

DESIGN & DRAWING OF CONCRETE SILT DETENTION STRUCTURE (2m & 4 m HEIGHT)

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Typical Design of Concrete Silt Detention Structure (2 m Height)

I. Brief Summary of Structure

- Mean annual rainfall : 1300 mm
- Type of structure proposed : PCC Silt Detention Structure
- Catchment area : 4.50 ha
- Maximum length of catchment area : 360
- Average width of catchment area : 120
- Length: Width Ratio : 3:1
- Rain fall in the area : 1300 mm
- Peak flood discharge : 0.61
- Type of soil : Sandy loam
- Total Height of the structure : 2.00
- Depth of foundation below GL : 1.00
- Base width : 0.50
- Top width : 0.50
- Drop of dam (height up to crest) : 1.50
- Length of apron : 2.30
- Head of weir : $0.30+0.20 = 0.50$

II. Hydraulic Data

- Catchment area : 4.50 ha
- Coefficient of runoff (C) : 0.35
- Intensity of rainfall : 140mm/hr
- Peak Discharge

$$Q = \frac{CIA}{360} = \frac{0.35 \times 140 \times 4.50}{360} = 0.61 \text{ Cum}$$

III. Hydrological Data

- Crest Length $Q = 1.711LH^{3/2}$

$$L = \frac{Q}{1.711H^{3/2}} = \frac{0.61}{1.711 \times 0.30^{3/2}} = \frac{0.60}{0.280} = 2.17 \text{ Say } 2.50$$

- Top Width $0.3f = 0.3 \times 1.50 = 0.45 \text{ say } 0.50 \text{ m}$
- Base Width 0.50 m
- Apron $1.5f + h = 1.5 \times 1.50 + h = 2.25 + 0.30 \text{ say } 2.55\text{m keep} = 2.30\text{m}$

IV. Estimated Cost: Rs 38,710/-

Detailed Estimate of Concrete Silt Detention Structure

S. No	Particular	No	L m	B m	D m	Contents Cum	
1	Excavation in foundation, trenches etc in earth work, lift upto 1.50m, stacking in excavated soil not more than 3m clear from the edge of excavation and their returning the stacked soil in 15 cm layers, where required, into plinth, sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposing of all surplus excavated earth as directed with in a lead of 20 m. (Pick work)						
	Main dam body foundation	1	5.50	0.50	0.60	1.65	
	Dam Body L/Side	1 st step	1	$\frac{2.30+0.0}{2}$	0.50	2.00	1.15
	R/Side	1 st step	1	$\frac{2.80+0.80}{2}$	0.50	1.00	0.90
		2 nd step	1	$\frac{1.30+0.0}{2}$	0.50	1.00	0.32
	Toe wall + toe wall extension	1	5.50	0.30	0.60	0.99	
	Apron	1	2.30	3.10	0.60	4.27	
		Total					9.28 Cum
	2	PCC work 1:3:6					
		Foundation	1	5.50	0.50	0.60	1.65
Dam body		Part A	1	8.00	0.50	1.00	4.00
		Part B	1	8.50	0.50	0.50	2.12
		Part C (8.50-2.50=6.0)	1	6.00	0.30	0.50	0.90
Toe wall + toe wall extension							
1 st Step		1	5.50	0.30	0.60	0.99	
Toe wall extension above foundation		1x2	1.20	0.30	0.50	0.36	
Apron 1 st step		1	2.30	3.10	0.30	2.13	
Side wall		Part A'	1x2	2.30	0.30	0.30	0.41
		Part B'	1x2	2.60	0.30	0.50	0.78
		Part C'	1x2	$\frac{2.0+0.50}{2}$	0.30	1.50	1.12
		Total					14.46 Cum
3	Form work						
	Dam body	1x2	$\frac{3.50+8.50}{2}$	-	2.00	24.00	
	Toe wall + toe wall ext 2 nd step	1x2	5.50	-	0.30	3.30	
	Toe wall ext above foundation	2x2	1.20	-	0.50	2.40	
	Side wall Part A'	2x2	2.30	-	0.50	4.60	

