REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF CONSTRUCTION
DEPARTMENT OF BRIDGE

DETAILED DESIGN STUDY ON THE BAGO RIVER BRIDGE CONSTRUCTION PROJECT

FINAL REPORT ATTACHMENTS

VOLUME III QUANTITY CALCULATION REPORT
Part IV PC Box Girder Bridge & On-ramp Bridge

DECEMBER 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.
ORIENTAL CONSULTANTS GLOBAL CO., LTD.
METROPOLITAN EXPRESSWAY COMPANY LIMITED.
CHODAI CO., LTD.
NIPPON ENGINEERING CONSULTANTS CO., LTD.

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PC BOX GIRDER BRIDGE

SUPERSTRUCTURE

CONTENTS

1. SUMMARY OF QUANTITY

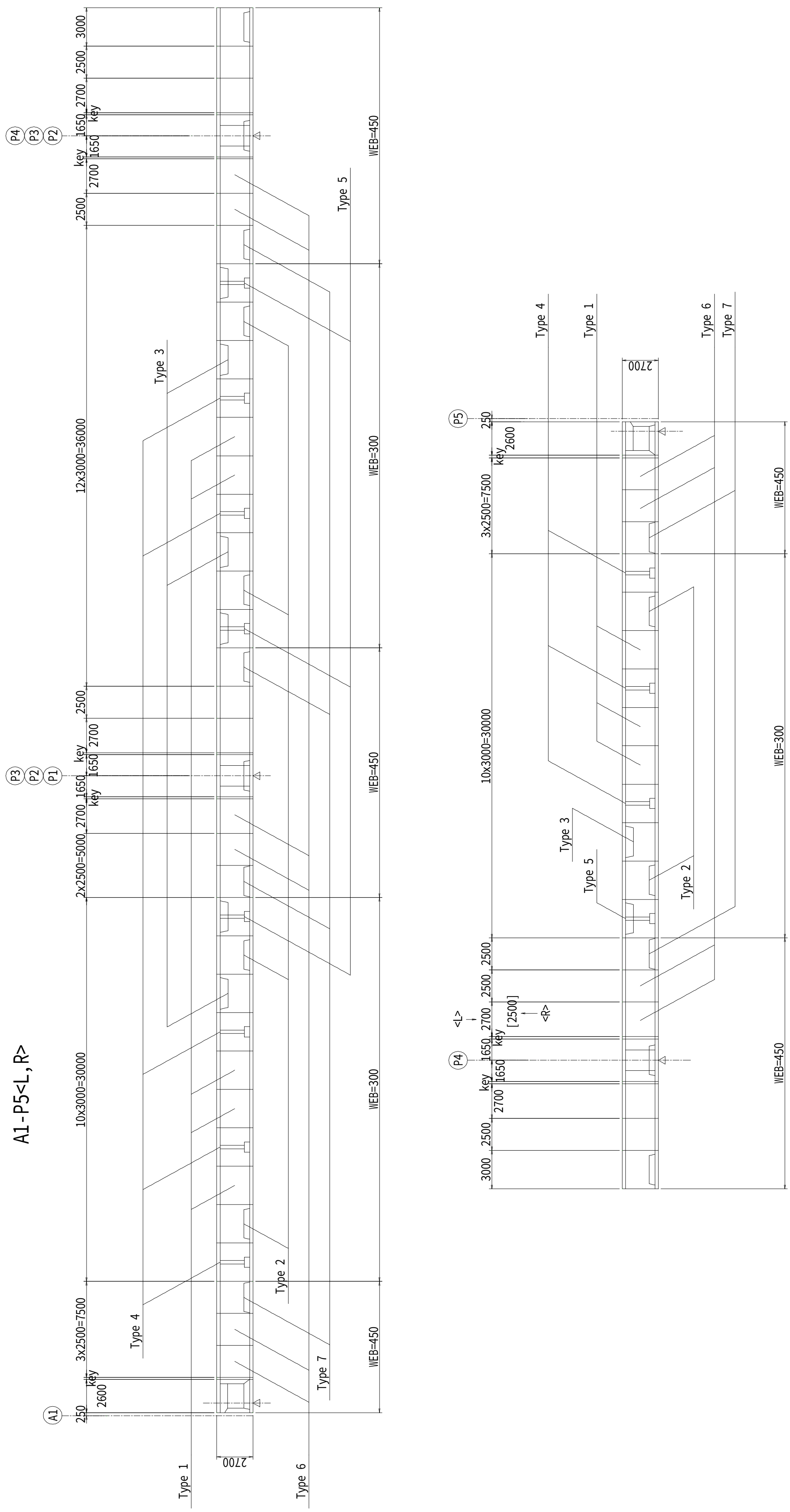
ITEM			UNIT	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
YARD FABRICATION								
CONCRETE f'c = 50 Mpa		SEG TYPE 1	m3	232.7	232.7	271.5	271.5	1008.4
		SEG TYPE 2		203.1	203.1	243.7	243.7	893.6
		SEG TYPE 3		162.6	162.6	203.2	203.2	731.5
		SEG TYPE 4		256.8	256.8	299.6	299.6	1112.7
		SEG TYPE 5		178.2	178.2	222.8	222.8	802.0
		SEG TYPE 6		369.0	366.2	443.3	443.3	1621.8
		SEG TYPE 7		209.0	209.0	253.6	253.6	925.0
		END SEG		29.8	29.8	29.8	29.8	119.2
		INTER PIER SEG		89.5	89.5	111.9	111.9	402.8
		TOTAL		1730.6	1727.8	2079.3	2079.3	7617.0
REBAR SD345		D13	ton	126.7	126.6	152.0	152.0	557.2
		D16-D25		132.8	132.8	158.8	158.8	583.2
		TOTAL		259.4	259.4	310.8	310.8	1140.4
FORMWORK	SIDE FORM	SEG TYPE 1	m2	306.4	306.4	357.4	357.4	1327.6
		SEG TYPE 2		255.3	255.3	306.4	306.4	1123.3
		SEG TYPE 3		204.2	204.2	255.3	255.3	919.1
		SEG TYPE 4		306.4	306.4	357.4	357.4	1327.6
		SEG TYPE 5		204.2	204.2	255.3	255.3	919.1
		SEG TYPE 6		439.1	435.7	527.6	527.6	1930.1
		SEG TYPE 7		238.3	238.3	289.3	289.3	1055.2
		END SEG		42.1	42.1	42.1	42.1	168.4
		INTER PIER SEG		111.4	111.4	139.3	139.3	501.3
		TOTAL		2107.4	2104.0	2530.1	2530.1	9271.6
	BOTTOM FORM	SEG TYPE 1	m2	198.0	198.0	231.0	231.0	858.0
		SEG TYPE 2		165.0	165.0	198.0	198.0	726.0
		SEG TYPE 3		132.0	132.0	165.0	165.0	594.0
		SEG TYPE 4		198.0	198.0	231.0	231.0	858.0
		SEG TYPE 5		132.0	132.0	165.0	165.0	594.0
		SEG TYPE 6		283.8	281.6	341.0	341.0	1247.4
		SEG TYPE 7		154.0	154.0	187.0	187.0	682.0
		END SEG		38.6	38.0	37.7	37.7	152.1
		INTER PIER SEG		96.5	96.5	121.2	121.2	435.4
		TOTAL		1397.9	1395.2	1676.9	1676.9	6146.9
	EDGE FORM	SEG TYPE 1	m2	151.3	151.3	176.5	176.5	655.5
		SEG TYPE 2		126.1	126.1	151.3	151.3	554.7
		SEG TYPE 3		100.8	100.8	126.1	126.1	453.8
		SEG TYPE 4		151.3	151.3	176.5	176.5	655.5
		SEG TYPE 5		100.8	100.8	126.1	126.1	453.8
		SEG TYPE 6		278.5	278.5	334.2	334.2	1225.5
		SEG TYPE 7		139.3	139.3	167.1	167.1	612.7
		END SEG		32.5	32.5	32.5	32.5	130.1
		INTER PIER SEG		55.7	55.7	69.6	69.6	250.7
		TOTAL		1136.3	1136.3	1359.8	1359.8	4992.3
	INNER FORM	SEG TYPE 1	m2	378.6	378.6	441.7	441.7	1640.6
		SEG TYPE 2		312.2	312.2	374.7	374.7	1373.8
		SEG TYPE 3		262.0	262.0	327.6	327.6	1179.2
		SEG TYPE 4		487.3	487.3	568.5	568.5	2111.7
		SEG TYPE 5		331.7	331.7	414.7	414.7	1492.8
		SEG TYPE 6		536.7	533.0	644.7	644.7	2359.2
		SEG TYPE 7		285.1	285.1	345.7	345.7	1261.5
		END SEG		39.0	39.0	39.0	39.0	156.0
		INTER PIER SEG		96.1	96.1	120.1	120.1	432.4
		TOTAL		2728.7	2725.1	3276.7	3276.7	12007.2

ITEM				UNIT	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
	SHEATH	12S15.2		m	2321.8	2317.9	2772.4	2772.4	10184.5
		4S15.2			59.3	59.3	59.3	59.3	237.3
		3S12.7			4844.2	4844.2	5815.0	5815.0	21318.2
		φ32			618.0	618.0	734.0	734.0	2704.0
	DEVIATOR PIPE	19S15.2	at Deviator	nos	120	120	144	144	528
			at Support	nos	16	16	20	20	72
	SLEEVE PIPE	19S15.2		nos	48	48	56	56	208
	STRESSING (Internal)	3S12.7	Tendon	kg	10382.9	10382.9	12477.7	12477.7	45721.2
			Anchor (total)	nos	912.0	912.0	1096.0	1096.0	4016.0
SITE CONSTRUCTION									
	CONCRETE f'c = 50 Mpa			m3	132.0	131.4	151.9	151.9	567.2
	FORMWORK			m2	188.8	187.7	215.0	215.0	806.6
	STRESSING (External)	19S15.2	Tendon	kg	42357.2	42283.3	50853.2	50853.2	186346.9
			for single span	nos	8	8	8	8	32
			for continous 2 span	nos	16	16	20	20	72
			Anchor (total)	nos	48	48	56	56	208
			Self Anchor	nos	8	8	8	8	32
			Tensionning Anchor (inside)	nos	16	16	20	20	72
			Tensionning Anchor (outside)	nos	24	24	28	28	104
	STRESSING (Internal)	12S15.2	Tendon	kg	30676.2	30623.7	36628.8	36628.8	134557.5
			Anchor (total)	nos	120	120	144	144	528
		4S15.2	Tendon	kg	261.3	261.3	261.3	261.3	1045.2
			Anchor (total)	nos	20	20	20	20	80
		3S12.7	Tendon	kg	865.2	865.2	1024.6	1024.6	3779.6
			Anchor (total)	nos	76	76	90	90	332
		φ32	Tendon	kg	3899.6	3899.6	4631.6	4631.6	17062.4
			Anchor (total)	nos	388	388	456	456	1688
	WHEEL GUARD	CONCRETE 30Mpa		m3	138.8	138.6	166.5	166.5	610.5
		FORMWORK		m2	700.3	699.1	839.7	839.7	3078.9
		REBAR D13		ton	10.2	10.2	12.3	12.3	44.9
	ANCHOR BAR	S35CN, φ70, φ100		kg	2287.2	2287.2	2793.2	2793.2	10160.7
	ADHESIVE COATING			m2	485.9	485.9	583.1	583.1	2138.1
	BEARING	G10	920 x 920 x 224	nos	0	0	2	2	4
		G10	920 x 920 x 210	nos	2	2	2	2	8
		G10	920 x 920 x 180	nos	2	2	0	0	4
		G10	1220 x 1220 x 210	nos	0	0	2	2	4
		G10	1220 x 1220 x 180	nos	4	4	6	6	20
		G10	1220 x 1220 x 150	nos	4	4	2	2	12
		Nonshrink mortar		m3	1.8	1.8	2.1	2.1	7.7
	PAVEMENT	t = 80mm		m2	2247.5	2243.5	2695.5	2695.5	9882.0
	WATERPROOF			m2	2247.5	2243.5	2695.5	2695.5	9882.0
	EXPANSION JOINT MAGEBA LR-6			m	10.2	10.2	10.2	10.2	40.8
	RAILING	H=1100 mm		m	250.4	249.6	300.0	300.0	1100.0
		H= 900 mm		m	250.0	250.0	300.0	300.0	1100.0
		REBAR D25		ton	3.2	3.1	3.7	3.7	13.7
	DRAINAGE	DRAIN PIT		nos	13	13	15	15	56
		PIPE	Superstructure VP200A	m	209.2	209.2	145.0	145.0	708.3
			Substructure VP200A	m	60.0		20.9		81.0
		SLAB DRAIN		nos	13	13	15	15	56
		SPIRAL DRAIN		m	268.4	267.6	318.0	318.0	1172.0
		REBAR D16		ton	0.7	0.7	0.8	0.8	2.8
	LIGHTING BASE (Tentative)	CONCRETE 30Mpa		m3	6.1	6.1	7.0	7.0	26.2
		FORMWORK		m2	28.9	28.9	33.3	33.3	124.5
		REBAR	D13	ton	0.8	0.8	0.9	0.9	3.4
			D16-D22	ton	0.3	0.3	0.4	0.4	1.5
	MANHOLE	STEEL MATERIAL SS400		kg	90.2	90.2	90.2	90.2	360.8
		HOLE IN ANCHOR SS400		nos	24	24	24	24	96
		HINGE SS400		nos	20	20	20	20	80

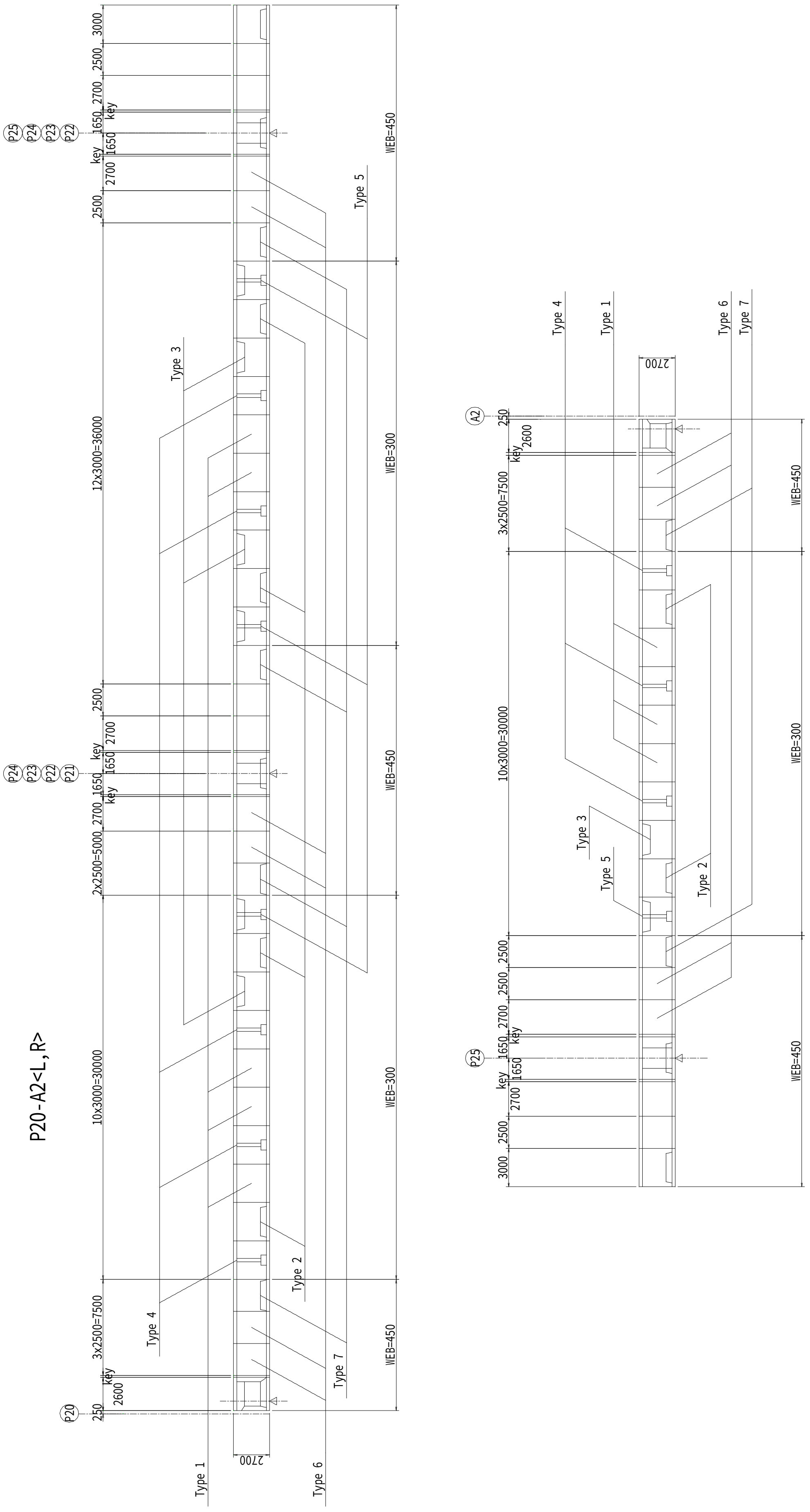
2. SEGMENT TYPE

2-1.Dimensions & Segment Types

1)A1-P5<L,R>



2)P20-A2<L,R>

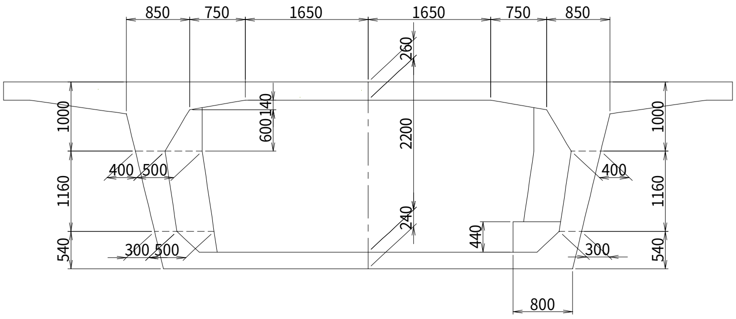


P20-A2<L,R>
P20
P21
P22
P23
P24
P25
A2
250
2600
key
3x2500=7500
10x3000=30000
12x3000=36000
2x2500=5000
2700
1650
2500
3000
WEB=450
WEB=300
Type 1
Type 2
Type 3
Type 4
Type 5
Type 6
Type 7

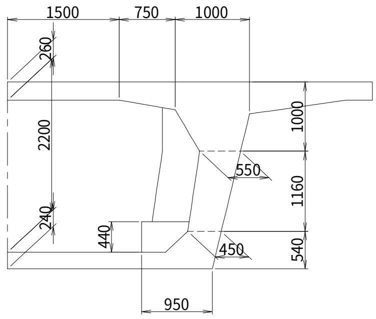
3）Summary (by Segment Types)

		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
PIER RABLE(END)		2	2	2	2	8
PIER RABLE(INTERMEDIATE)		4	4	5	5	18
TOTAl		86	86	103	103	378

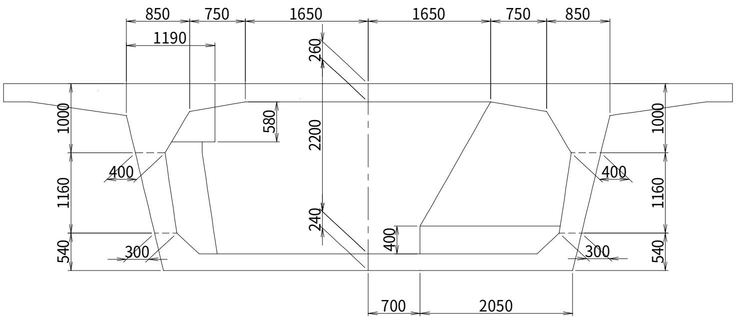
type 1 type 2



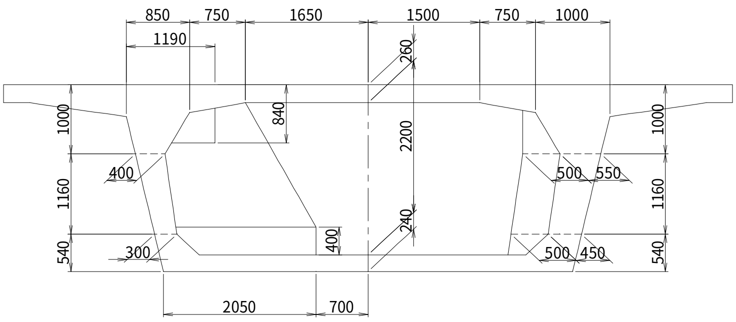
type 7



type 3 type 4

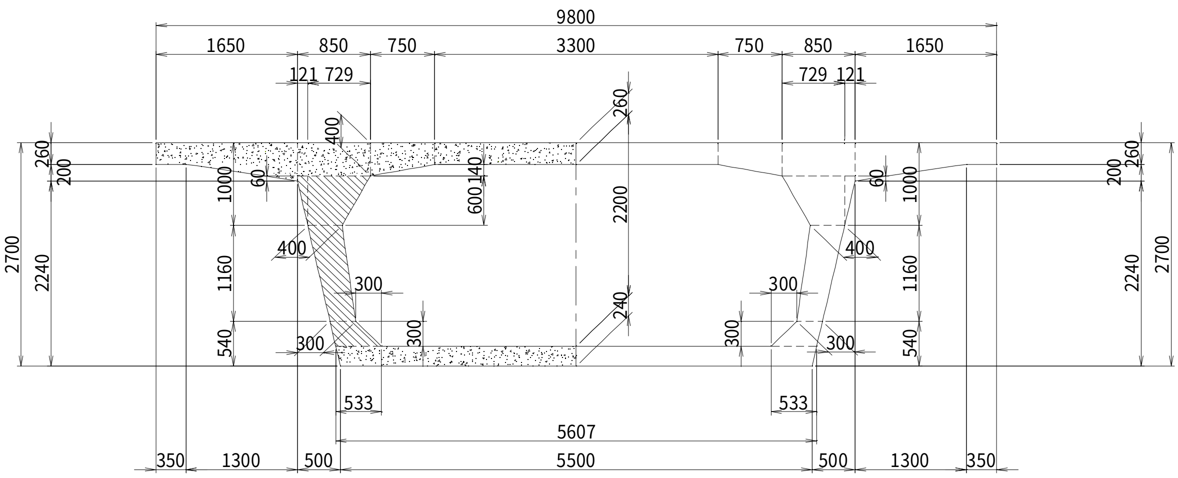


type 5 type 6



2-2. Cross-sectional Area

1）Standard Section　Web=300mm



• Top Slab (one side)

$$A1 = 0.260 \times 0.350 + 1/2 \times (0.260 + 0.460) \times 1.300 + 1/2 \times (0.260 + 0.400) \times 0.750 + 0.850 \times 0.400 + 0.260 \times 1.650 = 1.5755 \ \mathrm{m}^2$$

• Web (one side)

$$A2 = 1/2 \times (0.060 + 0.600) \times 0.121 + 1/2 \times (0.400 + 0.729) \times 0.600 + 1/2 \times (0.300 + 0.400) \times 1.160 + 1/2 \times (0.300 + 0.533) \times 0.300 = 0.9096 \ \mathrm{m}^2$$

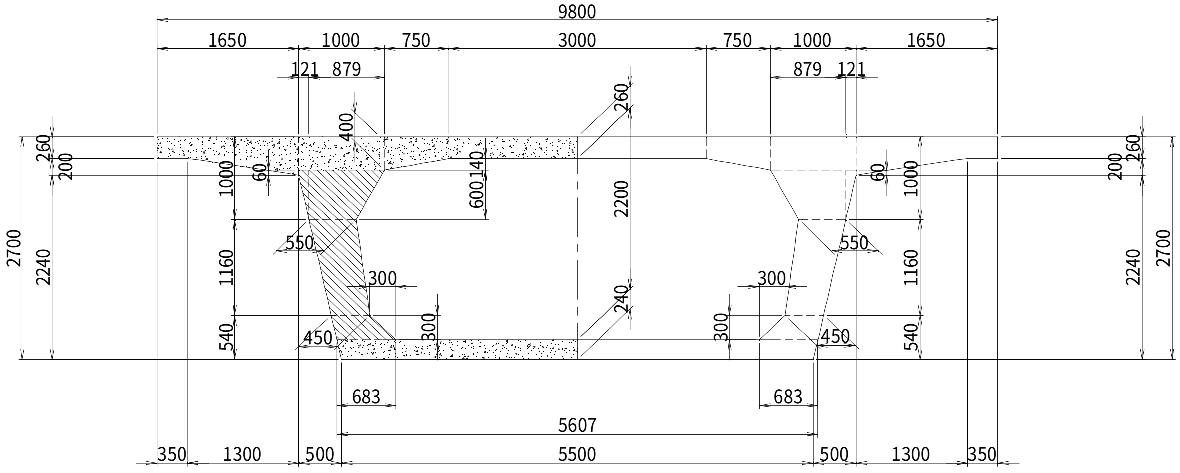
• Bottom Slab (one side)

$$A3 = 1/2 \times (2.750 + 2.8035) \times 0.240 = 0.6664 \ \mathrm{m}^2$$

• Total

$$\sum A = (1.5755 + 0.9096 + 0.6664) \times 2 = 6.303 \ \mathrm{m}^2$$

2）Standard Section　Web=450mm



• Top Slab (one side)

A1	=	0.260	×	0.350									
	＋	1/2	×(	0.260	＋	0.460	)×	1.300					
			＋	1/2	×(	0.260	＋	0.400	)×	0.750			
			＋	1.000	×	0.400	＋	0.260	×	1.500	=	1.5965	m^2

• Web (one side)

A2	=	1/2	×(	0.060	＋	0.600	)×	0.121					
			＋	1/2	×(	0.550	＋	0.879	)×	0.600			
			＋	1/2	×(	0.450	＋	0.550	)×	1.160			
			＋	1/2	×(	0.450	＋	0.683	)×	0.300	=	1.2186	m^2

• Bottom Slab (one side)

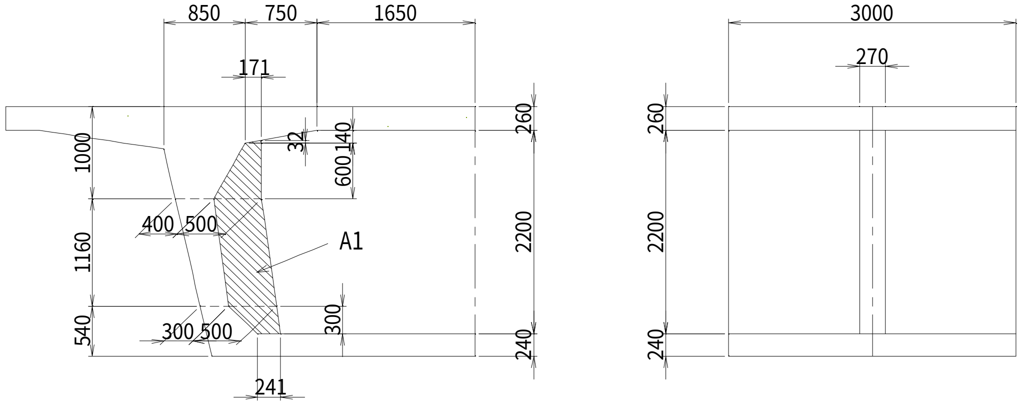
A3	=	1/2	×(	2.750	＋	2.8035	)×	0.240			=	0.6664	m^2

• Total

∑A	=(	1.5965	＋	1.2186	＋	0.6664	)×	2			=	6.963	m^2

3) Rib (type1)

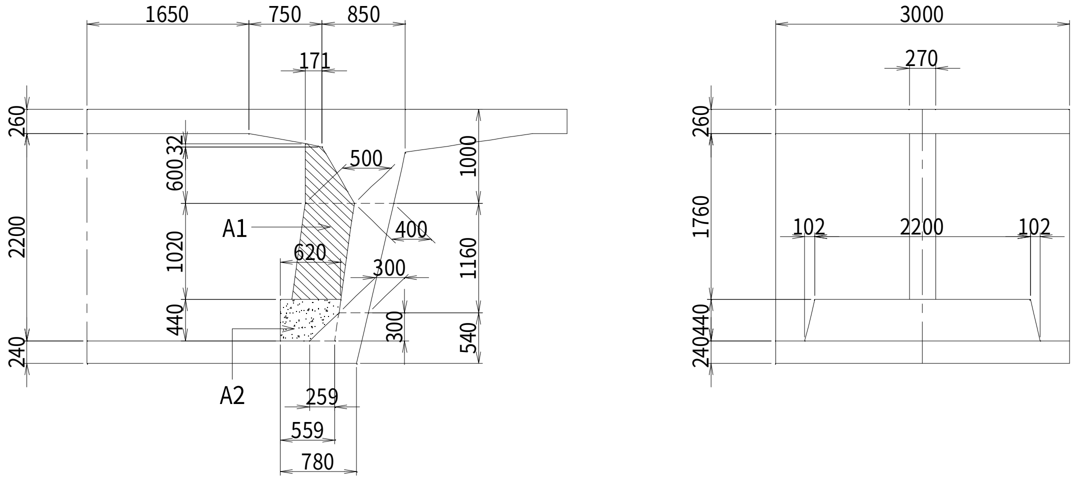
type 1



$$A1 = 1/2 \times 0.171 \times 0.032 + 0.500 \times 1.160 + 1/2 \times (0.171 + 0.500) \times 0.600 + 1/2 \times (0.500 + 0.241) \times 0.300 = 0.8952\ m^2$$

4) Rib + Blister (Bottom) (type2)

type 2

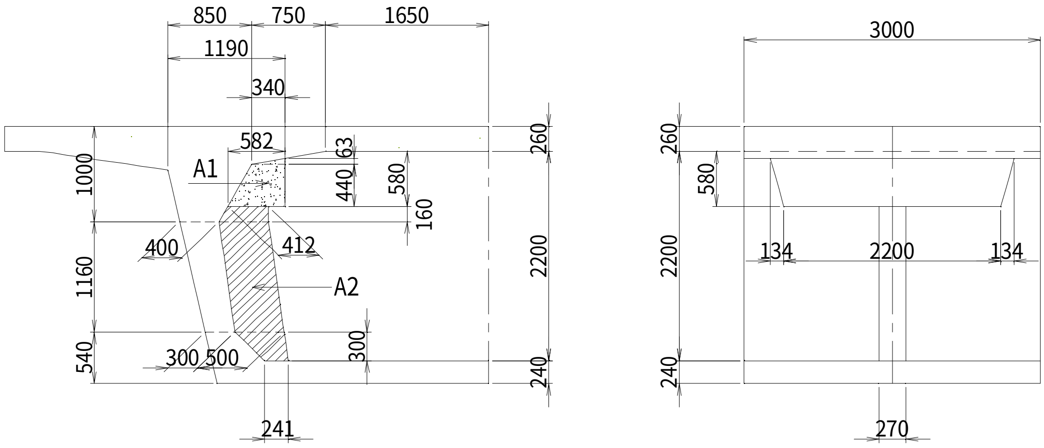


$$A1 = 1/2 \times 0.171 \times 0.032 + 1/2 \times (0.171 + 0.500) \times 0.600 + 0.500 \times 1.020 = 0.7140\ m^2$$

$$A2 = 1/2 \times (0.620 + 0.559) \times 0.440 - 1/2 \times 0.259 \times 0.300 = 0.2205\ m^2$$

5) Rib + Blister (Top) (type3)

type 3

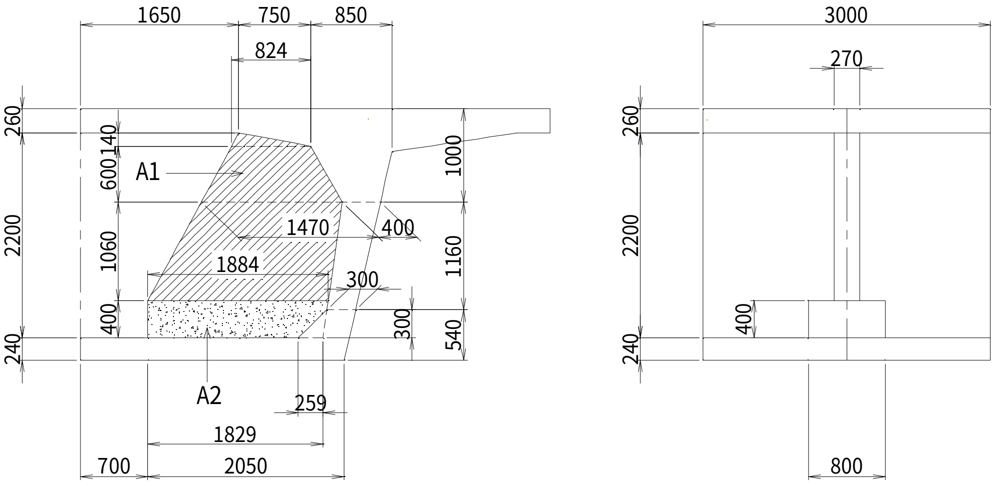


$$A1 = 1/2 \times 0.340 \times 0.063 + 1/2 \times (0.340 + 0.582) \times 0.440 = 0.2136 \ m^2$$

$$A2 = 1/2 \times (0.412 + 0.500) \times 0.160 + 0.500 \times 1.160 + 1/2 \times (0.500 + 0.241) \times 0.300 = 0.7641 \ m^2$$

6) Deviator (type4)

type 4

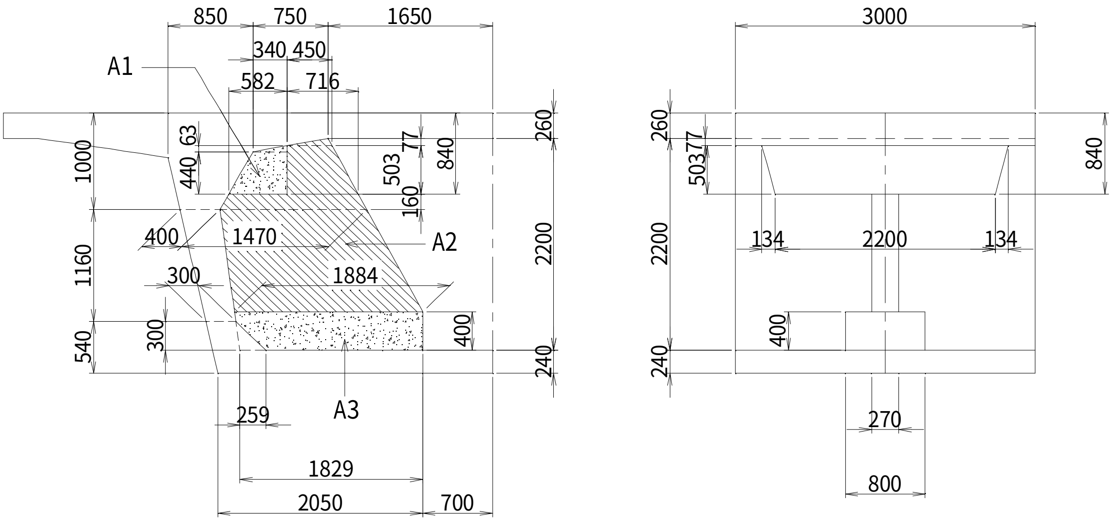


$$A1 = 1/2 \times 0.824 \times 0.140 + 1/2 \times (0.824 + 1.470) \times 0.600 + 1/2 \times (1.470 + 1.884) \times 1.060 = 2.5235 \ m^2$$

$$A2 = 1/2 \times (1.884 + 1.829) \times 0.400 - 1/2 \times 0.259 \times 0.300 = 0.7038 \ m^2$$

7) Deviator + Blister (Top) (type5)

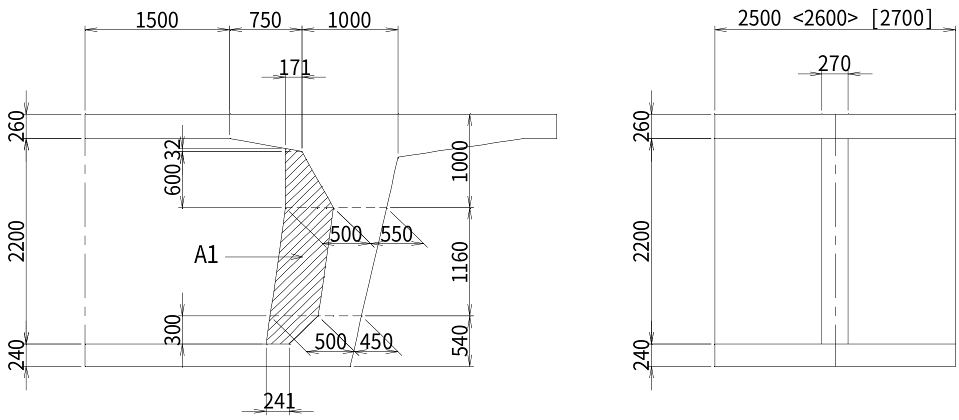
type 5



A1	=	1/2	×	0.340	×	0.063					
			+	1/2	×(	0.340	+	0.582	)×	0.440	= 0.2136 m^2
A2	=	1/2	×	0.077	×	0.450					
			+	1/2	×(	0.450	+	0.716	)×	0.503	
			+	1/2	×(	1.298	+	1.470	)×	0.160	
			+	1/2	×(	1.470	+	1.884	)×	1.060	= 2.3096 m^2
A3	=	1/2	×(	1.884	+	1.829	)×	0.400			
					-	1/2	×	0.259	×	0.300	= 0.7038 m^2

8) Rib (type6)

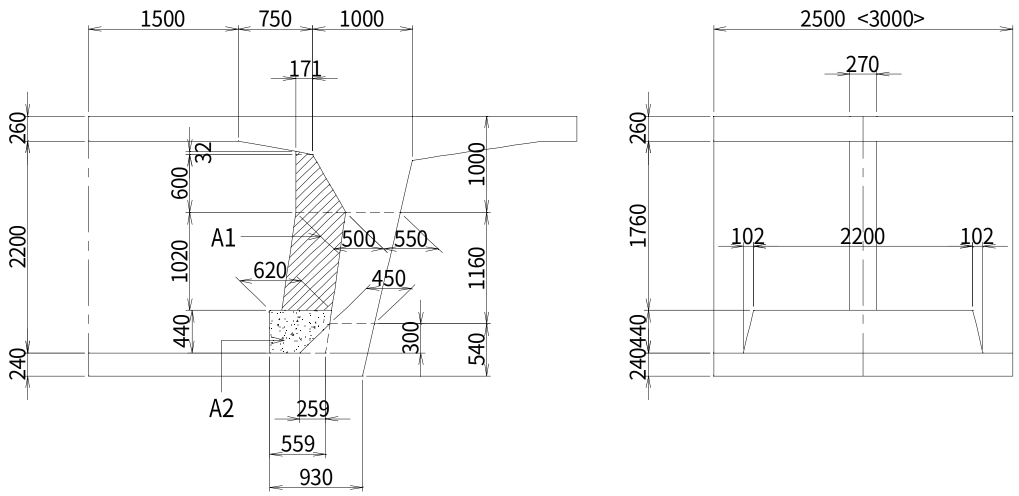
type 6



A1	=	1/2	×	0.171	×	0.032	+	0.500	×	1.160	
			+	1/2	×(	0.171	+	0.500	)×	0.600	
			+	1/2	×(	0.500	+	0.241	)×	0.300	= 0.8952 m^2

9) Rib + Blister (Bottom) (type7)

type 7



$$A1 = 1/2 \times 0.171 \times 0.032 + 1/2 \times (0.171 + 0.500) \times 0.600 + 0.500 \times 1.020 = 0.7140 \ m^2$$

$$A2 = 1/2 \times (0.620 + 0.559) \times 0.440 - 1/2 \times 0.259 \times 0.300 = 0.2205 \ m^2$$

3. CONCRETE

3-1. Standard Segment

1) type1

V1	=	6.303	×	3.000	+	0.8952	×	0.270	×	2	=	19.392	m^3

2) type2

V1	=	6.303	×	3.000	+	0.7140	×	0.270	×	2			
			+	0.2205	×(	2.200	+	0.102	)×	2	=	20.310	m^3

3) type3

V1	=	6.303	×	3.000	+	0.7641	×	0.270	×	2			
			+	0.2136	×(	2.200	+	0.134	)×	2	=	20.319	m^3

4) type4

V1	=	6.303	×	3.000	+	2.5235	×	0.270	×	2			
					+	0.7038	×	0.800	×	2	=	21.398	m^3

5) type5

V1	=	6.303	×	3.000	+	2.3096	×	0.270	×	2			
			+	0.2136	×(	2.200	+	0.134	)×	2			
					+	0.7038	×	0.800	×	2	=	22.279	m^3

6) type6

・ L=2.5m

V1	=	6.963	×	2.500	+	0.8952	×	0.270	×	2	=	17.891	m^3

・ L=2.6m

V2	=	6.963	×	2.600	+	0.8952	×	0.270	×	2	=	18.587	m^3

・ L=2.7m

V3	=	6.963	×	2.700	+	0.8952	×	0.270	×	2	=	19.284	m^3

7) type7

・ L=2.5m

V1	=	6.963	×	2.500	+	0.7140	×	0.270	×	2			
			+	0.2205	×(	2.200	+	0.102	)×	2	=	18.808	m^3

・ L=2.6m

V1	=	6.963	×	3.000	+	0.7140	×	0.270	×	2			
			+	0.2205	×(	2.200	+	0.102	)×	2	=	22.290	m^3

8) Summary of Standard Segments

• Number of Segments

		Number				TOTAL
		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
TOTAl		80	80	96	96	352

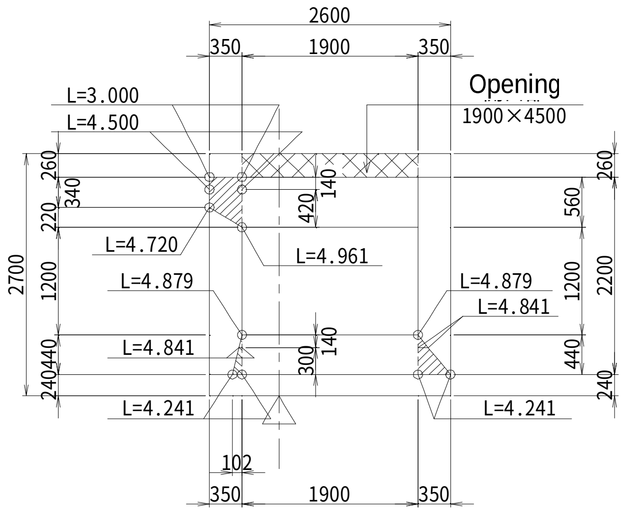
• Volume per one bridge

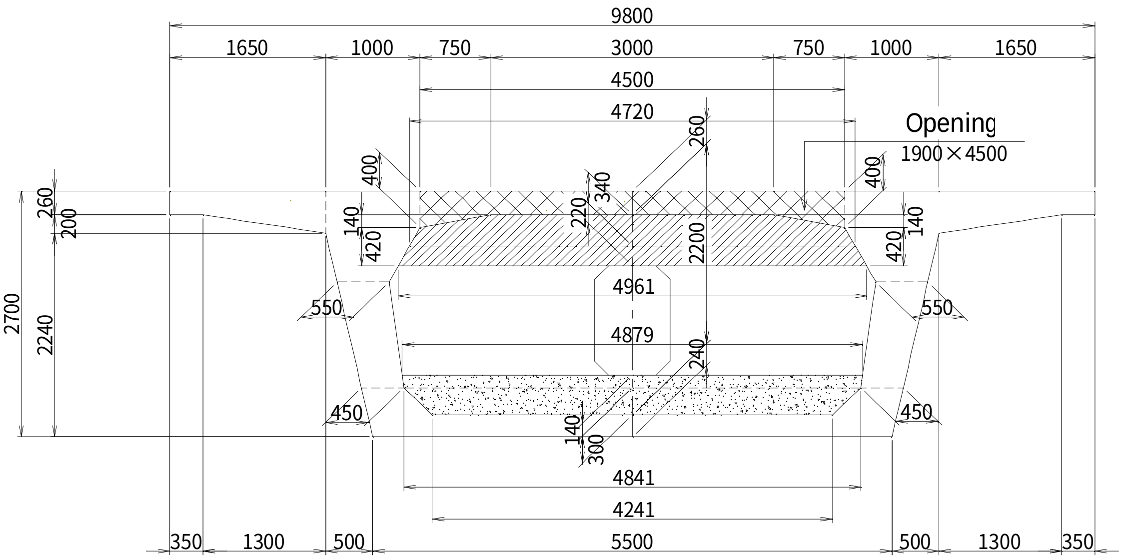
		per segment m^3	Volume by Type				TOTAL
			A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
type1	3.0m	19.392	232.704	232.704	271.488	271.488	1008.384
type2	3.0m	20.310	203.100	203.100	243.720	243.720	893.640
type3	3.0m	20.319	162.552	162.552	203.190	203.190	731.484
type4	3.0m	21.398	256.776	256.776	299.572	299.572	1112.696
type5	3.0m	22.279	178.232	178.232	222.790	222.790	802.044
type6	2.5m	17.891	214.692	232.583	250.474	250.474	948.223
	2.6m	18.587	0.000	37.174	0.000	0.000	37.174
	2.7m	19.284	154.272	96.420	192.840	192.840	636.372
type7	2.5m	18.808	75.232	75.232	75.232	75.232	300.928
	3.0m	22.290	133.740	133.740	178.320	178.320	624.120
TOTAl			1611.300	1608.513	1937.626	1937.626	7095.065

3-2. Segments at Support

1) End Segments

1-1) Shapes and Dimensions





1-2) Concrete Volume (Precast Portion)

• at A1, A2

V1 = 6.963 × 2.600 = 18.104 m^3

V2 = 1/2 ×(0.340 + 0.560)× 0.350
× 1/6 ×(3.00 × 2 + 4.500 × 2
+ 4.720 + 4.961) = 0.648 m^3

V3 = 1/2 × 0.440 × 0.102
× 1/5 ×(4.241 × 2
+ 4.841 × 2 + 4.879)= 0.103 m^3

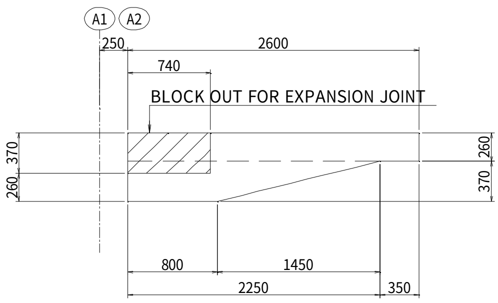
V4 = 1/2 × 0.440 × 0.350
× 1/5 ×(4.241 × 2
+ 4.841 × 2 + 4.879)= 0.355 m^3

V5 = 1/2 ×(0.800 + 2.250)× 0.370
×(0.350 + 1.300)× 2 = 1.862 m^3

-V6 = -0.740 × 0.370 × 9.800 = -2.683 m^3

-V7 =[0.260 × 3.000
+ 1/2 ×(0.400 + 0.260)
× 0.750 × 2]× 1.90 = -2.423 m^3

ΣV = 15.966 m^3



• at P5, P20

$V1 = 6.963 \times 2.600 = 18.104\ m^3$

$V2 = 1/2 \times (0.340 + 0.560) \times 0.350$
$\times 1/6 \times (3.00 \times 2 + 4.500 \times 2$
$+ 4.720 + 4.961) = 0.648\ m^3$

$V3 = 1/2 \times 0.440 \times 0.102$
$\times 1/5 \times (4.241 \times 2$
$+ 4.841 \times 2 + 4.879) = 0.103\ m^3$

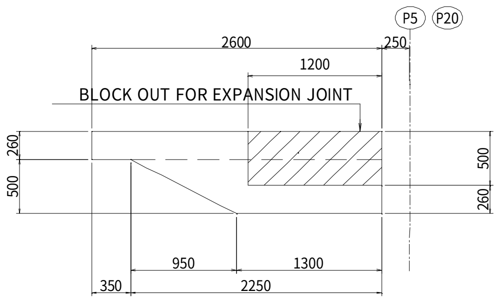
$V4 = 1/2 \times 0.440 \times 0.350$
$\times 1/5 \times (4.241 \times 2$
$+ 4.841 \times 2 + 4.879) = 0.355\ m^3$

$V5 = 1/2 \times (1.300 + 2.250) \times 0.500$
$\times (0.350 + 1.300) \times 2 = 2.929\ m^3$

$-V6 = -1.200 \times 0.500 \times 9.800 = -5.880\ m^3$

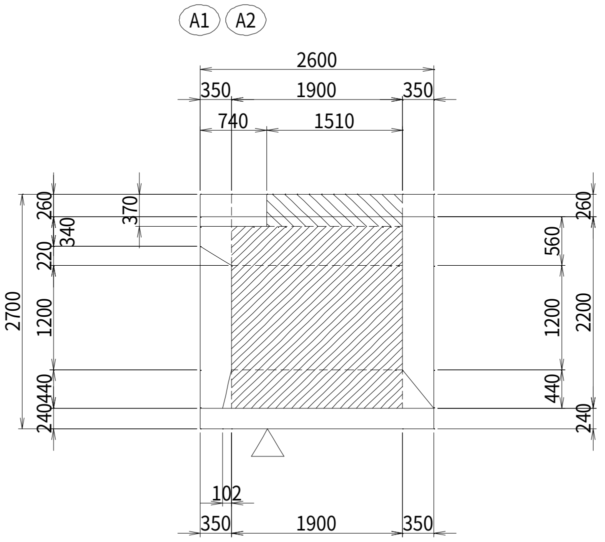
$-V7 = [0.260 \times 3.000$
$+ 1/2 \times (0.400 + 0.260)$
$\times 0.750 \times 2] \times 1.90 = -2.423\ m^3$

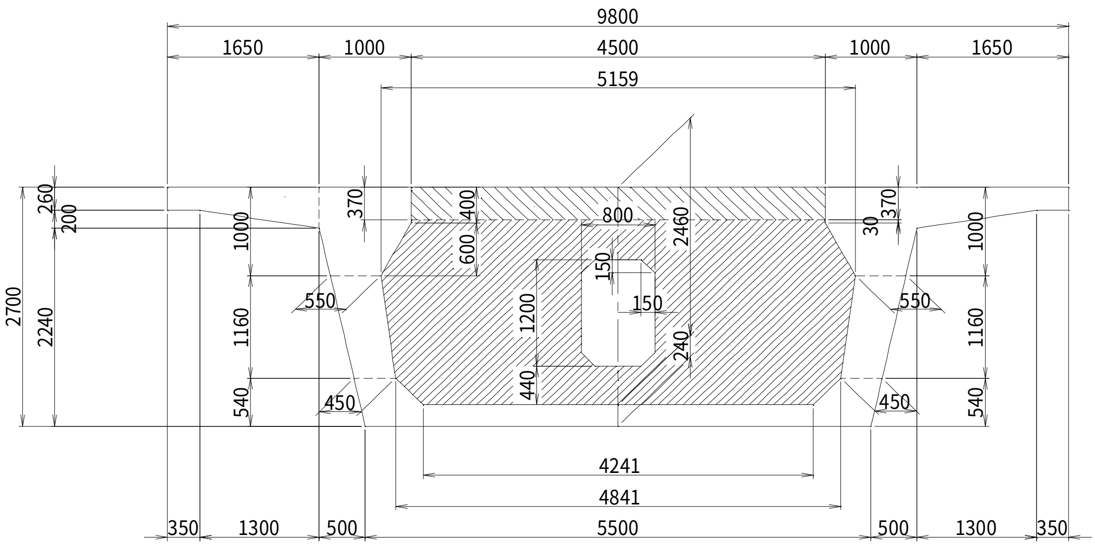
$\Sigma V = 13.836\ m^3$



1-3) Concrete Volume (CIP Portion)

• at A1, A2





• Cross-sectional Area

$$a1 = 4.500 \times 0.370 = 1.6650 \ m^2$$

$$\begin{aligned} a2 = {} & 4.500 \times 0.030 \\ & + 1/2 \times (4.500 + 5.159) \times 0.600 \\ & + 1/2 \times (5.159 + 4.841) \times 1.160 \\ & + 1/2 \times (4.841 + 4.241) \times 0.300 = 10.1950 \ m^2 \end{aligned}$$

$$a3 = 1.200 \times 0.800 - 0.15 \times 0.15 \times 2 = 0.9150 \ m^2$$

• at A1, A2

<A1(L,R)>

$V1 = 1.665 \times 1.510 + (10.1950 - 0.9150) \times 1.900 = 20.146\ m^3$

(See "BEARINGS" for the volume of non-shrink mortar layer.)

$V2 = 1.700 \times 1.200 \times 0.705 = 1.438\ m^3$

$\Sigma V = 21.584\ m^3$

<A2(L,R)>

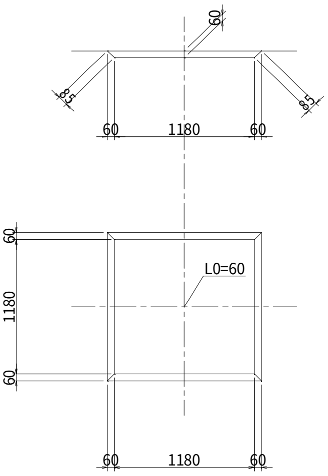
$V1 = 1.665 \times 1.510 + (10.1950 - 0.9150) \times 1.900 = 20.146\ m^3$

(See "BEARINGS" for the volume of non-shrink mortar layer.)

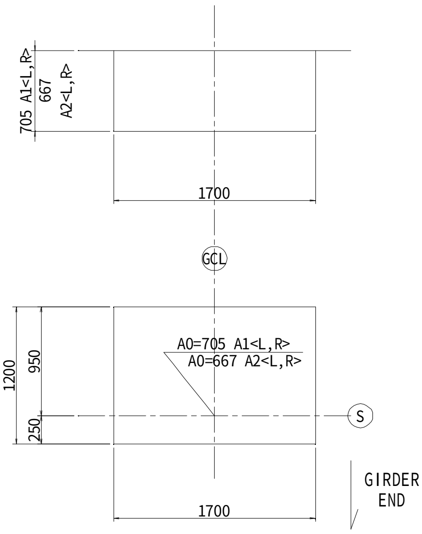
$V2 = 1.700 \times 1.200 \times 0.667 = 1.361\ m^3$

$\Sigma V = 21.507\ m^3$

Detail of Mortar Layer



Detail of Block for Anchor Bar



Layer thickness is taken at the cente

HEIGHT (mm)

	L0	A0
A1(L)	60	705
P5(L)	60	735

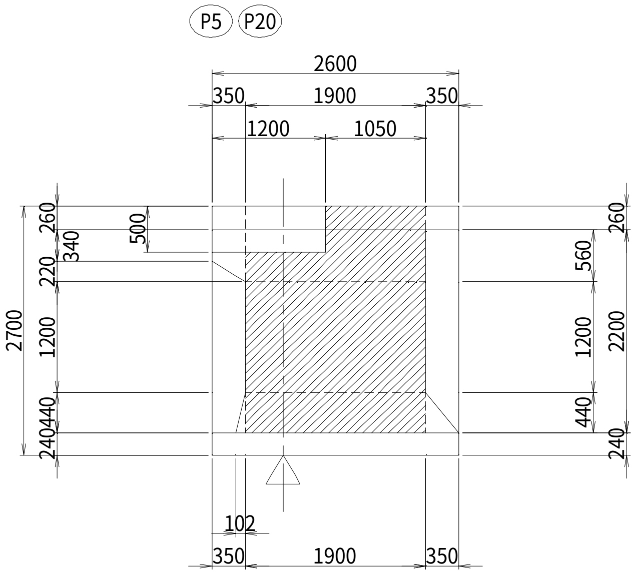
HEIGHT (mm)

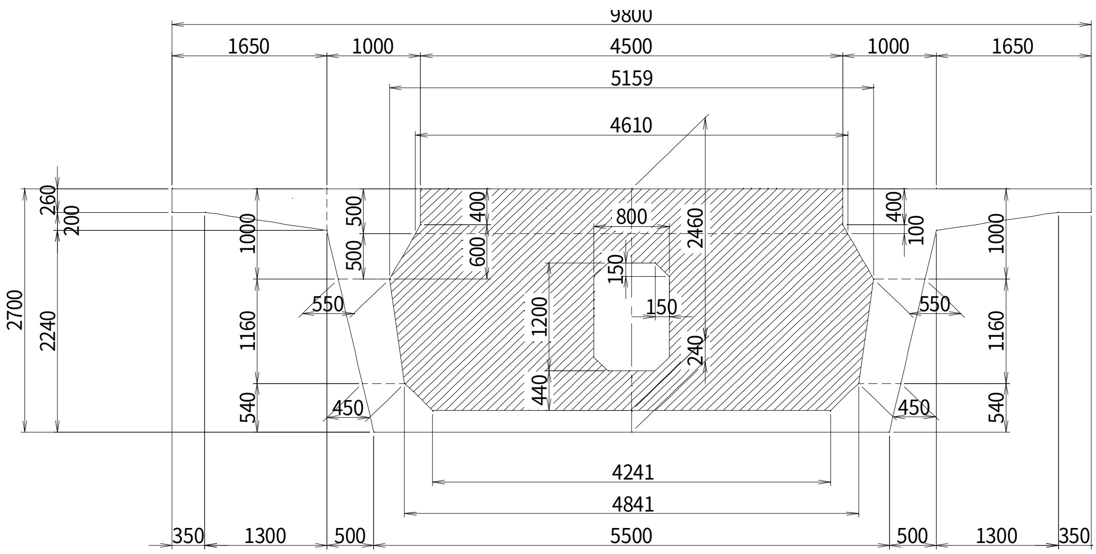
	L0	A0
A1(R)	60	705
P5(R)	60	635

HEIGHT (mm)

	L0	A0
P20(L,R)	50	643
A2(L,R)	60	667

• at P5, P20





• Cross-sectional Area

a1 = 4.500 × 0.400
$\quad + \frac{1}{2} \times (4.500 + 4.610) \times 0.100 = 2.2555 \ m^2$

a2 = 1/2 ×(4.500 + 4.610)× 0.500
$\quad + \frac{1}{2} \times (5.159 + 4.841) \times 1.160$
$\quad + \frac{1}{2} \times (4.841 + 4.241) \times 0.300 = 9.4398 \ m^2$

a3 = 1.200 × 0.800 - 0.15 × 0.15 × 2 = 0.9150 m^2

• at P5, P20

<P5(L)>

V1 = 2.2555 × 1.050 +(9.4398 - 0.9150)× 1.900 = 18.565 m^3

(See "BEARINGS" for the volume of non-shrink mortar layer.)

V2 = 1.700 × 1.200 × 0.735 = 1.499 m^3

ΣV = 20.064 m^3

<P5(R)>

V1 = 2.2555 × 1.050 +(9.4398 - 0.9150)× 1.900 = 18.565 m^3

(See "BEARINGS" for the volume of non-shrink mortar layer.)

V2 = 1.700 × 1.200 × 0.635 = 1.295 m^3

ΣV = 19.860 m^3

<P20(L,R)>

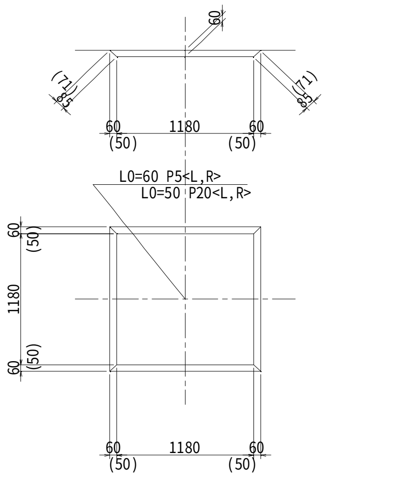
V1 = 2.2555 × 1.050 +(9.4398 - 0.9150)× 1.900 = 18.565 m^3

(See "BEARINGS" for the volume of non-shrink mortar layer.)

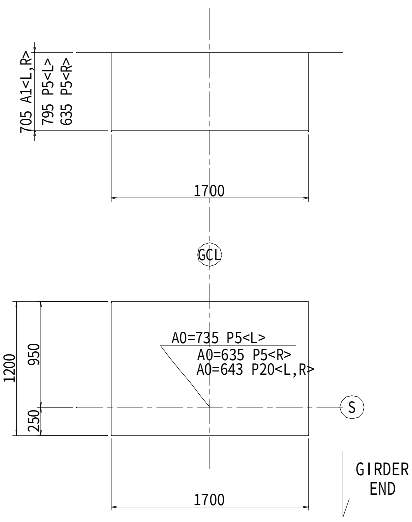
V2 = 1.700 × 1.200 × 0.643 = 1.312 m^3

ΣV = 19.877 m^3

Detail of Mortar Layer



Detail of Block for Anchor Bar



Layer thickness is taken at the center

HEIGHT (mm)

	L0	A0
A1(L)	60	705
P5(L)	60	735

HEIGHT (mm)

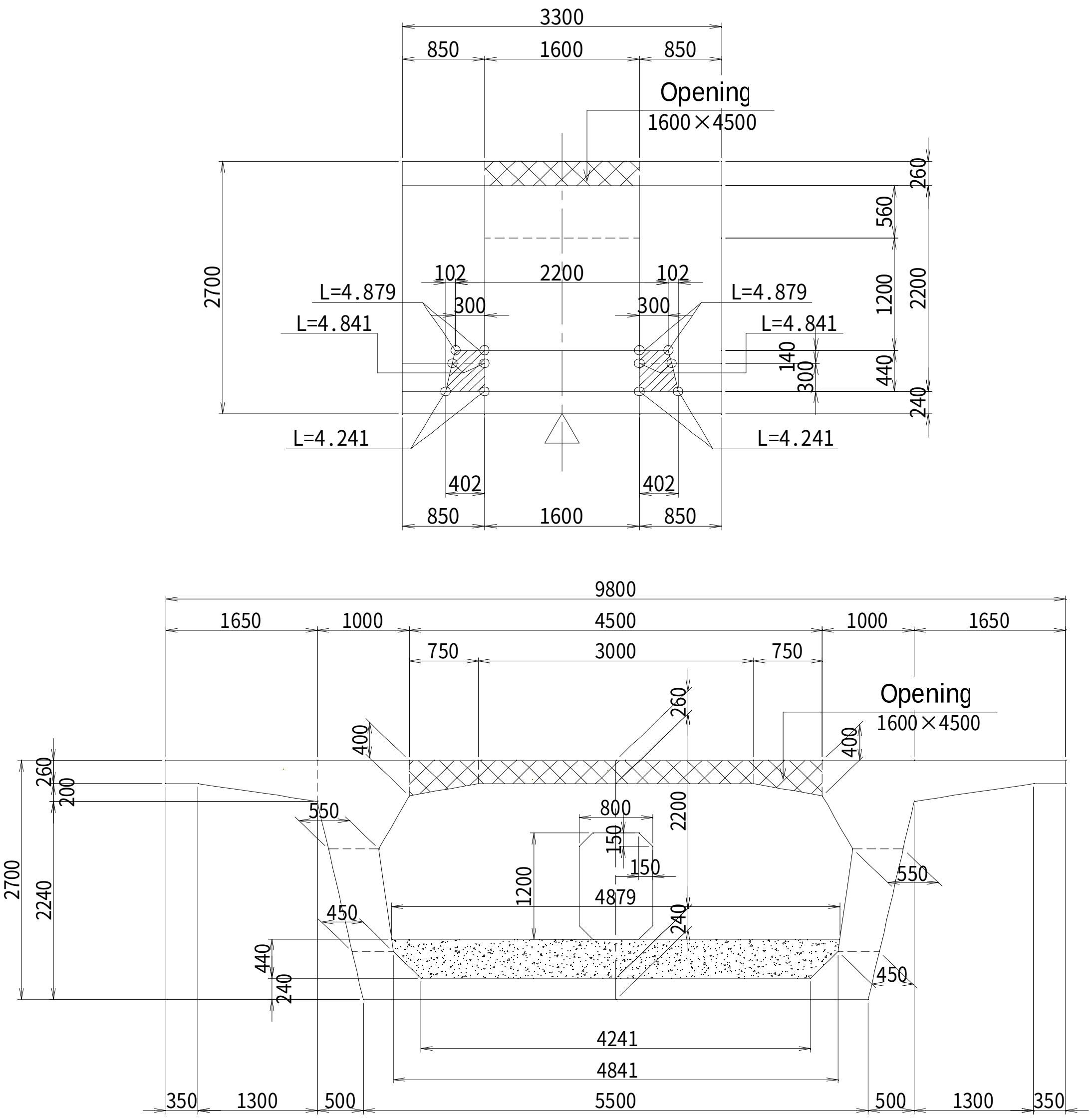
	L0	A0
A1(R)	60	705
P5(R)	60	635

HEIGHT (mm)

	L0	A0
P20(L,R)	50	643
A2(L,R)	60	667

2) Intermediate Pier Segments

2-1) Shapes and Dimensions



2-2) Concrete Volume (Precast Portion)

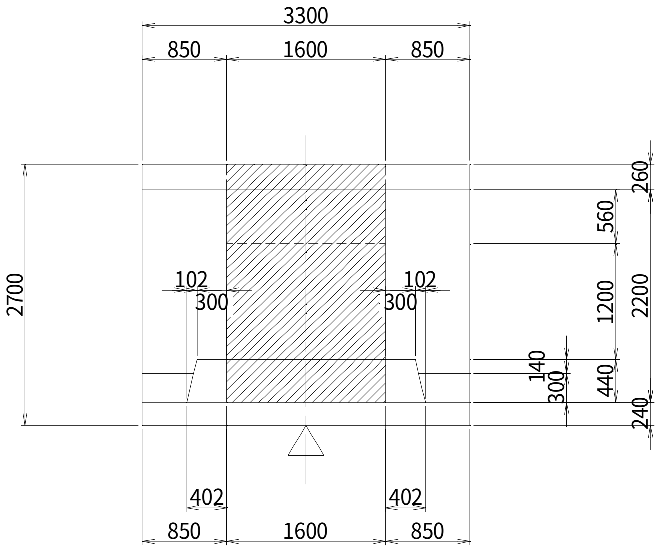
• P1~P4 [[A1-P5(L,R), N=4 nos.] , (per 1 nos.)

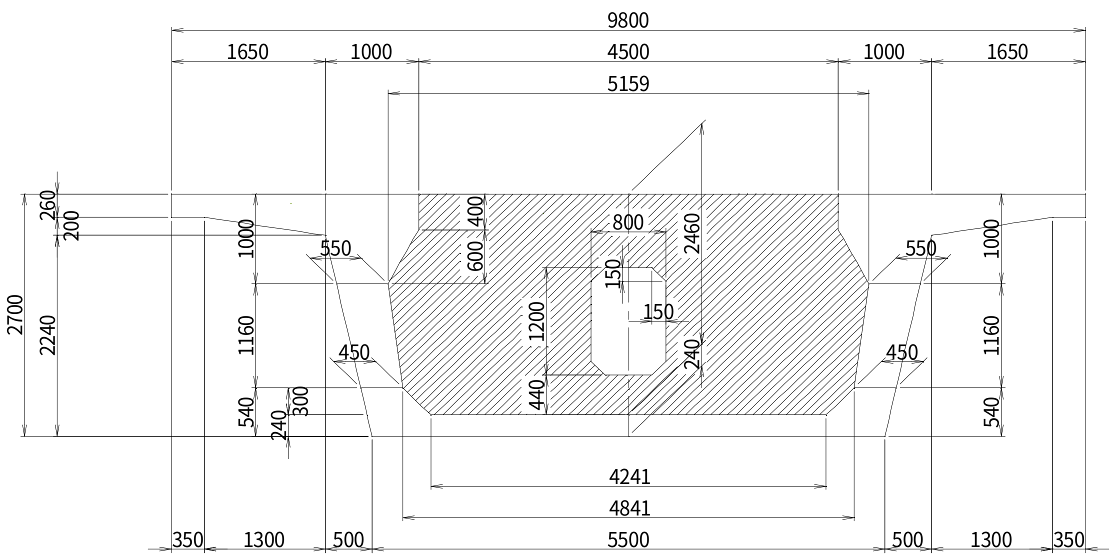
V1	=	6.963	×	3.300							=	22.978	m^3
V2	=[	1/2	×(	0.300	+	0.402	)×	0.440					
	×	1/6	×(	4.879	×	2	+	4.841	×	2			
					+	4.241	×	2	)				
									]×	2	=	1.437	m^3
-V3	=[	0.260	×	3.000									
			+	1/2	×(	0.400	+	0.260	)				
					×	0.750	×	2	]×	1.60	=	-2.040	m^3
										ΣV	=	22.375	m^3
										4×ΣV	=	89.500	m^3

· P21~P25 [P20-A2(L,R), N=5 nos.], (per 1 nos.)

V1	=	6.963	×	3.300							=	22.978	m^3
V2	=[	1/2	×(	0.300	+	0.402	)×	0.440					
	×	1/6	×(	4.879	×	2	+	4.841	×	2			
					+	4.241	×	2	)				
									]×	2	=	1.437	m^3
-V3	=[	0.260	×	3.000									
			+	1/2	×(	0.400	+	0.260	)				
					×	0.750	×	2	]×	1.60	=	-2.040	m^3
										ΣV	=	22.375	m^3
										5×ΣV	=	111.875	m^3

2-3) Concrete Volume (CIP Portion)





• Cross-sectional Area

a1 = 4.500 × 0.400
＋ 1/2 ×(4.500 ＋ 5.159)× 0.600
＋ 1/2 ×(5.159 ＋ 4.841)× 1.160
＋ 1/2 ×(4.841 ＋ 4.241)× 0.300 = 11.8600 m^2

a2 = 1.200 × 0.800 - 0.15 × 0.15 × 2 = 0.9150 m^2

• P1~P4 [[A1-P5(L,R), N=4 nos.] , (per 1 nos.)

$V1 = (11.8600 - 0.9150) \times 1.600 = 17.512\ m^3$

(See "BEARINGS" for the volume of non-shrink mortar layer.)

$V2 = 1.700 \times 1.600 \times 0.716 = 1.948\ m^3$

$\Sigma V = 19.460\ m^3$

$4 \times \Sigma V = 77.840\ m^3$

· P21~P25 [[P20-A2(L,R), N=5 nos.] , (per 1 nos.)

$V1 = (11.8600 - 0.9150) \times 1.600 = 17.512\ m^3$

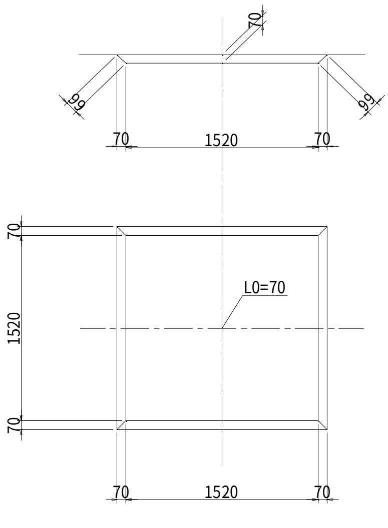
(See "BEARINGS" for the volume of non-shrink mortar layer.)

