ESTIMATE Jay bholenath.

→ Culvert is a structure constructed over running water or physical obstruction.

- The main purpose of constructing curvet structure a to provide passage over the obstruction.
- Culvert is provided under roads and highways for crossing of water
- Culvert are available in many and shape like round, piershape, elliptical & box like construction.

Different types of Culvert :~

I) pipe culvert.
II) pipe arch culvert.
III) Box culvert.
IV) Arch culvert.
V) Bridge culvert.
VI) Metal box culvert.

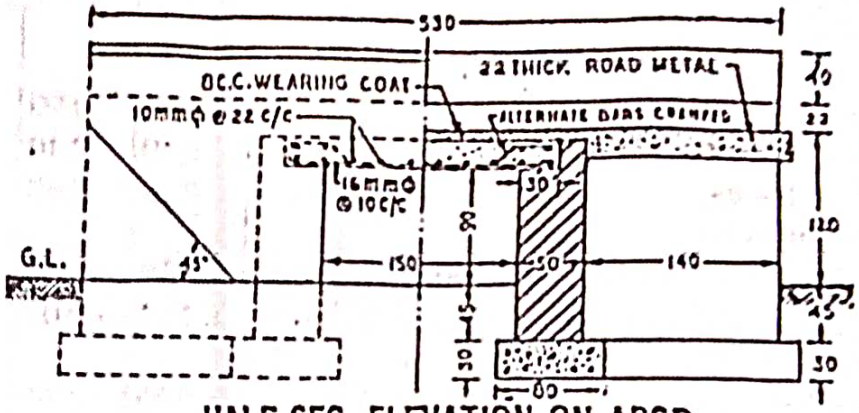
Pipe Culvert :—

- When a pipe is placed in an excavated trads to move water away it is known as pipe Culvert.
- It is the most commonly used drainage features.
- Economy Easy of Installation have made this type of culvert is very popular.
- Pipe culvert are found in different shapes such as circular Eliptical, pipe arch.
- It is used in uplant where suitable stones are not available to build cross drains.

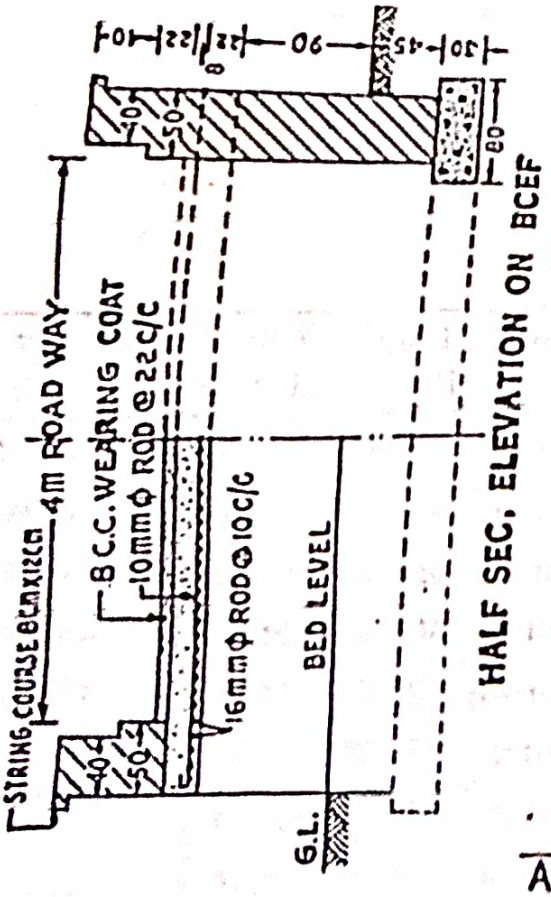
Example–2. Estimate of a simple Slab Culvert.—Prepare a quantity survey for a slab culvert of 1·5 m cl
span and 4 m road way as shown in the fig. 10-25.

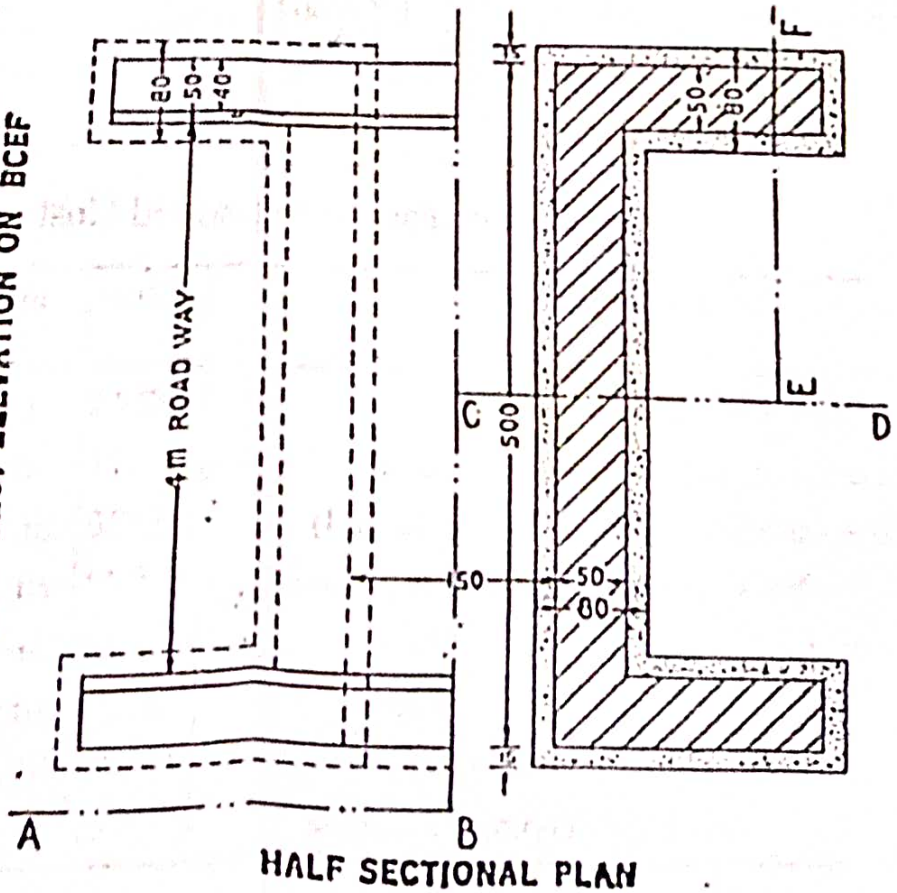
The general specifications are as follows :—

Foundation shall be of cement concrete 1 : 2 : 4. Brickwork shall be of 1st. class in cement mo
1 : 4. Exposed surfaces of brick masonry shall be cement pointed 1 : 3 carried up to 15 cm below G. L.
exposed surfaces of R. C. C. shall be given a smooth finish during centering, and no plastering shall be allow
The string courses shall be 8 cm deep and 12 mm thick with cement mortar 1 : 3 finished with neat cement. (
of 16 mm and 10 mm dia. bars are 1·58 kg and 0·62 kg respectively per r m.)



HALF SEC. ELEVATION ON ABCD





HALF SECTIONAL PLAN

All dimensions in centimet

Item No.	Particulars of Works	No	Length	Breadth	Height or Depth	Quantity	Explanation
1.	Earthwork in excavation in foundation —						
	Abutments	2	5.10	0.70	0.60	4.28	
	Wings walls	4	1.20	0.70	0.60	2.02	
					Total	6.30	
2.	Cement concrete 1:3:6 in foundation with stone ballast — Abutments	2	5.10	0.70	0.30	2.14	
	Wings walls	4	1.20	0.70	0.30	1.01	
					Total	3.15	
3.	1-class brickwork in 1:4 cement mortar —						
	Abutments	2	4.80	0.40	1.50	5.76	
	Wing walls	4	1.20	0.40	1.50	2.88	
	Parapets up to Kerb	2	4.70	0.40	0.30	1.13	
	Parapets above Kerb	2	4.70	0.30	0.50	1.41	
	parapet coping	2	4.90	0.40	0.10	0.39	
					Total	11.57	
	Deduct —						
	Bearing of R.C.C slab in abutment	2	4.80	0.30	0.20	0.57	
					Net total	11.00	
4.	R.C.C Work 1:2:4 in slab excluding steel and its bending but including centering shuttering and binding steel	1	4.80	2.10	0.20	2.016 cum.	
5.	Steel bars including bending in R.C.C. Works —						
	8mm dia bars —						
	Main Straight bars 30 cm/c	17	2.38			4.46	L = 2.10 − 2 side covers + 2 nos 2.10 − (2×4cm) + (18×20) = 2.38m
	(No = $\frac{4.80}{30}$ + 1 = 17)						

