

UNIT - 1

ESTIMATE OF RCC STRUCTURE

RCC works is usually estimated under two items:-

- (A) The concrete work including Scaffolding & Shuttering.
- (B) Binding of Steel bars is taken under the one item in meter cube.

- The steel reinforcement and its bending is taken under a separate item in quintal.
- The quantity of steel being small no deduction is made for steel from the volume of concrete.
- Steel reinforcement is calculated as per actual reinforcement as laid in position including overlap, hooks, cranks, etc. and its determine from the detail drawing.
- If the detail drawing are not available steel reinforcement may be calculated approximately on the percentage basis of concrete.
- The density of steel = 78.5 quintal
= 7850 kg
- The percentage of steel concrete may be taken approximately

(A) Lintel, Slab = $0.7 - 1\%$

(B) Beam = $1 - 2\%$

(C) column = $1 - 5\%$

(D) Foundation raft, footing etc. = $0.5 - 0.6\%$

→ In RCC work the end of side cover for steel bar may be taken as $40\text{ mm} - 5\text{ cm}$

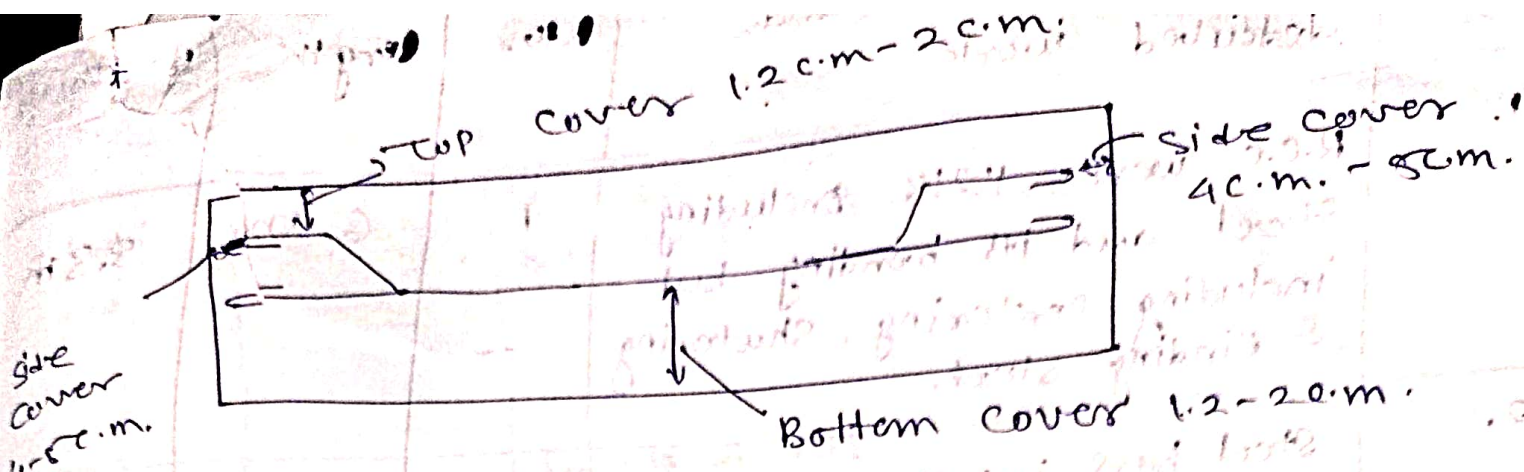
→ And the bottom and top cover may be taken as 1.2 cm and 2 cm for slab and $2.5\text{ cm} - 5\text{ cm}$ for beam.

→ The length of one hook may be taken as $\frac{9}{\text{diameter}}$ of bar and the total length of straight bar hooked at bottom end = $L + 16 \text{ diameter}$

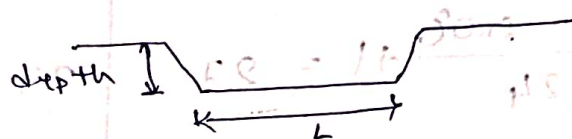
→ For 45° crank or bent up bar, then additional for one bent-up is = $L + 0.45 \text{ depth}$

→ For two bent ups additional length is = $L + 0.9 \text{ depth}$

→ For 30° bent up bar = $L + 0.73 \text{ depth}$



Bent-up bars 45



$$\text{length of rod} = L + 0.45 \text{ depth [one side]}$$

$$= 2 L + 0.9 \text{ depth [both side]}$$

Hook

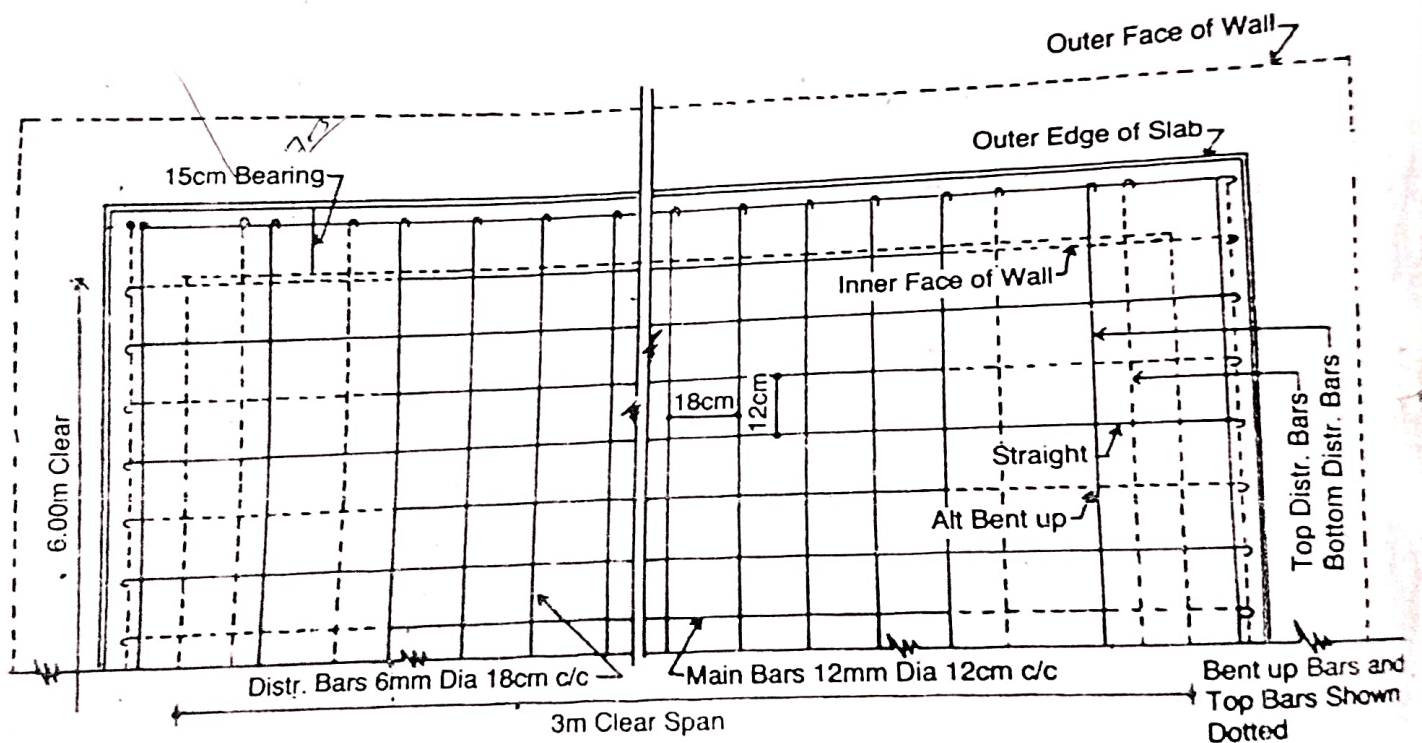
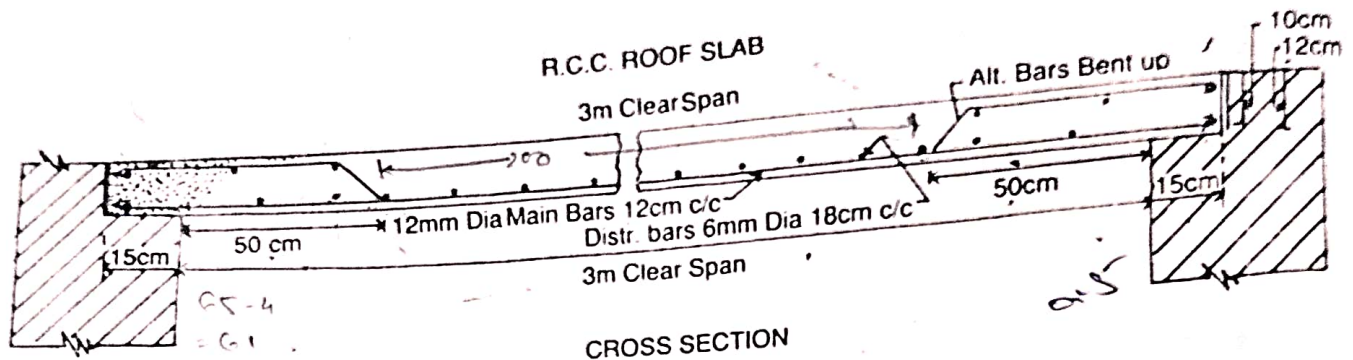


$$\text{length of rod} = L + 19 \text{ diameter}$$

ESTIMATE OF R.C.C. ROOF

Example 2 — Prepare a detailed estimate of a R.C.C. Roof Slab of 3 metres clear span and 6 metres long from the given drawings (Fig. 5-4). R.C.C. work including centering and shuttering and steel reinforcement in detail shall be taken separately.

Also prepare a schedule of bars.



