Module- 1

→ General items of work:

1. Earthwork (m^3)
2. Concrete in foundation (m^3)
3. Soling (m^2)
4. Damp proof course (m^2)
5. Masonry (m^3)
6. Lintels (m^3)
7. RCC and RB wall (m^3)
8. Flooring & Roofing (m^2)
9. Plastering & pointing (m^2)
10. Cornice (m)
11. Paint (m^2)
12. Steel work (quintal)

→ Estimation:

- Estimation for any construction work may be defined the process of calculating the quantity & cost of various items required in construction works.
- It is prepared by calculating the quantities from the dimensions on the drawings for the various items required to complete the project and multiplied by the unit cost of the item, concerned.

→ Purpose of Estimation:-

- To ascertain the necessary ... material required by the owner to complete the proposed work.
- To fix up the completion period from the vol. of works involved in the estimation.
- To invite tenders and prepare bills for payment.
- To estimate for an existing property is req. for valuation.

→ Types of Estimation:-

① Detailed estimation.

② Abstract Estimation.

1. Detailed Estimation:

Preparation of detailed estimate consists of working out the quantities of different items of work and then working out the cost, i.e, the estimate is prepared.

Item no.	Description or Particulars	No.	Length (L)	B (or) T	H (or) D	Quantity

2. Abstract estimation:

Item no.	Description or Particulars	Quantity	Unit	Rate	Amount

The cost under item of work is calculated from the quantities already computed at workable Rate.

→ We include a percentage of 3-5% to the total cost for the unforseen expenditure changes in rates etc. which may occur during the execution of work and we also add 1.5 to 2% to meet the expenditures of the work charged establishment, contracters profit 5%.

S.No.	Particulars of item	units of measurement	units of payment
1.	Earth work.		
	→ In Excavation	m^3	per % m^3
	→ In filling in foundation trenches		
	→ In filling in plinth		
2.	concrete.		
	→ lime concrete in foundation		
	→ cement concrete in lintels		
	→ RCC slab	m^3	per cu.m
	→ cement concrete (or) RCC sunshade (or) sajja.		
	→ lime concrete in roofterracing		
	→ cement concrete bed.		
3.	Damp proof course [thickness should be mentioned (2.5mm)]	m^2	per m^2.
4.	Brick work: → Reinforced Brick work	cu.m	per cu.m
	→ Brick work in foundation	cu.m	
	→ In plinth.	cu.m	
	→ In super structure.	cu.m	
	→ thin partition walls	m^2	→ per m^2
	→ ... work in arches	cu.m	

S.No	Particulars of item	units of measurement	units of payment.
5.	Stone work or stone masonry	cu.m	per cu.m
6.	**Wood work**		
	→ doors and window-frames (or) Choukath	cu.m	per cu.m
	→ Shutters of doors and windows [thickness should be specified]	sq.m	per sq.m
	→ Doors and window fittings (hinges, tower bolts, handles)	number	per number
7.	**Steel work.**		
	→ Steel reinforcement bar etc, in RCC & RB work.	Quintal	per Quintal
	→ Bending, binding of steel Reinf.	Quintal	
	→ Revets, bolts, nuts, anchor bolts, holding down bolt.	Quintal	
	→ Iron hold fasts	Qunital	
	→ Iron railing	Quintal	
	→ Iron grills	m^2	→ per m^2.
8.	**Roofing.**		
	→ RCC & RB slab roof (Excluding steel)	cu.m	per cu.m
	→ Lime concrete, roof cover & inclusing of tiles (or) bricks (or) Stone slab	m^2	per m^2.
	→ Centring & shuttering of form work	m^2	
	→ AC sheet roofing	m^2	

S.No	Particulars of item	units of measurement	units of payment.
9.	Plastering, pointing and finishing → plastering cement (or) lime mortar (thickness & proportion specify) → pointing → white washing, colour washing [no of coats specified] → Distempering	m^2	per m^2
10.	flooring → 25mm cement concrete over 75mm lime concrete floor. → 25mm or 40mm cement concrete floor. → Doors and windows.	m^2	per m^2
11.	Rainwater pipe (or) plane pipe	Running mt	per runni m
12.	Steel wooden trusses	numbers	per numb
13.	Glass panels	m^2	per m^2
14.	fixing of glass panels & cleaning	numbers	per numb

→ Types of Estimates:

* Approximate Estimate:

The other name of approx Estimate is preliminary (or) rough ".

This is done to find out an approx. cost in a short time and thus enable the responsible authority concerned to consider the financial aspect of the steel for according sanction to the same.

① Plinth area method.

② Unit Base method.

③ cubic Rate method.

* Plinth area method :-

The cost of construction is determined by multiplying Plinth area with plinth area

The plinth area is obtained by multiplying the outer dimensions of the Building.

- As per IS 3861:1966, the following areas include while calculating the plinth area of the Building.

Areas to be included,

(i) Area of walls at floor level.

ii) Internal shafts of sanitary installations not Excluding 2 sq.m

iii) Lifts, air conditioning ducts Etc.,

iv) Area of Barsati at terrace level.

v) Portures of non cantilever.

Areas which are not to include:

→ Unenclosed Balconies

→ Architectural bands, cornices

→ Domes, towers projecting above terrace level.

② ★ Unit base method :

According to this method, the cost of structure is determined by multiplying the total number of units with unit rate of each item.

The unit rate is calculated by dividing the actual Expenditure incured or cost of similar building in the near by locality by the no. of units.

★ ③ cubical rate method or condeme method :-

This method is generally used for multi-storeyed Buildings. It is more accurate than the other two methods.

Cost of Building = Vol. of Building × Rate per unit vol.

① Prepare an approximate estimate of Building project if total plinth area of the building is 800 m^2 and use the following data,

(i) plinth area rate is Rs. 4500/km^2.

(ii) cost of water supply @ 7.5% of cost of building.

(iii) cost " sanitary & electrical installations each @ 7.5% CB

iv) " " architectural features @ 1% of c of B.

v) " " lawns @ 5% of c of B.

vi) " " contingencies @ 4% of Building cost. Determine the total cost of the building project.

Sol) Given, plinth area = 800m^2

plinth ar. Rate = 4500/m^2

cost of the Building = 800 × 4500 = 36,00,000/-

ii) cost of water supply = $\frac{7.5}{100}$ × 36,00,000/- = 27,0000/-

iii) " " sanitary & electrical installation.

$= \frac{15}{100} \times 36,00,000 = 54,0000/-$

v) lawn = $36,00,000 \times \frac{5}{100}$ = 18,0000/-

iv) archite = $\frac{1}{100} \times 36,00,000$ = 36,000/-

vi) contigencies = $\frac{4}{100} \times 36,00,000$ = 144000/-

Supervision or contracter profit (takes 5-10%) = $\frac{5}{100} \times 36,00,000$/- = 180000/-

Total = 49,50,000/-

(2) prepare the rough estimate for the proposed commerical complex for a municipal corporation for following data.

- plinth area = 500 m^2 per floor.
- Height of each storey = 3.5 m
- No. of storey = G+2
- cubical content rate = Rs. 1000/- per m^3.

provide the following as % of structural cost.

① water supply and sanitary arrangement 8%.

② Electrical = 6%.

③ Fluctuation of rate = 5%.

④ contractors profit = 10%.

⑤ supervision and contingencies = 3%.

(ii) cubic Rate method :-

cost of Building = $\frac{\text{vol. of building} \times \text{Rate}}{\text{unit vol.}}$

cubical content = plinth area × [ht. of each storey] × No. of storey

= 500 × 3.5 × 3

= 5250 m^3.

Structural cost = 5250 × 1000

= 52.5 lakhs.

* water supply & sanitary arr.

$= \frac{8}{100} \times 5250 \times 10^{3-2}$.

$= 8 \times 5250 \times 10 = 4200000/-$

* Electrical = $\frac{6}{100} \times 5250 \times 10^{3-1}$

$= 6 \times 5250 \times 10$.

$= 3,15,000/-$

* Fluctuation of rate = 5%

$\frac{5}{100} \times 5250 \times 10^{3-2} \cdot 10$

$= 26,2,500/-$

* contractors profit = 10%

$\frac{10}{100} \times 5250 \times 10^{3-2} \cdot 10$

$= 5,25,000/-$

* supervision & contingencies =

$\frac{3}{100} \times 5250 \times 10^{3-2} \cdot 10$

$= 1,57,500/-$

Total = 62,47,500/-

*contractors profit = 10%

$\frac{10}{100} \times 62 \times 47,500 = 624750/-$

* supervision & contingencies

$\Rightarrow \frac{3}{100} \times 62,47,500 = 187425/-$

Total cost Estimation = (62,47,500 + 624750 + 187425)

$= 70,59,675/-$

(3) Prepare an approx. Estimate of a Hospital building for 50 Beds the cost of construction all together for each Bed is Rs. 60,000/-. Determine the Total cost of the Building.

Sol) $50 \times 60,000 = 30,00,000/-$

(4a) Prepare a detail estimate of a part of the wall of Building from the given section and general specification.

→ foundation concrete shall be of lime concrete.

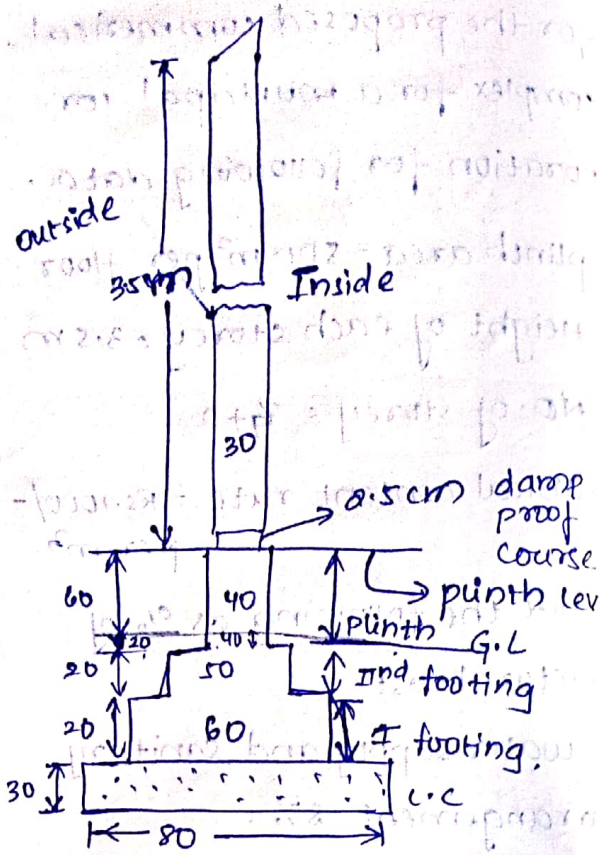
→ foundation & plinth shall be of 1st class brick work in lime mortar

→ Damp proof course - 2.5cm of cement concrete ratio 1:1.5:3.