Item No	Particulars of Items of Works	No	Length	Breadth	Height or Depth	Quantity	Explanatory
	Main bent up bars 30 cm c/c (No = 4.80/30 = 16)	16	2.54			40.64m	Adding one depth 16 cm for two bent ups L = 2.38+16 = 2.54m
			Total	81.10m	@ 2.47	Kg/m = 200.32kg	
	10mm Dia bars – Distributing bottom bars 25 cm c/c	9	4.90			44.10m	L = 4.80 – 2 end covers + 3 hooks = 4.80 – (2×4cm + (8×10mm) = 4.90m
	Distributing top bars	4	4.90			19.60m	
			Total 63.70m	@ 0.62kg	=	39.49kg	
5.	Cement Concrete 1:2:4		Total	of	Steel	2.39.81kg	2.39% quantity
	Wearing coat.	1	4.00	2.30	0.10	0.92 cum	In bet^n parapets
6.	Cement pointing 1:2 in walls – face wall from 10 cm below G.L up to bottom of coping	2	4.70	–	2.10	19.74	
	Inner side of parapet excluding coping	2	4.70	–	1.80	7.52	H = (20+10+5) = 0.80m
	Coping (Inner edge, top, outer edge and outer end side)	2	4.90	0.70	–	6.86	B = (10+40+10) cm = 0.70m
	Ends of parapet	4	–	0.40	0.20	0.32	
	Ends of parapet	4	–	0.30	0.50	0.60	
	Ends of coping	4	–	0.40	0.20	0.32	
					total	35.36	
	Deduct Rectangular opening	2	1.50		1.30	3.90	
	Triangular portion below earth slope	2	(1/2 × 1.30 × 1.30)			1.69	
				Total of deduction		5.59	
				Net	total	29.77	sqm

ARCHED CULVERTS — TWO METRE SPAN

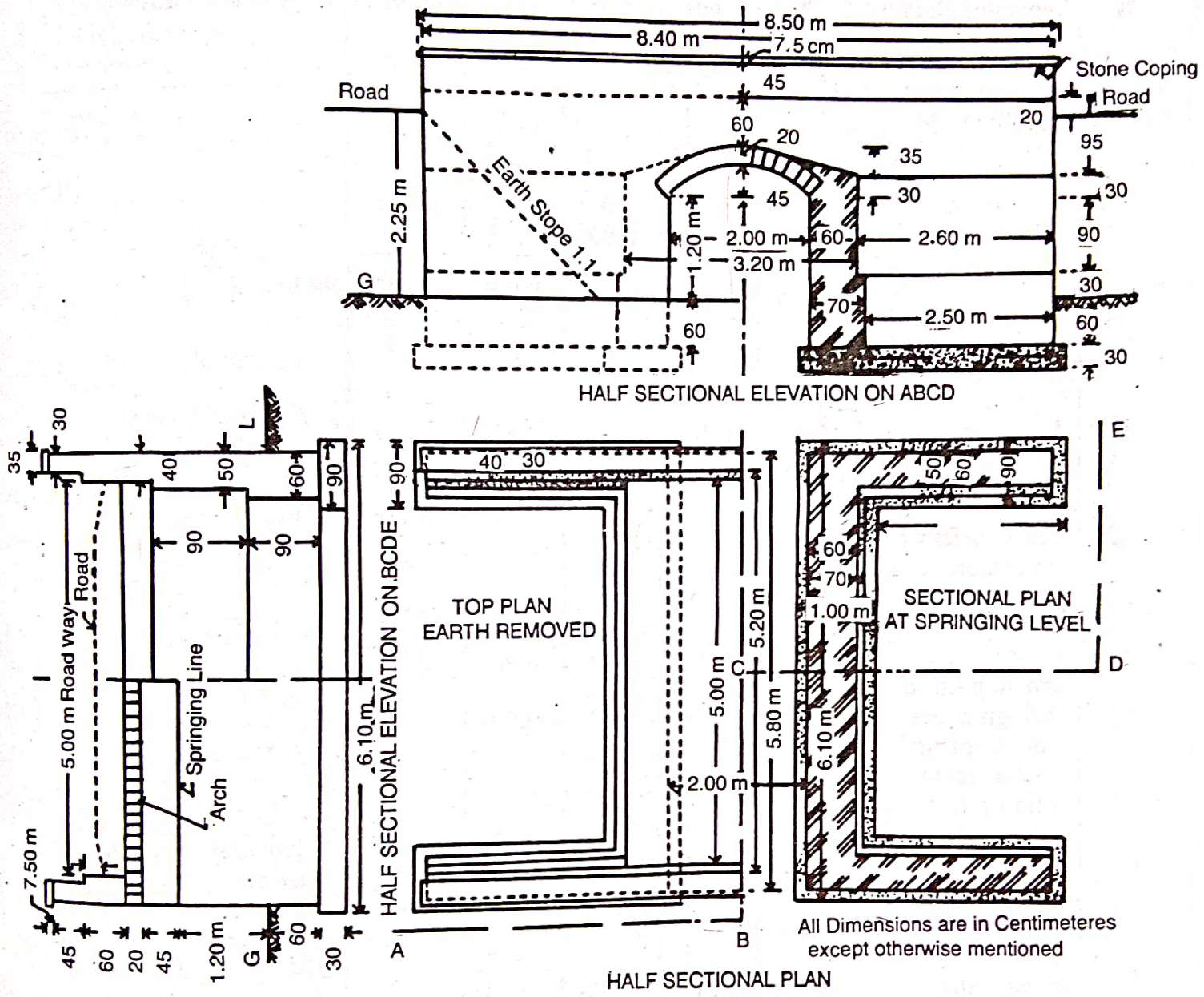


Fig. 8-6

Item No	Particulars of Items and details of works	No	Length	Breadth	Hight or Depth	Quantity	Explanation
1.	Earthwork in excavation in foundation —						
	Abutments	2	6.10	1.00	0.90	10.98	
	Wings wall	4	2.50	0.90	0.90	8.10	
					total	19.08	
2.	Cement concrete 1:4:8 with overburnt brick ballast in foundation —						
	Abutments	2	6.10	1.00	0.30	3.66	
	Wing walls	4	2.50	0.90	0.30	2.70	
					Total	6.36	
3.	1- class brick work in 1:5 cement local sand Mortar -						
	Abutments —						
	1st Step	2	5.80	0.70	0.90	7.31	
	2nd Step up to Springing level	2	5.80	0.60	0.90	6.26	
	Above Springing level as rectangular Solid up to top of Crown	1	5.80	3.21	0.65	12.06	
	Wings walls —						
	1st step —	4	2.50	0.60	0.90	5.40	
	2nd step up to Spandrel level —	4	2.60	0.50	1.20	6.25	
	Parapet up to Kerbs as Solid (whole length) —	2	8.40	0.40	0.95	6.32	
	Parapet above Kerbs	2	8.40	0.30	0.45	2.27	
					Total	45.93	
	Deduct —						
	Arch opening Segmental portion	1	5.80	(4/3×2.00×45)		3.48	
	Arch Masonary Triangular portions	1	Same as for Items (4)			2.82	

	above abutment	2	5.80	(1/2×3.20×.35)	6.50
	Triangular portions above parapet	2	(1/2×3.20×.35×.40)		0.45
			Total of deduction		13.25
				Net total	32.68 cum
4.	1st class brick work in arch in 1:3 cement Coarse Sand Mortar	1	5.80	2.43	0.20 2.82 cum

Arch calculation :—

$\frac{h}{2} + \frac{s^2}{8h} = \frac{.45}{2} + \frac{2^2}{8 \times .45} = 1.336$m, $r_m = r + \frac{t}{2} = 1.336 + \frac{.20}{2} = 1.436$m

$= \sqrt{a^2+h^2} = \sqrt{1^2+(.45)^2} = 1.096$, $\frac{8b-2a}{3} = \frac{8\times1.096 - 2\times1.00}{3} = 2.250$m