$V2 = 1.700 \times 1.600 \times 0.731 = 1.988\ m^3$

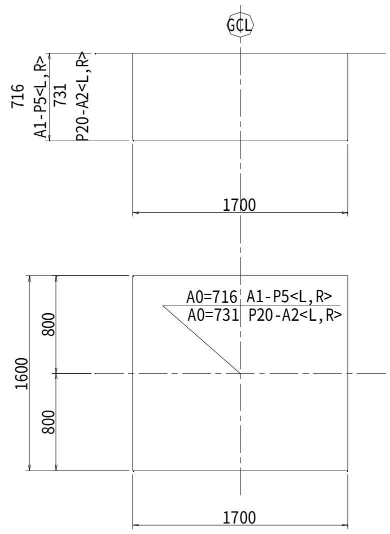
$\Sigma V = 19.500\ m^3$

$5 \times \Sigma V = 97.500\ m^3$

Detail of Mortar Layer



Detail of Block for Anchor Bar



Layer thickness is taken at the center

HEIGHT (mm) A1-P5<L>

	L0	A0
P1(L)	70	733
P2(L)	70	698
P3(L)	70	698
P4(L)	70	733
平均	70	716

HEIGHT (mm) A1-P5<R>

	L0	A0
P1(R)	70	733
P2(R)	70	698
P3(R)	70	698
P4(R)	70	733
平均	70	716

HEIGHT (mm) P20-A2<L,R>

	L0	A0
P21(L,R)	60	723
P22(L,R)	70	733
P23(L,R)	70	698
P24(L,R)	70	733
P25(L,R)	70	767
平均	68→70	731

3) Summary of Support Segments

3-1) End Segments

		units	Concrete Volume				TOTAL
			A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
Precast Portion	A1,A2	m^3	15.966	15.966	15.966	15.966	63.864
	P5,P20	m^3	13.836	13.836	13.836	13.836	55.344
	Subtotal	m^3	29.802	29.802	29.802	29.802	119.208
CIP Portion	A1,A2	m^3	21.584	21.584	21.507	21.507	86.182
	P5,P20	m^3	20.064	19.860	19.877	19.877	79.678
	Subtotal	m^3	41.648	41.444	41.384	41.384	165.860
TOTAL		m^3	71.450	71.246	71.186	71.186	285.068

3-2) Intermediatee Pier Segments

	units	Concrete Volume				TOTAL
		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
Precast Portion	m^3	89.500	89.500	111.875	111.875	402.750
CIP Portion	m^3	77.840	77.840	97.500	97.500	350.680
TOTAL	m^3	167.340	167.340	209.375	209.375	753.430

3-3. Key Segments

1) Concrete Volume

A1-P5(L)	A1-P1	P1-P2	P2-P3	P3-P4	P4-P5	TOTAL or Ave
Seg. Length (Ave) [mm]	157	157.5	157.5	203	221	179.2
2×Ave [mm]	314	315	315	406	442	1792
Cross-sectional Area [m^2]	6.963	6.963	6.963	6.963	6.963	6.963
Concrete Volume [m^3]	2.186	2.193	2.193	2.827	3.078	12.477

A1-P5(R)	A1-P1	P1-P2	P2-P3	P3-P4	P4-P5	TOTAL or Ave
Seg. Length (Ave) [mm]	157	157.5	157.5	211	190	174.6
2×Ave [mm]	314	315	315	422	380	1746
Cross-sectional Area [m^2]	6.963	6.963	6.963	6.963	6.963	6.963
Concrete Volume [m^3]	2.186	2.193	2.193	2.938	2.646	12.156

P20-A2(L,R)	P20-P21	P21-P22	P22-P23	P23-P24	P24-P25	P25-A2	TOTAL or Ave
Seg. Length (Ave) [mm]	151.5	153.5	155.5	157.5	157.5	157.5	155.5
2×Ave [mm]	303	307	311	315	315	315	1866
Cross-sectional Area [m^2]	6.963	6.963	6.963	6.963	6.963	6.963	6.963
Concrete Volume [m^3]	2.110	2.138	2.165	2.193	2.193	2.193	12.992

2) Summary of Concrete Volume

	units	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
CIP Portion	m^3	12.477	12.156	12.992	12.992	50.617

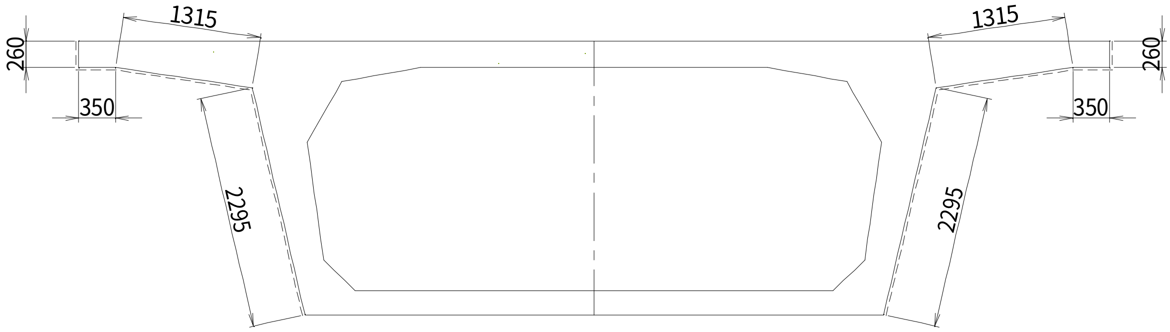
3-4. Summary of Concrete

		units	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTALE
PRESCAST CONCRETE							
	Seg type1	m^3	232.704	232.704	271.488	271.488	1008.384
	Seg type2	m^3	203.100	203.100	243.720	243.720	893.640
	Seg type3	m^3	162.552	162.552	203.190	203.190	731.484
	Seg type4	m^3	256.776	256.776	299.572	299.572	1112.696
	Seg type5	m^3	178.232	178.232	222.790	222.790	802.044
	Seg type6	m^3	368.964	366.177	443.314	443.314	1621.769
	Seg type7	m^3	208.972	208.972	253.552	253.552	925.048
	End Seg.	m^3	29.802	29.802	29.802	29.802	119.208
	Inter. Pier Seg.	m^3	89.500	89.500	111.875	111.875	402.750
	TOTAL	m^3	1730.602	1727.815	2079.303	2079.303	7617.023
CIP CONCRETE							
	End Seg.	m^3	41.648	41.444	41.384	41.384	165.860
	Inter. Pier Seg.	m^3	77.840	77.840	97.500	97.500	350.680
	Key Seg.	m^3	12.477	12.156	12.992	12.992	50.617
	TOTAL	m^3	131.965	131.440	151.876	151.876	567.157

4. FORMWORKS

4-1. Standard Segments

1) Side Form

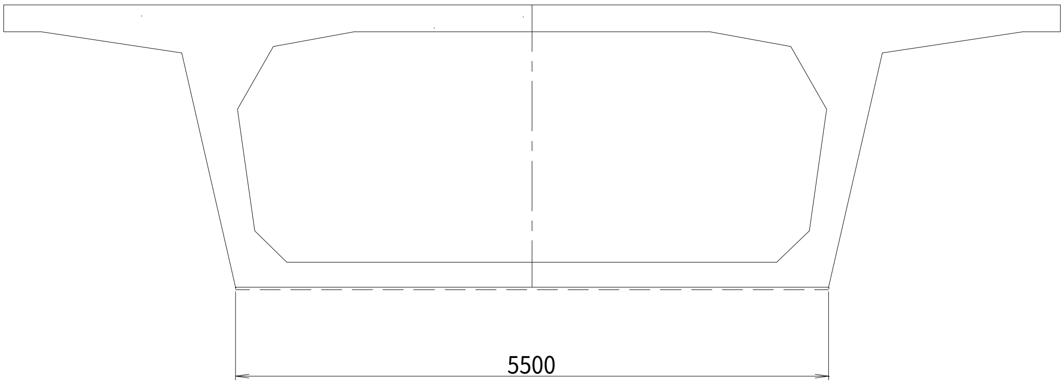


L1 = (0.260 + 0.350 + 1.350 + 2.295)× 2 = 8.510 m

		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
TOTAl		80	80	96	96	352

		Aside	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	25.530	306.360	306.360	357.420	357.420	1327.560
type2	3.0m	25.530	255.300	255.300	306.360	306.360	1123.320
type3	3.0m	25.530	204.240	204.240	255.300	255.300	919.080
type4	3.0m	25.530	306.360	306.360	357.420	357.420	1327.560
type5	3.0m	25.530	204.240	204.240	255.300	255.300	919.080
type6	2.5m	21.275	255.300	276.575	297.850	297.850	1127.575
	2.6m	22.126	0.000	44.252	0.000	0.000	44.252
	2.7m	22.977	183.816	114.885	229.770	229.770	758.241
type7	2.5m	21.275	85.100	85.100	85.100	85.100	340.400
	3.0m	25.530	153.180	153.180	204.240	204.240	714.840
TOTAL			1953.896	1950.492	2348.760	2348.760	8601.908

2) Bottom Form



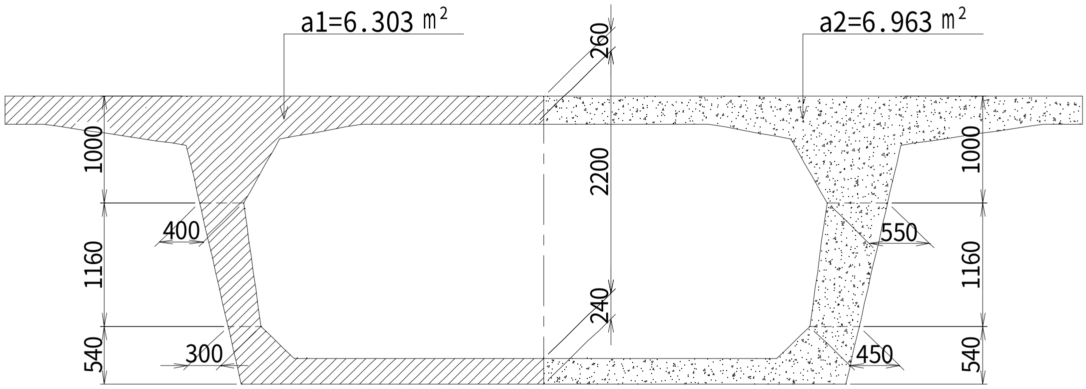
• Perimeter of Bottom Form

L1 = 5.500 m

		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
TOTAL		80	80	96	96	352

		Abottom	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	16.500	198.000	198.000	231.000	231.000	858.000
type2	3.0m	16.500	165.000	165.000	198.000	198.000	726.000
type3	3.0m	16.500	132.000	132.000	165.000	165.000	594.000
type4	3.0m	16.500	198.000	198.000	231.000	231.000	858.000
type5	3.0m	16.500	132.000	132.000	165.000	165.000	594.000
type6	2.5m	13.750	165.000	178.750	192.500	192.500	728.750
	2.6m	14.300	0.000	28.600	0.000	0.000	28.600
	2.7m	14.850	118.800	74.250	148.500	148.500	490.050
type7	2.5m	13.750	55.000	55.000	55.000	55.000	220.000
	3.0m	16.500	99.000	99.000	132.000	132.000	462.000
TOTAL			1262.800	1260.600	1518.000	1518.000	5559.400

3) Edge Form

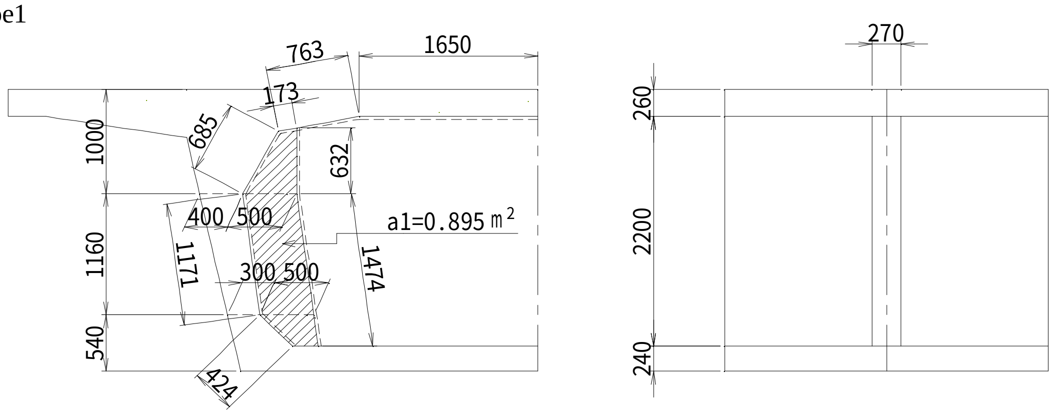


		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
TOTAl		80	80	96	96	352

		Aedge	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type1	3.0m	12.606	151.272	151.272	176.484	176.484	655.512
type2	3.0m	12.606	126.060	126.060	151.272	151.272	554.664
type3	3.0m	12.606	100.848	100.848	126.060	126.060	453.816
type4	3.0m	12.606	151.272	151.272	176.484	176.484	655.512
type5	3.0m	12.606	100.848	100.848	126.060	126.060	453.816
type6	2.5m	13.926	167.112	181.038	194.964	194.964	738.078
	2.6m	13.926	0.000	27.852	0.000	0.000	27.852
	2.7m	13.926	111.408	69.630	139.260	139.260	459.558
type7	2.5m	13.926	55.704	55.704	55.704	55.704	222.816
	3.0m	13.926	83.556	83.556	111.408	111.408	389.928
TOTAL			1048.080	1048.080	1257.696	1257.696	4611.552

4) Inner Form

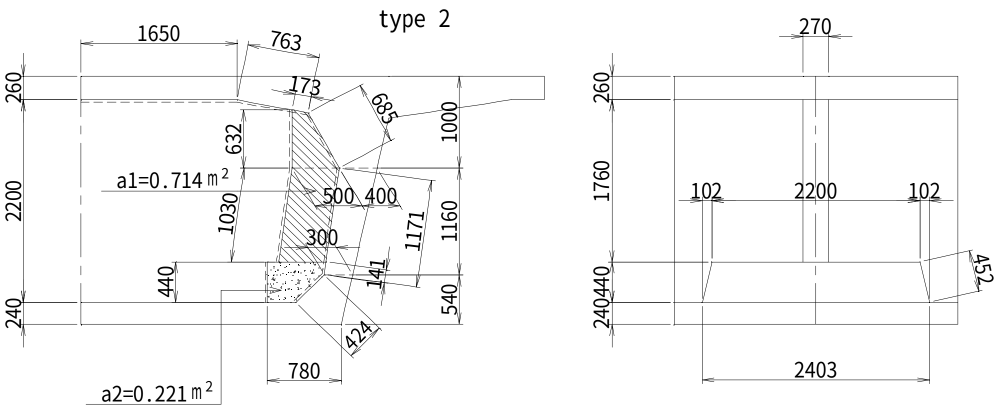
・type1



A1	= (	1.650	＋	0.763	＋	0.685	＋	1.171				
					＋	0.424	)×	2	×	3.00	=	28.158 m^2
A2	=	0.895	×	4	＋(	0.632	＋	1.474	)			
							×	0.270	×	2	=	4.717 m^2
-A3	= (	0.173	＋	0.685	＋	1.171	＋	0.424	)			
							×	0.270	×	2	=	-1.325 m^2
										∑A	=	31.550 m^2

・type2

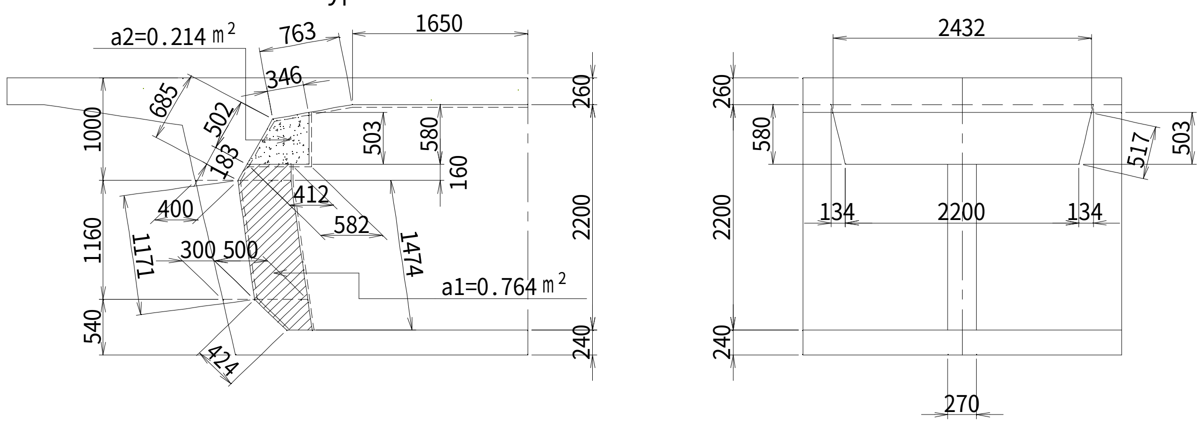
type 2



A1	= (	1.650	＋	0.763	＋	0.685	＋	1.171				
					＋	0.424	)×	2	×	3.00	=	28.158 m^2
A2	=	0.714	×	4	＋(	0.632	＋	1.030	)			
							×	0.270	×	2	=	3.753 m^2
-A3	= (	0.173	＋	0.685	＋	1.171	-	0.141	)			
							×	0.270	×	2	=	-1.020 m^2
A4	=	0.221	×	452/440	×	4						
	＋	1/2	×(	2.200	＋	2.403	)×	0.440	×	2	=	2.933 m^2
-A5	= (	0.141	＋	0.424	)							
			＋	1/2	×(	2.200	＋	2.403	)×	2	=	-2.601 m^2
										∑A	=	31.223 m^2

・type3

type 3



$$A1 = (1.650 + 0.763 + 0.685 + 1.171 + 0.424) \times 2 \times 3.00 = 28.158\ m^2$$

$$A2 = 0.764 \times 4 + (0.160 + 1.474) \times 0.270 \times 2 = 3.938\ m^2$$

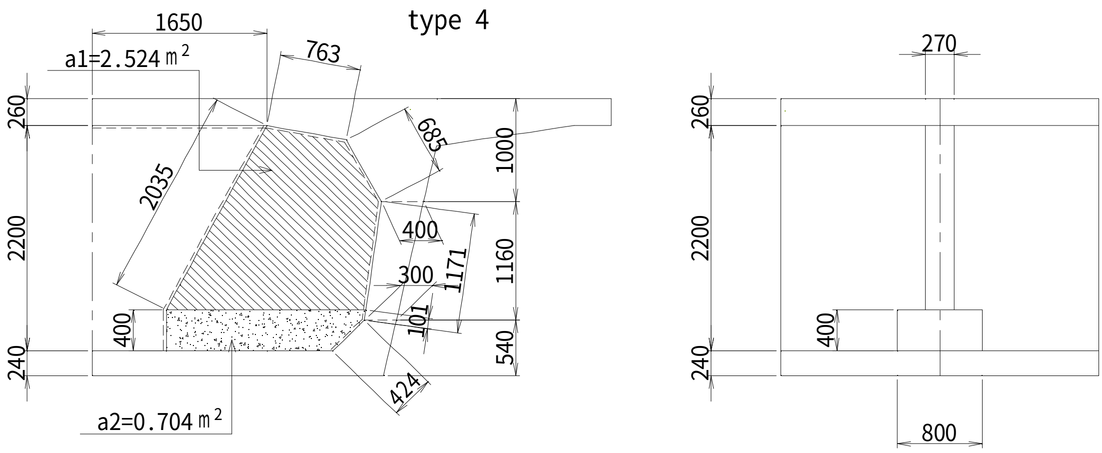
$$A3 = 0.214 \times 517/503 \times 4 + 1/2 \times (2.200 + 2.432) \times 0.503 \times 2 + 0.582 \times 2.200 \times 2 = 5.771\ m^2$$

$$-A4 = (0.412 + 0.183 + 1.171 + 0.424) \times 0.270 \times 2 = -1.183\ m^2$$

$$-A5 = (0.346 + 0.502) \times 1/2 \times (2.200 + 2.432) \times 2 = -3.928\ m^2$$

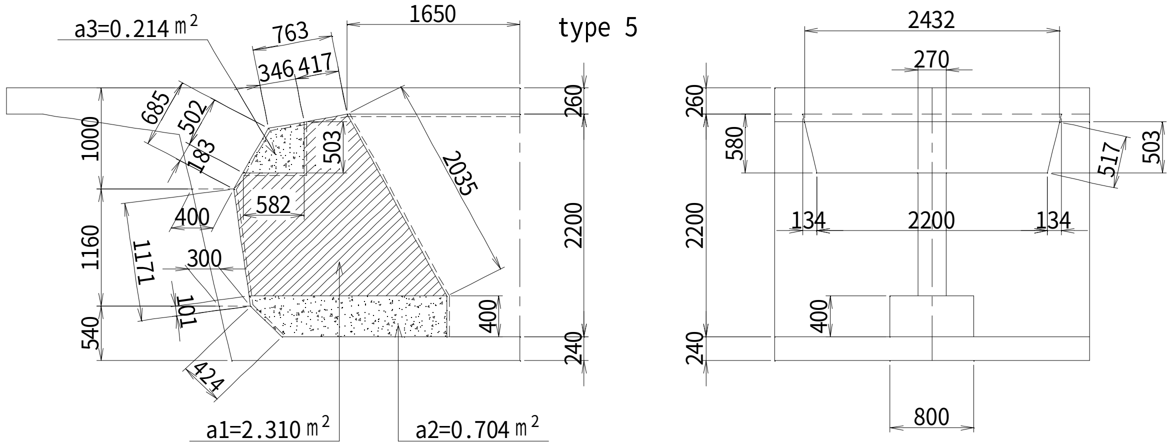
$$\sum A = 32.756\ m^2$$

・type4



A1	=	(	1.650	＋	0.763	＋	0.685	＋	1.171						
						＋	0.424	)×	2	×	3.00	=	28.158	m^2
A2	=		2.524	×	4	＋	2.035	×	0.270	×	2	=	11.195	m^2
A3	=		0.704	×	4	＋	0.400	×	0.800	×	2	=	3.456	m^2
-A4	=	(	0.763	＋	0.685	＋	1.171	-	0.101	)				
								×	0.270	×	2	=	-1.360	m^2
-A5	=	(	0.101	＋	0.424	)×	0.800	×	2			=	-0.840	m^2
											∑A	=	40.609	m^2

・type5



A1 = (1.650 ＋ 0.763 ＋ 0.685 ＋ 1.171
＋ 0.424)× 2 × 3.00 = 28.158 m^2

A2 = 2.310 × 4 ＋ 2.035 × 0.270 × 2 = 10.339 m^2

A3 = 0.704 × 4 ＋ 0.400 × 0.800 × 2 = 3.456 m^2

A4 = 0.214 × 517/503 × 4
＋ 1/2 ×(2.200 ＋ 2.432)× 0.503 × 2
＋ 0.582 × 2.200 × 2 = 5.771 m^2

-A5 = (0.417 ＋ 0.183 ＋ 1.171 - 0.101
＋ 0.503 ＋ 0.582)× 0.270 × 2 = -1.488 m^2

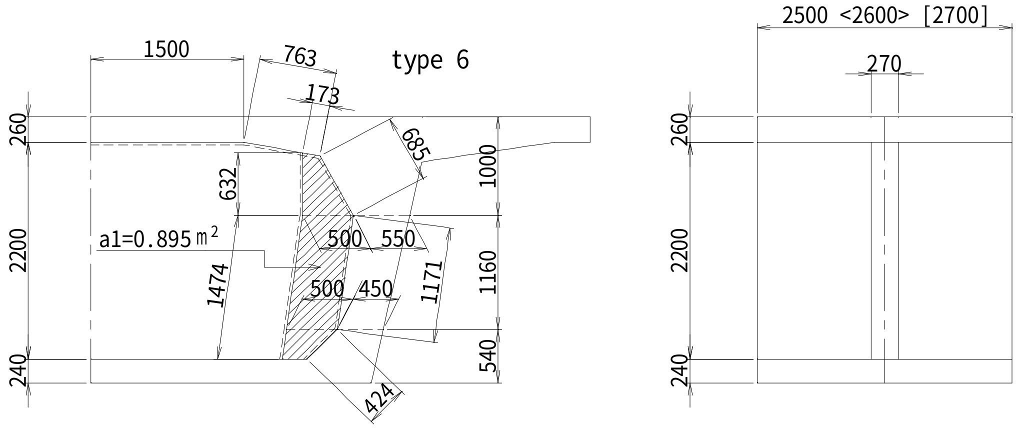
-A6 = (0.101 ＋ 0.424)× 0.800 × 2 = -0.840 m^2

-A7 = (0.346 ＋ 0.502)
× 1/2 ×(2.200 ＋ 2.432)× 2 = -3.928 m^2

∑A = 41.468 m^2

・type6

(L=2.5m,2.6m,2.7m)



・L=2.5m

A1	=	(	1.500	＋	0.763	＋	0.685	＋	1.171						
						＋	0.424	)×	2	×	2.50	=	22.715	m^2	

・L=2.6m

A1	=	(	1.500	＋	0.763	＋	0.685	＋	1.171					
						＋	0.424	)×	2	×	2.60	=	23.624	m^2

・L=2.7m

A1	=	(	1.500	＋	0.763	＋	0.685	＋	1.171					
						＋	0.424	)×	2	×	2.70	=	24.532	m^2

A2	=	0.895	×	4	＋(	0.632	＋	1.474	)				
							×	0.270	×	2	=	4.717	m^2
-A3	= (	0.173	＋	0.685	＋	1.171	＋	0.424	)				
							×	0.270	×	2	=	-1.325	m^2

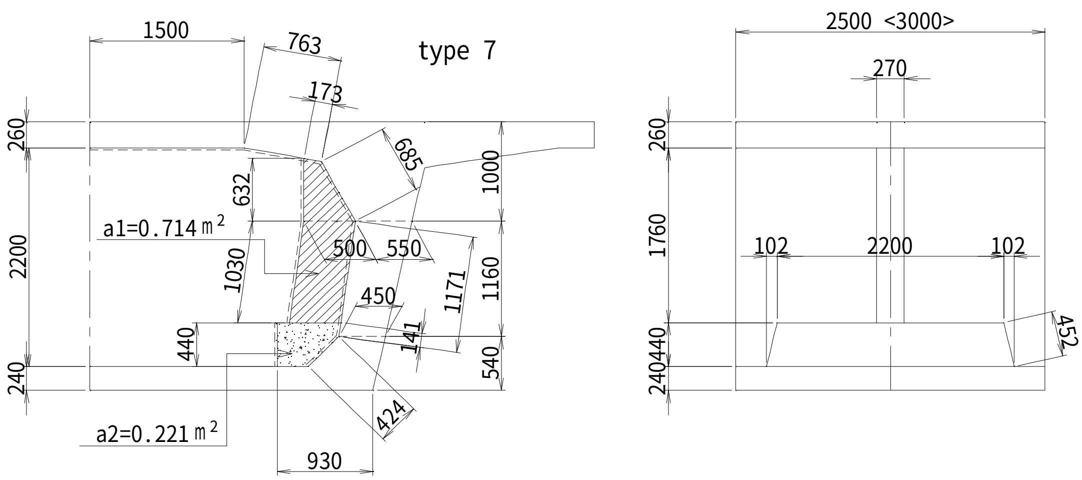
L=2.5m ∑A = 26.107 m^2

L=2.6m ∑A = 27.016 m^2

L=2.7m ∑A = 27.924 m^2

・type7

(L=2.5m,3.0m)



・L=2.5m

A1	=（	1.500	＋	0.763	＋	0.685	＋	1.171					
					＋	0.424	)×	2	×	2.50	=	22.715	m^2

・L=3.0m

A1	=（	1.500	＋	0.763	＋	0.685	＋	1.171					
					＋	0.424	)×	2	×	3.00	=	27.258	m^2

A2	=	0.714	×	4	＋(	0.632	＋	1.030	)				
							×	0.270	×	2	=	3.753	m^2
-A3	=（	0.173	＋	0.685	＋	1.171	-	0.141	)				
							×	0.270	×	2	=	-1.020	m^2
A4	=	0.221	×	452/440	×	4							
	＋	1/2	×(	2.200	＋	2.403	)×	0.440	×	2	=	2.933	m^2
-A5	=（	0.141	＋	0.424	)								
			＋	1/2	×(	2.200	＋	2.403	)×	2	=	-2.601	m^2
										L=2.5m ∑A	=	25.780	m^2
										L=3.0m ∑A	=	30.323	m^2

5) Summary of Inner Form

• Number of Segments

		Number				TOTAL
		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
type1	3.0m	12	12	14	14	52
type2	3.0m	10	10	12	12	44
type3	3.0m	8	8	10	10	36
type4	3.0m	12	12	14	14	52
type5	3.0m	8	8	10	10	36
type6	2.5m	12	13	14	14	53
	2.6m	0	2	0	0	2
	2.7m	8	5	10	10	33
type7	2.5m	4	4	4	4	16
	3.0m	6	6	8	8	28
TOTAL		80	80	96	96	352

• Summary of Inner Form per 1 bridge

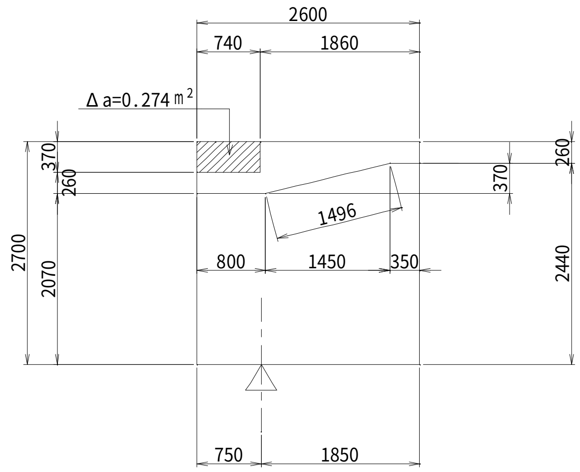
		per segment m^3	Area by type				TOTAL
			A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
type1	3.0m	31.550	378.600	378.600	441.700	441.700	1640.600
type2	3.0m	31.223	312.230	312.230	374.676	374.676	1373.812
type3	3.0m	32.756	262.048	262.048	327.560	327.560	1179.216
type4	3.0m	40.609	487.308	487.308	568.526	568.526	2111.668
type5	3.0m	41.468	331.744	331.744	414.680	414.680	1492.848
type6	2.5m	26.107	313.284	339.391	365.498	365.498	1383.671
	2.6m	27.016	0.000	54.032	0.000	0.000	54.032
	2.7m	27.924	223.392	139.620	279.240	279.240	921.492
type7	2.5m	25.780	103.120	103.120	103.120	103.120	412.480
	3.0m	30.323	181.938	181.938	242.584	242.584	849.044
TOTAL			2593.664	2590.031	3117.584	3117.584	11418.863

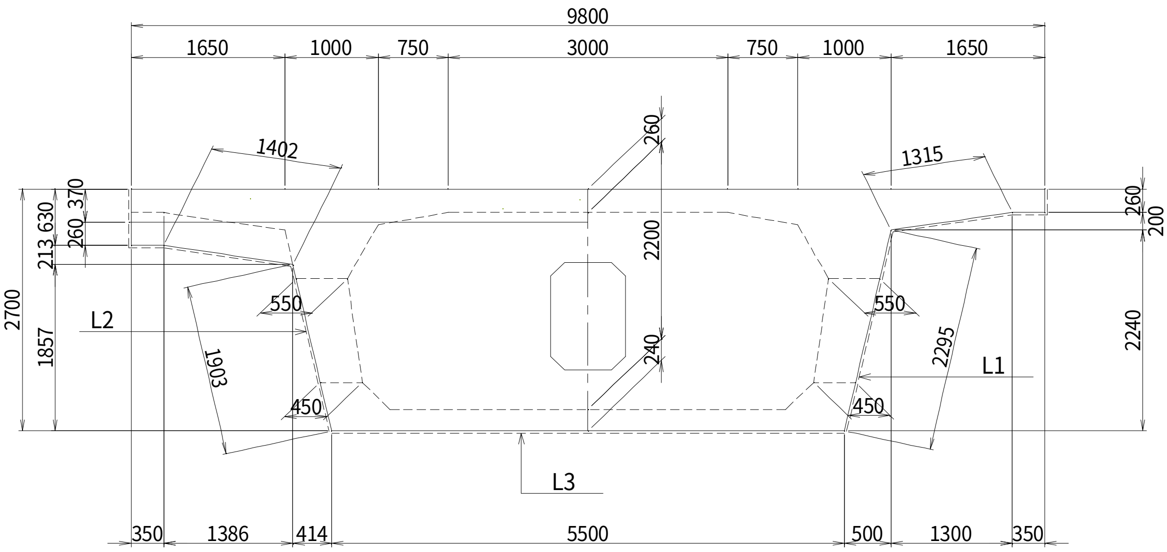
4-2. Segments at Support

1) End Segments

1-1) Formwork for Precast Portion

- at A1, A2





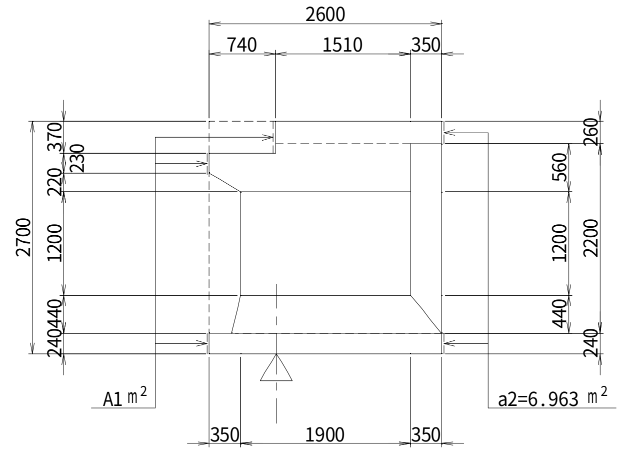
Perimeters of Formwork

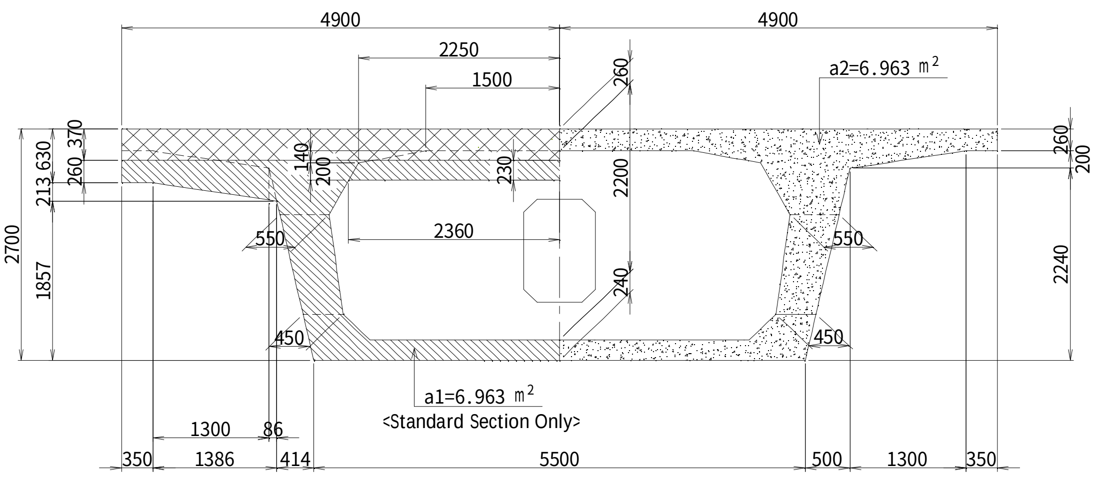
L1	=(	0.260	+	0.350	+	1.315	+	2.295	)×	2	=	8.440 m
L2	=(	0.630	+	0.350	+	1.402	+	1.903	)×	2	=	8.570 m
L3	=	5.500	m									
Δa	=	0.740	×	0.370							=	0.2738 m^2

a) Side Form

A1	=	8.440	×	0.350	+	8.570	×	0.800			=	9.810	m^2
				<ΔL1>		<ΔL2>							
A2	=	1/2	×(	5.810	+	5.766	)×	1.450					
	+	1/2	×(	1.402	+	1.315	)×	1.496	×	2	=	12.457	m^2
-A3	=	-0.2738	×	2							=	-0.548	m^2
										ΣA	=	21.719	m^2
ΔL1	=	8.440	-	1.315	×	2					=	5.810	m
ΔL2	=	8.570	-	1.402	×	2					=	5.766	m

b) Edge Form





		<a1>											
A1	=	6.963	+(	0.350	+	1.300	)×	0.260	×	2			
			+	1/2	×	0.086	×	0.260	×	2			
	+	1/2	×(	1.500	+	2.250	)×	0.140	×	2			
	+	1/2	×(	2.250	+	2.360	)×	0.200	×	2	=	9.290	m^2
				<a2>									
ΣA	=	9.290	+	6.963							=	16.253	m^2

c) Bottom Form

<A1(L,R)>

A1 = 5.500 × 2.600 = 14.300 m^2

A2 = 1/2 ×(1.180 + 1.240)× 0.085 × 4 × 2 = 0.823 m^2

A3 =(1.700 + 1.200)× 2 × 0.705 = 4.089 m^2

ΣA = 19.212 m^2

<A2(L,R)>

A1 = 5.500 × 2.600 = 14.300 m^2

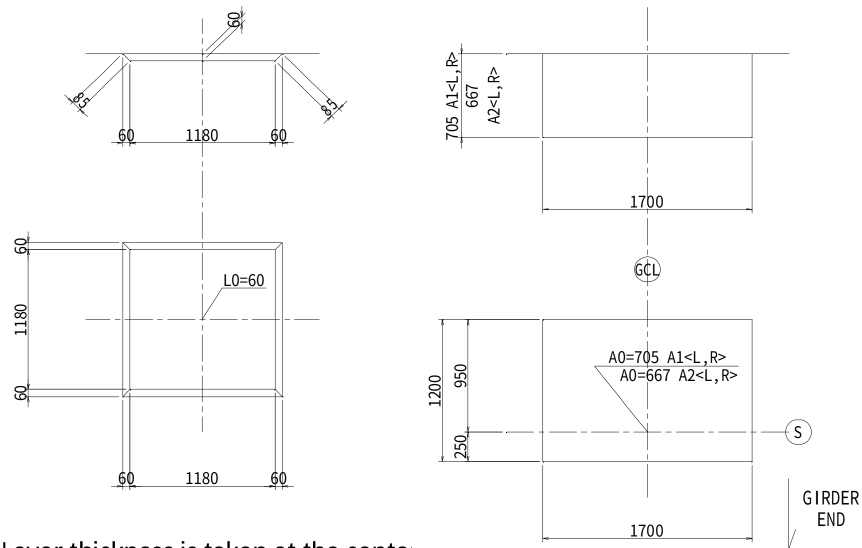
A2 = 1/2 ×(1.180 + 1.240)× 0.085 × 4 × 2 = 0.823 m^2

A3 =(1.700 + 1.200)× 2 × 0.667 = 3.869 m^2

ΣA = 18.992 m^2

Detail of Mortar Layer

Detail of Block for Anchor Bar



Layer thickness is taken at the cente

HEIGHT (mm)

	L0	A0
A1(L)	60	705
P5(L)	60	735

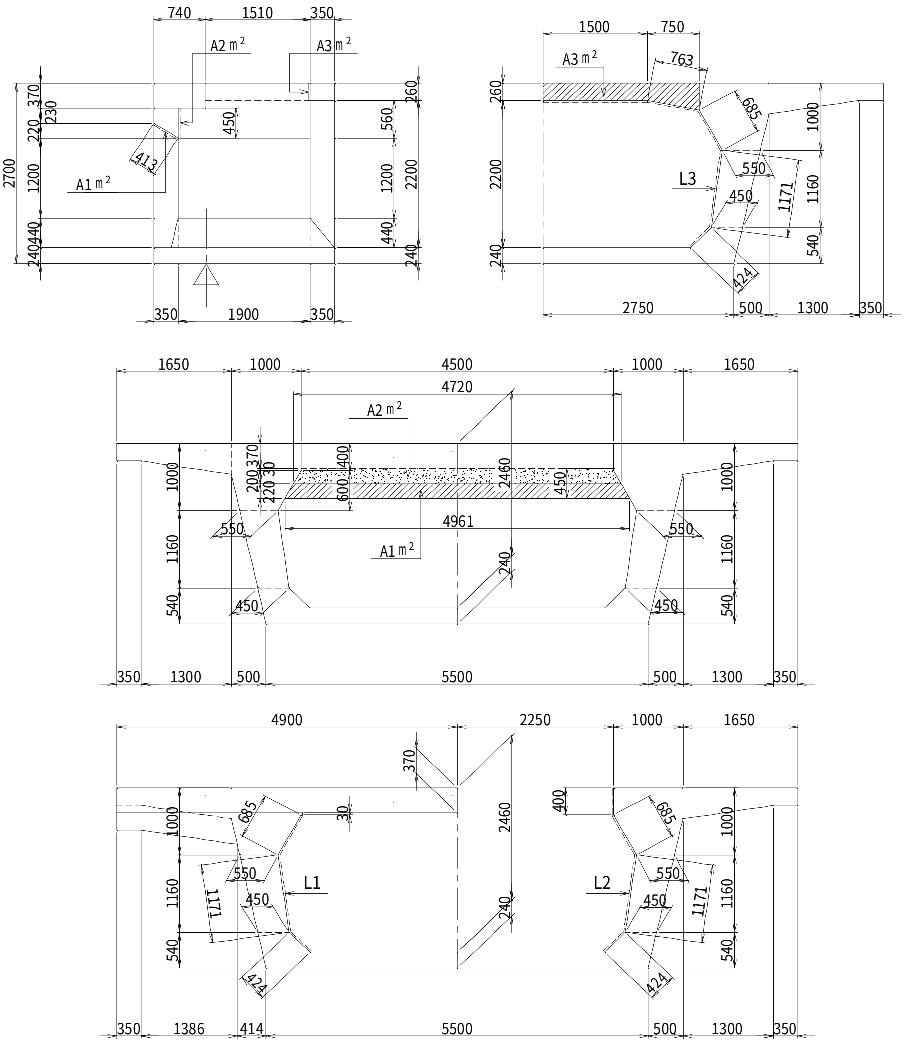
HEIGHT (mm)

	L0	A0
A1(R)	60	705
P5(R)	60	635

HEIGHT (mm)

	L0	A0
P20(L,R)	50	643
A2(L,R)	60	667

d) Inner Form



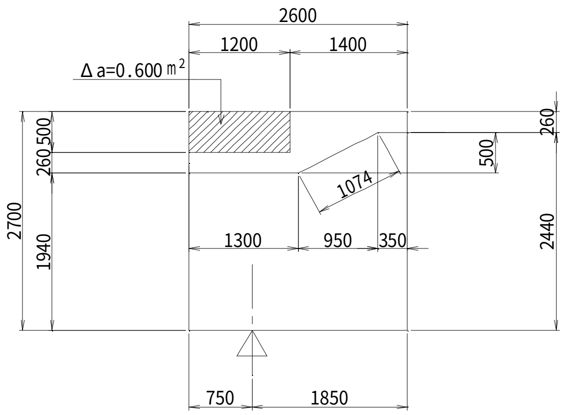
Perimeter of Formwork

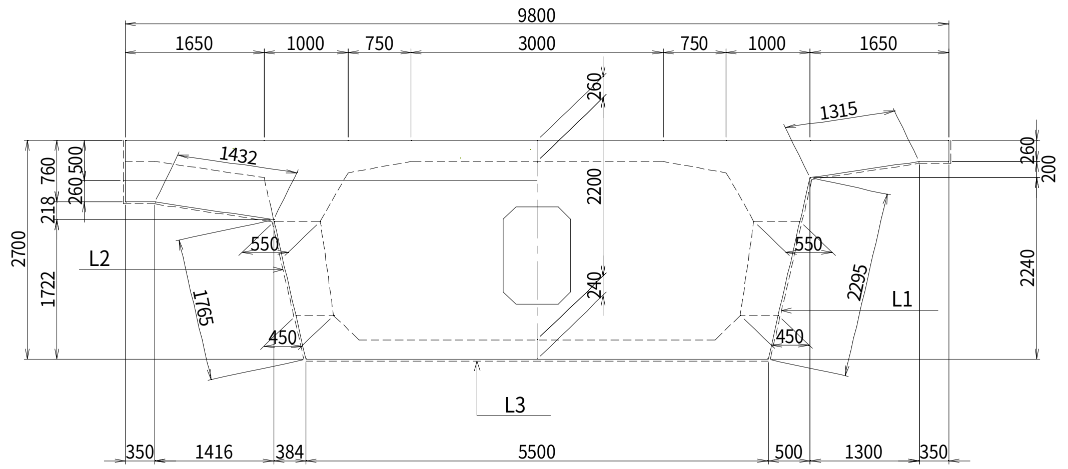
L1	=(	0.030	＋	0.685	＋	1.171	＋	0.424	)×	2	=	4.620	m
L2	=(	0.400	＋	0.685	＋	1.171	＋	0.424	)×	2	=	5.360	m
L3	=(	1.500	＋	0.763	＋	0.685							
					＋	1.171	＋	0.424	)×	2	=	9.086	m

Area of Formwork

A1	=	1/2	×(	4.720	＋	4.961	)×	0.413			=	1.999	m^2
A2	=	1/2	×(	4.500	＋	4.961	)×	0.440					
							＋	0.030	×	4.500	=	2.216	m^2
A3	=	1/2	×(	0.260	＋	0.400	)×	0.750	×	2			
							＋	0.260	×	3.000	=	1.275	m^2
A4	=	4.620	×	0.740	＋	5.360	×	1.510					
							＋	9.086	×	0.350	=	14.693	m^2
										ΣA	=	20.183	m^2

• at P5, P20





Perimeter of Form

L1 =(0.260 + 0.350 + 1.315 + 2.295)× 2 = 8.440 m

L2 =(0.760 + 0.350 + 1.432 + 1.765)× 2 = 8.614 m

L3 = 5.500 m

Δa = 1.200 × 0.500 = 0.600 m^2
ΔL1 = 8.440 - 1.315 × 2 = 5.810 m
ΔL2 = 8.614 - 1.432 × 2 = 5.750 m

a) Side Form

A1 = 8.440 × 0.350 + 8.614 × 1.200 = 13.291 m^2

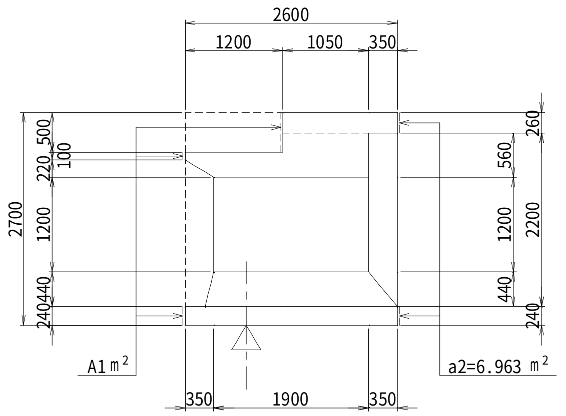
<ΔL1> <ΔL2>

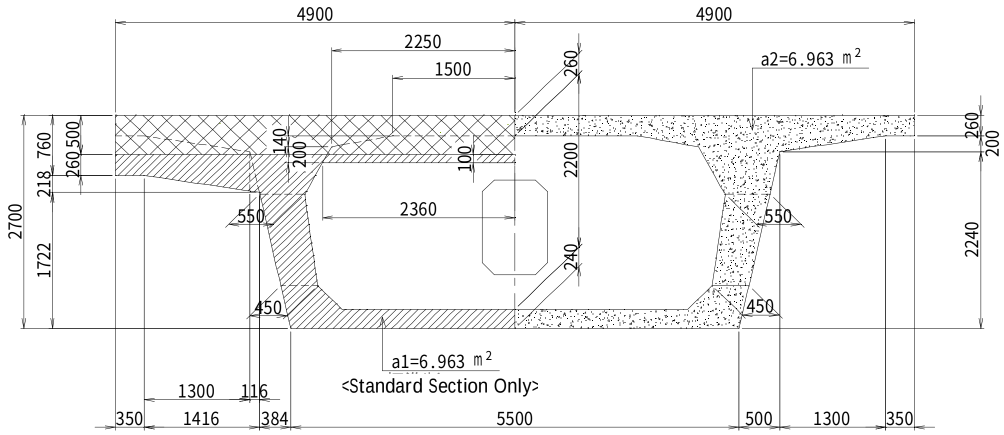
A2 = 1/2 ×(5.810 + 5.750)× 0.950
+ 1/2 ×(1.432 + 1.315)× 1.017 × 2 = 8.285 m^2

-A3 = -0.600 × 2 = -1.200 m^2

ΣA = 20.376 m^2

b) Edge Form





<a1>

$A1 = 6.963 + (0.350 + 1.300) \times 0.260 \times 2$

$+ 1/2 \times 0.116 \times 0.260 \times 2$

$+ 1/2 \times (1.500 + 2.250) \times 0.140 \times 2$

$+ 1/2 \times (2.250 + 2.360) \times 0.200 \times 2 = 9.298 \ m^2$

<a2>

$\Sigma A = 9.298 + 6.963 = 16.261 \ m^2$

c) Bottom Form

<P5(L)>

$A1 = 5.500 \times 2.600 = 14.300\ m^2$

$A2 = 1/2 \times (1.180 + 1.240) \times 0.085 \times 4 \times 2 = 0.823\ m^2$

$A3 = (1.700 + 1.200) \times 2 \times 0.735 = 4.263\ m^2$

$\Sigma A = 19.386\ m^2$

<P5(R)>

$A1 = 5.500 \times 2.600 = 14.300\ m^2$

$A2 = 1/2 \times (1.180 + 1.240) \times 0.085 \times 4 \times 2 = 0.823\ m^2$

$A3 = (1.700 + 1.200) \times 2 \times 0.635 = 3.683\ m^2$

$\Sigma A = 18.806\ m^2$

<P20(l,R)>

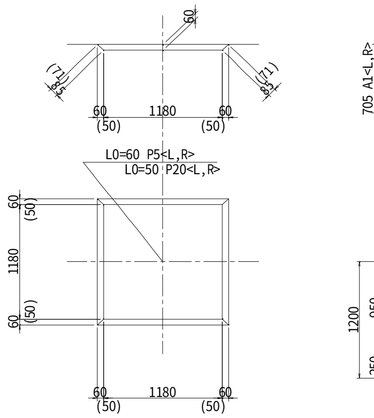
$A1 = 5.500 \times 2.600 = 14.300\ m^2$

$A2 = 1/2 \times (1.180 + 1.280) \times 0.071 \times 4 \times 2 = 0.699\ m^2$

$A3 = (1.700 + 1.200) \times 2 \times 0.643 = 3.729\ m^2$

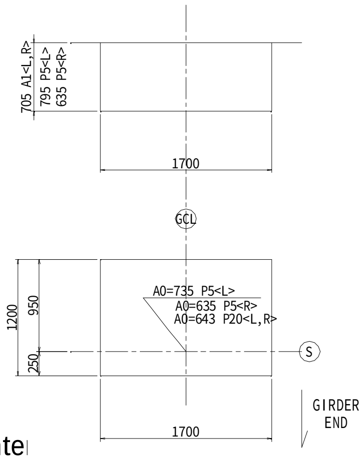
$\Sigma A = 18.728\ m^2$

Detail of Mortar Layer



Layer thickness is taken at the center

Detail of Block for Anchor Bar



HEIGHT (mm)

	L0	A0
A1(L)	60	705
P5(L)	60	735

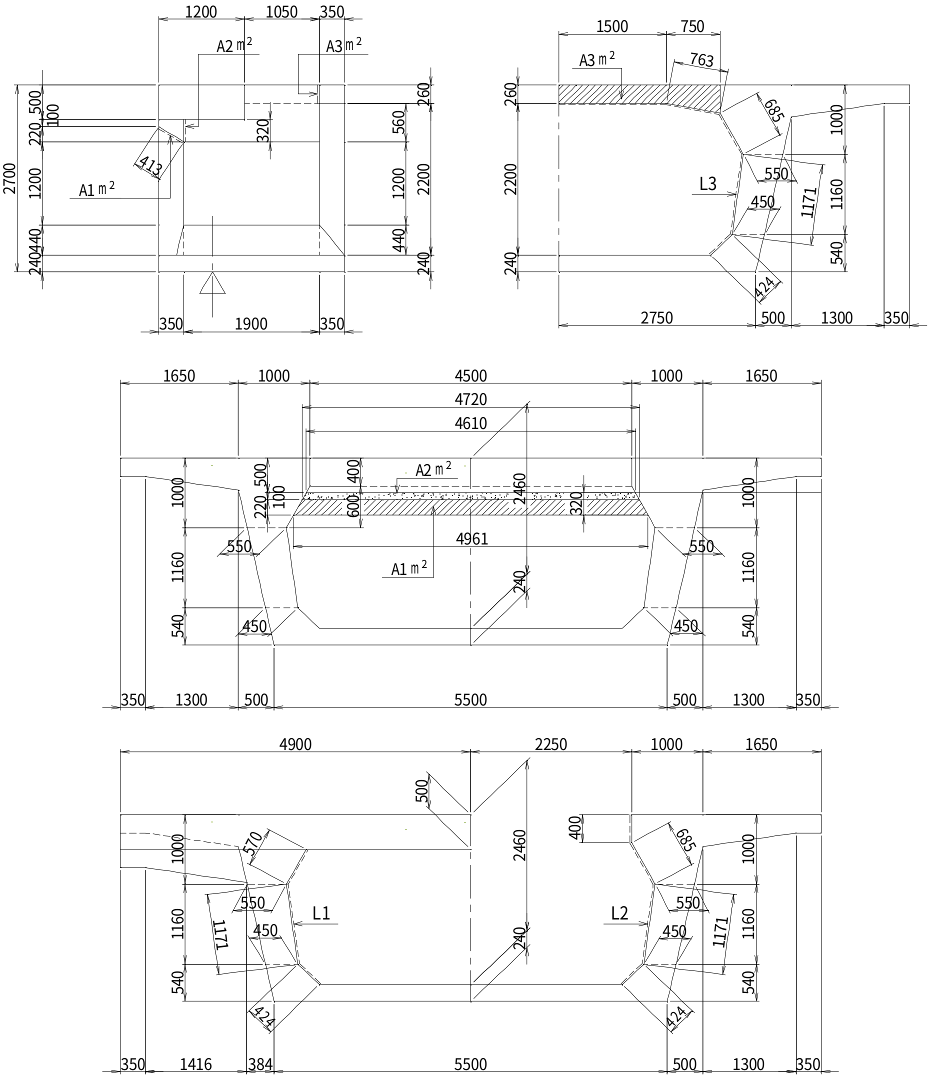
HEIGHT (mm)

	L0	A0
A1(R)	60	705
P5(R)	60	635

HEIGHT (mm)

	L0	A0
P20(L,R)	50	643
A2(L,R)	60	667

d) Inner Form



Perimeter of Formwork

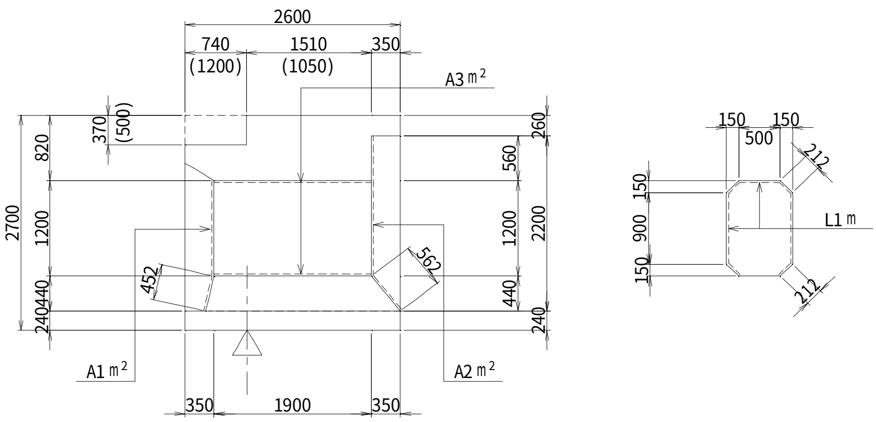
L1	=(	0.570	+	1.171	+	0.424	)×	2				=	4.330	m
L2	=(	0.400	+	0.685	+	1.171	+	0.424	)×	2		=	5.360	m
L3	=(	1.500	+	0.763	+	0.685								
					+	1.171	+	0.424	)×	2		=	9.086	m

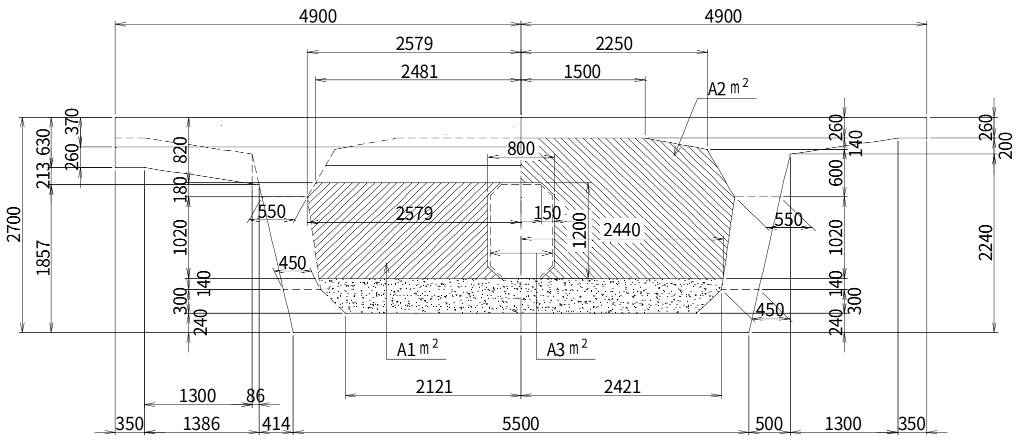
Area of Formwork

A1	=	1/2	×(	4.720	+	4.961	)×	0.413			=	1.999	m^2
A2	=	1/2	×(	4.610	+	4.961	)×	0.320			=	1.531	m^2
A3	=	1/2	×(	0.260	+	0.400	)×	0.750	×	2			
							+	0.260	×	3.000	=	1.275	m^2
A4	=	4.330	×	1.200	+	5.360	×	1.050					
							+	9.086	×	0.350	=	14.004	m^2
										ΣA	=	18.809	m^2

1-2) Formwork for CIP Portion

• at A1, A2, P5, P20





Δa	=	1.200	×	0.800	-	0.15	×	0.15	×	2	=	0.9150	m^2
ΔL	=(	0.212	×	2	+	0.900	)×	2	+	0.500	=	3.148	m

a) Edge Form

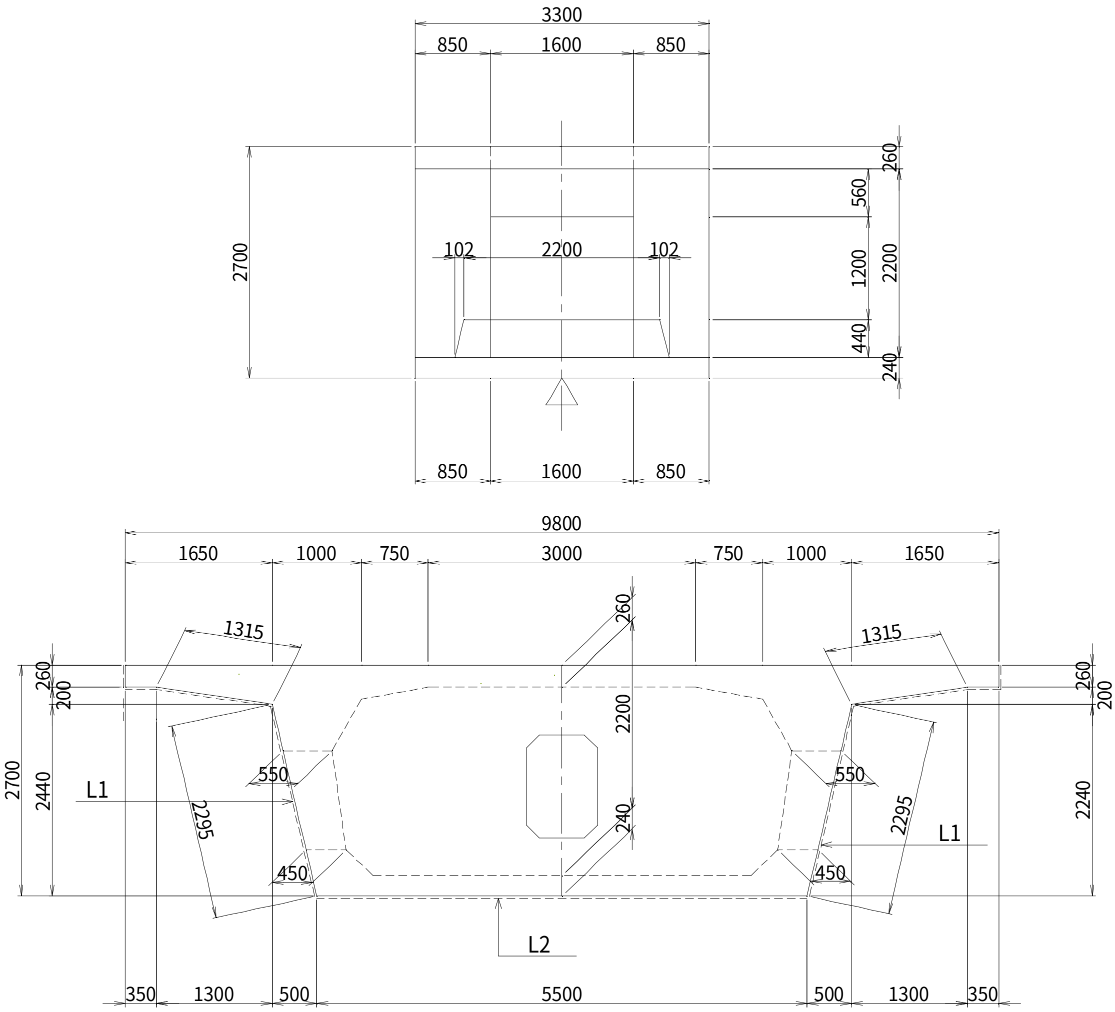
A1	=	1/2	×(	2.481	+	2.579	)×	0.180	×	2			
	+	1/2	×(	2.579	+	2.440	)×	1.02	×	2			
	+[	1/2	×(	2.440	+	2.421	)×	0.140	×	2			
	+	1/2	×(	2.421	+	2.121	)×	0.30					
					×	2	]×	452/440	-	0.9150	=	7.214	m^2
A2	=	1/2	×(	1.500	+	2.250	)×	0.140	×	2			
	+	1/2	×(	2.250	+	2.579	)×	0.6	×	2			
	+	1/2	×(	2.579	+	2.440	)×	1.02	×	2			
	+[	1/2	×(	2.440	+	2.421	)×	0.140	×	2			
	+	1/2	×(	2.421	+	2.121	)×	0.30					
					×	2	]×	562/440	-	0.9150	=	10.236	m^2
										ΣA	=	17.450	m^2

b) Inner Form

A3	=	3.148	×	1.900							=	5.981	m^2

2) Intermediate Pier Segments

2-1) Formwork for Precast Portion



Perimeter of Formwork

L1 =(0.260 + 0.350 + 1.315 + 2.295)× 2 = 8.440 m

L2 = 5.500 m

a) Side Form

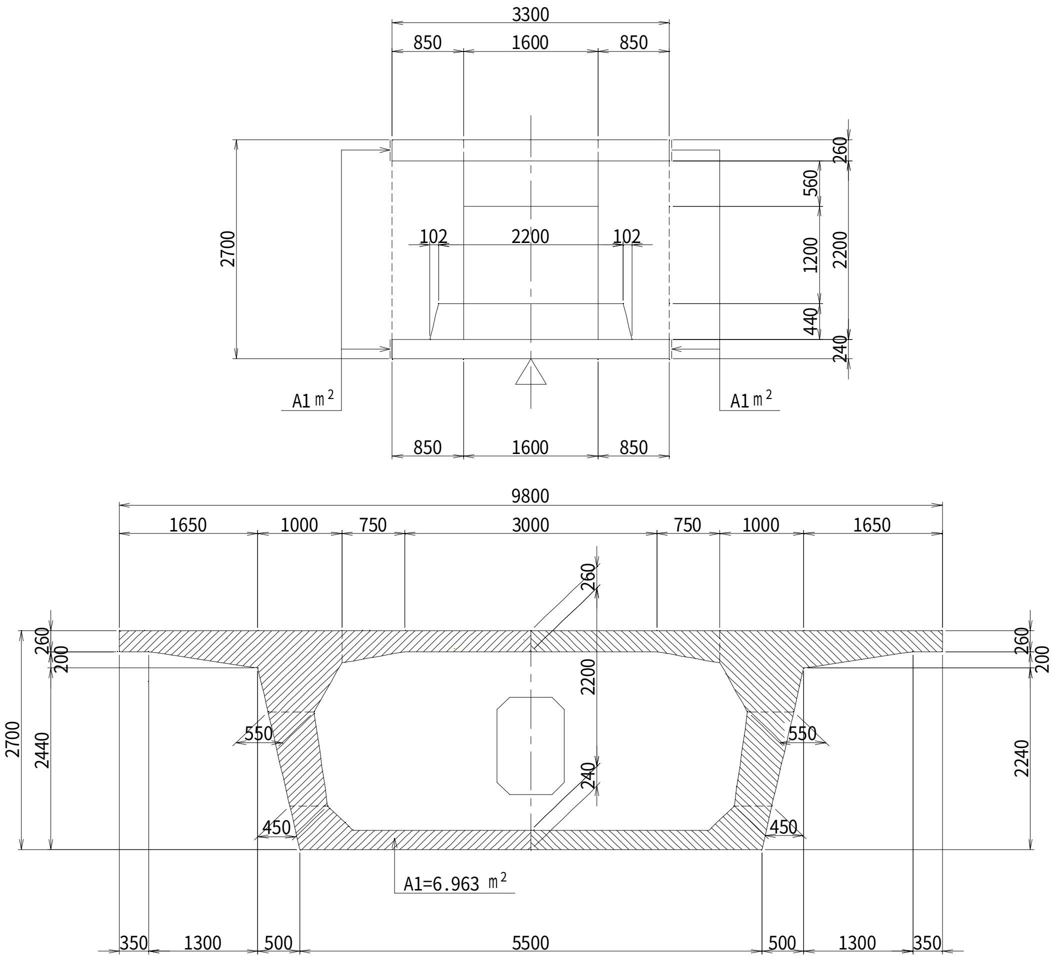
A1 = 8.440 × 3.300 = 27.852 m^2

<per 1 nos.> ΣA = 27.852 m^2

[A1-P5(L,R), N=4 nos.] 4×ΣA = 111.408 m^2

[P20-A2(L,R), N=5 nos.] 5×ΣA = 139.260 m^2

b) Edge Form



A1 = 6.963 × 2 = 13.926 m^2

<per 1 nos.> ΣA = 13.926 m^2

[A1-P5(L,R), N=4 nos.] 4×ΣA = 55.704 m^2

[P20-A2(L,R), N=5 nos.] 5×ΣA = 69.630 m^2

c) Bottom Form

• [A1-P5(L,R), N=4 nos.], (per 1 nos.)

A1 = 5.500 × 3.300 = 18.150 m^2

A2 = 1/2 ×(1.520 ＋ 1.660)× 0.099 × 4 × 2 = 1.259 m^2

A3 =(1.700 + 1.600)× 2 × 0.716 = 4.726 m^2

ΣA = 24.135 m^2

4×ΣA = 96.540 m^3

• [P20-A2(L,R), N=5 nos.], (per 1 nos.)

A1 = 5.500 × 3.300 = 18.150 m^2

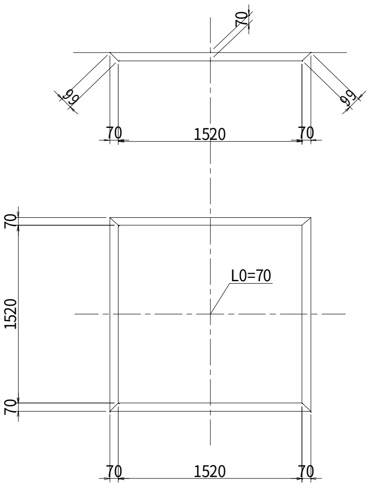
A2 = 1/2 ×(1.520 ＋ 1.660)× 0.099 × 4 × 2 = 1.259 m^2

A3 =(1.700 + 1.600)× 2 × 0.731 = 4.825 m^2

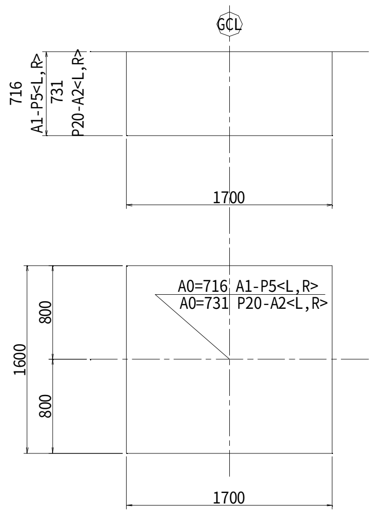
ΣA = 24.234 m^2

5×ΣA = 121.170 m^3

Detail of Mortar Layer



Detail of Block for Anchor Bar



Layer thickness is taken at the cente

HEIGHT (mm) A1-P5<L>

	L0	A0
P1(L)	70	733
P2(L)	70	698
P3(L)	70	698
P4(L)	70	733
平均	70	716

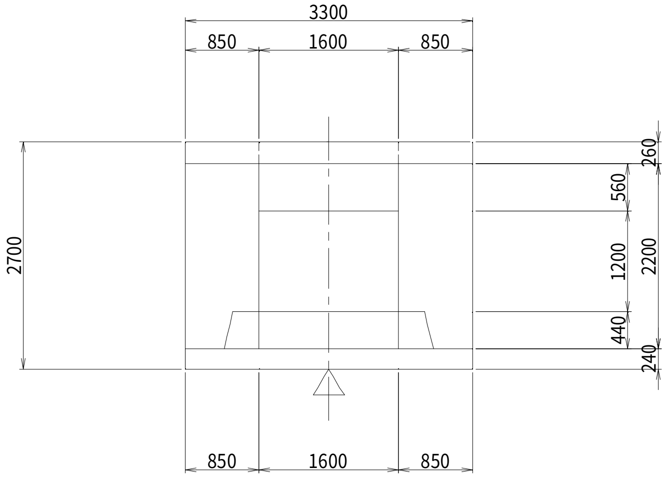
HEIGHT (mm) A1-P5<R>

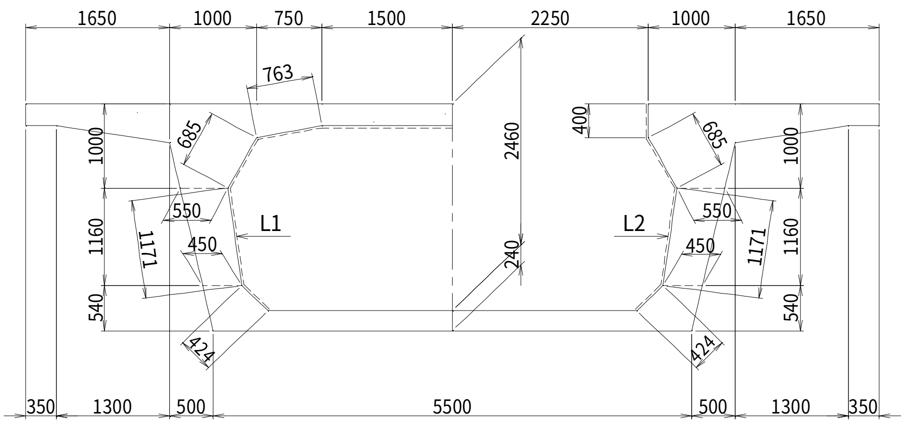
	L0	A0
P1(R)	70	733
P2(R)	70	698
P3(R)	70	698
P4(R)	70	733
平均	70	716

HEIGHT (mm) P20-A2<L,R>

	L0	A0
P21(L,R)	60	723
P22(L,R)	70	733
P23(L,R)	70	698
P24(L,R)	70	733
P25(L,R)	70	767
平均	68→70	731

d) Inner Form





Perimeter of Formwork

L1 =(1.500 + 0.763 + 0.685 + 1.171 + 0.424)× 2 = 9.086 m

L2 =(0.400 + 0.685 + 1.171 + 0.424)× 2 = 5.360 m

Area of Formwork

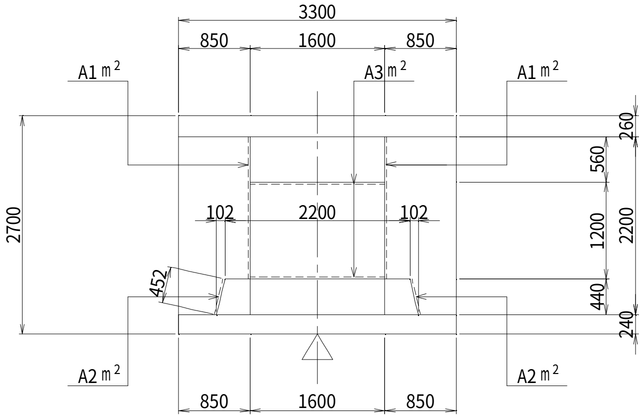
A1 = 9.086 × 0.850 × 2 + 5.360 × 1.600 = 24.022 m^2

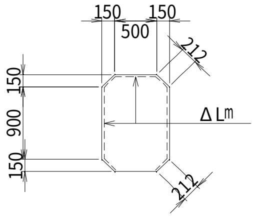
<per 1 nos.> ΣA = 24.022 m^2

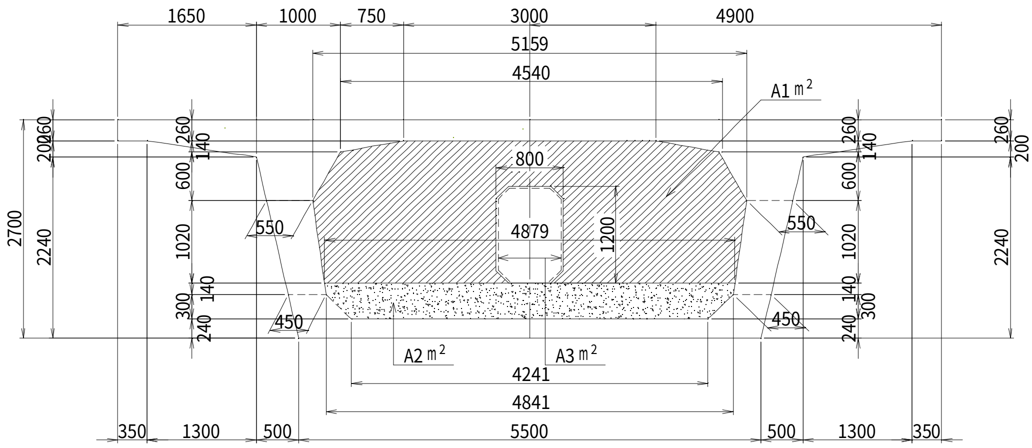
[A1-P5(L,R), N=4 nos.] 4×ΣA = 96.088 m^2

[P20-A2(L,R), N=5 nos.] 5×ΣA = 120.110 m^2

2-2) Formwork for CIP Portion







Δa = 1.200 × 0.800 - 0.15 × 0.15 × 2 = 0.9150 m^2

ΔL =(0.212 × 2 ＋ 0.900)× 2 ＋ 0.500 = 3.148 m

a) Edge Form

A1 = 1/2 ×(3.000 ＋ 4.540)× 0.140
＋ 1/2 ×(4.540 ＋ 5.159)× 0.60
＋ 1/2 ×(5.159 ＋ 4.879)× 1.020
- 0.9150 = 7.642 m^2

A2 =[1/2 ×(4.879 ＋ 4.841)× 0.140
＋ 1/2 ×(4.841 ＋ 4.241)× 0.30]× 452/440 = 2.098 m^2

<one side> ΣA = 9.740 m^2

<per 1. nos.> 2×ΣA = 19.48 m^2

[A1-P5(L,R), N=4 nos.] 4×2×ΣA = 77.920 m^2

[P20-A2(L,R), N=5 nos.] 5×2×ΣA = 97.400 m^2

b) Inner Form

A3	=	3.148	×	1.600		=	5.037	m^2
					<per 1 nos.>	ΣA =	5.037	m^2
					[A1-P5(L,R), N=4 nos.]	$4\times\Sigma A$ =	20.148	m^2
					[P20-A2(L,R), N=5 nos.]	$5\times\Sigma A$ =	25.185	m^2

3) Summary of Formworks for Support Segments

3-1) End Segments

			units	Area of Formwork				TOTAL
				A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
Precast Portion	A1,A2	Side	m^2	21.719	21.719	21.719	21.719	86.876
		Edge	m^2	16.253	16.253	16.253	16.253	65.012
		Bottom	m^2	19.212	19.212	18.992	18.992	76.408
		Inner	m^2	20.183	20.183	20.183	20.183	80.732
		Sum	m^2	77.367	77.367	77.147	77.147	309.028
	P5,P20	Side	m^2	20.376	20.376	20.376	20.376	81.504
		Edge	m^2	16.261	16.261	16.261	16.261	65.044
		Bottom	m^2	19.386	18.806	18.728	18.728	75.648
		Inner	m^2	18.809	18.809	18.809	18.809	75.648
		Sum	m^2	74.832	74.252	74.174	74.174	75.648
	Subtotal	Side	m^2	42.095	42.095	42.095	42.095	75.648
		Edge	m^2	32.514	32.514	32.514	32.514	75.648
		Bottom	m^2	38.598	38.018	37.720	37.720	75.648
		Inner	m^2	38.992	38.992	38.992	38.992	75.648
		Sum	m^2	152.199	151.619	151.321	151.321	606.460
CIP Portion	A1,A2	Edge	m^2	17.450	17.450	17.450	17.450	69.800
		Inner	m^2	5.981	5.981	5.981	5.981	23.924
		Sum	m^2	23.431	23.431	23.431	23.431	93.724
	P5,P20	Edge	m^2	20.064	20.064	20.064	20.064	80.256
		Inner	m^2	5.981	5.981	5.981	5.981	23.924
		Sum	m^2	26.045	26.045	26.045	26.045	104.180
	Subtotal	Edge	m^2	37.514	37.514	37.514	37.514	150.056
		Inner	m^2	11.962	11.962	11.962	11.962	47.848
		Sum	m^2	49.476	49.476	49.476	49.476	197.904
TOTAl			m^2	201.675	201.095	200.797	200.797	804.364

Note: Mortar layers on bearings and blocks for anchor bars are included

3-2) Intermediate Pier Segments

		units	Area of Formwork				TOTAL
			A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	
Precast Portion	Side	m^2	111.408	111.408	139.260	139.260	501.336
	Edge	m^2	55.704	55.704	69.630	69.630	250.668
	Bottom	m^2	96.540	96.540	121.170	121.170	435.420
	Inner	m^2	96.088	96.088	120.110	120.110	432.396
	Sum	m^2	359.740	359.740	450.170	450.170	1619.820
CIP Portion	Edge	m^2	77.920	77.920	97.400	97.400	350.640
	Inner	m^2	20.148	20.148	25.185	25.185	90.666
	Sum	m^2	98.068	98.068	122.585	122.585	441.306
TOTAl		m^2	457.808	457.808	572.755	572.755	2061.126

Note: Mortar layers on bearings and blocks for anchor bars are included

4-3. Key Segments

1) Area of Formwork

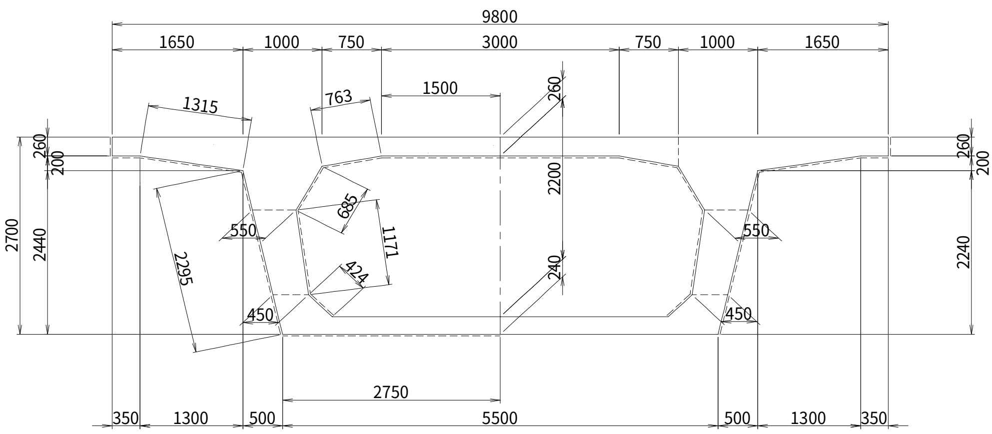
A1-P5(L)	A1-P1	P1-P2	P2-P3	P3-P4	P4-P5	TOTAL or Ave
Seg. Length (Ave) [mm]	157	157.5	157.5	203	221	179.2
2×Ave [mm]	314	315	315	406	442	1792
Perimeter [m]	23.026	23.026	23.026	23.026	23.026	23.026
Area of Formwokr [m^2]	7.230	7.253	7.253	9.349	10.177	41.262

A1-P5(R)	A1-P1	P1-P2	P2-P3	P3-P4	P4-P5	TOTAL or Ave
Seg. Length (Ave) [mm]	157	157.5	157.5	211	190	174.6
2×Ave [mm]	314	315	315	422	380	1746
Perimeter [m]	23.026	23.026	23.026	23.026	23.026	23.026
Area of Formwokr [m^2]	7.230	7.253	7.253	9.717	8.750	40.203

P20-A2(L,R)	P20-P21	P21-P22	P22-P23	P23-P24	P24-P25	P25-A2	TOTAL or Ave
Seg. Length (Ave) [mm]	151.5	153.5	155.5	157.5	157.5	157.5	155.5
2×Ave [mm]	303	307	311	315	315	315	1866
Perimeter [m]	23.026	23.026	23.026	23.026	23.026	23.026	23.026
Area of Formwokr [m^2]	6.977	7.069	7.161	7.253	7.253	7.253	42.966

2) Summary of Formwork

	units	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Formwork for Key Seg.	m^2	41.262	40.203	42.966	42.966	167.397



Item	Formula for Perimeter	L(m)
Outer form	(0.260+0.350+1.315+2.295+2.750)×2	13.940
Inner Form	(1.500+0.763+0.685+1.171+0.424)×2	9.086
	ΣL=	23.026

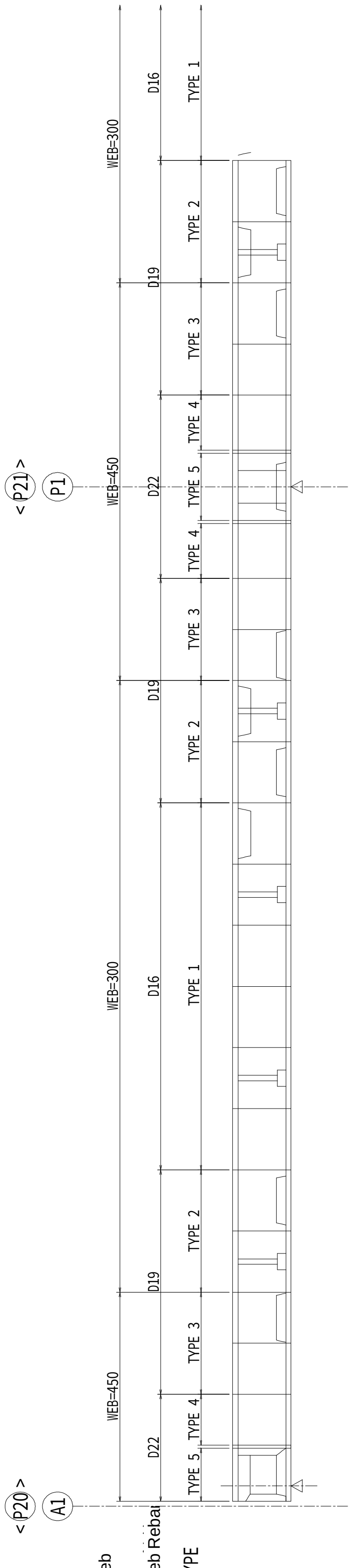
4-4. Summary of Formworks

		units	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Formwork for Precast Portion							
SIDE FORM	type1	m^2	306.360	306.360	357.420	357.420	1327.560
	type2	m^2	255.300	255.300	306.360	306.360	1123.320
	type3	m^2	204.240	204.240	255.300	255.300	919.080
	type4	m^2	306.360	306.360	357.420	357.420	1327.560
	type5	m^2	204.240	204.240	255.300	255.300	919.080
	type6	m^2	439.116	435.712	527.620	527.620	1930.068
	type7	m^2	238.280	238.280	289.340	289.340	1055.240
	End Seg	m^2	42.095	42.095	42.095	42.095	168.380
	Inter Pier Seg	m^2	111.408	111.408	139.260	139.260	501.336
	TOTAL	m^2	2107.399	2103.995	2530.115	2530.115	9271.624
BoTTOM FORM	type1	m^2	198.000	198.000	231.000	231.000	858.000
	type2	m^2	165.000	165.000	198.000	198.000	726.000
	type3	m^2	132.000	132.000	165.000	165.000	594.000
	type4	m^2	198.000	198.000	231.000	231.000	858.000
	type5	m^2	132.000	132.000	165.000	165.000	594.000
	type6	m^2	283.800	281.600	341.000	341.000	1247.400
	type7	m^2	154.000	154.000	187.000	187.000	682.000
	End Seg	m^2	38.598	38.018	37.720	37.720	152.056
	Inter Pier Seg	m^2	96.540	96.540	121.170	121.170	435.420
	TOTAL	m^2	1397.938	1395.158	1676.890	1676.890	6146.876
EDGE FORM	type1	m^2	151.272	151.272	176.484	176.484	655.512
	type2	m^2	126.060	126.060	151.272	151.272	554.664
	type3	m^2	100.848	100.848	126.060	126.060	453.816
	type4	m^2	151.272	151.272	176.484	176.484	655.512
	type5	m^2	100.848	100.848	126.060	126.060	453.816
	type6	m^2	278.520	278.520	334.224	334.224	1225.488
	type7	m^2	139.260	139.260	167.112	167.112	612.744
	End Seg	m^2	32.514	32.514	32.514	32.514	130.056
	Inter Pier Seg	m^2	55.704	55.704	69.630	69.630	250.668
	TOTAL	m^2	1136.298	1136.298	1359.840	1359.840	4992.276
INNER FORM	type1	m^2	378.600	378.600	441.700	441.700	1640.600
	type2	m^2	312.230	312.230	374.676	374.676	1373.812
	type3	m^2	262.048	262.048	327.560	327.560	1179.216
	type4	m^2	487.308	487.308	568.526	568.526	2111.668
	type5	m^2	331.744	331.744	414.680	414.680	1492.848
	type6	m^2	536.676	533.043	644.738	644.738	2359.195
	type7	m^2	285.058	285.058	345.704	345.704	1261.524
	End Seg	m^2	38.992	38.992	38.992	38.992	155.968
	Inter Pier Seg	m^2	96.088	96.088	120.110	120.110	432.396
	TOTAL	m^2	2728.744	2725.111	3276.686	3276.686	12007.227
Formwork for CIP Portion							
End Segment		m^2	49.476	49.476	49.476	49.476	197.904
Inter Pier Segment		m^2	98.068	98.068	122.585	122.585	441.306
Key Segment		m^2	41.262	40.203	42.966	42.966	167.397
TOTAL		m^2	188.806	187.747	215.027	215.027	806.607

Note: Mortar layers on bearings and blocks for anchor bars are included in Bottom Form

5. REINFORCEMENT BARS

5-1 Types by Segments



5-2. Main Girder

1) Reinforcement for Main Girder (per 1 type) (kg)

		Weight by Size				Subtotal		TOTAL
		D13	D16	D19	D22	D13	D16-D22	
type 1	3.0m	1429	466	0	0	1429	466	1895
type 2	3.0m	1429	0	732	0	1429	732	2161
type 3	2.5m	1211	0	586	0	1211	586	1797
	3.0m	1421	0	698	0	1421	698	2119
type 4 凸凹	2.5m	1379	0	0	802	1379	802	2181
	2.6m	1462	0	0	878	1462	878	2340
	2.7m	1498	0	0	878	1498	878	2376
type 4 凹凹	2.5m	1368	0	0	802	1368	2170	3538
	2.6m	1452	0	0	878	1452	878	2330
	2.7m	1485	0	0	878	1485	878	2363
type 5	2.6m	1326	374	0	785	1326	1159	2485
	2.6m	1291	374	0	764	1291	1138	2429
	3.3m	1450	481	0	993	1450	1474	2924

2) Number of Segments

		A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
type 1	3.0m	30	30	36	36	132
type 2	3.0m	20	20	24	24	88
type 3	2.5m	14	14	16	16	60
	3.0m	6	6	8	8	28
type 4 凸凹	2.5m	1	1	1	1	4
	2.6m	0	1	0	0	1
	2.7m	4	3	5	5	17
type 4 凹凹	2.5m	1	1	1	1	4
	2.6m	0	1	0	0	1
	2.7m	4	3	5	5	17
type 5	2.6m	1	1	1	1	4
	2.6m	1	1	1	1	4
	3.3m	4	4	5	5	18
TOTAL		86	86	103	103	378

3) Summary of Reinforcement for Main Girder

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
type 1	42870	13980	42870	13980	51444	16776	51444	16776
type 2	28580	14640	28580	14640	34296	17568	34296	17568
type 3-1	16954	8204	16954	8204	19376	9376	19376	9376
type 3-2	8526	4188	8526	4188	11368	5584	11368	5584
type 4-1 a	1379	802	1379	802	1379	802	1379	802
type 4-2 a	0	0	1462	878	0	0	0	0
type 4-3 a	5992	3512	4494	2634	7490	4390	7490	4390
type 4-1 b	1368	2170	1368	2170	1368	2170	1368	2170
type 4-2 b	0	0	1452	878	0	0	0	0
type 4-3 b	5940	3512	4455	2634	7425	4390	7425	4390
type 5-1	1326	1159	1326	1159	1326	1159	1326	1159
type 5-1	1291	1138	1291	1138	1291	1138	1291	1138
type 5-2	5800	5896	5800	5896	7250	7370	7250	7370
TOTAL	120026	59201	119957	59201	144013	70723	144013	70723

5-3. Crossbeams

1) Reinforcement for Crossbeam (per 1 nos.) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
End Crossbeam-a	0	681	665	0	0	1346	1346
End Crossbeam-b	0	662	653	0	0	1315	1315
Inter. Pier Crossbeam	0	659	668	0	0	1327	1327

2) Number of Crossbeams

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
End Crossbeam-a	1	1	1	1	4
End Crossbeam-b	1	1	1	1	4
Inter. Pier Crossbeam	4	4	5	5	18

3) Summary of Crossbeam Reinforcement (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
End Crossbeam-a	0	1346	0	1346	0	1346	0	1346
End Crossbeam-b	0	1315	0	1315	0	1315	0	1315
Inter. Pier Crossbeam	0	5308	0	5308	0	6635	0	6635
TOTAL	0	7969	0	7969	0	9296	0	9296

5-4. Deviators

1) Reinforcement for Deviator (per 1 nos.) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
TYPE A	29	419	0	695	29	1114	1143
TYPE B1	32	396	0	561	32	957	989
TYPE B2	32	396	0	561	32	957	989

2) Nmuber of Deviators

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
TYPE A	10	10	12	12	44
TYPE B1	7	7	8	8	30
TYPE B2	3	3	4	4	14

3) Summary of Reinforcement for Deviators (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
TYPE A	290	11140	290	11140	348	13368	348	13368
TYPE B1	224	6699	224	6699	256	7656	256	7656
TYPE B2	96	2871	96	2871	128	3828	128	3828
TOTAL	610	20710	610	20710	732	24852	732	24852

5-5. Ribs

1) Reinforcement for Rib (per 1 nos.) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
Rib A (web=300-400)	0	27	101	0	0	128	128
Rib B (web=450-550)	0	27	114	0	0	141	141

2) Number of Ribs

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Rib A (web=300-400)	100	100	120	120	440
Rib B (web=450-550)	60	60	72	72	264

3) Summary of Reinforcement for Ribs (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
Rib A	0	12800	0	12800	0	15360	0	15360
Rib B	0	8460	0	8460	0	10152	0	10152
TOTAL	0	21260	0	21260	0	25512	0	25512

5-6. Bristers for Tendon Anchorages

1) Reinforcement for Blister (per 1 nos.) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
TYPE A	2	149	78	0	2	227	229
TYPE B1	2	129	78	0	2	207	209
TYPE B2	2	132	78	0	2	210	212
TYPE C	0	532	270	0	0	802	802
TYPE D	0	1076	432	0	0	1508	1508
TYPE E	0	923	288	0	0	1211	1211

2) Number of Blisters

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
TYPE A	32	32	40	40	144
TYPE B1	20	20	24	24	88
TYPE B2	20	20	24	24	88
TYPE C	2	2	2	2	8
TYPE D	2	2	2	2	8
TYPE E	2	2	3	3	10

3) Summary of Reinforcement for Blisters (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
TYPE A	64	7264	64	7264	80	9080	80	9080
TYPE B1	40	4140	40	4140	48	4968	48	4968
TYPE B2	40	4200	40	4200	48	5040	48	5040
TYPE C	0	1604	0	1604	0	1604	0	1604
TYPE D	0	3016	0	3016	0	3016	0	3016
TYPE E	0	2422	0	2422	0	3633	0	3633
TOTAL	144	22646	144	22646	176	27341	176	27341

5-7. Lifting Rebars

1) Weight of Lifting Rebars (per 1 nos.) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
LIFTING	14	0	0	0	14	0	14

2) Number of Lifting Rebars (sets)

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
SEGMENT	86	86	103	103	378

3) Summary of Lifting Rebars (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
LIFTING	1204	0	1204	0	1442	0	1442	0

5-8.Mortar Layers on Bearings, Blocks for Anchor Bars

1) Reinforcement for Mortar Layers on Bearing and Block for Anchor Bars (per 1 support) (kg)

	Weight by Size				Subtotal		TOTAL
	D13	D16	D19	D22	D13	D16-D22	
End Support (A1,P5)	168	100	0	0	168	100	268
Inter Pier Support (P1-P4)	228	135	0	0	228	135	363
End Support (A2,P20)	160	98	0	0	160	98	258
Inter Pier Support (P21-P25)	229	135	0	0	229	135	364

2) Number of Supports

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
End Support (A1,P5)	2	2	0	0	4
Inter Pier Support (P1-P4)	4	4	0	0	8
End Support (A2,P20)	0	0	2	2	4
Inter Pier Support (P21-P25)	0	0	5	5	10

3) Summary of Reinforcement for Mortar Layers on Bearing and Blocks for Anchor Bars (kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
A1,P5	336	200	336	200	0	0	0	0
P1-P4	912	540	912	540	0	0	0	0
A2,P20	0	0	0	0	320	196	320	196
P21-P25	0	0	0	0	1145	675	1145	675
TOTAL	1248	740	1248	740	1465	871	1465	871

5-9.Reinforcement for Expansion Joints

5-9-1.Abutment side (on A1 and A2)

	D(mm)	L(mm)	N(nos)	Units W(kg)	Rod W(kg)	W(kg)
D1	D16	1050	48	1.56	1.638	79
D2	D16	690	96	1.56	1.076	103
D3	D16	880	8	1.56	1.373	11
D4	D16	1040	24	1.56	1.622	39
Total(D16)						232

5-8-2.On P5 and P20

See the quantity calculation for Steel Box Girder Bridges

5-9-3 Summary of Reinforcement for Expansion Joints

(kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
EXP joint	0	232	0	232	0	232	0	232

5-10.Shear Keys

	A1-P5(L,R)		P20-A2(L,R)	
	D13	D16-D22	D13	D16-D22
per 1 nos.	46	0	46	0
Numbers	75	75	90	90
Total	3450	0	4140	0

5-11. Summary of Reinforcement Bars

(kg)

	A1-P5(L)		A1-P5(R)		P20-A2(L)		P20-A2(R)	
	D13	D16-D22	D13	D16-D22	D13	D16-D22	D13	D16-D22
MAIN GIRDE	120026	59201	119957	59201	144013	70723	144013	70723
CROSSBEAN	0	7969	0	7969	0	9296	0	9296
DEVATOR	610	20710	610	20710	732	24852	732	24852
RIB	0	21260	0	21260	0	25512	0	25512
BLISTER	144	22646	144	22646	176	27341	176	27341
LIFTING	1204	0	1204	0	1442	0	1442	0
AT SUPPOR	1248	740	1248	740	1465	871	1465	871
EXP JOINT	0	232	0	232	0	232	0	232
SHEAR KEY	3450	0	3450	0	4140	0	4140	0
TOTAL	126682	132758	126613	132758	151968	158827	151968	158827

6. PC TENDONS

6-1. A1-P5(L)

<1> Extrenal Tendons

<1-1> Tendon Length

Tendon Type 19S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C01	50.364	2	100.728	One side	A1-P1
C02	50.364	2	100.728	One side	A1-P1
C03	100.546	2	201.092	One side	P1-P4
C04	100.546	2	201.092	One side	P1-P4
C05	101.995	2	203.990	Both side	P1-P4
C06	101.995	2	203.990	Both side	P1-P4
C07	102.086	2	204.172	Both side	P1-P4
C08	102.086	2	204.172	Both side	P1-P4
C09	100.754	2	201.508	Both side	P1-P4
C10	100.754	2	201.508	Both side	P1-P4
C11	50.460	2	100.920	Both side	P4-P5
C12	50.460	2	100.920	Both side	P4-P5
TOTAL		24	2024.820		

<1-2> Weight of Prestresing Steel

W1 = 2024.820 × 20.919 kg/m = 42357.2 kg

<1-2> Single Span Cable = 8 nos.

