LECTURE NOTE

ON

E&CE-II

FOR

DIPLOMA IN CIVIL ENGINEERING

(5TH SEMESTER STUDENTS)

AS PER SCTE&VT SYLLABUS

PREPARED BY:

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Government Polytechnic, Sambalpur (Rengali)

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Th5. ESTIMATION & COST EVALUATION – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE

The course exposes the students to the techniques and best practices to prepare detailed estimates of roads, bridges, culverts, irrigation structures and PWD works.

B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Create detailed estimate of culverts and bridges
2. Prepare estimates of irrigation structures
3. Prepare estimates of a macadam road and a national highway in cutting and filling
4. Prepare detailed estimates for septic tank and soak pits
5. Prepare detailed estimates of miscellaneous works
6. Comprehend the management practices in Public Works Department
7. Interpret the building bylaws furnished by regulatory bodies

C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1.	Detailed estimate of culverts and bridges	12
2.	Estimate of irrigation structures	14
3.	Detailed estimate of roads	12
4.	Detailed estimates of miscellaneous works	12
5.	PWD accounts works	10

D. COURSE CONTENTS:

1. Detailed estimate of culverts and bridges

1.1 Detailed estimate of a RCC slab culvert with right angled wing walls with bar bending schedule.

1.2 RCC Hume pipe culvert with splayed angled wing wall

2. Estimate of irrigation structures

2.1 Detailed estimate of simple type of vertical fall to given specification

2.2 Detailed estimate of drainage siphon to given specification.

3. Detailed estimate of roads

3.1 Detail estimate of a water bound macadam road

3.2 Detailed estimate of a flexible pavement in cutting / filling

3.2 Detailed estimate of septic tank and soak pit for 50 users

4. Miscellaneous estimates

4.1 Tube well, Piles and Pile cap, Isolated and combined footings.

5. PWD Accounts works

5.1 Works

5.1.1 Classification of work-original, major, petty, repair work, annual repair, special repair, quadrantal repair.

5.1.2 Concept of Method of execution of works through the contractors and department, contract and agreement, work order, types of contract, piece work agreement.

5.2 Accounts of works –

5.2.1 Explanation of various terms

Administrative approval, technical sanction, tender, preparation of notice inviting tender, quotations, earnest money, E-tendering, security deposit, advance payment, intermediate payment, final payment, running bill, final bill, regular and temporary establishment, cash, major & subhead of account, temporary advance (imprest money),supervision charges, suspense account, debit, credit, book transfer, voucher and related accounts .

5.2.2 Measurement book use & maintenance, procedure of marking entries of measurement of work and supply of materials, labour employed, standard measurement books and common irregularity

5.2.3 Muster roll : Its preparation & use for making payment of pay & wages

5.2.4 Acquittance Roll : Its preparation & use for making payment of pay & wages

5.2.5 Labour & labour report, method of labour payment, use of forms and necessity of Submission

5.2.6 Classification of stores, receipt / issue statement on standard form, method of preparation of stock account, preparation and submission of returns, verification of stocks, shortage and excess

5.3 Building BYLAWS and REGULATORY Bodies, Development authorities, types and their levels, RERA etc.

E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT

Chapters 1, 2, 3

F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakraborty.	Estimating,Costing,specification &Valuation in Civil Engineering	Published by author
2	B.N.Dutta.	Estimating &Costing	UBSPD
3	Birdi &Ahuja.	Estimating &Costing	Dhanpat Rai Publication
4	Latest Orissa PWD Schedule of Rates & Analysis of rates		Govt. of Odisha

1. Detailed Estimate of culverts & Bridges.

According to IRC Specification

(i) Culvert : ~~(Linear water way~~ $\frac{\text{Linear water way}}{6\text{m}}$

(ii) Minor bridge ⟶ 6m ~~to 30m~~ above 6m but less than 30m

(iii) Major bridge ⟶ 30m or more than 30m

* Culvert is of two types slab culvert & hume pipe culvert.

* Some common terms :-

(i) Abutments :- Two end supports of a bridge or culvert. (2nos)

(ii) Wing walls :- (4nos) - Sustain embankment of approach.

(iii) Return walls :- (4nos) -

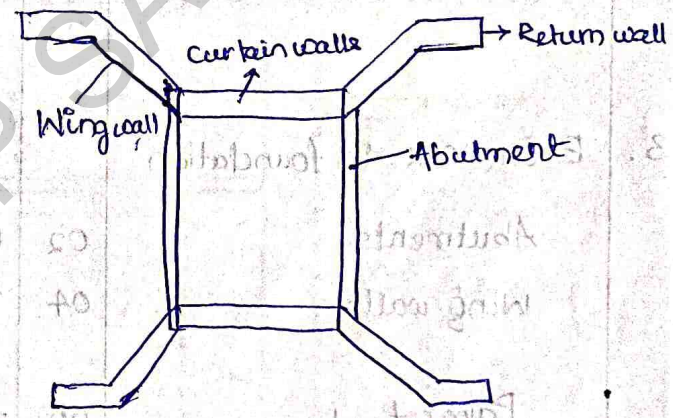
(iv) Curtain walls :- (2nos)

(v) Pier :- Intermidiate supports of a bridge or culvert.

~~(i) Abutments :- Two end supports of a bridge or culvert.~~

(iii) Return wall :-

(1) Return wall is parallel to the centre of road line & return the embankment.



(iv) Curtain walls :-

(i) Curtain walls are built across the streamline or riverline which protects the structure from erosion of soil due to strong current flow of water.

8-15. **Estimate of a simple Slab Culvert**—Prepare a quantity survey for a s ulvert of 1·5m clear span and 4m road way as shown in the fig. 8-15.

The general specifications are as follows :—

Foundation shall be of cement concrete 1 : 2 : 4. Brickwork shall be of 1st. class ement mortar 1:4. Exposed surfaces of brick masonry shall be cement pointed 1:3 carri pto 15cm below G.L. The exposed surfaces of R.C.C. slab shall be given a smooth fini uring centering, and no plastering shall be allowed. The string courses shall be 8cm de nd 12mm thick with cement mortar 1 : 3 finished with neat cement. (Wt. of 16mm a 0mm dia. bars are 1·58kg & 0·62 kg respectively per rm)

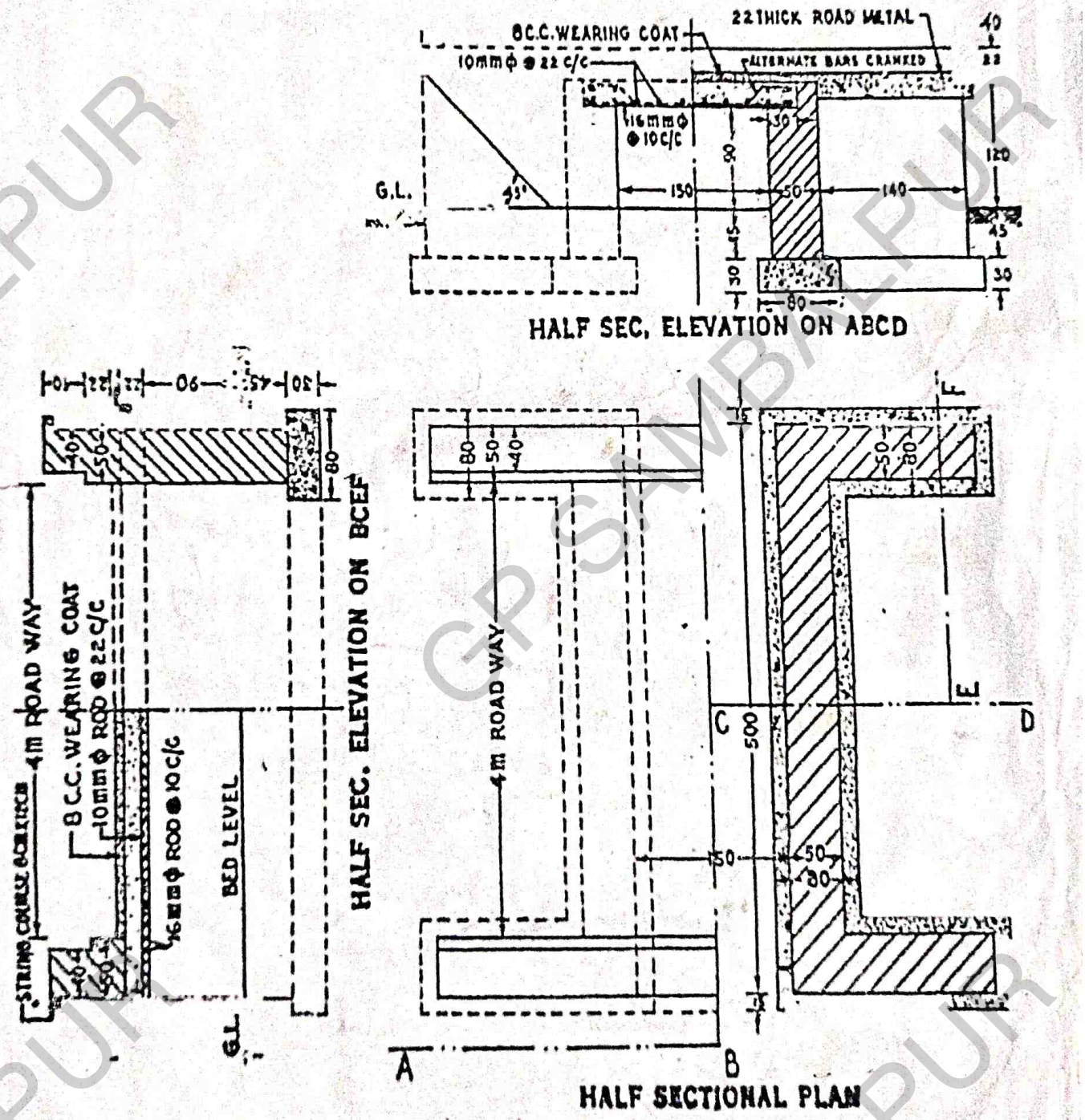


FIG. 8.15

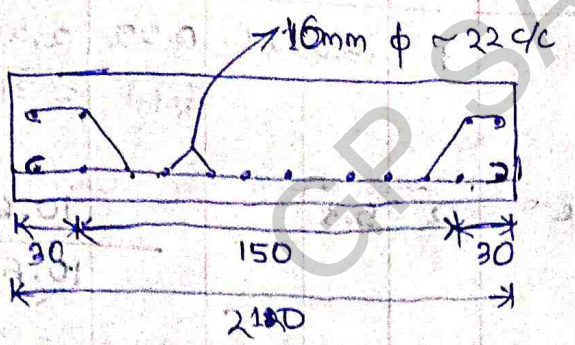
All dimensions are in Centimetre. Scale 1 : 75

1. Estimate of a simple slab culvert.

* Prepare detailed estimate for a slab culverts of 1.5m clear span and 4m roadway as shown in figure 8.15.

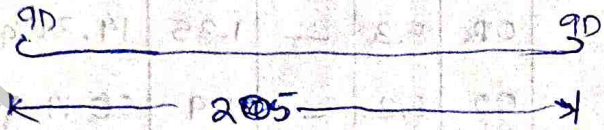
Item No.	Particulars	N	L(m)	W(m)	H/D(m)	Quantity (m^3)	Remarks
1.	Earthwork in excavation						
	Abutments	02	5.30	0.80	0.75	6.36	500+15+15 = 530
	Wingwall	04	1.40	0.80	0.75	3.36	220-80 = 140
					Total =	9.72 cum	
2.	Cement concrete in foundation						
	Abutments	02	5.30	0.80	0.3	2.54	
	Wingwall	04	1.40	0.80	0.3	1.34	
					Total =	3.88 cum	
3.	Brickwork in foundation						
	Abutments	02	5.0	0.5	1.57	7.85 cum	22+90+45 = 157 cm = 1.57m
	Wing walls	04	1.4	0.5	1.57	4.396 cum	190-50 = 140 cm
					Total =	12.246 cum	
	Parapet - 1	02	5.3	0.5	0.3	1.59 cum	D.H = 8+22 = 30
	Parapet - 2	02	5.3	0.4	0.4	1.696 cum	L = 190+150+190 = 530 cm
					Total =	15.54 cum	
	Deduction for R.C.C slab bearing	02	5.0	0.3	0.22	0.66 cum	
					Grand total =	14.88 cum	

Item No	Particulars	N	L(m)	W(m)	H/D(m)	Quantity	Remarks
04	RCC slab	1	5.0	2.2	0.22	2.31 cum	150+30+30=210
					Total	2.31 cum	
05.	8 cm x 12 cm string course	2	5.3			10.6 m	
						10.6 m	
06.	Cement pointed plastering (1:3)						
	Abutments	02	5.0	—	1.05	10.5 Sqm	H = 90+15 = 105 cm
	Facewall & Backwall	02	5.3	—	1.35	14.31 sqm	H = 90+22+8+15 = 135 cm
	Parapet	02	5.3	—	1.9	20.14 sqm	22+10+40+8 +12+8+28+22 = 190 cm
	Parapet ends (50 cm wall)	04	0.5	—	0.22	0.44 sqm	
	(40 cm wall)	04	0.4	—	0.4	0.64 sqm	
	Deduction				Total =	46.02 sqm	
	Facewall	0.2	1.5	—	1.05	3.15 sqm.	
	Triangular earth filling portion	04			Area = 0.98	3.96 sqm.	Area = $\frac{1}{2}$ x 140 x 140 = 0.98 sqm
					Grand total =	38.91 sqm	
06.	Reinforcement :-						
	10 mm ϕ Bottom steel	10	5.13			51.3	L + 2x9xD 4950 + 2x9x10 = 5130 mm
	10 mm ϕ top steel	04	5.13			20.52	
						71.82	L + 2x9xD 2050 + 2x9x16 = 2338
	16 mm ϕ straight steel	25	2.338			58.45	
	16 mm ϕ cranked steel	25	2.538			63.54	
						121.99	
	16 mm ϕ in kg =	121.9	x 1.058		=	192.602 kg	
	10 mm ϕ in kg =	71.82	x 0.62		=	44.528 kg	
						237.13 kg	



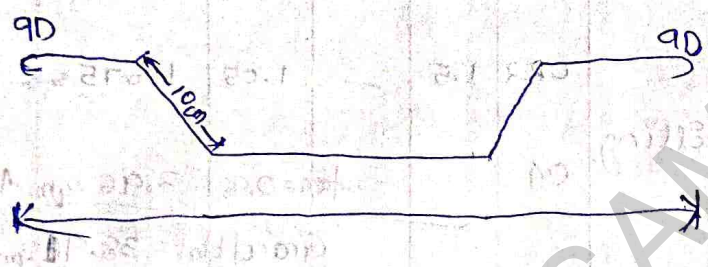
$210 - 25 - 25 = 205$ cm

$= \frac{500 - 5}{10} = 49.5 \simeq 50$ nos



$210 - 2.5 - 2.5 = 205$ cm

$= 2050$ mm



$205 + 2 \times 10$

$2050 + 2 \times 100 + 2 \times 9 \times 16$

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

$500 + 9D + 10cm$

$1 m = 1000 mm$

$1 mm = \frac{1}{1000} m$

Example 1. — Prepare a detailed estimate of a slab culvert of 1.50 metre span and 4.00 metre roadway from the given drawing (Fig. 8.5). The general specifications are as follows :

Foundation concrete shall be of cement concrete 1 : 3 : 6 with stone ballast and coarse sand. Masonry shall be of first class brickwork in 1 : 4 cement coarse sand mortar. Slab shall be of R.C.C. 1 : 2 : 4 with reinforcement as per drawing. Exposed surface of brick masonry shall be cement pointed 1 : 2. Road shall be provided with 10cm thick wearing coat of 1 : 2 : 4 cement concrete. Assume suitable rates.

