1ST CHAPTER
INTRODUCTION

Estimate:

An Estimate is a calculation of the various items of an engineering works, so as to know its approximate cost & the quantities of various materials required with the labour involved for its satisfactory completion.

Types of Estimate:

- Preliminary on Approximate estimate
- Rough cost estimate based plinth area
- Rough cost estimate based on cubic content
- Detailed estimate
- Annual repairs estimate
- Special repairs estimate
- Revised estimate
- Supplementary estimate

Preliminary or Approximate estimate:

Approximate estimate is made to find out an approximate cost in a short time without taking out actual quantity. Preliminary estimate required various aspect of work on project to decide financial position & policy of administrative approval.

Plinth area Estimate:

Plinth area of a building means Length x Breadth (roofed portion only) excluding plinth offsets. The estimates are prepared on the basis of plinth areas of the various buildings proposed to be constructed. The rates are being arrived at by dividing the total cost of construction with its plinth area.

For example: If total cost of a building is 3.5 lac and its plinth area is 50 sq. m., then plinth area rate =3,50,000/50=Rs.7000/- per sq.m.

Using this rate as basis of the next construction, approximate or rough cost of the proposal can be arrived at by multiplying the plinth area of the proposed building with this plinth area rate.

The following documents are attached with the estimate.

(a) Line plan of the building with brief specifications.

(b) Cost of various services added i.e. electric and water

(c) North line should be shown clearly on line plan.

Cubic Contents Estimate (Based on Rough Cost):

The cubic contents of a building means plinth area x height of the building. The height is taken from top of floor level to top of roof.

The cubic contents of the proposed building are multiplied with cubic rates arrived at for the similar construction i.e. total cost of construction divided by cubic contents = cost per cubic metre. Documents attached ‘

(Administrative approval is granted on rough cost estimate)

Detailed Estimate:

After getting Administrative approval on rough cost estimate, detailed estimates are prepared.

In this, the estimate is divided into sub-heads and quantities of various items are calculated individually.

In the end of the detailed quantities, an abstract of cost giving quantities of each item and rate of every item according to the sanctioned schedule of rates shall be attached. In case of non-schedule rates i.e. rates which are not given in the sanctioned schedule of rates, proper analysis of rates shall be attached.

Annual Repair Estimate:

In order to keep Buildings and Roads in perfect condition, annual repairs should be carried under:

(i) In Case of a Building-white washing, oiling and painting of doors and windows, cement plaster repairs (inside & outside), repairs of floors etc. In no case this annual repair amount should increase more than 14% to 2% of the capital cost of the building.

(ii) In Case of a Road-filling patches, maintenance of beams etc.

Special Repairs Estimate:

If the work cannot be carried out of the annual repair funds due to certain reasons resulting in the genuine increase in cost, then special repairs estimate is to be prepared.

The reason of increase may be:

(i) In case of a Building-opening of new doors, change of floors, re plastering walls etc.

(ii) In case of Roads-If the whole surface is full of corrugation & patches, then the total surface is to be scarified. The old metal is taken out, reconsolidation by adding more metal is done and top surface is repainted.

Revised Estimate:

When the sanctioned estimate exceeds by 5% either due to the rates being found insufficient or due to some other which Revised Estimate. A

comparative statement on the last page of the estimate is attached giving therein reasons of the crease of cost in case of each item.

Supplementary Estimate:

This is a fresh detailed estimate in addition the additional works are deemed necessary during the progress work supplement the original works.

The abstract of cost should show the amount original sanctioned estimate as well supplementary amount for which sanction is required. For example: construction generator room in the proposed office.

SOME IMPORTANT TERMS

Site Plan:

With every estimate of building, a site plan to scale of 1 cm. = 2m. (1:200) or I (1:500) showing the following should be attached:

(a) Site of the proposed building.

(b) Adjacent boundaries of the plot.

(c) North point which will help in orientation of the building.

(d) Position of roads, drains and utility of the building.

The site plan will give an idea about the value, comfort and utility of the building.

Lay-out Plan (For Buildings):

In planning the colonies or group of buildings, lay-out plan generally prepared which give data:

(a) Adequate roads alignment so that every plot holder should have an approach to his
house.

(b) Water Supply and Drainage arrangements.

(c) North point should be shown which will give an idea of orientation of a plot.

The lay-out plan should also show the position Hospital, School, Market, Lawns etc.

The plots in a lay-out plan should also be numbered.

Index Plan (For Roads):

With every estimate of a road, an Index plan scale of -0.25 km. or 4 cm.= 1 km. be attached. The Index plan will show following:

(a) Alignment of road followed.

(b) Important towns and mandis, road will connecting.

(c) Rivers, Nallahas etc. the road is crossing.

(d) Number bridges or culverts be constructed.

Contingencies:

It is defined as incidental expenses of miscellaneous character which cannot be classified approximately under any distinct sub-head, but is added in the cost of construction necessarily. It is 5% of the estimate and added as contingencies & petty works, e.g. medicines for labour or purchase of tools.

Work Charged Establishment:

During the construction of big projects of buildings and roads, a number of skilled Supervisors, Munshis, Mates and Chowkidars are employed to assist the existing staff. Their salaries are paid from work charged establishment accounts, the provision of which is made in the estimate. The payment to work charged establishment is made monthly on work charge rolls, which are charged direct to works.

The provision is @ 1 1/2% to 2% of the cost of estimate.

Tools and Plant (T & P):

For the execution of big works, provision for the purchase of machinery etc. 1 1/2% to 2% of

the estimated cost is provided. If the work is given on contract basis, it is the job of the contractor to arrange for tools and plant and the required machinery.

Sub-head:

For finding the detailed estimate, the Head of the work is divided into sub-beads. This helps in dividing the cost sub-head wise resulting in the control of expenditure e.g. Earth work, Concrete, Brick work, Painting etc. are sub-heads, of the head House.

Sub-work:

If the project is very big, it is divided into small works.

This helps in keeping the accounts under control and a check on expenditure sub-work wise. For example if a Technical Institute building with hostels is under construction, then hostel is sub-work of main construction.

Provisional Sum:

It is provided in the estimate and bill of quantities for some special work to be done by a specialist firm whose details are not known at the time of "preparation" of estimate, e.g. anti-termite and sub soil water treatment in basement.

Capital Cost:

It is total cost of construction including all the expenditure incurred from beginning to the completion of the work.

