

Item	Formula	Quantity
1. Joint	<p>EACH LENGTH $L = 10.750$</p> <p>EACH = 4</p> <p>TOTAL LENGTH</p> <p>$L = 10.750 \times 4 =$</p>	<p>43.000 m</p>
3. Bearing pad	<p>ELASTOMERIC 600x300x57</p> <p>EACH for One SPAN</p> <p>EACH = 10</p> <p>TOTAL EACH</p> <p>EACH = $10 \times 2 =$</p> <p>ELASTOMERIC 500x250x50</p> <p>EACH for One SPAN</p> <p>EACH = 10</p> <p>TOTAL EACH</p> <p>EACH = $10 \times 4 =$</p>	<p>EACH 20</p> <p>EACH 40</p>
4. Anchor bar	<p>EACH for One SPAN</p> <p>EACH = 48</p> <p>TOTAL EACH (FIX)</p> <p>EACH = $8 \times 4 = 32$</p> <p>TOTAL EACH (MOVE)</p> <p>EACH = $8 \times 2 = 16$</p>	<p>EACH 48.000</p>
5. Pavament	<p>a. WATER PROOFING 5MM 10.75 X 93.5 X 2 = 2010 m2</p> <p>b. ALPHALT CONCRETE 70MM 10.75 X 93.5 X 2 = 2010 m2</p>	<p>2010 m2</p> <p>2010 m2</p>

QUANTITY TABLE OF ABUTMENTS

ITEMS		UNIT	ABUTMENT A1	ABUTMENT A2	TOTAL	
A- ABUTMENT						
PILE	NUMBER OF PILES	PILE	10.0	10.0	20.0	
	TOTAL LENGTH OF BORED PILES Ø1500mm	m	550.0	550.0	1100.0	
	CONCRETE CLASS D	m ³	971.9	971.9	1943.8	
	EXCAVATION	m ³	1023.2	1023.2	2046.4	
	REINFORCEMENT	D28	kg	18563.0	18563.0	37126.0
		D25	kg	29591.0	29591.0	59182.0
		D22	kg	3039.0	3039.0	6078.0
		D16	kg	334.0	334.0	668.0
		D10	kg	8594.0	8594.0	17188.0
		TOTAL	kg	60121.0	60121.0	120242.0
ABUTMENT	CONCRETE CLASS E	m ³	578.3	572.9	1151.2	
	REINFORCEMENT	D25	kg	15342.9	15209.3	30552.2
		D22	kg	4302.5	4273.3	8575.8
		D20	kg	4925.4	4897.0	9822.4
		D18	kg	519.6	519.6	1039.2
		D16	kg	4428.4	4394.5	8822.9
		D14	kg	2573.8	2603.0	5176.8
		D10	kg	106.4	106.4	212.8
		TOTAL	kg	32199.0	32003.1	64202.1
	FORM	m ²	494.9	494.9	989.7	
	SCHAFFOLDING	H ≤ 4 m	m ²	147.4	147.4	294.8
		4m < H < 30m	m ²	434.8	434.8	869.6
	SUPPORT	m ³	5.5	5.5	11.0	
	LEAN CONCRETE CLASS G	m ³	17.9	17.9	35.8	
	BLINDING STONE	m ³	35.8	35.8	71.6	
	EXCAVATION	m ³	1101.0	1027.2	2128.2	
BACK FILL	m ³	462.0	394.1	856.1		
B- APPROACH SLAB						
	CONCRETE CLASS E	m ³	45.6	45.1	90.7	
	LEAN CONCRETE CLASS G	m ³	14.0	13.9	27.9	
	FORM	m ²	27.0	26.8	53.7	
	ASPHALTIC JOINT FILLER T=20mm	m ³	0.43	0.42	0.85	
	REINFORCEMENT	D20	kg	3540.4	3540.4	7080.8
		D16	kg	3536.5	3536.5	7073.0
		D10	kg	264.7	264.7	529.4
		TOTAL	kg	7341.6	7341.6	14683.2
C- SLOPE PROTECTION						
SIDE SLOPE	STONE MASONRY T=300mm	m ³	226.1	230.6	456.7	
	BLINDING AGGREGATE T=100mm	m ³	75.0	76.9	151.9	
	GEOTEXTILE	m ²	236.0	296.0	532.0	
	PVC PILE Ø50mm DIA., L=1000mm	m	52.0	54.0	106.0	
FOOTING	WOODEN PILE LENGTH L=3m	m	6259.0	6461.0	12720.0	
	BLINDING	m ³	8.3	8.6	16.9	
	STONE MASONRY	m ³	37.6	38.8	76.4	
	EXCAVATION	m ³	680.6	1025.4	1706.0	
	BACK FILL	m ³	500.8	789.7	1290.5	
	LENGTH OF FOOTING	m	131.7	132.3	263.9	

Abut A1

Item	Formula	Quantity
1) Concrete		
* BackWall		
v1 =	25.35 x 2.04 x 0.40 =	20.63 m3
* Frontwall		
v2 =	25.35 x ((3.34 + 3.59) / 2	
x	1.50 - 0.10 ^2 / 2) =	131.70 m3
* Corbel		
v3 =	0.30 x (0.30 + 0.60) / 2	
x	24.35 =	3.29 m3
* Haunch		
v4 =	5.38 x 0.50 x 0.50 / 2 x 2	
x	=	1.34 m3
* Wingwall		
v5 = {	3.50 x (5.38 + 5.30) / 2	
+	1.00 x (1.05 + 2.52) / 2 } =	
x	2 =	40.95 m3
* Parapet		
v7 = (	0.50 x 0.30 + 0.20 ^2	
-	0.15 ^2 / 2) x 5.20 x	
x	2 =	1.86 m3
* Footing		
v6 =	25.35 x 7.50 x 2.00	
-	10 x pi x 0.75 ^2 x 0.1	
x	=	378.48 m3
	Total	578.3 m3
2) Form		
* BackWall		
a1 =	2.00 x 2.04 x 25.35 -	
-	2.04 x (0.50 + 0.50) x	
x	2 =	99.10 m2
* Frontwall		
a2 =	25.35 x (3.34 + 3.5935)	
-	(0.5 + 0.5) x 3.5935 x	
+	3.47 x 1.5 x 2 =	178.98 m2
* Corbel		
a3 = {	0.3 + (0.3 ^2 + 0.3 ^2) ^ 0.5	
x	24.35 =	17.64 m2
* Haunch		
a4 =	+ (0.5 ^2 + 0.5 ^2) ^ 0.5	
x	5.375 x 2 =	7.60 m2
* Wingwall		
a5 =	2 x (3.5 x (5.375 + 5.30) x 1/2	
+	1 x (1.05 + 2.52) x 1/2	
+	0.5 x (1.05 + 1.76 + 2.78)	
-	0.5 x 5.38 } =	41.16 m2
* Parapet		
a5 = {	5.2 x (0.5 + 0.3 + 0.05	
+	1.4142 x 0.15 + 0.05)	
+	2 x 0.17875 } x 2	
x	=	12.28 m2
* Footing		
a6 =	2 x (25.350 + 7.500) x 2.00	
x	=	131.40 m2
	Total	488.2 m2

Abut A1

Item	Formula	Quantity
3) Scaffolding:	* H<=4m A2 = { 2 x (25.35 + 7.50) + 8 } x 2 =	147.4 m2
	* 4m < H <= 30m A2 = {(24.1+2) + (4.50+1.5+2) + (0.5+2) + (4.50+1-1) +(24.1-2 x 1.5) + (4.50-1+1) + (0.5+2) + (4.50+1.5+2)} x (2.04+4.94)	434.8 m2
4) Support	V = (7.78 - 1.55 + 4.78) x 1.00 / 2 x 0.50 x 2 =	5.5 m3
5) Lean Concrete	* Concrete class G V = 0.1 x { (25.35 + 0.2) x (7.50 + + 0.2) - 10 x 1/4 x pi x 1.50 ^2 } =	17.9 m3
	* Form A = 0.1 x { (25.35 + 0.2) + (7.50 + 0.20) } x 2 =	6.65 m2
6) Blinding Stone	v = 0.2 x { (25.35 + 0.2) x (7.50 + + 0.2) - 10 x 1/4 x pi x 1.50 ^2 } =	35.8 m3
7) Bored Pile	* Concrete = 10 x 1/4 x pi x 1.50 x 1.50 x (54.90 + 0.10) =	971.9 m3
	* Excavation Length N<20: = 31.3 x 10 = 313.0 m 20<N<40: = 16.4 x 10 = 164.0 m 40<N: = 7.3 x 10 = 73.0 m	
	* Excavation Volume = 10 x 1/4 x pi x 1.50 x 1.50 x 57.90	1023.2 m3
	* Excavation for foundation = 1.93 / 6 x { (9.50 x 27.35) + (13.36 x 31.21) + (9.50 + 13.36) x (27.35 + 31.21) } =	648.3 m3
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volume = 10 x pi / 4 x 1.50 x 1.50 x 0.400 = 7.07 m3 Excess Soil = 639.04 m3	
9) Approach Slab	* Back Fill 452.7 = 9.3 m3	
8) Earthworks	* Concrete = 24.29 x { 6.00 x 0.30 + (0.30 + 0.50) / 2 x 0.20 } - 0.50 x 0.50 / 2 x 0.3 x 2 =	45.59 m3
	* Lean Concrete = (0.30 + 0.28 + 5.20) x 24.29 x 0.1 =	14.0 m3
	* Asphaltic Joint Filler = { 0.30 x (0.02 + 0.06) / 2 + 0.30 x 0.02 } x 24.29 =	0.43 m3
	* Form = (2 x (6.00 x 0.30) + 12.15 x (0.30 + 0.50) + (0.50 + 0.30) x 0.50 x 2) x 2 =	26.95 m2

Abut A2

Item	Formula	Quantity
1) Concrete		
* BackWall	v1 = 25.10 x 2.04 x 0.40 =	20.43 m3
* Frontwall	v2 = 25.10 x ((3.34 + 3.59) / 2 - 1.50 - 0.10 ^2 / 2) =	130.35 m3
* Corbel	v3 = 0.30 x (0.30 + 0.60) / 24.10 =	3.25 m3
* Haunch	v4 = 5.38 x 0.50 x 0.50 / 2 x 2 =	1.34 m3
* Wingwall	v5 = (3.50 x (5.38 + 5.30) / 2 + 1.00 x (1.05 + 2.52) / 2) =	40.95 m3
* Parapet	v7 = (0.50 x 0.30 + 0.20 ^2 - 0.15 ^2 / 2) x 5.20 x 2 =	1.86 m3
* Footing	v6 = 25.10 x 7.50 x 2.00 - 10 x pi x 0.75 ^2 x 0.1 =	374.73 m3
Total		572.9 m3
2) Form		
* BackWall	a1 = 2.00 x 2.04 x 25.10 - 2.04 x (0.50 + 0.50) x 2 =	98.09 m2
* Frontwall	a2 = 25.1 x (3.34 + 3.591) - (0.5 + 0.5) x 3.591 x 2 + 3.47 x 1.5 x 2 =	177.18 m2
* Corbel	a3 = (0.3 + (0.3 ^2 + 0.3 ^2) ^ 0.5) x 24.1 =	17.45 m2
* Haunch	a4 = (0.5 ^2 + 0.5 ^2) ^ 0.5 x 5.375 =	7.60 m2
* Wingwall	a5 = 2 x (3.5 x (5.375 + 5.30) x 1/2 + 1 x (1.05 + 2.52) x 1/2 + 0.5 x (1.05 + 1.76 + 2.78) - 0.5 x 5.38) =	41.16 m2
* Parapet	a5 = (5.2 x (0.5 + 1.4142 + 2) x (0.3 + 0.15 + 0.17875) + 0.05 + 0.05) x 2 =	12.28 m2
* Footing	a6 = 2 x (25.100 + 7.500) x 2.00 =	130.40 m2
Total		484.2 m2

Abut A2

Item	Formula	Quantity
3) Scaffolding:	* H<=4m $A2 = \left(2 \times (25.10 + 7.50) + \frac{8}{2} \right) \times 1.00$	146.4 m2
	* 4m< H<=30m $A2 = \{ (24.1+2) + (4.50+1.5+2) + (0.5+2) + (4.50+1-1) + (24.1-2 \times 1.5) + (4.50-1+1) + (0.5+2) + (4.50+1.5+2) \} \times (2.04+4.94)$	432.2 m2
4) Support	V = $\left(\frac{7.78 - 1.55}{2} + 4.78 \right) \times 1.00$	5.5 m3
5) Lean Concrete	* Concrete class G $V = \left(\frac{0.1 \times (25.10 + 0.2)}{10} \right) \times \left(\frac{7.50 + 1.50}{2} \right) \times \pi$	17.7 m3
	* Form $A = \left(\frac{0.1 \times (25.10 + 0.2)}{2} + 7.50 \right) \times 2$	6.60 m2
6) Blinding Stone	v = $\left(\frac{0.2 \times (25.10 + 0.2)}{10} \right) \times \left(\frac{7.50 + 1.50}{2} \right) \times \pi$	35.4 m3
7) Bored Pile	* Concrete $= 10 \times \left(\frac{1}{4} \times \pi \times 1.50 \times 1.50 \right) \times (54.90 + 0.10)$	971.9 m3
	* Excavation Length N<20: = 31.3 x 10 = 313.0 m 20<N<40: = 16.4 x 10 = 164.0 m 40<N: = 7.3 x 10 = 73.0 m	
	* Excavation Volume $= 10 \times \left(\frac{1}{4} \times \pi \times 1.50 \times 1.50 \right) \times 57.90$	1023.2 m3
	* Excavation for foundation $= \frac{1.93}{6} \times \left(\frac{9.50 \times 27.10}{30.96} + \left(\frac{9.50 + 13.36}{27.10 + 30.96} \right) \right)$	642.8 m3
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volume = $10 \times \left(\frac{\pi}{4} \times 1.50 \times 1.50 \right) \times 0.400$ Excess Soil =	7.07 m3 633.13 m3
9) Approach Slab	* Back Fill = 384.4	9.7 m3
	* Concrete $= 24.04 \times \left(\frac{6.00 \times 0.30 + (0.30 + 0.50)}{2} \right) \times 2 \times 0.20$	45.12 m3
	* Lean Concrete $= (0.30 + 0.28 + 5.20) \times 24.04 \times 0.1$	13.9 m3
	* Asphaltic Joint Filler $= \left(\frac{0.30 \times (0.02 + 0.06)}{2} + 0.30 \times 0.02 \right) \times 24.04$	0.42 m3
	* Form $= \left(2 \times (6.00 \times 0.30) + \left(\frac{0.30 + 0.50}{2} \right) \times (0.50 + 0.30) \right) \times 6.00 \times 0.30$	26.75 m2