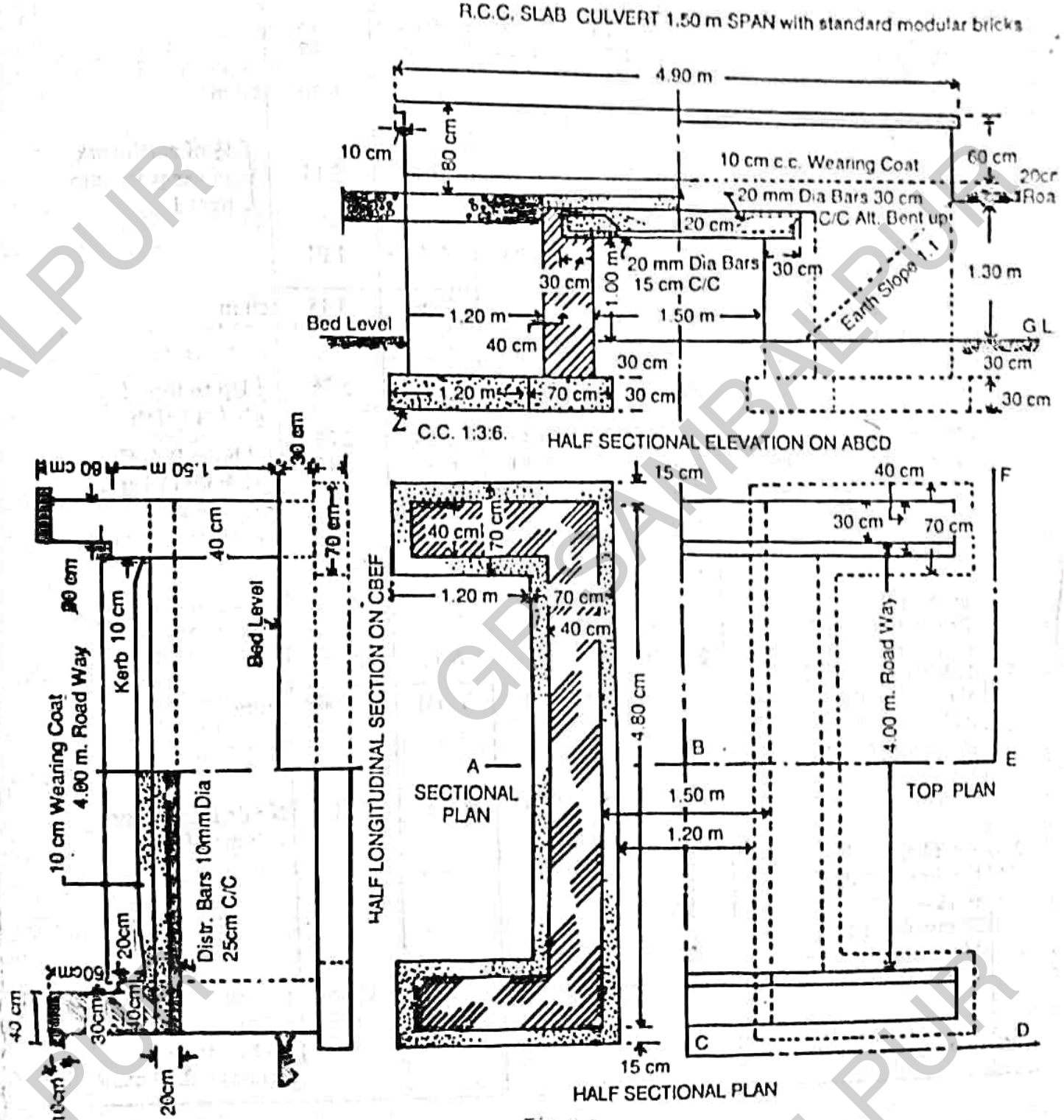
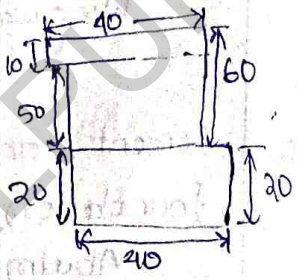


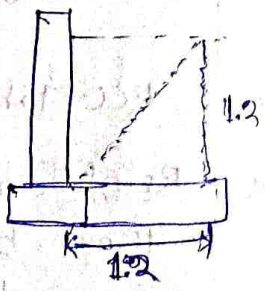
Fig. 8-5

* Prepare a detailed estimate of a slab culvert of 1.5 m span & 4m road way. Foundation concrete shall be cement concrete of 1:3:6. Brickwork shall be 1:4 cement mortar. RCC slab shall be 1:2:4 with reinforcement as per the given drawing.

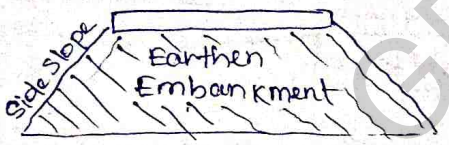
Sl no	Particulars	N	L(m)	B(m)	H(m)	Quantity	Remarks
01.	Earthwork in excavation						
	Abutments	02	5.1	0.7	0.6	4.284 m^3	4.8 + 0.15 + 0.15 = 5.1
	Wingwall	04	1.2	0.7	0.6	2.016 m^3	
						6.3 m^3	
02.	Cement Concrete in foundation						
	Abutments	02	5.1	0.7	0.3	2.142 m^3	
	Wing wall	04	1.2	0.7	0.3	1.008 m^3	
						3.15 m^3	
03.	RCC Slab	1	4.8	2.1	0.2	2.016 m^3	
04.	Reinforcement						
	10mm bottom bar	09	4.93			44.37m	
	10mm top bar	04	4.93			19.72	
						64.09m	
	20mm straight bar	16	2.41			38.56m	
	20mm Hooked bar	16	2.61			41.76 m	
						80.32	
		10mm rod weight = 39.73 Kg					
		20 mm rod weight = 198.4 kg					
05.	1st class Brickwork in 1:4 cement mortar						
	Abutments	02	4.8	0.4	1.50	5.76	
	Wingwalls	04	1.2	0.4	1.50	2.88	
	Parapets	02	4.7	0.4	0.3	1.128	
	Parpets	02	4.7	0.3	0.5	1.41	
	Parapets coping	02	4.9	0.4	0.1	0.392	
						+ 11.57	
	Deduction for slab bearing	02	4.8	0.3	0.2	- 0.576	

Sl no	Particulars	N	L	B	H	Quantity	Remarks
					Grand total →	10.994 cum	
6.	Cement Plastering 1:2 in walls.						
	Abutments	02	4.8	—	1.1	10.56 m²	1.0+0.1 = 1.1
	Facewall & Brickwall	02	4.7	—	1.4	13.16 m²	1.0+0.1+0.2+0.1 = 1.4 m
	End of wing wall	04	0.4	—	1.4	2.24 m²	
	Parapets	02	4.7	—	2.2	20.68 m²	0.2+0.5+0.1+0.1 +0.4+0.6+0.1+0.2 = 2.2
	End of parapets						
	40 cm wall	04	0.4	—	0.2	0.32 m²	
	30 cm wall	04	0.3	—	0.5	0.60	
	Coping	04	0.4	—	0.1	0.16	
					Total →	47.72	
	Deduction for openings	2	1.5	—	1.1	3.3 m²	
	Earth slope	4				2.88	
						- 6.18	
					Grand Total =	41.54	

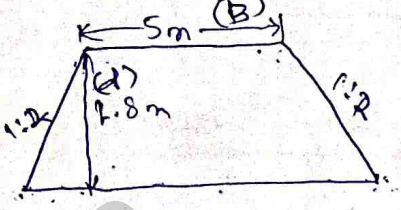




Estimate of Earthwork :-



Q. Length of the Road = 1000m



$1:S = \frac{1}{S} = \frac{V}{H}$

V : H

$$\text{Area} = \frac{1}{2}(\text{upper side} + \text{lower side}) \times h$$

$$= \frac{1}{2} \times 17.2 \times 1.8$$

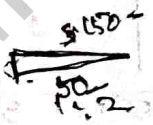
$$= 15.48\ m^2$$

1 : 2 =
V : H =
V = 1.8
H = 2 × 1.8
= 3.6

$$\text{Quantity} = A \times L$$

$$= 15.48 \times 1000$$

$$= 12240\ m^3$$



$$\text{Area} = (Bd + Sd^2)$$

$$= 15.48\ m^2$$

Qu

If slope = 1:3 calculate the area

$$A = (bd + sd^2)$$

$$= 5 \times 1.8 + 3 \times 1.8^2$$

$$= 18.72 \text{ m}^2$$

Quantity = A × L

$$= 18.72 \times 1000$$

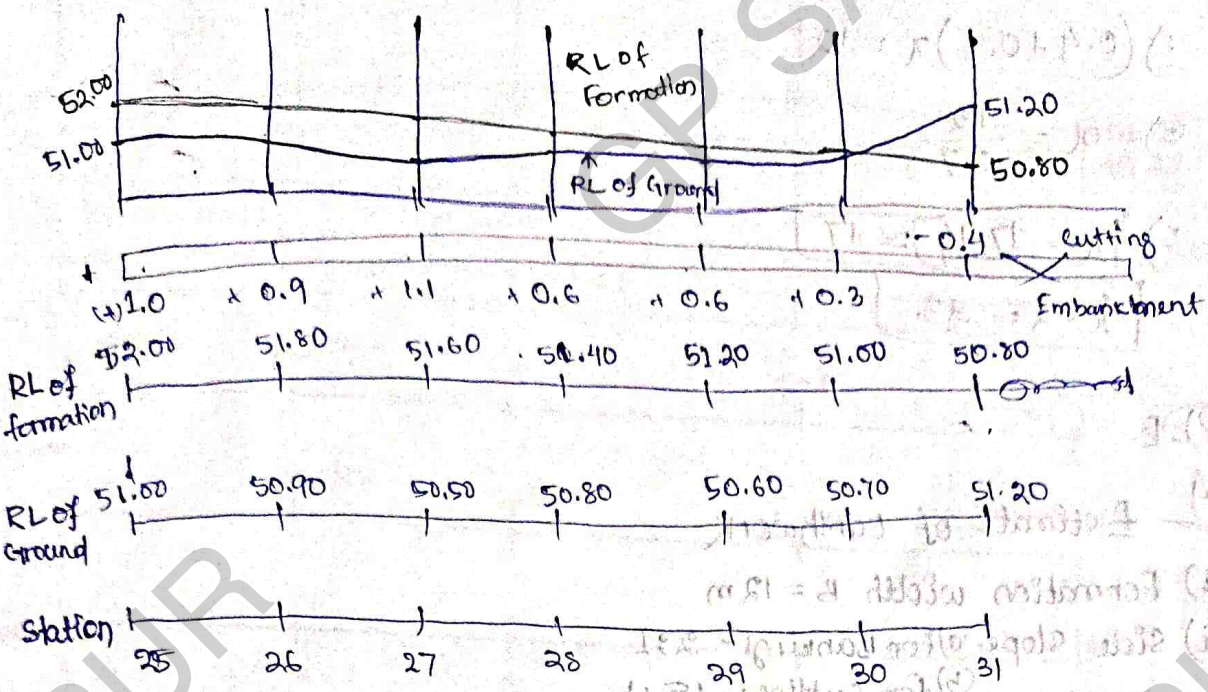
$$= 18720 \text{ m}^3$$

Q.2 (i) formation width, B = 10m

(ii) Side slope are = 2:1 in banking and 1.5:1 in cutting.

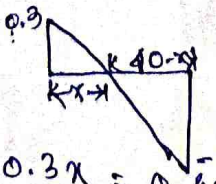
(iii) Length of road = 240m

Station	Dist (m)	RL of ground	RL of formation
25	1000	51.00	52.00
26	1040	50.90	|
27	1080	50.50	
28	1120	50.80	Downward
29	1160	50.60	Gradient
30	1200	50.70	1:200
31	1240	51.20	



~~Station Distance Depth Mean depth Central Area Areas of sides~~

Station	Distance (m)	Depth (m)	Mean Depth (d) (m)	Central Area (Bd) (m^2)	Area of sides (Csd^2) (m^2)	Total Area (m^2)	Length (L)	Quantity (m^3)	
								cutting	Filling
25	1040	1.0							
26	1090	0.90	0.95	9.50	1.805	11.305	40		452.2
27	1180	1.10	1.0	10.00	2.00	12.00	40		480.0
28	1220	0.60	0.85	8.50	1.445	9.945	40		397.8
29	1160	0.60	0.60	6.0	0.72	6.72	40		268.8
30	1200	0.30	0.45	4.50	0.405	4.905	40		196.2
~~30(a)~~ ~~31~~	~~1240~~	~~+0.0 -0.4~~	~~0.05~~ 0.15	1.50	0.045	1.545	17		26.265
30(a)	~~1217~~	+0.0							
			-0.20	-2.0	-0.06	-2.06	23	47.38	
31	1240	-0.40						47.38	1821.265



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

$= \frac{(40-x)0.3}{0.4x} \Rightarrow 12 - 0.3x = 0.4x \Rightarrow 0.4x + 0.3x = 12.$

$\Rightarrow (0.4 + 0.3)x = 12$

$\Rightarrow x = \frac{12}{0.7}$

$\Rightarrow \boxed{x = 17.14 \approx 17}$

$\boxed{40 - x = 23}$

(4) DB.

Q.1 Estimate of Earthwork

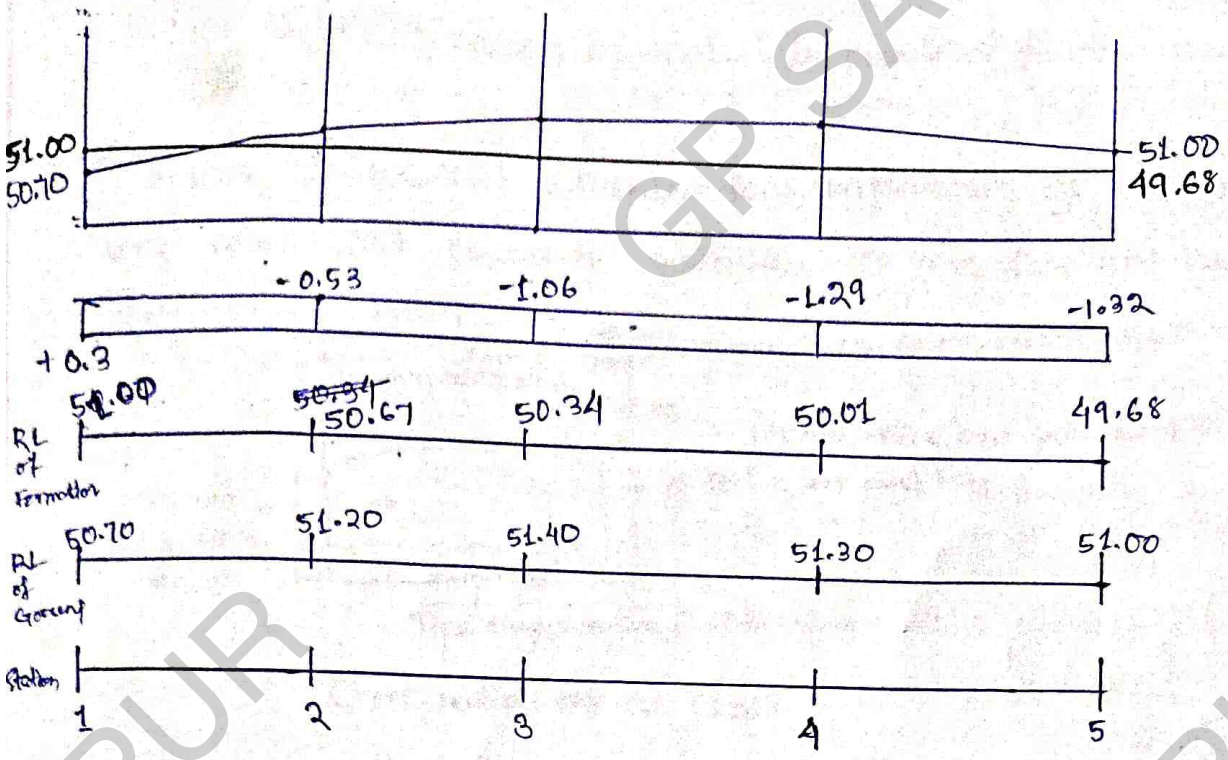
(i) Formation width B = 12 m

(ii) Side slope a) For Banking :- 2:1

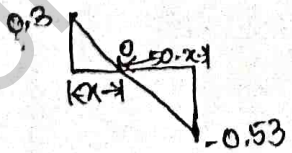
b) for cutting :- 1.5 : 1

(iii) Length of road = 200m

Station	Distance	RL of Ground	RL of formation
01	1000	50.70	51.00
02	1050	51.20	~~Downward~~
03	1100	51.40	↓
04	1150	51.30	Downward Grade
05	1200	51.00	1:150



Station	Distance (m)	Depth (m)	Mean Depth (m)	Central Area (m^2) Bd	Area of sides sd^2 (m^2)	Total Area (m^2)	Length (m)	Quantity	
								cutting	Filling
1	1000	0.3	0.15	1.8	0.045	1.845	18		33.21
1(a)	1018	0.0							
2	1050	-0.53	-0.265	-3.18	0.105	-3.285	32	105.12	
3	1100	-1.06	-0.795	-9.54	0.948	-10.488	50	524.4	
4	1150	-1.29	-1.175	-14.1	2.07	-16.17	50	808.5	
~~5~~ 5	~~1200~~ 1200	-1.32	-1.305	-15.66	2.55	-18.214	50	910.7	
								2348.72	33.21



$$\frac{0.3}{x} = \frac{0.53}{(50-x)}$$

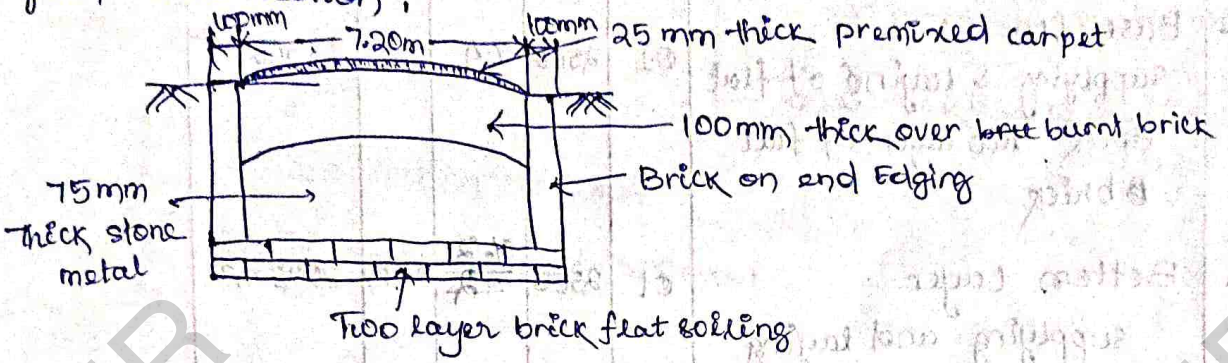
$$\Rightarrow 50 \times 0.3 - 0.3x = 0.53x$$

$$\Rightarrow 15 = (0.53 + 0.3)x$$

$$\Rightarrow x = \frac{15}{0.83} = 18 \qquad 50 - x = 32$$

Estimation of materials required for the road.