Material Statement:

A form showing total quantity of various building materials required for the completion of the construction is known as material statement.

Plinth Area:

It is defined as covered area of a building measured at floor level. It is measured by taking external dimensions of the building excluding plinth offset if any.

Floor Area:

It is defined as clear covered area i.e. plinth area excluding area of walls (generally 10%-15%). Sills of the doors are not included in floor area. The floor area of every storey shall be measured separately.

Carpet Area:

This means area in a building which is useful one i.e. Area of drawing room, dining room, bed room etc. Areas of kitchens, staircase, stores, verandahs, entrance hall, bath room, basement etc. are excluded. It is generally 50% to 60% of the plinth area.

Circulation Area:

Area used for movement i.e. verandah, staircase, corridor, balconies etc. is termed as circulation area.

Circulation area is approximately equal to plinth area minus carpet area.

ROUGH COST ESTIMATE

Rough cost estimate as already discussed in "Types of Estimates", is prepared for getting Administrative Approval. The basis of preparation of this estimate is old construction of similar type in that locality. The total expenditure of this building is divided by the plinth area of that building to get plinth area rate. There are two types of rates used to find the rough cost estimate namely: Rate per square metre and Rate per cubic metre

The calculation for rates is done as under:

(i) Total Cost Plinth Area = Rate per square metre

(ii) Total Cost Cubical Contents = Rate per cubic metre

The plinth area of proposed construction is found out and is multiplied by per square metre rate to have the rough cost estimate. Similarly to find the rough cost estimate of other construction, the following basis are considered per unit as under.

Example I:

Calculate the rough cost estimate for a 1st class building having plinth area 500 sq. m. Make necessary addition for public health and electric services.

Solution:

Plinth Area = 500 sq.m.

Rate per Sq.m. = Rs.6000/- (assumed)

Total Cost = 500*6000 = Rs.30,00,000/-

Add for Public Health & Electric Services

@20% of the estimate = Rs.6,00,000/-

Total = Rs.30,00,000+6,00,000 = Rs.36,00,000.00/-

Example II

Prepare a preliminary estimate of multi-storeyed office building having carpet area of 2,200 sq.m. 35% the building area will be taken up by corridors, verandah, lavatory, staircase etc. and 10% of the built up area will be occupied by walls. Assume plinth area rate to be 6000/- per sq.m. and also provide for water supply, sanitary fittings & electric installations, contingencies and other services.

Solution:

Carpet area = 2,200sq.m.

Area covered by corridors etc. = 35% of the total area

Area covered by walls = 10% of the total area

Let the built up area = x sq.m.

x = Carpet area +35% of the built up area+10% of the built up area,

=2,200+[(35/100)x+(10/100)x]

11x =2200*20=44,000 sq.m.

x=4,000sq.m.

Rate per sq.m. =Rs.6000/-

Total cost = 4000*6000=Rs.2,40,00,000

Add 30% of services =Rs. 72,00,000

Total =Rs.3,12,00,000

Note: For Services add 20%-30% depending upon type of building.

Deduction for Openings:

Rectangular Openings:

l*h*thickness of wall

Doors & windows with Small Segmental Arches:

L*h*thickness of wall

Segmental Arch Openings:

Deduction will be =[(l*h)+(2/3*l*r)]*thickness of wall

Semi-Circular Arch Opening:

Deduction will be =[(l*h)+(3/4*l*r)]*thickness of wall

Arch masonry work:

Lm*t*thickness of wall

2nd Chapter

QUANTITY ESTIMATE OF BUILDING

METHODS OF ESTIMATE

- Long wall Short wall Method
- Centerline Method

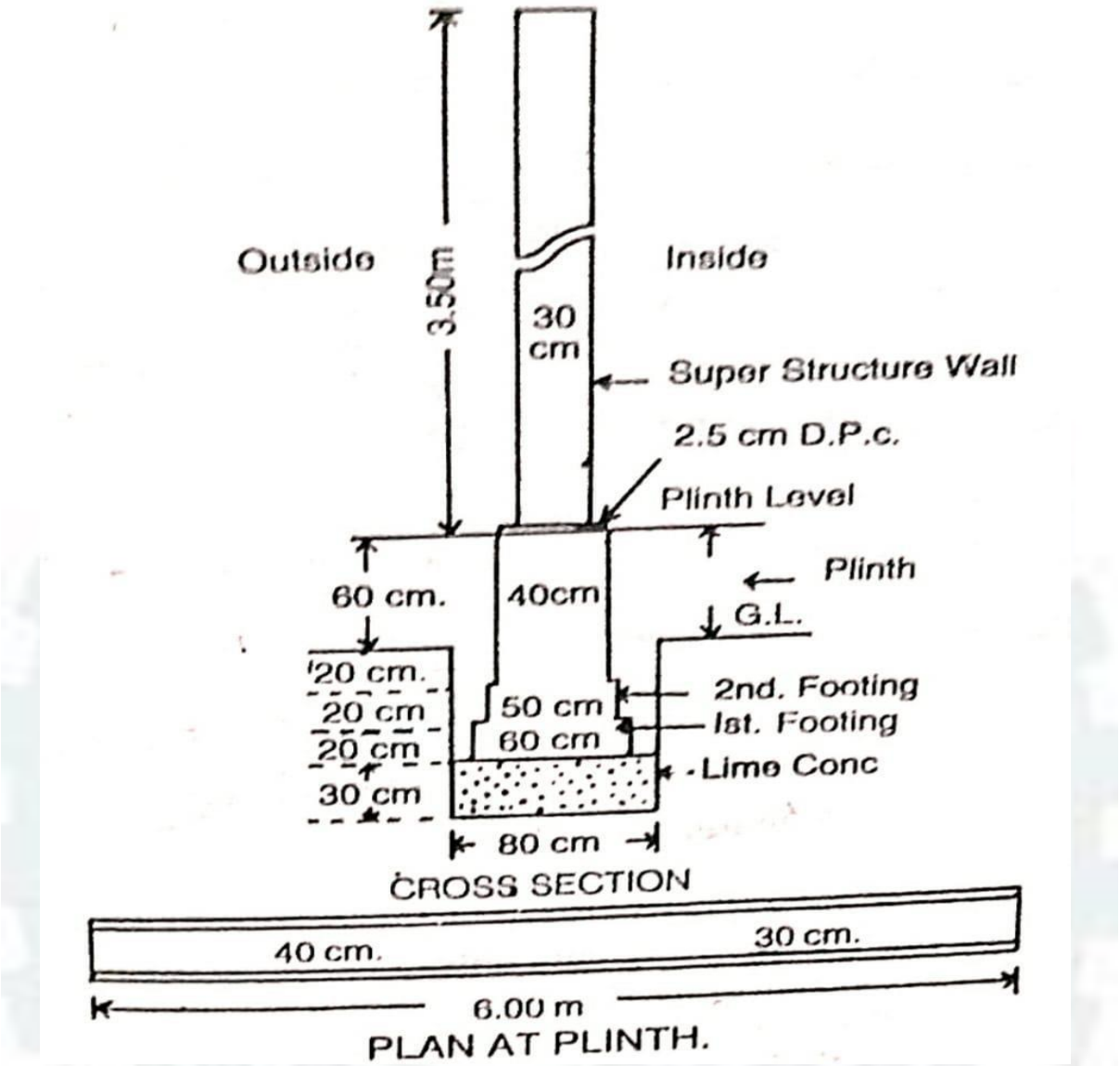
LONG WALL SHORT WALL METHOD

Length of Long Wall = Center to Center Length of wall + Half Breadth on One Side + Half Breadth on the Other Side. Length of Short Wall = Center to Center Length – One breadth.

CENTERLINE METHOD

In this method, the total centre line length of the walls in a building is calculated and then multiplied by the breadth and depth of the respective item to get the total quantity.

Estimate Of Wall



Item No.	Description of items of work	No.	Length	Breadth	Height	Quantity	Ex. Notes
1.	Earthwork in Excavation in foundation	01	6.00m	0.80m	0.90m	4.32	
2.	Lime Concrete in Foundation	01	6.00m	0.80m	0.30m	1.44	
3.	1st Class brickwork in lime mortar in foundation and plinth						
	1st Footing	01	6.00m	0.60m	0.20m	0.72	

	2nd Footing	01	6.00m	0.50m	0.20m	0.60	
	Plinth wall up to G.L.	01	6.00m	0.40m	0.20m	0.48	
	Plinth wall above G.L.	01	6.00m	0.40m	0.60m	1.44	
4.	2.5cm Damp proof course DPC c.c. 1:1 ½:3	01	6.00m	0.40m	-	2.40	
5.	1st class brickwork in lime mortar for superstructure	01	6.00m	0.30m	3.50m	6.30	
6.	12 mm plaster of cement sand 1:6						
	Inside	01	6.00m		3.50m	2.10	
	Outside including 10cm below G.L.	01	6.00m		4.20m	25.2	
7.	White washing 3 coats (inside)	01	6.00m		3.50m	21.0	
8.	Colour washing 2 coats over one coat of white washing (outside above G.L.)	01	6.00m		4.10m	24.6	

Example 4(a). — Estimate the quantities of the following items of a two roomed building from the given plan and section (Fig. 2-6) :—

(1) Earthwork in excavation in foundation, (2) Lime concrete in foundation, (3) 1st class brickwork in cement mortar 1 : 6 in foundation and plinth, (4) 2.5 cm c.c. damp proof course, and (5) 1st class brickwork in lime mortar in superstructure.

TWO ROOMED BUILDING

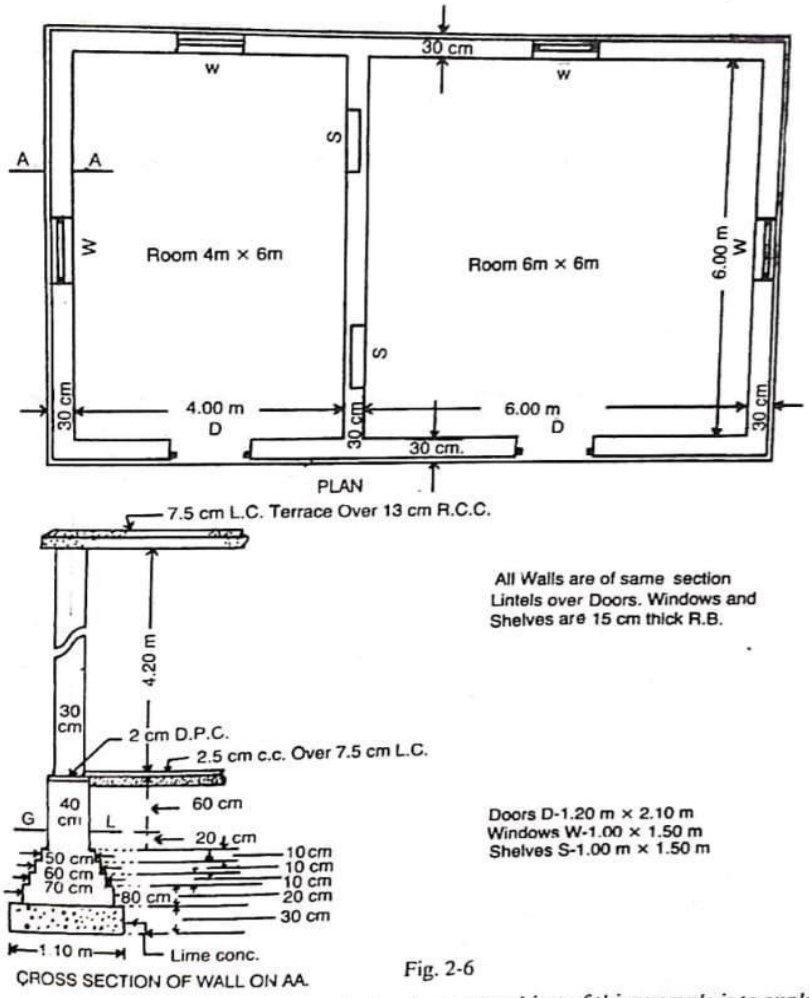


Fig. 2-6

Note : — *No beam has been shown in the plan as the object of this example is to explain the method of estimating the walls only.*