$= 1 \times \frac{r_m}{r} = 2.256 \times \frac{1.436}{1.336} = 2.43$m. $Q = l \times l_m \times t = 5.80 \times 2.43 \times .20 = 2.82$ cm

5.	Cut Stone work laid with 1:3 cement Coarse Sand Mortar in coping	2	8.50	0.35	0.075 0.45 cum
6.	Cement pointing 1:2 in exposed Surface Including 10 cm below ground —				
	face wall from 10 cm below G.L. up to top of parapet Inner face of parapets above roof level —	2	8.41	—	3.00 50.40
		2	8.41	—	0.75 12.60
	Ends of parapets —	4	—	0.40	0.20 0.32
	Ends of parapets —	4	—	0.30	0.45 0.54
					C.O. 63.86
	Inner face of abutments —				B.F 63.86
	Soffit of arch —	2	5.80	—	1.30 15.08
		1	5.80	2.256	— 13.08

Items No		No	length	Breadth	Height or Depth	Quantity	Explanatory
	Deduct —						
	Rectangular openings	2	2.00	—	1.30	5.20	
	Arch opening Segmental portion	2	(2/3 × 2.00 × 0.45)			1.20	2/3 span × rise
	Triangular portion below earth slope in face walls. —	4	(1/2 × 2.35 × 2.35)			11.14	Area = 1/2 base ×
			Total	of	deduction	17.44	
				Net	total	74.58	Sqm.

Example 7.—Prepare a detailed estimate of Hume pipe Culvert of three pipes each of 60 cm diameter from the given plan and elevations Fig. 8-14. Foundation concrete shall be of 1 : 4 : 8 cement concrete and brickwork shall be of first class in 1 : 6 cement sand mortar. Exposed surfaces shall be pointed with 1 : 2 cement sand mortar.

Assume suitable rates.

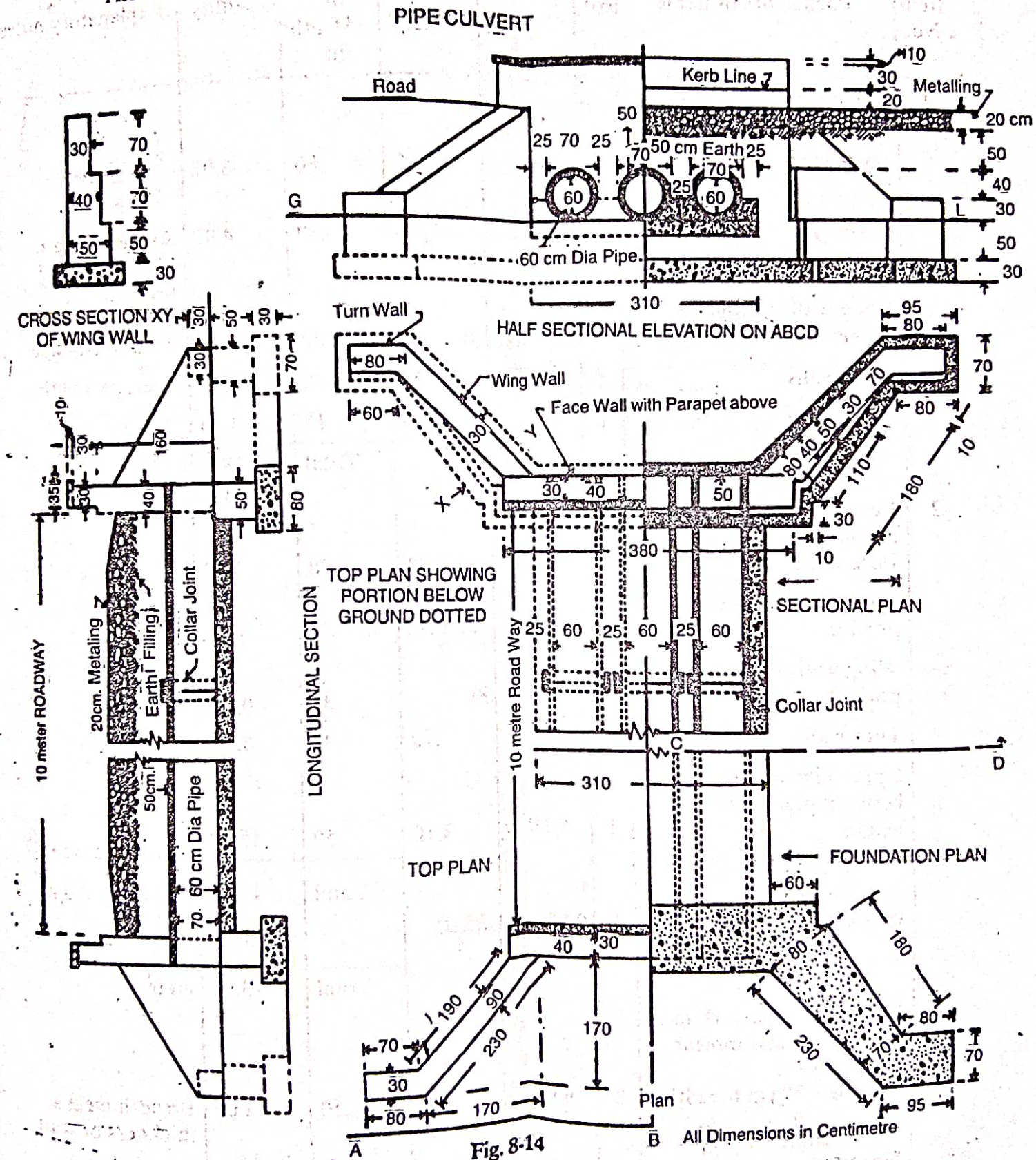
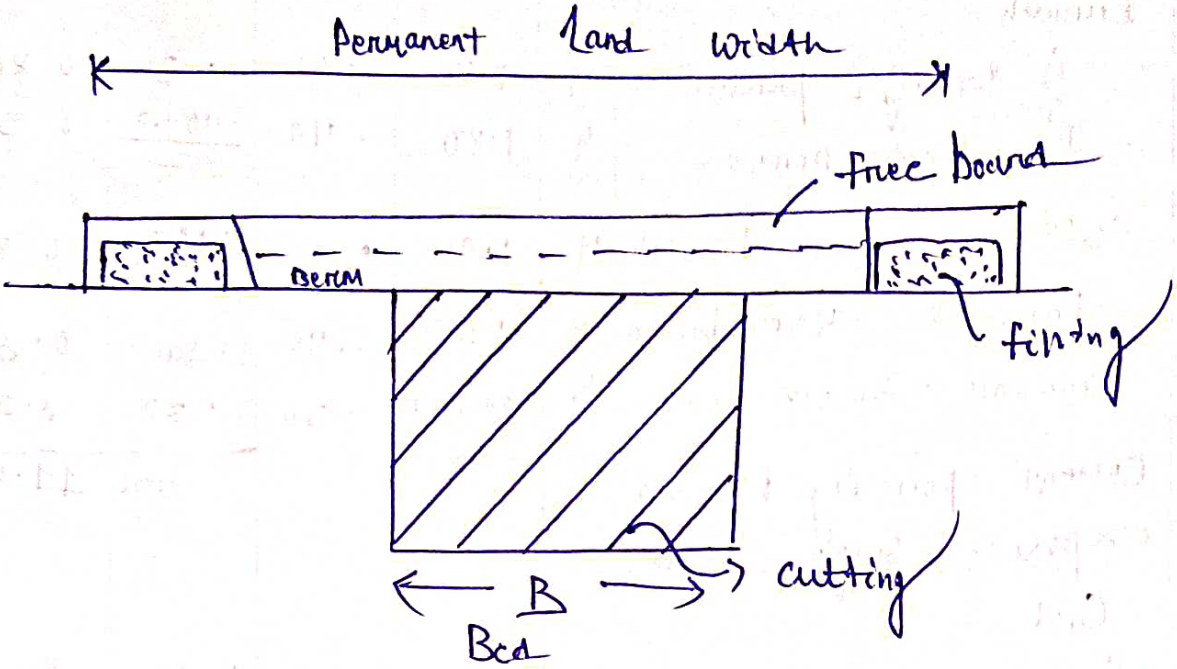