Q.5/ Prepare a detailed estimate for construction of 2.5 km long road and calculate quantities of materials for the given cross-section.



Cross-section of the road

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* For 100 mm thick 150 mm loose ~~meth~~ metal

Bitumen

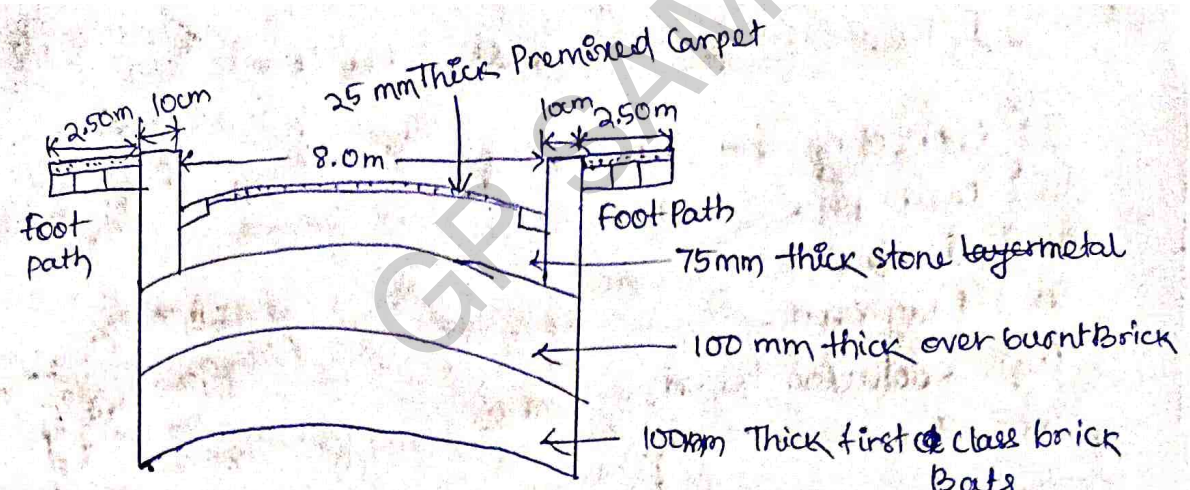
280 Kg per 100 sqm.

for 1 sqm. 0.357 Kg

$\frac{280}{100} \times 15000 = 50400$

Sl No	Particulars	N	L (m)	B (m)	H/D (m)	Quantity (m²/m³)	Remark
1.	Box cutting:	01	2500	7.4	—	18500 m^2	
2.	Brick Edging:	02	2500	—	—	5000 m	
3.	Base Course: Supplying & Laying ~~of flat Brick~~ two layer of flat Brick	01	2500	7.4	—	18500 m^2	
4.	Bottom Layer Supplying and laying of 75mm thick stone metal	01	2500	7.2	0.1125	2025 m^3	
5.	Top Layer Supplying and laying of 100mm thick over burnt brick	01	2500	7.2	0.150	2700 m^3	
6.	25 mm thick premixed carpet (Wearing course)	01	2500	7.2	—	18000 m^2	

Q.6



Cross-section of Road

Length of the Road = 500m

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
1.	Box Cutting	01	500	8.2	—	4100 sqm.	
2.	Brick Edging	04	500	—	—	2000 m	
3.	Base Course:	01	500	8.2	0.15	615 m^3	
4.	Bottom layer:- Supplying and laying of 100 mm thick over burnt	01	500	8.2	0.15	615 m^3	
5.	Top Layer :- Supplying and laying of 75 mm thick Stone metal.	01	500	8.0	0.125	450 m^3	
6.	25 mm thick premixed carpet (Wearing Course)	01	500	7.6	—	3800 m^2	
7.	Bitumen @ 280 kg/100 sqm					10640 kg	
8.	Consumption of fuel @ 0.45 kg per 1 kg of bitumen					4788 kg	10640 × 0.45 = 4788 kg

Estimate for tube well

① Main Pipe
② Strainer
③ Hand Pump
④ Construction of masonry platform
⑤ Brick masonry surface drainage.
⑥ 40mm dia CI plug cutter
⑦ 40mm dia steel plug cutter

* G.I. - Galvanised Iron

For Fig. 1

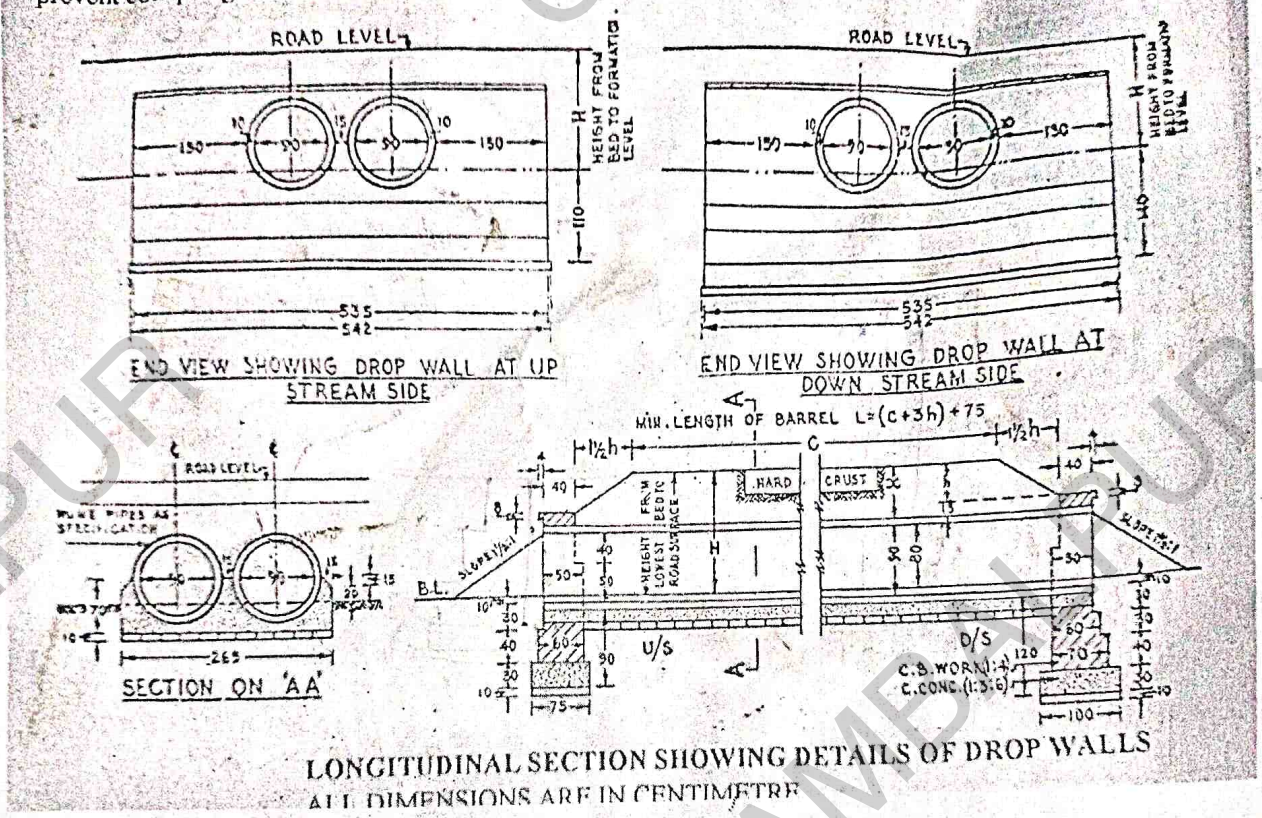
Sl.no.	Particular	Quantity	Rate	Unit	Amount	Remarks
1.	Main Pipe (40mm GI)	86.4	280.25	metre	24213.6	
2	40mm dia strainer	3.6	680 Per 1.8m	metre	1360	$\frac{3.6}{1.8} \times 680 =$
3.	Hand Pump	1	1100	Set or Each	1100	
4.	Construction of masonary platform	1	3410	Each	3410	Assumed rate
5.	Brick masonary surface drain	2	400	metre	800	
6.	40mm dia cast iron plug cutter	1	65	Each	65	
7.	40 mm dia steel plug cutter	1	185	Each	185	
				Total	31133.6 rs	
8.	Labour boring & skill labour for boring tube well.	90		m	13500	
				Total	44632.6 rs	

Q.8 Estimation for tubewell (Fig.-6.2)

(i) Connecting rod with casing
(ii) Main pipe
(iii) Strainer
(iv) Plug cutter
(v) Reducing Socket
(vi) Jam Nut
(vii) Hand pump
(viii) Solid Base or platform
(ix) Surface Drain
(x) Wages for labour and skilled labour
(xi) Contractor Profit

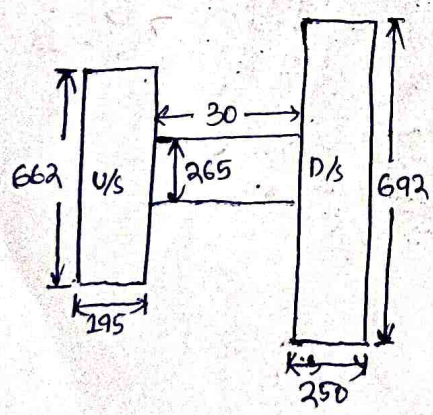
Sl No.	Particulars	Qty.	Rate	Unit	Amount	Remarks
01	Connecting rod with casing	40 m	390	m	15600	- 4 x 10 = 40
02	Main pipe	46.4	28025	m	13004	- 90 - 3.6 - 40 = 46.4
03	Strainer	3.6	680	m	1360	- 1.8 x 2 = 3.6
04	Plug Cutter	1	65	each	65	
05	Reducing Socket	1	150	each	150	
06	Jam nut	6	10	each	60	
07	Hand pump	1	1100	each	1100	
08	Solid base or platform	1	3000	each	3000	
09	Brick masonry surface drain	2	400	m	800	
10	Wages for labour & skill labour	90	150	m	13500	
					48639	
11	Contractor's profit 10%	$= \frac{10}{100} \times 48639$				
		$= 4863.9$				
		Total = 48639 + 4863.9 =			53502.9	

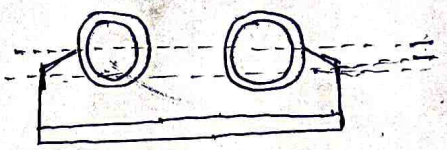
Prepare a quantity estimate for a barrel of 30 cm length (total length depends on the bank height) and the drop walls. In the estimate, the earth cushion whose depth has been indicated by X = 60 cm minimum and the Hard Crust are not to be included. General specification of works are same as mentioned in the drawing. Extra earthwork in excavation shall be considered in the estimate to provide a side slope of 1 : 2 in order to prevent collapsing of earthwork at water level.

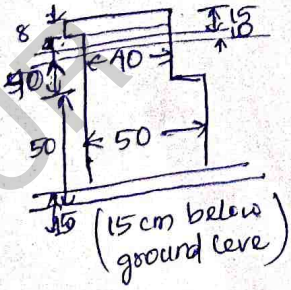


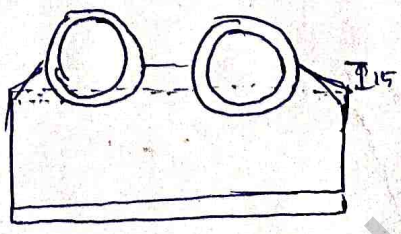
LONGITUDINAL SECTION SHOWING DETAILS OF DROP WALLS

ALL DIMENSIONS ARE IN CENTIMETRE







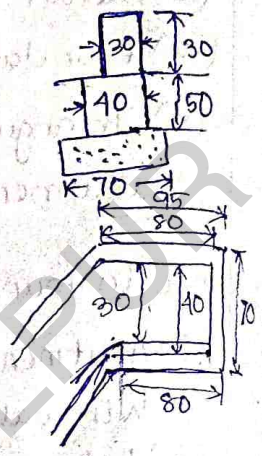


Q.9

Prepare a detailed estimate of hume pipe culvert (Fig 8.14)

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
1.	Earthwork in Excavation						
	(i) Abutments	2	3.10	0.80	0.80	3.97 m^3	
	(ii) Wingwalls	4	2.05	0.75	0.80	4.92 m^3	$\frac{180+220}{2}=2.05$
	(iii) Return walls	1	0.875	0.70	0.80	1.96 m^3	$\frac{95+80}{2}=87.5=0.875m$
	(iv) foundation Bed	1	9.8	3.10	0.15	4.55 m^3	
	(v) Triangular portion of abutments	4	$\frac{1}{2}\times0.8\times0.6=0.24$		0.8	0.768 m^3	
					Total =	16.17	
2.	PCC in foundation						
	(i) Abutments	2	3.10	0.80	0.30	1.488 m^3	
	(ii) Wingwalls	4	2.05	0.75	0.30	1.845 m^3	
	(iii) Return walls	4	0.875	0.70	0.30	0.735 m^3	
	(iv) Triangular portion of abutments	4	$\frac{1}{2}\times0.8\times0.6=0.24$		0.30	0.288 m^3	
	(v) Foundation bed	1	9.8	3.10	0.15	4.557 m^3	10-0.1-0.1=9.8
	(vi) Between the hume pipe	1	9.8	0.508	—	4.9784 m^3	$3.10\times0.35=1.085$ deduction
3.	~~Brickwork in foundation & superstructure~~				Total	13.891 m^3	$3\times\left(\frac{\pi}{4}\times a^2\right)/2$ = 0.577; 1.085 - 0.577 = 0.508
3.	Brickwork in foundation & superstructure						
	(i) Abutments (a) 50 cm walls-	02	4.0	0.50	0.50	2.0 m^3	
	(b) 40 cm walls-	02	3.80	0.40	1.60	1.864 m^3	
	(c) 30 cm walls-	02	3.8	0.3	0.3	0.684 m^3	
	(d) Copings	02	4.0	0.35	0.1	0.28 m^3	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
	(ii) Wing walls						
	(a) 50 cm walls	04	1.1	0.5	0.25	0.55 m^3	
	(b) 10 cm walls	04					
	(i) inclined wall	"	1.8	0.4	0.2	0.576 m^3	
	(ii) Straight wall	"	1.8	0.4	0.3	0.864 m^3	
	(c) 30 cm walls	04	1.9	0.3	0.35	0.798 m^3	$\frac{0+0.7}{2} = 0.35$
	(iii) Turn walls						
	(a) 40 cm walls	04	0.775	0.4	0.5	0.62 m^3	
	(b) 30 cm wall	04	0.75	0.3	0.3	0.27 m^3	
					Total	11.506 m^3	
4.	Hume pipe heavy type 60 cm dia including collar joint (running m.)	03	10.8	—	—	32.4 m	
5.	Cement plastering (1:2)						
	face walls	02	3.10	—	1.40	8.68 m^2	
	Parapet -						
	(i) Outer sides -	02	3.80	—	0.65	4.94 m^2	
	(ii) Inner sides -	02	3.80		0.70	5.32 m^2	
	Wingwalls						
	(i) Outer sides	04	2.3	—	0.85	7.82 m^2	
	(ii) Top	04	2.3	0.3	—	2.76 m^2	
	Turn walls						
	(i) Three sides	04	1.8	—	0.3	2.16 m^2	30+70+80 = 180
	(ii) Top surface	04	0.75	0.3		0.9 m^2	
					Total	32.58 m^2	



#Estimate of 90 cm Dia. double barrel hume pipe culvert.