→ super structure 1st class Brick work in lime motar

→ wall finshing - Inside wall = 12mm cement plastered with 1:6 proportion & white wash is 3coats.

- outside wall = 12mm cement plastered 1:6 including 10cm below ground level & finished. with 2 coats of colour wash over 1 coat of white washing.



→ Length of the wall = 6m

→ Damp proof width = 40cm

(4b)

* Abstract Estimation.

1. Earthwork = 350/% of m^3
2. Lime concrete = 220/% of m^3
3. Iclass brick = 300/% of m^3

D.P.C = Rs. 20/m^2

B.W in superstructure = Rs. 320/m

plastering = 8.5/m^2

white wash = Rs. 0.75/m^3

colour wash = Rs. 0.82/m^3.

$10 \times 10^{-2} = 0.1$

Item No.	Description of items	No.	L	B	H	Quantity	Total quantity
1.	Earthwork in Excavation.	1	6.0	0.8	0.7	3.36	3.36.
2.	Lime concrete in foundation.	1	6.0	0.8	0.3	1.44	1.44
3.	I class Brick work in lime mortar in foundation & plinth						
	→I footing	1	6.0	0.6	0.2	0.72	
	→II footing	1	6.0	0.5	0.2	0.60	
	→plinth wall upto G.L	1	6.0	0.4	0.2	0.48	3.24
	→plinth wall above G.L	1	6.0	0.4	0.6	1.44	
4.	D.p.c	1	6.0	0.4	-	2.4	2.4
5.	I class B.w in c.m for super structure	1	6.0	0.3	3.5	6.3	6.3.
6.	12mm plaster of 1:6						
	-Inside	1	6.0	-	3.5	21	
	- outside	1	6.0	-	3.6	21.6	
7.	white wash 3 coats	1	6.0	-	3.5	21.0×3 = 63	84.6
	outside	1	6		3.6	21.6	
8.	colour wash over 2 coats of white wash	1	6.0	-	3.6	21.6×2 = 43.2	43.2

Item no.	Description of items	Quantity	unit	Rate	Amount.
1.	Earth work	3.36	m^3	350/% m^3	$\frac{350 \times 3.36}{100} = 11.76$
2.	Lime concrete	1.44	m^3	220/% m^3	$\frac{220 \times 1.44}{100} = 3.168$
3.	I st class Brick. w	3.24	m^3	300/% m^3	$\frac{300 \times 3.24}{100} = 9.72$
4.	D.P.C	2.4	m^2	20	$20 \times 2.4 = 48$
5.	B.w in super-structure	6.3	m^3	320	$320 \times 6.3 = 2016$

Item no:	Description	quantity	unit	Rate	Amount
6.	Plastering	42.6	m^2	8.5	42.6×8.5 = 362.1
7.	white wash	84.6	m^2	0.75	84.6×0.75 = 63.45
8.	colour wash	43.2	m^2	0.82	43.2×0.82 = 35.42
					Rs. 2549.562

→ contractor profit = 5%

$= \frac{5}{100}(2549.562)$

$= 127.4/-$

→ Contigenuous = 3%

$= \frac{3}{100}(2549.562)$

$= 76.486/-$

[2549.562 + 127.4 + 76.48 = 2753.52]

Total cost = 2753.52/-

5) with the above specifications the size of the room is 20x25 m. and 1 door and 2 windows.

24/07

MODULE-2

⇒ DETAILED ESTIMATION OF LOAD BEARING STRUCTURE.

we have two methods of estimation:

1. Long wall, short wall method.
2. centre line method.

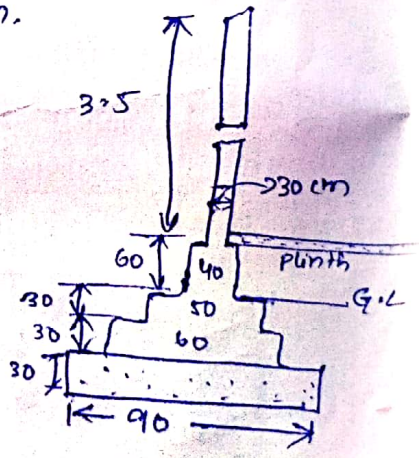
Long wall / short wall method:

In this method, we measure or find out external length of the walls running in the longitudinal direction generally the long walls out to out and the internal lengths of the walls running in the transverse direction in to in that is of cross or short wall lengths.

And we calculated the quantity = L x b x ht. of the wall.

(02) The plan represents the plan of superstructure wall of a single room building of 5x4m and the sections represent the cross-section of walls with the foundation. Estimate the quantities of:

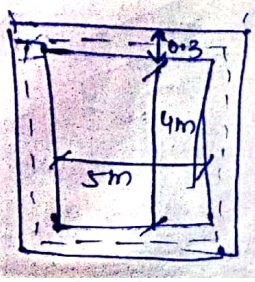
i) Earthwork excavation in foundation.
ii) concrete in foundation.
iii) Brick " " & plinth
iv) Brick work in superstructure.



centre to centre line

Sol) long wall = $\frac{0.3}{2} + 5 + \frac{0.3}{2} = 5.3\,m$

short wall = $\frac{0.3}{2} + 4 + \frac{0.3}{2} = 4.3\,m$



Item no.	Description of items	No.	L	B (or) T	H (or) D	Quantity	Total quantity	
1.	Earth work excavation in foundation.							
	→ long walls	2	6.2	0.9	0.9	10.04		L = 5.3 + 0.9 = 6.2 m; B = 0.9
	→ short walls	2	3.4	0.9	0.9	5.51		L = 4.3 - 0.9 = 3.4
							15.55 m³	
2.	concrete in foundation.							
	C/W	2	6.2	0.9	0.3	3.34		
	S/W	2	3.4	0.9	0.3	1.8		
							5.18	
3.	Brick work in foundation & plinth							
	C/W I st footing	2	5.9	0.6	0.3	2.124	6.594	5.3 + 0.6 < = 5.9
	II nd footing	2	5.8	0.5	0.3	1.74		5.3 + 0.5 = 5.8
	plinth wall	2	5.7	0.4	0.6	2.736		L = 5.3 + 0.4 = 5.7
	S/W I st footing	2	3.7	0.6	0.3	1.32	4.33	L = 4.3 - 0.6
	II nd footing	2	3.8	0.5	0.3	1.14		L = 4.3 - 0.5
	plinth	2	3.9	0.4	0.6	1.87		L = 4.3 - 0.4
4.	Brick works in super-structure.							
	C/W	2	5.6	0.3	3.5	11.76	20.16	L = 5.3 + 0.3 = 5.6 m
	S/W	2	4	0.3	3.5	8.4		L = 4.3 - 0.3 = 4 m.
							51.83	

(2) Estimate the quantities of the following items of a 2 roomed Building from the given plan and section.

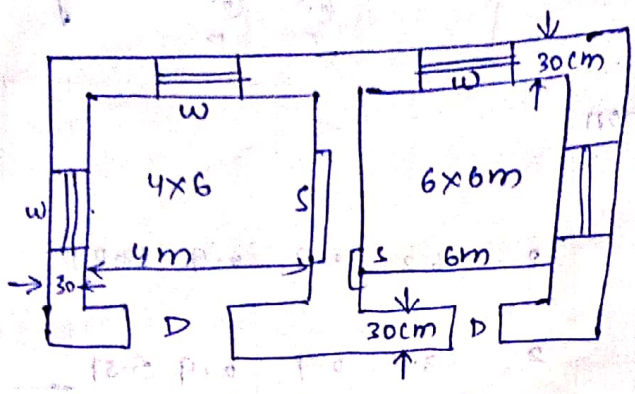
(i) Earth work in excavation and foundation

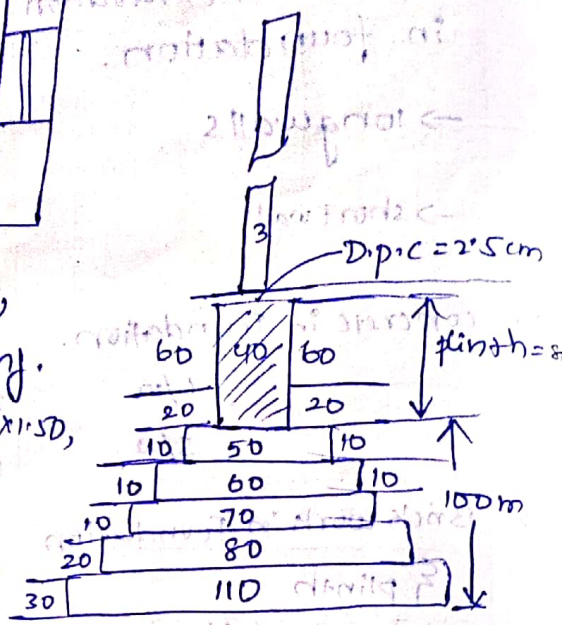
(ii) lime concrete in foundation

iii) I st class Brick work in cement mortar; 1:6 in foundation & plinth

(iv) ~~2.5 cm~~ 2.5 cm damp proof coarse

(V) Ist class B.W in lime mortar in sup





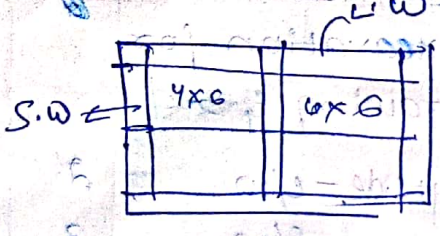
All wall are of same lintels over doors, windows, shelves are thick 15cm reinf. work size of door 1.2 × 2.1m, window = 1×1.5D, shelves = 1×1.5