Fig. 8-14

Item No	Particulars of Items	No	Length	Breadth	Height or Depth	Quantity	Explanatory notes
1.	Earth work in excavation in foundation –						
	face walls –	2	3.10	.80	.80	3.97	
	wing walls Inclined portion –	4	$\frac{2.3+1.8}{2}$	$\frac{.8+.7}{2}$	.80	4.92	
	wing walls triangular Corner	4	(1/2x.6x.8)		.80	0.77	
	Turn walls	4	$\frac{.95+.80}{2}$	.70	.80	1.96	
	under pipe	1	9.80	3.10	.15	4.56	
					total	16.18 cum	
2.	Cement concrete 1:4:8 in foundation –						
	face walls	2	3.10	.80	.30	1.49	
	wings walls Inclined proton	4	$\frac{2.3+1.8}{2}$	$\frac{.8+.7}{2}$	.30	1.85	
	wings walls Inclined proton	4	(1/2x.6x.8)		.30	0.29	
	Turn walls	4	$\frac{.95+.80}{2}$	.70	.30	0.74	
	upper pipe and in bet^n pipe up to half heigh	1	9.80	3.10	.50	15.19	Thickness = $15+\frac{70}{2}$ = 50 cm = .5
					total	19.56	
	Deduct half of pipes	3	9.8x1/2	$\frac{\pi \times .7^2}{4}$		5.66	
					total	13.90 cum	
3.	first class brickwork in 1:6 cement sand mortar face walls –						
	footing – 50 cm breadth	2	4.00	.50	.50	2.00	
	Above footing 40 cm breadth	2	3.80	.40	1.60	4.88	
					C.O.	6.86	
	Parapet – 30 cm breadth	2	3.80	.30	B.F	6.86	
	Coping – 35 cm breadth	2	4.00	.35	.30	0.68	
					.10	0.28	
	Wings walls –						
	1st step – 40 cm breadth	4	1.10	$\frac{.5+.0}{2}$	.50	0.55	

	2nd Step - 40 cm breadth -						
	i) Straigh portion --	4	1·80	·40	·30	0·86	
	ii) Sloping portion	4	1·80	·40	$\frac{·40+.0}{2}$	0·58	Average height
	3rd Step - 30 cm breadth	4	1·90	·30	$\frac{·70+0}{2}$	0·80	
	turn wall - 40 cm breadth	4	$\frac{·8+·7}{2}$	·40	·50	0·60	
	turn wall - 30 cm breadth	4	$\frac{·80+·75}{2}$	·30	·30	0·28	
					total	11·49cum	
4.	Cement pointing 1:2 in exposed surfaces above G.L.						
	face walls outer sides.	2	3·10	-	1·40	8·68	up to road level above road level
	face wall parapet outer side	2	3·80	-	·65	4·94	Including coping Ht = 20+30+10+5 = 65 = ·65 m
	Parapet Inner faces	2	3·80	-	·70	5·37	Including Kerb offset of 10 cm
	Wing walls Vertical face	4	2·30	-	$\frac{1·40+.50}{2}$	8·74	Avg. height
	wing walls top --	4	2·30	·30	-	2·76	
	turn walls Vertical face three sides --	4	1·80	-	·30	2·16	L = perimeter = 80+30+7[illegible] = 180 cm = 1·80 m
	Turn walls top	4	$\frac{·8+·7}{2}$	·30	-	0·90	
					total	33·50 sqm	
5.	Humepipe heavy type 60 cm dia. Including Collar Joint	3	10·80	-	-	32·40	L = 10+·4+·4 = 10·8

Estimation of Irrigation structure :-



Canal cutting

When NSL is above the top of the bank, the Canal section will have to be and it shall be called canal cutting

This section is cutting and partly in filling and aims in balancing the quantity of earth work.

F.S.L = Fully supplied level

N.S.L = Natural supplied level

* Where NSL is lower than the CBL the canal section will have in filling and it is canal in filling.

* The margin bet^n F.S.L and bank level is known as the free board.

* The amount of free board depends up on the discharging of the channel.

Bank :—

- The primary purpose of bank is to remain water.
- These can be used as means of communication and as inspection path.
- They should be wide enough so that a minimum cover of 0.5 on is available above the saturation li

Berm :—

Berm is the horizontal dis" left and ground lev bet" toy of the bank and the top edge of cuttin

- Berm is provided additional strength to bank and help it guarding they against branches.
- It is also provided for future widening of channel.

Side slope :—

- The side slope should be such that they are stable depending up on the type of soil.
- It comparatively steeper so it can be provided in cutting wheather than in filling as the soil
- In the formal case shall be more stable

Example 7. —Prepare a detailed estimate of a Drainage Syphon across a minor from the given drawing, Figs. 9-8 and 9-9.

Foundation concrete shall be of 1 : 4 : 8 cement concrete with brick ballast. All brickwork shall be of 1 : 4 cement mortar. Exposed surfaces of brickwork shall be struck pointed with 1 : 2 cement mortar. Brick pitching shall be of dry brick with straight over burnt bricks.

Assume suitable rates for the different items of work.

