Ch-1

Date :- 17-12-19

Estimating :-

→ Estimation means the amount required to complete the work.

→ It is basically required for civil engineer for constructing bridge, canal, dam etc.

Types of estimate :-

Estimate is 2 types :- (i) Abstract estimate
(ii) Detail estimate

Abstract estimate :-

→ It means cost formula or summary.

SL. NO	Description or Particulars	Quantity	unit	Rate RS P	unit of rate	Amount RS P

Detail estimate :-

SL. NO	Item of work	NO	Description			quantity	Explanatory Note
			L in m	B in m	H in m		

Project :-

→ Project means newly develop structure and Project management objective is how to manage the Project so that outcome will be efficient.

→ It also deals with labour and material.

→ Project management basically depend upon :-
(i) Planning
(ii) scheduling
(iii) controlling

Planning :-

Planning means to know the objective of the Project.

Scheduling :-

Scheduling means alongation of resources and set time for resources or project.

controlling :-

controlling means to reduce the difference betwee Planning and Scheduling.

Important term :-

Bridge & culvert :-

According I.R.C specification a culvert is one in which has a linier water way upto 6m and structure having a linier water way above 6m but below 30m and miner bridge the structure having a linier water way 30m or more are measure bridge.

★ Aboutment :- 2x area of aboutment x depth of evation.

★ wing wall :- 4x area of wingwall x depth of evation.

★ curtain wall :- 2x area of curtain wall x depth of evatio

unit and measurement :-

Sl. No	Description	measurement	unit rate
1	earthwork in excavation	cum	per cum
2	earth filling in excavation foundation.	cum	Per cum
3	surface dressing	sq m	per sq m
4	cutting trees	number	Per number
5	Brickwork with cement mortar.	cum	Per cum
6	Brick work in arches.	cum	Per cum
7	reinforcement brick work.	cum	Per cum
8	Honeycomb brick work.	sq m	Per sq m
9	Half (10c.m) brick work	sq m	Per sq m
10	Brick flat soiling	sq m	Per sq m
11	cornice string coarse	r m (running metres)	Per r m
12	cutting hole inexisting brick work	c.m	Per c.m
13	cutting opening inexisting brick work.	cum	Per cum.
	concrete work:-		
14	Lime and cement concrete in foundation.	cum	Per cum.
15	Reinforce cement concrete work.	cum	Per cum.
16	frame work.	sq m	Per sq m.
17	Reinforcement	quintal	Per quintal.

18	R.C.C chajja	cum	Perc cum.
19	Expansion joint in concrete.	rcm	Perc rcm.
20	concrete chajja	sqm	Perc sqm.
21	Random rubble masonry stone wall, arches.	cum	Perc cum.
22	Stone work for wall finishing.	sqm	Perc sqm.
23	Stone work in chajja	sqm	Perc sqm
24	Roofing (Stone work)	sqm	Perc sqm
25	Tile roofing	sqm	Perc sqm
26	Asbestos, iron sheet roofing	sqm	Perc sqm
27	ceiling, lining, water Proof lining.	sqm	Perc sqm
28	Brick flat flooring	sqm	Perc sqm
29	Lime and cement concrete floor.	sqm	Perc sqm
30	moisce flooring or tile flooring.	sqm	Perc sqm
31	Wood work :- Door, windows, shutter	sqm	Perc sqm
32	Door windows frame	cum	Perc cum
33	Baten and trusses	cum	Perc cum
34	Steel work :- Iron gate, steel rolling, grills etc.	sqm	Perc sqm

Slab culvert

Date:- 19.12.19

Q Prepare a quantity survey for a slab culvert 1.5m clear span and 4m road way as shown in the fig 10-25.

The general specifications are as follows:- foundation shall be of cement concrete 1:2:4. Brick work shall be of 1st class in cement mortar 1:4 exposed surfaces of brick masonry shall be cement pointed 1:3 carried upto 15c.m below G.L. The exposed surfaces of R.C.C. shall be given a smooth finish during centering and no plastering shall be allowed, The string courses shall be 8c.m deep and 12mm thick with cement mortar 1:3 finished with neat cement.

Sl No.	Item of work	No	Description L	B	H	Quantity	Explanatory note
1	Earth work excavation in foundation.						
	Abutment	2	5.3m	0.8m	0.75m	6.36 m^3	
	wing wall	4	1.4m	0.8m	0.75m	3.36 m^3	
						9.72 m^3	
2	cement-concrete in foundation (1:2:4)						
	abutment	2	5.3m	0.8m	0.3m	2.544 m^3	
	wing wall	4	1.4m	0.8m	0.30	1.344 m^3	
						3.888 m^3	

Assume suitable rates.

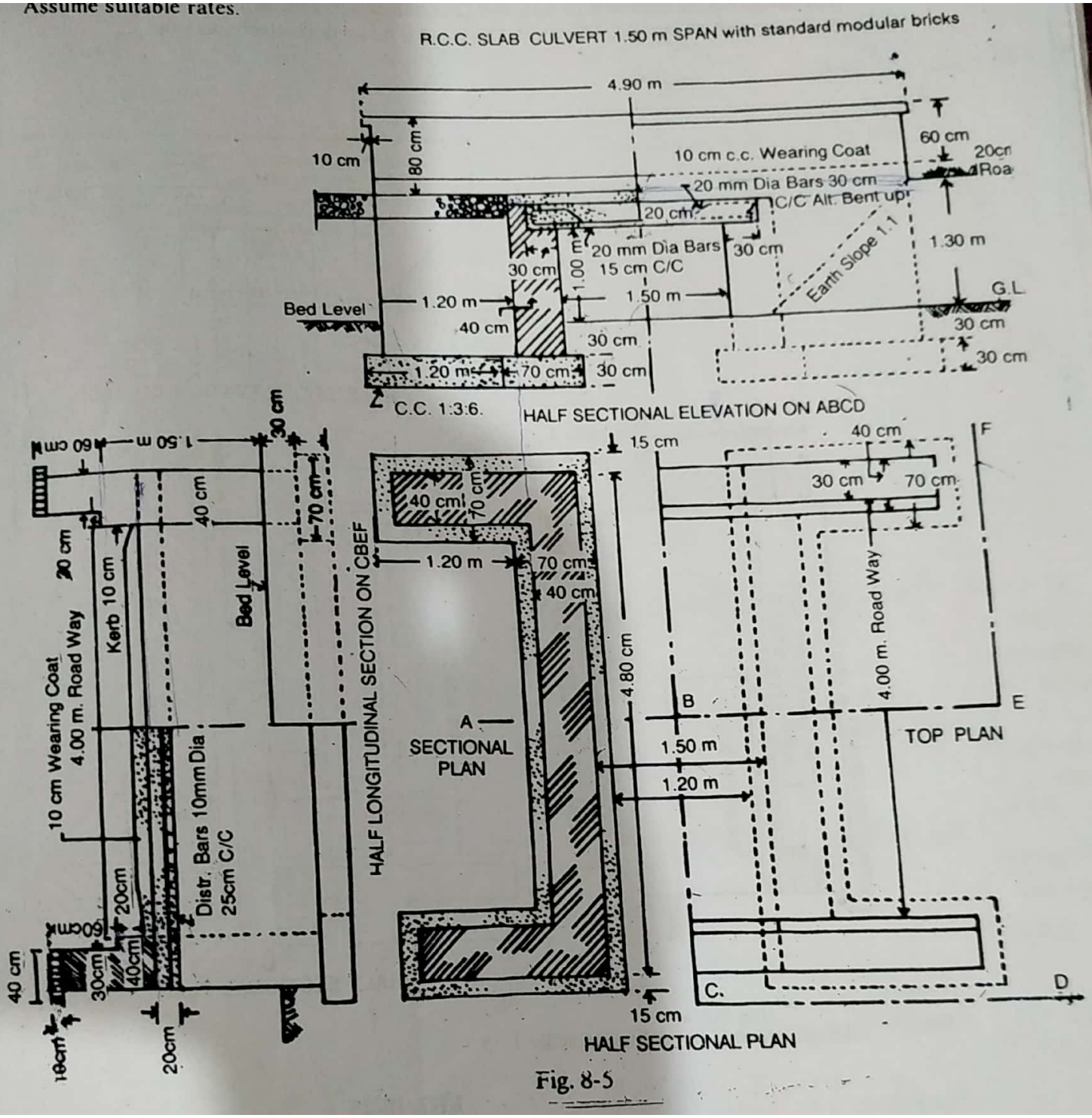


Fig. 8-5

3	1st class brick work in cement mortar (1:4)						
	abutment wall	2	5 m	0.50m	1.57m	$7.85\ m^3$	90+45+22 = 1.57
	wing wall	4	1.4m	0.50m	1.57 m	$4.316\ m^3$	
	Parapet wall						
	50c.m layer	2	5.3m	0.50m	.30m	$1.59\ m^3$	22+80=38
	40 c.m layer	2	5.3m	0.40m	.40m	$1.696\ m^3$	
	Deduction for bearing of R.C.C. Slab	2	5m	0.30 m	.22m	$0.66\ m^3$	
					Total =	14.872	
4	cement pointing (1:3) to exposed surface of brick work						
	(i) Innerfaces of the abutment	2	5m	——	1.05m	$10.5\ m^2$	H 90+15 = 105 (Assume 15 cm below G.L)
	(ii) face wall (as taken in hole)	2	5.3 m	—	1.89 m	$20.034\ m^2$	H=120−8 +22+40+15 = 189
	Inner side & top of the parapet	2	5.3m		1.12m	$11.872\ m^2$	H=40+40 +10+22 =112
	End of the Parapet						
	50c.m layer	2×2=4	.5m		.30m	$.6\ m^2$ ~~$0.15\ m^2$~~	H=22+8 =30
	40 c.m layer	4	.4m		.4m	$0.64\ m^2$	
	Deduction for						
	(i) rectangular opening	2	1.5m		1.05m	$3.15\ m^2$	H=90+15 =105
	(ii) Triangular portion of face wall hidden by earth.	4	1.4		1.4	$3.92\ m^2$	
				[(4×½×1.4×1.4) = 3.92]	Total =	36.5760	

5.	8cm x 12cm string course	-	2	5.3	-	10.6 rcm.	
6.	R.C.C. Slab excluding reinforcement but including shuttering	1	5.0	2.1	22	2.31 cu m.	210 = 150 + 25%
7.	Reinforcement						
	(a) 16mm ø straight bar	25	234	= 58.5 rcm.			
	(b) 16mm ø bent up bar	25	254	= 635 rcm.			
				122 rcm @ 1.58 kg		= 193 kg.	
	(c) 10mm ø botton distribution bar	10	513	= 51.30 rcm.			
	(d) Top bar	4	513	= 20.52			
				Total = 71.82 rcm @		.62 kg = 45 kg	
						Total 238 kg.	