<1-3> Continuous Cable (2Span) = 16 nos.

<1-5> Anchorage Device (ADnC15 Freyssinet)

N =(8 + 16)× 2 = 48 nos.

<1-6> Number of Jacking

Inside the box = 16 nos.

Outside the box = 24 nos.

<1-7> Deviator Pipe

at Divator 24 ea/span × 5 span = 120 nos.

at Suppor 4 ea/sup × 4 support = 16 nos.

<2> Internal Tendons

<2-1> Tendon Length　　Tendon Type　12S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
1U1	36.881	2	73.762	Both side	Top slab
1U2	24.882	2	49.764	Both side	Top slab
2U1	37.381	2	74.762	Both side	Top slab
2U2	25.381	2	50.762	Both side	Top slab
3U1	37.427	2	74.854	Both side	Top slab
3U2	25.427	2	50.854	Both side	Top slab
4U1	36.992	2	73.984	Both side	Top slab
4U2	24.992	2	49.984	Both side	Top slab
1L1	50.680	2	101.360	One side	Bottom slab
1L2	50.680	2	101.360	One side	Bottom slab
1L3	50.680	2	101.360	One side	Bottom slab
1L4	34.863	2	69.726	Both side	Bottom slab
1L5	23.363	2	46.726	Both side	Bottom slab
2L1	52.381	2	104.762	Both side	Bottom slab
2L2	52.381	2	104.762	Both side	Bottom slab
2L3	35.363	2	70.726	Both side	Bottom slab
2L4	23.363	2	46.726	Both side	Bottom slab
3L1	52.381	2	104.762	Both side	Bottom slab
3L2	52.381	2	104.762	Both side	Bottom slab
3L3	35.363	2	70.726	Both side	Bottom slab
3L4	23.363	2	46.726	Both side	Bottom slab
4L1	52.471	2	104.942	Both side	Bottom slab
4L2	52.471	2	104.942	Both side	Bottom slab
4L3	35.363	2	70.726	Both side	Bottom slab
4L4	23.363	2	46.726	Both side	Bottom slab
5L1	50.807	2	101.614	Both side	Bottom slab
5L2	50.807	2	101.614	Both side	Bottom slab
5L3	50.807	2	101.614	Both side	Bottom slab
5L4	34.864	2	69.728	Both side	Bottom slab
5L5	23.364	2	46.728	Both side	Bottom slab
TOTAL		60	2321.844		

<2-2> Weight of Prestressing Steel

W1 = 2321.844 × 13.212 kg/m = 30676.2 kg

<2-3> Sheaths

Ls = = 2321.844 m

<2-4> Grouting

Lg = = 2321.844 m

<2-5> Anchorage Devices (AnC15 Freyssinet)

N = 60 × 2 = 120 nos.

<3> Transverse Tendons for Crossbeams (4S15.2)

<3-1> Tendon Length

• End Crossbeams (A1,P5) Tendon Type 4S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C1-1	5.981	4	23.924	One side alternate	A1,P5
C1-2	5.902	6	35.412	One side alternate	A1,P5
TOTAL		10	59.336		

<3-2> Weight of Prestressing Steel

W1 = 59.336 × 4.404 kg/m = 261.3 kg

<3-3> Sheaths

Ls = = 59.336 m

<3-4> Grouting

Lg = = 59.336 m

<3-5> Anchorage Devices (AnC15 Freyssinet)

N = 10 × 2 = 20 nos.

<4> PT Bars for Crossbeams (φ32mm)

<4-1> Tendon Length

• End Crossbeams (A1,P5) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	5.438	6	32.628	One side alternate	A1,P5
V1-1	2.400	40	96.000	One side	Vertical (A1,P5)
V1-2	2.180	6	13.080	One side	Vertical (A1)
V1-2	2.050	6	12.300	One side	Vertical (P5)
TOTAL		58	154.008		

· Inter Pier Crossbeams (P1-P4) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	6.108	24	146.592	One side alternate	P1-P4
B2	5.438	16	87.008	One side	P1-P4
V1	2.400	96	230.400	One side	Vertical (P1-P4)
TOTAL		136	464.000		

· End (A1,P5) + Inter Pier (P1-P4) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
		58	154.008		
		136	464.000		
TOTAL		194	618.008		

<4-2> Weight of Prestressing Steel

W1 = 618.008 × 6.310 kg/m = 3899.6 kg

<4-3> Sheaths

Ls = = 618.008 m

<4-4> Grouting

Lg = = 618.008 m

<4-5> Anchorage Devices

N = 194 × 2 = 388 nos.

<5> Transverse Tendons for Deck Slabs

<5-1> Tendon Length

Tendon Type 3S12.7

TYPE	Number of Tendons per segment: K	Number of Segments: N	K×N (nos.)	Length: L(m)	K×L×N (m)
1（site）	5	1	5	9.806	49.030
2（yard）	5	16	80	9.806	784.480
3（yard）	0	0	0	9.806	0.000
4（yard）	5	8	40	9.806	392.240
5（yard）	6	56	336	9.806	3294.816
6（site）	7	4	28	9.806	274.568
7（site）	5	1	5	9.806	49.030
(yard)		80	456		4471.536
(site)		6	38		372.628
YOTAL		86	494		4844.164

Yard Fabrication

<5-2> Weight of Prestressing Steel

W1 = 4471.536 × 2.322 kg/m = 10382.9 kg

<5-3> Sheaths

Ls = = 4471.536 m

<5-4> Grouting

Lg = = 4471.536 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 456 × 2 = 912 nos.

Site Construction

<5-2> Weight of Prestressing Steel

W2 = 372.628 × 2.322 kg/m = 865.2 kg

<5-3> Sheaths

Ls = = 372.628 m

<5-4> Grouting

Lg = = 372.628 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 38 × 2 = 76 nos.

6-2. A1-P5(R)

<1> Extrenal Tendons

<1-1> Tendon Length

Tendon Type 19S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C01	50.365	2	100.730	One side	A1-P1
C02	50.365	2	100.730	One side	A1-P1
C03	100.546	2	201.092	One side	P1-P4
C04	100.546	2	201.092	One side	P1-P4
C05	101.995	2	203.990	Both side	P1-P4
C06	101.995	2	203.990	Both side	P1-P4
C07	101.907	2	203.814	Both side	P1-P4
C08	101.907	2	203.814	Both side	P1-P4
C09	100.311	2	200.622	Both side	P1-P4
C10	100.311	2	200.622	Both side	P1-P4
C11	50.198	2	100.396	Both side	P4-P5
C12	50.198	2	100.396	Both side	P4-P5
TOTAL		24	2021.288		

<1-2> Weight of Prestresing Steel

W1 = 2021.288 × 20.919 kg/m = 42283.3 kg

<1-3> Single Span Cable = 8 nos.

<1-4> Continuous Cable （2Span) = 16 nos.

<1-5> Anchorage Device (ADnC15 Freyssinet)

N =(8 + 16)× 2 = 48 nos.

<1-6> Number of Jacking

Inside the box = 16 nos.
Outside the box = 24 nos.

<1-7> Deviator Pipe

at Divator 24 ea/span × 5 span = 120 nos.

at Suppor 4 ea/sup × 4 support = 16 nos.

<2> Internal Tendons

<2-1> Tendon Length Tendon Type 12S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
1U1	36.881	2	73.762	Both side	Top slab
1U2	24.882	2	49.764	Both side	Top slab
2U1	37.381	2	74.762	Both side	Top slab
2U2	25.381	2	50.762	Both side	Top slab
3U1	37.335	2	74.670	Both side	Top slab
3U2	25.335	2	50.670	Both side	Top slab
4U1	36.667	2	73.334	Both side	Top slab
4U2	24.668	2	49.336	Both side	Top slab
1L1	50.680	2	101.360	One side	Bottom slab
1L2	50.680	2	101.360	One side	Bottom slab
1L3	50.680	2	101.360	One side	Bottom slab
1L4	34.863	2	69.726	Both side	Bottom slab
1L5	23.363	2	46.726	Both side	Bottom slab
2L1	52.381	2	104.762	Both side	Bottom slab
2L2	52.381	2	104.762	Both side	Bottom slab
2L3	35.363	2	70.726	Both side	Bottom slab
2L4	23.363	2	46.726	Both side	Bottom slab
3L1	52.381	2	104.762	Both side	Bottom slab
3L2	52.381	2	104.762	Both side	Bottom slab
3L3	35.363	2	70.726	Both side	Bottom slab
3L4	23.363	2	46.726	Both side	Bottom slab
4L1	52.287	2	104.574	Both side	Bottom slab
4L2	52.287	2	104.574	Both side	Bottom slab
4L3	35.364	2	70.728	Both side	Bottom slab
4L4	23.364	2	46.728	Both side	Bottom slab
5L1	50.544	2	101.088	Both side	Bottom slab
5L2	50.544	2	101.088	Both side	Bottom slab
5L3	50.544	2	101.088	Both side	Bottom slab
5L4	34.864	2	69.728	Both side	Bottom slab
5L5	23.364	2	46.728	Both side	Bottom slab
TOTAL		60	2317.868		

<2-2> Weight of Prestressing Steel

W1 = 2317.868 × 13.212 kg/m = 30623.7 kg

<2-3> Sheaths

Ls = = 2317.868 m

<2-4> Grouting

Lg = = 2317.868 m

<2-5> Anchorage Devices (AnC15 Freyssinet)

N = 60 × 2 = 120 nos.

<3> Transverse Tendons for Crossbeams (4S15.2)

<3-1> Tendon Length

• End Crossbeams (A1,P5) Tendon Type 4S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C1-1	5.981	4	23.924	One side alternate	A1,P5
C1-2	5.902	6	35.412	One side alternate	A1,P5
TOTAL		10	59.336		

<3-2> Weight of Prestressing Steel

W1 = 59.336 × 4.404 kg/m = 261.3 kg

<3-3> Sheaths

Ls = = 59.336 m

<3-4> Grouting

Lg = = 59.336 m

<3-5> Anchorage Devices (AnC15 Freyssinet)

N = 10 × 2 = 20 nos.

<4> PT Bars for Crossbeams (φ32mm)

<4-1> Tendon Length

• End Crossbeams (A1,P5) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	5.438	6	32.628	One side alternate	A1,P5
V1-1	2.400	40	96.000	One side	Vertical (A1,P5)
V1-2	2.180	6	13.080	One side	Vertical (A1)
V1-2	2.050	6	12.300	One side	Vertical (P5)
TOTAL		58	154.008		

• Inter Pier Crossbeams (P1-P4) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	6.108	24	146.592	One side alternate	P1-P4
B2	5.438	16	87.008	One side	P1-P4
V1	2.400	96	230.400	One side	Vertical (P1-P4)
TOTAL		136	464.000		

• End (A1,P5) + Inter Pier (P1-P4) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
		58	154.008		
		136	464.000		
TOTAL		194	618.008		

<4-2> Weight of Prestressing Steel

W1 = 618.008 × 6.310 kg/m = 3899.6 kg

<4-3> Sheaths

Ls = = 618.008 m

<4-4> Grouting

Lg = = 618.008 m

<4-5> Anchorage Devices

N = 194 × 2 = 388 nos.

<5> Transverse Tendons for Deck Slabs

<5-1> Tendon Length

Tendon Type 3S12.7

TYPE	Number of Tendons per segment: K	Number of Segments: N	K×N (nos.)	Length: L(m)	K×L×N (m)
1 (site)	5	1	5	9.806	49.030
2 (yard)	5	17	85	9.806	833.510
3 (yard)	5	2	10	9.806	98.060
4 (yard)	5	5	25	9.806	245.150
5 (yard)	6	56	336	9.806	3294.816
6 (site)	7	4	28	9.806	274.568
7 (site)	5	1	5	9.806	49.030
(yard)			456		4471.536
(site)			38		372.628
TOTAL		86	494		4844.164

Yard Fabrication

<5-2> Weight of Prestressing Steel

W1 = 4471.536 × 2.322 kg/m = 10382.9 kg

<5-3> Sheaths

Ls = = 4471.536 m

<5-4> Grouting

Lg = = 4471.536 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 456 × 2 = 912 nos.

Site Construction

<5-2> Weight of Prestressing Steel

W2 = 372.628 × 2.322 kg/m = 865.2 kg

<5-3> Sheaths

Ls = = 372.628 m

<5-4> Grouting

Lg = = 372.628 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 38 × 2 = 76 nos.

6-3.P20-A2(L,R)

<1> Extrenal Tendons

<1-1> Tendon Length

Tendon Type 19S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C01	50.327	2	100.654	Both side	P20-P21
C02	50.327	2	100.654	Both side	P20-P21
C03	100.521	2	201.042	Both side	P21-P25
C04	100.521	2	201.042	Both side	P21-P25
C05	101.987	2	203.974	Both side	P21-P25
C06	101.987	2	203.974	Both side	P21-P25
C07	101.996	2	203.992	Both side	P21-P25
C08	101.996	2	203.992	Both side	P21-P25
C09	101.995	2	203.990	Both side	P21-P25
C10	101.995	2	203.990	Both side	P21-P25
C11	100.548	2	201.096	One side	P21-P25
C12	100.548	2	201.096	One side	P21-P25
C13	50.365	2	100.730	One side	P25-A2
C14	50.365	2	100.730	One side	P25-A2
TOTAL		28	2430.956		

<1-2> Weight of Prestresing Steel

W1 = 2430.956 × 20.919 kg/m = 50853.2 kg

<1-3> Single Span Cable = 8 nos.

<1-4> Continuous Cable（2Span) = 20 nos.

<1-5> Anchorage Device (ADnC15 Freyssinet)

N =(8 + 20)× 2 = 56 nos.

<1-6> Number of Jacking

Inside the box = 20 nos.

Outside the box = 28 nos.

<1-7> Deviator Pipe

at Divator 24 ea/span × 6 span = 144 本

at Suppor 4 ea/sup × 5 support = 20 本

<2> Internal Tendons

<2-1> Tendon Length

Tendon Type 12S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
1U1	36.864	2	73.728	Both side	Top slab
1U2	24.876	2	49.752	Both side	Top slab
2U1	37.381	2	74.762	Both side	Top slab
2U2	25.381	2	50.762	Both side	Top slab
3U1	37.383	2	74.766	Both side	Top slab
3U2	25.382	2	50.764	Both side	Top slab
4U1	37.381	2	74.762	Both side	Top slab
4U2	25.381	2	50.762	Both side	Top slab
5U1	36.881	2	73.762	Both side	Top slab
5U2	24.881	2	49.762	Both side	Top slab
1L1	50.666	2	101.332	Both side	Bottom slab
1L2	50.666	2	101.332	Both side	Bottom slab
1L3	50.666	2	101.332	Both side	Bottom slab
1L4	34.864	2	69.728	Both side	Bottom slab
1L5	23.364	2	46.728	Both side	Bottom slab
2L1	52.368	2	104.736	Both side	Bottom slab
2L2	52.368	2	104.736	Both side	Bottom slab
2L3	35.364	2	70.728	Both side	Bottom slab
2L4	23.364	2	46.728	Both side	Bottom slab
3L1	52.374	2	104.748	Both side	Bottom slab
3L2	52.374	2	104.748	Both side	Bottom slab
3L3	35.364	2	70.728	Both side	Bottom slab
3L4	23.364	2	46.728	Both side	Bottom slab
4L1	52.380	2	104.760	Both side	Bottom slab
4L2	52.380	2	104.760	Both side	Bottom slab
4L3	35.363	2	70.726	Both side	Bottom slab
4L4	23.363	2	46.726	Both side	Bottom slab
5L1	52.382	2	104.764	Both side	Bottom slab
5L2	52.382	2	104.764	Both side	Bottom slab
5L3	35.363	2	70.726	Both side	Bottom slab
5L4	23.363	2	46.726	Both side	Bottom slab
6L1	50.679	2	101.358	One side	Bottom slab
6L2	50.679	2	101.358	One side	Bottom slab
6L3	50.679	2	101.358	One side	Bottom slab
6L4	34.863	2	69.726	Both side	Bottom slab
6L5	23.363	2	46.726	Both side	Bottom slab
TOTAL		72	2772.392		

<2-2> Weight of Prestressing Steel

W1 = 2772.392 × 13.212 kg/m = 36628.8 kg

<2-3> Sheaths

Ls = = 2772.392 m

<2-4> Grouting

Lg = = 2772.392 m

<2-5> Anchorage Devices (AnC15 Freyssinet)

N = 72 × 2 = 144 nos.

<3> Transverse Tendons for Crossbeams (4S15.2)

<3-1> Tendon Length

• End Crossbeams (A1,P5) Tendon Type 4S15.2

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
C1-1	5.981	4	23.924	One side alternate	P20,A2
C1-2	5.902	6	35.412	One side alternate	P20,A2
TOTAL		10	59.336		

<3-2> Weight of Prestressing Steel

W1 = 59.336 × 4.404 kg/m = 261.3 kg

<3-3> Sheaths

Ls = = 59.336 m

<3-4> Grouting

Lg = = 59.336 m

<3-5> Anchorage Devices (AnC15 Freyssinet)

N = 10 × 2 = 20 nos.

<4> PT Bars for Crossbeams (φ32mm)

<4-1> Tendon Length

• End Crossbeams (P20,A2) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	5.438	6	32.628	One side alternate	P20,A2
V1-1	2.400	40	96.000	One side	Vertical(A2,P20)
V1-2	2.180	6	13.080	One side	Vertical (A2)
V1-2	2.050	6	12.300	One side	Vertical (P20)
TOTAL		58	154.008		

• Inter Pier Crossbeams (P21-P25) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
B1	6.108	30	183.240	One side alternate	P21-P25
B2	5.438	20	108.760	One side	P21-P25
V1	2.400	120	288.000	One side	Vertical (P21-P25)
TOTAL		170	580.000		

• End (A1,P5) + Inter Pier (P21-P25) Tendon Type φ32mm

Tendon No.	Length L(m)	Nos.	L×N (m)	Jacking	Remarks
		58	154.008		
		170	580.000		
TOTAL		228	734.008		

<4-2> Weight of Prestressing Steel

W1 = 734.008 × 6.310 kg/m = 4631.6 kg

<4-3> Sheaths

Ls = = 734.008 m

<4-4> Grouting

Lg = = 734.008 m

<4-5> Anchorage Devices

N = 228 × 2 = 456 nos.

<5> Transverse Tendons for Deck Slabs

<5-1> Tendon Length

Tendon Type 3S12.7

TYPE	Number of Tendons per segment: K	Number of Segments: N	K×N (nos.)	Length: L(m)	K×L×N (m)
1（site）	5	1	5	9.806	49.030
2（yard）	5	18	90	9.806	882.540
3（yard）	5	0	0	9.806	0.000
4（yard）	5	10	50	9.806	490.300
5（yard）	6	68	408	9.806	4000.848
6（site）	7	5	35	9.806	343.210
7（site）	5	1	5	9.806	49.030
(yard)		96	548		5373.688
(site)		7	45		441.270
TOTAL		103	1186		5814.958

Yard Fabrication

<5-2> Weight of Prestressing Steel

W1 = 5373.688 × 2.322 kg/m = 12477.7 kg

<5-3> Sheaths

Ls = = 5373.688 m

<5-4> Grouting

Lg = = 5373.688 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 548 × 2 = 1096 nos.

Site Construction

<5-2> Weight of Prestressing Steel

W2 = 441.270 × 2.322 kg/m = 1024.6 kg

<5-3> Sheaths

Ls = = 441.270 m

<5-4> Grouting

Lg = = 441.270 m

<5-5> Anchorage Devices (AnC13 Fresyssine)

N = 45 × 2 = 90 nos.

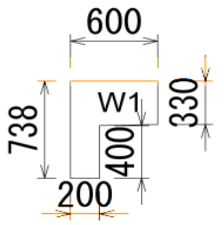
6-4. SUMMARY OF PC TENDONS

				Unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
Yard Fabrication								
	Sheath	12S15.2		m	2321.844	2317.868	2772.392	2772.392
		4S15.2		m	59.336	59.336	59.336	59.336
		3S12.7		m	4844.164	4844.164	5814.958	5814.958
		φ32		m	618.008	618.008	734.008	734.008
	Deviator Pipe	19S15.2	Pipe at Deviator	nos	120	120	144	144
			Pipe at Support	nos	16	16	20	20
	Sleeve Pipe	19S15.2		nos	48	48	56	56
	Prestressing	3S12.7	Weight of PC Tendon	kg	10382.9	10382.9	12477.7	12477.7
	(Internal Tendon)		Anchor (total)	nos	912	912	1096	1096
Site Construction								
	Prestressing	19S15.2	Weight of PC Tendon	kg	42357.2	42283.3	50853.2	50853.2
	(External Tendon)		for single span	nos	8	8	8	8
			for continous 2 spans	nos	16	16	20	20
			Anchor (total)	nos	48	48	56	56
			Self Anchor	nos	8	8	8	8
			Tensionning Anchor (inside)	nos	16	16	20	20
			Tensionning Anchor (outside)	nos	24	24	28	28
	Prestressing	12S15.2	Weight of PC Tendon	kg	30676.2	30623.7	36628.8	36628.8
	(Internal Tendon)		Anchor (total)	nos	120	120	144	144
		4S15.2	Weight of PC Tendon	kg	261.3	261.3	261.3	261.3
			Anchor (total)	nos	20	20	20	20
		3S12.7	Weight of PC Tendon	kg	865.2	865.2	1024.6	1024.6
			Anchor (total)	nos	76	76	90	90
		φ32	Weight of PC Bar	kg	3899.6	3899.6	4631.6	4631.6
			Anchor (total)	nos	388	388	456	456

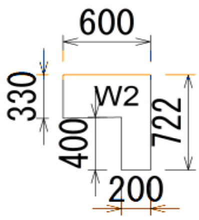
7. VARIOUS COMPONENTS

7-1. WHEEL GUARDS

1) Concrete



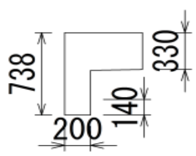
W1=0.2812m2



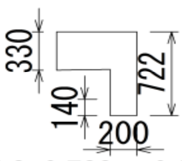
W2=0.2748m2

		Length (m)	A(m2)	V(m3)
A1-P5(L)	Left side(W1)	249.932	0.2812	70.281
	Right side(W2)	249.515	0.2748	68.567
A1-P5(R)	Left side(W1)	249.485	0.2812	70.155
	Right side(W2)	249.068	0.2748	68.444
P20-A2(L)	Left side(W1)	299.500	0.2812	84.219
	Right side(W2)	299.500	0.2748	82.303
P20-A2(R)	Left side(W1)	299.500	0.2812	84.219
	Right side(W2)	299.500	0.2748	82.303

2) Formwork



L1=0.738m+0.200m
+0.140m+0.330m=1.408m



L2=0.722m+0.200m
+0.140m+0.330m=1.392m

		Length (m)	L(m)	Edge (m2)	A(m2)
A1-P5(L)	Left side(L1)	249.932	1.408	0.5624	352.467
	Right side(L2)	249.515	1.392	0.5496	347.874
A1-P5(R)	Left side(L1)	249.485	1.408	0.5624	351.837
	Right side(L2)	249.068	1.392	0.5496	347.252
P20-A2(L)	Left side(L1)	299.500	1.408	0.5624	422.258
	Right side(L2)	299.500	1.392	0.5496	417.454
P20-A2(R)	Left side(L1)	299.500	1.408	0.5624	422.258
	Right side(L2)	299.500	1.392	0.5496	417.454

3) Rebar

		Length (m)	D13 (kg)
A1-P5(L)	Left side(L1)	249.932	10215
	Right side(L2)	249.515	
A1-P5(R)	Left side(L1)	249.485	10197
	Right side(L2)	249.068	
P20-A2(L)	Left side(L1)	299.500	12254
	Right side(L2)	299.500	
P20-A2(R)	Left side(L1)	299.500	12254
	Right side(L2)	299.500	

4) Summary of Wheel Guards

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Concrete	m3	138.848	138.599	166.522	166.522	610.491
Formwork	m2	700.341	699.090	839.712	839.712	3078.855
Rebar	kg	10215	10197	12254	12254	44919

7-2. ANCHOR BARS

	fai	N (nos)	A (mm2)	L (mm)	W (kg)
A1	70	3	3848	1450	131.5
P1	100	4	7854	2050	506.0
P2	100	4	7854	2050	506.0
P3	100	4	7854	2050	506.0
P4	100	4	7854	2050	506.0
P5	70	3	3848	1450	131.5
P20	70	3	3848	1450	131.5
P21	100	4	7854	2050	506.0
P22	100	4	7854	2050	506.0
P23	100	4	7854	2050	506.0
P24	100	4	7854	2050	506.0
P25	100	4	7854	2050	506.0
A2	70	3	3848	1450	131.5

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
ANCHOR	kg	2287.2	2287.2	2793.2	2793.2

7-3. ADHESIVE COATING

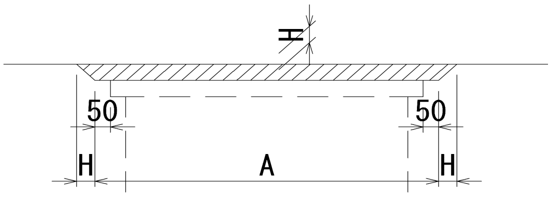
A = 6.303 x 11 + 6.963 x 4 = 97.185 m2 / 1SPAN

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
SPAN		5	5	6	6	22
ADHESIVE	m2	485.925	485.925	583.110	583.110	2138.070

7-4. BEARINGS

SIZE (mm)	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
920 x 920 x 224	nos.	0	0	2	2	4
920 x 920 x 210	nos.	2	2	2	2	8
920 x 920 x 180	nos.	2	2	0	0	4
1220 x 1220 x 210	nos.	0	0	2	2	4
1220 x 1220 x 180	nos.	4	4	6	6	20
1220 x 1220 x 150	nos.	4	4	2	2	12
TOTAL	nos.	12	12	14	14	52

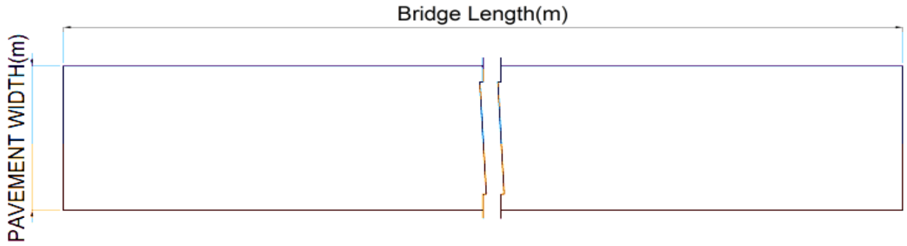
Non-shrink mortar



	A (mm)	B (mm)	H (mm)	V (m3)	V x 2 (m3)
A1	1180	1180	60	0.092	0.184
P1	1520	1520	70	0.177	0.354
P2	1520	1520	70	0.177	0.354
P3	1520	1520	70	0.177	0.354
P4	1520	1520	70	0.177	0.354
P5	1180	1180	60	0.092	0.184
P20	1180	1180	50	0.076	0.152
P21	1520	1520	60	0.150	0.300
P22	1520	1520	70	0.177	0.354
P23	1520	1520	70	0.177	0.354
P24	1520	1520	70	0.177	0.354
P25	1520	1520	70	0.177	0.354
A2	1180	1180	60	0.092	0.184

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Non-shrink mortar	m3	1.784	1.784	2.052	2.052	7.672

7-5. PAVEMENT AND WATERPROOF



		Length (m)	Width (m)	Area (m2)
A1-P5(L)	Left side(L1)	249.932	9.000	2247.512
	Right side(L2)	249.515		
A1-P5(R)	Left side(L1)	249.485	9.000	2243.489
	Right side(L2)	249.068		
P20-A2(L)	Left side(L1)	299.500	9.000	2695.500
	Right side(L2)	299.500		
P20-A2(R)	Left side(L1)	299.500	9.000	2695.500
	Right side(L2)	299.500		

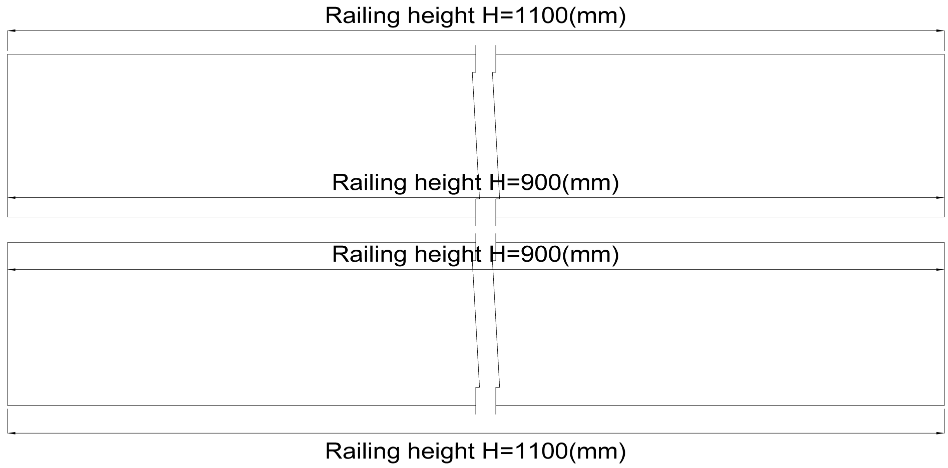
	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
PAVEMENT	m2	2247.512	2243.489	2695.500	2695.500	9882.000
WATERPROOF	m2	2247.512	2243.489	2695.500	2695.500	9882.000

7-6. EXPANSION JOINTS

Only Abutment side

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
EXPANSION JOINT	m	10.200	10.200	10.200	10.200	40.800

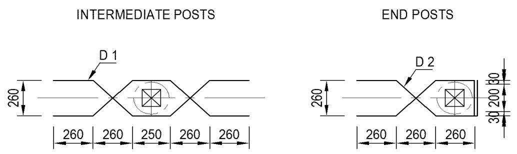
7-7. RAILINGS



		H (mm)	Length (m)
A1-P5(L)	Left side	1100	250.432
	Right side	900	250.015
A1-P5(R)	Left side	900	249.985
	Right side	1100	249.568
P20-A2(L)	Left side	1100	300.000
	Right side	900	300.000
P20-A2(R)	Left side	900	300.000
	Right side	1100	300.000

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
RAILING H=1100mm	m	250.432	249.568	300.000	300.000	1100.000
RAILING H=900mm	m	250.015	249.985	300.000	300.000	1100.000

Reinforcement rebar for railing post (D25)



	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Rebar (D25)	kg	3150	3138	3703	3703	13695

7-8. DRAINAGE

1) DRAIN PIT

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
DRAIN PIT	nos.	13	13	15	15

2) DRAIN PIPE

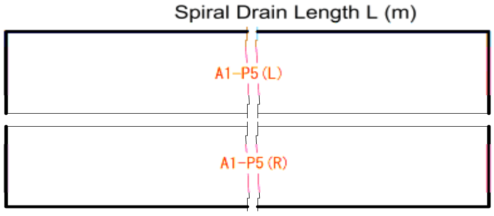
		unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
Superstcucture	vertical	m	20.7	20.7	34.2	34.2
	horizontal	m	188.5	188.5	110.8	110.8
	Subtotal	m	209.2	209.2	145.0	145.0
Substructure	vertical	m	25.6	18.0	10.5	10.5
	horizontal	m	8.2	8.2	-	-
	Subtotal	m	60.0		20.9	
TOTAL		m	478.4		310.8	

3) SLAB DRAIN

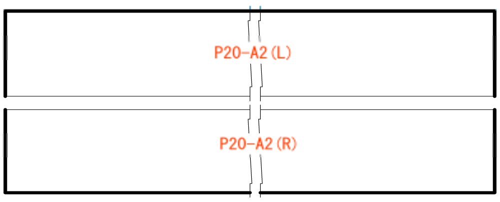
	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
SLAB DRAIN	nos.	13	13	15	15

4) SPIRAL DRAIN

Spiral Drain Length L (m)



Spiral Drain Length L (m)



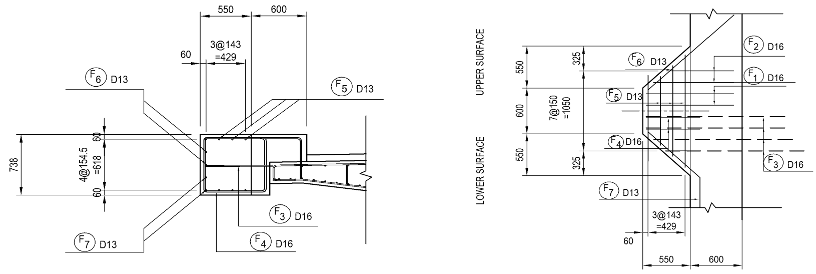
		Width(m)×2	Bridge Length(m)	Spiral Drain Length (m)
A1-P5(L)	Left side	18.000	250.432	268.432
A1-P5(R)	Right side	18.000	249.568	267.568
P20-A2(L)	Left side	18.000	300.000	318.000
P20-A2(R)	Right side	18.000	300.000	318.000

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)
SPIRAL DRAIN	m	268.432	267.568	318.000	318.000

5) Reinforcement Rebar

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
Rebar (D16)	kg	650	650	750	750	2800

7-9. LIGHTING BASES



(QUANTITY / 1 LIGHTING BASE)

Concrete = (0.600 x 0.550 + 0.550 x 0.550) x 0.738 = 0.467 m3

Formwork = (0.600 x 0.550 + 0.550 x 0.550) +
(0.600 + 0.550 x $\sqrt{2 \times 2}$) x 0.738 = 2.223 m2

REBAR = D16 = 60 kg
D13 = 26 kg

(NUMBER OF LIGHTING BASE)

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
LIGHTING BASE	13	13	15	15	56

Tentative

(QUANTITY OF LIGHTING BASE)

		unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
CONCRETE		m2	6.071	6.071	7.005	7.005	26.152
FORMWORK		m2	28.899	28.899	33.345	33.345	124.488
REBAR	D16	kg	780	780	900	900	3360
	D13	kg	338	338	390	390	1456

7-10. MANHOLE DOORS

(QUANTITY / 1 MANHOLE)

STEEL MATERIAL (SS400) = 45.1 kg
HOLE IN ANCHOR (M16) = 12 nos.
HINGE (SS400) = 10 nos.

(NUMBER OF MANHOLE DOORS)

	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
MANHOLE	2	2	2	2	8

(QUANTITY OF MANHOLE DOORS)

	unit	A1-P5(L)	A1-P5(R)	P20-A2(L)	P20-A2(R)	TOTAL
STEEL MATERIAL	kg	90.2	90.2	90.2	90.2	360.8
HOLE IN ANCHOR	nos.	24	24	24	24	96
HINGE	nos.	20	20	20	20	80

ON-RAMP BRIDGE

SUPERSTRUCTURE

Contents

§1. Quantity Summary Table

1) Superstructure Work

(for 1Bridge)

Type			Specification	Unit	Quantity	Note
Main Girder Work	Number of Girders			Girder	8	
	Concrete		σck＝ 40 N/mm^2	m^3	234.2	
	Weight			t	585.4	
	Formworks	Side Form		m^2	1184.1	
		Edge Form		m^2	25.5	
		Bottom Form		m^2	160.3	
		Side + Edge Form		m^2	1209.6	w/o bottom form
	PC tendons	Prestressing Steel	SWPR7BL 12S12.7mm	kg	8424.5	w/o extra length
		Sheath	φ85mm	m	903.5	for Longitudinal
			φ42mm	m	95.6	for Transverse
		Grout	φ80mm	m	907.0	
		Anchorage Devices	for 12S12.7	set	64	AnC15/12C5
	rebars	D19	SD345	kg	3188	
		D16	SD345	kg	15328	
		D13	SD345	kg	14748	
		D10	SD345	kg	0	
		Total	SD345	kg	33264	
Crossbeam work	Concrete		σck＝ 30 N/mm^2	m^3	69.4	
	Formworks			m^2	184.3	
	PC tendons	Prestressing Steel	φ32mm	kg	2004.2	w/o extra length
		Sheath	φ40	m	224.2	
		Grout	φ40	m	317.6	
		Anchorage Devices	for φ32mm	set	140	
	rebars	D19	SD345	kg	0	
		D16	〃	kg	3780	
		D13	〃	kg	2141	
		Total	SD345	kg	5921	
	Insert Anchors		M12	set	160	
Slab Work	Concrete		σck＝ 30 N/mm^2	m^3	152.9	
	Formwork			m^2	288.4	
	rebars	D19	SD345	kg	21480	
		D16	SD345	kg	20811	
		D13	SD345	kg	4499	
		Total	SD345	kg	46790	
PC Board Work	Precast	A-type	2680×998×100	m3	25.8	n=100
		B-type	2680×944×100	m3	0.5	n=2
		C-type	2680×769×100	m3	0.4	n=2
		D-type	2680×761×100	m3	0.4	n=2
		E-type	2680×923×100	m3	0.2	n=1
		F-type	2680×923×100	m3	0.2	n=1,incline
		Total		m3	27.5	
	Joint Filler		Tape (15mm x 10mm)	m	213.6	
	Filler in Gap		Non-shrinkage Mortar	m3	0.64	between girder and PC boad
	Sealing Material		Non-shrinkage Mortar	m3	0.12	between PC boards

2) Bearing Work

<table>
<tr><th colspan="2">Type</th><th>Specification</th><th>Unit</th><th>Quantity</th><th>Note</th></tr>
<tr><td rowspan="4">Bearing</td><td rowspan="3">Elastmeric Bearings (Pad Type)</td><td>G10</td><td>EA</td><td>2</td><td>600 x 400 x 80mm</td></tr>
<tr><td>G10</td><td>EA</td><td>12</td><td>600 x 400 x 60mm</td></tr>
<tr><td>G10</td><td>EA</td><td>2</td><td>600 x 400 x 100mm</td></tr>
<tr><td>Anchor Bars</td><td>S35CN</td><td>kg</td><td>576</td><td></td></tr>
</table>

3) Bridge Surface Work

<table>
<tr><th colspan="3">Type</th><th>Specification</th><th>Unit</th><th>Quantity</th><th>Note</th></tr>
<tr><td rowspan="19">Bridge Surface Work</td><td rowspan="2">Wheel Guard</td><td>Concrete</td><td>$\sigma ck = 24\ N/mm^2$</td><td>m^3</td><td>55.4</td><td></td></tr>
<tr><td>Formworks</td><td></td><td>m^2</td><td>184.6</td><td></td></tr>
<tr><td rowspan="3">rebar</td><td>D16</td><td>SD345</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D13</td><td>SD345</td><td>kg</td><td>3430</td><td></td></tr>
<tr><td>Total</td><td>SD345</td><td>kg</td><td>3430</td><td></td></tr>
<tr><td colspan="2">Pavement</td><td>Asphalt</td><td>m^2</td><td>601.3</td><td>t=80mm</td></tr>
<tr><td colspan="2">Adjustment Concrete</td><td>$\sigma ck = 18\ N/mm^2$</td><td>m^3</td><td>43.1</td><td>carrageway</td></tr>
<tr><td colspan="2">Expansion Joint</td><td></td><td>m</td><td>5.25</td><td>AO1 side</td></tr>
<tr><td colspan="2">Rebars for Exp. Joint</td><td>SD345</td><td>kg</td><td>98</td><td>AO1 side</td></tr>
<tr><td colspan="2">Concrete for Exp. Joint</td><td></td><td>m^3</td><td>1.6</td><td></td></tr>
<tr><td colspan="2">Railing</td><td>H=1100</td><td>m</td><td>240.1</td><td>including railing on AO1 Abut</td></tr>
<tr><td colspan="2">Rebars for Railing</td><td>D25 (SD345)</td><td>kg</td><td>1492.0</td><td></td></tr>
<tr><td rowspan="3">Waterproof</td><td>Area</td><td>Spray Type</td><td>m^2</td><td>601.3</td><td></td></tr>
<tr><td>Spiral Pipe</td><td>φ18mm</td><td>m</td><td>120.4</td><td></td></tr>
<tr><td>Slab Drain</td><td></td><td>EA</td><td>6</td><td></td></tr>
<tr><td colspan="2">Drain Pits</td><td></td><td>EA</td><td>6</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Drainage Pipe</td><td>VP200A</td><td>m</td><td>75.8</td><td>Superstructure</td></tr>
<tr><td>VP200A</td><td>m</td><td>25.8</td><td>Substructure</td></tr>
</table>

4) Quantities per One Girder

(1) AO1~PO1 (Number of Girder 2 girders.)

Item		Specification	Unit	G1 Girder	G2 Girder	per span	Remarks
Concrete		σck=40N/mm^2	m^3	29.328	29.328	58.656	
Weight			t	73.320	73.320	146.640	
Formwork	Side Form		m^2	148.242	148.242	296.484	
	Edge Form		〃	3.190	3.190	6.380	
	Bottom Form		〃	20.050	20.050	40.100	
	Side + Edge Form		〃	151.432	151.432	302.864	
PC tendon	Prestressing Steel	SWPR7BL12S12.7mm	kg	1052.293	1052.293	2104.586	w/o extra length
	Sheath	φ85mm	m	112.856	112.856	225.712	for Longitudinal
		φ42mm	〃	10.200	10.200	20.400	for Transverse
	Grout	φ80mm	〃	113.296	113.296	226.592	
	Anchorage Device	for 12S12.7	set	8	8	16	AnC15/12C15
Rebar	D19	SD345	kg	399	399	798	
	D16	〃	kg	1918	1918	3836	
	D19~D16	〃	kg	2317	2317	4634	
	D13	〃	kg	1848	1848	3696	
	D10	〃	kg	0	0	0	
	Total	SD345	kg	4165	4165	8330	

(2) PO1~PO1 (Number of Girder 2 girders.)

Item		Specification	Unit	G1 Girder	G2 Girder	per span	Remarks
Concrete		σck=40N/mm^2	m^3	29.327	29.327	58.654	
Weight			t	73.320	73.320	146.640	
Formwork	Side Form		m^2	148.237	148.237	296.474	
	Edge Form		〃	3.190	3.190	6.380	
	Bottom Form		〃	20.049	20.049	40.099	
	Side + Edge Form		〃	151.427	151.427	302.854	
PC tendon	Prestressing Steel	SWPR7BL12S12.7mm	kg	1054.327	1054.327	2108.654	w/o extra length
	Sheath	φ85mm	m	113.075	113.075	226.150	for Longitudinal
		φ42mm	〃	13.700	13.700	27.400	for Transverse
	Grout	φ80mm	〃	113.515	113.515	227.030	
	Anchorage Device	for 12S12.7	set	8	8	16	AnC15/12C15
Rebar	D19	SD345	kg	399	399	798	
	D16	〃	kg	1918	1918	3836	
	D19~D16	〃	kg	2317	2317	4634	
	D13	〃	kg	1848	1848	3696	
	D10	〃	kg	0	0	0	
	Total	SD345	kg	4165	4165	8330	

(3) PO2~PO3 (Number of Girder 2 girders.)

Item		Specification	Unit	G1 Girder	G2 Girder	per span	Remarks
Concrete		σck=40N/mm^2	m^3	29.312	29.312	58.624	
Weight			t	73.280	73.280	146.560	
Formwork	Side Form		m^2	148.147	148.147	296.294	
	Edge Form		〃	3.190	3.190	6.380	
	Bottom Form		〃	20.038	20.038	40.075	
	Side + Edge Form		〃	151.337	151.337	302.674	
PC tendon	Prestressing Steel	SWPR7BL12S12.7mm	kg	1053.659	1053.659	2107.318	w/o extra length
	Sheath	φ85mm	m	113.003	113.003	226.006	for Longitudinal
		φ42mm	〃	13.700	13.700	27.400	for Transverse
	Grout	φ80mm	〃	113.443	113.443	226.886	
	Anchorage Device	for 12S12.7	set	8	8	16	AnC15/12C15
Rebar	D19	SD345	kg	399	399	798	
	D16	〃	kg	1918	1918	3836	
	D19~D16	〃	kg	2317	2317	4634	
	D13	〃	kg	1847	1847	3694	
	D10	〃	kg	0	0	0	
	Total	SD345	kg	4164	4164	8328	

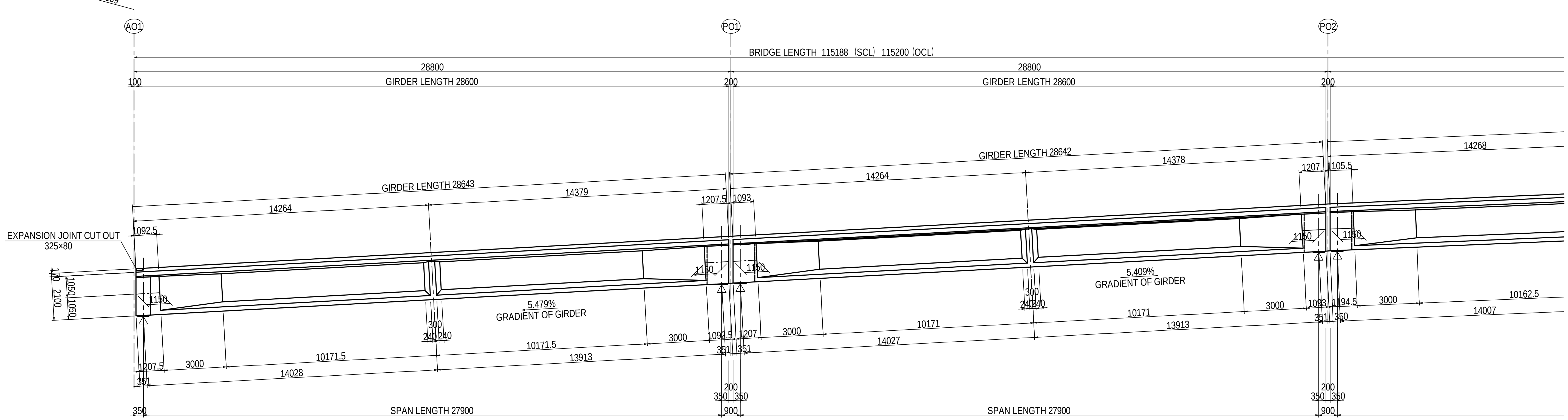
(4) PO3~P5 (Number of Girder 2 girders.)

Item		Specification	Unit	G1 Girder	G2 Girder	per span	Remarks
Concrete		σck=40N/mm^2	m^3	29.113	29.113	58.226	
Weight			t	72.780	72.780	145.560	
Formwork	Side Form		m^2	147.415	147.415	294.830	
	Edge Form		〃	3.191	3.191	6.382	
	Bottom Form		〃	20.019	20.019	40.038	
	Side + Edge Form		〃	150.606	150.606	301.212	
PC tendon	Prestressing Steel	SWPR7BL12S12.7mm	kg	1051.977	1051.977	2103.954	w/o extra length
	Sheath	φ85mm	m	112.822	112.822	225.644	for Longitudinal
		φ42mm	〃	10.203	10.203	20.406	for Transverse
	Grout	φ80mm	〃	113.262	113.262	226.524	
	Anchorage Device	for 12S12.7	set	8	8	16	AnC15/12C15
Rebar	D19	SD345	kg	397	397	794	
	D16	〃	kg	1910	1910	3820	
	D19~D16	〃	kg	2307	2307	4614	
	D13	〃	kg	1831	1831	3662	
	D10	〃	kg	0	0	0	
	Total	SD345	kg	4138	4138	8276	

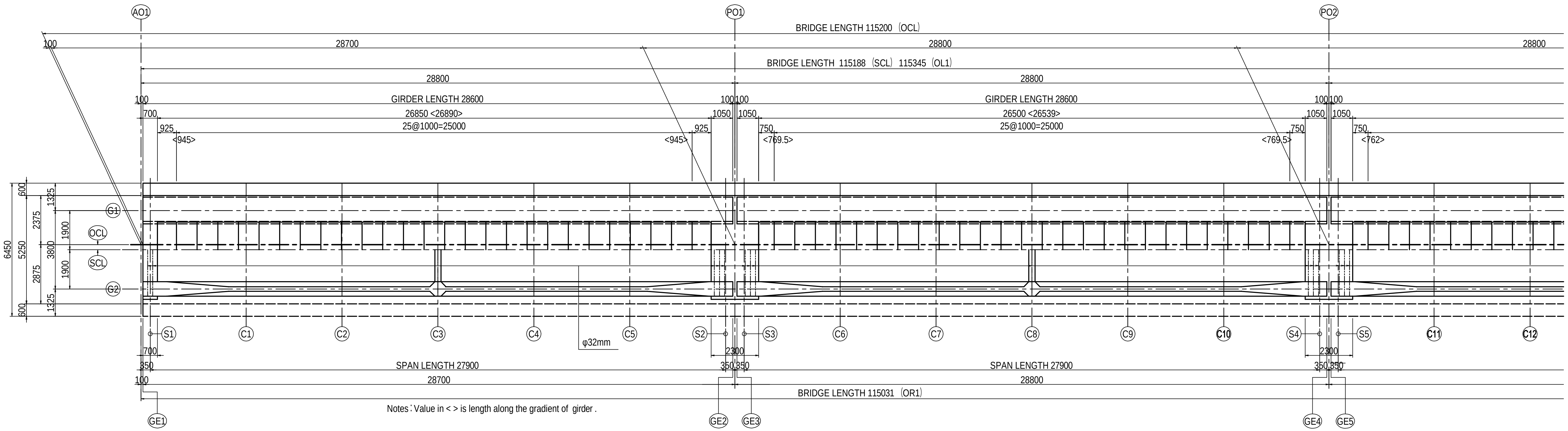
GENERAL VIEW OF SUPERSTRUCTRE FOR ON-RAMP (1)

S=1:200

SIDE ELEVATION



PLAN VIEW



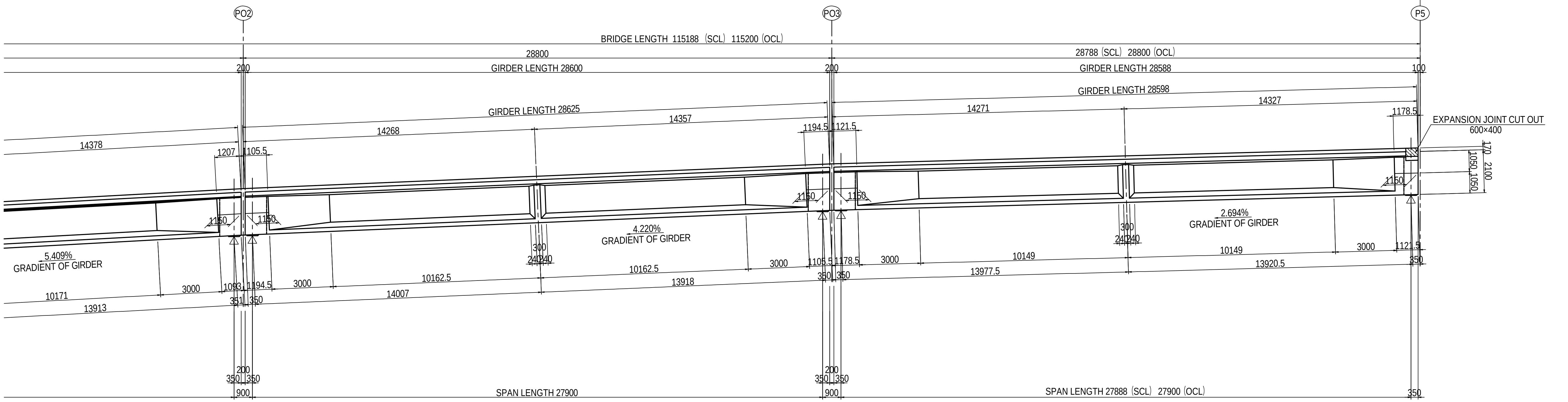
Notes：Value in < > is length along the gradient of girder .

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 浩弘	15 Jun.2017	GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (1)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 [illegible]	21 Jun.2017		P1-OR-1001

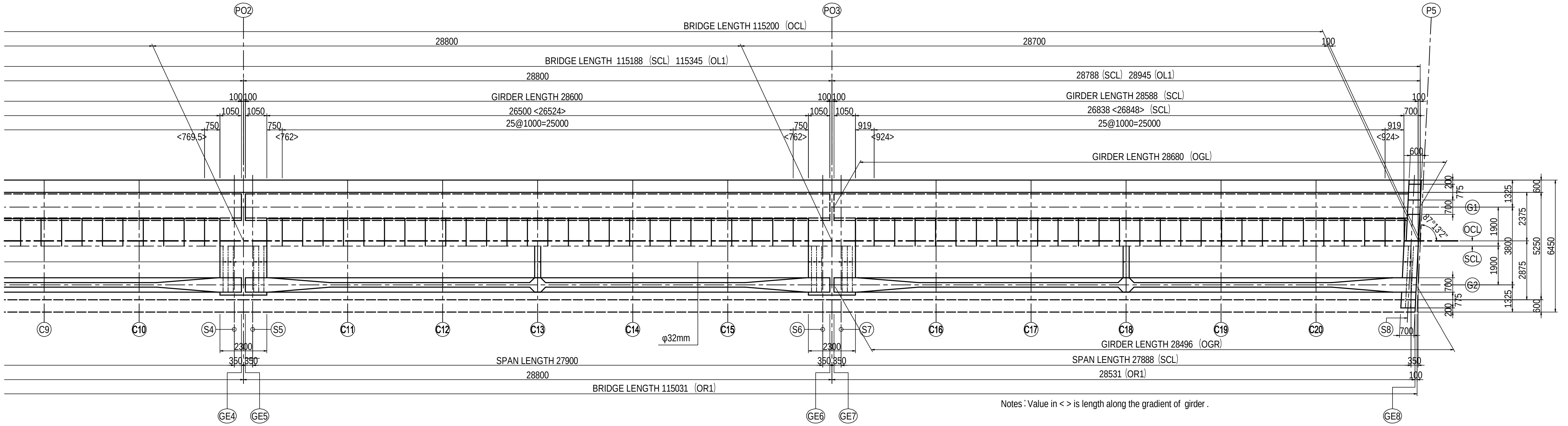
GENERAL VIEW OF SUPERSTRUCTRE FOR ON-RAMP (2)

S=1:200

SIDE ELEVATION



PLAN VIEW



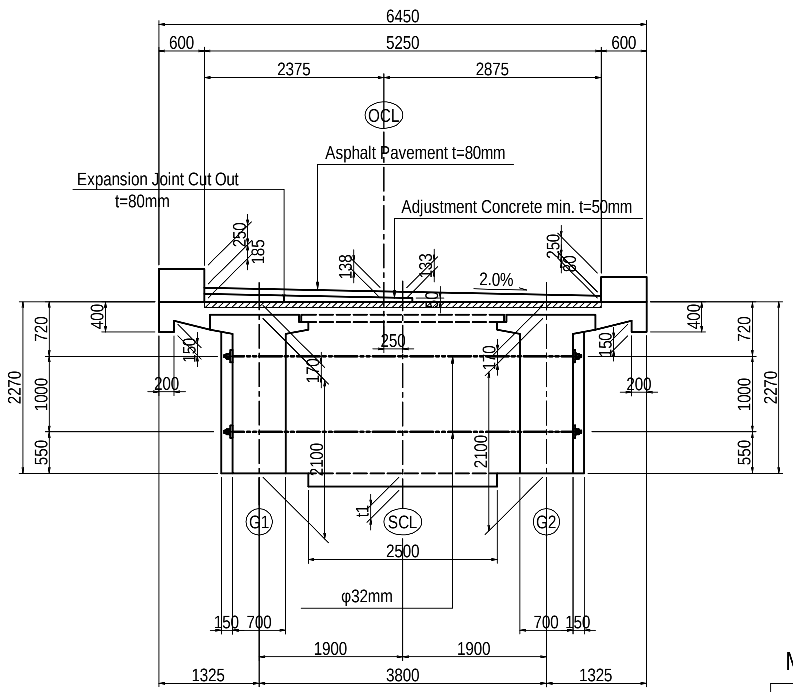
Notes：Value in < > is length along the gradient of girder .