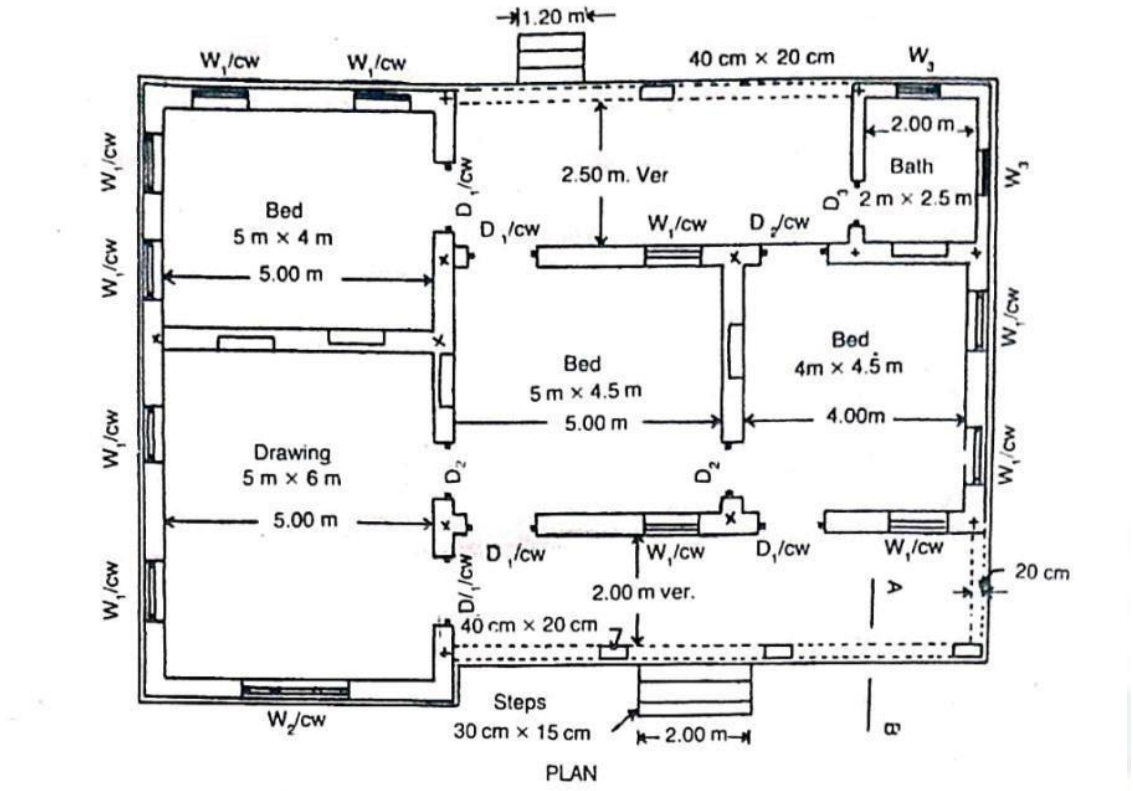
Item No.	Description of items of work	No.	Length	Breadth	Height	Quantity	Ex. Notes
01.	Earthwork in excavation in						Long wall c/c length =4+6+.30+2*(.30/2) =10.60m Short & Inter walls, c/c length =6+2*(.30/2)=6.30m

	foundation						
	Long walls	2	11.70m	1.10m	1.00m	25.74	
	Short walls	3	5.20m	1.10m	1.00m	17.16	
					Total	42.90	cu m
02.	Lime Concrete in foundation						
	Long walls	2	11.70m	1.10m	0.30m	7.72	
	Short walls	3	5.20m	1.10m	0.30m	5.15	
					Total	12.87	cu m
03.	1st class brickwork in 1:6 cement mortar in foundation & plinth						
	Long walls						
	1st Footing	2	11.40m	0.80m	0.20m	3.65	
	2nd Footing	2	11.30m	0.70m	0.10m	1.58	
	3rd Footing	2	11.20m	0.60m	0.10m	1.34	
	4th Footing	2	11.10m	0.50m	0.10m	1.11	
	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	
	2nd Footing	3	5.60m	0.70m	0.10m	1.18	
	3rd Footing	3	5.70m	0.60m	0.10m	1.03	
	4th Footing	3	5.80m	0.50m	0.10m	0.87	
	Plinth wall						
	Above Footing	3	5.90m	0.40m	0.80m	5.66	
					Total	26.10	cu m
04.	Damp proof course 2.5cm thick c.c.						
	Long walls	2	11.00m	0.40m	-	8.80	
	Short walls	3	5.90m	0.40m	-	7.08	
					Total	15.88	
	Deduct door sills	2	1.20m	0.40m	-	0.96	
					Total	14.92	sq m
05.	1st class brickwork in lime mortar in superstructure						
	Long walls	2	10.90m	0.30m	4.20m	27.47m	
	Short walls	3	6.00m	0.30m	4.20m	22.68m	
					Total	50.15	cu m
	Deduct-						
	Door openings	2	1.20m	0.30m	2.10m	1.51	
	Window openings	4	1.00m	0.30m	1.50m	1.80	
	Shelves	2	1.00m	0.20m	1.50m	0.60	
	Lintel over doors	2	1.50m	0.30m	0.15m	0.14	

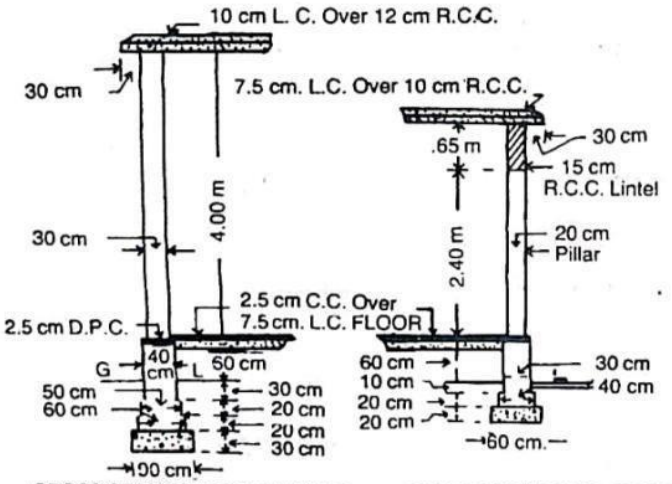
	Lintels over windows	4	1.30m	0.30m	0.15m	0.23	
	Lintel over shelves	2	1.30m	0.30m	0.15m	0.12	
			Total	Deduc-	tion	4.40	
				Net	Total	45.75	cu m

ESTIMATING AND COSTING

RESIDENTIAL BUILDING



PLAN



CROSS SECTION OF MAIN WALLS

CROSS SECTION AB OF VER.WALL

Doors:-
D_1 – 120 cm × 210 cm (1.20 m × 2.10 m)
D_2 – 100 cm × 200 cm (1.00 m × 2.00 m)
D_3 – 75 cm × 180 cm (.75 m × 1.80 m).

