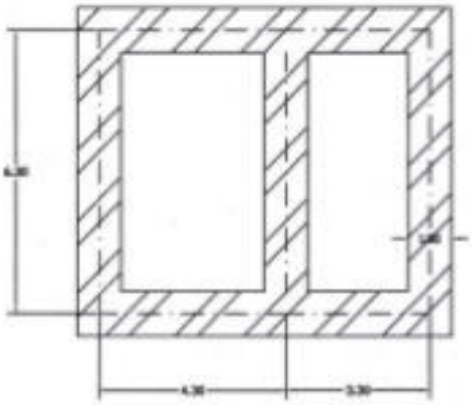
TWO ROOMED BUILDING
(LOAD BEARING TYPE STRUCTURE)





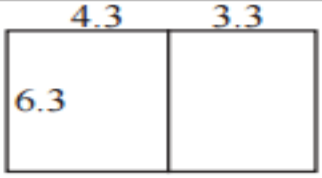
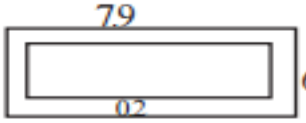
D=1x2.1
W=1.5x1.2

Note: All Dimensions are in 'M'



Plan for first footing

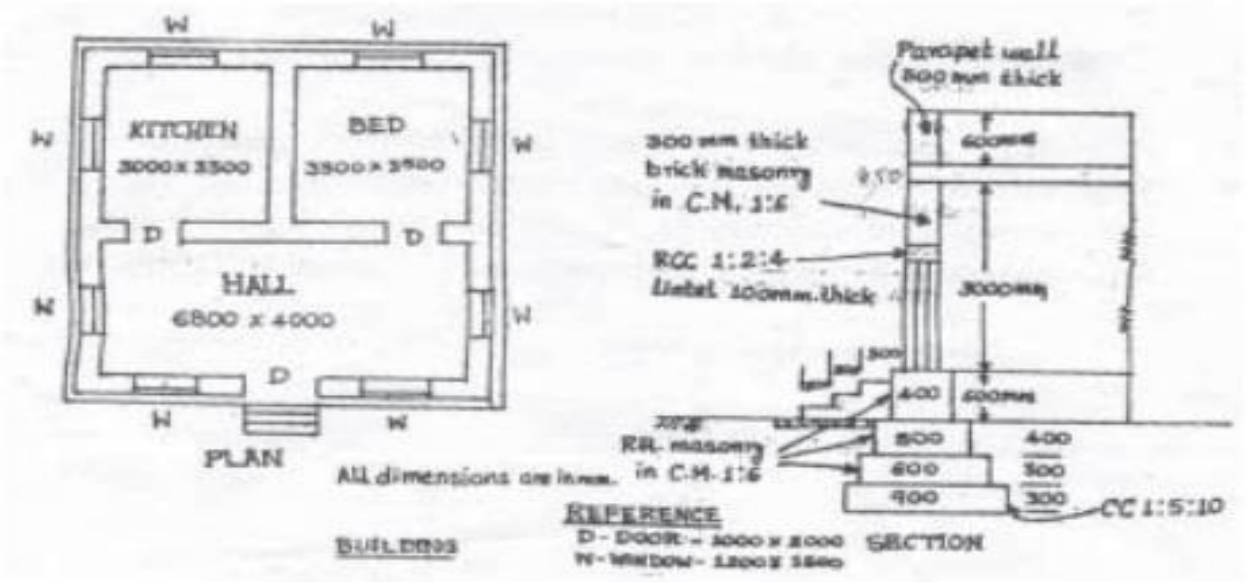
S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation** for foundation						
	a) Long walls	2	8.6	1.0	1.05	18.05	L=7.6+0.5+0.5=86
	b) Short walls	3	5.3	1.0	11.05	16.70	L=6.3-0.5-0.5=5.3
					Total	**34.75**	**m^3**
2.	**C.C.(1:4:8) bed for** foundation						
	a) Long walls	2	8.6	1.0	0.2	3.44	
	b) Short walls	3	5.3	1.0	0.2	3.18	
					Total	**6.62**	**m^3**
3.	**Brick masanory for** footings with CM(1:4)						
	first footing						
	a) Longwalls	2	8.45	0.85	0.4	5.746	L=7.6+0.425+0.425=8.45
	b) Short walls	3	5.45	0.85	0.4	5.560	L=6.3-0.425-0.425=5.45
	2nd fooring						
	a) Long walls	2	8.20	0.6	0.45	4.428	L=7.6+0.3+0.3=8.2
	b) short walls	3	5.70	0.6	0.45	4.617	L=6.3-0.3-0.3=5.7
	ii) for base ment	2	8.00	0.4	0.4	2.560	L=7.6+0.2+0.0=8.0
	long walls	3	5.90	0.4	0.4	2.832	L=6.3-0.2-0.2=5.9
	short walls						
	iii) for super structure	2	7.90	0.3	3.0	14.22	L=7.6+0.15+0.15=7.9
	long walls	3	6.00	0.3	3.0	16.20	L=6.3-0.15-0.15=6.0
	short walls						
	iv) Parapet wall						
	a) long walls	2	7.90	0.2	0.70	2.212	
	b) Shot walls	2	6.20	0.2	0.70	1.736	
					Total	**60.11**	
	Deductions for openings						
	Doors	3	1.0	0.3	2.1	1.89	
	Windows	3	1.5	0.3	1.2	1.62	
	Lintels over doors	3	1.20	0.3	0.10	0.108	
	windows	3	1.70	0.3	0.10	0.153	
	Net B.M.=60.11-377=56.34m^3				Total	**3.771**	

