DEPARTMENT OF CIVIL ENGINEERING

LECTURE NOTES ON
ESTIMATION AND COST EVALUATION-I

PREPARED BY: LOTAK KUMAR MOHAPATRA

NILASAILA INSTITUTE OF SCIENCE AND TECHNOLOGY

(Approved By AICTE and Affiliated To SCTE&VT, Odisha)

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CH-1(INTRODUCTION)

Estimate

It is the probable & antiseptic cost of all the items of the work before execution of work.

It is two types

(a) Rough estimate or Preliminary estimate.
(b) Final estimate or detailed estimate.

Rough estimate

Rough estimate is done for administrative approval of the work from the competent authority.

Detailed estimate

Detailed estimate is done for technical sanction to obtain from the competent authority.

Technical sanction

Technical sanction means the sanction of the competent authority to a properly detailed estimate for a work to be done.

Methods of Building Estimate

- Centerline method
- Long wall & short wall method

Centerline method

- Center to Center length (Long wall) + One breadth (Thickness of the wall) .
- Center to Center length (Short wall) + One breadth (One side thickness of the wall)

Long wall & Short wall

- Length of long wall is measured out to out.
- Length of short wall is measured in to in.

Accuracy in estimate

- Accuracy in estimate is very important, if estimate is exceeded it becomes a very difficult problem for engineers to explain.
- If the estimated cost is greater than the money available then omit some items or change the design.
- In farming a correct estimate, care should be taken to find out the dimensions of all the items correctly & to avoid omissions of any kind of work or part there of.
- The rate of each item should also be reasonable & workable ,the rates in the estimate provide for the complete work, which consist of the cost of cost of materials, cost of transport, cost of labor, cost of scaffolding, cost of tools &supervision cost, reasonable profit of construction etc.
- In estimate knowledge of drawing is essential.

Main items of work

- **Soiling**

  It is measured in sqm.

- **Earthwork Excavation**

It is measured in cum.

- **Concrete in foundation**

  It is measured in cum.

- **Damp Proof Course (DPC)**
  DPC usually of 2.5 cm (1'').
  It is measured in sqm.

- **Masonry**
  It is measured in cum.

Units of measurement in Metric system

Particulars of materials & work	Dimensions in metric system
1. Bricks, Stone blocks etc.	cm
2. Tiles,slates,wall board,glass panes,a.c sheets etc.	Length and breadth is cm or m.
3. Door,Window etc.	Height & breadth in cm.
4. Flooring, white washing, plastering,	Square meter.
5. Masonry work.	Cum.
6. Size of aggregate.	mm.
7. Steel rebar.	Kg or quintal.
8. Barbed wire.	Running meter per kg.
9. Half brick work.	Square meter.
10. Rolled steel sections as I-beam, channel, Angle etc.	Length in m,section is mm.

Mention the volume of a batch box usually used for volume batching.

The volume of a batch box usually used for volume batching is 1.25x1.25x1.0=1.5625m^3.

Plinth area estimate

- Plinth area is the built up covered area measured at the floor level of the basement or of any story of a building.
- Plinth area can be calculated by taking the external dimensions of the building excluding plinth offsets.

Carpet area

- The carpet area is the floor area less the area of the following portion.
  - Verandah
  - Corridor
  - Passage
  - Entrance hall
  - Porch
  - Staircase & stair cover
  - Bathroom & lavatory
  - Kitchen & pantry
  - Store
  - Canteen
  - Shaft

- Machine room for lift
- Air-conditioning duct &plant room
- Shaft for sanitary piping

Lead

Lead is the average horizontal distance between site of earthwork and the area of disposal. The lead is generally measured in terms of 50m distance.

Lift

Lift is the average vertical distance between level of excavation and the place of spreading or heaping. The unit of lift is 2.00m for first lift and one extra lift for every 1.0m.

CH-2(ONE ROOM BUILDING ESTIMATE)

Question – 1

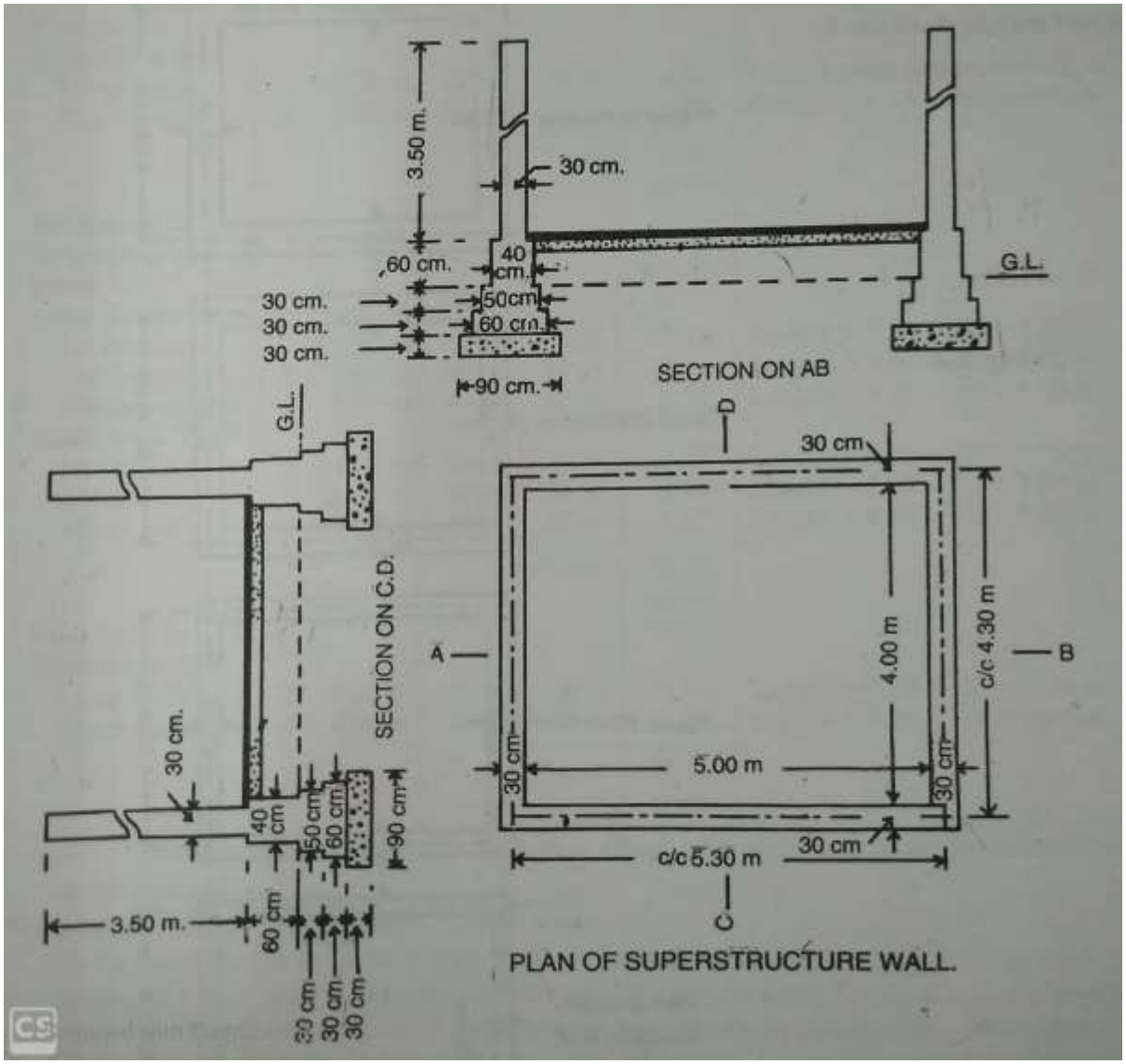
From the figure , the plan represents the plan of superstructure wall of a single room building of 5mx4m, and sections represent the cross-sections of the walls with foundation. Estimate the quantities of –

- **Earthwork in excavation in foundation.**
- **Concrete in foundation.**
- **Brickwork in foundation & plinth.**
- **Brickwork in superstructure.**

The length of long wall centre to centre = 5.00 + 1⁄2 x 0.30 + 1⁄2 x 0.30 = 5.30m.

The length of short wall centre to centre = 4.00 + 1⁄2 x 0.30 + 1⁄2 x 0.30 = 4.30m.