Sl No.	Particulars	N	L	B	H/D	Quantity	Remarks
01.	Earthwork in excavation						
	Central Portion						
	30 cm length barrel	01	0.3	3.10	0.45	0.418 m^3	
	U/s drop wall	01	6.62	1.95	1.20	15.49 m^3	
	D/s drop wall	01	6.92	2.50	1.50	25.95 m^3	
					Total	41.958	
2.	Brick flat soling						
	U/s drop wall	01	5.42	0.75	—	4.065 m^2	
	D/s drop wall	01	5.42	1.0	—	5.42 m^2	
	30 cm length barrel	01	0.30	2.65	—	0.795 m^2	
					Total	10.28 m^2	
3.	PCC in foundation						
	U/s Drop wall	01	5.35	0.75	0.3	1.203 m^3	
	D/s Drop wall	01	5.35	1.0	0.3	1.605 m^3	
	Double barrel 30 cm length upto depth of 55 cm	01	0.3	2.65	0.55	0.437 m^3	
	Inside the humepipe	0.1	0.3	2.50	0.15	0.1125 m^3	
						3.3575	
	Deduction						
	Half of hume pipe	01	Area = $\frac{\pi}{4} \times 1.1^2 =$	0.95	0.3	0.285 m^3	
					Total	3.0725	
4.	Brickwork in foundation and superstructure						
	(a) U/s Drop Wall						
	60 cm wall	1	5.35	0.6	0.4	1.284 m^3	
	50 cm wall	1	5.35	0.5	0.8	2.14 m^3	
	40 cm wall	1	5.35	0.4	0.65	1.391 m^3	
	Coping	1	5.35	0.04	0.08	0.017 m^3	

Sl.no	Particulars	N	L	B	H/D	Quantity	Remarks
					Total =	4.832 m^3	
	(b) D/S drop wall.						
	70 cm wall	1	5.35	0.7	0.4	1.498 m^3	
	60 cm wall	1	5.35	0.6	0.3	0.963 m^3	
	50 cm wall	1	5.35	0.5	0.8	2.14 m^3	
	40 cm wall	1	5.35	0.4	0.65	1.391 m^3	
	Coping	1	5.35	0.04	0.08	0.017 m^3	
					Total	6.009 m^3	
			Total brickwork =			10.841 m^3	
5.	12mm thick plastering (1:2)						
	U/S & D/S						
	→ faces (15 cm below GL)	2	5.35	—	2.12	+ 11.98 m^2	(15+40+40+10+7 = 112)
	→ Coping & Top	2	5.35	—	0.56	+ 5.99 m^2	1+8+44 = 56
	→ Deduction for pipes openings	2×2	$\frac{\pi}{4} \times 1^2$ =			- 3.8 m^2	
					Total	14.17 m^2	
6.	90 cm dia 10cm thick Hume pipe	2	0.3	—	—	0.60 RM	RM = Running Meter

least 15 cm for bottom ... Example

DRAINAGE SYPHON ACROSS A MINOR

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.

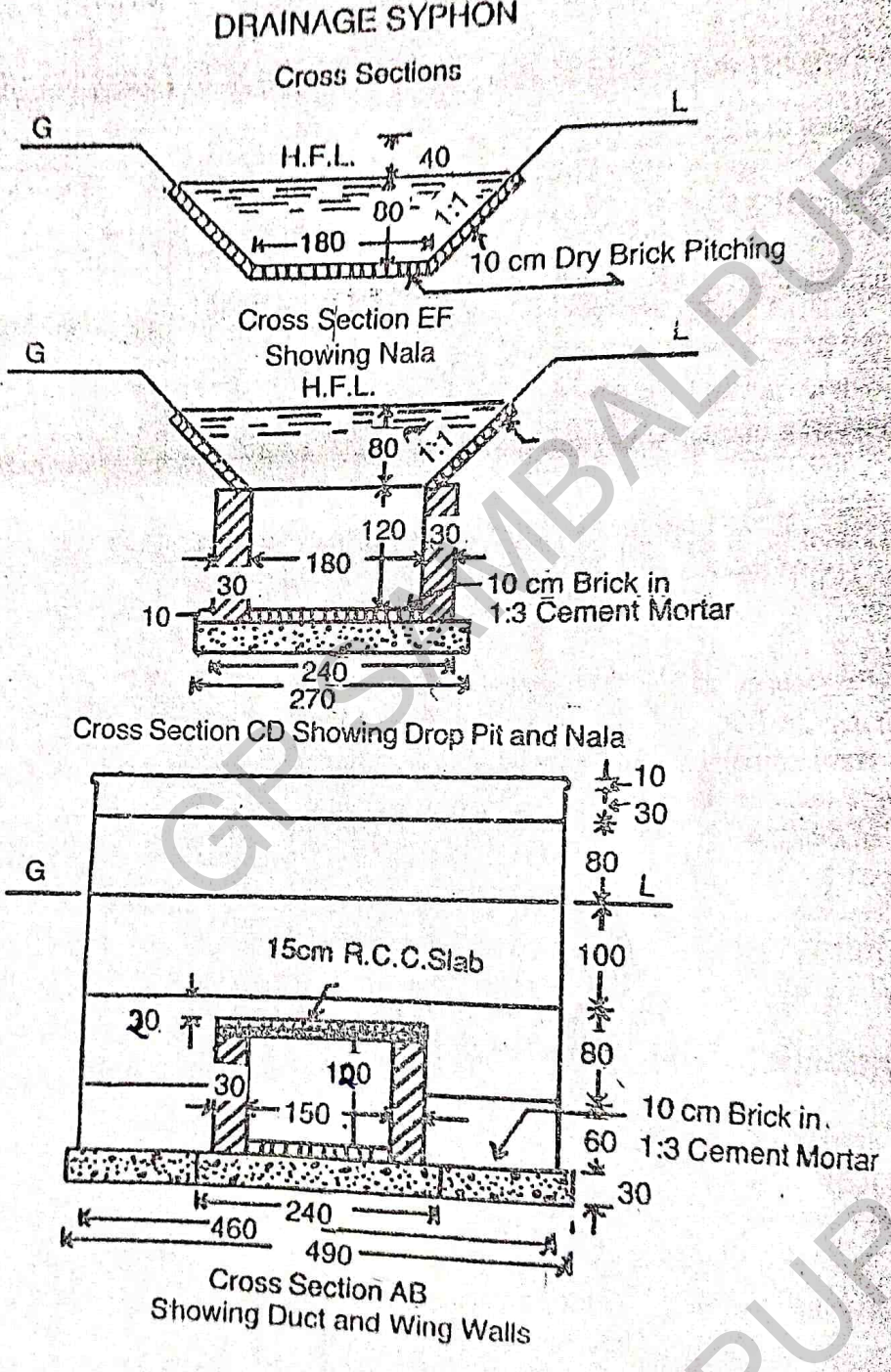


Fig. 9-8

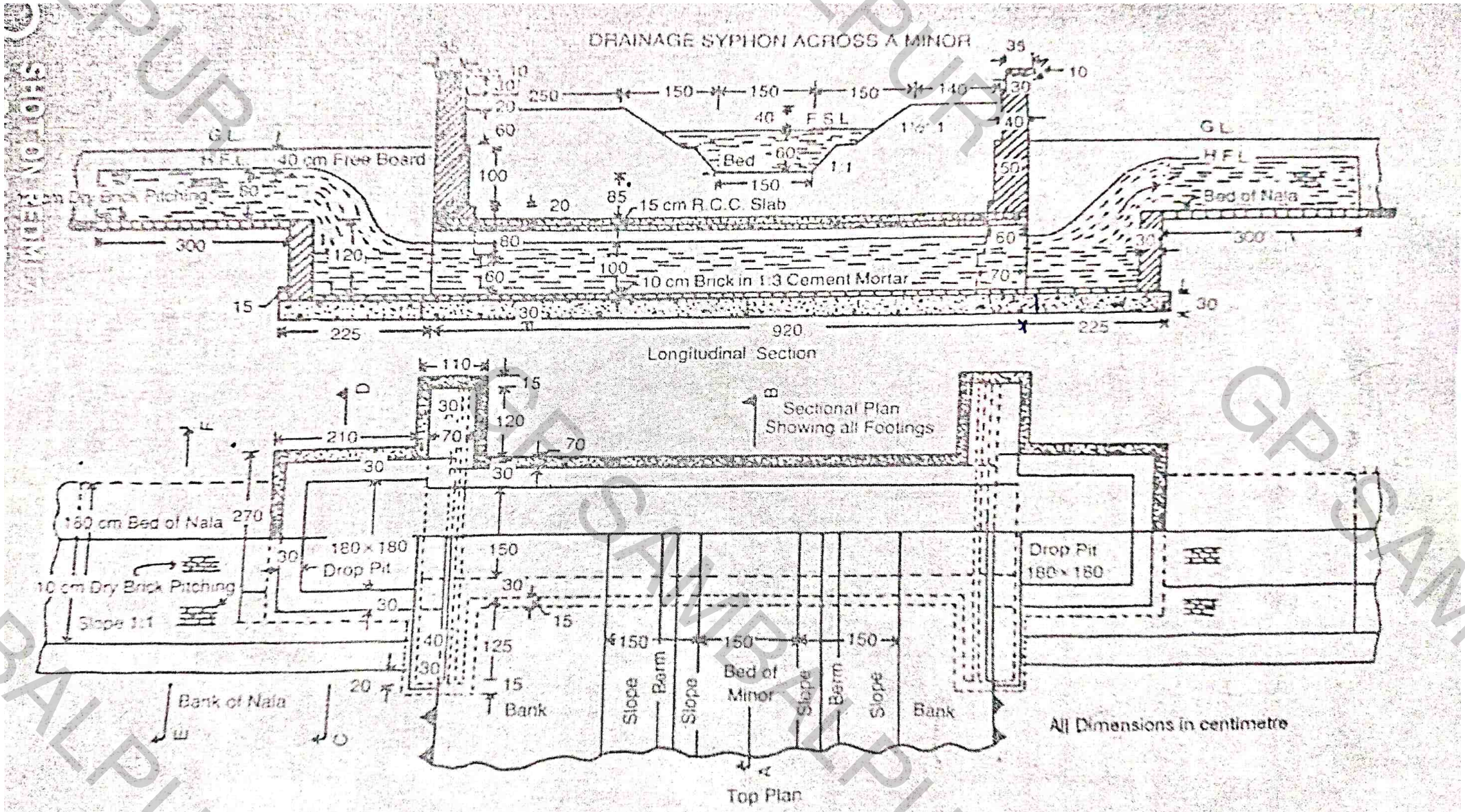
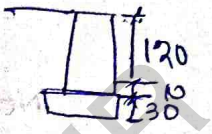

DRAINAGE SYPHON ACROSS A MINOR
G.L
H.F.L
40 cm Free Board
15 cm Dry Brick Pitching
F.S.L
Bed
15 cm R.C.C. Slab
10 cm Brick in 1:3 Cement Mortar
Bed of Nala
Longitudinal Section
Sectional Plan
Showing all Footings
160 cm Bed of Nala
10 cm Dry Brick Pitching
Slope 1:1
180 × 180
Drop Pit
Bank of Nala
Bank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

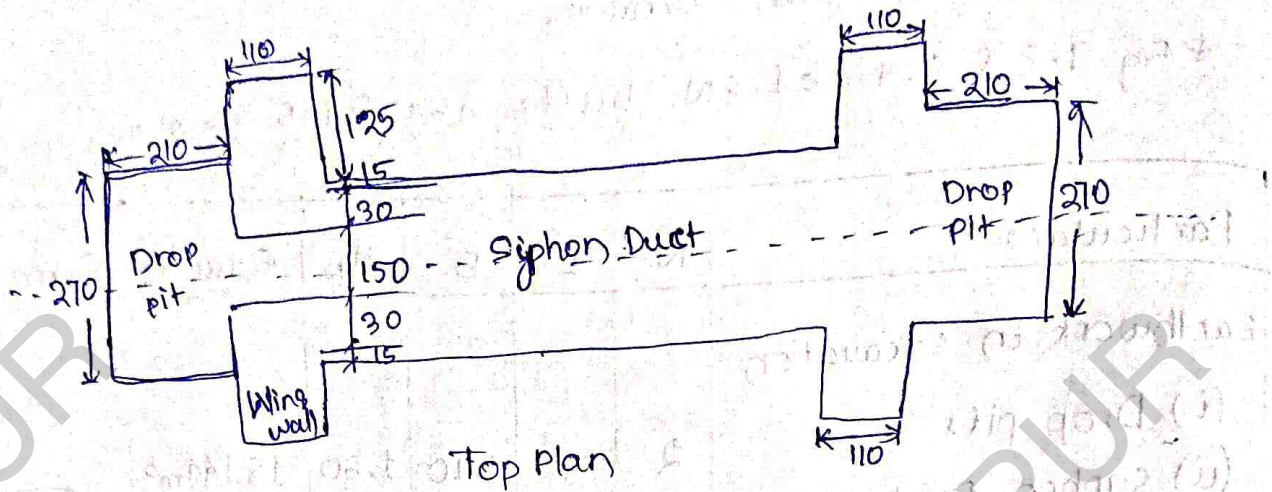
Fig. 9 9

(a) Prepare Detailed Estimate of a Drainage syphon across a minor from the given Drawing

*Fig 9.8 & 9.9 of B.N. Dutta 434 & 435 page no.

Sl No	Particulars	N	L	B	H/D	Quantity	Remark
1.	Earthwork in Excavation						
	(i) Drop pits	2	2.70	2.10	1.60	18.144 m^3	
	(ii) Syphon Duct	1	9.50	2.40	1.60	36.48 m^3	
	(iii) Wing walls	4	1.25	1.10	1.60	8.8 m^3	
					Total	63.424 m^3	
2.	P.C.C in foundation with ~~brick ballast~~						
	(i) Drop pit	2	2.7	2.1	0.3	3.4	
	(ii) Syphon duct	1	9.5	2.4	0.3	6.84	
	(iii) Wing wall	4	1.25	1.1	0.3	1.65	
						11.89	
3.	Brickwork in 1:4 cement mortar						
	(i) Walls of syphon duct	2	9.2	0.3	1.3	7.176	H = 1.2+0.1 = 1.3 m
	(ii) Drop pits	2	6.0	0.3	1.3	4.68	
	(iii) Wingwall below slab (70 cm wall)	4	1.25	0.7	0.7	2.45	
	60 cm wall	4	1.25	0.6	0.6	1.2	
	above the slab						
	60 cm wall	2	4.6	0.6	0.2	1.104	
	(iv) Parapet walls @ 50 cm wall	2	4.6	0.5	1.0	4.6	
	40 cm wall	2	4.6	0.4	0.8	2.944	
	30 cm wall	2	4.6	0.3	0.3	0.828	
	Coping	2	4.7	0.35	0.1	0.329	
						29.311	





No. of drop pit = 2

No. of syphon duct = 1

No. of wing wall = 4

4.	RCC excluding reinforcement						
	(i) Slab	1	9.2	2.1	0.15	2.89 cum	
						2.89 cum	
5.	Dry brick pitching						
	(a) Nala bed	2	3.0	1.8		10.8 sqm	
	(b) Side slope	4	3.0	1.13		13.56 sqm	
						24.36 sqm	
6.	10 cm brick in (1:3)	4					
	(a) Bed of the syphon duct	1	9.2	1.5		13.8 sqm	
	(b) Bed of drop pit	2	1.8	1.8		6.48 sqm	
						20.28 sqm	
7.	Struck pointing with (1:2) cm						
	(i) Onside wall of ~~of supply~~ syphon duct	2	9.2	~~1.2~~	1.2	22.08 sqm	L = 3×1.8 + 2×0.15 = 5.7m
	(ii) Drop pit	2	5.7		1.2	13.68 sqm	
	(iii) Wall top of drop pit	2	6.0	0.3		3.6 sqm	L = 2×1.8 + 2×1 = 6m
	(iv) Parapet wall ~~Eside~~	2	4.6		2.3	21.16 sqm	
	(v) Outer wall of ~~parapet~~ wingwall up to slab top.	2	1.8		1.2	4.32 sqm	
	(vi) Triangular pattern of outer wall	4	0.32			1.28	
						66.12 sqm	