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
	4.3 3.3  6.3						
	Total centre line length =(4.3+3.3)2+6.3x3=34.1m						
1.	**Earth work excavation**	1	33.1	1.0	1.05	34.75	L=34.1-2x1/2=33.1
2.	**C.C.(1:4:8) bed for foundation**	1	33.1	1.0	0.20	6.62	**m³**
3.	**Brick masonry with CM(1:4)**						
	a) for foundation						
	i) first footing	1	33.25	0.85	0.40	11.30	L=34.1-0.85=33.25
	ii) 2nd footing	1	33.50	0.60	0.45	9.045	L=34.1-0.6x2/2
	b) for basement	1	33.7	0.40	0.40	5.392	L=34.1-0.4x2/2
	c) for super structure	1	33.80	0.30	3.0	30.42	L=34.1-0.3x2/2
	d) for parapet wall						
	7.9  6.6 02			77		6.4	
	Total centre line length =2(7.7+6.4)=28.2	1	28.2	0.2	0.70	3.948	
					Total	**60.10**	**m³**
	Deductions for Openings Doors	3	1.0	0.3	2.1	1.89	
	windows	3	1.5	0.3	1.2	1.62	
	Lintels Doors	3	1.2	0.3	0.1	0.108	
	Windows	3	1.7	0.3	0.1	1.153	
					Total	**3.771**	**m³**
	Net B.M.=60.11-3.771=56.34m³						
4.	Quantity of R.C.C. Roof, Plastering for walls and cealing and flooring, White washing is same as Longwall & Short wall method.						

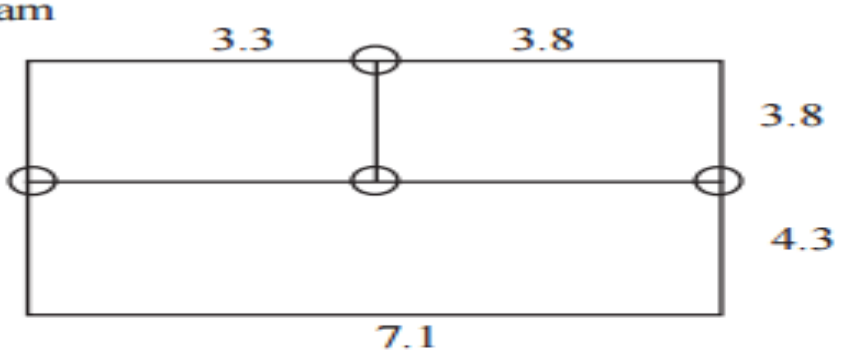
Abstract estimate of two roomed building (Load bearing type structure)

S.No.	Description of item	Quantity	Unit	Rate	Per	Amount
1.	Earth work excavation	34.75	m^3	465	$10m^3$	1615.90
2.	Cement concrete(1:4:8)	6.62	m^3	1545	$1m^3$	10228.00
3.	Sand filling in basement	12.036	m^3	195.20	$10m^3$	235.00
4.	Brick masonry in country Bricks of standard size in CM(1:8)	56.34	m^3	2291	m^3	129075.00
5.	R.C.C. (1:2:4) for lintels, beams etc.	3.303	m^3	6030	m^3	19918.00
6.	R.C.C.(1:2:4) for slabs,	6.26	m^3	6030	m^3	37748.00
7.	Cement concrete (1:5:10) for flooring	4.2	m^3	1452	m^3	6098.40
8.	Supplying and fixing of country wood for doors.	6.3	m^3	1650	m^2	10395.00
9.	Supplying and fixing of country wood for windows and ventilators.	5.4	m^2	2300	m^2	12420.00
10.	Plastering to all exposed surfaces of brick work and basement with C.M (1:5)	222.72	m^2	582	$10m^2$	12962.30
11	White washing with best shell lime	264.72	m^2	116	$10m^2$	3070.75
12	Flooring with spartek tiles set in C.M (1:3)	42	m^2	4230	$10m^2$	17766.00
13	Painting with ready mixed enamel paint	25.305	m^2	335	$10m^2$	8477.17
						128090.00
14	Provision for water supply and sanitary arrangements @12.5%					16011.25
15	Provision for electrification @7.5%					9606.75
16	Provision for architectural appearance @2%					2561.80
17	Provision for unforeseen items 2%					2561.80
18	Provision for P.S.and contingencies @4%					5123.60
				Grand Total		**163955.23**

Example 3 :- From the given figure below calculate the details and abstract estimate for the single Storeyed residential building with no of rooms (Load bearing type structure) by Centre Line Method