PART PLAN SHOWING ARRANGEMENT OF REINFORCEMENT BARS

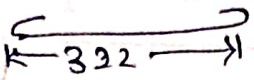
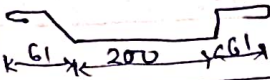
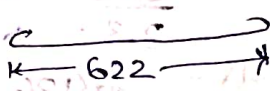
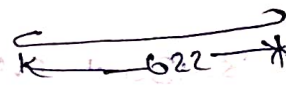
Fig. 5-4

0.45 depth

0.45 to 0.45 d
 0.9 d

1.05
 2.50

Schedule of bars

S.N.	Description of bar	Shape of Bending C.m	Length of each m.	No.	Total Length	Weight
1.	main strength bar 12mm dia		3.44	27	92.68m	
2.	main bentup bars 12mm dia		3.52	26	91.52m	
				Total =	184.4m	164.116
3.	Bottom Distribution bar 6mm dia		6.33	18	113.94m.	
4.	Top distribution bar 6mm dia		6.33	6	37.98	
				Total =	151.92	33.42

$(116.8 \times 5) + 30.0 = 584.0$
 $(200.0 \times 2) + 30.0 = 430.0$
 $584.0 + 430.0 = 1014.0$

$(510.0 \times 2) + 30.0 = 1050.0$
 $1014.0 + 1050.0 = 2064.0$

2223 clarks + 2222 = 4445

$150 + 10 + 100 + 100 = 360$

4445 + 360 = 4805

4805 + 120.0 = 4925

4925 + 100.0 = 5025

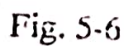
5025 + 100.0 = 5125



4925.00

4925.00

4925.00



Item No.	Particular of item & detailed work	No.	Length	Breadth	Height	Quantity
1.	RCC work excluding steel and its bending but including centering & shuttering & binding of rods					
	i) Roof slab	1	9.3 m.	6.4 m.	0.12	7.142 m ³
	ii) Beam (216) portion below slab	2	6.4 m	0.25	0.88	1.021 m ³
					Total	8.163 m ³
2.	Steel reinforcement including bending in RCC work.					
	1) Roof slab					
	→ Main bars 12 mm ϕ @ 0.086 kg/m					
	NO = $\frac{6.4 - 0.086}{0.012} \times 1 = 54$	54	10.26	-	-	554.04 kg
	② extra top over beam	54	1.87	-	-	150.98
	③ extra top over wall	54	1.026	-	-	55.40
		Total	710.42	0.88	Total	828.16 kg/m
	→ Distribution bar 6 mm ϕ @ 0.22 kg/m					
	bottom bars at 20 cm c/c	47	6.43 m			302.21 m
	NO = $\frac{9.3 - 0.086}{0.20} = 47$					
	Top bar over beam	9x2	6.43 m.			118.74 m

Explaining notes

$$H = 56.12 = 38 \text{ cm}$$

$$NO = \frac{6.4 - 0.086}{0.012} + 1$$

$$10.26 - 0.086 + 1$$

Length

$$= 9.3 - 0.086 + (2 \times 9.3 \times 0.012) + 40 \times 0.012$$

$$= 9.3 - 0.086 + 0.216 + 0.48 = 9.91$$

$$= 9.3 - 0.086 + (2 \times 9.3 \times 0.012) + 40 \times 0.012$$

$$= 9.3 - 0.086 + 0.216 + 0.48 = 9.91$$

Top

$$= 6.4 - 0.086 + (2 \times 6.4 \times 0.012) + 40 \times 0.012$$

Length

$$= 6.4 - 0.086 + 0.1536 + 0.48 = 6.9476$$

Length

$$= 6.4 - 0.086 + (2 \times 6.4 \times 0.012) + 40 \times 0.012$$

Length

$$= 6.4 - 0.086 + 0.1536 + 0.48 = 6.9476$$

Length

$$= 6.4 - 0.086 + (2 \times 6.4 \times 0.012) + 40 \times 0.012$$

Length

$$= 6.4 - 0.086 + 0.1536 + 0.48 = 6.9476$$

Length

$$= 6.4 - 0.086 + (2 \times 6.4 \times 0.012) + 40 \times 0.012$$

Length

$$= 6.4 - 0.086 + 0.1536 + 0.48 = 6.9476$$

S.L	Particulars	No.	L	B	H	D
	Top bars over & Near walls	512	6.43			64.3 m
		Total	482.26	0.22		482.26 m
	<u>ii) T-Beam</u>					106.09 kg/m
	a) main straight bar 05 mm ϕ @ 3.95 kg/m.	3	6.74 m.	3.95 kg/m		78.19 kg
	b) main bent-up bar 22 mm ϕ @ 2.15 kg/m.	3	7.15 m.	2.15 kg/m		63.92 kg
	c) Top spacer bar 12 mm ϕ @ 0.88 kg/m.	2	4.51 m.	0.88 kg/m		8.02 kg
	d) stirrups 18 mm ϕ @ 0.99 kg/m.					

$L \times B \times D$

No = $\frac{0.81}{0.2} = 5$

$L = 6.4 + 0.08 + (2 \text{ hooks})$
 $= 6.4 + 0.08 + (18 \times 0.025)$
 $= 6.74 \text{ m.}$

$L = 6.4 + 0.08 + 2 \text{ hooks} + \text{dup}$
 $= 6.77 + 0.38 = 7.15 \text{ m.}$

$L = 2.50 + 0.9 + 0.9 + 2(18 \times 0.012)$
 $L = 4.81 \text{ m.}$

$L = 2A + 2B + 2 \text{ hooks} + \text{extra } 20 \text{ cm.}$

Assignment

Q/P

A roof slab over a room of size 3×7 m. is resting on walls of width 30 cm. main reinforcement of 10 mm ϕ @ 125 mm c/c spacing is provided with alternate bent-up and distribution bar of 8 mm ϕ @ 250 mm c/c spacing are provided in the slab. If the thickness of slab is 120 mm then estimate the quantities of R.C.C. work reinforcement, of steel work and formwork.

1) R.C.C. work

$$\text{Area} = \frac{3 \times 7}{2} = 10.5 \text{ m}^2$$

2) Steel work

$$\text{Weight} = \frac{10.5 \times 250}{250} = 10.5 \text{ kgs}$$

3) Formwork

$$\text{Volume} = \frac{10.5 \times 120}{1000} = 1.26 \text{ m}^3$$

4) Bottom part formwork

5) Top part formwork

Item No.	Description of items detailed work	NO.	Length	Breadth	Height	Quantity
1.	R.C.C. work 12:3 including steel & its bending but including centering, shuttering & binding.	913	7.3m	3.8m	0.12m	2.859 m ³
2.	steel bars including bending in R.C.C. work					
$\frac{B^2}{162}$	if main bar 10 mm ϕ @ 0.62 kg/m					
	→ slight bar 0.25 c/c					
	$N_b = \frac{7.3 - 0.06}{0.25} + 1 = 30$	30	3.4m			
	→ Backup bars 0.25 c/c					
	$N_b = \frac{7.3 - 0.06}{0.25} = 29$	29	3.48			
		Total =	202.92m	@ 0.62	kg/m	125.96 kg
$\frac{B^2}{162}$	if Distribution bars 8 mm ϕ @ 0.40 kg/m					
	→ Bottom bars covered portion 200mm c/c					
	$N_b = \frac{2}{0.25} + 1 = 9$	9	4.36m			
	→ Bottom bars two side					
	→ Top Bars two side					
		2x3	4.86			
		2x3	4.86			
			154.56m	@ 0.40	kg/m	61.82 kg
					Total =	187.65 kg
						1.87 quantity

Explanatory notes

$$N_b = \frac{\text{Length of bar} - 2 \times c}{c/c \text{ dk.}} + 1$$

$$L = \text{Length of bar} - 2 \times c + 2 \times \text{hook}$$

$$L = 3.3 - 0.06 + (100 \times 0.01)$$

$$L = 3.4 \text{ m.}$$

$$L = 3.4 + 2 \times 0.1$$

$$L = 3.4 + 0.2 = 3.6 \text{ m.}$$

$$L = 3.46 \text{ m.}$$

$$L = \text{Length} - 0.06 + (2 \times \text{hook})$$

$$= 7.3 - 0.06 + (100 \times 0.01)$$

$$= 7.36 \text{ m.}$$

SSC
T4th ME.

particular of item & detailed work

Quantity

Rate

Amount

Estimate

1. R.C.C. work 1:2:4 excluding steel and H.S. bonding but including centering, shuttering & binding.

2. Steel bars including in R.C.C. work.

a) main bar

$\frac{P^2}{162}$

20 mm ϕ right bar @ 2.47 kg/m

16 mm ϕ straight bar @ 1.59 kg/m

16 mm ϕ bent up bar @ 2.47 kg/m

b) stirrups

8 mm ϕ bars @ 0.40 kg/m

2.24 m

125.44

79.29 kg

8.3 m

0.3

1.74 m

11.16 @ 2.47 kg/m =

42.39 kg

7.02 m @ 1.59 kg/m =

27.06 kg

18.32 @ 1.59 kg/m =

29.12 kg

= 9.16 m.

NO. of stirrups = $\frac{\text{length of span}}{\text{c/c space}}$

= $\frac{8.3}{0.18} = 58.33$

= 58

L = 24 + 20 + 2100 kg + extra 300 c.m.

= 240.25 + 240.68 + 2100 + 0.3

= 0.6 + 1.3 + 0.144 + 0.3

= 2.24

= 2.24 m.

L = length of span - 0.06 + (b/d)

= 8.3 - 0.06 + (16 x 0.00)

L = 8.3 - 0.06 + (16 x 0.016)

L = 8.51 m.

L = 8.3 - 0.06 + (16 x 0.016) + depth

= 8.3 - 0.06 + (16 x 0.016) + 0.65

= 9.16 m.

R.C.C. COLUMN WITH FOUNDATION

Example 5—Prepare a detailed estimate of a R.C.C. column with foundation footing from the given drawings Fig. 5-7.