MATERIAL OF PILE(L=55M)

TYPE	D(mm)	LENGTH OF BAR (mm)	UNIT WEIGHT (kg/m)	NUMBER	WEIGHT (kg)
N1	D28	12000	4.834	32	1856.3
N2	D25	12000	3.853	64	2959.1
N3	D22	4229	2.984	6	75.7
N4	D22	4248	2.984	18	228.2
N5	D10	152053	0.617	1	93.8
N6	D10	174851	0.617	1	107.9
N7	D10	788875	0.617	1	485.5
N8	D10	4105	0.617	68	172.2
N9	D16	1322	1.578	16	33.4
D10		859.4	kg		
D16		33.4	kg		
D22		303.9	kg		
D25		2959.1	kg		
D28		1856.3	kg		
TOTAL		6012.1	kg		

**LIST REINFORCEMENT OF APPROACH SLAB
(FOR 1 ABUTMENT A1)**

TYPE	Ø (mm)	LENGTH OF BAR (mm)	U.WEIGHT (kg/m)	NUMBER	WEIGHT (Kg)	
AS1	Ø20	5850	2.466	238	3433.4	
AS2	Ø16	12170	1.578	110	2112.5	
AS3	Ø16	6320	1.578	120	1196.8	
AS4	Ø16	1200	1.578	120	227.2	
AS5	Ø20	700	2.466	62	107.0	
AS6	Ø10	1580	0.617	62	60.4	
AS7	Ø10	519	0.617	638	204.3	
					D10	264.7 kg
					Ø16	3536.5 kg
					Ø20	3540.4 kg
					TOTAL	7341.6 kg
					LEAN CONCRETE	13.9 m ³
					ASPHATIC JOINT FILLER	0.6 m ³

**LIST REINFORCEMENT OF APPROACH SLAB
(FOR 1 ABUTMENT A2)**

TYPE	Ø (mm)	LENGTH OF BAR (mm)	U.WEIGHT (kg/m)	NUMBER	WEIGHT (Kg)	
AS1	Ø20	5850	2.466	238	3433.4	
AS2	Ø16	12170	1.578	110	2112.5	
AS3	Ø16	6320	1.578	120	1196.8	
AS4	Ø16	1200	1.578	120	227.2	
AS5	Ø20	700	2.466	62	107.0	
AS6	Ø10	1580	0.617	62	60.4	
AS7	Ø10	519	0.617	638	204.3	
					D10	264.7 kg
					Ø16	3536.5 kg
					Ø20	3540.4 kg
					TOTAL	7341.6 kg
					LEAN CONCRETE	13.9 m ³
					ASPHATIC JOINT FILLER	0.6 m ³

STEEL OF ABUTMENT A1

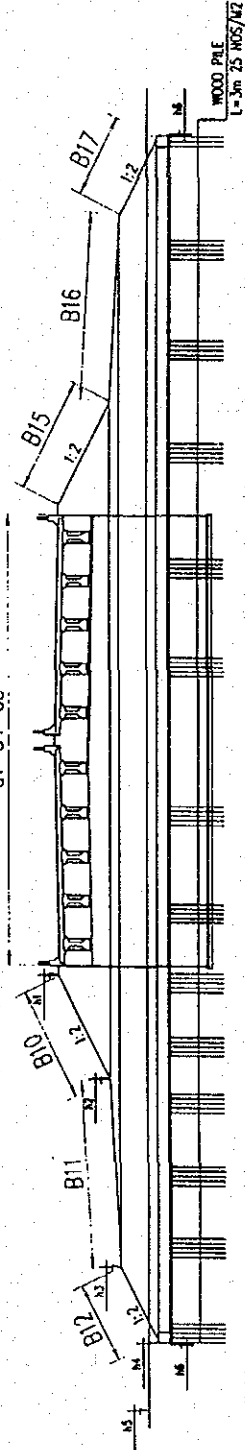
DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	TOTAL STEEL (kg)
A1	14	2540	304	1.208	932.8
A2	14	26002	16	1.208	502.6
A3	14	720	153	1.208	133.1
A4	16	1837	102	1.578	295.7
A5	14	690	102	1.208	85.0
A6	16	26124	4	1.578	164.9
F1	25	10800	203	3.853	8447.3
F2	25	8070	102	3.853	3171.6
F3	25	5000	101	3.853	1945.8
F4	25	7950	16	3.853	490.1
F5	20	26450	16	2.466	1043.6
F6	20	4670	144	2.466	1658.3
F7	16	29990	30	1.578	1419.7
F8	20	27190	30	2.466	2011.5
W1	22	4250	101	2.984	1280.9
W2	22	5543	102	2.984	1687.1
W3	16	5626	102	1.578	905.5
W4	14	1822	147	1.208	323.5
W5	16	26124	15	1.578	618.4
W6	14	26002	19	1.208	596.8
W7	16	1790	102	1.578	288.1
K1	22	5370	12	2.984	192.3
K2	22	2950	14	2.984	123.2
K3	22	4050	14	2.984	169.2
K4	25	7710	28	3.853	831.8
K5	25	4385	20	3.853	337.9
K6	22	5170	24	2.984	370.3
K7	18	6220	12	1.998	149.1
K8	16	5360	12	1.578	101.5
K9	16	1285	40	1.578	81.1
K10	16	2485	2	1.578	7.8
K11	20	2250	20	2.466	111.0
K12	16	7605	28	1.578	336.0
K13	18	5100	24	1.998	244.6
K14	10	755	126	0.617	58.7
K15	10	4908	8	0.617	24.2
K16	20	5118	8	2.466	101.0
K17	22	2298	8	2.984	54.9
K18	25	1918	8	3.853	59.1
K19	25	3850	4	3.853	59.3
K20	18	4797	2	1.998	19.2
K21	18	5377	2	1.998	21.5
K22	16	735	46	1.578	53.4
K23	22	3810	26	2.984	295.6
K24	16	2251	44	1.578	156.3
K25	22	5406	8	2.984	129.1
K26	18	5336	8	1.998	85.3
R1	10	300	60	0.617	11.1
R2	10	500	40	0.617	12.3
TOTAL :				32199.0	Kg
D10	106.4	Kg	D20	4925.4	Kg
D14	2573.8	Kg	D22	4302.5	Kg
D16	4428.4	Kg	D25	15342.9	Kg
D18	519.6	Kg			

STEEL OF ABUTMENT A2

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	TOTAL STEEL (kg)
A1	14	2540	301	1.208	923.6
A2	14	25752	16	1.208	497.7
A3	14	720	147	1.208	127.9
A4	16	1837	101	1.578	292.8
A5	14	690	101	1.208	84.2
A6	16	25874	4	1.578	163.3
F1	25	10800	201	3.853	8364.1
F2	25	8070	101	3.853	3140.5
F3	25	5000	100	3.853	1926.5
F4	25	7950	16	3.853	490.1
F5	20	26200	16	2.466	1033.7
F6	20	4670	144	2.466	1658.3
F7	16	29740	30	1.578	1407.9
F8	20	26940	30	2.466	1993.0
W1	22	4250	100	2.984	1268.2
W2	22	5543	101	2.984	1670.6
W3	16	5626	101	1.578	896.7
W4	14	1822	172	1.208	378.6
W5	16	25874	15	1.578	612.4
W6	14	25752	19	1.208	591.1
W7	16	1790	101	1.578	285.3
K1	22	5370	12	2.984	192.3
K2	22	2950	14	2.984	123.2
K3	22	4050	14	2.984	169.2
K4	25	7710	28	3.853	831.8
K5	25	4385	20	3.853	337.9
K6	22	5170	24	2.984	370.3
K7	18	6220	12	1.998	149.1
K8	16	5360	12	1.578	101.5
K9	16	1285	40	1.578	81.1
K10	16	2485	2	1.578	7.8
K11	20	2250	20	2.466	111.0
K12	16	7605	28	1.578	336.0
K13	18	5100	24	1.998	244.6
K14	10	755	126	0.617	58.7
K15	10	4908	8	0.617	24.2
K16	20	5118	8	2.466	101.0
K17	22	2298	8	2.984	54.9
K18	25	1918	8	3.853	59.1
K19	25	3850	4	3.853	59.3
K20	18	4797	2	1.998	19.2
K21	18	5377	2	1.998	21.5
K22	16	735	46	1.578	53.4
K23	22	3810	26	2.984	295.6
K24	16	2251	44	1.578	156.3
K25	22	5406	8	2.984	129.1
K26	18	5336	8	1.998	85.3
R1	10	300	60	0.617	11.1
R2	10	500	40	0.617	12.3
TOTAL :				32003.1	Kg
D10	106.4	Kg	D20	4897.0	Kg
D14	2603.0	Kg	D22	4273.3	Kg
D16	4394.5	Kg	D25	15209.3	Kg
D18	519.6	Kg			Kg

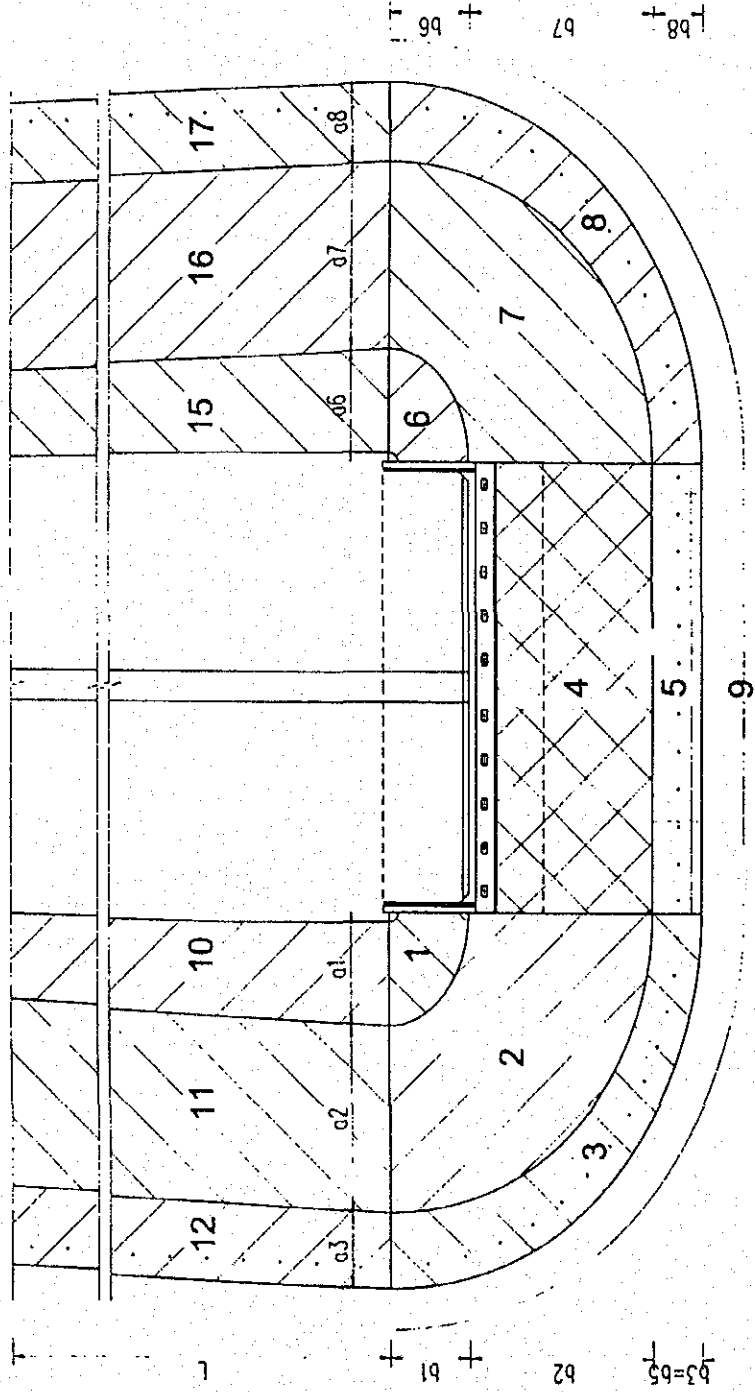
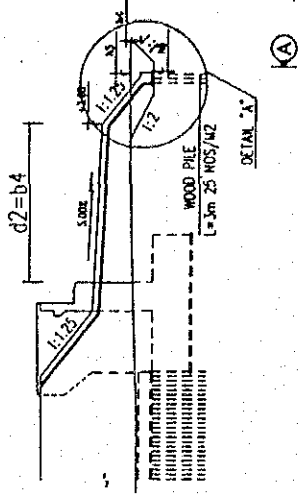
EARTHWORKS SLOPE PROTECTION

A-A
d1=04=05



PLAN

SIDE ELEVATION



EARTHWORKS SLOPE PROTECTION-cakda

Bridge CAIDA
Abutment A1

h1	h2	h3	h4	h5	h6	d1	d2
6.24	0.87	0.87	0.87	1.74	0.17	11.24	7.213

Block	a	b	Δh	R	r	L	Sxq	W	Masonry	Blinding
	(m)	(m)	(m)	(m)	(m)	(m)	(m ²)	(m)	(m ³)	(m ³)
1	11.240	7.213	5.370	9.226	0.000	10.675	77.317		23.19	7.73
2	0.000	0.000	0.000	9.226	9.226	0.000	0.000		0.00	0.00
3	0.000	0.000	0.000	9.226	9.226	0.000	0.000		0.00	0.00
4	0.000	0.000	0.000				0.000		0.00	0.00
5	0.000	0.000	0.000				0.000		0.00	0.00
6	11.240	7.213	5.370	9.226	0.000	10.675	77.317		23.19	7.73
7	0.000	0.000	0.000	9.226	9.226	0.000	0.000		0.00	0.00
8	0.000	0.000	0.000	9.226	9.226	0.000	0.000		0.00	0.00
9			1.570				6.523	54.320		
Extra	9.500	6.125	4.500	7.813				49.881	46	15
FOOTING	Wood pile		(m)	3259						
	Binding		(m ³)	4.3						
	Stone masonry		(m ³)	19.8						
	Excavation		(m ³)	354.4						
	Back fill		(m ³)	281						
SIDE SLOPE	Masonry		(m ³)	46						
	Blinding		(m ³)	15						
	Geotextile		(m ²)	50						
	PVC Pipe		(m)	27						

LENGTH OF FOOTING : L = 54.32 (m)

Abutment A2

h1	h2	h3	h4	h5	h6	d1	d2
6.24	0.45	0.45	0.45	1.74	-0.25	25.1	7.513

Block	a	b	Δh	R	r	L	Sxq	W	Masonry	Blinding
	(m)	(m)	(m)	(m)	(m)	(m)	(m ²)	(m)	(m ³)	(m ³)
1	12.080	7.738	5.790	9.909	0.000	11.476	89.268		26.78	8.93
2	0.000	0.000	0.000	9.909	9.909	0.000	0.000		0.00	0.00
3	0.000	0.000	0.000	9.909	9.909	0.000	0.000		0.00	0.00
4	0.000	0.000	0.000				0.000		0.00	0.00
5	0.000	0.000	0.000				0.000		0.00	0.00
6	15.090	6.600	4.560	10.845	0.000	11.785	100.157		30.05	10.02
7	0.000	0.000	0.000	10.845	10.845	0.000	0.000		0.00	0.00
8	0.000	0.000	0.000	10.845	10.845	0.000	0.000		0.00	0.00
9			1.990				9.522	57.683		
Extra1	12.080	7.738	5.790	9.909				57.683	57	19
Extra2	15.090	6.600	4.560	10.845						
FOOTING	Wood pile		(m)	3461						
	Binding		(m ³)	4.6						
	Stone masonry		(m ³)	20.8						
	Excavation		(m ³)	549.3						
	Back fill		(m ³)	423						
SIDE SLOPE	Masonry		(m ³)	57						
	Blinding		(m ³)	19						
	Geotextile		(m ²)	110						
	PVC Pipe		(m)	29						

LENGTH OF FOOTING : L = 57.68 (m)

NOTES:

* INPUT VALUES : GRAY CELLS ; TOTAL VALUES : BOLD NUMBERS
* No. of Blocks : see drawing. Extra blocks used for calculation only.