ONE ROOM BUILDING FIGURE



One room building estimate

Item no	Particulars of item	No	Length	Breadth	Height	Quantity	Explanatory note
1	Earthwork in excavation –						
	Long walls ….	2	6.20m	0.90m	0.90m	10.04	**L**=5.30+0.90=6.20m
	Short walls …	2	3.40m	0.90	0.90m	5.51	B=4.30-0.90=3.40m
					Total =	15.15cum	
2	Concrete in foundation –						
	Long walls –	2	6.20m	0.90m	0.30m	3.35	
	Short walls –	2	3.40m	0.90m	0.30m	1.83	
					Total =	5.18cum	
3	Brickwork in foundation & plinth –						
	Long walls –						
	1st footing –	2	5.90m	0.60m	0.30m	2.13	L=5.30+0.60=5.90m
	2nd footing –	2	5.80m	0.50m	0.30m	1.74	L=5.30+0.50=5.80m
	Plinth walls –	2	5.70m	0.40m	0.60m	2.74	L=5.30+0.40=5.70m
	Short walls –						
	1st footing –	2	3.70m	0.60m	0.30m	1.33	L=4.30-0.60=3.70m
	2nd footing –	2	3.80m	0.50m	0.30m	1.14	L=4.30-0.50=3.80m
	Plinth walls –	2	3.90m	0.40m	0.60m	1.87	L=4.30-0.40=3.90m
					Total =	10.95cum	
4	Brickwork in superstructure –						
	Long walls –	2	5.60m	0.30m	3.50m	11.76	L=5.30+0.30=5.60m
	Short walls -	2	4.00m	0.30m	3.50m	8.40	L=4.30-0.30=4.00m
					Total =	20.16cum	

TWO ROOM BUILDING ESTIMATE

Question – 2

Estimate the quantities of the following items of a two roomed building from the given plan and section. Estimates the quantities of –

- **Earthwork in excavation in foundation.**
- **Lime concrete in foundation.**
- **1st class brickwork in cement mortar 1:6 in foundation and plinth.**
- **2.5cm damp proof course.**
- **1st class brickwork in lime mortar in superstructure.**

Long wall c/c length=4+6+0.30+2x0.30/2 =10.60m.
Short wall c/c length=6+2x0.30/2 =5.20m

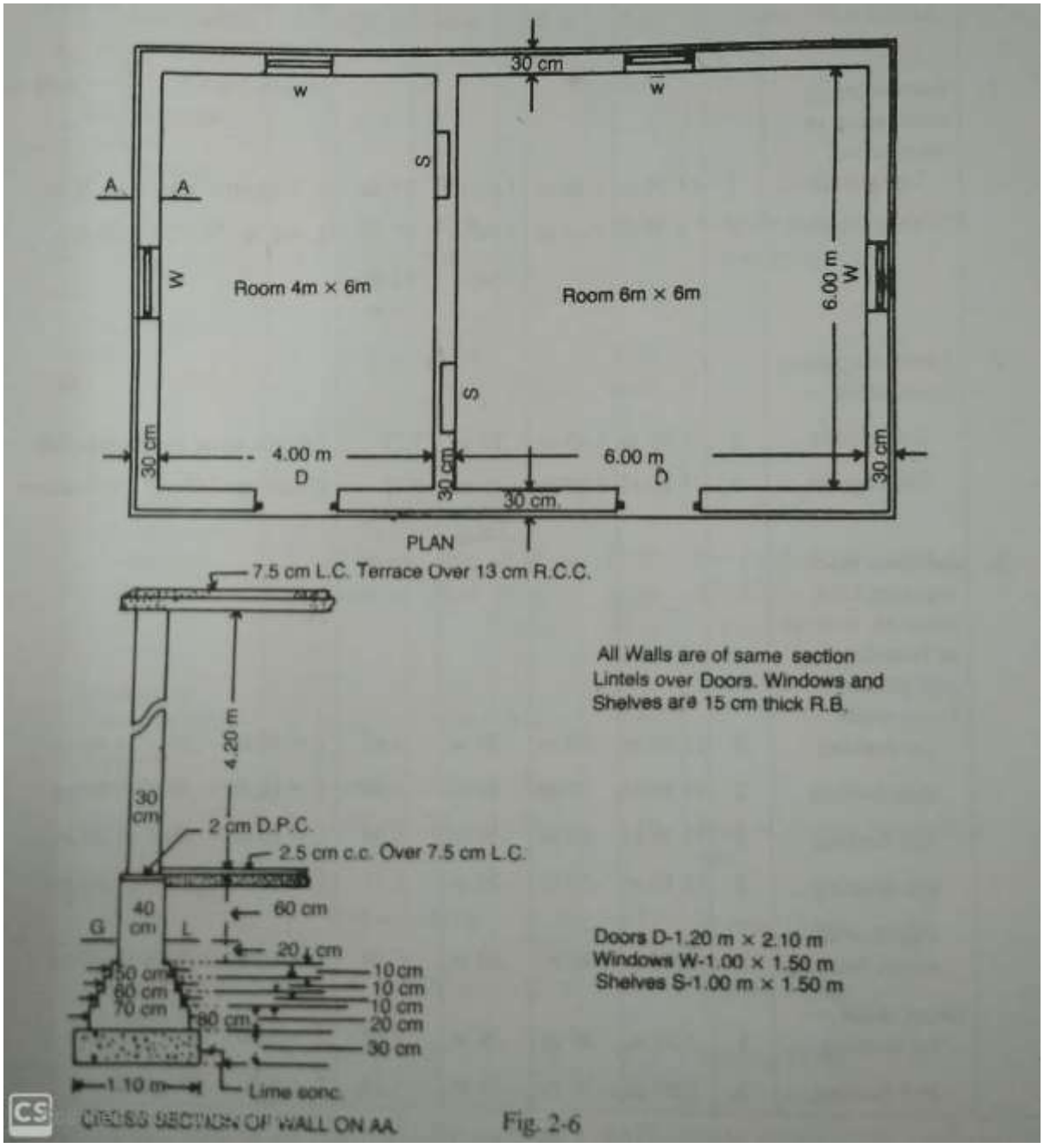


Fig. 2-6

Two room building estimate.

Item no	Particulars of items	No	Length	Breadth	Height Or Depth	Quantity	Explanatory note
1	Earthwork in excavation in foundation – Long walls – Short walls –	2 3	11.70m 5.20m	1.10m 1.10m	1.00m 1.00m	25.74 17.16	L=10.60+1.10=11.70m L=6.30-1.10=5.20m
					Total=	42.90cum	
2	Lime concrete in foundation – Long walls – Short walls –	2 3	11.70m 5.20m	1.10m 1.10m	0.30m 0.30m	7.72 5.15	

					Total=	12.87cum	
3	1st class brick work in 1:6 cement mortar in foundation and plinth –						
	Long walls –						
	1st footing –	2	11.40m	0.80m	0.20m	3.65	L=10.60+0.80=11.40m
	2nd footing –	2	11.30m	0.70m	0.10m	1.58	L=10.60+0.70=11.30m
	3rd footing –	2	11.20m	0.60m	0.10m	1.34	L=10.60+0.60=11.20m
	4th footing –	2	11.10m	0.50m	0.10m	1.11	L=10.60+0.50=11.10m
	Plinth wall above footing -	2	11.00m	0.40m	0.80m	7.04	
	Short walls –						
	1st footing –	3	5.50m	0.80m	0.20m	2.64	L=6.30-0.80=5.50m
	2nd footing –	3	5.60m	0.70m	0.10m	1.18	L=6.30-0.70=5.60m
	3rd footing –	3	5.70m	0.60m	0.10m	1.03	L=6.30-0.60=5.70m
	4th footing –	3	5.80m	0.50m	0.10m	0.87	L=6.30=0.50=5.80m
	Plinth wall above footing –	3	5.90m	0.40m	0.80m	5.66	L=6.30-0.40=5.90m
					Total =	26.10cum	
4	Damp proof course –						
	2.5 cm thick c.c –						
	Long walls –	2	11.00m	0.40m	_	8.80	
	Short walls –	3	5.90m	0.40m	_	7.08	
					Total =	15.88cum	
	Deduct door	2	1.20m	0.40m	_	0.96	

5	Sills - 1st class brick work in lime mortar in superstructure – Long walls – Short walls -	 2 3	 10.90m 6.00m	Net 0.30m 0.30m	Total = 4.20m 4.20m Total =	14.92sqm 27.47 22.68 50.15cum	 L=10.60+0.30=10.90m L=6.30-0.30=6.00m

	Deduct – Door openings – Window openings – Shelves - Lintels over door – Lintels over windows- Lintels over shelves -	 2 4 2 2 4 2	 1.20m 1.00m 1.00m 1.50m 1.30m 1.30m	 0.30m 0.30m 0.20m 0.30m 0.30m 0.30m	 2.10m 1.50m 1.50m 0.15m 0.15m 0.15m	 1.51 1.80 0.60 0.14 0.23 0.12	 Back of shelves 10 cm thick wall. Bearing 15cm Bearing 15cm Bearing 15cm
			Total of	deduct-	Ion =	4.40cum	
				Net	Total =	45.75cum	

CH-3 (Analysis of Rates and Valuation)

Calculation of bricks:-

Standard size=(20x10x10)cm
=(0.2x0.1x0.1)m

For one cum area brick required
1/(0.2x0.1x0.1)= 500 nos
(Standard size)

Calculation of mortar (wet):-

For 1 cum area brick required

1-500x0.19x0.09x0.09=0.23 cum (Actual standard size brick)

Add 15% more for wastage and filling of voids.
15/100 x.23 =0.03
Total=0.23+0.03=0.26 cum

Dry material calculation:-
Standard for 100 cum are, the dry material required =125 cum (m^3)
For one cum = 1.25 ⁄ 100 cum (dry material)

Dry material required
0.23x1.25=0.28 cum
In proportion 1:6

0.28 ⁄ 1+6 =0.04 cum

Cement =0.04x1 =0.04 cum
Sand=0.04x6 =0.24 cum

For 1 cum cube cement required =30 bags.
Then 0.04 cum=0.04x30=1.2 bags.

