

QUANTITY SURVEYING ABUTMENT FOR A1

No.

Item	Formula	Quantity
3.1.9) Approach Slab		
3.1.9.1 Concrete	$= 23.04 \times \left(\frac{6.00 \times 0.30}{2} + \frac{0.30 + 0.50}{2} \right) + \frac{0.50 \times 0.50}{2} \times 2 \times 0.20$	43.24 m ³
3.1.9.2 Lean Concrete	$= (0.30 + 0.28 + 5.20) \times 23.04 \times 0.1$	13.3 m ³
3.1.9.3 Asphaltic Joint Filler	$= \left\{ \frac{0.30 \times (0.02 + 0.06)}{2} + 0.30 \times 0.02 \right\} \times 23.04$	0.41 m ³
3.1.9.4 Form	$= \left(2 \times \left(\frac{6.00 \times 0.30}{2} + \frac{0.30 + 0.50}{2} \right) + \frac{0.50 \times 0.50}{2} \right) \times 2 + 11.52$	24.15 m ²

QUANTITY SURVEYING ABUTMENT FOR A2

No.

Item	Formula						Quantity
3.1.10) Concrete							
3.1.10.1 BackWall	$v1 = 24.10 \times 2.04 \times 0.40 =$						19.67 m ³
3.1.10.2 Frontwall	$v2 = 24.10 \times \left(\frac{4.94 + 5.18}{2} - 1.50 \right) \times 0.10 \times 2 =$						182.82 m ³
3.1.10.3 Corbel	$v3 = 0.30 \times \left(\frac{0.30 + 0.60}{2} \times 23.10 \right) =$						3.12 m ³
3.1.10.4 Haunch	$v4 = 6.98 \times 0.50 \times 0.50 \times 2 \times 2 =$						1.75 m ³
3.1.10.5 Wingwall	$v5 = \left(\frac{3.50 \times (6.98 + 6.90)}{2} + \frac{1.85 \times (1.05 + 3.41)}{2} \right) \times 0.50 \times 2 =$						28.41 m ³
3.1.10.6 Parapet	$v6 = \left(\frac{0.50 \times 0.30}{2} + 0.20 \right) \times \left(\frac{0.15 \times 2}{2} \right) \times 5.75 \times 2 =$						2.06 m ³
3.1.10.7 Footing	$v7 = \frac{24.10 \times 7.50 \times 2.00}{12 \times \pi \times 0.75} \times 0.1 =$						359.38 m ³
Total							597.2 m³
3.1.11) Form							
3.1.11.1 BackWall	$a1 = 2.00 \times 2.04 \times 24.10 - 2.04 \times \left(\frac{0.50 + 0.50}{2} \right) \times 2 =$						94.25 m ²
3.1.11.2 Frontwall	$a2 = 24.1 \times \left(\frac{4.94 + 5.181}{2} - 0.5 \right) + 5.06 \times \left(\frac{0.5 + 1.5}{2} \right) \times 5.181 \times 2 =$						248.74 m ²
3.1.11.3 Corbel	$a3 = \left(0.3 + \frac{0.3 \times 2 + 0.3 \times 23.1}{2} \right) \times 0.5 =$						16.73 m ²
3.1.11.4 Haunch	$a4 = \left(\frac{0.5 \times 2 + 0.5 \times 2}{2} \right) \times 6.98 \times 2 =$						9.87 m ²
3.1.11.5 Wingwall	$a5 = 2 \times \left(\frac{3.5 \times (6.98 + 6.90)}{2} + \frac{1.85 \times (1.05 + 3.41)}{2} \right) + 0.5 \times \left(\frac{1.05 + 2.97}{2} + 6.98 \right) =$						114.19 m ²
3.1.11.6 Parapet	$a6 = \left(\frac{5.75 \times (0.5 + 0.3 + 0.05)}{2} + 1.4142 \times 0.15 + 2 \times 0.17875 \right) \times 2 =$						13.50 m ²
3.1.11.7 Footing	$a7 = 2 \times (24.100 + 7.500) \times 2.00 =$						126.40 m ²
Total							623.7 m²

QUANTITY SURVEYING ABUTMENT FOR A2

No.

Item	Formula	Quantity
3.1.12) Scaffolding:	3.1.12.1 (H<=4m) A2 = { 2 x (24.10 + 7.50) + 8 } x 2 =	142.4 m2
	3.1.12.2 (4m < H <= 30m) A2 = ((24.1+2) + (5.35+1.5+2) + (0.5+2) + (5.35+1-1) + (24.1-2 x 1.5) + (5.35-1+1) + (0.5+2) + (5.35+1.5+2)) x (2.04+4.94)	562.6 m2
3.1.13) Support	= (9.35 - 1.55 + 5.48) x 1.85 / 2 x 0.50 x 2 =	12.3 m3
3.1.14) Lean Concrete	3.1.14.1 Concrete class G v = 0.1 x { (24.10 + 0.2) x (7.50 + 0.2) - 12 x 1/4 x pi x 1.50 ^2 } =	16.6 m3
	3.1.14.2 Form A = 0.1 x { (24.10 + 0.2) + (7.50 + 0.20) } x 2 =	6.40 m2
3.1.15) Blinding Stone	v = 0.2 x { (24.10 + 0.2) x (7.50 + 0.2) - 12 x 1/4 x pi x 1.50 ^2 } =	33.2 m3
3.1.16) Bored Pile	* Concrete D N = 90 = 90 nos per 40.0m	
	V1 = (0.450 x 0.450 - 0.020 x 0.020) x 1/2 x 4 x 10.000 x 4 =	8.068 m3
	V2 = (0.450 x 0.450 - 0.020 x 0.020) x 1/2 x 4 + 0.090 x 0.090) =	0.065 m3
	V = 8.133 x 90 = 731.970 m3	
	*Form A1 = 0.020 x 1.414 x 4 x 10.000 = 1.131 m2	
	A2 = 0.410 x 3 x 10.000 = 12.300 m2	
	A3 = 0.450 x 0.450 - 0.020 x 0.020 x 1/2 x 4 = 0.202 m2	
	A4 = (0.450 + 0.090) x 1/2 x 0.620 x 3 = 0.502 m2	
	A = A1 x 4 + A2 x 4 + A3 x 7 + A4 = 55.640 m2 (per one)	
	3.1.17) Earthworks	3.1.17.1 Excavation for foundation = 1.69 / 6 x ((9.50 x 26.10) + (12.88 x 29.48) + (9.50 + 12.88) x (26.10 + 29.48)) =
3.1.17.2 Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume	* Pile Occupied Volume = 12 x pi / 4 x 1.50 = 8.48 m3	
* Excess Soil	x 1.50 x 0.400 = 417.63 m3	
3.1.17.2 Back Fill	= 109.5 m3	

QUANTITY SURVEYING ABUTMENT FOR A2

No.

Item	Formula	Quantity
3.1.18) Approach Slab		
3.1.18.1 Concrete	$= 23.04 \times \left\{ \frac{6.00 \times 0.30 + (0.30 + 0.50) / 2 \times 0.20 - 0.50 \times 0.50 / 2 \times 0.3}{2} \right\}$	43.24 m3
3.1.18.2 Lean Concrete	$= (0.30 + 0.28 + 5.20) \times 23.04 \times 0.1$	13.3 m3
3.1.18.3 Asphaltic Joint Filler	$= \left\{ \frac{0.30 \times (0.02 + 0.06) + 0.30 \times 0.02}{23.04} \right\} \times 2$	0.41
3.1.18.4 Form	$= (2 \times (6.00 \times 0.30) + (0.30 + 0.50) \times 0.50) + (0.50 + 0.30) \times 0.50 \times 2 - 6.00 \times 0.30$	24.15 m2

LIST OF REINFORCEMENT (FOR 1 ABUTMENT)

REINF No.	DIA.	LENGTH	NUMBER	UNIT WEIGHT	WEIGHT	REMARKS
	mm	mm		kg/m	kg	
A1	14	2411	289	1.208	842.00	
A2	14	24752	18	1.208	538.39	
A3	14	720	144	1.208	125.29	
A4	16	1837	97	1.578	281.24	
A5	14	690	97	1.208	80.88	
A6	14	23552	4	1.208	113.84	
F1	25	10800	97	3.853	4036.78	
F2	25	7300	96	3.853	2700.43	
F3	25	8174	97	3.853	3055.24	
F4	25	5000	96	3.853	1849.61	
F5	20	8050	16	2.466	317.64	
F6	20	25200	16	2.466	994.35	
F7	16	4830	144	1.578	1097.76	
F8	20	28700	30	2.466	2123.36	
F9	20	25900	30	2.466	1916.20	
W1	22	5485	94	2.984	1538.54	
W2	22	6989	97	2.984	2022.98	AVERAGE
W3	16	6850	97	1.578	1048.73	AVERAGE
W4	14	1822	212	1.208	466.77	
W5	16	24856	21	1.578	823.85	
W6	14	24752	25	1.208	747.77	
W7	16	1860	97	1.578	284.76	
K1	22	5955	8	2.984	142.16	
K2	22	3085	16	2.984	147.29	
K3	22	4185	12	2.984	149.86	
K4	25	9664	28	3.853	1042.69	AVERAGE
K5	25	4587	12	3.853	212.10	
K6	22	5205	30	2.984	465.96	
K7	18	6770	8	1.998	108.19	
K8	16	6945	12	1.578	131.54	
K9	16	1731	44	1.578	120.21	
K10	16	2370	2	1.578	7.48	
K11	20	2250	22	2.466	122.07	
K12	16	9505	28	1.578	420.06	AVERAGE
K13	18	5135	28	1.998	287.21	
K14	10	690	240	0.617	102.10	
K15	22	5585	12	2.984	199.99	AVERAGE
K16	18	6400	12	1.998	153.41	AVERAGE
K17	16	2880	16	1.578	72.73	AVERAGE
K18	16	2880	16	1.578	72.73	AVERAGE
K19	22	5785	6	2.984	103.58	AVERAGE
K20	18	5715	6	1.998	68.50	AVERAGE
K21	25	4914	4	3.853	75.74	
K22	14	875	60	1.208	63.44	
K23	20	3810	34	2.466	319.47	
K24	16	2227	44	1.578	154.66	
K25	22	5956	8	2.984	142.18	
K26	18	5841	8	1.998	93.34	
R1	10	3800	10	0.617	23.43	
TOTAL						
		32009	kg			
	D10:	126	kg	D20:	5793	kg
	D14:	2978	kg	D22:	4913	kg
	D16:	4516	kg	D25:	12973	kg
	D18:	711	kg			

XI. QUANTITIES OF EARTHWORKS SLOPE PROTECTION OF INFRONT OF ABUTMENTS

Abutment A1

h1	h2	h3	h4	h5	h6	d1	d2
8.45	3.5	2.9	1.04	1.54	0.34	24.1	12

Block	a (m)	b (m)	Dh (m)	R (m)	r (m)	L (m)	Sxq (m ²)	W (m)	Masonry (m ³)	Blinding (m ³)
1	10.400	6.688	4.950	8.544	0.000	9.874	66.224		19.87	6.62
2	12.000	12.000	0.600	20.544	8.544	12.015	274.347		82.30	27.43
3	3.720	2.325	1.860	23.566	20.544	3.549	122.887		36.87	12.29
4	24.100	12.000	0.600				289.561		86.87	28.96
5	24.100	2.325	1.860				71.757		21.53	7.18
6	10.400	6.688	4.950	8.544	0.000	9.874	66.224		19.87	6.62
7	12.000	12.000	0.600	20.544	8.544	12.015	274.347		82.30	27.43
8	3.720	2.325	1.860	23.566	20.544	3.549	122.887		36.87	12.29
9			1.200				4.320	98.098	35.32	7.85
Extra								88.607	422	137
FOOTING	Wood pile		(m)	5886	LENGTH OF FOOTING : L = 98.10 (m)					
	Binding		(m ³)	7.8						
	Stone masonry		(m ³)	35.3						
	Excavation		(m ³)	423.8						
	Back fill		(m ³)	294						
SIDE SLOPE	Masonry		(m ³)	422						
	Blinding		(m ³)	137						
	Geotextile		(m ²)	406						
	PVC Pipe		(m)	49						

Abutment A2

h1	h2	h3	h4	h5	h6	d1	d2
8.27	3.5	2.9	1.04	1.54	0.34	24.1	12

Block	a (m)	b (m)	Dh (m)	R (m)	r (m)	L (m)	Sxq (m ²)	W (m)	Masonry (m ³)	Blinding (m ³)
1	10.040	6.463	4.770	8.251	0.000	9.531	61.733		18.52	6.17
2	12.000	12.000	0.600	20.251	8.251	12.015	268.829		80.65	26.88
3	3.720	2.325	1.860	23.274	20.251	3.549	121.258		36.38	12.13
4	24.100	12.000	0.600				289.561		86.87	28.96
5	24.100	2.325	1.860				71.757		21.53	7.18
6	10.040	6.463	4.770	8.251	0.000	9.531	61.733		18.52	6.17
7	12.000	12.000	0.600	20.251	8.251	12.015	268.829		80.65	26.88
8	3.720	2.325	1.860	23.274	20.251	3.549	121.258		36.38	12.13
9			1.200				4.320	97.180	34.98	7.77
Extra								87.689	414	134
FOOTING	Wood pile		(m)	5831	LENGTH OF FOOTING : L = 97.18 (m)					
	Binding		(m ³)	7.8						
	Stone masonry		(m ³)	35.0						
	Excavation		(m ³)	420						
	Back fill		(m ³)	292						
SIDE SLOPE	Masonry		(m ³)	414						
	Blinding		(m ³)	134						
	Geotextile		(m ²)	402						
	PVC Pipe		(m)	49						

NOTES :

* INPUT VALUES : GRAY CELLS ; TOTAL VALUES : BOLD NUMBERS

* No. of Blocks : see drawing. Extra block used for calculation only.