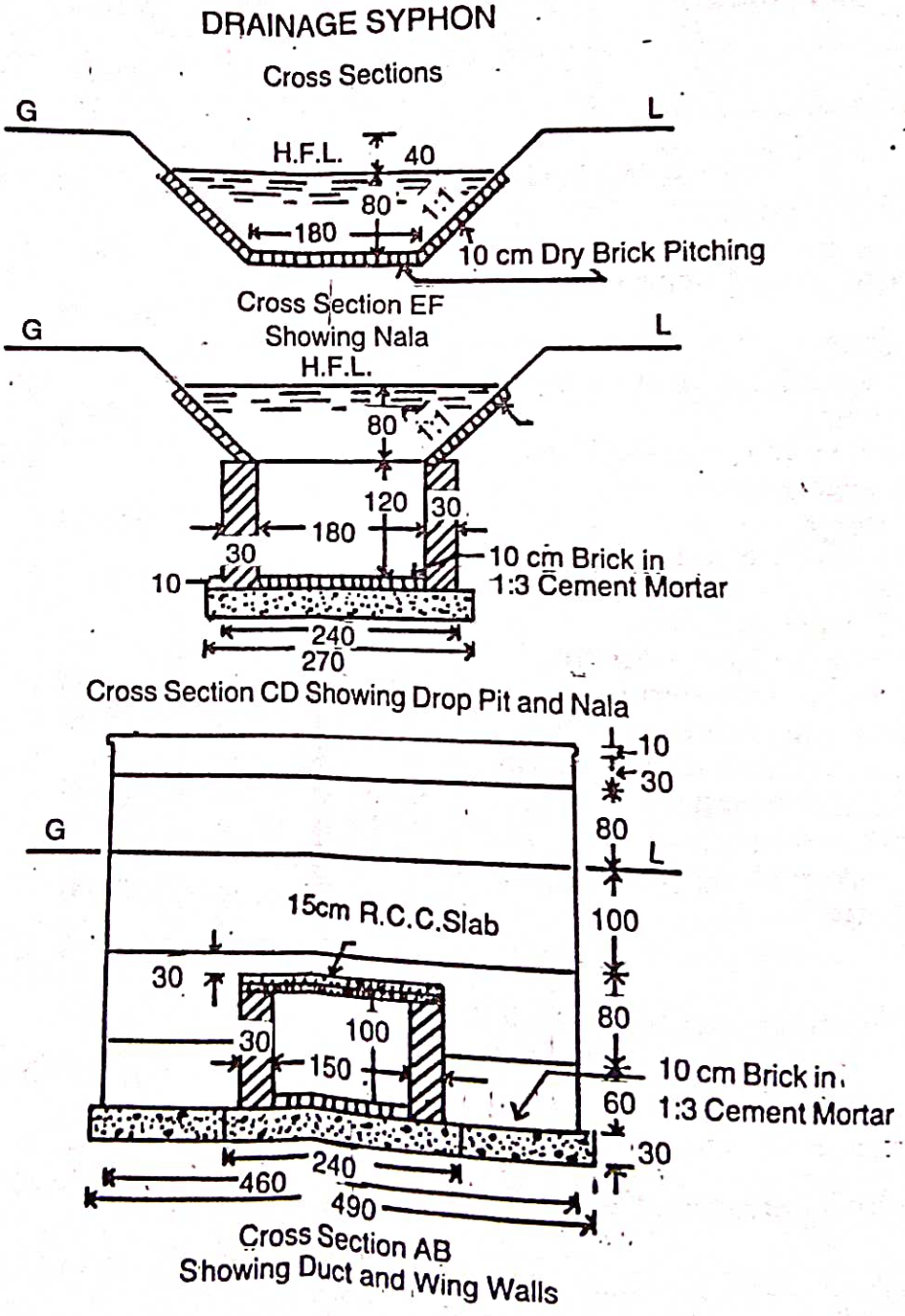


Fig. 9-8

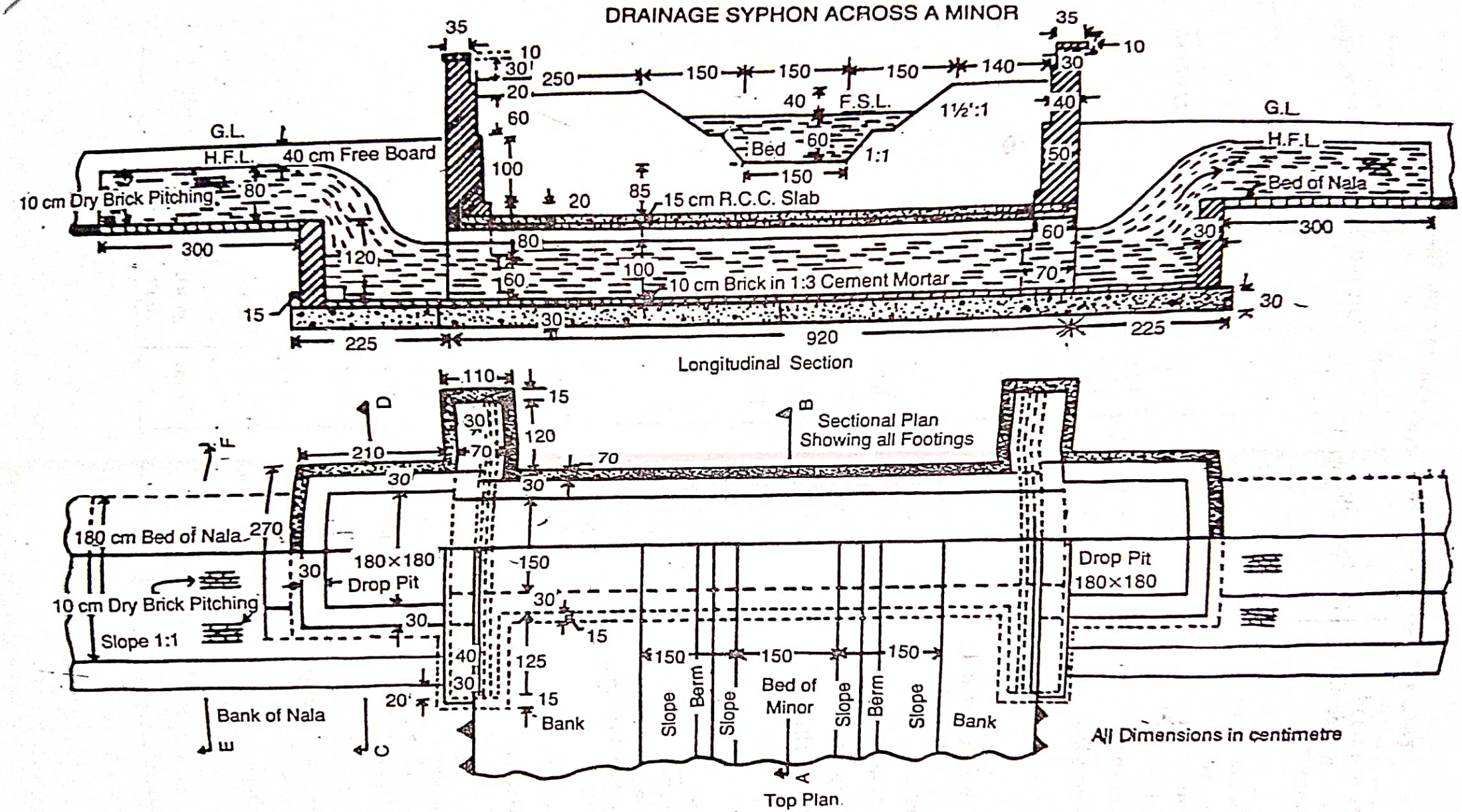

DRAINAGE SYPHON ACROSS A MINOR
G.L
H.F.L.
40 cm Free Board
10 cm Dry Brick Pitching
F.S.L.
Bed
1½':1
1:1
15 cm R.C.C. Slab
10 cm Brick in 1:3 Cement Mortar
Bed of Nala
Longitudinal Section
Sectional Plan
Showing all Footings
180 cm Bed of Nala
Drop Pit
180×180
Slope 1:1
Bank of Nala
Slope
Berm
Bed of
Minor
Bank
All Dimensions in centimetre
Top Plan.

Fig. 9.9

Items No.	Particulars of Items and details of work	No	Length	Breadth	Height or Depth	Quantity	Explan.
1.	Earth work in excavation in foundation —						
	Syphon duct —	1	9.50	2.40	1.60	36.48	
	Drop pit —	2	2.10	2.70	1.60	18.14	
	Wing walls —	4	1.25	1.10	1.60	8.80	
					total	63.42 cum	
2.	Cement concrete 1:4:8 with brick ballast —						
	Syphon duct —	1	9.50	2.50	0.30	6.84	
	Drop pit —	2	2.10	2.70	0.30	3.40	
	Wing walls —	4	1.25	1.10	0.30	1.65	
					total	11.89 cum	
3.	1st class brick work in 1:4 Cement Mortar —						
	Syphon duct side walls	2	9.20	0.30	1.30	7.18	
	Drop pit walls	2x2	2.10	0.30	1.30	3.28	
	Wings walls —	2	1.80	.30	1.30	1.40	
	1st Step 70 cm walls —	4	1.25	0.70	0.70	2.45	
	2nd Step 60 cm walls —	4	1.25	0.60	0.60	1.80	
	2nd Step 60 cm — walls above slab	2	4.60	0.60	0.20	1.10	up top of slab
	3rd Step 50 cm walls	2	4.60	0.50	1.00	4.60	
	4th Step 40 cm walls	2	4.60	0.40	0.80	2.94	
	5th Step 30 cm wall						
	Coping (Parapet)	2	4.60	0.30	0.30	0.83	
		2	4.70	0.35	0.10	0.33	
					total	25.91 cum	

4.	RCC Slab of Syphon duct Including steel reinforcement complete work	1	9.20	2.10	0.15	2.90 cum	
5.	10cm thick brick floor in 1:3 cement Mortar Including 1:2 cement pointing —						
	floor of Syphon duct	1	9.20	1.50	—	13.80	
	floor of drop pit	2	1.80	1.80	—	6.48	
					total	20.28 sq.m	
6.	cement struck pointing 1:2						
	Syphon duct Inner faces	2	9.20	—	1.00	18.40	
	Drop pit 3 Vertical faces	2×3	1.80	—	1.20	12.96	
	Drop pit 3 top faces	2	5.70	—	0.30	3.46	L=2×1.80 +2.10 =5.70
	Parapet wall Inner face top and outer face up to G.L	2	4.60	—	2.30	21.16	H= 2.0+1.0 +3.0+1.0 +3.5+1.0=11.0 =23.1
	Outer face of wing wall	2	1.80	—	1.20	4.32	
	wall above slab triangular portion of outer face of wing walls	2×2	(1/2×8×.8)		=	1.28	
					total	61.54 sq.m	Thin pitching unit in area basis
7.	10cm dry Brick pitching with straight over burnt bricks —						up and down stream stopping breadth
	Bed of nala	2	3.00	1.80	—	10.80	
	Side slopes of nala	2×2	3.00	1.13	—	13.56	$\sqrt{8^2+3^2}$ =1.13
					total	24.36 sqm	

How to draw the L-Sections of canal :-

Q) Draw L- Section and Calculate the Quantity of earth work of an Irrigation channel with the following data :