- h_i : Elevations (see drawing)
- d_i : Distances (see drawing)
- a_i : Long edge of ellipse (or rectangle) : a_i = Δh_i * slope
- b_i : Short edge of ellipse (or rectangle) : b_i = Δh_i * slope
- Δh_i : Height of cone (or truncated cone)
- R_i : Average radius of lower ellipse : R_i = (Σa_i + Σb_i) / 2
- r_i : Average radius of upper ellipse : r_i = (Σa_i + Σb_i) / 2
- L_i : Generatrix of cone : L_i = sqrt(Δh_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 1,2,3,5,7,8
Sxq_i = a_i * sqrt(b_i² + Δh_i²) for block 4,5
Sxq_i = (1.8 + 1.8 * Δh_i + 2 * Δh_i²) * Δh_i / 2 for block 9

- W : Length of masonry's footing : W_i
W_i = 2 * 3.14 * R_i / 4 + a_i + 2 * 3.14 * R_i / 4 , and
W_i = 2 * 3.14 * R_i / 4 + a_i + 2 * 3.14 * R_i / 4 (for A1)
W_i = 2 * 3.14 * R_i / 4 + a_i + 2 * 3.14 * R_i / 4 (for A2)
- Masonry_i = 0.3 * Sxq_i
- Blinding_i = 0.1 * Sxq_i
- Geotextile = Sxq₁ + Sxq₂ + Sxq₃ + W₂ * (1 + 1.6 * 1) (for A1)
= Sxq₁ + Sxq₂ + Sxq₃ + W₂ * (1 + 1.6 * 1) (for A2)
- PVC Pipe = W₂ / 2
- Wood Pile = W₂ * 0.8 * 25 * 3
- Excavation = W₂ * Sxq₉
- Filling = Excavation - W₂ * Δh₉ * 1.1

CAI DA BRIDGE : QUANTITIES OF EARTHWORKS SLOPE PROTECTION OF 25M BEHIND HEAD WALL

ABUTMENT A1:

Block	B	L	S	Thick	Masonry	Blinding (T=0.1m)	
	m	m	m2	m	m3	m3	
10	12.01	25	300.19	0.30	90.06	30.02	
11	0.00	25	0.00	0.30	0.00	0.00	
12	0.00	25	0.00	0.30	0.00	0.00	Geotextile (m2)
15	12.01	25	300.19	0.30	90.06	30.02	= 2 x (L + (1 + 1.72) x L) = 186
16	0.00	25	0.00	0.30	0.00	0.00	PVC pipe (m)
17	0.00	25	0.00	0.30	0.00	0.00	= 2 x L/2 x 1m = 25
FOOTING	Wood pile		(m)		3000		
	Blinding		(m3)		4		
	Stone masonry		(m3)		18.00		LENGTH OF FOOTING L = 50 (m)
	Excavation		(m3)		326.17		
	Back fill		(m3)		239.82		
SIDE SLOPE	Stone masonry		(m3)		180.12		
	Blinding		(m3)		60.04		
	Geotextile		(m2)		186		
	PVC pile		(m)		25		
No	h	Dh	S	L	Total (m3)		
	m	m	m2	m	Excavation	Back fill	
5	1.74						Excavation = 2 x S x L
6	0.17	1.57	6.52335	25	326	240	Filling = Excavation - 2 x 25 x Dh x 1.1

ABUTMENT A2:

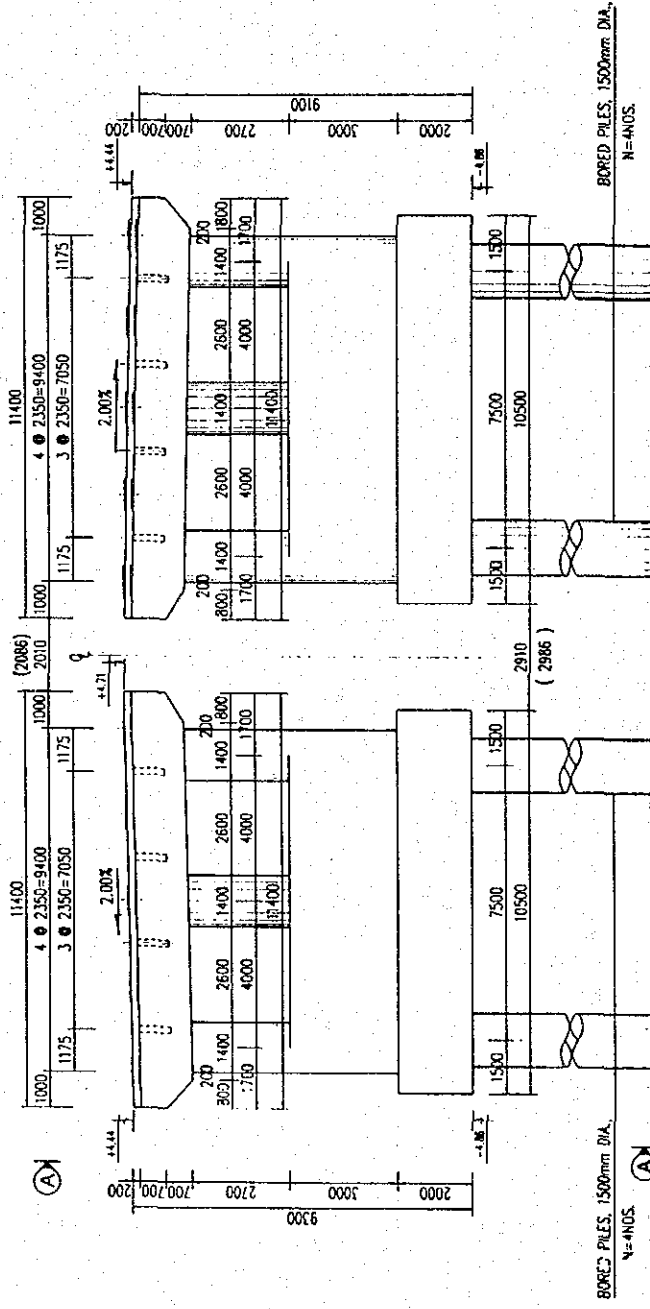
Block	B	L	S	Thick	Masonry	Blinding (T=0.1m)	
	m	m	m2	m	m3	m3	
10	12.95	25	323.67	0.30	97.10	32.37	
11	0.00	25	0.00	0.30	0.00	0.00	
12	0.00	25	0.00	0.30	0.00	0.00	Geotextile (m2)
15	10.20	25	254.91	0.30	76.47	25.49	= 2 x (L + (1 + 1.72) x L) = 186
16	0.00	25	0.00	0.30	0.00	0.00	PVC pipe (m)
17	0.00	25	0.00	0.30	0.00	0.00	= 2 x L/2 x 1m = 25
FOOTING	Wood pile		(m)		3000		
	Blinding		(m3)		4		
	Stone masonry		(m3)		18.00		LENGTH OF FOOTING L = 50 (m)
	Excavation		(m3)		476.11		
	Back fill		(m3)		366.66		
SIDE SLOPE	Stone masonry		(m3)		173.57		
	Blinding		(m3)		57.86		
	Geotextile		(m2)		186		
	PVC pile		(m)		25		
No	h	Dh	S	L	Total (m3)		
	m	m	m2	m	Excavation	Back fill	
5	1.74						Excavation = 2 x S x L
6	-0.25	1.99	9.52215	25	476	367	Filling = Excavation - 2 x 25 x Dh x 1.1

Quantity table of pier

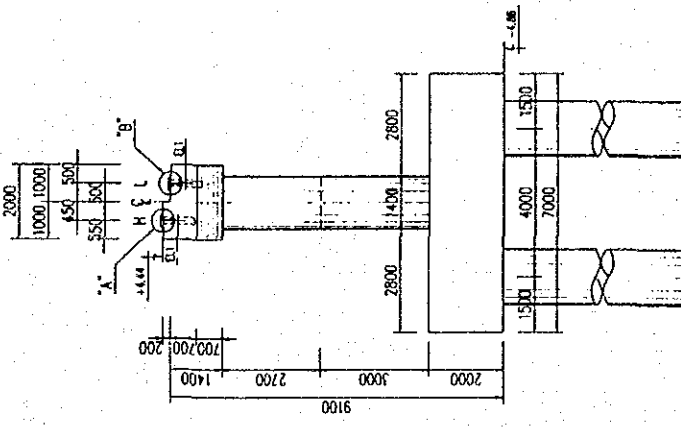
Items		Unit	Pier 1	Pier 2	Total	
Pile	Number of piles	Pile	8	8	16	
	Total length bored piles D=1500mm Dia.	m	416.0	416.0	832.0	
	Concrete piles class D	m ³	735.1	735.1	1470.3	
	Excavation	m ³	812.9	793.1	1606.0	
	Reinforcement	D10	kg	6593.6	6593.6	13187.2
		D16	kg	267.2	267.2	534.4
		D22	kg	2329.6	2329.6	4659.2
		D25	kg	19462.4	19462.4	38924.8
D28		kg	6496.8	6496.8	12993.6	
Total		kg	35149.6	35149.6	70299.2	
Pier	Concrete class E	m ³	460.9	460.9	921.7	
	Reinforcement	D10	kg	69.1	69.1	138.1
		D14	kg	5725.9	5725.9	11451.8
		D16	kg	1842.0	1842.0	3684.0
		D20	kg	1404.7	1404.7	2809.4
		D22	kg	7414.9	7414.9	14829.8
		D28	kg	8921.9	8921.9	17843.8
		D32	kg	9369.7	9369.7	18739.4
		Total	kg	34748.2	34748.2	69496.4
	Form	Curve	m ²	99.8	99.8	199.5
		Flat	m ²	347.0	347.0	694.1
	Scaffoldingding work	H < 4m	m ²	262.9	262.9	525.8
		4m ≤ H < 30m	m ²	336.4	336.4	672.9
	Support		m ³	166.5	166.5	332.9
	Earth work	Excavation for foundation	m ³	1824.3	1405.8	3230.1
		Blinding Concrete class G	m ³	70.0	70.0	139.9
		Rip rap	m ³	1395	1013	2408
	Cofferdams	Sheet pile Larsen IV	m	13815.5	13815.5	27630.9
		Steel pile I 400	m	720.0	720.0	1440.0
		Brace C 300	m	724.0	724.0	1448.0

DETAILS OF PIERS P1&P2

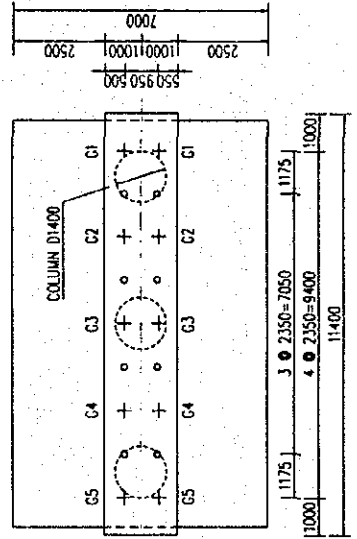
PIER ELEVATION



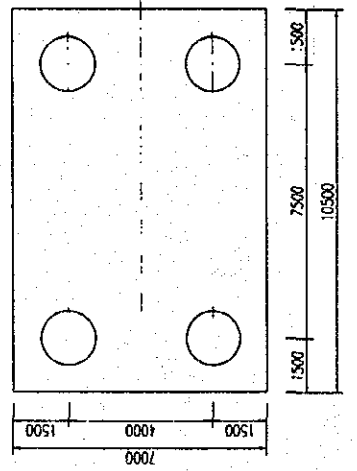
A-A



HALF PLAN



HALF PILE FOOTING



QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.31) Concrete		
3.2.31.1 Headstock	$v1 = \left(\begin{aligned} &11.40 \times 1.40 - 0.80 \times 0.70 \\ &+ \left(11.40 \times 1.60 - 0.80 \times 0.70 \right) \times 1.00 \end{aligned} \right) \times 2 =$	66.16 m ³
3.2.31.2 Column	$v2 = 2 \times \left(\frac{1}{4} \times \pi \times 1.40^2 \times (2.70 + 2.78 + 2.86) \right) =$	25.68 m ³
* Wall	$v3 = 2 \times \left(3.00 \times \left(\frac{1}{4} \times \pi \times 1.40^2 \right) + 8.00 \times 1.40 \right) =$	76.44 m ³
3.2.31.3 Footing	$v3 = 2 \times \left(10.50 \times 7.00 \times 2.00 - 8 \times \pi \times 0.75^2 \times 0.1 \right) =$	292.59 m ³
	Total	460.86 m³
3.2.32) Form		
3.2.32.1 Headstock	$a1 = \left(\begin{aligned} &11.40 \times 1.40 - 0.80 \times 0.70 \\ &+ (1.06 + 0.70) \times 1.00 \times 2 \\ &+ (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) \\ &+ (11.40 \times 1.60 - 0.80 \times 0.70) \end{aligned} \right) \times 2 =$	111.03 m ²
3.2.32.2 Column (Curve form)	$a2 = 2 \times \pi \times 1.40 \times (2.70 + 2.78 + 2.86) =$	73.36 m ²
* Wall (Curve form)	$a3-1 = 2 \times \pi \times 1.40 \times 3.00 =$	26.39 m ²
* Wall (Flat form)	$a3-2 = 2 \times 2 \times 8.00 \times 3.00 =$	96.00 m ²
3.2.32.3 Footing	$a3 = 2 \times \left(10.500 + \frac{7.000}{2} \right) \times 2.00 =$	140.00 m ²
	Total	Curve = 99.75 m²
		Flat = 347.03 m²
3.2.33) Scaffolding:		
3.2.33.1 (H<=4m)	$A1 = 2 \times \left(25.91 + 9.00 \right) \times 2.00$ $+ (2 \times (4.00 + 26.81)) \times 2.00 =$	262.88 m ²
3.2.33.2 (4m< H<=30m)	$A2 = 2 \times (4.00 + 26.81) \times 5.46 =$	336.45 m ²
3.2.34) Support	$= (11.40 - 3 \times 1.40) \times 2.00$ $+ 5.78 \times 2 =$	166.46 m ³
3.2.35) Blinding Concrete		
3.2.35.1 Concrete class G	$v = 0.50 \times \left(\begin{aligned} &10.50 + 0.2 \\ &+ 0.2 \end{aligned} \right) \times \left(\begin{aligned} &7.00 + \\ &1.50^2 \end{aligned} \right) \times \left(\frac{1}{4} \times \pi \times 1.50^2 \right) \times 2 =$	69.97 m ³
3.2.35.2 Form	$A = 0.10 \times \left(\begin{aligned} &10.50 + 0.2 \\ &+ 0.2 \end{aligned} \right) + (7.00$	

QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.37) Bored Pile	+ 0.20)}x 2 x 2 =	69.97 m ²
3.2.37.1 Concrete	= 8 x 1/4 x pi x 1.50 x 1.50 x (51.90 + 0.10) =	735.13 m ³
3.2.37.2 Excavation Length	N<20: = 38.0 x 8 = 20<N<40: = 5.0 x 8 = 40<N: = 9.0 x 8 =	304.00 m 40.00 m 72.00 m
3.2.37.3 Excavation Volume	= 8 x 1/4 x pi x 1.50 x 1.50 x 57.50	812.89 m ³
3.2.38) Earthwork	3.2.38.1 Excavation for footing (inside cofferdam) = 6.20 x (27.91 x 11.00) - 8 x pi /4 x 1.50 ^2 x 5.60 =	1824.29 m ³
3.2.38.2 Excess Soil	v1 = Lean Concrete = v2 = Footing Volume = v3 = Occupied volume of wall = (pi/4 x 1.400 ^2 + 1.40 x 8.00) x 2.600 x 2 = Total =	69.97 m ³ 292.59 m ³ 66.24 m ³ 428.80 m ³
3.2.14.3 Riprap	= Excavation for footing - Excess Soil = 1824.29 - 428.80 =	1395 m ³
3.2.15.1 Larsen I	= 768 nos L= 18 m =	13815.45 m
3.2.15.2 I 400	= 40.00 nos L= 18 m =	720.00 m
3.2.15.3 C 300	=	724.00 m

QUANTITY SURVEYING FOR PIER P2

No.

Item	Formula	Quantity
3.2.31) Concrete		
3.2.31.1 Headstock	$v1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (11.40 \times 1.60 - 0.80 \times 0.70) \} \times 2 =$	66.16 m3
3.2.31.2 Column	$v2 = 2 \times \frac{1}{4} \times \pi \times 1.40^2 \times (2.70 + 2.78 + 2.86) =$	25.68 m3
* Wall	$v3 = 2 \times 3.00 \times (\frac{1}{4} \times \pi \times 1.40^2 + 8.00 \times 1.40) = 76.44 \text{ m}^3$	
3.2.31.3 Footing	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 8 \times \pi \times 0.75^2 \times 0.1 =$	292.59 m3
	Total	460.86 m3
3.2.32) Form		
3.2.32.1 Headstock	$a1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (1.06 + 0.70) \times 1.00 \times 2 + (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) + (11.40 \times 1.60 - 0.80 \times 0.70) \} \times 2 =$	111.03 m2
3.2.32.2 Column (Curve form)	$a2 = 2 \times \pi \times 1.40 \times (2.70 + 2.78 + 2.86) =$	73.36 m2
* Wall (Curve form)	$a3-1 = 2 \times \pi \times 1.40 \times 3.00 = 26.39 \text{ m}^2$	
* Wall (Flat form)	$a3-2 = 2 \times 2 \times 8.00 \times 3.00 = 96.00 \text{ m}^2$	
3.2.32.3 Footing	$a3 = 2 \times (10.500 + 7.000) \times 2.00 =$	140.00 m2
	Total	99.75 m2
		347.03 m2
3.2.33) Scaffolding:		
3.2.33.1 (H<=4m)	$A1 = 2 \times (25.91 + 9.00) \times 2.00 + (2 \times (4.00 + 26.81) \times 2.00 =$	262.88 m2
3.2.33.2 (4m< H<=30m)	$A2 = 2 \times (4.00 + 26.81) \times 5.46 =$	336.45 m2
3.2.34) Support	$= (11.40 - 3 \times 1.40) \times 5.78 \times 2 =$	166.46 m3
3.2.35) Blinding Concrete		
3.2.35.1 Concrete class G	$v = 0.50 \times \{ (10.50 + 0.2) \times (7.00 + 0.2) - 4 \times \frac{1}{4} \times \pi \times 1.50^2 \} \times 2 =$	69.97 m3
3.2.35.2 Form	$A = 0.10 \times \{ (10.50 + 0.2) \times 2 \times 7.00 + 0.20 \} \times 2 =$	69.97 m2
3.2.37) Bored File		
3.2.37.1 Concrete		

QUANTITY SURVEYING FOR PIER P2

No.

Item	Formula	Quantity
	$= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (51.90 + 0.10) =$	735.13 m ³
3.2.37.2	Excavation Length	
	N<20: = 38.0 x 8 =	304.00 m
	20<N<40: = 5.0 x 8 =	40.00 m
	40<N: = 9.0 x 8 =	72.00 m
3.2.37.3	Excavation Volume	
	$= 8 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 56.10$	793.10 m ³
3.2.38) Earthwork	3.2.38.1 Excavation for footing (inside cofferdam)	
	$= 4.80 \times (27.91 \times 11.00)$	
	$- 8 \times \frac{\pi}{4} \times 1.50^2 \times 4.80 =$	1405.79 m ³
	3.2.38.2 Excess Soil	
	v1 = Lean Concrete =	69.97 m ³
	v2 = Footing Volume =	292.59 m ³
	v3 = Occupied volume of wall	
	$= (\frac{\pi}{4} \times 1.40^2 + 1.200 \times 2) \times 8.00$	30.57 m ³
	Total =	393.13 m ³
	3.2.14.3 Riprap = Excavation for footing - Excess Soil	
	$= 1405.79 - 393.13 =$	1013 m ³
	3.2.15.1 Larsen P = 768 nos L = 18 m =	13815.45 m
	3.2.15.2 I 400 = 40.00 nos L = 18 m =	720.00 m
	3.2.15.3 C 300 =	724.00 m

MATERIAL OF PILE(L=52M)

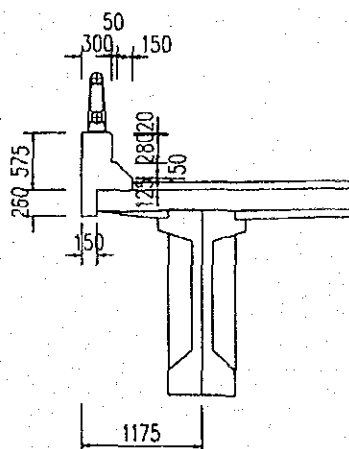
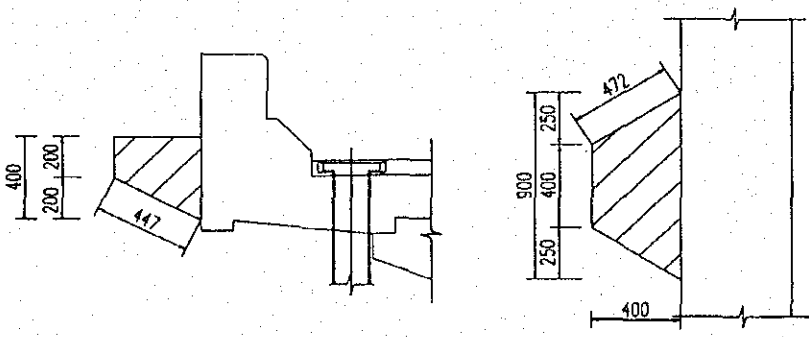
TYPE	D(mm)	LENGTH OF BAR (mm)	UNIT WEIGHT (kg/m)	NUMBER	WEIGHT (kg)
N1	D28	12000	4.834	14	812.1
N2	D25	12000	3.853	42	1941.9
N3	D25	9100	3.853	14	490.9
N4	D22	4229	2.984	6	75.7
N5	D22	4248	2.984	17	215.5
N6	D10	152053	0.617	1	93.8
N7	D10	174861	0.617	1	107.9
N8	D10	729855	0.617	1	450.3
N9	D10	4105	0.617	68	172.2
N10	D16	1322	1.578	16	33.4
D10		824.2	kg		
D16		33.4	kg		
D22		291.2	kg		
D25		2432.8	kg		
D28		812.1	kg		
TOTAL		4383.7	kg		

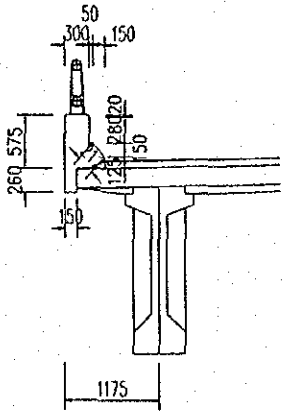
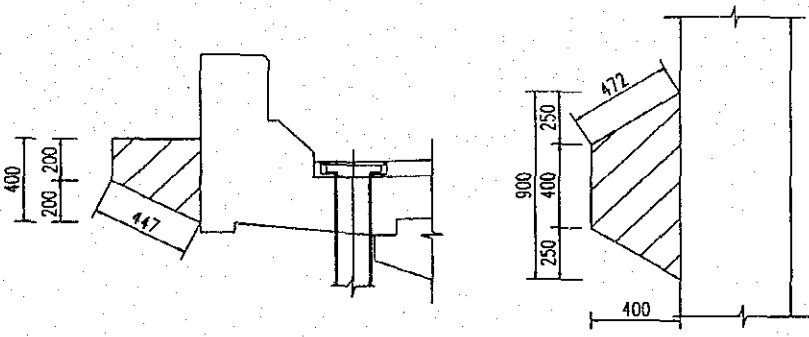
STEEL OF PIER 1&2 (for one direction)

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGHT (kg/m)	TOTAL STEEL (kg)
PIER CAP	R1	10	5600	10	0.617	34.5
	B1	28	11200	14	4.834	757.9
	B2	28	9800	13	4.834	615.8
	B3	16	11200	9	1.578	159.1
	B3a	16	10490	4	1.578	66.2
	B4	14	4916	49	1.208	291.1
	B4a	14	4266	49	1.208	252.6
	B4b	14	1982	49	1.208	117.4
	B4c	14	3566	49	1.208	211.2
	B4d	14	2332	49	1.208	138.1
	B5	14	4151	8	1.208	40.1
	B5a	14	3501	8	1.208	33.8
	B5b	14	1600	6	1.208	11.6
	B5c	14	2801	6	1.208	20.3
	B5d	14	2332	14	1.208	39.5
	B6	28	3393	7	4.834	114.8
	B6a	28	3793	5	4.834	91.7
	B7	28	3377	7	4.834	114.3
B7a	28	3777	7	4.834	127.8	
COLUMN	C1	32	8834	84	6.313	4684.9
	C2	14	4498	114	1.208	619.6
	C3	14	4725	78	1.208	445.4
	C4	14	1758	78	1.208	165.7
	C4A	14	1322	12	1.208	19.2
	C5	14	9612	12	1.208	139.4
	C6	14	21934	12	1.208	318.1
FOOTING	F1	22	11070	25	2.984	825.8
	F2	22	14587	47	2.984	2045.8
	F3	28	10300	53	4.834	2638.7
	F4	22	7570	37	2.984	835.8
	F5	20	7500	16	2.466	295.9
	F6	20	10300	16	2.466	406.4
	F7	16	4689	94	1.578	695.7
TOTAL	D = 10		34.5		(kg)	
	D = 14		2862.9		(kg)	
	D = 16		921.0		(kg)	
	D = 20		702.4		(kg)	
	D = 22		3707.5		(kg)	
	D = 28		4461.0		(kg)	
	D = 32		4684.9		(kg)	
	TOTAL		17374.1		(kg)	

QUANTITY OF MISCELLANEOUS

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS E	Parapet	m3	95.36	
		Lighting pole base	m3	0.18	
Form		Parapet	m2	598.51	
		Lighting pole base	m2	1.22	
		Total		599.73	
Re-bar		Parapet	ton	14.815	
		Lighting pole base	ton	0.063	
		Total	ton	14.88	
Steel Railing			m	394.00	
Lighting	Pole		set	2	
	Pipe Φ 100		m	374.00	
Drainage	Pot		set	14	
	Pipe Φ 180		m	24.56	

Item	Formula	Quantity
<p>1.Parapet Class "E"</p>	 $A = ((0.300 \times 0.575 + 0.260 \times 0.150 + (0.125 + 0.275) \times 0.150 \times 1/2 + 0.275 \times 0.050) \times 2 \times 2 = 1.021 \text{ m}^2$ $V = 1.021 \times (28.100 + 37.200 + 28.100) = 95.36 \text{ m}^3$	<p>95.36 m3</p>
<p>2.Lighting Class "E"</p>	 $V = (0.200 \times 0.400 + 0.400 \times 0.900) \times 1/2 \times 0.4 \times 2 = 0.176 \text{ m}^3$	<p>0.176 m3</p>

Item	Formula	Quantity
1.Parapet	 $A = 2 \times \left(\frac{0.575 + 0.260 + 0.15 + 0.125 + 0.212 + 0.280}{2} \right) \times (28.100 + 37.200 + 28.100) = 598.51 \text{ m}^2$	598.51 m2
2.Lighting	 $A = 2 \times \left\{ \frac{(0.900 + 0.400)}{2} \times 0.447 \times \frac{1}{2} + (0.400 + 0.200) \times 0.4 \times \frac{1}{2} \right\} \times 2 + 0.2 \times 0.400 \times 2 = 1.221 \text{ m}^2$	1.221 m2

Re-Bar Lighting

Par BRIDGE

SCHEDULE OF REINFORCEMENT (OF LIGHTING)													
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												31.52	