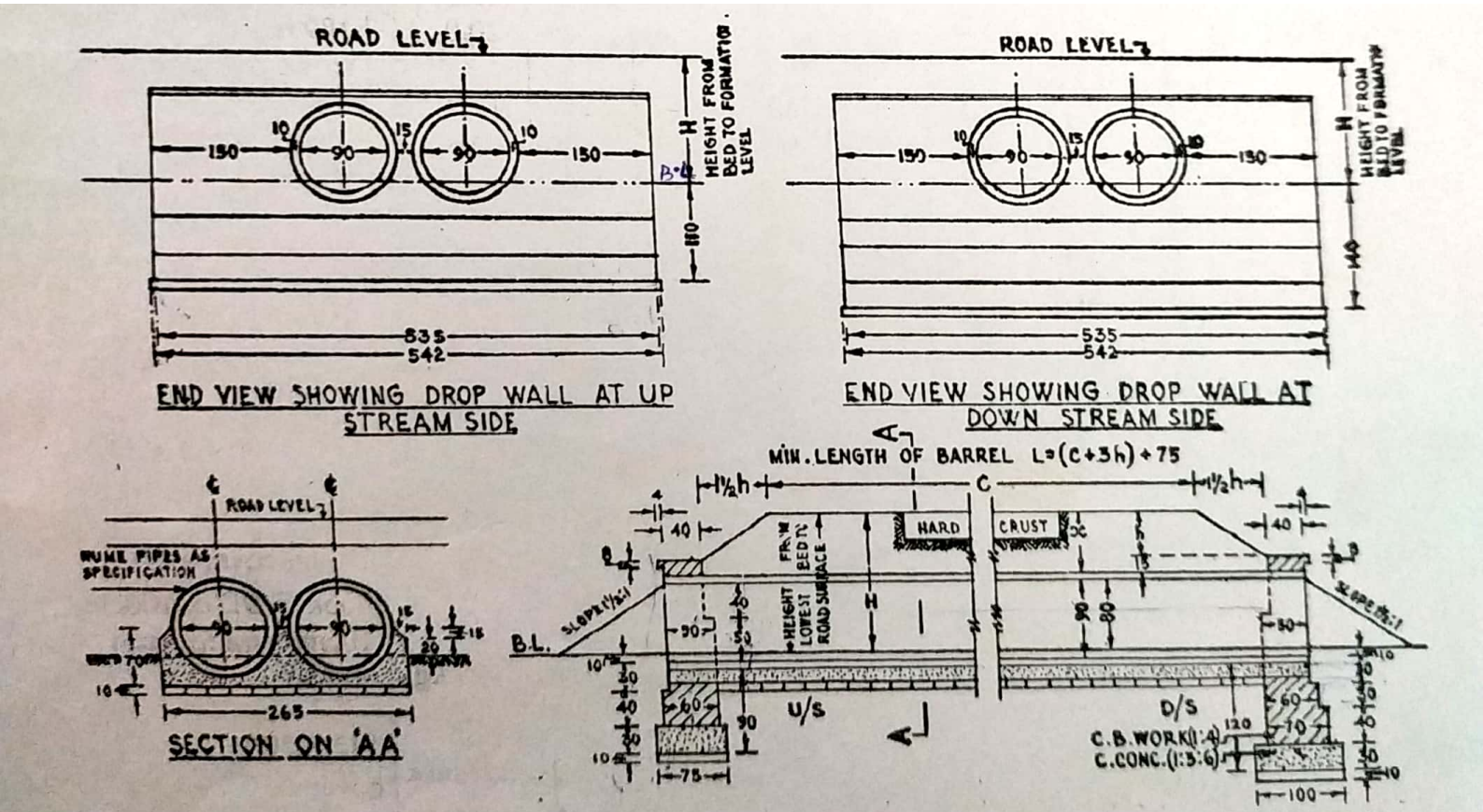
Hume pipe culvert

Date :- 13.1.19

Estimate of a 90c.m dia double barrel hume pipe culvert (are used in national highway). Prepare a quantity estimate for a barrel of 30c.m length the drop walls. In the estimate, the earth cushion whose depth has been indicated by x = 60c.m minimum are the hardcrust are not to be included. General specification of works same as mentioned in the drawing Extra earthwork in excavation shall be considered in the estimate to provide a sideslope of 1:2 in order to prevent collapsing of earthwork at waterlevel.

Sl. No	Item of work	NO	L in m	B in m.	H in m	Qty	Explanatory note
(i)	For 30c.m length of barrel						
(a)	Earth work excavation	1	.30	3.10	.45	0.4185 m^3	$B = 2.65 + 2x\left(\frac{.45}{2}\right) = 3.10$ $H = 2x\left(\frac{.45}{2}\right) = .45$
(b)	Earth work filling and ramming	2	.30	.225	.45	0.0607 m^3	$B = \frac{.45}{2} = .225$
(c)	Single brick flat soiling	1	.30	2.65	—	0.795 m^2	
(d)	cement concrete 1:3:6 with brick ballast (considering hole first)						
	Rectangle	1	.30	2.65	.55	0.43725 m^3	
	chamfering Portion	1	.30	$\frac{1}{2} \times (2.65+2.35) \times .15 = 0.375$		0.1125 m^3	$\frac{1}{2} \times (a+b) \times h$ $= \frac{1}{2} \times (2.65+2.35) \times .15$ $= 0.375$
	Deduction for Pipes	2	.30	$\frac{1}{2} \times \frac{\pi}{4} \times (1.10)^2 = 0.95$		0.285 m^3	$2 \times \frac{1}{2} \times \frac{\pi}{4} \times (d)^2$
					Total =	1.53895	

5



LONGITUDINAL SECTION SHOWING DETAILS OF DROP WALLS

ALL DIMENSIONS ARE IN CENTIMETRE

FIG. 10-26 Scale 1:75

⑤	90c.m dia 10c.m thick home pipe	2	.30	—	—	0.6πm	
⑥	shuttering for concrete	2	.30	—	.70	0.42m²	
					Total =	1.02	
⑦	quantities for drop wall						
⑧	Earth work excavation						
	upstream side	1	6.62	1.45	1.20	15.4908m³	Loose soil extra 1:2 45= 45/2 =60 542+60+60=662
	downstream side	1	6.92	2.50	1.50	25.95 m³	D/S = 150/2 = 75 542+75+75=692 B = 250+75+75=250
					Total =	41.4408	
②	single brick flat soling						
	upstream side	1	5.42	.75	—	4.065 m²	10 c.m thick = .1m .1m x 9.4 = 9.4
	down stream side	1	5.42	1	—	5.42 m²	
					Total =	9.485 m²	
③	cement concrete (1:3:6) with brick ballast						
	upstream side	1	5.35	.75	.30	1.20375m³	
	down stream side	1	5.35	1.0	.30	1.605 m³	
					Total =	2.80875 m³	
④	1st class brick work with cement mortar (1:4)						
	upstream side						
	60c.m layer	1	5.35	.60	.40	1.284m³	
	50c.m layer	1	5.35	.50	.80	2.14 m³	
	40c.m layer	1	5.35	.40	.65	1.391 m³	H = .40+.10+.15 = 0.65
					Total =	4.815m³	

downstream side						
70 c.m layer	1	5.35	0.70	0.40	1.498 m^3	
60 c.m layer	1	5.35	0.60	0.30	0.963 m^3	
50 c.m layer	1	5.35	0.50	0.80	2.14 m^3	
40 c.m layer	1	5.35	0.40	0.65	1.391 m^3	
				Total =	5.992 m^3	
deduction for pipe opening both upstream and downstream side	4	0.95		.45	1.71 m^3	$\frac{\pi}{4} \times (d)^2$ $= \frac{\pi}{4} \times (1.10)^2$ $= 0.95$
concrete under pipes	2	$\frac{.437}{.3} \times .5$ $= 0.7284$			1.45	30 c.m barrel $\frac{.437}{.3}$ 50 c.m barrel pipe $= \frac{.437}{.3} \times .5$ $= 0.7284$
				Total =	7.647	

⑤ Earthwork filling — Total Excavation work − Ptam (1) − Ptam (2) and Ptam (3) and portion of work upto ground level from Ptam no. 4.

$= 41.44 - 2.808 + 9.485 + 1.284 + 1.07 + 1.498 + 0.963 + 1.02$

$= 23.262$

⑥ 12mm cement Plaster (1:2)	2	5.35	—	1.20	12.84 m^2	H = 40 + 50 + 15 + 15 = 120
Tops of wall	2	5.35	.40	—	4.28 m^2	
Deduction for pipe opening	4	$\frac{\pi}{4} \times (d)^2$ $= \frac{\pi}{4} \times (1.10)^2$			3.80	
				Total =	13.32	

7	shuttering for concrete, work in foundation	4	535	—	30.	6.42m²
8	string course at top	2	535	—	—	10.7rm

Siphon

Aqueduct :-

A hydraulic structure in which the irrigation canal is taken over the drainage is known as aqueduct.