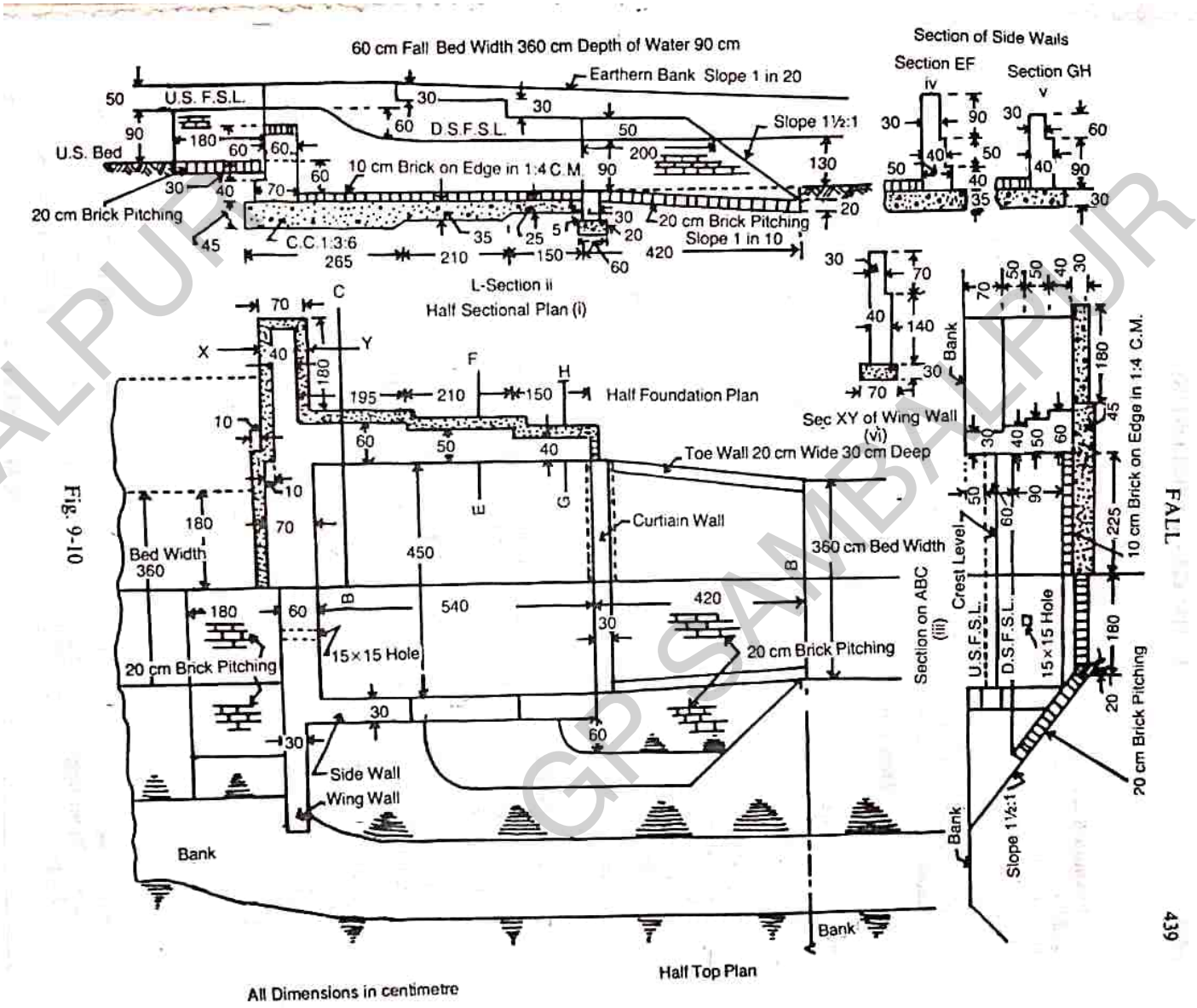


Fig. 9-10

Sl No.	Particulars	N	L	B	H/D	Quantity	Remarks
1.	Earthwork in excavation						
a)	Crest wall & side wall combined						
	1st step	1	2.65	6.0	1.15	18.285 m^3	B = 4.5 + 0.6 x 2 + 0.15 x 2 = 6.0
	2nd step	1	2.1	5.8	1.05	12.789 m^3	H = 0.6 + 0.1 + 0.45 = 1.15 m
	3rd step	1	1.5	5.6	0.95	7.98 m^3	
b)	Wing walls	2	1.8	0.7	1.0	2.52 m^3	
c)	Curtain wall	1	4.5	0.6	1.2	3.24 m^3	H = 0.6 + 0.1 + 0.25 + 0.05 + 0.2 = 1.2
d)	D/s bed beyond curtain wall	1	3.9	4.05	0.8	12.636 m^3	B = $\frac{4.5+3.6}{2}$ = 4.05
e)	~~Pitching~~ Brick pitching beyond curtain in D/s bed	1	3.9	3.65	0.2	2.847	H = $\frac{1+0.6}{2}$ = 0.8
f)	D/s side slopes beyond curtain wall	2	3.1	1.44	0.2	1.785	
g)	Curved slope portion of D/s	2	$\frac{1}{4} \times \pi \times 0.6^2$		0.2	0.1128	
h)	U/s Bed	1	1.8	3.6	0.2	1.296	
i)	U/s side slopes	2	1.8	1.62	0.2	1.622	
j)	Toe wall	2	3.9	0.2	0.3	0.468	
	Deduction Set back distance for junction of crest wall and side wall.	2	0.6	0.1	1.15	-0.138	
					Net total	64.982 cum	
2.	Foundation concrete (1:3:6)						
	(a) Foundation of crest wall side wall combined.						
	(i) 1st step	1	2.65	6.0	0.45	7.155	
	(ii) 2nd step	1	2.10	5.8	0.35	4.263	
	(iii) 3rd step	1	1.5	5.6	0.25	2.1	
	(b) Wing wall.	2	1.8	0.7	0.3	0.756	
	(c) Curtain wall	1	1.5	0.6	0.2	0.54	
					Total →	14.814	

Deduction					
Set back	2	0.6	0.1	0.45	0.054
				Net total →	14.76
3. 10cm Brick on edge in (1:4) cm.					
(a) D/s bed b/w crest wall and curtain wall.	1	5.4	4.5	—	24.3 m²

4.4.	1st class brickwork in 1:4 cm. cement mortar						
	(a) Crest wall (70 cm wall)	1	4.5	0.7	0.4	1.26 cum	
	(60 cm wall)	1	1.5	0.6	0.9	2.43 cum	H = 0.6 + 0.3 = 0.9
	(b) Side wall						
	1st step	2	2.35	0.6	0.4	1.128 cum	L = 1.95 + 0.4 = 2.35
		2	2.35	0.5	0.5	1.175 cum	
		2	2.35	0.4	0.5	0.94 cum	
		2	2.35	0.3	0.7	0.987 cum	
	2nd step	2	2.1	0.5	0.4	0.84 cum	
		2	2.1	0.4	0.5	0.84 cum	
		2	2.1	0.3	0.9	1.134 cum	
	3rd step	2	1.5	0.4	0.9	1.08 cum	
		2	1.5	0.3	0.6	0.54 cum	
	(C) Wing wall						
	1st step	2	1.8	0.4	1.4	2.016 cum	
	2nd step	2	1.8	0.3	0.7	0.756 cum	
	(d) Curtain wall	1	4.5	0.3	0.4	0.54 cum	
	(e) Toe wall	2	3.9	0.2	0.3	~~0.234 cum~~ 0.468 cum	
						16.134 cum	

5	Brick Pitching					
	(a) U/s Bed	1	1.8	3.6	0.2	1.296
	(b) U/s side slope	2	1.8	1.62	0.2	1.166
	(c) D/s Bed beyond curtain wall	1	3.9	3.65	0.2	2.847
	(d) D/s side slope beyond curtain wall	2	3.1	1.44	0.2	1.785
	(e) Curved portion	2	$\frac{1}{4}\times\pi\times0.6^2$		0.2	0.113
					Total →	7.207 cum
6.	Pointing in 1:4 cement mortar					
	(a) Crest wall outer surface	1	4.5	~~2.0~~	2.4	10.8 m^2
	(b) Sidewall					
	1st step	2	1.95		2.3	8.97 m^2
	2nd step	2	2.1		2.0	8.4 m^2
	3rd step	2	1.5		1.7	5.1 m^2
	Top ends of side walls	2	1.1	0.3		0.66 m^2
	(c) Wing walls top	2	~~2.1~~ 3.9	~~0.3~~ 0.2		1.56 m^2
	(d) Top of curtain wall	1	4.5	0.3		1.35 m^2
	(e) Top of toe wall	2	~~0.2~~			1.26 m^2
	(f) U/s side slope of wing wall	2	$\frac{1}{2}\times1.4\times2.1$			2.94
						41.045

H = 0.9 + 0.6

H = 1.8 − 0.1 + 0
= 2.0

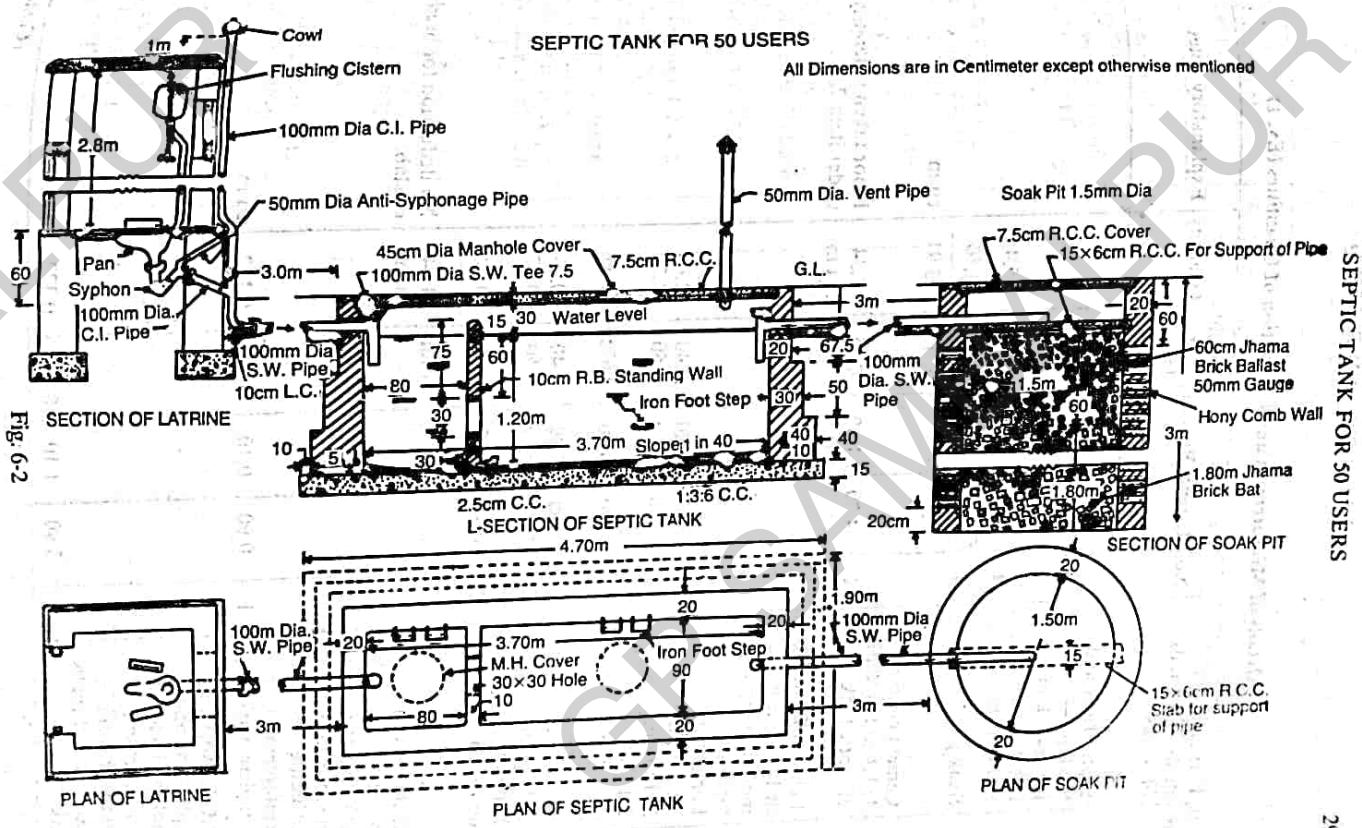

SEPTIC TANK FOR 50 USERS
All Dimensions are in Centimeter except otherwise mentioned
Cowl
1m
Flushing Cistern
2.8m
100mm Dia C.I. Pipe
50mm Dia Anti-Syphonage Pipe
50mm Dia. Vent Pipe
Soak Pit 1.5mm Dia
7.5cm R.C.C. Cover
15×6cm R.C.C. For Support of Pipe
60
Pan
Syphon
100mm Dia. C.I. Pipe
3.0m
45cm Dia Manhole Cover
100mm Dia S.W. Tee 7.5
7.5cm R.C.C.
G.L.
3m
15
30
Water Level
100mm Dia S.W. Pipe
10cm L.C.
75
60
80
30
10cm R.B. Standing Wall
Iron Foot Step
1.20m
3.70m
Slope 1 in 40
10
5
30
2.5cm C.C.
1:3:6 C.C.
L-SECTION OF SEPTIC TANK
20
67.5
100mm Dia. S.W. Pipe
50
30
40
10
15
20cm
1.5m
60
60cm Jhama Brick Ballast 50mm Gauge
Hony Comb Wall
3m
1.80m Jhama Brick Bat
1.80m
SECTION OF SOAK PIT
SECTION OF LATRINE
4.70m
1.90m
100m Dia. S.W. Pipe
20
3.70m
M.H. Cover
30×30 Hole
10
80
Iron Foot Step
90
3m
100mm Dia S.W. Pipe
1.50m
15
15×6cm R.C.C. Slab for support of pipe
PLAN OF LATRINE
PLAN OF SEPTIC TANK
PLAN OF SOAK PIT

Fig. 6-2

Sl No.	Particulars	No.	L	B	H/D	Quantity	Remarks
1.	Earthwork in excavation for foundation.						
	(i) Septic tank	1	1.7	1.9	2.725	15.404 m^3	
	(ii) Soak pit	1	$\frac{\pi}{4} \times 1.89^2$		3.0	8.505 m^3	
						23.909 m^3	
2.	Foundation in concrete (1:3:6)						
	(i) Septic tank	1	1.7	1.1	0.15	1.339 m^3	
3.	2.5 cm cement concrete						
	(i) Bed of septic tank	1	3.7	0.9	—	3.33 m^2	
4.	1st class brick work. (1:4) cement mortar						
	Septic tank						
	* Long side						
	1st step	2	4.5	0.4	0.4	1.44	4.7 − 0.2 = 4.5
	2nd step	2	4.3	0.3	0.25	1.29	4.5 − 0.2 = 4.3
	3rd step up to slab top	2	4.1	0.2	0.675	1.107	4.3 − 0.2 = 4.1
	* Short wall						
	1st step	2	0.9	0.4	0.4	0.255	
	2nd step	2	0.9	0.3	0.5	0.27	
	3rd step upto slab top	2	0.9	0.2	0.675	0.243	
					Total →	4.638 cum	
5.	Reinforced R.B. wall for septic wall (partition)	1	0.9	0.1	1.35	0.121 m^3	H = 1.2 + 0.15 = 1.35 m
6.	RCC included reinforcement						
	(a) Septic tank	1	3.9	1.1	0.075	0.321	
	(b) Soak pit	1	$\pi/4 \times 1.7^2$		0.075	0.170	
	(c) Support for pipe in soak pit	1	1.7	0.15	0.06	0.015	
					Total →	0.506 cum	

Sl No.	Particulars	N	L	B	H/D	Quantity	Remarks
7.	Honey comb wall (a) Soak Pit	1	$\pi \times 1.5$	0.2	3.0	2.83 cum	
8.	Jhamma brick bat in soak pit	1	$\frac{\pi}{4} \times 1.5^2$	—	1.8	3.18 cum	
9.	Jhamma brick ballast 50mm gauge	1	$\frac{\pi}{4} \times 1.5^2$	—	0.6	1.06 cum	
10.	Manhole cover (45cm dia slab of septic tank).	2				2 Nos	
11.	Iron foot step.	8				8 Nos.	
12.	Vent pipe (150 mm dia) with bend.	1				1 No.	

Assignment Questions

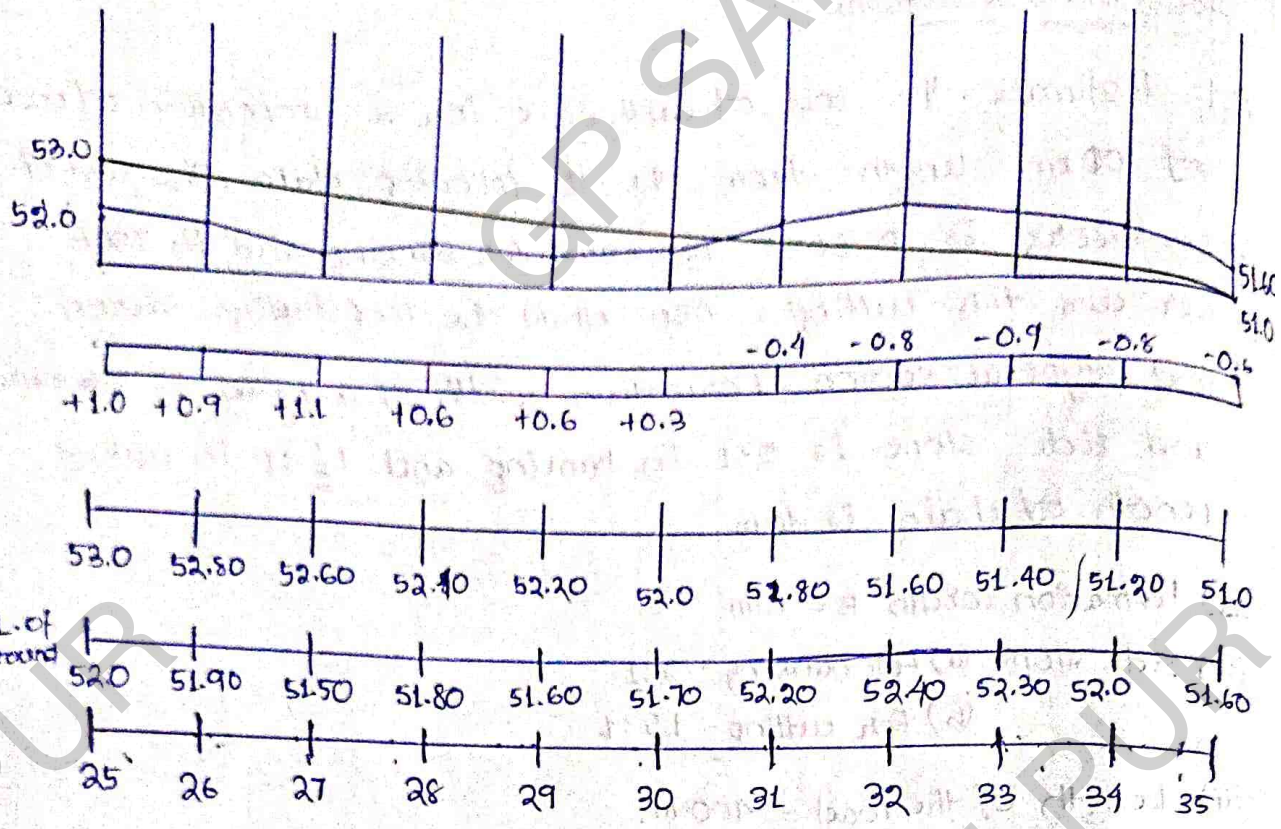
Q.1 Estimate the cost of earthwork for a proportion of road of 400 km length from the 10 following data. The cost of earthwork is Rs. 600/- per cum for banking and Rs. 750/- per cum for cutting. Also draw the longitudinal section and typical section. Formation width of a road is 10 metre and side slope is 2:1 in banking and $1\frac{1}{2}$:1 in cutting. Length of chain is 10 m.