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 浩弘	15 Jun.2017	GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (2)	1
				CHECKED BY	T. HAYAKAWA	早川 和邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 祐一	21 Jun.2017		P1-OR-1002

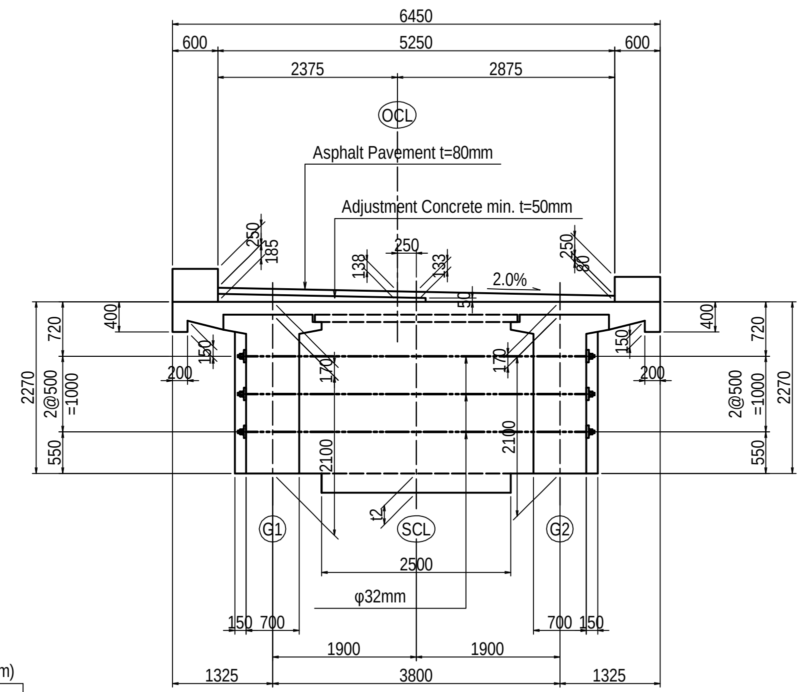
GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (3)

CROSS SECTIONS S=1:100

AT AO1 (GE1)



AT CROSS BEAM SECTION (PO1)

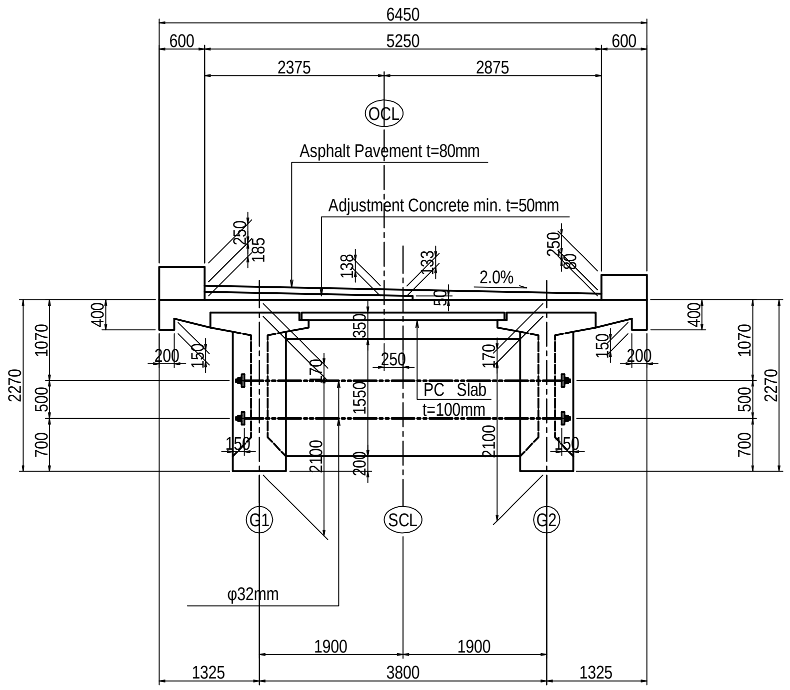


MEMBER DIMENSIONS

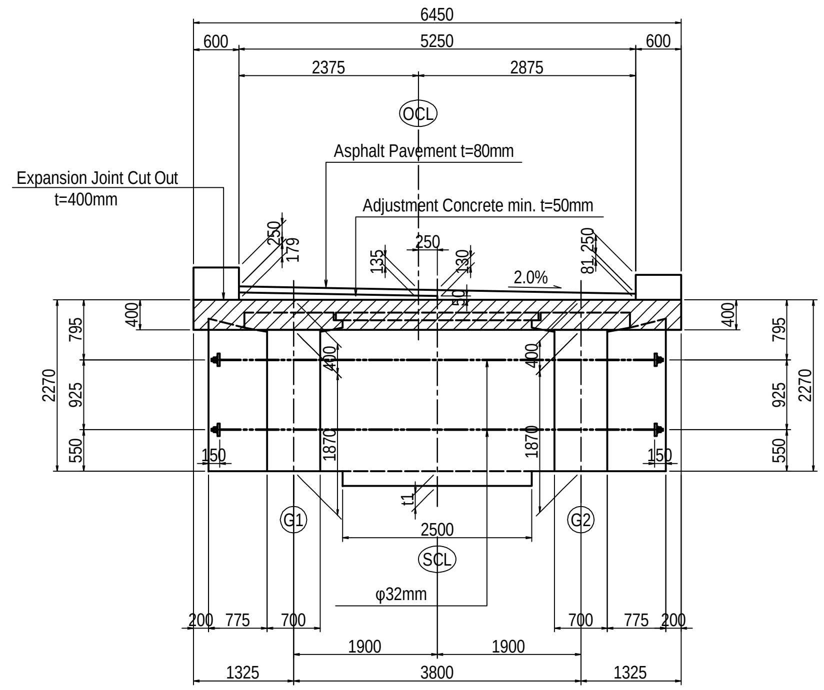
(mm)

	AO1	P01	P02	P03	P5	
t1	171	—	—	—	189	on bearing support line
t2	—	267	263	259	—	on center of pier

AT INTERMEDIATE CROSS BEAM SECTION (C3)



AT P5 (GE8)



Notes:
- Unless otherwise indicated in drawing, transverse PC bars shall be tensioned from one side alternately.
- Reinforcement for tendon anchorage such as grid rebar shall be arranged sufficiently.
- 800 N/mm2 is assumed as jacking force of φ32mm in design stage. Jacking force considering jacking sequence shall be indicated on shop drawings and shall be approved by Engineer.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 満弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 和邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017

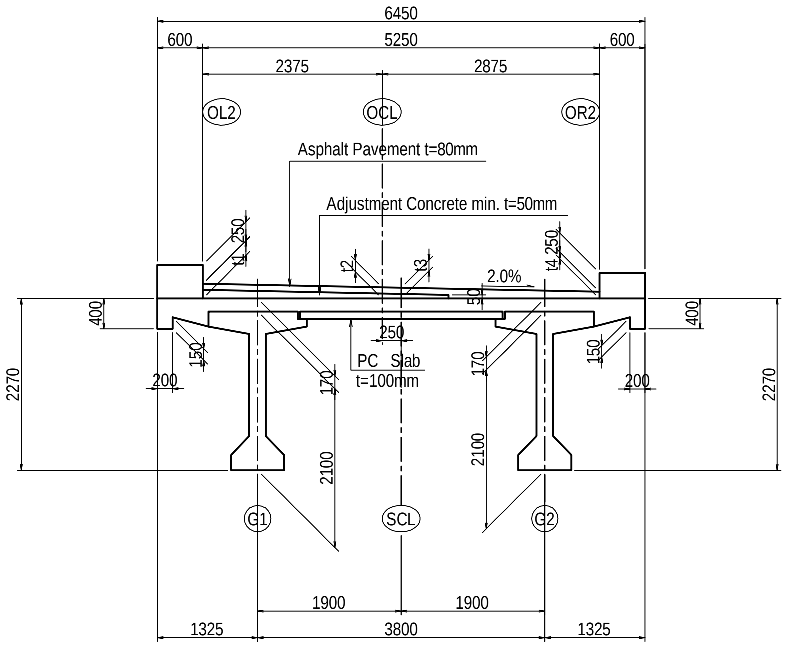
DRAWING TITLE	PACKAGE	1
GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP(3)	DWG No.	P1-OR-1003

GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (4)

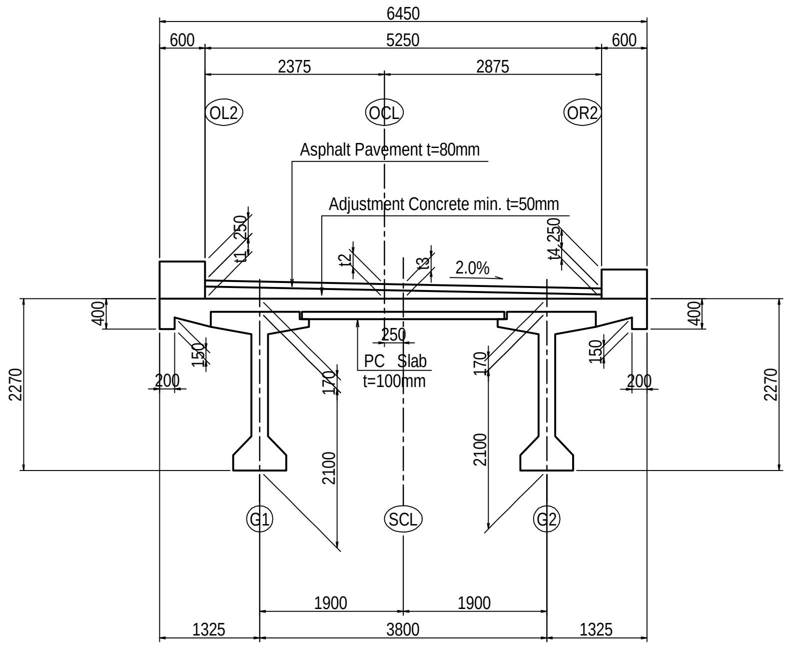
CROSS SECTIONS S=1:100

STANDARD SECTION

AT（C8）



AT（C13）



MEMBER DIMENSIONS

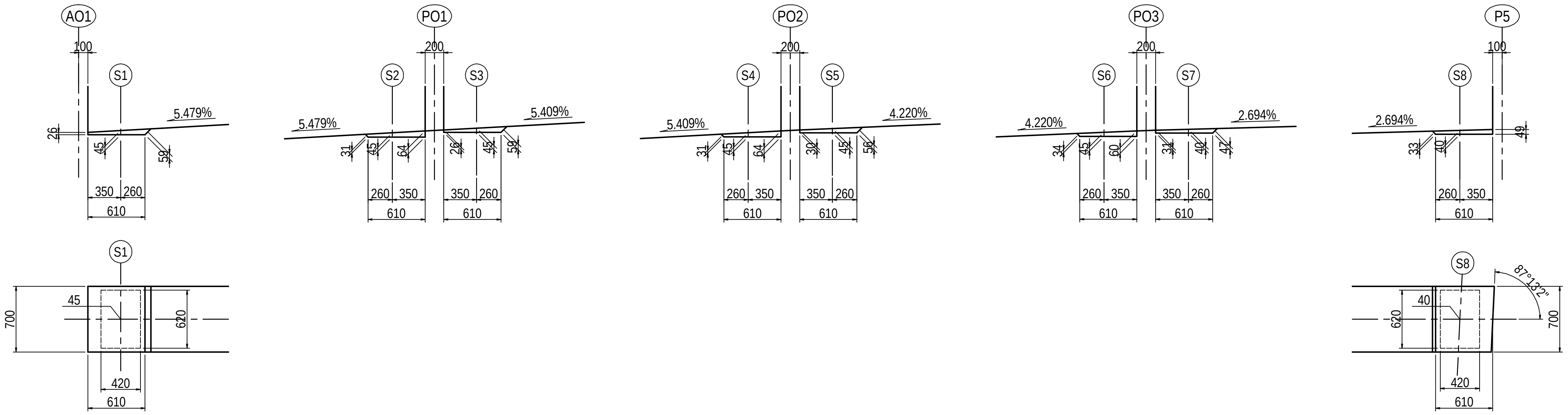
（UNIT：mm）

		AO1	GE1	S1	C1	C2	C3	C4	C5	S2	GE2	PO1	GE3	S3	C6	C7	C8	C9	C10	S4	GE4	PO2	GE5	S5	C11	C12	C13	C14	C15	S6	GE6
OL2	t1	185	185	185	185	185	185	185	185	185	185	185	185	185	189	192	195	198	198	187	185	185	186	189	218	236	242	236	218	189	186
OCL	t2	138	138	138	138	138	138	138	138	138	138	138	138	138	141	144	148	151	151	139	138	138	138	141	171	188	194	188	171	141	138
SCL	t3	133	133	133	133	133	133	133	133	133	133	133	133	133	136	139	143	146	146	134	133	133	133	136	166	183	189	183	166	136	133
OR2	t4	80	80	80	80	80	80	80	80	80	80	80	80	80	84	87	90	93	93	82	80	80	81	84	113	131	137	131	113	84	81

（UNIT：mm）

		PO3	GE7	S7	C16	C17	C18	C19	C20	S8	GE8	P5
OL2	t1	185	186	188	216	231	235	226	206	181	179	178
OCL	t2	138	138	141	168	184	187	179	159	136	134	134
SCL	t3	133	133	136	163	179	182	174	154	131	130	129
OR2	t4	80	81	83	111	126	130	121	102	82	81	80

DETAIL OF ADJUSTMENT LAYER S=1:30



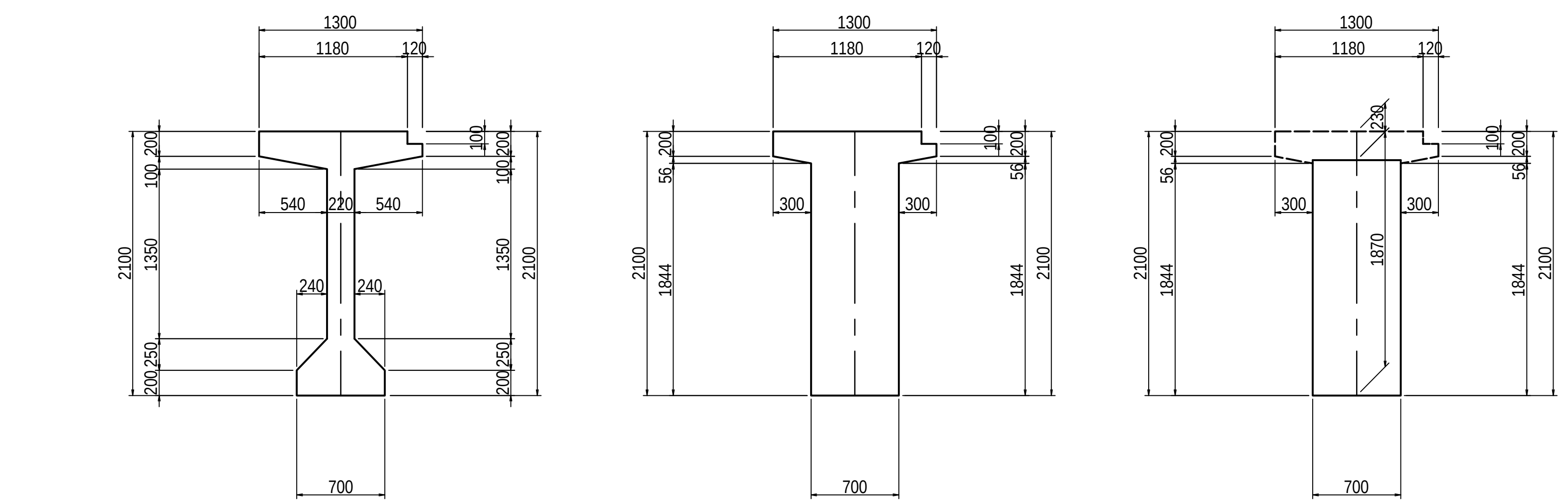
PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA		15 Jun.2017
CHECKED BY	T. HAYAKAWA		20 Jun.2017
APPROVED BY	Y. SANO		21 Jun.2017

DRAWING TITLE	PACKAGE
GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (4)	1
	DWG No.
	P1-OR-1004

GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (5)

CROSS SECTION S=1:30



DESIGN DONDITION

ROAD GARDE	Equivalent to CLASS C
BRIDGE TYPE	4 span continuous PC-I girder bridge with composite deck(PC board and RC deck)
BRIDGE LENGTH	L = 115.200m
SPAN LENGTH	L = 27.900 + 27.900 + 27.900 + 27.900m
WIDTH OF THE ROAD	TOTAL : 6.450m L = 0.600 + 0.750 + 3.250 + 1.250 + 0.600m
HORIZONTAL ALIGNMENT	R = ∞
LONGITUDINAL SLOPE	5.479% ～ 2.197%
SUPERELEVATION	2.00%
ANGLE OF SKEW	AO1, PO1, PO2, PO3 : 90°00'00" , P5 : 87°13'02"
PAVEMENT	ASPHALT PAVEMENT t = 80 mm
SLAB	REINFORCED CONCRETE t = 170 mm
PLATE	PRESTRESS CONCRETE BOARD t = 100 mm
LIVE ROAD	AASHTO HL-93
DESIGN STANDARD	AASHTO LRFD BRIDGE DESIGN 2014(LIVE LOAD) Specifications for highway bridges (Japan Road Association) Part I Common, Part III Concrete Bridges, Part V Seismic Design (April 2012)

MATERIALS LIST

(N/mm^2)

CONCRETE		MAIN GIRDER	CROSS BEAM	PC BOARD	RC SLAB	COUPLING CONCRETE
DESIGN STRENGTH OF CONCRETE		40.0	30.0	40.0	30.0	30.0
ALLOWABLE FLEXURAL COMPRESSIVE STRESS	IMMEDIATELY AFTER PRESTRESSING	19.0	15.0	19.0	—	—
	OTHERS	14.0	11.0	14.0	10.0	10.0
ALLOWABLE FLEXURAL TENSILE STRESS	IMMEDIATELY AFTER PRESTRESSING	-1.5	-1.2	-1.5	—	—
	DEAD LOAD	0.0	0.0	—	—	—
	OTHERS	-1.5	-1.2	0.0	—	—
MEAN SHEAR STRESS CONCRETE CAN CARRY		0.55	0.45	—	—	—
MAXIMUM MEAN CONCRETE SHEAR STRESS	IN CASE WHERE ONLY SHEAR FORCES	5.3	4.0	—	—	—
ALLOWABLE DIAGONAL TENSILE STRESS (DEAD LOAD)	IN CASE WHERE ONLY SHEAR FORCES	-1.0	-0.8	—	—	—
ALLOWABLE DIAGONAL TENSILE STRESS (DESIGN LOAD)	IN CASE WHERE ONLY SHEAR FORCES	-2.0	-1.7	—	—	—

(N/mm^2)

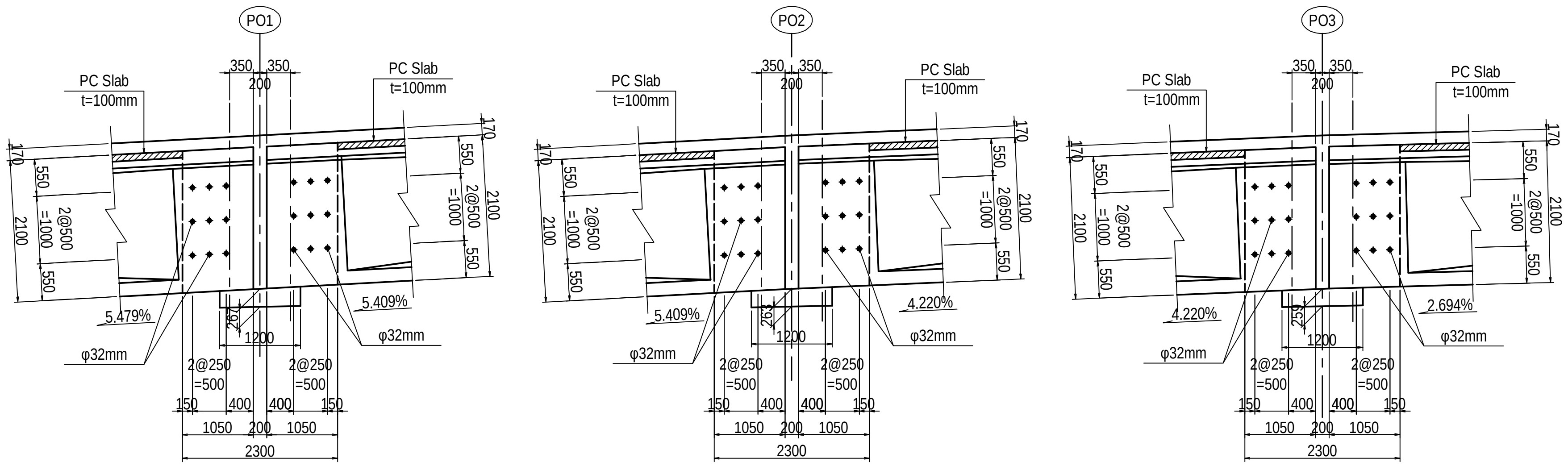
PC STRAND		SWPR7BL 12S12.7mm	SBPR930/1080 φ32mm	SWPR7 1S9.3mm
TENSILE STRENGTH		1850	1080	1700
YIELD POINT		1600	980	1450
ALLOWABLE TENSILE STRESS	DURING PRESTRESSING	1440	837	1305
	IMMEDIATELY AFTER PRESTRESSING	1295	756	1190
	UNDER DESIGN LOAD	1110	648	1020

(N/mm^2)

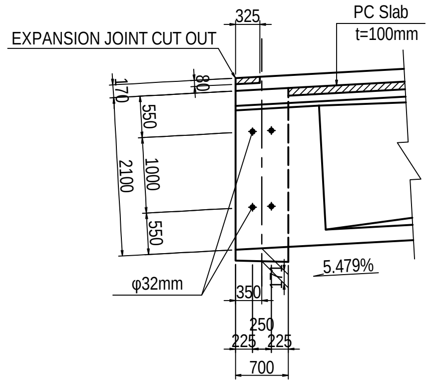
REINFORCING STEEL		MAIN GIRDER	CROSS BEAM	RC SLAB	COUPLING CONCRETE
STEEL TYPE		SD345	SD345	SD345	SD345
YIELD POINT		345	345	345	345
ALLOWABLE TENSILE STRESS	DEAD LOAD	—	—	100	100
	DESIGN LOAD	180	180	140	160

DETAIL OF CROSS BEAM S=1:50

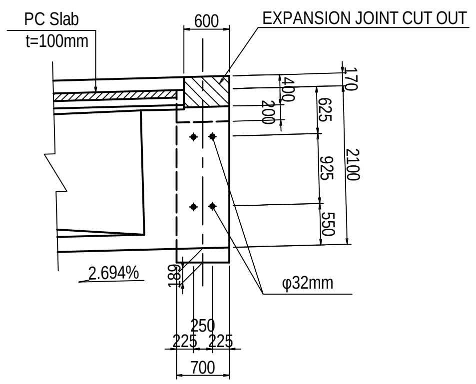
CONNECTION PART



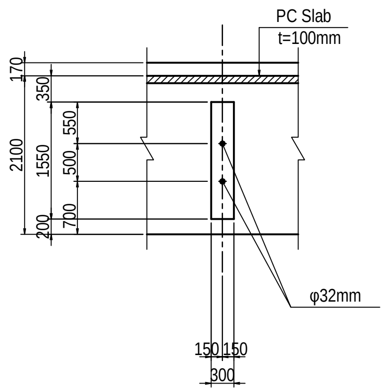
AO1 END CROSS BEAM



P5 END CROSS BEAM



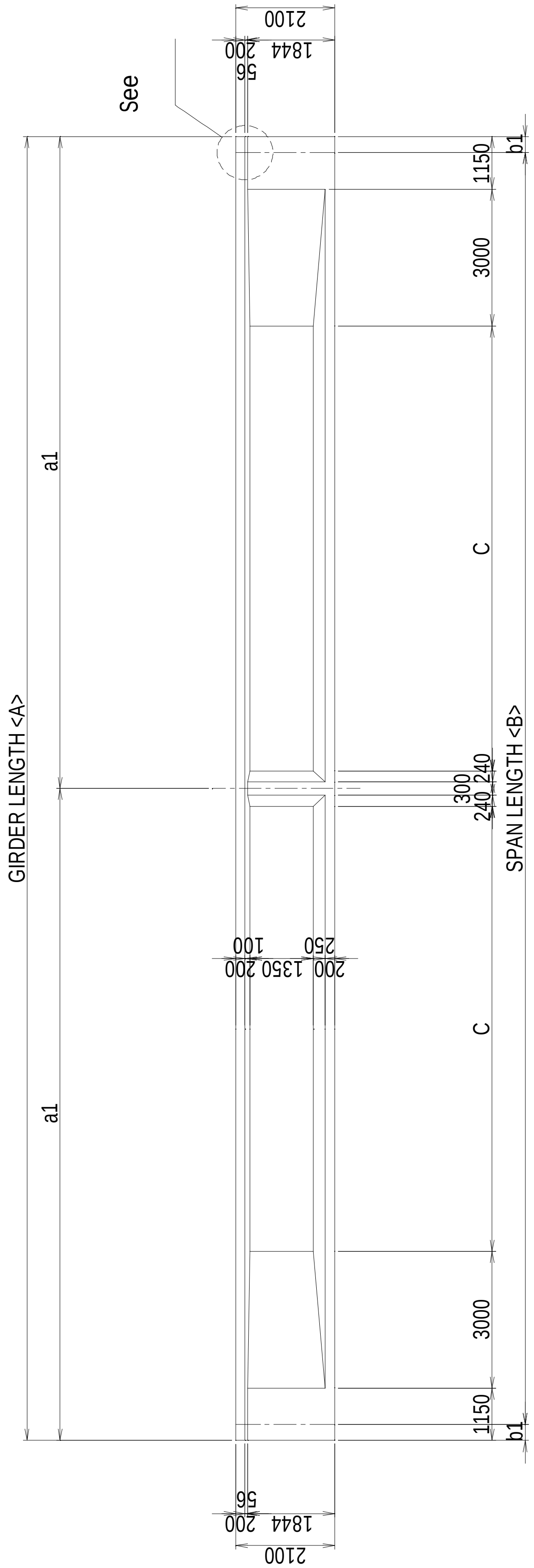
INTERMEDIATE CROSS BEAM



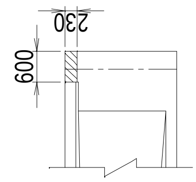
PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 満弘	15 Jun.2017	GENERAL VIEW OF SUPERSTRUCTURE FOR ON-RAMP (5)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-OR-1005

§3 Main Girder Work

1. Shapes and Dimensions



Note: only for P03~P5.

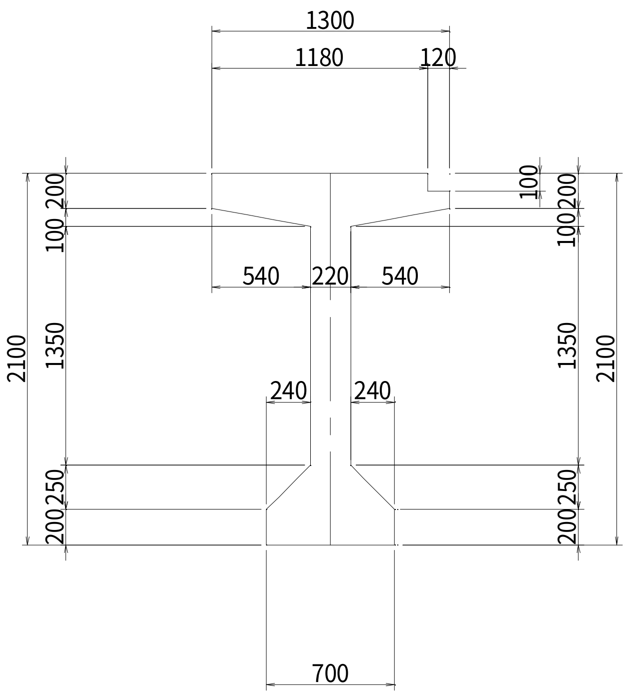


DIMENSION TABLE

	A	B	C	a1	b1
A01～P01	28643	27941	9781.5	14321.5	351
P01～P02	28642	27940	9781	14321	351
P02～P03	28625	27925	9772.5	14312.5	350
P03～P5	28598	27898	9759	14299	350

2. Cross-sectional Area

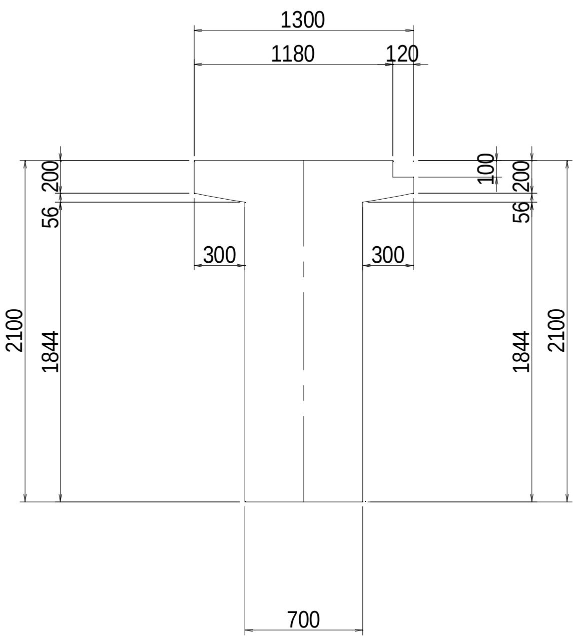
1) Standard section

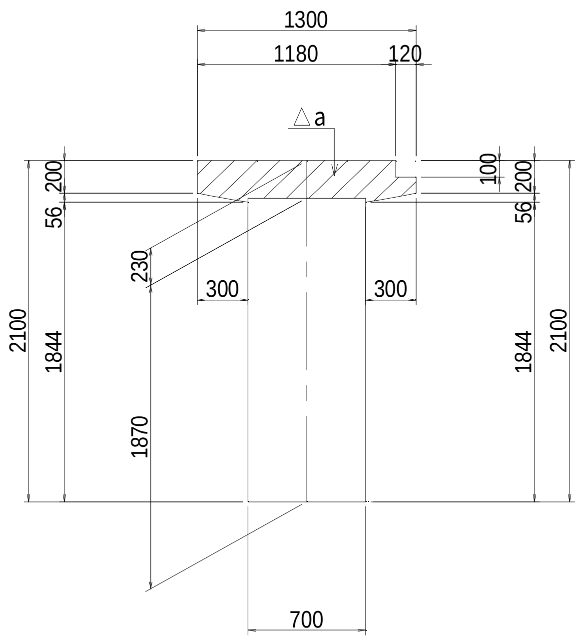


• Outer Girder

a1 =	1.300	×	0.20							
		+	1/2	×(	1.300	+	0.220	) ×	0.100	
		+	1.350	×	0.22					
		+	1/2	×(	0.220	+	0.700	) ×	0.250	
		+	0.700	×	0.20					
		-	0.120	×	0.10					= 0.8760 m^2

2) Section at Support





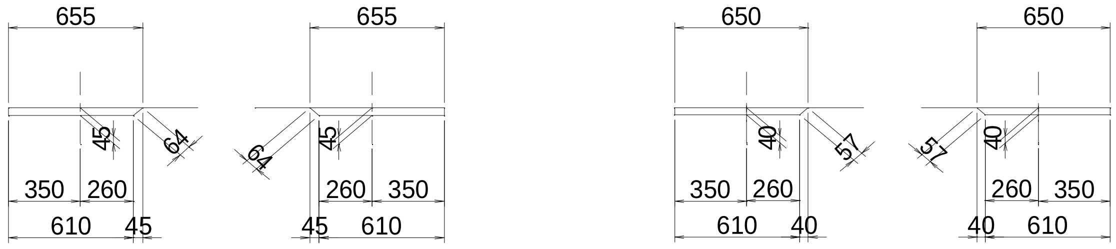
• G1,G2

$$
\begin{aligned}
a1 = \; & 1.300 \times 0.20 \\
& + 1/2 \times (1.300 + 0.700) \times 0.056 \\
& + 1.844 \times 0.70 \\
& - 0.120 \times 0.10 = 1.5948 \; m^2
\end{aligned}
$$

$$\Delta a = 1.595 - 1.870 \times 0.70 = 0.2858 \; m^2$$

DETAIL OF ADJUSTMENT LAYER

AO1-PO1 , PO1-PO2 , PO2-PO3 PO3-P5



3. Concrete Volume (σck= 40 N/mm2)

1) AO1~PO1

	V1	=	1.5948	×	1.150	×	2					=	3.668	m^3
	V2	=	1/2	×(	1.5948	+	0.8760	) ×	3.000	×	2	=	7.412	m^3
	V3	=	0.876	×	9.7815	×	2					=	17.137	m^3
	V4	=	1.5948	×	0.30							=	0.478	m^3
	V5	=	1/2	×(	1.5948	+	0.8760	) ×	0.240	×	2	=	0.593	m^3
Layer	V6	=	1/2	×(	0.610	+	0.655	) ×	0.045					
								×	0.700	×	2	=	0.040	m^3
											ΣV	=	29.328	m^3

2) PO1~PO2

	V1	=	1.5948	×	1.15	×	2					=	3.668	m^3
	V2	=	1/2	×(	1.5948	+	0.8760	) ×	3.000	×	2	=	7.412	m^3
	V3	=	0.876	×	9.781	×	2					=	17.136	m^3
	V4	=	1.5948	×	0.30							=	0.478	m^3
	V5	=	1/2	×(	1.5948	+	0.8760	) ×	0.240	×	2	=	0.593	m^3
Layer	V6	=	1/2	×(	0.610	+	0.655	) ×	0.045					
								×	0.700	×	2	=	0.040	m^3
											ΣV	=	29.327	m^3

3) PO2~PO3

	V1	=	1.5948	×	1.15	×	2					=	3.668	m^3
	V2	=	1/2	×(	1.5948	+	0.8760	) ×	3.000	×	2	=	7.412	m^3
	V3	=	0.876	×	9.7725	×	2					=	17.121	m^3
	V4	=	1.5948	×	0.30							=	0.478	m^3
	V5	=	1/2	×(	1.5948	+	0.8760	) ×	0.240	×	2	=	0.593	m^3
Layer	V6	=	1/2	×(	0.610	+	0.655	) ×	0.045					
								×	0.700	×	2	=	0.040	m^3
											ΣV	=	29.312	m^3

4) PO3~P5

	V1	=	1.5948	×	1.150	×	2					=	3.668	m^3
	V2	=	1/2	×(	1.5948	+	0.8760	) ×	3.000	×	2	=	7.412	m^3
	V3	=	0.876	×	9.759	×	2					=	17.098	m^3
	V4	=	1.5948	×	0.30							=	0.478	m^3
	V5	=	1/2	×(	1.5948	+	0.8760	) ×	0.240	×	2	=	0.593	m^3
Layer	V6	=	1/2	×(	0.610	+	0.655	) ×	0.040					
								×	0.700	×	2	=	0.035	m^3
	0	=	-0.2858	×	0.600							=	-0.171	m^3
											ΣV	=	29.113	m^3

5) per 1 bridge

ΣV	=	29.328	×	2	+	29.327	×	2					
			+	29.312	×	2	+	29.113	×	2	=	234.160	m^3

4. Weight of Main Girder

1) AO1~PO1

$W1 = 29.328 \times 2.5\ t/m^3 = 73.32\ t$

2) PO1~PO2

$W2 = 29.327 \times 2.5\ t/m^3 = 73.32\ t$

3) PO2~PO3

$W3 = 29.312 \times 2.5\ t/m^3 = 73.28\ t$

4) PO3~P5

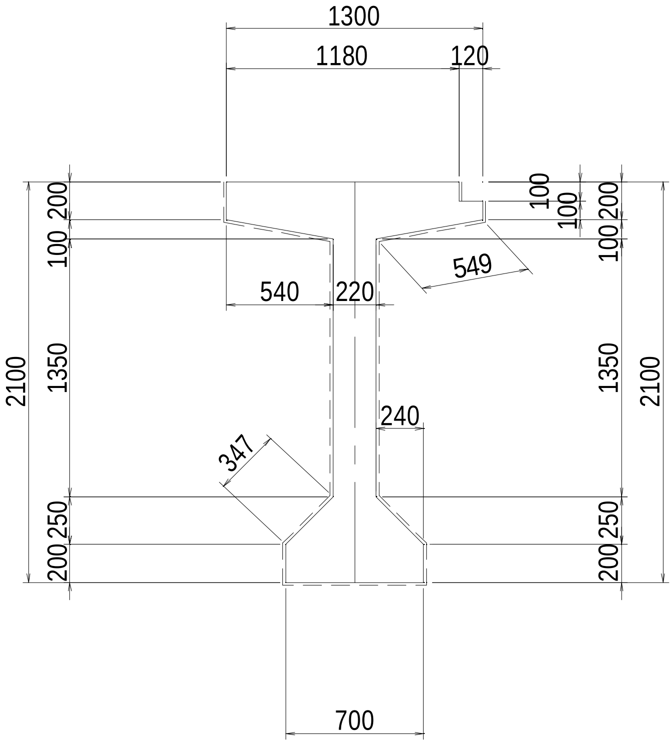
$W3 = 29.113 \times 2.5\ t/m^3 = 72.78\ t$

5) per 1 bridge

$$\Sigma V = 73.32 \times 2 + 73.32 \times 2 + 73.28 \times 2 + 72.78 \times 2 = 585.40\ t$$

5. Perimeter of Formworks

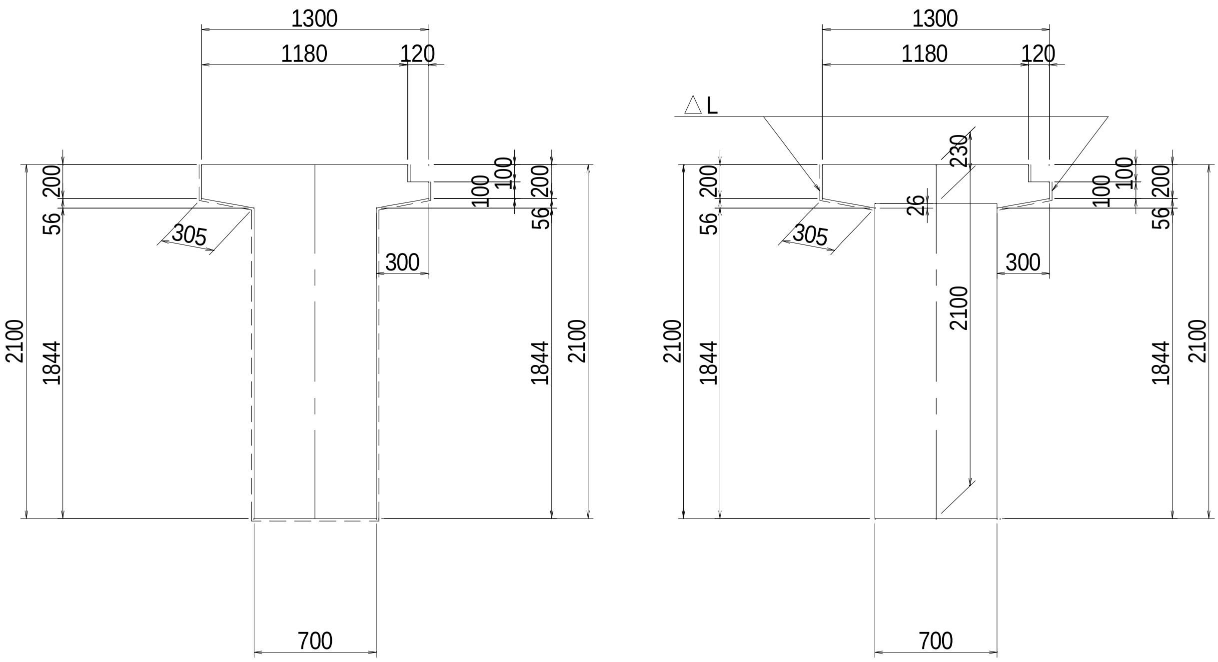
1) Standard Section



• G1,G2

L1 =(0.200 ＋ 0.549 ＋ 1.350 ＋ 0.347
＋ 0.200)× 2 = 5.292 m

2) Section at Support



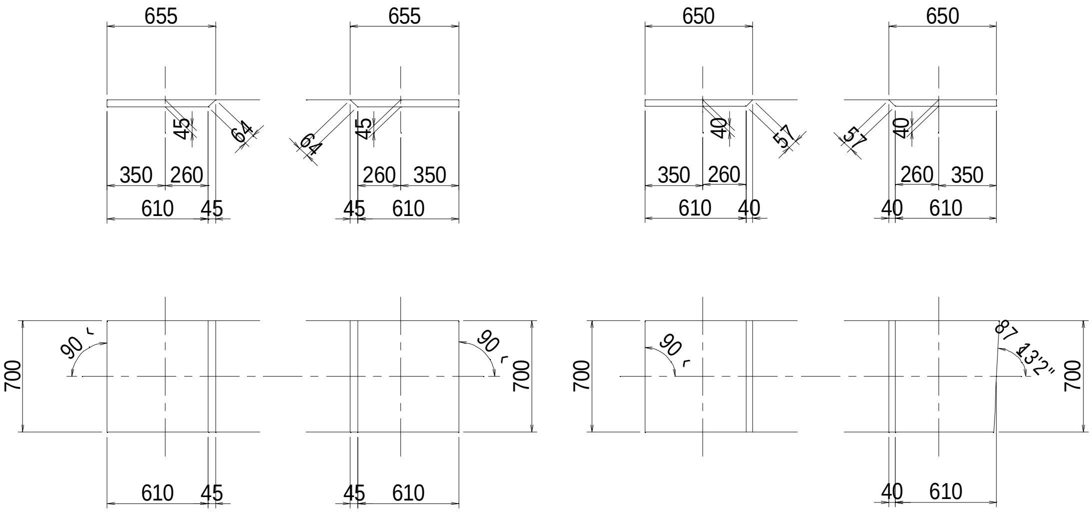
• G1,G2

$L1 = (0.200 + 0.305 + 1.844) \times 2 = 4.698$ m

$-\Delta L = -(0.200 + 0.305) \times 2 + 0.026 \times 2 = -0.958$ m

DETAIL OF ADJUSTMENT LAYER

AO1-PO1 , PO1-PO2 , PO2-PO3 PO3-P5



6. Area of Formworks

1) AO1~PO1

• Side Form

	A1	=	4.698	×	1.150	×	2					=	10.805 m^2
	A2	=	1/2	×(	4.698	+	5.292	)×	3.000	×	2	=	29.970 m^2
	A3	=	5.292	×	9.7815	×	2					=	103.527 m^2
	A4	=	4.6980	×	0.30							=	1.409 m^2
	A5	=	1/2	×(	4.698	+	5.292	)×	0.240	×	2	=	2.398 m^2
Layer	A6	=	1/2	×(	0.610	+	0.655	)×	0.045	×	2		
				+	0.700	×	0.045	×	1/sin90°				
				+	0.700	×	0.064					=	0.133 m^2
											ΣA	=	148.242 m^2

• Edge Form

A1	=	1.5948	×	1/sin90°	×	2	=	3.190 m^2
						ΣA	=	151.432 m^2

• Bottom Form

A1	=	28.643	×	0.700		=	20.0501 m^2
					ΣA	=	171.482 m^2

2) PO1~PO2

• Side Form

	A1	=	4.698	×	1.150	×	2					=	10.805 m^2
	A2	=	1/2	×(	4.698	+	5.292	)×	3.000	×	2	=	29.970 m^2
	A3	=	5.292	×	9.781	×	2					=	103.522 m^2
	A4	=	4.6980	×	0.30							=	1.409 m^2
	A5	=	1/2	×(	4.698	+	5.292	)×	0.240	×	2	=	2.398 m^2
Layer	A6	=	1/2	×(	0.610	+	0.655	)×	0.045	×	2		
				+	0.700	×	0.045	×	1/sin90°				
				+	0.700	×	0.064					=	0.133 m^2
											ΣA	=	148.237 m^2

• Edge Form

A1	=	1.5948	×	1/sin90°	×	2	=	3.190 m^2
						ΣA	=	151.427 m^2

• Bottom Form

A1	=	28.642	×	0.700		=	20.0494 m^2
					ΣA	=	171.476 m^2

3) PO2~PO3

• Side Form

	A1	=	4.698	×	1.150	×	2					=	10.805	m^2
	A2	=	1/2	×(	4.698	+	5.292	)×	3.000	×	2	=	29.970	m^2
	A3	=	5.292	×	9.7725	×	2					=	103.432	m^2
	A4	=	4.698	×	0.30							=	1.409	m^2
	A5	=	1/2	×(	4.698	+	5.292	)×	0.240	×	2	=	2.398	m^2
Layer	A6	=	1/2	×(	0.610	＋	0.655	)×	0.045	×	2			
				＋	0.700	×	0.045	×	1/sin90°					
				＋	0.700	×	0.064					=	0.133	m^2
											ΣA	=	148.147	m^2

• Edge Form

A1	=	1.5948	×	1/sin90°	×	2					=	3.190	m^2
										ΣA	=	151.337	m^2

• Bottom Form

A1	=	28.625	×	0.700		=	20.0375	m^2
					ΣA	=	171.375	m^2

4) PO3~P5

• Side Form

	A1	=	4.698	×	1.150	×	2					=	10.805	m^2
	A2	=	1/2	×(	4.698	+	5.292	)×	3.000	×	2	=	29.970	m^2
	A3	=	5.292	×	9.759	×	2					=	103.289	m^2
	A4	=	4.698	×	0.30							=	1.409	m^2
	A5	=	1/2	×(	4.698	+	5.292	)×	0.240	×	2	=	2.398	m^2
Layer	A6	=	1/2	×(	0.610	＋	0.655	)×	0.04	×	2			
				＋	0.700	×	0.04	×	1/sin87°13′2″					
				＋	0.700	×	0.057					=	0.119	m^2
	A7	=	-0.958	×	0.60							=	-0.575	m^2
											ΣA	=	147.415	m^2

• Edge Form

A1	=	1.5948	×	1/sin90°	＋	1.5948	×	1/sin87°13′2″		=	3.191	m^2
									ΣA	=	150.606	m^2

• Bottom Form

A1	=	28.598	×	0.700		=	20.019	m^2
					ΣA	=	170.625	m^2

5) per 1 bridge

• Side Form

$$\Sigma A = 148.242 \times 2 + 148.237 \times 2 + 148.147 \times 2 + 147.415 \times 2 = 1184.082 \ m^2$$

• Edge Form

$$\Sigma A = 3.190 \times 2 + 3.190 \times 2 + 3.190 \times 2 + 3.191 \times 2 = 25.522 \ m^2$$

• Bottom Form

$$\Sigma A = 20.050 \times 2 + 20.049 \times 2 + 20.038 \times 2 + 20.019 \times 2 = 160.312 \ m^2$$

8. PC Tendons

1) AO1~PO1

• PC Tendons (per 1 girder)

Tendon Type									SWPR7BL 12S12.7	mm
Unit Weight	γ	=							9.288	kg/m
Number of Tendons	N	=							4	nos.
Tendon Length	ΣL	=	28.438	＋	28.361	＋	28.281	＋	28.216	
		=							113.296	m
Extra Length	2×ΔL	=	0.7	×	2			=	1.400	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 113.296 × 9.288 kg/m = 1052.293 kg

(2) Weight of Prestressing Steel (Including Extra Length)

W2 = W1 + 1.400 × 4 × 9.288 kg/m = 1104.306 kg

(3) Sheath (φ85) <Ext. Dia.>

Ls = ΣL - 2 × 0.055 × 4 = 112.856 m

(4) Grout (φ80) <Int. Dia.>

Lg = ΣL = 113.296 m

(5) Anchorage Devices

N = 4 × 2 = 8 sets

(6) Embedded Sheath for Transverse Tendons (φ42)

• Outer Girders (G1,G2)

L1 =(0.700 × 4 ＋ 0.550 × 2
＋ 0.700 × 9)× 1/sin90° = 10.200 m

(7) Jacking (12S12.7)

Both Side N = 4 Tendons

2) PO1~PO2

• PC Tendons (per 1 girder)

Tendon Type									SWPR7BL 12S12.7	mm
Unit Weight	γ	=							9.288	kg/m
Number of Tendons	N	=							4	nos.
Tendon Length	ΣL	=	28.502	＋	28.422	＋	28.332	＋	28.259	
		=							113.515	m
Extra Length	$2\times\Delta L$	=	0.7	×	2			=	1.400	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 113.515 × 9.288 kg/m = 1054.327 kg

(2) Weight of Prestressing Steel (Including Extra Length)

W2 = W1 + 1.400 × 4 × 9.288 kg/m = 1106.340 kg

(3) Sheath (φ85) <Ext. Dia.>

Ls = ΣL - 2 × 0.055 × 4 = 113.075 m

(4) Grout (φ80) <Int. Dia.>

Lg = ΣL = 113.515 m

(5) Anchorage Devices

N = 4 × 2 = 8 sets

(6) Embedded Sheath for Transverse Tendons (φ42)

• Outer Girders (G1,G2)

L1 =(0.700 × 9 ＋ 0.550 × 2
＋ 0.700 × 9)× 1/sin90° = 13.700 m

(7) Jacking (12S12.7)

Both Side N = 4 Tendons

3) PO2~PO3

• PC Tendons (per 1 girder)

Tendon Type									SWPR7BL 12S12.7	mm
Unit Weight	γ	=							9.288	kg/m
Number of Tendons	N	=							4	nos.
Tendon Length	ΣL	=	28.484	＋	28.404	＋	28.314	＋	28.241	
		=							113.443	m
Extra Length	$2\times\Delta L$	=	0.7	×	2			=	1.400	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 113.443 × 9.288 kg/m = 1053.659 kg

(2) Weight of Prestressing Steel (Including Extra Length)

W2 = W1 + 1.400 × 4 × 9.288 kg/m = 1105.672 kg

(3) Sheath (φ85) <Ext. Dia.>

Ls = ΣL - 2 × 0.055 × 4 = 113.003 m

(4) Grout (φ80) <Int. Dia.>

Lg = ΣL = 113.443 m

(5) Anchorage Devices

N = 4 × 2 = 8 sets

(6) Embedded Sheath for Transverse Tendons (φ42)

• Outer Girders (G1,G2)

L1 =(0.700 × 9 ＋ 0.550 × 2
＋ 0.700 × 9)× 1/sin90° = 13.700 m

(7) Jacking (12S12.7)

Both Side N = 4 Tendons

4) PO3~P5

• PC Tendons (per 1 girder)

Tendon Type										SWPR7BL 12S12.7	mm
Unit Weight	γ	=								9.288	kg/m
Number of Tendons	N	=								4	nos.
Tendon Length	ΣL	=	28.41	＋	28.359	＋	28.279	＋		28.214	
		=								113.262	m
Extra Length	$2\times\Delta L$	=	0.7	×	2				=	1.400	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 113.262 × 9.288 kg/m = 1051.977 kg

(2) Weight of Prestressing Steel (Including Extra Length)

W2 = W1 + 1.400 × 4 × 9.288 kg/m = 1103.990 kg

(3) Sheath (φ85) <外径>

Ls = ΣL - 2 × 0.055 × 4 = 112.822 m

(4) Grout (φ80) <内径>

Lg = ΣL = 113.262 m

(5) Anchorage Devices

N = 4 × 2 = 8 sets

(6) Embedded Sheath for Transverse Tendons (φ42)

• 外桁(G1,G2)

L1 = 0.700 × 9 ＋ 0.550 × 2
＋ 0.700 × 4 × 1/sin87°13′2″ = 10.203 m

(7) Jacking (12S12.7)

Both Side N = 4 Tendons

9. Rebars (SD345)

1) AO1-PO1

	(G1 Girder)	(G2 GIeder)	Summary (for 2 Girders)
D22	0	0	0
D19	399	399	798
D16	1918	1918	3836
Subtotal	2317	2317	4634
D13	1848	1848	3696
D10	0	0	0
Total	4165	4165	8330

2) P01-PO2

	(G1 Girder)	(G2 GIeder)	Summary (for 2 Girders)
D22	0	0	0
D19	399	399	798
D16	1918	1918	3836
Subtotal	2317	2317	4634
D13	1848	1848	3696
D10	0	0	0
Total	4165	4165	8330

3) P02-PO3

	(G1 Girder)	(G2 GIeder)	Summary (for 2 Girders)
D22	0	0	0
D19	399	399	798
D16	1918	1918	3836
Subtotal	2317	2317	4634
D13	1847	1847	3694
D10	0	0	0
Total	4164	4164	8328

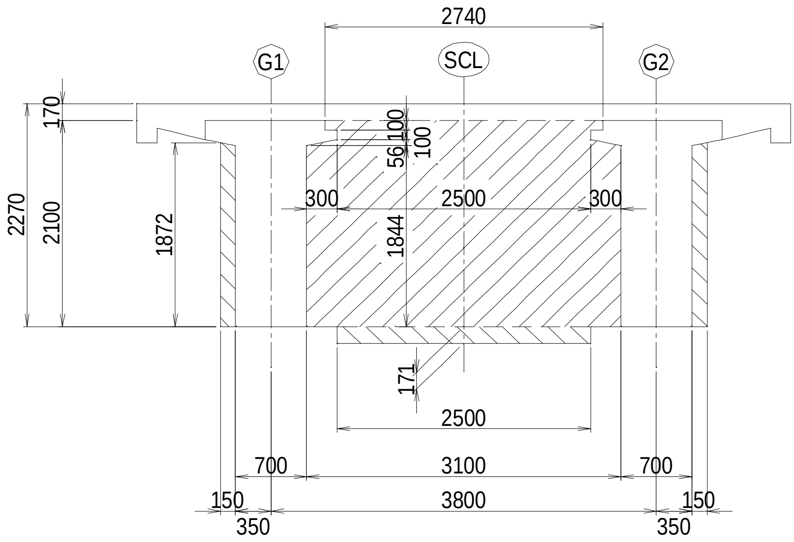
4) P03-P5

	(G1 Girder)	(G2 GIeder)	Summary (for 2 Girders)
D22	0	0	0
D19	397	397	794
D16	1910	1910	3820
Subtotal	2307	2307	4614
D13	1831	1831	3662
D10	0	0	0
Total	4138	4138	8276

§4 Crossbeam Work

1. End Crossbeams

1) Cross-sectional Area (AO1)



• End Crossbeam

a1	=	2.740	×	0.100							
			+	2.500	×	0.100					
			+	1/2	×(	2.500	+	3.100	)×	0.056	
			+	3.100	×	1.844				=	6.3972 m^2

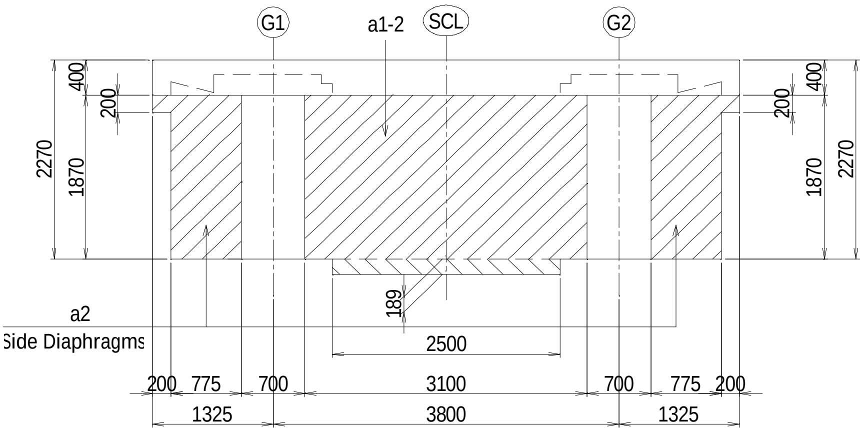
• Side Diaphragm

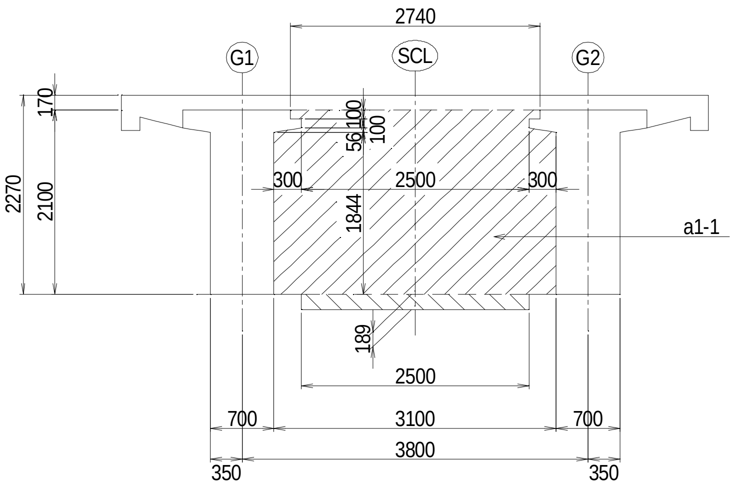
$a2 = 1/2 \times (1.844 + 1.872) \times 0.150 = 0.2787\ m^2$

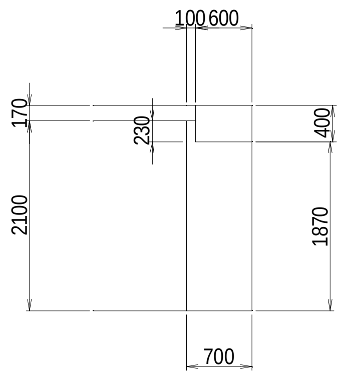
• Soffit Block

$a3 = 2.500 \times 0.171 = 0.4275\ m^2$

2) Cross-sectional Area (P5)







• End Crossbeam

a1-1 = 2.740 × 0.100
+ 2.500 × 0.100
+ 1/2 ×(2.500 + 3.100)× 0.056
+ 3.100 × 1.844 = 6.3972 m^2

a1-2 = 3.100 × 1.870 = 5.7970 m^2

• Side Diaphragm

a2 =(0.775 × 1.870 + 0.200 × 0.200)× 2 = 2.9785 m^2

• Soffit Block

a3 = 2.500 × 0.189 = 0.4725 m^2

3) Concrete Volume (σck= 30 N/mm²)

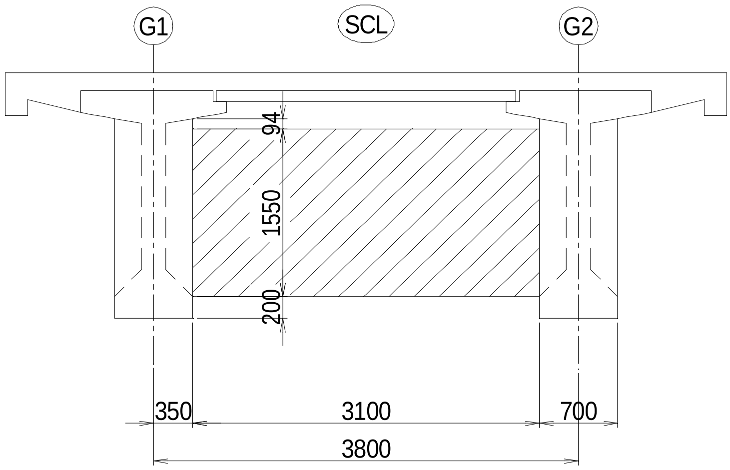
V1	=	6.3972	×	0.700												
			+	0.2787	×	0.700	×	2								
							+	0.4275	×	0.700			=	5.167	m^3	
V2	=(	5.7970	+	2.9785	)×	0.600										
			+	6.3972	×	0.100	+	0.4725	×	0.700			=	6.236	m^3	
											ΣV		=	11.403	m^3	

4) Area of Formwork

A1	=	6.3972	×	1/sin90°	×	2						=		
					+	0.700	×	3.100				=	14.964	m^2
A2	=(	6.3972	+	5.7970	)×	1/sin87°13′2″								
					+	0.700	×	3.100				=	14.379	m^2
A3	=(	1.872	+	0.150	)×	0.700	×	2						
			+(	1.870	+	0.200	)×	0.700	×	2		=	5.729	m^2
A4	=	0.2787	×	4	+	2.9785	×	1/sin87°13′2″						
							×	2				=	7.079	m^2
A5	=(	0.4275	+	0.700	×	0.171	)×	2						
			+(	0.4725	×	1/sin87°13′2″								
					+	0.700	×	0.189	)×	2		=	2.305	m^2
											ΣA	=	44.456	m^2

2. Mid-span Crossbeams

1) Cross-sectional Area



a1	=	3.100	×	1.550	=	4.805	m^2

2) Concrete Volume (σck= 30 N/mm^2)

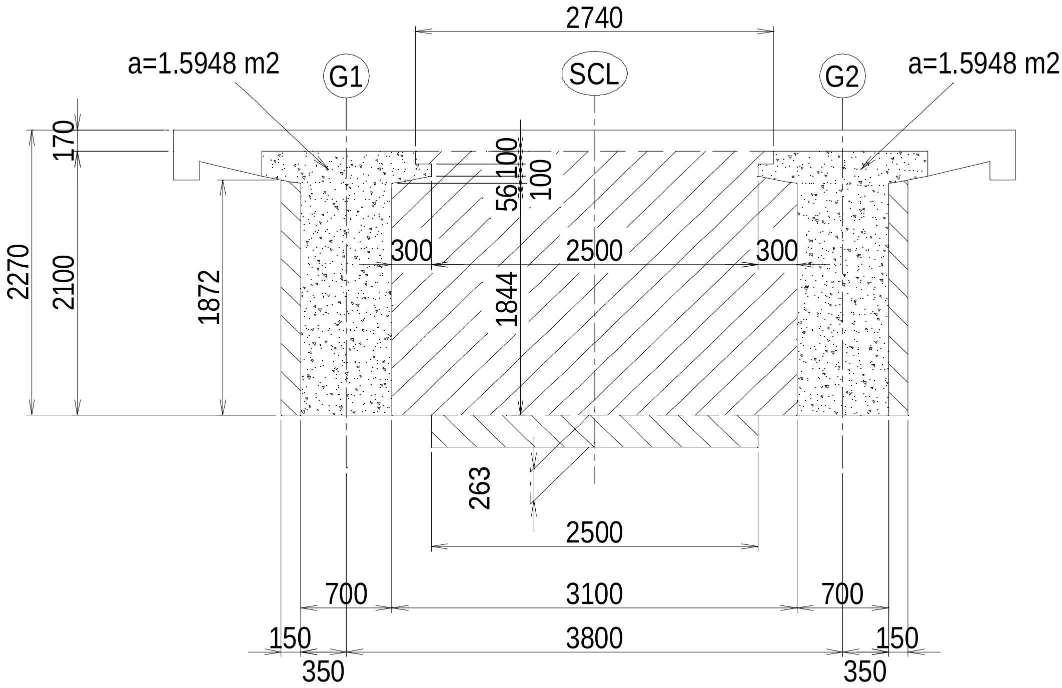
V1	=	4.8050	×	0.300	×	1	×	4	=	5.766	m^3
								ΣV	=	5.766	m^3

3) Area of Formwork

A1	=(	4.8050	×	1/sin90°	×	2					
			+	0.300	×	3.100	)×	4	=	42.160	m^2
								ΣA	=	42.160	m^2

3. Crossbeams at Splice (at Intermediate Support)

1) Cross-sectional Area



• Crossbeam at Intermediate Support

$$a1 = 2.740 \times 0.100 + 2.500 \times 0.100 + 1/2 \times (2.500 + 3.100) \times 0.056 + 3.100 \times 1.844 = 6.3972 \ m^2$$

• Side Diaphragm

$$a2 = 1/2 \times (1.844 + 1.872) \times 0.150 = 0.2787 \ m^2$$

• Soffit Block

$$a3 = 2.500 \times 0.263 = 0.6575 \ m^2$$

2) Concrete Volume (σck= 30 N/mm^2)

$$V1 = 6.3972 \times (1.050 + 0.200 + 1.050) = 14.714 \ m^3$$

$$V2 = 0.2787 \times 2.300 \times 2 = 1.282 \ m^3$$

$$V3 = 1.5948 \times 2 \times 0.200 = 0.638 \ m^3$$

$$V3 = 0.6575 \times 1.200 = 0.789 \ m^3$$

$$\Sigma V = 17.423 \ m^3$$

$$3\times\Sigma V = 52.269 \ m^3$$

3) Area of Formwork

$$A1 =(6.3972 \times 1/\sin 90° \times 2 + 2.300 \times 3.100)\times 1 = 19.924 \ m^2$$

$$A2 =(1.872 + 0.150)\times 2.300 \times 2 = 9.301 \ m^2$$

$$A3 = 0.2787 \times 4 = 1.115 \ m^2$$

$$A4 = 0.700 \times 2 \times 0.200 = 0.280 \ m^3$$

$$A5 =(2.500 + 1.200)\times 0.263 \times 2 = 1.946 \ m^2$$

$$\Sigma A = 32.566 \ m^2$$

$$3\times\Sigma A = 97.698 \ m^3$$

4. Summary of Concrete and Formwork

1) Summary of Concrete

(m^3)

	Concrete
End Crossbeams	11.403
Mid-span Crossbeams	5.766
Crossbeams at Splice	52.269
Total	69.438

2) Summary of Formwork

(m^3)

	Formwork
End Crossbeams	44.456
Mid-span Crossbeams	42.160
Crossbeams at Splice	97.698
Total	184.314

5. Transverse Tendons

1) End Crossbeams

Tendon Type								φ32	mm
Unit Weight	γ	=						6.31	kg/m
Number of Tendons	N	=	4	+	4		=	8	nos.
Tendon Length	L1	=	4.500	×	4				
		+	5.750	×	1/sin87°13′2″		×	4	
		=						41.027	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 41.027 × 6.31 kg/m = 258.880 kg

(3) Sheath (φ40)

L1 =(3.100 + 0.015 × 2)× 4 = 12.520 m

L2 =(3.100 × 1/sin87°13′2″ + 0.015 × 2)× 4 = 12.535 m

L3 =(0.625 × 1/sin87°13′2″ × 2 + 0.015 × 2)× 4 = 5.126 m

ΣL = 30.181 m

(4) Grout (φ40)

Lg = 4.500 × 4 + 5.750 × 1/sin87°13′2″ × 4 = 41.027 m

(5) Anchorage Devices

N = 8 × 2 = 16 sets

2) Mid-span Crossbeams

Tendon Type										φ32	mm
Unit Weight	γ =									6.31	kg/m
Number of Tendons	N =	2	×	4				=		8	nos.
Tendon Length	L1 = (	4.500	-	0.3	)×	2	×	4			
	=									33.600	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 =	33.600	×	6.31	kg/m	=	212.016	kg

(3) Sheath (φ40)

L1 =(	3.100	+	0.015	×	2	)×	8	=	25.040	m

(4) Grout (φ40)

Lg = (	4.500	-	0.3	)×	2	×	4	=	33.600	m

(5) Anchorage Devices

N =	8	×	2	=	16	sets

3) Crossbeams at Splice

Tendon Type									φ32	mm
Unit Weight	γ	=							6.31	kg/m
Number of Tendons	N	=	9	×	2	×	3	=	54	nos.
Tendon Length	L1	=	4.500	×	54					
		=							243.000	m

(1) Weight of Prestressing Steel (w/o Extra Length)

W1 = 243.000 × 6.31 kg/m = 1533.330 kg

(3) Sheath (φ40)

L1 =(3.100 + 0.015 × 2)× 54 = 169.020 m

(4) Grout (φ40)

Lg = 4.500 × 54 = 243.000 m

(5) Anchorage Devices

N = 54 × 2 = 108 sets

4) Summary of Transverse Tendons

	Prestressing Steel (kg)	Sheath (m)	Grout (m)	Anchorage Devices (sets)
	w/o Extra Length	(φ40)	(φ40)	
End Crossbeams	258.880	30.181	41.027	16
Mid-span Crossbeams	212.016	25.040	33.600	16
Crossbeams at Splice	1533.330	169.020	243.000	108
Total	2004.226	224.241	317.627	140

5) Reinforcement (SD345)

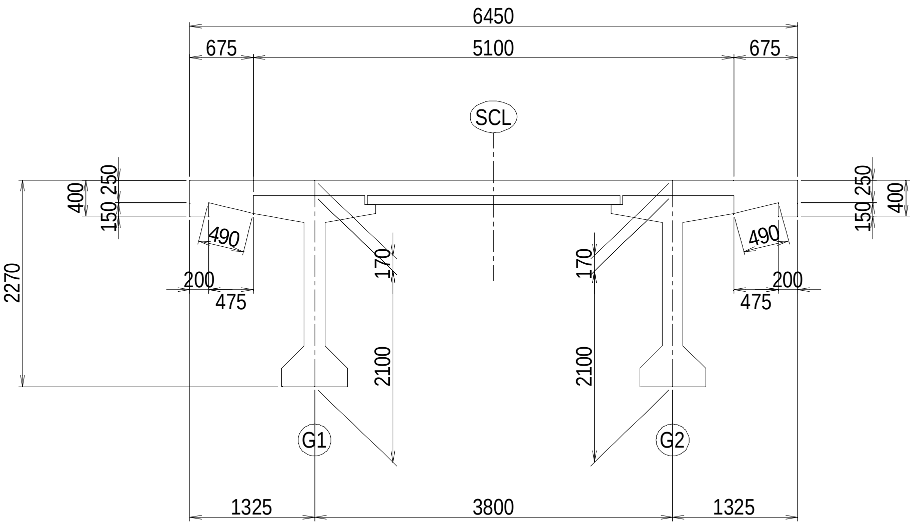
(kg)

size	Rebars	Total
D19	0	0
D16	3780	3780
D13	2141	2141
Total	5921	5921

Insert Anchors 160 nos.

AO1 28 nos.
PO1 44 nos.
PO2 44 nos.
PO3 44 nos.
P5 0 nos.

§5. Slab Work



1) Cross-sectional Area

a1	=	1/2	×(	0.250	+	0.370	)×	0.475	×	2		
			+	5.100	×	0.170						
					+	0.400	×	0.200	×	2	=	1.322 m^2

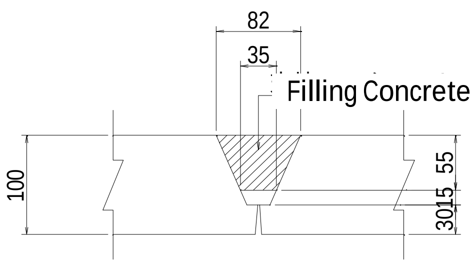
2) Concrete Volume

V	=	1.322	×	115.188	-	0.325	×	0.080				
							×	5.25	×	2	=	152.006 m^3

Filling concrete between PC boards

ΔV	=	1/2	×(	0.035	+	0.082	)×	0.055				
					×	2.680	×	26	×	4	=	0.897 m^3

ΣV = 152.903 m^3



4) Perimeter of Formwork

L =(0.400 + 0.200 + 0.150 + 0.490)× 2 = 2.480 m

5) Area of Formwork

A	=	1.322	+	1.322	×	1/sin87°13′2″		
					+	2.480 × 115.188	=	288.355 m^2

6) Rebars (SD345)

D19	21480	kg
D16	20811	kg
D13	4499	kg
Total	46790	kg

§6 PC Board Work

1) Concrete Volume

• A-TYPE

L	=	2680	mm	t	=	100	mm
B	=	998	mm	N	=	100	nos.

W	=(	0.998	×	0.100						
	-	1/2	×(	0.040	+	0.010	)×	0.070		
					×	2	)×	2.680	=	0.258 m^3
ΣW	=	0.258	×	100					=	25.800 m^3

• B-TYPE

L	=	2680	mm	t	=	100	mm
B	=	944	mm	N	=	2	nos.

W	=(	0.944	×	0.100						
	-	1/2	×(	0.040	+	0.010	)×	0.070		
					×	2	)×	2.680	=	0.244 m^3
ΣW	=	0.244	×	2					=	0.488 m^3

• C-TYPE

L	=	2680	mm	t	=	100	mm
B	=	769	mm	N	=	2	nos.

W	=(	0.769	×	0.100						
	-	1/2	×(	0.040	+	0.010	)×	0.070		
					×	2	)×	2.680	=	0.197 m^3
ΣW	=	0.197	×	2					=	0.394 m^3

• D-TYPE

L	=	2680	mm	t	=	100	mm
B	=	761	mm	N	=	2	nos.

W	=(	0.761	×	0.100						
	-	1/2	×(	0.040	+	0.010	)×	0.070		
					×	2	)×	2.680	=	0.195 m^3
ΣW	=	0.195	×	2					=	0.390 m^3

• E-TYPE and F-TYPE

L	=	2680	mm	t	=	100	mm
B	=	923	mm	N	=	2	nos.

$$W = (0.923 \times 0.100 - 1/2 \times (0.040 + 0.010) \times 0.070 \times 2) \times 2.680 = 0.238 \ m^3$$

$$\Sigma W = 0.238 \times 1 \quad \text{E-TYPE} \quad = 0.238 \ m^3$$

$$\Sigma W = 0.238 \times 1 \quad \text{F-TYPE} \quad = 0.238 \ m^3$$

	Number		Concrete Volume
A-TYPE	100	nos.	25.800 m^3
B-TYPE	2	nos.	0.488 m^3
C-TYPE	2	nos.	0.394 m^3
D-TYPE	2	nos.	0.390 m^3
E-TYPE	1	nos.	0.238 m^3
F-TYPE	1	nos.	0.238 m^3
Total	108	nos.	27.548 m^3

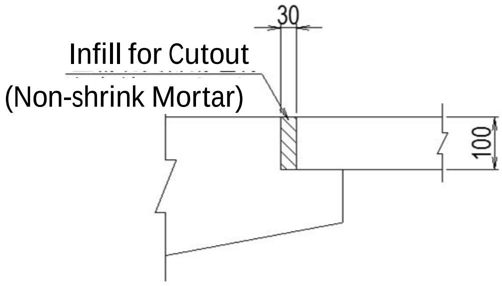
2) Installation Area of PC Boards

$A = 2.680 \times 106.801 \times 1 = 286.227\ m^2$

3) Joint Filler (Sponge Rubber 15mm×10mm)

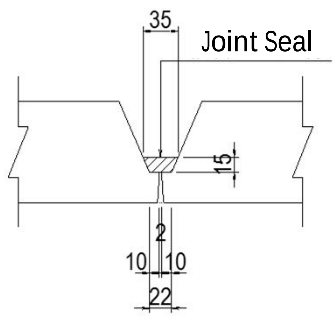
$L = 106.801 \times 2 \times 1 = 213.602\ m$

4) Infill for Cutout (Non-shrink mortar)



$V = 0.030 \times 0.100 \times 106.801 \times 2$
$\times 1 = 0.641\ m^3$

5) Joint Seal (Non-shrink mortar)

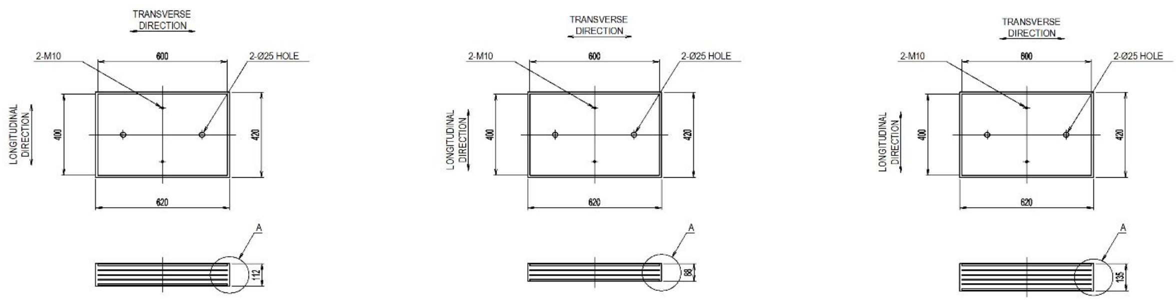


$V = 1/2 \times(0.035 + 0.022)\times 0.015$
$\times 2.680 \times 26 \times 4 = 0.119\ m^3$

§7 Bearing Work

1. Bearings (Pad bype)

AO1 PO1-PO3 P5



Substructure	nos.	Specification
AO1	2	600mm (Lg.) x 400mm (Tr.) x 80mm (Total Thickness of Rubber)
PO1	4	600mm (Lg.) x 400mm (Tr.) x 60mm (Total Thickness of Rubber)
PO2	4	600mm (Lg.) x 400mm (Tr.) x 60mm (Total Thickness of Rubber)
PO3	4	600mm (Lg.) x 400mm (Tr.) x 60mm (Total Thickness of Rubber)
P5	2	00mm (Lg.) x 400mm (Tr.) x 100mm (Total Thickness of Rubber

Note: Lg. = Longitudinal, Tr. = Transverse

2. Anchor Bars

Substructure	Diameter (mm)	nos.	Material
AO1	36	6	S35CN
PO1	75	6	S35CN
PO2	50	6	S35CN
PO3	50	6	S35CN
P5	36	6	S35CN

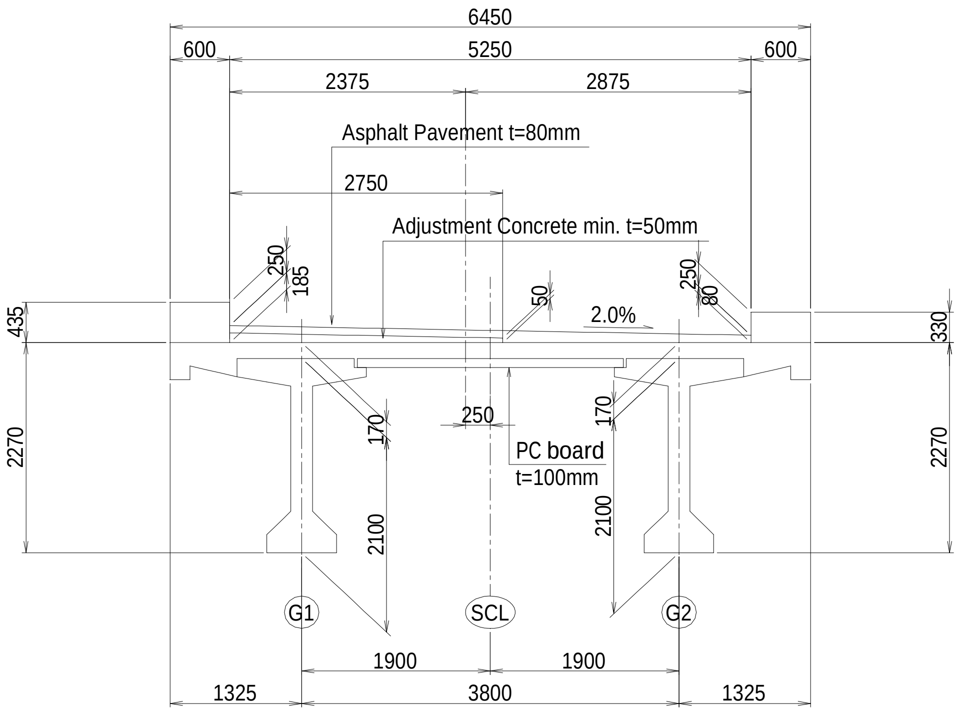
Weight of Anchor Bars

Substructure	AO1	PO1	PO2	PO3	P5
Diameter (mm)	36	75	50	50	36
Number of Anchor Bars (nos.)	6	6	6	6	6
Vertical Spacing below soffit block (mm)	20	20	20	20	20
Length of Anchor Bars (mm)	740	1520	1020	1020	740
Unit weight per length (kg/m)	7.99	34.68	15.41	15.41	7.99
Weight per bar (kg/nos.)	5.91	52.71	15.72	15.72	5.91
Weight per substructure (kg)	35.48	316.28	94.33	94.33	35.48

Total = 575.9 kg

§8 Bridge Surface Work

1. Wheel Guard



See next page for detail

1) Concrete Volume (σck= 24 N/mm^2)

V1 = = 55.391 m^3

2) Area of Formwork

A1 =

= 184.637 m^2

3) Rebars (SD345)

(kg)

Size	Wheel Guard
D25	0
D13	3430
Total	3430

(Reinforcement for Railing)

Volume and Formwork Area for Wheel Guard (considering variation of pavement thickness)

	AO1	GE1	S1	C1	C2	C3	C4	C5	S2	GE2	PO1	Subtotal
Wheel Guard (L) Height (m)	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	0.4350	
Wheel Guard (R) Height (m)	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	
Distance between Sections (m)		0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	28.8000
Wheel Guard (L) Volume (m3)			0.0914	1.2137	1.2137	1.2137	1.2137	1.2137	1.2137	0.0914	0.0261	7.4907
Wheel Guard (L) Formwork (m2)			0.3045	4.0455	4.0455	4.0455	4.0455	4.0455	4.0455	0.3045	0.0870	24.9690
Wheel Guard (R) Volume (m3)			0.0693	0.9207	0.9207	0.9207	0.9207	0.9207	0.9207	0.0693	0.0198	5.6826
Wheel Guard (R) Formwork (m2)			0.2310	3.0690	3.0690	3.0690	3.0690	3.0690	3.0690	0.2310	0.0660	18.9420

	PO1	GE3	S3	C6	C7	C8	C9	C10	S4	GE4	PO2	Subtotal
Wheel Guard (L) Height (m)	0.4350	0.4351	0.4353	0.4386	0.4419	0.4451	0.4484	0.4483	0.4367	0.4354	0.4350	
Wheel Guard (R) Height (m)	0.3300	0.3301	0.3303	0.3336	0.3369	0.3401	0.3434	0.3433	0.3317	0.3304	0.3300	
Distance between sections (m)	0.1000	0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	28.8000
Wheel Guard (L) Volume (m3)		0.0261	0.0914	1.2191	1.2283	1.2374	1.2464	1.2509	1.2346	0.0916	0.0261	7.6518
Wheel Guard (L) Formwork (m2)		0.0870	0.3046	4.0636	4.0943	4.1246	4.1548	4.1697	4.1153	0.3052	0.0870	25.5061
Wheel Guard (R) Volume (m3)		0.0198	0.0693	0.9261	0.9353	0.9444	0.9535	0.9579	0.9416	0.0695	0.0198	5.8374
Wheel Guard (R) Formwork (m2)		0.0660	0.2311	3.0871	3.1178	3.1481	3.1783	3.1932	3.1388	0.2317	0.0660	19.4581

	PO2	GE5	S5	C11	C12	C13	C14	C15	S6	GE6	PO3	Subtotal
Wheel Guard (L) Height (m)	0.4350	0.4358	0.4385	0.4681	0.4858	0.4917	0.4858	0.4681	0.4385	0.4358	0.4350	
Wheel Guard (R) Height (m)	0.3300	0.3308	0.3335	0.3631	0.3808	0.3867	0.3808	0.3631	0.3335	0.3308	0.3300	
Distance between sections (m)	0.1000	0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	
Wheel Guard (L) Volume (m3)		0.0261	0.0918	1.2647	1.3307	1.3636	1.3636	1.3307	1.2647	0.0918	0.0261	8.1539
Wheel Guard (L) Formwork (m2)		0.0871	0.3060	4.2157	4.4356	4.5454	4.5454	4.4356	4.2157	0.3060	0.0871	27.1796
Wheel Guard (R) Volume (m3)		0.0198	0.0698	0.9718	1.0377	1.0707	1.0707	1.0377	0.9718	0.0698	0.0198	6.3395
Wheel Guard (R) Formwork (m2)		0.0661	0.2325	3.2392	3.4591	3.5689	3.5689	3.4591	3.2392	0.2325	0.0661	21.1316

	PO3	GE7	S7	C16	C17	C18	C19	C20	S8	GE8	P5	Subtotal
Wheel Guard (L) Height (m)	0.4350	0.4357	0.4383	0.4655	0.4810	0.4846	0.4764	0.4561	0.4303	0.4286	0.4281	
Wheel Guard (R) Height (m)	0.3300	0.3307	0.3333	0.3605	0.3760	0.3796	0.3714	0.3523	0.3324	0.3306	0.3301	
Distance between sections (m)	0.100	0.100	0.350	4.650	4.650	4.650	4.650	4.650	4.650	0.350	0.100	
Wheel Guard (L) Volume (m3)		0.0261	0.0918	1.2608	1.3204	1.3470	1.3406	1.3008	1.2365	0.0902		8.0142
Wheel Guard (L) Formwork (m2)		0.0871	0.3059	4.2027	4.4012	4.4900	4.4687	4.3361	4.1218	0.3006		26.7141
Wheel Guard (R) Volume (m3)		0.0198	0.0697	0.9679	1.0274	1.0541	1.0476	1.0096	0.9552	0.0696		6.2208
Wheel Guard (R) Formwork (m2)		0.0661	0.2324	3.2262	3.4247	3.5135	3.4922	3.3652	3.1839	0.2321		20.7362

Total Volume of Wheel Guard 55.391 m3

Total Area of Formwork 184.637 m2

2. Pavement

1) Carriageway

A1 = 5.250 ×(115.188 - 0.325 × 2) = 601.325 m^2

4. Leveling Concrete

V1 = = 43.126 m^3

	AO1	GE1	S1	C1	C2	C3	C4	C5	S2	GE2	PO1	Subtotal
Thickness of Leveling (L) (m)	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	
Thickness of Leveling (R) (m)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Distance between Sections (m)		0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	
Volume of Leveling Concrete (m3)		0.02756	0.09647	1.28166	1.28166	1.28166	1.28166	1.28166	1.28166	0.09647	0.02756	7.938

	PO1	GE3	S3	C6	C7	C8	C9	C10	S4	GE4	PO2	Subtotal
Thickness of Leveling (L) (m)	0.105	0.105	0.105	0.109	0.112	0.115	0.118	0.118	0.107	0.105	0.105	
Thickness of Leveling (R) (m)	0.0000	0.0001	0.0003	0.0036	0.0069	0.0101	0.0134	0.0133	0.0017	0.0004	0.0000	
Distance between Sections (m)	0.1000	0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	
Volume of Leveling Concrete (m3)		0.02759	0.09684	1.32926	1.40982	1.48916	1.5685	1.60756	1.46475	0.0984	0.02767	9.120

	PO2	GE5	S5	C11	C12	C13	C14	C15	S6	GE6	PO3	Subtotal
Thickness of Leveling (L) (m)	0.105	0.106	0.109	0.138	0.156	0.162	0.156	0.138	0.109	0.106	0.105	
Thickness of Leveling (R) (m)	0.0000	0.0008	0.0035	0.0331	0.0508	0.0567	0.0508	0.0331	0.0035	0.0008	0.0000	
Distance between Sections (m)	0.1000	0.1000	0.3500	4.6500	4.6500	4.6500	4.6500	4.6500	4.6500	0.3500	0.1000	
Volume of Leveling Concrete (m3)		0.02777	0.10042	1.72841	2.30576	2.59383	2.59383	2.30576	1.72841	0.10042	0.02777	13.512

	PO3	GE7	S7	C16	C17	C18	C19	C20	S8	GE8	P5	Subtotal
Thickness of Leveling (L) (m)	0.105	0.106	0.108	0.136	0.151	0.155	0.146	0.126	0.101	0.099	0.098	
Thickness of Leveling (R) (m)	0.0000	0.0007	0.0033	0.0305	0.0460	0.0496	0.0414	0.0223	0.0022	0.0005	0.0000	
Distance between Sections (m)	0.100	0.100	0.350	4.650	4.650	4.650	4.650	4.650	4.650	0.350	0.100	
Volume of Leveling Concrete (m3)		0.02775	0.10014	1.69423	2.21543	2.44857	2.39243	2.05187	1.53249	0.09275		12.556

Total Volume of Leveling Concrete 43.126 m3

5. Expansion Joints

1) at AO1

• Expansion Joint

L1 = = 5.250 m

• Postcast Concrete

(Girder Side)

V1 = 0.289 ×(0.160 + 0.265)/ 2 × 5.250 = 0.322 m^3

(Abutment Side)

V2 = 0.900 × 0.160 × 5.250 = 0.756 m^3

V3 = 0.600 ×(0.160 + 0.250)× 2 = 0.492 m^3

TOTAL 1.570 m^3

• Reinforcement for Expansion Joint

S1 D16 5.250 × 1.560 × 8 = 65.5 kg

E1 D16 0.800 × 1.560 × 26 = 32.4 kg

TOTAL 98.0 kg

2) at P5

• Expansion Joint

See the quantities of Steel Box Girder Bridge.

• Postcast Concrete

See the quantities of Steel Box Girder Bridge.

• Reinforcement for Expansion Joint

See the quantities of Steel Box Girder Bridge. = 0.0 kg

6. Railings

1) Length of Railings

Including railings on AO1 Abutment

L1 = 120.200 + 119.900 = 240.100 m

Left side Right side (Including Abutment Section)

2) Rebars

D25 = 1492 kg

7. Waterproofing

• Area of Waterproofing (Paint type)

A1 = 5.250 ×(115.188 - 0.325 × 2) = 601.325 m^2

• Spiral Pipes (φ18mm)

L1 = 115.188 + 5.250 = 120.438 m

• Slab Drains

N = 6 nos.

4. Drainage

• Number of Drain Pits

N = 6 nos.