Long wall = $\frac{0.3}{2} + 4 + 0.3 + 6 + \frac{0.3}{2} = 10.6m$

S/w = $\frac{0.3}{2} + 6 + \frac{0.3}{2} = 6.3$

Item no.	Details	No.	L	B	H	Q	T.Q	Remarks
								L/w c/c = 10.6m + 1.1 = 1
								S/w c/c = 6.3m
								L.L = 5
1.	Earthwork in excavation.							
	Long wall	2	11.7	1.1	1.0	25.74	42.90 m³	
	short wall	3	5.2	1.1	1.0	17.16		
2.	C.C L/w	2	11.7	1.1	0.3	7.72	12.87 m³	
	S/w	3	5.2	1.1	0.3	5.15		
3.	I class R.W in footing							
	L/w I —	4	11.4	0.8	0.2	3.648		10.6+0.8 =
	II —		11.3	0.4	0.1	1.582		10.6+0.7 = 1
	III —		11.2	0.6	0.1	1.344		10.6+0.6 = 1
	IV —		11.1	0.5	0.1	1.11		10.6+0.5 = 1
	Plinth wall		11	0.4	0.8	7.04		10.6+0.4 = 1
	plinth wall —		5.9	0.4	0.8	5.664		6.3-0.4 = 5
	S/w	3	5.5	0.8	0.2	2.64	26.09 m³	6.3-0.8 = 5
	"		5.6	0.7	0.1	1.176		6.3-0.7 = 5
			5.7	0.6	0.1	0.926		6.3-0.6 = 5
			5.8	0.5	0.1			

Item no.	Details	No.	L	B	H	Q	T.Q	Remarks.
(4)	~~plinth~~ wall damp proof course. →	2	11	0.4	–	~~8.8~~	15.88 m³	
	"							
	c/w	3	5.9	0.4	–	7.08		
	s/w							
	Deduction for door sills c/w	– 2	1.2	0.4	–	0.96 ⇒ 0.96		(15.88 − 0.96) 14.92 m².
	s/w	–	–					
6)	deduction • doors	2	1.2	0.3	~~2.1~~	~~1.512~~		
	• window	4	1	0.3	~~1.5~~	1.08	26.09 − 3.163 = 22.129 m²	
	shelfs.	2	1	0.2	1.5	0.6		
	lintel over door	2	1.2+0.3 1.5	0.3	0.15	0.135		
	window	4	1.3	0.3	0.15	0.234	41.79 − 4.49 = 37.341	
	sleves	2	1.3	0.3	0.15	0.117		
						0.486		
(5)	~~1st floor~~ superstructe							
	c/w	2	10.9	0.3	3.5	22.89		L = 10.6 + 0.3 = 10.9
	s/w	3	6	0.3	3.5	8.9		L = 6.3 − 0.3 = 6.
							41.79 m³	

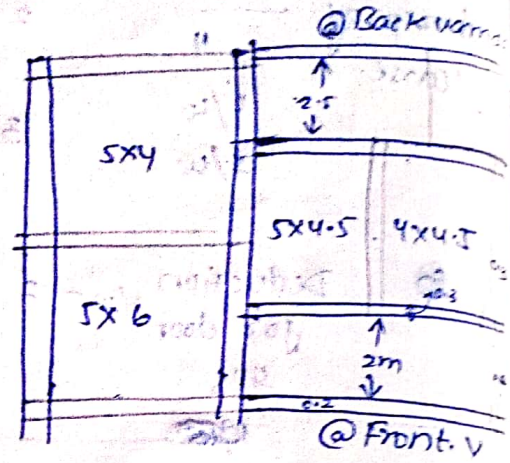


31/07/19

@problem from Fig.

Pg.38

pencil line – short wall
pen lines – long wall



Left Bedroom & Drawing Room

$y/w = \frac{0.3}{2} + 6 + 0.3 + 4 + \frac{0.3}{2} = 10.6m$

$s/w = \frac{0.3}{2} + 5 + \frac{0.3}{2} = 5.3m$

Right Two Bed Rooms

$y/w = \frac{0.3}{2} + 5 + 0.3 + 4 + \frac{0.3}{2} = 9.6$

$s/w = \frac{0.3}{2} + 4.5 + \frac{0.3}{2} = 4.8m$

F.Y

$y/w = \frac{0.3}{2} + 5 + 0.3 + 4 + (0.3 - \frac{0.2}{2}) = 9.65m$

$s/w = \frac{0.3}{2} + 2 + \frac{0.2}{2} = 2.25m$

B.Y

y/w = same as FY

$s/w = \frac{0.3}{2} + 2.5 + \frac{0.2}{2} = 2.75m$

Item no.	Details	NO	L	B	H	Q	T.Q	Remarks
1.	Earthwork in excavation for drawing & Bed							y/w cc = 10.6+0.9 = 11.5
	left side – c/w	2	11.5	0.9	1	20.7	28.62	s/w cc = 5.3-0.9 = 4.45
	s/w	3	4.45	0.9	1	11.8		
	Right side – y/w	2	9.6	0.9	1	17.28		y/w = 9.6 - 0.9/2 = 9.6
	s/w	2	3.6	0.9	1	6.48	23.76	s/w = 4.8 - (0.3/2 + 0.2/2) = 4.8 - 0.9

Item no.	Description		No.	L	B	H	Q	T.Q	Remarks.
	Back.V	L/W	1	9.5	0.6	0.5	2.85	4.05	$9.65-\frac{0.9}{2}+\frac{0.6}{2}$ $=9.5$
		S/W	2	2.0	0.6	0.5	1.2		$2.75-0.45-0.3$ $=2$
	front.V	L/W	1	9.5	0.6	0.5	2.85	3.3	
		S/W	1.	1.5	0.6	0.5	0.45		
								59.73	
2.	Lime Concrete in foundation.			~~11.5~~					
	(i) left side bedroom and drawing room			~~11.5~~	0.9	~~0.3~~			
	(ii) Right side	L/W	2	11.5	0.9	0.3	6.4	9.96	$2.25-\frac{0.9}{2}-\frac{0.6}{2}$ $=11.5$
		S/W	2	4.4	0.9	0.3	3.56		
	(ii) Right side	L/W	2	9.6	0.9	0.3	5.184	7.29	
		S/W	2	3.9	0.9	0.3	2.106		
	(iii) ~~Back~~ front. V	L/W		~~9.7~~	0.6	0.2	1.164	1.368	$9.65-\frac{0.5}{2}+\frac{0.6}{2}$ $=9.7$
		S/W	1	1.7	0.6	0.2	0.204		$2.25-\frac{0.5}{2}-\frac{0.6}{2}$ $=1.7$
	(iv) Back V	L/W	1	9.7	0.6	0.2	1.164	1.692	$9.65-\frac{0.5}{2}+\frac{0.6}{2}$ $=9.7$
		S/W	2	2.2	0.6	0.2	0.528		$2.75-\frac{0.5}{2}-\frac{0.6}{2}$ $=2.2$
								20.31.	
3.	First class B.W in (a) ~~4~~ t B.R & D.R								
	L/W	I	2	11.2	0.6	0.2	2.68		
		II	2	11.1	0.5	0.2	2.22		
		plinth wall	2	11	0.4	0.9	7.92		
	S/W	I	3	4.7	0.6	0.2	1.69		$5.3-0.3-0.3$ $=4.7$
		II	3	4.8	0.5	0.2	1.44		$5.3-0.5=4.8$
		plinth	3	4.9	0.4	0.9	5.292		$5.3-0.4=4.9$

(ii) Right B.B & D.B						
c/w I.	2	9.6	0.6	0.2	2.304	$9.6-\frac{0.6}{2}+$ $=9.6$
II.	2	9.6	0.5	0.2	1.92	$9.6-\frac{0.5}{2}$ $=9.6$
plinth wall	2	9.6	0.4	0.9	6.192	$9.6-\frac{0.4}{2}+$ $=9.6$
s/w — I.	2	4.2	0.6	0.2	1.008	$4.8-\frac{0.6}{2}$ $=4.2$
II	2	4.3	0.5	0.2	0.86	$4.8-\frac{0.5}{2}$ $=4.3$
plinth	2	4.4	0.4	0.9	3.168	$4.8-\frac{0.4}{2}$ $=4.3$
(iii) Front varenda.						
c/w footing	1	9.65	0.4	0.2	0.772	$9.65-\frac{0.4}{2}$ $=9.65$
plinth wall	1	9.6	0.3	0.7	2.016	$9.65-\frac{0.4}{2}+$ $=9.6$
s/w footing	1	1.85	0.4	0.2	0.043	$2.25-\frac{0.4}{2}$ $=1.85$
plinth wall	1	1.9	0.3	0.7	0.399	$2.25-\frac{0.4}{2}$ $=1$
(iv) Back varenda						
c/w footing	1	9.65	0.21	0.2	0.386	$9.65-\frac{0.4}{2}$ $=9.65$
Plinth ~~wall~~ wall	1	9.6	0.3	0.7	2.016	$9.65-\frac{0.4}{2}$ $=9.6$
s/w footing	2	2.35	0.4	0.2	0.376	$2.35-\frac{0.4}{2}$ $=2.35$
plinth ~~wall~~ wall	2	2.4	0.3	0.7	1.008	$2.75-\frac{0.4}{2}$ $=2.4$
4. Damproof course.						
B.B & D.B						
c/w	2	11	0.4	—	8.8	Same as plinth (length width
s/w	3	4.9	0.4	—	5.88	
2 Bedroom						
c/w	2	9.6	0.4		7.68	
s/w	2	4.9	0.4		3.52	
varend pillar	4	0.5	0.3			
Bathroom						

Rare wall	1	2.5	0.3				
side & inner wall	2	2.4	0.3				
						28.67	
Deduction							
D_1	5	1.2	0.4		2.4		28.67 - 3.825 = 24.85
D_2	3	1.0	0.4		1.2		
D_3	1	0.75	0.3		0.225		
						3.825	

5. Super Structure

1st B.W.C

B.R & D.R

c/w	2	10.9	0.3	4	26.16		10.6 + 0.3
s/w	3	5	0.3	4	18		5.3 - 0.3

2 Bed room

y/w	2	9.6	0.3	4	23.04		$9.6 - \frac{0.3}{2} + \frac{0.3}{2}$
s/w	2	4.5	0.3	4	10.8		$4.8 - \frac{0.3}{2} - \frac{0.3}{2}$