DETAILS OF QUANTITIES

1. Earthwork in excavation in foundation

$$1 \times 2.00 \times 2.00 \times .83 \text{ m} = 3.32 \text{ cu m}$$

2. Cement Concrete 1 : 4 : 8 in base

$$1 \times 2.00 \times 2.00 \times .08 = 0.32 \text{ cu m}$$

3. R.C.C. work 1 : 2 : 4 : in footing excluding steel and its bending but including centering and shuttering and binding steel

Bottom square portion

$$1 \times 2.00 \times 2.00 \times .25 \text{ m} = 1.00 \text{ cu m}$$

Trapezoidal portion, vol.

$$\frac{h}{6} (A_1 + A_2 + 4A_m)$$

$$\frac{.50}{6} \left\{ 2^2 + .35^2 + 4 \left(\frac{2 + .35}{2} \right)^2 \right\} = 0.804 \text{ cu m}$$

$$\text{Total} \quad 1.804 \text{ cu m}$$

4. R.C.C. work 1 : 2 : 4 : in column above G.L. excluding steel and its bending but including centering and shuttering and binding steel

Square portion below plinth level

$$= 1 \times .35 \times .35 \times .60 = 0.074 \text{ cu m}$$

Circular portion above plinth level

$$= 1 \times \frac{\pi \times .30^2}{4} \times 3.30 = 0.233 \text{ cu m}$$

$$\text{Total} \quad 0.307 \text{ cu m}$$

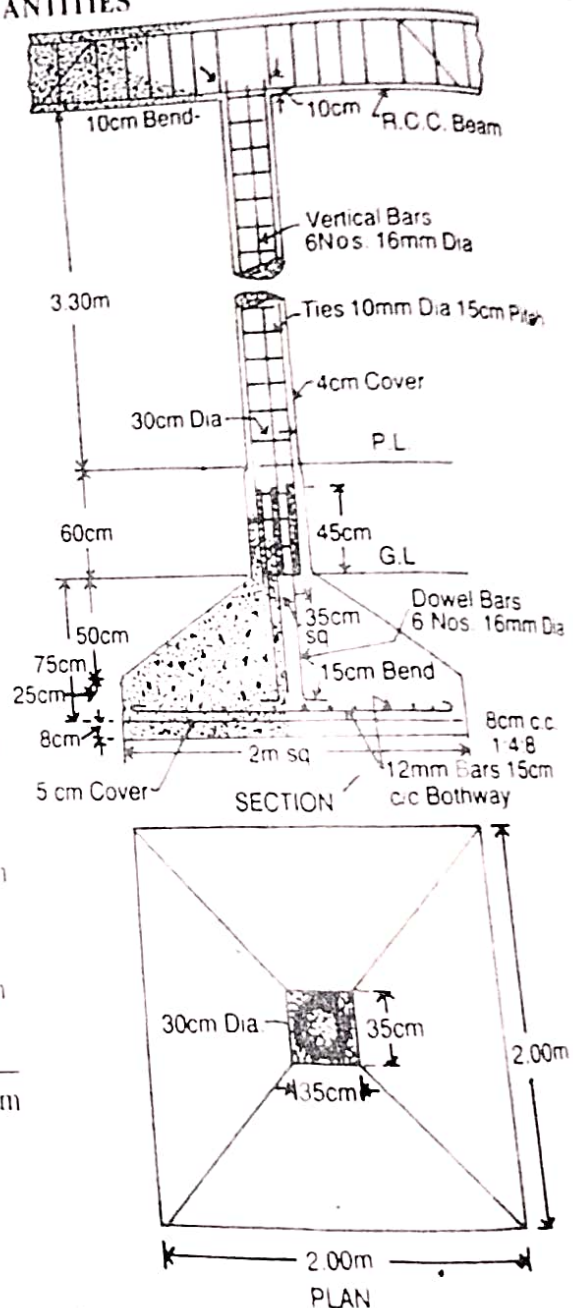


Fig. 5-7

5. Steel reinforcing bars including bending—

(i) 12 mm Dia. bars @ .89 kg in base footing

$$\left\{ \begin{array}{l} \text{No. of bars} = \frac{200 \text{ cm} \times 8 \text{ cm}}{15 \text{ cm}} + 1 = 14 \text{ nos. one way} \\ L = 200 - 2 \text{ cover} - 2 \text{ hooks} = 200 \end{array} \right.$$

$$2 \times 4 \times 18 \times 1.2 = 213.6 = 214 \text{ cm} \quad 2.14 \text{ m}$$

$$2 \times 14 \text{ nos.} \times 2.14 \times .89 = 53.33 \text{ kg}$$

Item No	Particular of item & detailed note	Ab.	length	Breadth	Height	Quantity	excluding rods
1.	Earthwork in excavation in foundation	1	2m	2m	0.63m	3.32 m ³	
2.	Cement Concrete 1:1.5:6 in base	1	2m	2m	0.06m	0.32 m ³	
3	Rec. work 1:2:4 in footing excluding steel and its bending but including centering & shuttering and binding steel. 1) Bottom Squared portion 2) Trapezoidal portion	1	2m	2m	0.25m	1 m ³	
4.	R.C. work 1:2:4 in column above ground level excluding steel & its bending but including centering & shuttering & binding steel. 1) Squared portion below plinth level 2) circular portion above plinth level	1	0.35m	0.35m	0.6m	0.0773 m ³	
5)	steel reinforcing bars including bending 1) 12mm φ bar @ 0.89 in base footing	1	$\left[\frac{L}{4} \times d \times 3\right] \times 8.30$		Center	0.233 m ³	
						0.306 m ³	

$$\frac{H}{6} [A_1 + A_2 + 4A_m] = \text{Trapezoidal vol}$$

$$= \frac{0.5}{6} \left[(2 \times 2) + (0.35 \times 0.35) \right]$$

$$= 0.60$$

$$\left(\frac{A}{4} \times d\right)^2 \times h \quad \text{circular}$$

$$k_b = \frac{2 \times 0.08}{0.15} + 1 = 13.8$$

$$\frac{D^2}{162} = 1.58$$

ii) 16 mm ϕ power bars @ 1.58 g/m

iii) 16 mm ϕ vertical bars @ 1.58 g/m

$$\frac{D^2}{162} = 1.58$$

iv) 10 mm ϕ bars @ 0.62 g/m.

In lateral ties

$$NO. = \frac{3-9}{0.15} + 1 = 27$$

For longitudinal bars

$$\left[\left(\frac{2 \times 0.08}{0.15} + 1 \right) + \left(\frac{2 \times 0.08}{0.15} + 1 \right) + 1 \right] \times 2.2 =$$

$$NO. = 27$$

14x2 2.14m @ 0.62 g/m

6 1.27 @ 1.58 g/m

6 4.1m @ 1.58 g/m

Σ 11.25 m

NO. = 27

27 0.070 m @ 0.62 g/m

Total =

Σ 11.25 m

Σ 11.25 m

NO. = 27

Σ 11.25 m

NO. = 27

$$NO. = \frac{2 \times 0.08}{0.15} + 1 = 13.8$$

Σ 11.25 m

Σ 11.25 m

Σ 11.25 m

Item	Particulars of item & detailed work	No.	Length	Breadth	Height	Quantity
1.	K.C.C. work 1'2"24 excluding and its bending but including centering & shuttering	1	8.4	0.4	0.8	2.69 m ³
2.	Steel bars including R.C.C. work A) main bars 20 mm ϕ straight bars @ 2.47 by 1m	4	8.68	2.47	1m	85.75 kg
3.	Stirrups 8 mm ϕ bars @ 0.40 leg 1m	56	3.94m	0.40	1m	88.28 kg

Explanatory notes



$$L = 8.4 - 0.08 + 2 \times 0.04 \\ 8.4 - 0.08 + 1.6 \times 0.02 \\ = 8.68 \text{ m.}$$

$$100 = \frac{8.4}{0.15} = 56$$

$$L = 2A + 2B + 2 \times 0.08 + 2 \times 0.02 \times 30 \\ = (2 \times 0.35) + (2 \times 0.75) + (2 \times 0.08 \times 0.3) \\ = 3.94 \text{ m.}$$

UNIT - 02



Question
WhatsApp
Group

Work + 30.0 - N.S. = J
(50.0 x 1) + 10.0 - N.S.
= 60.0 - N.S.

$$\frac{N.S.}{21.0} = 0.0$$

For (50.0 x 1) + 10.0 - N.S. = J
(50.0 x 1) + 10.0 - N.S. = J

... m.c.s. =

Epi 12.5

847F.28

12.085.8.8

Item No.	Particulars of item & detailed work	QTY	Length	Breadth	Area	Weight	Total Quantity
1.	Steel work in one truss						
	i) Principal rafters 2-75x50x6 mm	2x2	7.6 m.	-	-	30.4 m ² 7.4 kg/m.	224.95 kg
	ii) Stair 75x50x10 mm angle	1x2	1.20 m	-	-	2.4 m 9 kg/m	21.6 kg
	iii) Stair 65x45x6 mm angle	2x2	0.85 m	-	-	2.2 m 6.4 kg/m	14.08 kg
	iv) Central subpender 50x50x6 mm angle	1	2.6 m.	-	-	2.6 m 4.5 kg/m	11.7 kg
	v) Cleats for Purlin 75x75x6 mm	6x2	0.11 m	-	-	1.32 m. 3.9 kg/m	11.74 kg
	vi) Cleat at base 75x75x10 mm Purlin	2x2	0.3 m	-	-	1.2 m.	11.0 kg/m.
	vii) Tie main Central 50x6 mm	2	4.8 m.	-	-	9.6 m.	3.1 kg/m.
	viii) Tie main sides 80x6 mm	2x2	3.4 m.	-	-	13.6 m.	3.3 kg/m.
	ix) Tie inclined						
	i) 50x6 mm	1x2	1.5 m	-	-	6 m.	3.1 kg/m.
	ii) 50x6 mm	1x2	3.3 m	-	-	6.6 m	3.1 kg/m
	x) Gusset plate 6 mm thick	1	0.75 m	0.45 m	-	0.33 m ²	
	at apex 75 cm x 45 cm.	-	-	-	-	-	-
	at base 70 cm x 45 cm.	1x2	0.7 m	0.45 m.	-	0.31 m ²	
	at head of stair 25 cm x 20 cm.	2x2	0.45	0.25	-	0.37 m ²	
	at head of stair 75 x 50	2x2	0.25	0.20	-	0.2 m ²	
	at bottom of stair	1x2	0.45	0.32	-	0.28 m ²	
	at bottom of stair	1x2	0.38	0.25	-	0.175 m ²	
	at inclined tie	1	0.20	0.25	-	0.05 m ²	
		1	0.20	0.25	-	0.10 m ²	