(i) Formation width B = 10 m

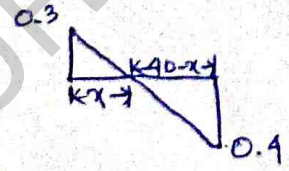
(ii) Side slope (a) For banking - 2:1
(b) For cutting - 1.5:1

(iii) Length of the road = 400 m.

Station	~~R.L. of ground~~ Distance	R.L. of ground	R.L of formation
25	1000	52.0	53.0
26	1040	51.9	↓
27	1080	51.5	Downward gradient
28	1120	51.8	of 1 in 200
29	1160	51.6	
30	1200	51.7	
31	1240	52.2	
32	1280	52.4	
33	1320	52.3	
34	1360	52.0	
35	1400	51.6	



Station	Distance (m)	Depth (m)	Mean Depth (d) (m)	Central Area (Bd) (m^2)	Area of sides (d^2) (m^2)	Total Area m^2	Length	Quantity (m^3) Cutting	Quantity (m^3) Filling
25	1000	1.0							
26	1040	0.9	0.95	9.5	1.805	11.305	40		452.2
27	1080	1.1	1.0	10.0	2.0	12.0	40		480
28	1120	0.6	0.85	8.5	1.445	9.945	40		397.8
29	1160	0.6	0.6	6.0	0.72	6.72	40		268.8
30	1200	0.3	0.45	4.5	0.405	4.905	40		196.2
30(a)	1217	0	0.15	1.5	0.045	1.545	17		26.265
31	1240	0.4	0.20	2.0	0.060	2.06	23	47.38	
32	1280	0.8	0.60	6.0	0.54	6.54	40	261.6	
33	1320	0.9	0.85	8.5	1.083	9.583	40	383.32	
34	1360	0.8	0.85	8.5	1.083	9.583	40	383.32	
35	1400	0.6	0.70	7.0	0.735	7.735	40	309.4	
								1385.02	1821.26



$\frac{0.3}{x} = \frac{0.4}{40-x} \Rightarrow (40-x)0.3 = 0.4x$

$\Rightarrow 12 - 0.3x = 0.4x$

$\Rightarrow 12 = 0.7x \Rightarrow x = \frac{12}{0.7} = 17.14 = 17$

$40 - 17 = 23$

The cost for banking = 600 × ~~1461.26~~ 1821.26

= ~~8,76,756 rs~~ 10,92,756 rs.

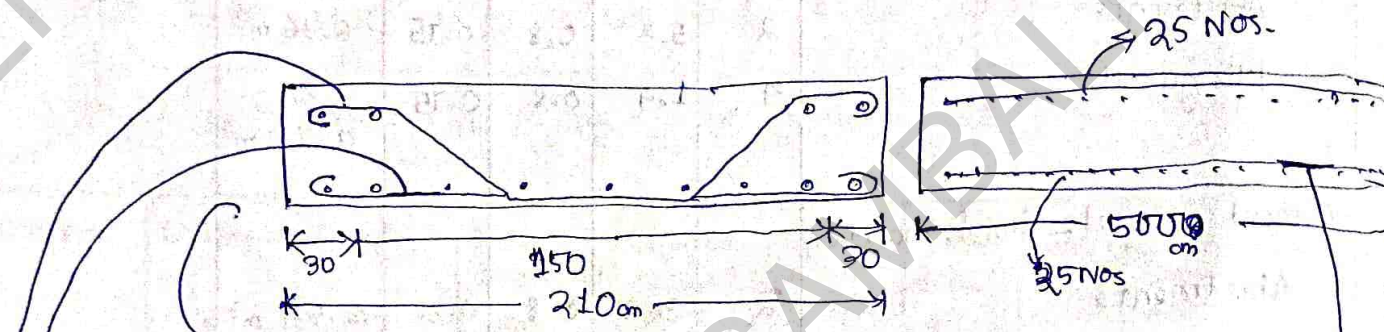
The cost for cutting = 750 × 1285.02

= 10,38,765 rs

Q.2

SL NO.	Particulars	N	L	B	H/D	Quantity	Remarks
1.	Earthwork in excavation						
	Abutments	2	5.3	0.8	0.75	6.36 m^3	
	Wingwalls	4	1.4	0.8	0.75	3.36	
						9.72 m^3	
2.	Cement concrete in foundation						
	Abutments	2	5.3	0.8	0.3	2.54 m^3	
	Wing wall	4	1.4	0.8	0.3	1.34 m^3	
						3.88 m^3	
3.	Brickwork in foundation & superstructure						
	Abutments	2	5.0	0.5	1.57	7.85	
	Wingwall	4	1.4	0.5	1.57	4.396	
						~~12.246~~	
	Parapet (50 cm)	2	5.3	0.5	0.3	1.59 m^3	
	Parapet (40 cm)	2	5.3	0.4	0.4	1.69 m^3	
						15.526 m^3	
	Deduction for R.C.C slab bearing	2	5.0	0.3	0.22	0.66 m^3	
					Grand total =	14.88 m^3	

Sl No	Particulars	N	L	B	H	Quantity	Remarks
A.	R.CC work in slab						
	10 mm ϕ top bars	4	5.13			20.52 m	
	10 mm ϕ bottom bars	9	5.13			46.17 m	
	16 mm ϕ straight bars	25	2.338			58.45 m	
	16 mm ϕ ~~straight~~ cranked bars	25	2.538			63.45 m	



$2100 - 2 \times 25 = 2050 = \frac{205}{16} = 12.81 \simeq 13$ Nos

(∵ d = 16)

$5000 - 50 = 4950 = \frac{495}{10} = 49.5 \simeq 50$ Nos.

$L = 4950 + 2 \times 9 \times D = 4950 \times 2 \times 9 \times 10 = 5130$

$L = 2050 + 2 \times 9 \times 16 = 2338$

$L = 2050 + 2 \times 9 \times 16 + 100 \times 2 =$

Estimation & Cost Evaluation - II

Dt - 13/12/2021

Security Deposit :-

→ Security deposit is an amount of money which shall be deposited by the contractor whose tender has been accepted in order to render himself ~~key~~ liable to the department.

→ After acceptance of the tender of a contractor the earnest money which he has deposited as the time of tender is treated as part of the security money.

→ The security deposit is refundable to a contractor after the maintainance is over.

→ Security money should be 2% of the value of the estimated cost.

Measurement Book (M.B.) :-

→ Measurement for all works done and supplies received in connection with a sanctioned estimate are recorded in a notebook known as measurement book.

→ It contains, details of actual measurements of length, breadth and depth.

→ Each book is provided with extra index, for review by the divisional accountants and for review by the executive engineer.

Technical Sanctioned

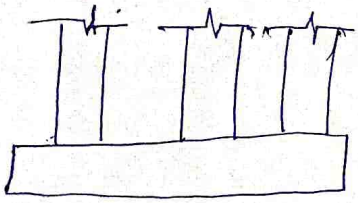
→ Technical sanction means an order of a government authority sanctioning a properly detailed estimate of the cost of a work of construction or repair proposed to be carried out in the public works departments.

→ Technical sanction, which ensures that the proposals are structurally sound and the estimate is accurately calculated.

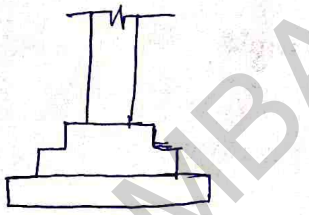
Differentiate between Isolated and Combined footings :-

Isolated footing

→ Isolated footings are commonly used for shallow ~~for~~ foundation in order to carry and spread concentrated loads, caused by columns.



Combined footings



Isolated footings

Combined footing :-

→ Combined footings usually supports two columns or greater than two columns.

→ Combined footings are used when two columns are so closed that single footings can not be used.

→ When one column is located at or near the property line, on that case combined footing should be used.

Labour Report

Daily Report of the day ____ of Dec. 2021,

Labour work on which employed	Class of labour	No. of each	Rate	Approx qty. of work done	Remarks	
Earthwork in excavation	class-IV	12	300	6 m^3		

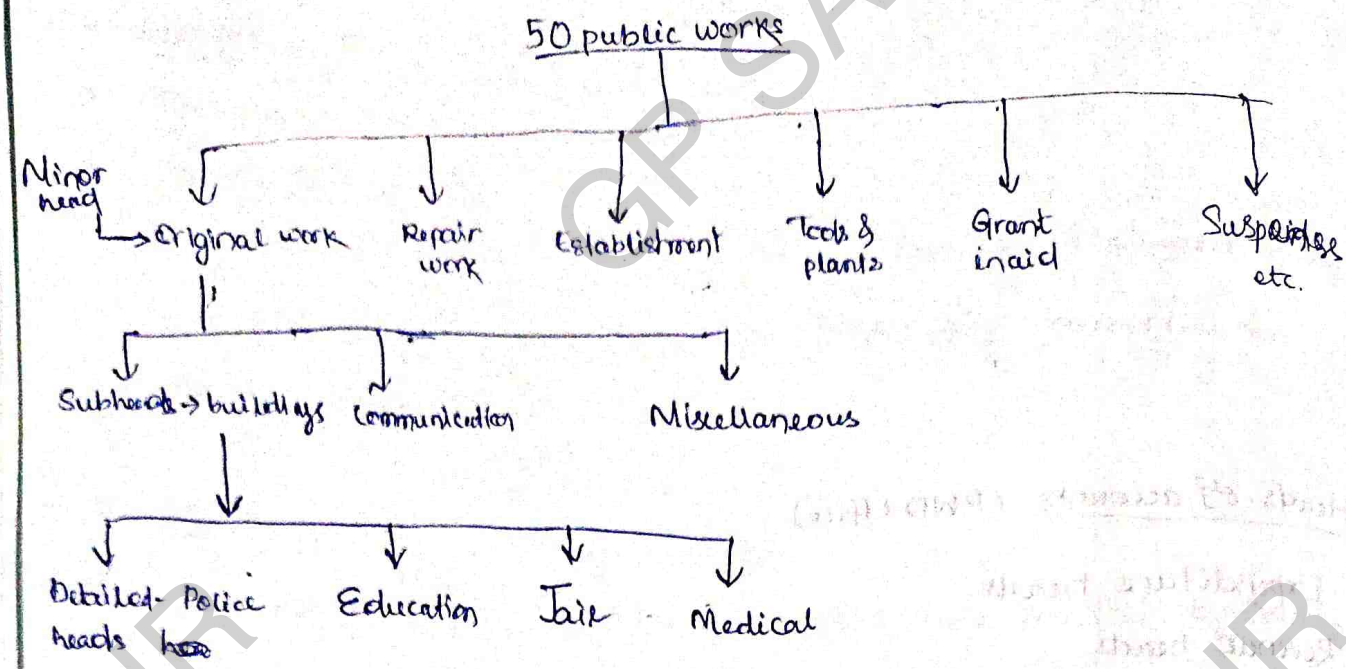
signature

Penalty :-

→ Penalty is a sort of fine for non-fulfillment of terms of ~~contra~~ contracts.

→ The penalty may be a fixed sum per day or a certain ~~progress~~ percentage of the estimated cost upto 10%.

→ Penalty is made for not maintaining the progress of work, for delay in completion and for bad work.



Temporary Advance / Temporary Imprest

→ Advance payment

→ Debit - Expenditure

→ Credit - Receipt

→ Issue Rate

→ Supervision charges = Book value + storage charges

→ Storage charges - Charges for store and maintain are added.

→ Suspense Accounts / heads

→ Measurement Books

Particular	Detailed of Actual Measurement				Content of Area
	No	L	B	H/D	

RERA :- Real Estate Regulatory Authority

10th March 2016 the RERA act was passed in central govt.
25th February 2017 the RERA act was applied in Odisha govt.

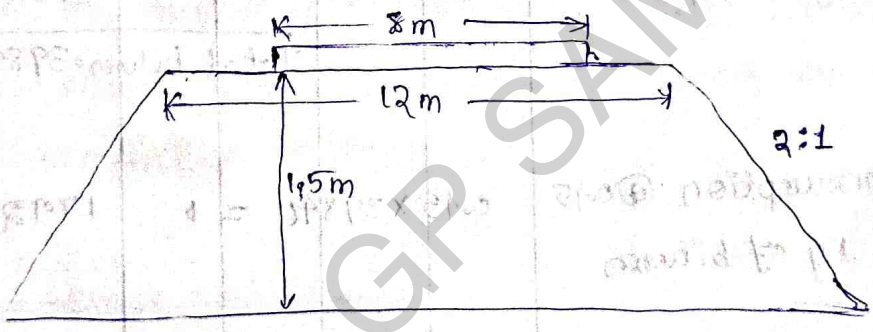
RERA :-

→ RERA stands for Real Estate Regulatory Authority.
→ The main aim of this act is to protect the home purchasers and also boosts the real estate investments.
→ The bill of this parliament of india act was passed on 10 March 2016 by upper house (Rajya Sabha)
→

* Estimate the items involved for the construction of a new state highway of WBM road from the following data:

Length of the road = 2 KM, Formation width = 12m, Metalled width = 8m, Width of permanent land = 35m, Depth of borrow pit = 30cm, Average height of bank = 1.5m (side slope = 2:1), Thickness of grade-I metal soiling = 90mm. Wearing coat of grade-II metal = 12cm loose and compacted to 8cm. Surface to be finished with 2 coats of bitument as given below.

First finising coat = 12mm chips @ 0.025 m^3 and bitumen @ 1.25 kg per m^2 of road surface. Second finishing coat = 6mm chips @ 0.020 m^3 and bitumen @ 1.24 kg per m^2 of road surface. Consumption of fuel @ 0.15 kg per kg of bitumen



$$A = (Bd + sd^2)$$

$$= [(12 \times 1.5) + (2 \times 1.5^2)]$$

$$= 22.5\ m^2$$

SL NO	Particulars	N	L	B	H/D	Quantity	Remarks
1	Earthwork in Embankment	1	2000 × [22.5 m²]			~~22500 m³~~ 45000 m³	
2.	Grade-I (Metal soiling)	1	2000	8	0.09	1440 m³	
3.	Grade-II (Wearing Coat)	1	2000	8	0.12	1920 m³	
4.	Surface finishing						
	(i) (a) 1st coat of 12 mm chips @ 0.025 m³	1	2000	8	~~0.0~~	16000 m²	
	~~(b) Quant~~						
	(b) 2nd finishing coat of 6mm chips @ 0.020 m³	1	2000	8		16000 m²	
	(ii) Quantity of bitumen required:-						
	(a) 1.25 kg per sqm for 1st coat = 1.25 × 16000 =					20000 kg	
	(b) 1.24 kg per sqm for 2nd coat = 1.24 × 16000 =					19840 kg	
				Total bitumen = 39840 kg			
5.	Fuel consumption @0.45 kg per kg of bitumen		0.45 × 39840 =			17928 kg	

(a) Calculate the quantity and cost of the asphalt for the following data :

Length of road = 5 km

Width of road = 6 m

Thickness of asphalt = 15 cm

Density of asphalt = 2330 Kg/m³

cost of asphalt = Rs 6000/ton

Ans =>

Volume of asphalt = $5000 \times 6 \times 0.15 = 1500\ m^3$

Asphalt in Kg = 1500×2330 = 10,485,000 Kg

Asphalt in ton = $\frac{10485000}{1000}$ = 10485 Ton

cost of Asphalt = 10485×6000 = Rs 6,29,10,000/—

(b) Calculate the quantity of metal required for 4.2 m wide macadam road for one kilometer length for one layer of 8 cm compacted thickness.

Solu?