Front.V

y/w	1	9.6	0.2	3.05	5.856		$9.65 - \frac{0.3}{2} + \frac{0.2}{2}$
s/w	1	2	0.2	3.05	1.22		$2.2 - \frac{0.3}{2} - \frac{0.2}{2}$

Back.V

y/w	1	9.6	0.2	3.05	5.86		
s/w	2	2.5	0.2	3.05	3.05		
						93.982	

Deduction

D_1	5	1.2	0.3	2.1	3.18		
D_2	3	1	0.3	2	1.8		
D_3	1	0.75	0.2	1.8	0.27		
w_1	11	1	0.3	1.5	4.95		
w_2	1	2	0.3	1.50	0.9		
w_3	2	0.75	0.2	1.2	0.36		
C.W	18	0.35	0.3	0.60	2.43		
Shelves	5	1	0.2	1.50	1.5		
						15.99	
F.V	1	8.4	0.2	2.4	4.032		
Opening in b/n pillar	1	2	0.2	2.4	0.96		
F.V	1	2	0.2	2.4	0.96		
B.V	1	6.8	0.2	2.4	3.264		

Lintels

over doors

D_1	5	1.2	0.3	0.15	0.27		
D_2	3	1.3	0.3	0.15	0.1755		
D_3	1	0.95	0.2	0.15	0.025		
over windows w_1	11	1.3	0.3	0.15	6.43		
w_2	1	2.3	0.3	0.15	0.103		
w_3	2	0.95	0.2	0.15	0.05		
C.W	18	0.95	0.3	0.15	0.76		
Shelves	5						
Narenda Lintel Front	1	1.3	0.3	0.15	0.29		
side	1	9.75	0.2	0.15	0.292		
Back	1	2.15	0.2				

93.99 - 27.915 = 66.077 Total.

* Centre line method :-

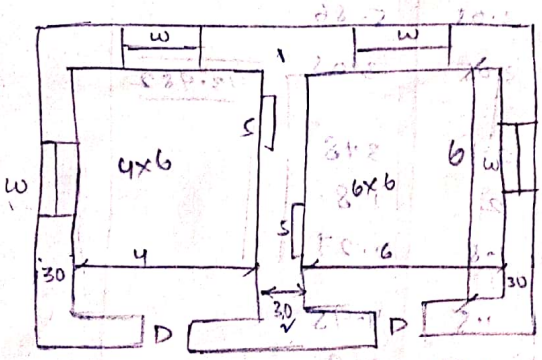
In this method sum or total length of central lines of walls, long and short has to be found out.

Find the total length of center lines of walls of same type long and short having same type foundation and footings and then find the equantities by multiplying the total centre length by the respective Breadth & height.

In case of Building width partition or cross wall having two junctions. for all quantities of estimation like earth work in Excavation, lime concrete Bed 1st class brick work in footings, Damp proof course, Superstructure etc.,

Here 1/2 Breadth of one junction to be deducted $\left[2 \times \frac{1}{2} (\text{Breadth of item work})\right]$

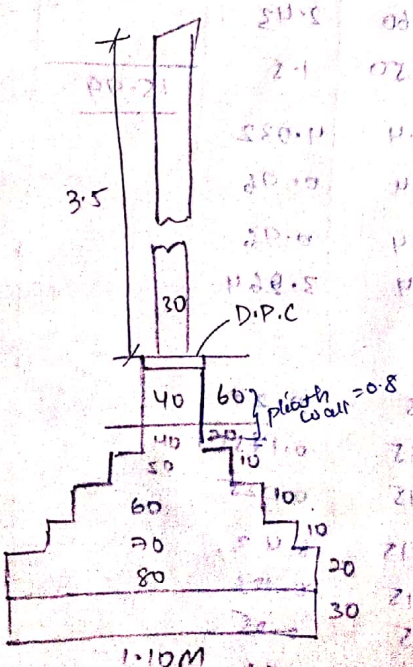
①



D = 1.2 x 2.1 m²

w = 1.00 x 1.5 m

S1 = 1.0 x 1.5 m



Total centre line length

4/w = 2

$\frac{0.3}{2} + 4 + 0.3 + 6 + \frac{0.3}{2} = 10.6\text{m}$

S/w = 3

$\frac{0.3}{2} + 6 + \frac{0.3}{2} = 6.3$

Total centie line length = 2 x 10.6 + 3 x 6.3

= 40.1m

S.NO	Description of particular	N	L	B	H	Q	T.Q	Remarks
1.	Earthwork in Excavation	1	39	1.1	1.	42.9	55.77	$40.1-2\times\frac{1.1}{2}$ = 39
②	lime. concrete		39	1.1	0.3	12.87		
3.	first class Brick work in footing	1	39.3	0.8	0.2	6.28		$40.1-2\times\frac{0.8}{2}$ = 39.3
	I.		39.4	0.7	0.1	2.75	19.8	
	II.		39.5	0.6	0.1	2.37		
	III.		39.6	0.5	0.1	1.98		
	IV		39.7	0.4	0.8	12.70		
	plinth wall							
4	Damp proof coarse		39.7	0.4	2.5	15.88	14.92	
5.	Deduction for doors	2	1.2	0.4	—	0.96		15.88 − 0.96 = 14.92
6.	I class B.w superstru.	1	39.8	0.3 (wall Thickness)	3.5	41.79		$40.1-2\times\frac{0.3}{2}$ = 39.8
	deduction; Doors	2	1.2	0.3	2.1		3.912 m^3	
	windows	4	1	0.3	1.5			
	shelves	2	1	0.2	1.5			
7.	Lintels (i) Doors	2	1.2+0.3	0.3	1.5			1.2+0.3=1.5
	(ii) windows	4	1+0.3	0.3	1.5	0.486		
	(iii) shelves	2	1+0.3	0.3	1.5			

37.39 m^3 = 41.879 − 3.912 = 0.486.

② @ Fig.

Left side D.B & B.B

C/w = 2

= 2×10.6

S/w = 3

= 3×5.3

Right side Two B.B

C/w = 2 no.'s

= 2×9.6

S/w = 2 no.'s

= 2×4.8

(2×10.6+3×5.3+2×9.6+2×4.8)

= 65.9m

@ 30cm wall centre line length.

F.V.

C/w = 1

= 1×9.65

S/w = 1

= 1×2.25

B.V

C/w = 1

= 1×9.6

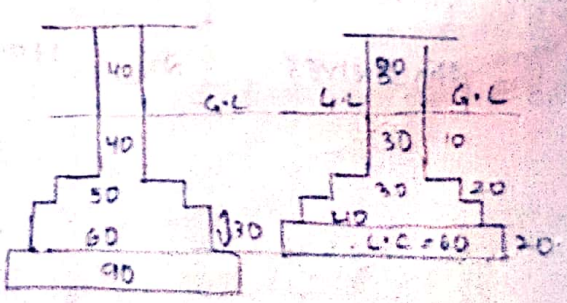
S/w = 2

= 2×2.25

(1×9.65+1×2.25+1×9.6+2×2.75)

= 27.05m

@ 20cm wall centre line length.



Item no.	Description of particular	N	L	B	H	Q	T.Q	Remarks. Junctions $-\frac{⑥ \times 0.9}{2}$
1.	Earth work in Excavation for 30cm wall.	1	63.2	0.9	1.	56.88	64.23	65.9 + Lime conc. = 63.2
	for 20cm wall.	1	25.5	0.6	0.5	7.35		$27.05 - \frac{5 \times 0.9}{2} - \frac{1 \times 0.6}{2}$ $= 24.85$
2.	Lime concrete Bed for 30cm wall	1	63.2	0.3	0.3	11.376		Same as earth work.
	for 20cm wall	1	25.5	0.6	0.2	3.06		$24.05 - \frac{5 \times 0.5}{2} - \frac{0.6}{2}$ $= 25.5$
3.	Ist class Brick work							
	30cm I footing	1	64.1	0.6	0.2	7.692		$65.9 - 6 \times \frac{0.6}{2}$ $= 64.1$
	II [illegible]	1	64.4	0.5	0.2	6.44		$65.9 - 6 \times \frac{0.5}{2} = 64.4$
	plinth. wall	1	64.7	0.4	0.3	7.764		$65.9 - \frac{6 \times 0.4}{2} = 64.7$
	20cm I footing	1	25.85	0.4	0.2	2.068		$27.05 - \frac{5 \times 0.4}{2} -$
	plinth wall	1	25.9	0.4	0.2	10.36		$\frac{1 \times 0.4}{2} = 25.85$ $27.05 - \frac{5 \times 0.4}{2} - \frac{1 \times 0.3}{2}$ $= 25.9$
			64.7	0.4	–	25.88		
4.	D.P.C							
	Verada pillar	4	0.5	0.3		0.6		L.W $\left(\frac{0.2}{2} + 2 + \frac{0.2}{2}\right)$
	Bedroom	3	7.2	0.3		6.48		S/W $2\left(\frac{0.2}{2} + 2.5 + \frac{0.3}{2}\right)$ $= 7.7 - \frac{0.4}{2} - 2\left(\frac{0.2}{2}\right)$ $= 7.2m.$

Bar Bending Schedule:

This is a list of reinforcement bars in a tabular form & the following essential details are generally given for a Bar Bending schedule in RCC works.

a) Bar mark: This gives the position of the bar in the structure.

b) Diameter of Bar:

c) Shape & Bending dimensions of the Bar:

d) Length of each Bar.

e) no. of same types of Bars.

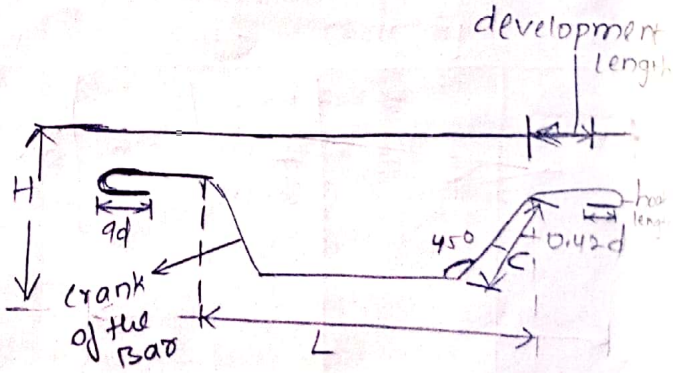
f) total length.

g) Weight

h) Total weight.