S. No	Particular	No	L m	B m	D m	Contents Cum
	Part B'	2x2	2.60	--	0.50	5.20
	Part C'	2x2	$\frac{2.00+0.50}{2}$	--	1.50	7.50
					Total	47.00
	Less spillway portion	1x2	2.50	--	0.50	2.50
					Total	44.50
						Sqmt
						Sqmt
						Say
						45.00
4	Earth filling behind the side wall					
	Left side	1	2.60	$\frac{2.20+1.20}{2}$	$\frac{2.0+0.50}{2}$	5.52
	Right side	1	2.60	$\frac{3.20+1.20}{2}$	$\frac{2.0+0.50}{2}$	7.15
					Total	12.67
						Cum

Material Statement

S. No	Particular	Qty	Cement	Sand	Bajri
1	PCC work 1:3:6	14.46 Cum	65.07	6.79	13.59
		Total	65.07	6.79	13.59
		Say	65 Bag	7 Cum	14 Cum

Cost Analysis

S. No	Particular	Qty	Rate	Unit	Amount
1	Excavation in foundation , trenches etc in earth work , lift upto 1.50 m, stacking in excavated soil not more than 3m clear from the edge of excavation and their returning the stacked soil in 15 cm layers, where required , into plinth, sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposing of all surplus excavated earth as directed with in a lead of 20 m. (Pick work)	9.28	62.70	Cum	581.85
2	Earth work side filling (12.67-9.28=3.39 Cum)	3.39	46.60	Cum	157.97
3	Plain 1:3:6 in walls including buttresses pilasters and their caps and bases string courses etc.	14.46	254.40	Cum	3678.62
4	Hiring charges of concrete mixer machine	14.46	12.50	Cum	180.75
5	Form work providing form work of ordinary timber planking so as to give rough finish including	45.00	39.30	Sqm	1768.50

S. No	Particular	Qty	Rate	Unit	Amount
	centering shuttering. Strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4mtrs. And removal of the same for in situ reinforced concrete and plain concrete work in.				
6	Carriage of cement from store to Village store lead 5 km including loading unloading & stacking by mechanical transport. (65/20=3.25 T) 0 – 5 km = 61.36	3.25	61.36	Tonne	199.42
7	Carriage of the cement village store to work site including loading unloading and stacking lead 1 km by manual labour	3.25	124.10	Tonne	403.32
8	Carriage of Crusher Sand & Crusher Bajri from Crusher to work site lead 10 km by mechanical transport including loading unloading Sand 7 Cum + Bajri 14 Cum = 21 Cum 0 – 5 km = 92.06 6 – 10 km @ 6.36 = 31.80 Total = 123.86 Cum	21.00	123.86	Cum	2601.06
	Total A				9571.49
	Add 100 % enhancement on items above				9571.49
	G. Total (A)				19142.98