Siphon aqueduct :-

It is a hydraulic structure where a canal is taken over the drainage but the drainage water can't pass clearly below the canal it flows under siphonic action so it is known as siphon-aqueduct.

(1) Prepare a detail estimate of a siphon aqueduct from the given figure the general specification cement concrete foundation shall be of 1:3 with brick ballast. Brickwork shall be of 10c.m thick dry brick pitching shall be of provided of both upstream and down stream side.

Sl. No.	Item of work	NO	L in m	B in m.	H in m.	Qty	Explanatory note
1	Earth work excavation						
(i)	siphon aqueduct	1	8 m	2.7 m	1.6m	34.56m^3	B=1.80+2x (0.30+0.15) = 2.7
(ii)	upstream droppit	1	2.25m	2.7m	1.6m	9.72 m^3	H=102.10-100.50 =1.6
(iii)	down stream droppit	1	2.25m	2.7m	1.4m	8.51m^3	H=101.90-100.50 = 1.4
(iv)	wing wall	4	1.3m	1.0m	1.6m	8.32 m^3	
					Total =	61.11 m3	
2	cement concrete in foundation (1:3) with brick ballast						
(i)	siphon aqueduct	1	8	2.7	0.30	6.48m^3	
(ii)	Both upstream and downstream droppit	2	2.25	2.7	0.30	3.645	
(iii)	wing wall	4	1.3	1.0	.30	1.56 m^3	
					Total=	11.685m^3	

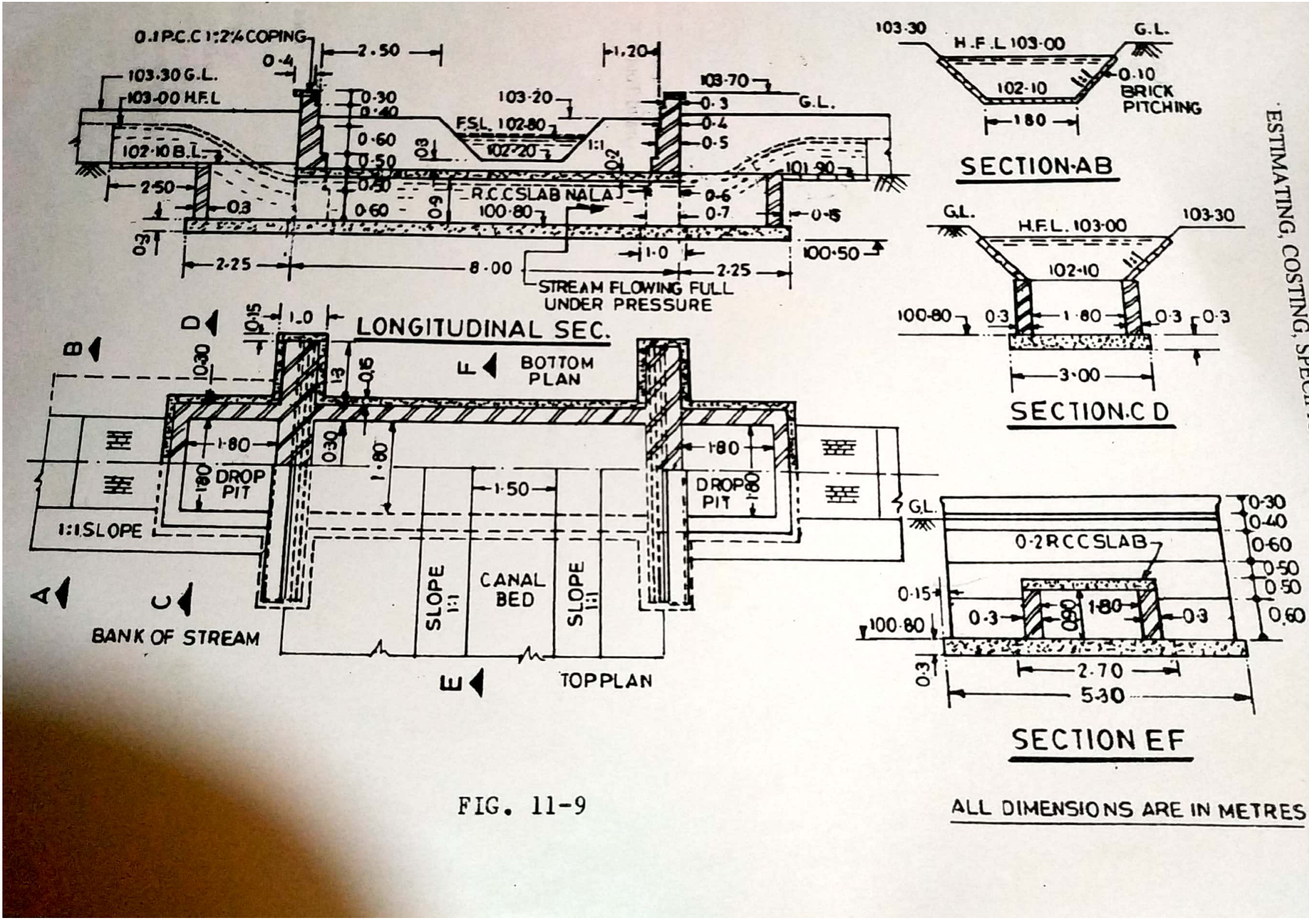


FIG. 11-9

ESTIMATING, COSTING, SPECI

③ first class brick work in cement mortar 1:4						
(i) siphon aqueduct	2	8	0.30 m	0.9 m	4.32 m^3	
(ii) upstream side droppit long wall	2	2.1 m	0.30 m	1.3 m	1.638	L = 1.8 + .30 = 2.1
upstream side droppit short wall	1	1.8 m	0.30 m	1.3 m	0.702	H = 102.10 − 100.80 = 1.3
downstream side droppit long wall	2	2.1 m	0.30 m	1.1 m	1.386 ~~0.693~~ m^3	H = 101.90 − 100.80 = 1.1
downstream side droppit short wall	1	1.8 m	0.30 m	1.1 m	0.594 m^3	
wing wall ~~first footing~~						
0.7 m layer	4	1.3 m	0.7 m	0.6 m	2.184 m^3	
0.6 m layer upto top of the slab	4	1.3 m	0.6 m	0.5 m	1.56 m^3	
Above deck slab	2	5 m ~~1.3 m~~	0.6 m	0.5 m	~~1.56~~ 3 m^3	L = 1.8 + 2x(.30+.3) = 5
0.5 m layer	2	5 m	0.5 m	0.6 m	3 m^3	
0.4 m layer	2	5 m	0.4 m	0.4 m	1.6 m^3	
Parapet wall 300 mm layer	2	5 m	0.3 m	0.2 m	0.6 m^3	
				Total =	20.584 m^3	

4	R.C.C (1:2:4) deckslab including reinforcement and shuttering	1	8m	2.4m	0.2m	3.84 m^3	B = 1.8 + .30 + .30 = 2.4
5	coping	2	5.3m	.4m	.1m	0.424	L = 5 + .30 = 5.3
6	cement pointing (1:3)					14.4 m^2	
(i)	siphon duct	2	8m	—	.90m		
	up stream droppit three inner side wall	3	1.8m	—	1.3m	7.02 m^2	H = 102.10 − 100.80 = 1.3
	down stream droppit three inner side wall	3	1.8m	—	1.1m	5.94 m^2	H = 101.90 − 100.80 = 1.1
	upstream and downstream three top surface	2	6m	.30m	—	3.6 m^2	B = 1.8 + 1.8 + 1.8 + .3 + .3 = 6
	Parapet wall above G.L						
	inner faces	2	5.3m	—	.7m	7.42 m^2	H = .4 + 1.2 = .7
	outer faces	2	5.3m	—	.3m	3.18 m^2	H = 102.70 − 102.40 = .3m
	outer faces for portion of droppit above deck slab	2	1.8m	—	1.4m	5.04 m^2	
	Triangular portions	4	$\frac{1}{2}$ ×	1.1 ×	1.1 =	2.42 m^2	
		4	~~$\frac{1}{2} \times 1.2 \times 1.1 = 2.42$~~		~~1.08m~~		
	edges						
	40 c.m layer	4	—	.4	.4m	0.64 m^2	
	30 c.m layer	4	—	.3	.2m	0.24 m^2	
					Total =	49.9 m^2	

7	10c.m thick brick pitching for stream.					
	Bed	2	1.8	2.5	$9m^2$	
	Sideslope	2x2	2.5	1.27	$12.7m^2$	$B=\sqrt{(.9)^2+(.9)^2}$ $=1.27$
					Total $=21.7m^2$	

Fall

Date :- 14.2.20

Irrigation channel are given certain longitudinal slope to develop certain velocities depending on the nature of soil & silt content in water. Steeper longitudinal slope develops higher velocities causing scour in the bed of the channel. If the general ground has a steep slope & the channel is given flatter slope the channel may meet the ground level & further may move the ground level necessitating high bank. To obviate the difficulty, falls or drops are given in the channel at suitable points where it tends to go near or above the ground level. Estimate of a small fall has been given in fig.