ii) Base plate	1x2	0.3 m	0.3 m	6.18 m ²	94.2 kg/m ²	16.35 kg
iii) Rivet studs and pulvin clead	5 % of above					
iv) Reg bolt 40mm φ 20mm long	2x2	-	-	28.69 kg	Total =	533.09 kg
* Steel for 5, raised	5 times of one rivet			4 Nos	5 kg/m ²	20 kg
Paints of eaves, roof and double wall at 4 corners. Partly partly embedded 75x50x8 mm angle	4	4.8 m.	-	6. m.	7.4 kg/m ²	44.4 kg
* Pulvin 125x75x8 mm angle	6x2	21.3 m	-	255.6 m.	12.1 kg/m	3092.76 kg
* Blind. 4x2 82x6 mm F.B.	1x2	21.30 m.	-	255.6 m.	1.5 kg/m	63.00 kg
Total =>						6313.96 kg
						63.19 quintal
2. <u>Painting</u>						
i) Principal rafters 75x50x8 mm angle (B = Perimeter = (45x4) x 2 = 22.5 m.	2x2	7.60	0.25	7.6 m ²		
ii) Studs 75x50x6 mm angles	1x2	1.20 m	0.25	0.6 m ²		

Sl. No.	Part	Size	Length (m)	Area (m ²)	Weight (kg)	Remarks
1	Strut	85 x 85 x 8 mm angle	2 x 2	0.55 m	0.464 m ²	
2	Central suspender	50 x 50 x 6	1	2.6 m	0.452 m ²	
3	cleads for purlin	75 x 75 x 8	6 x 2	0.11 m	0.396 m ²	
4	cleads at butt	75 x 75 x 10	2 x 2	0.3 m	0.36 m ²	
5	Tie main central	50 x 8	2	4.8 m	1.113 m ²	
6	Tie main sides	80 x 6 mm	2 x 2	3.4 m	0.56 m ²	
7	Tie inclined	50 x 8 mm	2 x 2	1.5 m	0.696 m ²	
8	So x 8 mm	1 x 2	3.3 m	0.116 m	0.765 m ²	
9	Gusset plate 6 mm thick	1 x 2	0.77 m	0.45 m	0.66 m ²	
10	at apex, 70 cm x 45 cm	1 x 2 x 2	0.7 m	0.45 m	1.26 m ²	
11	at head of strut	1 x 2 x 2	0.75 m	0.28 m	0.75 m ²	
12	at head of strut	2 x 2 x 2	0.28 m	0.28 m	0.40 m ²	
13	at bottom of strut	1 x 2 x 2	0.45 m	0.32 m	0.35 m ²	
14	at bottom of strut	1 x 2 x 2	0.35 m	0.35 m	0.56 m ²	
15	at bottom of suspender	1 x 2	0.20 m	0.25 m	0.32 m ²	
16	at inclined tie	2 x 2	0.32 m	0.28 m	0.10 m ²	
17	Base plate	1 x 2 x 2	0.3 m	0.3 m	0.86 m ²	
18	of one truss				19.66 m ²	
19	5 times of one truss				98.4 m ²	

Profile 125 x 75 x 6 mm angle
wind 413 32 x 6 mm

12	21.30	0.40	1
2	21.30h	0.076	-

102.24m ²
3.239m ²

total = 203.87m²

Cr.I. Roofing (au fitting)
hook bolt, Cr.I. bolt. weather
etc.)

12	21.30h	7.8	h
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332.28m²

Cr.I. Ridding

1	21.30h	1	1
---	--------	---	---

21.30 m

88.0
85.1
74.0
01.0
28.0
32.0
53.0
1.0
2.0
25.0
21.30.0
26.0

21.30.0 (1.0h)

26.0

Q13 / 2023 NOV. Dec

10.11.2023

10.11.2023

10.11.2023

10.11.2023

10.11.2023

- (i) Galvanised Corrugated Iron sheets (G.C.I. sheets), (ii) Asbestos cement sheet (A.C. sheet),
 (iii) Tiles, (iv) Timber, (v) Planks, Thatch, and (vi) Slate.

They are supported over trusses, purlins, etc.

Example 4. — Prepare a detailed estimate of the verandah roof of a building from the given plan and sectional drawings (Fig. 4-5). The verandah roof consist of 24 B.G., G.G.I. sheets supported over sal wood rafters and purlins. Wood work shall be painted two coats over one coat of priming. Assume suitable rates.

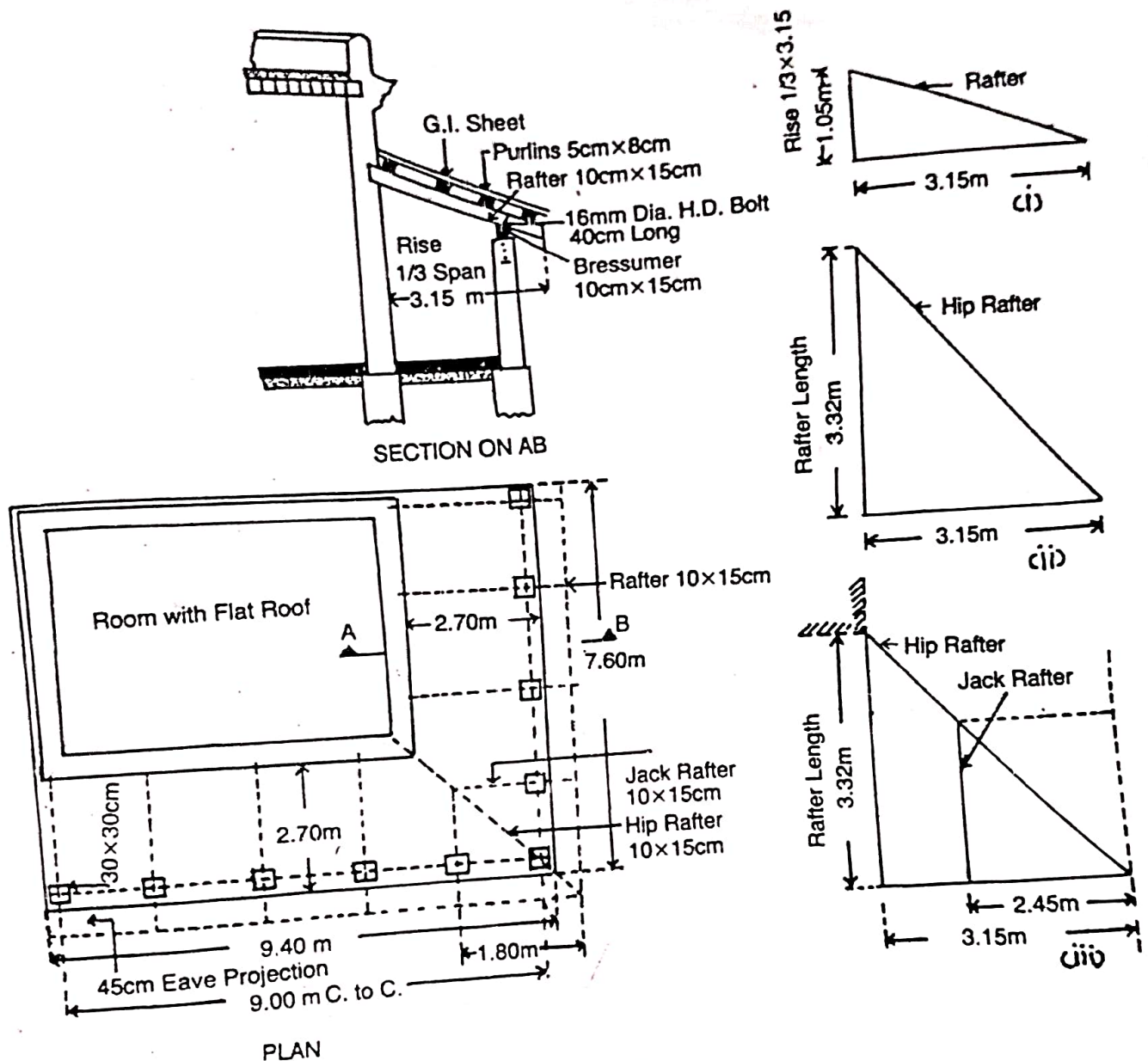


Fig. 4-5

b. 1) main rafter

ii) Hip rafter

iii) Jack rafter

iv) Purlin front

v) Purlin side

vi) Brekumer but

vii) Brekumer side

Fe. 25

2000 = 2000 + 200

2000 = 2000 + 200

2500 = 2500 + 200

2500 = 2500 + 200

2500 = 2500 + 200

2500 = 2500 + 200

2500 = 2500 + 200



2500 = 2500 + 200

2500 = 2500 + 200

2500 = 2500 + 200

3.49m.

4.42m

2.56m

8.275m

6.475m

9.3m

9.8m

0.80m

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Q/P 2' AM
2024

5058.011

(i) Ga
(ii) Tiles
They
Exam
plan and
supporter
printing.