Cost of Material

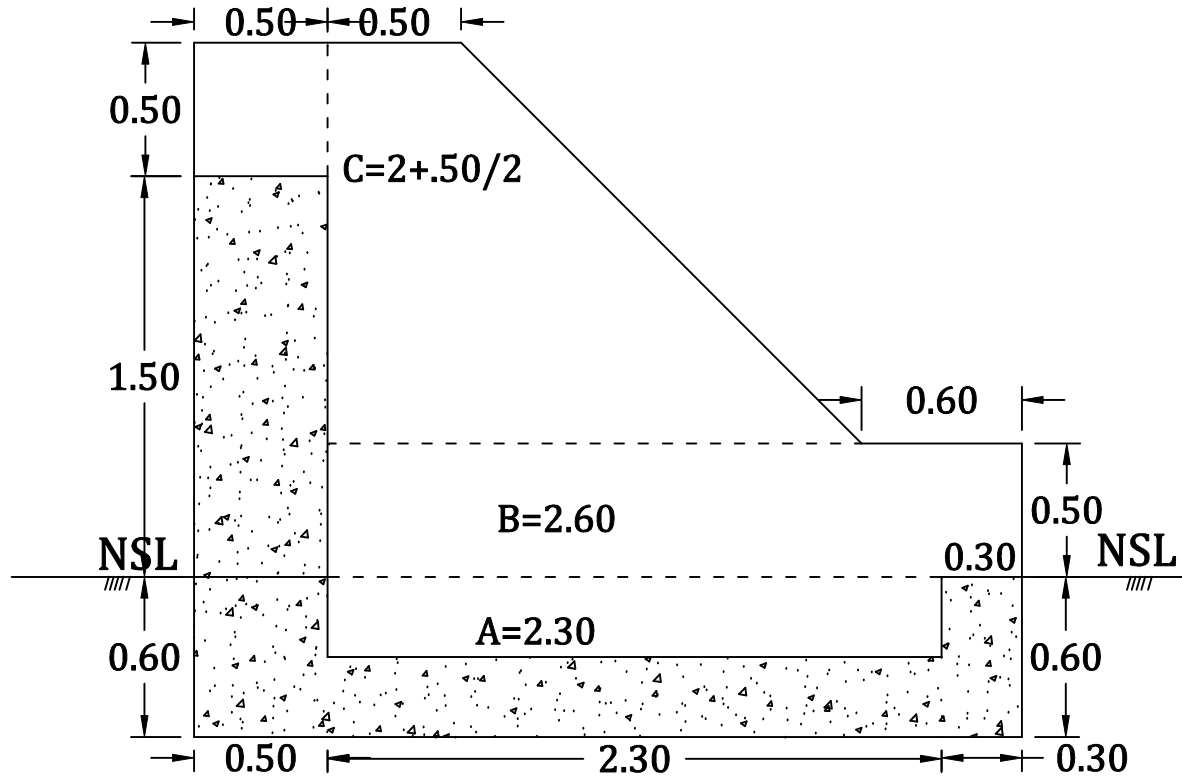
S.No	Particular	Qty	Unit	Rate	Amount
1	Cost of Cement	65	Bags	176.00	11440.00
2	Cost of Crusher Bajri	14	Cum	400.00	5600.00
3	Cost of Crusher Sand	7	Cum	200.00	1400.00
	Total (B)				18440.00
	Total (A+B) = 19142.98 + 18440.00				37582.98
	Add 3 % contingency				1127.48
	G. Total				38710.46 Say 38710.00