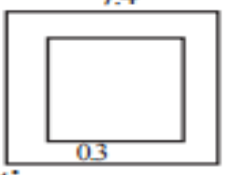


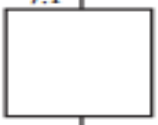
Centre line diagram



Total centre line length =(3.3+3.8)3+3.8×3+4.3×2=41.3m
no of T Junctions = 4

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	Earth work Excavation	1	39.5	0.9	1.0	35.55	41.3-4x0.9/2=39.5
2.	C.C. bed (1:5:10)	1	39.5	0.9	0.3	10.665	**m³**
3.	R.R. Masonary in CM 1:6						
	1st Footing	1	40.1	0.6	0.3	7.218	41.3-4x0.6/2=40.1
	IInd Footing	1	40.3	0.5	0.4	8.06	41.3-4x0.5/2=40.3
	Basement	1	40.5	0.4	0.6	9.72	41.3-4x0.4/2=40.5
					Total	**25.00**	**m³**
4.	Damp proof course over basement alround the building with CC (1:2:4)	1	40.5	0.6	---	16.2	**m²**
	Deduct for Door sills	3	1.0	0.3		- 0.9	**m²**
	Net Quantity =16.2-0.9=15.3sq.m				---		
5.	First class brick work in wall in						
	a) superstructure with CM 1:6	1	40.7	0.3	3.0	36.63	L =41.3-4x0.3/2
	b) Parapet wall	1	30.4	0.3	0.6	5.472	L=2(7.1+8.1)
					Total	**42.102**	**m³**
	Deductions:						
	Doors	3	1.0	0.3	2.0	1.80	
	Windows	8	1.4	0.3	0.1	0.336	projection on either side
					Total	**6.564**	
	Net Quantity of BM = 42.102-6.564 = 35.538m³						
6.	Plastering with 12mmth in CM 1:5	1x2	40.1	---	3.0	240.6	L=41.3-4x0.3=40.1
	Deductions for openings						





	Doors	3x2	1.0	---	2.0	12.0	
	windows	8x2	1.2	---	1.5	28.8	
					Total	**40.8**	**m²**
	Plastering for parapet wall (sides)	1x2	30.4	---	0.6	36.48	
	Top	1	30.4	0.3	---	9.12	
					Total	**45.60**	**m²**
	Net Plastering = 240.6-40.8+45.6=245.4 m²						
7.	Flooring with 25mm th CC(1:2:4)						
	Kitchen	1	3.0	3.5	--	10.5	
	Bed	1	3.5	3.5	--	12.25	
	Hall	1	6.8	4.0	--	27.20	
	Sills of Doors	3	1.0	0.3	--	0.90	
					Total	**50.85**	**m²**
8.	Ceiling = Same as Flooring					50.85	**m²**
9.	white washing = Same as Plastering for walls and ceiling 245.4+50.85 = 296.25 m²						
10.	RCC(1:2:4) for						
	a) Slab	1	7.40	8.40	1.5	9.324	
	b) lintels over Doors	3	1.2	0.3	0.1	0.108	
	Windows	8	1.4	0.3	0.1	0.336	
	c) beams	1	40.7	0.3	0.3	3.663	
					Total	**13.431**	**m³**
11	Supply & Fixing of best country wood for						
	a) Doors	3				3Nos.	
	b) Windows	8				8 Nos	
12	Painting with ready mixed synthetic enamil paints two coats over primary coat for new wood for						
	a) Doors	2¼x3	1.0	--	2.0	13.50	
	b) Windows	2¼x8	1.2	--	1.5	32.40	
						45.90	**m²**
13	2% unforeseen items						
14	4% P.S & contingencies and round off.						

Example: Calculate the quantities of items of the stair case of the figure shown in below.