Windows:-
W_1 – 100 cm × 150 cm (1.00 m × 1.50 m)
W_2 – 200 cm × 150 cm (2.00 m × 1.50 m)
W_3 – 75 cm × 120 cm (.75 m × 1.20 m)
C.W. – 75 cm × 60 cm (.75 m × .60 m).

Shelves:-
S – 100 cm × 150 cm (1.00 m × 1.50 m)
Lintel Over Doors, Windows Etc.
15 cm R.B.

All walls of Drawing Rooms and Bed Rooms have same section

Bath Room walls have similar section.

Note—*No beam has been shown in the plan.*

Fig. 2-7

Estimate the quantities of the following items of a residential building from the given drawings.

(1) Earthwork in excavation in foundation,

(2) Lime concrete in foundation,

(3) First class brickwork in 1 : 6 cement sand mortar in foundation and plinth,

(4) 2.5 cm Damp proof course, and

(5) First class brickwork in lime mortar in superstructure

Centre to centre lengths of wall-
For estimating it is convenient to find the centre to centre lengths of different walls first.

Drawing & left hand side bedroom combined-
c. to c. Long walls = 6.00+4.00+.30+2*0.15 = 10.60m.
c. to c. Short walls = 5.00+2*0.15 = 5.30m.

Bedroom right side bedroom combined-
c. to c. Long walls = 5.00+4.00+0.30+2*0.15 = 9.60m.
c. to c. Short walls = 4.50+2*0.15 = 4.80m.

Front Verandah-
Front wall c. to c. Length = 5.00+4.00+2*0.30+(0.30/2)-(0.20/2) = 9.65m.
Side wall c. to c. Length = 2.00+(0.30/2)+(0.20/2) = 2.25m.

Back Verandah-
c. to c. Long wall (rear wall including bath room) 9.65m same as front Ver. Wall.
c. to c. Length of side wall of bath room = 2.50+(0.30/2)+(0.20/2) = 2.75m.

DETAILS OF MESURMENT & CALCULATION OF QUANTITIES

Item No.	Description of items of work	No.	Length	Breadth	Height	Quantity	Ex. Notes
1.	Earthwork in excavation in foundation						
	Drawing room & Left bedroom-						
	Long walls	2	11.50m	0.90m	1.00m	20.70	
	Short walls	3	4.40m	0.90m	1.00m	11.88	
	Bedroom right side (both)-						
	Long walls	2	9.60m	0.90m	1.00m	17.28	
	Short walls	2	3.90m	0.90m	1.00m	7.02	
	Front Verandah						
	Front Long wall	1	9.50m	0.60m	0.50m	2.85	
	Side Short wall	1	1.50m	0.60m	0.50m	0.45	
	Back Verandah including bath room						
	Long wall(rear wall including bath)	1	9.50m	0.60m	0.50m	2.85	
	Short wall (remaining walls of bath)	2	2.00m	0.60m	0.50m	1.20	

					Total	64.23 cu m	
2.	Lime concrete in foundation-						
	Drawing room & Left bedroom-						
	Long walls	2	11.50m	0.90m	0.30m	6.21	
	Short walls	3	4.40m	0.90m	0.30m	3.56	
	Bedroom right side (both)-						
	Long walls	2	9.60m	0.90m	0.30m	5.18	
	Short walls	2	3.90m	0.90m	0.30m	2.11	
	Front Verandah						
	Front Long wall	1	9.70m	0.60m	0.20m	1.16	
	Side Short wall	1	1.70m	0.60m	0.20m	0.20	
	Back Verandah including bath room						
	Long wall(rear wall including bath)	1	9.70m	0.60m	0.20m	1.16	
	Short wall (remaining walls of bath)	2	2.20m	0.60m	0.20m	0.53	
					Total	20.11 cu m	
3.	1st class brickwork in foundation and plinth in 1:6 cement mortar-						
	Drawing & Left bedroom Long walls						
	1st Footing	2	11.20m	0.60m	0.20m	2.69	
	2nd Footing	2	11.10m	0.50m	0.20m	2.22	
	Plinth wall above footing	2	11.00m	0.40m	0.90m	7.92	
	Short walls						
	1st Footing	3	4.70m	0.60m	0.20m	1.69	
	2nd Footing	3	4.80m	0.50m	0.20m	1.44	
	Plinth wall above footing	3	4.90m	0.40m	0.90m	5.29	
	Bed rooms right side (both)						
	Long walls						
	1st Footing	2	9.60m	0.60m	0.20m	2.31	
	2nd Footing	2	9.60m	0.50m	0.20m	1.92	
	Plinth wall above footing	2	9.60m	0.40m	0.90m	6.91	
	Short walls						
	1st Footing	2	4.20m	0.60m	0.20m	1.01	
	2nd Footing	2	4.30m	0.50m	0.20m	0.86	
	Plinth wall above						

	footing	2	4.40m	0.40m	0.90m	3.17	
	Front Verandah Front wall						
	Footing	1	9.65m	0.40m	0.20m	0.77	
	Plinth wall above footing	1	9.60m	0.30m	0.70m	2.02	
	Side short wall						
	Footing	1	1.85m	0.40m	0.20m	0.15	
	Plinth wall above footing	1	1.90m	0.30m	0.70m	0.40	
	Back Verandah including bath room						
	Long wall						
	Footing	1	9.65m	0.40m	0.20m	0.77	
	Plinth wall above footing	1	9.60m	0.30m	0.70m	2.02	
	Side short wall						
	Footing	2	2.35m	0.40m	0.20m	0.38	
	Plinth wall above footing	2	2.40m	0.30m	0.70m	1.01	
					Total	44.95 cu m	
4.	2.5 cm Damp proof course						
	Drawing & Left bedroom-						
	Long walls	2	11.00m	0.40m	-	8.80	
	Short walls	3	4.90m	0.40m	-	5.88	
	Bedroom inner side						
	Long walls	2	9.60m	0.40m	-	7.68	
	Short walls	2	4.40m	0.40m	-	3.52	
	Verandah Pillars	4	0.50m	0.30m	-	0.60	
	Bath room-						
	Rear wall	1	2.50m	0.30m	-	0.75	
	Side & inter walls	2	2.40m	0.30m	-	1.44	
					Total	28.67 Sq m	
	Deduct-						
	Door sills D1	6	1.20m	0.40m	-	2.88	
	Door sills D2	2	1.00m	0.40m	-	0.80	
	Door sills D3	1	0.75m	0.30m	-	0.23	
			Total	of didu	-ction	3.91 sq m	
				Net	Total	24.76 sq m	
5.	1st class brickwork in superstructure in lime mortar-						
	Drawing & Left bedroom –						