Rs. Thirty Eight Thousand Seven Hundred and Ten Only

*** The rates applied are general in nature. To calculate the exact cost, appropriate rates may please be applied**

Drawing & Design of Concrete Silt Detention Structure

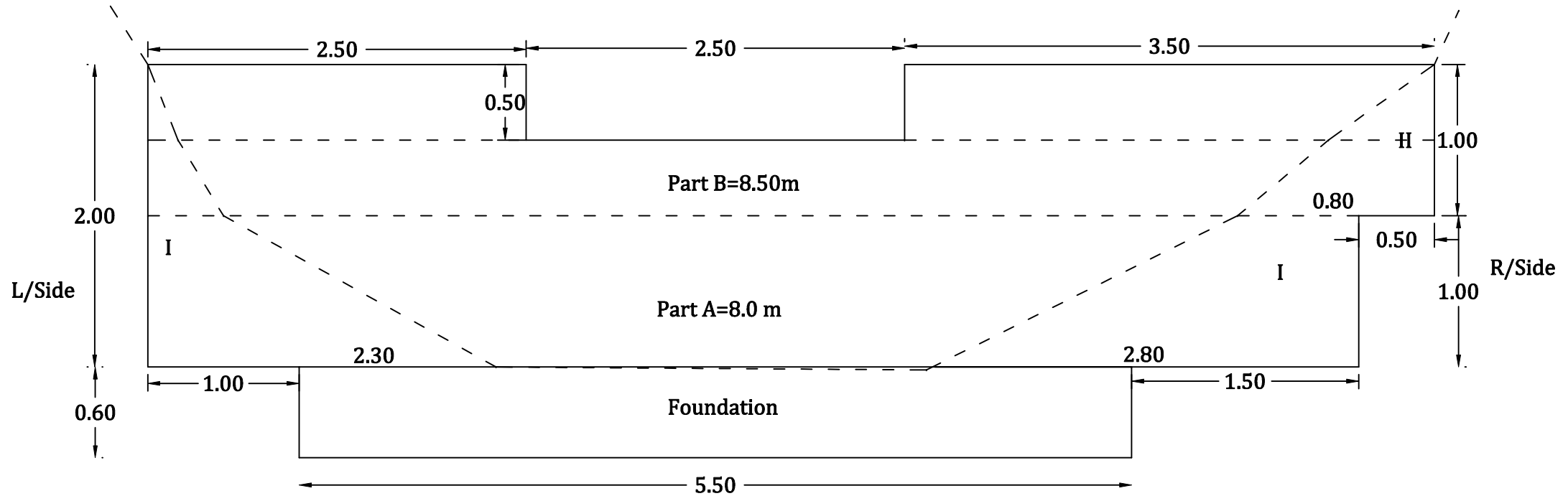
Scale 1cm = 0.50 m



Section AB

Drawing & Design of Concrete Silt Detention Structure

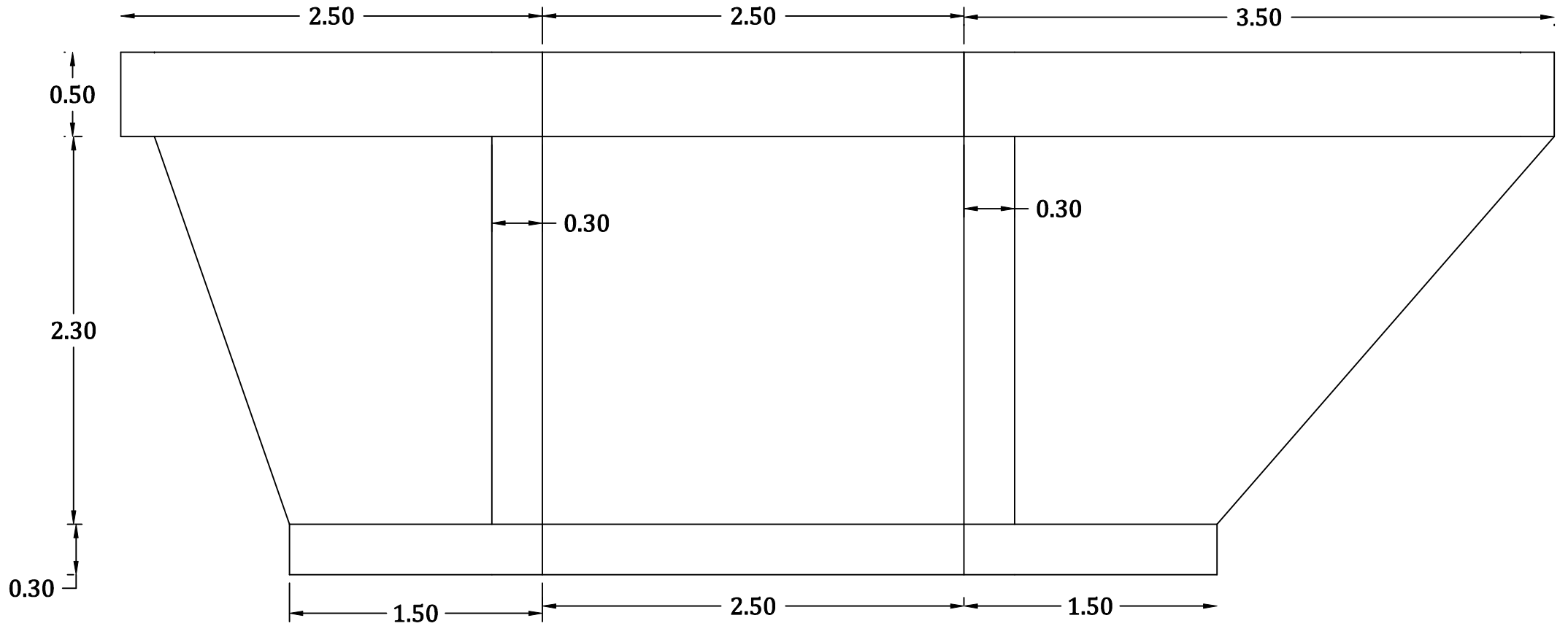
Scale 1cm = 0.50 m



X-Section

Drawing & Design of Concrete Silt Detention Structure

Scale 1cm = 0.50 m



Plan

Typical Design of Concrete Silt Detention Structure (4 m Height)