Total Weight

$$\text{Total} = 31.52 \times 2 = 63.04 \text{ (kg)}$$

Item	Formula	Quantity
1. Drainage	<p>TOTAL EACH</p> <p>EACH = 7 x 2 = 14</p> <p>PIPE = 2.034 x 6 + 1.544 x 8 = 24.56</p>	<p>EACH</p> <p>24.56 m</p>
2. Steel railing	<p>EACH LENGTH for SPAN</p> <p>L = 28.150 + 37.200 + 28.150</p> <p>EACH = 3 SPAN</p> <p>Length for abutment</p> <p>L = 5.0 x 4 = 20.00 m</p> <p>TOTAL LENGTH</p> <p>L = 93.500 x 2 x 2 + 20.00 = 394.000 m</p>	<p>394.000 m</p>
3. Lighting	<p>EACH for One SPAN</p> <p>EACH = 2 = 2.000 pole</p> <p>PVC Φ 100 MM = 374.000 m</p>	<p>374.000 m</p>

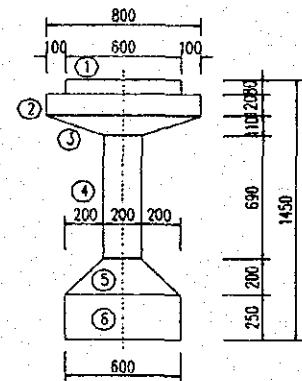
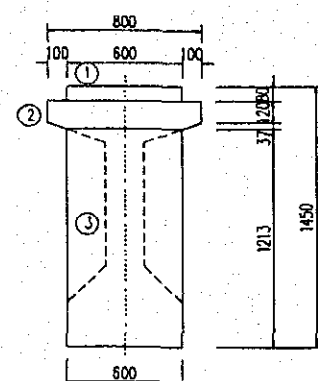
Quantity table of caida bridge

ITEMS	UNIT	SUPERSTRUCTURE	ABUTMENTS	PIERS	MISCELLANEOUS WORKS			TOTAL
					DRAINAGE	LIGHTING-BASE	RAILING	
CONCRETE	CLASS B	m3	703.6					703.6
	CLASS D	m3	696.4	1943.9	1470.3			4110.5
	CLASS E	m3		1241.9	922	0.2	95.4	2259.2
	CLASS G	m3		63.7	56			119.7
	12 S15.2	ton						0.0
12 S12.7	ton		7.7				7.7	
3 S12.7	ton		0.4				0.4	
SHEATHING	CABLES Ø80/85	m	3503.7					3503.7
	CABLES Ø 50/55	m	723.6					723.6
STEEL JOINT KEY	CEMENT GROUT IN SHEATHING	m3	19.9					19.9
		set	240.0					240.0
ANCHORAGE	CABLES 12S12.7	live	220.0					220.0
		dead						0.0
	CABLES 3S12.7	live	144.0					144.0
		dead						0.0
REINFORCEMENT	D <= 14	ton	158.361	23.1	19.0		14.8	215.3
	16 <= D <= 25	ton	109.177	138.9	54.8		0.1	302.9
	25 < D <= 32	ton		37.1	31.3			68.4
	TOTAL	ton	267.538	199.1	105.0		14.8	586.6
EXPANSION JOINT	100mm	m	43.0					43.0
	Non-Shrink Mortar	m3						0.0
BEARING	600 x 300 x 57	set	20.0					20.0
	500 x 250 x 50	set	40					40.0
	Ø 75 mm, L=1250mm	set	48.0					48.0
ANCHORAGE BAR	Ø 125 mm, L=2500mm	set						0.0
	Ø 50 mm	m		106.0				106.0
DRAINAGE	Pot	m				14.0		14.0
	Pile Ø 180	m				24.6		24.6
LIGHTING POLE		set					2	2.0
	WATER PROOFING 5 mm	m2	2010.3					2010.3
PAVEMENT	ASPHALT CONCRETE 70 mm	m2	2010.3					2010.3
		m2						
GEOTEXTILE	STONE MASONRY T=300mm	m3		532.0				532.0
	BLINDING AGGREGATE T=100mm	m3		533.1				533.1
RIP RAP		m3		168.8				168.8
		m3			2408.0			2408.0
BLINDING STONE		m3		71.6	140.0			211.6
	WOODEN PILE, L=3m	m		12720.0				12720.0
EXCAVATION		m3		5880.6	3230.1			9110.7
		m2		294.8	525.8			820.6
SEAFFOLDING	H <= 4m	m2		869.6	672.9			1542.5
	4m < H < 30m	m2		11.0	322.9			343.9
SUPPORT		m3		2147				2146.6
	BACK FILL	m			27630.9			27630.9
COFFERDAMS	LARSEN IV	m			1440.0			1440.0
	I 400	m						1448.0
	C 300	m						1448.0

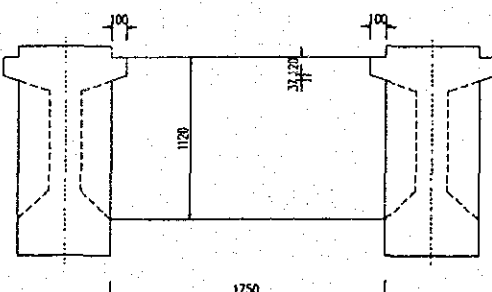
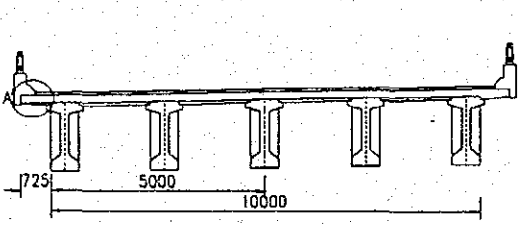
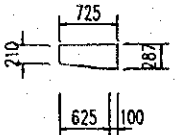
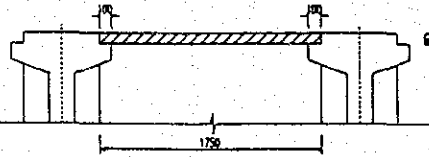
3.4. Ba Mang bridge

QUANTITY OF SUPERSTRUCTURE

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS B	Girder	m3	158.79	$\sigma_{ck}=400\text{kgf/cm}^2$
	CLASS D	Panel	m3	28.00	
		Deck Slab	m3	123.40	
		Cross beam	m3	23.25	
		Total	m3	174.65	
Total			m3	333.43	
Formworks		Girder	m2	1,072.87	
		Cross beam	m2	155.88	
		Deck Slab	m2	83.50	
		Panel	m2	438.00	
	Total			m2	1,750.25
Platform for construction			m2	446.05	
Reinforcement		Girder	ton	31.74	
		Cross beam	ton	2.10	
		Deck Slab	ton	29.09	
		Panel	ton	3.36	
	Total			ton	66.28
PC Cable	12S12.7(B)	Longitudinal Tendons	ton	6.90	SWPR7B
Anchor	12S12.7(B)		set	60	
Steel shear key			set	60	
Sheathing	$\Phi 80/85$		m	742.58	
Cement grout in sheathing		$\Phi 80/85$	m3	3.73	
Expansion joint	50mm		m	43	
Bearing 500x250x50			set	20	
Anchorage Bar	$\Phi 75, L=1500$		set	16	
Pavement	Water Proofing t = 5mm		m2	539.65	
	Asphalt Concrete t = 70mm		m2	539.65	

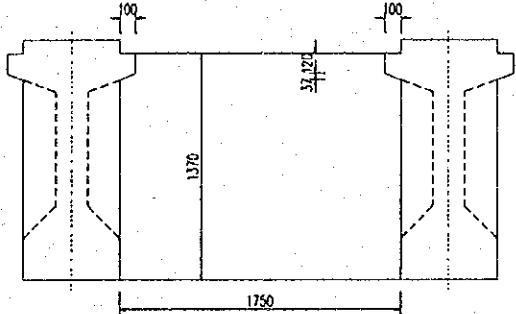
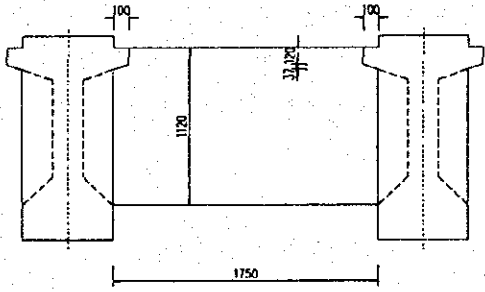
Item	Formula	Quantity																																				
1. Girder CLASS "B"	<p>(1) Calculation of Sectional Area</p> <p>[1] Middle Section</p> <p>Summary of Sectional Length For ONE GIRDER</p> <table border="1" data-bbox="319 448 1053 705"> <thead> <tr> <th>No</th> <th>Formula</th> <th>(m2)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.600×0.080</td> <td>= 0.048</td> </tr> <tr> <td>2</td> <td>0.800×0.120</td> <td>= 0.096</td> </tr> <tr> <td>3</td> <td>$1/2 \times 1.000 \times 0.110$</td> <td>= 0.055</td> </tr> <tr> <td>4</td> <td>0.690×0.200</td> <td>= 0.138</td> </tr> <tr> <td>5</td> <td>$1/2 \times 0.800 \times 0.200$</td> <td>= 0.080</td> </tr> <tr> <td>6</td> <td>0.250×0.600</td> <td>= 0.150</td> </tr> </tbody> </table> <p style="text-align: right;">Total Area 0.567 m2</p>  <p>[2] End Section</p> <p>Summary of Sectional Length For ONE GIRDER</p> <table border="1" data-bbox="319 1355 1053 1556"> <thead> <tr> <th>No</th> <th>Formula</th> <th>(m2)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.600×0.080</td> <td>= 0.048</td> </tr> <tr> <td>2</td> <td>0.800×0.120</td> <td>= 0.096</td> </tr> <tr> <td>3</td> <td>$1/2 \times 1.400 \times 0.037$</td> <td>= 0.026</td> </tr> <tr> <td>4</td> <td>0.600×1.213</td> <td>= 0.728</td> </tr> </tbody> </table> <p style="text-align: right;">Total Area 0.898 m2</p> 	No	Formula	(m2)	1	0.600×0.080	= 0.048	2	0.800×0.120	= 0.096	3	$1/2 \times 1.000 \times 0.110$	= 0.055	4	0.690×0.200	= 0.138	5	$1/2 \times 0.800 \times 0.200$	= 0.080	6	0.250×0.600	= 0.150	No	Formula	(m2)	1	0.600×0.080	= 0.048	2	0.800×0.120	= 0.096	3	$1/2 \times 1.400 \times 0.037$	= 0.026	4	0.600×1.213	= 0.728	
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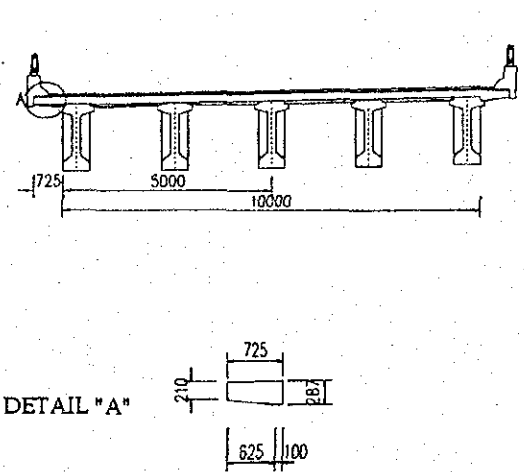
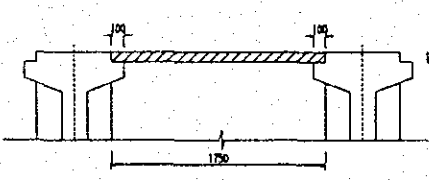
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	<p>(2) Calculation of Form Area</p> <p>[1] A1-A2 Girder Length 25.000 m</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th>Section No.</th> <th>Section Area</th> <th>Average of Section Length</th> <th>Length of Block</th> <th>Concrete Volume</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>END</td> <td>0.898</td> <td>0.898</td> <td>0.45</td> <td>0.404</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>0.567</td> <td>0.733</td> <td>3.500</td> <td>2.566</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>0.567</td> <td>0.567</td> <td>17.100</td> <td>9.696</td> <td></td> </tr> <tr> <td>END</td> <td>0.898</td> <td>0.733</td> <td>3.500</td> <td>2.566</td> <td></td> </tr> <tr> <td>END</td> <td>0.898</td> <td>0.898</td> <td>0.450</td> <td>0.404</td> <td></td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td>25.000</td> <td>15.636</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">No. of Girder 10 × 1 = 10</p> <p>V1 = 15.636 × 10 = 156.360 m³</p> <p>[2]. Diaphragm</p> <div style="text-align: center; margin: 10px 0;"> </div> <p style="margin-left: 100px;"> $V2 = (0.200 \times 0.963 + 0.6 \times 0.690) \times \frac{1}{2} \times 0.2$ $\quad \quad \quad \times \quad \quad \quad 2 \times \quad \quad \quad 2 \times \quad \quad \quad 10 \times \quad \quad \quad 1 = \quad \quad \quad 2.43 \text{ m}^3$ </p> <p style="margin-left: 100px;"> Total V = 156.360 + 2.426 = 158.786 m³ 158.786 m³ </p>	Section No.	Section Area	Average of Section Length	Length of Block	Concrete Volume	Remark	END	0.898	0.898	0.45	0.404		MIDDLE	0.567	0.733	3.500	2.566		MIDDLE	0.567	0.567	17.100	9.696		END	0.898	0.733	3.500	2.566		END	0.898	0.898	0.450	0.404		Total			25.000	15.636		
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2. Cross Beam CLASS "D"	<p>(1) End Cross Beam</p> <div style="text-align: center; margin: 10px 0;"> </div> <p style="text-align: center;">3 - 4 - 3</p>																																											

Item	Formula	Quantity
	$V1 = \left\{ 1.750 \times 1.370 - \frac{(0.120 + 0.157) \times 2/2}{4 \times 2} \times 0.100 \right\} \times 0.450 \times 2 = 17.063 \text{ m}^3$	
	<p>(2) Intermediate Cross Beam</p>	
		
	$V2 = \left\{ 1.750 \times 1.120 - \frac{(0.120 + 0.157) \times 2/2}{4 \times 2} \times 0.100 \right\} \times 0.200 \times 2 = 6.183 \text{ m}^3$	
	$V = 17.063 + 6.183 = 23.246 \text{ m}^3$	23.246 m3
3. Deck Slab CLASS "D"		
	<p>DETAIL "A"</p> 	
	$A = \left\{ \frac{(0.210 + 0.287) \times 0.625 \times 1/2 + 0.100 \times 0.287}{4 + (5.000 \times 2) \times 0.210 \times 2} \right\} \times 4.936 \text{ m}^2$	
	$V = 4.936 \times 25.000 = 123.400 \text{ m}^3$	123.400 m3
4. Panel concrete Class D	$V = 1.750 \times 0.08 \times 8 \times 25.000 \times 1 = 28.000 \text{ m}^3$	28.000 m3
		