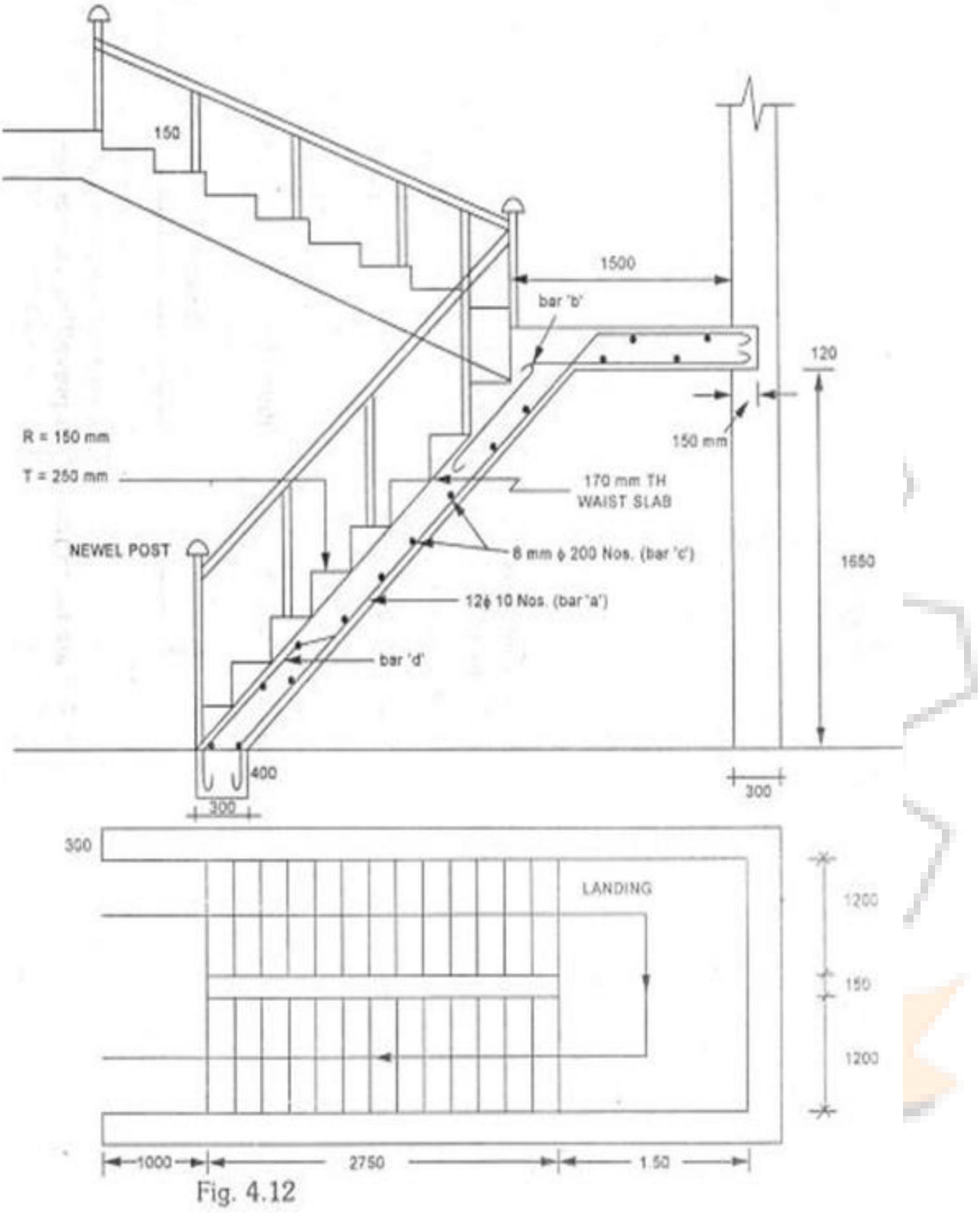


Fig. 4.12

R.C.C. Stair Case

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1	R.C.C. (1:2:4) excluding steel and its fabrication but including centering and shuttering and binding wire.						
	a) Toe wall	1x1	3.15	0.3	0.4	0.38	m^3 L=(1.2+0.15+1.2+2x0.3)
	b) Waist slab for I and II flights $L=\sqrt{2.75^2+1.65^2}=3.21m$	1x2	3.21	1.2	0.17	1.31	
	c) Landing Middle and first floor	1x2	2.85	1.65	0.17	1.60	L=(1.2+0.15+1.2+2x0.15)
					Total	3.29	m^3
2.	Ist class brick work in C.M. (1:4) for steps	2x11	1.2	½x(0.25+1.5)		0.495	
3.	20mm. thick cement plastering (1:5) for steps finished neat						
	a) Treads & Rises	2x11	1.2	x (0.25+0.15)		10.56	
	b) ends of steps	2x11		½x(0.25+1.5)		0.41	
					Total	10.97	m^2
4.	2.5cm No sing in steps	2x12	1.2	--	--	28.8	RM
5.	2.5cm. C.C. flooring finished neat cement floating in middle and first floor landing.	1x2	2.55	1.2	--	6.12	m^2
6.	Supplying and fixing of best teak wood hand rail finished smooth	1x1	6.67	--	--	6.67	RM
7.	supply and fixing of best teak wood newel posts & finished smooth	1x2	1.0	0.1	0.1	0.02	m^3
8.	Cap of Newel post	1x2	---	--	---	2Nos.	

ANALYSIS OF RATES AND VALUATION

ANALYSIS OF RATES:

- Engineering departments prepare rates according to the market rates for the payments that are known as **Schedule of Rates.**
- It includes rates of cement, sand, gravel, and steel bars, etc.
- However, it also shows the rates of labour or material as well.
- Rates of labour are known as **Labour Rates**.
- Rates of labour along with the materials are known as Composite Rates and shortly known as **CSR**.
- Schedule of Rates is regularly issued observing the rates fluctuation in the market.
- Rates are analyzed for their establishment which is known as **Analysis of Rates.**
- Rates are subjected to increase even after issuance of the Schedule of Rates that is why additional rates are decided during agreement with the contractor that is known as **Premium.**
- Rates are also subjected to decrease even after issuance of the Schedule of Rates.
- Decreased rates are decided during agreement with the contractor that is known as **Rebate.**
- It is issued at the start of each year that will be practicable for at least three months.
- It is known as **Market Rates Schedule** that is uploaded on the Internet and shortly known as **MRS**.

Purpose of Rate Analysis.

Purposes of Analysis of Rates are as follow.

1. Determining the cost of construction in Per Unit according to the Specifications.
2. Determining the overall cost or budget of the building.
3. Proportioning the effect of market rates on payments being made for constructional work.
4. Making uniform standards for constructional works being done in limits of government and engineering departments.
5. Establishing the amount of Rebate or Premium over departmental payments.

Pre-requisite for Analysis of Rates.

Cost of five given factors plays a vital role in Analysis of Rates.

1. Cost of Material.
2. Cost of Labour.
3. Cost of Equipment.
4. Overhead Charges.
5. Contractor's Profit.

1. Cost of Materials.

During Analysis of Rates, quantities of material per unit of measurement of any constructional work are determined, and their rates are resolved from the market.

These material rates include carriage, tax, and other costs as well.

If cement, steel, and other materials are to be provided to the government sector, then their rates are not included in the analysis.

However, carriage charges are included to get materials to the construction site.

2. Cost of Labour.

During Analysis of Rates, the number of labour per unit of measurement of any constructional project is determined, and their approximate figure is written.

For example, numbers of labour such as Mason, secretary, and labour, etc. are written.

Moreover, their numbers are multiplied with relevantly applicable wages in order to acquire cost of labour in Per Unit.

3. Cost of Equipment.

Different types of machinery and equipment are employed in construction work.

If machinery is being employed for particular item of Work, then its cost will be added into the cost of that particular Item.

For example, Concrete Mixer If only employed in the preparation of concrete.

Hence, Its cost along with rent with depreciation is included.

If machinery is being employed for different types of construction work, then the separate budget of 1.0 to 1.5 % of the overall budget is reserved for them.

4. Overhead Charges.

During rate analysis, overhead charges such as office rent, furniture and appliances charges, staff salaries and wages, service charges and other contingencies are included in the analysis.

These charges usually weigh around 2.5 to 5 % of the overall cost.

Nowadays, 6% tax has to be paid in prior.

Therefore, it is included weighing up to 10 % in the budget.

5. Contractor's Profit.

Contractor (s) are generally hired for constructional projects.

10% profit for the contractor is generally included in the overall cost.

