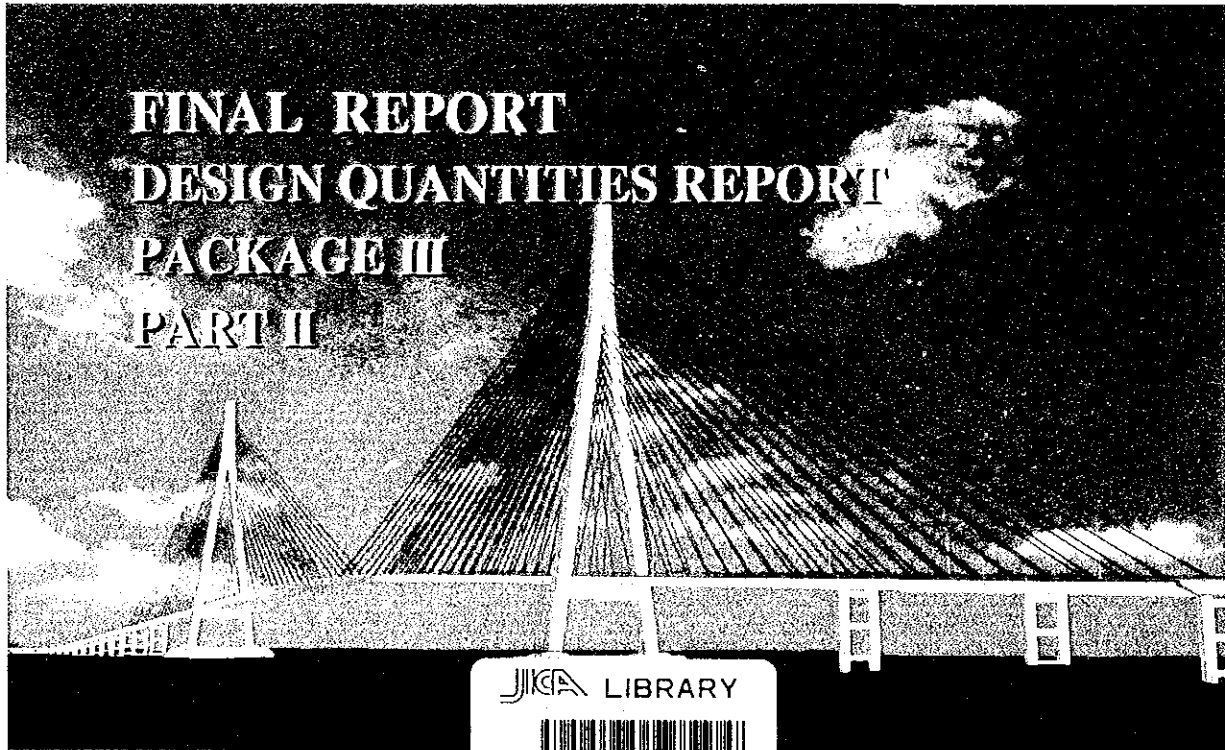


JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF TRANSPORT
SOCIALIST REPUBLIC OF VIET NAM

THE DETAILED DESIGN
ON
THE CAN THO BRIDGE CONSTRUCTION
IN
SOCIALIST REPUBLIC OF VIET NAM



FINAL REPORT
DESIGN QUANTITIES REPORT
PACKAGE III
PART II

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OCTOBER 2000

NIPPON KOEI CO., LTD.

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1161257 [9]

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Package III

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Notes

1. General

Unless otherwise noted these notes are applied to all design quantities.

2. Concrete

Concrete strengths are specified as followings base on 28 days cylinder strength.

Concrete class	Strength	Typical use
Concrete class B	40MPa	Cast in place PC box girder, Precast PC I girder
Concrete class C	35MPa	Hollow slab
Concrete class D	30MPa	Cast in place bored concrete pile, Deck slab, Diaphragm, Precast RC panel
Concrete class E	24MPa	Abutment, Pier, Pile cap, Footing
Concrete class G	15MPa	Lean concrete, Plain concrete

3. Reinforcement

Reinforcements are specified as SD345.

4. Prestressing

Prestressed tendons are specified as SWPR7B.

5. Anchor Bar

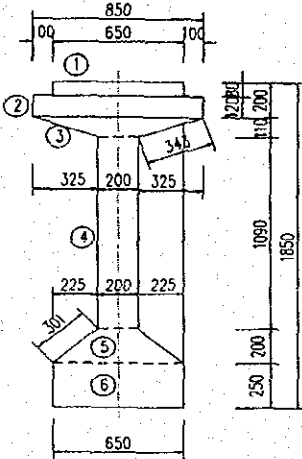
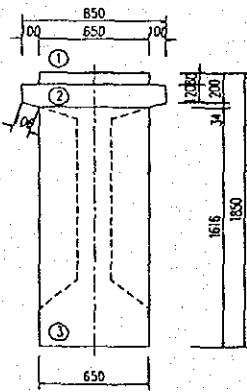
Anchor bars are specified as SS400.

3. Bridges

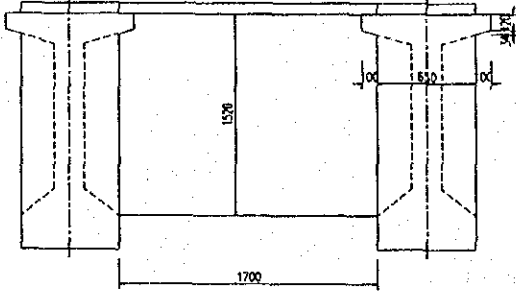
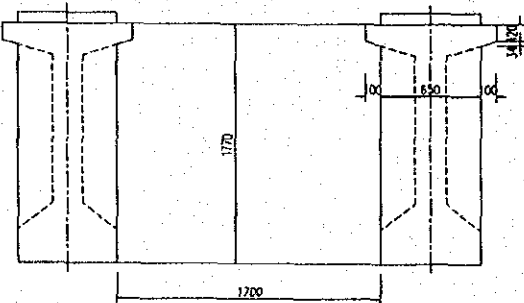
3.1. Cai Tac 1 bridge

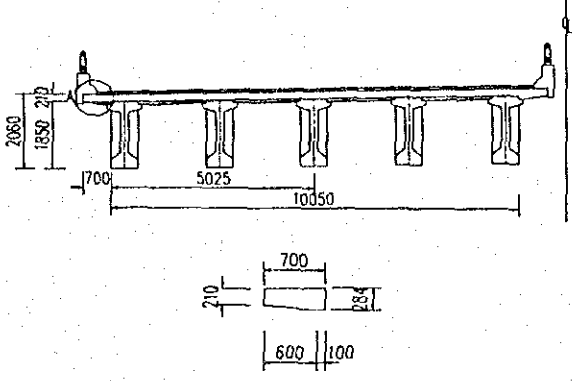
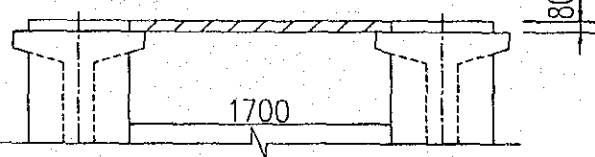
QUANTITY OF SUPERSTRUCTURE

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS B	Girder	m3	1,461.28	ock=400kgf/cm2
	CLASS D	Panel	m3	201.28	
		Deck Slab	m3	914.45	
		Cross beam	m3	286.70	
		Total	m3	1,402.43	
Total			m3	2,863.71	
Formworks		Girder	m2	9,857.21	
		Cross beam	m2	1,063.02	
		Deck Slab	m2	481.46	
		Panel	m2	2,752.80	
		Total	m2	14,154.49	
Scaffolding		Platform of construction	m2	4,627.53	
Reinforcement		Gider	ton	267.22	
		Cross beam	ton	19.89	
		Deck Slab	ton	225.89	
		Panel	ton	24.15	
		Total	ton	537.16	
PC Cable	12S12.7(B)	Longitudinal Tendons	ton	85.36	SWPR7B
	3S12.7	Transverse Tendons	ton	3.36	
Anchor	12S12.7(B)		set	500	
	3S12.7		set	288	
Steel shear key			set	600	
Sheathing	Φ80/85		m	9,188.80	
	Φ50/55		m	1,447.20	
Cement grout in sheathing		Φ80/85	m3	46.16	
		Φ50/55	m3	2.84	
		Total	m3	49.00	
Expansion Joint	50mm		m	43.00	
Bearing 600x300x57			set	100	
Anchorage Bar			set	80	
Pavement	Water Proofing t = 5mm		m2	3,977.50	
	Asphalt Concrete t = 70mm		m2	3,977.50	

Item	Formula	Quantity																																	
1. Girder CLASS "B"	<p>(1) Calculation of Sectional Area</p> <p>[1] Middle Section</p> <p>Summary of Sectional Area For ONE GIRDER</p> <table border="1" data-bbox="317 427 999 651"> <thead> <tr> <th>No</th> <th>Formula</th> <th>(m²)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.650×0.080</td> <td>= 0.052</td> </tr> <tr> <td>2</td> <td>0.850×0.120</td> <td>= 0.102</td> </tr> <tr> <td>3</td> <td>$1/2 \times 1.050 \times 0.110$</td> <td>= 0.058</td> </tr> <tr> <td>4</td> <td>1.090×0.200</td> <td>= 0.218</td> </tr> <tr> <td>5</td> <td>$1/2 \times 0.850 \times 0.200$</td> <td>= 0.085</td> </tr> <tr> <td>6</td> <td>0.250×0.650</td> <td>= 0.163</td> </tr> </tbody> </table> <p style="text-align: right;">Total Area 0.678 m²</p>  <p>[2] End Section</p> <p>Summary of Sectional Area For ONE GIRDER</p> <table border="1" data-bbox="317 1272 999 1417"> <thead> <tr> <th>No</th> <th>Formula</th> <th>(m²)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.650×0.080</td> <td>= 0.052</td> </tr> <tr> <td>2</td> <td>$0.850 \times 0.120 + 0.034/2 \times 1.500$</td> <td>= 0.128</td> </tr> <tr> <td>3</td> <td>0.650×1.616</td> <td>= 1.050</td> </tr> </tbody> </table> <p style="text-align: right;">Total Area 1.230 m²</p> 	No	Formula	(m ²)	1	0.650×0.080	= 0.052	2	0.850×0.120	= 0.102	3	$1/2 \times 1.050 \times 0.110$	= 0.058	4	1.090×0.200	= 0.218	5	$1/2 \times 0.850 \times 0.200$	= 0.085	6	0.250×0.650	= 0.163	No	Formula	(m ²)	1	0.650×0.080	= 0.052	2	$0.850 \times 0.120 + 0.034/2 \times 1.500$	= 0.128	3	0.650×1.616	= 1.050	
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	(2) Calculation of Concrete Volume																																											
	<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 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>1.230</td> <td>1.23</td> <td>0.5</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>1.230</td> <td>0.954</td> <td>5.300</td> <td>5.056</td> <td></td> </tr> <tr> <td>END</td> <td>1.230</td> <td>1.230</td> <td>0.500</td> <td>0.615</td> <td></td> </tr> <tr> <td>Total</td> <td></td> <td></td> <td>37.000</td> <td>28.563</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">No. of Girder 10 × 5 = 50</p> <p>V1 = 28.563 × 50 = 1,428.15 m³</p> <p>[2]. Diaphragm</p> <div style="text-align: center; margin: 10px 0;"> </div> <p>V2 = $(0.200 \times 1.366 + 0.65 \times 1.090) \times \frac{1}{2} \times 0.225$ $\times 2 \times 3 \times 10 \times 5 = 33.13 \text{ m}^3$</p> <p style="text-align: center;">Total V = 1428.150 + 33.132 = 1461.28 m³ 1461.28 m³</p>		Section No	Section Area	Average of Section Length	Length of Block	Concrete Volume	Remark	END	1.230	1.23	0.5	0.615		MIDDLE	0.678	0.954	5.300	5.056		MIDDLE	0.678	0.678	25.400	17.221		END	1.230	0.954	5.300	5.056		END	1.230	1.230	0.500	0.615		Total			37.000	28.563	
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2. Cross beam CLASS "D"	<p>(1) End Cross Beam</p> <div style="text-align: center; margin: 10px 0;"> </div>																																											

Item	Formula	Quantity
	$V1 = \left[\frac{1.770 \times 1.700 - (0.120 + 0.154) \times 2/2 \times 0.100}{4 \times 2} \right] \times 0.500 \times 2 = 23.85 \text{ m}^3$	
(2) Intermediate Cross Beam		
		
	$V2 = \left[\frac{1.700 \times 1.520 - (0.120 + 0.154) \times 2/2 \times 0.100}{4 \times 3 \times 5} \right] \times 0.200 \times 2 = 61.36 \text{ m}^3$	
(3) Connection Cross Beam		
		