For 10 cum, dry concrete required =15.4 cum
Mortar means=(cement+sand)
Concrete means=(cement+sand+aggregate)

For 1 cum 15.4⁄ 10=1.54 cum (concrete)

Plastering of brick work (m^2)
Outside of room=12mm (1:4 cement mortar)
Inside of room=20mm (1:6 cement mortar)

Suppose 1m^2 area
=1x12 mm
=1x0.012
=0.012 cum
=0.012x30
=0.36 bags

30% for waste and filling the holes=0.012x30⁄ 100

=0.012x0.3=0.036 cum
For making of 1.54 cum wet concrete dry material required=1.54x1.25
=1.92 cum (dry material)

CH-4(Administrative Set-Up of Engineering Organizations)

Duties of J.E. and (Responsibility)

I. To prepare the necessary drawings, specifications and estimate in accordance with the requirements of the owner.
II. To check up the soil conditions.
III. Preparation of tender paper.
IV. To supervise the work and ensure that the drawing and specifications are faithfully followed.
V. It is the duty of the engineer to give necessary instructions to supply working drawing to the contractor.
VI. To check up the progress of the work with the passage of time and submit progress report to the owner.
VII. The engineer shall check the quality of work measurement of work done quantities, rates and pass the bill for payment.
VIII. To ensure that no damages are being made on any part of the completed work at the time of handling over the same to the owner.

Duties and Responsibility of Assistant Engineering

I. Each division is divided in the no's of sub-divisions, each under change of S.D.O. (Sub-Divisional Officer) or Asst. Engg.
II. Asst. Engg. are directly in change of work falling under their charge and have to execute supervise and manage the works and have to maintain the quality and progress of work.
III. There may be more Asst. Engg. (A.E.) in a sub-division, if the work is heavy who are directly responsible to the executive Engg. with respect to the works.
IV. The S.D.O. has the power of disbursement (payment) and has to maintain initial account and has to submit account monthly to the divisional officer.
V. The work load of SDO or AE is 10 to 15 lakhs.
VI. Before preparing a bill, the JE must satisfy himself, that the work has actually been executed in accordance with the detailed measurement recorded and personally inspect all works of any magnitude before recommending final payment.
VII. The A.E. take measurement of all important works and he must satisfy himself about the correctness of all the measurement recorded.

Royalty

Royalty means quality of materials, of the quality in good higher rate is allowed and bed means the rate will be lowered. The materials generally natural products like moorum, sand, earth, stone metal and chips etc.

Conveyance

Conveyance means the transportation cost of the materials from its source to place of work etc.

How to estimate the requirement of binding wire?

For every 10 sqm. Slabs approximately 2.7kg. to 18 gauge soft block iron wire is required for other works 1kg. per quintal of steel may be recommended.

Mention the volume of a batch box usually used for volume batching.

The volume of a batch box usually used for volume batching is
$1.25 \times 1.25 \times 1.0 = 1.5625\ m^3$

Plinth Area

I. Plinth area is the built up covered area measured at the floor level of the basement or of any storey of a building.
II. Plinth area can be calculated by taking the external dimensions of the building excluding plinth offsets.

Carpet Area

I. The carpet area is the floor area less the area of the following portions.
II. Verandah, corridor, and passage, entrance hall and porch, staircase and stair cover, bathroom and lavatory and kitch and pantry, store, canteen, shaft and machine room for lift, air conditioning duct and plant room, shaft for sanitary piping.

Define overhead charge in the analysis of rate.

In the analysis of rates the overhead charge includes general office expenses, rents, taxes supervision and other costs which are indirect expense and not productive expenses on the job.

Lead

I. Lead is the average horizontal distance b/w site of earthwork and the area of disposal. The lead is generally measured in terms of 50m distances.
II. Lift is the average vertical distance b/w level of excavation and the to the place of spreading or heaping. The unit of lift is 2.00m for first lift and one extra lift for every 1.0m

Rate Analysis

The process of determining rate per unit of any work in Civil Engineering project like earthwork, concrete work, brickwork, plastering, painting etc. is known as Analysis of Rates or simply Rate Analysis. The rates of materials and labour vary from place to place and hence the rates of different items of works also vary from place to place. The rates of these works further help in determining cost of particular work and in turn cost of the project.

Necessity of Rate Analysis

- To determine the actual cost per unit of the items.
- To work out the economical use of materials and processes in completing the particulars item.
- To calculate the cost of extra items which are not provided in the contract bond, but are to be executed as per the directions of the department.
- To revise the schedule of rates due to increase in the cost of material and labour or due to change in technique.

Factors Deciding Rate of Items

The various factors that are involved in determining rate of any item, process or work are mentioned below:

- Specifications of works and material about their quality, proportion and constructional operation method.
- Quantity of materials and their costs.
- Cost of labour and their wages.
- Location of site of work and the distances from source and conveyance charges.
- Overhead and establishment charges
- Profit and miscellaneous expenses of the contractor

Procedure of Rate Analysis

The analysis of rates is worked out for the unit payment of the particular item of work under two heads: Materials and Labour.

- The cost of items of work = Material cost + Labour cost
- Other costs included to the above cost of items of work are:

- Tools and Plants (T & P) = 2.5 to 3 % of the labour cost
- Transportation cost (if conveyance more than 8 km is considered.)
- Water charges = 1.5 to 2 % 0f total cost
- Contractor's profit = 10 %

Material cost

The rate of various materials as per specifications for the items under consideration can be chalked out from market survey. The costs of materials are taken as delivered at site of work. This is inclusive of:

- The first cost (cost at origin),
- Cost of transport, railway freight (if any), etc.
- Local taxes and other charges.

a) Lead statement

The distance between the source of availability of material and construction site is known as "Lead" and is expressed in Km. The cost of conveyance of material depends on lead. This statement is required when a material is transported from a distant place, more than 8kms (5 miles). The lead statement will give the total cost of materials per unit item including first cost, conveyance loading-unloading, stacking charges etc.

A typical lead statement is provided as follows:

Sl. No.	Materials	Unit	Cost at Source (per unit)	Lead (in Km)	Conveyance charges (Per Km/ Per Unit)	Total Conveyance charges (/Per Unit)	Total Cost (In Rs. /Per unit)
1	Rough Stone	Cum	250.00	25	5.00	125.00	375.00
2	Sand	Cum	12.00	20	4.00	80.00	92.00
3	Cement	Bag	370.00	Local	-	-	-

Labour cost

To obtain labour cost the number and wages of different categories of labourers, skilled (Skilled 1st Class), semi-skilled (Skilled 2nd Class) and unskilled, required for each unit of work should be known and this number is multiplied by the respective wage per day. The labour charges can be obtained from the standard schedule of rates. 30% of the skilled labour provided in the data may be taken as 1st class, remaining 70% as 2nd class.

The length of time required to do a certain piece of the work may vary according to the skill and mental development of the workmen and working conditions to the particular job.

a) Task or out-turn work

This is the quantity of work which can be done by an artisan or skilled labour (with the help of semiskilled and unskilled labours) of the trade working for 8 hours a day. The out-turn of work per artisan varies according to the nature, size, height, situation, location etc. Out-turn is more in larger cities, as the more specialized and experienced labours are available, than the small cities and country sides.

Miscellaneous cost

a) Cost of equipment, Tools and Plants (T & P)

The cost of equipment and ordinary tools and plats and miscellaneous petty items (sundries) are added to the specific item rate as lump-sum. A provision of 2.5 to 3 % of the labour cost is made for such items. In certain tools and plants if it is difficult to allocate their use for a particular item of rate; then the cost of such tools or plants may be allocated to the over-head expenditure.