I. Brief Summary of Structure

- Mean annual rainfall : 1300 mm
- Maximum Length of the catchment area : 570 m
- Average width of the catchment area : 450 m
- Catchment area : 26 ha
- Type of Structure : PCC Structure
- Length: Width Ratio : 1.27:1
- Rain fall in the area : 1300 mm
- Peak flood discharge : 3.56
- Type of soil : Sandy loam
- Top width of Structure : 1 m
- Height of Structure upto crest : 3 m
- Total Height of Structure : 4 m
- Depth of foundation below G.L : 1 m

II. Hydraulic Data

- Catchment Area (A) : 26 ha
- Coefficient of Runoff (C) : 0.35
- Intensity of Rainfall (I) : 140 mm/hr
- Peak Discharge $Q = 0.0028 \text{ CIA}$: $0.0028 \times 0.35 \times 140 \times 26 = 3.56$

III. Hydrological Data

- Calculation of Disposal of Peak Discharge

$$L = \frac{Q}{1.711 \times H^{3/2}} = \frac{3.56}{1.711 \times 0.75^{3/2}} = \frac{3.56}{1.11} = 3.20 \text{ say } 3.50$$

- Apron = $F(2.28) \left(\frac{H}{F} + 0.52 \right) = 3(2.28) \left(\frac{0.75}{3} + 0.52 \right)$
 $= 6.84 \times (0.25 + 0.52) = 5.26 \text{ Say } 5 \text{ m}$

- Top Width of WHS

$$0.552\sqrt{3} = 0.96 \text{ Say } 1 \text{ m}$$

- Base Width = $\frac{F}{\sqrt{S}}$

$$= \frac{3}{\sqrt{2.4}} = 1.94 \text{ Say } 2 \text{ m}$$

IV. Estimated Cost : Rs. 2,15,888/-

Detailed Estimate of Concrete Silt Detention Structure

S. No	Particulars	No	L	B	H	Contents
			M	M	M	M ³
1	Earthwork foundation, Dam body					
	Foundation, Apron and Side Wall	1	4.50	8.50	1.00	38.25
	Left Side					
	1st Step	1	1.60 + 1.00	2.00 + 1.70	1.00	2.40
			2	2		
	2nd Step	1	1.00 + 0.80	1.70 + 1.30	1.00	1.35
			2	2		
	3rd Step	1	1.30 + 0.80	1.30 + 1.00	1.00	1.21
			2	2		
	4th Step	1	0.80 + 0.00	1.00	1.00	0.40
			2			
	Right Side					
	1st Step	1	4.50 + 2.00	2.00 + 1.70	1.00	6.01
			2	2		
	2nd Step	1	4.50 + 1.00	1.70 + 1.30	1.00	4.12
			2	2		
	3rd Step	1	4.50 + 1.70	1.30 + 1.00	1.00	3.56
		2	2			
4th Step	1	1.70 + 0.00	1.00	1.00	0.85	
		2				
Toe wall & Toe wall extension	1	6.50	0.50	1.00	3.25	
Total					61.40 Cum	
2	Earthwork Filling Sides					
	Left Side	1	5.00	7.00 + 1.00	4.00 + 1.00	50.00
				2	2	
	Right Side	1	5.00	1.50 + 1.00	4.00 + 1.00	15.62
				2	2	
Total					65.62 Cum	
3	PCC Work 1:3:6 in Dambody					
	Foundation	1	4.50	2.00	1.00	9.00
	Dam Body					
	Part A	1	6.50	2.00 + 1.70	1.00	12.02
				2		
	Part B	1	9.00	1.70 1.30	1.00	13.50
				2		
	Part C	1	13.00	1.30 + 1.00	1.00	14.95
				2		
	Part D (13.0-3.50=9.50)	1	9.50	1.00	1.00	9.50
	Apron	1	4.00	4.50	0.50	9.00
	Toe Wall & Toe Wall Extension	1	6.50	0.50	1.00	3.25
	Above NSL Toewall Extension	1x2	1.00	0.50	1.00	1.00
	Toe Wall Protection Works	1	2.00	4.50	0.50	4.50
	Side Wall					
	Part A'	1x2	4.00	0.50	0.50	2.00
	Part B'	1x2	4.50	0.50	1.00	4.50
Part C'	1x2	2.30 + 1.70	0.50	2.00	4.00	
			2			
Part D'	1x2	1.70 + 1.00	0.50	1.00	1.35	
			2			
Total					88.57 Cum	