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3	$1.213 \times 2 + 0.600$	= 3.026																																				

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	<p>(2) Calculation of Form Area</p> <p>[1] A1-A2 Girder Length 25.000 m</p> <table border="1" style="width:100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th>Section No.</th> <th>Section Length</th> <th>Average of Section Length</th> <th>Length of Block</th> <th>Form Area</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>END</td> <td>3.640</td> <td>3.64</td> <td>0.45</td> <td>1.638</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>4.086</td> <td>3.863</td> <td>3.500</td> <td>13.521</td> <td></td> </tr> <tr> <td>MIDDLE</td> <td>4.086</td> <td>4.086</td> <td>17.100</td> <td>69.871</td> <td></td> </tr> <tr> <td>END</td> <td>3.640</td> <td>3.863</td> <td>3.500</td> <td>13.521</td> <td></td> </tr> <tr> <td>END</td> <td>3.640</td> <td>3.640</td> <td>0.450</td> <td>1.638</td> <td></td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td>25.000</td> <td>100.189</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">No. of Girder 10 × 1 = 10</p> <p>A1= 100.189 × 10 = 1,001.890 m²</p> <p>[2]. Diaphragm</p> <div style="text-align: center; margin: 10px 0;"> </div> <p>A2 = (0.200 + 0.963) × 1/2 × 10 = 53.03 m²</p> <p>[3]. External form at girder ends</p> <p>A3 = (0.60 × 0.080 + 0.800 × 0.120 + (0.800 + 0.600) × 0.037 × 1/2 + 0.600 × 1.213) × 2 × 10 = 17.95 m²</p> <p>Total A = 1,001.890 + 53.028 + 17.95 = 1,072.872 m² 1,072.872 m²</p>	Section No.	Section Length	Average of Section Length	Length of Block	Form Area	Remark	END	3.640	3.64	0.45	1.638		MIDDLE	4.086	3.863	3.500	13.521		MIDDLE	4.086	4.086	17.100	69.871		END	3.640	3.863	3.500	13.521		END	3.640	3.640	0.450	1.638		Total			25.000	100.189		
Section No.	Section Length	Average of Section Length	Length of Block	Form Area	Remark																																							
END	3.640	3.64	0.45	1.638																																								
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END	3.640	3.640	0.450	1.638																																								
Total			25.000	100.189																																								

Item	Formula	Quantity
2. Cross beam		
(1) End Cross Beam	 $A1 = \left[\left\{ 1.750 \times 1.370 - \frac{(0.120 + 0.157) \times 2}{2} \times 0.100 \right\} \times 2 + 1.75 \times 0.450 \right] \times 8 = 88.434 \text{ m}^2$	
(2) Intermediate Cross Beam	 $A1 = \left[\left\{ 1.750 \times 1.120 - \frac{(0.120 + 0.154) \times 2}{2} \times 0.100 \right\} \times 2 + 1.75 \times 0.200 \right] \times 8 = 67.443 \text{ m}^2$	
A =	$88.434 + 67.443 = 155.877 \text{ m}^2$	155.877 m2

Item	Formula	Quantity
3. Deck Slab	 <p>DETAIL "A"</p> $A-1 = (0.210 + 0.625) \times 2 \times 2 = 3.340 \text{ m}$ $A = 3.340 \times 25.000 = 83.5 \text{ m}^2$	83.5 m2
4. Panel	 $A = \frac{((1.000 + 1.750) \times 0.080 \times 2 + 1.750 \times 1.000)}{8 \times 25} = 438.000 \text{ m}^2$	438.000 m2
5. Platform for construction	$A = 26.100 \times 22.000 = 446.049 \text{ m}^2$	446.049 m2

Item	Formula						Quantity	
PC CABLE 12S12.7(B)	For ONE GIRDER							
	CABLE VAR.	EACH LENGTH	CABLE NO.	EACH	TOTAL LENGTH	UNIT WEIGHT		WEIGHT
	1	24.702	C1	1	24.702	9.290		229.482
	2	24.738	C2	1	24.738	9.290		229.816
	3	24.818	C3	1	24.818	9.290		230.559
	TOTAL			3	74.258			689.857
	SUB-TOTAL WEIGHT OF PC CABLES per BRIDGE (A1-A2)							
	$W_p = 689.857 \times 10 \times 1$							= 6,898.570 kg
	TENSION UNIT							
	$N_s = 3 \times 2 \times 10 \times 1$							= 60 each
SHEATHING Φ 80/85MM				74.258 x	10	= 742.580 m		
STEEL SHEAR KEY				6 x	10	= 60 set		
CEMENT GROUT IN SHEATHING				$3.14 \times 0.08 \times 0.080 /$	4 x 742.580	= 3.731 m ³		
ANCHOR				6 x	10	= 60 set		

Item	Formula	Quantity
1. Joint	Each length $L = 10.750 + 10.750 = 21.500$ Each = 2 Total length $L = 21.500 \times 2 =$	43.000 m
2. Bearing pad	ELASTOMERIC 500x250x50 Each for one span Each = 10 TOTAL EACH Each = $10 \times 2 =$	EACH 20
3. Anchor bar	Each for one span Each = 16 Total each (fix) Each = $8 \times 1 =$ Total each (move) Each = $8 \times 1 =$ TOTAL	EACH 16.000 8 set 8 set 16 set
4. Pavement	a. Water proofing 5mm $10.75 \times 25.1 \times 2 = 540 \text{ m}^2$ b. Asphalt concrete 70mm $10.75 \times 25.1 \times 2 = 540 \text{ m}^2$	540 m2 540 m2

SCHEDULE OF REINFORCEMENT FOR GIRDER														
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						
G1	14	190	1557	117	1557	190			3611	1.208	119	519.1		
G2	14	190	1557	317	1557	190			3811	1.208	48	221.0	Average	
G3	14	190	1557	517	1557	190			4011	1.208	8	38.8		
G4	14	190	1557	517	1557	190			4011	1.208	4	19.4		
G5	14	200	209	159	509	159	209	200	1645	1.208	131	260.3		
G6	14	200	43	709	43	200			1195	1.208	131	189.1		
G7	14	200	283	189	517	189	283	200	1861	1.208	75	168.6		
G8	14	200	141	189	517	189	141	200	1577	1.208	48	91.4	Average	
G9	14	389	517	389					1295	1.208	8	12.5		
G10	22	7445	9950	7445					24840	2.984	6	444.7		
G11	14	7445	9950	7445					24840	1.208	18	540.1		
G12	14	420	3436	17128	3436	420			24840	1.208	8	240.1		
G13	14	100	277	151	277	100			905	1.208	16	17.5		
G14	14	200	800						1000	1.208	12	14.5		
G15	16	1600							1600	1.578	52	131.3	Interior	
G16	16	1100							1100	1.578	52	90.3	Exterior	
G17	10	520							520	0.617	12	3.9		
G18	10	150							150	0.617	32	3.0		
G19	14	333	369	509	369	333			1913	1.208	119	275.0		
Total	Interior & Exterior	Interior girder											3190.2	
		Exterior girder											3149.2	

3) Total Weight

Span	Mid/Side	Int/Ext	Nos.	Weight/G	Total	Remark
A1-A2	Interior & Exterior Span	Interior Beam	6	3190.20	19141.20	
		Exterior Beam	4	3149.17	12596.68	
Total					31737.88	

Per EACH

SCHEDULE OF REINFORCEMENT FOR CROSS BEAM													
(1) END DIAPHRAGM													
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					
A1	16	1750							1750	1.578	112	309.29	
A2	14	198	1559	360	1559	198			3874	1.208	56	262.07	
Sub-Total												571.36	
(2) INTERMEDIATE CROSS BEAM													
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					
B1	16	1750							1750	1.578	96	265.10	
B2	14	198	1309	110	1309	198			3124	1.208	56	211.33	
Sub-Total												476.43	

3) Total Weight

SECTION	Nos.	Weight/EACH	Weight
END CROSS BEAM	2	571.36	1142.72
INTERMEDIATE CROSS BEAM	2	476.43	952.86
Total			2095.58

No.

Re-bar Deck slab

Per BRIDGE

SCHEDULE OF REINFORCEMENT FOR DECK SLAB													
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					
S1	20	11350							11350	2.466	334	9348.36	
S2	20	10850							10850	2.466	334	8936.54	
S3	14	133	623	207					963	1.208	668	777.09	
S4	14	25752							25752	1.208	200	6221.68	
S5	25	11350							11350	3.853	20	874.63	
S6	25	10850							10850	3.853	20	836.10	
S7	12	210	145	210					565	0.888	4175	2094.68	
Total												29089.08	

QUANTITY TABLE OF ABUTMENTS

ITEMS		UNIT	ABUTMENT A1	ABUTMENT A2	TOTAL	
A- ABUTMENT						
PILE	NUMBER OF PILES	PILE	78.0	78.0	156	
	TOTAL LENGTH OF RC 450MM	M	3120.0	3120.0	6240	
	CONCRETE CLASS 'D'	M3	634.4	634.4	1269	
	REINFORCEMENT	D32	KG	397.8	397.8	796
		D28	KG	0.0	0.0	0
		D25	KG	40341.6	40341.6	80683
		D22	KG	77563.2	77563.2	155126
		D16	KG	5187.0	5187.0	10374
φ 6		KG	14344.2	14344.2	28688	
TOTAL	KG	137833.8	137833.8	275668		
ABUTMENT	CONCRETE CLASS 'E'	M3	544.6	544.6	1089	
	REINFORCEMENT	D25	KG	15084.9	15084.9	30170
		D22	KG	4926.3	4926.3	9853
		D20	KG	7782.1	7782.1	15564
		D18	KG	0.0	0.0	0
		D16	KG	5308.4	5282.8	10591
		D14	KG	3664.6	3664.6	7329
		D10	KG	69.2	69.2	138
	TOTAL	KG	36835.5	36809.9	73645	
	LEAN CONCRETE CLASS 'G'	M3	18.9	18.9	34	
	FORM	M2	527.8	527.8	1055.6	
	BLINDING STONE	M3	33.9	33.9	68	
	EXCAVATION FOR FOUNDATION	M3	715.1	715.1	1430.2	
	BACK FILL	M3	297.5	297.5	594.9	
SCAFFOLDING WORK	H < 4m	M2	142.4	142.4	284.8	
	4m ≤ H < 30m	M2	430.4	430.4	860.8	
SUPPORT	M3	6.1	6.1	12.3		
B- APPROACH SLAB						
	CONCRETE CLASS 'E'	M3	43.2	43.2	86	
	LEAN CONCRETE CLASS 'G'	M3	13.3	13.3	27	
	ASPHALTIC JOINT FILLER T=20MM	M3	0.4	0.4	0.8	
	FORM	M2	24.2	24.2	48.3	
	REINFORCEMENT	D20	KG	3421.6	3421.6	6843
		D16	KG	3402.3	3402.3	6805
		D10	KG	255.8	255.8	512
TOTAL	KG	7079.7	7079.7	14159		
C- SLOPE PROTECTION						
FOOTING	WOODEN PILE L=3M	M	5931.1	5931.1	11862	
	BLINDING AGGREGATE T=100MM	M3	7.9	7.9	16	
	STONE MASONRY T=300MM	M3	35.6	35.6	71	
	EXCAVATION	M3	949.0	949.0	1898	
	BACK FILL	M3	467.7	467.7	935	
SIDE SLOPE	STONE MASONRY T=300MM	M3	445.0	445.0	890	
	BLINDING AGGREGATE T=100MM	M3	152.2	152.2	304	
	GEOTEXTILE	M2	578.7	578.7	1157	
	PVC PILE φ50MM DIA., L=1000MM	M	49.4	49.4	99	

QUANTITY SURVEYING ABUTMENT A1

No.

Item	Formula						Quantity
1) Concrete							
* BackWall	v1 =	24.10	x	1.82	x	0.40	= 17.50 m3
* Frontwall	v2 =	24.10	x((	3.76	+	4.00	)/ 2
	x	1.50	-	0.10	^2/	2	]-= 140.16 m3
* Corbel	v3 =	0.30	x(	0.30	+	0.60	)/ 2
					x	23.10	= 3.12 m3
* Haunch	v4 =	5.58	x	0.50	x	0.50	/ 2x2
							= 1.39 m3
*Wingwall	v5 = {	3.50	x(	5.58	+	5.56	)/ 2
	+	1.00	x(	1.05	+	1.86	)/ 2 }
			x	0.50	x	2	= 20.93 m3
* Parapet	v7 = (	0.50	x	0.30	+	0.20	^2
	-	0.15	^2/	2	)x	4.90	x
							= 2
							= 1.75 m3
*Footing	v6 =	24.10	x	7.50	x	2.00	
	-	10	x	pi	x	0.75	^2 x
							= 0.1
							= 359.73 m3
							Total
							544.6 m3
2) Form							
* BackWall	a1 =	2.00	x	1.82	x	24.10	-
	-	1.82	x(	0.50	+	0.50	)x
							= 2
							= 83.85 m2
* Frontwall	a2 =	24.1	x(	3.76	+	4.001)
	- (	0.5	+	0.5	)x	4.001	x
	+	3.88	x	1.5	x	2	= 2
							= 190.68 m2
* Corbel	a3 = (	0.3	+	0.3	^2+	0.3	^2)^ 0.5)
					x	23.1	= 16.73 m2
* Haunch	a4 =	+	0.5	^2+	0.5	^2)^ 0.5	
	x		5.575	x	2	=	7.88
*Wingwall	a5 =	2 x {	3.5	x(	5.575	+	5.56)
	+		1	x(	1.05	+	1.86)
	+	0.5	x(	1.05	+	1.28	+
	-		0.5	x	5.58	]-	3.73)
							= 84.22 m2
* Parapet	a5 = {	4.9	x(	0.5	+	0.3	+
	+		1.4142	x	0.15	+	0.05)
	+		2	x	0.17875	}]x	2
							= 11.61 m2
*Footing	a 6 =	2 x(	24.100	+	7.500	)x	2.00
							126.40 m2
							Total
							521.4 m2
3) Scaffolding:							
* H<=4m	A2 = {	2 x(	24.10	+	7.50	) +	8 }
						x	2 =
							142.4 m2
* 4m < H <= 30m	A2 =	$\frac{[(24.1+2) + (5.35+1.5+2)] + (0.5+2) + (5.35+1-1)}{+(24.1-2 \times 1.5) + (5.35-1+1) + (0.5+2) + (5.35+1.5+2)} \times (2.04+4.94)$					
							430.4 m2
4) Support							
	= (	8.08	-	1.55	+	5.73	)x
		x	0.50	x	2		1.00 /2
							= 6.1 m3

QUANTITY SURVEYING ABUTMENT A1

No.