~~Volume of metal = 1000~~

Data,

Length = 1 Km = 1000 m

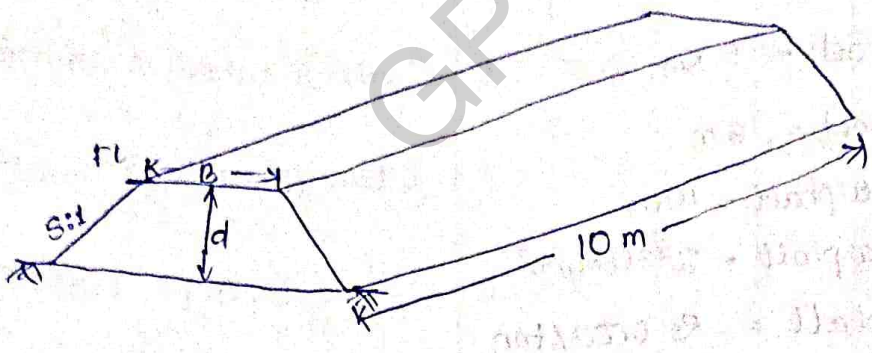
Width = 4.2 m

Thickness = 8 cm

Volume of metal = $1000 \times 4.2 \times 0.08 = 336\ m^3$ (compacted)

For loose metal = $1.5 \times 336 = 504\ m^3$

Q. Calculate the quantity of earthwork for the portion of road.



B = 5 m
d = 3 m
S = 2
L = 10 m

Quantity of earthwork = $L \times$ ~~$(Bd + Sd^2)$~~ A

$= L \times (Bd + Sd^2)$ $(\because A = Bd + Sd^2)$

$= 10 \times (5 \times 3 + 2 \times 3^2)$

$= 330\ m^3$

Q. Calculate the quantity of asphalt in Ton.

Data,
B = 8 m
d = 15 cm = 0.15 cm
L = 2 Km = 2000 m

Density of asphalt = 2330 kg/m³

Ans ⇒
Volume of asphalt = 2000 × 8 × 0.15 = 2400 m³

Weight of asphalt in kg = 2400 × 2330 = 5592000

Weight of asphalt in Ton = $\frac{5592000}{1000}$ = 5529 Ton

Q. A cement concrete road is 2 km long, 8 m wide & 15 cm thick over the sub-base of 20 cm thick consolidated soil gravel. Prepare a detailed estimate of this road.

Soln. L = 2 km = 2000 m

B = 8 m

Thickness of base course = 15 cm = 0.15 m

Thickness of sub base course = 20 cm = 0.2 m

Sl No.	Particulars	Unit	No	L (m)	B (m)	H/D (m)	Quantity	Remarks
1.	Box cutting	Sqm.	1	2000	8	—	16000 m^2	
2.	Metal in sub-base	Cum	1	2000	8	0.3	4800 m^3	Thickness = 1.5X0.2 = 0.3
3.	Concrete Base	Cum	1	2000	8	0.15	2400 m^3	

Module-IV (ECE-II)

- PWD Accounts Works -

Works -

(i) For any original work, the Engg. Deptt./PWD deptt. prepares a proposal on the basis of preliminary estimate, from the requirements & information supplied by the department concerned/user department.

(ii) The department after due consideration approves the proposal with respect to the work and fund & convey their approval or administrative sanction to the engg. department.

(iii) The engg. department then prepares a detailed estimate after necessary surveying, preparing plan and designing. The detailed estimate is then technically sanctioned by the competent authority of the engg. department.

(iv) The detailed estimate is prepared by Assistant Engineer with the help of overseers and with the guidance of Executive Engineer. It is checked & technically sanctioned by the Executive Engineer, if within his competence otherwise sent to higher authorities for technical sanction.

(v) On sanction of the estimate technically and on allotment of fund, the execution work is taken up. The contract is arranged by inviting sealed tenders and work is given to the lowest tenderer generally.

Classification of works -

1) According to their nature, works are classified into two types such as, a) Original work
b) Repair or maintenance work.

Original works - (i) It includes entirely new construction of buildings, bridge, road, dam project etc.

(ii) Additions or alterations to the existing work, that will increase the value of property like addition of rooms, district.

a big room into two rooms etc.

(iii) Special repairs for renovation or for thorough repairs of the damaged works — like changing of roof, changing of floor, changing of doors & windows etc.

Repair/ maintenance works —

(i) It includes repairs required to maintain the work in proper condition as annual repair to buildings / roads etc — Annual repairs, white washing, colour washing etc.

(ii) Minor additions and alterations, which will not increase the value of the property like opening a door, providing sunshade, providing shelves etc.

(iii) Special repairs (SR) — Renovations or renewals of structures or damaged works. It includes minor improvements in the building. Monsoon repair or flood damage repair also come under Special repair.

B) According to the cost of works, original works are classified as major works, minor works or petty works.

Major works — Work costing more than 2 lakhs is called major work & such estimate is called major estimate.

Minor Est works — work costing more than Rs 5000/- but not exceeding 2 lakhs is called minor work.

Petty work — The work whose cost does not exceed Rs 5000/- is called petty work & estimate is called petty estimate.

Types of Repair works —

a) Annual repair or maintenance work (A.R) work — (i) All works and structures are repaired & maintained in proper condition. The normal repair works done annually come under A.R. work.

(ii) All buildings are white washed, colour washed & repaired for minor repairs once in every year.

(ii) For annual repair of buildings, 1-1.5% of the original Construction cost of the whole building is provided. AR work is usually done by inviting tenders or quotations.

(iii) For maintenance & repair, money is allotted in the budget under Annual Repair & maintenance head. Annual repairs are executed by the user department concerned generally.

b) Quadrennial Repair -

(i) Besides annual repair of white washing & colour washing, every fourth year Special repair works are done for thorough repair as painting of doors & windows, patch repair of plastering etc.

(ii) Special repair work every fourth year is called quadrennial Repair.

Contract System -

Contract - Contract is an undertaking by a person or firm to do any work under certain terms & conditions. The work may be construction, maintenance and repair, for the supply of materials, for supply of labours or for transport of materials etc.

Contractor - A person or firm who undertakes any type of contract.

Tender - (i) Tender is an offer in writing to execute some specified work or to supply some specified articles at certain rates within a fixed time under certain conditions of contract. and agreement. between the contractor and the department or owner or party.

(ii) The construction of work is usually done by contract.

(iii) Sealed tenders are invited and the work is usually entrusted to the lowest tender.

(iv) While inviting tenders the bill of quantities, detailed specification conditions of contract and plans and drawings are supplied on payment of the requisite cost to the contractors who tender or quote their rates.

Earnest money –

(i) While submitting a tender the contractor in to deposit certain amount about 2% of the estimated cost with the department as earnest money as guarantee of the tender.

(ii) This amount in for a check so that the contractor may not refuse the accept the work or run away when his tender in accepted.

(iii) In case the contractor refuses to take up the work his earnest money in forfeited.

(iv) This amount in refundable for tenderers whose tender has not been accepted.

(v) This money in encashable at any time and should be in cash. This money may be in the form of deposit in treasury, State bank or any other govt. approved banks approved by the Executive Engineer.

Security money –

(i) On acceptance of the tender, the contractor has to deposit 10% of the tendered amount as security money with the department which in inclusive of the earnest money already deposited.

(ii) This amount in kept as a check so that the contractor fulfills all the terms and conditions of the contract and carries out the work satisfactorily according to the specifications and maintain progress and completes the work in time.

(iii) If the contractor fails to fulfills the terms of the contract his whole or part of the security money in forfeited by the department.

(iv) The security money in refunded to the contractor after the satisfactory completion of the whole work after a specified time usually after one rainy season or six months of the completion of the work.

(v) Instead of collecting the whole security money in one instalment. before starting the work, this can be done by gradually collecting by deduction from the running account bills of the contractor.

(vi) Usually earnest money in taken as part of security money and the balance amount of the security money in collected by deduction from the running account bill of the contractor at 10% of every running bill upto the extent of 10% of the total cost of whole work.

Piece-Work Agreement (PWA) –

(i) Piece work agreement (PWA) is that where only rates are agreed upon without reference to the total quantity of work or time and that involves payment of work done at the stipulated rate.

(ii) Smaller works or piece works up to value Rs 2000/- may be carried out through contractors by piece-work agreements.

(iii) It contains only the descriptions of different items of the work to be done & the rate to be paid for but does not provide the quantities of different items to be executed nor the time in which the work is to be completed.

(iv) Detailed specifications of each items of work and total cost of whole work is included in the PWA.

(v) Contractors have to arrange all materials, labours etc required for the execution of work. There is no penalty clause or no security money in this case & the department may terminate the work at any time they like to but a notice specifying the date of termination should be given to the piece worker/ contractor.

(vi) Urgent small works are selected by taking quotations. Rates of different items should be within schedule of rates and within the sanctioned estimated rates.

(vii) Payment is made on the measurement of the work actually done.

Work order –

→ Smaller works upto Rs. 2000/- may be carried out by work order.

→ This is a contract and specifies the approximate quantities of different items of the work, detailed specifications of each item of work, time of completion of the whole work, penalty clause for not fulfilling the terms and conditions.

→ Payment is made on the measurement of the work done and 10% of the bill amount is deducted from the running account bill of the contractor as security money, which is refundable.

→ Debitable agency can be engaged for bad work or for unsatisfactory progress.

Contract System –

→ In contract system, the work is done through contractors who arrange all materials and labours required for the completion of work in time.

→ A contract agreement (CA) in a bond, the contractor and the department are bound by the terms and conditions of the contract.

→ A CA stipulates the quantities of works & rates, the detailed specifications of various items of the work to be done, the time limit within which the whole work shall have to be completed and various other conditions.

→ Contracts are usually arranged by inviting sealed tenders and the entrusting the work to the lowest tender usually.

Lumpsum Contract –

→ In lumpsum contract, the contractor undertakes the execution or construction of a specific work with all its contingencies to complete it in all respects within a specified time for a fixed amount.

→ The detailed specification of all items of works pertaining to the whole work, plans and detailed drawings and 10% security money deposit, penalty, progress and other conditions of contract are included in the contract agreement.

→ The general specifications and descriptions of different parts of the buildings and dimensions where required are included.

→ The quantities or Schedule of different items of work are not provided, the contractor shall have to complete

the work as per plan & specifications, within the fixed Contract Sum & fixed time irrespective of quantities of different items.

→ On completion of work, no detailed measurement of different items of work is required but the whole work is compared and checked with plan & drawings.

Lumpsum & Schedule Contract —

→ In this type, schedule rates is also provided in the CA.
→ In this system, the contractor undertakes the execution or construction of a particular work at a fixed sum within a specified time as per plans and the detailed specifications and conditions. A schedule of rates of various items of work are also provided which regulates the extra amount to be paid or deducted for any additions and alterations.
→ In this case, no measurement of various items of works involved in the original work is required, but measurement of extra items only shall have to be taken.

Schedule or ~~Item~~ Item Rate contract —

→ In schedule contract, the contractor undertakes the execution or construction of a work on the item rate basis.
→ The amount the contractor is to receive depends on the quantity of various items of work actually done.
→ The CA includes quantities, rates and amounts for various items of work and the total amount of Contract (BOQ with rate) plans and detailed drawings, detailed specifications and deposit of 10% security money / penalty, program and date of completion and other conditions of the contract.
→ This system is used for all works.
→ This system may also be a percentage above or below the printed schedule of rates of the department.

Contract Documents —

→ Before the work is given out on contract an agreement or bond is prepared.
→ The following document shall be attached to the contract agreement or bond which should be duly endorsed and sealed.

→ Each paper shall bear the signature of contractor and the accepting authority and the corrections shall be similarly ~~in~~ initialled. (8)

→ It includes Title page, Index page, tender notice, tender form, Bill of quantities or schedule of quantities, schedule of issue of materials, general specifications, detailed specifications, Drawings ~~and~~, conditions of contract and special conditions of contract.

Labour Contract –

→ In this contract, the contractor undertakes contract for the labour portion.

→ All materials for the construction are arranged and supplied at the site of work by the department or owner. & the labour contractor engages labour & gets the work done according to the specifications.

→ The contract is on item rate basis for labour portion only and the contractor is paid for quantities of work done on measurement of different items of work at the stipulated rate in the CA.

→ Contractor uses his own tools ~~& plants~~ for working but the department arranges plants & machineries.

→ This system of contract is not generally adopted in the Govt. department. Private buildings are however constructed by labour contract system, which is less troublesome.

~~Labour~~ Cost Plus percentage Contract –

→ In this system, contractor is given certain percentage over the actual cost of the construction as his profit.

→ Contractor arranges materials & labour at his cost and keeps proper account & he is paid by the department the whole cost together with certain percentage say 10% as his profit as agreed upon before hand.

→ An agreement is prepared with all conditions of contract in advance.

→ In this case, proper control in the purchase of the materials and in labour shall have to be exercised by the dept. or owner.

Daily Labour engaged by Contractor –

→ Normally, labourers should not be engaged and paid through contractors, except in the worst case.

→ When quantities of work done are not paid through suitable measurement & rates, it is permissible to pay the contractor on the basis of no. of labourers employed day-to-day at current rates a profit or Commission being included in the rate or paid separately on lumpsum or percentage basis.

→ When payment on measured work is not possible, a record of the number of labours employed day to day should be kept by the overseer incharge and the report submitted to Assistant Engineer or Executive Engineer to enable him keep a check on the work and expenditure & to deal with contractor's claim.

→ Works sometimes may be executed departmentally by employing daily labour as masons, coolies, blacksmiths, carpenters etc, which is maintained by muster "muster Roll System."

Accounts of works –

Explanation of various terms –

Administrative Approval (A.A)

(i) For any work or project required by the department, an approval or sanction of the competent authority of the department with respect to cost and work is necessary at the first instance.

(ii) A.A denotes the formal acceptance by the department concerned of the proposal & after the AA is given the engineering department (PWD) takes up the work and prepares detailed design, plans and estimates and

then executes the work.

(iii) The engg. department prepares approximate estimates and preliminary plans and submits to the department concerned for Administrative approval.

Technical sanction—

(i). Technical sanction means the sanction of the detailed estimate, design calculations, quantities of work, rates and cost of the work by the competent authority of the engg. department.

(ii) After the technical sanction (TS) of the estimate given, then only the work is taken up for construction.

(iii) In case of original work, the counter signature of the local head of the department should be obtained in the plan and estimate before technical sanction is accorded by the engg. department.

(iv) The power for T.S. differs from state to state financially.

Contigency Budget—

→ It is an amount of money that is included to cover potential events that are not specifically accounted for in a cost estimate.

→ The purpose is to compensate for the uncertainty inherent in cost and time estimates as well as unpredictable risk exposure.

→ The amount allotted for contingency and details of what is intended to cover may be laid out in documents shared with the clients and may be only specified within the project management organisation.

→ This money is on reserve and not allocated to one area of work and simply "insurance"

against other cases.

Tender Notice –

→ Tender for work or supply are invited by issuing tender notice in prescribed form.

→ On the tender notice, the following particulars are given,
(i) Name of the authority inviting tender
(ii) Name of the work and its location.
(iii) Estimated cost
(iv) Time of completion
(v) Cost of complete set of tender forms and conditions.
(vi) Date, time and place of tender
(vii) Amount of earnest money and Security money
(viii) validity of tender.

→ Tender notice is posted in the notice board of the department and for major work, the tender notice in brief is also given in the newspaper.

Submission of tender –

According to the directions contained in the notice inviting ~~tender~~ tenders (NIT), the contractors are required to submit their tender on or before the date & hour fixed for the same, duly filled in, signed and witnessed. Before that he has to deposit the earnest money in the manner prescribed in the P.W.D form–6.

Opening of Tenders –

→ The sealed tenders received are to be opened in the presence of contractor or their representatives tending for the work at the time & place already notified.

→ The divisional accountant should be requested to remain present on such occasion. The officer opening the tenders has to read out the rates offered in case of item rate and percentage rate of tenders and amount in case of lumpsum tenders for information of all those present.

→ The tenders which are not received in the proper form duly filled in or signed and are not supported

by requisite earnest money are to be summarily rejected and a record of such cases to be kept in the Register of tender received.

Comparative statement of tender—

→ Comparative statements of percentage rates and lumpsum tenders are made out by the officer opening the tender in PWD form-13 himself.

→ Comparative statement of item rate tender is more elaborate and comprehensive and is drawn up by the Office in PWD Form-14 after thorough computation and check under supervision of the Divisional Accountant.

→ On the basis of the comparative statement, the divisional officer has to make intelligent scrutiny himself. It must correctly incorporate the rates and amounts and the totals drawn up and checked on the individual tenders.

→ A mistake in it may lead to the work being awarded to a contractor who is not lowest.

Payment to Contractors— The payment to contractor may be made finally by one payment when the work is completed or by number of payments by running account bills during the progress of the work.

→ Usually payment are made on running account (RA) bills and the final payment is made on the completion of the work.

Bill— Bill is the account of work done or of supply of materials made and includes the particulars and quantities of work done or materials supplied, their rates and the amount due. Reference to agreement No. is also given in the bill.

Voucher— Voucher is a written document which deals with proof of payment made. After the payment made, bill becomes voucher document which is kept in record.

Advance Payment—

→ This means payment made on a running account bill to the contractor for work done by him but not measured.

→ It is not generally made to contractor, but under special cases when the work is sufficiently progressed but measurement can not be taken for certain valid reasons, on certificate of the Asst. Engineer in charge of work that the value of the work done is in no case less than the advance payment made or proposed to be made and the detailed measurement will be taken as soon as possible.

First & Final payment—

The term indicates a single payment made for a job or contract on its completion. In this case, the payment finished after one payment after the completion of the work. This is applicable to small work.

On account or running or interim payment—

→ This means payment made on a running account to the contractor for works done or supplies made by him duly measured and entered in the measurement Book (MB) when only a part of the whole work or supply has been done and the work or supply is in progress.

→ During the progress of the work the contractor is paid time to time and when the contractor has done some progress he is paid upto the extent of work done by him.

Final Payment–

→ This means the payment made on running account made to a contractor on the completion or termination of his contract and is full settlement of the account.

→ The bill on which final payment is made is called "Final Bill."

Regular establishment–

(i) Both permanent & temporary employees of the department are included in regular establishment.