S. No	Particulars	No	L	B	H	Contents	
			M	M	M	M ³	
4	Form Work Dam Body Toe Wall Extension Above NSL Toewall Extension Side Wall Part A' Part B' Part C' Part D' Deduction of Spillway Portion Total	1x2	6.50 + 13.00 2	-	4.00	78.00	
		1x2	6.50	-	0.50	6.50	
		2x2	1.00	-	1.00	4.00	
		2x2	4.00	-	0.50	8.00	
		2x2	4.50	-	1.00	18.00	
		2x2	2.30 + 1.70 2	-	2.00	16.00	
		2x2	1.70 + 1.00 2	-	1.00	5.40	
		2x2	3.50	-	1.00	-14.00	
							121.90 Sq M

Material Statement

S. No	Particular	Qty	Cement	River Sand	Crusher Bajri
			Bags	Cum	Cum
1	PCC 1:3:6	88.57	398.56	41.62	83.25
	Total		398.56	41.62	83.25
			Say 399 Bags	Say 42 Cum	Say 83 Cum

Cost Analysis of Concrete Silt Detention Structure

S. No	Particular	Qty	Unit	Rate	Amount
1	Excavation in foundation, trenches etc in earth work, lift upto 1.50 m, stacking the excavated soil not more than 3 m clear from the edge of excavation and their returning the stacked soil in 15 cm layers, where required, into plinth, sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposing of all surplus excavated earth as directed with in a lead of 20 m.				
	50% Pick Work	31.00	Cum	62.70	1943.70
	50% Soft Rock	30.40	Cum	90.70	2757.28
2	Filling in plinth with sand under floor including watering, ramming consolidating and dressing complete (65.00-61.40=3.60)	3.60	Cum	46.60	167.76
3	Cement/Lime Concrete in Foundation and Under Floors: Plain 1:3:6 in walls including buttressess pilasters and their caps and bases and string courses	88.57	cum	254.40	22532.20
4	Hiring and operating charge for vibrator and mixer (PCC 1:3:6 = 88.57)	88.57	Cum	25.00	2214.25
5	Carriage of Cement from Store to Village Store (399/20=19.95 Tonne) Lead 26 km upto 5 Km = 61.36 6 to 10 Km @4.25 = 21.25 11 to 20 km@3.31 = 33.10 21 to 26 km@2.58 = 15.48 Total = 131.19	19.95	Tonne	131.19	2617.24
6	Carriage of Cement from village store to work site lead 2 km by manual labour including loading, unloading and stacking	19.95	Tonne	219.30	4375.04
7	Carriage of Bajri from crusher to work site by Tractor Trolly lead 16 km including loading, unloading. 0-5 km = 92.06 6-10 Km@6.36 = 31.80 11-16 Km@4.97 = 29.82 Total = 153.68	83.00	Cum	153.68	12755.44
8	Carriage of sand from River to work site lead 7 km 0-5 km = 92.06 6-7 Km@6.36 = 12.72 Total = 104.78	42.00	Cum	104.78	4400.76
8	Form work: Providing form work of ordinary timber planking so as to give rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 mtrs. And removal of the same for in situ reinforced concrete and plain concrete work in: Vertical surfaces such as soffits & suspended floors, roofs landing & the like including attached pilasters,, buttresses, plinth & string courses and the like.	121.90	Sq M	39.30	4790.67
	Total				58554.34
	Add 83.33% enhancement on items above				48793.33
A	Total				107347.66