• Length of Drain Pipes (VP200A)

L = Superstructure side = 75.8 m

Substructure side = 25.8 m

PC BOX GIRDER BRIDGE &
ON-RAMP BRIDGE

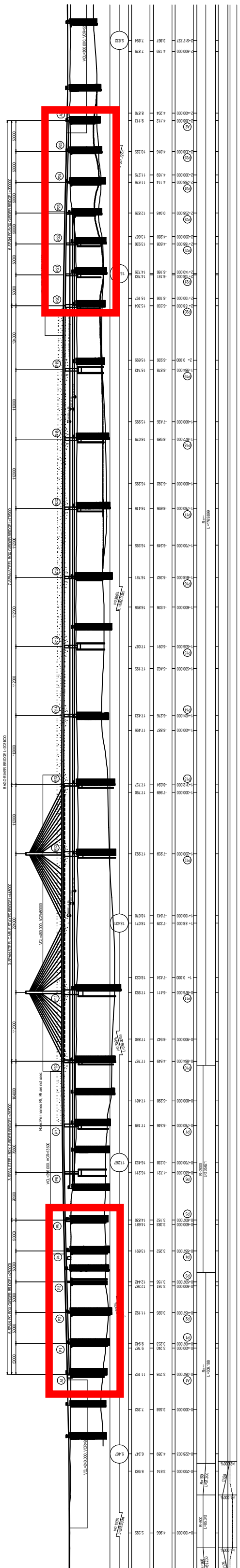
SUBSTRUCTURE

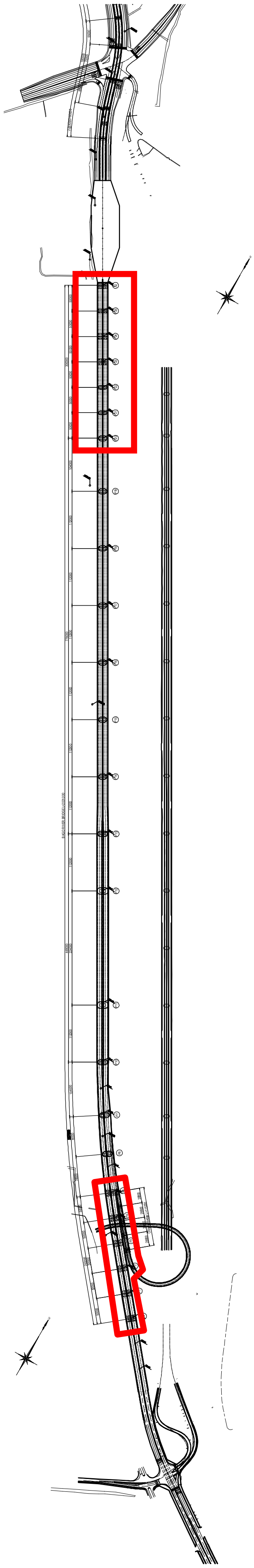
CONTENTS

CHAPTER 3. QUANTITY OF STEEL PIPE SHEET PILE FOUNDATIONS

APPENDIX

Location Map





Version 2017/05/15
Note:
All the survey data are updated
Shapes of the structures are modified by Detailed Design results.
Road plan including toll plaza and intersection is not finalized.
Spanning of P5-P10 is reconsidered as Option-2b.

Elevation represents above MSL unless otherwise indicated.

Dimensions of Substructure

Main Bridge

Item		Unit	A1	P1	P2	P3	P4	P5	P20	P21	P22	P23	P24	P25	A2
Station Number		m	357.0	407.0	457.0	507.0	557.0	607.0	2088.0	2138.0	2188.0	2238.0	2288.0	2338.0	2388.0
Total bridge width		m	20.700	20.700	20.700	20.700	20.700	27.297	20.700	20.700	20.700	20.700	20.700	20.700	20.700
Halving Joints Pier		-	-	N	N	N	N	**Y**	**Y**	N	N	N	N	N	-
Proposed Height (PH)		MSL+m	8.692	9.942	11.192	12.442	13.691	14.830	15.304	14.753	13.926	12.825	11.575	10.325	9.113
Substructure PH		MSL+m	8.692	6.424	7.709	8.959	10.173	11.309	11.868	11.245	10.408	9.342	8.057	6.773	9.113
Column height		m	4.700	2.700	4.000	5.200	6.400	7.600	19.400	18.800	17.900	11.800	4.300	3.000	5.400
Pilecap/top slab height		m	1.900	1.900	1.900	1.900	1.900	2.000	4.000	4.000	4.000	2.200	1.900	1.900	1.900
Total height		m	6.600	4.600	5.900	7.100	8.300	9.600	23.400	22.800	21.900	14.000	6.200	4.900	7.300
Beam	width	m	20.700	17.000	17.000	17.000	17.000	25.000	17.000	17.000	17.000	17.000	17.000	17.000	20.700
	thickness		0.500	2.500	2.500	2.500	3.000	4.500	4.500	3.000	3.000	3.000	2.500	2.500	0.500
Column	width	m	20.700	17.000	17.000	17.000	11.250	19.000	11.000	11.000	11.000	11.000	17.000	17.000	20.700
	thickness	m	2.800	2.500	2.500	2.500	3.000	4.500	4.500	3.000	3.000	3.000	2.500	2.500	2.800
Pilecap/ Top Slab	Longitudinal	m	12.000	12.000	12.000	14.000	12.000	12.000	11.373	8.535	8.535	12.000	12.000	9.000	10.500
	Transversal	m	21.000	19.000	19.000	19.000	16.000	28.000	17.164	17.222	17.222	16.000	19.000	19.000	20.700
On land / In River		-	Land	Land	Land	Land	Land	Land	River	River	River	River	Land	Land	Land
Foundation Type		-	CIP	CIP	CIP	CIP	CIP	CIP	SPSP	SPSP	SPSP	CIP	CIP	CIP	CIP
Pile diameter and length		m	φ1.5, 53.0	φ2.0, 58.0	φ2.0, 62.0	φ2.0, 57.0	φ2.0, 58.0	φ2.0, 55.5	φ1.2, 42.0	φ1.2, 44.5	φ1.2, 39.5	φ2.0, 32.5	φ2.0, 47.0	φ2.0, 38.0	φ1.5, 31.5
Pile layout and number		nos	4x7=28	3x4=12	3x4=12	3x4=12	3x4=12	3x7=21	36	32	32	3x4=12	3x4=12	2x4=8	3x6=18

Dimensions of Substrucuter

On-ramp Bridge

Item		Unit	AO1	PO1	PO2	PO3					
Station Number		m	411.009	439.809	468.609	497.409					
Total bridge width		m	6.450	6.450	6.450	6.450					
Halving Joints Pier		-	-	N	N	N					
Proposed Height (PH)		MSL+m	9.452	11.030	12.587	13.803					
Substructure PH		MSL+m	9.452	8.332	9.891	11.111					
Column height		m	5.700	4.600	6.200	7.400					
Pilecap/top slab height		m	1.900	1.900	1.900	1.900					
Total height		m	7.600	6.500	8.100	9.300					
Beam	width	m	6.600	5.500	5.500	5.500					
	thickness		0.500	1.500	1.500	1.500					
Column	width	m	6.600	5.500	5.500	5.500					
	thickness	m	2.000	1.500	1.500	1.500					
Pilecap/ Top Slab	Longitudinal	m	9.000	10.400	8.000	8.000					
	Transversal	m	9.000	9.000	8.000	8.000					
On land / In River		-	Land	Land	Land	Land					
Foundation Type		-	CIP	CIP	CIP	CIP					
Pile diameter and length		m	φ1.5, 56.5	φ2.0, 57.0	φ2.0, 57.5	φ2.0, 58.0					
Pile layout and number		nos	3x3=9	2+1+2=5	2x2=4	2x2=4					

Bago Bridge Project in Myanmar

Substructure Heights and Foundation Depth

1. A1 (Thilawa) Side: PC-Box Girder Bridge

Item	Mark	Unit	A1	P1	P2	P3	P4	P5		Remark
Station Number	STA	m	357.00	407.00	457.00	507.00	557.00	607.00		STA No of Main Bridge
Structure Type (1:Abutment,2:Pier)	–	–	1	2	2	2	2	2		
			Abutment	Pier	Pier	Pier	Pier	Pier		
Proposed height	PH	m	8.692	9.942	11.192	12.442	13.691	14.831		Proposed height at CL
Top elevation of substructure	KCL	m	8.692	6.454	7.709	8.959	10.173	11.309		Pier Top Elevation at KCL
Existing Ground EL	GL1	m	3.223	3.254	3.025	3.156	3.260	3.149		Current GL
Future Ground EL	GL	m	4.300	4.300	4.300	4.300	4.300	4.300		Deepest point=-5.30m for PC Box Br A1 side.
Control for pile cap EL 1:Overburden thickness 2:Top EL	–	–	1	1	1	1	1	1		
			Overburden	Overburden	Overburden	Overburden	Overburden	Overburden		
Thickness or EL	–	m	0.500	0.500	0.500	0.500	0.500	0.500		Planed overburden thickness or pile cap EL
Actual Overburden thickness	do	m	0.508	0.546	0.591	0.541	0.527	0.591		
Pile cap thickness	FH	m	1.900	1.900	1.900	1.900	1.900	2.000		Pile cap or Top slab thickness
"Column height of Pier" or "Wall + Ballast wall height of Abutment"	H1	m	4.892	2.654	3.909	5.159	6.373	7.509		Based on overburden thickness
			8.192	5.954	7.209	8.459	9.673	10.809		Based on pile cap top surface EL
			4.900	2.700	4.000	5.200	6.400	7.600		Round up by 10cm
Total Substructure height	H	m	6.800	4.600	5.900	7.100	8.300	9.600		Column + pile cap (top slab)
EL of Pile cap bottom	FL	m	1.892	1.854	1.809	1.859	1.873	1.709		Bottom EL of Pile cap or Top slab
EL of Bearing layer	S	m	-49.020	-53.620	-57.660	-52.770	-53.590	-51.480		To be confirmed
Pile diameter	D	m	1.500	2.000	2.000	2.000	2.000	2.000		Pile diameter
Minimum socket length			1.0D	1.0D	1.0D	1.0D	1.0D	1.0D		D=Pile diameter. Pile: 1D, SPSP: 1D (minimum)
Foundation Type (1:CIP Pile, 2:SPSP)	–	–	1	1	1	1	1	1		
			CIP Pile	CIP Pile	CIP Pile	CIP Pile	CIP Pile	CIP Pile		Pile Foundation or SPSP Foundation
Pile Length	L	m	53.000	58.000	62.000	57.000	58.000	55.500		SPSP: from Top slab top EL to socket
Reference Boring No.	–	–	*BD23*	*BD22*	*BD21*	*BH-01*	*BD20*	*BD19*		Reference for Detailed Design
Bearing Stratum	–	–	*CS-II*	*CS-II*	*CS-II*	*CS-II*	*CS-II*	*CS-II*		CS: Clayey SAND

2. A2 (Yangon) Side: PC-Box Girder Bridge

Item	Mark	Unit	P20	P21	P22	P23	P24	P25	A2	Remark
Station Number	STA	m	2088.00	2138.00	2188.00	2238.00	2288.00	2338.00	2388.00	STA No of Main Bridge
Structure Type (1:Abutment,2:Pier)	-	-	2	2	2	2	2	2	1	
			Pier	Pier	Pier	Pier	Pier	Pier	Abutment	
Proposed height	PH	m	15.304	14.752	13.926	12.824	11.575	10.325	9.113	Proposed height at CL
Top elevation of substructure	KCL	m	11.868	11.245	10.408	9.342	8.057	6.773	9.113	Pier Top Elevation at KCL
Existing Ground EL	GL1	m	-6.554	-6.155	-4.610	-0.041	4.116	4.016	4.110	Current GL
Future Ground EL	GL	m	-7.490	-7.490	-7.490	0.550	4.300	4.300	4.300	Deepest point=-6.49m for PC Box Br A2 side.
control for pile cap EL 1:Overburden thickness 2:Top EL	-	-	2	2	2	2	1	1	1	
			Pilecap EL	Pilecap EL	Pilecap EL	Pilecap EL	Overburden	Overburden	Overburden	
Thickness or EL	-	m	-7.490	-7.490	-7.490	-2.390	0.500	0.500	0.500	Planed overburden thickness or pile cap EL
Actual Overburden thickness	do	m	0.042	0.065	0.002	3.008	0.543	0.527	0.587	
Pile cap thickness	FH	m	4.000	4.000	4.000	2.200	1.900	1.900	1.900	Pile cap or Top slab thickness
"Column height of Pier" or "Wall + Ballast wall height of Abutment"	H1	m	11.868	11.245	10.408	6.402	4.257	2.973	5.313	Based on overburden thickness
			19.358	18.735	17.898	11.732	7.557	6.273	8.613	Based on pile cap top surface EL
			19.400	**18.800**	**17.900**	**11.800**	**4.300**	**3.000**	**5.400**	Round up by 10cm
Total Substructure height	**H**	**m**	**23.400**	**22.800**	**21.900**	**14.000**	**6.200**	**4.900**	**7.300**	Column + pile cap (top slab)
EL of Pile cap bottom	FL	m	-11.532	-11.555	-11.492	-4.658	1.857	1.873	1.813	Bottom EL of Pile cap or Top slab
EL of Bearing layer	S	m	-47.300	-49.450	-42.400	-34.650	-42.650	-33.760	-27.870	**To be confirmed**
Pile diameter	D	m	1.200	1.200	1.200	2.000	2.000	2.000	1.500	Pile diameter
Minimum socket length			1.4D	1.4D	3.1D	1.0D	1.0D	1.0D	1.0D	D=Pile diameter. Pile: 1D, SPSP: 1D (minimum)
Foundation Type (1:CIP Pile, 2:SPSP)	-	-	2	2	2	1	1	1	1	
			SPSP	SPSP	SPSP	CIP Pile	CIP Pile	CIP Pile	CIP Pile	Pile Foundation or SPSP Foundation
Pile Length	L	m	41.500	44.000	39.000	32.500	47.000	38.000	31.500	SPSP: from Top slab top EL to socket
Reference Boring No.	-	-	*BD3*	*BD2*	*BD1*	*BD17*	*BD16*	*BD15*	*BD14*	Reference for Detailed Design
Bearing Stratum	-	-	*CS-I*	*CS-I*	*CS-I*	*CS-I*	*CS-I*	*CS-I*	*CS-I*	CS: Clayey SAND

3. ON Ramp Bridge: PC-T Girder Bridge

Item	Mark	Unit	AO1	PO1	PO2	PO3	PO4 (P5)			Remark
Station Number	STA	m	0+411.009	0+439.809	0+468.609	0+497.409	0+526.209			STA No of ON Ramp. PO4 = P5 (Main Bridge)
Structure Type (1:Abutment,2:Pier)	–	–	1	2	2	2	2			
			Abutment	Pier	Pier	Pier	Pier			
Proposed height	PH	m	9.452	11.030	12.587	13.803	14.571			Proposed height at CL
Top elevation of substructure	KCL	m	9.452	8.332	9.891	11.111	11.275			Pier Top Elevation at KCL
Existing Ground EL	GL1	m	3.281	2.936	2.959	3.076	3.149			Current GL
Future Ground EL	GL	m	4.300	4.300	4.300	4.300	4.300			Future ground elevation
control for pile cap EL 1:Overburden thickness 2:Top EL	–	–	1	1	1	1	1			
			Overburden	Overburden	Overburden	Overburden	Overburden			
Thickness or EL	–	m	0.500	0.500	0.500	0.500	0.500			Planed overburden thickness or pile cap EL
Actual Overburden thickness	do	m	0.548	0.568	0.609	0.589	0.525			
Pile cap thickness	FH	m	1.900	1.900	1.900	1.900	1.900			Pile cap or Top slab thickness
"Column height of Pier" or "Wall + Ballast wall height of Abutment"	H1	m	5.652	4.532	6.091	7.311	7.475			Based on overburden thickness
			8.952	7.832	9.391	10.611	10.775			Based on pile cap top surface EL
			5.700	**4.600**	**6.200**	**7.400**	**7.500**			Round up by 10cm
Total Substructure height	H	**m**	**7.600**	**6.500**	**8.100**	**9.300**	**9.400**			Column + pile cap (top slab)
EL of Pile cap bottom	FL	m	1.852	1.832	1.791	1.811	1.875			Bottom EL of Pile cap or Top slab
EL of Bearing layer	S	m	-52.770	-52.770	-53.590	-53.590	-51.480			
Pile diameter	D	m	1.500	2.000	2.000	2.000	2.000			Pile diameter
Minimum socket length			1.0D	1.0D	1.0D	1.0D	1.0D			D=Pile diameter. Pile: 1D as minimum.
Foundation Type (1:CIP Pile, 2:SPSP)	–	–	1	1	1	1	1			
			CIP Pile	CIP Pile	CIP Pile	CIP Pile	CIP Pile			Pile Foundation or SPSP Foundation
Pile Length	L	**m**	**56.500**	**57.000**	**57.500**	**58.000**	**55.500**			SPSP: from Top slab top EL to socket
Reference Boring No.	–	–	*BH-01*	*BH-01*	*BD20*	*BD20*	*BD19*			Reference for Detailed Design
Bearing Stratum	–	–	*CS-II*	*CS-II*	*CS-II*	*CS-II*	*CS-II*			CS: Clayey SAND

CHAPTER 1

SUMMARY

Cost estimate of Bago River Bridge　　　　　Package 1-2

Item No.	Item	Description	Unit	Qty			
				Package1		Package2	
				PCPCaBox A1, P1-P5	Mbox, MCS P6-P12	Mbox P13-P19	PCPCaBox P20-25, A2
1	Substructure (Reverse T-shaped Abutment)						
	Bored pile	D=1500, Ave.L= 53.0m(Pack1) 31.5m(Pack2)	nos	28			18
	Concrete	Nominal strength = 30N/mm^2	m^3	2,622.2			1,001.9
	Re-bar	SD390 or equivalent, D10-D13	kg	392			252
	Re-bar	SD345 or equivalent, D16-D25	kg	142,352			52,110
	Re-bar	SD345 or equivalent, D29-D32	kg	86,940			0
	Re-bar	SD345 or equivalent, D35	kg	0			75,060
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Earth Work						
	Excavation		m^3	758.3			718.2
	Backfilling		m^3	172.3			203.3
	Footing						
	Concrete	Class A (24N/mm^2)	m^3	478.8			413.0
	Re-bar	SD345 or equivalent, D10-D13	kg	185			165
	Re-bar	SD345 or equivalent, D16-D25	kg	11,187			8,762
	Re-bar	SD345 or equivalent, D29-D32	kg	12,998			11,994
	Re-bar	SD345 or equivalent, D35	kg	0			0
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Formwork		m^2	125.4			118.6
	Lean concrete	18N/mm^2, t=0.1m	m^3	25.9			22.4
	Lean concrete formwork		m^2	6.7			6.3
	Crushed stone	t=0.2m	m^2	258.6			223.6
	Wall, Parapet, Wing wall						
	Concrete	Class A (24N/mm^2)	m^3	156.2			179.0
	Re-bar	SD345 or equivalent, D10-D13	kg	251			198
	Re-bar	SD345 or equivalent, D16-D25	kg	6,080			6,283
	Re-bar	SD345 or equivalent, D29-D32	kg	16,588			15,584
	Re-bar	SD345 or equivalent, D35	kg	0			0
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Formwork		m^2	327.5			332.5
	Box-out (Cylindrical form)		m	17.2			17.3
	Non-shrinkage mortar		m^3	0.7			0.7
	Approach slab						
	Concrete	Class A (24N/mm^2)	m^3	31.4			31.4
	Re-bar	SD345 or equivalent, D10-D13	kg	326			326
	Re-bar	SD345 or equivalent, D16-D25	kg	2,642			2,640
	Re-bar	SD345 or equivalent, D29-D32	kg	2,958			2,958
	Re-bar	SD345 or equivalent, D35	kg	0			0
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Formwork		m^2	9.8			8.1
	PDA test		Set	0			0
	Subtotal of Abutment						
2	Substructure (Pier on land)						
	Bored pile	D=2000, Ave.L= 57.8m(Pack1) 39.3m(Pack2)	nos	69			32
	Concrete	Nominal strength = 30N/mm^2	m^3	12,522.3			3,952.7
	Re-bar	SD345 or equivalent, D10-D13	kg	1,932			896
	Re-bar	SD345 or equivalent, D16-D25	kg	353,571			117,396
	Re-bar	SD345 or equivalent, D29-D32	kg	698,256			158,816
	Re-bar	SD345 or equivalent, D35	kg	99,528			134,156
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Earth Work						
	Excavation		m^3	4,255.6			2,742.7
	Backfilling		m^3	1,327.5			1,263.8
	Footing						
	Concrete	Class A (24N/mm^2)	m^3	2,408.6			1,180.5
	Re-bar	SD345 or equivalent, D10-D13	kg	0			0
	Re-bar	SD345 or equivalent, D16-D25	kg	64,892			19,735
	Re-bar	SD345 or equivalent, D29-D32	kg	226,435			81,658
	Re-bar	SD345 or equivalent, D35	kg	0			28,005
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0

Item No.	Item	Description	Unit	Qty			
				Package1		Package2	
				PCPCaBox A1, P1-P5	Mbox, MCS P6-P12	Mbox P13-P19	PCPCaBox P20-25, A2
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Formwork		m^2	627.4			347.4
	Lean concrete	18N/mm^2, t=0.1m	m^3	128.3			60.9
	Lean concrete formwork		m^2	33.1			17.7
	Crushed stone	t=0.2m	m^2	1,282.6			608.4
	Pier column						
	Concrete	Class A (30N/mm^2)	m^3	953.9			422.8
	Concrete	Class A (24N/mm^2)	m^3	494.5			303.5
	Re-bar	SD345 or equivalent	kg	3,571			872
	Re-bar	SD345 or equivalent, D16-D25	kg	96,281			55,678
	Re-bar	SD345 or equivalent, D29-D32	kg	15,321			7,272
	Re-bar	SD345 or equivalent, D35	kg	0			0
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	9,152			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			28,647
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Formwork		m^2	1,108.2			653.2
	Box-out (Cylindrical form)		m	112.6			68.4
	Non-shrinkage mortar		m^3	6.9			3.9
	PDA test		Set	0.0			0.0
	Subtotal of Pier on land						
3	Substructure (Pier on river)						
	Steel sheet pipe pile foundation						
	Falsework(Guide, Frame, Wale, Strut)	H-300, H-400	kg	0			335
		[-300	kg	0			8
	Steel sheet pipe pile (circumferentials)	Total pile numbers	nos	0			100
		Total driving length φ=1200, t =14mm~16mm	m	0.0			4,322.2
		φ=1200, t =14mm, SKY400	kg	0			1,570
		φ=1200, t =14mm, SKY490	kg	0			232
		φ=1200, t =16mm, SKY400	kg	0			111
		φ=165.2, t =11mm, SKY400 (Joint Pile)	kg	0			377
	Steel sheet pipe pile (Bulkhead)	Total pile numbers	nos	0			14
		Total driving length φ=1200, t =14mm	m	0.0			604.0
		φ=1200, t =14mm, SKY400	kg	0			298
		φ=165.2, t =11mm, SKY400 (Joint Pile)	kg	0			72
	Cleaning of Inside joint pipe	Pipe-junction Dia=165.2mm	m	0.0			10,747.0
	Mortar filling of Inside joint pipe	Pipe-junction Dia=165.2mm	m	0.0			8,251.8
	Sealing of Inside joint pipe	Pipe-junction Dia=165.2mm	m	0.0			2,012.4
	Excavation inside of the well		m^3	0.0			2,479.4
	Excavation inside of the pipe pile		m^3	0.0			901.0
	Concrete Filling to Steel Pipe	18N/mm^2	m^3	0.0			760.2
	Welding of the dowel	Stud method, D22 (SM490A-SD) L=0.8, 1.0m	nos	0			9,288
	Spread sand		m^3	0.0			143.8
	Bottom slab concrete	Underwater concrete, 30N/mm^2	m^3	0.0			575.4
	Cut-off the pipe		nos	0			100
	Footing						
	Concrete	Class A (30N/mm^2)	m^3	0.0			1,214.1
	Re-bar	SD345 or equivalent, D10-D13	kg	0			550
	Re-bar	SD345 or equivalent, D16-D25	kg	0			14,340
	Re-bar	SD345 or equivalent, D29-D32	kg	0			70,609
	Re-bar	SD345 or equivalent, D35	kg	0			14,860
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			0
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			0
	Pier column						
	Concrete	Class A (30N/mm^2)	m^3	0.0			2,211.8
	Concrete	Class A (24N/mm^2)	m^3	0.0			0.0
	Re-bar	SD345 or equivalent, D10-D13	kg	0			0
	Re-bar	SD345 or equivalent, D16-D25	kg	0			129,554
	Re-bar	SD345 or equivalent, D29-D32	kg	0			20,016
	Re-bar	SD345 or equivalent, D35	kg	0			0
	Re-bar	SD345 or equivalent, D38	kg	0			0
	Re-bar	SD390 or equivalent, D10-D13	kg	0			0
	Re-bar	SD390 or equivalent, D16-D25	kg	0			0
	Re-bar	SD390 or equivalent, D29-D32	kg	0			65,652
	Re-bar	SD390 or equivalent, D35	kg	0			0
	Re-bar	SD390 or equivalent, D38	kg	0			154,968
	Formwork		m^2	0.0			1,704.0
	Box-out (Cylindrical form)		m	0.0			73.6
	Non-shrinkage mortar		m^3	0.0			4.4
	PDA test		Set	0			3
	Equipment rental fee	SPSP driving on river (by Crawler crane mounted on barge	L.S.				
	Subtotal of Pier on river						
4	Steel cable stayed bridge (superstructure)	including fabrication and erection					
5	Steel box girder bridge (superstructure)	including fabrication and erection					
6	PC Precast Box Girder (Superstructure)						
7	Approach road						
8	Miscellaneous						
	Temporary work						
	Temporary Coffering	Steel Sheet Pile L average=14m (Type III)	nos	1,124			511

Item No.	Item	Description	Unit	Qty			
				Package1		Package2	
				PCPCaBox A1, P1-P5	Mbox, MCS P6-P12	Mbox P13-P19	PCPCaBox P20-25, A2
			ton	843,000			383,250
		Steel Sheet Pile L average=24m (Type V_L)	nos	0			148
			kg	0			349,650
		Wale, Strut	kg	0			124,662
		Underwater concrete, 30N/mm^2	m^3	0.0			0.0
	Temporary Jetty		m^2				
	Bent	Constructed by using residual cut steel sheet pipe pile					
	Clearing and Levelling of construction yard		m^2				
	Concrete Batcher Plant		L.S.				
	Lighting and Electrical Wireing		m				
	Toll Gate		L.S.				
	Falsework	Scaffloding (Handrail precede type) H<30m	m^2	1,893.9			3,469.2
	Supporting	Wedge type (under 80 kN/m2)	m^3	172.5			410.1
	Subtotal of miscellaneolus work						

Cost estimate of Bago River Bridge   Package 1-2

Item No.	Item	Description	Unit	Qty																		
				Package1											Package2							
				PCPCaBox (A1, P1-P9)										Sub Total	PCPCaBox (P20-25, A2)							Sub Total
				A1	P1	P2	P3	P4	P5	P6	P7	P8	P9		P20	P21	P22	P23	P24	P25	A2	
1	Substructure (Reverse T-shaped Abutment)																					
	Bored pile	D=1500, Ave.L= 53.0m(Pack1) 31.5m(Pack2)	nos	28.0										28.0							18.0	18.0
	Concrete	Nominal strength = 30N/mm^2	m^3	2,622.2										2,622.2							1,001.9	1,001.9
	Re-bar	SD345 or equivalent, D10-D13	kg	392										392							252	252
	Re-bar	SD345 or equivalent, D16-D25	kg	142,352										142,352							52,110	52,110
	Re-bar	SD345 or equivalent, D29-D32	kg	86,940										86,940								0
	Re-bar	SD345 or equivalent, D35	kg											0							75,060	75,060
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Earth Work																					
	Excavation		m^3	758.3										758.3							718.2	718.2
	Backfilling		m^3	172.3										172.3							203.3	203.3
	Footing																					
	Concrete	Class A (24N/mm^2)	m^3	478.8										478.8							413.0	413.0
	Re-bar	SD345 or equivalent, D10-D13	kg	185										185							165	165
	Re-bar	SD345 or equivalent, D16-D25	kg	11,187										11,187							8,762	8,762
	Re-bar	SD345 or equivalent, D29-D32	kg	12,998										12,998							11,994	11,994
	Re-bar	SD345 or equivalent, D35	kg											0								0
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Formwork		m^2	125.4										125.4							118.6	118.6
	Lean concrete	18N/mm^2, t=0.1m	m^3	25.9										25.9							22.4	22.4
	Lean concrete formwork		m^2	6.7										6.7							6.3	6.3
	Crushed stone	t=0.2m	m^2	258.6										258.6							223.6	223.6
	Wall, Parapet, Wing wall																					
	Concrete	Class A (24N/mm^2)	m^3	156.2										156.2							179.0	179.0
	Re-bar	SD345 or equivalent, D10-D13	kg	251										251							198	198
	Re-bar	SD345 or equivalent, D16-D25	kg	6,080										6,080							6,283	6,283
	Re-bar	SD345 or equivalent, D29-D32	kg	16,588										16,588							15,584	15,584
	Re-bar	SD345 or equivalent, D35	kg											0								0
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Formwork		m^2	327.5										327.5							332.5	332.5
	Box-out (Cylindrical form)		m	17.2										17.2							17.3	17.3
	Non-shrinkage mortar		m^3	0.7										0.7							0.7	0.7
	Approach slab																					
	Concrete	Class A (24N/mm^2)	m^3	31.4										31.4							31.4	31.4
	Re-bar	SD345 or equivalent, D10-D13	kg	326										326							326	326
	Re-bar	SD345 or equivalent, D16-D25	kg	2,642										2,642							2,640	2,640
	Re-bar	SD345 or equivalent, D29-D32	kg	2,958										2,958							2,958	2,958
	Re-bar	SD345 or equivalent, D35	kg											0								0
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Formwork		m^2	9.8										9.8							8.1	8.1
	PDA test		Set	0.0										0.0							0.0	0.0
	Subtotal of Abutment													0.0								0.0
2	Substructure (Pier on land)																					
	Bored pile	D=2000, Ave.L= 57.8m(Pack1) 39.3m(Pack2)	nos		12.0	12.0	12.0	12.0	21.0					69.0				12.0	12.0	8.0		32.0
	Concrete	Nominal strength = 30N/mm^2	m^3		2,186.8	2,337.6	2,149.1	2,186.8	3,662.0					12,522.3				1,225.4	1,772.1	955.2		3,952.7
	Re-bar	SD345 or equivalent, D10-D13	kg		336	336	336	336	588					1,932				336	336	224		896
	Re-bar	SD345 or equivalent, D16-D25	kg		61,860	65,496	60,600	61,896	103,719					353,571				37,608	51,276	28,512		117,396
	Re-bar	SD345 or equivalent, D29-D32	kg		133,392	140,664	133,032	54,120	237,048					698,256				21,948	116,028	20,840		158,816
	Re-bar	SD345 or equivalent, D35	kg					99,528						99,528				81,684		52,472		134,156
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Earth Work																					
	Excavation		m^3		732.7	732.7	820.5	593.7	1,376.0					4,255.6				1,469.7	707.1	565.9		2,742.7
	Backfilling		m^3		204.5	204.5	212.7	153.7	552.1					1,327.5				913.4	183.0	167.4		1,263.8
	Footing																					
	Concrete	Class A (24N/mm^2)	m^3		433.2	433.2	505.4	364.8	672.0					2,408.6				422.4	433.2	324.9		1,180.5
	Re-bar	SD345 or equivalent, D10-D13	kg											0								0
	Re-bar	SD345 or equivalent, D16-D25	kg		21,621	21,621	15,476	2,466	3,708					64,892				2,556	13,474	3,705		19,735

Item No.	Item	Description	Unit	Qty																		
				Package1											Package2							
				PCPCaBox (A1, P1-P9)										Sub Total	PCPCaBox (P20-25, A2)							Sub Total
				A1	P1	P2	P3	P4	P5	P6	P7	P8	P9		P20	P21	P22	P23	P24	P25	A2	
	Re-bar	SD345 or equivalent, D29-D32	kg		21,561	21,561	54,166	45,898	83,249					226,435				23,517	39,607	18,534		81,658
	Re-bar	SD345 or equivalent, D35	kg											0				28,005				28,005
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Formwork		m^2		117.8	117.8	125.4	106.4	160.0					627.4				123.2	117.8	106.4		347.4
	Lean concrete	18N/mm^2, t=0.1m	m^3		23.4	23.4	27.3	19.8	34.4					128.3				19.8	23.4	17.7		60.9
	Lean concrete formwork		m^2		6.3	6.3	6.7	5.7	8.1					33.1				5.7	6.3	5.7		17.7
	Crushed stone	t=0.2m	m^2		234.2	234.2	272.6	197.6	344.0					1,282.6				197.6	234.2	176.6		608.4
	Pier column																					
	Concrete	Class A (30N/mm^2)	m^3					251.6	702.3					953.9				422.8				422.8
	Concrete	Class A (24N/mm^2)	m^3		112.7	166.2	215.6							494.5					178.5	125.0		303.5
	Re-bar	SD345 or equivalent, D10-D13	kg		322	479	620	760	1,390					3,571					515	357		872
	Re-bar	SD345 or equivalent, D16-D25	kg		10,361	12,641	15,750	19,160	38,369					96,281				32,139	12,701	10,838		55,678
	Re-bar	SD345 or equivalent, D29-D32	kg					7,272	8,049					15,321				7,272				7,272
	Re-bar	SD345 or equivalent, D35	kg											0								0
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg					2,991	6,161					9,152								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0				28,647				28,647
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Formwork		m^2		103.0	150.9	195.1	236.2	423.0					1,108.2				377.1	162.0	114.1		653.2
	Box-out (Cylindrical form)		m		22.8	22.8	22.8	22.8	21.4					112.6				22.8	22.8	22.8		68.4
	Non-shrinkage mortar		m^3		1.3	1.3	1.3	1.3	1.7					6.9				1.3	1.3	1.3		3.9
	PDA test		Set		0.0	0.0	0.0	0.0	0.0					0.0								0.0
	Subtotal of Pier on land													0.0								0.0
3	Substructure (Pier on river)																					
	Steel sheet pipe pile foundation																					
	Falsework(Guide, Frame, Wale, Strut)	H-300, H-400	ton											0	117	109	109					335
		[-300	ton											0	3	3	3					8
	Steel sheet pipe pile (circumferentials)	Total pile numbers	nos											0.0	36	32	32					100.0
		Total driving length φ=1200, t =14mm~16mm	m											0.0	1,529	1,453	1,340					4,322.2
		ϕ=1200, t =14mm, SKY400	ton											0	528	550	492					1,570
		ϕ=1200, t =14mm, SKY490	ton											0	135	97	0					232
		ϕ=1200, t =16mm, SKY400	ton											0	0	0	111					111
		ϕ=165.2, t =11mm, SKY400 (Joint Pipe)	ton											0	132	129	117					377
	Steel sheet pipe pile (Bulkhead)	Total pile numbers	nos											0.0	6	4	4					14.0
		Total driving length φ=1200, t =14mm	m											0.0	255	182	168					604.0
		ϕ=1200, t =14mm, SKY400	ton											0	128	89	81					298
		ϕ=165.2, t =11mm, SKY400 (Joint Pipe)	ton											0	30	22	20					72
	Cleaning of Inside joint pipe	Pipe-junction Dia=165.2mm	m											0.0	3,857.0	3,610.0	3,280.0					10,747.0
	Mortar filling of Inside joint pipe	Pipe-junction Dia=165.2mm	m											0.0	2,956.2	2,812.8	2,482.8					8,251.8
	Sealing of Inside joint pipe	Pipe-junction Dia=165.2mm	m											0.0	702.0	655.2	655.2					2,012.4
	Excavation inside of the well		m^3											0.0	921.5	712.1	845.7					2,479.4
	Excavation inside of the pipe pile		m^3											0.0	291.0	284.0	326.0					901.0
	Concrete Filling to Steel Pipe	21N/mm2	m^3											0.0	267.3	247.3	245.6					760.2
	Welding of the dowel	Stud method, D22 (SM490A-SD) L=0.8m, 1.0m	nos											0.0	3,240.0	3,024.0	3,024.0					9,288.0
	Spread sand		m^3											0.0	58.2	42.8	42.8					143.8
	Bottom slab concrete	Underwater concrete, 21N/mm^2	m^3											0.0	232.9	171.2	171.2					575.4
	Cut-off the pipe		nos											0.0	36.0	32.0	32.0					100.0
	Footing																					
	Concrete	Class A (24N/mm^2)	m^3											0.0	492.9	360.6	360.6					1,214.1
	Re-bar	SD345 or equivalent, D10-D13	kg											0	236	157	157					550
	Re-bar	SD345 or equivalent, D16-D25	kg											0	5,062	4,639	4,639					14,340
	Re-bar	SD345 or equivalent, D29-D32	kg											0	21,923	24,343	24,343					70,609
	Re-bar	SD345 or equivalent, D35	kg											0	14,860							14,860
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0								0
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0								0
	Pier column																					
	Concrete	Class A (30N/mm^2)	m^3											0.0	959.3	640.2	612.3					2,211.8
	Concrete	Class A (24N/mm^2)	m^3											0.0								0.0
	Re-bar	SD345 or equivalent, D10-D13	kg											0								0
	Re-bar	SD345 or equivalent, D16-D25	kg											0	56,696	37,057	35,801					129,554
	Re-bar	SD345 or equivalent, D29-D32	kg											0	5,472	7,272	7,272					20,016
	Re-bar	SD345 or equivalent, D35	kg											0								0
	Re-bar	SD345 or equivalent, D38	kg											0								0
	Re-bar	SD390 or equivalent, D10-D13	kg											0								0
	Re-bar	SD390 or equivalent, D16-D25	kg											0								0
	Re-bar	SD390 or equivalent, D29-D32	kg											0	65,652							65,652
	Re-bar	SD390 or equivalent, D35	kg											0								0
	Re-bar	SD390 or equivalent, D38	kg											0		78,940	76,028					154,968
	Formwork		m^2											0.0	616.7	555.1	532.2					1,704.0
	Box-out (Cylindrical form)		m											0.0	27.6	23.2	22.8					73.6
	Non-shrinkage mortar		m^3											0.0	1.8	1.3	1.3					4.4

Item No.	Item	Description	Unit	Qty																		
				Package1											Package2							
				PCPCaBox (A1, P1-P9)										Sub Total	PCPCaBox (P20-25, A2)							Sub Total
				A1	P1	P2	P3	P4	P5	P6	P7	P8	P9		P20	P21	P22	P23	P24	P25	A2	
	PDA test		Set											0.0	1.0	1.0	1.0					3.0
	Equipment rental fee	SPSP driving on river (by Crawler crane mounted on barge	L.S.											0.0								0.0
	Subtotal of Pier on river													0.0								0.0
4	Steel cable stayed bridge (superstructure)	including fabrication and erection												0.0								
5	Steel box girder bridge (superstructure)	including fabrication and erection												0.0								
6	PC Precast Box Girder (Superstructure)													0.0								
7	Approach road													0.0								
8	Miscellaneous																					
	Temporary work																					
	Temporary Coffering	Steel Sheet Pile Ave.L= 12.5m (TypeIII)	nos	185.0	175.0	175.0	185.0	160.0	244.0					1,124.0					175	160	176	511
			kg	138,750	131,250	131,250	138,750	120,000	183,000					843,000					131,250	120,000	132,000	383,250
		Steel Sheet Pile Ave.L= 24m (TypeVL)	nos											0.0				148				148
			kg											0				349,650				349,650
		Wale, Strut	kg											0				124,662				124,662
		Underwater concrete, 30N/mm^2	m^3											0.0								0.0
	Temporary Jetty		m^2											0.0								0.0
	Bent	Constructed by using residual cut steel sheet pipe pile												0.0								0.0
	Clearing and Levelling of construction yard		m^2											0.0								0.0
	Concrete Batcher Plant		L.S.											0.0								0.0
	Lighting and Electrical Wireing		m											0.0								0.0
	Toll Gate		L.S.											0.0								0.0
	Falsework	Scaffloding (Handrail precede type) H<30m	m^2	306.8	201.3	258.2	310.7	312.3	504.6					1,893.9	791.0	724.8	808.9	496.8	188.2	131.3	328.2	3,469.2
	Supporting	Wedge type (under 80 kN/m2)	m^3	0.0	0.0	0.0	0.0	56.0	116.5					172.5	108.7	66.2	78.0	157.2	0.0	0.0	0.0	410.1
	Subtotal of miscellaneolus work													0.0								0.0

Cost estimate of Ramp PKG1

Item No.	Item	Description	Unit	Qty
1	Substructure (Reverse T-shaped Abutment)			
	Bored pile	D=1500, Ave.L=56.5m	nos	9
	Concrete	Nominal strength = 30N/mm^2	m^3	898.5
	Re-bar	SD345 or equivalent, D10-D13	kg	126
	Re-bar	SD345 or equivalent, D16-D25	kg	49,221
	Re-bar	SD345 or equivalent, D29-D32	kg	28,305
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Earth Work			
	Excavation		m^3	290.1
	Backfilling		m^3	104.2
	Footing			
	Concrete	Class A (24N/mm^2)	m^3	153.9
	Re-bar	SD345 or equivalent, D10-D13	kg	139
	Re-bar	SD345 or equivalent, D16-D25	kg	3,504
	Re-bar	SD345 or equivalent, D29-D32	kg	2,581
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Formwork		m^2	68.4
	Lean concrete	18N/mm^2, t=0.1m	m^3	8.5
	Lean concrete formwork		m^2	3.7
	Crushed stone	t=0.2m	m^2	84.6
	Wall, Parapet, Wing wall			
	Concrete	Class A (24N/mm^2)	m^3	80.0
	Re-bar	SD345 or equivalent, D10-D13	kg	142
	Re-bar	SD345 or equivalent, D16-D25	kg	6,220
	Re-bar	SD345 or equivalent, D29-D32	kg	1,558
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Formwork		m^2	191.5
	Box-out (Cylindrical form)		m	3.8
	Non-shrinkage mortar		m^3	0.1
	Approach slab			
	Concrete	Class A (24N/mm^2)	m^3	9.4
	Re-bar	SD345 or equivalent, D10-D13	kg	91
	Re-bar	SD345 or equivalent, D16-D25	kg	795
	Re-bar	SD345 or equivalent, D29-D32	kg	873
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Formwork		m^2	2.6
	PDA test		Set	-
	Subtotal of Abutment			
2	Substructure (Pier on land)			
	Bored pile	D=2000, Ave.L=57.5m	nos	13
	Concrete	Nominal strength = 30N/mm^2	m^3	2,347.1
	Re-bar	SD345 or equivalent, D10-D13	kg	364
	Re-bar	SD345 or equivalent, D16-D25	kg	66,127
	Re-bar	SD345 or equivalent, D29-D32	kg	138,405
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Earth Work			
	Excavation		m^3	843.8
	Backfilling		m^3	339.0
	Footing			
	Re-bar	SD345 or equivalent, D10-D13	m^3	421.0
	Re-bar	SD345 or equivalent, D10-D13	kg	0
	Re-bar	SD345 or equivalent, D16-D25	kg	15,152
	Re-bar	SD345 or equivalent, D29-D32	kg	10,349
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0

Item No.	Item	Description	Unit	Qty
	Re-bar	SD390 or equivalent, D38	kg	0
	Formwork		m^2	195.3
	Lean concrete	$18N/mm^2$, t=0.1m	m^3	23.2
	Lean concrete formwork		m^2	10.6
	Crushed stone	t=0.2m	m^2	231.9
	Pier column			
	Concrete	Class A ($24N/mm^2$)	m^3	142.3
	Re-bar	SD345 or equivalent, D10-D13	kg	0
	Re-bar	SD345 or equivalent, D16-D25	kg	13,759
	Re-bar	SD345 or equivalent, D29-D32	kg	11,177
	Re-bar	SD345 or equivalent, D35	kg	0
	Re-bar	SD345 or equivalent, D38	kg	0
	Re-bar	SD390 or equivalent, D10-D13	kg	0
	Re-bar	SD390 or equivalent, D16-D25	kg	0
	Re-bar	SD390 or equivalent, D29-D32	kg	0
	Re-bar	SD390 or equivalent, D35	kg	0
	Re-bar	SD390 or equivalent, D38	kg	0
	Formwork		m^2	233.5
	Box-out (Cylindrical form)		m	12.3
	Non-shrinkage mortar		m^3	0.6
	PDA test		Set	-
	Subtotal of Pier on land			
3	PC I girder bridge			
4	Approach road			
5	Miscellaneous			
	Temporary work			
	Temporary Coffering	Steel Sheet Pile Laverage= 14m (TypeIII)	nos	427
			kg	320,250
	Clearing and Levelling of construction yard		m^2	
	Lighting and Electrical Wireing		m	
	Subtotal of approach road			
	Falsework	Scaffloding (Handrail precede type) H<30m	m^2	517.0
	Supporting	Wedge type (under 80 kN/m2)	m^3	0.0
	Total of flyover			

Cost estimate of Ramp PKG1

Item No.	Item	Description	Unit	Qty				
				AO1	PO1	PO2	PO3	Total
1	Substructure (Reverse T-shaped Abutment)							
	Bored pile	D=1500, Ave.L=56.5m	nos	9.0				9.0
	Concrete	Nominal strength = 30N/mm^2	m^3	898.5				898.5
	Re-bar	SD345 or equivalent, D10-D13	kg	126				126
	Re-bar	SD345 or equivalent, D16-D25	kg	49,221				49,221
	Re-bar	SD345 or equivalent, D29-D32	kg	28,305				28,305
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Earth Work							
	Excavation		m^3	290.1				290.1
	Backfilling		m^3	104.2				104.2
	Footing							
	Concrete	Class A (24N/mm^2)	m^3	153.9				153.9
	Re-bar	SD345 or equivalent, D10-D13	kg	139				139
	Re-bar	SD345 or equivalent, D16-D25	kg	3,504				3,504
	Re-bar	SD345 or equivalent, D29-D32	kg	2,581				2,581
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Formwork		m^2	68.4				68.4
	Lean concrete	18N/mm^2, t=0.1m	m^3	8.5				8.5
	Lean concrete formwork		m^2	3.7				3.7
	Crushed stone	t=0.2m	m^2	84.6				84.6
	Wall, Parapet, Wing wall							
	Concrete	Class A (24N/mm^2)	m^3	80.0				80.0
	Re-bar	SD345 or equivalent, D10-D13	kg	142				142
	Re-bar	SD345 or equivalent, D16-D25	kg	6,220				6,220
	Re-bar	SD345 or equivalent, D29-D32	kg	1,558				1,558
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Formwork		m^2	191.5				191.5

Item No.	Item	Description	Unit	Qty				
				AO1	PO1	PO2	PO3	Total
	Box-out (Cylindrical form)		m	3.8				3.8
	Non-shrinkage mortar		m^3	0.1				0.1
	Approach slab							
	Concrete	Class A ($24N/mm^2$)	m^3	9.4				9.4
	Re-bar	SD345 or equivalent, D10-D13	kg	91				91
	Re-bar	SD345 or equivalent, D16-D25	kg	795				795
	Re-bar	SD345 or equivalent, D29-D32	kg	873				873
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Formwork		m^2	2.6				2.6
	PDA test		Set					0.0
	Subtotal of Abutment							
2	Substructure (Pier on land)							
	Bored pile	D=2000, Ave.L=57.5m	nos		5	4	4	13
	Concrete	Nominal strength = $30N/mm^2$	m^3		895.5	722.7	728.9	2,347.1
	Re-bar	SD345 or equivalent, D10-D13	kg		140	112	112	364
	Re-bar	SD345 or equivalent, D16-D25	kg		25,335	20,272	20,520	66,127
	Re-bar	SD345 or equivalent, D29-D32	kg		59,745	39,220	39,440	138,405
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Earth Work							
	Excavation		m^3		344.2	249.8	249.8	843.8
	Backfilling		m^3		132.4	103.3	103.3	339.0
	Footing							
	Concrete	Class A ($24N/mm^2$)	m^3		177.8	121.6	121.6	421.0
	Re-bar	SD345 or equivalent, D10-D13	kg					0
	Re-bar	SD345 or equivalent, D16-D25	kg		5,637	3,189	6,326	15,152
	Re-bar	SD345 or equivalent, D29-D32	kg		8,623	1,726		10,349
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0

Item No.	Item	Description	Unit	Qty				
				AO1	PO1	PO2	PO3	Total
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Formwork		m^2		73.7	60.8	60.8	195.3
	Lean concrete	$18N/mm^2$, t=0.1m	m^3		9.8	6.7	6.7	23.2
	Lean concrete formwork		m^2		4.0	3.3	3.3	10.6
	Crushed stone	t=0.2m	m^2		97.5	67.2	67.2	231.9
	Pier column							
	Concrete	Class A ($24N/mm^2$)	m^3		36.0	48.5	57.8	142.3
	Re-bar	SD345 or equivalent, D10-D13	kg					0
	Re-bar	SD345 or equivalent, D16-D25	kg		3,585	6,345	3,829	13,759
	Re-bar	SD345 or equivalent, D29-D32	kg		5,726		5,451	11,177
	Re-bar	SD345 or equivalent, D35	kg					0
	Re-bar	SD345 or equivalent, D38	kg					0
	Re-bar	SD390 or equivalent, D10-D13	kg					0
	Re-bar	SD390 or equivalent, D16-D25	kg					0
	Re-bar	SD390 or equivalent, D29-D32	kg					0
	Re-bar	SD390 or equivalent, D35	kg					0
	Re-bar	SD390 or equivalent, D38	kg					0
	Formwork		m^2		59.2	79.5	94.8	233.5
	Box-out (Cylindrical form)		m		5.1	3.6	3.6	12.3
	Non-shrinkage mortar		m^3		0.2	0.2	0.2	0.6
	PDA test		Set					0.0
	Subtotal of Pier on land							
3	PC I girder bridge							0.0
4	Approach road							0.0
5	Miscellaneous							0.0
	Temporary work							
	Temporary Coffering	Steel Sheet Pile Ave.L= 14m (TypeIII)	nos	110	117	100	100	427
			kg	82,500	87,750	75,000	75,000	320,250
	Clearing and Levelling of construction yard		m^2					0.0
	Lighting and Electrical Wireing		m					0.0
	Subtotal of approach road							0.0
	Falsework	Scaffloding (Handrail precede type) H<30m	m^2	159.8	90.3	121.7	145.2	517.0
	Supporting	Wedge type (under 80 kN/m2)	m^3	0.0	0.0	0.0	0.0	0.0
	Total of flyover							0.0

Concrete Bridge Piers

Summary Table (Thanlyin Side)

	Description	Specification Dimensions			Unit	Concrete Bridge: A1 Side								Total			
						A1	P1	P2	P3	P4	P5			Abutment	Pires (Land)	Pires (River)	Total
Substructure	Concrete	σck = 30 $^{N/mm2}$		Body	m^3					251.6	702.3			0.0	953.9	0.0	953.9
		σck = 24 $^{N/mm2}$		Body	m^3	156.2	112.7	166.2	215.6					156.2	494.5	0.0	650.7
		σck = 24 $^{N/mm2}$		Pile cap	m^3	478.8	433.2	433.2	505.4	364.8	672.0			478.8	2,408.6	0.0	2,887.4
		Total			m^3	635.0	545.9	599.4	721.0	616.4	1,374.3			635.0	3,857.0	0.0	4,492.0
	Formwork	Normal Type		Body	m^2	327.5	103	150.9	195.1	236.2	423			327.53	1108.2	0	1,435.7
				Pile cap	m^2	125.4	117.8	117.8	125.4	106.4	160.0			125.4	627.4	0.0	752.8
				Total	m^2	452.9	220.8	268.7	320.5	342.6	583.0			452.9	1,735.6	0.0	2,188.5
	Rebar	SD 390	Total Mass	D38	kg		0	0	0	0	0			0	0	0	0
				D35	kg		0	0	0	0	0			0	0	0	0
				D29-32	kg		0	0	0	0	0			0	0	0	0
				D16-25	kg		0	0	0	2,991	6,161			0	9,152	0	9,152
				D10-13	kg		0	0	0	0	0			0	0	0	0
				Total	kg		0	0	0	2,991	6,161			0	9,152	0	9,152
		SD 345	Total Mass	D38	kg	0	0	0	0	0	0			0	0	0	0
				D35	kg	0	0	0	0	0	0			0	0	0	0
				D29-32	kg	32,544	21,561	21,561	54,166	53,170	91,298			32,544	241,756	0	274,300
				D16-25	kg	19,909	31,982	33,783	30,606	21,626	42,077			19,909	160,074	0	179,983
				D10-13	kg	762	322	479	620	760	1,390			762	3,571	0	4,333
				Total	kg	53,215	53,865	55,823	85,392	75,556	134,765			53,215	405,401	0	458,616
		SD 390	Mass for Body	D38	kg		0	0	0	0	0			0	0	0	0
				D35	kg		0	0	0	0	0			0	0	0	0
				D29-32	kg		0	0	0	0	0			0	0	0	0
				D16-25	kg		0	0	0	2,991	6,161			0	9,152	0	9,152
				D10-13	kg		0	0	0	0	0			0	0	0	0
				Total	kg		0	0	0	2,991	6,161			0	9,152	0	9,152
		SD 345	Mass for Body	D38	kg	0	0	0	0	0	0			0	0	0	0
				D35	kg	0	0	0	0	0	0			0	0	0	0
				D29-32	kg	16,588	0	0	0	7,272	8,049			16,588	15,321	0	31,909
				D16-25	kg	6,080	10,361	12,162	15,130	19,160	38,369			6,080	95,182	0	101,262
				D10-13	kg	251	322	479	620	760	1,390			251	3,571	0	3,822
				Total	kg	22,919	10,683	12,641	15,750	27,192	47,808			22,919	114,074	0	136,993
		SD 345	Mass for Footing	D38	kg	0	0	0	0	0	0			0	0	0	0
				D35	kg	0	0	0	0	0	0			0	0	0	0
				D29-32	kg	12,998	21,561	21,561	54,166	45,898	83,249			12,998	226,435	0	239,433
				D16-25	kg	11,187	21,621	21,621	15,476	2,466	3,708			11,187	64,892	0	76,079
				D10-13	kg	185	0	0	0	0	0			185	0	0	185
				Total	kg	24,370	43,182	43,182	69,642	48,364	86,957			24,370	291,327	0	315,697
		SD 345	Mass for App. Slab	D38	kg									0	0	0	0
				D35	kg	0								0	0	0	0
				D29-32	kg	2,958								2,958	0	0	2,958
				D16-25	kg	2,642								2,642	0	0	2,642
				D10-13	kg	326								326	0	0	326
				Total	kg	5,926								5,926	0	0	5,926
	Lean concrete	σck = 18 $^{N/mm2}$, t = 10 ^{cm}			m^3	25.9	23.4	23.4	27.3	19.8	34.4			25.9	128.3	0.0	154.1
	Lean concrete form	Normal Type			m^2	6.7	6.3	6.3	6.7	5.7	8.1			6.7	33.1	0.0	39.8
	Crushed stone				m^2	258.6	234.2	234.2	272.6	197.6	344.0			258.6	1,282.6	0.0	1,541.2

	Description	Specification Dimensions		Unit	Concrete Bridge: A1 Side								Total			
					A1	P1	P2	P3	P4	P5			Abutment	Pires (Land)	Pires (River)	Total
Box-out	Total length of form	Cylindrical form		m	17.2	22.8	22.8	22.8	22.8	21.4			17.2	112.6	0.0	129.8
	Total number of locations	bridge railings and anchor bars		nos	28	24	24	24	24	32			28	128	0	156
	Filling mortar	Non-shrinkage mortar, xx Mpa		m^3	0.7	1.3	1.3	1.3	1.3	1.7			0.7	6.8	0.0	7.6
Foundation	CIP/SPSP	Pile Length		m	53.0	58.0	62.0	57.0	58.0	55.5			53.0	290.5	0.0	343.5
		φ1.2m	Total number	nos									0	0	0	0
		φ1.5m	Total number	nos	28								28	0	0	28
		φ2.0m	Total number	nos		12	12	12	12	21			0	69	0	69
		Total	Total number	nos	28	12	12	12	12	21			28	69	0	97
		concrete	σck = 30 N/mm2	m^3	2,622.2	2,186.8	2,337.6	2,149.1	2,186.8	3,662.0			2,622.2	12,522.3	0.0	15,144.5
	Rebar	SD345 Mass	D38	kg	0	0	0	0	0	0			0	0	0	0
			D35	kg	0	0	0	0	99,528	0			0	99,528	0	99,528
			D29-32	kg	86,940	133,392	140,664	133,032	54,120	237,048			86,940	698,256	0	785,196
			D16-25	kg	142,352	61,860	65,496	60,600	61,896	103,719			142,352	353,571	0	495,923
			D10-13	kg	392	336	336	336	336	588			392	1,932	0	2,324
			Total	kg	229,684	195,588	206,496	193,968	215,880	341,355			229,684	1,153,287	0	1,382,971
	Miscellaneous Steel	SS400 or equivalent		kg	3,839	15,321	16,327	15,028	15,321	25,686			3,839	87,683	0	91,522
Approach Slab	Concrete	σck = 24 N/mm2		m^3	31.4								31	0	0	31
	Formwork	Ordinal formwwork		m^2	9.8								10	0	0	10
	Rebar	SD345	D29-32	kg	2,958.0								2,958	0	0	2,958
			D16-25	〃	2,642.0								2,642	0	0	2,642
			D10-13	〃	326.0								326	0	0	326
			Total	〃	5,926.0								5,926	0	0	5,926
Earth Work	Foundation Excavation	Inside cofferdam, unsuitable soil		m^3	758.3	732.7	732.7	820.5	593.7	1376.0			758.3	4255.6	0.0	5013.9
				m^3									0.0	0.0	0.0	0.0
				m^3									0.0	0.0	0.0	0.0
		Total		m^3	758.3	732.7	732.7	820.5	593.7	1376.0			758.3	4255.6	0.0	5013.9
	Backfill	Purchased soil		m^3	172.3	204.5	204.5	212.7	153.7	552.1			172.3	1,327.5	0.0	1,499.8
	Surplus Soil			m^3	758.3	732.7	732.7	820.5	593.7	1,376.0			758.3	4,255.6	0.0	5,013.9
	Ground Preparation			m^2	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0
Temp work	Steel sheet pile Cofferdam	Type III or V		kg	138,750	131,250	131,250	138,750	120,000	183,000			138,750	704,250	0	843,000
		Number of Sheet Pile		nos	185	175	175	185	160	244			185	939	0	1,124
		Number of Joint		nos	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Supporting Beam			kg	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Brace			kg	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Bond Timber			kg	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Sub-member(A)	22%		kg	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Sub-member(B)	4%		kg	0	0	0	0	0	0			0	0	0	0
	Mold Steel: Total			kg	0	0	0	0	0	0			0	0	0	0
Falsework		Scaffloding (Handrail precede type) H<30m		m^2	464.7	252.7	309.6	369.7	435.4	652.2			464.7	2,019.6	0.0	2,484.3
Supporting		Wedge type (under 80 kN/m2)		m^3	0.0	0.0	0.0	0.0	56.0	116.5			0.0	172.5	0.0	172.5

Concrete Bridge Piers

Summary Table (Yangon Side)

	Description	Specification Dimensions			Unit	Concrete Bridge: A2 Side								Total			
							P20	P21	P22	P23	P24	P25	A2	Abutment	Pires (Land)	Pires (River)	Total
Substructure	Concrete	σck = 30 $^{N/mm2}$		Body	m^3		959.3	640.2	612.3	422.8				0.0	422.8	2,211.8	2,634.5
		σck = 24 $^{N/mm2}$		Body	m^3						178.5	125.0	179.0	0.0	178.5	304.0	482.6
		σck = 24 $^{N/mm2}$		Body, Pile cap	m^3		0.0	0.0	0.0	422.4	433.2	324.9	413.0	413.0	1,180.5	0.0	1,593.5
		Total			m^3		959.3	640.2	612.3	845.2	611.7	449.9	592.0	592.0	1,906.8	2,211.8	4,710.6
	Formwork	Normal Type		Body	m^2		616.7	555.1	532.2	377.1	162.0	114.1	332.5	332.5	653.2	1,704.0	2,689.7
				Pile cap	m^2		0.0	0.0	0.0	123.2	117.8	106.4	118.6	118.6	347.4	0.0	466.0
				Total	m^2		616.7	555.1	532.2	500.3	279.8	220.5	451.1	451.1	1,000.6	1,704.0	3,155.7
	Rebar	SD 390	Total Mass	D38	kg		0	78,940	76,028	0	0	0		0	0	154,968	154,968
				D35	kg		0	0	0	0	0	0		0	0	0	0
				D29-32	kg		65,652	0	0	28,647	0	0		0	28,647	65,652	94,299
				D16-25	kg		0	0	0	0	0	0		0	0	0	0
				D10-13	kg		0	0	0	0	0	0		0	0	0	0
				Total	kg		65,652	78,940	76,028	28,647	0	0		0	28,647	220,620	249,267
		SD 345	Total Mass	D38	kg		0	0	0	0	0	0	0	0	0	0	0
				D35	kg		14,860	0	0	28,005	0	0	0	0	28,005	14,860	42,865
				D29-32	kg		27,395	31,615	31,615	30,789	39,607	18,534	30,536	30,536	88,930	90,625	210,091
				D16-25	kg		61,758	41,696	40,440	34,695	26,175	14,543	17,685	17,685	75,413	143,894	236,992
				D10-13	kg		236	157	157	0	515	357	689	689	872	550	2,111
				Total	kg		104,249	73,468	72,212	93,489	66,297	33,434	48,910	48,910	193,220	249,929	492,059
		SD 390	Mass for Body	D38	kg		0	78,940	76,028	0	0	0		0	0	154,968	154,968
				D35	kg		0	0	0	0	0	0		0	0	0	0
				D29-32	kg		65,652	0	0	28,647	0	0		0	28,647	65,652	94,299
				D16-25	kg		0	0	0	0	0	0		0	0	0	0
				D10-13	kg		0	0	0	0	0	0		0	0	0	0
				Total	kg		65,652	78,940	76,028	28,647	0	0		0	28,647	220,620	249,267
		SD 345	Mass for Body	D38	kg		0	0	0	0	0	0	0	0	0	0	0
				D35	kg		0	0	0	0	0	0	0	0	0	0	0
				D29-32	kg		5,472	7,272	7,272	7,272	0	0	15,584	15,584	7,272	20,016	42,872
				D16-25	kg		56,696	37,057	35,801	32,139	12,701	10,838	6,283	6,283	55,678	129,554	191,515
				D10-13	kg		0	0	0	0	515	357	198	198	872	0	1,070
				Total	kg		62,168	44,329	43,073	39,411	13,216	11,195	22,065	22,065	63,822	149,570	235,457
		SD 345	Mass for Footing	D38	kg		0	0	0	0	0	0	0	0	0	0	0
				D35	kg		14,860	0	0	28,005	0	0	0	0	28,005	14,860	42,865
				D29-32	kg		21,923	24,343	24,343	23,517	39,607	18,534	11,994	11,994	81,658	70,609	164,261
				D16-25	kg		5,062	4,639	4,639	2,556	13,474	3,705	8,762	8,762	19,735	14,340	42,837
				D10-13	kg		236	157	157	0	0	0	165	165	0	550	715
				Total	kg		42,081	29,139	29,139	54,078	53,081	22,239	20,921	20,921	129,398	100,359	250,678
		SD 345	Mass for App. Slab	D38	kg									0	0	0	0
				D35	kg								0	0	0	0	0
				D29-32	kg								2,958	2,958	0	0	2,958
				D16-25	kg								2,640	2,640	0	0	2,640
				D10-13	kg								326	326	0	0	326
				Total	kg								5,924	5,924	0	0	5,924
	Lean concrete	σck = 18 $^{N/mm2}$, t = 10 ^{cm}			m^3		0.0	0.0	0.0	19.8	23.4	17.7	22.4	22.4	60.8	0.0	83.2
	Lean concrete form	Normal Type			m^2		0.0	0.0	0.0	5.7	6.3	5.7	6.3	6.3	17.7	0.0	24.0
	Crushed stone				m^2		0.0	0.0	0.0	197.6	234.2	176.6	223.6	223.6	608.4	0.0	832.0

	Description	Specification Dimensions	Unit	Concrete Bridge: A2 Side								Total			
					P20	P21	P22	P23	P24	P25	A2	Abutment	Pires (Land)	Pires (River)	Total
Box-out	Total length of form	Cylindrical form	m^3		27.6	23.2	22.8	22.8	22.8	22.8	17.3	17.3	68.4	73.6	159.3
	Total number of locations	bridge railings and anchor bars	nos		38	24	24	24	24	24	28	28	72	86	186
	Filling mortar	Non-shrinkage mortar, xx Mpa	m^2		1.8	1.3	1.3	1.3	1.3	1.3	0.7	0.7	3.8	4.3	8.9
Foundation	CIP/SPSP	Pile Length	m		0.0	0.0	0.0	32.5	47.0	38.0	31.5	31.5	117.5	0	149
		φ1.2m Total number	nos		0	0	0					0	0	0	0
		φ1.5m Total number	nos								18	18	0	0	18
		φ2.0m Total number	nos					12	12	8		0	32	0	32
		Total Total number	nos		0	0	0	12	12	8	18	18	32	0	50
		concrete σck = 30 N/mm2	m^3		0.0	0.0	0.0	1,225.4	1,772.1	955.2	1,001.9	1,002	3,953	0	4,955
	Rebar	SD345 Mass D38	kg		0	0	0	0	0	0	0	0	0	0	0
		D35	kg		0	0	0	81,684	0	52,472	75,060	75,060	134,156	0	209,216
		D29-32	kg		0	0	0	21,948	116,028	20,840	0	0	158,816	0	158,816
		D16-25	kg		0	0	0	37,608	51,276	28,512	52,110	52,110	117,396	0	169,506
		D10-13	kg		0	0	0	336	336	224	252	252	896	0	1,148
		Total	kg		0	0	0	141,576	167,640	102,048	127,422	127,422	411,264	0	538,686
	Miscellaneous Steel	SS400 or equivalent	kg		0	0	0	8,778	12,489	6,797	1,784	1,784	28,064	0	29,847
Approach Slab	Concrete	σck = 24 N/mm2	m^3								31.4	31.4	0	0	31.4
	Formwork	Ordinal formwwork	m^2								8.1	8	0	0	8
	Rebar	SD345 D32	kg								2,958.0	2,958	0	0	2,958
		D25～D16	〃								2,640.0	2,640	0	0	2,640
		D12	〃								326.0	326	0	0	326
		Total	〃								5,924.0	5,924	0	0	5,924
Earth Work	Foundation Excavation	Inside cofferdam, unsuitable soil	m^3		0.0	0.0	0.0	1,469.7	707.1	565.9	718.2	718.2	2,742.6	0.0	3,460.8
			m^3									0.0	0.0	0.0	0.0
			m^3									0.0	0.0	0.0	0.0
		Total	m^3		0.0	0.0	0.0	1,469.7	707.1	565.9	718.2	718.2	2,742.6	0.0	3,460.8
	Backfill		m^3		0.0	0.0	0.0	913.4	183.0	167.4	203.3	203.3	1,263.7	0.0	1,467.0
	Surplus Soil	Forumra: [excavation] - [Backfill]/0.9	m^3		0.0	0.0	0.0	1,469.7	707.1	565.9	718.2	718.2	2,742.7	0.0	3,460.9
	Ground Preparation		m^2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temp work	Steel sheet pile Cofferdam	Type III or V	kg		0	0	0	349,650	131,250	120,000	132,000	132,000	600,900	0	732,900
		Number of Sheet Pile	nos		0	0	0	148	175	160	176	176	483	0	659
		Number of Joint	kg		0	0	0	148	0	0	0	0	148	0	148
	Mold Steel: Supporting Beam		kg		0	0	0	33,024	0	0	0	0	33,024	0	33,024
	Brace		kg		0	0	0	36,894	0	0	0	0	36,894	0	36,894
	Bond Timber		kg		0	0	0	17,668	0	0	0	0	17,668	0	17,668
	Sub-member(A)	22%	kg		0	0	0	21,766	0	0	0	0	21,766	0	21,766
	Sub-member(B)	4%	kg		0	0	0	3,958	0	0	0	0	3,958	0	3,958
	Total		kg		0	0	0	124,662	0	0	0	0	124,662	0	124,662
Falsework		Scaffloding (Handrail precede type) H<30m	m^2		1,027.3	978.5	974.7	718.4	322.7	254.4	462.5	463	1,296	2,981	4,739
Supporting		Wedge type (under 80 kN/m2)	m^3		114.0	60.5	51.5	155.4	0.0	0.0	0.0	0	155	226	381.4

On Ramp Bridge Piers

Summary Table (On-Ramp Bridge)

	Description	Specification Dimensions			Unit	Concrete Bridge: On-Ramp Bridge				Total			
						AO1	PO1	PO2	PO3	Abutment	Pires (Land)	Pires (River)	Total
Substructure	Concrete	σck = 30 N/mm2		Body	m^3					0.0	0.0		0.0
		σck = 24 N/mm2		Body	m^3	80.0	36.0	48.5	57.8	80.0	142.3		222.3
		σck = 24 N/mm2		Pile cap	m^3	153.9	177.8	121.6	121.6	153.9	421.0		574.9
		Total			m^3	233.9	213.9	170.1	179.4	233.9	563.3		797.2
	Formwork	Normal Type		Body	m^2	191.5	59.2	79.5	94.8	191.5	233.5		425.0
				Pile cap	m^2	68.4	73.7	60.8	60.8	68.4	195.3		263.7
				Total	m^2	259.9	132.9	140.3	155.6	259.9	428.8		688.7
	Rebar	SD 390	Total Mass	D38	kg					0	0		0
				D35	kg					0	0		0
				D29-32	kg					0	0		0
				D16-25	kg					0	0		0
				D10-13	kg					0	0		0
				Total	kg					0	0		0
		SD 345	Total Mass	D38	kg	0	0	0	0	0	0		0
				D35	kg	0	0	0	0	0	0		0
				D29-32	kg	5,012	14,349	1,726	5,451	5,012	21,526		26,538
				D16-25	kg	10,519	9,222	9,534	10,155	10,519	28,911		39,430
				D10-13	kg	372	0	0	0	372	0		372
				Total	kg	15,903	23,571	11,260	15,606	15,903	50,437		66,340
		SD 390	Mass for Body	D38	kg	0	0	0	0	0	0		0
				D35	kg	0	0	0	0	0	0		0
				D29-32	kg	0	0	0	0	0	0		0
				D16-25	kg	0	0	0	0	0	0		0
				D10-13	kg	0	0	0	0	0	0		0
				Total	kg	0	0	0	0	0	0		0
		SD 345	Mass for Body	D38	kg	0	0	0	0	0	0		0
				D35	kg	0	0	0	0	0	0		0
				D29-32	kg	1,558	5,726	0	5,451	1,558	11,177		12,735
				D16-25	kg	6,220	3,585	6,345	3,829	6,220	13,759		19,979
				D10-13	kg	142	0	0	0	142	0		142
				Total	kg	7,920	9,311	6,345	9,280	7,920	24,936		32,856
		SD 345	Mass for Footing	D38	kg	0	0	0	0	0	0		0
				D35	kg	0	0	0	0	0	0		0
				D29-32	kg	2,581	8,623	1,726	0	2,581	10,349		12,930
				D16-25	kg	3,504	5,637	3,189	6,326	3,504	15,152		18,656
				D10-13	kg	139	0	0	0	139	0		139
				Total	kg	6,224	14,260	4,915	6,326	6,224	25,501		31,725
		SD 345	Mass for App. Slab	D38	kg					0	0		0
				D35	kg	0				0	0		0
				D29-32	kg	873				873	0		873
				D16-25	kg	795				795	0		795
				D10-13	kg	91				91	0		91
				Total	kg	1759				1,759	0		1,759
	Lean concrete	σck = 18 N/mm2, t = 10 cm			m^3	8.5	9.8	6.7	6.7	8.5	23.2		31.7
	Lean concrete form	Normal Type			m^2	3.7	4.0	3.3	3.3	3.7	10.6		14.3
	Crushed stone				m^2	84.6	97.5	67.2	67.2	84.6	231.9		316.5

	Description	Specification Dimensions	Unit	Concrete Bridge: On-Ramp Bridge AO1	PO1	PO2	PO3					Total Abutment	Pires (Land)	Pires (River)	Total
Box-out	Total length of form	Cylindrical form	m^3	3.8	5.1	3.6	3.6					3.8	12.3	0.0	16.1
Box-out	Total number of locations	bridge railings and anchor bars	nos	12	6	6	6					12	18		30
Box-out	Filling mortar	Non-shrinkage mortar, xx Mpa	m^2	0.1	0.2	0.2	0.2					0.1	0.6	0.0	0.7
Foundation	CIP/SPSP	Pile Length	m	56.5	57.0	57.5	58.0					56.5	172.5		229
Foundation	CIP/SPSP	φ1.2m Total number	nos									0	0		0
Foundation	CIP/SPSP	φ1.5m Total number	nos	9								9	0		9
Foundation	CIP/SPSP	φ2.0m Total number	nos		5	4	4					0	13		13
Foundation	CIP/SPSP	Total Total number	nos	9	5	4	4					9	13		22
Foundation	CIP/SPSP	concrete σck = 30 N/mm2	m^3	898.5	895.5	722.7	728.9					899	2,347		3,246
Foundation	Rebar	SD345 Mass D38	kg	0	0	0	0					0	0		0
Foundation	Rebar	SD345 Mass D35	kg	0	0	0	0					0	0		0
Foundation	Rebar	SD345 Mass D29-32	kg	28,305	59,745	39,220	39,440					28,305	138,405		166,710
Foundation	Rebar	SD345 Mass D16-25	kg	49,221	25,335	20,272	20,520					49,221	66,127		115,348
Foundation	Rebar	SD345 Mass D10-13	kg	126	140	112	112					126	364		490
Foundation	Rebar	SD345 Mass Total	kg	77,652	85,220	59,604	60,072					77,652	204,896		282,548
Foundation	Miscellaneous Steel	SS400 or equivalent	kg	1,288	6,262	5,048	5,107					1,288	16,417		17,705
Approach Slab	Concrete	σck = 24 N/mm2	m^3	9.4								9.4	0		9.4
Approach Slab	Formwork	Ordinal formwwork	m^2	2.6								3	0		3
Approach Slab	Rebar	SD345 D29-32	kg	873.0								873	0		873
Approach Slab	Rebar	SD345 D16-25	〃	795.0								795	0		795
Approach Slab	Rebar	SD345 D10-D13	〃	91.0								91	0		91
Approach Slab	Rebar	SD345 Total	〃	1,759.0								1,759	0		1,759
Earth Work	Foundation Excavation	Inside cofferdam, unsuitable soil	m^3	290.1	344.2	249.8	249.8					290.1	843.9		1,134.0
Earth Work	Foundation Excavation		m^3									0.0	0.0		0.0
Earth Work	Foundation Excavation		m^3									0.0	0.0		0.0
Earth Work	Foundation Excavation	Total	m^3	290.1	344.2	249.8	249.8					290.1	843.9		1,134.0
Earth Work	Backfill		m^3	104.2	132.4	103.3	103.3					104.2	339.1		443.3
Earth Work	Surplus Soil		m^3	290.1	344.2	249.8	249.8					290.1	843.8		1,133.9
Earth Work	Ground Preparation		m^2	0.0	0.0	0.0	0.0					0.0	0.0		0.0
Temp work	Steel sheet pile Cofferdam	Type III	kg	82,500	87,750	75,000	75,000					82,500	237,750		320,250
Temp work	Steel sheet pile Cofferdam	Number of Sheet Pile	nos	110	117	100	100					110	317		427
Temp work	Steel sheet pile Cofferdam	Number of Joint	nos	0	0	0	0					0	0		0
Temp work	Mold Steel Supporting Beam		kg	0	0	0	0					0	0		0
Temp work	Mold Steel Brace		kg	0	0	0	0					0	0		0
Temp work	Mold Steel Bond Timber		kg	0	0	0	0					0	0		0
Temp work	Mold Steel Sub-member(A)	22%	kg	0	0	0	0					0	0		0
Temp work	Mold Steel Sub-member(B)	4%	kg	0	0	0	0					0	0		0
Temp work	Mold Steel Total		gk	0	0	0	0					0	0		0
Falsework		Scaffloding (Handrail precede type) H<30m	m^2	279.1	180.7	199.2	222.7					279.1	602.6		881.7
Supporting		Wedge type (under 80 kN/m2)	m^3	0.0	0.0	0.0	0.0					0	0		0

Summarize of SPSP foundation for P20~P21

Item	Description	Unit	P20	P21	P22	TOTAL
Outside Steel Pipe Well	**Number of Pile**	nos	36	32	32	100
	Pile weight φ=1200, t =14mm, SKY490,	ton	134.970	97.342	0.000	232.312
	φ=1200, t =14mm, SKY400,	ton	527.610	549.696	492.436	1,569.742
	φ=1200, t =16mm, SKY400,	ton	0.000	0.000	111.146	111.146
	φ=165.2, t =11mm, SKY400, (Joint pipe)	ton	131.670	128.744	117.040	377.454
	Driving Length φ=1200, t =14mm~16mm	m	1,529.2	1,452.8	1,340.2	4,322.2
Diaphragm Steel Sheet Pipe Wall	**Number of Pile**	nos	6	4	4	14
	Pile weight φ=1200, t =14mm, SKY400,	ton	127.608	89.162	80.982	297.752
	φ=165.2, t =11mm, SKY400, (Joint pipe)	ton	29.553	22.154	20.064	71.771
	Driving Length φ=1200, t =14mm	m	254.9	181.6	167.5	604.0
Excavation inside of pipe pile	—	m³	290.6	283.9	326.5	901.0
Excavation inside of pile head	—	m³	40.0	28.5	28.5	97.0
Concrete filling to steel pipe pile	σck=18N/mm²	m³	258.9	241.7	240.0	740.6
Concrete filling to pile head	σck=24N/mm²	m³	8.4	5.6	5.6	19.6
Cleaning inside joint pipe	—	m	3857.0	3610.0	3280.0	10747.0
Mortar filling inside joint pipe	σck=21N/mm²	m³	73.9	70.3	62.1	206.3
Sealing inside joint pipe	σck=0.2N/mm²	m³	17.6	16.4	16.4	50.3
Excavation inside the well	—	m³	921.5	712.1	845.7	2479.4
Backfill inside the well	—	m³	0.0	0.0	0.0	0.0
Surplus soil (waste soil)	—	m³	0.0	0.0	0.0	0.0
Spread sand	—	m³	58.2	42.8	42.8	143.8
Bottom slab concrete	σck=21N/mm²	m³	232.9	171.2	171.2	575.4
Falsework (guide frame, wale, strut)	SS400	t	119.000	112.000	112.000	343.000
Concrete filling to space between steel pipe well and wale	σck=18N/mm²	m³	10.8	10.1	10.1	31.0
Welding of the dowel	SD345	nos	3240	3024	3024	9,288
Cut-off the pipe	SKY400	nos	36	32	32	100
Dynamic Load Test		nos	1	1	1	3

BAGO BR. SHEET PILE LIST OF DIMENSIONS FOR PC BOX GIRDER BRIDGE

ITEM		UNIT	SYMBOL	A1	P1	P2	P3	P4	P5
COFFERDAM TYPE		-	-	FS	FS	FS	FS	FS	FS
SHEET PILE LENGTH		M	L1	12.5	12.5	12.5	12.5	12.5	12.5
SHEET PILE WIDTH		M	W	0.40	0.40	0.40	0.40	0.40	0.40
SHEET PILE SHAPE		-	-	III	III	III	III	III	III
SHEET PILE MATERIAL		-	-	SY295	SY295	SY295	SY295	SY295	SY295
UNIT WEIGHT		KG/M	-	60.0	60.0	60.0	60.0	60.0	60.0
ASSUMED GROUND ELEVATION BEFORE EXCAVATION		MSL+ M	EL2	3.300	3.300	3.300	3.300	3.300	3.300
APPROXIMATE DESIGN FLOOR HEIGHT AFTER EXCAVATION		MSL+ M	EL3	1.600	1.500	1.500	1.600	1.600	1.600
TOP ELEVATION OF SHEET PILE		MSL+ M	EL1	4.900	4.900	4.900	4.900	4.900	4.900
TIP ELEVATION OF SHEET PILE		MSL+ M	EL4	-7.600	-7.600	-7.600	-7.600	-7.600	-7.600
PILE CAP DIMENSIONS	LONGITUDINAL	M	L2	12.000	12.000	12.000	14.000	12.000	12.000
PILE CAP DIMENSIONS	TRANSVERSAL	M	L3	21.000	19.000	19.000	19.000	16.000	28.000
SPACE BETWEEN PILE CAP AND COFFERDAM		M	-	1.0	1.0	1.0	1.0	1.0	2.2
PLANAR DIMENSION OF COFFERDAM	LONGITUDINAL	M	L4	14.000	14.000	14.000	16.000	14.000	16.400
PLANAR DIMENSION OF COFFERDAM	TRANSVERSAL	M	L5	23.000	21.000	21.000	21.000	18.000	32.400
TOTAL LENGTH IN PLAN		M	-	74.000	70.000	70.000	74.000	64.000	97.600
NUMBER OF SHEET PILE		NOS	-	185	175	175	185	160	244
TOTAL WEIGHT OF SHEET PILE		KG	-	138,750	131,250	131,250	138,750	120,000	183,000

NOTE: "SF" IS ABBREVIATION OF "SELF-STANDING.
"SB" IS ABBREVIATION OF "STEEL SHEET PILES WITH STRONG BACK".
QUANTITIES AND DIMENSIONS OF STEEL PIPE SHEET PILE SHALL BE REFERRED TO OTHER SECTION.