This profit is kept 15% in small projects and 8% in big projects.

Analysis of Rate for Masonry.

Masonry work is accomplished with bricks, stones or blocks of concrete.

Bricks, stones or blocks of concrete are used with mortar.

Therefore, two things are basically used in masonry work, bricks or other blocks, and mortar for binding.

A measurement unit is selected for analysis in which the number of bricks, stones or concrete blocks and the amount of mortar to be used in masonry is determined.

Their quantities depend over the sizes of used bricks, stones or concrete blocks and relevant joints.

Increase in the number of joints and their corresponding gaps will relatively increase the quantity of mortar.

In masonry, their standard sizes are selected and analyzed as standards play a vital role in constructional works.

Size of bricks used in masonry will be 9″ x 4.5″ x 3″ in the British System while this size will be 20 x 10 x 10 cm in French System (M.K.S System).

There will be 1350 Bricks in 100 cubic feet in standard masonry and **500** bricks in a cubic meter.

Hence, there will be 30 cubic feet of dry mortar used in 100 cubic feet of bricks masonry while there will be 0.30 cubic meter of dry mortar used in one cubic mortar.

Rate Analysis for Concrete Work:

For analysis of concrete work, 100 cubic feet is regarded as Unit of Rate.

Cost of materials for concrete ingredients, cost of labour and the cost of carriage are included during analysis of concrete work.

Initially, Unit of Rate is thoroughly analyzed for determining, the quantity of material that will be concrete in wet form.

This quantity is multiplied with **1.54** in order to calculate the concrete volume in dry form.

Concrete volume is increased because cement fills spaces in the sand and resultant mixture fills space in gravel.

Therefore, the volume of separate concrete ingredients brings about a decline in the overall volume of the concrete.

A decline in concrete volume depends on the ratio of concrete and size of gravel and sand.

The volume of dry materials helps find quantities of concrete ingredients such as cement, sand (fine aggregate) and gravel (coarse aggregate).

Therefore, the ratio of concrete ingredients is determined initially by the following formula.

Quantity of Material = (Ratio of Material / Sum of Ratio) x Dry Material of Concrete.

After determining quantities of all of the materials, their cost is calculated according to the recent market rates.

Then, the cost of labour is also determined for relevant concrete work.

Finally, the carriage cost is calculated.

All these costs are accumulated, and the profit of the contractor is added up to determine the overall cost for one unit.

Rate Analysis for Floors.

The floor is the part of a building which is used to store the goods and residents use it to walk on it.

Floor separates different stories of the building, and this is how it is named.

For example, floor constructed over the ground level is known as Ground Floor, the above is known as the First Floor and then, Second Floor and so on.

Hence, floor constructed beneath the ground level is known as Basement Floor.

A floor has the following components.

1. Sub Base
2. Base.
3. Topping.

Sub Base is constructed in case of Ground Floor that is the lower part of the floor.

Sub Base is generally formed with Lime Concrete or by Lean Cement Concrete.

Concrete (1:4:8) or (1:3:6) is used in its construction.

Sub Base is not required if the ground is rigid.

The base is a mandatory part of the floor which is constructed directly over the sub-grade on the ground.
This part of the floor is usually constructed with cement concrete. The part actually bears the load being applied over the floor.
Hence, this part must be constructed in such a way that it can bear up the load being applied over it.

This part is made with concrete (1:2:4).
The topping is the most upper part of the floor.
This part must be as delicate as a house or building. Topping must be strong enough against Friction and Wear.
The topping is usually constructed with Terrazzo, Mosaic, Cement Concrete, and Tiles.
The standard proportion of floor components is maintained with an aspect of soil.
Components of the floor are constructed thicker if the floor seems lean. On the contrary, components of floor are constructed thicker if floor seems rigid.
Quantities of materials used in the construction of floors are determined for analyzing floors.
Areas of items are multiplied with their thickness in order to determine relevant volume, and then quantities of all other materials are determined separately.
Subsequently, the cost of the material is calculated.
Cost of material is calculated according to the market rates. Moreover, carriage cost is also included if do so.
Then the cost of labour is also included as they have constructed the floor.
Finally, all these costs are added up to get the overall cost.
10% profit for the contractor is added up to the overall cost and analysis of floor is completed.

Rate Analysis of Plaster:

For rate analysis of plaster, 10 square meters is regarded as Unit Area.
Cost of materials for plaster ingredients, cost of labour and the cost of carriage are included during analysis of concrete work.
Initially, Unit Area is thoroughly analyzed for determining the quantity of material that will be plaster in wet form.
This quantity is multiplied with **1.27** in order to calculate the plaster volume in dry form.
Plaster volume is increased because cement fills spaces in the sand.
Therefore, a volume of separate plaster ingredients brings about a decline in the overall volume of the plaster.
The decline in plaster volume depends on the ingredients of the plaster.
Sum of ratios of mortar is determined in order to calculate the quantities of cement and sand in the volume of dry mortar.
Then cement ratio is divided by the sum of ratios of mortar and multiplied with the dry volume.
Then the quantity of cement is converted into bags.
For this, cement volume in cubic meters is divided by the **0.035,** while cement volume in cubic feet will be divided by the **1.25**.

For determining the sand volume, the sand ratio is divided by the sum of ratios of mortar and multiplied with the dry volume of cement mortar.
Subsequently, the cost of the material is calculated.
Cost of material is calculated according to the market rates. Moreover, carriage cost is also included if do so.
Then the cost of the labour is also included as they have rendered the plaster.
Finally, all these costs are added up to get the overall cost.
10% profit for the contractor is added up to the overall cost, and rate analysis of plaster is completed.