- h₁ : Elevations (see drawing)
- d : Distances (see drawing)
- a₁ : Long edge of ellipse (or rectangle) : a₁=Dh₁*slope
- b₁ : Short edge of ellipse (or rectangle) : b₁=Dh₁*slope₁
- Dh₁ : Height of cone (or truncated cone)
- R₁ : Average radius of lower ellipse : R₁=(S_{a1}+S_{b1})/2
- r₁ : Average radius of upper ellipse : r₁=(S_{a1}+S_{b1})/2
- L₁ : Generatrix of cone : L₁=sqrt(Dh₁²+(R₁-r₁)²)
- Sxq : Area of cone's side (or plane before abutment) :
 Sxq=3.14/4*(R₁+r₁)*L₁ for block 1,2,3,6,7,8
 Sxq=a₁*sqrt(b₁²+Dh₁²) for block 4,5
 Sxq=(1.8+1.8*Dh₁+2*Dh₁²)*Dh₁/2 for block 9
- W : Length of masonry's footing : W₀
 W₀=2*3.14*R₂/4+a₃+2*3.14*R₇/4 , and
 W_{Ex}=2*3.14*R₂/4+a₃+2*3.14*R₇/4
- Masonry₁ = 0.3*Sxq₁
- Blinding₁ = 0.1*Sxq₁
- Geotextile = Sxq₁ + Sxq₂ + Sxq₃ + W_{Ex}*1
- PVC Pipe = W₀/2
- Wood Pile = W₀*0.8*25*3
- Excavation = W₀*Sxq₀
- Filling = Excavation-W₀*Dh₀*1.1

X. QUANTITIES OF EARTHWORKS SLOPE PROTECTION OF 25M BEHIND BACK WALLS OF ABUTMENTS

ABUTMENT A1 :

Block	B m	L m	S m2	Thick m	Masonry m3	Blinding (T=0.1m) m3	
10	11.07	25	276.71	0.30	83.01	27.67	
11	12.01	25	300.37	0.30	90.11	30.04	
12	4.16	25	103.98	0.30	31.19	10.40	Geotextile (m2)
15	11.07	25	276.71	0.30	83.01	27.67	= 2 x (L + S12) =
16	12.01	25	300.37	0.30	90.11	30.04	PVC pipe (m)
17	4.16	25	103.98	0.30	31.19	10.40	= 2 x L/2 x 1m =
FOOTING	Wood pile		(m)		3000		LENGTH OF FOOTING L = 50 (m)
	Blinding		(m3)		4		
	Stone masonry		(m3)		18.00		
	Excavation		(m3)		216.00		
	Back fill		(m3)		150.00		
SIDE SLOPE	Stone masonry		(m3)		408.64		
	Blinding		(m3)		136.21		
	Geotextile		(m2)		258		
	PVC pile		(m)		25		
No	h m	Dh m	S m2	L m	Total (m3)		
					Excavation	Back fill	
5	1.54						Excavation = 2 x S x L
6	0.34	1.2	4.32	25	216	150	Filling = Excavation - 2 x 25 x Dh x 1.1

ABUTMENT A2 :

Block	B m	L m	S m2	Thick m	Masonry m3	Blinding (T=0.1m) m3	
10	10.67	25	266.65	0.30	80.00	26.67	
11	12.01	25	300.37	0.30	90.11	30.04	
12	4.16	25	103.98	0.30	31.19	10.40	Geotextile (m2)
15	0.00	25	0.00	0.30	0.00	0.00	= 2 x (L + S12) =
16	12.01	25	300.37	0.30	90.11	30.04	PVC pipe (m)
17	4.16	25	103.98	0.30	31.19	10.40	= 2 x L/2 x 1m =
FOOTING	Wood pile		(m)		3000		LENGTH OF FOOTING L = 50 (m)
	Blinding		(m3)		4		
	Stone masonry		(m3)		18.00		
	Excavation		(m3)		216.00		
	Back fill		(m3)		150.00		
SIDE SLOPE	Stone masonry		(m3)		322.61		
	Blinding		(m3)		107.54		
	Geotextile		(m2)		258		
	PVC pile		(m)		25		
No	h m	Dh m	S m2	L m	Total (m3)		
					Excavation	Back fill	
5	1.54						Excavation = 2 x S x L
6	0.34	1.2	4.32	25	216	150	Filling = Excavation - 2 x 25 x Dh x 1.1

QUANTITY TABLE OF PIERS

ITEMS		UNIT	PIER P1	PIER P2	PIER P3	PIER P4	PIER P5	TOTAL 1 dir	TOTAL 2 dir	
PILE	NUMBER OF PILES ϕ 1500	pile	8	18	18	8		52	104	
	NUMBER OF PILES \square 450						30	30	60	
	TOTAL LENGTH OF BORED P1500mm	m	400	882	882	360		2524	5048	
	TOTAL LENGTH OF RCPile \square 450mm						1200	1200	2400	
	CONCRETE CLASS D	m ³	706.86	1558.62	1558.6	636.17	0	4460.28	8920.55	
	REINFORCEMENT	D32	kg					153	153	306
		D28	kg		14617.8	14618			29235.6	58471.2
		D25	kg	23681	40876.2	40876	21522	1764	128720	257439
		D22	kg	2231.2	5013	5013	2028	29832	44117.2	88234.4
		D16	kg	267.2	565.2	565.2	267.2	1995	3659.8	7319.6
		D10	kg	6344	14202	14202	5875.2		40623.2	81246.4
		ϕ 6	kg					5517	5517	11034
		TOTAL	kg	32523	75274.2	75274	29693	39261	252025	504051
PIER	CONCRETE CLASS E	m ³	462.7	999.0	999.0	462.7	403.5	3326.8	6653.6	
	REINFORCEMENT	D32	kg	6892.6	35709	35709	6892.6	16629.8	101833	203666
		D28	kg					3490.2	3490.2	6980.4
		D25	kg	11584	46293.8	46294	11584	0	115755	231510
		D22	kg	7414.8	17078	17078	7414.8	7414.8	56400.4	112801
		D18	kg	1404.6	2653.4	2653.4	1404.6	1404.6	9520.6	19041.2
		D16	kg	5306.4	303	303	5306.4	1738.2	12957	25914
		D14	kg	2951.8			2951.8	3550.6	9454.2	18908.4
		D10	kg	59.8			59.8	71.6	191.2	382.4
	TOTAL	kg	35614	102037	102037	35614	34299.8	309601	619203	
	BLINDING STONE	m ³	28.0			28.0	27.28	83.26	166.52	
	LEAN CONCRETE CLASS G	m ³	14.0	193.4	193.4	14.0	13.6	428.44	856.88	
	RIP RAP	m ³		2082.35	1833.5			3915.87	7831.74	
	EXCAVATION	m ³	2038.6	4947.3	4698.8	1837.1	1651.4	15173.3	30346.6	
	BACK FILL	m ³	951.1			823.9	461.9	2236.9	4473.8	
	FORM	FLAT	m ²	366.1	377.2	377.2	366.1	259.3	1745.97	3491.94
		CURVE	m ²	59.7	155.7	155.7	59.7	142.0	572.69	1145.38
	SEAFFOLDING	H \leq 4m	m ²	255.6	261.6	261.6	255.6	254.4	1288.8	2577.6
		4m $<$ H $<$ 30m	m ²	286.1	237.4	237.4	286.1	289.2	1336.09	2672.18
	SUPPORT	m ³	120.5			146.6	154.9	421.98	843.96	
COFFERDAMS	LARSEN IV	m		3720.0	3720.0				7440.0	
	I 400	m		840	840.0				1680.0	
	C 300	m		1082.6	1082.6				2165.2	

QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.1) Concrete		
3.2.1.1 Headstock	$v1 = \left\{ \left(11.40 \times 1.84 - 2.25 \times 0.80 \right) \right. \\ \left. + \left(11.40 \times 1.60 - 2.25 \times 0.80 \right) \right\} \times 1.40 \times 2 =$	80.55 m3
3.2.1.2 Wall	$v2 = 2 \times 5.16 \times \left(\frac{1}{4} \times \pi \times 1.40 \right) + 5.10 \times 1.40 =$	89.57 m3
3.2.1.3 Footing	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 8 \times \pi \times 0.75 \times 0.1 =$	292.59 m3
	Total	462.71 m3
3.2.2) Form		
3.2.2.1 Headstock	$a1 = \left\{ \left(11.40 \times 1.84 - 2.25 \times 0.80 \right) \right. \\ \left. + \left(2.39 + 1.04 \right) \times 0.90 \times 2 \right. \\ \left. + \left(6.90 \times 2.30 - \frac{\pi}{4} \times 5.10 \times 1.40 \right) \right. \\ \left. + \left(11.40 \times 1.60 - 2.25 \times 0.80 \right) \right. \\ \left. + \left(2.39 + 0.80 \right) \times 1.40 \times 2 \right\} \times 2 =$	115.81 m2
3.2.2.2 Wall (Curve form)	$a2-1 = 2 \times \pi \times 1.84 \times 5.16 =$	59.66 m2
3.2.2.3 Wall (Flat form)	$a2-2 = 2 \times 2 \times 5.10 \times 5.16 =$	105.26 m2
3.2.2.4 Footing	$a3 = 2 \times \left(10.500 + \frac{7.000}{2} \right) \times 2.00 =$	140.00 m2
	Total	59.66 m2
	Curve Flat	361.07 m2
3.2.3) Scaffolding:		
3.2.3.1 (H<=4m)	$A1 = 2 \times \left(24.85 + 9.00 \right) \times 2.00 + 2 \times \left(4.30 + 25.75 \right) \times 2.00 =$	255.60 m2
3.2.3.2 (4m<H<=30m)	$A2 = 2 \times \left(4.30 + 25.75 \right) \times 4.76 =$	286.08 m2
3.2.4) Support	$= \left(11.40 - 5.10 - 1.40 \right) \times 2.30 + 2.25 \times 0.80 \times 2.30 =$	120.45 m3
3.2.5) Lean Concrete		
3.2.5.1 Concrete class G	$v = 0.10 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50 \right) + \frac{1}{4} \times \pi \times 1.50^2 \right\} \times 2 =$	13.99 m3
3.2.5.2 Form	$A = 0.10 \times \left\{ \left(10.50 + 0.2 \right) \times 2 + 0.20 \right\} \times 2 =$	5.02 m2
3.2.6) Blinding Stone	$v = 0.20 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50 \right) + \frac{1}{4} \times \pi \times 1.50^2 \right\} \times 2 =$	27.99 m3

QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.7) Bored Pile	3.2.7.1 Concrete $= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (49.90 + 0.10) =$	706.86 m3
3.2.7.2 Excavation Length	$N < 20: = 29.3 \times 8 =$ $20 < N < 40: = 19.6 \times 8 =$ $40 < N: = 1.1 \times 8 =$	234.64 m 156.64 m 8.72 m
3.2.7.3 Excavation Volume	$= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 53.26$	752.95 m3
3.2.8) Earthwork	3.2.8.1 Excavation for footing (slope 1:1) $= \frac{3.66}{6} \times \{ (24.85 \times 9.00) + (24.85 + 32.17) \times (9.00 + 16.32) + (32.17 \times 16.32) \}$ $- 8 \times \frac{\pi}{4} \times 1.50^2 \times 3.66 =$	1285.63 m3
3.2.8.2 Excess Soil	$v1 = \text{Lean Concrete} =$ $v2 = \text{Blinding Stone} =$ $v3 = \text{Footing Volume} =$ $\text{Total} =$	13.99 m3 27.99 m3 292.59 m3 334.57 m3
3.2.8.3 Back Fill	$= \text{Excavation for footing} - \text{Excess Soil}$ $= 1285.63 - 334.57 =$	951.06 m3

QUANTITY SURVEYING FOR PIER P2

No.

Item	Formula	Quantity
3.2.9) Concrete		
3.2.9.1 Wall	$v1 = 2 \times 8.26 \times (\frac{1}{4} \times \pi \times 3.00)^2 + 3.50 \times 3.00$	290.23 m3
3.2.9.2 Footing	$v2 = 18 \times 2 \times 11.30 \times \pi \times 10.50 \times 0.75 \times 3.00 + 0.1$	708.72 m3
	Total	998.95 m3
3.2.10) Form		
3.2.10.1 Wall (Curve form)	$a1-1 = 2 \times \pi \times 3.00 \times 8.26$	155.70 m2
3.2.10.2 Wall (Flat form)	$a1-2 = 2 \times 2 \times 3.50 \times 8.26$	115.64 m2
3.2.10.3 Footing	$a2 = 2 \times (11.300 + \frac{10.500}{2}) \times 3.00$	261.60 m2
	Total	552.94 m2
	Curve	155.70 m2
	Flat	377.24 m2
3.2.11) Scaffolding:		
3.2.11.1 (H<=4m)	$A1 = 2 \times (25.65 + 12.50) \times 3.00 + (2 \times (2.00 + 14.35) \times 1.00$	261.60 m2
3.2.11.2 (4m< H<=30m)	$A2 = 2 \times (2.00 + 14.35) \times 7.26$	237.40 m2
3.2.12) Lean Concrete		
3.2.12.1 Concrete class G	$v = 0.50 \times \{ (23.65 + 4) \times (10.50 + 4) - (6 \times 12.35 \times 2) - 18 \times \frac{1}{4} \times \pi \times 1.50^2 \}$	6
3.2.13) Bored Pile		
3.2.13.1 Concrete	$= 18 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (48.90 + 0.10)$	1558.62 m3
3.2.13.2 Excavation Length		
N<20:	$= 27.8 \times 18$	499.86 m
20<N<40:	$= 18.6 \times 18$	334.80 m
40<N:	$= 2.6 \times 18$	47.34 m
3.2.13.3 Excavation Volume	$= 18 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 56.28$	1790.03 m3
3.2.14) Earthwork		
3.2.14.1 Excavation for footing (slope 1:1)	$= 7.88 \times (27.65 \times 14.50)$	3157.28 m3
3.2.14.2 Excess Soil		
v1 = Lean Concrete		193.41 m3
v2 = Footing Volume		708.72 m3
v3 = Occupied volume of piles	$= 18 \times \frac{\pi}{4} \times 1.50^2 \times 0.60$	19.09 m3
v4 = Occupied volume of wall	$= (\frac{\pi}{4} \times 3.000^2 + 3.50 \times 3.00) \times 4.375 \times 2$	153.73 m3
	Total	1074.94 m3
3.2.14.3 Riprap	$= \text{Excavation for footing} - \text{Excess Soil}$ $= 3157.28 - 1074.94$	2082.35 m3
3.2.15) Corferdams		

Item	Formula	Quantity
3.2.15.1 Larsen IV =	248.00 nos L= 15 m =	3720.00 m
3.2.15.2 I 400 =	56.00 nos L= 15 m =	840.00 m
3.2.15.3 C 300 =		1082.60 m

QUANTITY SURVEYING FOR PIER P3

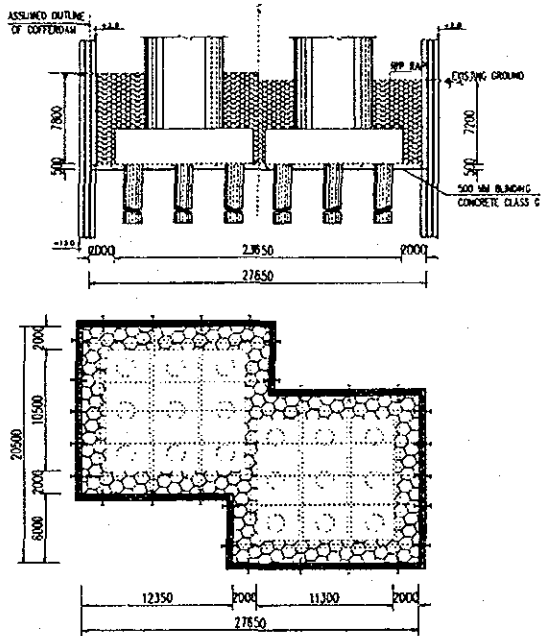
No.

Item	Formula	Quantity
3.2.16) Concrete		
3.2.16.1 Wall		
v1 =	$2 \times 8.26 \times (\frac{1}{4} \times \pi \times 3.00)^2 + 3.50 \times 3.00$	290.23 m3
3.2.16.2 Footing		
v2 =	$2 \times 11.30 \times 10.50 \times 3.00 - 18 \times \pi \times 0.75 \times 0.1$	708.72 m3
	Total	998.95 m3
3.2.17) Form		
3.2.17.1 Wall (Curve form)		
a1-1 =	$2 \times \pi \times 3.00 \times 8.26$	155.70 m2
3.2.17.2 Wall (Flat form)		
a1-2 =	$2 \times 2 \times 3.50 \times 8.26$	115.64 m2
3.2.17.3 Footing		
a2 =	$2 \times (11.300 + \frac{10.500}{2}) \times 3.00$	261.60 m2
	Total	155.70 m2
	Total	377.24 m2
3.2.18) Scaffolding:		
3.2.18.1 (H<=4m)		
A1 =	$2 \times (25.65 + 12.50) \times 3.00 + (2 \times (2.00 + 14.35)) \times 1.00$	261.60 m2
3.2.18.2 (4m< H<=30m)		
A2 =	$2 \times (2.00 + 14.35) \times 7.26$	237.40 m2
3.2.19) Lean Concrete		
3.2.19.1 Concrete class C		
v =	$0.50 \times ((23.65 + 4) \times (10.50 + 4) - (6 \times 12.35 \times 2) - 18 \times \frac{1}{4} \times \pi \times 1.50^2)$	6
3.2.20) Bored Pile		
3.2.20.1 Concrete		
=	$18 \times \frac{1}{4} \times \pi \times 1.50 \times (48.90 + 0.10)$	1558.62 m3
3.2.20.2 Excavation Length		
N<20:	26.2×18	470.70 m
20<N<40:	15.6×18	280.80 m
40<N:	7.3×18	130.50 m
3.2.20.3 Excavation Volume		
=	$18 \times \frac{1}{4} \times \pi \times 1.50 \times 56.28$	1790.19 m3
3.2.21) Earthwork		
3.2.21.1 Excavation for footing (slope 1:1)		
=	$7.88 \times (27.65 \times 14.50) - 18 \times \frac{\pi}{4} \times 1.50^2 \times 7.88$	2908.64 m3
3.2.21.2 Excess Soil		
v1 = Lean Concrete		193.41 m3
v2 = Footing Volume		708.72 m3
v3 = Occupied volume of piles		
=	$18 \times \frac{\pi}{4} \times 1.50^2 \times 0.60$	19.09 m3
v4 = Occupied volume of wall		
=	$(\frac{\pi}{4} \times 3.000^2 + 3.50 \times 3.00) \times 4.380 \times 2$	153.90 m3
	Total	1075.11 m3
3.2.21.3 Riprap		
=	Excavation for footing - Excess Soil	
=	2908.64 - 1075.11	1833.52 m3

QUANTITY SURVEYING FOR PIER P3

No.