Description	NO	L	B	H	Q+y	Explanatory note
Earthwork excavation (considering hole parts of crest wall, side wall and floor)						
(i)	1	2.65	6	1.15	18.285 m^3	B = 450+60+60 +15+15 = 600
(ii)	1	2.10	5.8	1.05	12.789 m^3	H = 45+10+60 = 115
(iii)	1	1.50	5.6	.95	7.98 m^3	B = 450+50+50+15+15 = 580
wing wall	2	1.8	.70	1	2.52 m^3	H = 1.15 − .15 = 1
curtain wall	1	4.50	.60	1.20	3.24 m^3	H = 60+25+5+20 = 1.20
upstream pitching 20cm depth Bed	1	1.8	3.6	.2	1.30 m^3	
Side slope upto f.s.l	2	1.8	1.62	.2	1.16 m^3	sloping breadth $= h \times \sqrt{S^2+1}$ $= .9 \times \sqrt{(1.5)^2+1}$ $= 1.62$

down stream channel beyond curtain wall trapizodial section	1	3.90	6.27		24.453 m^3	$Bd + SD^2$ $= 4.05 \times 1.1 + (1.5) \times (1.10)^2$ $= 6.27$
						$\frac{4.5 + 3.6}{2} = 4.05$ $\frac{.9 + 1.3}{2} = 1.1$
Down stream pitching 20c.m depth	1	3.90	3.65	0.20	2.847 m^3	$B = \frac{4 + 3.2}{2} = 3.6$
side slope	2	3.10	1.99	1.1	13.57 m^3	$L = \frac{420 - 200}{2} = 3.1$
						$B = h \times \sqrt{S^2 + 1}$ $= 1.1 \times \sqrt{1.5^2 + 1}$ $= 1.99$
curved portion	2	$4\pi r^2$ $= 4 \times \pi \times \frac{1}{4} \times (r)^2$ $= 4 \times \pi \times \frac{1}{4} \times (.6)^2$ $= 1.13$		0.20	0.452	$4 \times \pi \times \frac{1}{4} \times (r)^2$ $4 \times \pi \times \frac{1}{4} \times (.6)^2$ $= 1.13$
Toe wall 20 c.m wide 30c.m deep	2	3.9	0.20	0.30	0.468 m^3	$L = 4.2 - .30$ $= 3.9$
Deduction for setback of wing wall	2	0.60	0.10	1.15	0.138 m^3	
				Total =	88.926 m^3	
(2) cement concrete 1:3:6 in foundation and floor, crest wall and side wall						
(i)	1	2.65	6	0.45	7.155 m^3	$B = 450 + 60 + 60 + 15 + 15 = 600$
(ii)	1	2.10	5.8	0.35	4.263 m^3	$B = 450 + 50 + 50 + 15 + 15 = 580$
(iii)	1	1.50	5.6	0.25	2.1 m^3	$B = 450 + 40 + 4 + 15 + 15 = 5$

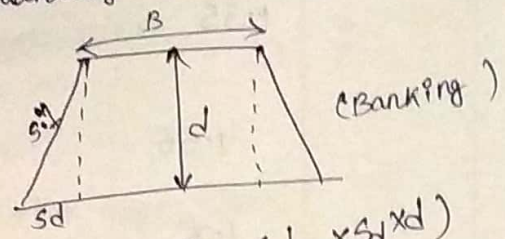
wingwall	2	1·80	0·70	0·30	0·756 m^3	
curtain wall	1	4·50	0.60	0·20	0·54 m^3	
				Total =	14·814	
Deduction for set back wingwall	2	0·60m	0·10m	0·45	0·054	
				Total =	14·764	
③ 1st class brick work in (1:4) cement mortar						
creast wall						
~~ABC~~ 70c·m layer	1	4·50	0·70	0·40	1·26 m^3	
60 c·m layer	1	4·50	0·60	0·90	2·43 m^3	H = ·6+·3 = ·9
side wall						
(i) 60c·m layer	2	2·35	0·60	0·40	1·128 m^3	L = 2·65 - ·15 - ·15 = 2·35
50 c·m layer	2	2·35	0·50	0·50	1·175 m^3	(section ABC)
40 c·m layer	2	2·35	0·40	0·50	0·94 m^3	
30 c·m layer	2	2·35	0·30	0·70	0·987 m^3	
(ii) 50 c·m layer	2	2·10	0·50	·40	0·84 m^3	(section EF)
40 c·m layer	2	2·10	0·40	0·50	0·84 m^3	
30 c·m layer	2	2·10	0·30	0·90	1·134 m^3	
(iii) 40 c·m layer	2	1·50	0·40	0·90	1·08 m^3	(section GH)
30 c·m layer	2	1·50	0·30	0·60	0·54 m^3	
wing wall	2	~~2·1~~	~~0·60·4~~			L = 1·8 + ·10 + ·10 + ·10 = 2·1
60 c·m layer	2	1·80	0·40	0·40	0·576 m^3	(section ABC)
50 c·m layer	2	1·90	0·40	0·50	0·76 m^3	
40 c·m layer	2	2·00	0·40	0·50	0·80 m^3	
30 c·m layer	2	2·10	0·30	0·70	0·882 m^3	

	curtain wall	1	4.50	0.30	0.40	$0.54\,m^3$	H=.25+.5 +.10 = .40
	Toe wall	2	3.90	0.20	0.30m	$0.468\,m^3$	
					Total =	$16.38\,m^3$	
4	brick edge floor in 1:8 cement mortar including pointing	1	5.40	4.50		$24.3\,m^2$	
5	cement pointing in 1:3 cement mortar						
	crest wall (upstream face, top and down stream face)	1	4.50		2.4	$10.8\,m^2$	
	side wall inner faces						1.95+.40-.60 =1.75
	1st side wall	2	1.75				
	2nd side wall	2	2.10		1.70	7.14	~~H=.90+.50 +.60=2.00~~
	3rd side wall	2	1.5		1.4	4.2	
	side wall portion above creast	2	2.35		0.8	3.76	H=1.70-.30=1.40 H=2.0-1.2 m =0.8
	vertical faces stepping	2x2	.3		.3	0.36	
	vertical faces end step	2					
	40 c.m layer	2		0.4	0.9	0.72	
	30c.m layer	2		0.3	0.6	0.36	

	top of side wall	2	6	0.3		3.6	L=5.4+0.6=6
	top of curtain wall	1	4.5	0.3		1.35	
	top of the toe wall	2	3.9	0.2		1.56	
	wing wall top faces	2	2.1	0.3		1.26	
	wing wall upstream side triangular portion above slope.	2	$\frac{1}{2} \times b \times h$ $= \frac{1}{2} \times 2.1 \times 1.4$ $= 1.47$			2.94	$\frac{1}{2} \times b \times h$ $= \frac{1}{2} \times 2.1 \times 1.4$ $= 1.47$ $\left[\frac{2.1}{1.5} = 1.4\right]$
						$1.296 m^3$	
6	Brick pitching	1	1.8	3.6	0.2		
	side slope	2	1.8	1.62	0.2	$1.1664 m^3$	
	down stream bed	1	3.90	3.65	0.2	$2.847 m^3$	
	side slope	2	3.10	1.99	0.2	2.467	
	curved portion	2	$4\pi r^2$ $= 4 \times \pi \times \frac{1}{4} \times (r)^2$ $= 4 \times \pi \times \frac{1}{4} \times (.6)^2$ $= 1.13$		0.2	$0.452 m^3$	

Road earthwork

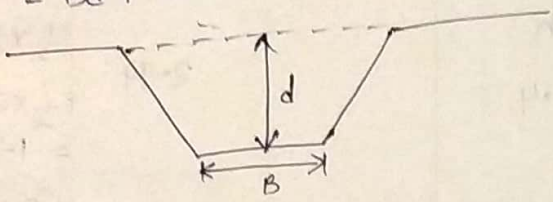
quantity or volume = section of area × length



(Banking)

$(B \times d) + 2 \times \left(\frac{1}{2} \times 5d \times d\right)$

$= Bd + 5d^2$



Total sectional area = area of central rectangular portion + area of two side triangular portion.

Area $= (Bd + 5d^2)$

volume or quantity $= bd + 5d^2 \times L$

Side slope = 5:1 that means it is the ratio of side slope as horizontal : vertical or one vertical and the horizontal is '5'.

mean height $= \frac{d_1 + d_2}{2}$

method-1 (mid section area method)

Total volume $= Bdm + 5dm^2 \times L$

Station or chainge	L in m	depth or height (formation level or G.L)	mean depth or height (d or dm)	area of central portion (B×d)	area of the side $5d^2$	Total area $(bd+5d^2)$	Length between the station (L)	quantity or volume V=A×L	
								Banking	Cutting

Problem

Date:- 6.3.20

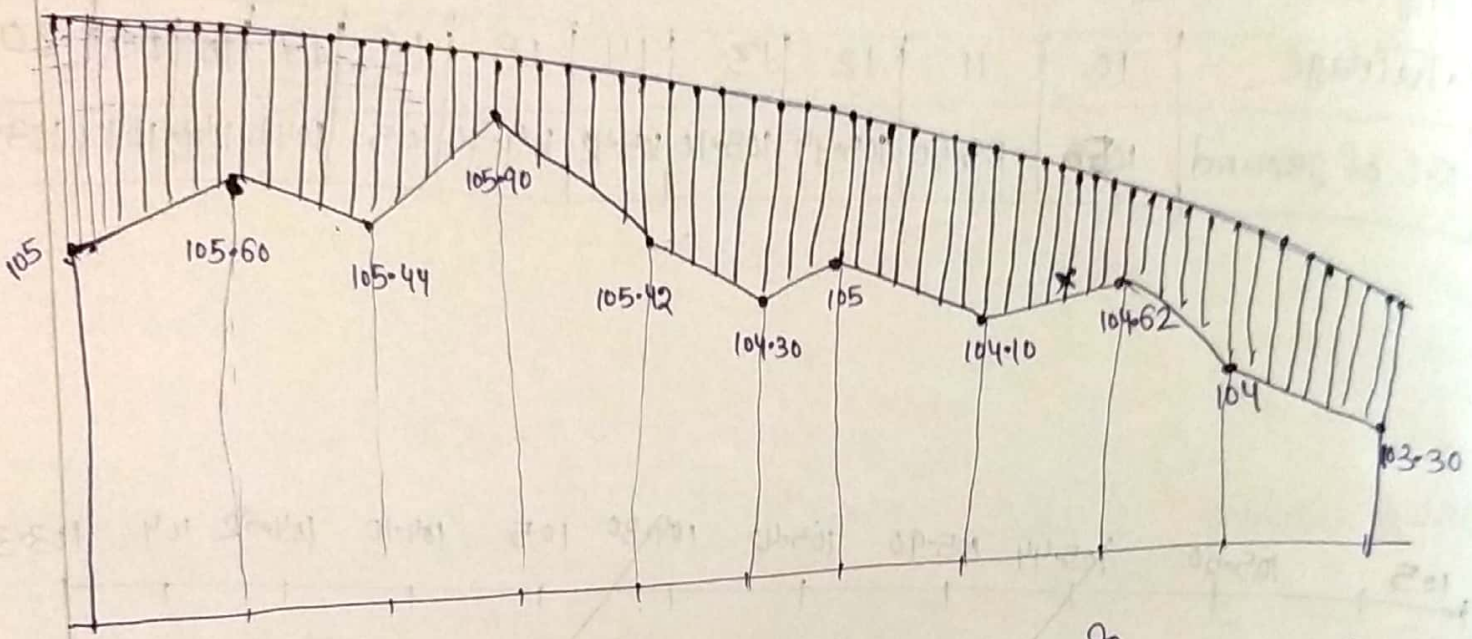
(1) R.L of ground along the centre line of a proposed road of the chainage 10-20 are given below. The formation level are the 10th chainage 107. and the road is downward gradient of 1 in 150 upto the chainage 14; and then the gradient changes to 1 in 100 downward. formation width of the road is 10m and side slope of banking are 2:1 (H:V) Length of the chain is 30m.