Item

Particular of item

No

Length

Breadth

Height

Quantity

Unit/Weight

Estimated quantity

1.

Steel work

(i) 2 ISA 100 x 75 x 10 mm

8 m

-

16 m

13 kg/m

208 kg

(ii) 2 ISA 100 x 65 x 8 mm

5 m

-

10 m

9.9 kg/m

99 kg

(iii) 2 ISA 125 x 75 x 8 mm

10 m

-

12.1 kg/m

121 kg

242 kg

(iv) 1 SA 75 x 50 x 8 mm

5 m

-

5 m

7.4 kg/m

37 kg

(v) 1 SA 60 x 60 x 6 mm

3 m

-

3 m

5.4 kg/m

162 kg

Cusset plate and support bracket

1

0.65 m

0.48 m

0.292 m

62.8 kg/m

18.71 kg

(vi) Cusset plate and support bracket

1

0.45 m

0.30 m

0.135 m

62.8 kg/m

8.49 kg

2. Painting work

(i) 2 ISA 100 x 75 x 10 mm

2

8 m

0.35 m

5.6 m²

(ii) 2 ISA 100 x 65 x 8 mm

2

5 m

0.38 m

7.53 m²

(iii) 2 ISA 125 x 75 x 8 mm

2

10 m

0.4 m

6 m²

(iv) 2 ISA 75 x 50 x 8 mm

1

5 m

0.25 m

1.28 m²

Cusset plate

(i) 1 SA 75 x 60 x 6

2

(ii) 6 ISA 60 x 60 x 6 mm

1

3 m

0.24

0.75 m²

Total =

27.188 kg

(i) Galv
Abo
(iii) Tiles.
They
Exam
plan and
supported
printing. A

11-11-11

Item	Particulars of item	No.	Length	Breadth	Height	Quantity	Unit weight	Total weight
1.	Steel work in one truss							
	i) Principal rafters - 250 100x75x6 7.5m.	2	7.5m	0.38m	-	15m	10.30kg/m	154.5 kg
	ii) Stut - 75 65x45x6	4	3m.	-	-	12m.	8.8kg/m	105.6 kg
	iii) Purlin - 75 100x75x6	10	22.3m	-	-	223m.	10.30kg/m	2296.9 kg
	iv) wind ties - 75 65x45x6	2	22.3m	-	-	44.6m.	8.8kg/m	392.48 kg
2.	Painting							2689.38 kg
	i) Principal rafters 250 100x75x6	2	7.5m	0.38m	-	5.25m ²		
	ii) Stut - 75 65x45x6	4	3m	0.22	-	2.64m ²		
	iii) Purlin 75 100x75x6	10	22.3m	0.38m	-	7.89m ²		
	iv) wind ties 75 65x45x6	2	22.3m	0.22	-	9.812m ²		
					Total	88.91m ²		

1. Steel work in RS J-section & connecting anglels plates, rivids, bolt etc.

i) Column rolled steel J-section 300x250mm @ 58.8 kg

ii) N/S. steel plate

→ Base plate 20mm thick

→ Gussied plate at base 16mm thick

→ Gussied plate at top 12mm

→ Cap plate - 16mm

→ Top plate over beam 12mm

iii) Angle iron clip cleat

→ A + base 150x115x15

→ A + base 150x115x15 angle

→ At middle connection

→ for main beam 100x100x12mm

→ for main beam 90x90x12mm

→ for smaller beam 100x100x12mm

→ for smaller beam 100x100x12

→ At top Connection

⑩ Cap plate 100x100x12mm angle

⑪ Cap plate 100x100x12mm angle

1	6.2 m	-	6.1 m	58.8 kg/m	462.16 kg
1	0.6	0.6	0.36 m	157 kg/m	56.52 kg
2x1	0.6	0.45	0.54	125.6 kg/m	67.82 kg
2	0.40	0.35	0.26	91.2 kg/m	26.37 kg
1	0.50	0.40	0.2	125.6	25.12 kg
1	0.45	0.45	0.20	91.2 kg/m	19.12 kg
2	0.6	-	1.2	29.5 kg	35.4 kg
2	0.25	-	0.5	29.5	14.75 kg
2	0.25	-	0.5	29.5	14.75 kg
2x2	0.36	-	1.2	15.6	18.72 kg
4	0.1	-	0.4	14.7 kg	7.06 kg
4	0.18	-	0.72	14.7	12.74 kg
2	0.4	-	0.8	14.7	14.16 kg
2	0.25	-	0.5	14.7	14.7 kg

[illegible]

Key Post
estimated

10.1.2

25.20

10.1

25.20

10.1.2

25.20

10.1.2

25.20

10.1.2

25.20

10.1.2

25.20

Item No.

Particulars of item work

breadth
weight

Quantity

completing work

1.

Gal wood work were wrought from 2 fixed in one rails

→ Principal rafters 12cm x 10cm

→ strut 10x10cm. 1.60m long

→ King post 10x10cm 1.60m.

→ Tie beam 9.60m. long tie 12cm x 10cm.

→ Stop plate at the foot of king post 10cm. x 4cm. 18cm long

→ Stop piece at top of king post 10cm x 4cm 30cm long

→ cleads for purlin 8cm x 8cm 18cm long

→ Wood work for 4 trusses

→ Common rafters 10x6cm at 9cm. c/c

→ Purlin 12cm x 8cm.

→ Ridge butt board 15x8cm

→ Ceave board

→ Gable plate 10x8cm.

Total 4x0.2179 =

total 0.2179 m³

0.56716 m²

0.79672 m³

0.2342 m³

0.0915

0.122 m³

0.1952 m³

Number of truss = $\frac{\text{length}}{\text{spacing}} = 1$

$$= \frac{12}{2.4} = 5$$

$$\text{Roof} = \frac{\text{length}}{\text{spacing}} + 1 = \frac{12}{0.6} + 1 = 16$$

10cm. bearing 180/ double way

Sl. No.	Particular	No.	Length	Breadth	Height	Quantity
1.	Batten 4cm x 4cm. → Ceiling beam → Ceiling batten 585cm - 1.20m spacing	14x2 3x2 11	12.2 12.2 m. 5.64m	0.04 0.06 0.05m	0.04 0.11 0.05m	0.546 m ³ 0.4392 m ³ 0.1551 m ³
2.	Field masonry	2	12.2 m.	4.10 m.	total =	3.4426 m ³ 100.04 m ²
3.	Field masonry ribbs	1	12.2 m.	-	-	12.2 m
4.	A.C. sheet ceiling including Boarding	1	12.2	6 m	58 m	7.82 7.82 m ²
5.	Painting two coats over one coat of priming in red masonry	2	12.2 x 10 x 10	0.44	-	3.08 m ²
	→ Principal, scatter 12x10cm.	2	3.85m	0.44	-	1.248 m ²
	→ Strut 10x10	2	1.86m	0.4	-	0.72 m ²
	→ King post 10x10	1	1.60m	0.4	-	2.904 m ²
	→ Tie beam 12x16cm	1	6.60	0.44	-	0.084 0.03 m ²
	→ Stop piece at the foot of king post 10x14cm.	2	0.18m	0.26	-	0.168 m ²
	→ Stop piece at the top of king post 10x14cm.	2	0.3	0.26	-	7.952
	→ Painting for 4 coats	7.952 x 4	-	-	-	31.808

$$= \frac{12}{1.2} + 1 = 11$$

$$\text{Length} = 6 - 6 \times 0.06 = 5.64 \text{ m.}$$

Particulars	No	Unit	Length	Area	Quantity
Common rafters 10x6cm	15x2	L:1.6	0.32	-	41.92m ² 24.92
Purlin 12x8cm	2	12.2m	0.4	-	9.76m ²
Rigid board 15x5cm	1	12.2	0.4	-	4.68m ²
Iron board	2	12.2	0.45	-	10.98m ²
wood plate 10x8cm	2	12.2	0.35	-	8.784m ²
Roofing 4x4cm	14x2	12.2	0.16	-	54.65m ²
Ceiling beam	3x2	12.2	0.32	-	23.42m ² 54.65
Ceiling battens 3x5cm	11	5.64	0.2	-	12.40
Ac Sheet	1	12	6	-	72m ²
				Total	238.65 270.65m ²

UNIT - 04

Estimation of water supply & sanitary work for buildings.

* Estimate of Saphic tank for 25 users.

Sl. No.	Particular of item & detailed work	No	Length	Breadth	Height	Quantity	Expenditure
1.	Earthwork in excavation → Saphic tank → Saphic pit up to 3 m depth → Saphic pit lesser portion	1	$\frac{\pi R^2}{4} \times H$ 2.8 m	1.70 m	1.05 m	9.282 m ³	$L = 200 + 30 + 30 + 10 + 10 = 280 \text{ cm.}$ $B = 90 + 10 + 10 = 110 \text{ cm.}$ $H = 140 + 30 + 20 + 15 = 195 \text{ cm}$ $DFA = 200 \text{ cm} = 2 \text{ m}$
2.	Cement concrete 1:3:6 → Floor and foundation → Slopping floor	1	2.8 m	1.40 m	0.2 m	0.952 m ³	
3.	First class brick work in 1:4 → Septic tank → long wall → 1st step → 2nd step → Short wall → 1st step → 2nd step	1	2.8 m	0.9 m	0.2 m	0.09 m ³	
		2	2.6 m	0.3 m	0.6 m	0.936 m ³	
		2	2.4 m	0.2	1.15 m	1.104 m ³	
		2	0.9 m	0.3 m	0.6 m	0.324 m ³	
		2	0.9 m	0.2	1.15	0.414 m ³	