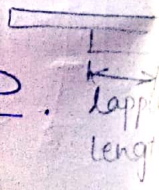
centring → columns & footings → shuttering

IS: 2502 - 1963.

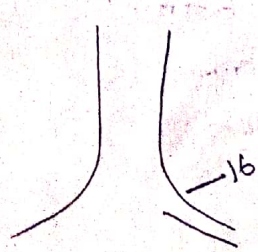


- BBS is provided to resists -ve Bending movement:
- It resists shear force which is higher at supports.
- To make the structure economical.

* caping length: for the tension member is 40 D.
for II compression member is 50 D.



Hook length = 9D



* Standard ~~rate~~ weight per m per kg = 0.00618 D^2
* weight of mild steel plates standard wt per m^2 is = 7.85 x t (thickness of plate in mm)

* wt. of one m^3 of mild steel (or) Torsteel = 7850 kg.
* wt. of one Bag of cement = 50 kg.
* volume of 1 Bag of cement = 0.0347 m^3.
* Density of steel 78.5 Quintal / m^3 (or) 7.85 gm/m^3.
* Standard length of Bar in m = 12 m.

* $\frac{\text{length}}{\text{spacing}} + 1$ = main Bar.
* $\frac{\text{length}}{\text{spacing}}$ = Distribution Bar

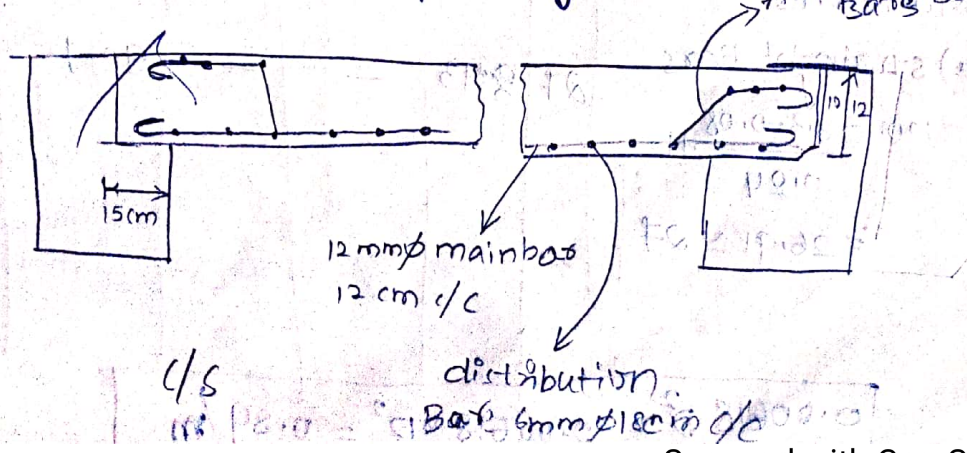
* Spacing = dist. b/n 2 consecutive reinforcing Bars.

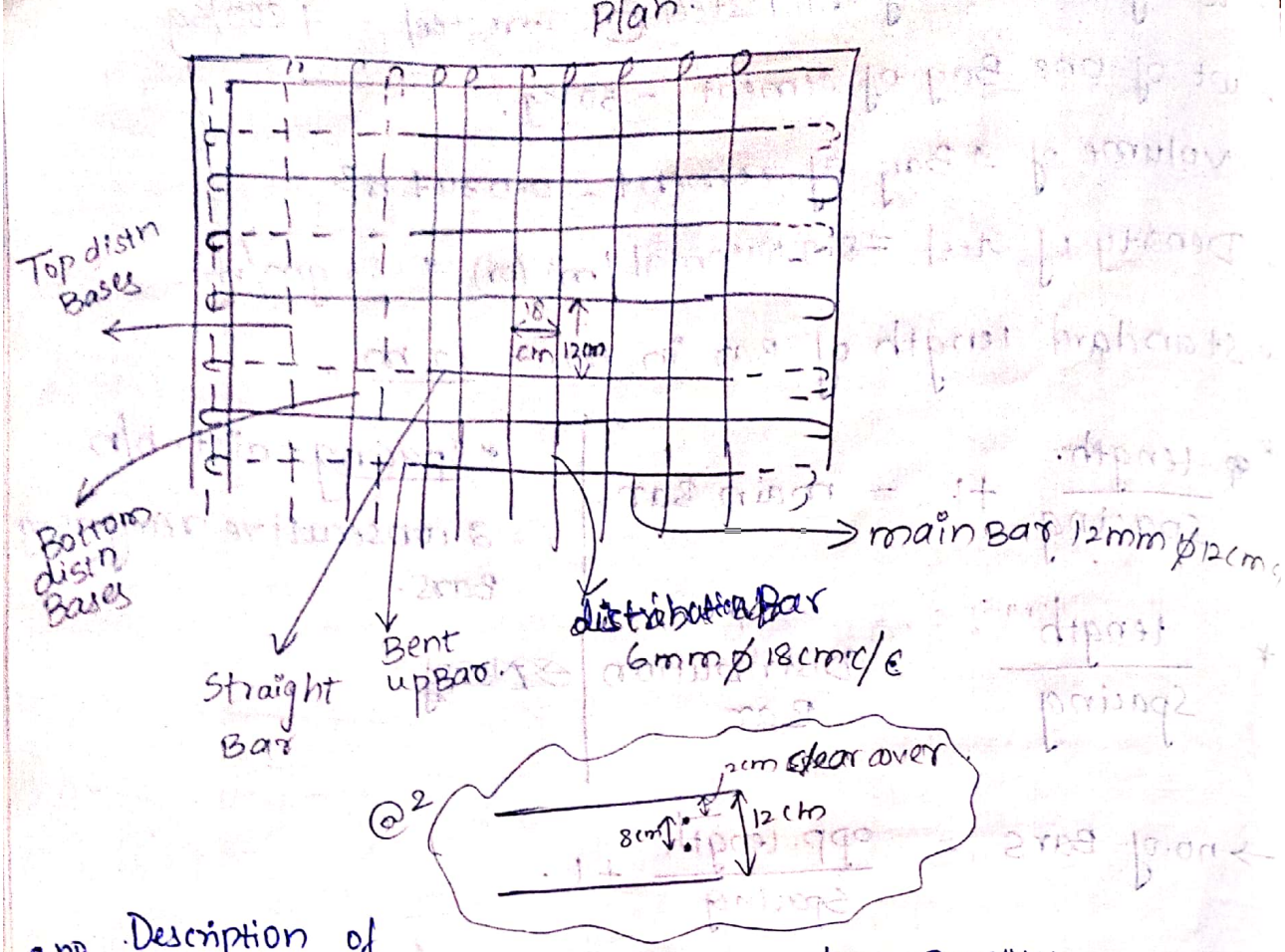
→ no. of Bars = $\frac{\text{opp. length}}{\text{spacing}} + 1$.

→ no. of stirrups = $\frac{\text{Actual length of column/Beam}}{\text{spacing}} + 1$.

→ Bend deduction for @45° = 1D
@90° = 2D
@135° = 3D.

① Prepare a detailed estimation of a roof slab (RCC) of 3m clear span & 6m long for a given drawing RCC work including centring and shuttering and steel reinforcement in detailed shall be taken seperately.





Sl.no	Description of Particulars	no.	L	B	H/D	Quantity
1.	Rcc work, excluding steel and its bending but including centring & shuttering and Binding the steel.	1	6.3	3.3	0.12	2.4948
2.	steel bars, including Bending in RCC work main bars of 12mm ø @ 0.89kg/m.					
	—Main Bars					
	a) straight Bars	27	3.43	—	—	92.7

$$no. = \frac{6.3 - 0.08}{0.24} + 1$$

$$= 26.91 \simeq 27$$

clear span + Beam

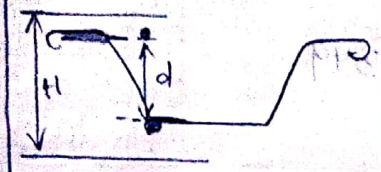
= 3.3 − 2(side cover) + 2 hook

$L = 3.3 - 0.08 + 2 \times 9 \times 0.012$

$L = 3.43$

$$0.00618\, D^2 = 0.00618 \times 12^2 = 0.89/m$$

	no.	L	B	H	Q
b) Cranked Bars. $= \frac{6.3-0.08}{0.24} = 26$	26	3.49	–	–	90.79



$d = H - (\text{clear cover}) - D$

$= 0.12 - (0.04) - 0.012$

$d = 0.068$

$\therefore 0.42 \times d = 0.028$

$L = 3.3 - 2(\text{side cover}) + 2\text{hooks} + 2\text{cranked length}$

$= 3.3 - 0.08 + (2 \times 9 \times 0.012) + d \times 2$

$\Downarrow$

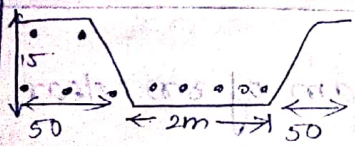
0.028

$\Rightarrow 3.49$

90.79 + 92.7

~~Calculate Number of Distribution Bars~~ 183.4 × 0.89 = 163.22

3. Distribution Bars



	12	6.33	–	–	~~75.96~~

no. = $\frac{L}{0.18} + 1 = 12$

length:

$6.3 - 0.08 = 6.22$ + hook long

$\therefore 6.22 + 2 \times 9 \times 0.06$

$L = 6.328$

Top distribution Bar	2×3	6.33	–	–	37.98
Bottom " "	2×3	6.33	–	–	37.98

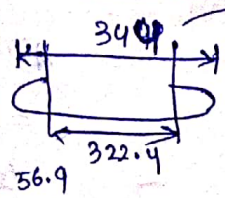
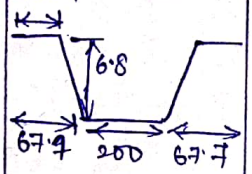
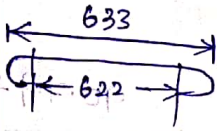
$\rightarrow \boxed{(0.00618 \times 6^2) = 0.22/m}$.