	$V3 = \left[\frac{1.770 \times 1.700 - (0.120 + 0.154) \times 2/2 \times 0.100}{1.800 \times 4 \times 8 + 2 \times 4} \right] \times 10.05 \times 1.85 \times 0.2 = 201.49 \text{ m}^3$	
Sub-total	$V = 23.853 + 61.358 + 201.488 = 286.70 \text{ m}^3$	286.70 m ³

Item	Formula	Quantity
3. Deck Slab CLASS "D"	 <p style="text-align: center;">DETAIL "A"</p> $A = \frac{1}{2} \times \left[\left(\frac{0.210 + 0.284}{2} \times 0.600 \right) + \left(0.100 \times 0.284 \right) \right] \times 2 + (5.025 \times 0.210 \times 2) = 4.927 \text{ m}^2$ $V = 4.927 \times (37.000 + 37.200 + 37.200 + 37.200 + 37.000) = 914.45 \text{ m}^3$	914.45 m3
4. Panel concrete Class "D"	 $V = 1.700 \times 0.08 \times 37.000 \times 5 \times 8 = 201.28 \text{ m}^3$	201.28 m3

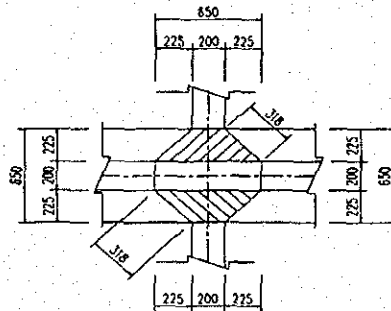
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(2) Calculation of Form Area

[1] A1-A2		Girder Length		37,000 m	
Section No	Section Length	Average of Section Length	Length of Block	Form Area	Remark
END	4.494	4.494	0.5	2.247	
MIDDLE	5.018	4.756	5.300	25.207	
MIDDLE	5.018	5.018	25.400	127.457	
END	4.494	4.756	5.300	25.207	
END	4.494	4.494	0.500	2.247	
Total			37,000	182,365	

$$A1 = 182.365 \times \text{No. of Girder } 50 = 9,118.25 \text{ m}^2$$

[2]. Diaphragm



$$A2 = \left(\frac{0.200 + 0.318 \times 2}{1/2 \times 3 \times 10} \right) \times 2 \times (1.090 + 1.366) = 615.97 \text{ m}^2$$

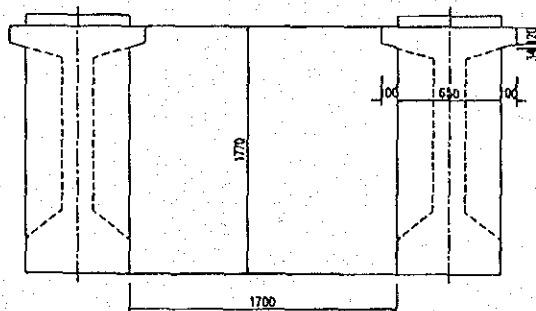
[3]. External form at girder ends

$$A3 = \left\{ \frac{0.65 \times 0.080}{0.034 \times 1/2} + \frac{0.850 \times 0.120}{0.650 \times 5.000} + \frac{(0.850 + 0.650)}{2 \times 10} \right\} \times 2 \times 5.000 = 122.99 \text{ m}^2$$

$$\text{Total } A = 9,118.3 + 615.965 + 122.990 = 9,857.21 \text{ m}^2$$

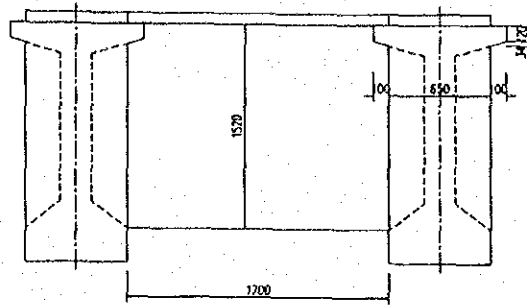
2. Cross Beam

(1). End Cross Beam



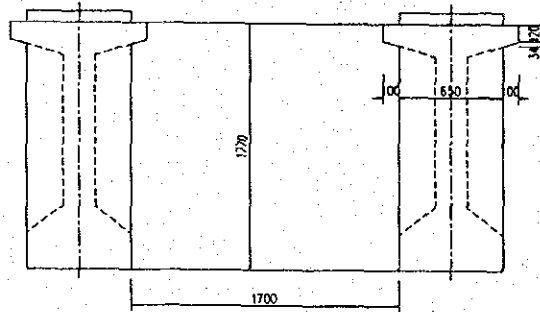
$$A1 = \left(\left[\frac{1.77 \times 1.700 - (0.120 + 0.154) \times 0.100}{8} \right] \times 2 + \frac{1.7 \times 0.500}{2} \right) \times 2 = 109.01 \text{ m}^2$$

(2). Intermediate Cross Beam



$$A2 = \left(\left[\frac{1.520 \times 1.700 - (0.120 + 0.154) \times 0.100}{8} \right] \times 2 + \frac{1.7 \times 0.200}{3 \times 5} \right) \times 5 = 654.38 \text{ m}^2$$

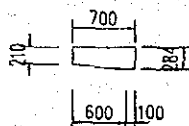
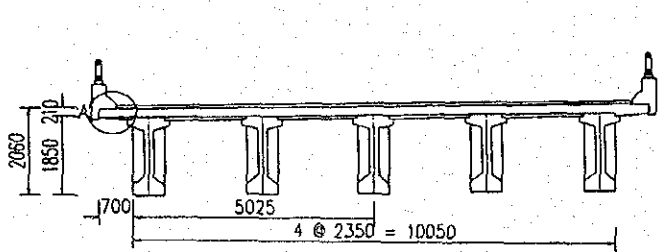
(3) Connection Cross Beam



$$A3 = \left(\left[\frac{1.770 \times 1.700 - (0.120 + 0.154) \times 0.100}{8} \right] \times \frac{2}{2} + 2.000 \times 1.700 \right) \times 4 = 299.62 \text{ m}^2$$

Sub-total A = 109.011 + 654.384 + 299.622 = 1063.02 m² 1,063.02 m²

3. Deck Slab



DETAIL "A"

$$A - 2 = (0.210 + 0.600) \times 2 \times 2 = 3.240 \text{ m}$$

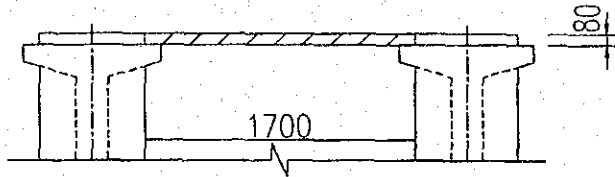
$$A = 3.240 \times (37.100 + 37.200 \times 2 + 37.100) = 481.46 \text{ m}^2 \quad 481.46 \text{ m}^2$$

4. Platform for construction

$$A = 26.100 \times 177.300 = 4,627.53 \text{ m}^2 \quad 4627.53 \text{ m}^2$$

5. Panel

$$A = (1.700 + 0.080 \times 2.000) \times 8 \times 5 \times \frac{37}{100} = 2752.8 \text{ m}^2$$



Item	Formula						Quantity			
PC CABLE 1) 12S12.7 (B)	1.A1-A2 For ONE GIRDER									
	CABLE VAR.	EACH LENGTH	CABLE NO.	EACH	TOTAL LENGTH	UNIT WEIGHT		WEIGHT		
	1	36.702	C1	1	36.702	9.290		340.962		
	2	36.714	C2	1	36.714	9.290		341.073		
	3	36.754	C3	1	36.754	9.290		341.445		
	4	36.784	C4	1	36.784	9.290		341.723		
	5	36.822	C5	1	36.822	9.290		342.076		
	TOTAL			5	183.776			1707.279		
	SUB-TOTAL WEIGHT OF PC CABLES per BRIDGE (A1-A2)									
	$W_p = 1707.279 \times 10 \times 5 =$								85,363.950 Kg	
	TENSION UNIT									
	$N_s = 5 \times 2 \times 10 \times 5 =$								EACH 500	
	2) 3S12.7	PC CABLE OF DIAPHRAGMS For A1-A2								
		LOCATION	EACH LENGTH	CABLE NO.	EACH	TOTAL LENGTH			UNIT WEIGHT	WEIGHT
		Connection One	10.050		144	1447.2			2.320	3357.504
		TOTAL			144	1447.200				3357.504
		TOTAL WEIGHT OF PC CABLES per BRIDGE (A1-A2)								
		$W_p = 3357.504$								3,357.504 kg
		TENSION UNIT								
		$N_s = 144 \times 2 =$								EACH 288
		SHEATHING P 80/85 183.776 x 10 x 5 =							9188.8 m	
		SHEATHING P 50/55 =							1447.20 m	
		STEEL SHEAR KEY 12 x 10 x 5 =							600 set	
CEMENT GROUT IN SHEATHING										
$3.14 \times 0.08 \times 0.08 / 4 \times 9188.80 =$							46.165 m3			
$3.14 \times 0.05 \times 0.05 / 4 \times 1447.20 =$							2.840 m3			
TOTAL =							49.005 m3			
ANCHOR 12S12.7B 10 x 10 x 5 =							500 set			
ANCHOR 3S12.7 18 x 2 x 4 x 2 =						288 set				

Re-bar girder

No.

A1-P1, P2-A2

For ONE GIRDER

SCHEDULE OF REINFORCEMENT (OF GIRDER)														
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						
G1	14	190	1957	117	1957	190			4411	1.208	184	980.4		
G2	14	190	1957	342	1957	190			4636	1.208	74	414.4	Average	
G3	14	190	1957	567	1957	190			4861	1.208	6	35.2		
G4	14	190	1957	567	1957	190			4861	1.208	6	35.2		
G5	14	200	238	154	567	154	238	200	1751	1.208	196	414.6		
G6	14	200	42	759	42	200			1243	1.208	196	294.3		
G7	14	200	301	183	567	183	301	200	1935	1.208	122	285.2		
G8	14	200	151	183	567	183	151	200	1635	1.208	74	146.2	Average	
G9	14	389	567	389					1345	1.208	6	9.8		
G10	22	6945	7450	7950	7450	6945			36740	2.984	6	657.8	Average	
G11	14	6945	7450	7950	7450	6945			36740	1.208	22	976.4		
G12	14	6950	7450	7950	7450	6950			36750	1.208	12	532.7		
G13	14	100	318	151	318	100			987	1.208	30	35.8		
G14	14	200	800						1000	1.208	12	14.5		
G15	16	1600							1600	1.578	78	196.9	Interior	
G16	16	1100							1100	1.578	78	135.4	Exterior	
G17	10	570							570	0.617	24	8.4		
G18	10	150							150	0.617	104	9.6		
G19	14	361	364	567	364	361			2017	0.888	184	329.6		
Total	Side span	Interior girder											5377.0	
		Exterior girder											5315.5	

Total Weight

Span	Mid/Side	Int/Ext	Nos.	Weight/C	Total	Remark
A1-P1	Side Span	Interior Beam	12	5377.03	64524.36	
P4-A2		Exterior Beam	8	5315.49	42523.92	
Total					107048.28	

Re-bar girder

No.