BAGO BR. SHEET PILE LIST OF DIMENSIONS FOR PC BOX GIRDER BRIDGE

ITEM		UNIT	SYMBOL	P23	P24	P25	A2
COFFERDAM TYPE		-	-	SB	FS	FS	FS
SHEET PILE LENGTH		M	L1	22.5	12.5	12.5	12.5
SHEET PILE WIDTH		M	W	0.50	0.40	0.40	0.40
SHEET PILE SHAPE		-	-	V	III	III	III
SHEET PILE MATERIAL		-	-	SY390	SY295	SY295	SY295
UNIT WEIGHT		KG/M	-	105.0	60.0	60.0	60.0
ASSUMED GROUND ELEVATION BEFORE EXCAVATION		MSL+ M	EL2	3.000	3.300	3.300	3.300
APPROXIMATE DESIGN FLOOR HEIGHT AFTER EXCAVATION		MSL+ M	EL3	-5.000	1.600	1.600	1.500
TOP ELEVATION OF SHEET PILE		MSL+ M	EL1	4.900	4.900	4.900	4.900
TIP ELEVATION OF SHEET PILE		MSL+ M	EL4	-17.600	-7.600	-7.600	-7.600
PILE CAP DIMENSIONS	LONGITUDINAL	M	L2	12.000	12.000	9.000	10.500
PILE CAP DIMENSIONS	TRANSVERSAL	M	L3	16.000	19.000	19.000	20.700
SPACE BETWEEN PILE CAP AND COFFERDAM		M	-	2.2	1.0	1.0	1.0
PLANAR DIMENSION OF COFFERDAM	LONGITUDINAL	M	L4	16.400	14.000	11.000	12.500
PLANAR DIMENSION OF COFFERDAM	TRANSVERSAL	M	L5	20.400	21.000	21.000	22.700
TOTAL LENGTH IN PLAN		M	-	73.600	70.000	64.000	70.400
NUMBER OF SHEET PILE		NOS	-	184	175	160	176
TOTAL WEIGHT OF SHEET PILE		KG	-	434,700	131,250	120,000	132,000

NOTE: "SF" IS ABBREVIATIOI NOTE:
"SB" IS ABBREVIATION OF "STEEL SHEET PILES WITH STRONG BACK".
QUANTITIES AND DIMENSIONS OF STEEL PIPE SHEET PILE SHALL BE REFERRED TO OTHER SECTION.

BAGO BR.   SHEET PILE LIST OF DIMENSIONS FOR PC BOX GIRDER BRIDGE

ITEM		UNIT	SYMBOL	AO1	PO1	PO2	PO3
COFFERDAM TYPE		-	-	FS	FS	FS	FS
SHEET PILE LENGTH		M	L1	12.5	12.5	12.5	12.5
SHEET PILE WIDTH		M	W	0.40	0.40	0.40	0.40
SHEET PILE SHAPE		-	-	III	III	III	III
SHEET PILE MATERIAL		-	-	SY295	SY295	SY295	SY295
UNIT WEIGHT		KG/M	-	60.0	60.0	60.0	60.0
ASSUMED GROUND ELEVATION BEFORE EXCAVATION		MSL+ M	EL2	3.300	3.300	3.300	3.300
APPROXIMATE DESIGN FLOOR HEIGHT AFTER EXCAVATION		MSL+ M	EL3	1.600	1.500	1.500	1.600
TOP ELEVATION OF SHEET PILE		MSL+ M	EL1	4.900	4.900	4.900	4.900
TIP ELEVATION OF SHEET PILE		MSL+ M	EL4	-7.600	-7.600	-7.600	-7.600
PILE CAP DIMENSIONS	LONGITUDINAL	M	L2	9.000	10.400	8.000	8.000
PILE CAP DIMENSIONS	TRANSVERSAL	M	L3	9.000	9.000	8.000	8.000
SPACE BETWEEN PILE CAP AND COFFERDAM		M	-	1.0	1.0	1.0	1.0
PLANAR DIMENSION OF COFFERDAM	LONGITUDINAL	M	L4	11.000	12.400	10.000	10.000
PLANAR DIMENSION OF COFFERDAM	TRANSVERSAL	M	L5	11.000	11.000	10.000	10.000
TOTAL LENGTH IN PLAN		M	-	44.000	46.800	40.000	40.000
NUMBER OF SHEET PILE		NOS	-	110	117	100	100
TOTAL WEIGHT OF SHEET PILE		KG	-	82,500	87,750	75,000	75,000

NOTE: "SF” IS ABBREVIATIO NOTE:

"SB” IS ABBREVIATION OF "STEEL SHEET PILES WITH STRONG BACK".

QUANTITIES AND DIMENSIONS OF STEEL PIPE SHEET PILE SHALL BE REFERRED TO OTHER SECTION.

CHAPTER 2

QUANTITY CALCULATION OF SUBSTRUCTURES AND CAST-IN-PLACE PILE FOUNDATIONS

QUANTITY CALCULATION

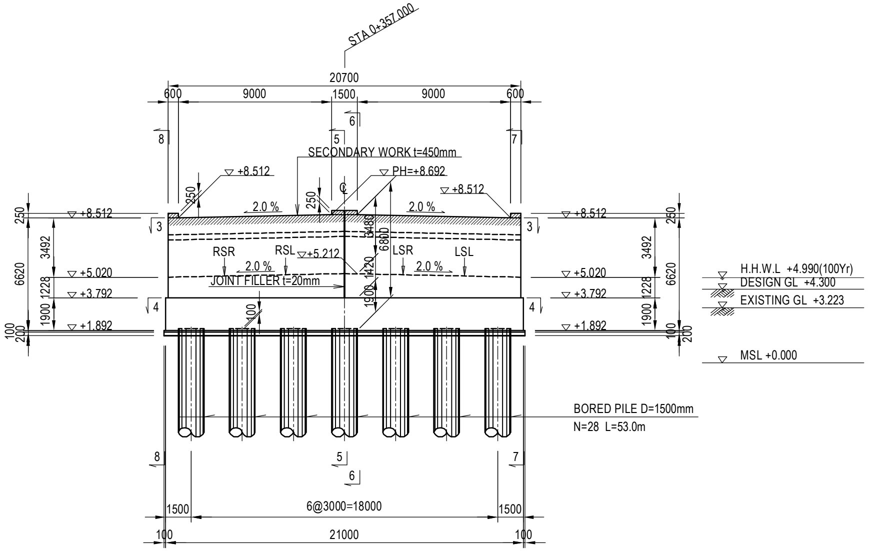
OF

ABUTMENT A1

GENERAL VIEW OF A1 ABUTMENT(1)

S =1:300

SECTION 1 - 1



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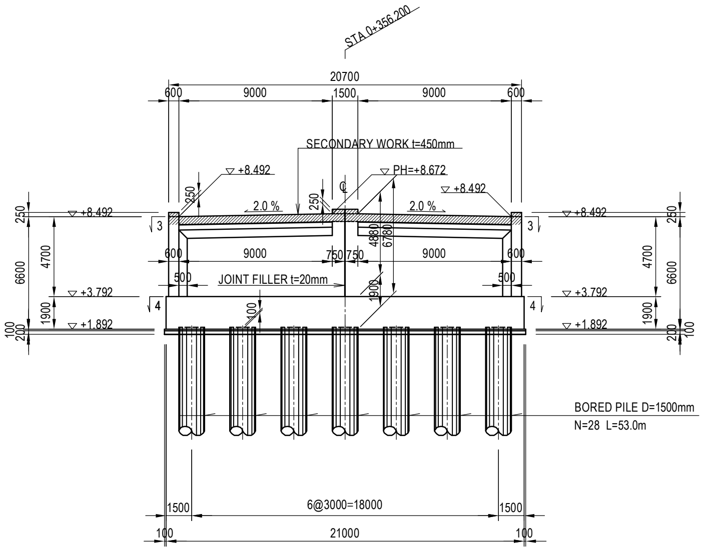

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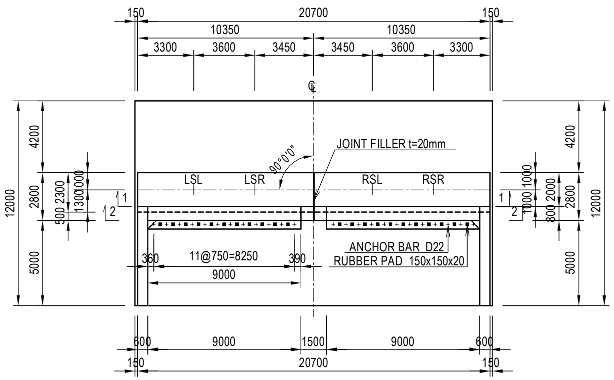

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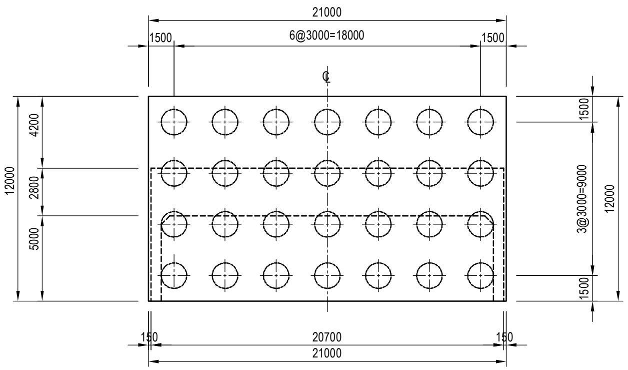
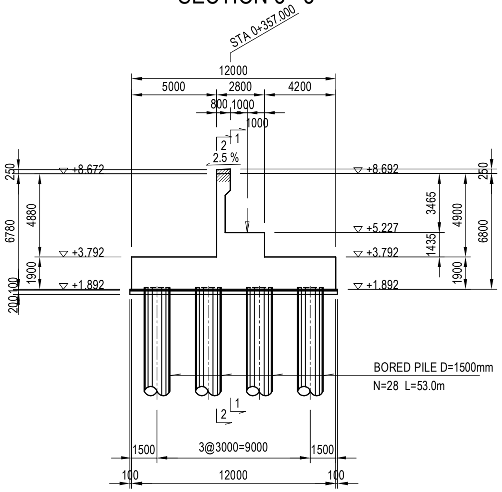


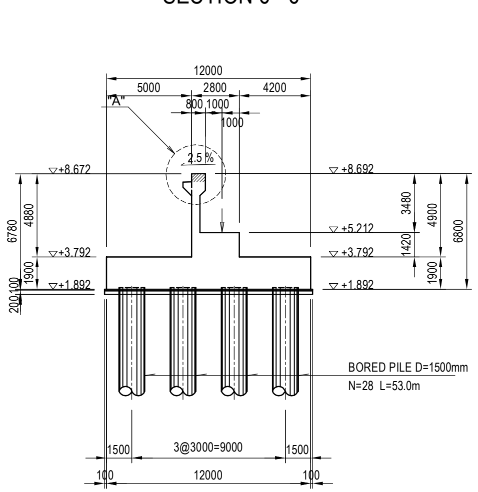
PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 尚弘	15 Jun.2017	GENERAL VIEW OF A1 ABUTMENT (1)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-PB-2001

GENERAL VIEW OF A1 ABUTMENT(2) S =1:300

SECTION 5 - 5



SECTION 6 - 6



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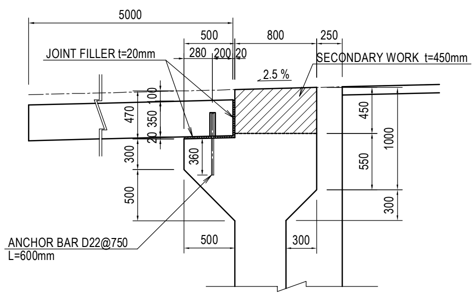
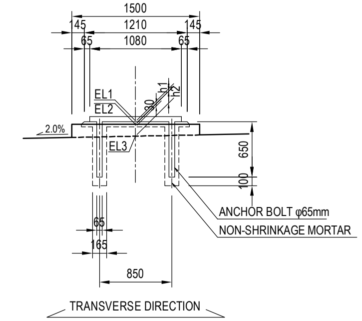
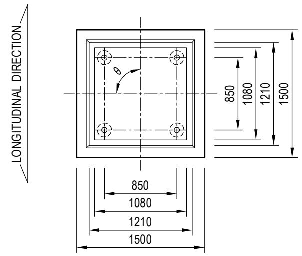


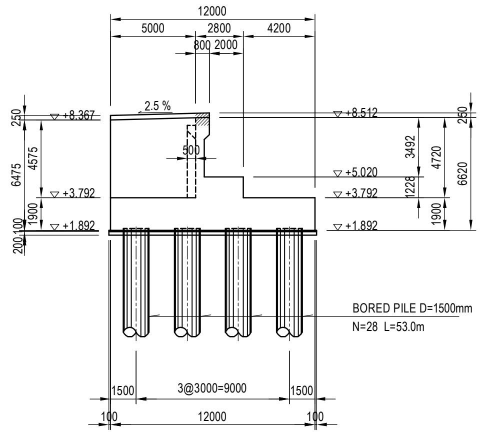
DETAIL OF BEARING S =1:60



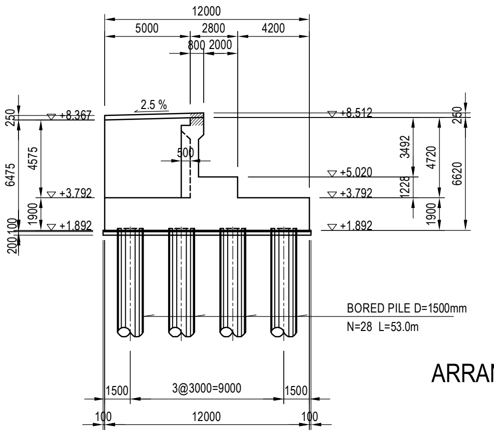


Unit : m	LSL	LSR	RSL	RSR
EL1	5.258	5.330	5.330	5.258
EL2	5.226	5.298	5.298	5.226
EL3	5.086	5.158	5.158	5.086
h1	0.032	0.032	0.032	0.032
h2	0.140	0.140	0.140	0.140
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

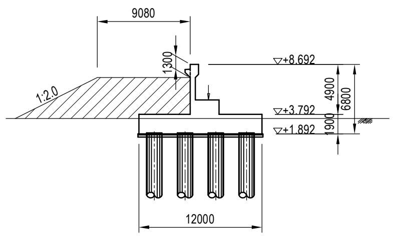
SECTION 7 - 7



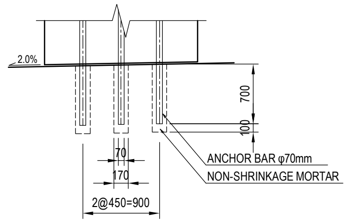
SECTION 8 - 8



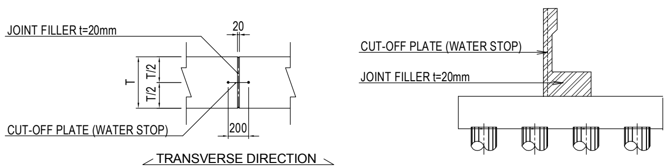
ARRANGEMENT OF BACK-FILLING APPROACH S =1:500



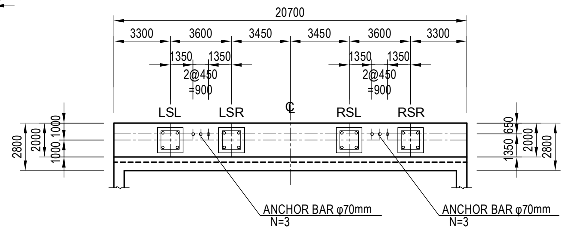
DETAIL OF ANCHOR BAR S =1:60



DETAIL OF JOINT FILLER



ARRANGEMENT OF BRIDGE SEAT



NOTE : 1. Weep holes shall be installed in abutment wall by 3 meter interval for discharge of water from backfilled soil.
2. Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

– 31 –

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017	GENERAL VIEW OF A1 ABUTMENT (2)	1
CHECKED BY	T. HAYAKAWA	早川 智邦	20 Jun.2017		DWG No.
APPROVED BY	Y. SANO	佐野	21 Jun.2017		P1-PB-2002

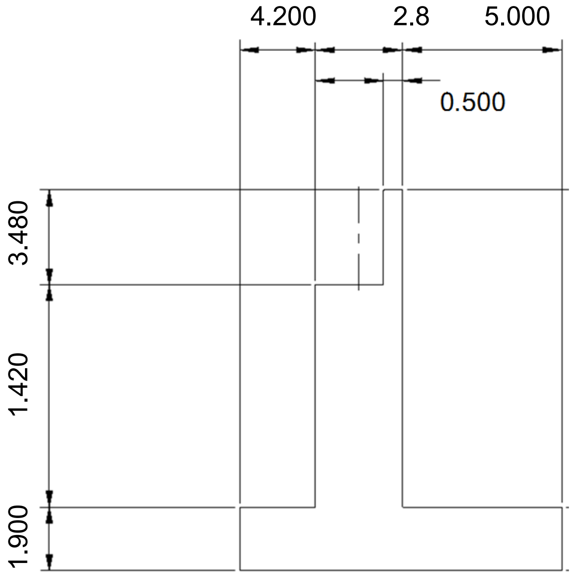
A1 Abutment

Summary Table

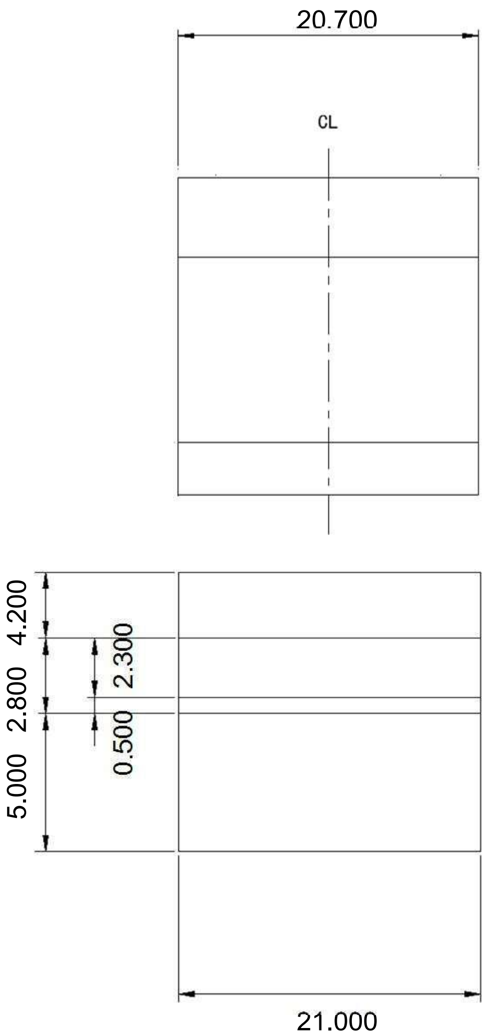
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Body	m^3	156.2	
		σck = 24 N/mm2		Pile cap	m^3	478.8	
				Total	m^3	635.0	
	Formwork	Normal Type		Body	m^2	327.5	
				Pile cap	m^2	125.4	
				Total	m^2	452.9	
				Post Cast	m^2	0.0	
	Rebar	SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	29586	
				D25 ~ D16	kg	17267	
				D10 - D13	kg	436	
				Total	kg	47289	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D32 ~ D29	nos	0	
				Total	nos	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	16588	
				D25 ~ D16	kg	6080	
				D10 - D13	kg	251	
				Total	kg	22919	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	12998	
				D25 ~ D16	kg	11187	
				D10 - D13	kg	185	
				Total	kg	24370	
	Lean concrete	σck = 18 N/mm2 , t = 10 cm			m^3	25.9	
	Lean concrete form	Normal Type			m^2	6.7	
	Crushed stone				m^2	258.6	
	Box out for bearing	Cylindrial form length		φ165 x 0.69m	m	11	
		Cylindrical form number			nos	16	
		Cylindrial form length		φ170 x 0.80m	m	4.8	
		Cylindrical form number			nos	6	
	Box out for bridge railing	Cylindrial form length		φ225 x 0.24m	m	1.42	
		Cylindrical form number			nos	6	
		Non-shrinkage mortar			m^3	0.728	

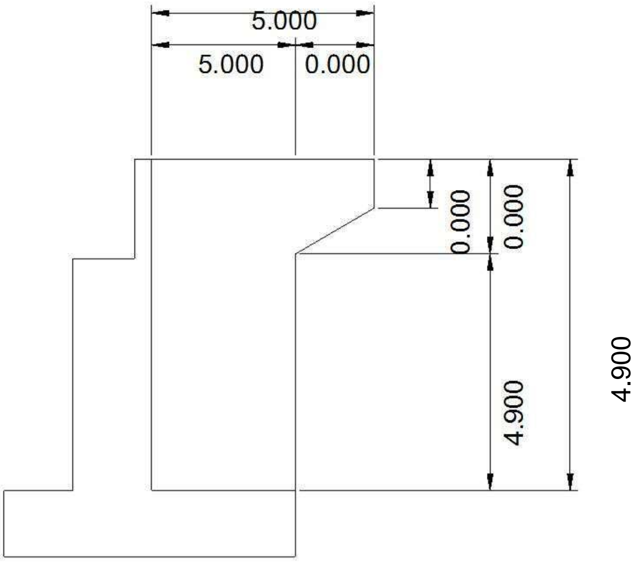
Foundation	CIP Pile		Diameter		Length	m	53.000	
			1500		Number	nos	28	
			Concrete		σck = 30N/mm2	m^3	2,622.2	
	Rebar		SD 345	Mass	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	86,940	
					D25 ~ D16	kg	142,352	
					D10 - D13	kg	392	
					Total	kg	229,684	
	Miscellaneous steel		spacers and sonic pipes			kg	3,839	
Earth Work	Foundation Excavation		inside cofferdam, unsuitable soil			m^2	758.3	
			Total			m^3	758.3	
	Backfill		Purchased soil			m^3	172.3	
	Surplus Soil					m^3	758.3	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III			kg	138,750	
			Number of Sheet Piles			nos	185	
			Number of Joint			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Approach slab	Concrete		σck = 24 N/mm2			m^3	31.4	
	Formwork		Normal Type			m^2	9.8	
	Rebar		SD345		D35	kg	0	
					D29 - D32	kg	2,958	
					D16 - D25	kg	2,642	
					D10 - D13	kg	326	
					Total	kg	5,926	
	Joint filler		t = 20 mm			m^2	14.4	
			t = 10 mm			m^2	3.4	
	Bearing pad		Rubber bearing			m^2	0.4	
			Pipe		SGP50A×220	kg	28	
			Cap		φ70×3.2.0	kg	2	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	464.7	

Schematic Diagram A1



Total height	6.800
Pile cap width	12.000
Pile cap depth	21.000





Top EL of Substructure	8.692 m
GL for construction	4.300 m

Wing wall thickness 0.600 m

Quantity Calculation A1

1. Concrete

1) Ballast wall ($\sigma ck = 24$ N/mm2)

3.480 × 0.500 × 20.700 = 36.0 m^3

2) Wall ($\sigma ck = 24$ N/mm2)

1.420 × 2.800 × 20.700 = 82.3 m^3

3) Pile cap ($\sigma ck = 24$ N/mm2)

1.900 × 12.000 × 21.000 = 478.8 m^3

4) Wing wall ($\sigma ck = 24$ N/mm2)

a) Left side: a projection part

1/2 × (0.000 + 0.000) × 0.000 × 0.600 = 0.0 m^3

Left side: side wall

5.000 × 4.900 × 0.600 = 14.7 m^3

b) Right side: (L & R are in a symmetric shape)

= 14.7 m^3

5) Cradle ($\sigma ck = 24$ N/mm2)

1/2 × (0.300 + 0.800) × 0.500 × 18.00 = 5.0 m^3

6) Haunch ($\sigma ck = 24$ N/mm2)

1/2 × 0.500 × 0.500 × 4.130 × 2 = 1.0 m^3

7) Base for bridge bearings ($\sigma ck = 24$ N/mm2)

1.500 × 1.500 × 0.140 × 4 = 1.3 m^3

0.000 × 0.000 × 0.000 × 0 = 0.0 m^3

8) Total concrete volume

ΣV = 36.0 + 82.3 + 478.8 + 14.7 + 14.7

+ 5.0 + 1.0 + 1.3 + 0.0 + 1.26 = 635.0 m^3

2. Formwork

1) Ballast wall

(0.500 + 20.700) × 3.480 × 2 = 147.6 m^2

2) Wall

(2.800 + 20.700) × 1.420 × 2 = 66.7 m^2

3) Pile cap

1.900 × (12.000 + 21.000) × 2 = 125.4 m^2

4) Wing wall A1

a) Left side a projection part

1/2(	0.000	+	0.000	) ×	0.000	×	2	=	0.0	m^2
	0.000	+	0.000	) ×	0.600			=	0.0	m^2

Left side a side wall

4.900	×	5.000	×	2		=	49.0	m^2
4.900	×	0.600				=	2.9	m^2
					A	=	51.9	m^2

b) Right (L & R are in a symmetric shape)

5) Cradle to be estimated

	0.300	×	9.000	×	2.000				=	5.4	m^2
	0.707	×	9.000	×	2.000				=	12.7	m^2
1/2(	0.300	+	0.800	) ×	0.500	×	2		=	0.6	m^2
	-0.800	×	9.000	×	2.000				=	-14.4	m^2
								A	=	4.3	m^2

6) Haunch

0.210 × 4.130 × 2 = 1.7 m^2

7) Base for bridge bearings

(1.500 + 1.500) × 2 × 0.140 × 4 = 3.4 m^2

8) Total Formwork Area

ΣA = 147.6 + 66.7 + 125.4 + 51.9 + 51.9
\+ 4.3 + 3.4 + 1.7 = 452.9 m^2

3. Rebar SD 345

	Diameter		Mass (kg)	Stud Welding (Number)	Body (kg)	Footing (kg)
Body	D38		0			
	D35		0			
	D32 - D29	D32	12,254		12,254	
		D29	17,332		4,334	12,998
		Sub total	29,586	0	16,588	12,998
	D25 ~ D16	D25	5,137		109	5,028
		D22	1,453		44	1,409
		D19	5,001		2,038	2,963
		D16	5,676		3,889	1,787
		Sub total	17,267	0	6,080	11,187
	D10 - D13		436		251	185
	Total		47,289	0	22,919	24,370

4. Box-out for Bearings and Railling (Cylindrical form) A1

Quantity of box-out form for anchor bar Type 1

Anchor bar diameter			φ65	mm		Length	L_0	=	0.588	m
Pipe diameter			φ165	mm		Number	n	=	4	nos
Length	l	=	0.688	m						
Total Length	L	=	0.688	×	4			=	2.750	m
For an abutment	(		4	locations)						
Total Length	L	=	2.750	×	4			=	11.000	m

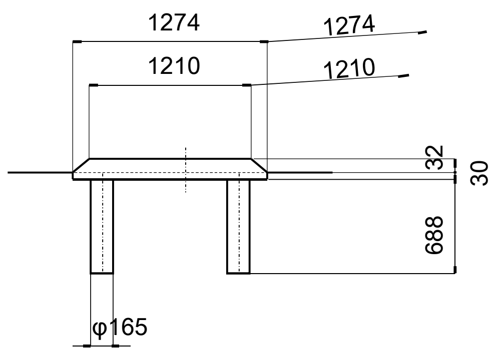
Quantity of box-out form for anchor bar Type 2

Anchor bar diameter			φ70	mm		Length	L_0	=	0.700	m
Pipe diameter			170	mm		Number	n	=	3	nos
Length	l	=	0.800	m						
Total Length	L	=	0.800	×	3			=	2.400	m
For an abutment	(		2	locations)						
Total Length	L	=	2.400	×	2			=	4.800	m

Quantity of box-out form for raillings

Railing post diameter			φ125	mm		Length	L_0	=	0.220	m
Pipe diameter			225	mm		Number	n	=	3	nos
Length	l	=	0.235	m						
Total Length	L	=	0.235	×	3			=	0.710	m
For right and left sides	(		2	locations)						
Total Length	L	=	0.710	×	2			=	1.420	m

Quantity of Non-shrinkage Mortar for Type 1



	mortar height
G1	32
G2	32
G3	32
G4	32
Ave	32.0

mm

Base mortar for one location A1

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a+a1)\times b+(2a1+a)\times b1\}$

$V1 = 0.032\ /6\times\{(2 \times 1.210 + 1.274) \times 1.210$

$+ (2 \times 1.274 + 1.210) \times 1.274\} = 0.049\ m^3$

$V2 = 1.274 \times 0.030 \times 1.274 = 0.049\ m^3$

$= 0.098\ m^3$

For an abutment

$V_{T1\text{-}1} = 0.098 \times 4 = 0.392\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter	φ65
Anchor bar number	4
Void diameter	φ165
Void length	0.688

$V3 = \pi/4 \times (0.165)^{\wedge 2} \times 0.688 \times 4 = 0.059\ m^3$

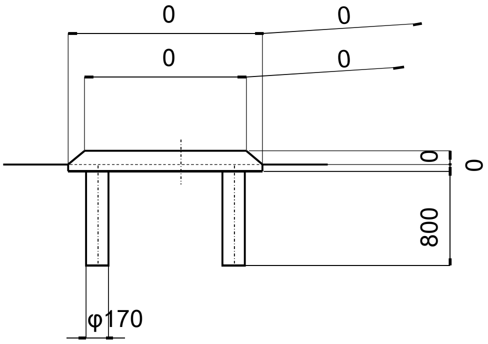
$V4 = - \pi/4 \times (0.065)^{\wedge 2} \times 0.588 \times 4 = -0.008\ m^3$

(Volume of anchor bar) $V = 0.051\ m^3$

Anchor bar for an abutment (4 locations)

$V_{T1\text{-}2} = 0.051 \times 4 = 0.204\ m^3$

Quantity of Non-shrinkage Mortar for Type 2



	mortar height
G1	
G2	
G3	
G4	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a+a1)\times b+(2a1+a)\times b1\}$

$V1 = 0.000\ /6\times\{(2 \times 0.000 + 0.000) \times 0.000$

$+ (2 \times 0.000 + 0.000) \times 0.000\} = 0.000\ m^3$

$V2 = 0.000 \times 0.000 \times 0.000 = 0.000\ m^3$

$= 0.000\ m^3$

For an abutment

$V_{T2\text{-}1} = 0.000 \times 2 = 0.000\ m^3$

Mortar for anchor bar Type 2 A1

Anchor bar diameter φ70

Anchor bar number 3

Void diameter φ170

Void length 0.800

V3 = π/4 × (0.170)^2 × 0.800 × 3 = 0.054 m^3

V4 = - π/4 × (0.07)^2 × 0.700 × 3 = -0.008 m^3

(Volume of anchor bar) V = 0.046 m^3

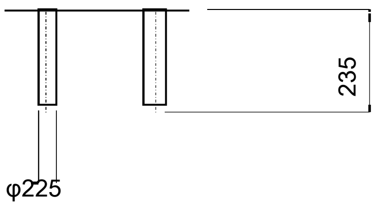
Anchor bar for an abutment (2 locations)

$V_{T2\text{-}2}$ = 0.046 × 2 = 0.092 m^3

Quantity of Non-shrinkage Mortar for railling

	mortar height
G1	0
G2	0
G3	
G4	
Ave	0

mm



Base mortar: Non.

For an abutment

$V_{T3\text{-}1}$ = = 0.000 m^3

Mortar for railing posts A1

Posts diameter φ125

Posts number 3

Void diameter φ225

Void length 0.235

$V3 = \pi/4 \times 0.225 \times 0.235 \times 3 = 0.028\ m^3$

$V4 = -\ \pi/4 \times (\ 0.125\ )^{2} \times 0.220 \times 3 = -0.008\ m^3$

(Volume of anchor bar) $V = 0.020\ m^3$

Posts for an abutment (2 locations)

$V_{T3\text{-}2} = 0.020 \times 2 = 0.040\ m^3$

Quantity of Non-shrinkage Mortar for railling

$V_{T1\text{-}1} + V_{T1\text{-}2} + V_{T2\text{-}1} + V_{T2\text{-}2} + V_{T3\text{-}1} + V_{T3\text{-}2} = 0.728\ m^3$

6. Lean concrete (σck = 18 N/mm2 , t = 10 cm)

Area

$12.200 \times 21.200 = 258.6\ m^2$

Volume ($V = 258.6 \times 0.100 = 25.9\ m^3$)

7. Lean concrete formwork

$0.100 \times (\ 12.200 + 21.200\ ) \times 2 = 6.7\ m^2$

8. Crushed stone

Area $12.200 \times 21.200 = 258.6\ m^2$

Volume ($V = 258.6 \times 0.200 = 51.7\ m^3$)

9. CIP Pile

1) Pile Diameter and number

$D = 1.500$ m $L = 53.00$ m $n = 28$ nos

2) Concrete (σck = 30 N/mm2)

Net sectional area $A = 1.767\ m^2$

Concrete $V = 1.767 \times 53.00 \times 28 = 2{,}622.2\ m^3$

3) Rebar (SD 345) A1

	Diameter		Mass (kg)	
			One Pile	On Pier
Body	D38		0	0
	D35		0	0
	D32 - D29	D32	0	0
		D29	3,105	86,940
		Sub total	3,105	86,940
	D25 ~ D16	D25	2,507	70,196
		D22	243	6,804
		D19	2,334	65,352
		D16	0	0
		Sub total	5,084	142,352
	D10 - D13		14	392
	Total		8,203	229,684

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				98	2,744
STK400,φ60.5,t=2.3	2.500	3	3.300	25	693
STK400,φ114.3,t=3.5	1.500	1	9.560	14	402
Total					3,839

10. Approach slab

1) Concrete ($\sigma ck = 24$ N/mm2)

V = 5.000 × 8.980 × 0.350 x 2 nos = 31.4 m^3

(L) (T)

2) Formwork

A = (8.980 + 0.020 + 5.000)× 0.350 x 2 nos = 9.8 m^2

3) Bridge bearing (200×200×20 mm)

A = 0.150 × 0.150 × 11 x 2 nos = 0.4 m^2

4) Joint filler t = 20mm

((0.350 + 0.500)× 8.980 - 0.4) x 2 nos = 14.4 m^2

5) Joint filler t = 10mm

(4.980 +)× 0.350 x 2 nos = 3.4 m^2

6) Pipe (SGP 50A)

L = 220 mm n = 12 nos

W = 0.220 × 12 × 5.31 x 2 nos = 28 kg

Cap

φ70 t = 3.2 mm n = 12 nos

W = π/4× 0.070 × 0.070 × 3.2 × 7.85 × 12

x 2 nos = 2 kg

7) Rebar (SD 345) A1

	Diameter		MASS (kg)
Body	D38		
	D35		
	D32 - D29	D32	
		D29	2,958
		Sub total	2,958
	D25 ~ D16	D25	1,260
		D22	
		D19	
		D16	1,382
		Sub total	2,642
	D10 - D13		326
	Total		5,926

10. Earth work

A1

1) Excavation for foundation

Fig

Excavation within Cofferdam

Area A = (12.000 + 1.0 × 2)x(21.000 + 1.0 × 2)= 322.0 m^2

Excavation Depth 2.710 m

322.0 × 2.710 = 872.6 m^3

Deduction of Pile Volume 1.500 ^2 x π/4 ×(2.710 - 0.40) x 28 = -114.3 m^3

V = 758.3 m^3

2) Backfill

Wall	0.510	×	20.700	×	2.800	=	29.6 m^3
Pile cap	12.000	×	21.000	×	1.900	=	478.8 m^3
Lean concrete	12.200	×	21.200	×	0.300	=	77.6 m^3
					Volume of Structure	=	586.0 m^3

V = 758.3 - 586.0 = 172.3 m^3

3) Surplus soil volume

V = 758.3 = 758.3 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

11. Temporary Cofferdam

1) Earth retaining method w= 0.4 Type-III

Steel Sheet Pile Type III	12.500	m	185	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	
12.500 × 60.0 × 185							=	138,750
0.000 × 76.1 × 0							=	0
0.000 × 105.0 × 0							=	0
						Σw	=	138,750

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××				0.000
	H- ×××				0.000
	H- ×××				0.000
Brace	H- ×××				0.000
	H- ×××				0.000
Bond Timber	H- ×××				0.000
Total of Main Member					0.000
Sub-member(A)	0.0 × 0.22				0.000
Sub-member(B)	0.0 × 0.04				0.000
Total of Sub-Member					0.000
Total of Mold Steel					0.000

12. Falsework

【height Division】 〔Average heightH≦30m

(Falsework height) H= 4.900 m

	Wall (Front)	w1=(	20.700	+	3.400)x	4.900			=	118.10 m^2
	Wall (Rear)	w2=(	19.500	-	3.400)x	4.900			=	78.90 m^2
	Wall (Left)	w3=(	7.800	+	0.500)x	4.900			=	40.70 m^2
	Wall (Right)	w4=(	7.800	+	0.500)x	4.900			=	40.70 m^2
	Wing (Left)	w5=(	5.000	-	0.500)x	4.900			=	22.10 m^2
	Wing (Right)	w6=(	5.000	-	0.500)x	4.900			=	22.10 m^2
Pile cap	w7= [2 x(	12.000	+	21.000)+	8.800]x	1.900)			=	142.10 m^2
	Sub-Total								=	464.70 m^3

Total = 464.70 m^3

QUANTITY CALCULATION

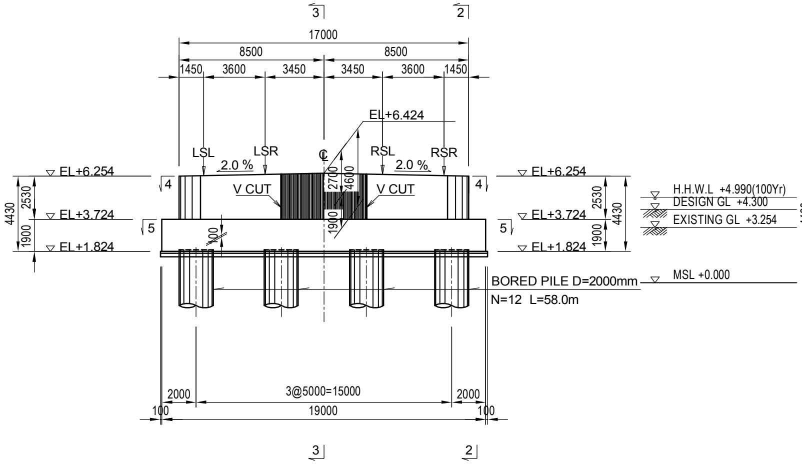
OF

PIER P1

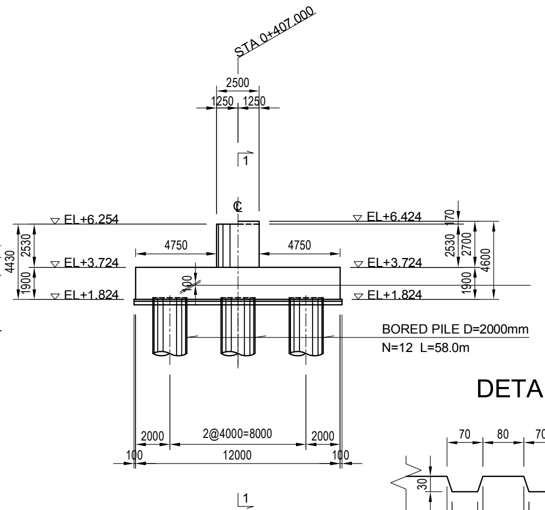
GENERAL VIEW OF P1 PIER

S =1:300

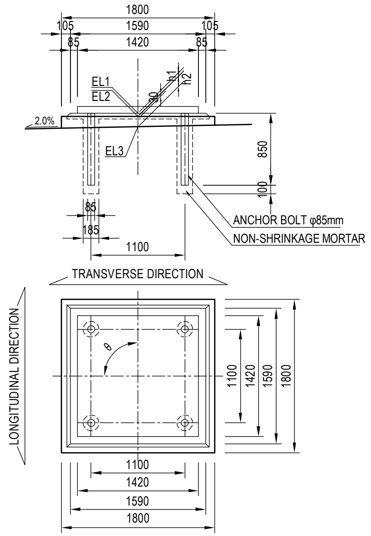
FRONT VIEW
1 - 1



SIDE VIEW
2 - 2 3 - 3

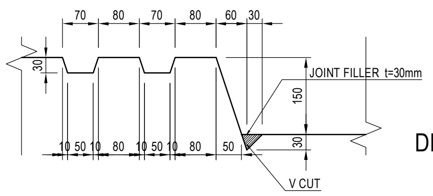


DETAIL OF BEARING
S =1:60

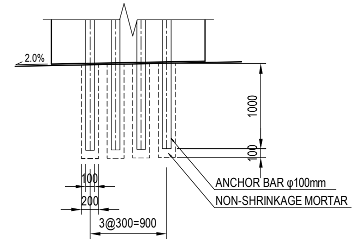


Unit : m	LSL	LSR	RSL	RSR
EL1	6.443	6.515	6.515	6.443
EL2	6.403	6.475	6.475	6.403
EL3	6.283	6.355	6.355	6.283
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

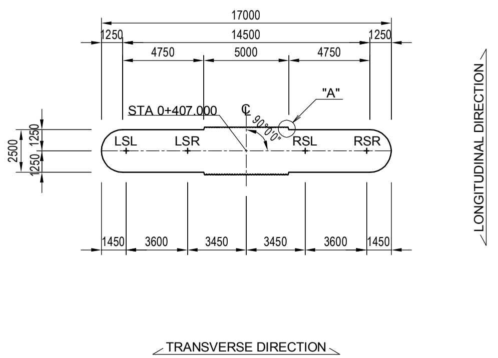
DETAIL "A"
S =1:10



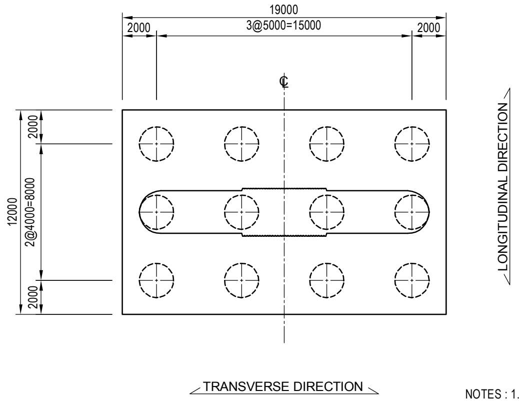
DETAIL OF ANCHOR BAR
S =1:60



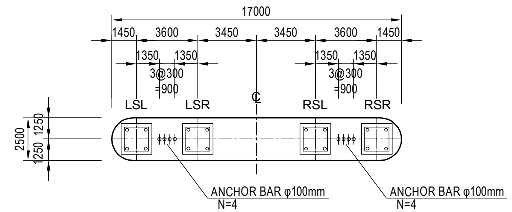
PLAN VIEW
4 - 4



PILE ARRANGEMENT
5 - 5



ARRANGEMENT OF BRIDGE SEAT



NOTES : 1. V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 [illegible]	15 Jun.2017	GENERAL VIEW OF P1 PIER	1
				CHECKED BY	T. HAYAKAWA	[illegible]	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	[illegible]	21 Jun.2017		P1-PB-2011

Summary Table

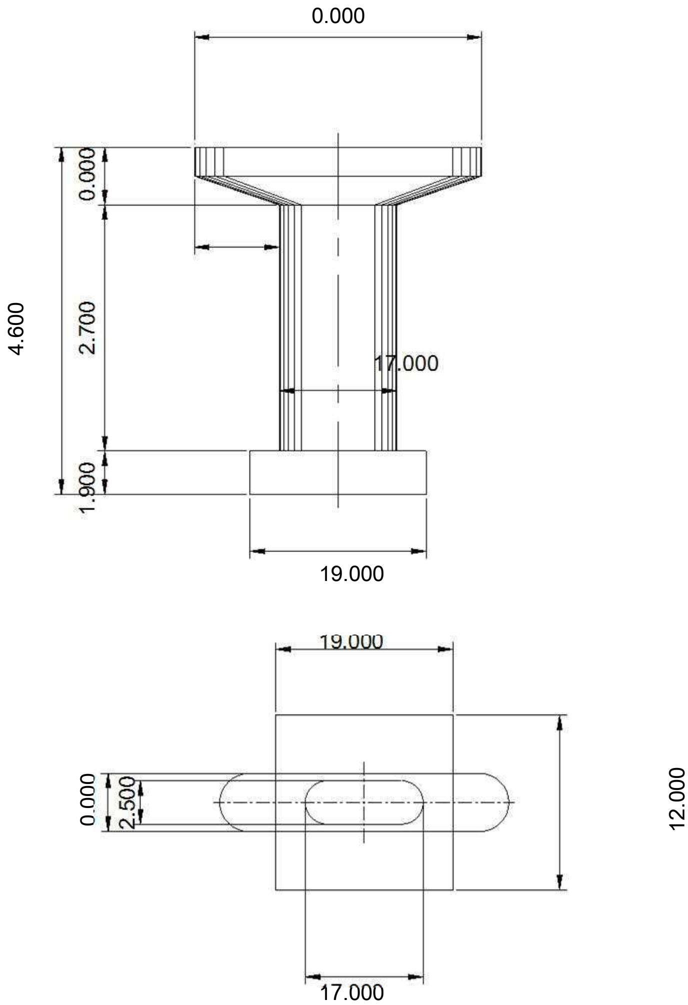
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	$\sigma ck = 24^{N/mm2}$		Beam	m^3	1.6	
				Column	m^3	111.1	
				Sub Total	m^3	112.7	
		$\sigma ck = 24^{N/mm2}$		Pile Cap	m^3	433.2	
				Sub Total	m^3	433.2	
		-		Total	m^3	545.9	
	Formwork	Normal Type		Beam	m^2	3.5	
				Column	m^2	99.5	
				Pile Cap	m^2	117.8	
				Total	m^2	220.8	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	21,561	
				D25 ~ D16	kg	31,982	
				D10 - D13	kg	322	
				Total	kg	53,865	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	10,361	
				D10 - D13	kg	322	
				Total	kg	10,683	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	21,561	
				D25 ~ D16	kg	21,621	
				D10 - D13	kg	0	
				Total	kg	43,182	
	Lean Concrete	$\sigma ck = 18^{N/mm2}$, $t = 10^{cm}$			m^3	23.4	
	Lean Concrete Form	Normal Type			m^2	6.3	
	Crushed stone				m^2	234.2	
	Box out for bearing	Cylindrial form length1		φ185 x 0.88m	m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ200 x 1.10m	m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

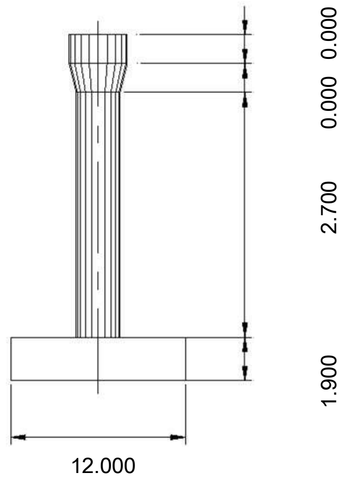
P1

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	58.000	
					number	nos	12	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	133,392	
					D25 ~ D16	kg	61,860	
					D10 - D13	kg	336	
					Total	kg	195,588	
	Concrete		σck = 24 N/mm2			m^3	2,186.8	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	15,321	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	732.7	
			Total			m^3	732.7	
	Backfill		purchased soil			m^3	204.5	
	Surplus Soil		unsuitable soil			m^3	732.7	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 12.50m			kg	131,250	
			Number of Sheet Piles			nos	175	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	252.7	
Supporting			Wedge type (under 80 kN/m2)			m^3	0.0	

Schimatic Diagram

P1





Top EL of Substructure	6.424 m
GL for construction	4.300 m

Quantity Calculation P1

1. Concrete

1) Beam (σck = 24 N/mm2)

(	0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x	0.000)	=	0.0 m^3
1/2x(	0.000 +	17.000) ×	2.500) ×	0 -	0.0	x	10^2 x [radians (22.383) - sin (radians(22.383))]	=	0.0 m^3
π × (	0.000 ^2	)/4 ×	0.000					=	0.0 m^3
							V1	=	0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4	=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
				V2	=	1.6 m^3

3) Column (σck = 24 N/mm2)

{ (2.500) ^2 ÷ 4×π + (17.000 - 2.500) × 2.500 }× 2.700

= 111.1 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

19.000 × 12.000 × 1.900 = 433.2 m^3

(V4)

5) Total

σck = 30 N/mm2	ΣV	=		+		+		+		=	0.0 m^3
σck = 24 N/mm2	ΣV	=	0.0	+	1.6	+	111.1	+	433.2	=	545.9 m^3

2. Formwork

1) Beam

1/2 × (	0.000 +	17.000) ×	0.000 ×	2		=	0.0 m^2
	0.000 ×	0.000 ×	2			=	0.0 〃
π ×	0.000 ×	0.000				=	0.0 〃
1/2 × (	0.000 +	0.000) ×	8.500 ×	2		=	0.0 〃
					A1	=	0.0 m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
						A2	=	3.5 m^2

3) Column

{ 2.500 ×π + (17.000 - 2.500) ×2}× 2.700 = 99.5 m^2

(A3)

4) Pile cap

(19.000 + 12.000) × 2 × 1.900 = 117.8 m^2

(A4)

5) Total

ΣA = 0.0 + 3.5 + 99.5 + 117.8 = 220.8 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P1

Area

19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.100 = 23.4 m^3)

4. Lean concrete formwork

0.100 × (19.200 + 12.200) × 2 = 6.3 m^2

5. Crushed stone

Area 19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.200 = 46.8 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0				
D41		0	0				
D38		0	0				
D35		0	0				
D29 - D32	D32	0	0				
	D29	0	21,561				21,561
	Sub Total	0	21,561	0	0	0	21,561
D25 ~ D16	D25	0	19,485			3,647	15,838
	D22	0	2,926				2,926
	D19	0	2,608			1,488	1,120
	D16	0	6,963			5,226	1,737
	Sub Total	0	31,982	0	0	10,361	21,621
D10 - D13		0	322			322	
Total		**0**	**53,865**	**0**	**0**	**10,683**	**43,182**

7. Box-out for Bearings (Cylindrical form)

P1

Quantity for Type1

Anchor bar diameter			φ85	mm		Anchor bar Length	L_0	=	0.780	m
Pipe diameter			185	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	0.880	m						
Total Length	L	=	0.880	×	4	(for one bearing)		=	3.500	m
For one pier	(		4	locations	)					
Total Length	L	=	3.500	×	4			=	14.000	m

Quantity for Type2

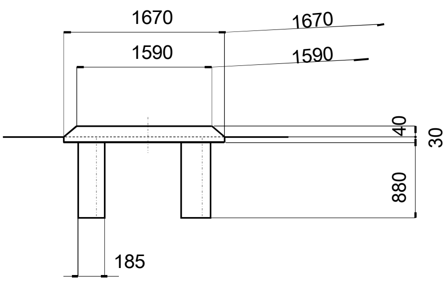
Anchor bar diameter			φ100	mm		Anchor bar Length	L_0	=	1.000	m
Pipe diameter			200	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	1.100	m						
Total Length	L	=	1.100	×	4	(for one bearing)		=	4.400	m
For one pier	(		2	locations	)					
Total Length	L	=	4.400	×	2			=	8.800	m

Quantity for Type3

Anchor bar diameter			φ0	mm		Anchor bar Length	L_0	=	0.000	m
Pipe diameter			100	mm		Anchor bar Number	n	=	0	nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0	(for one bearing)		=	0.000	m
For one pier	(		0	locations	)					
Total Length	L	=	0.000	×	0			=	0.000	m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

V1 = 0.040 /6× { (2 × 1.590 + 1.670) × 1.590
+ (2 × 1.670 + 1.590) × 1.670 } = 0.106 m^3

V2 = 1.670 × 0.030 × 1.670 = 0.084 〃

= 0.190 m^3

Total base mortal volume for Type 1

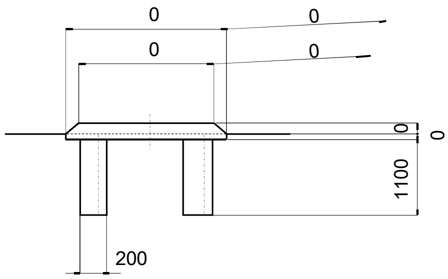
V_{T1-1} = 0.190 × 4 = 0.760 m^3

Mortar for anchor bar Type 1

Anchor bar diameter φ85
Anchor bar number 4
Void diameter φ185
Void length 0.880

V3 = π/4 × (0.185)^2× 0.880 × 4 = 0.095 〃
V4 = - π/4 × (φ85)^2× 0.780 × 4 = -0.018 〃
(Volume of anchor bar) V = 0.077 m^3
Anchor bar for an abutment (4 locations)
V_{T1-2} = 0.077 × 4 = 0.308 m^3

Quantity for Tyep 2



	mortar height
G5	
G6	
G7	
G8	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000
+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3
V2 = 0.000 × 0.000 × 0.000 = 0.000 〃
= 0.000 m^3

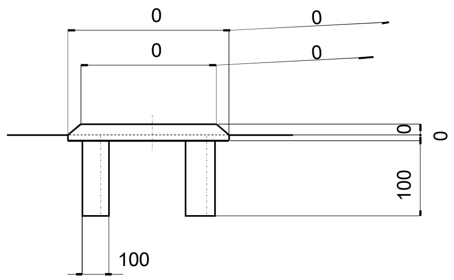
Total base mortal volume for Type 2
V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100
Anchor bar number 4
Void diameter φ200
Void length 1.1

V3 = π/4 × (0.200)^2× 1.100 × 4 = 0.138 〃
V4 = - π/4 × (φ100)^2× 1.000 × 4 = -0.031 〃
(Volume of anchor bar) V = 0.107 m^3
Anchor bar for an abutment (2 locations)
V_{T2-2} = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3 P1



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

\+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = 1.282 m^3

8. CIP Pile P1

(1)Diameter and number

D = 2.000 m L = 58.00 m n = 12 nos

Net Area = 3.142 m^2

(2)Concrete = 3.142 × 58.00 × 12 = 2,186.8 m^3

(3) Rebar (SD 345)

Item		Mass (kg) One Pile	Mass (kg) On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	6,373	76,476
	D29	4,743	56,916
	Sub-total	11,116	133,392
D25 ~ D16	D25	0	0
	D22	5,155	61,860
	D19	0	0
	D16	0	0
	Sub-total	5,155	61,860
D13		28	336
Total		16,299	195,588

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				109	1,308
STK400,φ60.5,t=2.3	60.500	3	3.300	599	7,187
STK400,φ114.3,t=3.5	59.500	1	9.560	569	6,826
Total					15,321

9. Earth work

1) Excavation for foundation

fig

Excavation within Cofferdam

Area A = (19.000 + 1.0 × 2)x(12.000 + 1.0 × 2) = 294.0 m^2

Excavation Depth 2.800 m

294.0 × 2.800 = 823.2 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.800 - 0.40) x 12 = -90.5 〃

V = 732.7 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (π /4 ×	2.500 ^{2} +	2.500	×	14.500	)	=	24.7	m^3
Pile cap	19.000	×	12.000	×	1.900			=	433.2	〃
Lean concrete	19.200	×	12.200	×	0.300			=	70.3	〃
						Volume of Structure		=	528.2	m^3

V = 732.7 - 528.2 = 204.5 m^3

3) Surplus soil volume (unsuitable soil)

V = 732.7 = 732.7 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	175	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

12.500	×	60.0	×	175		=	131,250
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	131,250

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕－H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w= [2 x(0.000 + 2.500)+ 8.800]x 0.000) = 0.00 m^2

2) Pierstud

(Falsework height) H2= 2.700 m

w1= 14.500 x 2.700 x 2 = 78.30 m^2

w2= π x 4.700 x 2.700 = 39.90 m^2

Sub-Total = 118.20 m^2

3) Pile cap

w= [2 x(19.000 + 12.000)+ 8.800]x 1.900) = 134.50 m^2

Total = 252.70 m^2

12. Supporting

【height Divisic 〔Average height〕 ---- H≦30m

【Average height 】

1/2 ×(0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 ×(0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

0 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 ×(0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

Package -1　PC Box Girder Bridge

QUANTITY CALCULATION

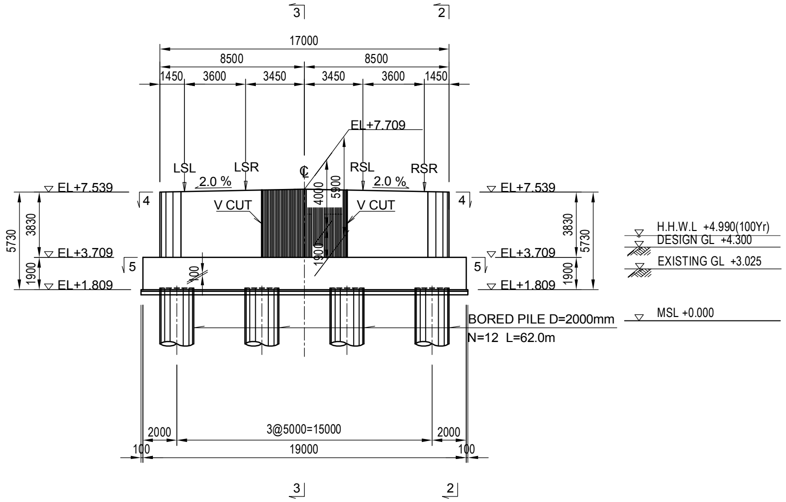
OF

PIER P2

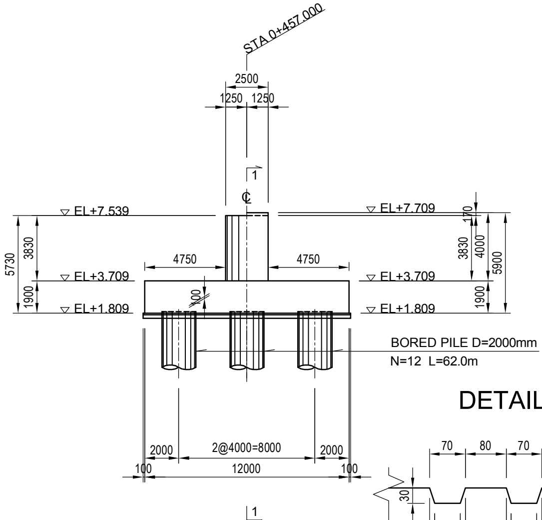
GENERAL VIEW OF P2 PIER

S =1:300

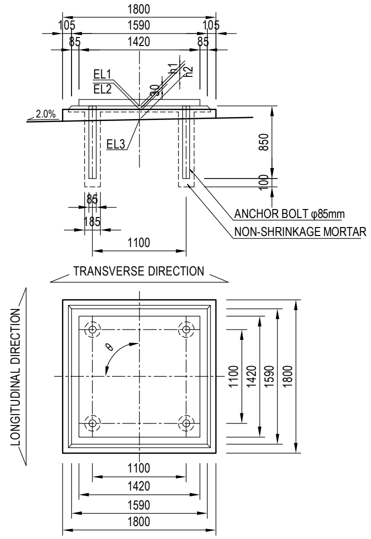
FRONT VIEW
1 - 1



SIDE VIEW
2 - 2 3 - 3

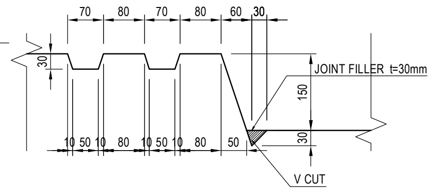


DETAIL OF BEARING
S =1:60

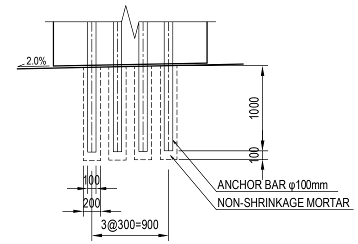


Unit : m	LSL	LSR	RSL	RSR
EL1	7.728	7.800	7.800	7.728
EL2	7.688	7.760	7.760	7.688
EL3	7.568	7.640	7.640	7.568
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

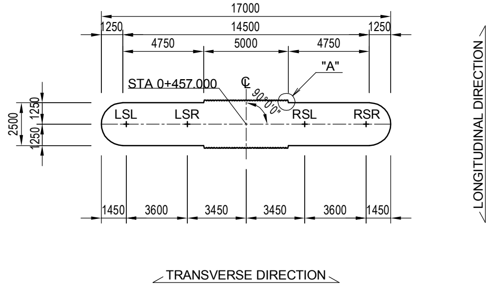
DETAIL "A"
S =1:10



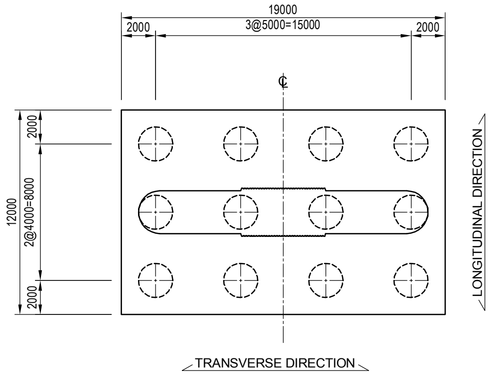
DETAIL OF ANCHOR BAR
S =1:60



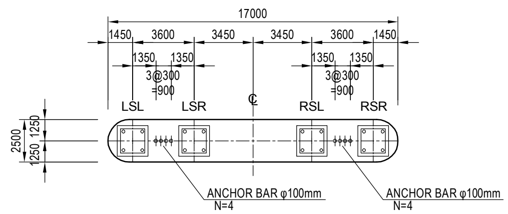
PLAN VIEW
4 - 4



PILE ARRANGEMENT
5 - 5



ARRANGEMENT OF BRIDGE SEAT



NOTE :1. V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017	GENERAL VIEW OF P2 PIER	1
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
APPROVED BY	Y. SANO	佐野 [illegible]	21 Jun.2017		P1-PB-2021

P2 Pier

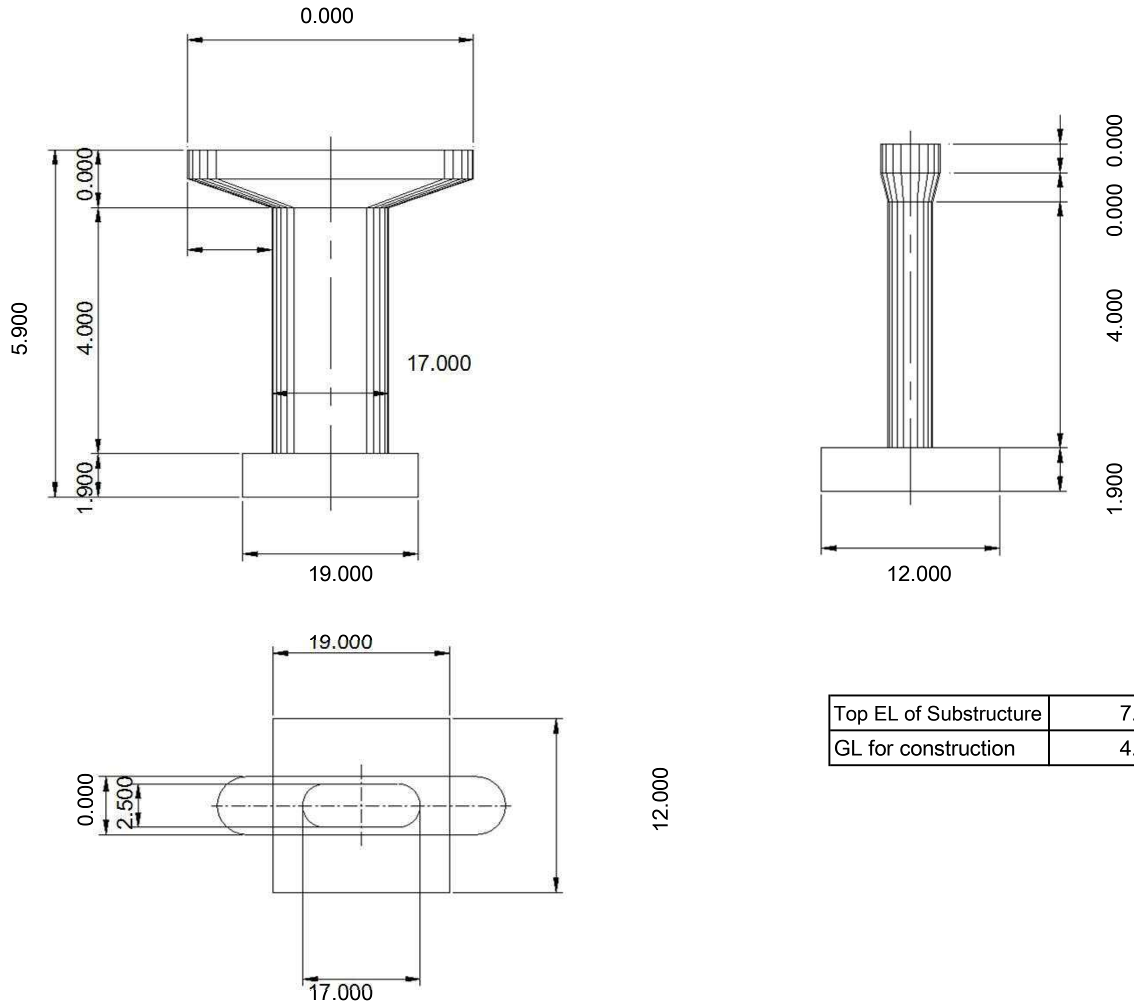
Summary Table

	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	1.6	
				Column	m^3	164.6	
				Sub Total	m^3	166.2	
		σck = 24 N/mm2		Pile Cap	m^3	433.2	
				Sub Total	m^3	433.2	
		-		Total	m^3	599.4	
	Formwork	Normal Type		Beam	m^2	3.5	
				Column	m^2	147.4	
				Pile Cap	m^2	117.8	
				Total	m^2	268.7	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	21,561	
				D25 ~ D16	kg	33,783	
				D10 - D13	kg	479	
				Total	kg	55,823	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	12,162	
				D10 - D13	kg	479	
				Total	kg	12,641	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	21,561	
				D25 ~ D16	kg	21,621	
				D10 - D13	kg	0	
				Total	kg	43,182	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	23.4	
	Lean Concrete Form	Normal Type			m^2	6.3	
	Crushed stone				m^2	234.2	
	Box out for bearing	Cylindrial form length1		φ185 x 0.88m	m	14	
		Cylindrical form number1			nos	16	
		Cylindrical form length2		φ200 x 1.10m	m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrical form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

<table>
<tr><th></th><th colspan="2">Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="11">Foundation</td><td colspan="2" rowspan="2">CIP Pile</td><td colspan="2">Diameter</td><td>Length</td><td>m</td><td>62.000</td><td></td></tr>
<tr><td colspan="2">2000</td><td>number</td><td>nos</td><td>12</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass for CIP & SPSP</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>140,664</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>65,496</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>336</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>206,496</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td colspan="3">$\sigma ck = 24$ N/mm2</td><td>m^3</td><td>2,337.6</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3"></td><td>m^2</td><td>0</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">Spacers and Sonic Pipes</td><td>kg</td><td>16,327</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3">Inside cofferdam, unsuitable</td><td>m^3</td><td>732.7</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>732.7</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">purchased soil</td><td>m^3</td><td>204.5</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3">unsuitable soil</td><td>m^3</td><td>732.7</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III 12.50m</td><td>kg</td><td>131,250</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>175</td><td></td></tr>
<tr><td colspan="3">Number of Wellding Joint (on site)</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>309.6</td><td></td></tr>
<tr><td colspan="3">Supporting</td><td colspan="3">Wedge type (under 80 kN/m2)</td><td>m^3</td><td>0.0</td><td></td></tr>
</table>

Schimatic Diagram

P2



Top EL of Substructure	7.709 m
GL for construction	4.300 m

1. Concrete

1) Beam (σck = 24 N/mm2)

(	0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x	0.000	=	0.0 m^3
1/2x(	0.000 +	17.000) ×	2.500) ×	0 -	0.0 x	10^2 x [radians (31.767) - sin (radians(31.767))]		=	0.0 m^3
π × (	0.000 ^2	)/4 ×	0.000					=	0.0 m^3
							V1	=	0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4		=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
					V2	=	1.6 m^3

3) Column (σck = 24 N/mm2)

{ (2.500) ^2 ÷ 4×π + (17.000 - 2.500) × 2.500 }× 4.000

= 164.6 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

19.000 × 12.000 × 1.900 = 433.2 m^3

(V4)

5) Total

σck = 30 N/mm2	ΣV	=		+		+		+		=	0.0 m^3
σck = 24 N/mm2	ΣV	=	0.0	+	1.6	+	164.6	+	433.2	=	599.4 m^3

2. Formwork

1) Beam

1/2	× (0.000	+ 17.000) ×	0.000	×	2		=	0.0 m^2
0.000	× 0.000	× 2					=	0.0 〃
π	× 0.000	× 0.000					=	0.0 〃
1/2	× (0.000	+ 0.000) ×	8.500	×	2		=	0.0 〃
						A1	=	0.0 m^2

2) Base for bridge bearings

Type1 (	1.800	+ 1.800	) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000	+ 0.000	) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000	+ 0.000	) ×	2 ×	0.000 ×	0		=	0 m^2
							A2	=	3.5 m^2

3) Column

{ 2.500 ×π + (17.000 - 2.500) X 2}× 4.000 = 147.4 m^2

(A3)

4) Pile cap

(19.000 + 12.000) × 2 × 1.900 = 117.8 m^2

(A4)

5) Total

ΣA = 0.0 + 3.5 + 147.4 + 117.8 = 268.7 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P2

Area

19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.100 = 23.4 m^3)

4. Lean concrete formwork

0.100 × (19.200 + 12.200) × 2 = 6.3 m^2

5. Crushed stone

Area 19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.200 = 46.8 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0				
D41		0	0				
D38		0	0				
D35		0	0				
D29 - D32	D32	0	0				
	D29	0	21,561				21,561
	Sub Total	0	21,561	0	0	0	21,561
D25 ~ D16	D25	0	17,388			1,550	15,838
	D22	0	4,472			1,546	2,926
	D19	0	2,968			1,848	1,120
	D16	0	8,955			7,218	1,737
	Sub Total	0	33,783	0	0	12,162	21,621
D10 - D13		0	479			479	0
Total		**0**	**55,823**	**0**	**0**	**12,641**	**43,182**

7. Box-out for Bearings (Cylindrical form) P2

Quantity for Type1

Anchor bar diameter φ85 mm — Anchor bar Length L_0 = 0.780 m

Pipe diameter 185 mm — Anchor bar Number n = 4 nos

Box-out Length l = 0.880 m

Total Length L = 0.880 × 4 (for one bearing) = 3.500 m

For one pier (4 locations)

Total Length L = 3.500 × 4 = 14.000 m

Quantity for Type2

Anchor bar diameter φ100 mm — Anchor bar Length L_0 = 1.000 m

Pipe diameter 200 mm — Anchor bar Number n = 4 nos

Box-out Length l = 1.100 m

Total Length L = 1.100 × 4 (for one bearing) = 4.400 m

For one pier (2 locations)

Total Length L = 4.400 × 2 = 8.800 m

Quantity for Type3

Anchor bar diameter φ0 mm — Anchor bar Length L_0 = 0.000 m

Pipe diameter 100 mm — Anchor bar Number n = 0 nos

Box-out Length l = 0.100 m

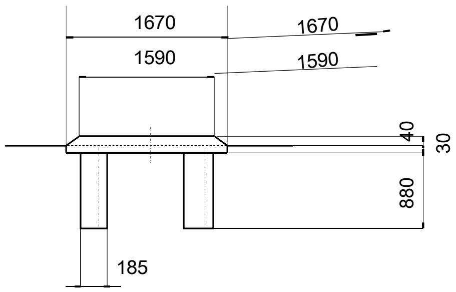
Total Length L = 0.100 × 0 (for one bearing) = 0.000 m

For one pier (0 locations)

Total Length L = 0.000 × 0 = 0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.040 /6× { (2 × 1.590 + 1.670) × 1.590

+ (2 × 1.670 + 1.590) × 1.670 } = 0.106 m^3

V2 = 1.670 × 0.030 × 1.670 = 0.084 〃

= 0.190 m^3

Total base mortal volume for Type 1

$V_{T1\text{-}1}$ = 0.190 × 4 = 0.760 m^3

Mortar for anchor bar Type 1 P2

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.880

V3 = π/4 × (0.185 $)^2$× 0.880 × 4 = 0.095 〃

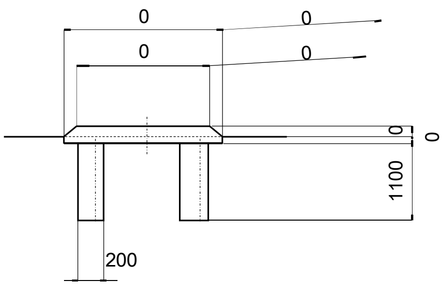
V4 = - π/4 × (φ85 $)^2$× 0.780 × 4 = -0.018 〃

(Volume of anchor bar) V = 0.077 m^3

Anchor bar for an abutment (4 locations)

V_{T1-2} = 0.077 × 4 = 0.308 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

\+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

V3 = π/4 × (0.200 $)^2$× 1.100 × 4 = 0.138 〃

V4 = - π/4 × (φ100 $)^2$× 1.000 × 4 = -0.031 〃

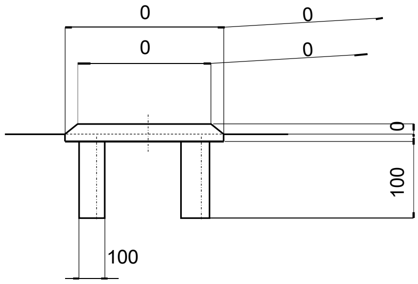
(Volume of anchor bar) V = 0.107 m^3

Anchor bar for an abutment (2 locations)

V_{T2-2} = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3

P2



	mortar height	
G9		
G10		
G11		
G12		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **1.282** m^3

8. CIP Pile P2

(1)Diameter and number

D = 2.000 m L = 62.00 m n = 12 nos

Net Area = 3.142

2)Concrete = 3.142 62.00 12 = 2,337.6 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	6,647	79,764
	D29	5,075	60,900
	Sub-total	11,722	140,664
D25 ~ D16	D25	0	0
	D22	5,458	65,496
	D19	0	0
	D16	0	0
	Sub-total	5,458	65,496
D13		28	336
Total		17,208	206,496

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				115	1,380
STK400,φ60.5,t=2.3	64.500	3	3.300	639	7,663
STK400,φ114.3,t=3.5	63.500	1	9.560	607	7,285
Total					16,327

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	19.000	+	1.0	×	2)x(	12.000	+	1.0	×	2) =	294.0 m^2

Excavation Depth 2.800 m

	294.00	×	2.800							=	823.2 m^3
Deduction of Pile Volume	2.000	^2 x	π/4	×(	2.800	-	0.40	) x	12	=	-90.5 〃
									V	=	732.7 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (	π /4	×	2.500 ^{2} +	2.500	×	14.500	)	=	24.7 m^3
Pile cap	19.000	×	12.000	×	1.900					=	433.2 〃
Lean concrete	19.200	×	12.200	×	0.300					=	70.3 〃
								Volume of Structure		=	528.2 m^3

V = 732.7 - 528.2 = 204.5 m^3

3) Surplus soil volume (unsuitable soil)

V = 732.7 = 732.7 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	175	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	
12.500 ×	60.0 ×		175				=	131,250
0.000 ×	76.1 ×		0				=	0
0.000 ×	105.0 ×		0				=	0
						Σw	=	131,250

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		6		0
	H- ×××		6		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕--H≦30m

1) Beam

(Falsework height)	H1=		0.000 m											
w=	2	x(	0.000	+	2.500	)+	8.800	]x	0.000	)	=	0.00	m^2

2) Pierstud

(Falsework height)	H2=	4.000 m					
w1=	14.500 x	4.000 x	2	=	116.00	m^2
w2=	π x	4.700 x	4.000	=	59.10	m^2
Sub-Total				=	175.10	m^2

3) Pile cap

w=	2	x(	19.000	+	12.000	)+	8.800	]x	1.900	)	=	134.50	m^2
Total											=	309.60	m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