151.9 × 0.22

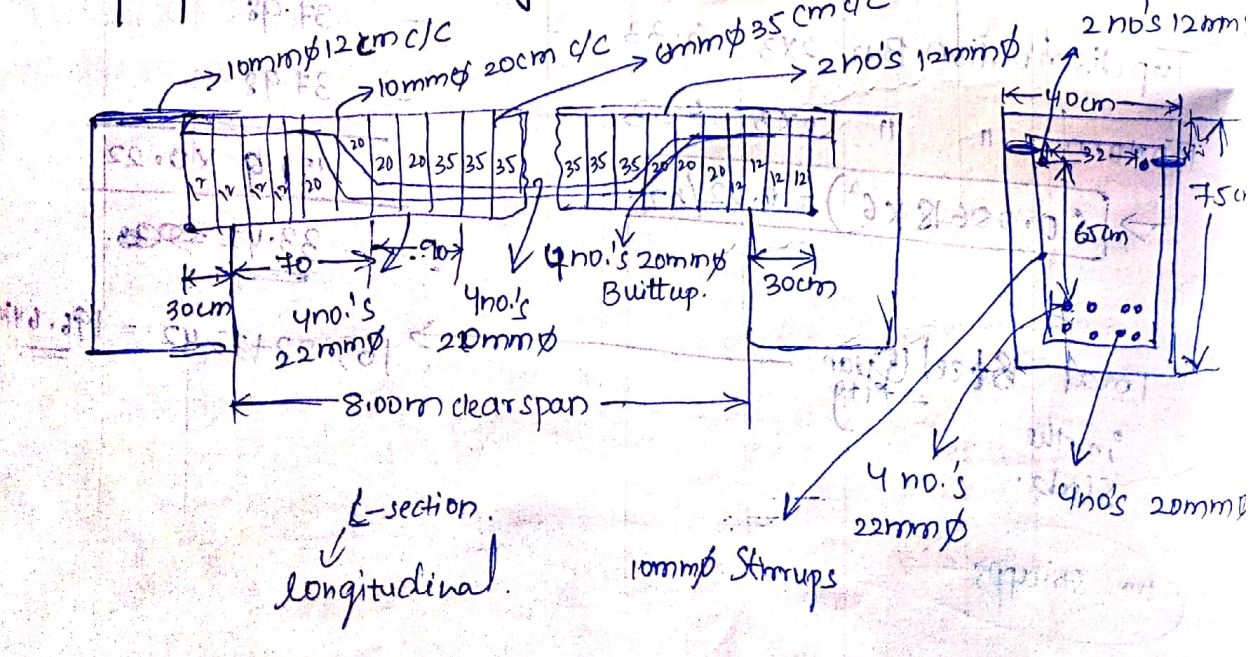
33.42 ~~kg~~.

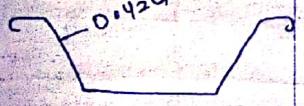
Total Steel Quantity in the Slab. → 163.22 + 33.42 = 196.64 kg

no. stirupps

Distribution of Bars	Shape of Bending dimensions in cm	length of each in m	No.	Total length	wt kg
main Bars 12mmØ		344-(2×9d) d=1.2cm => 322.4	27	344	163.2
Bent up	 (67.7-9(1.2)) = 56.9	349-200 -6.8×2=135.4 = 135.4/2 = 67.7	26	349	
Distance Bars Top :			6	633	33.42
Bottom.			=18 (6+12)	633	

② Prepare a detailed Estimation of RCC beam of 8m clear span and 75×40cm in section from the given drawing steel in detail and RCC works shall be cal. seperately. also prepare schedule of Bar.



Sl.no	Description of Particulars.	no.	L	B	D/H	Q	TQ	Remarks
1.	Rcc works Exclude steel and its Bending, But including centring and shuttering	1	8.6	0.4	0.7	2.408		
②	Steel Bars including Bentup Bars							
	@ straight Bars	4	8.92	—	—	35.664 x 2.99 = 106.6 kg	106.6 kg	L = 8.6 − (2) clear cover + 2 hooks. L = 8.6 − 2(0.04) + 2×9(0.022) L = 8.92 m
	$0.00618D^2 = (0.00618)(22)^2 = 2.9 kg/m$. (22 mm)							
	ⓑ Cranked Bars	4	9.42	—	—	37.68 x 2.47 = 93.06 kg.		L = (8.6 − (2) clear cover + 2×0.42d + 2 hooks) L = 8.6 − 2(0.04) + 2×0.42×0.65 + 2×9×0.020 L = 9.42 m.
	 d = H − clear cover − D. d = 75 − 8 − 20 d = 65 cm d = 0.65 m.							
	$0.00618d^2 = 0.00618 \times 20^2 = 2.47$							
	ⓒ 12mmØ Top bars	2	8.74	—	—	17.48 x 0.889 = 15.5 kg		L = 8.6 − 2 clear cove + 2(hook) ⇒ 9d L = 8.6 − 2(0.04) + 2×9(0.012) L = 8.74
	$0.00618d^2 = 0.00618 \times 12^2 = 0.889$							1 quintal = 100 kg
3.	no. distribution Bars Stiruppss 10mmØ Bars @ the end 12cm c/c no. of stiruppss = length/spacing = 70/12 = 5.83 ≈ 5	5×2	2.42	—	—	24.2 x 0.618 = 14.9 kg		L = 2(65+32) + 2(9×1) + 30 cm L = 2.42 m

∵ end zone distribution is same on B.S)

$0.00618d^2 = 0.618$, $d = \sqrt{10} = 3.16$

12mmØ

75 cm

8mmØ

	no.s	L	B	H	Q	TQ	Remarks
II) $\frac{90}{20} = 4.5 \simeq 4$	4×2	2.42	—	—	19.36 × 0.618	⇒11.96 kg	$L = 2(65+32) + 2(9 \times 0.6) + 30 = 2.348$
III) $\frac{420}{35} = 12$	12	2.34	—	—	28.08 × 0.222	6.23kg	800 − 2(30 + 90) = 420
						248.25	

$0.00618 \times d^2$; $d = 6$

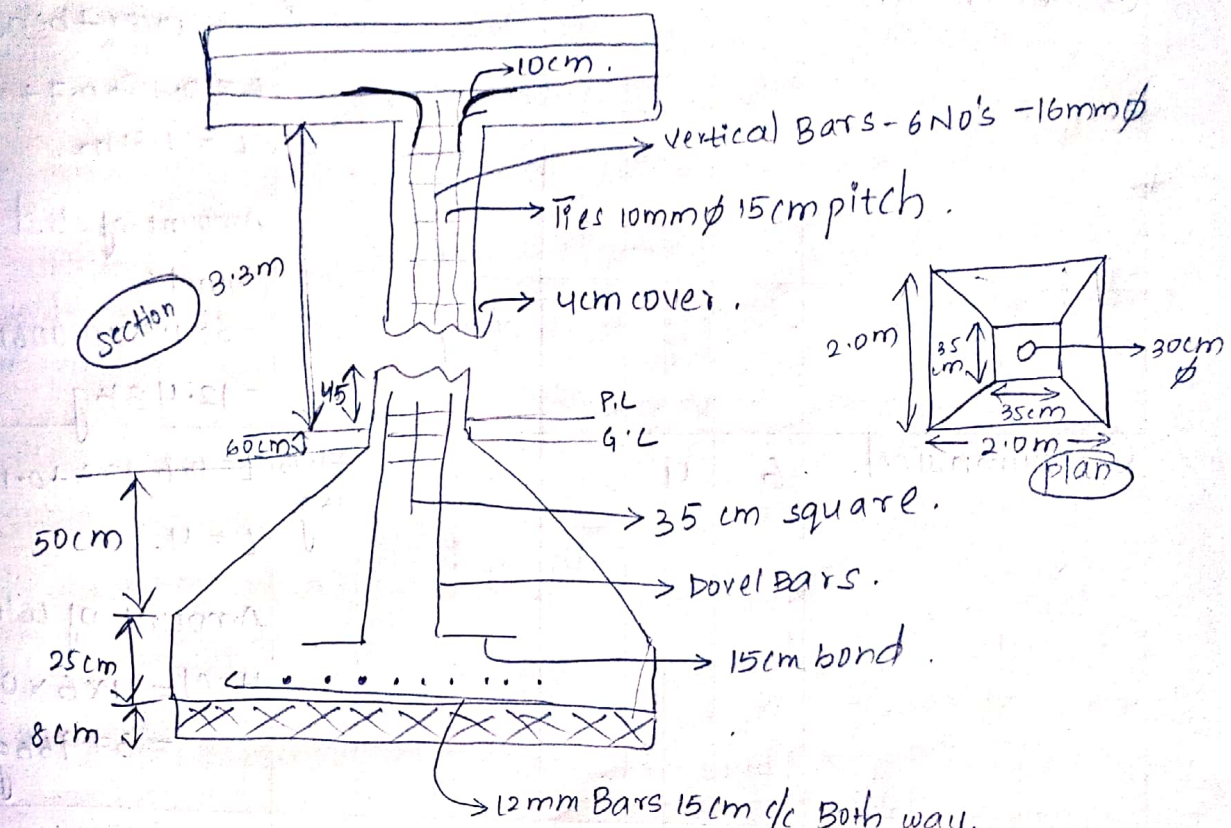
$0.00618 \times 10^2 = 0.618$

Total steel = $\simeq$ 249 kg

shape of Bending Dimensions in cm	length of each m	no.	Total length	wt. Kg
	892 − (2×9 ×2.2) ; d = 2.2 = 852.4	4	892	
	942 −			

16/09

1. Prepare a detailed Estimation of Rcc column of foundation footing.



Sl.No	Description	NO	L	B	H	Q	T.Q	Remarks.
1.	Earthwork in Excavation	1	2	2	0.8	3.32m³		vol. of square + 0.6 column.
	(i) cement concrete in the base	1	2	2	0.08	0.32		$\rightarrow 0.35 * 0.35 \times 0.6 + \frac{\pi}{4}(0.1)^2 \times 3.3$
	(ii) Rcc work in footing	1	2	2	0.25	1		
	Trapezoidal							vol. of Trapezoidal = Ar. x side.
	Rcc work in column.							$= \left(\frac{a+b}{2}\right)h \times h$ $= \left(\frac{2.0+0.35}{2}\right)(6.5)^2$ $= 1.58$ T.
2.	Steel reinforcing bar including Bending.							L = 200 - 8 + hook. = 200 - 8 + 2(9d) = 213.6 cm = 2.14 m
	(a) Steel in footing.							
	No.'s = $\frac{200-8}{15} + 1$ = 14	14	2.14				53.32 kg	Q = 14 x 2.14 x Unit wt x 2(way) Q = 14 x 2.14 x 0.00618D² x 2 = 53.32 kg.