P1-P2, P2-P3, P3-P4

For ONE GIRDER

SCHEDULE OF REINFORCEMENT (OF GIRDER)														
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						
G1	14	190	1957	117	1957	190			4411	1.208	184	980.4		
G2	14	190	1957	342	1957	190			4636	1.208	74	414.4	Average	
G3	14	190	1957	567	1957	190			4861	1.208	6	35.2		
G4	14	190	1957	567	1957	190			4861	1.208	6	35.2		
G5	14	200	238	154	567	154	238	200	1751	1.208	196	414.6		
G6	14	200	42	759	42	200			1243	1.208	196	294.3		
G7	14	200	301	183	567	183	301	200	1935	1.208	122	285.2		
G8	14	200	151	183	567	183	151	200	1635	1.208	74	146.2	Average	
G9	14	389	567	389					1345	1.208	6	9.8		
G10	22	6945	7450	7950	7450	6945			36740	2.984	6	657.8	Average	
G11	14	6945	7450	7950	7450	6945			36740	1.208	22	976.4		
G12	14	6950	7450	7950	7450	6950			36750	1.208	12	532.7		
G13	14	100	318	151	318	100			987	1.208	30	35.8		
G14	14	200	800						1000	1.208	12	14.5		
G15	16	1600							1600	1.578	72	181.8	Interior	
G16	16	1100							1100	1.578	72	125.0	Exterior	
G17	10	570							570	0.617	24	8.4		
G18	10	150							150	0.617	104	9.6		
G19	14	361	364	567	364	361			2017	0.888	184	329.6		
Total	Mid span	Interior girder											5361.9	
		Exterior girder											5305.1	

Total Weight

Span	Mid/Side	Int/Ext	Nos.	Weight/G	Total	Remark
P1-P2	Mid span	Interior Beam	18	5361.89	96514.02	
P2-P3		Exterior Beam	12	5305.08	63660.96	
P3-P4						
Total					160174.98	

Per EACH

SCHEDULE OF REINFORCEMENT (OF DIAPHRAGM)													
(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					
I1	16	1700							1700	1.578	72	193.15	
I2	14	198	1959	410	1959	198			4724	1.208	28	159.78	
Sub-Total												352.93	
(2) INTERMEDIATE 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					
J1	16	1700							1700	1.578	64	171.69	
J2	14	198	1709	110	1709	198			3924	1.208	28	132.73	
Sub-Total												304.42	
(3) CONNECTION 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					
L1	16	1700							1700	1.578	96	257.53	
L2	14	245	1910	245					2400	1.208	112	324.71	
L3	14	198	1959	1128	1959	198			5442	1.208	56	368.14	
L4	14	198	1959	1200	1959	198			5514	1.208	28	186.51	
L5	16	9950							9950	1.578	2	31.40	
Sub-Total												1168.29	

3) Total Weight

SECTION	Nos.	Weight/EACH	Weight
END DIAPHRAGM	4	352.93	1411.72
INTERMEDIATE DIAPHRAGM	30	304.42	9132.60
CONNECTION DIAPHRAGM	8	1168.29	9346.32
Total			19890.64

Per BRIDGE

SCHEDULE OF REINFORCEMENT (OF 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	2328	65158.6	
S2	20	10850							10850	2.466	2328	62288.2	
S3	14	133	623	207					963	1.208	4956	5765.3	
S4	22	12000							12000	2.984	800	28646.4	
S5	14	27460							27460	1.208	600	19903.0	
S6	14	31606							31606	1.208	200	7636.0	
S6'	14	33606							33606	1.208	200	8119.2	
S7	25	11350							11350	3.853	150	6559.7	
S8	25	10850							10850	3.853	150	6270.8	
S9	12	210	145	210					565	0.888	30975	15540.8	
Total												225888.0	

Item	Formula	Quantity
1. Joint	Each length $L = 10.750$ Each = 2 Total length $L = 10.750 \times 2 \times 2 =$	43.000 m
2. Bearing pad	ELASTOMERIC 600x300x57 Each for one span Each = 10 TOTAL EACH $Each = 10 \times 5 \times 2 =$	EACH 100
3. Anchor bar	Each for one span Each = 8 Total each (fix) $Each = 8 \times 4 =$ Total each (move) $Each = 8 \times 6 =$ TOTAL $=$	EACH 32 EACH 48 80
4. Pavement	a. Water proofing 5mm $10.75 \times 37.00 \times 5 \times 2 = 3978 \text{ m}^2$ b. Asphalt concrete 70mm $10.75 \times 37.00 \times 5 \times 2 = 3978 \text{ m}^2$	3978 m2 3978 m2

QUANTITY TABLE OF ABUTMENTS

ITEMS		UNIT	ABUTMENT A1	ABUTMENT A2	TOTAL	
A- ABUTMENT						
PILE	NUMBER OF PILES	PILE	10.0	12.0	22	
	TOTAL LENGTH OF BORED PILES Ø1500MM	M	510.0	660.0	1170	
	CONCRETE CLASS "D "	M3	903.0	1168.4	2071	
	EXCAVATION MATERIALS	M3	901.2	1166.3	2067.6	
	REINFORCEMENT	D32	KG	0.0	27272.4	27272
		D28	KG	18563.0	7413.6	25977
		D25	KG	27186.0	28435.2	55621
		D22	KG	2785.0	3639.6	6425
		D16	KG	334.0	400.8	735
		D10	KG	8125.0	10976.4	19101
TOTAL	KG	56993.0	78138.0	135131		
ABUTMENT	CONCRETE CLASS "E "	M3	526.4	589.7	1116	
	REINFORCEMENT	D25	KG	11593.7	12961.1	24555
		D22	KG	3907.5	4980.5	8888
		D20	KG	6536.9	5838.0	12375
		D18	KG	0.0	649.8	650
		D16	KG	4084.0	4369.1	8453
		D14	KG	2695.4	3110.9	5806
		D10	KG	145.4	135.1	281
	TOTAL	KG	28962.9	32044.5	61007	
	LEAN CONCRETE CLASS "G"	M3	16.9	16.6	34	
	FORM	M2	517.3	619.9	1137.1	
	BLINDING STONE	M3	33.9	33.2	67	
	EXCAVATION FOR FOUNDATION	M3	881.3	1046.1	1927.4	
	BACK FILL	M3	463.7	628.5	1092.1	
	SCAFFOLDING WORK	H < 4m	M2	142.4	142.4	284.8
4m ≤ H < 30m		M2	421.4	544.1	965.5	
SUPPORT	M3	7.2	8.5	15.7		
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	8653.2	4738.2	13391	
	BLINDING AGGREGATE T=100MM	M3	11.5	6.3	18	
	STONE MASONRY T=300MM	M3	51.9	28.4	80	
	EXCAVATION	M3	822.9	457.0	1280	
	BACK FILL	M3	428.3	203.0	631	
SIDE SLOPE	STONE MASONRY T=300MM	M3	527.1	429.5	957	
	BLINDING AGGREGATE T=100MM	M3	183.2	145.5	329	
	GEOTEXTILE	M2	608.5	306.9	915	
	PVC PILE Ø50MM DIA., L=1000MM	M	72.1	39.5	112	

QUANTITY SURVEYING ABUTMENT A1

No.

Item	Formula	Quantity
1) Concrete		
* BackWall		
v1 =	24.10 x 2.24 x 0.40 =	21.55 m3
* Frontwall		
v2 =	24.10 x ((3.14 + 3.38) / 2 - 1.50 - 0.10 ^2 / 2) =	117.75 m3
* Corbel		
v3 =	0.30 x (0.30 + 0.60) / 2 x 23.10 =	3.12 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 + 1.30 x (1.05 + 2.53) / 2 x 0.50 x 2 =	21.01 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 =	24.10 x 7.50 x 2.00 - 10 x pi x 0.75 ^2 x 0.1 =	359.73 m3
Total		526.4 m3
2) Form		
* BackWall		
a1 =	2.00 x 2.24 x 24.10 - 2.24 x (0.50 + 0.50) x 2 =	103.26 m2
* Frontwall		
a2 =	24.1 x (3.14 + 3.381) - (0.5 + 0.5) x 3.381 x 2 + 3.26 x 1.5 x 2 =	160.18 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 5.375 x 2 =	7.60
* Wingwall		
a5 =	2 x (3.5 x (5.375 + 5.30) + 1.3 x (1.05 + 2.53) + 0.5 x (1.05 + 1.95 + 2.78) - 0.5 x 5.38) =	84.43 m2
* Parapet		
a5 = (	5.2 x (0.5 + 0.3 + 0.05) + 1.4142 x 0.15 + 2 x 0.17875) x 2 =	12.28 m2
* Footing		
a 6 =	2 x (24.100 + 7.500) x 2.00 =	126.40 m2
Total		510.9 m2

QUANTITY SURVEYING ABUTMENT A1

No.

Item	Formula	Quantity
3) Scaffolding:	* H<=4m A2 = { 2 x (24.10 + 7.50) + 8 } x 2 =	142.4 m2
	* 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	421.4 m2
4) Support	= (7.78 - 1.55 + 4.78) x 1.30 / 2 x 0.50 x 2 =	7.2 m3
5) Lean Concrete	* Concrete class G v = 0.1 x { (24.10 + 0.2) x (7.50 + + 0.2) - 10 x 1/4 x pi x 1.50 ^2 } =	16.9 m3
	* Form A = 0.1 x { (24.10 + 0.2) + (7.50 + 0.20) } x 2 =	6.40 m2
6) Blinding Stone	v = 0.2 x { (24.10 + 0.2) x (7.50 + + 0.2) - 10 x 1/4 x pi x 1.50 ^2 } =	33.9 m3
7) Bored Pile	* Concrete = 10 x 1/4 x pi x 1.50 x 1.50 x (51.00 + 0.10) =	903.0 m3
	* Excavation Length N<20: = 35.0 x 10 = 350.0 m 20<N<40: = 10.0 x 10 = 100.0 m 40<N: = 6.0 x 10 = 60.0 m Total = 510.0 m	
	* Excavation Volume = 10 x 1/4 x pi x 1.50 x 1.50 x 51.00 =	901.2 m3
8) Earthworks	* Excavation for foundation = 2.54 / 6 x { (9.50 x 26.10) + (14.58 x 31.18) + (9.50 + 14.58) x (26.10 + 31.18) } = 881.3 m3	
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volum = 10 x pi / 4 x 1.50 x 1.50 x 0.400 = 7.07 m3 Excess Soil = 417.63 m3	
	* Back Fill = 463.7 m3	
9) Approach Slab	* Concrete = 23.04 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 = 43.24 m3	
	* Lean Concrete = (0.30 + 0.28 + 5.20) x 23.04 x 0.1 = 13.3 m3	
	* Asphaltic Joint Filler = { 0.30 x (0.02 + 0.06) / 2 + 0.30 x 0.02 } x 23.04 = 0.41 m3	
	* Form = (2 x (6.00 x 0.30) + 11.52 x (0.30 + 0.50) + (0.50 + 0.30) x 0.50 x 0.20 x 2) x 2 - 6.00 x 0.30 = 24.15 m2	

QUANTITY SURVEYING ABUTMENT A2

No.

Item	Formula						Quantity
1) Concrete							
* BackWall	v1 =	24.10	x	2.24	x	0.40	= 21.55 m3
* Frontwall	v2 =	24.10	x ((	4.74	+	4.98	)/ 2
	x	1.50	-	0.10	^2 /	2	= 175.59 m3
* Corbel	v3 =	0.30	x ((	0.30	+	0.60	)/ 2
				x	23.10		= 3.12 m3
* Haunch	v4 =	6.98	x	0.50	x	0.50	/ 2 x 2
							= 1.74 m3
* Wingwall	v5 = (	3.50	x ((	6.98	+	6.92	)/ 2
	+	1.20	x ((	1.05	+	2.56	)/ 2
	x		x	0.50	x	2	= 26.48 m3
* Parapet	v7 = (	0.50	x	0.30	+	0.20	^2
	-	0.15	^2 /	2	)x	5.10	x 2
							= 1.82 m3
* Footing	v6 =	24.10	x	7.50	x	2.00	
	-	12	x	pi	x	0.75	^2 x 0.1
							= 359.38 m3
							Total 589.7 m3
2) Form							
* BackWall	a1 =	2.00	x	2.24	x	24.10	-
	-	2.24	x ((	0.50	+	0.50	)x 2
							= 103.26 m2
* Frontwall	a2 =	24.1	x ((	4.74	+	4.981)
	- (	0.5	+	0.5	)x	4.981	x 2
	+	4.86	x	1.5	x	2	= 238.90 m2
* Corbel	a3 = (	0.3	+	(	0.3	^2 +	0.3
				x	23.1	=	16.73 m2
* Haunch	a4 =		+	(	0.5	^2 +	0.5
	x	6.975	x	2	=	9.86	
* Wingwall	a5 =	2 x (	3.5	x ((	6.975	+	6.92)
	+		1.2	x ((	1.05	+	2.56)
	+	0.5	x ((	1.05	+	1.91	+
	-		0.5	x	6.98	]=	106.25 m2
* Parapet	a5 = (	5.1	x ((	0.5	+	0.3	+
	+		1.4142	x	0.15	+	0.05)
	+		2	x	0.17875	]x	2
							= 12.06 m2
* Footing	a 6 =	2 x (	24.100	+	7.500	)x	2.00
							126.40 m2
							Total 613.5 m2

QUANTITY SURVEYING ABUTMENT A2

No.