For big works and projects where it becomes necessary to use special types of equipment like batching plants or WMM plant or dumpers or cranes for transportation of concrete mix, provisions of an amount 1% to 1.5% of the estimated cost is provided in the estimate under the head “special tools and plants”.

b) Water charges

For drinking purpose of the workers and for the work, arrangement of water is made sinking tube well; bore well or from temporary connection from municipality. For this purpose a provision of 1.5 to 2 % of total cost (Material + Labour+ Sundries) is made in the estimate.

c) Over head charges

Overhead charges include general office expanses, rents, taxes, supervision and other cost which are indirect expanses on the job. Expanses for small tools such as planks, ladders, ropes and other hand tools are also included in the over-head charges. A provision of 2.5% to 5% is made in the rate analysis as overhead charge. Overhead charges can be divided under two categories: General Overhead and job overhead.

General overhead:

These are the expanses made throughout the year irrespective to running works in hand. These include:

- Establishment charge including rent of office space and taxes
- Salaries to office staff
- Purchase of stationary, Printing, postage etc.

- Electricity, telephone and water bills
- Travelling expanses

Job overhead:

These are the expanses indirectly incurred for the job or the project. These include:

- Salaries of personnel engaged for the work (Site engineers, Surveyors or site office staff)
- Rent of temporary site office space, electricity, telephone and water bills
- Handling of materials
- Repairs, carriage and depreciation of T & P.
- Labour welfare, safety measures and insurance etc.
- Interest on investment
- Thept and other losses.

c) Contractor's profit

Generally a provision of 10% is made in the rate analysis as contractor's profit for ordinary contracts. For small jobs 15% profit and for large jobs 8% profit may be considered as reasonable. Contractors profit is not included in rate analysis if material is supplied by the department.

Rate Analysis of Important Items

Earthwork in excavation in foundation including filling in trenches up to 30m lead and 1.5 m lift

Assume volume of excavation = 100 cu m

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges	-	-	-
Labour Charges			
1. Head Mason	/ Nos.	450.00 per day	225.00
2. Beldar	18 Nos.	250.00 per day	4500.00
3. Mazdoor	14 Nos.	220.0 per day	3080.00
T&P, Sundries, etc.	LS	240.00 LS	240.00
		Total Materials and Labour	**8045.00**
		Add 1.5% water charges	120.67
		Add 10% Contractors profit	804.50

Grand Total	**8970.17**
Rate per cu m	**Rs. 89.70**

First class brickwork in super structure with cement mortar (1:6)

a) Estimation of Materials

Assume volume of brickwork = 10 cu m

Nominal size of modular brick = 10 cm×10 cm× 20 cm

Hence, the number of bricks required = _____

Actual size of modular brick = 9 cm× 9 cm× 19 cm

The remaining space is filled by mortar, hence the volume of mortar required for 10 cum

= 10 – (5000 × 0.09 ×0.09 × 0.19) = 2.3 cu m.

Additional mortar required for frog filling, brick bonding and wastages @ 15%.

Thus volume of set mortar = 2.3 + 2.3 × 15\100 = 2.64 cum.

But, 1.25 cu m of dry volume of mortar materials produces 1.0 cu m set mortar.

Hence, volume of dry materials required for 2.64 cu m of set mortar

= 1.25 × 2.64 cu m = 3.30 cu m.

[Note: As a thumb rule, dry volume of mortar materials is 30% of brick work] Sum

of proportion of cement and sand = 1+6 = 7

Hence, volume of cement = 3.3/7 = 0.47 cu m.

However, cement is available in 50 kg bag whose volume is 0.0347 cu m.

[*Mass = 50 kg; Density =1440 kg/m3; Thus, Volume = 50/1440 = 0.0347 cu m*]

[*Thumb rule: 1 cu m of cement = 30 bags of cement*.]

Therefore, number of bags required = 0.47 / 0.0347 ≈ 13.5 bags.

Volume of sand required = 0.47 × 6 = 2.82 cu m.

b) Rate Analysis

Assume, the volume of brickwork = 10 cu m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Brick	5000 Nos.	250.00 (/100 nos.)	12500.00
2. Cement	13.5 bags	320.00 per bag	4320.00
3. Sand	2.82 cu m	350 per cu m	987.00
Labour Charges			
1. Head Mason	2 Nos.	450.00 per day	900.00
2. Mason	6 Nos.	350.00 per day	2100.00
3. Mazdoor	16 Nos.	220.00 per day	3520.00
4. Bhisti	08 Nos.	220.0 per day	1760.00
T&P, Sundries, etc.	LS	200.00 LS	200.00
		Total Materials and Labour	**26287.00**
		Add 1.5% water charges	394.30
		Add 10% Contractors profit	2628.70
		Grand Total	**29310**
		Rate per cu m	**Rs. 2931.00**

12 mm thick plaster with cement mortar (1:6)

a) Estimation of Materials

Assume plastering area = 100 sq m

Hence volume of mortar for 12 mm plaster = 100 m × 0.012 m = 1.2 cum

Add 30 % more to the above volume for filling of joints, for making un uniform surface well and for wastages

Thus total set volume of mortar including wastages and joint filling etc.

= 1.2 + 1.2 × 30\100 = 1.56 cu m.

As, 1.25 cu m of dry volume of mortar materials produces 1.0 cu m set mortar;

Volume of dry materials required for 1.56 cu m of set mortar is

= 1.25 × 1.56 cu m = 1.95 cu m,

Hence, volume of cement = 1.95/7 = 0.28 cu m.

Number of bags required = 0.28 / 0.0347 ≈ 8 bags.

Volume of sand required = 0.28 × 6 = 1.68 cu m.

b) Rate Analysis

Assume, the area of plastering = 100 sq. m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Cement	8 bags	320.00 per bag	2560.00
2. Sand	1.68 cu m	350 per cu m	588.00
Labour Charges			
1. Head Mason	2 Nos.	450.00 per day	900.00
2. Mason	6 Nos.	350.00 per day	2100.00
3. Mazdoor	08 Nos.	220.00 per day	1760.00
4. Bhisti	02 Nos.	220.0 per day	440.00
T&P, Sundries, etc.	LS	200.00 LS	130.00
		Total Materials and Labour	**8478.00**
		Add 1.5% water charges	127.17
		Add 10% Contractors profit	847.80
		Grand Total	**9452.97**
		Rate per sq m	**Rs. 94.53**

Cement Concrete (1:2:4) for RC work excluding reinforcement and form work

a) Estimation of Materials

Assume volume of R.C.C. = 10 cu m (Set volume)

1.54 cu m dry volume of concrete making materials produces 1.0 cu m set concrete

Therefore volume of dry materials required for 10 cu m of set concrete is 15.4 cu m.

Sum of proportion of cement, sand and course aggregate = 1+2+4 = 7

Hence, volume of cement = 15.4/7 = 2.2 cu m.

Number of bags required = 2.2 / 0.0347 ≈ 64 bags.

Volume of sand required = 2.2 × 2 = 4.4 cu m.

Volume of course aggregate required = 2.2 × 4 = 8.8 cu m.

b) Rate Analysis

Assume, volume of R.C.C. = 10 cu m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Cement	64 bags	320.00 per bag	20480.00
2. Sand	4.4 cu m	350 per cu m	1540.00
3. C. aggregate	8.8 cu m	800 per cu m	7040.00
Labour Charges			
1. Head Mason	/ Nos.	450.00 per day	225.00
2. Mason	2 Nos.	350.00 per day	700.00
3. Beldar	10 Nos.	220.00 per day	2200.00
4. Mazdoor	10 Nos.	220.00 per day	2200.00
5. Bhisti	05 Nos.	220.0 per day	1100.00
T&P, Sundries, etc.	LS	200.00 LS	200.00
Scaffolding	LS	400.00 LS	400.00
		Total Materials and Labour	**36085.00**
		Add 1.5% water charges	541.28
		Add 10% Contractors profit	3608.50
		Grand Total	**40234.78**
		Rate per sq m	**Rs. 4023.50**

Note: If concrete mixture is employed for mixing of concrete, hiring and running charges may add @ Rs. 100.00 per cu m of concrete; but the labour may be reduced by 2 beldars per 10 cu m of concrete.

Lime Concrete in foundation with 25 mm down brick chips (or jhama chips) with lime surki mortar (1:2:5½)

a) Estimation of Materials

Assume volume of lime concrete = 10 cu m (Set volume)

m set 1.54 cu m dry volume produces 1.0 cu concrete

Therefore volume of dry materials required for 10 cu m of set lime concrete is 15.4 cu m.

Sum of proportion of cement, sand and course aggregate = 1+2+5½ = 8½

Hence, volume of slaked lime = 15.4/8½ = 1.8 cu m.

Volume of surki required = 1.8 × 2 = 3.6 cu m.