	Long walls	2	10.90m	0.30m	4.00m	26.16	
	Short walls	3	5.00m	0.30m	4.00m	18.00	
	Bed room right side						
	Long walls	2	9.60m	0.30m	4.00m	23.04	
	Short walls	2	4.50m	0.30m	4.00m	10.80	
	Front verandah						
	Front wall as solid	1	9.60m	0.20m	3.05m	5.86	
	Side wall as solid	1	2.00m	0.20m	3.05m	1.22	
	Back verandah including bath room						
	Back long wall as solid	1	9.60m	0.20m	3.05m	5.86	
	Side & inter walls of bath	2	2.50m	0.20m	3.05m	3.05	
					Total	93.99 Cu m	
	Deduct-						
	Door Openings						
	D. openings D1	6	1.20m	0.30m	2.10m	4.54	
	D. openings D2	2	1.00m	0.30m	2.00m	1.20	
	D. openings D3	1	0.75m	0.20m	1.80m	0.27	
	Window Openings						
	W. openings W1	11	1.00m	0.30m	1.50m	4.95	
	W. openings W2	2	2.00m	0.30m	1.50m	0.90	
	W. openings W3	2	0.75m	0.20m	1.20m	0.36	
	Clearstory window (C.W) openings	18	0.75m	0.30m	0.60m	2.43	
	Shelves openings	5	1.00m	0.20m	1.50m	1.50	
	Front verandah opening in between pillars	1	8.40m	0.20m	2.40m	4.03	
	Front verandah Opening side	1	2.00m	0.20m	2.40m	0.96	
	Back verandah opening	1	6.80m	0.20m	2.40m	3.26	
	Lintels-						
	Over doors						
	D doors D1	6	1.50m	0.30m	0.15m	0.405	
	D doors D2	2	1.30m	0.30m	0.15m	0.117	
	D doors D3	1	0.95m	0.20m	0.15m	0.029	
	Over windows						
	W. windows W1	11	1.30m	0.30m	0.15m	0.644	
	W. windows W2	1	2.30m	0.30m	0.15m	0.103	
	W. windows W3	2	0.95m	0.20m	0.15m	0.057	
	Over C.W.	1	0.95m	0.30m	0.15m	0.770	
	Over Shelves	5	1.30m	0.30m	0.15m	0.293	
	Verandah Lintels						
	Front	1	9.75m	0.20m	0.15m	0.293	
	Side	1	2.15m	0.20m	0.15m	0.065	

	Back	1	7.50m Total	0.20m of dedu Net	0.15m -ction Total	0.225 27.401 Cu m 66.59 Cu m	

3rd CHAPTER
ANALYSIS OF RATES & VALUATION

Definition:

The process of determining rate 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 these works further help in determining cost of particular work and in turn cost of the project.

The rate of any process or work depends on various factors:

• The various factors that are involved in determining rate of any 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

Need 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.

For calculating the rate per unit of an item following sub-heads are estimated and added together to get the rate per unit of an item.

- Quantity of material and Its cost
- Labour cost
- sundries
- Water charges (1.5%)
- Contractor profit (10%)

Rates of Materials :

- 1st class bricks = Rs 4500 per 1000 Nos.
- 2nd class bricks = Rs 4000 per 1000 Nos.
- Brick Ballast = Rs 800 per cum
- Coarse sand = Rs 800 per cum
- Cement 50 kg bag = Rs 270 per bag
- Twisted bars = Rs 5000 per Quintel
- Bitumen = Rs 10 per kg

Rate of labours:

- Head Mason = Rs 450 per day
- Mason = Rs 400 per day
- Carpenter = Rs 400 per day
- Bhishti = Rs 250 per day
- Mazdoor = Rs 250 per day
- Painter = Rs 300 per day
- Boys and women coolies
- Blacksmith = Rs 300 per day
- polisher-=Rs 250 per day

Labour requirement for different type of work:

1. cement concrete in foundation for10cum

- head mason-1/2 nos
- mason-1.5 nos
- Mazdoor-12nos
- Boys and women coolies-18 nos
- Bhisti-4 nos

2. Brick masonary in cement motar for 10cum

- Head mason-1/2 nos
- Mason-7nos
- Mazdoor-7nos
- Boys and women coolies-7 nos
- Bhisti-2nos

3. Plastering of 100sqm

- head mason-1/3nos
- mason-10 nos
- Mazdoor-15nos
- Bhisti-3nos

4. Mosaic or terrazo tile flooring for 100sqm

- Head mason-1nos
- Mason-15nos
- Mazdoor-15nos
- Bhisti -1.5nos
- Polisher-120 nos

5. R.c.c work for 10 cum

- Head mason-1/2nos
- Mason-3nos
- Mazdoor-12nos
- Bhisti -6nos
- Boys and women coolies-20 nos

For bending and cranking and binding of steel

- Blacksmith -8nos
- Mazdoor-8nos

For centering and shuttering.

- Carpenter-10nos
- Mazdoor-10nos

Analysis of rate for Cement concrete :

Example 1. Find out dry materials required for 1 cu m. C.
concrete 1:4:8 in foundation.
Solution.
Ratio = 1:4:8 (cement, sand and aggregate)
Sum = 1+4+8=13 cont..
Total dry mortar for 10 cu m cement concrete =15.2 cu m
Therefore the following materials are required:
Cement = 15.2/13 = 1.17 cum
Sand = 1.17*4= 4.68 cu m cont..
Aggregate (Brick ballast) = 1.17*8= 9.36 cu m
so materials for 10 cu m cement concrete 1:4:8.
Cement cum into bags
We know 1bag=0.034cum
So, 1.17 cum=1/0.034*1.17=34bags

OVERHEAD COSTS

The overhead costs comes to about 6-8% of the project cost and include the indirect expenses incurred during the execution of a project. General Overheads a) Establishment (office staff) b) Stationary, printing, postage c) Travel expense d) Telephone d) Rent
& taxes Job Overheads a) Supervision (salaries of engineer, supervisor etc) b) Handling of materials c) Repairs, carriage, depreciation of T&P d) Labour amenities e) Workers compensation, insurance etc f) Interest on investment g) Losses on advances.