chainage	10	11	12	13	14	15	16	17	18	19	20
R.L of ground	105.60	105.44	105.40	105.42	104.30	105	104.10	104.60	104	103.30

S = 2

10th chainage = 107

formation width (b) = 10m



Height or depth (Banking)	2	1.2	1.16	0.5	0.78	1.6	0.6	1.2	0.38	.7	1.1
formation level	107	106.80	106.60	106.40	106.20	105.90	105.60	105.30	105	104.70	104.40
natural G.L	105	105.60	105.44	105.90	105.42	104.30	105	105.10	104.62	104	103.30
chainage	10	11	12	13	14	15	16	17	18	19	20
	0	30	60	90	120	150	180	210	240	270	300

10 to 14th

1 in 150

$= \frac{1}{150} \times 30 = 0.2$

15 to 20th

1 in 100

$= \frac{1}{100} \times 30 = 0.3$

$\frac{d_1+d_2}{2}$ Calculation of Quantities of Earthwork

B = 10m, S = 2

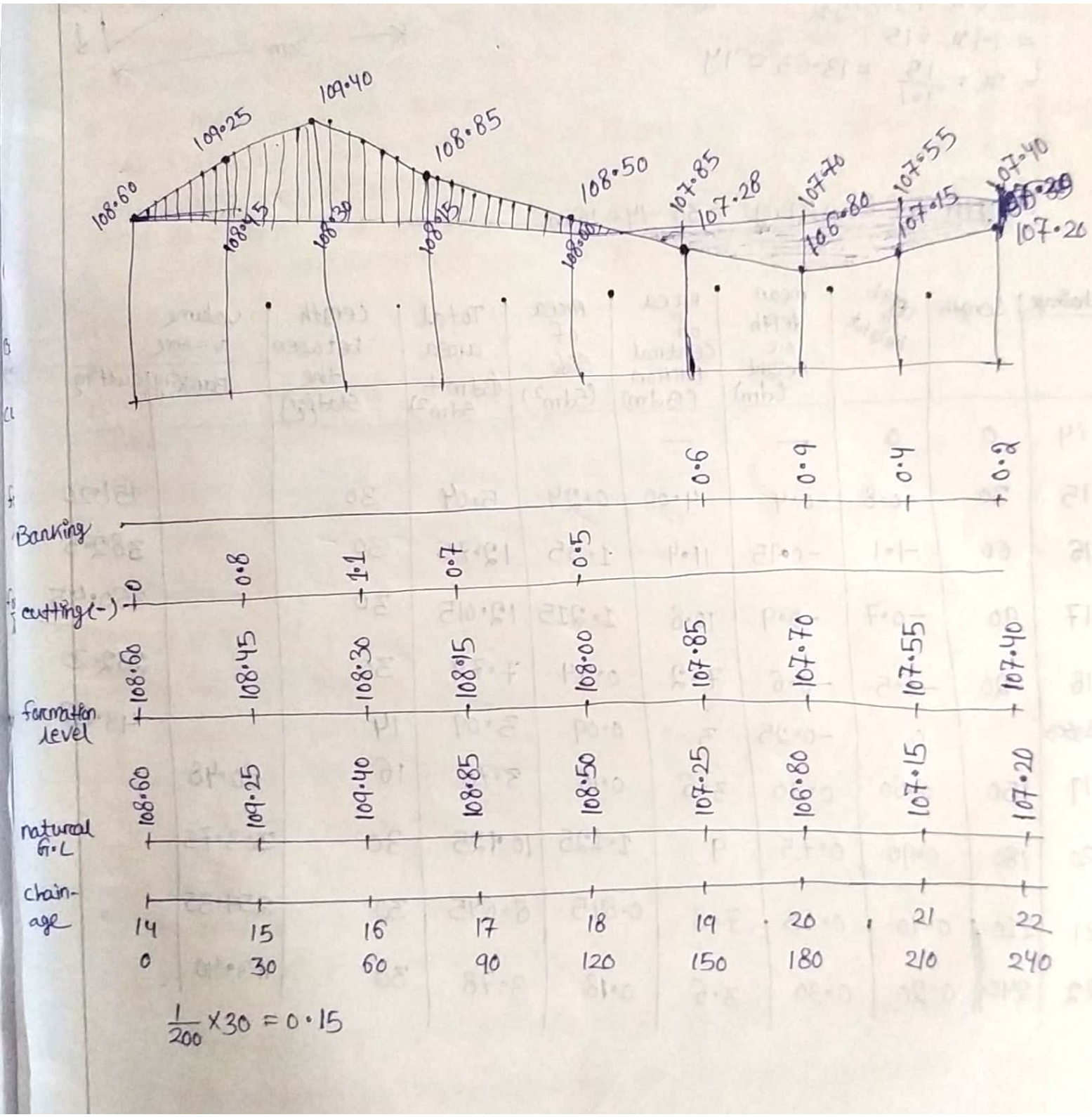
station or chainage	length	depth or height	mean depth or height (d)	area of central portion (Bd)	area of the side (Sd²)	Total area Bd+Sd²	length between the station (L)	volume V = A×L Banking m³	volume V = A×L cutting m³
10	30	2	—						
11	30	1.2	1.6	16	5.12	21.12	30	633.6	
12	60	1.16	1.18	11.8	2.7848	14.5848	30	437.544	
13	90	0.5	0.83	8.3	1.3778	9.6778	30	290.334	
14	120	0.78	0.64	6.4	0.8192	7.2192	30	216.576	
15	150	1.6	1.19	11.9	2.8322	14.7322	30	441.966	
16	180	0.6	1.1	11	2.42	13.42	30	402.6	
17	210	1.2	0.9	9	1.062	10.062	30	318.6	
18	240	0.38	0.79	7.9	1.2482	9.1482	30	274.446	
19	270	0.7	0.54	5.4	0.5832	5.9832	30	179.496	
20	300	1.1	0.9	9	1.062	10.062	30	318.6	

Total 3513.6 cum.

Problem

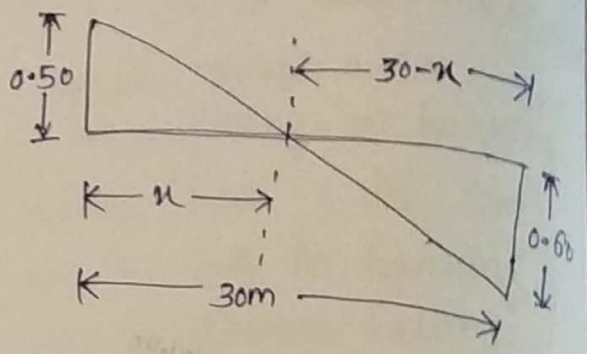
Prepare a estimate for the portion of a road from chainage 14-22 from the data given below draw also longitudinal and typhical crossection for cutting or banking. the formation width of the proposal road is 12m and side slope $1\frac{1}{2}:1$ in cutting and in 2:1 in banking. The road formation is prepared are uniform falling 1 in 200 passing through g.l are chainage 14. Length of the one chain is 30m.

Chainage	RL of ground
14	108.60
15	109.25
16	109.40
17	108.85
18	108.50
19	107.28
20	106.80
21	107.15
22	107.20



$\frac{1}{200} \times 30 = 0.15$

distance from 18 chainage upto portion of cutting = x



$$\frac{x}{0.50} = \frac{30-x}{0.60}$$

$= 0.6x = 15 - 0.5x$

$= 1.1x = 15$

$= x = \frac{15}{1.1} = 13.63 \simeq 14m$

Length of banking $= 30 - 14 = 16m$

Chainage	Length	Depth or height	mean depth or Height (dm)	Area of central portion (Bdm)	Area of side (Sdm^2)	Total area (Bdm + Sdm^2)	Length between the stations (L)	Volume V = AxL	
								Banking	cutting
14	0	0	—	—					
15	30	-0.8	-0.4	4.80	0.24	5.04	30		151.20
16	60	-1.1	-0.95	11.4	1.35	12.75	30		382.5
17	90	-0.7	-0.9	10.8	1.215	12.015	30		360.45
18	120	-0.5	-0.6	7.2	0.54	7.74	30		232.20
Passes		0	-0.25	3	0.09	3.09	14		43.26
19	150	0.60	0.30	3.6	0.18	3.78	16	60.48	
20	180	0.90	0.75	9	1.125	10.125	30	303.75	
21	210	0.40	0.65	7.8	0.845	8.645	30	259.35	
22	240	0.20	0.30	3.6	0.18	3.78	30	113.40	
							Total	1169.70 Cu.m	740.28 Cum.