Volume of jhama brick chips required = 1.8 × 5½ = 10 cu m.

b) Rate Analysis

Assume, volume of R.C.C. = 10 cu m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Slaked lime	1.8 cum	600.00 per cum	1080.00
2. Surki	3.6 cu m	250.00 per cu m	900.00
3. Brick chips	10.0 cu m	350.00 per cu m	3500.00
Labour Charges			
1. Head Mason	/ Nos.	450.00 per day	225.00
2. Mason	1 Nos.	350.00 per day	350.00
3. Mazdoor	18 Nos.	220.00 per day	3960.00
4. Bhisti	02 Nos.	220.0 per day	440.00
T&P, Sundries, etc.	LS	300.00 LS	150.00
		Total Materials and Labour	**10605.00**
		Add 1.5% water charges	159.08
		Add 10% Contractors profit	1060.50
		Grand Total	**11824.58**
		Rate per sq m	**Rs. 1182.50**

Note: In case of cement concrete in foundation, the labours and T&P will be same as this item. The materials like cement, sand and course aggregate can be calculated by the example 21.5.6 and accordingly rate analysis can be made.

Providing cold twisted steel reinforcement in R.C.C. slab including bending, binding and placing in position complete.

a) Estimation of Materials

If bar bending schedule is available, then reinforcement quantity may be estimated from the schedule. Alternatively, reinforcement steel for beams and slabs may be taken as @ 1% of volume of concrete and for columns @ 2% of volume of concrete. The weight of 1 cum of steel is 78.5 quintals.

Consider, first 10 m × 10 m of continuous slab of thickness 100 mm.

The volume of reinforced concrete = 10 m × 10 m × 0.1 m = 10 cu m

Reinforcement required by volume = 10×1/100 = 0.1 cu m

Weight of reinforcement required = 0.1 × 78.5 qu. = 7.85 qu.

Increase this amount by 5% for wastages.

Thus the volume of reinforcement required = 7.85 × 5/100 = 8.25 qu.

Black iron wire @ 1kg per quintal = 8.25 kg.

b) Rate Analysis

Assume, volume of R.C.C. slab = 10 cu m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Reinforcement	8.25 qu.	3800.00 per qu	31350.00
2. Black Iron wire	8.25 kg	45.00 per kg	371.25
Labour Charges			
1. Blacksmith	8.25 Nos.	450.00 per day	3712.50
2. Mazdoor	8.25 Nos.	220.00 per day	1815.00
T&P, Sundries, etc.	LS	300.00 LS	130.00
		Total Materials and Labour	**37378.75**
		Add 1.5% water charges	560.70
		Add 10% Contractors profit	3737.88

Grand Total	**41677.33**
Rate per cu m	**Rs. 4167.75**

Note: R.C.C. works are paid separately for cement concrete work; for steel reinforcement and for centering and shuttering as per the PWD practices.

25 mm thick cement concrete (1:2:4) damp proof course.

a) Estimation of Materials

Assume area of DPC is = 100 sq m

The volume of concrete will be = 0.025*100= 2.5 cum.

Following example 21.5.4, the quantity of cement, sand and course aggregates required for 2.5 cu m concrete are estimated as:

Number of cement bags required = 16½ bags.

Volume of sand required = 1.10 cu m.

Volume of course aggregate required = 2.20 cu m.

Quantity of water proofing compound required = 3% by weight of cement =

= 3% of 16½×50 kg = 25 kg.

b) Aalysisn Rate

Assume, area of DPC = 100 sq m.

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges			
1. Cement	16½ bags	320.00 per bag	5280.00
2. Sand	1.1 cu m	350.00 per cu m	385.00
3. C. aggregate	2.2 cu m	800.00 per cu m	1760.00
4. Water proof compound	25 kg	25.00 per kg	625.00
Labour Charges			
1. Head Mason	/ Nos.	450.00 per day	225.00
2. Mason	08 Nos.	350.00 per day	2800.00
3. Mazdoor	08 Nos.	220.00 per day	1760.00
4. Bhisti	01 Nos.	220.0 per day	220.00

T&P, Sundries, etc.	LS	500.00 LS	100.00
		Total Materials and Labour	**13155.00**
		Add 1.5% water charges	197.33
		Add 10% Contractors profit	1315.50
		Grand Total	**14667.83**
		Rate per sq m	**Rs. 146.70**

Lead and Lift:

Lead:

It is the average horizontal distance between the centre of excavation to the centre **of** deposition. The unit of lead is 50m.

Lift :

It is the average height through which the earth has to be lifted from source to the place of spreading or heaping. The unit of lift is 2.00m for first lift and one extra lift for every 1.0m. for example when earth is to be lifted for 4.5m, Four lifts are to be paid to the contractor.

i.e. Upto2.0 - 1 lift

1.0 - 1 lift Total 04 lifts

0.5 - 1 lift

1.0 - 1 Lift

Earthwork in excavation in foundation including filling in trenches up to 30m lead and 1.5 m lift

Assume volume of excavation = 100 cu m

Particulars	Qnty/Nos.	Rate (Rs.)	Cost (Rs.)
Material Charges	-	-	-
Labour Charges			
1. Head Mason	/ Nos.	450.00 per day	225.00

2. Beldar	18 Nos.	250.00 per day	4500.00
3. Mazdoor	14 Nos.	220.0 per day	3080.00
T&P, Sundries, etc.	LS	240.00 LS	240.00
		Total Materials and Labour	**8045.00**
		Add 1.5% water charges	120.67
		Add 10% Contractors profit	804.50
		Grand Total	**8970.17**
		Rate per cu m	**Rs. 89.70**

First class brickwork in super structure with cement mortar (1:6)

a) Estimation of Materials

Assume volume of brickwork = 10 cu m

Nominal size of modular brick = 10 cm×10 cm× 20 cm

Hence, the number of bricks required = _____

Actual size of modular brick = 9 cm× 9 cm× 19 cm

The remaining space is filled by mortar, hence the volume of mortar required for 10 cum

= 10 – (5000 × 0.09 ×0.09 × 0.19) = 2.3 cu m.

Additional mortar required for frog filling, brick bonding and wastages @ 15%.

Thus volume of set mortar = 2.3 + 2.3 × 15\100 = 2.64 cum.

But, 1.25 cu m of dry volume of mortar materials produces 1.0 cu m set mortar.

Hence, volume of dry materials required for 2.64 cu m of set mortar

= 1.25 × 2.64 cu m = 3.30 cu m.

[Note: As a thumb rule, dry volume of mortar materials is 30% of brick work] Sum

of proportion of cement and sand = 1+6 = 7

Hence, volume of cement = 3.3/7 = 0.47 cu m.

However, cement is available in 50 kg bag whose volume is 0.0347 cu m.

[*Mass = 50 kg; Density =1440 kg/m3; Thus, Volume = 50/1440 = 0.0347 cu m*]

[*Thumb rule: 1 cu m of cement = 30 bags of cement*.]

Therefore, number of bags required = 0.47 / 0.0347 ≈ 13.5 bags.

Volume of sand required = 0.47 × 6 = 2.82 cu m.

VALUATION

Definition

Valuation is the technique of determination of fair price of a property such as land, building, factory or other structures. Valuation determines present value of the property for sale or renting purpose.

Difference between Cost, Price and Value

- Cost means the original cost of construction minus the loss due to its age and change in taste or fashion.
- Price is the amount calculated adding the cost of the production, interest on investment and profit to the producer or the owner.
- Value is the worth or utility of a property. Value of a property depends largely on the demand and supply.

For example the cost to draw a painting may be 1,000/- rupees, but by adding profit for the painter the price may be fixed at 1,500/- rupees. Let us consider the painting is a very famous painting whose demand is more (like Monalisa by Leonardo da Vinci) then the value of the painting may be significantly high.

Purpose of the Valuation

The main purposes of valuation are as follows:

- Sale or Purchase of a property
- To fix up the municipal taxes, wealth tax and estate duty on a property
- To fix up the gift tax payable to the govt when the property is gifted to somebody else.
- To probate, i.e. to prove before a court that the written paper purporting to be the will of a person who has died is indeed his lawful act the official copy of a will is to be presented along with court stamp fees. The stamp fee depends on the value of

a property and for this valuation is necessary.

- To divide the property among the shareholders in case of the partition.
- Assessment of income or stamp duty.

- To pay the capital gains tax when a capital asset is disposed of and the proceeds exceed the costs incurred in acquiring the asset.
- Rent Fixation
- To work out the insurance value of a property
- To determine the quantum of loan that can be sanctioned against a property as mortgage or security
- For compulsory acquisition of the property by govt. for public purpose.
- To determine the speculative value of a property, *i.e.* the purchase of a property with intention to sale at a later date and to make some profit.
- To fix up the betterment charges, *i.e.* construction of new road, providing market complex, community hall etc. so that the value of the property will increase.