(ii) The salaries and allowances are drawn monthly on regular pay bills from the treasury in prescribed form.

(iii) The payment to each is made after taking receipts (Stamped signature) on the pay bill.

(iv) The salary is met from the budget grant under the head establishment.

(v) Permanent establishments are not liable for retrenchment and they are entitled for leave, pensions and other amenities as per service rule.

Temporary Establishments–

Temporary establishments are employed when the work is increased and their services can be terminated at any time with proper notice as per rules.

Cash– The term cash includes legal tender coin notes, cheques payable on demand, remittance transfer receipts and demand drafts. A small supply of revenue stamps maybe kept as a part of cash balance.

Heads of the account -

The transaction of public work offices are grouped under the following heads.

(1) Expenditure heads - Expenditure heads are for charges adjustable finally in the account of divisional offices.

(2) Revenue heads - These heads are for revenue receipts creditable finally to the government in the account of divisional office.

(3) Remittance heads - These heads are for receipts as well as for payment of cash, Stores of other values received from, or paid to, or on behalf of other departments or governments.

(4) Debit or deposit heads - These heads are for certain receipts and payments held in suspense till such time as they are cleared by payment or recovery.

(5) The transaction under each of these heads are further sub-divided for the purpose of accounts.

(6) In case of expenditure and revenue heads, the main unit of classification is called the major head. A major head is divided into minor heads and each of the minor head is further subdivided into Detailed heads.

(7) In some cases, the minor heads are divided into Subheads which is again divided into detailed heads

Major Revenue heads -

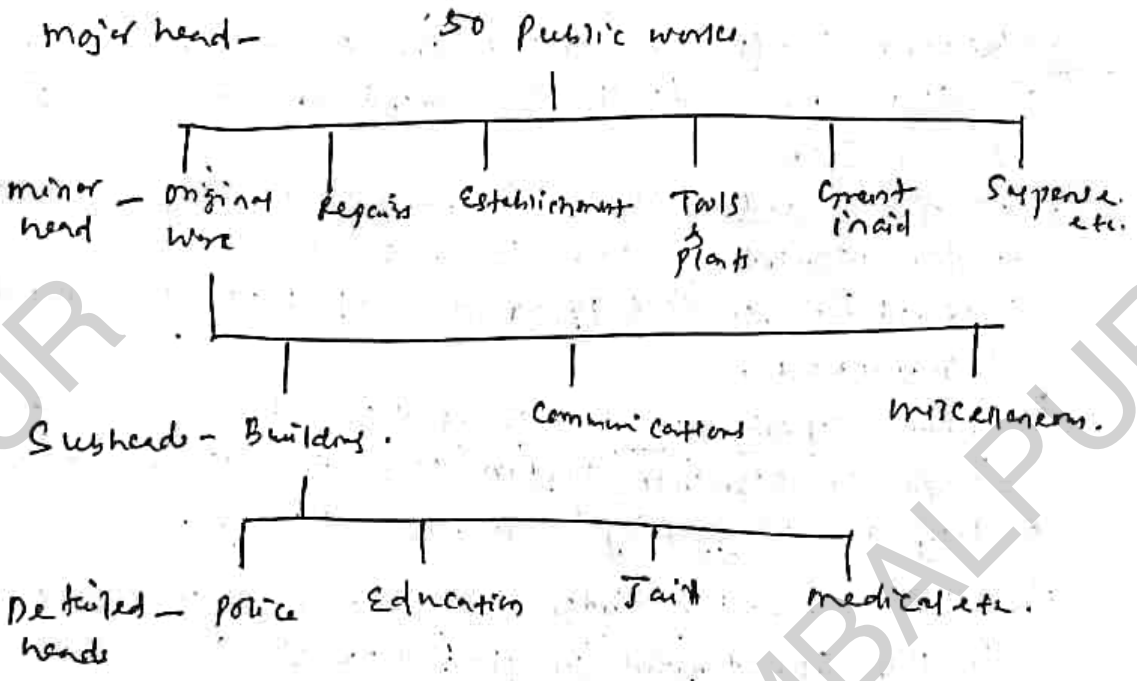
It includes, multipurpose river schemes, irrigation and electricity schemes; Public works including Roads and schemes of misc. Public improvements.

Major Expenditure heads -

It includes multipurpose river schemes, irrigation, electricity schemes, capital account of multipurpose river schemes; irrigation & electricity schemes with revenue account.

⑧ The details of account heads for all receipts and payments are given in public works account Code in financial handbook, budget manual etc.

Example –



Temporary Advance/Temporary Imprest –

→ It is the amount which is advanced by a Disbursing officer to a Sub-ordinate officer to enable him to make a number of specific payment out of a muster-roll or any other voucher which has already been passed for payment.

→ The amount of temporary advance should be closed as soon as possible.

→ The maximum amount of temporary advance depends on the security of the Sub ordinate officer usually upto Rs. 2500/- or on the discretion of the Executive Engineer.

→ The temporary advance amount is advanced for payment of passed bill, while the permanent imprest amount is advanced for payment of unpassed bills as and when required.

Debit — Debit means expenditure. when an amount is to be debited to a work means the amount in to be shown as expenditure of work.

Credit — Credit means receipts. when an amount in to be Credited to a work it means that the amount in to be shown as receipt under the work.

Issue rate — (i) It denotes the cost per unit fixed on the articles of stock for the purpose as calculating the amount Creditable to the subhead concerned of stock account when issued from stock.

(ii) It is fixed for each article of stock on the basis of actual cost plus other expenses including storage charges.

(iii) It is fixed on the principle that there may not be ultimate profit or loss in the stock account and the rate should include the actual cost of the materials in the cost of transport, expenditure on work charged establishment for handling and keeping initial record expenditure on the custody of stock, watch and ward, expenditure on the maintenance of store godown or yards.

Supervision charges —

→ This is ordinarily applied to the charges which are imposed in addition to the book value and storage charge in respect of stock material sold or transferred and are intended to cover such items of expenditure incurred on the stores as do not enter the book value and are not included in storage charges.

Storage charges — It means expenditure incurred on ~~Storage~~ store materials after the acquisition of Stores, on work charged establishment employed on handling and keeping initial accounts the custody of Stocks and the maintenance of Store godown or yards etc. and added on a percentage basis of the cost so as to form part of the issue rate.

Suspense Accounts —

→ Suspense accounts/heads are such that are reserved for temporary booking of the transactions of following nature.

(i) When the final head of account to which cost is ultimately debitable cannot be determined at once.

(ii) When the materials have been received from a supplier or some other division and the bills of same have not been received.

(iii) To watch recovery of cost of materials on their sale and of other shortages, pending adjustment by recovery or otherwise.

→ Minor head "Suspense" is divided into five Sub heads like Purchase, Stock, Miscellaneous P.W. advances, London Stores and Workshop Suspense.

Measurement Book (M.B.) —

→ The measurements of all works and supplies are recorded in the measurement book (Form No-23) and payment of all works and supplies are made on the basis of measurement recorded.

→ This is a very important account record;

Form-23 (Measurement Book)

Particulars	Details of actual measurement				Contents of area
	NO	L	B	D	

→ All MBs are numbered serially and a register is maintained in the divisional office showing the serial number of each book, the name of the SDO to whom issued, the date of issue, date of return and remarks. A similar record is also maintained in the Subdivisional office.

Points to be observed in recording measurement in MB -

(i) The measurements are recorded by the executive or assistant Engineer or Sectional officer to whom measurement books have been issued for the purpose.

(ii) The measurement of the works are taken accurately and recorded neatly for the different items of works for the respective units.

(iii) For the supplies of materials, the quantities received are measured, weighed or counted as applicable & recorded in the measurement book.

(iv) Before taking measurement the overseer should make himself familiar with all conditions and specifications provided in the contract agreement. measurement should be taken with correct metallic tape, preferably with a steel tape.

(v) All measurements should be recorded in the ink directly in the MB and ~~nowhere~~ nowhere else.

(vi) The entries in the content of area column should be made in ink after necessary calculations.

(viii) No entries should be erased if a mistake is made, it should be corrected by crossing out and inserting the corrections and the corrections thus made being initialled and dated.

(ix) measurement should be taken in presence of contractor and his signature should be taken at the bottom of the measurements.

(x) The pages of the measurement book are machine numbered. Entries should be recorded continuously and no blank ~~left~~ pages left or pages torn out. Separate measurement books should be used for the works done by the contractor and by the departmental labour.

(xi) Each MB should be provided with an index of the contents of different entries at the beginning.

(xii) Loss of MB is a serious matter and is to be reported to the higher authorities. When a MB cannot be traced for a month, the fact should be reported to the SE for suitable action in this matter.

(xiii) The cause of loss is fully investigated and suitable action is taken if any body found responsible.

~~(xiii)~~

(xiv) In case of bills for work done, the measurement should commence with following entries like full name of the work, situation of the work, Agency executing the work, Name of contractor, Date of written order to commence work, date of actual completion of work, Date of measurement, Number of measurements (1st, 2nd, 3rd, or first and final etc).

(xv) In case of bills for supply of materials, MB ~~will~~ should commence with following like name of the supplying contractor, ~~name~~ Number and date of agreement or order, purpose of supply (i.e. purchase ~~of~~ for stock, purchase for direct issue to work with the name of the work, date of written order to commence supplies, date of actual completion of work, date of measurement etc.

Standard measurement Book (SMB) —

→ A measurement book where the detailed measurements of certain items of work of a building is recorded correctly in ink on the completion of the construction and the accuracy of which is certified by an Assistance engineer, it called Standard measurement Book (SMB).

→ This book is kept as a record to facilitate the preparation of estimate for periodical repairs and their execution.

→ In case of annual whitewashing, colour washing etc no detailed measurment need to be taken, the Contractor's bill are prepared and Payments to Contractors are made on the basis of measurments in the SMB.

→ SMB is checked every five years and alterations if any are entered in the SMB, which is called "quinquennial checking".

→ It is mainly used for annual repair and maintenance works.

Muster Roll —

→ The attendance of labourers is kept in muster Roll (Form 21) by the overseer or by his authorised agent as work supervisor.

→ The attendance of labour is checked and initially by the Assistance engineer or SDO or divisional engineer frequently during their inspections.

→ Generally, if work is executed by the department by employing daily labour as mason, coolies, bhisties etc, their the labour attendance is made in muster Roll.

Muster Roll (Continue) —

→ When the muster roll is closed for payment the work done during the period are measured and entered in the measurement book and the muster roll is completed by the overseer showing the amount payable to each labourer and the total amount payable and the qty. of work done.

→ The muster roll is then submitted to Assistant Engineer or SDO or Executive Engineer who gets it checked by the clerk and then gives passed or pay order.

→ The muster roll consists of two parts such as,

Part-I - Nominal Roll, where daily attendance are recorded. In this part there are columns for names of labourer, designation, father's name, dates of attendance, rates, total amounts due for each, total amount due for whole, signature of the person taking attendance, signature of the officer making payment and these columns are duly filled up.

→ The names of the labourer are grouped according to the class of masons, mazdoors, carpenters etc.

→ Muster Roll never be made in duplicate and entries should be made in such as manner (with ink) that it may not be possible to interpolate or to alter them.

→ The ~~root~~ Part-II of muster roll contains details of quantity of work done by the labourer and progress of work.

Rules for Preparation of muster roll (MR) —

The muster rolls are prepared and dealt in accordance with the following rules.

(i) One or more muster rolls may be kept for each work, but it should not be prepared in duplicate.

(ii) Labourers may be paid more than once in a month, but separate muster roll must be prepared for each period of payment.

(iii) The daily attendance and absense of labourers and fine if any, imposed on them should be recorded in the daily in the Muster Roll.

(iv) After the MR has been passed, payment should be made as quickly as possible and each payment is initialled and dated by the paying officer. If any item remains unpaid, the details of such items should be recorded in the Register of unpaid wages.

(v) The amount of unpaid wages is deposited in the cash and the amount is kept as deposit. The amount may be paid later on Hand Receipt — Form 28 duly signed and a note of payment is entered in the register of unpaid wages against the original entry.

Labour Report —

→ For large work or a group of works which is done through daily labour, a consolidated labour report showing the labourers employed day to day is prepared by the overseer from the muster roll in a prescribed form (as given below) & is submitted daily to the SDO or Executive Engineer for control and check.

Labour Report

Daily report of the day ___ of 2020.

Labour work on which employed	Class of Labour	No. of each	Rate	Approx. qty of work done.	
*	*	*	*	*	

Form 21--Muster Roll

Cash Book Voucher No. . . . . . Date . . . . . .

Name of work . . . . . .

Part I—Nominal Roll

Designation Description	No. (Sl.No.)	Name grouped according to classes	Father's Name	Dates. . . . . Month	Total	Rate Rs. P.	Amount Rs. P.	Dated initial of paying officer
Daily Total								
Initial of person marking daily attendance ...								
Initial of Inspecting Officer ...								

Passed for Rs. . . . . (Rupees. . . . .) Signature. . . . . Rank. . . . . .

	Rs.	P.
Grand total of this muster roll	...	...
Deduct—Payment not made as per details transferred to register of arrears	...	...
Total amount paid in words Rupees	...	...

Date . . . . . Signature. . . . . Rank. . . . . .

Part II--Details of measurement of work done by this labour employed as per this Nominal muster roll in cases in which the work is succeptible to measurement.

Description of work (Grouped sub-headwise)	Quantity	Deduct as shown on the last muster roll	Balance

Measurement of taken on (. . . . . date . . . . .) Signature . . . . . Rank . . . . . .

Measurement Book No. . . . . page. . . . . Date . . . . . .

→ The labour report is compared with the MR as soon as it is received by the SDO or divisional office and discrepancies if any are investigated and necessary action taken.

→ Labour report form in duplicate is in book form, one copy is submitted and the counterpart is retained by the overseer.

Acquittance Roll —

→ The payment of salary to person of regular establishment working in ~~isolation~~ station is drawn on the regular pay-bill, but the payment is made on a separate receipt form called acquittance roll after taking duly stamped signature of the person.

→ It is a receipt in evidence of payment on a prescribed form having 5 columns such as Item No, Name, Designation, Net amount payable and dated signature.

→ It is prepared for the total amount as per Establishment bill are passed by the Drawing officer.

→ After the payment has been made the paying officer returns it after certifying that proper receipts (signature) has been taken from the person entitled to receive payment, which is then attached to the original establishment bill as a record of payment.

Stores —

→ The stores are procured by inviting tenders for the supply of the stores or materials on the same principle of work.

→ The contract document should contain the descri and specifications of the materials to be supplie of each article to be supplied, place where to b supplied and quantities to be delivered at each place, progress to be maintained and date & time by which delivery should be completed & Specifications of materials.

→ Manufactured articles and machineries are usually Purchased through Store purchase department.

Unstamped receipt — In public work account, it is used for the receipts of stores and materials issued to the contractor or other persons. At the time of issue of materials, these receipts are taken from the contractor duly signed but not stamped. These are printed in triplicate in a book form.

Unstamped Receipt —

Name of the work. _____

Name of the Contractor _____

Sl No.	Name of materials	Quantity	Rate		Cost		Remarks.
			M.	P.	Rs	P.	

Received materials above.

Signature of issuing officer

Name of the Contractor _____

Signature of Contractor.

Date _____

Accounting Procedure of Stores —

→ The account of stores are based on the principle that the cost of every article is ultimately debited to the final head of the account concerned or the particular work for which it is required.

→ When the materials are issued, their cost is charged to specific head of account of work and suspense head cleared

Classes of Stores –

Stores are classified into following types,

1. Stock of general Store
2. materials charged direct to the works.
3. Road metal.
4. Tools & plants

→ One SDO or Assistant Engineer and an overseer remains in-charge of stock. A store keeper is also employed for all time for issue work, receipt and recording.

Stock Account –

→ Stock account is maintained in the Sub division office and a separate account is also maintained in the division office.

→ All transactions of receipts and issues of materials are recorded day to day in the Register of Stock Receipts and Issues. in form NO – 8 in the order of their occurrence. as soon as they take place.

→ On closing of monthly account, Abstract of Stock receipts is prepared in form – 9 and a single Abstract of Stock issues is prepared in form – 10. & submitted by SDO or store incharge to the divisional officer for inclusion in the monthly divisional account.

→ Half yearly balance returns of stock for every six months for the periods ending 30th Sept and 31st march are also prepared in form – 11 by the SDO or AE from monthly accounts and then submitted to Divisional office where they are compared with Half yearly Register

of stock (Form 12) already posted in the division.

→ Quantity account is the account in which the qty. of number of materials is accounted. ~~Value Account~~ It is maintained by the AE or SDO.

→ Value account is the account in which value of each material is accounted.

Bin card — A record of receipts, issues, & running balances of certain articles of stock kept in Bin card, which is kept where the materials are stored.

Stock Taking, Shortage and Surpluses —

→ Stock is checked, verified physically by counting, measuring or weighing once in a year for the period ending 31st march by the SDO or AE incharge of stores.

→ If there is no mistake, Surplus if any should be taken as receipt in Form 8 and the cost credited to revenue to Govt and the ~~shortage~~ shortage if any should be taken in Suspense head.

→ Unserviceable stores are sold by Public auction. For this, 'Sale Account' in form-19 is prepared and submitted to the Divisional office.

THANK YOU...!

For any query, contact through:

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