TASK / OUT TURN WORK :

The capacity of doing work by an artisan or skilled labour in the form of quantity of work per day in known as Task Work or
Out-turn of the labour. The out turn of work per artisan varies with situations and locations. In bigger cities where specialised and
experienced labour is available, the out-turn is greater than in small towns and country side. In well organised work, less labour is required.

VALUATION:

Valuation is the technique of estimating and determining the fair price or value of a property such as a building, a factory or other
engineering structures of various types, land etc. The present value of a property may be decided by its selling price, or the rent it may fetch.

VALUATION DEPENDS ON:

Type of the building

Location
Building
Structure and durability
The quality of materials used in the construction
Size of the building

COST:
The original cost of construction or purchase.

VALUE:
The present value that may be higher or lower than the cost. The valuation of a building is determined on working out its cost of construction at present day rate and allowing a suitable depreciation.

PURPOSE OF VALUATION:
Buying or selling property When it is required to buy or sell a property Taxation To assess the tax of a property.
Taxes may be municipal tax, wealth tax, Property tax etc, and all the taxes are fixed on the valuation of the property.
Rent Calculation In order to determine the rent of a property.
Rent is usually fixed on the certain percentage of the amount of valuation which is 6% to 10% of valuation.

PURPOSE OF VALUATION:
Security of Loans and Mortgage When loans are taken against the security of the property. Compulsory Acquisition Whenever a property is acquired by law; compensation is paid to the owner.
Valuation of the property is required in order to determine the amount of compensation. Insurance, Betterment charges, Speculation.

GROSS INCOME :
It is the total income and includes all receipts from various sources. The outgoings, and the operational and collection charges are not deducted.

NET INCOME or NET RETURN:
It is the savings or the amount left after deducting all outgoings, operational and collection expenses from the gross income or the total receipt.
Net Income = Gross income – outgoings.

OUTGOINGS:
Outgoings are the expenses that are required to be incurred in order to maintain the revenue of the building.
Taxes these include taxes paid by the owner of the property annually. Municipal tax, Property tax, Wealth tax etc. These taxes are fixed on the basis

of the Annual Rental Value' of the property after deductions for annual repairs etc.

Repairs:

Repairs need to be carried out every year in order to maintain a property in good condition. The amount spent depends on the age, materials, nature of construction, use of building etc. 10 – 15% of the gross income or gross rent or the rent of 1 – 1.5 months is allowed for repairs. For annual repairs, 1 – 1.5% of the total cost of construction may also be taken Management and Collection charges These include the expenses on rent collector, chaukidar, lift-man, pump attendant, sweeper etc. About 5 – 10% of the gross rent may be taken for this. For small buildings, none of these might be required and hence there shall be no outgoings in these accounts. 4. Annual Sinking fund A certain amount of the gross rent is set aside annually as sinking fund to accumulate the cost of construction when the life of the building is over. It accumulates sufficient amount to meet the cost of construction or maintenance or replacement of structure after its utility period.

Loss of Rent The property may not be kept fully occupied all through the year. A suitable amount is deducted from the gross rent under outgoings. 6. Miscellaneous This includes electric charges for running lifts, pumps, lighting common spaces and other similar charges that are borne by the owner of the building.

MUNICIPAL TAXES:

The municipality needs money in order to undertake and maintain public utility facilities. The same is collected by imposing taxes on the property. Utility works include: Roads, Drainages, Water Supply etc. and their construction and maintenance. The taxes are assessed on some percentage basis on the net income from the property and varies from 10-25% of the net income. Usually, taxes are lesser for small house and vice versa. Market value Scrap value Salvage value Ratable value Book Value.

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. The market value also changes from time to time for various miscellaneous reasons such as changes in industry, changes in fashions, means of transport, cost of materials and labour etc.

SCRAP VALUE:

Scrap value may be defined as the value of materials of dismantled buildings. After the completion of utility period, the dismantled materials such as steel,

timber, bricks and furniture will fetch a certain amount which is called scrap value of building. In case of machines, the scrap value is the value of the metal or the value of the dismantled parts. Scrap value of building is about 10% of its total cost of construction. The cost of dismantling and removal of the rubbish material is deducted from the total receipt from the sale of the useable materials to get the actual scrap value.

SALVAGE VALUE:

The value of building at the end of utility period without being dismantled is called the Salvage Value. A machine after the completion of its usual span of life , may be sold or purchased by some one for other use. The sale value of that machine is called Salvage value. It does not include the cost of removal, sale, etc. Salvage value of a property or an asset may be positive, zero or negative. For example the salvage value of RCC structures is negative, because dismantling and removal will be costly. Salvage value of machine is Positive because its parts may be used for other purposes.

BOOK VALUE :

Book value is the amount shown in the account book after allowing necessary depreciations. The book value of a property at a particular year is the original cost minus the amount of depreciation upto the previous year. Book value = Original cost – depreciation upto previous year Book value depends on the amount of depreciation allowed per year and will be gradually reduced year to year and at the end of the utility period of the property, the book value will be only scrap value.

RATEABLE VALUE :

Rateable value is the net annual letting value of a property, which is obtained after deducting the amount of yearly repairs from the gross income.
Rateable value = Gross income – yearly repair cost Municipal and other taxes are charged at a certain percentage on the rateable value of the property.

SINKING FUND :

Sinking fund is created by regular annual or periodic deposits in compound interest bearing investment, which will form the amount of replacement at the end of the utility period of a property Annual Sinking fund, I = Si (1+i)n -1 Where, S = total amount of sinking fund to be accumulated n = number of years required to accumulate 'I' i = rate of interest in decimal (eg: 5% = 0.05) I = annual instalment required.

SINKING FUND:

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 instalment of

sinking fund required to be deposited to accumulate the whole amount of 4% compound interest. Annual Sinking fund, I = S * i (1+i)n -1 = 2500 * 0.04 (1+0.04)15 -1 = 2500 * 0.05 = Rs. 125.00

DEPRECIATION:

It is the loss in value of a building or property due to structural deterioration, wear and tear, decay and obsolescence. 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. Annual depreciation is the annual decrease in the value of the property.