Bed Width = 5.00 Mtr

Side Slope in cutting (S_1) = 1:1

Side Slope in Banking (S_2) = 1:5:1

Top Width of left bank = 3.00 Mtr

Top Width of right bank = 2.00 Mtr

Longitudinal Slope bed = 1 in 5000

full supply depth = 2.10 Mtr

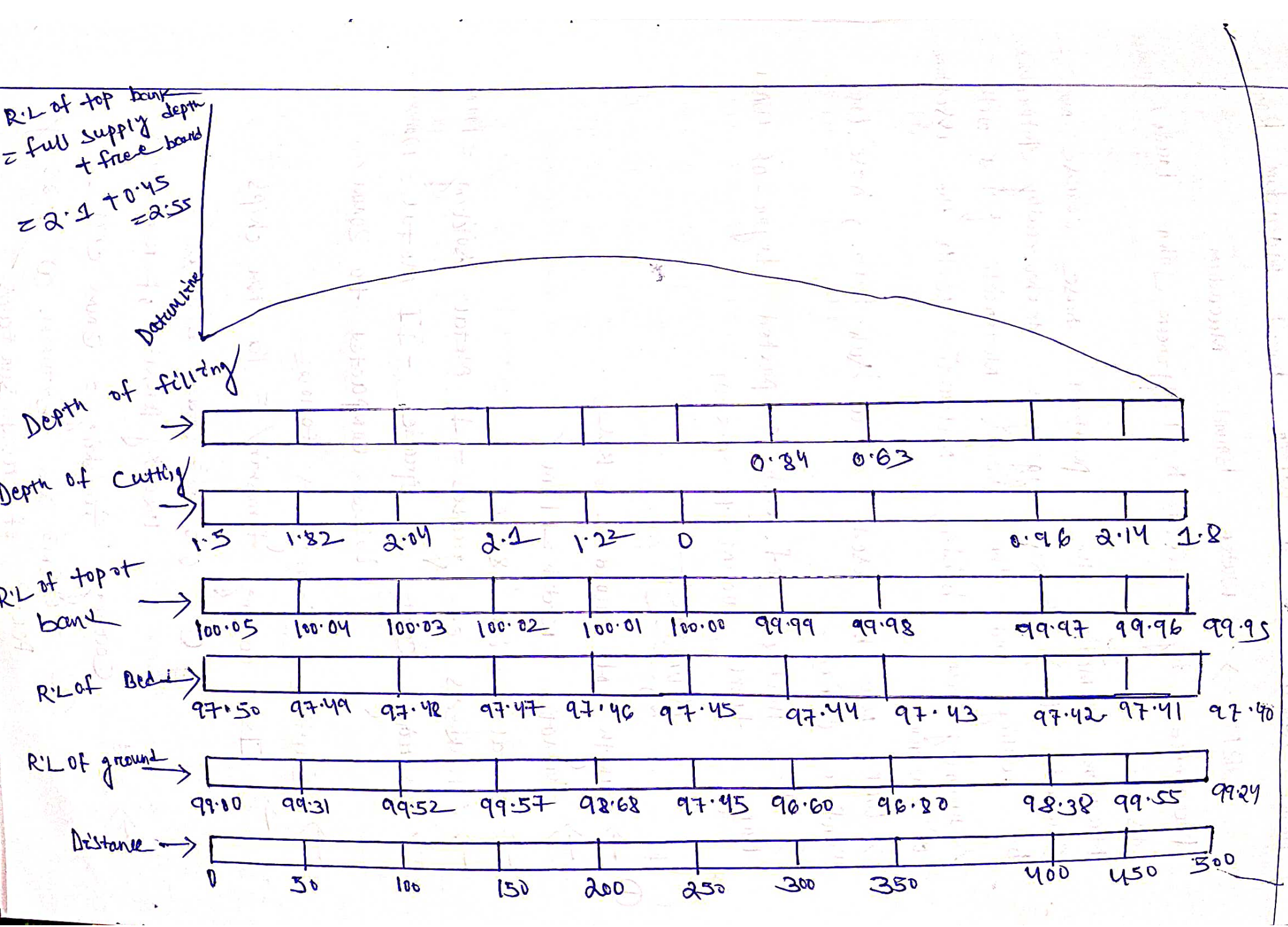
free board = 0.45 Mtr

R.L of bed at R.D.0 = 97.50

Distance	0	50	100	150	200	250	300	350	400	450	500
R.L of ground	99.00	99.31	99.51	99.57	98.68	97.45	96.60	96.80	98.38	99.55	99.24
R.L of proposed Bed level	97.50	97.49	97.48	97.47	97.46	97.45	97.44	97.43	97.42	97.41	97.40

$\frac{1}{5000} \times 50 = 0.01$

R·L of top bank
= full supply depth
+ free board
= 2·1 + 0·45
= 2·55



Detail estimate of a Water bound Macadam Road :-

WBM → Water Bound Macadam

Pioneered by Scottish Engineer John Loudev Groud 1820.

Macadam means the pavement base coarse made of Crushed (or) broken aggregate Mechanically Interlocked by rolling and the voids material filled with screening and binding material with the assistance of water.

→ WBM May be used as a sub-base, base (or) Surface coarse.

→ The thickness of each compacted layer of WBM range from 100 mm to 7.5 cm.

Question :-

①
→ Length of road = 6 KM
→ formation width = 10 M
→ Metal with 8 M.
→ Thickness of grade - I Metal Soiling = 100 mm
→ Wearing coat of Grade - II Metal = 120mm
Lossed Compacted to 80mm.
→ Surface facing as follows.
→ Ist coating finishing = 12 mm chips.
@ 0.020 M^3 and bitumen @ 1.20 Kg per M^2 of road surface.
→ 2nd coating finishing = 6 mm chips
@ 0.018 M^3 and bitumen @ 1.25 Kg per M^2 of road surfaces.

Fuel Consumption = 950 Kg Per Kg of Bitumen.

Given data :-

Length of road = 6 KM = 6000M

→ formation width = 10M

→ Metal width = 8M

→ Thickness of Grade - I Metal soiling = 100mm
= 0.1M

→ Wearing coat of Grade = II Metal = 120 mm
= 0.12 mm

Quantity of Grade - I Metal soting

$Q = (L \times \text{Metal width}) \times \text{thickness}$

$= (6000 \times 8) \times 0.1$

$= 4800M^3$

Wearing Coat

$Q = (L \times \text{Metal width}) \times \text{thickness}$

$= (6000 \times 8) \times 0.12$

$= 5760M^3$

1st Coat of finishing

chips → $Q = (L \times \text{Metal width}) \times \text{thickness}$

$= (6000 \times 8) \times 0.020$

$= 960M^3$

Bitumen

$Q = (L \times \text{Metal Width}) \times \text{thickness}$

$= (6000 \times 8) \times 1.20$

$= 5760 KG$

2nd Coat of finishing chips -

$$Q = (L \times \text{Metal Width}) \times 0.018$$
$$= (6000 \times 8) \times 0.018$$
$$= 864 M^3$$

Bitumen

$$Q = (L \times \text{Metal Width}) \times 1.25$$
$$= (6000 \times 8) \times 1.25$$
$$= 60000 kg$$

total Bitumen = 57600 + 60000
= 117600 kg

fuel Consumption = 0.50 × 117600
= 58800 kg

Methods of road estimation :

(i) Mean Sectional Area Method,
(ii) Mid Section Area Method -
(iii) Prismoidal Method

$$d_M = \frac{d_1 + d_2}{2}$$

$$Q = A_M \times L$$

$$A_M = B d_M + S d_M^2$$

$$L \times \frac{A_1 + A_2}{2}$$

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

$$A_2 = B d_2 + S d_2^2$$

$$\frac{1}{6} \times A_1 \times A_2 + 4 A_M$$

Q) Calculate the Quantity of earthwork for a portion of road from the following data.

chainage	50	51	52	53	54	55	56	57	58	59	6
R.L of ground	132.1	132.2	131.9	132.2	131.8	131.7	131.6	131.4	131.1	130.5	130

The formation level at the chainage 50 is 131.1m and the road is in a rising gradient of 1 in 200. The width of formation is 10m and the side slopes are 1:5:1 in banking and 2:1 in cutting and the lateral slopes of the road is assumed as level. The length of one chain is 20m.