Item	Formula	Quantity
3) Scaffolding:	* H<=4m $A2 = \left\{ \frac{2 \times (24.10 + 7.50)}{2} + \frac{8}{2} \right\}$	142.4 m2
	* 4m < H <= 30m $A2 = \{ [(24.1+2) + (5.35+1.5+2) + (0.5+2) + (5.35+1-1) + (24.1-2 \times 1.5) + (5.35-1+1) + (0.5+2) + (5.35+1.5+2)] \times (2.04+4.94) \}$	544.1 m2
4) Support	$= \left(\frac{9.40 - 1.55}{2} + \frac{6.36}{2} \right) \times 1.20$	8.5 m3
5) Lean Concrete	* Concrete class G $v = \left\{ \frac{0.1 \times \left[\frac{24.10 + 0.2}{12} \times \left(\frac{7.50 + 1.50}{2} \right)^2 \right] \right\}$	16.6 m3
	* Form $A = \left\{ \frac{0.1 \times \left[\frac{24.10 + 0.2}{2} + \frac{7.50}{2} \right] \right\}$	6.40 m2
6) Blinding Stone	$v = \left\{ \frac{0.2 \times \left[\frac{24.10 + 0.2}{12} \times \left(\frac{7.50 + 1.50}{2} \right)^2 \right] \right\}$	33.2 m3
7) Bored Pile	* Concrete $= 12 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times \left(\frac{55.00 + 0.10}{2} \right)$	1168.4 m3
	* Excavation Length N<20: = 30.0 x 12 = 360.0 m 20<N<40: = 21.0 x 12 = 252.0 m 40<N: = 4.0 x 12 = 48.0 m Total = 660.0 m	
	* Excavation Volume $= 12 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 55.00$	1166.3 m3
	* Excavation for foundation $= \frac{2.89}{15.28} \times \left[\frac{6 \times \left(\frac{9.50 \times 26.10}{31.88} + \frac{9.50 + 15.28}{2} \right) \right]$	1046.1 m3
	* Excess Soil = Lean Concrete + Blinding Stone + Footing Volume + Pile Occupied Volume Pile Occupied Volum = 12 x pi/4 x 1.50 x 1.50 = 8.48 m3 Excess Soil = 1046.1 - 8.48 = 417.63 m3	
8) Earthworks	* Back Fill = 628.5 m3	
	* Concrete $= \frac{23.04 \times \left[\frac{6.00 \times 0.30}{0.50} + \frac{0.50}{2} \right] \times 2 \times 0.20}{2}$	43.24 m3
	* Lean Concrete $= \left(\frac{0.30 + 0.28 + 5.20}{23.04 \times 0.1} \right)$	13.3 m3
	* Asphaltic Joint Filler $= \left\{ \frac{0.30 \times (0.02 + 0.06)}{2} + \frac{0.30 \times 0.02}{23.04} \right\} \times 23.04$	0.41 m3
	* Form $= \left(\frac{2 \times (6.00 \times 0.30)}{0.50} + \frac{0.50}{2} \right) \times 0.30 \times 23.04$	24.15 m2
9) Approach Slab		

REINFORCEMENT OF ABUTMENT A1
(For 1 Abument)

No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
A1	14	2800	289	1.208	977.5
A2	14	24752	18	1.208	538.2
A3	14	720	188	1.208	163.5
A4	16	1837	97	1.578	281.2
A5	14	690	97	1.208	80.9
A6	14	23126	3	1.208	83.8
F1	25	10800	97	3.853	4036.4
F2	25	7300	95	3.853	2672.1
F3	25	8174	97	3.853	3055.0
F4	25	5000	95	3.853	1830.2
F5	20	8050	16	2.466	317.6
F6	20	25200	16	2.466	994.3
F7	16	4830	144	1.578	1097.5
F8	20	28700	30	2.466	2123.2
F9	20	25900	30	2.466	1916.1
W1	22	4385	94	2.984	1230.0
W2	22	5326	97	2.984	1541.6
W3	16	5256	97	1.578	804.5
W4	14	1822	141	1.208	310.3
W5	16	24874	14	1.578	549.5
W6	14	24752	18	1.208	538.2
W7	16	1790	97	1.578	274.0
K1	20	5370	12	2.466	158.9
K2	20	2950	16	2.466	116.4
K3	20	4050	12	2.466	119.8
K4	22	7710	28	2.984	644.2
K5	22	4385	20	2.984	261.7
K6	20	5170	24	2.466	306.0
K7	16	6334	12	1.578	119.9
K8	16	5160	10	1.578	81.4
K9	16	1285	42	1.578	85.2
K9a	22	5405	8	2.984	129.0
K9b	16	2294	42	1.578	152.0
K9c	14	626	4	1.208	3.0
K10	16	2360	2	1.578	7.4
K11	20	2250	22	2.466	122.1
K12	16	7605	28	1.578	336.0
K13	16	5100	24	1.578	193.1
K14	10	755	180	0.617	83.9
K15	20	4796	10	2.466	118.3
K16	16	4726	10	1.578	74.6
K17	22	2303	8	2.984	55.0
K18	16	2198	8	1.578	27.7
K19	22	3850	4	2.984	46.0
K20	20	3809	26	2.466	244.2
K21	10	743	44	0.617	20.2
R1	10	400-700	80-50	0.617	41.3
	D25	11594	(kg)		
	D22	3908	(kg)		
	D20	6537	(kg)		
	D18	0	(kg)		
	D16	4084	(kg)		
	D14	2695	(kg)		
	D10	145	(kg)		
	TOTAL	28963	(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	28	12000	32	4.834	1856.3
N2	25	12000	48	3.853	2219.3
N3	25	8100	16	3.853	499.3
N4	22	4229	6	2.984	75.7
N5	22	4248	16	2.984	202.8
N6	10	152053	1	0.617	93.8
N7	10	174861	1	0.617	107.9
N8	10	710848	1	0.617	438.6
N9	10	4105	68	0.617	172.2
N10	16	1322	16	1.578	33.4
TOTAL		D = 32	0.0		(kg)
		D = 28	1856.3		(kg)
		D = 25	2718.6		(kg)
		D = 22	278.5		(kg)
		D = 16	33.4		(kg)
		D = 10	812.5		(kg)
	TOTAL		5699.3		(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	192.3
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	2785	289	1.208	972.3
A2	14	24752	18	1.208	538.2
A3	14	720	144	1.208	125.2
A4	16	1837	97	1.578	281.2
A5	14	690	97	1.208	80.9
A6	14	23552	4	1.208	113.8
F1	25	10800	97	3.853	4036.4
F2	25	7300	95	3.853	2672.1
F3	25	8174	97	3.853	3055.0
F4	25	5000	95	3.853	1830.2
F5	20	8050	16	2.466	317.6
F6	20	25200	16	2.466	994.3
F7	16	4830	144	1.578	1097.5
F8	20	28700	30	2.466	2123.2
F9	20	25900	30	2.466	1916.1
W1	22	5485	94	2.984	1538.5
W2	22	6955	97	2.984	2013.1
W3	16	6850	97	1.578	1048.5
W4	14	1822	212	1.208	466.6
W5	16	24856	21	1.578	823.7
W6	14	24752	25	1.208	747.5
W7	16	1860	97	1.578	284.7
K1	22	5305	12	2.984	190.0
K2	22	3085	16	2.984	147.3
K3	22	4185	18	2.984	224.8
K4	25	9389	30	3.853	1085.3
K5	25	4587	12	3.853	212.1
K6	22	5205	36	2.984	559.1
K7	18	6120	12	1.998	146.7
K8	16	6945	10	1.578	109.6
K9	16	1285	40	1.578	81.1
K9a	22	5305	8	2.984	126.6
K9b	16	2294	40	1.578	144.8
K9c	14	626	4	1.208	3.0
K10	16	2370	2	1.578	7.5
K11	20	2250	20	2.466	111.0
K12	16	9195	30	1.578	435.3
K13	18	5135	36	1.998	369.4
K14	10	690	252	0.617	107.3
K15	22	4892	8	2.984	116.8
K16	18	5707	8	1.998	91.2
K17	16	2183	8	1.578	27.6
K18	16	2183	8	1.578	27.6
K19	22	5388	4	2.984	64.3
K20	18	5318	4	1.998	42.5
K21	25	4541	4	3.853	70.0
K22	14	875	60	1.208	63.4
K23	20	3810	40	2.466	375.8
R1	10	4500	10	0.617	27.8
	D25	12961	(kg)		
	D22	4981	(kg)		
	D20	5838	(kg)		
	D18	650	(kg)		
	D16	4369	(kg)		
	D14	3111	(kg)		
	D10	135	(kg)		
	TOTAL	32045	(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	30	6.313	2272.7
N2	28	8520	15	4.834	617.8
N3	25	12000	45	3.853	2080.6
N3'	25	5000	15	3.853	289.0
N4	22	4203	6	2.984	75.3
N5	22	4229	3	2.984	37.9
N6	22	4248	15	2.984	190.1
N7	10	152053	1	0.617	93.8
NR	10	323113	1	0.617	199.4
N9	10	650027	1	0.617	401.1
N10	10	4105	87	0.617	220.4
N11	16	1322	16	1.578	33.4
TOTAL	D = 32		2272.7		(kg)
	D = 28		617.8		(kg)
	D = 25		2369.6		(kg)
	D = 22		303.3		(kg)
	D = 16		33.4		(kg)
	D = 10		914.7		(kg)
	TOTAL		6511.5		(kg)

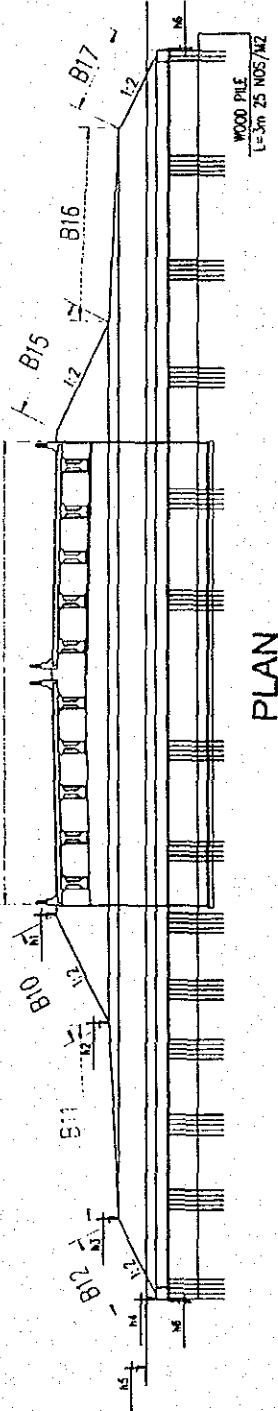
REINFORCEMENT OF APPROACH SLAB FOR ABUMENT
(For 1 Direction)

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)

EARTHWORKS SLOPE PROTECTION

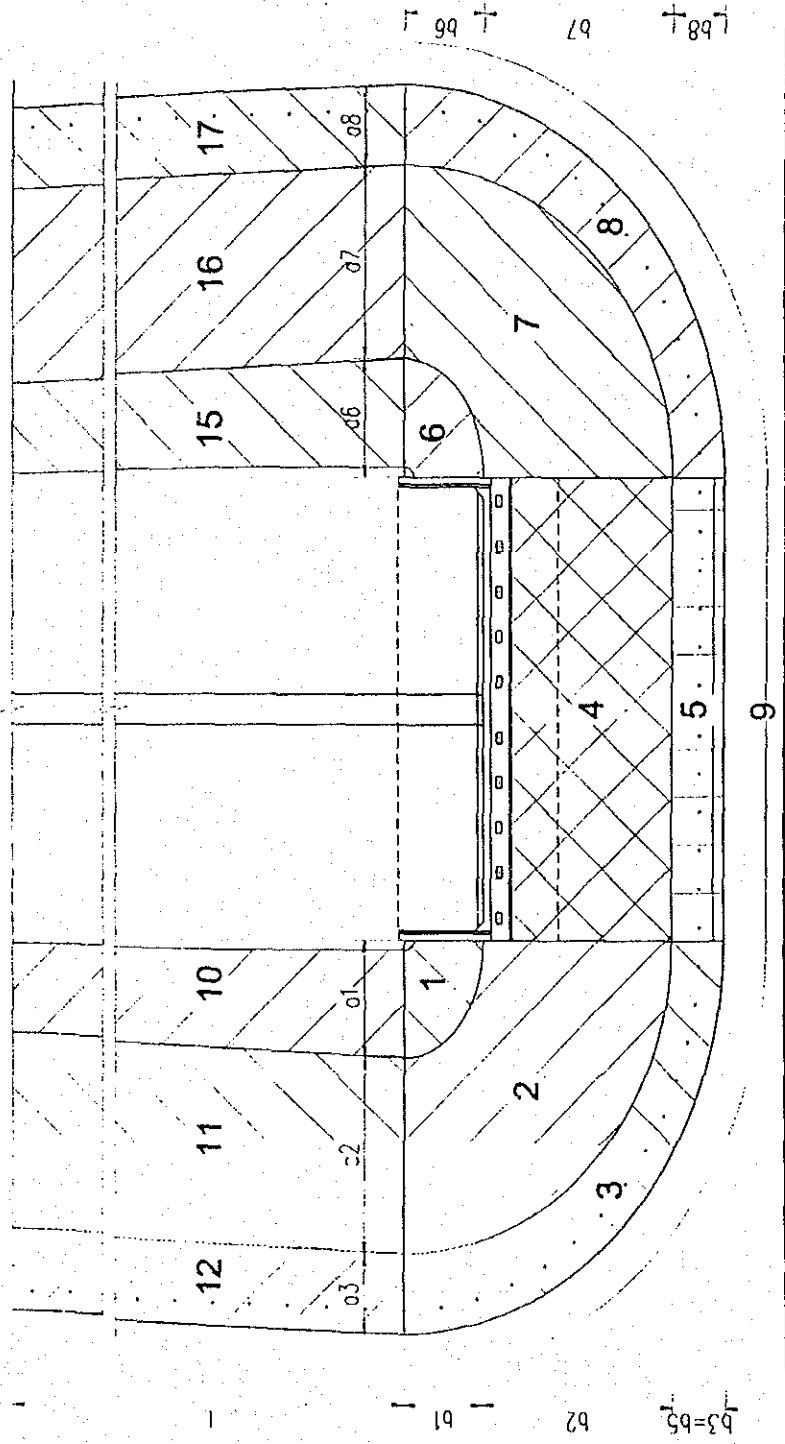
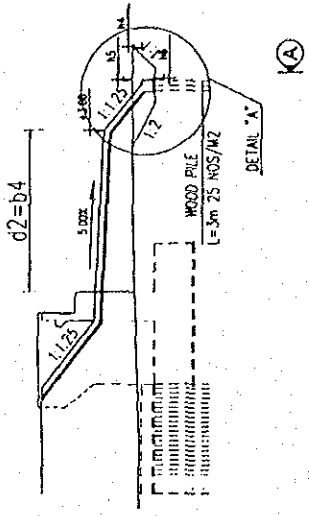
A-A