Item	Formula	Quantity
3.2.22) Cofferdams		
3.2.22.1 Larsen =	248.00 nos L= 15 m =	3720.00 m
3.2.22.2 I 400 =	56.00 nos L= 15 m =	840.00 m
3.2.22.3 C 300 =		1082.66 m



QUANTITY SURVEYING FOR PIER P4

No.

Item	Formula	Quantity									
3.2.23) Concrete	3.2.23.1 Headstock										
	$v1 = \left\{ \left(11.40 \times 1.84 - 2.25 \times 0.80 \right) + \left(11.40 \times 1.60 - 2.25 \times 0.80 \right) \right\} \times 1.40 \times 2 =$	80.55 m3									
	3.2.23.2 Wall										
	$v2 = 2 \times 5.16 \times \left(\frac{1}{4} \times \pi \times 1.40 \right) + 5.10 \times 1.40 =$	89.57 m3									
	3.2.23.3 Footing										
	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 8 \times \pi \times 0.75 \times 0.1 =$	292.59 m3									
	Total	462.71 m3									
3.2.24) Form	3.2.24.1 Headstock										
	$a1 = \left\{ \left(11.40 \times 1.84 - 2.25 \times 0.80 \right) + \left(2.39 + 1.04 \right) \times 0.90 + \left(6.90 \times 2.30 - \frac{\pi}{4} \times 5.10 \times 1.40 \right) + \left(11.40 \times 1.60 - 2.25 \times 0.80 \right) + \left(2.39 + 0.80 \right) \times 1.40 \right\} \times 2 =$	115.81 m2									
	3.2.24.2 Wall (Curve form)										
	$a2-1 = 2 \times \pi \times 1.84 \times 5.16 =$	59.66 m2									
	3.2.24.3 Wall (Flat form)										
	$a2-2 = 2 \times 2 \times 5.10 \times 5.16 =$	105.26 m2									
	3.2.24.4 Footing										
	$a3 = 2 \times \left(10.50 + \frac{7.000}{2} \right) \times 2.00 =$	140.00 m2									
	Total	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;">Curve</td> <td style="text-align: center;">=</td> </tr> <tr> <td></td> <td style="text-align: center;">Flat</td> <td style="text-align: center;">=</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">361.07 m2</td> </tr> </table>		Curve	=		Flat	=			361.07 m2
	Curve	=									
	Flat	=									
		361.07 m2									
3.2.25) Scaffolding:	3.2.25.1 (H<=4m)										
	$A1 = 2 \times \left(24.85 + 9.00 \right) \times 2.00 + \left(2 \times \left(4.30 + 25.75 \right) \times 2.00 \right) =$	255.60 m2									
	3.2.25.2 (4m< H<=30m)										
	$A2 = 2 \times \left(4.30 + 25.75 \right) \times 4.76 =$	286.08 m2									
3.2.26) Support	$= \left(11.40 - 5.10 - 1.40 \right) \times 2.30 + \left(2.25 \times 0.80 \times 2.30 \right) =$	120.45 m3									
3.2.27) Lean Concrete	3.2.27.1 Concrete class G										
	$v = 0.10 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50 \right) + \frac{1}{4} \times \pi \times 1.50^2 \right\} - 0.2 =$	13.99 m3									
	3.2.27.2 Form										
	$A = 0.10 \times \left\{ \left(10.50 + 0.20 \right) \times 2 + 7.00 \right\} =$	5.02 m2									
3.2.28) Blinding Stone	$v = 0.20 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50 \right) + \frac{1}{4} \times \pi \times 1.50^2 \right\} - 0.2 =$	27.99 m3									

QUANTITY SURVEYING FOR PIER P4

No.

Item	Formula	Quantity
3.2.29) Bored Pile	3.2.29.1 Concrete	
	$= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (44.90 + 0.10) =$	636.17 m ³
	3.2.29.2 Excavation Length	
	N<20: = 24.9 x 8 =	199.44 m
	20<N<40: = 19.2 x 8 =	153.36 m
	40<N: = 0.9 x 8 =	7.20 m
	3.2.29.3 Excavation Volume	
	$= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 48.01$	678.65 m ³
3.2.30) Earthwork	3.2.30.1 Excavation for footing (slope 1:1)	
	$= \frac{3.41}{6} \times \left(\frac{24.85 \times 9.00}{2} + \frac{24.85 + 31.66}{2} \times 9.00 + \frac{31.66 \times 15.81}{2} \right) - 8 \times \frac{\pi}{4} \times 1.50^2 \times 3.41 =$	1158.49 m ³
	3.2.30.2 Excess Soil	
	v1 = Lean Concrete =	13.99 m ³
	v2 = Blinding Stone =	27.99 m ³
	v3 = Footing Volume =	292.59 m ³
	Total =	334.57 m ³
	3.2.30.3 Back Fill = Excavation for footing - Excess Soil	
	= 1158.49 - 334.57 =	823.92 m ³

QUANTITY SURVEYING FOR PIER P5

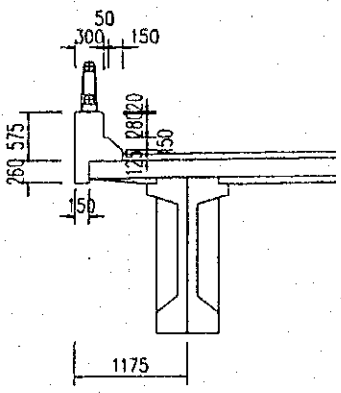
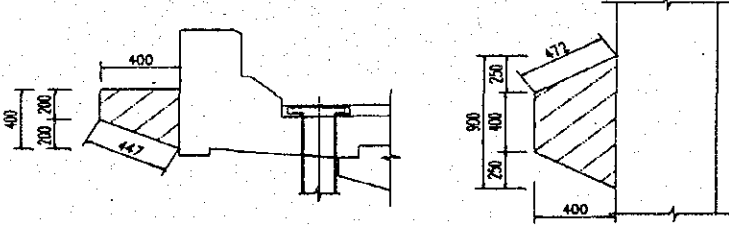
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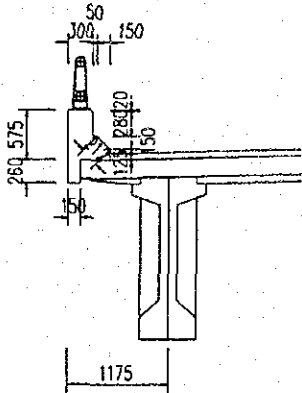
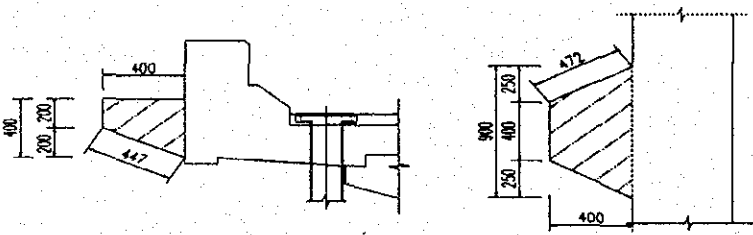
Item	Formula	Quantity
3.2.31) Concrete	3.2.31.1 Headstock	
	$v1 = \left\{ \left(11.40 \times 1.40 - 0.80 \times 0.70 \right) \times \frac{2.00}{2} \right\} \times 2 =$	61.60 m3
	3.2.31.2 Column	
	$v2 = 2 \times \left(\frac{1}{4} \times \pi \times 1.40^2 \times 5.30 + 5.38 + 5.46 \right) =$	49.69 m3
	3.2.31.3 Footing	
	$v3 = 2 \times \left(10.50 \times 7.00 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 \right) =$	292.23 m3
	Total	403.52 m3
3.2.32) Form	3.2.32.1 Headstock	
	$a1 = \left\{ \left(11.40 \times 1.40 - 0.80 \times 0.70 \right) + \left(1.06 + 0.70 \right) \times 2.00 + \left(9.80 \times 2.00 - 3 \times \frac{\pi}{4} \times 1.40^2 \right) + \left(11.40 \times 1.40 - 0.80 \times 0.70 \right) \right\} \times 2 =$	105.67 m2
	3.2.32.2 Column (Curve form)	
	$a2 = 2 \times \pi \times 1.40 \times \left(5.30 + 5.38 + 5.46 \right) =$	141.97 m2
	3.2.32.3 Footing	
	$a3 = 2 \times \left(10.500 + 7.000 \right) \times 2.00 =$	140.00 m2
	Total	141.97 m2
	Curve Flat	245.67 m2
3.2.33) Scaffolding:	3.2.33.1 (H<=4m)	
	$A1 = 2 \times \left(24.85 + 9.00 \right) \times 2.00 + \left(2 \times \left(4.00 + 25.75 \right) \right) \times 2.00 =$	254.40 m2
	3.2.33.2 (4m< H<=30m)	
	$A2 = 2 \times \left(4.00 + 25.75 \right) \times 4.86 =$	289.17 m2
3.2.34) Support	$= \left(11.40 - 3 \times 1.40 \right) \times 2.00 + \left(5.38 \times 2 \right) =$	154.94 m3
3.2.35) Lean Concrete	3.2.35.1 Concrete class G	
	$v = 0.10 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50^2 \right) - 5 \times \frac{1}{4} \times \pi \times 1.50^2 \right\} \times 2 =$	13.64 m3
	3.2.35.2 Form	
	$A = 0.10 \times \left\{ \left(10.50 + 0.2 \right) \times 7.00 + \left(0.20 \right) \times 2 \right\} \times 2 =$	13.64 m2
3.2.36) Blinding Stone	$v = 0.20 \times \left\{ \left(10.50 + 0.2 \right) \times \left(7.00 + 1.50^2 \right) - 5 \times \frac{1}{4} \times \pi \times 1.50^2 \right\} \times 2 =$	27.28 m3

4.Quantity of Miscellaneous Works

Item	Work Item		Unit	Quantity	Remarks
Concrete Class E	Raling		m3	263.9	
	Lighting- Base		m3	0.5	
	Total		m3	264.5	
Form	Raling		m2	1,553.1	
	Lighting- Base		m2	3.9	
	Total		m2	1,557.0	
Re-bar	Railing	D14	ton	41.300	
	Lighting-Base	D16 -D25	ton	0.189	
	TOTAL		ton	41.489	
Steel Railing			m	1,057.0	
Drainage	Pot		set	35.0	
	Pile ϕ 180		m	58.5	
Lighting pole			set	6	

4.1. Concrete

Item	Formula	Quantity
<p>4.1.1 Railing CLASS "E"</p>	 $A = \left\{ (0.300 \times 0.575 + 0.260 \times 0.150 + (0.125 + 0.275) \times 0.150 \times \frac{1}{2} + 0.275 \times 0.050) \times 2 \right\} \times \frac{2}{2}$ $V = 1.021 \times 258.50 = 263.929 \text{ m}^3$	<p>263.929 m³</p>
<p>4.1.2 Lighting-Base CLASS "E"</p>	 $V = ((0.4 \times 0.9) + (0.2 \times 0.4)) \times 0.5 \times 0.4 \times 6 = 0.528 \text{ m}^3$	<p>0.528 m³</p>

Item	Formula	Quantity
4.2.1 Railing	 $A = \frac{(0.575 + 0.260 + 0.125 + 0.212 + 0.05 + 0.280)}{2} \times 2 \times 258.500 = 1553.068 \text{ m}^2$	1553.068 m ²
4.2.2 Lighting-Base	 $A = \left(\frac{(0.900 + 0.400) \times 0.447}{2} + \frac{(0.400 + 0.200) \times 0.472}{2} \right) \times 2 \times 0.2 = 3.923 \text{ m}^2$	3.923 m ²

Item	Formula	Quantity
4.4.1 DRAIN	TOTAL EACH EACH = 35 set PILE = $1.670 \times 35 = 58.450 \text{ m}$	35 Set 58.450 m
4.4.2 STEEL RAILING	TOTAL LENGTH : $L = (4 \times 258.5) + (2 \times 5.75) \times 2 = 1,057.0 \text{ m}$	1,057.0 m

4.3.1 REINFORCEMENT OF LIGHTING- BASE

SCHEDULE OF REINFORCEMENT (OF LIGHTING -BASE)													
BAR MARK	SIZE (mm)	DIMENSIONS (mm)							LENGTH (mm)	UNIT WEIGHT (kg/m)	NO. OF BARS	WEIGHT (kg)	REMARKS
		a	b	c	d	e	f	g					
P1	20	113	825	320					1258	2.466	3	9.31	
P2	16	113	380	488	280				1261	1.578	3	5.97	
P3	20	1000	300	1000					2300	2.466	2	11.34	
P4	16	282	285	282					849	1.578	2	2.68	
P5	16	208	285	208					701	1.578	2	2.21	
Total												31.51	

Total Weight

$$\text{Total} = 31.51 \times 6 = 189.06 \text{ (kg)}$$

4.3.2. REINFORCEMENT OF RAILING

SCHEDULE OF REINFORCEMENT OF RAILING													
BAR MARK	SIZE (mm)	DIMENSIONS (mm)							LENGTH (mm)	UNIT WEIGHT (kgf/m)	NO. OF BARS	WEIGHT (kgf)	REMARKS
		a	b	c	d	e	f	g					
P1	14	210	741	212	787	70			2020	1.208	68	165.99	
P2	14	190	337	176	275	245			1223	1.208	68	100.50	
P3	14	10000							10000	1.208	11	132.93	
Total												399.42	

Total Weight

$$\text{Total} = 399.42 / 10 \times 258.5 \times 4 = 41,300.03 \text{ (kg)}$$

3.8. Interchange with NH.91B Overbridge

INTERCHANGE 3 FLYOVER BRIDGE

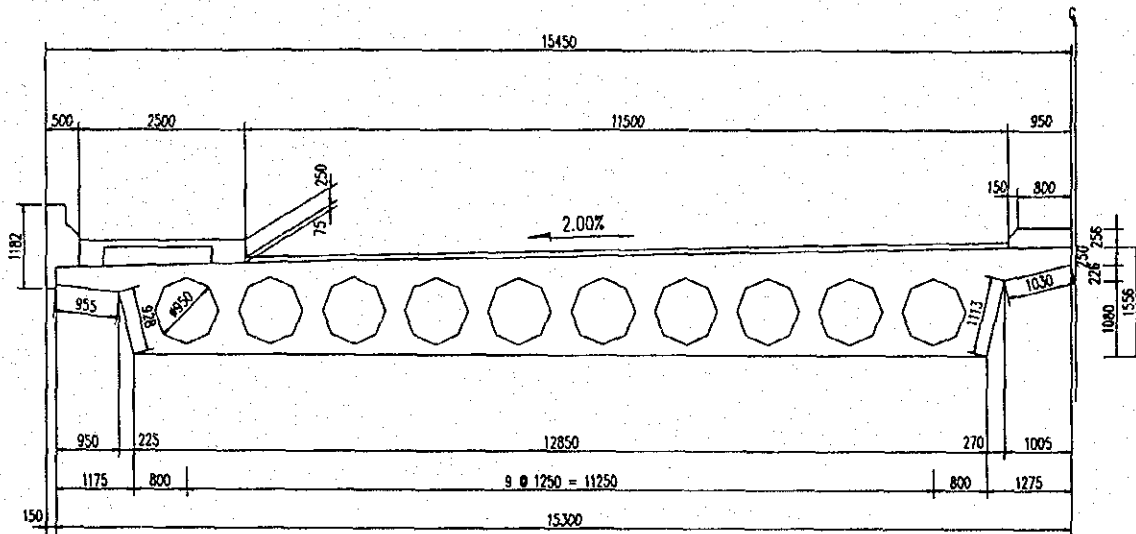
QUANTITY TABLE OF SUPERSTRUCTURE

ITEMS		UNIT	QUANTITY
A- HOLLOW SLAB			
	CONCRETE CLASS C	m3	2697
	ASPHALT CONCRETE 70mm	m2	2302
	WATER PROOFING 5mm	m2	2302
	CABLES 12S12.7	m	6608
	CABLE ANCHORAGES 12S12.7	set	132
	SHEATHING OF CABLES 12S12.7 Φ 65/72mm	m	6608
	CEMENT GROUT IN SHEATHING	m3	12
REINFORCEMENT	D25	kg	22565
	D20	kg	41390
	D16	kg	114905
	D12	kg	56388
	TOTAL	kg	235248
	FORM WORK FOR SLAB	m2	8134
	SCAFFOLDING WORK FOR HOLLOW	m2	0
	SUPPORT WORK	m3	470
B- PARAPET, SIDE WALK			
	CONCRETE CLASS E	m3	224
REINFORCEMENT	D14	kg	33241
	FORM WORK FOR PARAPET	m2	470
	FORM WORK FOR SIDE WALK	m2	611
C- RAILING		m	236
D- LIGHTING			
	LIGHTING POLES	poles	3
	PVC PILE Φ 100mm	m	100
E- DRAINAGE			
	DRAINAGE	set	16
	PVC PILE Φ 200mm	m	88
F- EXPANSION JOINT 100MM		m	62
G- BEARING	(800x600x52)mm	set	10
	(700x350x50)mm	set	20
H- ANCHORAGE BAR Φ80mm		set	24