S. No	Particular	Qty	Unit	Rate	Amount
Cost of Material					
1	Cement	399	Bags	173	69027
2	Crusher Aggregate (bajri) 12-15 mm	83	Cum	333	27639
3	Crusher Sand	42	Cum	133	5586
B	Total				102252.00
	Total (A+B)	107347.66		+102252	209599.66
	Add 3% Contingency				6287.99
	Grand Total				215887.65

Say 2,15,888/-

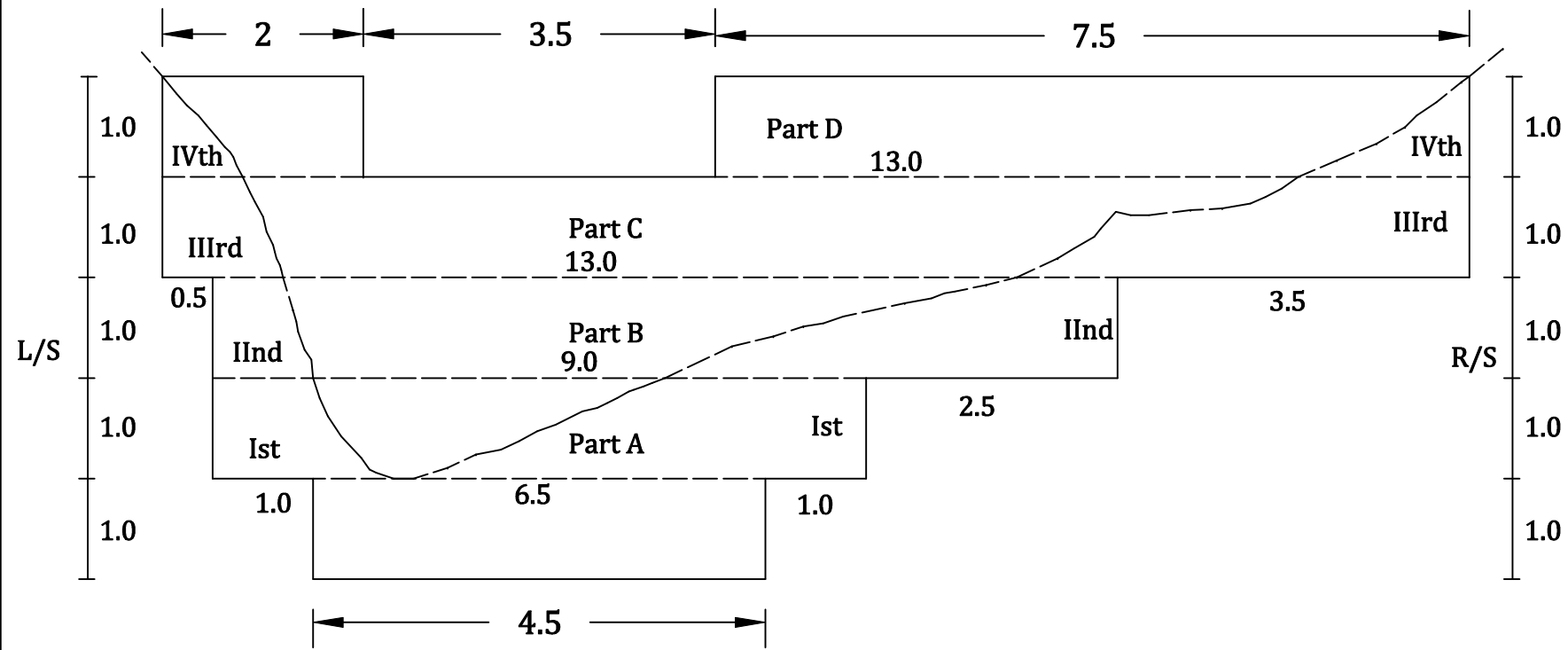
Rs. Two Lakh Fifteen Thousand Eight Hundred and Eighty Eight Only