$$H = \frac{1000}{2} = 500 \text{ cm} = 5 \text{ m}$$

$$H = 140 + 30 + 15 = 185 \text{ cm.}$$

4. Second class brick work in 1:6					
→ Sunk pit					
upper portion	1	$\pi \times 1.20$	0.2 m	0.5 m	0.37 m ³
lower portion	1	$\pi \times 1.20$	0.2 m	0.2 m	0.15 m ³
			<u>Total</u>		0.52 m ³
5 Second class brick work in Sunk pit	1	$\pi \times 1.20$	0.20 m	0.5 m	1.06 m ³
6. Precast R.C.C work finished					
→ Reinforcement including steel reinforcement complete laid in position	1	$\frac{\pi}{4} \times 1.4^2$	1.3 m	0.075 m	0.234 m ³
→ Roof cover slab of septic tank	1	1 m	0.04 m	0.45 m	0.115 m ³
→ Baffle wall in septic tank	1			<u>Total =</u>	0.267 m ³
7. 12 mm cement-plaster					
Septic tank	2	2 m	1.75 m		7 m ²
long wall	2	0.9 m	1.75 m		3.15 m ²
Short wall	2				10.15 m ²
8. 20 mm cement plaster floor of Septic tank	1	2 m	0.8 m		1.6 m ²
9. 50 mm size brick aggregate					
→ outer side of Sunk pit	1	$\pi \times 1.85$	0.15 m	2.5 m	1.82 m ³
→ Bottom of Sunk pit	1	$\frac{\pi}{4} \times 1.7^2$	0.2 m		0.157 m ³
			<u>Total</u>		4.97 ≈ 2 m ³

inner radius

$L = 90 + 5 + 5 = 100 \text{ cm}$
 $H = 90 + 5 = 45 \text{ cm}$

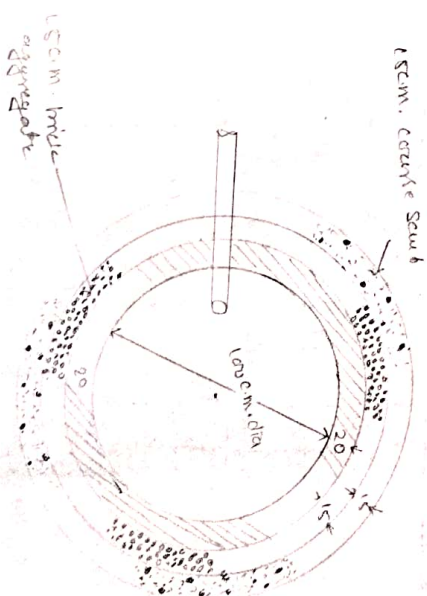
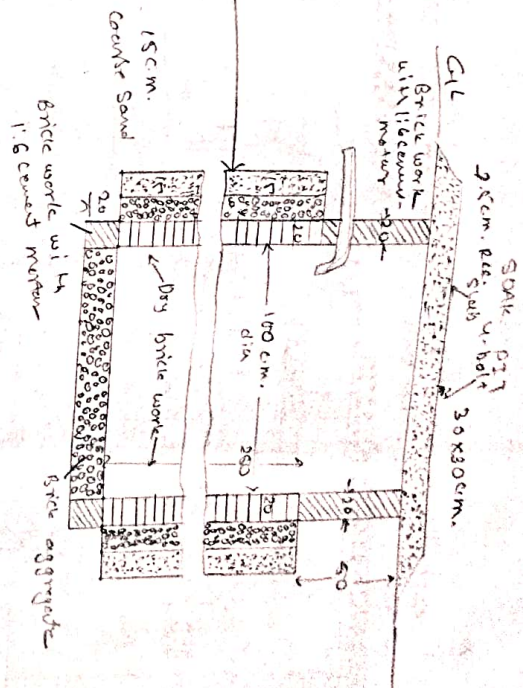
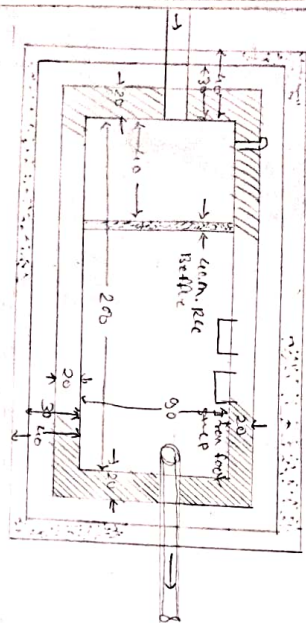
inner Radius

$L = 100 + 20 + 20 + 75 + 75 = 150 \text{ cm}$

P S P					
10.	Coarse sand outer side of Soak pit	1	2x1.85 0.15 m	0.5 m	2.179 m ³
11.	from first step of 6mm ϕ bar	4	-	-	4 nos.
12.	100 mm ϕ S.W. pipe inlet end from washroom to septic tank → outer end from septic tank to soak pit	1	3 m. 3.3 m	-	3 m. 3.3 m.
13.	Stiff S.W. 100 mm ϕ with one leg of 40 cm.	1	2.0 m	Retard	6.3 m.
14.	S.W. Bend 100 mm ϕ	1	-	-	1 nos.
15.	50 mm ϕ C.I. ventilating pipe	1	-	2 m	1 nos.
16.	50 mm ϕ C.I. cover at top of ventilating pipe	1	-	-	2 nos.

$$V = 100 + 20420 + 15410 + 715 + 715$$

→ 30.0 m. extra



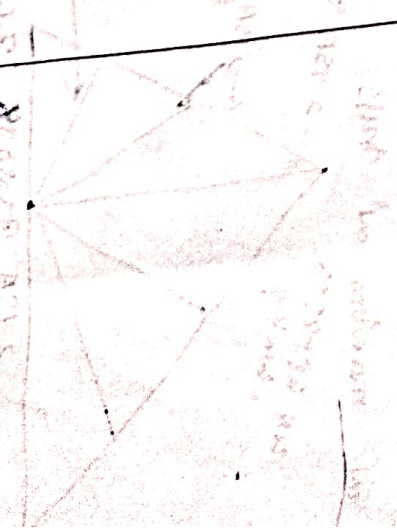
Item	Particulars of item & dimensions	Ab.	Length	Breadth	Height	Quantity
1	Septic tank and soak pit → Earthwork in excavation Septic tank Soak pit	1	4.7m	1.90m	1.425m	16.46 m ³
2	→ Cement concrete 1:3:6 in-situ of septic tank	1	4.7m	1.9m	0.15m	23.9 m ³
3	→ First class brick work - 1:4 cement mortar Septic tank long wall 1st 2nd 3rd short wall 1st 2nd 3rd	2 2 2 2 2 2 2 2 2 2 2 2	4.5m 4.3m 4.1m 0.9m 0.9m 0.9m 0.9m 0.9m 0.9m 0.9m 0.9m 0.9m	0.4 0.3 0.2 0.4 0.3 0.2 0.4 0.3 0.2 0.4 0.3 0.2	0.4 0.5 0.6 0.45 0.4 0.5 0.645 0.5 0.645 0.5 0.645 0.5 0.645 0.5 0.645	1.44 m ³ 1.29 m ³ 1.107 m ³ 5.268 m ³ 10.27 m ³ 10.243 m ³ 4.638 m ³ 10.121 m ³
4	→ R.B work in partition wall with 1:3 cement mortar in septic tank including reinforce concrete work	1	0.9	0.1m	1.95	4.638 m ³
5	→ R.C work in septic tank & soak pit including reinforcement concrete work → Slab cover of septic tank	1	8.9m	1.1m	0.075	0.822 m ³

exp

$$H = 0.67 \times 10.3 + 12 \times 0.15$$

1. 1st class brick work 1:4 cement mortar
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100. 1st class brick work 1:4 cement mortar

Sl. No.	Particulars	Unit	Quantity	Rate	Amount
1	Slab cover of soak pit	$\frac{\pi}{4} \times d^2$	0.045	0.140 m ³	
2	Base support of pipe in soak pit	1.7 m	0.06	0.0153 m ³	
3	Plastering in side Septic tank				
4	long wall	3.7 m	1.5 m	11.1 m ²	
5	Short wall	0.9 m	1.5 m	2.7 m ²	
6	Partition wall both side	0.9 m	1.35	2.43 m ²	
7	Partition wall top side	0.9 m	0.1 m	0.09 m ²	
8	CC floor in septic tank	3.7	0.9	3.33 m ²	
9	Second class brick work in 1:6 cement mortar in soak pit (honey comb wall as solid)	$\pi \times 1.7$	0.2	3.20 m ³	
10	Thermal brick ballast 10mm size in side Soak pit	$\frac{\pi}{4} \times 1.5^2$	0.6 m	1.06 m ³	
11	Thermal brick ballast in side Soak pit (lower layer)	$\frac{\pi}{4} \times 1.5^2$	1.8 m	3.16 m ³	
12	8:1 manholes cover 45cm dia over septic tank	2	2 NOS		
13	Open flat top septic tank	2	2 NOS		



Q.P — 2023 N.D

★ An R.C.C. Beam of size $300\text{ mm} \times 700\text{ mm}$ having clear span of 8 m . is resting over a wall of width 30 cm . in a bearing of 150 cm . Details of steel reinforced given as

- i) Top diameter 16 mm bar 2 Nos. (straight)
- ii) Bottom diameter 20 mm bar 2 Nos. (straight)
- iii) Bottom diameter 16 mm bar 2 Nos. (@ 45° bent up)
- iv) Stirrups diameter 8 mm bar @ 150 mm c/c. distance

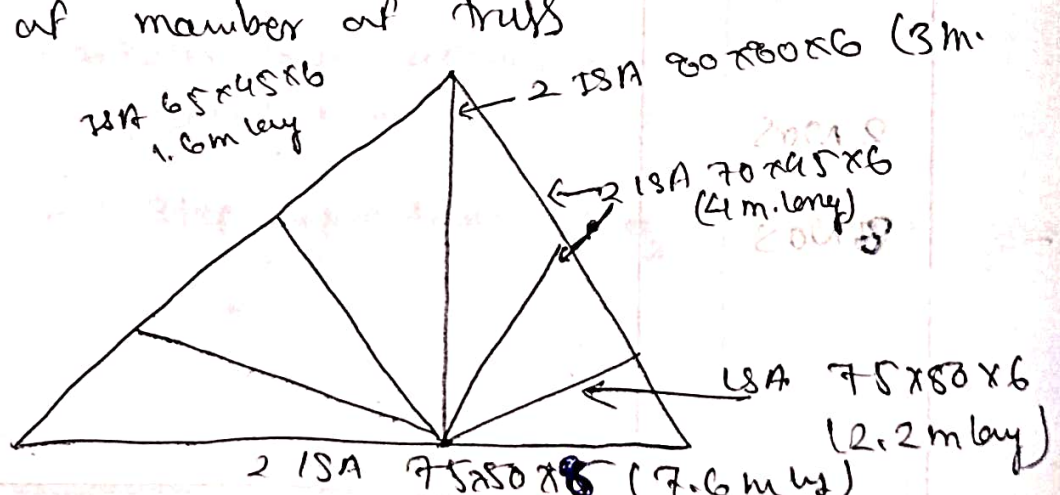
from the given data calculate the following work

- (i) quantity of R.C.C. work
- (ii) quantity of reinforced steel
- (iii) form work.