0 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

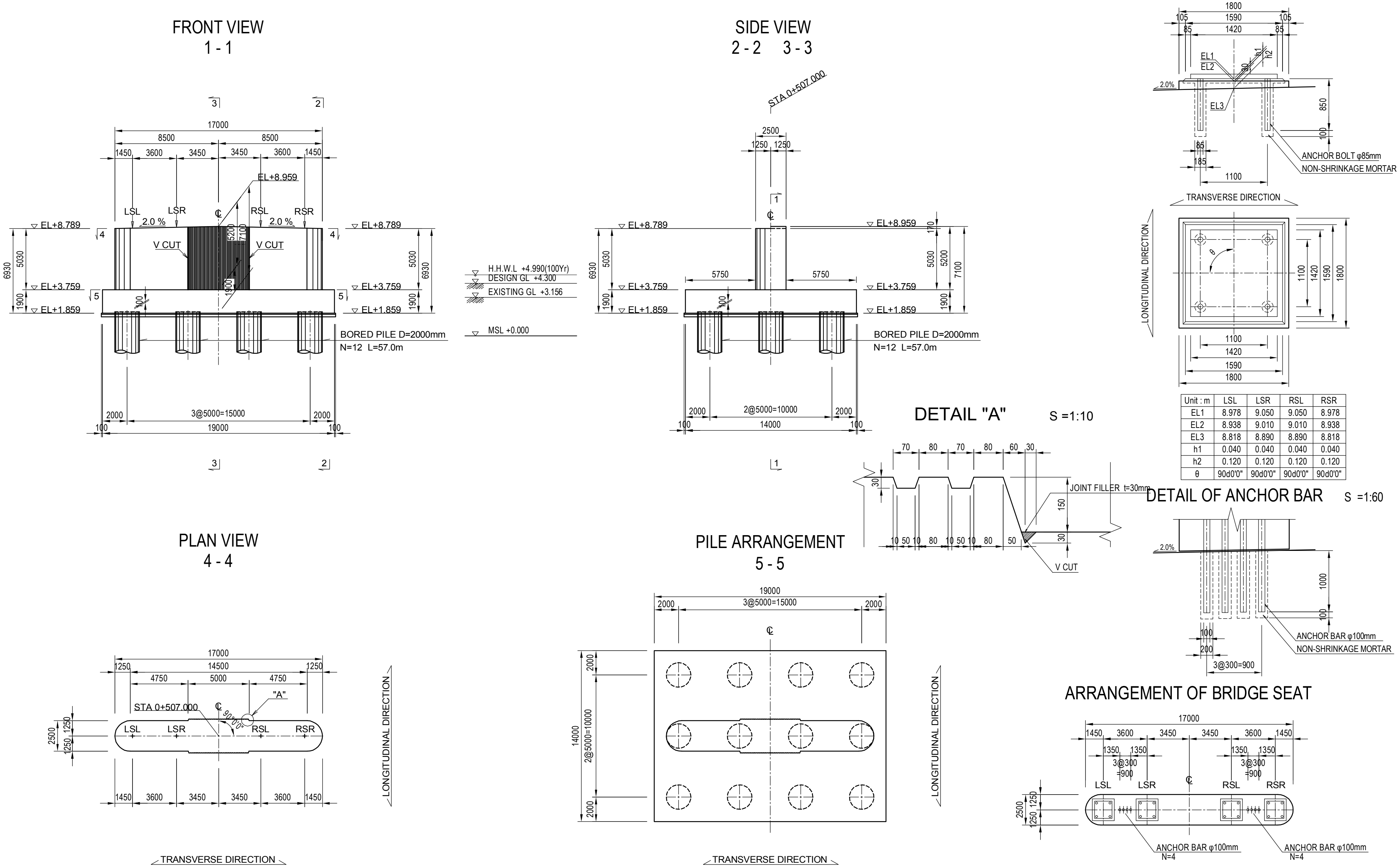
QUANTITY CALCULATION

OF

PIER P3

GENERAL VIEW OF P3 PIER

S =1:300



Unit : m	LSL	LSR	RSL	RSR
EL1	8.978	9.050	9.050	8.978
EL2	8.938	9.010	9.010	8.938
EL3	8.818	8.890	8.890	8.818
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

NOTE : 1.V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2.Regardless of existences of indications on the Drawings,baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 高弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF P3 PIER

PACKAGE: 1

DWG No.: P1-PB-2031

Summary Table

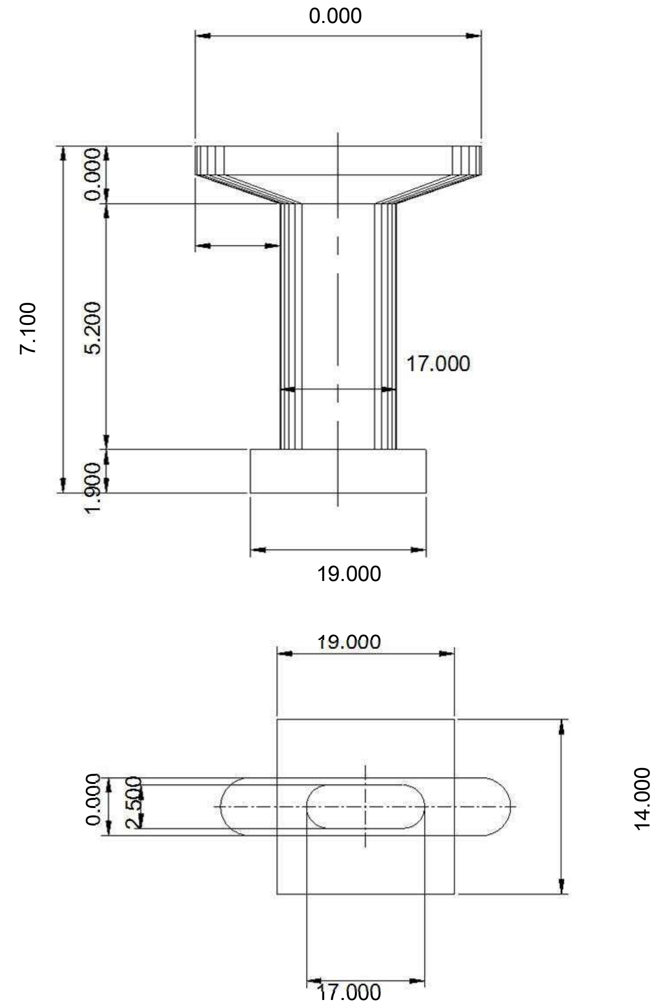
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	1.6	
				Column	m^3	214.0	
				Sub Total	m^3	215.6	
		σck = 24 N/mm2		Pile Cap	m^3	505.4	
				Sub Total	m^3	505.4	
		-		Total	m^3	721.0	
	Formwork	Normal Type		Beam	m^2	3.5	
				Column	m^2	191.6	
				Pile Cap	m^2	125.4	
				Total	m^2	320.5	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	54,166	
				D25 ~ D16	kg	30,606	
				D10 - D13	kg	620	
				Total	kg	85,392	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	15,130	
				D10 - D13	kg	620	
				Total	kg	15,750	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	54,166	
				D25 ~ D16	kg	15,476	
				D10 - D13	kg	0	
				Total	kg	69,642	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	27.3	
	Lean Concrete Form	Normal Type			m^2	6.7	
	Crushed stone				m^2	272.6	
	Box out for bearing	Cylindrial form length1		φ185 x 0.88m	m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ200 x 1.10m	m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

P3

<table>
<tr><th></th><th colspan="2">Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="11">Foundation</td><td colspan="2" rowspan="2">CIP Pile</td><td colspan="2" rowspan="2">Diameter
2000</td><td>Length</td><td>m</td><td>57.000</td><td></td></tr>
<tr><td>number</td><td>nos</td><td>12</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass
for
CIP &
SPSP</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>133,032</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>60,600</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>336</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>193,968</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td colspan="3">$\sigma ck = 24$ N/mm2</td><td>m^3</td><td>2,149.1</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3"></td><td>m^2</td><td>0</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">Spacers and Sonic Pipes</td><td>kg</td><td>15,028</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3">Inside cofferdam, unsuitable</td><td>m^3</td><td>820.5</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>820.5</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">purchased soil</td><td>m^3</td><td>212.7</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3">unsuitable soil</td><td>m^3</td><td>820.5</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III 12.50m</td><td>kg</td><td>138,750</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>185</td><td></td></tr>
<tr><td colspan="3">Number of Wellding Joint (on site)</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>369.7</td><td></td></tr>
<tr><td colspan="3">Supporting</td><td colspan="3">Wedge type (under 80 kN/m2)</td><td>m^3</td><td>0.0</td><td></td></tr>
</table>

Schimatic Diagram

P3



Top EL of Substructure	8.959 m
GL for construction	4.300 m

1. Concrete

1) Beam (σck = 24 N/mm2)

(0.000 × 0.000 × 0.000)-(0.000 /2)^2 x (4-π) x 0.000 = 0.0 m^3

1/2x(0.000 + 17.000) × 2.500) × 0 - 0.0 x 10^2 x [radians (40.65) - sin (radians(40.65))] = 0.0 m^3

π × (0.000 ^2)/4 × 0.000 = 0.0 m^3

V1 = 0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4	=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
				V2	=	1.6 m^3

3) Column (σck = 24 N/mm2)

{ (2.500) ^2 ÷ 4×π + (17.000 - 2.500) × 2.500 }× 5.200

= 214.0 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

19.000 × 14.000 × 1.900 = 505.4 m^3

(V4)

5) Total

σck = 30 N/mm2 ΣV = + + + = 0.0 m^3

σck = 24 N/mm2 ΣV = 0.0 + 1.6 + 214.0 + 505.4 = 721.0 m^3

2. Formwork

1) Beam

1/2 × (0.000 + 17.000) × 0.000 × 2 = 0.0 m^2

0.000 × 0.000 × 2 = 0.0 〃

π × 0.000 × 0.000 = 0.0 〃

1/2 × (0.000 + 0.000) × 8.500 × 2 = 0.0 〃

A1 = 0.0 m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
						A2	=	3.5 m^2

3) Column

{ 2.500 ×π + (17.000 - 2.500) x 2}× 5.200 = 191.6 m^2

(A3)

4) Pile cap

(19.000 + 14.000) × 2 × 1.900 = 125.4 m^2

(A4)

5) Total

ΣA = 0.0 + 3.5 + 191.6 + 125.4 = 320.5 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P3

Area

19.200 × 14.200 = 272.6 m^2

Volume (V = 272.6 × 0.100 = 27.3 m^3)

4. Lean concrete formwork

0.100 × (19.200 + 14.200) × 2 = 6.7 m^2

5. Crushed stone

Area 19.200 × 14.200 = 272.6 m^2

Volume (V = 272.6 × 0.200 = 54.5 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0				
D41		0	0				
D38		0	0				
D35		0	0				
D29 - D32	D32	0	30,607				30,607
	D29	0	23,559				23,559
	Sub Total	0	54,166	0	0	0	54,166
D25 ~ D16	D25	0	6,062			1,550	4,512
	D22	0	14,385			4,589	9,796
	D19	0	1,168				1,168
	D16	0	8,991			8,991	
	Sub Total	0	30,606	0	0	15,130	15,476
D10 - D13		0	620			620	
Total		**0**	**85,392**	**0**	**0**	**15,750**	**69,642**

7. Box-out for Bearings (Cylindrical form)

P3

Quantity for Type1

Anchor bar diameter φ85 mm — Anchor bar Length L_0 = 0.780 m

Pipe diameter 185 mm — Anchor bar Number n = 4 nos

Box-out Length l = 0.880 m

Total Length L = 0.880 × 4 (for one bearing) = 3.500 m

For one pier (4 locations)

Total Length L = 3.500 × 4 = 14.000 m

Quantity for Type2

Anchor bar diameter φ100 mm — Anchor bar Length L_0 = 1.000 m

Pipe diameter 200 mm — Anchor bar Number n = 4 nos

Box-out Length l = 1.100 m

Total Length L = 1.100 × 4 (for one bearing) = 4.400 m

For one pier (2 locations)

Total Length L = 4.400 × 2 = 8.800 m

Quantity for Type3

Anchor bar diameter φ0 mm — Anchor bar Length L_0 = 0.000 m

Pipe diameter 100 mm — Anchor bar Number n = 0 nos

Box-out Length l = 0.100 m

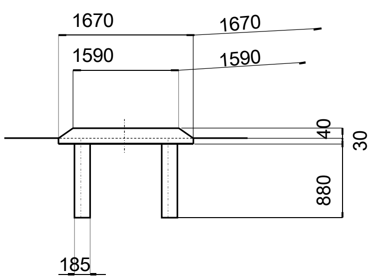
Total Length L = 0.100 × 0 (for one bearing) = 0.000 m

For one pier (0 locations)

Total Length L = 0.000 × 0 = 0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.040 /6 \times \{ (2 \times 1.590 + 1.670) \times 1.590$

$+ (2 \times 1.670 + 1.590) \times 1.670 \} = 0.106\ m^3$

$V2 = 1.670 \times 0.030 \times 1.670 = 0.084$ 〃

$= 0.190\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.190 \times 4 = 0.760\ m^3$

Mortar for anchor bar Type 1 P3

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

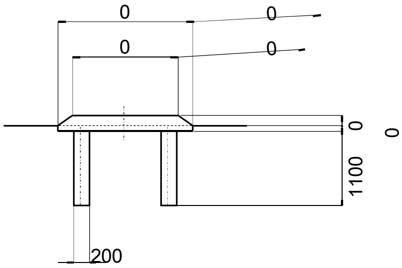
Void length 0.880

V3	=	π/4	× (	0.185	$)^2$×	0.880	×	4	=	0.095	〃
V4	=	- π/4	× (	φ85	$)^2$×	0.780	×	4	=	-0.018	〃
(Volume of anchor bar)								V	=	0.077	m^3

Anchor bar for an abutment (4 locations)

V_{T1-2} = 0.077 × 4 = 0.308 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

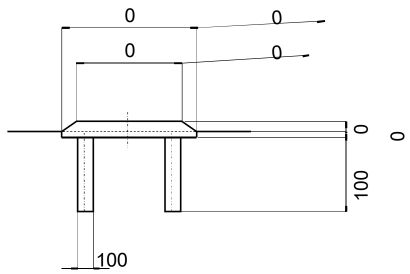
V3	=	π/4	× (	0.200	$)^2$×	1.100	×	4	=	0.138	〃
V4	=	- π/4	× (	φ100	$)^2$×	1.000	×	4	=	-0.031	〃
(Volume of anchor bar)								V	=	0.107	m^3

Anchor bar for an abutment (2 locations)

V_{T2-2} = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3

P3



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000
+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **1.282 m^3**

8. CIP Pile P3

(1)Diameter and number

D = 2.000 m L = 57.00 m n = 12 nos

Net Area = 3.142

2) Concrete = 3.142 57.00 12 = 2,149.1 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	6,510	78,120
	D29	4,576	54,912
	Sub-total	11,086	133,032
D25 ~ D16	D25	0	0
	D22	5,050	60,600
	D19	0	0
	D16	0	0
	Sub-total	5,050	60,600
D13		28	336
Total		16,164	193,968

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				104	1,248
STK400,φ60.5,t=2.3	59.500	3	3.300	589	7,069
STK400,φ114.3,t=3.5	58.500	1	9.560	559	6,711
Total					15,028

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (19.000 + 1.0 × 2)x(14.000 + 1.0 × 2) = 336.0 m^2

Excavation Depth 2.700 m

336.00 × 2.700 = 907.2 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.700 - 0.40) x 12 = -86.7 〃

V = 820.5 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.500	× (π /4 ×	2.500 ^2 +	2.500	×	14.500	)	=	20.6	m^3
Pile cap	19.000	×	14.000	×	1.900			=	505.4	〃
Lean concrete	19.200	×	14.200	×	0.300			=	81.8	〃
						Volume of Structure		=	607.8	m^3

V = 820.5 - 607.8 = 212.7 m^3

3) Surplus soil volume (unsuitable soil)

V = 820.5 = 820.5 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	185	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	

12.500	×	60.0	×	185		=	138,750
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	138,750

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		6		0
	H- ×××		6		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w= 2 x(0.000 + 2.500)+ 8.800]x 0.000) = 0.00 m^2

2) Pierstud

(Falsework height) H2= 5.200 m

w1= 14.500 x 5.200 x 2 = 150.80 m^2

w2= π x 4.700 x 5.200 = 76.80 m^2

Sub-Total = 227.60 m^2

3) Pile cap

w= 2 x(19.000 + 14.000)+ 8.800]x 1.900) = 142.10 m^2

Total = 369.70 m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

0 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

Package -1   PC Box Girder Bridge

QUANTITY CALCULATION

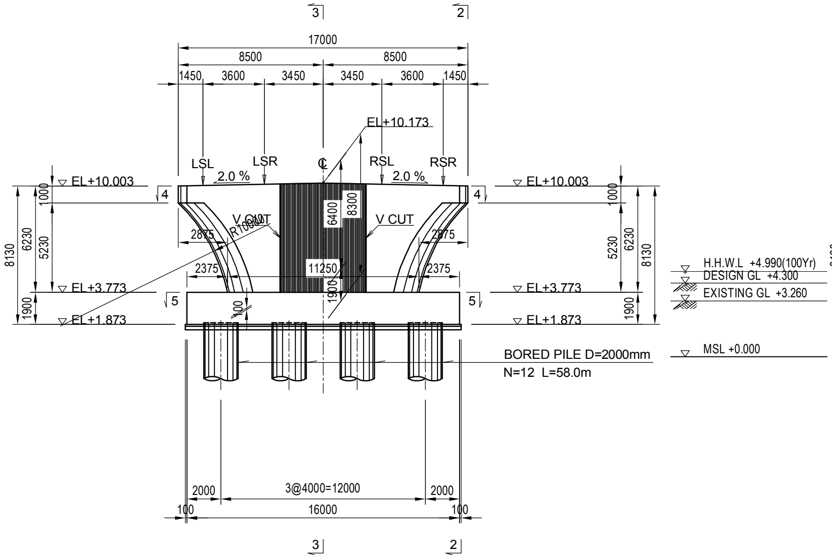
OF

PIER P4

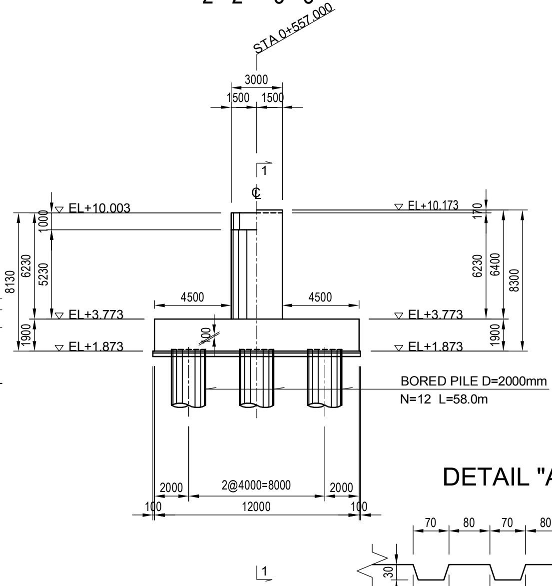
GENERAL VIEW OF P4 PIER

S =1:300

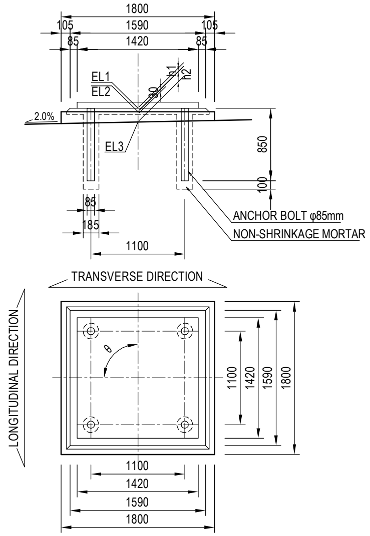
FRONT VIEW 1 - 1



SIDE VIEW 2 - 2 3 - 3

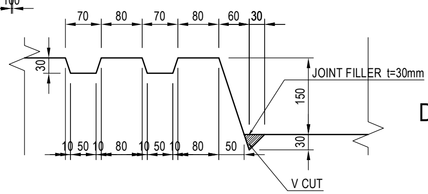


DETAIL OF BEARING S =1:60

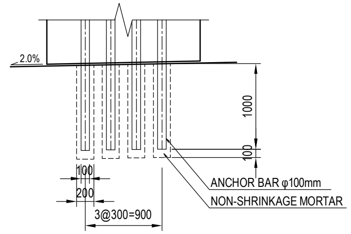


Unit : m	LSL	LSR	RSL	RSR
EL1	10.192	10.264	10.264	10.192
EL2	10.152	10.224	10.224	10.152
EL3	10.032	10.104	10.104	10.032
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

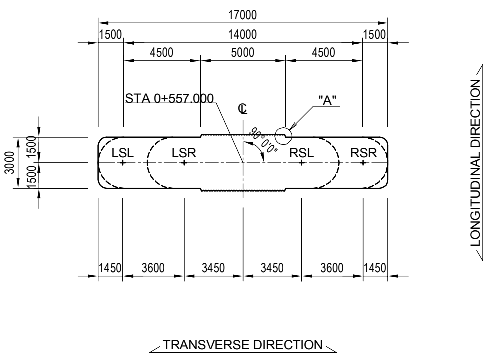
DETAIL "A" S =1:10



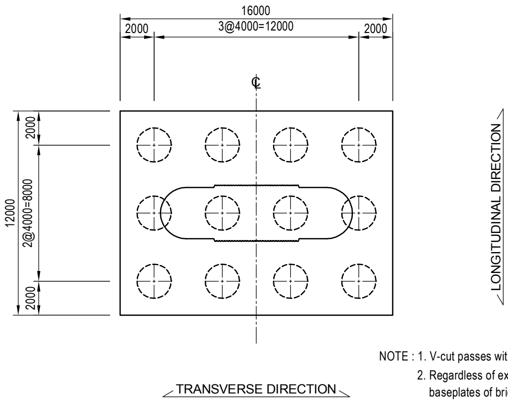
DETAIL OF ANCHOR BAR S =1:60



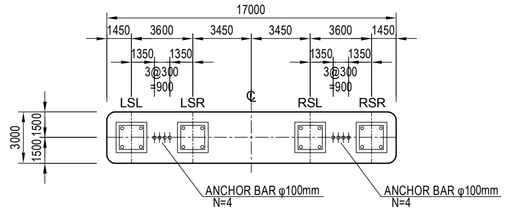
PLAN VIEW 4 - 4



PILE ARRANGEMENT 5 - 5



ARRANGEMENT OF BRIDGE SEAT



NOTE : 1. V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山雅弘	15 Jun.2017	GENERAL VIEW OF P4 PIER	1
				CHECKED BY	T. HAYAKAWA	早川知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野裕一	21 Jun.2017		P1-PB-2041

P4 Pier

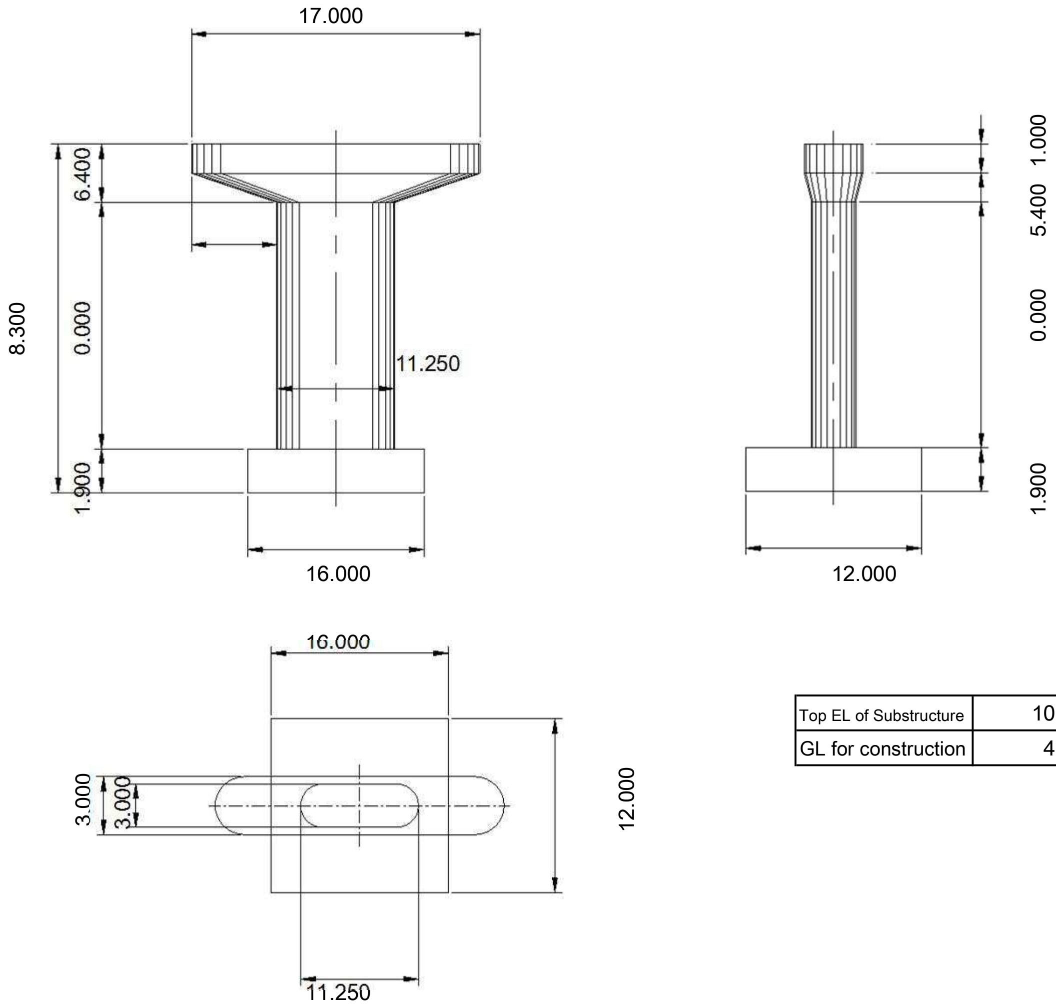
Summary Table

	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 30 N/mm2		Beam	m^3	251.6	
				Column	m^3	0.0	
				Sub Total	m^3	251.6	
		σck = 24 N/mm2		Pile Cap	m^3	364.8	
				Sub Total	m^3	364.8	
		-		Total	m^3	616.4	
	Formwork	Normal Type		Beam	m^2	236.2	
				Column	m^2	0.0	
				Pile Cap	m^2	106.4	
				Total	m^2	342.6	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	2,991	
				D10 - D13	kg	0	
				Total	kg	2,991	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	53,170	
				D25 ~ D16	kg	21,626	
				D10 - D13	kg	760	
				Total	kg	75,556	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	2,991	
				D10 - D13	kg	0	
				Total	kg	2,991	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	7,272	
				D25 ~ D16	kg	19,160	
				D10 - D13	kg	760	
				Total	kg	27,192	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	45,898	
				D25 ~ D16	kg	2,466	
				D10 - D13	kg	0	
				Total	kg	48,364	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	19.8	
	Lean Concrete Form	Normal Type			m^2	5.7	
	Crushed stone				m^2	197.6	
	Box out for bearing	Cylindrial form length1	φ185 x 0.88m		m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2	φ200 x 1.10m		m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3	φ100 x 0.10m		m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

<table>
<tr><th></th><th colspan="2">Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="11">Foundation</td><td colspan="2" rowspan="2">CIP Pile</td><td colspan="2" rowspan="2">Diameter 2000</td><td>Length</td><td>m</td><td>58.000</td><td></td></tr>
<tr><td>number</td><td>nos</td><td>12</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass for CIP & SPSP</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>99,528</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>54,120</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>61,896</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>336</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>215,880</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td colspan="3">$\sigma ck = 24^{N/mm2}$</td><td>m^3</td><td>2,186.8</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3"></td><td>m^2</td><td>0</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">Spacers and Sonic Pipes</td><td>kg</td><td>15,321</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3">Inside cofferdam, unsuitable</td><td>m^3</td><td>593.7</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>593.7</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">purchased soil</td><td>m^3</td><td>153.7</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3">unsuitable soil</td><td>m^3</td><td>593.7</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III 12.50m</td><td>kg</td><td>120,000</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>160</td><td></td></tr>
<tr><td colspan="3">Number of Wellding Joint (on site)</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>435.4</td><td></td></tr>
<tr><td colspan="3">Supporting</td><td colspan="3">Wedge type (under 80 kN/m2)</td><td>m^3</td><td>56.0</td><td></td></tr>
</table>

Schimatic Diagram

P4



Top EL of Substructure	10.173 m
GL for construction	4.300 m

Quantity Calculation P4

1. Concrete

1) Beam (σck = 30 $^{N/mm2}$)

(17.000 × 3.000 × 1.000)-(3.000 /2)^2 x (4-π) x 1.000 = 49.1 m^3

1/2x(14.000 + 8.250) × 3.000) × 5 - 3.0 x 10^2 x [radians (40.65) = 162.8 m^3
- sin (radians(40.65))]

π × (3.000 ^2)/4 × 5.400 = 38.2 m^3

V1 = 250.1 m^3

2) Base for bridge bearings (σck = 30 $^{N/mm2}$)

Type1 1.800 × 1.800 × 0.120 × 4 = 1.6 m^3
Type2 0.000 × 0.000 × 0.000 × 0 = 0.0 m^3
Type3 0.000 × 0.000 × 0.000 × 0 = 0.0 m^3

V2 = 1.6 m^3

3) Column (σck = 30 $^{N/mm2}$)

{ (3.000) ^2 ÷ 4×π + (11.250 - 3.000) × 3.000 }× 0.000

= 0.0 m^3
(V3)

4) Pile cap (σck = 24 $^{N/mm2}$)

16.000 × 12.000 × 1.900 = 364.8 m^3
(V4)

5) Total

σck = 30 $^{N/mm2}$ ΣV = 250.1 + 1.6 + 0.0 + = 251.6 m^3
σck = 24 $^{N/mm2}$ ΣV = 364.8 = 364.8 m^3

2. Formwork

1) Beam

1/2 × (17.000 + 11.250) × 5.400 × 2 = 152.6 m^2
17.000 × 1.000 × 2 = 34.0 〃
π × 3.000 × 1.000 = 9.4 〃
1/2 × (3.000 + 3.000) × 6.118 × 2 = 36.7 〃

A1 = 232.7 m^2

2) Base for bridge bearings

Type1 (1.800 + 1.800) × 2 × 0.120 × 4 = 3.5 m^2
Type2 (0.000 + 0.000) × 2 × 0.000 × 0 = 0 m^2
Type3 (0.000 + 0.000) × 2 × 0.000 × 0 = 0 m^2

A2 = 3.5 m^2

3) Column

{ 3.000 ×π + (11.250 - 3.000) x 2}× 0.000 = 0 m^2
(A3)

4) Pile cap

(16.000 + 12.000) × 2 × 1.900 = 106.4 m^2
(A4)

5) Total

ΣA = 232.7 + 3.5 + 0 + 106.4 = 342.6 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P4

Area

16.200 × 12.200 = 197.6 m^2

Volume (V = 197.6 × 0.100 = 19.8 m^3)

4. Lean concrete formwork

0.100 × (16.200 + 12.200) × 2 = 5.7 m^2

5. Crushed stone

Area 16.200 × 12.200 = 197.6 m^2

Volume (V = 197.6 × 0.200 = 39.5 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		0	0		0	0	0
D35		0	0		0	0	0
D29 - D32	D32	0	37,955		0	4,691	33,264
	D29	0	15,215		0	2,581	12,634
	Sub Total	0	53,170	0	0	7,272	45,898
D25 ~ D16	D25	2,991	12,567		2,991	12,567	0
	D22	0	0		0	0	0
	D19	0	2,798		0	1,786	1,012
	D16	0	6,261		0	4,807	1,454
	Sub Total	2,991	21,626	0	2,991	19,160	2,466
D10 - D13		0	760		0	760	0
Total		**2,991**	**75,556**	**0**	**2,991**	**27,192**	**48,364**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter φ85 mm — Anchor bar Length L_0 = 0.780 m
Pipe diameter 185 mm — Anchor bar Number n = 4 nos
Box-out Length l = 0.880 m
Total Length L = 0.880 × 4 (for one bearing) = 3.500 m
For one pier (4 locations)
Total Length L = 3.500 × 4 = 14.000 m

Quantity for Type2

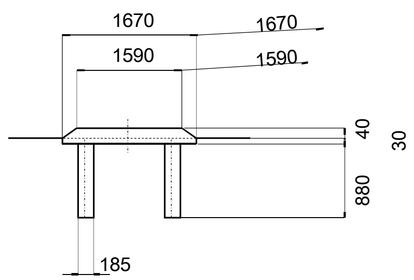
Anchor bar diameter φ100 mm — Anchor bar Length L_0 = 1.000 m
Pipe diameter 200 mm — Anchor bar Number n = 4 nos
Box-out Length l = 1.100 m
Total Length L = 1.100 × 4 (for one bearing) = 4.400 m
For one pier (2 locations)
Total Length L = 4.400 × 2 = 8.800 m

Quantity for Type3

Anchor bar diameter φ0 mm — Anchor bar Length L_0 = 0.000 m
Pipe diameter 100 mm — Anchor bar Number n = 0 nos
Box-out Length l = 0.100 m
Total Length L = 0.100 × 0 (for one bearing) = 0.000 m
For one pier (0 locations)
Total Length L = 0.000 × 0 = 0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.040 /6× { (2 × 1.590 + 1.670) × 1.590
+ (2 × 1.670 + 1.590) × 1.670 } = 0.106 m^3

V2 = 1.670 × 0.030 × 1.670 = 0.084 〃

= 0.190 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.190 × 4 = 0.760 m^3

Mortar for anchor bar Type 1

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.880

$V3 = \pi/4 \times (0.185)^2 \times 0.880 \times 4 = 0.095$ 〃

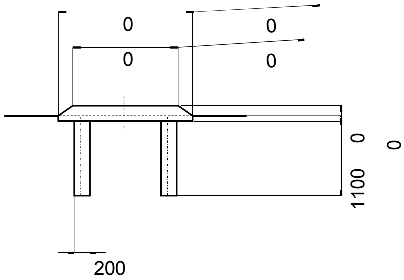
$V4 = - \pi/4 \times (φ85)^2 \times 0.780 \times 4 = -0.018$ 〃

(Volume of anchor bar) $V = 0.077\ m^3$

Anchor bar for an abutment (4 locations)

$V_{T1-2} = 0.077 \times 4 = 0.308\ m^3$

Quantity for Tyep 2



	mortar height
G5	
G6	
G7	
G8	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.000 /6 \times \{ (2 \times 0.000 + 0.000) \times 0.000$

$+ (2 \times 0.000 + 0.000) \times 0.000 \} = 0.000\ m^3$

$V2 = 0.000 \times 0.000 \times 0.000 = 0.000$ 〃

$= 0.000\ m^3$

Total base mortal volume for Type 2

$V_{T2-1} = 0.000 \times 0 = 0.000\ m^3$

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

$V3 = \pi/4 \times (0.200)^2 \times 1.100 \times 4 = 0.138$ 〃

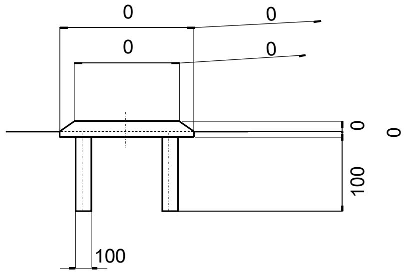
$V4 = - \pi/4 \times (φ100)^2 \times 1.000 \times 4 = -0.031$ 〃

(Volume of anchor bar) $V = 0.107\ m^3$

Anchor bar for an abutment (2 locations)

$V_{T2-2} = 0.107 \times 2 = 0.214\ m^3$

Quantity for Tyep 3 P4



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1	=	0.000 /6× { (2 × 0.000 + 0.000) × 0.000				
		+ (2 × 0.000 + 0.000) × 0.000 }		=	0.000	m^3
V2	=	0.000 × 0.000 × 0.000		=	0.000	〃
				=	0.000	m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = 1.282 m^3

8. CIP Pile P4

(1)Diameter and number

D = 2.000 m L = 58.00 m n = 12 nos

Net Area = 3.142

2)Concrete = 3.142 58.00 12 = 2,186.8 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		8294	99,528
D32 ~ D29	D32	0	0
	D29	4,510	54,120
	Sub-total	4,510	54,120
D25 ~ D16	D25	0	0
	D22	5,158	61,896
	D19	0	0
	D16	0	0
	Sub-total	5,158	61,896
D13		28	336
Total		17,990	215,880

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				109	1,308
STK400,φ60.5,t=2.3	60.500	3	3.300	599	7,187
STK400,φ114.3,t=3.5	59.500	1	9.560	569	6,826
Total					15,321

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (16.000 + 1.0 × 2)x(12.000 + 1.0 × 2) = 252.0 m^2

Excavation Depth 2.700 m

252.00 × 2.700 = 680.4 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.700 - 0.40) x 12 = -86.7 〃

V = 593.7 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.500	× (π /4 ×	3.000 ^2 +	3.000	×	8.250	)	=	15.9 m^3
Pile cap	16.000	×	12.000	×	1.900			=	364.8 〃
Lean concrete	16.200	×	12.200	×	0.300			=	59.3 〃
							Volume of Structure	=	440.0 m^3

V = 593.7 - 440.0 = 153.7 m^3

3) Surplus soil volume (unsuitable soil)

V = 593.7 = 593.7 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	160	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	
12.500 ×	60.0 ×		160				=	120,000
0.000 ×	76.1 ×		0				=	0
0.000 ×	105.0 ×		0				=	0
						Σw	=	120,000

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		6		0
	H- ×××		6		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 6.400 m

w=	2	x(	17.000	+	3.000	)+	8.800	]x	6.400)	=	312.30	m^2

2) Pierstud

(Falsework height) H2= 0.000 m

w1=	8.000 x	0.000 x	2		=	0.00	m^2
w2=	π x	5.200 x	0.000		=	0.00	m^2
Sub-Total					=	0.00	m^2

3) Pile cap

w=	2	x(	16.000	+	12.000	)+	8.800	]x	1.900)	=	123.10	m^2
Total										=	435.40	m^2

12. Supporting

【height Divis 〔Average height〕---- H≦30m

【Average height 】

1/2 × (6.230 + 5.230) = 5.70 m

【Support capacity】

Average beam height

1/2 × (1.000 + 6.230) = 3.60 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 9.86 x 2 = 19.70 m^2

A2= 0.43 x 4 = 1.70 m^2

【Supporting volume】

V1=			19.70	x	0.000			=	0.00	m^3
V2=	1/2	× (	19.700	+	1.700	)x	5.230	=	56.00	m^3
Total								=	56.00	m^3

Package -1 PC Box Girder Bridge

QUANTITY CALCULATION

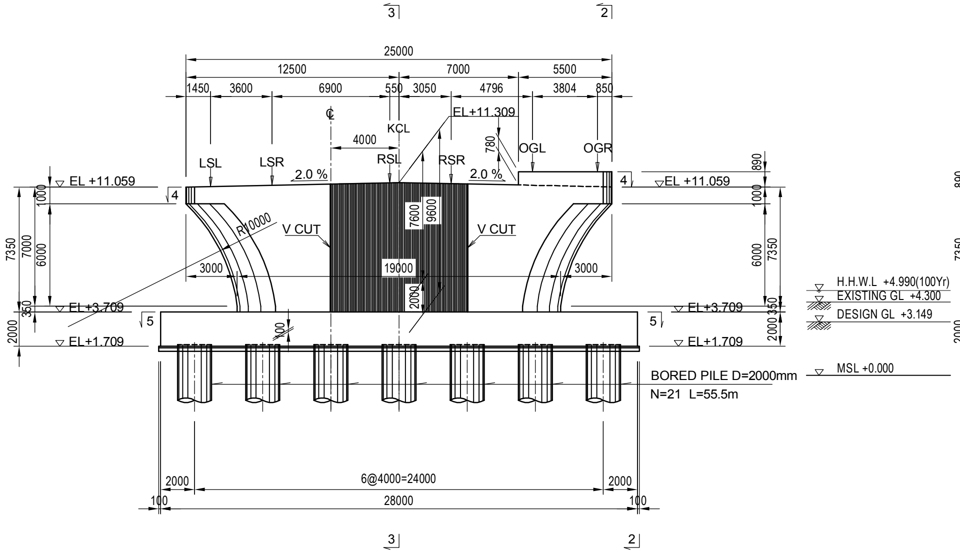
OF

PIER P5

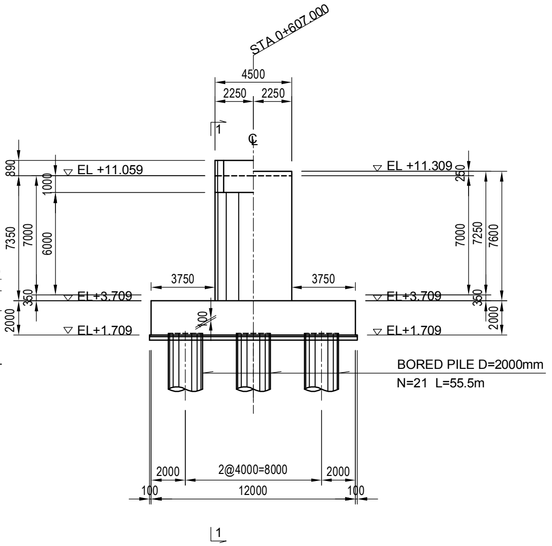
GENERAL VIEW OF P5 PIER(1)

S =1:300

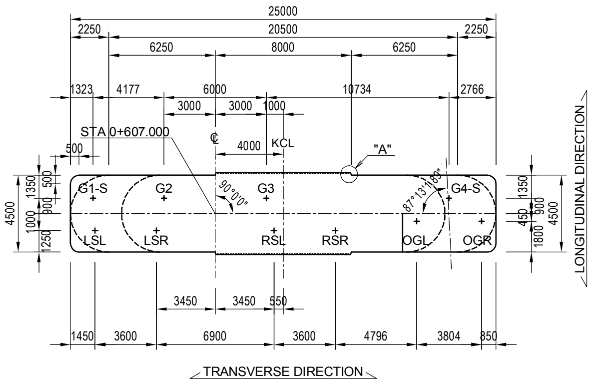
FRONT VIEW
1 - 1



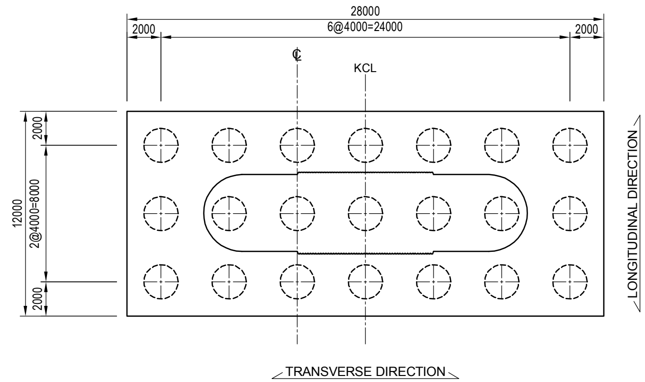
SIDE VIEW
2 - 2 3 - 3



PLAN VIEW
4 - 4



PILE ARRANGEMENT
5 - 5

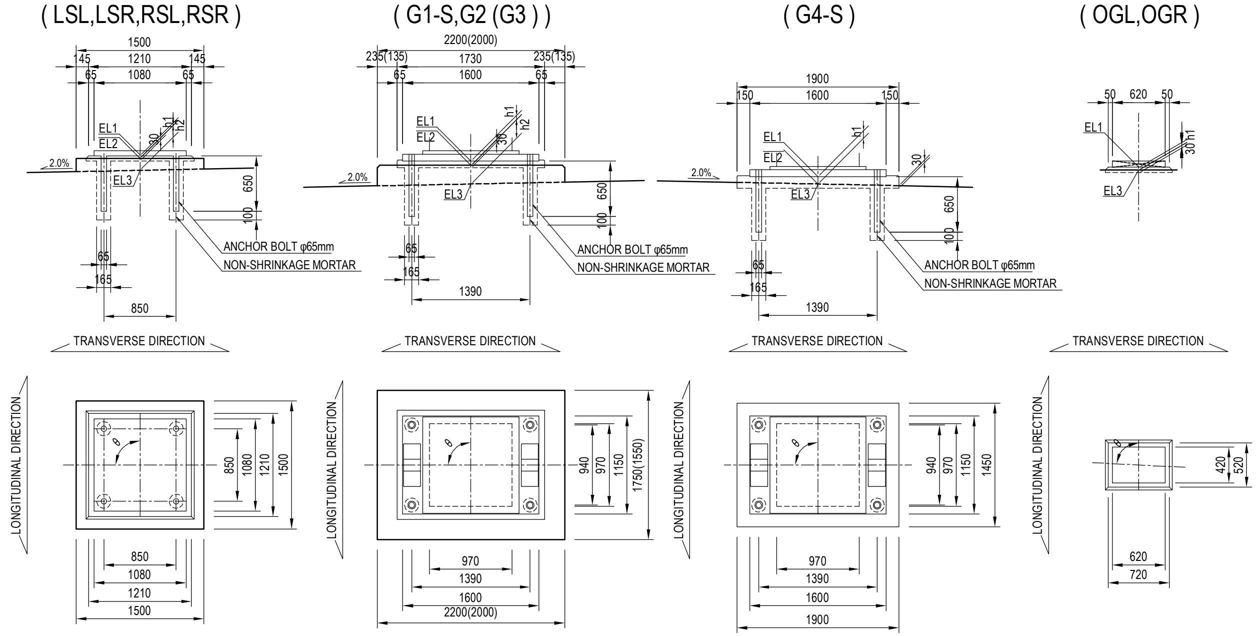


PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 尚弘	15 Jun.2017	GENERAL VIEW OF P5 PIER(1)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-PB-2051

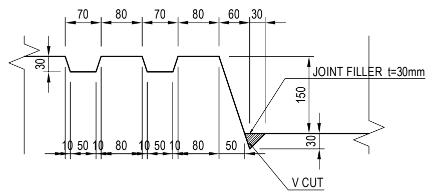
GENERAL VIEW OF P5 PIER(2)

S =1:300

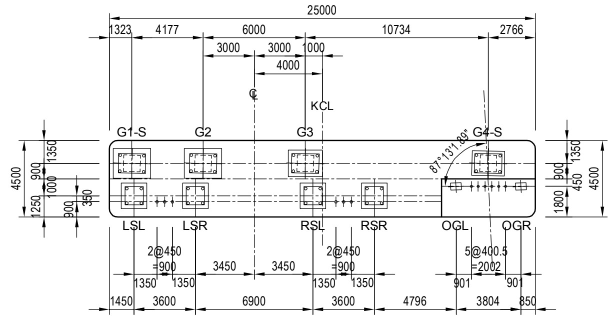
DETAIL OF BEARING S =1:60



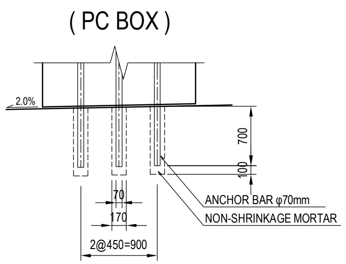
DETAIL "A" S =1:10

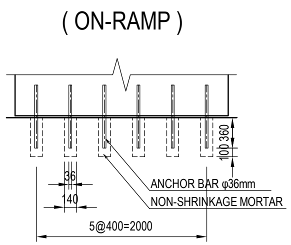


ARRANGEMENT OF BRIDGE SEAT



DETAIL OF ANCHOR BAR S =1:60





Unit : m	LSL	LSR	RSL	RSR	OGL	OGR	G1-S	G2	G3	G4-S
EL1	11.384	11.456	11.456	11.384	11.986	11.981	11.335	11.424	11.424	11.200
EL2	11.338	11.410	11.418	11.348			11.305	11.389	11.389	11.114
EL3	11.088	11.160	11.298	11.248	11.949	11.949	11.085	11.169	11.289	11.114
h1	0.046	0.046	0.038	0.036	0.037	0.032	0.030	0.035	0.035	0.086
h2	0.250	0.250	0.120	0.100			0.220	0.220	0.100	0.000
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"	87d13'1.89"	87d13'1.89"	91d6'42"	91d6'42"	91d6'42"	91d6'42"

NOTE : 1. V-cut passes with joint filler shall be made on abutment wall.
The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME: DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT

FINANCED BY: JAPAN INTERNATIONAL COOPERATION AGENCY

COUNTERPART: REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE

JICA STUDY TEAM: NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA		15 Jun.2017
CHECKED BY	T. HAYAKAWA		20 Jun.2017
APPROVED BY	Y. SANO		21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF P5 PIER(2)

PACKAGE: 1

DWG No.: P1-PB-2052

Summary Table

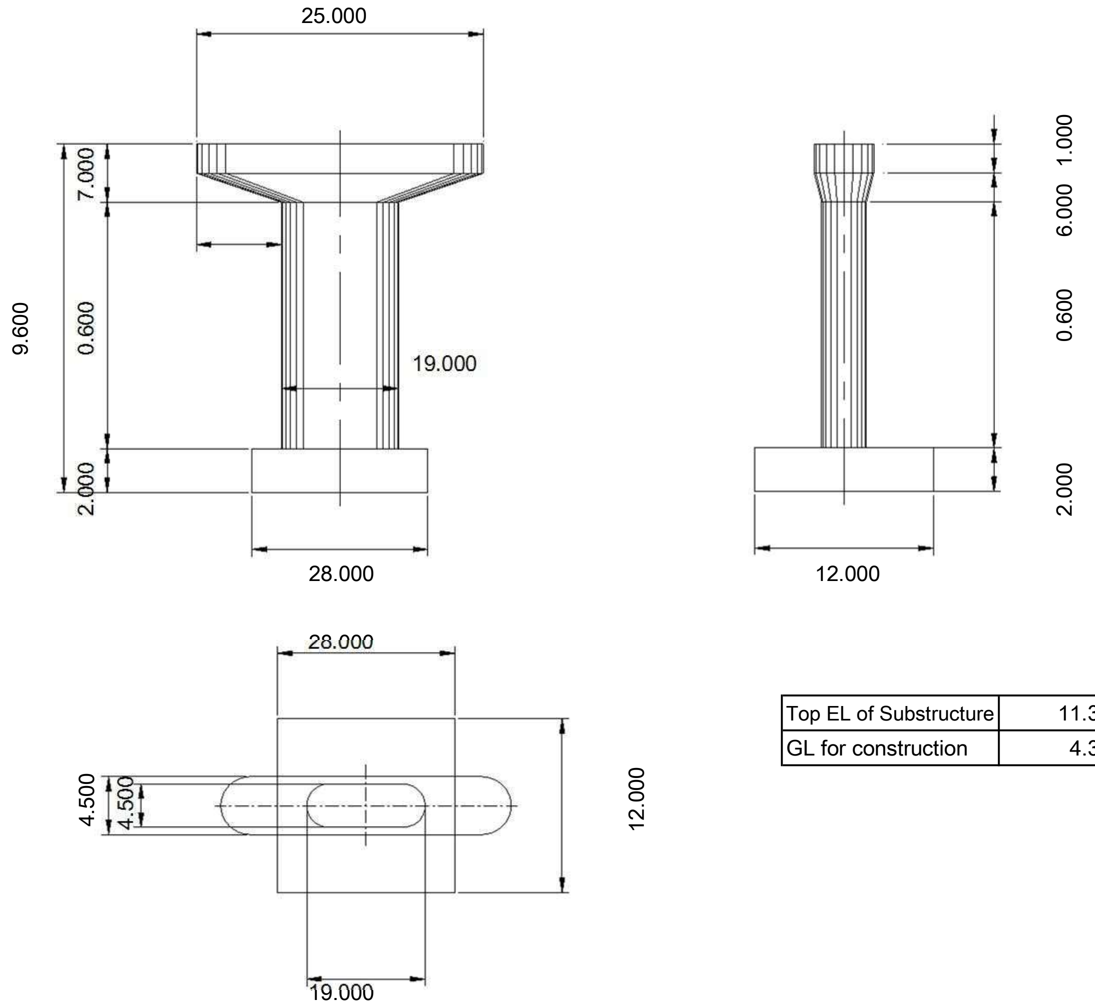
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 30 N/mm2		Beam	m^3	653.6	
				Column	m^3	48.7	
				Sub Total	m^3	702.3	
		σck = 24 N/mm2		Pile Cap	m^3	672.0	
				Sub Total	m^3	672.0	
		-		Total	m^3	1,374.3	
	Formwork	Normal Type		Beam	m^2	397.1	
				Column	m^2	25.9	
				Pile Cap	m^2	160.0	
				Total	m^2	583.0	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	6,161	
				D10 - D13	kg	0	
				Total	kg	6,161	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	91,298	
				D25 ~ D16	kg	42,077	
				D10 - D13	kg	1,390	
				Total	kg	134,765	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	6,161	
				D10 - D13	kg	0	
				Total	kg	6,161	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	8,049	
				D25 ~ D16	kg	38,369	
				D10 - D13	kg	1,390	
				Total	kg	47,808	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	83,249	
				D25 ~ D16	kg	3,708	
				D10 - D13	kg	0	
				Total	kg	86,957	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	34.4	
	Lean Concrete Form	Normal Type			m^2	8.1	
	Crushed stone				m^2	344.0	
	Box out for bearing	Cylindrial form length1		φ165 x 0.68m	m	10.8	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ165 x 0.69m	m	8.1	
		Cylindrical form number2			nos	12	
		Cylindrial form length3		φ165 x 0.63m	m	2.5	
		Cylindrical form number3			nos	4	
		Total Non-shrinkage mortar Volume			m^3	1.699	

P5

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	55.500	
					number	nos	21	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	237,048	
					D25 ~ D16	kg	103,719	
					D10 - D13	kg	588	
					Total	kg	341,355	
	Concrete		σck = 24 N/mm2			m^3	3,662.0	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	25,686	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	1,376.0	
			Total			m^3	1,376.0	
	Backfill		purchased soil			m^3	552.1	
	Surplus Soil		unsuitable soil			m^3	1,376.0	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 12.50m			kg	183,000	
			Number of Sheet Piles			nos	244	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	652.2	
Supporting			Wedge type (under 80 kN/m2)			m^3	116.5	

Schimatic Diagram

P5



Top EL of Substructure	11.309 m
GL for construction	4.300 m

Quantity Calculation P5

1. Concrete

1) Beam (σck = 30 $^{N/mm2}$)

(25.000 × 4.500 × 1.000)-(4.500 /2)^2 x (4-π) x 1.000 = 108.2 m^3

1/2x(20.500 + 14.500) × 4.500) × 6 - 4.5 x 10^2 x [radians (40.65) = 446.4 m^3

- sin (radians(40.65))]

π × (4.500 ^2)/4 × 6.000 = 95.4 m^3

V1 = 650.0 m^3

2) Base for bridge bearings (σck = 30 $^{N/mm2}$)

Type1 1.500 × 1.500 × 0.185 × 4 = 1.7 m^3

Type2 2.200 × 1.750 × 0.220 × 2 = 1.7 m^3

Type3 2.000 × 1.550 × 0.100 × 1 = 0.3 m^3

V2 = 3.7 m^3

3) Column (σck = 30 $^{N/mm2}$)

{ (4.500) ^2 ÷ 4×π + (19.000 - 4.500) × 4.500 }× 0.600

= 48.7 m^3

(V3)

4) Pile cap (σck = 24 $^{N/mm2}$)

28.000 × 12.000 × 2.000 = 672 m^3

(V4)

5) Total

σck = 30 $^{N/mm2}$ ΣV = 650.0 + 3.7 + 48.7 + = 702.3 m^3

σck = 24 $^{N/mm2}$ ΣV = 672.0 = 672.0 m^3

2. Formwork

1) Beam

1/2 × (25.000 + 19.000) × 6.000 × 2 = 264.0 m^2

25.000 × 1.000 × 2 = 50.0 〃

π × 4.500 × 1.000 = 14.1 〃

1/2 × (4.500 + 4.500) × 6.708 × 2 = 60.4 〃

A1 = 388.5 m^2

2) Base for bridge bearings

Type1 (1.500 + 1.500) × 2 × 0.185 × 4 = 4.4 m^2

Type2 (2.200 + 1.750) × 2 × 0.220 × 2 = 3.5 m^2

Type3 (2.000 + 1.550) × 2 × 0.100 × 1 = 0.7 m^2

A2 = 8.6 m^2

3) Column

{ 4.500 ×π + (19.000 - 4.500) x 2}× 0.600 = 25.9 m^2

(A3)

4) Pile cap

(28.000 + 12.000) × 2 × 2.000 = 160 m^2

(A4)

5) Total

ΣA = 388.5 + 8.6 + 25.9 + 160 = 583 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P5

Area

28.200 × 12.200 = 344.0 m^2

Volume (V = 344 × 0.100 = 34.4 m^3)

4. Lean concrete formwork

0.100 × (28.200 + 12.200) × 2 = 8.1 m^2

5. Crushed stone

Area 28.200 × 12.200 = 344.0 m^2

Volume (V = 344 × 0.200 = 68.8 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		0	0		0	0	0
D35		0	0		0	0	0
D29 - D32	D32	0	36,424		0	0	36,424
	D29	0	54,874		0	8,049	46,825
	Sub Total	0	91,298	0	0	8,049	83,249
D25 ~ D16	D25	6,161	22,466		6,161	22,466	0
	D22	0	3,735		0	3,735	0
	D19	0	1,321		0	0	1,321
	D16	0	14,555		0	12,168	2,387
	Sub Total	6,161	42,077	0	6,161	38,369	3,708
D10 - D13		0	1,390		0	1,390	0
Total		**6,161**	**134,765**	**0**	**6,161**	**47,808**	**86,957**

7. Box-out for Bearings (Cylindrical form) P5

Quantity for Type1

Anchor bar diameter			φ65	mm			Anchor bar Length	L_0	=	0.579 m
Pipe diameter			165	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	0.679	m						
Total Length	L	=	0.679	×	4	(for one bearing)			=	2.700 m
For one pier	(		4	locations	)					
Total Length	L	=	2.700	×	4				=	10.800 m

Quantity for Type2

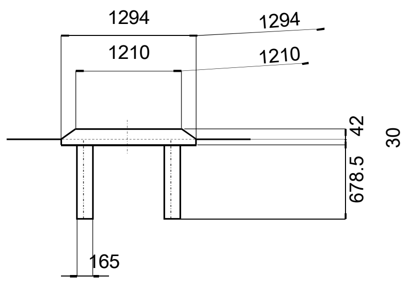
Anchor bar diameter			φ65	mm			Anchor bar Length	L_0	=	0.587 m
Pipe diameter			165	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	0.687	m						
Total Length	L	=	0.687	×	4	(for one bearing)			=	2.700 m
For one pier	(		3	locations	)					
Total Length	L	=	2.700	×	3				=	8.100 m

Quantity for Type3

Anchor bar diameter			φ65	mm			Anchor bar Length	L_0	=	0.534 m
Pipe diameter			165	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	0.634	m						
Total Length	L	=	0.634	×	4	(for one bearing)			=	2.500 m
For one pier	(		1	locations	)					
Total Length	L	=	2.500	×	1				=	2.500 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	46
G2	46
G3	38
G4	36
Ave	42

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.042 /6 \times \{ (2 \times 1.210 + 1.294) \times 1.210$

$+ (2 \times 1.294 + 1.210) \times 1.294 \} = 0.066\ m^3$

$V2 = 1.294 \times 0.030 \times 1.294 = 0.050$ 〃

$= 0.116\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.116 \times 4 = 0.464\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter	φ65
Anchor bar number	4
Void diameter	φ165
Void length	0.679

V3 = π/4 × 0.165 × 0.679 × 4 = 0.058 〃

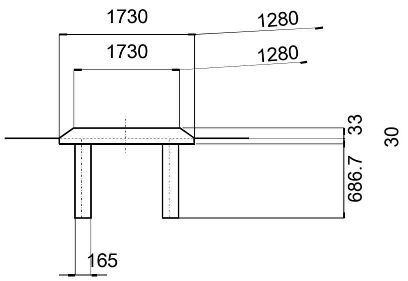
V4 = - π/4 × (φ65)^2× 0.579 × 4 = -0.008 〃

(Volume of anchor bar) V = 0.050 m^3

Anchor bar for an abutment (4 locations)

V_{T1-2} = 0.050 × 4 = 0.200 m^3

Quantity for Tyep 2



	mortar height
G5	30
G6	35
G7	35
G8	
Ave	33

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.033 /6× { (2 × 1.730 + 1.730) × 1.280

\+ (2 × 1.730 + 1.730) × 1.280 } = 0.073 m^3

V2 = 1.730 × 0.030 × 1.280 = 0.066 〃

= 0.139 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.139 × 3 = 0.417 m^3

Mortar for anchor bar Type 2

Anchor bar diameter	φ65
Anchor bar number	4
Void diameter	φ165
Void length	0.6867

V3 = π/4 × 0.165 × 0.687 × 4 = 0.059 〃

V4 = - π/4 × (φ65)^2× 0.587 × 4 = -0.008 〃

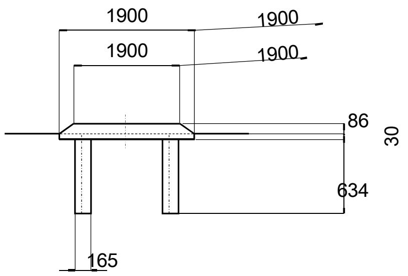
(Volume of anchor bar) V = 0.051 m^3

Anchor bar for an abutment (3 locations)

V_{T2-2} = 0.051 × 3 = 0.153 m^3

Quantity for Tyep 3

P5



	mortar height
G9	
G10	
G11	
G12	86
Ave	86

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a + a1)\times b + (2a1 + a)\times b1\}$

V1 = 0.086 /6× { (2 × 1.900 + 1.900) × 1.900
+ (2 × 1.900 + 1.900) × 1.900 } = 0.310 m^3

V2 = 1.900 × 0.030 × 1.900 = 0.108 〃

= 0.418 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.418 × 1 = 0.418 m^3

Mortar for anchor bar

Anchor bar diameter φ65

Anchor bar number 4

Void diameter φ165

Void length 0.634

V3 = π/4 × 0.165 × 0.634 × 4 = 0.054 〃

V4 = - π/4 × (φ65 $)^2$× 0.534 × 4 = -0.007 〃

(Volume of anchor bar) V = 0.047 m^3

Anchor bar for an abutment (1 locations)

V_{T3-2} = 0.047 × 1 = 0.047 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **1.699 m^3**

8. CIP Pile P5

(1)Diameter and number

D = 2.000 m L = 55.50 m n = 21 nos

Net Area = 3.142

2)Concrete = 3.142 55.50 21 = 3,662.0 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	6,989	146,769
	D29	4,299	90,279
	Sub-total	11,288	237,048
D25 ~ D16	D25	0	0
	D22	4,939	103,719
	D19	0	0
	D16	0	0
	Sub-total	4,939	103,719
D13		28	588
Total		16,255	341,355

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				104	2,184
STK400,φ60.5,t=2.3	58.000	3	3.300	574	12,058
STK400,φ114.3,t=3.5	57.000	1	9.560	545	11,443
Total					25,686

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (28.000 + 2.2 × 2)x(12.000 + 2.2 × 2) = 531.4 m^2

Excavation Depth 2.900 m

531.36 × 2.900 = 1540.9 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.900 - 0.40) x 21 = -164.9 〃

V = 1376.0 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (π /4	×	4.500 ^{2} +	4.500	×	14.500	)	=	48.7 m^3
Pile cap	28.000	×	12.000	×	2.000				=	672.0 〃
Lean concrete	28.200	×	12.200	×	0.300				=	103.2 〃
							Volume of Structure		=	823.9 m^3

V = 1376.0 - 823.9 = 552.1 m^3

3) Surplus soil volume (unsuitable soil)

V = 1376.0 = 1376.0 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	244	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

12.500	×	60.0	×	244		=	183,000	
0.000	×	76.1	×	0		=	0	
0.000	×	105.0	×	0		=	0	
					Σw	=	183,000	

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 7.000 m

w=	2	x(	25.000	+	4.500	)+	8.800	]x	7.000)	=	474.60 m^2

2) Pierstud

(Falsework height) H2= 0.000 m

w1=	14.500 x	0.000 x	2	=	0.00 m^2
w2=	π x	6.700 x	0.000	=	0.00 m^2
Sub-Total				=	0.00 m^2

3) Pile cap

w=	2	x(	28.000	+	12.000	)+	8.800	]x	2.000)	=	177.60 m^2
Total										=	652.20 m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (7.350 + 6.350) = 6.90 m

【Support capacity】

Average beam height

1/2 × (1.000 + 7.000) = 4.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 15.57 x 2 = 31.10 m^2

A2= 1.03 x 4 = 4.10 m^2

【Supporting volume】

V1=	31.10	x	0.350				=	10.90 m^3
V2=	1/2	× (	31.100	+	4.100)x	6.000	=	105.60 m^3
Total							=	116.50 m^3

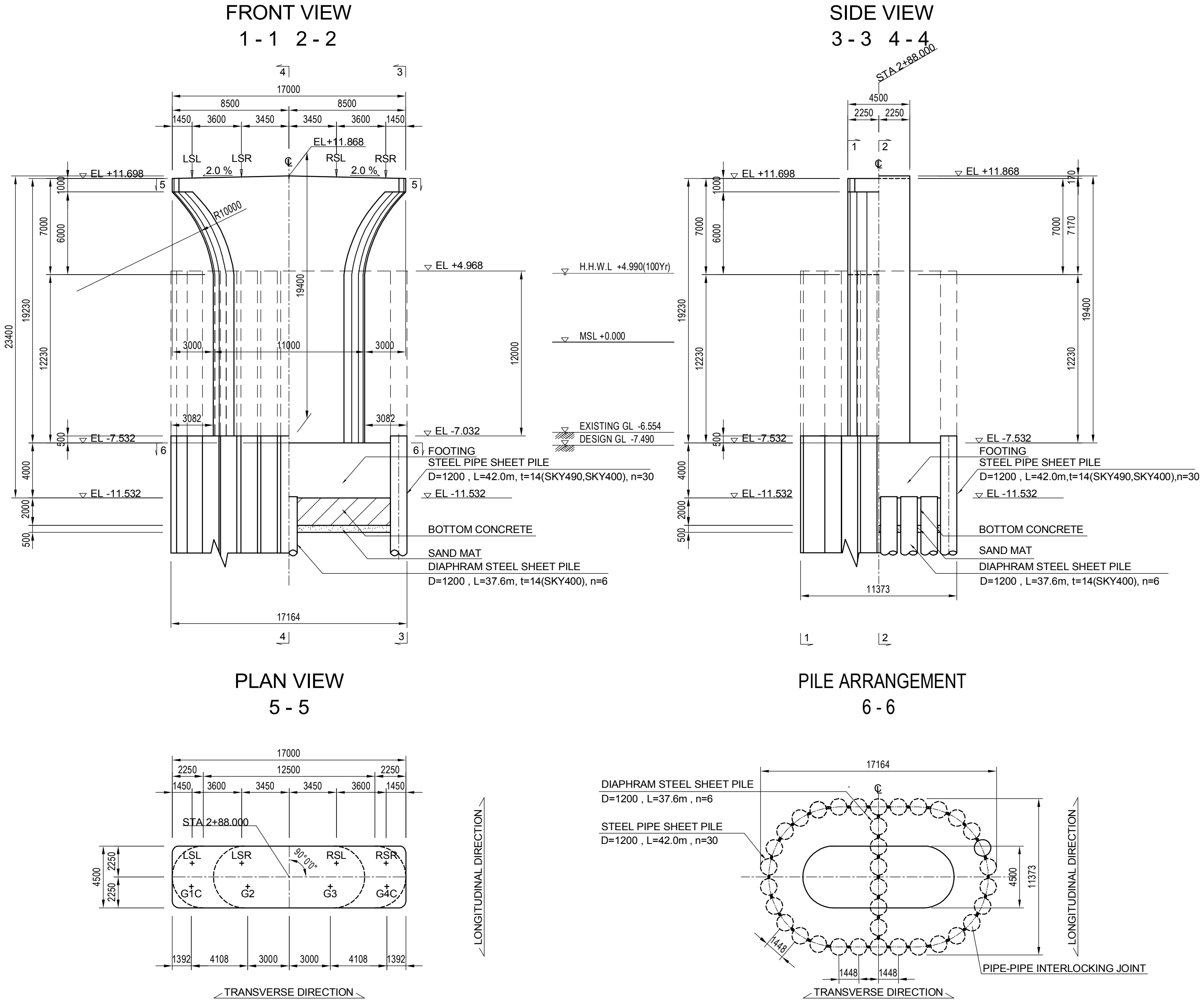
QUANTITY CALCULATION

OF

PIER P20

GENERAL VIEW OF P20 PIER(1)

S =1:300



PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

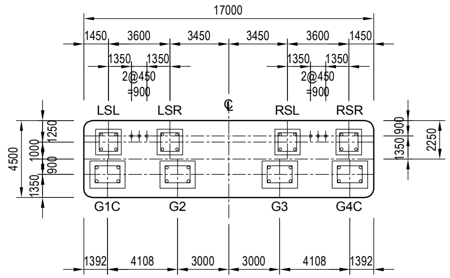
	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017

DRAWING TITLE	PACKAGE
GENERAL VIEW OF P20 PIER(1)	2
	DWG No.
	P2-PB-2011

GENERAL VIEW OF P20 PIER(2)

S =1:300

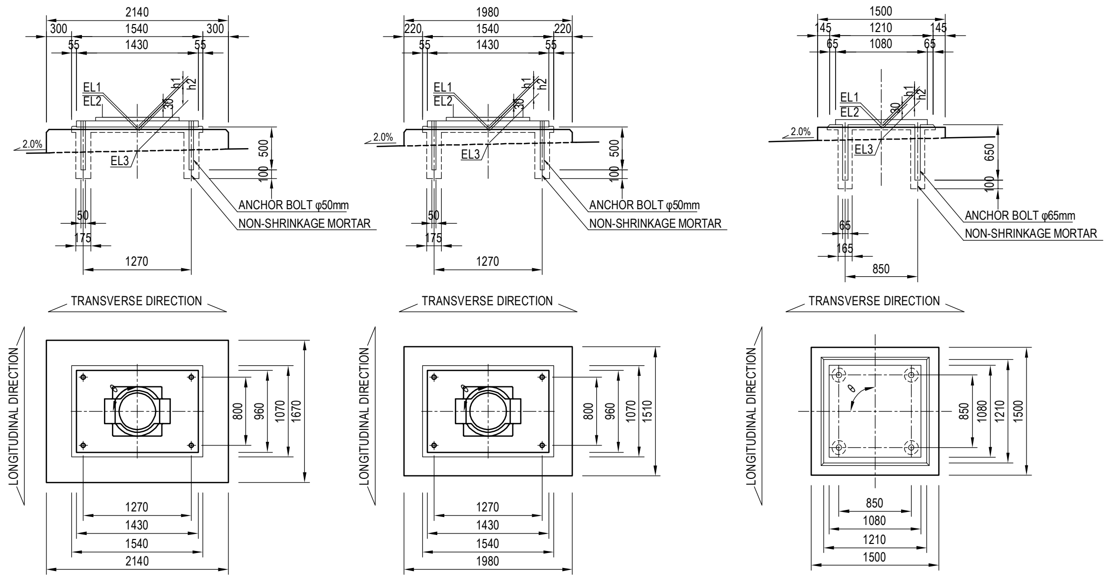
ARRANGEMENT OF BRIDGE SEAT



DETAIL OF BEARING

S =1:60

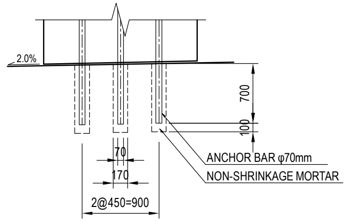
(G1C,G4C) (G2,G3) (LSL,LSR,RSL,RSR)



Unit : m	G1C	G2	G3	G4C	LSL	LSR	RSL	RSR
EL1	12.023	12.023	12.023	12.023	11.847	11.919	11.919	11.847
EL2	11.977	11.978	11.978	11.977	11.817	11.889	11.889	11.817
EL3	11.727	11.808	11.808	11.727	11.727	11.799	11.799	11.727
h1	0.046	0.045	0.045	0.046	0.030	0.030	0.030	0.030
h2	0.250	0.170	0.170	0.250	0.090	0.090	0.090	0.090
θ	90d0'00"	90d0'00"	90d0'00"	90d0'00"	90d0'00"	90d0'00"	90d0'00"	90d0'00"

DETAIL OF ANCHOR BAR

S =1:60



Notes : Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017
APPROVED BY	Y. SANO	[illegible]	21 Jun.2017

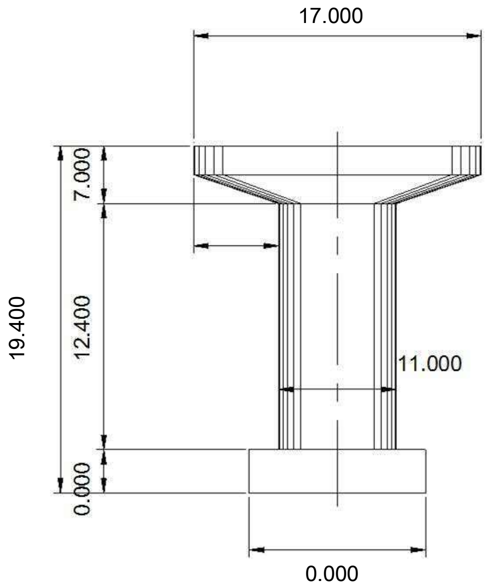
DRAWING TITLE	PACKAGE
GENERAL VIEW OF P20 PIER(2)	2
	DWG No.
	P2-PB-2012

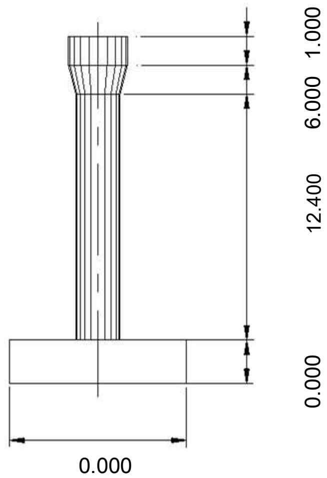
Summary Table

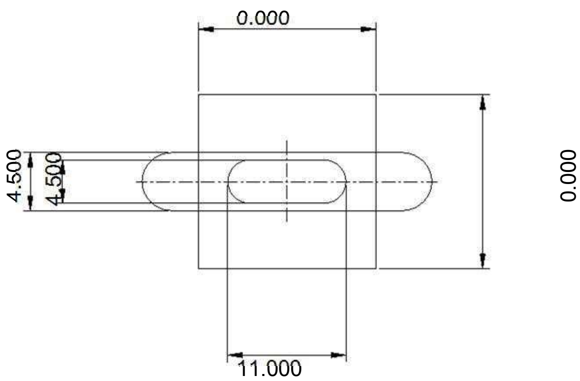
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 30 N/mm2		Beam	m^3	399.4	
				Column	m^3	559.9	
				Sub Total	m^3	959.3	
		σck = 24 N/mm2		Pile Cap	m^3	0.0	
				Sub Total	m^3	0.0	
		-		Total	m^3	959.3	
	Formwork	Normal Type		Beam	m^2	280.2	
				Column	m^2	336.5	
				Pile Cap	m^2	0.0	
				Total	m^2	616.7	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	65,652	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	65,652	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	14,860	
				D29 - D 32	kg	27,395	
				D25 ~ D16	kg	61,758	
				D10 - D13	kg	236	
				Total	kg	104,249	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	65,652	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	65,652	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	5,472	
				D25 ~ D16	kg	56,696	
				D10 - D13	kg	0	
				Total	kg	62,168	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	14,860	
				D29 - D 32	kg	21,923	
				D25 ~ D16	kg	5,062	
				D10 - D13	kg	236	
				Total	kg	42,081	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	0.0	
	Lean Concrete Form	Normal Type			m^2	0.0	
	Crushed stone				m^2	0.0	
	Box out for bearing	Cylindrial form length1		φ175 x 0.63m	m	10.8	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ165 x 0.75m	m	12	
		Cylindrical form number2			nos	16	
		Cylindrial form length3		φ170 x 0.80m	m	4.8	
		Cylindrical form number3			nos	6	
		Total Non-shrinkage mortar Volume			m^3	1.756	

P20

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 1200		Length	m	0.000	
					number	nos	0	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	0	
					D25 ~ D16	kg	0	
					D10 - D13	kg	0	
					Total	kg	0	
	Concrete		σck = 24 N/mm2			m^3	0.0	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	0	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	0.0	
			Total			m^3	0.0	
	Backfill		purchased soil			m^3	0.0	
	Surplus Soil		unsuitable soil			m^3	0.0	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 0.00m			kg	0	
			Number of Sheet Piles			nos	0	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	1,027.3	
Supporting			Wedge type (under 80 kN/m2)			m^3	114.0	







Top EL of Substructure	11.868 m
GL for construction	-6.554 m

1. Concrete

1) Beam (σck = 30 N/mm2)

(17.000 × 4.500 × 1.000)-(4.500 /2)^2 x (4-π) x 1.000	=	72.2 m^3
1/2x(12.500 + 6.500) × 4.500) × 6 - 4.5 x 10^2 x [radians (40.65) - sin (radians(40.65))]	=	230.4 m^3
π × (4.500 ^2)/4 × 6.000	=	95.4 m^3
V1	=	398.0 m^3

2) Base for bridge bearings (σck = 30 N/mm2)

Type1 1.870 × 1.400 × 0.112 × 2 (P19 side)	=	0.6 m^3
Type2 1.500 × 1.500 × 0.090 × 4 (P21 side)	=	0.8 m^3
Type3 0.000 × 0.000 × 0.000 × 0	=	0.0 m^3
V2	=	1.4 m^3

3) Column (σck = 30 N/mm2)

{ (4.500) ^2 ÷ 4×π + (11.000 - 4.500) × 4.500 }× 12.400

= 559.9 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

0.000 × 0.000 × 0.000 = 0 m^3

(V4)

5) Total

σck = 30 N/mm2 ΣV = 398.0 + 1.4 + 559.9 +	=	959.3 m^3
σck = 24 N/mm2 ΣV = 0.0	=	0.0 m^3

2. Formwork

1) Beam

1/2 × (17.000 + 11.000) × 6.000 × 2	=	168.0 m^2
17.000 × 1.000 × 2	=	34.0 〃
π × 4.500 × 1.000	=	14.1 〃
1/2 × (4.500 + 4.500) × 6.708 × 2	=	60.4 〃
A1	=	276.5 m^2

2) Base for bridge bearings

Type1 (1.870 + 1.400) × 2 × 0.112 × 2	=	1.5 m^2
Type2 (1.500 + 1.500) × 2 × 0.090 × 4	=	2.2 m^2
Type3 (0.000 + 0.000) × 2 × 0.000 × 0	=	0 m^2
A2	=	3.7 m^2

3) Column

{ 4.500 ×π + (11.000 - 4.500) x 2}× 12.400 = 336.5 m^2

(A3)

4) Pile cap

(0.000 + 0.000) × 2 × 0.000 = 0 m^2

(A4)