Item	Formula	Quantity
5) Lean Concrete	* Concrete class G $v = \frac{0.1 \times \left\{ \left(\frac{24.10 + 0.2}{10} \right) \times \left(\frac{7.50 + 1.50^2}{1.50} \right) \right\}}{2}$	16.9 m3
	* Form $A = \frac{0.1 \times \left\{ \left(\frac{24.10 + 0.2}{2} \right) + \left(\frac{7.50}{2} \right) \right\}}{2}$	6.40 m2
6) Blinding Stone	$v = \frac{0.2 \times \left\{ \left(\frac{24.10 + 0.2}{10} \right) \times \left(\frac{7.50 + 1.50^2}{1.50} \right) \right\}}{2}$	33.9 m3
7) RcPile	*pile n = 78	78.00 nos
	* Concrete class D $V1 = \left(\frac{0.450}{2} \times \left(\frac{0.450}{4} - 0.020 \right) \times 10.000 \right) \times 4$ $V2 = \left(\frac{0.450}{2} \times \left(\frac{0.450}{4} + 0.090 \right) \times 0.090 \right) \times 0.62$ <p style="text-align: right;">Total (per one)</p> $V = 8.133 \times 78.00$	per 40.0m 8.068 m3 0.065 m3 8.133 m3 634.374 m3
8) Earthworks	* Form $A1 = 0.020 \times 1.414 \times 4 \times 10.000$ $A2 = 0.410 \times 3 \times 10.000$ $A3 = \frac{0.450}{2} \times 4$ $A4 = \left(\frac{0.450}{3} + 0.090 \right) \times \frac{1}{2} \times 0.620$ $A = A1 + A3$	1.131 m2 12.300 m2 0.202 m2 0.502 m2 55.640 m2 (per one)
	* Excavation for foundation $= \frac{2.16}{13.82} \times \left(6 \times \left(\frac{9.50}{30.42} \times \frac{26.10}{13.82} \right) + \left(\frac{9.50}{30.42} + \frac{13.82}{30.42} \right) \times \left(\frac{26.10}{30.42} + \frac{30.42}{30.42} \right) \right)$	715.1 m3
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume $\text{Pile Occupied Volume} = 10 \times \frac{\pi}{4} \times 1.50 \times 0.400$	1.50 m3 7.07 m3
	Excess Soil	417.63 m3
	* Back Fill	297.5 m3
	9) Approach Slab	* Concrete $= \frac{23.04 \times \left\{ \left(\frac{6.00 \times 0.30 + 0.30 + 0.50}{2} \right) + \left(\frac{0.50 \times 0.50}{2} \right) \right\}}{2}$	43.24 m3
* Lean Concrete $= \left(\frac{0.30 + 0.28 + 5.20}{23.04} \right) \times 0.1$	13.3 m3	
* Asphaltic Joint Filler $= \left(\frac{0.30 \times (0.02 + 0.06)}{2} + 0.30 \times 0.02 \right) \times 23.04$	0.41 m3	
* Form $= \left(\frac{2 \times \left(\frac{6.00 \times 0.30 + 0.30 + 0.50}{2} \right) + \left(\frac{0.50 \times 0.30}{2} \right) \times 6.00 \times 0.30 \right)}{2}$	11.52 m2 2 m2 24.15 m2	

QUANTITY SURVEYING ABUTMENT A2

No.

Item	Formula	Quantity
1) Concrete		
* BackWall		
v1 =	$24.10 \times 1.82 \times 0.40 =$	17.50 m3
* Frontwall		
v2 =	$24.10 \times \left(\frac{3.76 + 4.00}{2} - 1.50 \right) \times 0.10$	140.16 m3
* Corbel		
v3 =	$0.30 \times \left(\frac{0.30 + 0.60}{2} \times 23.10 \right)$	3.12 m3
* Haunch		
v4 =	$5.58 \times 0.50 \times 0.50 \times 2 \times 2 =$	1.39 m3
* Wingwall		
v5 =	$\left(\frac{3.50 \times (5.58 + 5.56)}{2} + \frac{1.00 \times (1.05 + 1.86)}{2} \right) \times 0.50 \times 2 =$	20.93 m3
* Parapet		
v7 =	$\left(\frac{0.50 \times 0.30 + 0.20}{2} \right) \times 4.90 \times 0.15 =$	1.75 m3
* Footing		
v6 =	$24.10 \times 7.50 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 =$	359.73 m3
	Total	544.6 m3
2) Form		
* BackWall		
a1 =	$2.00 \times 1.82 \times 24.10 - 1.82 \times \left(\frac{0.50 + 0.50}{2} \right) \times 2 =$	83.85 m2
* Frontwall		
a2 =	$24.1 \times \left(\frac{3.76 + 4.001}{2} \right) - \left(\frac{0.5 + 0.5}{2} \right) \times 4.001 \times 2 + 3.88 \times 1.5 \times 2 =$	190.68 m2
* Corbel		
a3 =	$\left(\frac{0.3 + 0.3}{2} \right) \times \left(\frac{0.3^2 + 0.3 \times 23.1 + 23.1^2}{2} \right) \times 0.5 =$	16.73 m2
* Haunch		
a4 =	$\left(\frac{0.5 + 0.5}{2} \right) \times 5.575 \times 2 =$	7.88
* Wingwall		
a5 =	$2 \times \left(\frac{3.5 \times (5.575 + 5.56)}{2} + \frac{1 \times (1.05 + 1.86)}{2} \right) + 0.5 \times \left(\frac{1.05 + 1.28}{2} \times 5.58 \right) =$	84.22 m2
* Parapet		
a5 =	$\left(\frac{4.9 \times (0.5 + 0.3)}{2} + 1.4142 \times 0.15 + 2 \times 0.17875 \right) \times 2 =$	11.61 m2
* Footing		
a 6 =	$2 \times (24.100 + 7.500) \times 2.00 =$	126.40 m2
	Total	521.4 m2
3) Scaffolding:		
* H<=4m		
A2 =	$2 \times (24.10 + 7.50) \times 8 =$	142.4 m2
* 4m < H <= 30m		
A2 =	$\left(\frac{(24.1+2) + (5.35+1.5+2) + (0.5+2) + (5.35+1+1)}{2} + \frac{(24.1-2 \times 1.5) + (5.35-1+1) + (0.5+2) + (5.35+1.5+2)}{2} \right) \times (2.04+4.94) =$	430.4 m2

QUANTITY SURVEYING ABUTMENT A2

No.

Item	Formula	Quantiv
4) Support	$= (8.08 - 1.55 + 5.73) \times 1.00 / 2$ $\times 0.50 \times 2 =$	6.1 m3
5) Lean Concrete	* Concrete class G $v = 0.1 \times \{ (24.10 + 0.2) \times (7.50 + 0.2) - 10 \times 1/4 \times \pi \times 1.50^2 \}$	16.9 m3
	* Form $A = 0.1 \times \{ (24.10 + 0.2) + (7.50 + 0.20) \} \times 2$	6.40 m2
6) Blinding Stone	$v = 0.2 \times \{ (24.10 + 0.2) \times (7.50 + 0.2) - 10 \times 1/4 \times \pi \times 1.50^2 \}$	33.9 m3
7) RcPile	*pile $n = 78$	78.00 nos
	* Concrete class D $V1 = (0.450 \times 0.450 - 0.020 \times 0.020) \times 1/2 \times 4 \times 10.000$ $V2 = (0.450 \times 0.450 - 0.020 \times 0.020) \times 1/2 \times 4 \times 0.090$ $V = 8.133 \times 78.00$	per 40.0m 8.068 m3 0.065 m3 8.133 m3 634.374 m3
	* Form $A1 = 0.020 \times 1.414 \times 4 \times 10.000$ $A2 = 0.410 \times 3 \times 10.000$ $A3 = 0.450 \times 0.450 - 0.020 \times 0.020$ $\times 1/2 \times 4$ $A4 = (0.450 + 0.090) \times 1/2 \times 0.620$ $A = A1 \times 4 + A2 \times 4$ $+ A3 \times 7 + A4$	1.131 m2 12.300 m2 0.202 m2 0.502 m2 55.640 m2 (per one)
8) Earthworks	* Excavation for foundation $= 2.16 / 6 \times \{ (9.50 \times 26.10) + (13.82 \times 30.42) + (9.50 + 13.82) \times (26.10 + 30.42) \}$	715.1 m3
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volume = $10 \times \pi / 4 \times 1.50$ Excess Soil = $1.50 \times 0.400 = 7.07$ m3	417.63 m3
	* Back Fill = 297.5 m3	
9) Approach Slab	* Concrete $= 23.04 \times \{ (6.00 \times 0.30 + (0.30 + 0.50) / 2 \times 0.20) - 0.50 \times 0.50 / 2 \}$	43.24 m3
	* Lean Concrete $= (0.30 + 0.28 + 5.20) \times 23.04 \times 0.1$	13.3 m3
	* Asphaltic Joint Filler $= \{ 0.30 \times (0.02 + 0.06) / 2 + 0.30 \times 0.02 \} \times 23.04$	0.41 m3
	* Form $= (2 \times (6.00 \times 0.30) + (0.30 + 0.50) \times (0.50 + 0.30) \times 2) \times 23.04$	24.15 m2

REINFORCEMENT OF ABUTMENT A1
(For 1 Abument)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
A1	14	2805	378	1.208	1280.8
A2	14	32224	18	1.208	700.7
A3	14	720	248	1.208	215.7
A4	16	1837	122	1.578	353.7
A5	14	31800	4	1.208	153.7
A6	14	690	126	1.208	105.0
F1	25	10795	126	3.853	5240.7
F2	25	7300	125	3.853	3515.9
F3	25	8174	126	3.853	3968.3
F4	25	4900	125	3.853	2360.0
F5	20	8000	16	2.466	315.6
F6	20	32550	16	2.466	1284.3
F7	16	4828	189	1.578	1439.9
F8	20	36002	30	2.466	2663.4
F9	20	33250	30	2.466	2459.8
W1	22	4285	125	2.984	1598.3
W2	22	5825	126	2.984	2190.1
W3	16	5720	126	1.578	1137.3
W4	14	1822	214	1.208	471.0
W5	16	32134	15	1.578	760.6
W6	14	32012	19	1.208	734.7
W7	16	1860	126	1.578	369.8
K1	20	7870	12	2.466	232.9
K2	20	2300	16	2.466	90.7
K3	20	3400	14	2.466	117.4
K4	22	8145	28	2.984	680.5
K5	22	4485	16	2.984	214.1
K6	20	5170	27	2.466	344.2
K7	16	6920	14	1.578	152.9
K8	16	5560	5	1.578	43.9
K8a	16	5420	5	1.578	42.8
K9	16	1285	48	1.578	97.3
K9a	22	6105	8	2.984	145.7
K9b	16	2294	48	1.578	173.8
K9c	14	626	4	1.208	3.0
K10	16	2520	2	1.578	8.0
K11	20	2250	22	2.466	122.1
K12	16	8040	14	1.578	177.6
K12a	16	7900	14	1.578	174.5
K13	16	4820	27	1.578	205.4
K14	10	719	156	0.617	69.2
K15	20	5159	10	2.466	127.2
K16	16	5089	10	1.578	80.3
K17	22	2337	14	2.984	97.6
K18	16	2232	14	1.578	49.3
K19	20	4971	2	2.466	24.5
K20	16	4971	2	1.578	41.3
K21	22	4030	4	2.984	41.3
K22	16	900	49	1.578	41.3
K23	20	3809	27	2.466	41.3
R1	10	300-700	80-40	0.617	41.2
	D25	15085	(kg)		
	D22	4926	(kg)		
	D20	7782	(kg)		
	D18	0	(kg)		
	D16	5308	(kg)		
	D14	3665	(kg)		
	D10	69	(kg)		
	TOTAL	36836	(kg)		

REINFORCEMENT OF PILE (L=51M) FOR ABUMENT 1

(For 1 Direction)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
N1	32	12000	28	6.313	2121.2
N2	25	12000	42	3.853	1941.9
N3	25	5400	14	3.853	291.3
N4	22	4203	6	2.984	75.3
N5	22	4248	15	2.984	190.1
N6	10	152053	1	0.617	93.8
N7	10	167258	1	0.617	103.2
N8	10	653828	1	0.617	403.4
N9	10	4105	72	0.617	182.4
N10	16	1242	16	1.578	32.1
TOTAL	D = 32		2121.2		(kg)
	D = 28		0.0		(kg)
	D = 25		2233.2		(kg)
	D = 22		265.4		(kg)
	D = 16		32.1		(kg)
	D = 10		782.8		(kg)
TOTAL			5434.7		(kg)

REINFORCEMENT OF APPROACH SLAB FOR ABUMENT 1

(For 1 Direction)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
AS1	20	5850	230	2.466	3318.0
AS2	16	11670	110	1.578	2025.7
AS3	16	6320	116	1.578	1156.9
AS4	16	1200	116	1.578	219.7
AS5	20	700	60	2.466	103.6
AS6	10	1580	60	0.617	58.5
AS7	10	519	616	0.617	197.3
TOTAL	D = 20		3421.6		(kg)
	D = 16		3402.3		(kg)
	D = 10		255.8		(kg)
	TOTAL			7079.7		(kg)