Terminology

Incomes:

a) **Gross income**: Total income from all sources.

b) **Outgoings**: these are the expenses which are required to be incurred to maintain the property. These includes: Taxes, periodic repairs, management and collection charges, sinking fund, and loss of rent (for the period when the property is not occupied).

c) **Net income**: The amount left after deducting all outgoings from the gross income.

d) Net income = gross income- outgoings.

e) **Perpetual income**: It is the income receivable for indefinite period of time.

f) **Deferred Income**: it is the income receivable after a lapse of certain period.

Scrap value

If a building is to be dismantled after the period its utility is over, some amount can be fetched from the sale of old materials. The amount is known as scrap value of a building. Scrap value varies from 7% to 10% of the cost of construction according to the availability of the material.

Salvage value

If a property after being discarded at the end of the utility period is sold without being into pieces, the amount thus realized by sale is known as its salvage

Scrap value	Salvage value
This is the dismantled sale value of the materials of an asset at the end of its useful life.	This is the estimated value of an asset as a whole without dismantling at the end of its useful life.
Scrap value is counted in the calculation of depreciation of a property at the end of the useful life and usually this is considered 10% of the cost of the structure or on lump sum basis.	Ordinarily the salvage value factor in the calculation is omitted by accounting scrap value
Scrap value of an asset is merely sale of scarp and has a limitation.	Salvage value deposition may take the form of a sale of the asset to a purchaser who will continue to use it for the function for which it was originally designed. In this case salvage value dominate scrap value in the calculation of depreciation
Scarp value is not counted as a minus quantity.	There are time when it may be a minus quantity

Year's purchase

It may be as the figure which when multiplied by the net income from a property gives capitalized value of the property. It can also be defined as "a certain amount of capital whose annuity of Rs.1/- at a certain rate of interest can be received"

Year"s purchase = 100/rate of interest = 1/i

Capitalized value

It is defined as that amount of money whose annual interest at the highest prevailing rate will be equal to the net income received from the property. To calculate the capitalized value, it is necessary to know highest prevailing on such properties and income from the property.

Example:

Calculate the capitalized value of a property fetching a net annual rent of 25000 and the highest rate of interest prevalent being 7%.

Ans:

Net annual rent = 25,000

Rate of interest = 8%

In order to get an annual interest equal to the net annual rent of Rs. 25,000

(8/100) * X = 25000

X = 25000 * (100/8) = 3, 12, 500.00

Capitalized value = Net annual income * Year‟s purchase (Ans.)

Obsolescence

The value of property decreases if its style and design are outdated *i.e* rooms not properly set, thick walls, poor ventilation etc. The reason of this is fast changing techniques of construction, design, ideas leading to more comfort etc.

Market value

The market value of a property is the amount, which can be obtained at any particular time from the open market if the property is put for sale. The market value will differ from time to time according to demand and supply.

Book value

Book value is the amount shown in the account book after allowing necessary depreciations. The book value of a property at a particularly year is the original cost minus the amount of depreciation up to the previous year.

Market Value	**Book Value**
Value is fixed by the purchaser	Value is fixed by the depreciation
Value is higher during the subsequent years due to increase in price index	Book value cannot be higher during subsequent years even due to the increase of price index.
Value may be constant for a period	Value cannot be constant, rather there is a gradual fall

Applicable to any type of property	This cannot be applicable in case of land or metal articles like steel copper or gold etc.
Market value is considered for the valuation	Book value is considered for the accounts book of a company
Depends on the forces of demand and supply	Book value does not vary due to demand and supply

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Annuity

It is defined as the return of capital investment in the shape of annual instalments monthly, quarterly, half-yearly and yearly. It is the annual payments for the repayment of the capital amount invested by a party. These annual payments are made at the beginning or end of a year, usually, for a specific number of years.

- **Annuity Certain**: If the amount of the annuity is paid for a definite number of years. The lesser the number of year higher the annuity and vice versa
- **Annuity Due**: If the amount of annuity is paid at the beginning of each period or year and payments are continued for definite number of periods
- **Deferred Annuity**: If the payment of the amount of annuity begins at a future date after a number of years.
- **Perpetual Annuity**: If the payment of the annuity continues for an indefinite period.

Though annuity means annual payment, the amount of annuity may be paid by 12 monthly instalments, quarterly or half-yearly instalments.

Sinking fund

It is an amount which has to set aside at fixed intervals of time (say annually) out of the gross income so that at the end of the useful life of the building or the property, the fund accumulated should be equal to the initial cost of the property. The sinking fund may also be required for payment of the loans.

$\frac{\quad}{(\quad)}$, Where, S = Total amount of sinking fund to be accumulated,

n = useful life of the property or nos. of years required to accumulate the sinking fund, i= rate of interest in decimals and I = is the annual instalments paid.

Example:

A pumping set with motor has been installed in a building at a cost of 2500.00. Assuming the life of the pump as 15 years, find the annual installment of sinking fund required to be deposited to accumulate the whole amount of 4% compound interest.

Ans:

Annual Sinking fund, $\frac{\quad}{(\quad)}$

$= \frac{\quad}{(\quad)}$

= 2500 * 0.05 = Rs. 125.00 (Ans.)

Factors Affecting Value of a Building

- Type of the building
- Location
- Building structure and durability
- The quality of materials used in the construction
- Size of the building

Depreciation

It is the loss in value of a building or property due to structural deterioration, wear and tear, decay and obsolescence. It depends on use, age, nature of maintenance etc. A certain percentage (per annum) of the total cost may be allowed as depreciation to determine its present value.

The percentage rate of depreciation is less at the beginning and increases with age.

Comparison Between Depreciation and Obsolescence

Depreciation	Obsolescence
This is the physical loss I the value of the property due to wear & tear, decay etc.	This is the loss in the value of the property due to the change in design, fashion, in structure of the other, change of utility and demand.
Depreciation depends on its original condition, quality of maintenance and mode of use.	Obsolesce depends on normal progress in the arts, inadequacy to present or growing needs etc.
This is variable according to age of the property. More is the age, more will be the amount for depreciation	This is not dependent on age of the building. A new building may suffer in its usual rent due to obsolescence.
There are different methods by which the amount of depreciation can be calculated	At present there is no method of calculation of obsolescence

Calculation of Depreciation

The amount of depreciation being known, the present value of the property can be calculated after deducting the total amount of depreciation from the original cost.

- Straight line method
- Constant percentage method
- Sinking fund method
- Quantity survey method

Straight line method

It is assumed that the property loses its value by the same amount every year. A fixed amount is deducted every year, so that at the end of the utility period, only the scrap value remains. Therefore, the annual depreciation “D” is estimated as:

And the book value after „n" years = Original cost – n x D

Constant percentage method (declining balance 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, (/
)

Or, (/
–)

Value of property of depreciated cost = C – DC

Sinking fund method

It is assumed that the depreciation is equal to the annual sinking fund plus the interest on the fund for the year, which is supposed to be invested on interest bearing investment.

If A is the annual sinking fund and b, c, d etc. represent interest on the sinking fund for subsequent years, then the depreciation at the end of various years can be calculated as:

Year	**Depreciation for the Year**	**Total Depreciation**	**Book Value**
1st year	A	A	C - A
2nd year	A + b	2A + b	C - (2A + b)
3rd Year	A + c	3A + b + c	C - (3A + b + c)
			And so on……

Quantity survey method

The property is studied in detail and loss in value worked out. Each step is based on some logical reasoning without any fixed percentage of the cost of the property.

Only an experienced valuator can work out the amount of depreciation and the present value of the property using this method.

Determination of Depreciation of a building

After deciding the cost using the previous measures, it is necessary to allow a suitable depreciation on the cost. The following table provides a reasonable depreciation of a building whose life if 80 years and well maintained.

Age of the building	Depreciation per year	Total depreciation
0-5 years	Nil	Nil
5-10 years	@ 0.50%	2.5%
10-20 years	@ 0.75%	7.5%
20-40 years	@ 1.00%	20%
40-80 years	@ 1.50%	60%
Total depreciation after 80 years		**90%**

The balance 10% is the net scrap value on dismantling at the end of the utility period.

Methods of Valuation of Building.

The valuation of a building is determined by working out its cost of construction at the present day rate and allowing a suitable depreciation.

Following data are required for valuation of a building

- Cost of incurred if the building to be constructed in present day
- Age of the building should be determined
- Visual inspection of its present condition
- Future life span should be determined

Estimation of present day cost

Present day cost may be estimated from the records, Estimates and Bill of Quantities. If the actual cost of construction is known, this may increase or decrease according to the percentage rise or fall in the rate obtained from the PWD Schedule of Rates. Following are the methods to ascertain the present day cost of a building:

a) Cost by detailed measurement

Cost of construction may be calculated by preparing the BOQs of various items of works by detailed measurement at site and taking the rate of each item of work as per the current PWD SOR. All the items of work shall be thoroughly scrutinized and their detailed specification ascertained as per original.

b) Cost by plinth area

The plinth area of the building is measured and the present day plinth area rate of similar buildings in the locality is studied, and the cost calculated. It is necessary to examine thoroughly the different parts of the building including the foundation, structure, doors & windows, finishes etc.