d1=d4=05



PLAN

SIDE ELEVATION



abutment Cai Tac 1

Bridge CAITAC 1

Abutment AI

h1	h2	h3	h4	h5	h6	d1	d2
7.46	3.5	2.9	0.81	1.31	0.11	24.1	10.05

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	8.420	5.450	3.960	6.935	0.000	7.986	43.475		13.04	4.35
2	12.000	12.000	0.600	18.935	6.935	12.015	244.000		73.20	24.40
3	4.180	2.613	2.090	22.331	18.935	3.988	129.181		38.75	12.92
4	24.100	10.050	0.600				242.636		72.79	24.26
5	24.100	2.613	2.090				80.630		24.19	8.06
6	8.420	5.450	3.960	6.935	0.000	7.986	43.475		13.04	4.35
7	12.000	12.000	0.600	18.935	6.935	12.015	244.000		73.20	24.40
8	4.180	2.613	2.090	22.331	18.935	3.988	129.181		38.75	12.92
9			1.200				4.320	94.220	33.92	7.54
Extra								83.556	381	123
Footing	Wood pile		(m)	5653						
	Excavation		(m ³)	407						
	Binding		(m ³)	7.5						
	Stone masonry		(m ³)	33.9						
	Back fill		(m ³)	113.1						
Side slope	Geotextile		(m ²)	423						
	PVC Pipe		(m)	47						
	Blinding		(m ³)	123						
	Masonry		(m ³)	381						
								Length of footing =	94	m

abutment Cai Tac 1

Abutment A2

h1	h2	h3	h4	h5	h6	d1	d2
5.98	0.61	0.61	0.61	1.74	-0.09	11.24	7.213

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	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			1.830				8.317	28.970	10.43	2.32
Extra	8.980	5.800	4.240	7.390				23.205	57	18
Footing	Wood pile		(m)	1738						
	Excavation		(m ³)	241						
	Binding		(m ³)	2.3						
	Stone masonry		(m ³)	10.4						
	Back fill		(m ³)	53.0						
Side slope	Geotextile		(m ²)	23						
	PVC Pipe		(m)	14						
	Blinding		(m ³)	18						
	Masonry		(m ³)	57						
Length of footing =									29	m

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=(Sa_i+Sb_i)/2

r_i : Average radius of upper ellipse : r_i=(Sa_{i-1}+Sb_{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*Dh₉)*Dh₉/2 for block 9

W : Length of masonry's footing : W₉

W₉=2*3.14*R₃/4+a₅+2*3.14*R₈/4 , and

W_{Ex}=2*3.14*R₂/4+a₅+2*3.14*R₇/4 (for A1)

W_{Ex}=2*3.14*R_{Ex}/4+a₄+2*3.14*R_{Ex}/4 (for A2)

Masonry_i = 0.3*Sxq_i

Blinding_i = 0.1*Sxq_i

Geotextile = Sxq₃ +Sxq₅ +Sxq₈ +W_{Ex}*1 (for A1)

= Sxq₃ +Sxq₅ +Sxq₈ +W_{Ex}*(1+1.6+1) (for A2)

PVC Pipe = W₉/2

Wood Pile = W₉*0.8*25*3

Excavation = W₉*Sxq₉.

Filling = Excavation-W₉*Dh₉*1.1

CAI TAC 1 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	Geotextile (m2) = 2 x (L + (1 + 1.72) x L) = 186
11	0.00	25	0.00	0.30	0.00	0.00	
12	0.00	25	0.00	0.30	0.00	0.00	PVC pipe (m) = 2 x L/2 x 1m = 25
15	12.01	25	300.19	0.30	90.06	30.02	
16	0.00	25	0.00	0.30	0.00	0.00	
17	0.00	25	0.00	0.30	0.00	0.00	
FOOTING	Wood pile	(m)	=	3000.00			LENGTH OF FOOTING L= 50 M
	Blinding	(m3)	=	4.00			
	Stone masonry	(m3)	=	18.00			
	Excavation	(m3)	=	415.87			
	Back fill	(m3)	=	315.22			
SIDE SLOPE	Stone masonry	(m3)	=	180.12			
	Blinding	(m3)	=	60.04			
	Geotextle	(m2)	=	186.00			
	PVC pile	(m)	=	25.00			

No	h	Dh	S	L	Total (m3)		
					Excavation	Filling	
5	1.74						Excavation = 2 x S x L
6	-0.09	1.8	8.31735	25	416	315	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	8.85	25	221.37	0.30	66.41	22.14	Geotextile (m2) = 2 x (L + S12) = 284
11	12.01	25	300.37	0.30	90.11	30.04	
12	4.67	25	116.83	0.30	35.05	11.68	PVC pipe (m) = 2 x L/2 x 1m = 25
15	8.85	25	221.37	0.30	66.41	22.14	
16	12.01	25	300.37	0.30	90.11	30.04	
17	4.67	25	116.83	0.30	35.05	11.68	
FOOTING	Wood pile	(m)	=	3000.00			LENGTH OF FOOTING L= 50 M
	Blinding	(m3)	=	4.00			
	Stone masonry	(m3)	=	18.00			
	Excavation	(m3)	=	216.00			
	Back fill	(m3)	=	150.00			
SIDE SLOPE	Stone masonry	(m3)	=	383.15			
	Blinding	(m3)	=	127.72			
	Geotextle	(m2)	=	283.67			
	PVC pile	(m)	=	25.00			

No	h	Dh	S	L	Total (m3)		
					Excavation	Filling	
5	1.31						Excavation = 2 x S x L
6	0.11	1.2	4.32	25	216	150	Filling = Excavation - 2 x 25 x Dh x 1.1

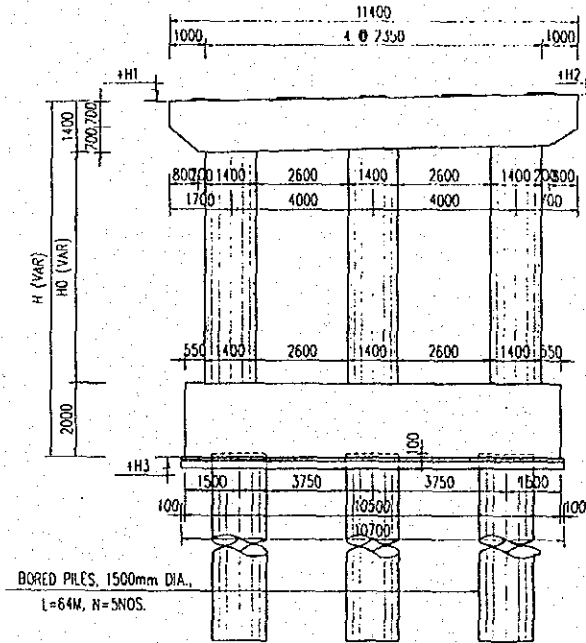
QUANTITY TABLE OF PIERS

Items		Unit	Pier 1	Pier 2	Pier 3	Pier 4	Total	
Pile	Number of piles	Pile	10	10	10	10	40	
	Total length bored piles D=1500mm Dia.	m	49.0	53.0	53.0	53.0	208.0	
	Concrete piles class "D"	m ³	867.7	938.4	938.4	938.4	3682.7	
	Reinforcement	D10	kg	7813.0	8359.0	8359.0	8282.0	32813.0
		D16	kg	334.0	334.0	334.0	334.0	1336.0
		D22	kg	2789.0	2912.0	2912.0	2915.0	11528.0
		D25	kg	29061.0	24867.0	24867.0	31219.0	110014.0
		D28	kg	0.0	8121.0	8121.0	0.0	16242.0
		Total	kg	39997.0	44593.0	44593.0	42750.0	171933.0
	Excavation	m ³	956.2	1009.7	1010.8	1014.3	3991.1	
Pier	Concrete class "E"	m ³	400.8	397.1	406.3	406.3	1610.4	
	Lean concrete class "G"	m ³	11.9	11.9	0.0	0.0	23.7	
	Blinding stone	m ³	23.7	23.7	0.0	0.0	47.5	
	Reinforcement	D10	kg	82.6	82.6	82.6	82.6	330.4
		D14	kg	3432.4	3432.4	3562.8	3432.4	13860.0
		D16	kg	1738.2	1738.2	1738.2	1738.2	6952.8
		D20	kg	1444.0	1444.0	1444.0	1444.0	5776.0
		D22	kg	7414.8	7414.8	7414.8	7414.8	29659.2
		D28	kg	3490.2	3490.2	3490.2	3490.2	13960.8
		D32	kg	15812.2	19635.6	21226.4	16448.4	73122.6
			Total	kg	33414.4	37237.8	38959.0	34050.6	143661.8
	Form	Curve	m ²	134.1	123.5	149.9	149.9	557.3
		Flat	m ²	245.7	245.7	245.7	245.7	982.7
	Scaffolding work	H < 4m	m ²	254.4	254.4	254.4	254.4	1017.6
		4m ≤ H < 30m	m ²	271.3	247.5	307.0	307.0	1132.9
	Support	m ³	146.3	134.8	163.6	163.6	608.3	
	Earth work	Excavation for foundation	m ³	2316.2	1698.6	1166.2	1221.8	6402.8
		Blinding Concrete class "G"	m ³	0.0	0.0	68.2	68.2	136.4
		Rip rap	m ³	0.0	0.0	785.5	839.2	1624.7
		Back fill	m ³	1959.6	1350.9	0.0	0.0	3310.5
Cofferdams	Sheet pile Larsen IV	m	0.0	0.0	2328.0	2328.0	4656.0	
	Steel pile I 400	m	0.0	0.0	480.0	480.0	960.0	
	Brace C 300	m	0.0	0.0	299.1	299.1	598.2	

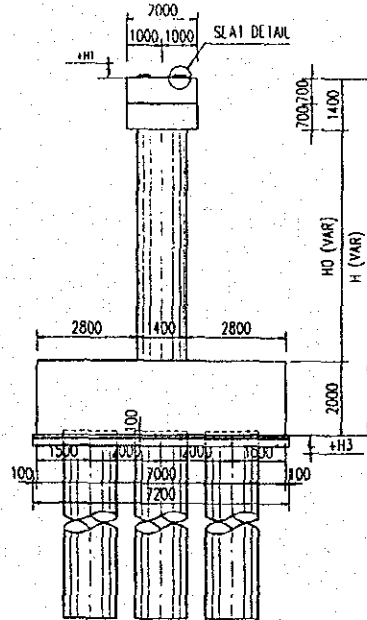
PIERS P1 & P2 & P3 & P4 OF CAI TAC 1 BRIDGE

(SCALE 1:200)

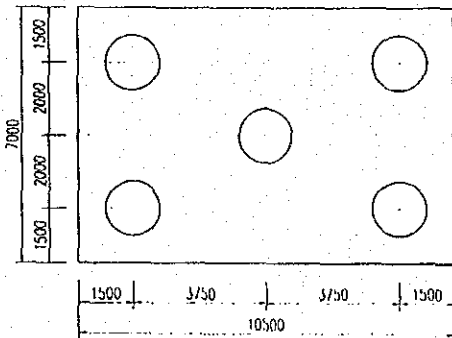
ELEVATION



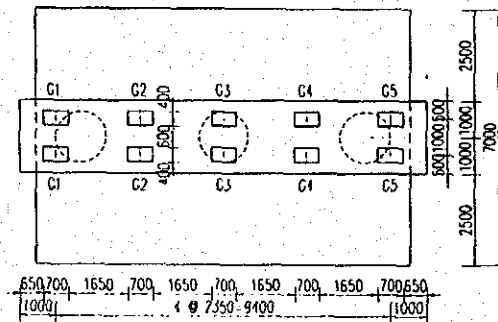
SIDE VIEW



HALF PLAN PILE FOOTING



HALF PLAN



NOTES

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.

QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.9) Concrete		
3.2.9.1 Headstock	$v1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) \times 2.00 \} \times 2 =$	61.60 m3
3.2.9.2 Column	$v2 = 2 \times \frac{1}{4} \times \pi \times 1.40^2 \times (5.00 + 5.08 + 5.16) =$	46.92 m3
3.2.9.3 Footing	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 =$	292.23 m3
	Total	400.75 m3
3.2.10) Form		
3.2.10.1 Headstock	$a1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (1.06 + 0.70) \times 2.00 \times 2 + (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) + (11.40 \times 1.40 - 0.80 \times 0.70) \} \times 2 =$	105.67 m2
3.2.10.2 Column (Curve form)	$a2 = 2 \times \pi \times 1.40 \times (5.00 + 5.08 + 5.16) =$	134.06 m2
3.2.10.3 Footing	$a3 = 2 \times (10.500 + 7.000) \times 2.00 \times 2 =$	140.00 m2
	Total	134.06 m2
	Curve	140.00 m2
	Flat	245.67 m2
3.2.11) Scaffolding:		
3.2.11.1 (H<=4m)	$A1 = 2 \times (24.85 + 9.00) \times 2.00 + (2 \times (4.00 + 25.75) \times 2.00) =$	254.40 m2
3.2.11.2 (4m<H<=30m)	$A2 = 2 \times (4.00 + 25.75) \times 4.56 =$	271.32 m2
3.2.12) Support	$= (11.40 - 3 \times 1.40) \times 2.00 \times 5.08 \times 2 =$	146.30 m3
3.2.13) Lean Concrete		
3.2.13.1 Concrete class G	$v = 0.10 \times \{ (10.50 + 0.2) \times (7.00 + 0.2) - 10 \times \frac{1}{4} \times \pi \times 1.50^2 \} \times 2 =$	11.87 m3
3.2.13.2 Form	$A = 0.10 \times \{ (10.50 + 0.2) + (7.00 + 0.20) \} \times 2 \times 2 =$	5.02 m2
3.2.14) Blinding Stone	$v = 0.20 \times \{ (10.50 + 0.2) \times (7.00 + 0.2) - 10 \times \frac{1}{4} \times \pi \times 1.50^2 \} \times 2 =$	23.75 m3

QUANTITY SURVEYING FOR PIER P1

No.

Item	Formula	Quantity
3.2.15) Bored Pile		
3.2.15.1 Concrete	$= 10 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (49.00 + 0.10) =$	867.67 m ³
3.2.15.2 Excavation Length		
N<20:	$= 37.0 \times 10 =$	370.00 m
20<N<40:	$= 6.0 \times 10 =$	60.00 m
40<N:	$= 6.0 \times 10 =$	60.00 m
3.2.15.3 Excavation Volume	$= 10 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 54.11 =$	956.20 m ³
3.2.16) Earthwork		
3.2.16.1 Excavation for footing (slope 1:f)	$= \frac{5.41}{6} \times \{ (24.85 \times 9.00) + (24.85 + 35.67) \times (9.00 + 19.82) + (35.67 \times 19.82) \} - 10 \times \frac{\pi}{4} \times 1.50^2 \times 5.41 =$	2316.19 m ³
3.2.16.2 Excess Soil		
v1 = Lean Concrete	=	11.87 m ³
v2 = Blinding Stone	=	23.75 m ³
v3 = Footing Volume	=	292.23 m ³
v4 = $2 \times \frac{1}{4} \times \pi \times 1.40^2 \times 3 \times 3.11 =$		28.72 m ³
	Total =	356.58 m ³
3.2.16.3 Back Fill	= Excavation for footing - Excess Soil	
	= 2316.19 - 356.58 =	1959.61 m ³

REINFORCEMENT OF PIER 1 (For 1 Direction)

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
BEAM	R1	10	6700	10	0.617	41.3
	B1	28	11200	13	4.834	703.8
	B2	28	9800	13	4.834	615.9
	B3	16	11200	6	1.578	106.0
	B3a	16	10490	4	1.578	66.2
	B4	14	4916	49	1.208	291.0
	B4a	14	3566	98	1.208	422.2
	B4b	14	2332	49	1.208	138.0
	B5	14	4078	8	1.208	39.4
	B5a	14	2728	16	1.208	52.7
	B5b	14	2332	14	1.208	39.4
	B6	28	3393	13	4.834	213.2
	B7	28	3377	13	4.834	212.2
COLUMN	C1	32	8410	84	6.313	4459.8
	C2	14	4498	135	1.208	733.5
FOOTING	F1	22	11070	25	2.984	825.8
	F2	22	14587	47	2.984	2045.8
	F3	32	10300	53	6.313	3446.3
	F4	22	7570	37	2.984	835.8
	F5	20	7500	16	2.466	295.9
	F6	20	10800	16	2.466	426.1
	F7	16	4698	94	1.578	696.9
TOTAL	D = 10		41.3		(kg)	
	D = 14		1716.2		(kg)	
	D = 16		869.1		(kg)	
	D = 20		722.0		(kg)	
	D = 22		3707.4		(kg)	
	D = 28		1745.1		(kg)	
	D = 32		7906.1		(kg)	
	TOTAL		16707.2		(kg)	

REINFORCEMENT OF PILE FOR PIER 1 (For 1 Direction)

PILE	N1	25	12000	56	3.853	2589.2
	N2	25	5875	14	3.853	316.9
	N3	22	4248	22	2.984	278.9
	N4	10	152053	1	0.617	93.8
	N5	10	182464	1	0.617	112.6
	N6	10	669034	1	0.617	412.8
	N7	10	4105	64	0.617	162.1
	N8	16	1322	16	1.578	33.4
TOTAL	D = 10		781.3		(kg)	
	D = 16		33.4		(kg)	
	D = 22		278.9		(kg)	
	D = 25		2906.1		(kg)	
	TOTAL		3999.7		(kg)	

QUANTITY SURVEYING FOR PIER P2

No.

Item	Formula	Quantity
3.2.9) Concrete		
3.2.9.1 Headstock		
	$v1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) \times 2.00 \} \times 2 =$	61.60 m3
3.2.9.2 Column		
	$v2 = 2 \times \frac{1}{4} \times \pi \times 1.40^2 \times (4.60 + 4.68 + 4.76) = 43.23$	m3
3.2.9.3 Footing		
	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 =$	292.23 m3
	Total	397.06 m3
3.2.10) Form		
3.2.10.1 Headstock		
	$a1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (1.06 + 0.70) \times 2.00 \times 2 + (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) + (11.40 \times 1.40 - 0.80 \times 0.70) \} \times 2 =$	105.67 m2
3.2.10.2 Column (Curve form)		
	$a2 = 2 \times \pi \times 1.40 \times (4.60 + 4.68 + 4.76) =$	123.50 m2
3.2.10.3 Footing		
	$a3 = 2 \times (10.500 + 7.000) \times 2.00 =$	140.00 m2
	Total	123.50 m2
	Curve	245.67 m2
	Flat	=
3.2.11) Scaffolding:		
3.2.11.1 (H<=4m)		
	$A1 = 2 \times (24.85 + 9.00) \times 2.00 + (2 \times (4.00 + 25.75) \times 2.00 =$	254.40 m2
3.2.11.2 (4m<H<=30m)		
	$A2 = 2 \times (4.00 + 25.75) \times 4.16 =$	247.52 m2
3.2.12) Support		
	$= (11.40 - 3 \times 1.40) \times 2.00 \times 4.68 \times 2 =$	134.78 m3
3.2.13) Lean Concrete		
3.2.13.1 Concrete class G		
	$v = 0.10 \times \{ (10.50 + 0.2) \times (7.00 + 0.2) - 10 \times \frac{1}{4} \times \pi \times 1.50^2 \} \times 2 =$	11.87 m3
3.2.13.2 Form		
	$A = 0.10 \times \{ (10.50 + 0.2) + (7.00 + 0.20) \} \times 2 \times 2 =$	5.02 m2
3.2.14) Blinding Stone		
	$v = 0.20 \times \{ (10.50 + 0.2) \times (7.00 + 0.2) - 10 \times \frac{1}{4} \times \pi \times 1.50^2 \} \times 2 =$	23.75 m3

QUANTITY SURVEYING FOR PIER P2

No.

Item	Formula	Quantity
3.2.15) Bored Pile		
3.2.15.1 Concrete	$= 10 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times (53.00 + 0.10) =$	938.35 m3
3.2.15.2 Excavation Length		
N<20:	$= 38.0 \times 10 =$	380.00 m
20<N<40:	$= 6.0 \times 10 =$	60.00 m
40<N:	$= 9.0 \times 10 =$	90.00 m
3.2.15.3 Excavation Volume	$= 10 \times \frac{1}{4} \times \pi \times 1.50 \times 1.50 \times 57.14$	1009.75 m3
3.2.16) Earthwork		
3.2.16.1 Excavation for footing (slope 1:1)	$= \frac{4.44}{6} \times \{ (24.85 \times 9.00) + (24.85 + 33.73) \times (9.00 + 17.88) + (33.73 \times 17.88) \}$	
	$- 10 \times \pi / 4 \times 1.50^2 \times 4.44 =$	1698.55 m3
3.2.16.2 Excess Soil		
v1 = Lean Concrete	$=$	11.87 m3
v2 = Blinding Stone	$=$	23.75 m3
v3 = Footing Volume	$=$	292.23 m3
v4 =	$2 \times \frac{1}{4} \times \pi \times 1.40^2 \times 3 \times 2.14 =$	19.77 m3
	Total =	347.62 m3
3.2.16.3 Back Fill	$= \text{Excavation for footing} - \text{Excess Soil}$	
	$= 1698.55 - 347.62 =$	1350.93 m3

REINFORCEMENT OF PIER 2 (For 1 Direction)

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
BEAM	R1	10	6700	10	0.617	41.3
	B1	28	11200	13	4.834	703.8
	B2	28	9800	13	4.834	615.9
	B3	16	11200	6	1.578	106.0
	B3a	16	10490	4	1.578	66.2
	B4	14	4916	49	1.208	291.0
	B4a	14	3566	98	1.208	422.2
	B4b	14	2332	49	1.208	138.0
	B5	14	4078	8	1.208	39.4
	B5a	14	2728	16	1.208	52.7
	B5b	14	2332	14	1.208	39.4
	B6	28	3393	13	4.834	213.2
	B7	28	3377	13	4.834	212.2
COLUMN	C1	32	8010	126	6.313	6371.5
	C2	14	4498	135	1.208	733.5
FOOTING	F1	22	11070	25	2.984	825.8
	F2	22	14587	47	2.984	2045.8
	F3	32	10300	53	6.313	3446.3
	F4	22	7570	37	2.984	835.8
	F5	20	7500	16	2.466	295.9
	F6	20	10800	16	2.466	426.1
	F7	16	4698	94	1.578	696.9
TOTAL	D = 10		41.3		(kg)	
	D = 14		1716.2		(kg)	
	D = 16		869.1		(kg)	
	D = 20		722.0		(kg)	
	D = 22		3707.4		(kg)	
	D = 28		1745.1		(kg)	
	D = 32		9817.8		(kg)	
	TOTAL		18618.9		(kg)	

REINFORCEMENT OF PILE FOR PIER 2 (For 1 Direction)

PILE	N1	28	12000	14	4.834	812.1
	N2	25	12000	42	3.853	1941.9
	N3	25	10100	14	3.853	544.8
	N4	22	4229	6	2.984	75.7
	N5	22	4248	17	2.984	215.5
	N6	10	152053	1	0.617	93.8
	N7	10	174861	1	0.617	107.9
	N8	10	748861	1	0.617	462.0
	N9	10	4105	68	0.617	172.2
	N10	16	1322	16	1.578	33.4
TOTAL	D = 10		835.9		(kg)	
	D = 16		33.4		(kg)	
	D = 22		291.2		(kg)	
	D = 25		2486.7		(kg)	
	D = 28		812.1		(kg)	
	TOTAL		4459.3		(kg)	

QUANTITY SURVEYING FOR PIER P3

No.