Sl.No	Description	No.	L	B	H	θ	TQ	Remarks.
	(b) Dowel Bars	6	1.31	-	-	-	12.43kg	$L = 0.45 + 0.5 + 0.25 - \underbrace{\text{cover}}_{4cm} + \text{bend}$ (→ isc…) $L = 0.45 + 0.7 + 0.15 - 0$ $L = 1.31\,m$. Amount of steel for dowel: $= 6 \times 1.31 \times 0.00618 \times 16$ $= 12.43\,kg$.
	(c) column steel.	6	4				37.96 kg.	$L = 0.6 + 3.3 + 0.1$. $L = 4$. Amount of column steel $= 4 \times 6 \times 0.00618$ $= 37.96\,kg$.
	(d) lateral ties. No. $= \frac{3.9}{15} + 1 = 27$	27	0.69				11.51 kg.	$L = \overbrace{\pi(30 - 8)}^{\text{circumference}}$ $= 69.11\,cm$. $= 0.69\,m$. Amount $= 27 \times 0.69 \times 0.00618 \times 10^{3}$ $= 11.51\,kg$.
					Total =		115.26kg.	

20/9/19

Valuation Of Buildings.

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

determination of Depreciation:

After deciding the cost of the building of the structure by -

1. cost from record.
2. cost by detail estimation.
3. " " plinth area.

By any of this method it neccessary to allow a suitable depreciation on the cost. The depreciation increases with the life.

years	Depreciation per year	Total depreciation
0-5	Nil	Nil
5-10	@ ½ %	2.5%
10-20	@ 3/4 %	7.5%
20-40	@ 1%	20%
40-80	@ 1½%	60%
		90%

Scrap value = 10%

100%

Different methods of valuation:

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

overall Buildings

individual part valuation by detailed estimate.

$$D = P\left(\frac{100 - rd}{100}\right)^n$$

where,

D - depreciated value.

P - cost at present market rate.

rd - fixed % of depreciation.

n - No. of years building has been constructed.

rd = 1 — 100 yrs.

rd = 1.3 — 75 yrs

rd = 2 — 50 yrs

rd = 4 — 25 yrs

rd = 5 — 20 yrs.

Fetches

1. A property ~~which is~~ a net angle income of Rs. 900/- Deducting all outgoings workout the capitalized value of the property. if the rate of interest is 6% ~~of the~~ per annum.

$$\text{Year purchase} = \frac{100}{\text{Rate of interest}} = \frac{100}{6} = 16.67.$$

$$\text{Capitalized value} = (\text{Net annual Income}) \times \text{Year purchase}$$

$$= 900 \times 16.67$$

$$= \text{Rs. } 15,003/-$$

Capitalized value:

The " " of a property is the amount of a money whose annual interest at the highest prevailing rate of interest will be equal to the net income from the property.

capitalized value = (Net annual income) x (year's purchased)

year purchase is defined as the capital sum required to be

invested in order to receive an annuity of Rs.1/- at certain rate of interest.

$$\text{Year purchase} = \frac{100}{\text{rate of Interest}}$$

Sinking Fund :-

The fund which is gradually accumulated by the way of periodic or annual deposit for the replacement of the building or structure at the end of the useful life is called sinking Fund.

→ The object of creating sinking fund is to accumulate sufficient money to meet the cost of construction of replacement of Building or structure after its utility period is done.

$$I = \frac{Si}{(1+i)^n - 1}$$

S - Total amount of sinking fund to be accumulated.
n - No. of years required to accumulate sinking Fund.
i - Rate of interest in decimal.
I - Annual installment required.

2. A pumping set with a motor has been installed in a building at a cost of Rs. 2500/-. Assuming the life of the pump as 15 yrs. Workout the amount of annual installment of sinking fund required to be deposited to accumulate the whole amount of 4% compound interest.

$$I = \frac{2500 \times 0.04}{(1+0.04)^{15} - 1} = \frac{100}{0.800} = 125.$$

3. An old building has been purchased by a person ... cost Rs. 30,000/- excluding the cost of land. cal. the amount of annual sinking fund at 4% interest assuming the future life of building as 20 yrs. & scrap value of the building as 10% of the cost of purchase. calculate.

90% of 30,000 = 27,000 = S.

$$I = \frac{27,000 \times 0.04}{(1+0.04)^{20} - 1} = 906.70 \simeq 907$$

$$I = \frac{1080.0}{1.19} = 907.5$$

Depreciation:

It is the gradual exhaustion of the usefulness of the property. This may be defined as the decrease or loss in a value of the ll due to structural detoriation use.

- The present value of a property can be calculated after deducting the total amount of depreciation from the original

Various methods of calculating depreciation:

① Straight line method. ⟶ Annual depreciation (D) = $\frac{\text{original cost} - \text{Scrap valu}}{\text{life in year}}$

$$= \frac{C-S}{n}$$

② constant percentage method.

$$D = 1 - \left(\frac{S}{C}\right)^{1/n}$$ (or) declining Balance method.

It fails when $s=0$.

③ Sinking fund method: ~~At the end of the year~~.

at the end of the year	Depreciation for year.	Total deprication	Book value.
I year	A	A	C - A
II	A+b	2A+b	C - (2A+b)
III	A+C	3A+b+c	C - (3A+b+c)

(4) Quantity survey method.

4. 3 storied building is standing on a plot of land measuring 800m². the plinth area of each store is 400m² the building is of RCC framed structure and future life may taken is 70 yr. The Building fetches a gross rent of 15,00/- per month calculate the capitalized value of the property on the basis of 6% net yield. For sinking fund 3% compound interest may be assumed cost of land may be taken as 40/m² other data may be assumed suitable.

Sol) Overall year Income = 1500 × 12 = 18,000/-

Outgoings:

1. Repairs @ $\frac{1}{12}$% of Gross Income = 1500/-
2. Municipal tax 20% of Gross Rent = 36,000/-
3. Property tax 5% " " = 900/-
4. Insurance premium @ ½% of " = $\frac{0.5}{100} \times 18000 = 90$.
5. Management charges @ 6% of " = 1080/-
6. Other miscellaneous charges @ 2% of Rent = 360/-
7. Sinking fund = 3 × 400 × 150
   = 1,80,000/-

$$S.f = \left[\frac{Si}{(1+i)^n - 1}\right] = \left[\frac{1,80,000 \times 0.03}{(1+0.03)^{70} - 1}\right] = 780.59$$

Net income = $18,000 - \{1500 + 3600 + 900 + 90 + 1080 + 360 + 780.59\}$

= 9689.41 ≃ 9690.

capitalised value = N.I × Y.P $\quad \left[Y.P = \frac{100}{6} = 16.67\right]$

= 9690 × 16.67.

= 1,61,532/-

Total building + Land.

1,61,523 + (40 × 800).

= 193,532/-

4/10/19

1. calculate the standard rent of a govt. residential building newly constructed from the following data.

(i) cost of land - Rs. 10,000/-

(ii) " " construction of the building = Rs. 40,000.

(iii) " " roads within the compound & fencing = Rs. 20,000/-

(iv) " " Electric installation including fans - 8% of the cost of the Building.

(v) " " sanitary and water supply works - 10% of the cost of the Building.

(vi) Municipal house tax, Rs. 400 per annum

(vii) water tax, Rs. 250 per anum

(viii) property tax Rs. 140 per annum.

Sol) cost of building = 40,000/-

" " roads within the compound & fencing = 20,000/-

+

" " Electric installation including fans = 8% = 3200/- = $\frac{40000}{100} \times 8$

+

" " sanitary & water supply works = 10% = 4000/-

Out going

Net rent = 3200 + 4000 = 7200.

Net income = cost of land + cost of building = 10,000 + 40,000

= 50,000/-

$\rightarrow \frac{50,000}{100} \times 6 = 3000$ = Net income.

Out going = 7200 + 400 + 250 + 140 = 7990 Rs.

Gross rent = 3000 + 9990 = Rs. 10,990/-

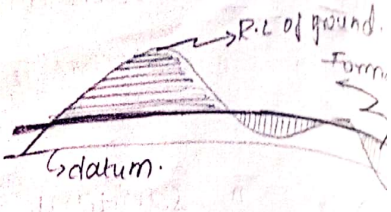
Net rent per month = $\frac{10,990}{12}$ = Rs. 915/-

21/10

4. Earthwork for Roads & Canals

→ Cross-section of earthwork of road is usually in shape of trapez is used to calculate the entire volume of soil needed in cutting and banking.

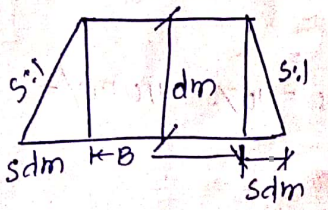
Quantity (or) vol. = c/s area × length



→ There are 3 methods to calculate

1. Mid sectional Area method.
2. Mean " "
3. Prismoidal.

Mid sectional Area :-



Total Ar. =

$$B d_m + \frac{1}{2} s \cdot d_m^2 \times 2$$

$$\boxed{B d_m + s \cdot d_m^2}$$

d_m – mean ht.

Mean sectional Area :-

$$Q = A \times L$$

$$= \left(\frac{A_1 + A_2}{2}\right) \times L$$

$$A_1 = B d_1 + s d_1^2$$

$$A_2 = B d_2 + s d_2^2.$$

Prismoidal :

$$Q = \frac{L}{6}[A_1 + A_2 + 4A_m]$$

A_m – Mean sectional Area.

$A_1 A_2$ – areas at 2 ends.