Rate Analysis for White Washing and Painting.

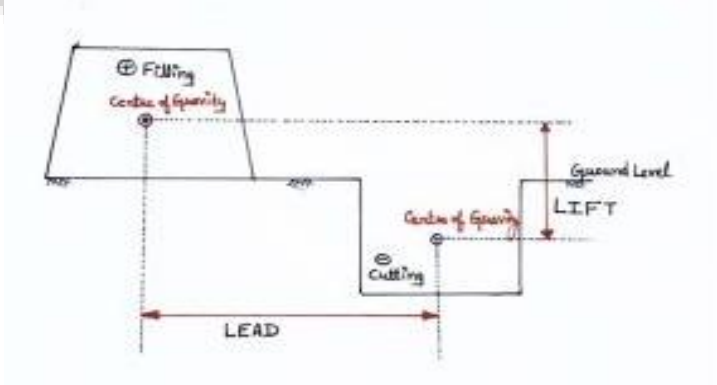
Whitewashing and painting is the last step in the completion of the building. Unit Area is selected for rate analysis of whitewashing and painting.
10 square meters and 100 square feet are regarded as Unit Area in meters and feet respectively.
Cost of material for this area, cost of carriage to the construction site and cost of labour are all added up to determine the overall cost for the unit.
2 kilograms of white fat lime will be needed for the whitewash of a single coat.
However, 0.06 kilogram of adhesive will be needed into the mixture.
For tipple coating, 3.3 kilograms of white fat lime along with 0.12 kilogram of adhesive will be required.
If it is intended to mix in wanted colour, then colour can be mixed into the mixture to conduct the colour washing. Colour is mixed with an approximation.
Cost of material is calculated according to the market rates. Moreover, carriage cost is also included if do so.
Then the cost of labour is also included as they have rendered the plaster.
Finally, all these costs are added up to get the overall cost.
10% profit for the contractor is added up to the overall cost.

Calculation of lead and lift :

Lead: –

Lead is the average horizontal distance between the center of excavation to the center of deposition. The unit of lead is 50m.

Lift:-Lift is the average vertical height through which the earth has to be lifted from source to the place of spreading or heaping. The unit of lift is 2.0 m for the first lift and one extra lift for every 1.0 m.



Abstract of cost of estimate:

It is actually last thing or method to do in the completion of detailed estimate .All the rates as well as the quantities of the of every type of work item is made in the abstract form in this.

Tabular form of Abstract Estimate:

Sl. No.	Description of Item	Unit	Quantity	Rate	Cost	Remarks

Valuation-

Valuation is the technique of estimating or determining the fair price or value of a property such as building, a factory, other engineering structure of various types, land…etc. By valuation the present value of a property is determined. The present value of property may be decided by its selling price, or income or rent it may fetch. The value of property also depends on its structure, life, maintenance, location, bank interest, legal contract etc. The value also depends on supply on demand and the purpose for which valuation is required.

Value and cost:

Cost means original cost of construction of purchase , while value means the present value (saleable value) which may be higher or lower than the cost. A building whole cost of construction is Rs. 50,000.00 , when put for sale may fetch Rs.60,000.00 this sale price is the value of the building . Similarly, the value may be less than the original cost.

Scrap value :

Scrap value is the value of dismantled materials. For a building when the life is over the end of utility period of dismantled materials as steel, bricks, timber. Etc. will fetch certain amount which is scrap value of a building.

Salvage value :

It is the value of end of utility period without being dismantled.

Assessed value:

For the purpose of taxation, a property is assessed for its monetary worth. This ascertained price is known as assessed value.

Sinking fund:

The fund is gradually accumulated by way of periodic on annual deposit for the replacement of the building or structure at the end of its useful life.

Depreciation :

Depreciation is the gradual exhaustion of a usefulness of a property. Decrease or loss in the value of a property due to its structural deterioration use, life wear and tear, decay and obsolescence.

Obsolesce:

The value of property or structures become less by its becoming out of date in style, in structure in design, etc., and this is termed as **Obsolesce.** An old dated building with massive walls, arrangement of rooms are not suited in present days and for similar reasons, less due to obsolete. The obsolescence may be due to the reasons such as progress in arts, changes in fashions, changes in planning ideas, new inventions , improvements in design technique, etc.

A machine of old design may become obsolete, through it may be in good running condition and its value will be less. Thus, though the property is physically sound , it may become functionally inadequate and its economical return becomes less.

Six important Purposes of Valuation:

The main purposes of valuation are as follows:

1.Buying or Selling Property

When it is required to buy or sell a property, its valuation is required.

2.Taxation

To assess the tax of a property, its valuation is required. Taxes may be municipal tax, wealth tax, Property tax etc, and all the taxes are fixed on the valuation of the property.

3.Rent Function

In order to determine the rent of a property, valuation is required. Rent is usually fixed on the certain percentage of the amount of valuation which is 6% to 10% of valuation.

4.Security of loans or Mortgage

When loans are taken against the security of the property, its valuation is required.

5.Compulsory acquisition

Whenever a property is acquired by law; compensation is paid to the owner. To determine the amount of compensation, valuation of the property is required. Valuation of a property is also required for **Insurance, Betterment charges, speculations** etc.

Valuation of Building:

Valuation of a building depends on the type of the building, its structure and durability, on the situation, size, shape, frontage, width of roadways, the quality of materials used in the construction and present day prices of materials. Valuation also depends on the height of the building, height of the plinth, thickness of the wall, nature of the floor, roof, doors, windows etc. The valuation of a building is determined on working out its cost of construction at present day rate and allowing a suitable depreciation.