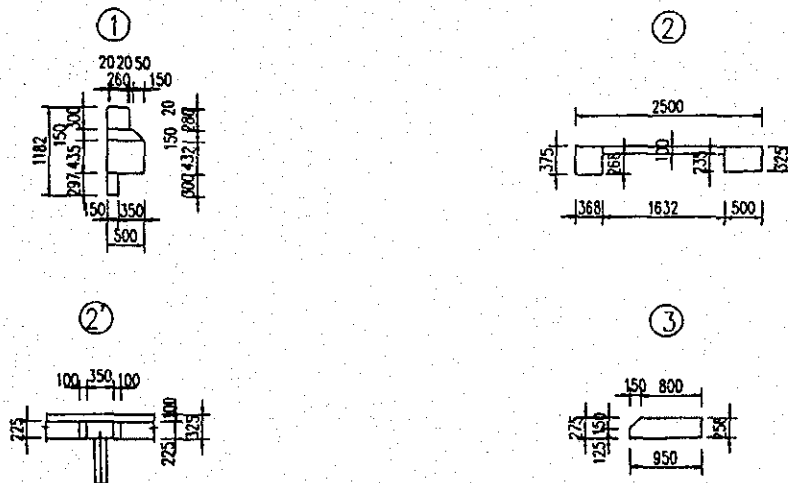
I. CONCRETE:

I-1. HOLLOW SLAB:

III-3- CONCRETE CLASS C		$\sigma_{ck} = 35 \text{ Mpa}$					
4×4^1	(250 + 369)	x	950	:	2	=	294025 (mm^2)
4^2	(369 + 1274)	x	225	:	2	=	184837.5 (mm^2)
4^3	(1274 + 1531)	x	12850	:	2	=	18022125 (mm^2)
4^4	(1531 + 456)	x	270	:	2	=	268245 (mm^2)
4^5	(250 + 456)	x	1005	:	2	=	354765 (mm^2)
							$S_4 = 19123997.5 (\text{mm}^2)$
$5 S_5 =$	10	x	3.14	x	950	x	$950 : 4 = 7084625 (\text{mm}^2)$
							$L = 2.4 + 4.8 + 4.8 + 4.8 + 2.4 + 0.3 \times 4 = 20.4 (m)$
$V(4) =$	19.12 (m^2)	x	20.4	x	2	=	780.259 (m^3)
							$L = 25 \times 4 - 20.4 = 79.6 (m)$
$V(5) =$	(19.12 - 7.08463) (m^2)	:	79.6	x	2	=	1916.668 (m^3)
$V =$	$V(4) + V(5)$						$= 2696.927 (\text{m}^3)$



PARAPET - SIDE WALK AND DRAINAGE



I.2 PARAPET

CONCRETE CLASS E:	$\sigma_{ck} =$	24 Mpa	
1 (280x300 - 0.5x20x20) + ((280+20+50)+(150+350))x150/2 + (432+435)x(150+350)/2 + (300+303)x150/2 =			409525 (mm ²)
2 (268+100+375)x368/2 + 1632x100 + (325+235+100)x500/2 =			464912 (mm ²)
2' 225x100x2 =			45000 (mm ²)
3 (800+950)x150/2 + ((256-150)+125)x950/2 =			240975 (mm ²)
L = 25 + 25 + 25 + 25 =			100 (m)
V = ((0.41 + 0.465 + 0.241) (m ²) x 1.623 x 8) x 2 + 0.045			224.369 (m ³)

I-3. ASPHALT CONCRETE OF 70 mm THICKNESS :

L = 100.1 (m)			
S = 11.5 x 2 x 100.1 =			2302.3 (m ²)
S =			2302 (m ²)

I-4. WATER PROOFING OF 5 mm THICKNESS :

L = 100.1 (m)			
S = 11.5 x 2 x 100.1 =			2302.3 (m ²)
S =			2302 (m ²)

II. FORM WORK- SUPPORT:II-1. FORM WORK FOR SLAB:

L_1	=	100	-	1.8	-	1.8	=	96.4	(m)
S_1	=	12.85	x	96.4	x	2	=	2477.48	(m ²)
L_2	=						=	100	(m)
S_2	=	4.526	x	100	x	2	=	905.20	(m ²)
$\Sigma S = S_1 + S_2 =$								2477.5 + 905.20	= 3382.68 (m ²)
						ΣS	=	3382.68	(m ²)

II-2. FORM WORK FOR HOLLOW:

N	=	(9.95 + 9.95)	x	10	x	4	=	796	(m)
L_3	=	0.95	x	π			=	2.984513	(m)
S_3	=	796	x	2.9845	x	2	=	4751.34	(m ²)
						S_3	=	4751.34	(m ²)

II-3. FORM WORK FOR PARAVET:

C	=	0.15+1.182+0.3+0.05+0.15*SQRT(2)+0.432+0.125+0.15*SQRT(2)+0.256	=	4.12	(m)				
L	=	100 (m)							
S	=	4.121	x	100	x	2	=	824.27	(m ²)
						S	=	824.27	(m ²)

II-4. FORM WORK FOR SIDE WALK:

C	=	0.268+1.632+0.235+0.325+0.15*SQRT(2)+0.256+0.125	=	3.05	(m)				
L	=	100 (m)							
S	=	3.053	x	100	x	2	=	610.63	(m ²)
						S	=	610.63	(m ²)

II-5. SUPPORT:

H_tb	=	(7.2 + 7 + 7.1 + 7.2) / 4	=	7.125	(m)				
R	=	31 + 1 + 1	=	33	(m)				
L_1	=	(25 - 1.8)	=	46.4	(m)				
L_2	=	(25 - 0.9 - 1.4)	x	2	=	45.4	(m)		
V_1	=	7.125	x	33	x	46.4	=	10909.8	(m ³)
V_2	=	7.125	x	33	x	45.4	=	10674.68	(m ³)
$\Sigma V = V_1 + V_2$							=	21584.48	(m ³)
						ΣV	=	21584.5	(m ³)

III- CABLE:

III-1. CABLE 12S12.7:

REINF	CABLE	LENGTH	NUMBER	TOTAL LENGTH
		mm		M
C1	12S12.7	100090	22	2201.98
C2	12S12.7	100070	22	2201.54
C3	12S12.7	100190	22	2204.18
TOTAL				6608

III-2. SHEATHING OF CABLE 12S12.7 ϕ 65/72 (mm):

$$L = 2202 + 2201.5 + 2204.18 = 6608 \text{ (m)}$$

III-3. CABLE ANCHORAGES 12S12.7:

132 (SET)

III-4. CEMENT GROUT IN SHEATHING:

$$L = 2202 + 2201.5 + 2204.18 = 6608 \text{ (m)}$$

$$V = (\pi \times 0.065 \times 0.065/4 - 12 \times \pi \times 0.0127 \times 0.0127/4) \times 6608 = 11.88241 \text{ (m}^3\text{)}$$

$$V = 12 \text{ (m}^3\text{)}$$

IV.REINFORCEMENT :IV-1. HOLLOW SLAB:

REINF NO	DIA. MM	LENGTH MM	NUMBER	UNIT WEIGHT KG/M	WEIGHT KG	REMARKS
A1	16	12000	64	1.578	1212.2	
A2	16	7111	60	1.578	673.4	
A3	16	8436	180	1.578	2396.7	
A4	16	12000	184	1.578	3485.0	
A5	12	8903	52	0.888	411.0	
A6	12	10199	52	0.888	470.9	
A7	16	7822	204	1.578	2518.5	
A8	16	9822	208	1.578	3224.5	
A9	12	2300	88	0.888	179.7	
A10	12	12000	228	0.888	2429.1	
A11	16	1000	364	1.578	574.5	
A12	12	9141	80	0.888	649.2	
A13	12	8027	8	0.888	57.0	
A14	12	6142	40	0.888	218.1	
A15	12	6068	40	0.888	215.5	
A16	12	4700	120	0.888	500.7	
B1	16	8836	64	1.578	892.6	
B2	16	12000	60	1.578	1136.4	
B3	16	12000	180	1.578	3409.2	
B4	16	6711	184	1.578	1949.0	
B5	20	12000	52	2.466	1538.9	
B6	20	12000	52	2.466	1538.9	
B7	20	12000	204	2.466	6037.1	
B8	20	12000	208	2.466	6155.5	
C1	25	12000	64	3.853	2959.4	
C2	25	12000	60	3.853	2774.4	
C3	25	12000	180	3.853	8323.3	
C4	25	12000	184	3.853	8508.2	
C5	16	12000	52	1.578	984.9	
C6	16	12000	52	1.578	984.9	
C7	16	12000	204	1.578	3863.8	
C8	16	12000	208	1.578	3939.5	
K1	16	3382	64	1.578	341.6	
K2	16	6404	60	1.578	606.5	
K3	16	12000	180	1.578	3409.2	
K4	16	12000	184	1.578	3485.0	
K5	20	12000	52	2.466	1538.9	
K6	20	3027	52	2.466	388.2	
K7	20	12000	204	2.466	6037.1	
K8	20	4981	208	2.466	2555.1	

REINF	DIA.	LENGTH	NUMBER	UNIT WEIGHT	WEIGHT	REMARKS
NO	MM	MM		KG/M	KG	
L1	16	12000	64	1.578	1212.2	
L2	16	12000	60	1.578	1136.4	
L3	16	3382	180	1.578	960.8	
L4	16	6403	184	1.578	1859.5	
L5	16	2867	52	1.578	235.3	
L6	16	12000	52	1.578	984.9	
L7	20	4407	204	2.466	2217.1	
L8	20	12000	208	2.466	6155.5	
M1	20	12000	32	2.466	947.0	
M2	20	9408	30	2.466	696.0	
M3	20	12000	90	2.466	2663.4	
M4	20	9408	92	2.466	2134.5	
M5	16	12000	26	1.578	492.4	
M6	16	9408	26	1.578	386.1	
M7	16	12000	102	1.578	1931.9	
M8	16	6816	104	1.578	1118.8	
E1	16	3402	310	1.578	1664.5	
E2	16	3720	310	1.578	1820.1	
E3	16	3770	310	1.578	1844.6	
E4	16	3820	310	1.578	1869.1	
E5	16	3870	310	1.578	1893.5	
E6	16	3920	310	1.578	1918.0	
E7	16	3970	310	1.578	1942.5	
E8	16	4020	310	1.578	1966.9	
E9	16	4070	310	1.578	1991.4	
E10	16	4120	310	1.578	2015.9	
E11	16	3891	310	1.578	1903.8	
F1	12	2971	720	0.888	1899.1	
F2	12	3021	720	0.888	1931.1	
F3	12	3071	720	0.888	1963.1	
F4	12	3121	720	0.888	1995.0	
F5	12	3171	720	0.888	2027.0	
F6	12	3221	720	0.888	2058.9	
F7	12	3271	720	0.888	2090.9	
F8	12	3321	720	0.888	2122.9	
F9	12	3371	720	0.888	2154.8	
F10	12	3421	720	0.888	2186.8	
F11	12	3471	720	0.888	2218.8	
G1	16	3002	20	1.578	94.8	
G2	16	3320	20	1.578	104.8	
G3	16	3370	20	1.578	106.4	
G4	16	3420	20	1.578	108.0	
G5	16	3470	20	1.578	109.5	

INTERGANGE 3 FLYOVER BRIDGE

QUANTITY OF TABLE

REINF NO	DIA. MM	LENGTH MM	NUMBER	UNIT WEIGHT KG/M	WEIGHT KG	REMARKS
G6	16	3520	20	1.578	111.1	
G7	16	3572	20	1.578	112.8	
G8	16	3620	20	1.578	114.3	
G9	16	3670	20	1.578	115.8	
G10	16	3720	20	1.578	117.4	
G11	16	3469	20	1.578	109.5	
H1	16	3111	88	1.578	432.1	
H2	16	3161	88	1.578	439.0	
H3	16	3211	88	1.578	446.0	
H4	16	3261	88	1.578	452.9	
H5	16	3311	88	1.578	459.9	
H6	16	3361	88	1.578	466.8	
H7	16	3411	88	1.578	473.8	
H8	16	3461	88	1.578	480.7	
H9	16	3511	88	1.578	487.7	
H10	16	3561	88	1.578	494.6	
H11	16	3611	88	1.578	501.5	
T1	12	12000	1590	0.888	16939.5	
T1a	16	5471	1590	1.578	13729.8	
T1b	16	4410	1590	1.578	11067.1	
T2	20	12000	20	2.466	591.9	
T'2	20	3939	20	2.466	194.3	
T3	16	12000	150	1.578	2841.0	
T'3	16	6613	150	1.578	1565.6	
T4	12	12000	728	0.888	7755.9	
T'4	12	6054	728	0.888	3912.9	
T5	16	1305	880	1.578	1812.6	
T'5	16	1432	880	1.578	1989.0	
T6	16	1742	880	1.578	2419.5	
T'6	16	2019	880	1.578	2804.3	
T7	16	4037	12	1.578	76.5	
T'7	16	1279	12	1.578	24.2	
TOTAL				235247.5		
25				22565.3		
20				41389.5		
16				114904.8		
12				56387.9		

IV-2. PARAPET:

REINF No	DIA (MM)	LENGTH (MM)	NUMBER	UNIT WEIGHT KG/M	WEIGHT KG	REMARKS
P1	D14	2634	68	1.208	216.4	<i>PER 10M LONG</i>
P2	D14	1453	68	1.208	119.4	
P3	D14	10000	14	1.208	169.1	
S1	D14	10000	34	1.208	410.7	
S2	D14	1021	68	1.208	83.9	
S3	D14	1015	68	1.208	83.4	
S4	D14	981	136	1.208	161.2	
S5	D14	2410	40	1.208	116.5	
C1	D14	10000	5	1.208	60.4	
C2	D14	1984	68	1.208	163.0	
C3	D14	933	68	1.208	76.6	
TOTAL		D14	<i>PER 10 M LONG</i>		1660.4	<i>KG</i>
			<i>ALL BRIDGE : 100.1 x 2 (m)</i>		33241	

V. PVC PILE:

V.1. LIGHTING: PVC PILE Φ 100mm
 $L = 100 = 100 \text{ (m)}$

V.2. DRAINAGE SYSTEM: PVC PILE Φ 200mm
 $L = 88 \text{ (m)}$

VI. LIGHTING POLES: N = 3 (Poles)

VII. RAILING: $L = 100 + 100 + 8.976 \times 4 = 235.9 \text{ (m)}$

VIII. DRAINAGE

DRAINAGE: $8 \times 2 = 16 \text{ (Set)}$

IX. EXPANSION JOINT

EXPANSION JOINT 50 mm : $31 + 31 = 62 \text{ (m)}$

X. BEARING (700 x 350 x 52) (mm)

$5 \times 2 = 10 \text{ (Set)}$

(800 x 600 x 52) (mm)