Estimation of present day value of the building

Following methods are available to determine value of a building:

a) Direct comparison method/ Plinth area method:

It is the simplest form of valuation. The cost of the property is derived from the cost of property sold recently at its neighbourhood. Plinth area cost prevailing in the locality is then worked out. Finally value of the property can be derived from Plinth area cost multiplied by the plinth area of the property. Similarly Cost may be estimated by Cubical content method.

b) Depreciation rate method:

After deciding the cost of the building or structure by any one method, described in 11.9.1, it is necessary to allow a suitable depreciation on the cost.

c) Rental method

In this method, the net income by way of rent is found out by deducting all outgoings from the gross rent. A suitable rate of interest as prevailing in the market is assumes and the years purchase is calculated. The net income multiplied by Y.P. gives the capitalized value or valuation of the property.

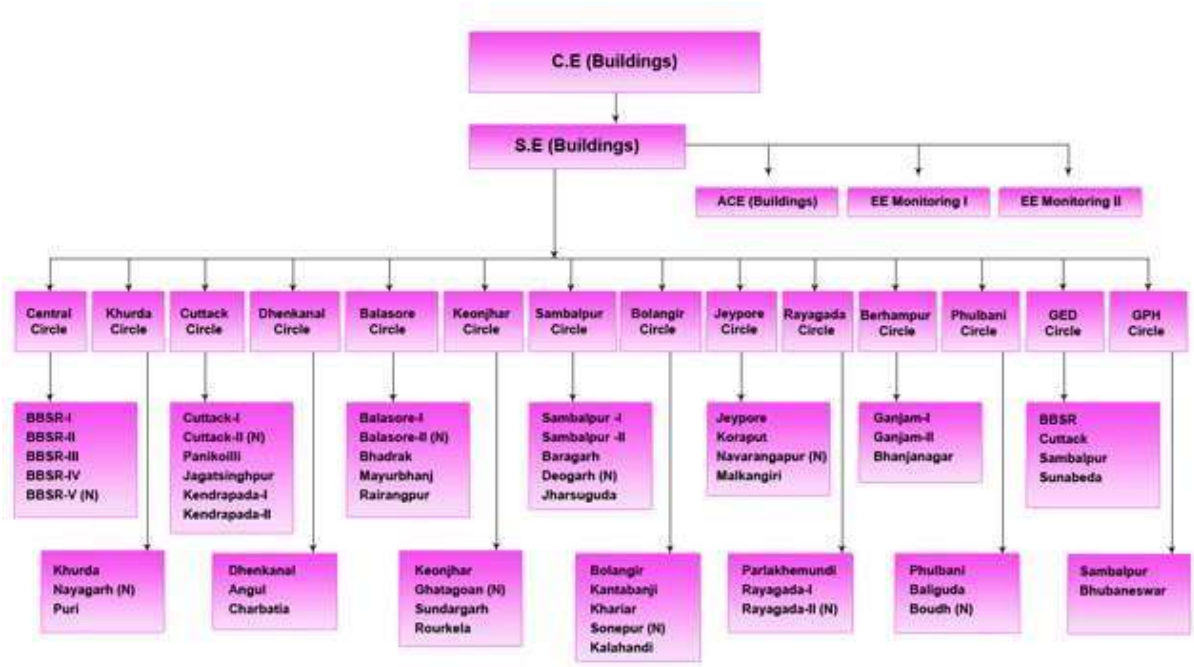
d) Land and building method

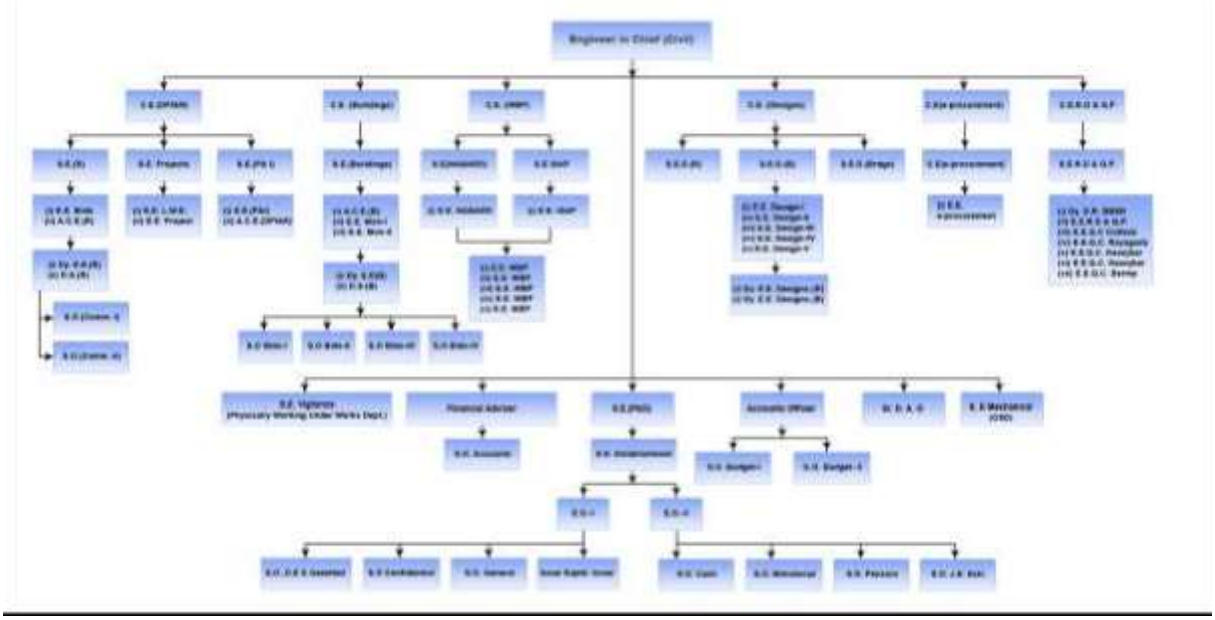
In this method, the market value of land and the depreciated value of building are determined individually. Then these two values are added to determine the final value of the property.

e) Development method

This method of valuation is used for the properties which are undeveloped or under developed. Those properties were brought, developed and then offered for the sale. The valuation in that case would depend on initial investment, development cost and expected profit.

ADMINISTRATIVE SET – UP OF ENGINEERING ORGANISATION





The Chief Engineer is responsible for efficient execution of all Civil & Electrical works and exercise full technical control.

- Chief Engineer is enlisting authority of contractors in building works for class-IV & class-III.
- Chief Engineer is responsible to carry out inspection of office of SE's regularly once a year.
- Transfer, promotion, deputation, posting, general policy matters and co-ordination with Department of Telecom.
- Transfer and posting of Group "A" & "B" officer.
- Creation of new circles / Divisions / Sub-Divisions.
- Creation / Retention / Permanency and abolition of post in Civil Wing.
- Suits / Notices / Court Cases / Union cases.
- To advise the concerned Member, Postal Services Board in regard to establishment, training of Civil Wing Staff, norms for Civil Wing.
- Cases going to works advisory boards relating to tenders, Arbitration awards in technical & engineering matters.
- Standardization and issue of circulars relating to technical and account matters.
- To advise on building matters on issues posed by Head of Circle and Directorate and vigilance cases relating to building matters.
- Matters relating to promotion and deputation of the officials of Postal Civil Wing.
- All the matters relating to deputation will be processed with the approval of concerned Member, Postal Services Board.
- To act as an Arbitrator for Civil./Electrical works wherever required.
- Examination/coordination for policy matters relating to contracts and accounts.
- To assist and advise concerned Member, Postal Services Board on all technical matters relating to proposed development and commercial utilization of Postal properties with private partnership and ancillary matters relating thereto including coordination with outside agencies wherever required.
- Construction / Maintenance of buildings.
- Coordination between all three streams of Civil, Electrical and Architectural Wing.
- Participating in the Budgeting and Annual Plan execution undertaken by the Department for drawing the works program.
- Supervision of work of all S.Es Civil/Electrical and Sr. Architects in the field.
- To act as an Appellate authority under RTI Act 2005 for Civil matters.

SUPERINTENDING ENGINEER

1. The Superintending Engineers is responsible to the Engineer-in Chief/ Chief Engineer for the Administration & General Professional /technical control of IPH Department in-charge of Officers of the Department within his Circle.