Methods of valuation:

There are Six Methods of Valuation

1. Rental Method of Valuation
2. Direct Comparisons of the capital value
3. Valuation based on the profit
4. Valuation based on the cost
5. Development method of Valuation
6. Depreciation method of Valuation

Rental Method of Valuation:

In this method, the net income by way of rent is found out by deducting all outgoing from the gross rent. A suitable rate of interest as prevailing in the market is assumed and

Year's purchase is calculated. This net income multiplied by Year's Purchase gives the capitalized value or valuation of the property. This method is applicable only when the rent is known or probable rent is determined by enquiries.

Direct comparison with the capital Value

This method may be adopted when the rental value is not available from the property concerned, but there are evidences of sale price of properties as a whole. In such cases, the capitalized value of the property is fixed by direct comparison with capitalized value of similar property in the locality.

Valuation based on profit

This method of Valuation is suitable for buildings like hotels, cinemas, theatres etc for which the capitalized value depends on the profit. In such cases, the net income is worked out after deducting gross income; all possible working expense, outgoings, interest on the capital invested etc. The net profit is multiplied by Year's Purchase to get the capitalized value. In such cases, the valuation may work out to be high in comparison with the cost of construction.

Valuation based on cost

In this method, the actual cost incurred in constructing the building or in possessing the property is taken as basis to determine the value of property. In such cases, necessary depreciation should be allowed and the points of obsolescence should also be considered.

Development Method of Valuation

This method of Valuation is used for the properties which are in the underdeveloped stage or partly developed and partly underdeveloped stage. If a large place of land is required to be divided into plots after providing for roads, parks etc, this method of valuation is to be adopted. In such cases, the probable selling price of the divided plots, the area required for roads, parks etc and other expenditures for development should be known.

If a building is required to be renovated by making additional changes, alterations or improvements, the development method of Valuation may be used.

Depreciation Method of Valuation

According to this method of Valuation, the building should be divided into four parts:

1. Walls
2. Roofs
3. Floors
4. Doors and Windows

And the cost of each part should first be worked out on the present day rates by detailed measurements.

The present value of land and water supply, electric and sanitary fittings etc should be added to the valuation of the building to arrive at total valuation of the property.

Depreciation is the gradual exhaustion of the usefulness of a property. This may be defined as the decrease or loss in the value of a property due to structural deterioration, life wear and tear, decay and obsolescence.

Methods for calculating depreciation

1. Straight line Method
2. Constant percentage method

3. Sinking Fund Method
4. Quantity Survey Method

Straight Line Method

In this method, it is assumed that the property losses its value by the same amount every year. A fixed amount of the original cost is deducted every year, so that at the end of the utility period, only the scrap value is left.

Annual Depreciation, D = (original cost of the asset – Scrap Value)/life in years

For example, a vehicle that depreciates over 5 years, is purchased at a cost of **US$17,000**, and will have a salvage value of **US$2000**, will depreciate at **US$3,000** per year:

($17,000? $2,000)/ 5 years = $3,000 annual straight-line **depreciation expense**. In other words, it is the **depreciable cost** of the asset divided by the number of years of its useful life.

Constant Percentage Method or Declining balance Method

In this method, it is assumed that the property will lose its value by a constant percentage of its value at the beginning of every year.

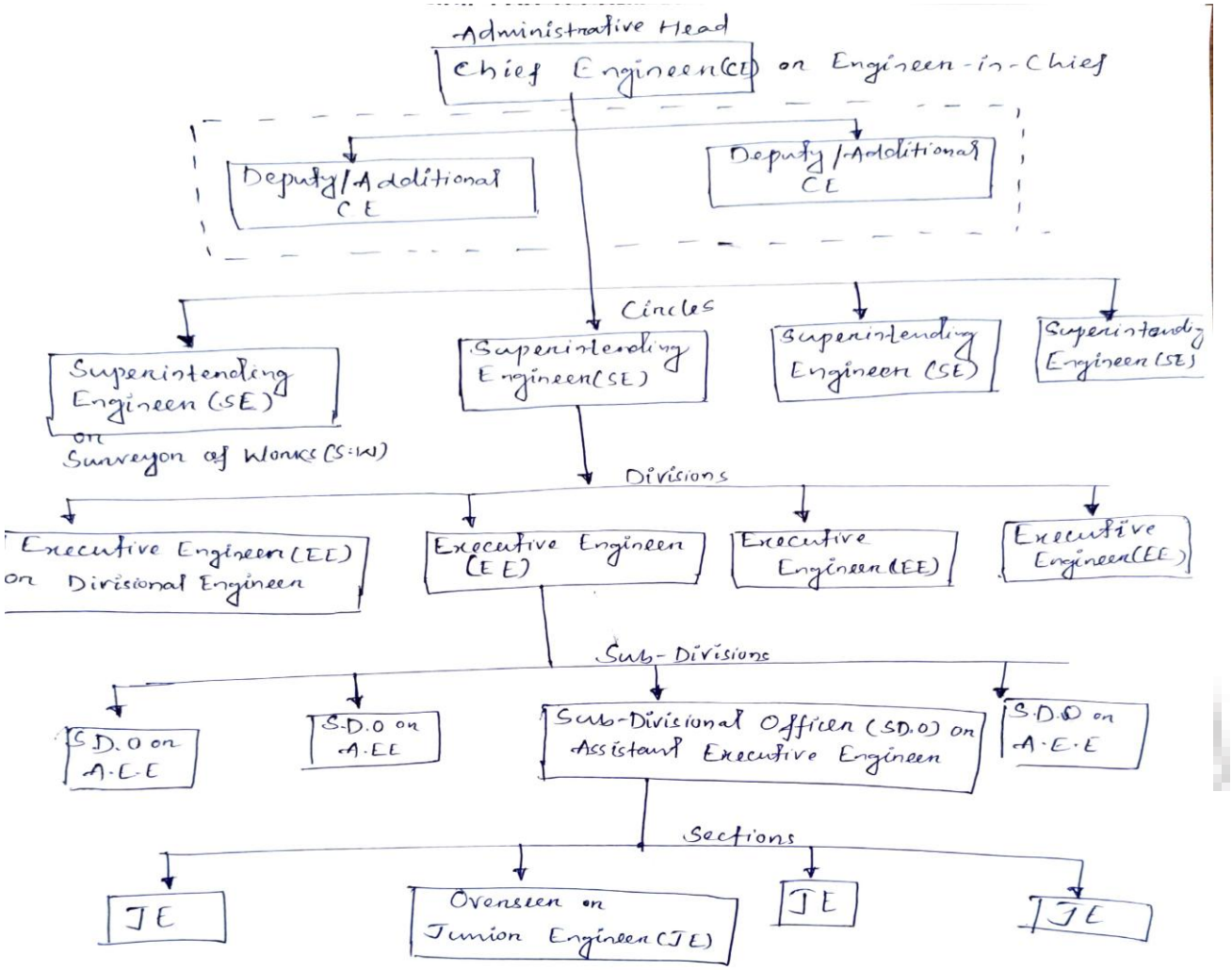
Annual Depreciation, D = 1-(scrap value/original value)1/life in year