* The rates applied are general in nature. To calculate the exact cost, appropriate rates may please be applied

Silt Detention Structure

Not to Scale

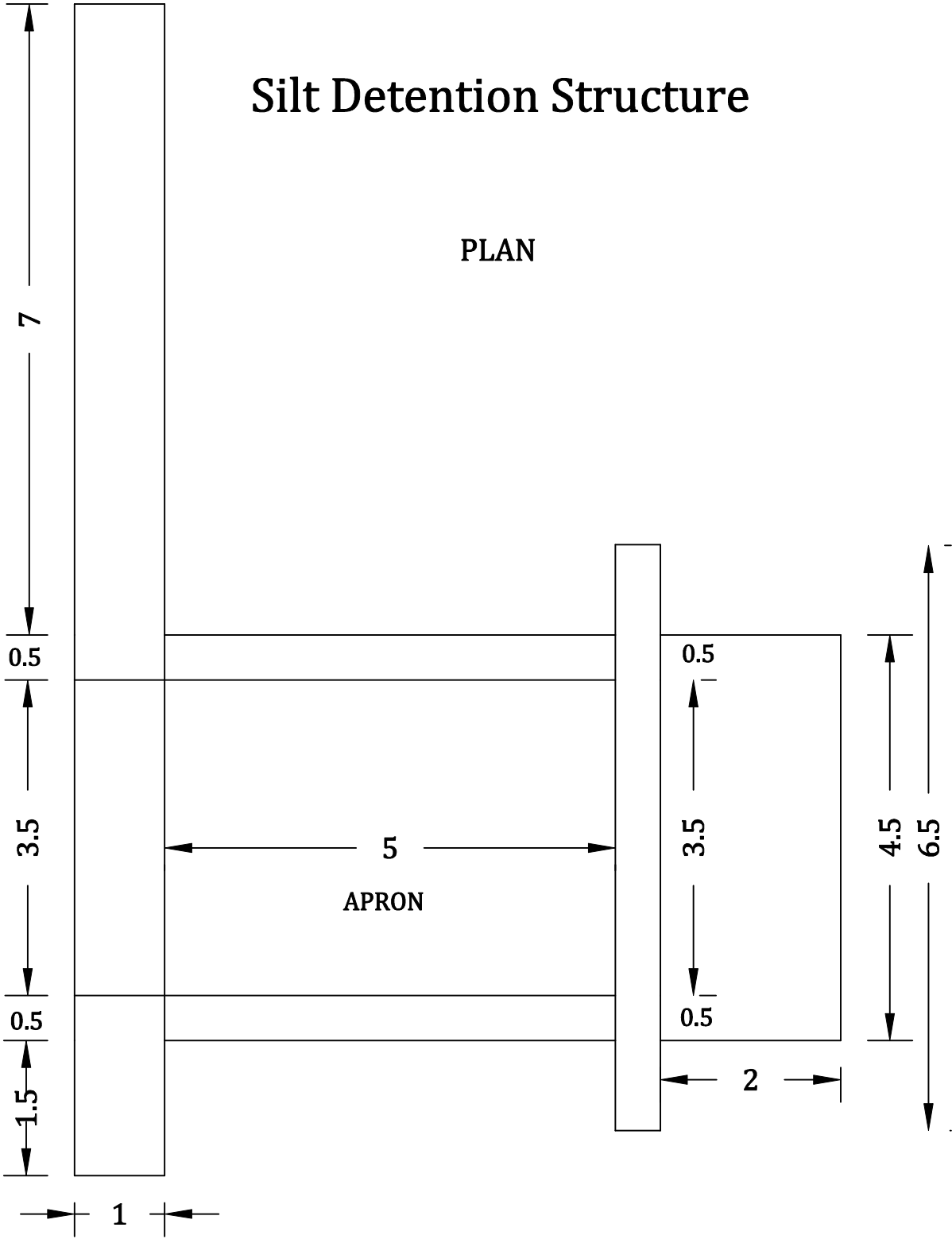
X-Section



Not to Scale

Silt Detention Structure

PLAN



Silt Detention Structure

Not to Scale

Section AB