2. He will transfer and post all members of establishment within his Circle, except Divisional office, Assistant Engineers Circle office Superintendent, Circle Head Draughtsman & Accountants. Superintending Engineers may, however arrange among themselves for transfer of non Gazetted establishment not born on Circle Cadres between their respective Circles and submit mature proposals to the Chief Engineer for approval such proposal may be made in respect of Gazetted officers also .

3. Superintending Engineer shall exercise close supervision over the works of the officers subordinate to him and shall impart ,from time to time, instructions and guidance to them kin the discharge their duties.

4. Superintending Engineer should ensure that all the periodical reports and returns due to Engineer-in-Chief/Chief Engineer are submitted well in time.

5. Superintending Engineers is required to write annual reports of the Divisional officers working in his Circle and his own office Establishment & to Submit the former alongwith the R.R. of the Technical staff and his office Superintendent to the Headquarter office.

6. Superintending Engineer shall see that the instructions in regard to matter of general Administration issued by him or by the Chief Engineer /Government from time to time is faithfully complied with by the officers and offices under him.

7. During his stay at the headquarters of a Division, the Superintending Engineer should with the Executive Engineer concerned , review the position of the divisional Accounts . He should examine whether the divisional Accounts are being kept in good order, or are being allowed to fall in arrears. He should pay particulars attention to the items under various suspense heads like purchases , stock , miscellaneous advances ,etc and should also examine the Contractors ledger to see if sufficient effort is being made to clear items as quickly as possible .In case he notices any serious delay or negligence on the part of the Divisional staff, he should send a report to the Chief Engineer .

8. The superintending Engineer should call a meeting of the representatives of the Contractors and labour Co-operative Societies ,working in a particulars divisions at the Divisional Headquarters once in every six months . In this meeting he should ascertain the up to date position of running and finial bills of the Contractors and Societies and should give patient hearing to their difficulties which he should try to solve .If any serious point come to the notice of the Superintending Engineer during these meetings , he should send a self contained report to the Chief Engineer.

EXECUTIVE ENGINEER:-

ASSISTANT EXECUTIVE ENGINEER:-

1. The Assistant Engineer is responsible to the Executive Engineer for the management and execution of works i.e. Water Supply Schemes, Irrigation Schemes, & Projects etc. within his Sub-Division and he is his Divisional Officers' Assistant .His main functions are summarized below:-

2. To arrange and supervise the actual execution of all works in the Sub-Division in accordance with sanctioned estimates, specifications and Drawings. In case of original works, he should invariably check all nishans himself and see that they have been correctly given in accordance with sanctioned plans.

3. To check the property in his charge including buildings of Pump Houses and keep them in a proper state of repairs by timely action and wise utilization of Government funds, with the sanction of competent authority.

4. To maintain all initial accounts for expenditure in respect of works in his charge and submit them every month to the Divisional Office punctually. To take measurements of the works and to check measure works, measured by his Junior Engineer according to provision made in para 10.55 (vii) of the PWD Manual. The Sub-Divisional Officers should remain in constant and close touch with day to day work of the Sectional Officers and should see that measurements are taken in due time and got checked. To ensure measurement being checked at the proper time each measurement book should be installed and dated by the Sub- Divisional Officers at intervals not exceeding 3 months.

5. The Assistant Engineer is responsible to check the muster-roll carefully in respect of labour employed on works executed departmentally , as per instructions contained in para 10.9 of the PWD manual and to make payment to the labour in his presence.

6. The Assistant Engineer is responsible to see that their subordinates thoroughly understand and strictly adhere to the details of the estimates for work on which they are engaged. Detailed instructions should be freely and patiently imparted on all points regarding which a subordinate has any doubts and he should be encouraged to ask for information on such points.

7. The Assistant Engineer shall report immediately to the Executive Engineer any serious accident or unusual occurrence resulting in serious injury to or death of any person or damage to any work or crop in his charge.

8. To keep a vigilant control over expenditure and to report progress of work periodically as same may be ordered by Divisional Officer, or higher authorities.

9. To personally examine all the standard measurement books of the sub-Divisional, once a year as laid down in paragraph 5 (a) of Appendix 10-C of the PWD manual.

10. Assistant Engineer will personally check all the stores in his Sub-Division twice a year and the T&P articles once a year. The provision under paras 4.31 and 4.35 of PWD Code should be carefully borne in mind for compliance. He will also carry out the check of all the materials at least once a year and record his check in the Measurement Book.

11. To exercise proper care over safe custody of Government cash, lying in the Government chest. 7.

JUNIOR ENGINEER

The smallest working unit in IPH/ B&R Department is known as 'Section' in the charge of a Section Officer/ Junior Engineer whose principal functions, duties and responsibilities are as under:-

1. Junior Engineer is responsible to prepare petty requisitions and plans and estimates for special repairs and additions and alterations of works/ schemes under his section.

2. To give Nishans for works to be done in his section and to carry out survey and leveling work when required to do so.

3. To supervise the actual execution of Water Supply Schemes, Irrigation Schemes, Flood Control Works, Sewerage Schemes, Projects works and other affairs in IPH Department and repairs in his section done through the contractors or by daily labour and to see that they are executed in accordance with the plans and specifications approved by the competent authority for the said work with sound materials. He shall also maintain the Register of progress and instructions on all major works and present then to all inspecting their orders, if any.

4. To make arrangement for adequate strength of labour at economical rates within the sanctioned rates when a work is required to be done departmentally.

5. To maintain accounts of all the stock and T&P in his charge, their receipts and issues and to maintain register of materials at site.

6. To take measurements of works and to assists the Sub-Divisional Officer or Executive Engineer in measurement or check measurement of works. To record, in time, the measurements of small works below foundations. In case of large work, to get the work measured up in time, from the Sub-Divisional office, before such works get covered over.

7. To prepare running bills of all works and final bills of such work as cost less than one lakh of rupees and to submit them to the S.D.O.

8. To put up measurement Books regularly to his Sub-Divisional Officer for order of payment at least twice a month.
9. To supervise labour employed on daily wages and to submit labour reports daily to the S.D.O. and to supervise the regular gangs and to check their attendance on his visits to works/ schemes under his charge.
10. To prepare, maintain and submit in time all rolls of work-charged establishment and to make payments to work-charged establishments and to permanent gangs on behalf of and under the instructions of the Sub-Divisional Officer when required to do so.
11. To keep a vigilant control over expenditure and report progress of work to his S.D.O. either daily or periodically as may be ordered.
12. To report to the S.D.O. immediately occurrence of any serious accident, etc. in his section and to ensure that no damage takes place to the government property in his charge.
13. To check the Visitors register of all rest- houses in his charge at least once a month and to receive collections of rent, etc, from Chowkidar of rest houses depositing them in the Sub- Divisional Office.
14. To keep Government land property free from encroachments and to promptly bring to the notice of his Sub-Divisional officer in writing when any encroachment temporary or permanent is threatened or actually takes place.
15. To check (count weight or measure, as the case may be) each half year, all the store in his charge and to prepare half yearly distribution list for stock and yearly T&P showing the closing balances and to certify distinctly hat the has checked the store, recording the result of such a check.
16. To check, measure all the works/ schemes side materials at lest once in six months and record his check in the measurement books.
17. To submit every report for all unserviceable stock and T&P.
18. When holding an imprest, the Junior Engineer is responsible for exercise of proper care in the custody of cash and in case of loss the onus of proof that proper care was exercised will be on him.
19. To carry out annual inspection of Schemes/ works/ Projects etc. under his section and report the result to S.D.O. He shall, in addition, be answerable for the general condition of all Schemes/ works under his charge & for bringing to notice structural weaknesses, if any.
20. The Sectional Officers, instead to keeping a separate Diary showing their visits to various workers in their charge should show all their journeys with in or beyond five miles areas of their head quarters in their monthly T.A. bills. 8.

SENIOR TECHNICAL ASSISTANT

1 Senior Technical Assistant is responsible to for Hydrogeological studies of catchments with a view to assess the water bearing potential of the rock formations.
2. He is responsible to Selection of hydrogeologically favorable sites for construction of above mentioned ground water winning structures.
3. He is responsible to attending drilling of boreholes at the approved sites for studying the samples of the sub-surface strata encountered within various depth ranges for assessing the hydrogeological characteristics and preparation of lithologs of each borehole drilled in connection with development of ground water resource of the Pradesh .
4. He is responsible for designing assembly for the deep bore hand pumps and after lowering of the same in the bore holes drilled, to ensure the development to the optimum level.
5. He is responsible to assist the Junior hydrogeologist in carrying out of the Geophysical logging of the boreholes drilled for the construction of tube well by using open hole technology .
6. He is responsible to monitor the function performance of the constructed ground water winning structure and in case of problematic ones ,to analyse the probable cause so that the appropriate rectification measures for restoring their trouble free function can be decided .