Quantity Survey Method

In this method, the property is studied in detail and loss in value due to life, wear and tear, decay, and obsolescence etc, worked out. Each and every step is based is based on some logical grounds without any fixed percentage of the cost of the property. Only experimental value can work out the amount of depreciation and present value of a property by this method.

ADMINISTRATIVE SET-UP OF ENGINEERING ORGANISATIONS

Administrative set-up and hierarchy of Engineering department in State Govt./Central Govt./PSUs/Private Sectors etc. :



Duties and responsibilities of Engineers at different positions /levels :

Chief Engineer (C.E):

- Each of the engineering department has a Chief Engineer (C.E) who is the administrative head of the department and is directly responsible to the Government.
- He prepares the budget estimates annually relating to the works under his control and administers the grant and keeps a close watch over the expenditure.
- He exercises control, with the Accountant General, in maintaining accounts, and in enforcing strict observance of rules.

- When there are large amount of works , there may be Regional Chief Engineers, Additional Chief Engineers and Deputy Chief Engineers to assist the main Chief Engineer or Engineer-in- Chief.

Superintending Engineer(S.E)

- The whole area and work under the Chief Engineer is divided into number of circles or region which are the administrative units of the department. Each circle is headed by a **Superintending Engineer (S.E)** who is the administrative and professional head of the circle and is responsible for the administration and general professional control of work in the circle.
- He is to see that the rules, regulations, and instructions, relating to the execution of works and maintenance of accounts are strictly followed.
- He inspects the various works in his circle and ensures that the management is efficient and economical.
- He keeps watch over the rates of works and sub-head wise expenditure on works. To check up the irregularities and lapses, the record, accounts, stock etc., of the divisional offices are inspected by S.E at least once in a year who submits his report to the Chief Engineer about the working of the division. In C.P.W.D certain classes of the Superintending Engineers are also designated as **Surveyor of Works(S.W)**

Executive Engineer(E.E):

- Each circle divided into number of divisions which are the executive units of the department. Each division is under an **Executive Engineer (E.E)** or **Divisional Engineer** who is responsible for the execution and management of all work in the division.
- He is also responsible for the maintenance of accounts correctly and submission of account monthly to the Accountant General .
- He has to keep a watch on the expenditure and has to see that the expenditure on any work is not exceeding the estimate.
- He has to inspect work frequently and has to ensure that the work is being done strictly as per design and sections.
- He has to inspect the sub-divisional office at least once in a year.
- He is also responsible for the preparation of projects, designs, estimates, etc. Executive Engineer is also known as Divisional Engineer.

Assistant Executive Engineer(A.E.E):

- Each division is divided into number of sub-divisions each under charge of **Sub-Divisional Officer** or **Engineer (S.D.O)** who is of the rank of Assistant Engineer. Sub-Divisional Officer and Assistant Engineer are directly in-charge of the work falling under their charge and have to execute, supervise and manage the work and have to maintain the quality and the progress of works.
- There may be more Assistant Engineer (A.E) in a sub-division if the work is heavy, who are directly responsible to the Executive Engineer with respect to the work.

- The Sub-Divisional Officer has the power of disbursement (payment) and has to maintain initial account and has to submit account monthly to the Divisional Officer.
- Assistant Engineer has got no power of disbursement, payments of all work under the Assistant Engineer are made through the Sub-Divisional Officer .
- Usually each district is under a Sub-Divisional Engineer designated as District Engineer.

Overseer and Sectional Officer or Sub-Ordinate:

- The sub-division is divided into number of sections each under the charge of an Overseer and Sectional Officer or Sub-Ordinate who is directly in-charge of works in the field.
- They have to stay at the site of works and to supervise the works and to maintain quality and progress of works.
- The day-to-day supervision of works is done by the overseers and the first stage of responsibility for the quality of works lies with them.
- They have to take measurements of works done under their charge and to prepare bills for payment.
- Overseers have to maintain accounts of materials, tools and plants, labour etc. and have to submit various reports from time to time.
- They have to maintain the required registers, records, accounts, etc. up-to-date correctly in details.
- Overseers may have supervisors under them to assist them if the work is heavy and important.