Item	Formula	Quantity
3.2.1) Concrete		
3.2.1 Headstock		
	$v1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) \times 2.00 \} \times 2 =$	61.60 m3
3.2.2 Column		
	$v2 = 2 \times \frac{1}{4} \times \pi \times 1.40^2 \times (5.60 + 5.68 + 5.76) =$	52.46 m3
3.2.3 Footing		
	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 =$	292.23 m3
	Total	406.29 m3
3.2.2) Form		
3.2.2.1 Headstock		
	$a1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (1.06 + 0.70) \times 2.00 + (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) + (11.40 \times 1.40 - 0.80 \times 0.70) \} \times 2 =$	105.67 m2
3.2.2.2 Column (Curve form)		
	$a2 = 2 \times \pi \times 1.40 \times (5.60 + 5.68 + 5.76) =$	149.89 m2
3.2.2.3 Footing		
	$a3 = 2 \times (10.500 + 7.000) \times 2.00 =$	140.00 m2
	Total	149.89 m2
	Curve	149.89 m2
	Flat	245.67 m2
3.2.3) Scaffolding:		
3.2.3.1 (H<=4m)		
	$A1 = 2 \times (24.85 + 9.00) \times 2.00 + (2 \times (4.00 + 25.75) \times 2.00 =$	254.40 m2
3.2.3.2 (4m<H<=30m)		
	$A2 = 2 \times (4.00 + 25.75) \times 5.16 =$	307.02 m2
3.2.4) Support		
	$= (11.40 - 3 \times 1.40) \times 2.00 \times 5.68 \times 2 =$	163.58 m3
3.2.5) Bored Pile		
3.2.5.1 Concrete		
	$= 10 \times \frac{1}{4} \times \pi \times 1.50^2 \times (53.00 + 0.10) =$	938.35 m3
3.2.5.2 Excavation Length		
N<20:	$= 27.0 \times 10 =$	270.00 m
20<N<40:	$= 23.0 \times 10 =$	230.00 m
40<N:	$= 3.0 \times 10 =$	30.00 m
3.2.5.3 Excavation Volume		
	$= 10 \times \frac{1}{4} \times \pi \times 1.50^2 \times 57.20 =$	1010.81 m3

QUANTITY SURVEYING FOR PIER P3

No.

Item	Formula	Quantity
3.2.6) Earthwork	3.2.6.1 Excavation for footing (inside cofferdam)	
	$= 4.20 \times (26.85 \times 11.00)$ $- 10 \times \pi / 4 \times 1.50^2 \times 4.20 =$	1166.25 m3
	3.2.6.2 Concrete class G	
	$v = 0.50 \times ((10.50 + 0.2) \times (7.00 + 0.2) - 5 \times 1/4 \times \pi \times 1.50^2)$	68.20 m3
	3.2.6.3 Excess Soil	
	v1 = Lean Concrete	68.20 m3
	v2 = Blinding Stone	0.00 m3
	v3 = Footing Volume	292.23 m3
	$v4 = 2 \times \pi / 4 \times 1.400^2 \times 3 \times 2.200 =$	20.32 m3
	Total	380.76 m3
	3.2.6.4 Rip Rap	
	= 1166.25 - 380.76	785.49 m3
	3.2.6.5 Back Fill = Excavation for footing - Excess Soil	
	= 1166.25 - 380.76 - 785.49 =	0.00 m3
3.2.7) Cofferdams		
	* Larsen IV 194.00 nos. L= 12 m =	2328.0 m
	* I400 40.00 nos. L= 12 m =	480.0 m
	*C300 = 142.80 + 156.30 =	299.1 m

REINFORCEMENT OF PIER 3 (For 1 Direction)

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
BEAM	R1	10	6700	10	0.617	41.3
	B1	28	11200	13	4.834	703.8
	B2	28	9800	13	4.834	615.9
	B3	16	11200	6	1.578	106.0
	B3a	16	10490	4	1.578	66.2
	B4	14	4916	49	1.208	291.0
	B4a	14	3566	98	1.208	422.2
	B4b	14	2332	49	1.208	138.0
	B5	14	4078	8	1.208	39.4
	B5a	14	2728	16	1.208	52.7
	B5b	14	2332	14	1.208	39.4
	B6	28	3393	13	4.834	213.2
	B7	28	3377	13	4.834	212.2
COLUMN	C1	32	9010	126	6.313	7166.9
	C2	14	4498	147	1.208	798.7
FOOTING	F1	22	11070	25	2.984	825.8
	F2	22	14587	47	2.984	2045.8
	F3	32	10300	53	6.313	3446.3
	F4	22	7570	37	2.984	835.8
	F5	20	7500	16	2.466	295.9
	F6	20	10800	16	2.466	426.1
	F7	16	4698	94	1.578	696.9
TOTAL		D = 10	41.3		(kg)	
		D = 14	1781.4		(kg)	
		D = 16	869.1		(kg)	
		D = 20	722.0		(kg)	
		D = 22	3707.4		(kg)	
		D = 28	1745.1		(kg)	
		D = 32	10613.2		(kg)	
		TOTAL	19479.5		(kg)	

REINFORCEMENT OF PILE FOR PIER 3 (For 1 Direction)

PILE	N1	28	12000	14	4.834	812.1
	N2	25	12000	42	3.853	1941.9
	N3	25	10100	14	3.853	544.8
	N4	22	4229	6	2.984	75.7
	N5	22	4248	17	2.984	215.5
	N6	10	152053	1	0.617	93.8
	N7	10	174861	1	0.617	107.9
	N8	10	748861	1	0.617	462.0
	N9	10	4105	68	0.617	172.2
	N10	16	1322	16	1.578	33.4
TOTAL		D = 10	835.9		(kg)	
		D = 16	33.4		(kg)	
		D = 22	291.2		(kg)	
		D = 25	2486.7		(kg)	
		D = 28	812.1		(kg)	
		TOTAL	4459.3		(kg)	

QUANTITY SURVEYING FOR PIER P4

No.

Item	Formula	Quantity
3.2.1) Concrete		
3.2.1 Headstock		
	$v1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) \times 2.00 \} \times 2 =$	61.60 m3
3.2.2 Column		
	$v2 = 2 \times \frac{1}{4} \times \pi \times 1.40^2 \times (5.60 + 5.68 + 5.76) =$	52.46 m3
3.2.3 Footing		
	$v3 = 2 \times 10.50 \times 7.00 \times 2.00 - 10 \times \pi \times 0.75^2 \times 0.1 =$	292.23 m3
	Total	406.29 m3
3.2.2) Form		
3.2.2.1 Headstock		
	$a1 = \{ (11.40 \times 1.40 - 0.80 \times 0.70) + (1.06 + 0.70) \times 2.00 \times 2 + (9.80 \times 2.00 - 3 \times \pi / 4 \times 1.40^2) + (11.40 \times 1.40 - 0.80 \times 0.70) \} \times 2 =$	105.67 m2
3.2.2.2 Column (Curve form)		
	$a2 = 2 \times \pi \times 1.40 \times (5.60 + 5.68 + 5.76) =$	149.89 m2
3.2.2.3 Footing		
	$a3 = 2 \times (10.500 + 7.000) \times 2.00 =$	140.00 m2
	Total	149.89 m2
	Curve Flat	= 245.67 m2
3.2.3) Scaffolding:		
3.2.3.1 (H<=4m)		
	$A1 = 2 \times (24.85 + 9.00) \times 2.00 + (2 \times (4.00 + 25.75) \times 2.00 =$	254.40 m2
3.2.3.2 (4m< H<=30m)		
	$A2 = 2 \times (4.00 + 25.75) \times 5.16 =$	307.02 m2
3.2.4) Support		
	$= (11.40 - 3 \times 1.40) \times 5.68 \times 2 =$	163.58 m3
3.2.5) Bored Pile		
3.2.5.1 Concrete		
	$= 10 \times \frac{1}{4} \times \pi \times 1.50^2 \times (53.00 + 0.10) =$	938.35 m3
3.2.5.2 Excavation Length		
N<20:	$= 27.0 \times 10 =$	270.00 m
20<N<40:	$= 23.0 \times 10 =$	230.00 m
40<N:	$= 3.0 \times 10 =$	30.00 m
3.2.5.3 Excavation Volume		
	$= 10 \times \frac{1}{4} \times \pi \times 1.50^2 \times 57.40 =$	1014.34 m3

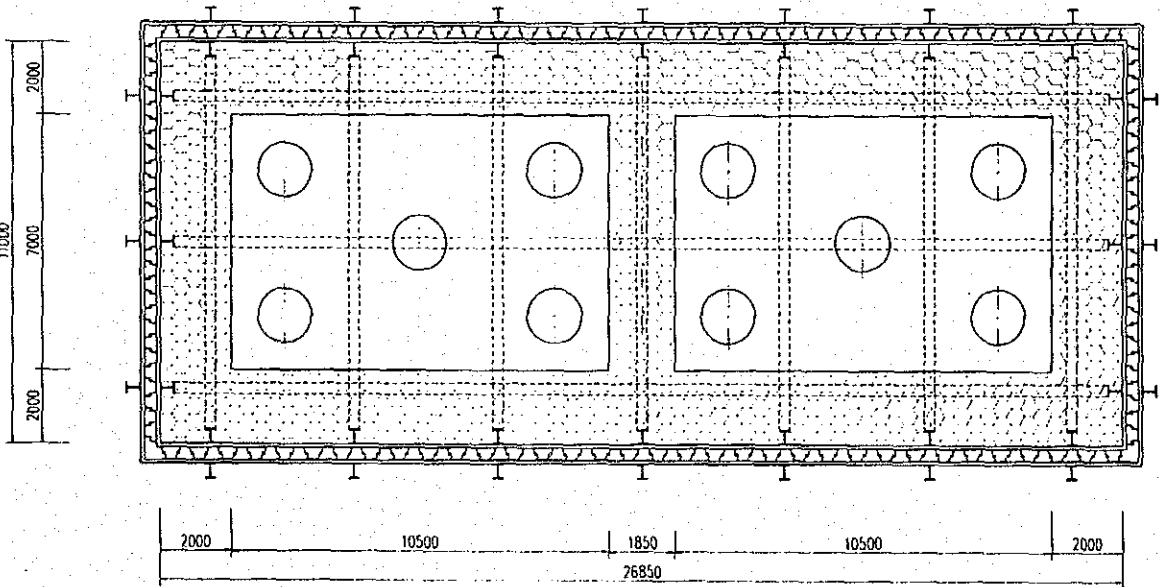
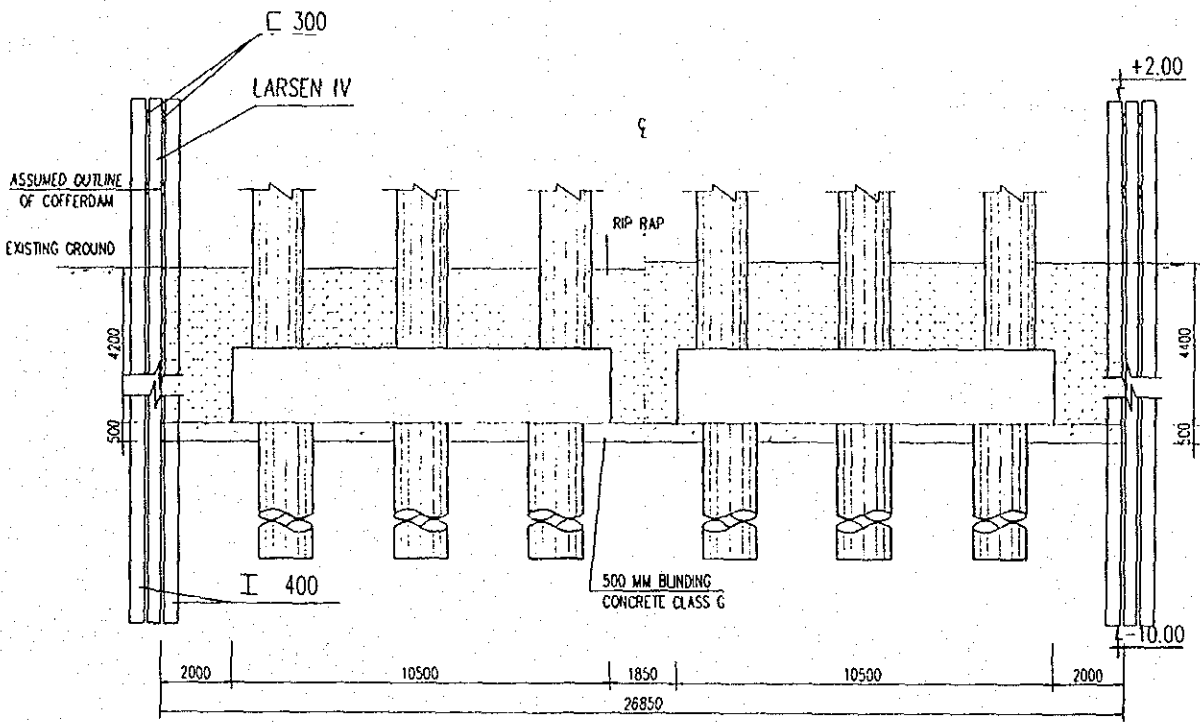
Item	Formula	Quantity
3.2.1) Concrete		
3.2.6) Earthwork	3.2.6.1 Excavation for footing (inside cofferdam)	
	= $4.40 \times (26.85 \times 11.00) - 10 \times \pi / 4 \times 1.50^2 \times 4.40$	1221.79 m3
	3.2.6.2 Concrete class G	
	v = $0.50 \times ((10.50 + 0.2) \times (7.00 + 0.2) - 5 \times 1/4 \times \pi \times 1.50^2) \times 2$	68.20 m3
	3.2.6.3 Excess Soil	
	v1 = Lean Concrete	68.20 m3
	v2 = Blinding Stone	0.00 m3
	v3 = Footing Volume	292.23 m3
	v4 = $2 \times \pi / 4 \times 1.400^2 \times 3 \times 2.400$	22.17 m3
	Total	382.60 m3
	3.2.6.4 Rip Rap	
	= 1221.79 - 382.60	839.18 m3
	3.2.6.5 Back Fill = Excavation for footing - Excess Soil	
	= 1221.79 - 382.60 - 839.18	0.00 m3
3.2.7) Cofferdams		
	* Larsen IV 194.00 nos. L= 12 m = 2328.0 m	
	* I400 40.00 nos. L= 12 m = 480.0 m	
	* C300 = 142.80 + 156.30 = 299.1 m	