WBM Problem.

Date - 13.3.20

Estimate the items involved for construction of a WBM road from the following data :-

Length of the road = 100m

metalled width = 5500mm

Thickness of the grade-I metal solving 80mm. wearing coat of grade II metal 120 mm loose consolidated to 80mm thick. Surface of the road is to be finished with two coats of bitumen a given below :-

1st finishing coat :- 12mm chips @ $0.018 m^3$ and bitumen @ 1.22kg per square meter of road surface. 2nd finishing coat 6mm chips @ $0.01 m^3$ and bitumen @ 1.22 kg per square meter of road surface, consumption of fuel @ 0.40 kg per kg of bitumen.

Given data :-

Length of the road = 100m

metalled width = 5500mm = 5.5m

Area of the road surface = 100×5.5
$= 550 m^2$

Thickness of grade I = 80mm = 0.08m

Volume required = $550 \times 0.08 = 44 m^3$

- Thickness of grade II metal 120mm loose consolidated to 80 mm thickness.

Volume required = $550 \times .12 = 66$

first coat finishing 12mm chips @ $0.018 m^3$ per square meter

for $550 m^2$ chips required = $550 \times 0.018 = 9.9 m^3$

~~1.22 kg~~

bitumen @ 1.22kg per square meter road surface

for $550 m^2$ bitumen required = $550 \times 1.22 = 671 kg$

2nd finishing coat 6mm chips @ $0.01 m^3$ ~~per sq~~

for $550 m^2$ chips required = $550 \times 0.01 = 5.5 m^3$

bitumen @ 1.22 kg per square meter road surface

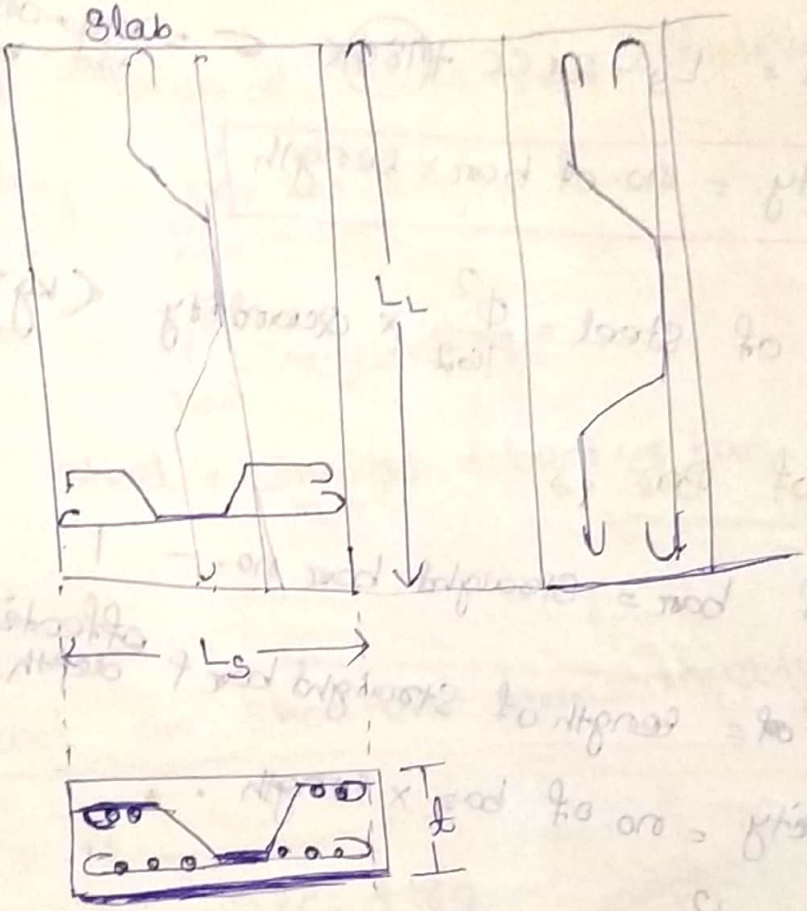
for $550 m^2$ bitumen required = $550 \times 1.22 = 671 kg$

Total bituminous required = 1st bitumen finishing + 2nd bitumen finishing
$= 671 + 671 = 1342 kg$

consumption of fuel @ 0.40 kg per kg of bitumen

$= 1342 \times .40 = 536.8$

Bar Bending Schedule



where L_L = length of longer leg

L_S = Length of shorter leg.

t = thickness of slab.

$\frac{L_L}{L_S} \leq 2$ (two way slab)

$\frac{L_L}{L_S} > 2$ (one way slab)

Main bars :⇒ It is two types (i) Straight bars (ii) Bent up bars.

Shorter span direction.

(i) Straight bars :⇒

How to calculate no. of bars :⇒

No. of bar = $\frac{L_L - 2 \times cc}{\text{spacing}}$ longer / shorter cc = clear cover

length = $L_S - 2 \times cc + 18\phi$

Quantity = no. of bar × length

weight of steel = $\frac{\phi^2}{162} \times$ Quantity (kg)

Bent of Bar :⇒

No. of bar = Straight bar no. − 1

length of = length of straight bar + effective depth.

Quantity = no. of bar × length.

weight = $\frac{\phi^2}{162} \times$ quantity.

Total steel bar = Straight bar + Bent of Bar.

Longer span Direction

Main Bar :− (i) straight bar
(ii) Bent up bar.

Straight bar :⇒

No. of bar = $\frac{L_S - 2 \times cc}{\text{spacing}}$ ~~shorter/longer~~

length = $L_L - 2 \times cc + 18\phi$

Quantity = no. × length.

weight = $\frac{\phi^2}{162} \times$ quantity.

Bent up bars

No. of bars = Straight bars - 1

length = length of straight bars + effective depth.

Quantity = no. of bars x length.

weight = $\frac{\phi^2}{162}$ x quantity.

Total steel = Straight + bent up bars.

Top bars :⇒

Top bars in shorter span direction :⇒

No. = 4

length = $L_s - 2 \times c_c + 18\phi$

quantity = 4x length.

weight = $\frac{\phi^2}{162}$ x quantity.

Top bars in ~~shorter~~ Longer span direction :⇒

No. = 4

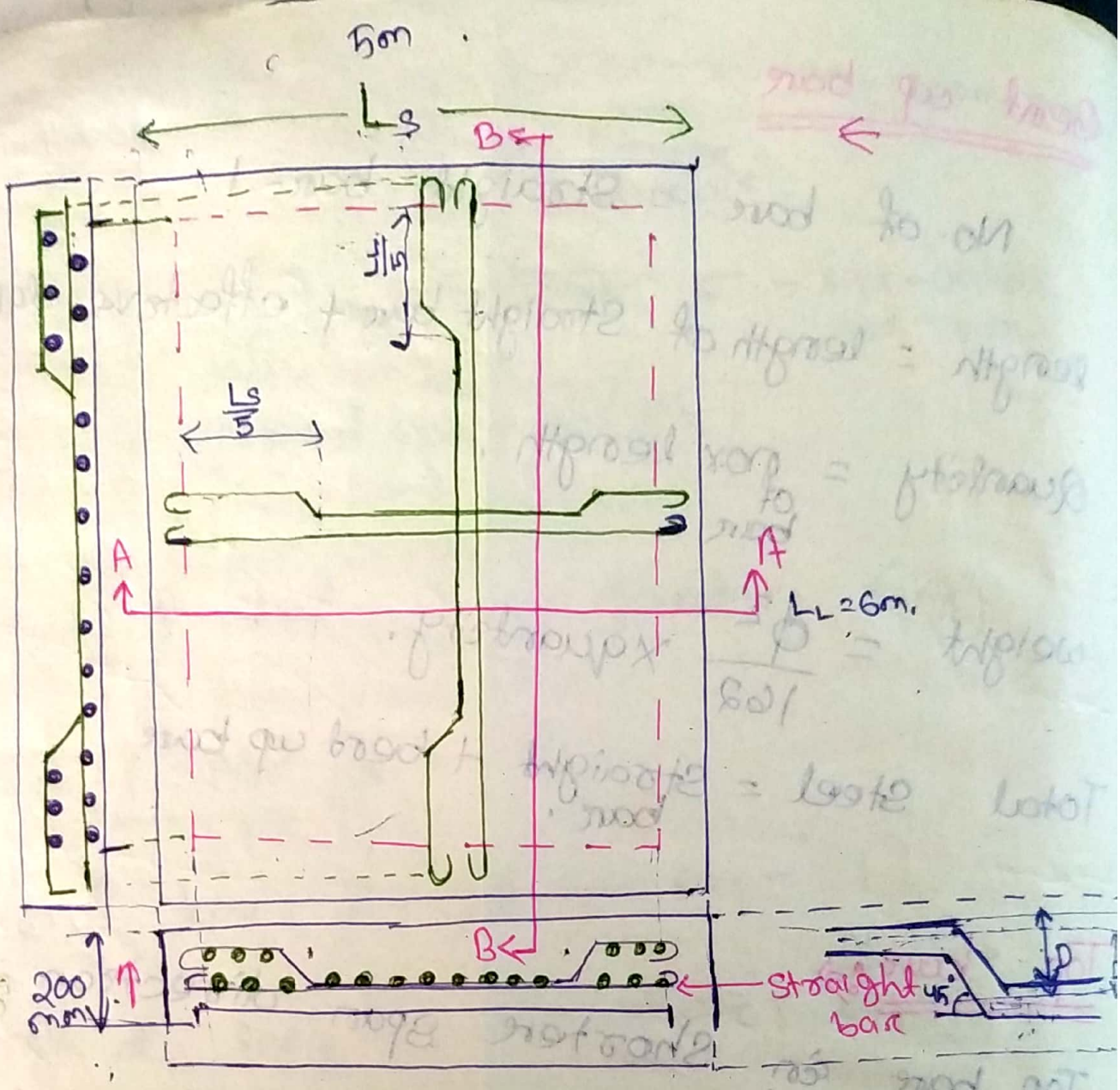
length = $L_L - 2 \times c_c + 18\phi$

quantity = 4x length.

weight = $\frac{\phi^2}{162}$ x quantity.