$5 \times 2 + 5 \times 2 = 20 \text{ (Set)}$

XI. ANCHORAGE BAR

ANCHORAGE BAR Φ 80 mm

$4 \times 2 \times 3 = 24 \text{ (Set)}$

QUANTITY TABLE OF ABUTMENT

ITEMS		UNIT	ABUTMENT	ABUTMENT	TOTAL	
			A1	A2		
A- ABUTMENT						
PILE	NUMBER OF PILES	PILE	20	20	40	
	BORED PILES F1500MM DIA. TOTAL LENGTH	m	1140	1140	2280	
	CONCRETE CLASS D	m ³	2018.1	2018.1	4036	
	REINFORCEMENT	25<D≤32	kg	48484.0	48484.0	96968
		16≤D≤25	kg	70364.0	70364.0	140728
D≤14		kg	18238.0	18238.0	36476	
	TOTAL	kg	137086	137086	274172	
ABUTMENT	CONCRETE CLASS E	m ³	1106.0	1106.0	2212	
	REINFORCEMENT	25<D≤32	kg	0	0	0
		16≤D≤25	kg	52302	52302	104604
		D≤14	kg	4291	4291	8582
		TOTAL	kg	56593	56593	113186
	FORM	m ²	1014.1	1014.1	2028	
	SCAFFOLDING WORK	H≤4M	m ²	229.2	229.2	458
		4M<H≤30M	m ²	656.1	656.1	1312
	SUPPORT	m ³	30	30	60	
	LEAN CONCRETE CLASS G	m ³	31.7	31.7	63	
	BLINDING STONE	m ³	63.4	63.4	127	
	EXCAVATION	m ³	1005	1005	2011	
FILLING	m ³	217	217	433		
B- APPROACH SLAB						
	CONCRETE CLASS E	m ³	43.2	43.2	86	
	LEAN CONCRETE CLASS G	m ³	13.3	13.3	27	
	ASPHANTIC BIND FILLER T=20mm	m ³	0.4	0.4	0.8	
	FORM	m ²	23.0	23.0	46.0	
	REINFORCEMENT	16≤D≤25	kg	7534.3	7534.3	15069
		D10	kg	273.3	273.3	547
		TOTAL	kg	7807.6	7807.6	15615
C- SLOPE PROTECTION						
	STONE MASONRY T=300mm	m ³	883.9	883.9	1768	
	BLINDING AGGREGATE T=100mm	m ³	294.3	294.3	589	
	GEOTEXTILE	m ²	975.0	975.0	1950	
	PVC PILE 50MM DIA., L=1000mm	m	79.0	79.0	158	
FOOTING	STONE MASONRY	m ³	54.0	54.0	108	
	BLINDING AGGREGATE T=100mm	m ³	12.0	12.0	24	
	WOODEN PILE L=3m	m	9467.0	9467.0	18934	
	EXCAVATION	m ³	682.0	682.0	1364	
	FILLING	m ³	473.0	473.0	946	

Item	Formula	Quantity
1) Concrete		
	* BackWall	
	$v1 = \left(\frac{1.672 + 1.612}{\cos(42.05)} + \frac{1.562 + 1.612}{\cos(42.05)} + \frac{1.462 + 1.692}{\cos(42.05)} + \frac{2.000}{\cos(42.05)} - 0.150 \right) \times 2.00 \times 0.400 = 26.79 \text{ m}^3$	
	* Frontwall	
	$v2 = \left(\frac{5.218 + 5.508}{\cos(42.05)} + \frac{5.75 + 5.508}{\cos(42.05)} \right) \times 1.5 - 0.10 \times 0.10 / 2.00 \times 31 / \cos(42.05) = 343.93 \text{ m}^3$	
	* Corbel	
	$v3 = \frac{0.30 \times (0.30 + 0.60)}{11.50 / \cos(42.05) \times 2.00} = 4.18 \text{ m}^3$	
	* Haunch	
	$v4 = 1.398 \times 1.550 / 2.00 \times 7.310 = 7.92 \text{ m}^3$	
	* Wingwall	
	$v5 = \left(\frac{6.89 + 6.82}{\cos(42.05)} + \frac{1.25 + 3.790}{\cos(42.05)} + \frac{7.310 + 7.24}{\cos(42.05)} + \frac{3.79}{2.00} \right) / 2.00 \times 0.500 = 40.09 \text{ m}^3$	
	* Parapet	
	$v7 = \frac{0.60 \times 0.30 + 0.20 \times 0.30 - 0.15^2 / 2}{2} \times 5.90 / \cos(42.05) \times 2.00 = 3.64 \text{ m}^3$	
	* Footing	
	$v6 = \frac{45.53 \times 7.50 \times 2.00 - 20 \times \pi \times 0.75^2 \times 0.1}{2} = 679.42 \text{ m}^3$	
	Total	1106.0 m³
2) Form		
	* BackWall	
	$a1 = \left(\frac{1.672 + 1.612}{\cos(42.05)} + \frac{1.562 + 1.612}{\cos(42.05)} + \frac{1.462 + 1.69}{\cos(42.05)} + \frac{2.00}{\cos(42.05)} + \frac{2.00}{\cos(42.05)} - 0.15 \right) \times 2.00 + 1.67 \times 0.40 + 0.40 - 0.60 \times 23.00 / \cos(42.05) - 1.398 \times 1.562 - 0.50 / \cos(42.05) \times 1.562 = 112.28 \text{ m}^2$	
	* Frontwall	
	$a2 = \left(\frac{5.218 + 5.508}{\cos(42.05)} \right) \times 2.00 \times 15.50$	

Item	Formula	Quantity
	$\frac{5.748 + 5.508}{2} \times \frac{15.50}{\cos(42.05)} + \frac{5.748 \times 1.50 - 0.50}{\cos(42.05)} \times 5.748 = 459.88 \text{ m}^2$	
	<p>* Corbel</p> $a3 = \frac{0.3 + (0.3^2 + 0.3^2)^{0.5}}{23.0} \times \cos(42.05) = 22.43 \text{ m}^2$	
	<p>* Haunch</p> $a4 = 1.550 \times (1.562 + 5.748) = 11.33 \text{ m}^2$	
	<p>* Wingwall</p> $a5 = \left(\frac{6.890 + 6.821}{2.00} \times \frac{2.00}{\cos(42.05)} + \frac{7.31 + 7.24}{2.00 \times 3.50} \right) \times \frac{2.00}{\cos(42.05)} + \left(\frac{3.790}{2.00} + \frac{1.25 + 2.50}{2.00} \right) \times \frac{2.00}{\cos(42.05)^{0.5}} + \frac{3.030 + 3.450}{0.50} \times 0.50 = 168.52 \text{ m}^2$	
	<p>* Parapet</p> $a5 = \left(0.60 + \frac{0.15^2 + 0.15^2}{5.90} \right) \times \frac{0.30}{\cos(42.05)} + \left(0.30 + \frac{0.30^2 + 0.30^2}{4.00} \right) \times 0.05 + 0.15 + 0.60 + 0.15 \times 0.60 = 26.49 \text{ m}^2$	
	<p>* Footing</p> $a6 = (45.53 + \frac{7.50}{2.00} \times \cos(15)) \times 2.00 = 213.18 \text{ m}^2$	
	Total	1014.1 m²
3) Scaffolding:	<p>* H<=4m</p> $A2 = 2 \times \left(45.53 + \frac{7.50}{8.00} \times \cos(15) \right) \times 2.00 = 229.2 \text{ m}^2$	
	<p>* 4m< H<=30m</p> $A2 = \left(\frac{31.0}{\cos(42.05)} + 2.00 \right) \times \left(\frac{0.50 + 2.00}{2.00} + \frac{5.50}{\cos(42.05)} \right) \times 2.00 \times 7.910 = 656.1 \text{ m}^2$	
4) Support	$= (0.50 \times 2.00 / \cos(42.05)) \times (3.030 + 1.250 + 6.455) + (3.450 + 1.250 + 6.875) = 30.0 \text{ m}^3$	
5) Lean Concrete	<p>* Concrete class G</p> $v = \left(\frac{0.10 \times ((45.53 + 0.2) \times (7.50 + 1.50^2))}{20 \times 1/4 \times \pi \times 1.50^2} \right) = 31.7 \text{ m}^3$	
	<p>* Form</p> $A = \left(\frac{0.10 \times ((45.53 + 0.2) + 7.50)}{2} \right) \times 2 = 10.69 \text{ m}^2$	
6) Blinding Stone	$v = \left(\frac{0.2 \times ((45.53 + 0.2) \times (7.50 + 1.50^2))}{20 \times 1/4 \times \pi \times 1.50^2} \right) = 63.4 \text{ m}^3$	

Item	Formula	Quantity
7) Bored Pile	* Concrete = $20 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (57.00 + 0.10)$	2018.1 m ³
	* Excavation Length N<20: = 19.8 x 20 =	396.0 m
	20<N<40: = 26.0 x 20 =	520.0 m
	40<N: = 11.2 x 20 =	224.0 m
	* Excavation Volume = $20 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 57.00$	2014.5 m ³
8) Earthworks	* Excavation for foundation = $1.80 / 6 \times \{ (9.50 \times 47.53) + (13.1 \times 51.13) + (9.50 + 13.1) \times (47.53 + 51.13) \}$	1005.3 m ³
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volume = $20 \times \pi / 4 \times 1.50 \times 1.50 \times 0.400$	14.14 m ³
	Excess Soil =	788.59 m ³
	* Back Fill =	216.7 m ³
9) Approach Slab	* Concrete = $23.00 \times \{ 6.00 \times 0.30 + (0.30 + 0.50) / 2 \times 0.20 \}$	43.2 m ³
	* Lean Concrete = $(0.30 + 0.28 + 5.20) \times 23.00 \times 0.1$	13.3 m ³
	* Asphaltic Joint Filler = $\{ 0.30 \times (0.02 + 0.06) / 2 + 0.30 \times 0.02 \} \times 23.00$	0.41 m ³
	* Form A = $\{ 6.00 \times 0.30 + (0.30 + 0.50) / 2.00 \} \times 11.50 / \cos(42.05) \times 2.00$	23.01 m ²

LIST OF REINFORCEMENTS (FOR 1 ABUTMENT)

TYPE	DIAMETER (mm)	LENGTH (mm)	NUMBER	UNITWEIGHT (kg/m)	WEIGHT (kg)	REMARKS
A1	16	2395	500	1.578	1890	AVERAGE
A2	14	21195	2	1.208	51	
A3	14	42818	20	1.208	1034	
A4	16	1800	124	1.578	352	
A5	14	720	249	1.208	217	
A6	16	1174	167	1.578	309	
F1	25	11170	183	3.853	7876	
F2	25	7506	180	3.853	5206	
F3	25	8424	183	3.853	5940	
F4	25	5047	180	3.853	3500	
F5	20	7506	16	2.466	296	
F6	20	48326	16	2.466	1907	
F7	16	4992	135	1.578	1063	
F8	20	51886	30	2.466	3637	
F9	20	48626	30	2.466	3597	
W1	22	7549	167	2.984	3762	AVERAGE
W2	22	5735	166	2.984	2841	
W3	16	7444	167	1.578	1962	AVERAGE
W4	16	43560	21	1.578	1443	
W5	14	1824	807	1.208	1778	
W6	14	43308	21	1.208	1099	
W7	16	1327	6	1.578	13	AVERAGE
W8	16	2274	167	1.578	599	
K1a	22	7680	6	2.984	138	
K1b	22	8130	6	2.984	146	
K2	22	3695	10	2.984	110	
K3	22	5180	22	2.984	340	
K4a	25	9068	9	3.853	314	
K4b	25	9504	19	3.853	696	
K5	25	5787	17	3.853	379	
K6a	22	6468	12	2.984	232	
K6b	22	6918	14	2.984	289	
K7a	22	7595	9	2.984	204	AVERAGE
K7b	22	8045	9	2.984	216	AVERAGE
K8	22	7460	2	2.984	45	
K9	25	2396	20	3.853	185	AVERAGE
K10	16	5238	4	1.578	33	
K11a	18	8080	6	1.998	97	
K11b	18	7610	6	1.998	91	
K12a	16	7468	4	1.578	47	
K12b	16	7728	4	1.578	49	
K13a	16	8928	18	1.578	254	
K13b	16	9347	17	1.578	251	
K14a	18	6533	12	1.998	157	
K14b	18	6083	14	1.998	170	
K15a	18	7840	1	1.998	16	
K15b	18	7390	1	1.998	15	
K16a	18	7975	9	1.998	143	AVERAGE
K16b	18	7525	9	1.998	135	AVERAGE
K17	16	2392	20	1.578	75	AVERAGE
K18	16	2444	62	1.578	239	
K19	16	3452	2	1.578	11	
K20a	20	3070	7	2.466	53	
K20b	20	4150	20	2.466	205	
K21	10	765	144	0.617	68	
K22	16	4847	4	1.578	31	
K23	18	1480	54	1.998	160	
K24	16	1991	62	1.578	195	
K25	16	7295	8	1.578	92	
K26	16	7750	8	1.578	98	
R1	10	550	130	0.617	44	
TOTAL	56592		KG			CONCRETE : 1106.0 M3
D25	24096		KG			
D22	8321		KG			
D20	9895		KG			
D18	984		KG			
D16	9006		KG			
D14	4179		KG			
D10	112		KG			

REINFORCING BAR LIST APPROACH SLAB

TYPE	DIAMETER	LENGTH OF BAR	U.WEIGHT	NUMBER	WEIGHT	
	(mm)	(mm)	(kg/m)		(Kg)	
AS1	D20	5850	2.466	230	3318.0	
AS2	D16	15584	1.578	110	2705.1	
AS3	D16	6320	1.578	116	1156.9	
AS4	D16	1200	1.578	116	219.7	
AS5	D20	700	2.466	78	134.6	
AS6	D10	1580	0.617	78	76.0	
AS7	D10	519	0.617	616	197.3	
					D10	273.3 kg
					D16	4081.7 kg
					D20	3452.6 kg
					TOTAL :	7807.6 kg
					CONCRETE :	43.2 m3
					LEAN CONCRETE :	13.3 m3
					ACPHATIC JOINT FILLER :	0.41 m3

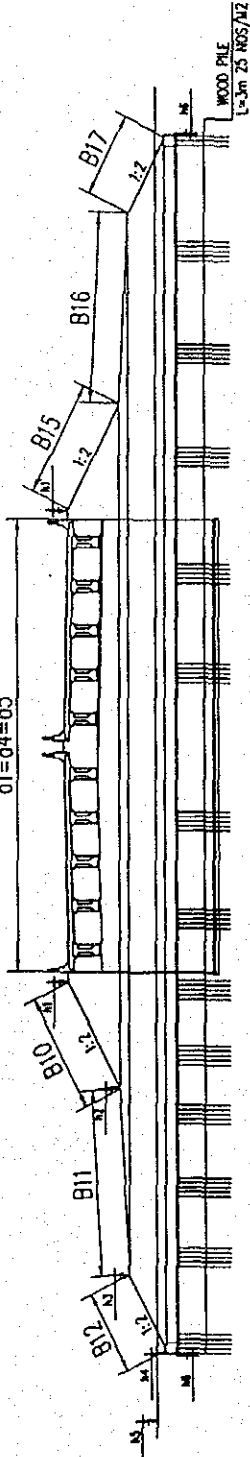
MATERIAL OF PILE

TYPE	D(mm)	LENGTH OF BAR (mm)	UNIT WEIGHT (kg/m)	NUMBER	WEIGHT (kg)	CONCRETE VOLUME (m ³)
N1	D32	12000	6.313	32	2424.2	
N2	D25	12000	3.853	48	2219.3	
N3	D25	8000	3.853	16	493.2	
N4	D25	7400	3.853	16	456.2	
N5	D22	4203	2.984	6	75.3	
N6	D22	4248	2.984	19	240.8	
N7	D10	152053	0.617	1	93.8	
N8	D10	167258	0.617	1	103.2	
N9	D10	809683	0.617	1	499.6	
N10	D10	4105	0.617	85	215.3	
N11	D16	1322	1.578	16	33.4	
	D10	911.9 kg				100.73
	D16	33.4 kg				
	D22	316.1 kg				
	D25	3168.7 kg				
	D32	2424.2 kg				
	TOTAL	6854.3kg				