The road is in a rising gradient of 1 in 200.

$$200 H = 1 V$$

$$1H = \frac{1}{200} V$$

$$20H = \frac{1}{200} \times 20 = 0.1V$$

Chainage	R.L of ground	formation level	Height or banking	Depth of Cutting	mean height (dm)	Area Am	Length	Quantity	
								Banking	cutting
50	132.1	131.0		1.1	= 1.1	13.42	20		268.4
51	132.2	131.1		1.1	= 0.9	10.62	20		212.4
52	131.9	131.2		0.7	= 0.8	9.28	20		185.2
53	132.2	131.3		0.9	= 0.65	7.34	20		146.8
54	131.8	131.4		0.4	= 0.3	3.18	20		63.6
55	131.7	131.5		0.2	= 0.1	1.02	20	20.4	
56	131.6	131.6	0		0.15	1.54	20	30.8	
57	131.4	131.7	0.3		= 1	12	20	240	
58	130.1	131.8	1.7		= 1.55	20.30	20	406	
59	130.5	131.9	1.4		= 1.35	17.4	20	342.8	
60	130.7	132	1.3						
								total = 1040 m^3	= 876.8 m^3

SEPTIC TANK FOR 50 USERS

All Dimensions are in Centimeter except otherwise mentioned

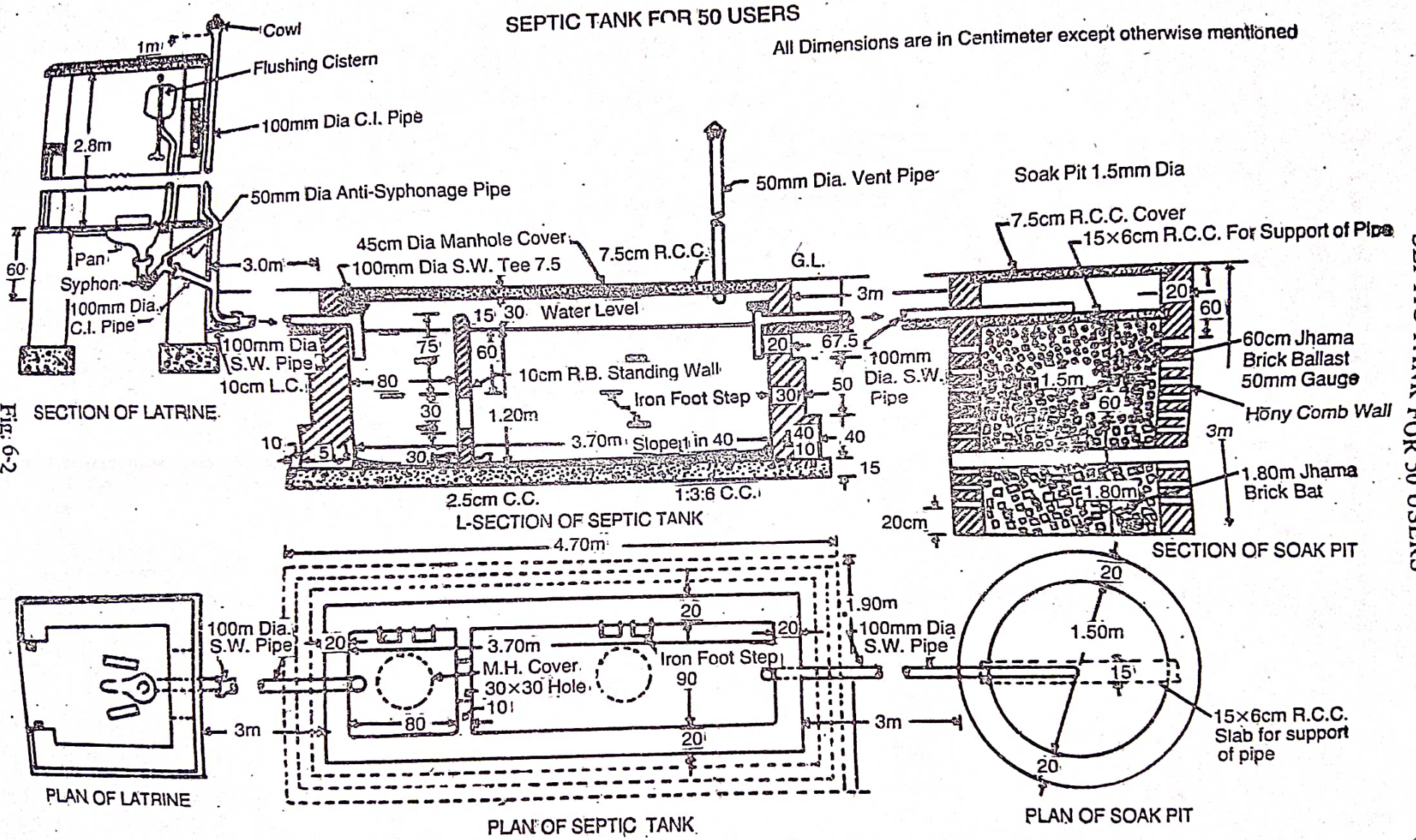


Fig. 6-2

Items No.	Particulars of Items details of works	No	Length	Breadth	Height or Depth	Quantity	Explanatory
1.	**Septic Tank and Soak-pit**						
	Earth work in Excavation —						
	Septic Tank —	1	4.70	1.90	1.725	15.41	
	Soak pit —	1	$\frac{\pi}{4} \times (1.9)^2 \times 3.00$		=	8.50	
			4		total	23.91	cum
2.	Cement concrete 1:3:6 in foundation of septic tank —	1	4.70	1.90	0.15	1.34 cum	Floor takes Separately under Item 7.
3.	1-class brick work in 1:4 cement Mortar in Septic tank —						
	long walls —						
	1st footing —	2	4.50	0.40	0.40	1.44	
	2nd footing —	2	4.30	0.30	0.50	1.29	
	3rd footing up to top —	2	4.10	0.20	0.675	1.11	
	Shorts walls —						
	1st footing —	2	0.90	0.40	0.40	0.29	
	2nd footing —	2	0.90	0.30	0.50	0.27	
	3rd footing up to top —	2	0.90	0.20	0.675	0.24	No deduction for beam of slab
					total	4.64 cum	
4.	R.B work in partition wall with 1:3 cement Mortar in Septic tank including rain-forcement Complete work —	1	1.90	0.10	1.35	0.122 cum	

5.	RCC work in septic tank and Soak pit including reinforcement complete work - Slab Cover of septic tank	1	3.90	1.10	0.075	0.322	
	Slab cover of ---. Soak pit	1	$\frac{\pi \times (1.7)^2}{4}$	×	0.075	0.170	
	RCC support of Pipe in Soak pit---	1	1.70	0.15	0.06	0.015	
					Total	0.507 cum	
6.	12mm plastering Inside Septic tank with 1:2 Cement Mortar Mixed with water proofing Compound —						
	Long walls ---	2	3.70	—	1.50	11.10	
	Short walls ---	2	0.90	—	1.50	2.70	
	Partition walls both Sides ---	2	0.90	—	1.35	2.43	
	Partition walls top	1	0.90	—	0.10	0.09	
					total	16.32 sqm	
7.	C.C floor 1:2:4, 5 CM average thickness ---	1	3.70	0.90	—	3.33 sqm	
8.	II class brickwork in 1:6 cement Mortar in Soak - pit (Honey comb work as solid) ---	1	π×1.70	×.20×	3.00 =	3.20 cum	Math drawing ference
9.	Thana brick ballast 10mm size Inside soak pit (upper layer) ---	1	π×1.5²	×0.60×	—	1.06 cum	

10.	Thana brick bats Inside soak-pit (lower layer) ---	1	$\frac{\pi \times 1.5^2}{4}$	x 1.80 x	—	3.18 cum	
11	C.I. Manhole cover 45 cm Dia. over Septic tank ---	2	—	—	—	2 Nos.	
12.	Iron foot steps Septic tank-	8	—	—	—	8 Nos.	
13.	Sanitary works — W.C. Indian pattern 50 cm white glazed pan with syphon and with 13.5-litre C.I. Flushing cistern (E.I.C) with brackets and 32 mm Dia G.I. telescopic flush pipe painted two Coats and with chain foot rests complete Supply and fixing --	1	—	—	—	1 Set	Flushing Cistern telescopic pipe foot rests etc. each may also be taken as Sepate Items
14.	S.W (Stone ware) pipe 100 mm dia laid over 10cm. C.C. in- Cluding digging, laying Jointing, testing etc. Complete Connecting latrine with Septic tank connecting	1	3.00	—	—	3.00	
	Septic tank with Soak-pit --	1	4.00	—	—	4.00	
					total	7.00 m	