METHODS OF VALUATION :

1. Rental method of Valuation
2. Direct comparison with capital value
3. Valuation based on profit
4. Valuation based on cost
5. Development method of valuation
6. Depreciation method of valuation

RENTAL METHOD (OF VALUATION) :

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 assumed and years purchase is calculated. The net income multiplied by the years purchase gives the capitalised value or the valuation of the property.

DIRECT COMPARISON WITH CAPITAL VALUE (FOR VALUATION):

This method is used when the rental value is not available for the concerned property. Capitalised value is fixed by direct comparison with capitalised value of similar property in the locality.

PROFIT BASED METHOD (OF VALUATION) :

This method is suitable for buildings like hotels, cinema theatre etc. where the capitalised value depends on the profit. The net annual income is worked out by deducting all outgoings from the gross income. The net profit is multiplied by the years purchase to get the capitalised value. In these cases, valuations works out to be much higher than the original cost of construction.

COST BASED METHOD (OF VALUATION) :

The actual cost incurred in the construction of the building or possessing the property is taken as the basis for the determination of the value of a property.

Necessary depreciation should be allowed. Points of obsolescence should be considered.

DEVELOPMENT METHOD (OF VALUATION) :

This method is used for properties which are in an undeveloped or partly developed stage. Large piece of land to be divided into plots, developed and sold. If a building is renovated by making additions, alterations or improvements. The anticipated future net income that the building/site may fetch is determined. The net income multiplied by the years purchase gives the anticipated capitalised value.

4th CHAPTER
ADMINISTRATIVE SET-UP OF ENGINEERING ORGANISATION

Different types of posts in Engineering Department:

- Chief Engineer
- Superintendent Engineer
- Executive Engineer
- Assistant Executive Engineer
- Sub Assistant Engineer Or Sub Divisional Engineer
- Junior Engineer

Duties and responsibilities of owner/contractor/engineer:

Duties and responsibilities of owner:

- To appoint the engineer and to give the power to behave.
- To inform about the equipment off project including his desired time to completion.
- To often necessaries and son for its construction of component or material bye authority in by collaboration with the engineer.
- To give necessary sanction to the estimated cost to the engineer.
- To enter into a construction with the contractor signing the construction document.
- To save ground the progress of work from outside interval data are beyond contractor or the engineer.
- To take over position of project finally from the contractor.

Duties and responsibilities of contractor:

- To prepare necessary drawing specification and estimate in according to the requirement of the owner.
- To cheque the soil condition before construction is started.
- It is a duty of contractor to impact of the safe save and study the condition of the site.
- They should be arrangement of material and labour and according proper the analysis of all item after receiving the work order it is the duty of contractor to state the work and carry out the work an according with contract,drawing and specification.
- It is the responsibility of contractor do the follow labour act.

- It is the responsibility of contractor to provide safe ground the complete portion of the work until it is hand over the owner.

Duties and responsibilities of engineer

- To prepare the total estimate cost of the project for contractor.
- To cheque off the soil condition of the site.
- To prepare the tender invite the tender on behalf of the owner.
- To supervise the work and ensure that the drawing and specification add follows.
- It is the duty of engineer to give the necessary instruction to the contractor about the drawing.
- The engineer has to check the quality of work and management of water and quality of material and pay the bill for payment technical terms used in estimate.

Security money:

On acceptance of tender the contractor has to deposit a certain amount of 10% of the total estimate cost is security money with including of concerned money to the department.

While Submitting a tender the contractor to deposit a certain amount of 2% of the estimated cost to the department of your earnest money also is there guarantee of a tender.

The amount is for cheque so that contractor may not refuse the aspect of work or run away when the tender is expected.

Arbitration:

It is the settlement of deposit by the desert not off a regular or ordinary quote of law but one or more chosen by the party who are called arbitration.

The arbitration is a domestic domestic quote where arbitration work is judge.

Dead mark:

When digging of earth some art are mark For future use is known as dead mark.

Dismantling:

Dismantling known as fully taking care of the equipment when deep end down and rivering carefully without damage.

Demolition:

The term demolition taking up Anne rivering without care of equipment structure is known as demolition.

Name different public centre organisation employing in civil engineering department in state of Odisha:

Orissa public work decorporatioater resources department.
Odisha hydro power corporation
Public health department
National Highway authority of India
Private section
Example L&T construction
Simplex private limited

Duty and responsibility of Junior Engineer:

- JE has to study at the site off work and supervise the work and maintain the quality of progress of work.
- JE is directly responsible and in charge of the site.
- JE have to maintain day to day supervision at the site off work.
- In case of any problem arriving in the site JE has the power to handle it.

Duty and responsibility of Assistant Executive Engineer:

- AEE is responsible for management of office execution of work with in his area.
- The AEE has to maintain initial record uplift has task and store under his charge.
- His duty is to ensure the correct account statement and submit to executive engineer.
- He should see the initial record Management book are maintained and written neatly and clearly in order to avoid all doubt about the work.
- His duty is to cheque Certain percentage as per rules as per management recorded in the management book buy some assistant engineer.

Duty and responsibility of Chief Engineer:

- Chief engineer is the administrative head of the department and directly responsible of government.
- The duty of the chief engineer is to grant the work.
- The duty of chief engineer is to keep close to work over the existing expense against the world.
- In case of any requirement applicant of revise fund is submitted.

Duties and responsibilities of Executive Engineer:

- It is the part of organic supervise execution of work and to see that they are suitable and economical.

- It is the duty of executive engineer to prepare the estimated budget of the work submitted to the superintending engineer.
- It is the beauty of invite the tender.
- It is his duty to see that the account statement is maintained day today.
- It is his duty responsibility for the correct in all original record of case and store.
- His duty is to inspect the work and cheque the measurement book at least 10% as per rule.
- His duty grand of war in his division cheque no issue and execution against the grant.

Duties and responsibilities Superintendent Engineer:

- It is the duty of SE to check the item of rate of estimated work submitted by executive engineer before 4 working 2 chief engineer he should invite tender for work in sanction from against the work.
- It is his duty supervise measurement and properly recorded and check the measurement in percentage of as for rules.
- He should give technical sanction to estimate to technical power.