EARTHWORKS SLOPE PROTECTION

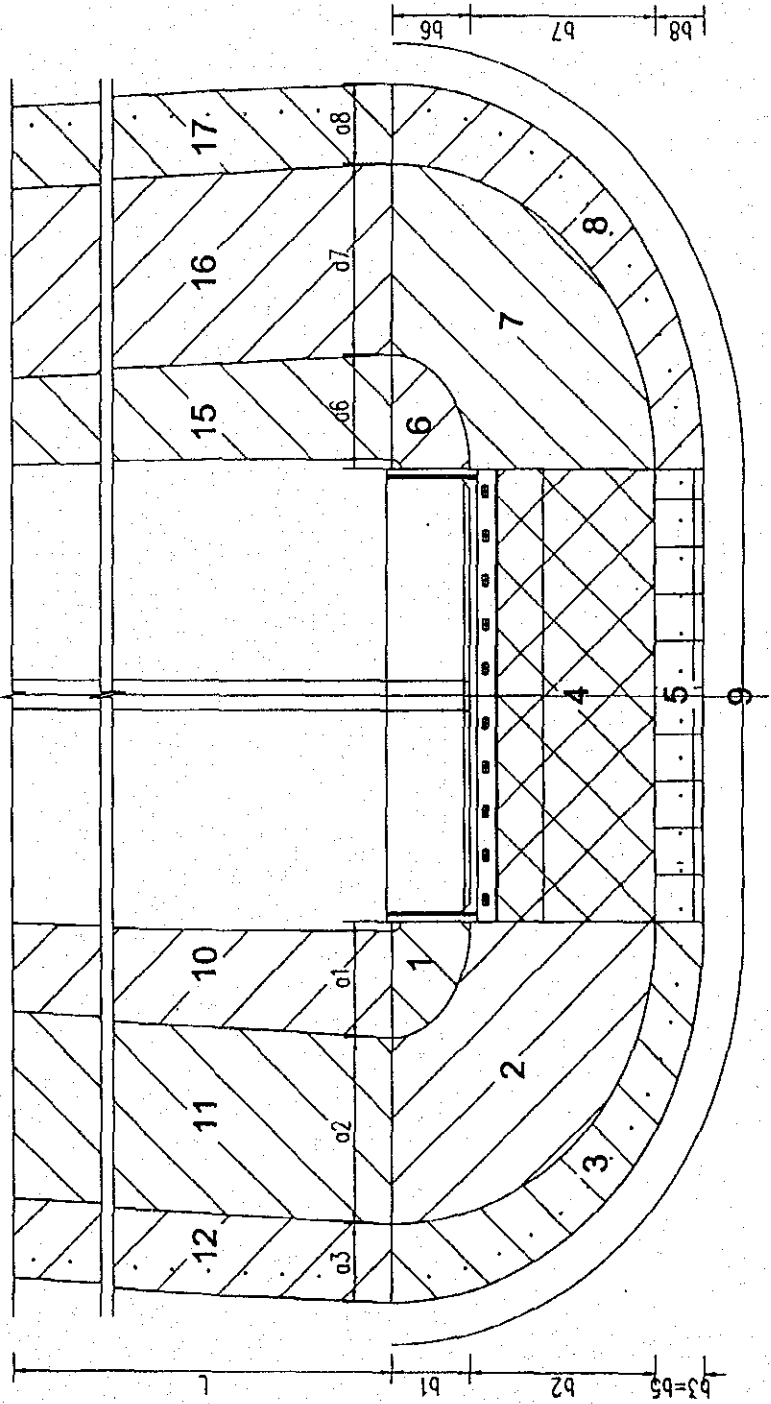
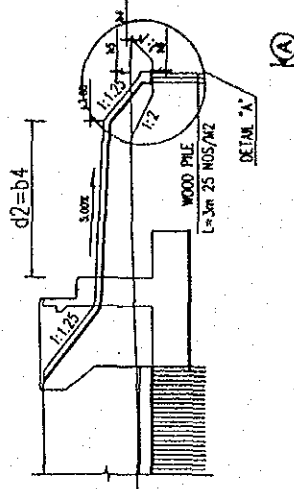
A-A

d1 = a4 = a5



PLAN

SIDE ELEVATION



INTERCHANGE 3 FLYOVER BRIDGE: QUANTITIES OF EARTHWORKS SLOPE PROTECTION OF 25M BEHIND HEAD WALL

ABUTMENT A1:

Block	B (m)	L (m)	S (m ²)	Thick (m)	Masonry (m ³)	Blinding (T=0.1m) (m ³)	
10	9.53	25	238.14	0.30	71.44	23.81	
11	12.01	25	300.37	0.30	90.11	30.04	
12	6.33	25	158.20	0.30	47.46	15.82	Geotextile (m ²)
15	10.71	25	267.77	0.30	80.33	26.78	= 2 x (L*1 + S12) = 366
16	12.01	25	300.37	0.30	90.11	30.04	PVC pipe (m)
17	6.33	25	158.20	0.30	47.46	15.82	= 2 x L/2 x 1m = 25
FOOTING	Wood pile		(m)		3000		
	Blinding		(m ³)		4		
	Stone masonry		(m ³)		18.00		LENGTH OF FOOTING L = 75 (m)
	Excavation		(m ³)		216.00		
	Back fill		(m ³)		150.00		
SIDE SLOPE	Stone masonry		(m ³)		426.92		
	Blinding		(m ³)		142.31		
	Geotextle		(m ²)		366		
	PVC pile		(m)		25		

No	h (m)	Dh (m)	S (m ²)	L (m)	Total (m ³)		
					Excavation	Back fill	
5	0.95						Excavation = 2 x S x L
6	-0.25	1.2	4.32	25	216	150	Filling = Excavation - 2 x 25 x Dh x 1.1

ABUTMENT A2:

Block	B (m)	L (m)	S (m ²)	Thick (m)	Masonry (m ³)	Blinding (T=0.1m) (m ³)	
10	9.53	25	238.14	0.30	71.44	23.81	
11	12.01	25	300.37	0.30	90.11	30.04	
12	6.33	25	158.20	0.30	47.46	15.82	Geotextile (m ²)
15	10.71	25	267.77	0.30	80.33	26.78	= 2 x (L*1 + S12) = 366
16	12.01	25	300.37	0.30	90.11	30.04	PVC pipe (m)
17	6.33	25	158.20	0.30	47.46	15.82	= 2 x L/2 x 1m = 25
FOOTING	Wood pile		(m)		3000		
	Blinding		(m ³)		4		
	Stone masonry		(m ³)		18.00		LENGTH OF FOOTING L = 75 (m)
	Excavation		(m ³)		216.00		
	Back fill		(m ³)		150.00		
SIDE SLOPE	Stone masonry		(m ³)		426.92		
	Blinding		(m ³)		142.31		
	Geotextle		(m ²)		366		
	PVC pile		(m)		25		

No	h (m)	Dh (m)	S (m ²)	L (m)	Total (m ³)		
					Excavation	Back fill	
5	0.52						Excavation = 2 x S x L
6	-0.68	1.2	4.32	25	216	150	Filling = Excavation - 2 x 25 x Dh x 1.1

QUANTITIES FOR EARTHWORKS SLOPE PROTECTION

Bridge INTERCHANGE 3 FLYOVER
Abutment A1

h1	h1'	h2	h3	h4	h5	h6	d1	d2
8.26	8.78	4	3.4	0.57	1.07	-0.13	31	12

Block	a	b	Dh	R	r	L	Sxq	W	Masonry	Blinding
	(m)	(m)	(m)	(m)	(m)	(m)	(m ²)	(m)	(m ³)	(m ³)
1	9.020	5.825	4.260	7.423	0.500	8.558	49.865		14.96	4.99
2	12.000	12.000	0.600	19.423	7.423	12.015	253.196		75.96	25.32
3	5.660	3.538	2.830	24.021	19.423	5.400	184.150		55.24	18.41
4	31.000	12.000	0.600				372.465		111.74	37.25
5	31.000	3.538	2.830				140.437		42.13	14.04
6	10.080	6.488	4.790	8.284	0.000	9.569	62.224		18.67	6.22
7	12.000	12.000	0.600	20.284	8.284	12.015	269.442		80.83	26.94
8	5.660	3.538	2.830	24.883	20.284	5.400	191.451		57.44	19.15
9			1.200				4.320	107.779		
Extra								93.339	457	152
FOOTING	Wood pile		(m)	6467	LENGTH OF FOOTING: L = 107.78 (m)					
	Blinding		(m ³)	8.0						
	Stone masonry		(m ³)	36.0						
	Excavation		(m ³)	468						
	Back fill		(m ³)	323						
SIDE SLOPE	Masonry		(m ³)	457						
	Blinding		(m ³)	152						
	Geotextile		(m ²)	609						
	PVC Pipe		(m)	54						

Abutment A2

h1	h1'	h2	h3	h4	h5	h6	d1	d2
8.26	8.79	4	3.4	0.57	1.07	-0.13	31	12

Block	a	b	Dh	R	r	L	Sxq	W	Masonry	Blinding
	(m)	(m)	(m)	(m)	(m)	(m)	(m ²)	(m)	(m ³)	(m ³)
1	9.020	5.825	4.260	7.423	0.000	8.558	49.865		14.96	4.99
2	12.000	12.000	0.600	19.423	7.423	12.015	253.196		75.96	25.32
3	5.660	3.538	2.830	24.021	19.423	5.400	184.150		55.24	18.41
4	31.000	12.000	0.600				372.465		111.74	37.25
6	31.000	3.538	2.830				140.437		42.13	14.04
6	10.080	6.488	4.790	8.284	0.000	9.569	62.224		18.67	6.22
7	12.000	12.000	0.600	20.284	8.284	12.015	269.442		80.83	26.94
8	5.660	3.538	2.830	24.883	20.284	5.400	191.451		57.44	19.15
9			1.200				4.320	107.779		
Extra								93.339	457	152
FOOTING	Wood pile		(m)	6467	LENGTH OF FOOTING: L = 107.78 (m)					
	Blinding		(m ³)	8.1						
	Stone masonry		(m ³)	36.5						
	Excavation		(m ³)	465.6						
	Back fill		(m ³)	323						
SIDE SLOPE	Masonry		(m ³)	457.0						
	Blinding		(m ³)	152.3						
	Geotextile		(m ²)	609						
	PVC Pipe		(m)	54						

NOTES:

* INPUT VALUES : GRAY CELLS ; TOTAL VALUES : BOLD NUMBERS

* No. of Blocks : see drawing. Extra block used for calculation only.

h_i : Elevations (see drawing)

d_i : Distances (see drawing)

a_i : Long edge of ellipse (or rectangle) : a_i=Dh_i'/slope_i

b_i : Short edge of ellipse (or rectangle) : b_i=Dh_i''/slope_i

Dh_i : Height of cone (or truncated cone)

R_i : Average radius of lower ellipse : R_i=(S_a+S_b)/2

r_i : Average radius of upper ellipse : r_i=(S_a''+S_b'')/2

L_i : Generatrix of cone : L_i=sqrt(Dh_i²+(R_i-r_i)²)

Sxq_i : Area of cone's side (or plane before abutment) :

Sxq_i=3.14/4*(R_i+r_i)*L_i for block 1,2,3,6,7,8

Sxq_i=a_i*sqrt(b_i²+Dh_i²) for block 4,5

Sxq₉=(1.8+1.8+Dh₉+2*Dh₉)*Dh₉/2 for block 9

W : Length of masonry's footing : W₉

W₉=2*3.14*R₉/4+a₉+2*3.14*R₉/4 , and

W_{EX}=2*3.14*R₉/4+a₉+2*3.14*R₉/4

Masonry_i = 0.3*Sxq_i

Blinding_i = 0.1*Sxq_i

Geotextile = Sxq₃+Sxq₅+Sxq₈+W_{EX}*1

PVC Pipe = W₉/2

Wood Pile = W₉*0.8*25*3

Excavation = W₉*Sxq₉

Filling = Excavation-W₉*Dh₉*1.1

QUANTITY TABLE OF PIERS

ITEMS		UNIT	PIER	PIER	PIER	TOTAL	
			P1	P2	P3		
PILE	NUMBER OF PILES	PILE	12.0	10.0	12.0	34	
	BORED PILES F1500MM DIA. TOTAL LENG	m	685.2	571.0	685.2	1941	
	CONCRETE CLASS D	m3	1210.8	1009.0	1208.4	3428	
	REINFORCEMENT	16≤D≤25	kg	44902.8	37419.0	44902.8	127225
		D10	kg	10783.2	8986.0	10783.2	30552
TOTAL		kg	55686.0	46405.0	55686.0	157777	
PIER	CONCRETE CLASS E	m3	642.5	646.8	642.5	1932	
	REINFORCEMENT	D28	kg	9368.5	0.0	9368.5	18737
		16≤D≤25	kg	40332.5	46070.8	40332.5	126736
		D≤14	kg	2332.4	2185.2	2332.4	6850
		TOTAL	kg	52033.4	48256.0	52033.4	152323
	FORM	m2	592.7	598.4	592.7	1784	
	SCAFFOLDING WORK	H<4m	m2	184.0	184.0	184.0	552
		4m≤H≤30m	m2	646.0	655.1	646.0	1947
	SUPPORT	m3	121.4	123.5	121.4	366	
	LEAN CONCRETE CLASS G	m3	15.4	15.8	15.4	47	
	BLINDING STONE	m3	30.9	31.6	30.9	93	
	EXCAVATION	m3	1302.7	1153.6	1302.7	3759	
	FILLING	m3	914.0	764.9	914.0	2593	

Item	Formula	Quantity
1) Concrete	<p>* Pier cap</p> $v1 = \left(\frac{17.305 \times 1.80 + 16.13 \times 1.80}{2.00} \right) \times 1.50 \times 2.00 = 90.28 \text{ m}^3$ <p>* Column</p> $v2 = \left(\frac{10.04 \times 1.50 + 14.11 \times 1.50 + 5.50 + 5.492 + 5.367}{2.00} \right) \times \left(\frac{1/4 \times \pi \times 1.5^2 + 14.11 \times 1.5 + 5.60}{2.00} \right) = 218.31 \text{ m}^3$ <p>* Footing</p> $v3 = 7.00 \times 12.00 \times 2.00 - \left(\frac{1/4 \times \pi \times 1.50^2}{2.00} \right) \times 12.00 = 333.88 \text{ m}^3$ <p style="text-align: right;">Total</p>	<p style="text-align: right;">642.5 m³</p>
2) Form	<p>* Pier cap</p> $a1 = \left(\frac{16.13 \times 1.80 + 1/4 \times \pi \times 1.50^2 + 16.13}{2.00} \right) \times 1.80 \times 2.00 + 14.11 \times 1.50 + 17.305 \times 1.50 \times 2.00 = 123.76 \text{ m}^2$ <p>* Column</p> $a2 = \left(\frac{14.113 + 10.04}{2.00} + \frac{5.5 + 5.492 + 5.367}{2.00} \right) \times \left(\frac{1/4 \times \pi \times 1.5^2 + 14.11 \times 1.5 + 5.60}{2.00} \right) = 316.949 \text{ m}^2$ <p>* Footing</p> $a3 = (7.0 + 12.0) \times 2 \times 2 = 152.00 \text{ m}^2$ <p style="text-align: right;">Total</p>	<p style="text-align: right;">592.7 m²</p>
3) Scaffolding:	<p>* H<=4m</p> $A2 = \left(2 \times \left(\frac{7.00 + 12.00}{2.00} \right) + 8 \right) \times 2 = 184.0 \text{ m}^2$ <p>* 4m< H<=30m</p> $A2 = \left(2 \times \left(\frac{17.31 + 1.80}{5.6 + 5.50 + 5.49 + 5.367} + 4 \times \frac{1.50}{2.00} \right) + 8 \right) \times 2 = 646.0 \text{ m}^2$	<p style="text-align: right;">646.0 m²</p>