Total = (Longer + Shorter span top bars.)

Grand total = Main bars in shorter +
Main bars in longer +
top bars in shorter +
" " longer



$$D = \underset{\text{Thickness}}{200} - \underset{\text{cover}}{\text{clear}}\ (25+25) - \underset{\text{bar}}{\text{Dia. of}}\ (12)$$

$$= 138\text{mm}.$$

→ All the bars are 12mm ϕ @ 100 c/c alternate Bent up

→ Top & bottom clear cover = 25mm.

→ Development considered for Fool.

→ Thickness of slab = 200mm.

① The dimension of a R.C.C. slab is 4m x 5m x 12cm deep. Reinforcement of 12mm rods are placed in shorter span @ 15c.m c/c of the total nos of rods, 16cm nos have been cranked and hooked at the ends. others rods are straight & hooked at the end. The 12mm dia rods weight 0.89 kg per meter. To hold the cranked portion 4nos 10mm dia straight & hooked rods have been used. The 10mm dia rods are placed in a direction of longer span @ 20 c/s & all are straight & hooked at ends. The 10mm dia rods weigh 0.62kg per mt. The clear covers are 1.8 cm. at the bottom & 2.5c.m at on all sides. Assume any other dimension not given. Estimate the total weight of steel required for reinforcement of the slab.

Abstract No.	Defination	Nos	L in m	Quantity	wt of 1m length of bar = Ø3 / 162	Remark
①	Reinforcement					
②	main bar in shorter span direction					
	straight bar					
	$\frac{L - 2 \times c.c}{\text{spacing in shorter}}$					
	$= \frac{5 - 2 \times 0.025}{0.15}$	33-16	L.S - 2xc.c +18ϕ	No. of bar x L	~~62.86~~	
	= 33 nos	= 17	= 4 - 2x0.025 + 18x0.012	= 17 x 4.16 = 70.72		
			= 4.16			
	bentup bar	17 - 1 = 16	4.16 + 0.096 = 4.256	68.096	~~60.52~~	
			Total	139.014 @ .89 kg per cm = 123.72 kg		

Description	NOS	L	Quantity
Mainbar in longer span dirn straight bar $\frac{Ls - 2 \times c.c}{\text{spacing in longer span}}$ $= \frac{4 - 2 \times 0.025}{0.20}$ $= 19.75 \simeq 20$	20	$Ll - 2 \times c.c + 18\phi$ $= 5 - 2 \times 0.025 + 18 \times 0.010$ $= 5.13$	No. of bar $\times L$ $= 20 \times 5.13$ $= 102.6$
@ 0.62 kg per metre			$= 102.6 \times 0.62 = 63.612 kg$
Top bar in longer span direction ~~NOR = 4~~	4	$5 - 2 \times 0.025 + 18 \times 0.010$ $= 5.13$	$4 \times l$ $= 4 \times 5.13 = 20.52$
@ 0.62 kg per metre			$= 20.52 \times 0.62 = 12.72 kg$

Grand Total = main bar in longer + main bar in shorter + ~~Main~~ Top bar in longer

$= 138.91 + 63.612 + 12.72$

$= 215.242 kg$.

Estimate (i) quantity of steel per m^3 of concrete.
(ii) The quantity of steel including 10% wastage.
(iii) quantity of binding wire
from the following data of a R.C.C slab of 5.5m x 5.5m x 15cm deep. 10mm dia rods are placed in short span @ 12cm c/c with one side 45° crank with end hooks. 8mm dia rods are placed in long span @ 15cm with one side 45° crank with end hooks, 8mm dia straight bars with end hooks span 6 nos along short & long span have been used. cover = 25mm & K = 2.

A:- shorter span = 10mm dia
12 c.m center to center one side 45° crank

longer span = 8 mm dia
15 c.m c/c with one side 45° crank

Top bars = 6 nos both dir^n = 8 mm dia

(i) volume of slab $= 5.5 \times 5.5 \times .15 = 4.537 m^3$

quantity of reinforcement in m^3 of concrete $= \frac{\text{Total weight}}{\text{volume of slab}}$

$= \frac{272.658}{4.537}$

$= 60 kg$

(ii) The quantity of steel $= 272.658$

including 10% westage $= 272.658 \times \frac{10}{100}$

$= 27.26$

~~272.658~~

$= 272.658 + 27.26 = 299.918 kg$

$= .299918$ tonne

[1 per ton 8213 kg for 8-12 diameter]

(iii) quantity of binding wire.

quantity of binding wire @10kg per tonne

$= .299918 \times 10 = 2.99918 kg$

SL NO	Description	Nos	Length	Quantity	weight	Remark
1	Reinforcement					
(i)	Main bar in shorter span direction					
(a)	Bent up bar	$=\frac{5.5-2\times 0.025}{0.12}$ $=45.41$ $\simeq 46$ nos	$(5.5-2\times0.025+18\times0.010)+0.15-0.025-2\times0.005$ $=5.75$m	No. of bar $\times l$ $=46\times5.75$ $=264.5$m	$\frac{d^2}{162}=\frac{10^2}{162}$ $=0.62$ kg/m weight of bar @ 0.62 kg $=264.5\times0.62$ $=163.99$ kg	
(ii)	Main bar in longer span direction					
(a)	Bent up bar	$\frac{5.5-2\times0.025}{0.15}$ $=36.34$ $\simeq 37$ nos	$(5.5-2\times0.025+18\times0.008)+0.15-0.025-2\times0.004$ $=5.715$m	37×5.715 $=211.529$m	$\frac{d^2}{162}=\frac{8^2}{162}$ $=0.39$ weight of bar @ 0.39 kg $=211.529\times0.39$ $=82.49$ kg	
(2)	TOP bar					
(a)	TOP bar in shorter span direction	6	$=5.5-2\times0.025+18\times0.008$ $=5.594$	6×5.594 $=33.564$m	$\frac{d^2}{162}=\frac{8^2}{162}$ $=0.39$ weight of bar @ 0.39 kg $=33.564\times0.39$ $=13.089$ kg	
(b)	TOP bar in longer span direction	6	$5.5-2\times0.025+18\times0.008$ $=5.594$	6×5.594 $=33.564$m	$\frac{d^2}{162}=\frac{8^2}{162}$ $=0.39$ weight of bar @ 0.39 kg $=33.564\times0.39$ $=13.089$ kg	

Total weight $= 163.99+82.49+13.089+13.089$

$= 272.658$ Kg

) volume of slab $= 5.5 \times 5.5 \times .15 = 4.537 m^3$

quantity of reinforcement in m^3 of concrete $= \frac{\text{Total weight}}{\text{volume of slab}}$

$= \frac{272.658}{4.537}$

$= 60 kg$

) The quantity of steel $= 272.658$

including 10% westage $= 272.658 \times \frac{10}{100}$

$= 27.26$

~~272.658~~

$= 272.658 + 27.26 = 299.918 kg$

$= .299918$ tonne

[1 per ton 8-13 kg for 8-12 diameter]

iii) quantity of binding wire.

quantity of binding wire @ 10kg per tonne

$= .299918 \times 10 = 2.99918 kg$

Types of WORK

classification of works according to their nature :-

The works according to their nature are classified under the two main classes as original work and repair or maintenance work :-

original work :-

The original work may be different types :-

(i) Entirely new construction as construction of new building, bridge, road, damp, project etc.

(ii) Additions and alterations to the existing works will increase the value of the property as addition of room or rooms, conversion of verandah into room, dividing a big room into two rooms, etc :

(iii) Special repairs for renovation or for thorough repairs of the damaged work - as changing of roof, changing of floor, changing of doors and windows etc.

Repair work :-

The repair works may be of the following types :-

(i) The repairs required to maintain the work in proper condition as annual repairs to buildings, roads etc. as - Annual repairs, white washing, colour washing etc.

(ii) Minor additions and alterations, with in certain monetary limit (say Rs. 200.00), which will not increase the value of the property as - opening a door, providing sunhades, providing ~~set~~ shelves etc.

(iii) Special repair, monsoon damage repair etc.

classification of works according to their cost :-

with respect to the cost, the original works classified as major work, minor work and petty work.

ESA

Major work :-

The work costing more than RS 2 lakhs is termed as major work, and the estimate for such work is known as major estimate.

Minor work :-

The work costing more than RS 50,000.00 but not exceeding RS. 2 lakhs is known as Minor work and the estimate for such work is known as Minor work.

Petty work :-

The work whose cost does not exceed RS. 50,000.00 is known as petty work and the estimate is known as petty estimate.

Different types of repairs work :-

Annual repair or maintenance work (A.R. work) :-

All works and structures are repaired and maintained in proper condition. The normal repair works done annually, com under Annual repair work.

All buildings are white washed, colour washed and repaired for minor repairs once in every year. for Annual repair of building 1 to 1 $\frac{1}{2}$ per cent of the original constructional cost of the whole building provided A.R. work is usually done by constract by inviting tenders or quotations, for maintainence and repair, money is allotted in the budget under Annual repair and maintainance head. Annual repair works are executed by the departments concerned as - Medical department buildings are maintained by the medical department, Police department buildings are maintained by the Police department, etc.

quadrennial repair :-

Besides annual repair work of white washing and colour washing, every fourth year special repair works are done for through repair as repainting of doores and windows, patch repair of plastering etc. special repair work every fourth year is known as quadrental repair.