Q.P — 2024 - A.P.

★ Calculate quantities of the following item for a Simarthal steel truss shown in line diagram

- (i) steel work for member of truss
- (ii) painting of member of truss



Hand	Description	NO	Length	Height	Pitch	Gradient	Wt (kg)	Total quantity
1.	STEEL WORK-							
	→ 2 ISA 80x80x6mm 3m. long	1	3m.	-	-	3m.	7.3kg/m	43.6 kg
	→ 2 ISA 80x45x6mm 4m. long	2x2	4m.	-	-	6m.	5.2kg/m	66.3 kg
	→ 2 ISA 75x50x6mm 7.6m. long	2x2	7.6m	-	-	18.2m.	7.4kg/m	265.12 kg
	→ 1SA 65x45x6mm 1.6m. long	2x2	1.6m	-	-	3.2m.	4.9kg/m	15.68 kg
	→ 1SA 75x50x6mm. 2.2m. long	2x2	2.2m.	-	-	2.4m.	5.6kg/m	24.64 kg
2.	Painting work							
	→ 2 ISA 80x80x6mm 3m. long	2	3m.	0.32m	-	1.92 m ²		
	→ 2 ISA 70x45x6mm 4m.	2	4m	0.23m	-	0.48 m ²		
	→ 2 ISA 75x50x6mm 7.6m	2	7.6m.	0.25m	-	3.8 m ²		
	→ 1SA 65x45x6mm 1.6m.	2	1.6m.	0.155m	-	6.48 m ²		
	→ 1SA 75x50x6mm 2.2m.	2	2.2m	0.28m	-	1.1 m ²		
	Total =					9.156 m ²		
							Total = 238.61 kg 238.17 kg	

Particulars	QTY	Unit	Length	Width	Height	Quantity
1. R.C.C. work			8.3m	6.3m	0.4m	1.711m ³
2. Steel work						
A) main bars			8.3m	2.46m		4206 kg
B) 20mm ϕ . Shrigid bar @ 246 kg/m.	2					26125 kg
C) 16mm ϕ . Shrigid bar @ 1.58 kg/m	2					2303 kg
D) 16mm ϕ . Bendup bar @ 1.58 kg/m	2					2909 kg
E) 8mm ϕ bars @ 6.46	56		2.24m	0.40 kg/m		84731 kg
F) Shripus						98.2

$$L = 3 \text{m} - 0.06 \text{m} + (2 \times 0.05 \text{m})$$

$$= 2.9 - 0.06 + (18 \times 0.02)$$

$$= 2.24 \text{m}$$

$$L = 8.3 - 0.06 + 2 \times 0.05$$

$$8.3 - 0.06 + (18 \times 0.02)$$

$$= 2.24 \text{m} \times 0.80$$

$$L = 8.3 - 0.06 + (18 \times 0.02) + 1 \text{m}$$

$$8.3 - 0.06 + (18 \times 0.02) \times 0.65$$

$$= 2.24 \text{m} \quad 9.15$$

$$100 \sim \frac{8.3}{0.15} = 55.3$$

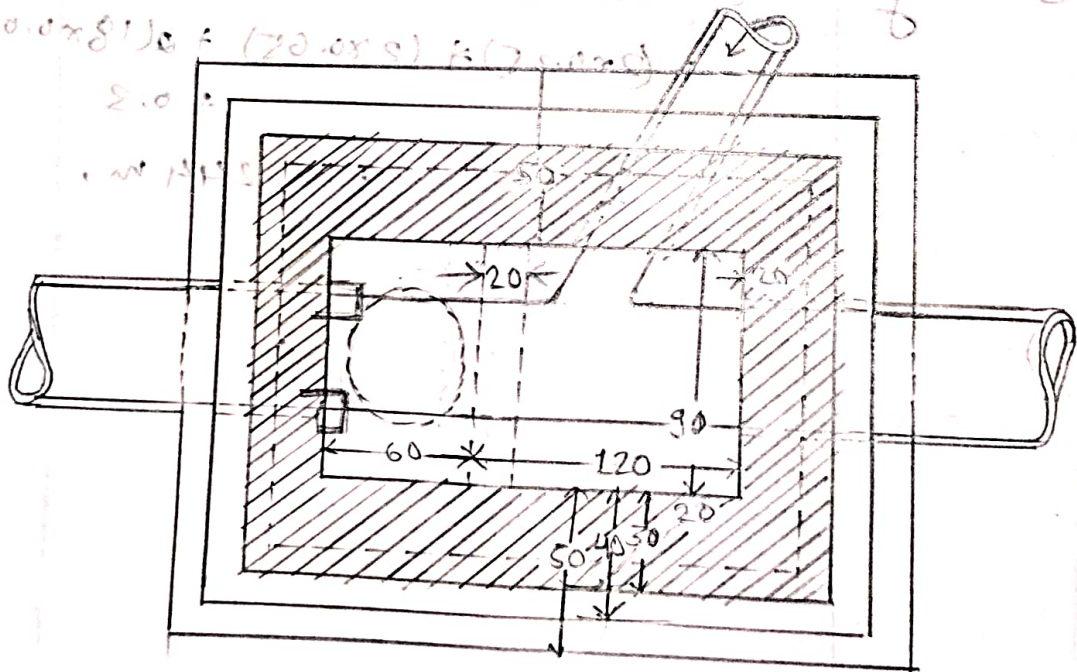
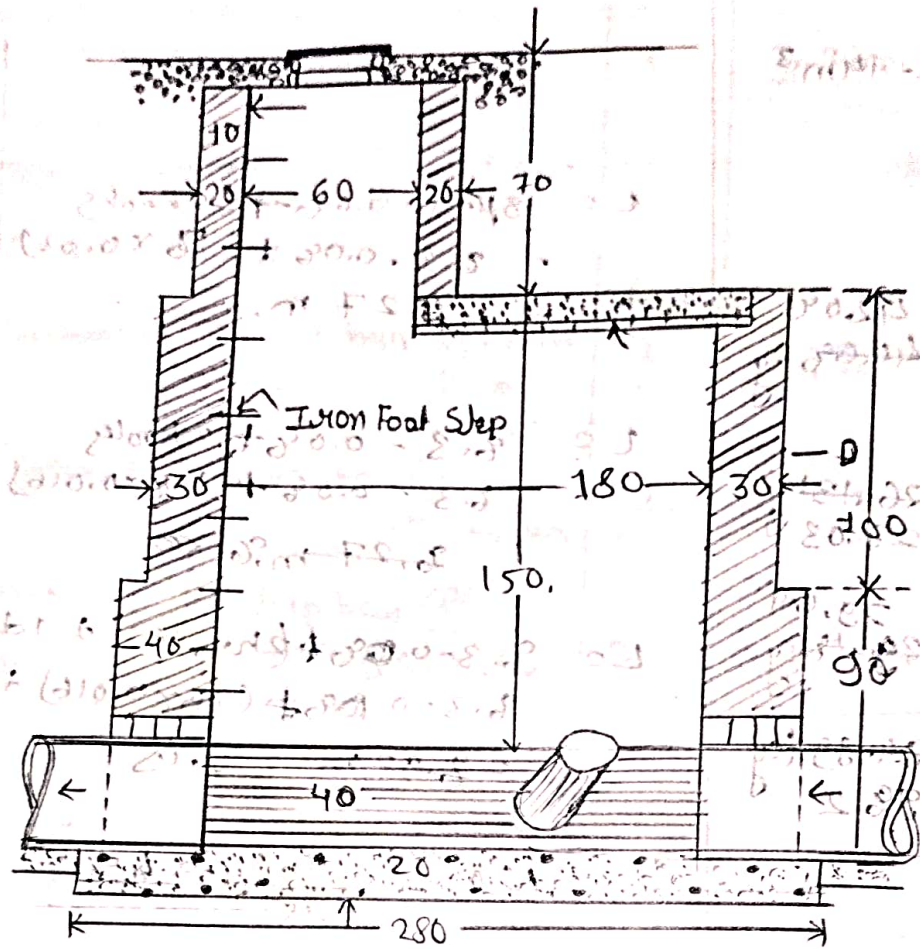
$$L = 2 \times 1.28 + 2 \times 0.6 + 30 \text{cm}$$