Item	Formula	Quantity
4) Support	$= [\frac{1.80 \times 0.585 \times (5.60 + 5.50 + 5.492 + 5.37 + 4 \times 1.5)}{2}] + [\frac{16.133 \times 1.8 - 14.113 \times 1.5 - 1/4 \times \pi \times (5.6 + 5.5 + 5.492 + 5.367)}{2}] \times (\frac{0.705 \times 1.5 \times (5.6 + 5.5 + 5.492 + 5.367)}{2}) =$	121.4 m3
5) Lean Concrete	* Concrete class G	
	$v = \{ \frac{0.1 \times (7.20 \times 12.2 - 1/4 \times \pi \times 1.5 \times 1.5 \times 6)}{2} \} \times 2.00 =$	15.4 m3
6) Blinding Stone	* Form	
	$A = 0.1 \times \{ (7.20 + 12.2) \times 2.00 \} \times 2 =$	7.76 m2
6) Blinding Stone	$v = \frac{0.2 \times (7.20 \times 12.2 - 1/4 \times \pi \times 1.5 \times 1.5 \times 6)}{2} \times 2.00 =$	30.9 m3
7) Bored Pile	* Concrete	
	$= 12 \times \{ \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (57.00 + 0.10) \} =$	1210.8 m3
	* Excavation Length	
	$\begin{aligned} N < 20: &= 19.8 \times 12 = 237.6 \text{ m} \\ 20 < N < 40: &= 26.0 \times 12 = 312.0 \text{ m} \\ 40 < N: &= 11.2 \times 12 = 134.4 \text{ m} \end{aligned}$	
* Excavation Volume	$= 12 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 57.00 =$	1208.7 m3
8) Earth Work	* Excavation	
	$V = \frac{1}{6} \times 3.1 \times \{ 14.00 \times 9.00 + 20.2 \times 15.2 + (14.00 + 20.20) \times (9.00 + 15.2) \} \times 2.00 =$	1302.7 m3
	* Excess Soil = Lean concrete + Blinding concrete + Footing Volume + Pile Occupied Volume	
	* Occupied Volume	$= 12.00 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 0.40 =$
* Excess Soil		388.7 m3
* Back Fill		914.0 m3

Item	Formula	Quantity
1) Concrete	<p>* Pier cap $v1 = \left(\frac{17.305 \times 1.80 + 16.13 \times 1.80}{2.00} \right) \times 1.50 \times 2.00 = 90.28 \text{ m}^3$</p> <p>* Column $v2 = \left(\frac{10.04 \times 1.50 + 14.11 \times 1.50 + 1/4 \times \pi \times 1.5^2}{2.00} \right) \times 5.58 + 5.599 + 5.599 + 5.578 = 222.24 \text{ m}^3$</p> <p>* Footing $v3 = 7.00 \times 12.00 \times 2.00 - 1/4 \times \pi \times 1.50^2 \times 10.00 = 334.23 \text{ m}^3$</p> <p style="text-align: right;">Total</p>	646.8 m3
2) Form	<p>* Pier cap $a1 = \left(\frac{16.13 \times 1.80 + 1/4 \times \pi \times 1.50^2 + 16.13}{2.00} \right) \times 1.80 \times 2.00 = 123.76 \text{ m}^2$</p> <p>* Column $a2 = \left(\frac{14.113 + 10.04}{5.599 + 5.599 + 5.578} \right) \times 2.00 + \pi \times 1.5 \times \left(\frac{5.578}{2} + 5.599 + 5.599 + 5.578 \right) = 322.651 \text{ m}^2$</p> <p>* Footing $a3 = (7.0 + 12.0) \times 2 \times 2 = 152.00 \text{ m}^2$</p> <p style="text-align: right;">Total</p>	598.4 m2
3) Scaffolding:	<p>* H<=4m $A2 = \left(2 \times (7.00 + 12.00) + 8 \right) \times 2 = 184.0 \text{ m}^2$</p> <p>* 4m< H<=30m $A2 = \left(2 \times (17.31 + 1.80) + 8 \right) \times (5.578 + 5.599 + 5.599 + 5.578) + 4 \times 1.50 = 655.1 \text{ m}^2$</p>	655.1 m2

Item	Formula	Quantity
4) Support	$= \left[\frac{1.80 \times 0.586 \times (5.58 + 5.60 + 5.599 + 5.58 + 4 \times 1.5)}{2} \right] + \left[\frac{16.133 \times 1.8 - 14.113 \times 1.5 - \frac{1}{4} \pi (1.5)^2}{2} \right] \times (5.578 + 5.599 + 5.599 + 5.578) = 123.5 \text{ m}^3$	123.5 m3
5) Lean Concrete	<p>* Concrete class G</p> $v = \left[\frac{0.1 \times (7.20 \times 12.2 - \frac{1}{4} \pi (1.5)^2)}{1.5 \times 1.5 \times 5} \right] \times 2.00 = 15.8 \text{ m}^3$ <p>* Form</p> $A = 0.1 \times \left[(7.20 + 12.2) \times 2.00 \right] \times 2 = 7.76 \text{ m}^2$	15.8 m3
6) Blinding Stone	$v = \frac{0.2 \times (7.20 \times 12.2 - \frac{1}{4} \pi (1.5)^2)}{1.5 \times 1.5 \times 5} \times 2.00 = 31.6 \text{ m}^3$	31.6 m3
7) Bored Pile	<p>* Concrete</p> $= 10 \times \left[\frac{1}{4} \pi \times 1.50 \times 1.50 \times (57.00 + 0.10) \right] = 1009.0 \text{ m}^3$ <p>* Excavation Length</p> <p>N<20: = 19.8 x 10 = 198.0 m</p> <p>20<N<40: = 26.0 x 10 = 260.0 m</p> <p>40<N: = 11.2 x 10 = 112.0 m</p> <p>* Excavation Volume</p> $= 10 \times \left[\frac{1}{4} \pi \times 1.50 \times 1.50 \times 57.00 \right] = 1007.3 \text{ m}^3$	1009.0 m3
8) Earth Work	<p>* Excavation</p> $V = \frac{1}{6} \times 2.85 \times \left[14.00 \times 9.00 + 19.7 \times 14.7 + \left(\frac{14.00 + 19.70}{2} \right) \times (9.00 + 14.7) \right] \times 2.00 = 1153.6 \text{ m}^3$ <p>* Excess Soil=Lean concrete +Blinding concrete + Footing Volume+Pile Occupied Volume</p> <p>*Occupied Volume</p> $= 10.00 \times \left[\frac{1}{4} \pi (1.5)^2 \times 1.50 \times 1.50 \times 0.40 \right] = 7.1 \text{ m}^3$ <p>*Excess Soil = 388.7 m3</p> <p>* Back Fill = 764.9 m3</p>	1153.6 m3

LIST OF REINFORCEMENTS (FOR 1 PIER)

TYPE	DIAMETER (mm)	LENGTH (mm)	NUMBER	UNITWEIGHT (kg/m)	WEIGHT (kg)	REMARKS
B1	12	17376	16	0.888	246.9	
B2	16	16482	16	1.578	416.1	
B3	12	1816	32	0.888	51.6	
B4	16	17014	24	1.578	644.4	AVERAGE
B5	12	2574	32	0.888	73.1	
B6	12	6748	234	0.888	1402.2	
B7	12	3850	122	0.888	417.1	
B8	12	4675	16	0.888	66.4	AVERAGE
B9	12	3524	24	0.888	75.1	AVERAGE
B10	20	2269	260	2.466	1454.8	
C1	25	10399	384	3.853	15385.9	
C2	16	31796	77	1.578	3863.4	AVERAGE
C3	16	3776	624	1.578	3718.1	AVERAGE
F1	25	16311	110	3.853	6913.1	
F2	22	13352	56	2.984	2231.2	
F3	28	10201	190	4.834	9368.5	
F4	22	7565	96	2.984	2167.1	
F5	20	13100	32	2.466	1033.7	
F6	20	7450	32	2.466	587.9	
F7	16	4801	264	1.578	1916.7	
TOTAL		52033.4	(KG)			
D12		2332.4	(KG)			
D16		10558.8	(KG)			
D20		3076.4	(KG)			
D22		4398.3	(KG)			
D25		22299.0	(KG)			
D28		9368.5	(KG)			

LIST OF REINFORCEMENTS FOR PIER P2

TYPE	DIAMETER (mm)	LENGTH (mm)	NUMBER	UNITWEIGHT (kg/m)	WEIGHT (kg)	REMARKS
B1	25	18027	16	3.853	1111.3	
B2	25	17011	16	3.853	1048.7	
B3	12	1816	32	0.888	51.6	
B4	16	17014	24	1.578	644.4	AVERAGE
B5	12	2574	32	0.888	73.1	
B6	12	6788	234	0.888	1410.5	
B7	12	3881	122	0.888	420.5	
B8	12	4686	16	0.888	68.6	AVERAGE
B9	12	3535	24	0.888	75.3	AVERAGE
C1	25	8933	384	3.853	13216.8	AVERAGE
C2	16	31796	80	1.578	4013.9	AVERAGE
C3	16	3776	624	1.578	3718.1	AVERAGE
F1	25	16311	110	3.853	6913.1	
F2	22	13352	56	2.984	2231.2	
F3	25	10201	190	3.853	7467.8	
F4	22	7565	96	2.984	2167.1	
F5	20	13100	32	2.466	1033.7	
F6	20	7450	32	2.466	587.9	
F7	16	4601	264	1.578	1916.7	
R1	10	14200	10	0.617	87.6	
TOTAL		48256.1	(KG)			
D10		87.6	(KG)			
D12		2097.6	(KG)			
D16		10293.1	(KG)			
D20		1621.6	(KG)			
D22		4398.3	(KG)			
D25		29757.8	(KG)			

MATERIAL OF PILE

TYPE	D(mm)	LENGTH OF BAR (mm)	UNIT WEIGHT (kg/m)	NUMBER	WEIGHT (kg)	CONCRETE VOLUME (m ³)
N1	D25	12000	3.853	56	2569.2	
N2	D25	8000	3.853	14	431.5	
N2'	D25	6875	3.853	14	370.9	
N3	D22	4248	2.984	25	316.9	
N4	D10	152053	0.617	1	93.8	
N5	D10	182464	0.617	1	112.6	
N6	D10	805881	0.617	1	497.2	
N7	D10	4105	0.617	77	195.0	
N8	D16	1322	1.578	16	33.4	
	D10	898.6 kg				
	D16	33.4 kg				
	D22	316.9 kg				
	<u>D25</u>	<u>3391.6 kg</u>				
	TOTAL	4640.5 kg				100.73

SUMMARY OF QUANTITY FOR INTERCHANGE 3 FLYOVER BRIDGE

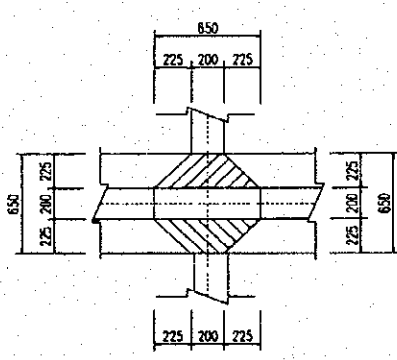
ITEMS	UNIT	ABUTMENTS	PIERS	SUPERSTRUCTURE	MISCELLANEOUS WORKS			TOTAL
					DRAINAGE	LIGHTING	RAILING	
CONCRETE	CLASS C	m3		2697				2697
	CLASS D	m3	4036					7464
	CLASS E	m3	2298	1932			224	4455
	CLASS G	m3	90	47				137
PC - STEEL	m			6608				6608
SHEATHING OF CABLES 12S12.7 Φ 65/72mm	m			6608				6608
CEMENT GROUT IN SEATHING	m3			12				12
CABLE ANCHORAGES 12S12.7	set			132				132
REINFORCEMENT	D32	kg	96968	18737				115705
	16 \leq D \leq 25	kg	260401	253960	178860			693221
	D \leq 14	kg	45605	37402	56388			172636
	TOTAL	kg	402973	310100	235248		33241	981562
FORM	m2	2074	1784	8134			1081	
SCAFFOLDING WORK	m2	1312	2499					
SUPPORT	m3	60	366	470				
EXPANSION JOIN	m	62						62
BEARING	700x350x52	set	20					20
	800x600x52	set		10				10
ANCHORAGE BAR	Φ 80 mm	set	16	8				24
	Φ 50 mm	m	158					158
	Φ 100 mm	m				100		100
	Φ 200 mm	m				88		88
RAILING	m					236	236	
LIGHTING POLE	set					3	3	
DRAINAGE		set				16		16
	WATERPROOFING	m2			2302			2302
PAVEMENT	ASPHALT CONCRETE	m2			2302			2302
		m2	1950					1950
STONE MASONRY	m3	1876						1876
BLINDING AGGREGATE	m3	613						613
BLINDING STONE	m3	127	93					220
FOOTING OF SLOPE PROTECTION	m	366						366
WOODEN PILE, L=3m	m	18934						18934
EXCAVATION GROUND	m3	3375	3759					7134
FILLING GROUND	m3	1379	2593					3972

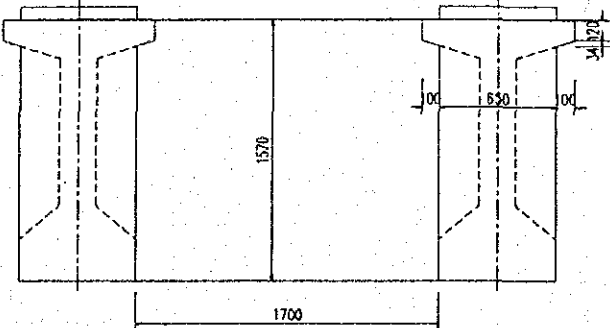
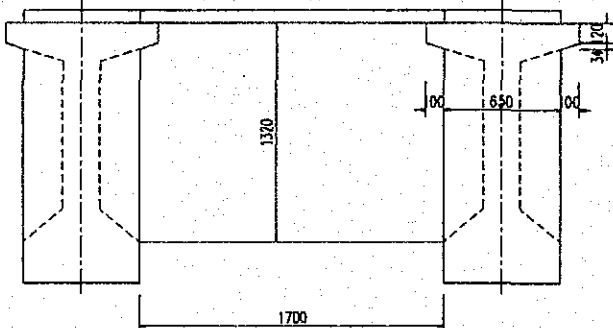
3.9. Interchange with NH.91B Ramp D

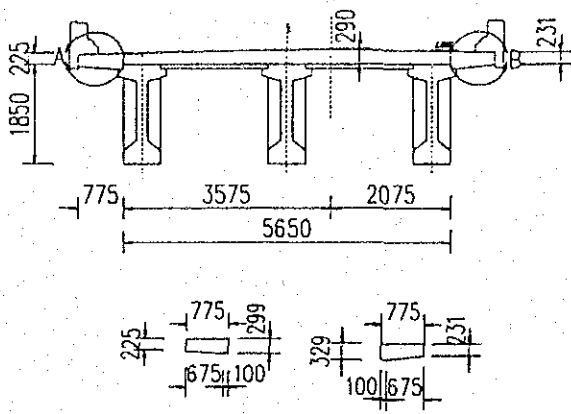
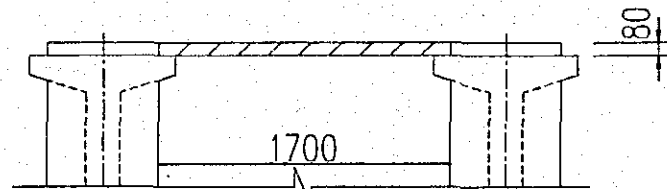
Quantity of Superstructure