① RL of the ground along the c.l of the proposed road from chainage 10-20 are given below. The formation level at the 10th chainage is 107m and the road is in downward gradient of 1 in 150 upto chainage 14 and then gradient changes to 1 in 100 downward. formation width of the road is 10m and the side slopes of Banking are 2:1 length of the chain 30m. Draw longitudinal section of the road & a typical c/s and prepare an Estimate of earthwork at the rate of Rs. 2.75 per cubic meter. Find also the ar. of the side slope & the cost of the trying. side slope at rate of Rs. 60/m².

chainage	10	11	12	13	14	15	16	17	18	19	20
R.L of ground	105.00	105.6	105.44	105.9	105.42	104.3	105	104.1	104.62	104.00	103.9
R.L of Formation	107.00	← 1 in 150 →				← 1 in 100 →					

$$\text{change per chainage} = \frac{\text{chainage}}{\text{slope}} = \frac{30}{150} = 0.2$$

$$= \frac{30}{100} = 0.3$$

10 → 107.	15 → 105.9
11 → 106.8	16 → 105.6
12 → 106.6	17 → 105.3
13 → 106.4	18 → 105
14 → 106.2	19 → 104.7
	20 → 104.4

B = 10m

Station / Chainage	length	+ve / -ve D [RL formation − RL of ground]	Mean ht. (d)	central Ar. (Bd) ↓ 10.	side Ar. sd^2 ↓ 2	Total Ar. $Bd+sd^2$	Quantity $(Bd+sd^2)L$ Banking	Quantity $(Bd+sd^2)L$ cutting	Turfing = side slopes: sloping breadth of side slope $d\sqrt{s^2+1}$	Turfing = side slopes: Ar. of both side slopes $2Ld\sqrt{s^2+1}$
10	300	2.0	—	—	—	—	—	—	3.577	214.2
11	330	1.2	1.6	16	5.12	21.12	6336		2.63	157.8
12	360	1.16	1.18	11.8	2.78	14.58		437.4	1.118	67.08
13	390	0.5	0.83	8.3	1.378	9.67	290.1		1.74	104.4
14	420	0.78	0.64	6.4	0.8192	7.22	216.6		3.57	214.2
15	450	1.6	1.19	11.9	2.8322	14.73	441.9		1.34	80.4
16	480	0.6	1.1	11	2.42	13.42	402.6		2.68	160.8
17	570	1.2	0.9	9	1.62	10.62	318.6		0.84	50.4
18	540	0.38	0.79	7.9	1.2482	9.1	273		1.565	93.6
19	570	0.7	0.54	5.4	0.5832	5.98	179.4		2.45	147
20	600	1.1	0.9	9	1.62	10.62	318.6			
							3511.8 ≈ 3513			1189.16 × 60 = 71349.6

Total Rate = 2.75 × 3513 = 9660.75.

5% of total rate = $9660.75 \times \frac{5}{100}$ = 483.03.

water charges
(01) miscellaneous chargers.

∴ Total = 9660.75 + 483.03 = 10,143.78/-

Q) Estimate the cost of Earthwork for a portion of road for 400m from the following data.

gradient 1 in 200

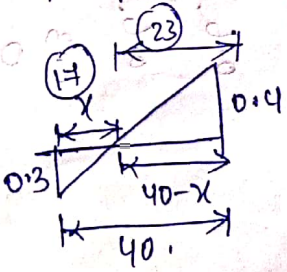
fw of road = 10m

side slopes are 2:1 in banking & 1.5:1 in cutting.

Station	25	26	27	28	29	30	31	32	33	34	35
dist (m)	1000	1040	1080	1120	1160	1200	1240	1280	1320	1360	1400
RL of ground	51.00	50.90	50.50	50.80	50.60	50.70	51.20	51.40	51.30	51.00	50.60
RL of formation	52.00	51.8	51.6	51.4	51.2	51	50.8	50.6	50.4	50.2	50

chainage/slope = $\frac{40}{200} = 0.2$

ht	+1	0.9	1.1	0.6	0.6	0.3	−0.4	−0.8	−0.9	−0.8	−0.6



$\frac{0.3}{x} = \frac{0.4}{40-x}$.

$x = 17.14m \simeq 17$

Cross sides slopes

Station	Ground length	RL of formation	d	Mean ht (d)	Area ($\frac{B+sd}{2}$)d		L	Q=AxL	Q
									B C
25			1	—	—		40	—	
26			0.9	0.95	11.305		40	452.2	
27			1.1	1	12		40	480	
28			0.6	0.85	9.945	S=2	40	397.8	
29			0.6	0.6	6.72		40	268.8	
30	1200		0.3	0.45	4.905		40	196.2	
x	1217		0	0.15	1.545		17	26.265	
31	1240		-0.4	-0.2	2.06		23	47.38	1821.265
32			-0.8	-0.6	6.54	S=1.5	40	261.6	
33			-0.9	-0.85	9.585		40	383.32	
34			-0.8	-0.85	9.585		40	383.32	
35			-0.6	-0.7	7.735		40	309.4	

(-ve symbol not considered)

S: C = ? 1385

① Prepare a detail Estimation of Earthwork for a portion of road from the following data. ~~Distance~~

Distance	~~0~~	100	200	300	400	500	600	700	800	900	1000	1100	1200
RL of ground	114.5	114.75	115.25	115.20	116.10	116.85	118.00	118.25	118.10	117.8	117.75	117.90	117.8
	(115)	← 1 in 200						← 1 in 400 downward					
RL of formation	115	115.5	116	116.5	117	117.5	118	117.75	117.5	117.25	117	116.75	116.5
~~H~~ 1	0.5	0.75	0.75	1.3	0.9	0.65	0	-0.5	-0.6	-0.55	-0.75	-1.15	-3
		0.625	0.75	1.025	1.1	0.775	0.325	-0.25	-0.55	-0.575	-0.65	-0.95	-2.075

$\frac{\text{chainge}}{\text{slope}} = \frac{100}{200} = 0.5$ | $\frac{\text{chainage}}{\text{slope}} = \frac{100}{400} = 0.25$

H	d	Ar. ($\frac{1}{2}(Bd+sd^2)$)	L	Q = AxL	Banking	Cutting
0.5	–	–	100	–		
0.75	0.625	7.03125	100	703.125		
0.75	0.75	8.625		862.5	5384	
1.3	1.025	12.351		1235.1	4041.95	
0.9	1.1	13.42		1342		
0.65	0.775	8.951		895.1		
0	0.325	3.461		346.1		
-0.5	-0.25	-2.59		-259		
-0.6	-0.55	-5.95		-595		
-0.55	-0.575	-6.245		-624.5		
-0.75	-0.65	-7.133		-713.3		
-1.15	-0.95	-10.85		-1085		5997.6
-3	-2.075	-27.208		-2720.8		4528

26/10.

5. ANALYSIS OF RATES

SSR

Standard Schedule Rate Book.

* Pg: 481

1. Cal. the lime concrete in foundation with 40mm brick gauge, brick ballast unit $1m^3$. The proportion of white lime & surkhi 1:2

1:2:6

Particulars	Quantity (or) Number	Rate	cost
materials			
(i) Brick Ballast I class 40mm gauge.	10 cu.m	1000/cum	10×1000
(ii) white lime	1.6cu.m	1000/cu.m	1.6×1000
iii) Surkhi	3.2 cu.m	800/cu.m	3.2×800
			14160.00
Labour			
1. Head mason	½ no.	450/day	450×½
2. Mason	1 no.	400/day	400×1
3. Mazdoor (Bddar)	12	250/day	250×12
4. men/women coolie	12	230/day	230×12
5. Bishti (water bag)	2	230/day	230×2
6. Lumpsum	1500		1500
			8345
		Total =	22505/-

150

10%. Contractors profit = $22505 \times \frac{10}{100} = 2250.5$

1.5%. works charge = $22505 \times \frac{1.5}{100} = 337.575$

$22505 + 2250.5 + 337.575 = 25093.07$

2. Cal. the analysis of rate for a cement concrete work of 1:5:10 (C S A) in foundation or floor with brick blast 40mm thick guage unit $1m^3$

$1\,cm^3$ — 1.44 gm.

$1\,m^3$ — 1440 kg.

$0.95\,m^3$ — ? kg.

1368.

cement = $\frac{15.2}{16.0} = 0.95\,m^3$

No. of Bags → $= \frac{1368}{50}$

$= 27.36 \simeq 28$ bags.

sand = $0.95 \times 5 = 4.75\,m^3$

coarse agg. = $0.95 \times 10 = 9.5\,m^3$

Particular	Quantity	Rate	cost
material			
cement	0.95	9700/m^3	
sand	4.75	1500/m^3	
coarse agg.	9.5	1000/m^3	25840
Labour			
Head Mason	1/2	425	
Maison	1 1/2	400	
Mazdour	12	250	
boy/women	18	230	
Bishti	4	230	
Lumpsum	150		9022.5
Total =			34862.5

10% contractor = $34862.5 \times \frac{10}{100} = 3486.25$

L.S water = 522.93

Total charge = 38871.68/-

for 1 cu.m = $\frac{38871.68}{10}$ = RS. 3887.168

Pg. 475 Q4

3. cal. the rate analysis for RCC work in column with 1:1.5:3 mix proportion for 1 cu.m ~~time~~.

cement = $\frac{15.2}{5.5} = 2.76 \simeq 2.8\ m^3$ → $2.8 \times 1440 = 4032$

$\frac{4032}{50} = 80.64 \simeq 81$ bag

Sand = $4.2\ m^3$

agg = $8.4\ m^3$

steel = 0.02/cum @ 78.5 quintal/cu.m ⇒ $0.02 \times 78.5 = 1.5$ qui

Binding wire = 2kg

Particulars	Quantity	Rate	cost
material			
C.A	$8.4\ m^3$	$2400/m^3$	8.4×2400
F.A	$4.2\ m^3$	$1800/m^3$	4.2×1800
Cement	$2.8\ m^3$	$9700/m^3$	~~2.8×9700~~ ✓
Steel - 2% = $0.02 m^3$ = $0.75\ q/m^3$	1.57 quintal	4200/quintal	1.57×4200
Binding wire	~~60kg~~ 2kg	65/kg	2×64
		Total =	61602
Labour:			
⑤ Bishti	6	230	
Blacksmith + Mazdor (Bending)	12	300	
⑥ Lumpsump	100		
① Head	½	425	
② Mason	3	4[illegible]	

③ mazdor	12	250	~~8092~~
④ Boy/women	8+10	230	Labour 8192.5
~~Labour for Bending~~ centring &			Bending 6600.0
⑤ shuttering work			67000.0
carpenter	10	280/day	2800
mazdor	10	220/day.	2200
~~unskilled~~	200		200
wooden planks	1500		1500
⑥ Iron planks			67,000

Total = 83096.5

10% → 8309.65

1.5% → 1246.44

Total = 83096.5 + 8309.65 + 1246.44 = 92,652.59

For 1 c.m = $\frac{92,652.59}{10}$ = 9265.259