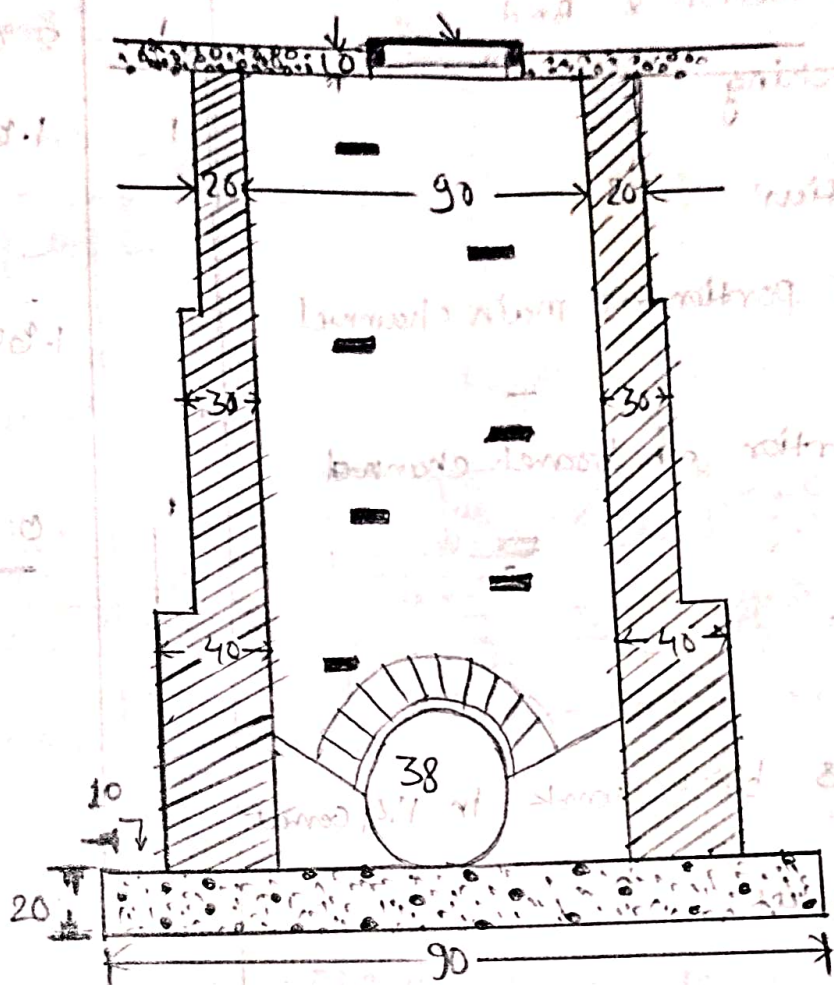
$$= (2 \times 0.25) + (2 \times 0.65) + 2(18 \times 0.02)$$

$$+ 0.3$$

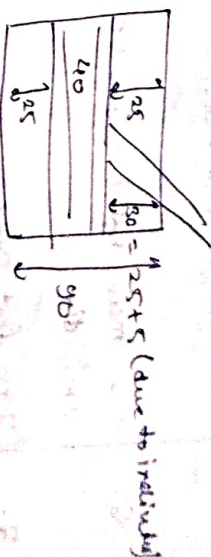
$$= 2.24 \text{m}$$

Estimate of A manhole





Item	Particular of item	No.	Quantity	Breadth	Height	Quantity
1.	Earthwork in excavation	1	2.8m.	1.90m	2.02m	15.53m ³
2.	Cement concrete with brick bulst	1				4.76m ³
	→ foundation & bed	1	2.8m	1.90m	0.2m	1.064m ³
	→ Benching	1	1.8m	0.90m	0.4m	0.646m ³
	Deduction	1				1.724m³
	Upper portion of main channel	1	1.80m	0.9 + 0.36	0.7	1.724m ³
	Upper portion of branch channel	1	0.3m	0.64m	0.15m	0.172m ³
3.	1st class brick work in 1:4 cement mortar	2	2.6m	0.40m	0.9m	1.692m ³
	→ long wall	2	2.4m	0.3m	0.1m	0.144m ³
	1st	2	1.1m	0.2	0.4m	0.28m ³
	→ Short wall	2	0.9m	0.40m	0.9m	0.646m ³
	2nd	2	0.9m	0.30m	1m	0.54m ³
	3rd	2	0.9m	0.2m	0.7m	0.252m ³
4.	Cement pointing	2	1.80	—	1.80	8.632m ³
	→ long wall up to slab	2	1.80	—	1.80	8.632m ³



0.003

Item	Particulars	No.	Length	Width	Q.
	Short wall up to slab	2	0.9 m	1.06 m	2.7 m ²
	Short wall left side	1	0.9 m	0.92 m	0.736 m ²
	Short wall right side above slab	1	0.9 m	0.94 m	0.63 m ²
	Remaining full	2	0.6 m	0.92 m	0.984 m ²
5.	Thick cement plaster 1 1/3 11 floor & channel	1	1.80 m	total =	10.452 m ²
6.	C.I. man holes cover 45 cm. dia	1	—	—	2.16 m ²
7.	Iron foot step	7	—	—	1208.
8.	R.C. slab including steel complete work	1	1.35 m	1.2 m	1
	→ Roof slab of working chamber	1	0.46 m	1.8 m	0.12 m
	→ Roof slab of shaft	1	0.46 m	1.8 m	0.1 m
	Deduction man hole cover	1	0.46 m	0.1 m	0.015 m ²
				total =	0.2824 m ²
					0.2674 m ³

1.20 + 1.2

$$\begin{array}{r} 0.9 \\ 0.1 \\ \hline 1.1 \end{array}$$

additional 30 cm for curvature channel

$$\begin{array}{r} 90 \\ 1.16 \\ \hline 1.20 \end{array}$$

$$180 - 60 + 15 = 135$$

T Bean
 Delivery

PHOTO
 ON MO

3 lots of potatoes
 potatoes and potatoes
 potatoes and potatoes
 potatoes and potatoes

$$1 + \frac{\text{potatoes}}{\text{total weight}} = .04$$

$$\text{d. of } 0.0 = 1 + \frac{0.0}{0.01} =$$

2 lots of potatoes
 potatoes and potatoes
 potatoes and potatoes
 potatoes and potatoes

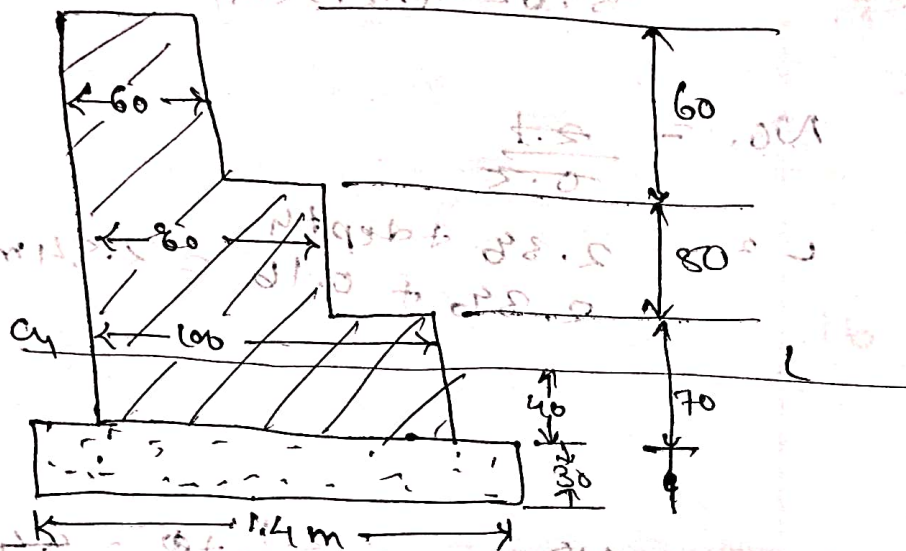
$$1 + \frac{0.0}{0.01} =$$

Item	Particulars	No.	L	B	H	Q	
1.	Rec work excluding steel & its bending but including cutting and shutting & binding of bars → 7-Beam rib → 4 fillet → Deck slab → Relling post No. = $\frac{\text{Total length}}{\text{c/c}} + 1$ = $\frac{6.9}{1.36} + 1 = 6.07 \approx 6$ → Kerb	3 8x2	6.9 m 6.9 m 6.9 m	0.35 m $\frac{1}{2} \times 15 \times 15$ 7.7 m	0.75 m - 0.2 m	6.43 m ³ 0.465 m ³ 10.626 m ³	Assume 45 cm bearing B = Area
2.	R.C.C. 1:2:4 in wearing coat	1	6.9 m	7 m	Total	17.814 m ³	B = 20 + 15 (Bearing) = 35 cm = 0.35 m
3.	40 mm ϕ G.I. Pipe in relling	4x2	6.9 m	-	0.1 m	4.93 m ³	
4.	Steel reinforcement bar including binding	3	6.9 m	0.35 m	0.95 m	6.98 x 2.57	Full depth
	→ Beam @ 2.5%					≈ 0.192	L = 78720 = 95
	→ Slab @ 2.5%	1	6.9 m	7.7 m	0.2 m	= 0.172 x 78.5 q/m = 13.50 quintal 10.626 x 17 = 6.10626785 q/m = 8.34 quintal	

[illegible]

★ 2023 / AM

Cross section of abutment 6.5m long is given below
Calculate the quantity of material of wall.



$$Q = \frac{1}{2} \times (60 + 100) \times 80 + 100 \times 40 + 60 \times 60$$

$$Q = 12400 \text{ cm}^3$$

Item	Particulars	No.	Length	Breadth	Weight	Quantity
1.	Earthwork in excavation in foundation Abutment	2	6.5m.	1.4m	0.7m	12.74m ³
2.	Cement Concrete 1:3:6 in foundation → Abutment	2	6.5m.	1.4m.	0.5m.	5.46 m ³
3.	First class brick work in 1:4 cement mortar Abutment	2	6.5m.	1m.	0.7m.	9.1 m ³
6a	Step 1	2	6.5m.	0.6m.	0.5m	5.2 m ³
	Step 2	2	6.5m.	0.6m.	0.6m.	4.68 m ³
	Step 3	2	6.5m.	0.6m.	0.6m.	18.96 m ³