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS B	Girder	M ³	210.6	$\sigma_{ck}=400\text{kg/cm}^2$
	CLASS D	Panel	M ³	25.3	
		Deck Slab	M ³	176.3	
		Diaphragm	M ³	27.7	
		Total	M ³	229.4	
Form		Girder	M ²	1,564.9	
		Diaphragm	M ²	174.5	
		Deck Slab	M ²	168.0	
		Panel	M ²	396.6	
		Total	M ²	2,303.9	
Scaffolding		Platform of construction	M ²	826.5	
Re-bar		D25	Ton	1.9	
		D22	Ton	9.7	
		D20	Ton	20.7	
		D16	Ton	2.0	added
		D14	Ton	40.1	added
		D12	Ton	2.5	added
		D10	Ton	0.1	
		D6	Ton	3.0	
		Total	Ton	80.0	
PC Cable	12S12.7B		Ton	9.8	SWPR7B
	3S12	Transverse Tendons	Ton	0.3	
Anchorage	12S12.7B		SET	66.0	
	3S12.7B		SET	44.0	
Steel shear key			SET	72.0	
Sheathing	ϕ 80/85		M	1,051.1	
	ϕ 50/55		M	203.4	
Cement grout in sheathing			M ³	5.7	
Expansion Joint			M	26.0	
Bearing	600x300x57		SET	6.0	
	500x250x50		SET	12.0	
Anchorage Bar			SET	12.0	
Pavement	5mm		M ²	607.8	
Water Proofing	70mm		M ²	607.8	

Item	Formula	Quantity																								
Concrete																										
1. Girder																										
CLASS "B"																										
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	[1] Middle Section																									
	Summary of Sectional Area For ONE GIRDER																									
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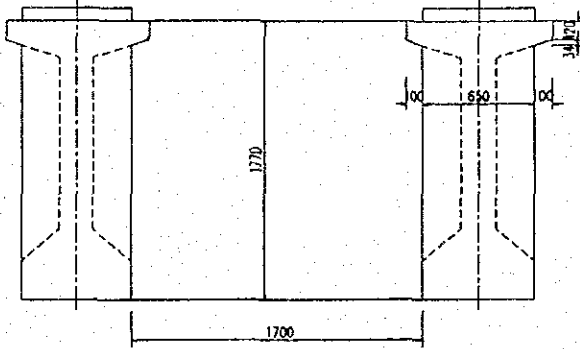
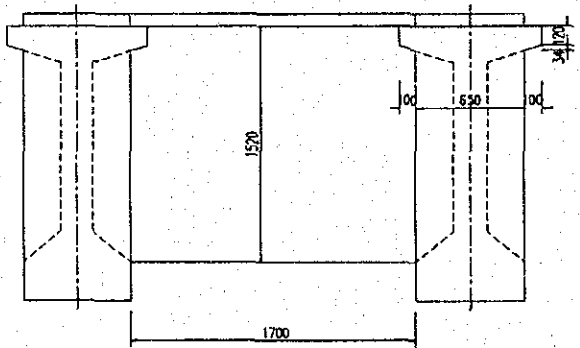
Item	Formula	Quantity				
2)Diaphragm	(2) Calculation of Concrete Volume					
	[1] A1-P1 Girder Length 28.000 m					
	Section No	Section Area (m2) Average of Section (m2) Length of Block (m) Concrete Volume (m3) Remark				
	END	1.1				
	END	1.1	1.1	0.450	0.495	
	MIDDLE	0.638	0.869	4.000	3.476	
	MIDDLE	0.638	0.638	19.100	12.186	
	END	1.1	0.869	4.000	3.476	
	END	1.1	1.1	0.450	0.495	
	Total			28	20.128	
	No. of Girder	3 × 2 = 6				
	V1=	20.128 × 6		= 120.768 m3		
						
	V2=	$(0.200 \times 1.166 + 0.650 \times 0.890) \times \frac{1}{2} \times 0.225$ $\times 2 \times 2 \times 3 \times 2 = 2.192 \text{ m}^3$				
	Total V =	120.768 + 2.192		= 122.960	122.960 m3	

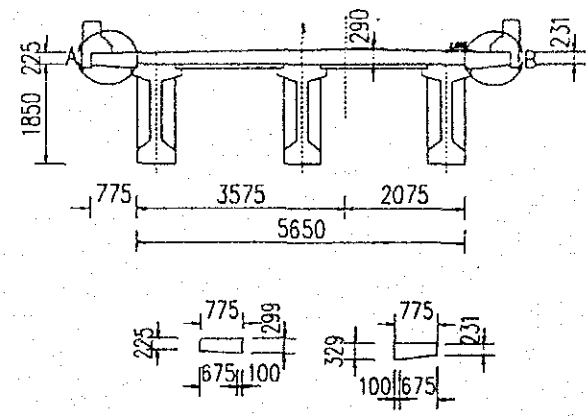
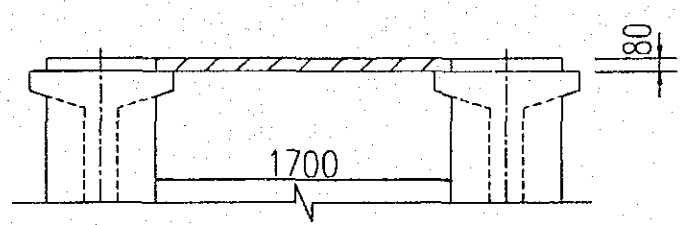
Item	Formula	Quantity
2. Diaphragm CLASS "D"	<p>(1) End Cross Beam</p>  <p>(2) Intermediate Cross Beam</p>  $V2 = \left\{ \left[1.700 \times 1320 - \left(\frac{0.120 + 0.154}{2} \right) \times 2 \times 0.100 \right] \times 0.200 \times 2 \right\} = 3.547 \text{ m}^3$ <p>Sub-tota V = 10.566 + 3.547 = 14.113 m³</p>	<p>14.113 m³</p>

Item	Formula	Quantity
3. Deck Slab CLASS "D"	 <p style="text-align: center;">DETAIL "A & B"</p> $ \begin{aligned} A &= \{ (0.225 + 0.299) \times 0.675 \times \frac{1}{2} + 0.100 \times 0.299 \} \\ &+ \{ (0.231 + 0.329) \times 0.675 \times \frac{1}{2} + 0.100 \times 0.329 \} \\ &+ (0.219 + 0.290) \times 3.575 \times \frac{1}{2} \\ &+ (0.249 + 0.290) \times 2.075 \times \frac{1}{2} &= 1.896 \text{ m}^2 \\ V &= 1.896 \times 28.000 \times 2 &= 106.176 \text{ m}^3 \end{aligned} $	106.176 m ³
4. Panel concrete Class "D"	$V = 1.700 \times 0.08 \times 2.000 \times 28.000 \times 2 = 15.232 \text{ m}^3$	15.232 m ³
		

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3	0.650×1.616	= 1.050																					
	Total Area 1.230 m ²																						

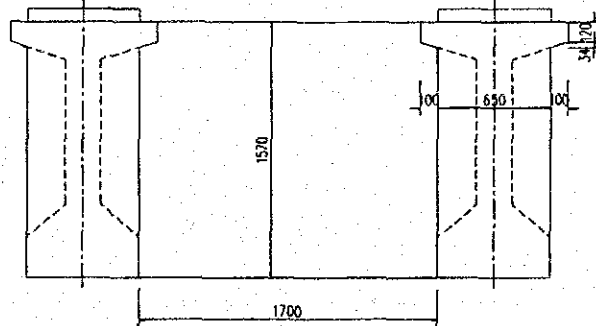
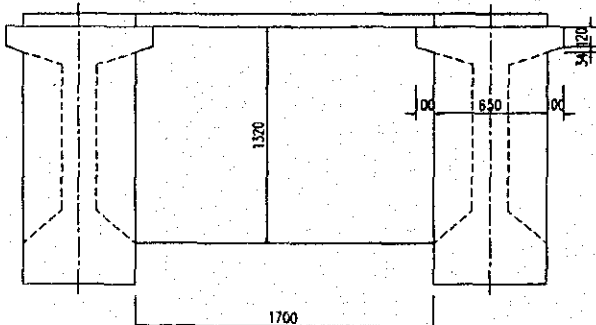
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<p>(2) Calculation of Concrete Volume</p> <p>[1] A1-A2 Girder Length 37.000 m</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Section No</th> <th>Section Area (m²)</th> <th>Average of Section (m²)</th> <th>Length of Block (m)</th> <th>Concrete Volume (m³)</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>END</td> <td>1.23</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>END</td> <td>1.23</td> <td>1.23</td> <td>0.500</td> <td>0.615</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>0.678</td> <td>0.954</td> <td>5.300</td> <td>5.056</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>0.678</td> <td>0.678</td> <td>25.400</td> <td>17.221</td> <td></td> </tr> <tr> <td>END</td> <td>1.23</td> <td>0.954</td> <td>5.300</td> <td>5.056</td> <td></td> </tr> <tr> <td>END</td> <td>1.23</td> <td>1.23</td> <td>0.500</td> <td>0.615</td> <td></td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td>37</td> <td>28.563</td> <td></td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 20px;"> No. of Girder 3 × 1 = 3 </p> <p> V1= 28.563 × 3 = 85.689 m³ </p> <div style="text-align: center; margin: 20px 0;"> </div> <p> V2= (0.200 × 1.366 + 0.650 × 1.090) × 1/2 × 0.225 × 2 × 3 × 3 × 1 = 1.988 m³ </p> <p> Total V = 85.689 + 1.988 = 87.677 87.677 m³ </p>	Section No	Section Area (m ²)	Average of Section (m ²)	Length of Block (m)	Concrete Volume (m ³)	Remark	END	1.23					END	1.23	1.23	0.500	0.615		MIDDLE	0.678	0.954	5.300	5.056		MIDDLE	0.678	0.678	25.400	17.221		END	1.23	0.954	5.300	5.056		END	1.23	1.23	0.500	0.615		Total			37	28.563		
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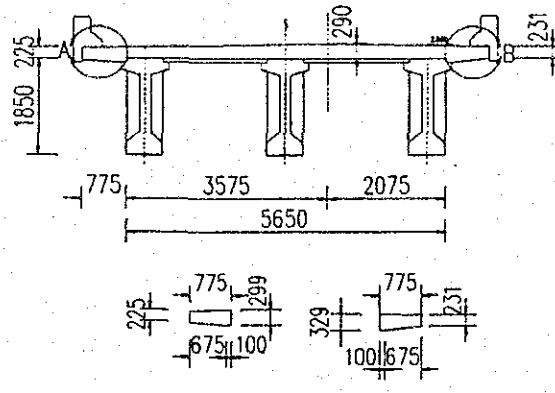
Item	Formula	Quantity
2. Diaphragm CLASS "D"	<p>(1) End Cross Beam</p>  $V1 = \left\{ \frac{1.570 \times 1.700 - (0.120 + 0.154) \times 2/2 \times 0.100}{0.500 \times 2 \times 4} \right\} = 10.566 \text{ m}^3$ <p>(2) Intermediate Cross Beam</p>  $V2 = \left[\frac{1.700 \times 1.520 - (0.120 + 0.154) \times 2/2 \times 0.100}{0.200 \times 2 \times 3 \times 1} \right] = 3.068 \text{ m}^3$ <p>Sub-tota V = 10.566 + 3.068 = 13.634 m³</p>	<p>13.634 m³</p>

Item	Formula	Quantity
<p>3. Deck Slab CLASS "D"</p>	 <p style="text-align: center;">DETAIL "A & B"</p> $ \begin{aligned} A &= \{ (0.225 + 0.299) \times 0.675 \times 1/2 + 0.100 \times 0.299 \} \\ &+ \{ (0.231 + 0.329) \times 0.675 \times 1/2 + 0.100 \times 0.329 \} \\ &+ (0.219 + 0.290) \times 3.575 \times 1/2 \\ &+ (0.249 + 0.290) \times 2.075 \times 1/2 &= 1.896 \text{ m}^2 \\ V &= 1.896 \times 37.000 &= 70.152 \text{ m}^3 \end{aligned} $	<p>70.152 m³</p>
<p>4. Panel concrete Class "D"</p>	$V = 1.700 \times 0.08 \times 2.000 \times 37.000 \times 1 = 10.064 \text{ m}^3$ 	<p>10.064 m³</p>

Item	Formula	Quantity
Form		
1. Girder		
1) Girder	(1) Calculation of Sectional Area	
	[1] Middle Section	
	Summary of Sectional Length	For ONE GIRDER
No	Formula	(m)
1	0.080×2	= 0.160
2	0.120×2	= 0.240
3	0.343×2	= 0.686
4	0.890×2	= 1.780
5	0.301×2	= 0.602
6	$0.250 \times 2 + 0.650$	= 1.150
	Total Length	4.618 m
	[2] End Section	
	Summary of Sectional Length	For ONE GIRDER
No	Formula	(m)
1	0.080×2	= 0.160
2	0.120×2	= 0.240
2	0.106×2	= 0.212
3	$1.416 \times 2 + 0.650$	= 3.482
	Total Length	4.094 m

Item	Formula	Quantity																																																
	<p>(2) Calculation of Form Area</p> <p>[1] A1-A2 Girder Length 37.000 m</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th>Section No</th> <th>Section Length (m)</th> <th>Average of Section (m)</th> <th>Length of Block (m)</th> <th>Form Area (m²)</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>END</td> <td>4.094</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>END</td> <td>4.094</td> <td>4.094</td> <td>0.500</td> <td>2.047</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>4.618</td> <td>4.356</td> <td>5.300</td> <td>23.087</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>4.618</td> <td>4.618</td> <td>25.400</td> <td>117.297</td> <td></td> </tr> <tr> <td>END</td> <td>4.094</td> <td>4.356</td> <td>5.300</td> <td>23.087</td> <td></td> </tr> <tr> <td>END</td> <td>4.094</td> <td>4.094</td> <td>0.500</td> <td>2.047</td> <td></td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td>37</td> <td>167.565</td> <td></td> </tr> </tbody> </table> <p style="margin-top: 20px;"> $A1 = 167.565 \times \text{No. of Girder} \quad 3 \times 2 = 6$ $= 167.565 \times 6 = 1,005.390 \text{ m}^2$ </p> <div style="text-align: center; margin: 20px 0;"> </div> <p style="margin-top: 20px;"> $A2 = \left[\left(\frac{0.200 \times 1}{2} + 0.650 \times 0.890 \right) \times 2 \right] \times \left(\frac{0.890 + 1.200}{2} \right) \times 3$ $= 7.083 \text{ m}^2$ </p> <p style="margin-top: 20px;"> Total A = 1,005.390 + 7.083 = 1,012.473 </p>	Section No	Section Length (m)	Average of Section (m)	Length of Block (m)	Form Area (m ²)	Remark	END	4.094					END	4.094	4.094	0.500	2.047		MIDDLE	4.618	4.356	5.300	23.087		MIDDLE	4.618	4.618	25.400	117.297		END	4.094	4.356	5.300	23.087		END	4.094	4.094	0.500	2.047		Total			37	167.565		<p>1,012.473 m²</p>
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2) Diaphragm																																																		

Item	Formula	Quantity
2. Diaphragm	<p>(1) End Cross Beam</p>  $A1 = \left[\left(\frac{1.570 \times 1.700}{2} - \left(\frac{0.120 + 0.154}{2} \right) \times \frac{2}{2} \times 0.100 \right) + 0.500 \times 1.700 \right] \times 2 \times 4 = 49.066 \text{ m}^2$ <p>(2) Intermediate Cross Beam</p>  $A2 = \left[\left(\frac{1.700 \times 1.320}{2} - \left(\frac{0.120 + 0.154}{2} \right) \times \frac{2}{2} \times 0.100 \right) + 0.200 \times 1.700 \right] \times 2 \times 2 = 38.186 \text{ m}^2$ <p>Sub-total A = 49.066 + 38.186 = 87.252 m²</p>	<p>87.252 m²</p>

Item	Formula	Quantity
3. Deck Slab	 <p style="text-align: center;">DETAIL "A & B"</p> $A-1 = (0.225 + 0.675) + (0.231 + 0.675) = 1.806 \text{ m}$ $A = 1.806 \times 28.000 \times 2 = 101.136 \text{ m}^2$	101.136 m ²
4. Platform for construction	$A = 9.500 \times 26.00 \times 2.000 = 494.000 \text{ m}^2$	494.000 m ²
5. Panel concrete	$A = \frac{(1.700 + 1.000) \times 0.080 \times 2 + 1.700 \times 2}{28.00 \times 2} = 238.784 \text{ m}^2$	238.784 m ²