REINFORCEMENT OF ABUTMENT A2

(For 1 Abument)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
A1	14	2805	378	1.208	1280.8
A2	14	32224	18	1.208	700.7
A3	14	720	248	1.208	215.7
A4	16	1837	122	1.578	353.7
A5	14	31800	4	1.208	153.7
A6	14	690	126	1.208	105.0
F1	25	10795	126	3.853	5240.7
F2	25	7300	125	3.853	3515.9
F3	25	8174	126	3.853	3968.3
F4	25	4900	125	3.853	2360.0
F5	20	8000	16	2.466	315.6
F6	20	32550	16	2.466	1284.3
F7	16	4828	189	1.578	1439.9
F8	20	36002	30	2.466	2663.4
F9	20	33250	30	2.466	2459.8
W1	22	4285	125	2.984	1598.3
W2	22	5825	126	2.984	2190.1
W3	16	5720	126	1.578	1137.3
W4	14	1822	214	1.208	471.0
W5	16	32134	15	1.578	760.6
W6	14	32012	19	1.208	734.7
W7	16	1860	126	1.578	369.8
K1	20	7870	12	2.466	232.9
K2	20	2300	16	2.466	90.7
K3	20	3400	14	2.466	117.4
K4	22	8145	28	2.984	680.5
K5	22	4485	16	2.984	214.1
K6	20	5170	27	2.466	344.2
K7	16	6920	14	1.578	152.9
K8	16	5560	5	1.578	43.9
K8a	16	5420	5	1.578	42.8
K9	16	1285	48	1.578	97.3
K9a	22	6105	8	2.984	145.7
K9b	16	2294	48	1.578	173.8
K9c	14	626	4	1.208	3.0
K10	16	2520	2	1.578	8.0
K11	20	2250	22	2.466	122.1
K12	16	8040	14	1.578	177.6
K12a	16	7900	14	1.578	174.5
K13	16	4820	27	1.578	205.4
K14	10	719	156	0.617	69.2
K15	20	5159	10	2.466	127.2
K16	16	5089	10	1.578	80.3
K17	22	2337	14	2.984	97.6
K18	16	2232	14	1.578	49.3
K19	20	4971	2	2.466	24.5
K20	16	4971	2	1.578	15.7
K21	22	4030	4	2.984	48.1
K22	16	900	49	1.578	69.6
K23	20	3809	27	2.466	253.6
R1	10	300-700	80-40	0.617	41.2
	D25	15085	(kg)		
	D22	4926	(kg)		
	D20	7782	(kg)		
	D18	0	(kg)		
	D16	5283	(kg)		
	D14	3665	(kg)		
	D10	69	(kg)		
	TOTAL	36810	(kg)		

REINFORCEMENT OF PILE (L=55M) FOR ABUMENT 2

(For 1 Direction)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
N1	32	12000	28	6.313	2121.2
N2	25	12000	42	3.853	1941.9
N3	25	5400	14	3.853	291.3
N4	22	4203	6	2.984	75.3
N5	22	4248	15	2.984	190.1
N6	10	152053	1	0.617	93.8
N7	10	167258	1	0.617	103.2
N8	10	653828	1	0.617	403.4
N9	10	4105	72	0.617	182.4
N10	16	1242	16	1.578	32.1
TOTAL	D = 32		2121.2		(kg)
	D = 28		0.0		(kg)
	D = 25		2233.2		(kg)
	D = 22		265.4		(kg)
	D = 16		32.1		(kg)
	D = 10		782.8		(kg)
TOTAL			5434.7		(kg)

REINFORCEMENT OF APPROACH SLAB FOR ABUMENT 2

(For 1 Direction)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
AS1	20	5850	230	2.466	3318.0
AS2	16	11670	110	1.578	2025.7
AS3	16	6320	116	1.578	1156.9
AS4	16	1200	116	1.578	219.7
AS5	20	700	60	2.466	103.6
AS6	10	1580	60	0.617	58.5
AS7	10	519	616	0.617	197.3
TOTAL	D = 20		3421.6		(kg)
	D = 16		3402.3		(kg)
	D = 10		255.8		(kg)
	TOTAL			7079.7		(kg)

LIST OF REINFORCEMENT

pile-1

SGN	DIACETER	LENGTH	NOS.	UNIT WEIGHT	PIECE WEGHT	TOTAL WEIGHT	NOTE
1	D25	9,900	12	3.854	38.200	458.4	
2	D6	1,614	95	0.222	0.358	34.0	
3	D6	490	120	0.222	0.109	13.1	
4	D25	1,911	2	3.854	7.360	14.7	
5	D22	350	8	2.984	1.040	8.3	
8	D25	0	0	3.854	0.000	0.0	
9	D16	1,508	8	1.579	2.380	19.0	
					TOTAL	547.5	
					D32	0.0	
					D25	473.1	
					D22	8.3	
					D16	19.0	
					φ6	47.1	
						547.5	

LIST OF REINFORCEMENT

pile-2

SGN	DIACETER	LENGTH	NOS.	UNIT WEIGHT	PIECE WEIGHT	TOTAL WEIGHT	NOTE
1	D22	9,900	12	2.984	29.500	354.0	
2	D6	1,614	95	0.222	0.358	34.0	
3	D6	490	120	0.222	0.109	13.1	
4	D25	1,911	2	3.854	7.360	14.7	
5	D22	350	8	2.984	1.040	8.3	
8	D25	0	0	3.854	0.000	0.0	
9	D16	1,508	8	1.579	2.380	19.0	
					TOTAL	443.1	
					D32	0.0	
					D25	14.7	
					D22	362.3	
					D16	19.0	
					φ6	47.1	
						443.1	

LIST OF REINFORCEMENT

pile-3

SGN	DIACETER	LENGTH	NOS.	UNIT WEIGHT	PIECE WEIGHT	TOTAL WEIGHT	NOTE
1a	D22	10,589	4	2.984	31.600	126.4	
1b	D22	10,612	4	2.984	31.700	126.8 (AVE)	
2	D6	1,614	95	0.222	0.358	34.0	
3	D6	490	60	0.222	0.109	6.5	
4	D25	1,911	2	3.854	7.360	14.7	
5	D22	350	8	2.984	1.040	8.3	
6	D6	9,460	1	0.222	2.100	2.1	
7	D32	810	1	6.313	5.110	5.1 (AVE)	
8	D25	0	0	3.854	0.000	0.0	
9	D16	1,508	4	1.579	2.380	9.5	
					TOTAL	333.4	
					D32	5.1	
					D25	14.7	
					D22	261.5	
					D16	9.5	
					φ6	42.6	
						333.4	

TOTAL

	Pile-1	Pile-2	Pile-3	Total
nos	1	2	1	
D32	0.0	0.0	5.1	5.1
D25	473.1	29.4	14.7	517.2
D22	8.3	724.6	261.5	994.4
D16	19.0	38.0	9.5	66.5
φ6	47.1	94.2	42.6	183.9
	547.500	886.200	333.400	1767.1

Abutment Ba Mang

Bridge **BA MANG**
Abutment **A1**

h1	h2	h3	h4	h5	h6	d1	d2
6.01	3.5	3	0.44	1.74	0.26	24.1	8.5

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	5.520	3.638	2.510	4.579	0.000	5.222	18.768		5.63	1.88
2	10.000	3.638	0.500	11.398	4.579	6.837	85.750		25.73	8.58
3	5.120	3.200	2.560	15.558	11.398	4.885	103.358		31.01	10.34
4	0.000	0.000	0.500				0.000		0.00	0.00
5	0.000	0.000	2.560				0.000		0.00	0.00
6	5.520	3.638	2.510	4.579	0.000	5.222	18.768		5.63	1.88
7	10.000	3.638	0.500	11.398	4.579	6.837	85.750		25.73	8.58
8	5.120	3.200	2.560	15.558	11.398	4.885	103.358		31.01	10.34
9			2.000				9.600	48.851	17.59	3.91
Extra								35.789	142	45
Footing	Wood pile		(m)	2931						
	Excavation		(m ³)	469						
	Binding		(m ³)	3.9						
	Stone masonry		(m ³)	17.6						
	Back fill		(m ³)	97.7						
Side slope	Geotextile		(m ²)	243						
	PVC Pipe		(m)	24						
	Blinding		(m ³)	45						
	Masonry		(m ³)	125						
							Length of footing	=	49	m

Abutment Ba Mang

Abutment A2

h1	h2	h3	h4	h5	h6	d1	d2
6.01	3.5	3	0.44	1.74	-0.26	24.1	8.5

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	5.520	3.638	2.510	4.579	0.000	5.222	18.768		5.63	1.88
2	10.000	3.638	0.500	11.398	4.579	6.837	85.750		25.73	8.58
3	5.120	3.200	2.560	15.558	11.398	4.885	103.358		31.01	10.34
4	0.000	0.000	0.500				0.000		0.00	0.00
5	0.000	0.000	2.560				0.000		0.00	0.00
6	5.520	3.638	2.510	4.579	0.000	5.222	18.768		5.63	1.88
7	10.000	3.638	0.500	11.398	4.579	6.837	85.750		25.73	8.58
8	5.120	3.200	2.560	15.558	11.398	4.885	103.358		31.01	10.34
9			2.000				9.600	48.851	17.59	3.91
Extra								35.789	142	45
Footing	Wood pile		(m)	2931						
	Excavation		(m ³)	469						
	Binding		(m ³)	3.9						
	Stone masonry		(m ³)	17.6						
	Back fill		(m ³)	97.7						
		Length of footing		=	49	m				
Side slope	Geotextile		(m ²)	243						
	PVC Pipe		(m)	24						
	Blinding		(m ³)	45						
	Masonry		(m ³)	125						

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_i}+S_{b_i})/2

r_i : Average radius of upper ellipse : r_i=(S_{a_{i-1}}+S_{b_{i-1}})/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*Dh₉²)*Dh₉/2 for block 9

W : Length of masonry's footing : W₉

W₉=2*3.14*R₉/4+a₉+2*3.14*R₈/4 , and

W_{Ex}=2*3.14*R₂/4+a₅+2*3.14*R₇/4

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

BA MANG BRIDGE: QUANTITIES OF EARTHWORKS SLOPE PROTECTION OF 25M BEHIND HEAD WALL

ABUTMENT A1:

Block	B	L	S	Thick	Masonry	Blinding (T=0.1m)	
	m	m	m ²	m	m ³	m ³	
10	5.61	25	140.31	0.30	42.09	14.03	Geotextile (m ²) = 2 x (L + S) x 2 = 336
11	10.01	25	250.31	0.30	75.09	25.03	
12	5.72	25	143.11	0.30	42.93	14.31	PVC pipe (m) = 2 x L / 2 x 1m = 25
15	5.61	25	140.31	0.30	42.09	14.03	
16	10.01	25	250.31	0.30	75.09	25.03	
17	5.72	25	143.11	0.30	42.93	14.31	
FOOTING	Wood pile	(m)	=		3000.00		LENGTH OF FOOTING L = 50 M
	Blinding	(m ³)	=		4.00		
	Stone masonry	(m ³)	=		18.00		
	Excavation	(m ³)	=		480.00		
	Back fill	(m ³)	=		370.00		
SIDE SLOPE	Stone masonry	(m ³)	=		320.24		
	Blinding	(m ³)	=		106.75		
	Geotextile	(m ²)	=		336.22		
	PVC pile	(m)	=		25.00		

No	h	Dh	S	L	Total (m ³)		
					Excavation	Filling	
5	1.74						Excavation = 2 x S x L
6	-0.26	2	9.6	25	480	370	Filling = Excavation - 2 x 25 x Dh x 1.1

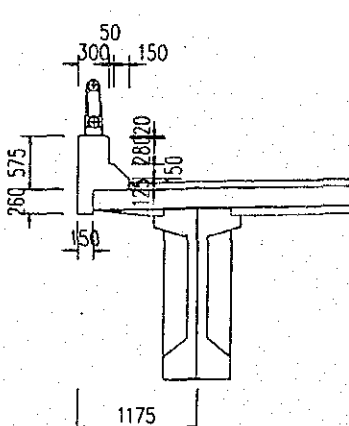
ABUTMENT A2:

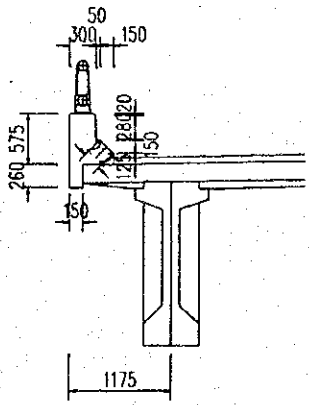
Block	B	L	S	Thick	Masonry	Blinding (T=0.1m)	
	m	m	m ²	m	m ³	m ³	
10	5.61	25	140.31	0.30	42.09	14.03	Geotextile (m ²) = 2 x (L + S) x 2 = 336
11	10.01	25	250.31	0.30	75.09	25.03	
12	5.72	25	143.11	0.30	42.93	14.31	PVC pipe (m) = 2 x L / 2 x 1m = 25
15	5.61	25	140.31	0.30	42.09	14.03	
16	10.01	25	250.31	0.30	75.09	25.03	
17	5.72	25	143.11	0.30	42.93	14.31	
FOOTING	Wood pile	(m)	=		3000.00		LENGTH OF FOOTING L = 50 M
	Blinding	(m ³)	=		4.00		
	Stone masonry	(m ³)	=		18.00		
	Excavation	(m ³)	=		480.00		
	Back fill	(m ³)	=		370.00		
SIDE SLOPE	Stone masonry	(m ³)	=		320.24		
	Blinding	(m ³)	=		106.75		
	Geotextile	(m ²)	=		336.22		
	PVC pile	(m)	=		25.00		

No	h	Dh	S	L	Total (m ³)		
					Excavation	Filling	
5	1.74						Excavation = 2 x S x L
6	-0.26	2	9.6	25	480	370	Filling = Excavation - 2 x 25 x Dh x 1.1

QUANTITY OF MISCELLANEOUS

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS E	Parapet	m3	25.53	
Form		Parapet	m2	160.20	
Re-bar		Parapet	ton	3.960	
Steel Railing			m	119.60	
Drainage		Pot	set	6	
		Pipe Φ 180	m	10.44	

Item	Formula	Quantity
1. Parapet CLASS "E"	<div style="text-align: center;">  </div> $A = \left\{ (0.300 \times 0.575 + 0.260 \times 0.150 + \frac{(0.125 + 0.275)}{2} \times 0.150) \times 2 \right\} \times 1175 = 1.021 \text{ m}^2$ $V = 1.021 \times 25.000 = 25.53 \text{ m}^3$	25.53 m3

Item	Formula	Quantity
Parapet	<div style="text-align: center;">  </div> $A = \frac{(0.575 + 0.260 + 0.15 + 0.125 + 0.212 + 0.280) \times 2}{2} \times 25.000 = 160.20 \text{ m}^2$	160.20 m2

Accessories

No.

Item	Formula	Quantity
1. Drainage	<p>TOTAL EACH</p> <p>EACH = 6 =</p> <p>PIPE = 1.74 x 6 =</p>	<p>6 each</p> <p>10.44 m</p>
2. Steel railing	<p>Length for one span</p> <p>L = 25.000 m</p> <p>Each = 1 span</p> <p>Length for abutment</p> <p>L = 4.9 x 4 = 19.60 m</p> <p>TOTAL LENGTH</p> <p>L = 25.000 x 1 x 2 x 2 + 19.600 =</p>	<p>119.600 m</p>

Re-bar Lighting

Per BRIDGE

SCHEDULE OF REINFORCEMENT (OF LIGHTING)													
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			
P2	16	113	380	488	280				1261	1.578			
P3	20	1000	300	1000					2300	2.466			
P4	16	282	285	282					849	1.578			
P5	16	208	285	208					701	1.578			
Total													

Total Weight

Total = _____ × 2 = _____ (kg)