15.	S.W tee 100 MM dia at the Inlet and outlet of Septic tank	2	—	—	—	2 Nos.
16.	C.I Heavy soil pipe 100 mm dia. Connecting latrine seat, vent pipe Including fixing with lead Jointing	1	5.00	—	—	5.00 M
17.	C.I Heavy soil pipe 50 mm dia - Complete with lead Jointing - connecting latrine pan with Vent pipe ---	1	0.60	—	—	0.60
	Vent pipe for Septic tank ---	1	3.00	—	—	3.00
					total	3.60 M
18.	C.I. Coul 100 mm dia in latrine	1	—	—	—	1 Nos.
19.	C.I. Coul 50 mm dia for Septic tank Vent pipe ---	1	—	—	—	1 Nos.
20.	250 - litre G.I Tank of 20 B.W.G sheets with 45 cm dia. Raised hinged cover with locking arrangement and fitted with 15 mm dia. brass ballcock supplying and fixing in position	1	—	—	—	1 No.

21.	15mm dia. G.I pipe with fitting Including digging, laying, clamping complete -						
	Connecting G.I tank with water main -	1	15.00	—	—	15.00	L = 10.00 + 60 + 2.80 + 1.00 + 60 extra = 15.00m
	Connecting flushing Cistern from G.I tank	1	2.00	—	—	2.00	
	Connecting water tap from G.I tank	1	4.50	—	—	4.50	Top on outside wall
					total	21.50 m	
22.	15mm dia. Brass Stop-cock Supplying and fixing ---	2	—	—	—	2 Nos.	
23.	15mm dia Brass bib cock supplying and fixing	1	—	—	—	1 NO	
24.	Brass ferrule 6 mm dia. Supplying and fixing	1	—	—	—	1 No -	

P.W.D Accounts Work

Define Lead and Lift.

→ Normally earthwork is estimated for 30M horizontal distance and 1.5M Vertical distance or height. The horizontal distance of 30M is known as lead and the Vertical distance of 1.5M is called as Lift. Normal rate of earthwork is on 30M lead and 1.5M lift. for greater horizontal distance (30M) and greater Vertical distance (1.5M), the rate of earthwork is different.

What is final bill and running bill.

final Bill :- This is also known as first and final (Form No. 240) which is used for making payments both to Contractors for work and to Suppliers when a Single payment is made for a Job Contract on it's Completion.

Running Bill :- This is otherwise known as runni account bill (Form No. 26) which is used for all running and final payments to Contractors and suppli ers including cases where advance payments are proposed to be made or are already outstanding in respect of the same work against the Contractor.

Explain Muster roll and Measurement book.

Muster Roll :- The attendance of the labourers is maintained in a Musterroll. The presence of each labourerin Muster roll should be marked by the proper officer at the starting hour of the day. Periodicinspections by the higher authority are done to check the actual labourers working. On the basis of the Muster roll payment is made to the labourers, weekly, fortnightly, Monthly or at the Completion of the work according to the requirement. In the to the Muster roll

names of the workers, designation, data of attendance, rate of wages, total amount due to each worker, Signature of person taking the attendance, signature of the officer checking, making payment etc. are entered.

Measurement Book (MB):-

Payments to contractors and suppliers for all the work done by them which requires measurement are done on the basis of measurements recorded in a book known as measurement Book (MB) in accordance with the rules. It is very important account of record. Usually Junior Engineer (JE) who is actually assigned to supervise the quality and progress of the work is authorized to make the entry of detailed measurements of the work. He records all the measurements after completion of the work or Interim as required and puts his dated signature in the book. The same is being check measured by his superior authorities time to time and they and also put their data signature in it. When the bill is prepared (running / final) the measurements are taken from this book.

Regular Establishment:-

1) Both permanent and temporary employees of the department are included in the regular establishment.

11) Their salaries and allowances are drawn Monthly on regular paybills from the treasury in prescribed from - "Detailed pay bill for regular establishment".

111) The salary is met from the budget grant under the head establishment. Their services are governed by civil service rules of the State or union government.

(iv) The permanent employees are not liable for retirement and they are entitled for leave, pensions and other amenities as per service rules.

(v) The temporary establishments are employed when the work is increased and their services can be terminated at any time with proper notices as per rules.

Aquittance Roll:-

i) The payment of salary to persons of regular establishment working outstation is drawn on the regular pay-bill on receipt form is known as Aquittance Roll.

ii) It is receipt in evidence of payment in a prescribed form having columns as Item no Designation, Net amount payable and Dated signature.

iii) It is prepared for the total amount as per Establishment Bill are passed by the Drawing officer.

iv) The aquittance roll is prepared for the total amount as per Establishment bills are passed by the Drawing officer.

Administrative Approval:-

i) This is an approval given by the Competent authority of the parent department whose construction project work is to be taken up by the P.W.D department.

ii) The parent department after ascertaining the funds position, technical feasibility of the project usually gives the approval.

iii) After getting the administrative approval the executing department proceeds for preparing detail

drawings and estimates for actual execution.

Tender;-

It is an offer in writing to execute some specified works or to supply some specified articles subjecte to certain terms and conditions like rates, time limits etc. Depending upon the type of contract, the tender may be lump-sum tender, Item-rates tender, Costplus tender, labour tender, demolition tender etc. Tenders which is always sealed in manner should be invited in the most open and public manner possible by places. The tenders after receiving data and time is over, are opened at the fixed time and data by authorized officer in the presence of the intending Contractors or their agents.

Contract;-

A construction contract is a mutual or legally binding agreement betn two parties based on policies and conditions recorded in document form. The two parties involved are one or more property owners and one or more contractors.

The different type of contracts are;-

i) Item rate contracts.
ii) Lump sum contracts.
iii) Labour contracts.
iv) Daily labour or Muster Roll system.
v) Piece work agreement.

Special Repair;- On the occuration of damages caused by flood, cyclone and other natural calamities repairs will be estimated and the cost of repair will be sanctioned by the

Competent authority for that work. Those are called Special repairs.

Quadrential Repair :-

The repair works taken up at every three Months will be called as quadrential repair) which is required for cleaning of sewer line, over-hawling of the hinges of the door and gate and windows etc, cleaning of surrounding area etc are very much necessary for Maintainance of the structure.

Define "Imprest Money"

Temporary Advance :-

This advance is granted to S.D.O of J.E for Making specific payments on bell in muster roll etc already passed for payment by the Executive Engineer, the account is maintained of expenditure and submitted to the Executive Engineer to be entered in cash book maintained there.

Imprest :-

An Imprest is a standing advance of a fixed sum of money given to Assistant Engineer and Sub Assistant Engineer to enable them to make day to day petty payments for proper discharge of their duties. In the end of the Month an Account for that expenditure will be made and will be sent to Executive Engineer for his knowledge and the balance amount after the expenditure will be noted.

What is RERA? Write down the data of establishment of RERA in odisha.

RERA stands for 'Real Estate Regulatory Authority' which aims to protect the home purchasers and also boosts the real estate investments. It was implimented in odisha 1st May 2017 and notified on 25 th february 2017.

Earnest Money Deposit;—

Earnest Money is an assurance or gurantee in the form of cash on the part of the contracter to keep open the offer for considiration and to conform his intention to take up the work accept in his favour for excution as perforns and conditions in the tender. The amount of earnest money not large it may be deposited in cash in division or sub-division office. The earnest money given by the Contractors except the three lowest tender should be returned with in a week will on 15 days of the except once of the tender if their offers not considirere. The earnest Money of the lowest tenderer whose tender is normaly excepted is kept by the department is securirty deposits for the due to performance of the Construct,

Security deposite;—

This deposite is an amount of Money which shall be deposited by the contracter whose tender has been accepted in order to render himself laible to the department to pay compasasin amounting being if the work is not satisfactory alone according to the specification,