REINFORCEMENT OF PIER 4 (For 1 Direction)

DETAIL	No	D (mm)	LENGTH (m)	QUANTITY (nos.)	UNIT WEIGH (kg/m)	TOTAL STEEL (kg)
BEAM	R1	10	6700	10	0.617	41.3
	B1	28	11200	13	4.834	703.8
	B2	28	9800	13	4.834	615.9
	B3	16	11200	6	1.578	106.0
	B3a	16	10490	4	1.578	66.2
	B4	14	4916	49	1.208	291.0
	B4a	14	3566	98	1.208	422.2
	B4b	14	2332	49	1.208	138.0
	B5	14	4078	8	1.208	39.4
	B5a	14	2728	16	1.208	52.7
	B5b	14	2332	14	1.208	39.4
	B6	28	3393	13	4.834	213.2
	B7	28	3377	13	4.834	212.2
COLUMN	C1	32	9010	84	6.313	4777.9
	C2	14	4498	135	1.208	733.5
FOOTING	F1	22	11070	25	2.984	825.8
	F2	22	14587	47	2.984	2045.8
	F3	32	10300	53	6.313	3446.3
	F4	22	7570	37	2.984	835.8
	F5	20	7500	16	2.466	295.9
	F6	20	10800	16	2.466	426.1
	F7	16	4698	94	1.578	696.9
TOTAL		D = 10	41.3		(kg)	
		D = 14	1716.2		(kg)	
		D = 16	869.1		(kg)	
		D = 20	722.0		(kg)	
		D = 22	3707.4		(kg)	
		D = 28	1745.1		(kg)	
		D = 32	8224.2		(kg)	
		TOTAL	17025.3		(kg)	

REINFORCEMENT OF PILE FOR PIER 4 (For 1 Direction)

PILE	N1	25	12000	56	3.853	2589.2
	N2	25	9875	14	3.853	532.7
	N3	22	4248	23	2.984	291.5
	N4	10	152053	1	0.617	93.8
	N5	10	182464	1	0.617	112.6
	N6	10	745060	1	0.617	459.7
	N7	10	4105	64	0.617	162.1
	N8	16	1322	16	1.578	33.4
TOTAL		D = 10	828.2		(kg)	
		D = 16	33.4		(kg)	
		D = 22	291.5		(kg)	
		D = 25	3121.9		(kg)	
		TOTAL	4275.0		(kg)	

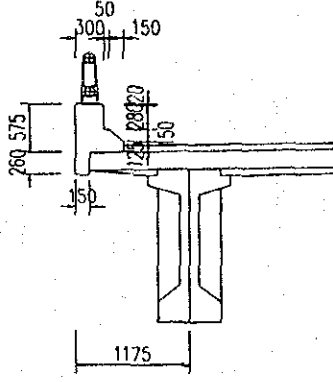
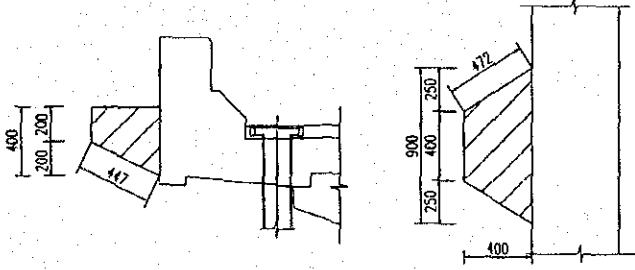


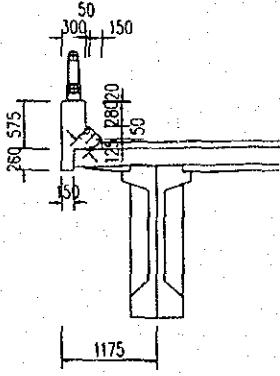
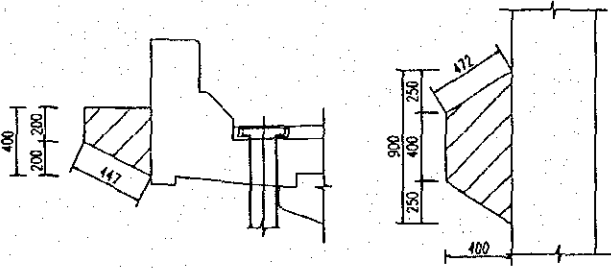
NOTES

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.

QUANTITY OF MISCELLANEOUS

Item		Work Item	Unit	Quantity	Remarks
Concrete	CLASS E	Parapet	m3	189.70	
		Lighting pole base	m3	0.44	
Form		Parapet	m2	1190.61	
		Lighting pole base	m2	3.05	
		Total		1193.66	
Re-bar		Parapet	ton	29.446	
		Lighting pole base	ton	0.158	
		Total	ton	29.60	
Steel Railing			m	764.80	
Lighting	Pole		set	5	
	Pipe Φ 100		m	744.00	
Drainage	Pot		set	24	
	Pipe Φ 195		m	41.76	

Item	Formula	Quantity
1. Parapet CLASS "E"	 $A = \left\{ (0.300 \times 0.575 + 0.260 \times 0.150 + (0.125 + 0.275) \times 0.150 \times \frac{1}{2} + 0.275 \times 0.050 \right\} \times 2 \times 2 = 1.021 \text{ m}^2$ $V = 1.021 \times (37.100 + 37.200 + 37.200 + 37.200 + 37.100) = 189.70 \text{ m}^3$	189.70 m3
2. Lighting CLASS "E"	 $V = (0.200 \times 0.400 + 0.400 \times 0.900) \times \frac{1}{2} \times 0.4 \times 5 = 0.440 \text{ m}^3$	0.440 m3

Item	Formula	Quantity
1. Parapet	 $A = \begin{matrix} (0.575 + & 0.260 + & 0.15 + & 0.125 + & 0.212 + & 0.280) \times \\ 2 \times & 2 \times & (37.100 + & 37.200 + & 37.200 + & 37.200 + & 37.100) \times \\ & & & & & & = \end{matrix} 1190.61 \text{ m}^2$	1190.61 m ²
2. Lighting	 $A = \begin{matrix} ((0.900 + & 0.400) \times & 0.447 \times & 1/2 + & (0.400 + & 0.200) \\ \times & 0.4 \times & 1/2 \times & 2 + & 0.2 \times & 0.400) \times & 5 \\ & & & & & & = \end{matrix} 3.053 \text{ m}^2$	3.053 m ²

Per 10m

SCHEDULE OF REINFORCEMENT (OF RAILING)												
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	14	250	701	212	747	70		1980	1.208	68	162.65	
P2	14	230	297	176	275	245		1223	1.208	68	100.46	
P3	14	10000						10000	1.208	11	132.88	
Total											395.99	

Total Weight

$$\text{Total} = 395.99 / 10 \times 185.9 \times 4 = 29,445.82 \text{ (kg)}$$

Re-bar Lighting

No. _____

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	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

Total = 31.51 × 5 = 157.56 (kg)

Item	Formula	Quantity
1. Drainage	<p>TOTAL EACH</p> <p>EACH = 12 x 2 = 24</p> <p>PIPE = 1.45 x 24 = 34.80 m</p>	<p>24</p> <p>EACH</p> <p>34.80 m</p>
2. Steel railing	<p>Length for one span</p> <p>L = 37.200 m</p> <p>Each = 5 span</p> <p>Length for abutment</p> <p>L = 5.2 x 4 = 20.80 m</p> <p>TOTAL LENGTH</p> <p>L = 37.200 x 5 x 2 + 20.800 = 764.800 m</p>	<p>764.800 m</p>
3. Lighting	<p>Each for one span</p> <p>Each = 5</p> <p>Total lighting poles</p> <p>5 x 1 = 5 pole</p> <p>PVC pipe Φ100mm = 744.000 m</p>	<p>5 pole</p> <p>744.000 m</p>

QUANTITY TABLE OF CAI TAC 1 BRIDGE

ITEMS		UNIT	ABUTMENTS	PIERS	SUPERSTRUCTURE	MISCELLANEOUS WORKS			TOTAL
						DRAINAGE	LIGHTING	RAILING	
CONCRETE	CLASS B	M3			1461.3				1461
	CLASS D	M3	2071.4	3682.7	1402.4				7157
	CLASS E	M3	1202.5	1610.4			0.44	190	3003
	CLASS G	M3	60.2	160.2					220
PC - CABLE	12 S12.7	TON			85.4				85
	3 S12.7	TON			3.4				3
SHEATHING	Φ80/85	M			9188.8				9189
	Φ50/55	M			1447.2				1447
	CEMENT GROUT IN SHEATHING	M3			49.0				49
ANCHORAGE	CABLES 12S12.7	DEAD	SET						
		LIVE	SET		500				500
	CABLES 3S12.7	DEAD	SET			288			288
		LIVE	SET			288			288
STEEL SHEAR KEY		SET			600			600	
REINFORCEMENT	D32	KG	27272	73123					100395
	D28	KG	25977	30203					56179
	D25	KG	80176	110014	12831				203021
	D22	KG	15313	41187	61536				118036
	D20	KG	19218	5776	127447		103		152544
	D18	KG	650						650
	D16	KG	15993	8289	16453		54		40789
	D14	KG	5806	13860	278291			29446	327404
	D12	KG			15541				15541
	D10	KG	19894	33143	904				53940
	D8	KG							
D6	KG			24154				24154	
TOTAL	KG	210298	315595	537156		158	29446	1092651	
EXPANSION JOINT	50MM	M			43.00				43.00
BEARING	600x300x57	SET			100				100
ANCHORAGE BAR	Φ75, L=1500	SET			80				80
STEEL RAILING		M					764.80		764.80
LIGHTING POLE	POLE	SET					5		5
	PIPE Φ100	M					744.00		
DRAINAGE	POT	SET				24			24
	PIPE Φ180	M				34.80			34.80
PAVEMENT	WATER PROOFING 5MM	M2			3977.50				3977.50
	ASPHALT CONCRETE 70 MM	M2			3977.50				3977.50
GEOTEXTILE		M2	915.42						915.42
STONE MANSORY		M3	1036.98						1036.98
BLINDING AGGREGATE		M3	346.59						346.59
RIP RAP		M3		1624.67					1624.67
BLINDING STONE		M3	67.07	47.49					114.56
WOODEN PILE L = 3M		M	13391.43						13391.43
EXCAVATION		M3	5274.83	10393.88					15668.71
BACK FILL		M3	1723.44	3310.55					5033.99
BORED PILE Φ1500MM		M	1170.00	208.00					1378.00
PVC PIPE	Φ50MM	M	111.60						111.60
FORM	FLAT	M2	1185.44	982.67	14154.49				16322.59
	CURVE	M2		557.34					557.34
SCAFFOLDING WORK	H < 4M	M2	284.80	1017.60					1302.40
	4M <= H <= 30M	M2	965.45	1132.88					2098.33
PLATFORM FOR CONSTRUCTION		M2			4627.53				
SUPPORTING FORM		M3	15.68	608.26					623.94