Special repair (S.R) :-

Special repair work consist of renovations or renewals of structures or damaged works. It generally consists of renewal of floor, roofs and other items of work involving replacements occurring at long intervals. Special repairs also comprise minor improvements in the

building etc. Repair of monsoon or flood damage works also come under special repair work.

Repair works are usually carried out by inviting tenders or quotations through P.W.D or works orders or contract Agreement.

Contract:-

contract is an undertaking by a person or firm to do any work under certain terms and conditions. The work may be for the construction or maintenance and repairs for the supply of materials, for the supply of labour for the transport of materials etc.

Contractor:-

The term contractor means a person or firm who undertakes any type of contract. usually, this term is confined to the contractors engaged for the construction or execution of works of repairs.

Tender:-

Tender is an offer in writing to execute some specified work or to supply some specified articles at certain rates, with in a fixed time under certain conditions of contract and agreement, between the contractor and the department or owner or party. The construction of work is usually done by contract. Sealed tenders are invited and the work is usually entrusted to the lowest tender.

Earnest money:-

while submitting a tender the contractor is to deposit a certain amount, about 2% of the estimated cost, with the department, as earnest money as guarantee of the tender. This amount is for a check so that the contractor may not refuse to accept the work or run away when his tender is accepted.

Daily labour:-

To execute work departmentally daily labours like Mazdoor, Mason, carpenter etc are engaged by the Assistant engineer or sub-assistant engineer with prior approval from competent authority daily labourers may be employed againest:-

Muster Roll :-

The categories of skilled and unskilled workers employed on works are daily rated wages are drawn in master roll whose daily attendance and out turn are recorded for purpose of payment.

Tools and Plants :-

The tools and plants of a division are of two categories. ordinary T and P i.e those required for the general use of the division and the cost of which is charged to minor head tools and plants.

Special T and P i.e those required for a specific work, the cost of which is borned by the work concerned.

Administrative approval :-

A formal approval is given by an administrative department of the govt for a work are project for which preliminary estimate has been framed by P.W.D. to meet the needs of department requiring the work.

Technical sanction :-

Department employed by the Govt., which ensures that the proposals are structurally sound and the estimate is accurately calculate based on adequate data such sanction is known as technical sanction and should be taken before inviting tenders to execute the work.

Security Deposit :-

This deposite is an amount of money which shall be deposited by the contractor whose tender has been accepted in order to tender himself liable to the department to pay compensation amounting being if the work is not satisfactory along according to the specification.

Earnest money :-

Earnest money is an assurance or gurantee in the form of cash on the part of the contractor to keep open the offer for consideration and to onform his intention to take up the work accepted in his favour for execution as performs and conditions in the tender.

(j) Running bill :-

The contractors may be paid according to the work done by them in bills i.e, partly payments the bill may be 3 types.

Running Payment as running account is shortly known as R.A-1, R.A-2, R.A-3 etc.

final bill :-

After giving some running payments then the contractor complete the work the last payment known as final payment made in the final bill before final payment the authority should check up the works has been done satisfactory no damage and to defects should be there.

(k) Annual repair :-

Annual repairs works are executed by the departments concerned ~~as~~ - Medical department buildings are maintained by the medical department, Police-department buildings are maintained by the police department etc.

Special repair :-

on the occasion of damages caused by flood, cyclone and other natural calamities repairs will be estimated and the cost of repair will be sanctioned by the compendent authority for that work.

Classificat^n of works

(According to their nature)

Original work

→ New construction work such as construct^n of new building, road, canal water supply project.

→ Addition to existing work which will increase the value of property.
Ex:- additional room.

→ Some of special repair to newly purchased
Ex:- change of flooring.
replacement & remodelling work of existing road.

Repair works.

→ operat^n undertaken to maintain in proper condit^n of building and works in ordinary use. such as annual repair works, plastering white washing etc.

→ special repairs on account of damage by floods, cyclones or other natural calamities

→ minor additions to residential buildings cost up to Rs 200/- & non residential building up to 1000/- is include in Repair work.

Types of Repair work:-

(a) Annual Repair:-

→ All works and structures are repaired and maintained in proper condit^n.
The repair work is done annually is called anual repair.
Ex:- White washed, Colour washed.

(b) Quadrennial repair:-
Every fourth year special repair works are done for thorough repair as repainting of doors, and windows, patch repair of plastering

(c) Special Repair:-
It consist of renewals of structures or damaged works. Ex:- renewal of floor, roofs
Repair of monsoon or flood damage work.

classificat^{n} of works according to their cost.

(work costing more than 2lakh) major work ←
(work costing more than Rs 50,000/- but not exceeding Rs 2lakh) minor work ←
(work cost does not exceed Rs 50,000/-) Petty work ←

Contract:- Contract is an undertaking by a person or firm to do any work under certain terms and conditions. The work may be for the construct^{n} or maintenance and repairs, for the supply of materials, for the supply of Labour, for the transport of materials.

Contractor:-

The term contractor means a person or firm who undertakes any type of contract. This term is confined to the contractors engaged for the construct^{n} or execut^{n} of works of repair.

Following are the different type of contracts for execution of civil engg. works:-

1. Item rate contract.
2. Lump sum contract.
3. Labour Contract.
4. Piece work agreement.
5. Scheduled contract.
6. Cost per percentage contract.

Item rate contract:- / Unit price contract / scheduled contract.

Contractors are required to quote rates for individual items of work on the basis of schedule of quantities provided by department.

→ This schedule indicates full nomenclature of the items as per sanctioned estimate, quantities and unit there in.

→ while filling up rates, the contractors are required to express amount in figures and words and also to work out the cost against each item. The final total amount of tendered for work is also drawn up by them.

Ex:- Railway Dept.

(2) Percentage rate contract:-

→ In this form of contract the department draws up the schedule of items according to descriptn of items sanctioned in the estimate with quantities, rates, units and amounts.

→ The departments fixes up the item rates of the tender (item rate tender)

→ The contractors are required to ~~offer~~ carry out the work as par with rates shown in percentage above or below the rates indicated in the schedule of work attached to the tender.

→ The percentage above or below or at par tendered by the contractor apply on the overall quantities.

(3) Lumpsum contract:-

In this type of contract contractors are required to quote a lumpsum for execution of a work complete in all respect i.e drawing, design and specificatn supplied to them with the tender with in specified time.

(4) Labour contract:- In Labour contract the contractor under takes contract for Labour portion. This contract is on item rate basis for Labour portion only and contractor is paid for quantities of workdone on measurement of different item of work.

Ex:- this system is not adopted in Govt. dept.

(5) Piece work aggrement:- Only a rate is agreed is that for which only a rate is agreed upon without reference to the total quanity of work to be done or the quantity of work to be done within a given period. In case of petty work valued up to Rs. 10,000/- each inclusive of cost of materials may be carried out through contractors by piece work agreement.

Work order:-

In case of acceptance is issued to a Contractor intimating that his rate has been accepted and to perform a formal agreement with in a specified number of days. After the formal agreement is performed for the contract a letter is issued to the contractor known as work order to take up the work and date of completion is treated from the date of issue of this letter. This is an order of commencement for a work and is issued to a contractor by executive engineer concerned.

Administrative Approval:- (to aggree)

are formal Approval and concurrence given by an administrative Dept. of Govt. for a work or project for which preliminary estimate has been framed by P.W.D to meet the needs of Dept - requiring the work. This order on the P.W.D to execute the proposed work with in the amount so sanctioned.

Technical sectn:-

Technical sectn is the term which denotes the order of the competent authority of the P.W.D sectioning a proper detailed estimate of a work or project. It amounts to no more than a guarantee that the estimate is accurately framed.

Tender:- 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, betn the contractor and department or party. The construction of work is done by contract. Sealed tender is invited and the work is usually to trust to the lowest tender. While inviting tenders the bill of quantities, detailed specificatn, conditn of contract and plan, drawing are

on payment of the requisite cost to the the contractors who tender or quote their rates

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 amount due.

Voucher :- Voucher is a written document with details which is kept in record as a proof of payment. for any payment first a bill is prepared, regularly checked and payment is made on the bill, and acknowledged by payee, by signature on revenue stamp as required, and after the payment is made bill becomes voucher document which is kept on record.

(Intermediate payment)

running payment :- This means Payment made on a running account to a contractor for works done or supplies made by him regularly measured and entered in M.B. when only a part of whole work or supply has been done and work or supply is in Progress. During progress of work the contractor is paid time to time and when the contractor has done some progress he is paid up to extent of work done by him.

Final payment :- This means the payment made on running account, made to a contractor on completion or determination of his contract and full settlement of account. The bill on which final payment is made is known as 'final bill'.

Advance payment:-

This means payment made on a running account to a contract for work done and ~~supplies made~~ by him but not measured. Advance payment is not generally made to the contractor, but may be made under special cases when the work is sufficiently progressed but measurement cannot be taken for certain valid reasons, on certificate of the Assistant engg. in charge of work that the value of work done is not less than adv. payment made or case proposed to be made and retained measurement will be taken as soon as posible

Cash:- The term cash includes legal tender coins notes, cheques payable on demand & demand draft & transferm receipt. A small supply of revenue Stamps may be kept as part of cash balance

Debit & credit:- Debit means expenditure and credipt mean receipts when an amount is to be debited to a work means that the amount is to be shown as expenditure on the work. Similarly when an amount is to be credited to a work it means that the amount is to be shown as receipt under the work

Earnest money:-

It is a gurantee in the form of cash on the part of contractor to keep open the offer for consideration & to conform his intention to take up the work accepted in his favour for execution as performs & condition in the tender.

The amount of earnest money not Large it may be deposited in cash in division or subdivision office. The earnest money given by the contractors except the 3 lowest tender should be returned with in a week will or 15 days of except. Once of tender if their offers not consider rate.