5) Total

ΣA = 276.5 + 3.7 + 336.5 + 0 = 616.7 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 0 cm) P20

Area

0.200 × 0.200 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

4. Lean concrete formwork

0.000 × (0.200 + 0.200) × 2 = 0 m^2

5. Crushed stone

Area 0.000 × 0.000 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		0	0		0	0	0
D35		0	14,860		0	0	14,860
D29 - D32	D32	65,652	12,050		65,652	0	12,050
	D29	0	15,345		0	5,472	9,873
	Sub Total	65,652	27,395	0	65,652	5,472	21,923
D25 ~ D16	D25	0	22,334		0	22,334	0
	D22	0	5,355		0	5,355	0
	D19	0	4,398		0		4,398
	D16	0	29,671		0	29,007	664
	Sub Total	0	61,758	0	0	56,696	5,062
D10 - D13		0	236		0	0	236
Total		**65,652**	**104,249**	**0**	**65,652**	**62,168**	**42,081**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ51	mm		Anchor bar Length	L_0	=	0.510	m
Pipe diameter			175	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	0.630	m						
Total Length	L	=	0.630	×	4 (for one bearing)			=	2.520	m
For one pier	(		4	locations)						
Total Length	L	=	2.520	×	4			=	10.800	m

Quantity for Type2

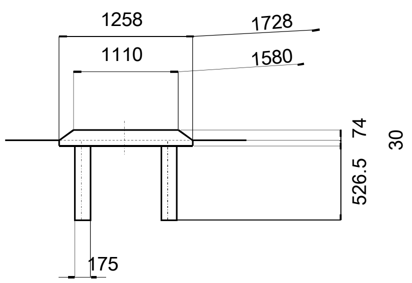
Anchor bar diameter			φ65	mm		Anchor bar Length	L_0	=	0.650	m
Pipe diameter			165	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	0.750	m						
Total Length	L	=	0.750	×	4 (for one bearing)			=	3.000	m
For one pier	(		4	locations)						
Total Length	L	=	3.000	×	4			=	12.000	m

Quantity for Type3

Anchor bar diameter			φ70	mm		Anchor bar Length	L_0	=	0.700	m
Pipe diameter			170	mm		Anchor bar Number	n	=	3	nos
Box-out Length	l	=	0.800	m						
Total Length	L	=	0.800	×	3 (for one bearing)			=	2.400	m
For one pier	(		2	locations)						
Total Length	L	=	2.400	×	2			=	4.800	m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	62
G2	85
G3	85
G4	62
Ave	74

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.074 /6 \times \{ (2 \times 1.110 + 1.258) \times 1.580$
$+ (2 \times 1.258 + 1.110) \times 1.728 \} = 0.145\ m^3$

$V2 = 1.258 \times 0.030 \times 1.728 = 0.065$ 〃

$= 0.210\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.210 \times 4 = 0.840\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter φ51

Anchor bar number 4

Void diameter φ175

Void length 0.630

V3 = π/4 × 0.175 × 0.630 × 4 = 0.061 〃

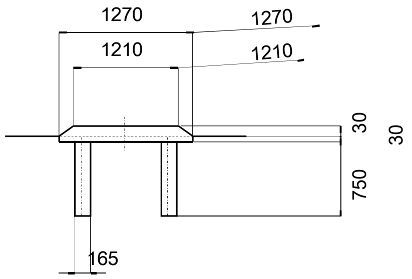
V4 = - π/4 × (φ51)^2× 0.510 × 4 = -0.004 〃

(Volume of anchor bar) V = 0.057 m^3

Anchor bar for an abutment (4 locations)

$V_{T1\text{-}2}$ = 0.057 × 4 = 0.228 m^3

Quantity for Tyep 2



	mortar height
G5	30
G6	30
G7	30
G8	30
Ave	30

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.030 /6× { (2 × 1.210 + 1.270) × 1.210

\+ (2 × 1.270 + 1.210) × 1.270 } = 0.046 m^3

V2 = 1.270 × 0.030 × 1.270 = 0.048 〃

= 0.094 m^3

Total base mortal volume for Type 2

$V_{T2\text{-}1}$ = 0.094 × 4 = 0.376 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ65

Anchor bar number 4

Void diameter φ165

Void length 0.75

V3 = π/4 × 0.165 × 0.750 × 4 = 0.064 〃

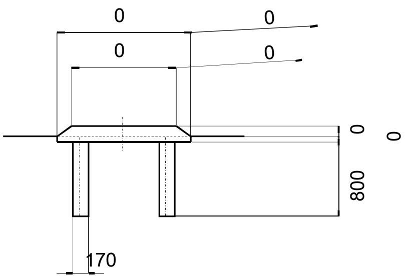
V4 = - π/4 × (φ65)^2× 0.650 × 4 = -0.009 〃

(Volume of anchor bar) V = 0.055 m^3

Anchor bar for an abutment (4 locations)

$V_{T2\text{-}2}$ = 0.055 × 4 = 0.220 m^3

Quantity for Tyep 3 P20



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1	=	0.000	/6× { (2	×	0.000	+	0.000	) ×	0.000			
			+ (2	×	0.000	+	0.000	) ×	0.000 }	=	0.000	m^3
V2	=	0.000	×	0.000	×	0.000				=	0.000	〃
										=	0.000	m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter	φ70
Anchor bar number	3
Void diameter	φ170
Void length	0.800

V3 = π/4 × 0.170 × 0.800 × 3 = 0.054 〃

V4 = - π/4 × (φ70)^2× 0.700 × 3 = -0.008 〃

(Volume of anchor bar) V = 0.046 m^3

Anchor bar for an abutment (2 locations)

V_{T3-2} = 0.046 × 2 = 0.092 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **1.756** m^3

8. CIP Pile P20

(1)Diameter and number

D = 0.000 m L = 0.00 m n = 0 nos

Net Area = 0

2)Concrete = 0 0.00 0 = 0.0 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38			0
D35			0
D32 ~ D29	D32		0
	D29		0
	Sub-total	0	0
D25 ~ D16	D25		0
	D22		0
	D19		0
	D16		0
	Sub-total	0	0
D13			0
Total		0	0

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer					0
STK400,φ60.5,t=2.3			3.300	0	0
STK400,φ114.3,t=3.5			9.560	0	0
Total					0

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (0.000 + 1.0 × 0)x(0.000 + 1.0 × 0) = 0.0 m^2

Excavation Depth 1.000 m

0.00 × 1.000 = 0.0 m^3

Deduction of Pile Volume 0.000 ^2 x π/4 ×(1.000 - 0.10) x 0 = 0.0 〃

V = 0.0 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	1.000	× (π /4	×	4.500 ^2 +	4.500	×	6.500	)	=	45.2 m^3
Pile cap	0.000	×	0.000	×	0.000				=	0.0 〃
Lean concrete	0.200	×	0.200	×	0.000				=	0.0 〃
						Volume of Structure			=	45.2 m^3

V = 0.0 - 45.2 = 0.0 m^3

3) Surplus soil volume (unsuitable soil)

V = 0.0 = 0.0 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	0.000	m	0	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

0.000	×	60.0	×	0		=	0
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	0

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕-H≦30m

1) Beam

(Falsework height)	H1=	7.270 m									
w=	2	x(	17.000	+	4.500	)+	8.800	]x	7.270)	=	376.60 m^2

2) Pierstud

(Falsework height)	H2=	14.130 m			
w1=	12.500 x	14.130 x	2	=	353.30 m^2
w2=	π x	6.700 x	14.130	=	297.40 m^2
Sub-Total				=	650.70 m^2

3) Pile cap

w=	2	x(	0.000	+	0.000	)+	8.800	]x	0.000)	=	0.00 m^2
Total										=	1027.30 m^2

12. Supporting

【height Divis 〔Average height〕----H≦30m

【Average height 】

1/2 ×(7.270 + 6.270) = 6.80 m

【Support capacity】

Average beam height

1/2 ×(1.000 + 7.000) = 4.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 15.57 x 2 = 31.10 m^2

A2= 1.03 x 4 = 4.10 m^2

【Supporting volume】

V1=	31.10	x	0.270				=	8.40 m^3
V2=	1/2	×(	31.100 +	4.100	)x	6.000	=	105.60 m^3
Total							=	114.00 m^3

QUANTITY CALCULATION

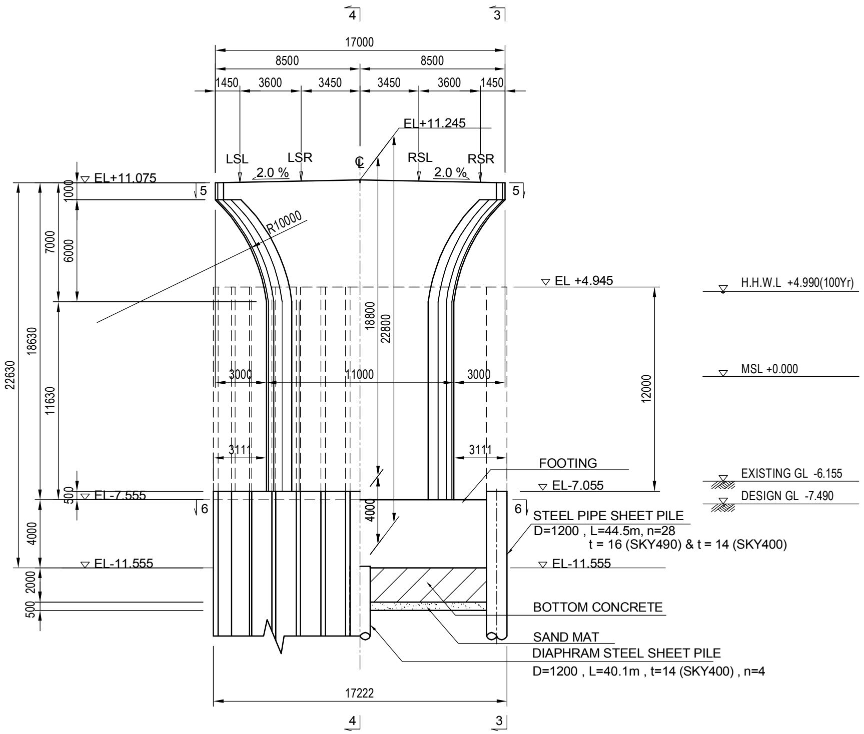
OF

PIER P21

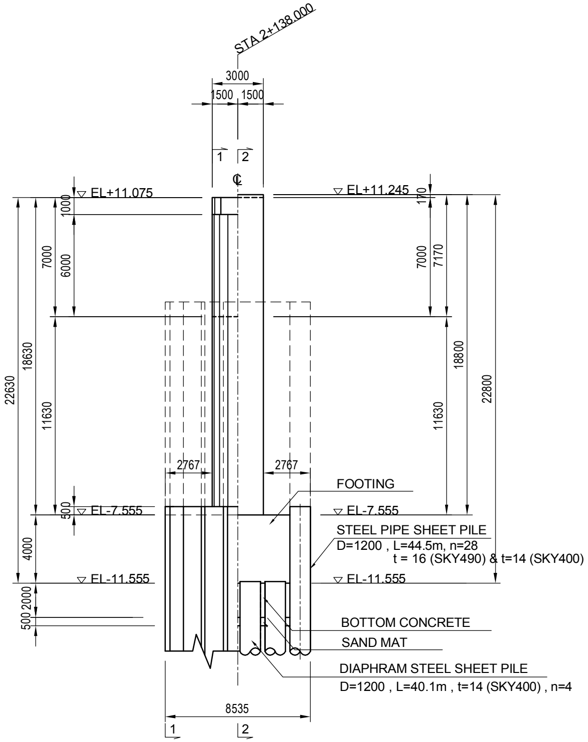
GENERAL VIEW OF P21 PIER

S =1:300

FRONT VIEW
1 - 1　2 - 2

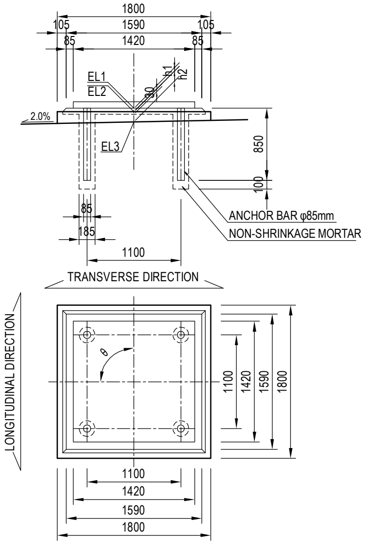


SIDE VIEW
3 - 3　4 - 4



DETAIL OF BEARING

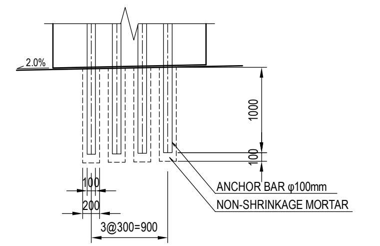
S =1:60



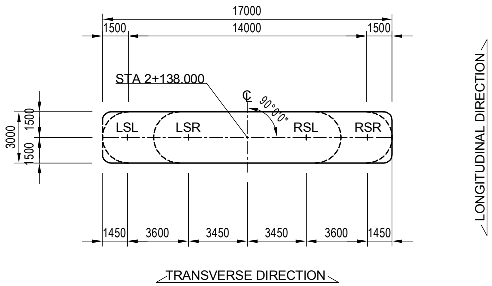
Unit : m	LSL	LSR	RSL	RSR
EL1	11.264	11.336	11.336	11.264
EL2	11.224	11.296	11.296	11.224
EL3	11.104	11.176	11.176	11.104
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR

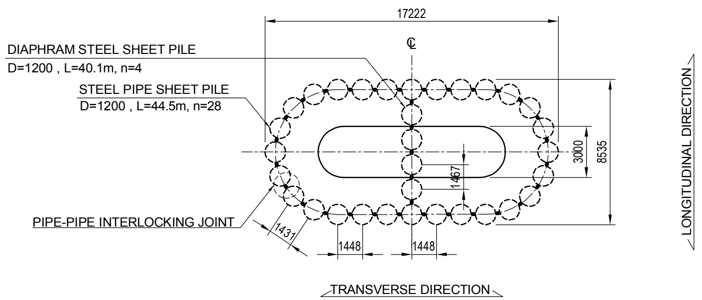
S =1:60



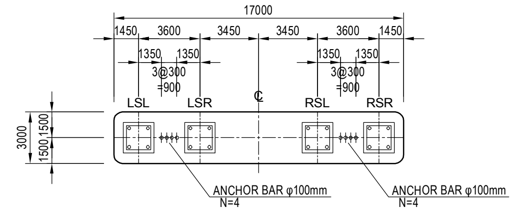
PLAN VIEW
5 - 5



PILE ARRANGEMENT
6 - 6



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

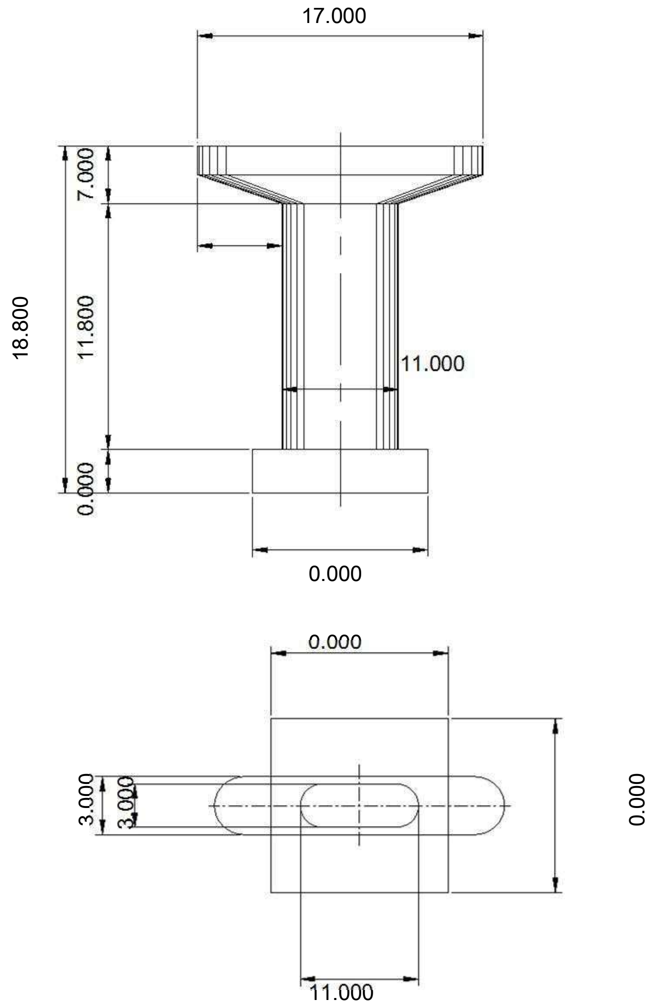
	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 [illegible]	20 Jun.2017
APPROVED BY	Y. SANO	佐野 [illegible]	21 Jun.2017

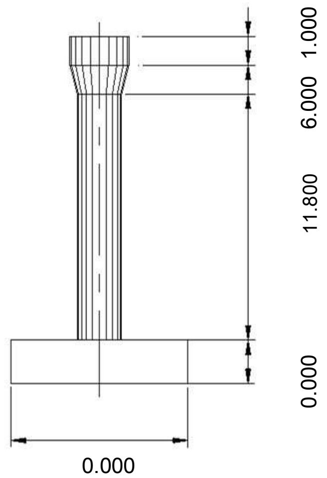
DRAWING TITLE	PACKAGE	DWG No.
GENERAL VIEW OF P21 PIER	2	P2-PB-2021

Summary Table

	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 30 N/mm2		Beam	m^3	273.6	
				Column	m^3	366.6	
				Sub Total	m^3	640.2	
		σck = 24 N/mm2		Pile Cap	m^3	0.0	
				Sub Total	m^3	0.0	
		-		Total	m^3	640.2	
	Formwork	Normal Type		Beam	m^2	255.1	
				Column	m^2	300.0	
				Pile Cap	m^2	0.0	
				Total	m^2	555.1	
	Rebar	SD 390	Total Mass	D 38	kg	78,940	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	78,940	
			Stud Joint	D38	nos	392	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	392	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	31,615	
				D25 ~ D16	kg	41,696	
				D10 - D13	kg	157	
				Total	kg	73,468	
		SD 390	Mass for Body	D 38	kg	78,940	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	78,940	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	7,272	
				D25 ~ D16	kg	37,057	
				D10 - D13	kg	0	
				Total	kg	44,329	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	24,343	
				D25 ~ D16	kg	4,639	
				D10 - D13	kg	157	
				Total	kg	29,139	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	0.0	
	Lean Concrete Form	Normal Type			m^2	0.0	
	Crushed stone				m^2	0.0	
	Box out for bearing	Cylindrial form length1		φ185 x 0.89m	m	14.4	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ200 x 1.10m	m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.286	

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 1200		Length	m	0.000	
					number	nos	0	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	0	
					D25 ~ D16	kg	0	
					D10 - D13	kg	0	
					Total	kg	0	
	Concrete		$\sigma ck = 24$ N/mm2			m^3	0.0	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	0	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	0.0	
			Total			m^3	0.0	
	Backfill		purchased soil			m^3	0.0	
	Surplus Soil		unsuitable soil			m^3	0.0	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 0.00m			kg	0	
			Number of Sheet Piles			nos	0	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	978.5	
Supporting			Wedge type (under 80 kN/m2)			m^3	60.5	





Top EL of Substructure	11.245 m
GL for construction	-6.155 m

1. Concrete

1) Beam (σck = 30 N/mm2)

(	17.000 ×	3.000 ×	1.000)-(	3.000	/2)^2 x (4-π)	x	1.000		=	49.1 m^3
1/2x(	14.000 +	8.000) ×	3.000) ×	6 -	3.0 x	10^2 x [radians (40.65)	- sin (radians(40.65))]		=	180.6 m^3
	π × (	3.000 ^2)/4	×	6.000					=	42.4 m^3
								V1	=	272.1 m^3

2) Base for bridge bearings (σck = 30 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4		=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
					V2	=	1.6 m^3

3) Column (σck = 30 N/mm2)

{ (3.000) ^2 ÷ 4×π + (11.000 - 3.000) × 3.000 }× 11.800

= 366.6 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

0.000 × 0.000 × 0.000 = 0 m^3

(V4)

5) Total

σck = 30 N/mm2	ΣV	=	272.1 +	1.6 +	366.6 +		=	640.2 m^3
σck = 24 N/mm2	ΣV	=	0.0				=	0.0 m^3

2. Formwork

1) Beam

1/2	× (17.000 +	11.000) ×	6.000 ×	2		=	168.0 m^2
17.000	× 1.000	× 2				=	34.0 〃
π	× 3.000	× 1.000				=	9.4 〃
1/2	× (3.000 +	3.000) ×	6.708 ×	2		=	40.2 〃
					A1	=	251.6 m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
						A2	=	3.5 m^2

3) Column

{ 3.000 ×π + (11.000 - 3.000) x 2}× 11.800 = 300 m^2

(A3)

4) Pile cap

(0.000 + 0.000) × 2 × 0.000 = 0 m^2

(A4)

5) Total

ΣA = 251.6 + 3.5 + 300 + 0 = 555.1 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 0 cm) P21

Area

0.200 × 0.200 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

4. Lean concrete formwork

0.000 × (0.200 + 0.200) × 2 = 0 m^2

5. Crushed stone

Area 0.000 × 0.000 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		78,940	0	392	78,940	0	0
D35		0	0		0	0	0
D29 - D32	D32	0	21,973		0	4,691	17,282
	D29	0	9,642		0	2,581	7,061
	Sub Total	0	31,615	0	0	7,272	24,343
D25 ~ D16	D25	0	12,456		0	12,456	0
	D22	0	0		0	0	0
	D19	0	5,325		0	1,786	3,539
	D16	0	23,915		0	22,815	1,100
	Sub Total	0	41,696	0	0	37,057	4,639
D10 - D13		0	157		0	0	157
Total		**78,940**	**73,468**	**392**	**78,940**	**44,329**	**29,139**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ85	mm			Anchor bar Length	L_0	=	0.790	m
Pipe diameter			185	mm			Anchor bar Number	n	=	4	nos
Box-out Length	l	=	0.890	m							
Total Length	L	=	0.890	×	4	(for one bearing)			=	3.600	m
For one pier	(		4	locations	)						
Total Length	L	=	3.600	×	4				=	14.400	m

Quantity for Type2

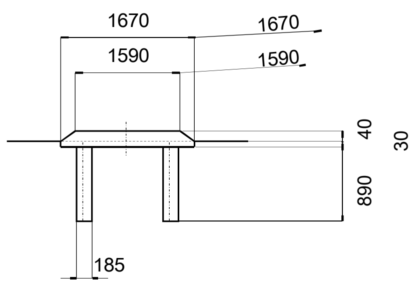
Anchor bar diameter			φ100	mm			Anchor bar Length	L_0	=	1.000	m
Pipe diameter			200	mm			Anchor bar Number	n	=	4	nos
Box-out Length	l	=	1.100	m							
Total Length	L	=	1.100	×	4	(for one bearing)			=	4.400	m
For one pier	(		2	locations	)						
Total Length	L	=	4.400	×	2				=	8.800	m

Quantity for Type3

Anchor bar diameter			φ0	mm			Anchor bar Length	L_0	=	0.000	m
Pipe diameter			100	mm			Anchor bar Number	n	=	0	nos
Box-out Length	l	=	0.100	m							
Total Length	L	=	0.100	×	0	(for one bearing)			=	0.000	m
For one pier	(		0	locations	)						
Total Length	L	=	0.000	×	0				=	0.000	m

Non-shrinkage Mortar for bearings

Quantity for Type 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.040 /6 \times \{ (2 \times 1.590 + 1.670) \times 1.590$

$+ (2 \times 1.670 + 1.590) \times 1.670 \} = 0.106\ m^3$

$V2 = 1.670 \times 0.030 \times 1.670 = 0.084$ 〃

$= 0.190\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.190 \times 4 = 0.760\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.890

V3 = π/4 × (0.185 $)^2$× 0.890 × 4 = 0.096 〃

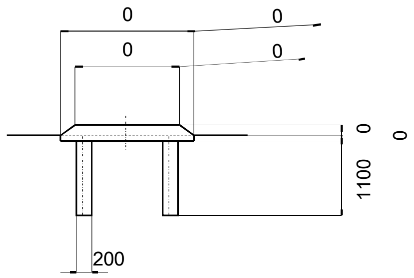
V4 = - π/4 × (φ85 $)^2$× 0.790 × 4 = -0.018 〃

(Volume of anchor bar) V = 0.078 m^3

Anchor bar for an abutment (4 locations)

V_{T1-2} = 0.078 × 4 = 0.312 m^3

Quantity for Tyep 2



	mortar height
G5	
G6	
G7	
G8	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

\+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

V3 = π/4 × (0.200 $)^2$× 1.100 × 4 = 0.138 〃

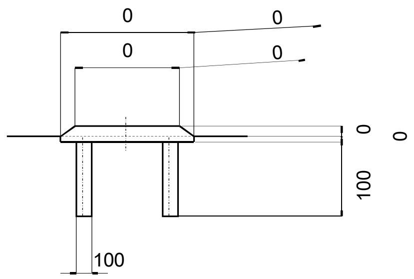
V4 = - π/4 × (φ100 $)^2$× 1.000 × 4 = -0.031 〃

(Volume of anchor bar) V = 0.107 m^3

Anchor bar for an abutment (2 locations)

V_{T2-2} = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3 P21



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000
+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **1.286** m^3

8. CIP Pile P21

(1)Diameter and number

D = 0.000 m L = 0.00 m n = 0 nos

Net Area = 0

2)Concrete = 0 0.00 0 = 0.0 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38			0
D35			0
D32 ~ D29	D32		0
	D29		0
	Sub-total	0	0
D25 ~ D16	D25		0
	D22		0
	D19		0
	D16		0
	Sub-total	0	0
D13			0
Total		0	0

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer					0
STK400,φ60.5,t=2.3			3.300	0	0
STK400,φ114.3,t=3.5			9.560	0	0
Total					0

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	0.000	+	1.0	×	0)x(	0.000	+	1.0	×	0) =	0.0 m^2

Excavation Depth 1.400 m

	0.00	×	1.400						=	0.0 m^3
Deduction of Pile Volume	0.000 ^2 x	π/4	×(	1.400	-	0.10) x	0		=	0.0 〃
								V	=	0.0 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	1.400	× (	π	/4	×	3.000 ^2 +	3.000	×	8.000	)	=	43.5 m^3
Pile cap	0.000	×	0.000		×	0.000					=	0.0 〃
Lean concrete	0.200	×	0.200		×	0.000					=	0.0 〃
								Volume of Structure			=	43.5 m^3

V = 0.0 - 43.5 = 0.0 m^3

3) Surplus soil volume (unsuitable soil)

V = 0.0 = 0.0 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	0.000	m	0	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

0.000	×	60.0	×	0		=	0
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	0

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕-H≦30m

1) Beam

(Falsework height) H1= 6.650 m

w=	2	x(	17.000	+	3.000	)+	8.800	]x	6.650	)	=	324.50	m^2

2) Pierstud

(Falsework height) H2= 14.750 m

w1=	14.000 x	14.750 x	2	=	413.00	m^2
w2=	π x	5.200 x	14.750	=	241.00	m^2
Sub-Total				=	654.00	m^2

3) Pile cap

w=	2	x(	0.000	+	0.000	)+	8.800	]x	0.000	)	=	0.00	m^2
Total											=	978.50	m^2

12. Supporting

【height Divis 〔Average height〕---- H≦30m

【Average height 】

1/2 × (6.650 + 5.650) = 6.20 m

【Support capacity】

Average beam height

1/2 × (1.000 + 7.000) = 4.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 9.86 x 2 = 19.70 m^2

A2= 0.43 x 4 = 1.70 m^2

【Supporting volume】

V1= 19.70 x 0.000 = 0.00 m^3

V2= 1/2 × (19.700 + 1.700)x 5.650 = 60.50 m^3

Total = 60.50 m^3

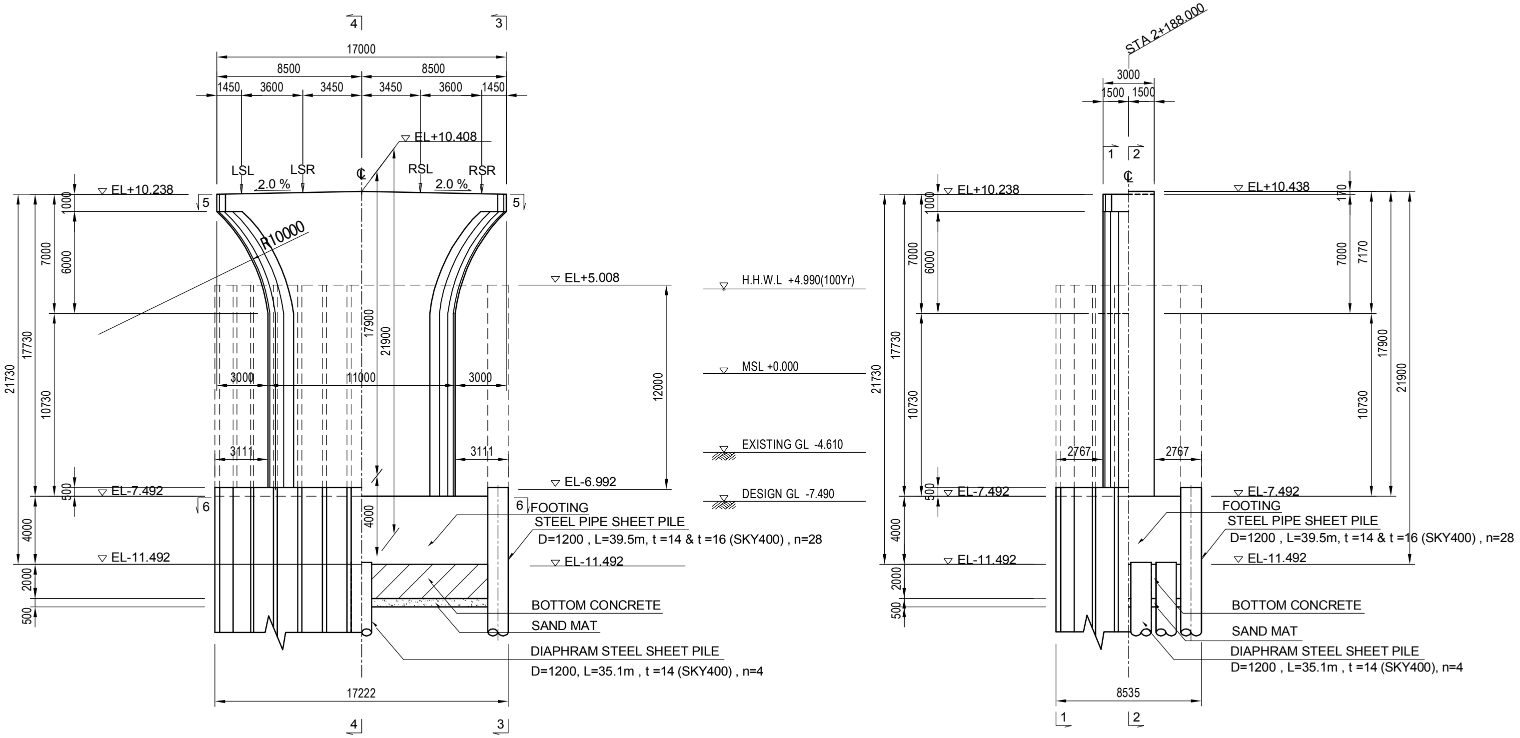
QUANTITY CALCULATION

OF

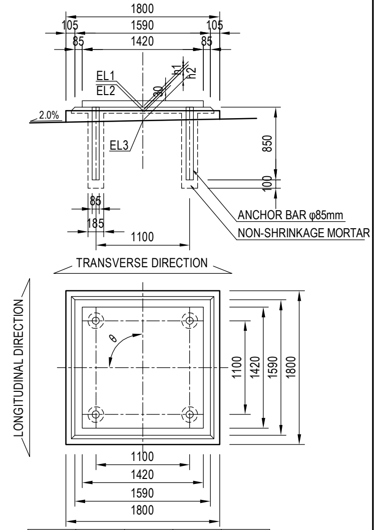
PIER P22

GENERAL VIEW OF P22 PIER

S =1:300

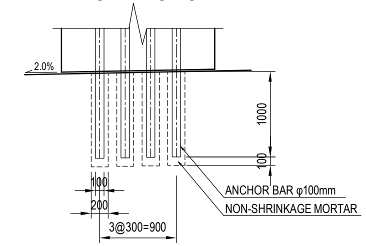


DETAIL OF BEARING S =1:60

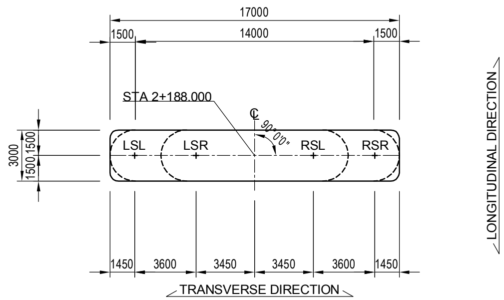


Unit : m	LSL	LSR	RSL	RSR
EL1	10.427	10.499	10.499	10.427
EL2	10.387	10.459	10.459	10.387
EL3	10.267	10.339	10.339	10.267
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

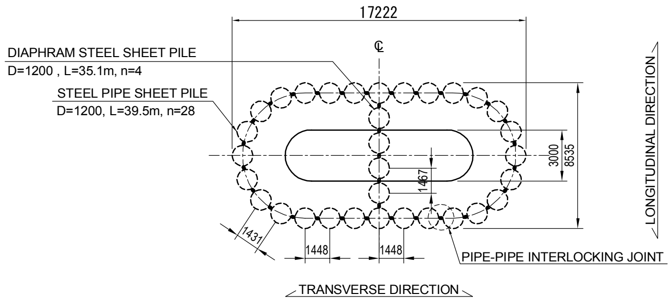
DETAIL OF ANCHOR BAR S =1:60



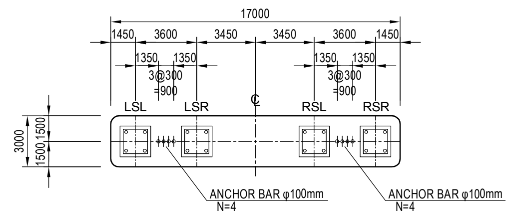
PLAN VIEW
5 - 5



PILE ARRANGEMENT
6 - 6



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 尚弘	15 Jun.2017	GENERAL VIEW OF P22 PIER	2
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P2-PB-2031

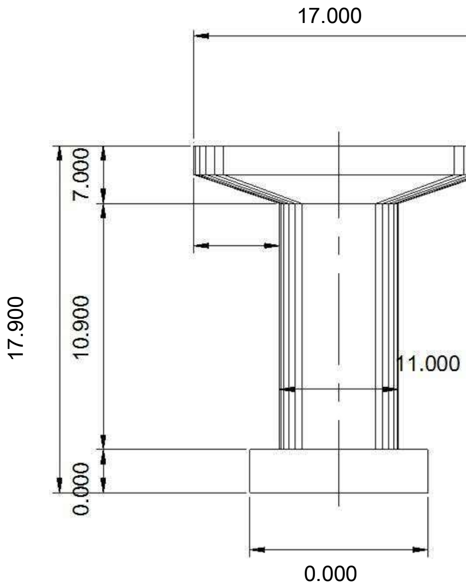
Summary Table

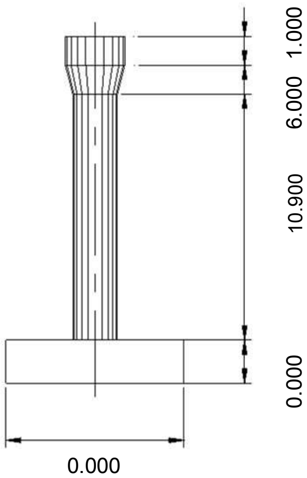
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 30 N/mm2		Beam	m^3	273.6	
				Column	m^3	338.6	
				Sub Total	m^3	612.3	
		σck = 24 N/mm2		Pile Cap	m^3	0.0	
				Sub Total	m^3	0.0	
		-		Total	m^3	612.3	
	Formwork	Normal Type		Beam	m^2	255.1	
				Column	m^2	277.1	
				Pile Cap	m^2	0.0	
				Total	m^2	532.2	
	Rebar	SD 390	Total Mass	D 38	kg	76,028	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	76,028	
			Stud Joint	D38	nos	392	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	392	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	31,615	
				D25 ~ D16	kg	40,440	
				D10 - D13	kg	157	
				Total	kg	72,212	
		SD 390	Mass for Body	D 38	kg	76,028	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	76,028	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	7,272	
				D25 ~ D16	kg	35,801	
				D10 - D13	kg	0	
				Total	kg	43,073	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	24,343	
				D25 ~ D16	kg	4,639	
				D10 - D13	kg	157	
				Total	kg	29,139	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	0.0	
	Lean Concrete Form	Normal Type			m^2	0.0	
	Crushed stone				m^2	0.0	
	Box out for bearing	Cylindrial form length1	φ185 x 0.88m		m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2	φ200 x 1.10m		m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3	φ100 x 0.10m		m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

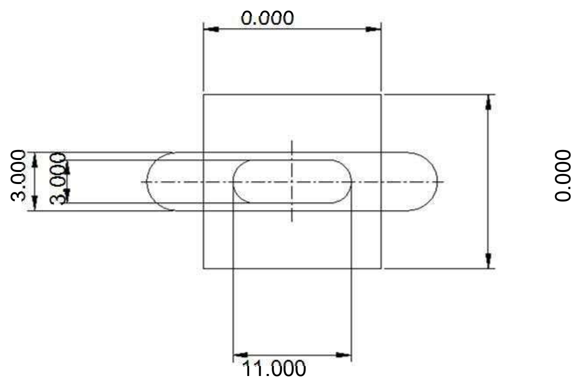
	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 1200		Length	m	0.000	
					number	nos	0	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	0	
					D25 ~ D16	kg	0	
					D10 - D13	kg	0	
					Total	kg	0	
	Concrete		$\sigma ck = 24$ N/mm2			m^3	0.0	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	0	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	0.0	
			Total			m^3	0.0	
	Backfill		purchased soil			m^3	0.0	
	Surplus Soil		unsuitable soil			m^3	0.0	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 0.00m			kg	0	
			Number of Sheet Piles			nos	0	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	974.7	
Supporting			Wedge type (under 80 kN/m2)			m^3	51.5	

Schimatic Diagram

P22







Top EL of Substructure	10.408 m
GL for construction	-4.610 m

1. Concrete

1) Beam (σck = 30 N/mm2)

(17.000 × 3.000 × 1.000)-(3.000 /2)^2 x (4-π) x 1.000) = 49.1 m^3

1/2x(14.000 + 8.000) × 3.000) × 6 - 3.0 x 10^2 x [radians (40.65) - sin (radians(40.65))] = 180.6 m^3

π × (3.000 ^2)/4 × 6.000 = 42.4 m^3

V1 = 272.1 m^3

2) Base for bridge bearings (σck = 30 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4	=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
					V2 =	1.6 m^3

3) Column (σck = 30 N/mm2)

{ (3.000) ^2 ÷ 4×π + (11.000 - 3.000) × 3.000 }× 10.900

= 338.6 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

0.000 × 0.000 × 0.000 = 0 m^3

(V4)

5) Total

σck = 30 N/mm2 ΣV = 272.1 + 1.6 + 338.6 + = 612.3 m^3

σck = 24 N/mm2 ΣV = 0.0 = 0.0 m^3

2. Formwork

1) Beam

1/2 × (17.000 + 11.000) × 6.000 × 2 = 168.0 m^2

17.000 × 1.000 × 2 = 34.0 〃

π × 3.000 × 1.000 = 9.4 〃

1/2 × (3.000 + 3.000) × 6.708 × 2 = 40.2 〃

A1 = 251.6 m^2

2) Base for bridge bearings

Type1 (1.800 + 1.800) × 2 × 0.120 × 4 = 3.5 m^2

Type2 (0.000 + 0.000) × 2 × 0.000 × 0 = 0 m^2

Type3 (0.000 + 0.000) × 2 × 0.000 × 0 = 0 m^2

A2 = 3.5 m^2

3) Column

{ 3.000 ×π + (11.000 - 3.000) x 2}× 10.900 = 277.1 m^2

(A3)

4) Pile cap

(0.000 + 0.000) × 2 × 0.000 = 0 m^2

(A4)

5) Total

ΣA = 251.6 + 3.5 + 277.1 + 0 = 532.2 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 0 cm) P22

Area

0.200 × 0.200 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

4. Lean concrete formwork

0.000 × (0.200 + 0.200) × 2 = 0 m^2

5. Crushed stone

Area 0.000 × 0.000 = 0.0 m^2

Volume (V = 0 × 0.000 = 0.0 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		76,028	0	392	76,028	0	0
D35		0	0		0	0	0
D29 - D32	D32	0	21,973	0	0	4,691	17,282
	D29	0	9,642	0	0	2,581	7,061
	Sub Total	0	31,615	0	0	7,272	24,343
D25 ~ D16	D25	0	12,456		0	12,456	0
	D22	0	0		0	0	0
	D19	0	5,325		0	1,786	3,539
	D16	0	22,659		0	21,559	1,100
	Sub Total	0	40,440	0	0	35,801	4,639
D10 - D13		0	157		0	0	157
Total		**76,028**	**72,212**	**392**	**76,028**	**43,073**	**29,139**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ85	mm			Anchor bar Length	L_0	=	0.780 m
Pipe diameter			185	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	0.880	m						
Total Length	L	=	0.880	×	4	(for one bearing)			=	3.500 m
For one pier	(		4	locations)						
Total Length	L	=	3.500	×	4				=	14.000 m

Quantity for Type2

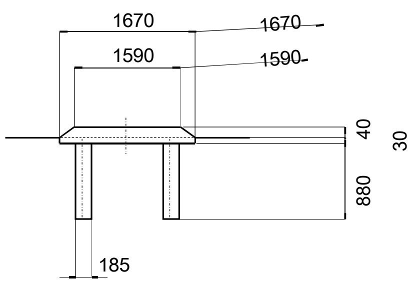
Anchor bar diameter			φ100	mm			Anchor bar Length	L_0	=	1.000 m
Pipe diameter			200	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	1.100	m						
Total Length	L	=	1.100	×	4	(for one bearing)			=	4.400 m
For one pier	(		2	locations)						
Total Length	L	=	4.400	×	2				=	8.800 m

Quantity for Type3

Anchor bar diameter			φ0	mm			Anchor bar Length	L_0	=	0.000 m
Pipe diameter			100	mm			Anchor bar Number	n	=	0 nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0	(for one bearing)			=	0.000 m
For one pier	(		0	locations)						
Total Length	L	=	0.000	×	0				=	0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1	=	0.040 /6× { (2	×	1.590	+	1.670	) ×	1.590		
		+ (2	×	1.670	+	1.590	) ×	1.670 }	=	0.106 m^3
V2	=	1.670	×	0.030	×	1.670			=	0.084 〃
									=	0.190 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.190 × 4 = 0.760 m^3

Mortar for anchor bar Type 1

Anchor bar diameter φ85
Anchor bar number 4
Void diameter φ185
Void length 0.880

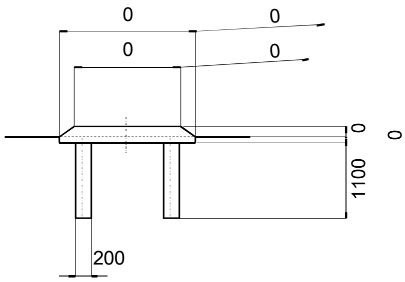
$V3 = \pi/4 \times (0.185)^2 \times 0.880 \times 4 = 0.095$ 〃
$V4 = -\pi/4 \times (φ85)^2 \times 0.780 \times 4 = -0.018$ 〃

(Volume of anchor bar) $V = 0.077\ m^3$

Anchor bar for an abutment (4 locations)

$V_{T1\text{-}2} = 0.077 \times 4 = 0.308\ m^3$

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.000 /6 \times \{ (2 \times 0.000 + 0.000) \times 0.000$
$+ (2 \times 0.000 + 0.000) \times 0.000 \} = 0.000\ m^3$
$V2 = 0.000 \times 0.000 \times 0.000 = 0.000$ 〃
$= 0.000\ m^3$

Total base mortal volume for Type 2

$V_{T2\text{-}1} = 0.000 \times 0 = 0.000\ m^3$

Mortar for anchor bar Type 2

Anchor bar diameter φ100
Anchor bar number 4
Void diameter φ200
Void length 1.1

$V3 = \pi/4 \times (0.200)^2 \times 1.100 \times 4 = 0.138$ 〃
$V4 = -\pi/4 \times (φ100)^2 \times 1.000 \times 4 = -0.031$ 〃

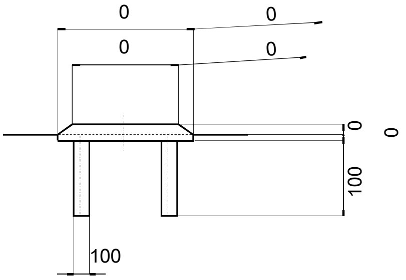
(Volume of anchor bar) $V = 0.107\ m^3$

Anchor bar for an abutment (2 locations)

$V_{T2\text{-}2} = 0.107 \times 2 = 0.214\ m^3$

Quantity for Tyep 3

P22



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a + a1)\times b + (2a1 + a)\times b1\}$

V1	=	0.000 /6× { (2 ×	0.000	+	0.000	) ×	0.000			
		+ (2 ×	0.000	+	0.000	) ×	0.000 }	=	0.000	m^3
V2	=	0.000 ×	0.000	×	0.000			=	0.000	〃
								=	0.000	m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter	φ0
Anchor bar number	0
Void diameter	φ100
Void length	0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

$V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} =$ **1.282** m^3

8. CIP Pile P22

(1)Diameter and number

D = 0.000 m L = 0.00 m n = 0 nos

Net Area = 0

2)Concrete = 0 0.00 0 = 0.0 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38			0
D35			0
D32	D32		0
~	D29		0
D29	Sub-total	0	0
D25	D25		0
	D22		0
~	D19		0
D16	D16		0
	Sub-total	0	0
D13			0
Total		0	0

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer					0
STK400,φ60.5,t=2.3			3.300	0	0
STK400,φ114.3,t=3.5			9.560	0	0
Total					0

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	0.000	+	1.0	×	0)x(	0.000	+	1.0	×	0) =	0.0 m^2

Excavation Depth 2.900 m

0.00	×	2.900		=	0.0 m^3

Deduction of Pile Volume	0.000 ^2 x	π/4	×(	2.900	- 0.10	) x	0	=	0.0 〃

V = 0.0 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	2.900	× (π /4	×	3.000 $^{\wedge 2}$ +	3.000	×	8.000	)	=	90.1	m^3
Pile cap	0.000	×	0.000	×	0.000				=	0.0	〃
Lean concrete	0.200	×	0.200	×	0.000				=	0.0	〃
							Volume of Structure		=	90.1	m^3

V = 0.0 - 90.1 = 0.0 m^3

3) Surplus soil volume (unsuitable soil)

V = 0.0 = 0.0 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	0.000	m	0	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

0.000	×	60.0	×	0		=	0
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	0

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××				0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××				0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 5.810 m

w=	2	x(	17.000	+	3.000	)+	8.800	]x	5.810)	=	283.50	m^2

2) Pierstud

(Falsework height) H2= 15.590 m

w1=	14.000 x	15.590 x	2		=	436.50	m^2
w2=	π x	5.200 x	15.590		=	254.70	m^2
Sub-Total					=	691.20	m^2

3) Pile cap

w=	2	x(	0.000	+	0.000	)+	8.800	]x	0.000)	=	0.00	m^2
Total										=	974.70	m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (5.810 + 4.810) = 5.30 m

【Support capacity】

Average beam height

1/2 × (1.000 + 7.000) = 4.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 9.86 x 2 = 19.70 m^2

A2= 0.43 x 4 = 1.70 m^2

【Supporting volume】

V1=	19.70 x	0.000				=	0.00	m^3
V2=	1/2 × (	19.700 +	1.700)x	4.810		=	51.50	m^3
Total						=	51.50	m^3

QUANTITY CALCULATION

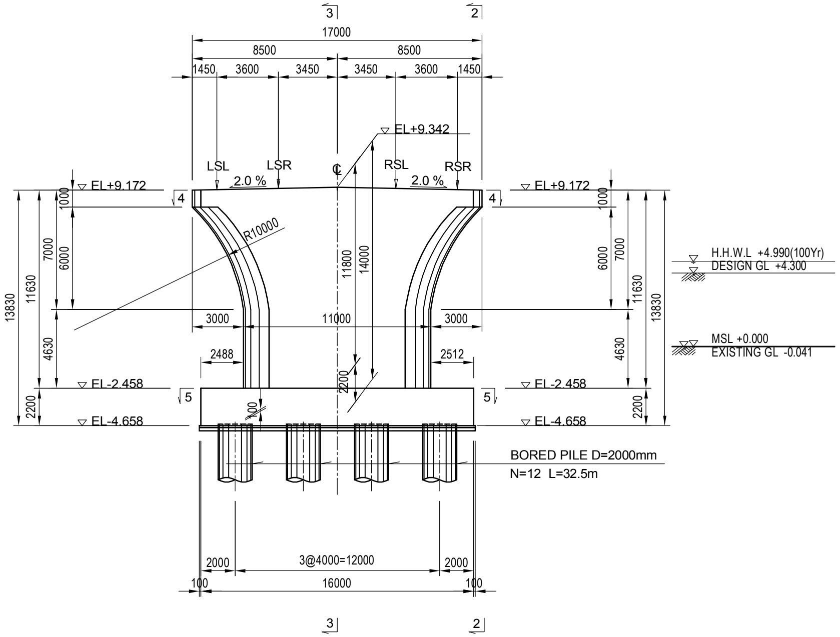
OF

PIER P23

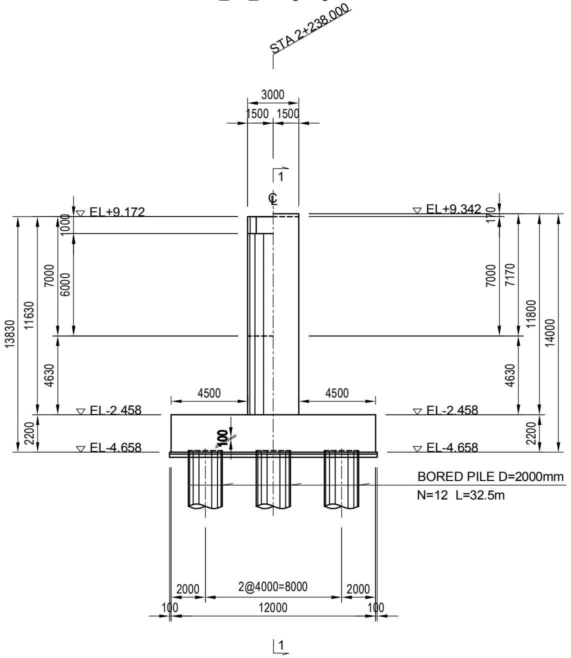
GENERAL VIEW OF P23 PIER

S=1:300

FRONT VIEW 1 - 1

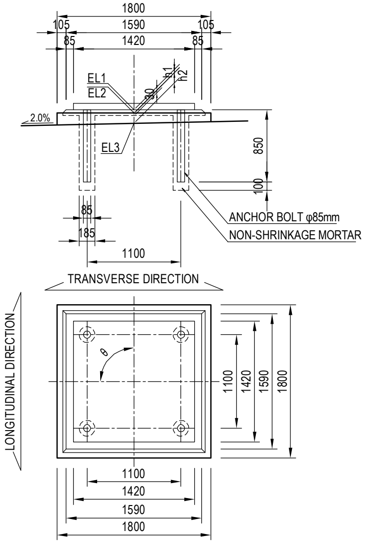


SIDE VIEW 2 - 2 3 - 3



DETAIL OF BEARING

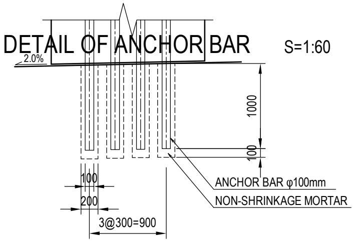
S=1:60



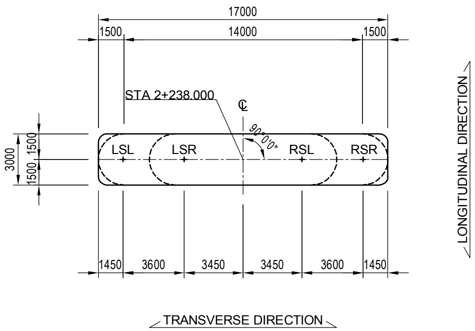
Unit : m	LSL	LSR	RSL	RSR
EL1	9.361	9.433	9.433	9.361
EL2	9.321	9.393	9.393	9.321
EL3	9.201	9.273	9.273	9.201
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR

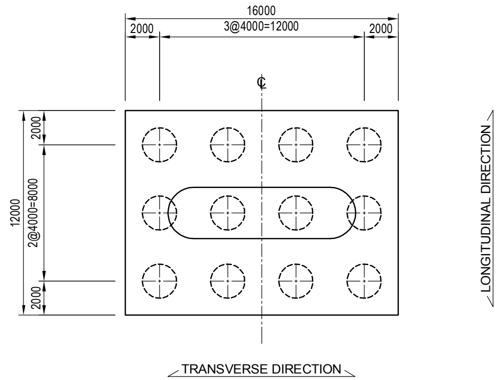
S=1:60



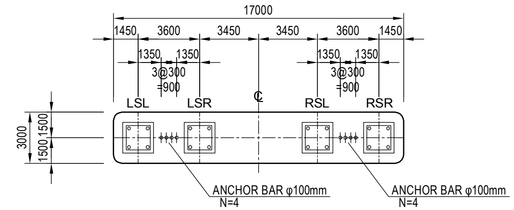
PLAN VIEW 4 - 4



PILE ARRANGEMENT 5 - 5



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野 [illegible]	21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF P23 PIER

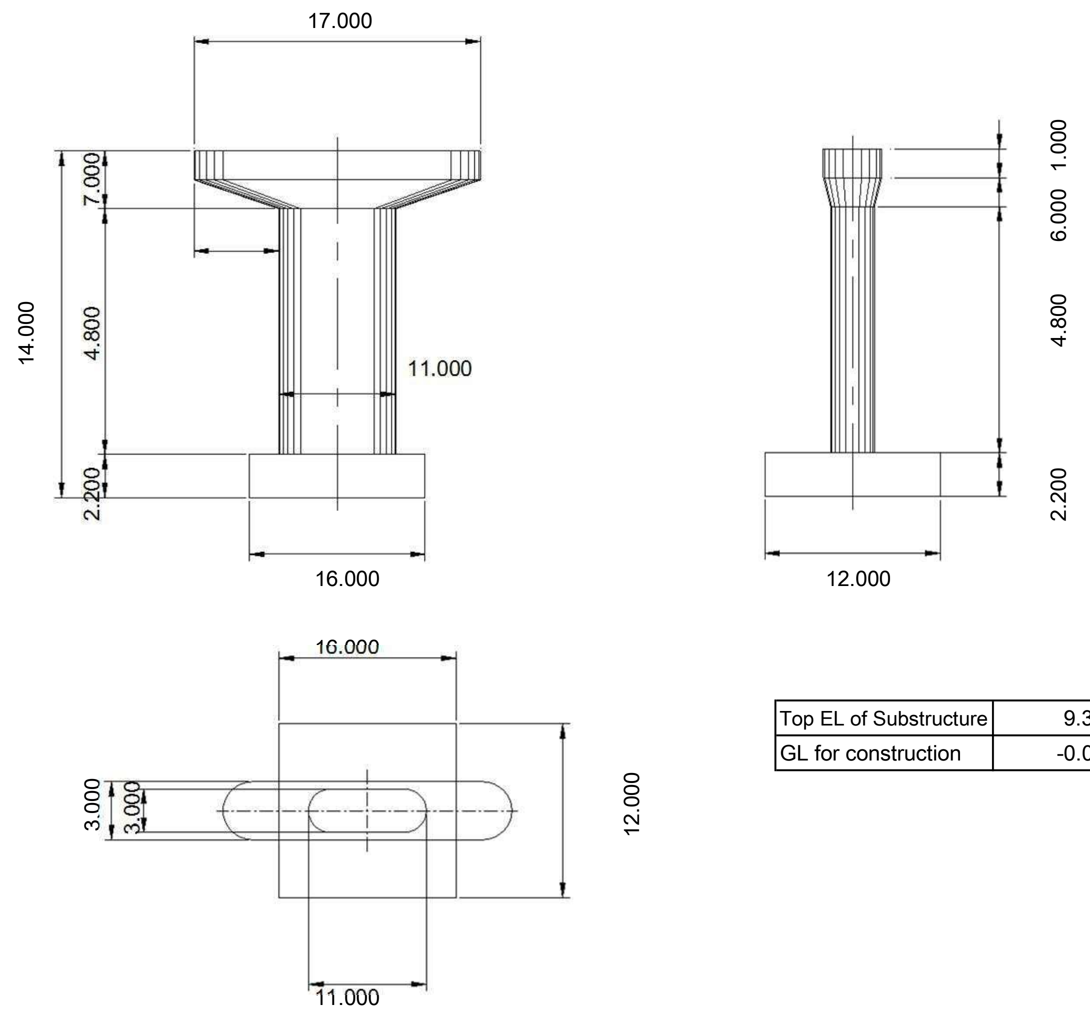
PACKAGE: 2

DWG No.: P2-PB-2041

Summary Table

<table>
<tr><th></th><th>Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="54">Substructure</td><td rowspan="6">Concrete</td><td colspan="2" rowspan="3">σck = 30 N/mm2</td><td>Beam</td><td>m3</td><td>273.6</td><td></td></tr>
<tr><td>Column</td><td>m3</td><td>149.1</td><td></td></tr>
<tr><td>Sub Total</td><td>m3</td><td>422.8</td><td></td></tr>
<tr><td colspan="2" rowspan="2">σck = 24 N/mm2</td><td>Pile Cap</td><td>m3</td><td>422.4</td><td></td></tr>
<tr><td>Sub Total</td><td>m3</td><td>422.4</td><td></td></tr>
<tr><td colspan="2">-</td><td>Total</td><td>m3</td><td>845.2</td><td></td></tr>
<tr><td rowspan="4">Formwork</td><td colspan="2" rowspan="4">Normal Type</td><td>Beam</td><td>m2</td><td>255.1</td><td></td></tr>
<tr><td>Column</td><td>m2</td><td>122.0</td><td></td></tr>
<tr><td>Pile Cap</td><td>m2</td><td>123.2</td><td></td></tr>
<tr><td>Total</td><td>m2</td><td>500.3</td><td></td></tr>
<tr><td rowspan="34">Rebar</td><td rowspan="10">SD 390</td><td rowspan="6">Total Mass</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>28,647</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>28,647</td><td></td></tr>
<tr><td rowspan="4">Stud Joint</td><td>D38</td><td>nos</td><td>0</td><td></td></tr>
<tr><td>D35</td><td>nos</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>nos</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">SD 345</td><td rowspan="6">Total Mass</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>28,005</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>30,789</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>34,695</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>93,489</td><td></td></tr>
<tr><td rowspan="6">SD 390</td><td rowspan="6">Mass for Body</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>28,647</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>28,647</td><td></td></tr>
<tr><td rowspan="6">SD 345</td><td rowspan="6">Mass for Body</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>7,272</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>32,139</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>39,411</td><td></td></tr>
<tr><td rowspan="6">SD 345</td><td rowspan="6">Mass for Footing</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>28,005</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>23,517</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>2,556</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>54,078</td><td></td></tr>
<tr><td>Lean Concrete</td><td colspan="3">σck = 18 N/mm2 , t = 10 cm</td><td>m3</td><td>19.8</td><td></td></tr>
<tr><td>Lean Concrete Form</td><td colspan="3">Normal Type</td><td>m2</td><td>5.7</td><td></td></tr>
<tr><td>Crushed stone</td><td colspan="3"></td><td>m2</td><td>197.6</td><td></td></tr>
<tr><td rowspan="7">Box out for bearing</td><td colspan="2">Cylindrial form length1</td><td>φ185 x 0.88m</td><td>m</td><td>14</td><td></td></tr>
<tr><td colspan="3">Cylindrical form number1</td><td>nos</td><td>16</td><td></td></tr>
<tr><td colspan="2">Cylindrial form length2</td><td>φ200 x 1.10m</td><td>m</td><td>8.8</td><td></td></tr>
<tr><td colspan="3">Cylindrical form number2</td><td>nos</td><td>8</td><td></td></tr>
<tr><td colspan="2">Cylindrial form length3</td><td>φ100 x 0.10m</td><td>m</td><td>0</td><td></td></tr>
<tr><td colspan="3">Cylindrical form number3</td><td>nos</td><td>0</td><td></td></tr>
<tr><td colspan="3">Total Non-shrinkage mortar Volume</td><td>m3</td><td>1.282</td><td></td></tr>
<tr><td></td><td colspan="3"></td><td></td><td></td><td></td></tr>
</table>

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	32.500	
					number	nos	12	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	81,684	
					D29 - D 32	kg	21,948	
					D25 ~ D16	kg	37,608	
					D10 - D13	kg	336	
					Total	kg	141,576	
	Concrete		σck = 24 N/mm2			m^3	1,225.4	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	8,778	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	1,469.7	
			Total			m^3	1,469.7	
	Backfill		purchased soil			m^3	913.4	
	Surplus Soil		unsuitable soil			m^3	1,469.7	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type V 0.00m			kg	349,650	
			Number of Sheet Piles			nos	148	
			Number of Wellding Joint (on site)			nos	148	
	Mold Steel	Supporting Beam	H-400×400×13×21			kg	33,024	
		Brace	H-400×400×13×21			kg	36,894	
		Bond Timber	H-400×400×13×21			kg	17,668	
		Sub-member(A)	0.22			kg	21,766	
		Sub-member(B)	0.04			kg	3,958	
		Total				kg	124,662	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	718.4	
Supporting			Wedge type (under 80 kN/m2)			m^3	155.4	



Top EL of Substructure	9.342 m
GL for construction	-0.041 m

1. Concrete

1) Beam (σck = 30 N/mm2)

(	17.000 ×	3.000 ×	1.000)-(	3.000	/2)^2 x (4-π)	x	1.000		=	49.1 m^3
1/2x(	14.000 +	8.000) ×	3.000) ×	6 -	3.0 x	10^2 x [radians (40.65) - sin (radians(40.65))]			=	180.6 m^3
π × (	3.000 ^2	)/4 ×	6.000						=	42.4 m^3
								V1	=	272.1 m^3

2) Base for bridge bearings (σck = 30 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4		=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
					V2	=	1.6 m^3

3) Column (σck = 30 N/mm2)

{ (3.000) ^2 ÷ 4×π + (11.000 - 3.000) × 3.000 }× 4.800

= 149.1 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

16.000 × 12.000 × 2.200 = 422.4 m^3

(V4)

5) Total

σck = 30 N/mm2	ΣV =	272.1 +	1.6 +	149.1 +		=	422.8 m^3
σck = 24 N/mm2	ΣV =	422.4				=	422.4 m^3

2. Formwork

1) Beam

1/2	× (17.000	+ 11.000) ×	6.000	× 2		=	168.0 m^2
	17.000 ×	1.000 ×	2			=	34.0 〃
	π ×	3.000 ×	1.000			=	9.4 〃
1/2	× (3.000	+ 3.000) ×	6.708	× 2		=	40.2 〃
					A1	=	251.6 m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
						A2	=	3.5 m^2

3) Column

{ 3.000 ×π + (11.000 - 3.000) x 2}× 4.800 = 122 m^2

(A3)

4) Pile cap

(16.000 + 12.000) × 2 × 2.200 = 123.2 m^2

(A4)

5) Total

ΣA = 251.6 + 3.5 + 122 + 123.2 = 500.3 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P23

Area

16.200 × 12.200 = 197.6 m^2

Volume (V = 197.6 × 0.100 = 19.8 m^3)

4. Lean concrete formwork

0.100 × (16.200 + 12.200) × 2 = 5.7 m^2

5. Crushed stone

Area 16.200 × 12.200 = 197.6 m^2

Volume (V = 197.6 × 0.200 = 39.5 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0		0	0	0
D41		0	0		0	0	0
D38		0	0		0	0	0
D35		0	28,005		0	0	28,005
D29 - D32	D32	0	15,574		0	4,691	10,883
	D29	28,647	15,215		28,647	2,581	12,634
	Sub Total	28,647	30,789	0	28,647	7,272	23,517
D25 ~ D16	D25	0	12,456		0	12,456	0
	D22	0	0		0	0	0
	D19	0	2,925		0	1,786	1,139
	D16	0	19,314		0	17,897	1,417
	Sub Total	0	34,695	0	0	32,139	2,556
D10 - D13		0	0		0	0	0
Total		**28,647**	**93,489**	**0**	**28,647**	**39,411**	**54,078**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ85	mm		Anchor bar Length	L_0	=	0.780	m
Pipe diameter			185	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	0.880	m						
Total Length	L	=	0.880	×	4	(for one bearing)		=	3.500	m
For one pier	(		4	locations	)					
Total Length	L	=	3.500	×	4			=	14.000	m

Quantity for Type2

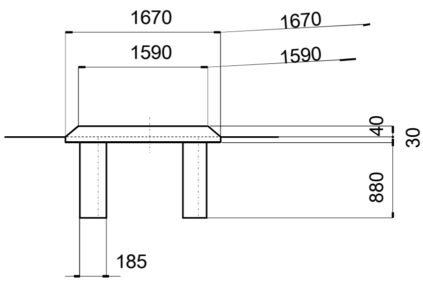
Anchor bar diameter			φ100	mm		Anchor bar Length	L_0	=	1.000	m
Pipe diameter			200	mm		Anchor bar Number	n	=	4	nos
Box-out Length	l	=	1.100	m						
Total Length	L	=	1.100	×	4	(for one bearing)		=	4.400	m
For one pier	(		2	locations	)					
Total Length	L	=	4.400	×	2			=	8.800	m

Quantity for Type3

Anchor bar diameter			φ0	mm		Anchor bar Length	L_0	=	0.000	m
Pipe diameter			100	mm		Anchor bar Number	n	=	0	nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0	(for one bearing)		=	0.000	m
For one pier	(		0	locations	)					
Total Length	L	=	0.000	×	0			=	0.000	m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.040 /6 \times \{ (2 \times 1.590 + 1.670) \times 1.590$
$+ (2 \times 1.670 + 1.590) \times 1.670 \} = 0.106\ m^3$

$V2 = 1.670 \times 0.030 \times 1.670 = 0.084$ 〃

$= 0.190\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.190 \times 4 = 0.760\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.880

V3 = π/4 × (0.185 $)^2$× 0.880 × 4 = 0.095 〃

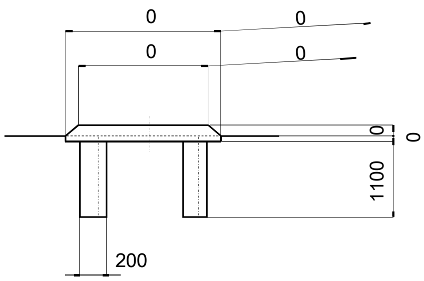
V4 = - π/4 × (φ85 $)^2$× 0.780 × 4 = -0.018 〃

(Volume of anchor bar) V = 0.077 m^3

Anchor bar for an abutment (4 locations)

$V_{T1\text{-}2}$ = 0.077 × 4 = 0.308 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

\+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

$V_{T2\text{-}1}$ = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

V3 = π/4 × (0.200 $)^2$× 1.100 × 4 = 0.138 〃

V4 = - π/4 × (φ100 $)^2$× 1.000 × 4 = -0.031 〃

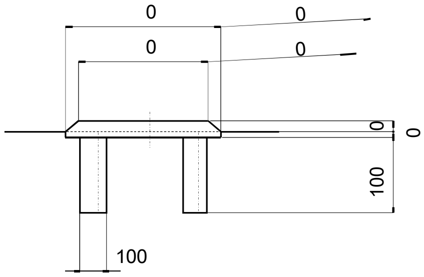
(Volume of anchor bar) V = 0.107 m^3

Anchor bar for an abutment (2 locations)

$V_{T2\text{-}2}$ = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3

P23



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

$V_{T3\text{-}1}$ = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

$V_{T3\text{-}2}$ = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

$V_{T1\text{-}1}$ + $V_{T1\text{-}2}$ + $V_{T2\text{-}1}$ + $V_{T2\text{-}2}$ + $V_{T3\text{-}1}$ + $V_{T3\text{-}2}$ = **1.282** m^3

8. CIP Pile P23

(1)Diameter and number

D = 2.000 m L = 32.50 m n = 12 nos

Net Area = 3.142

2)Concrete = 3.142 32.50 12 = 1,225.4 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		6807	81,684
D32 ~ D29	D32	0	0
	D29	1,829	21,948
	Sub-total	1,829	21,948
D25 ~ D16	D25	0	0
	D22	3,134	37,608
	D19	0	0
	D16	0	0
	Sub-total	3,134	37,608
D13		28	336
Total		11,798	141,576

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				60	720
STK400,φ60.5,t=2.3	35.000	3	3.300	347	4,158
STK400,φ114.3,t=3.5	34.000	1	9.560	325	3,900
Total					8,778

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	16.000	+	2.2	×	2)x(	12.000	+	2.2	×	2) =	334.6	m^2

Excavation Depth 4.900 m

334.56	×	4.900	=	1639.3	m^3

Deduction of Pile Volume	2.000 ^2 x	π/4	×(	4.900	-	0.40) x	12		=	-169.6	〃
								V	=	1469.7	m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	2.400	× (π /4	×	3.000 ^2 +	3.000	×	8.000)	=	74.6	m^3
Pile cap	16.000	×	12.000	×	2.200			=	422.4	〃
Lean concrete	16.200	×	12.200	×	0.300			=	59.3	〃
							Volume of Structure	=	556.3	m^3

V	=	1469.7	-	556.3	=	913.4	m^3

3) Surplus soil volume (unsuitable soil)

V	=	1469.7	=	1469.7	m^3

4) Area of ground preparation for foundation

A	=	×	-	π	/4	×	^{2}×	=	0.0	m^2

1) Earth retaining method w= 0.5 (Type V)

Steel Sheet Pile Type III		m		nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V	22.5	m	148	nos	Unit weight	105.0	kg/m	

0.000	×	60.0	×	0		=	0
0.000	×	76.1	×	0		=	0
22.500	×	105.0	×	148		=	349,650
					Σw	=	349,650

Number of joints N = 0 + 0 + 148 = 148 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- 400×400×13×21	18.000	6	172.0	18,576
	H- 400×400×13×21	14.000	6	172.0	14,448
	H- ×××				0
Brace	H- 400×400×13×21	16.700	6	172.0	17,234
	H- 400×400×13×21	12.700	9	172.0	19,660
Bond Timber	H- 400×400×13×21	0.420	12	172.0	867
	H- 400×400×13×21	2.540	12	172.0	5,243
	H- 400×400×13×21	1.120	60	172.0	11,558
Intermidiate Pile	H- 400×400×13×21	22.000	3	172.0	11,352
Total of Main Member					98,938
Sub-member(A)	98,938 × 0.22				21,766
Sub-member(B)	98,938 × 0.04				3,958
Total of Sub-Member					25,724
Total of Mold Steel					124,662

11. Falsework

【height Division】 〔Average height〕H≦30m

1) Beam

(Falsework height) H1= 11.800 m

w= 2 x(17.000 + 3.000)+ 8.800]x 11.800) = 575.80 m^2

2) Pierstud

(Falsework height) H2= 0.000 m

w1= 8.000 x 0.000 x 2 = 0.00 m^2

w2= π x 5.200 x 0.000 = 0.00 m^2

Sub-Total = 0.00 m^2

3) Pile cap

w= 2 x(16.000 + 12.000)+ 8.800]x 2.200) = 142.60 m^2

Total = 718.40 m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (11.630 + 10.630) = 11.10 m

【Support capacity】

Average beam height

1/2 × (1.000 + 7.000) = 4.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 9.86 x 2 = 19.70 m^2

A2= 0.43 x 4 = 1.70 m^2

【Supporting volume】

V1= 19.70 x 4.630 = 91.20 m^3

V2= 1/2 × (19.700 + 1.700)x 6.000 = 64.20 m^3

Total = 155.40 m^3

QUANTITY CALCULATION

OF

PIER P24

GENERAL VIEW OF P24 PIER

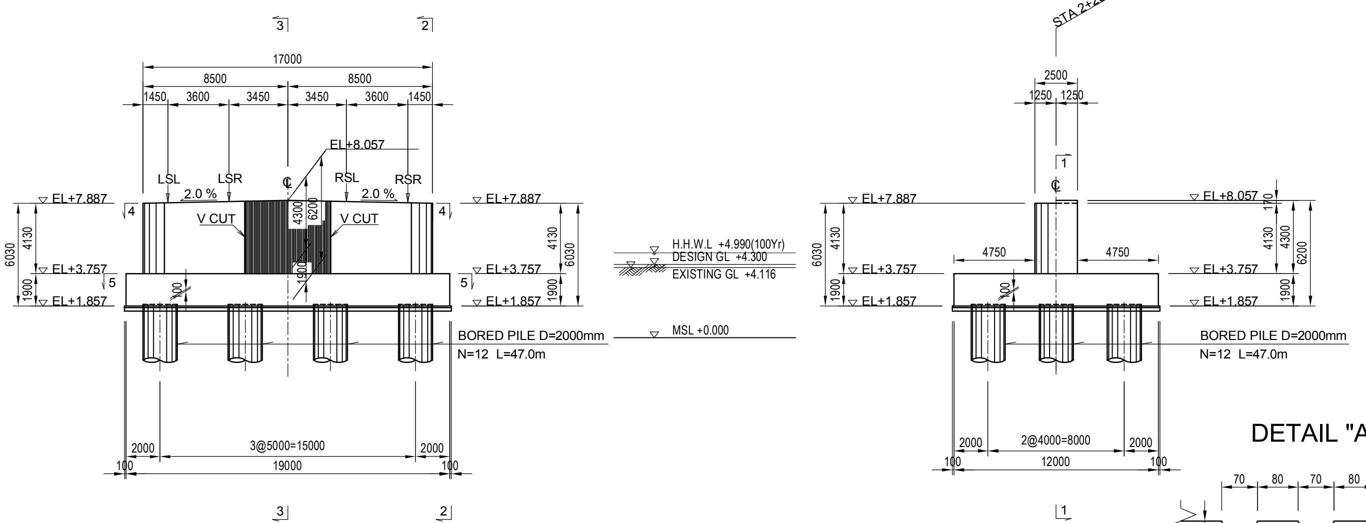
S =1:300

FRONT VIEW

1 - 1

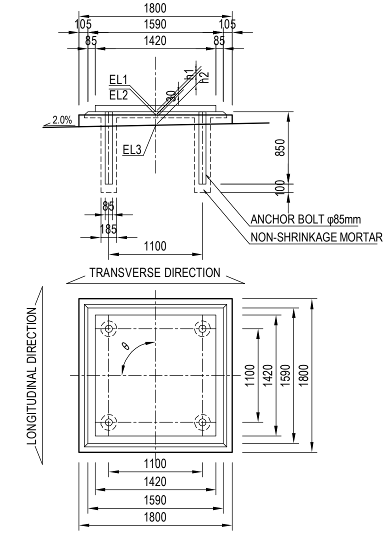
SIDE VIEW

2 - 2   3 - 3



DETAIL OF BEARING

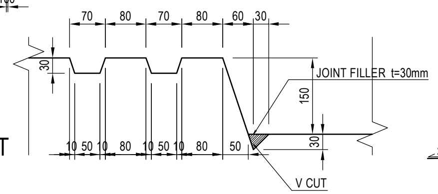
S =1:60



Unit : m	LSL	LSR	RSL	RSR
EL1	8.076	8.148	8.148	8.076
EL2	8.036	8.108	8.108	8.036
EL3	7.916	7.988	7.988	7.916
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

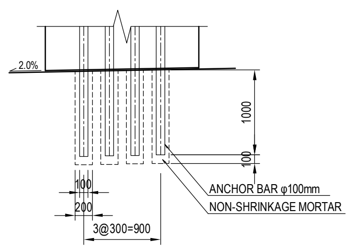
DETAIL "A"

S =1:10



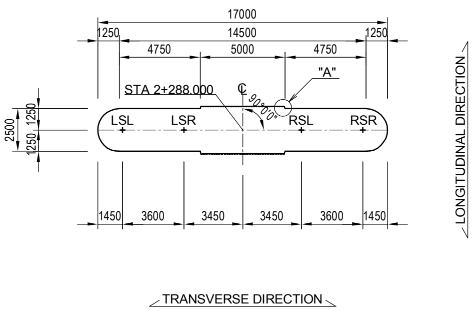
DETAIL OF ANCHOR BAR

S =1:60



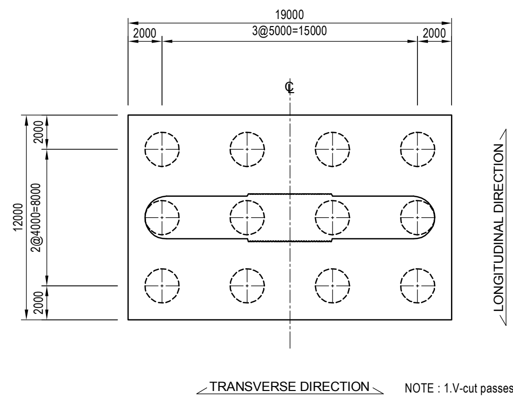
PLAN VIEW

4 - 4

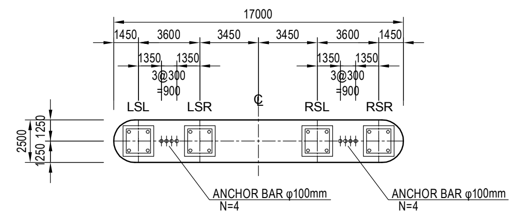


PILE ARRANGEMENT

5 - 5



ARRANGEMENT OF BRIDGE SEAT



NOTE : 1.V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME: DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT
FINANCED BY: JAPAN INTERNATIONAL COOPERATION AGENCY
COUNTERPART: REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE
JICA STUDY TEAM: NIPPON KOEI CO., LTD. / ORIENTAL CONSULTANTS GLOBAL CO., LTD. / METROPOLITAN EXPRESSWAY COMPANY LIMITED / CHODAI CO.,LTD. / NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川知邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野裕一	21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF P24 PIER
PACKAGE: 2
DWG No.: P2-PB-2051

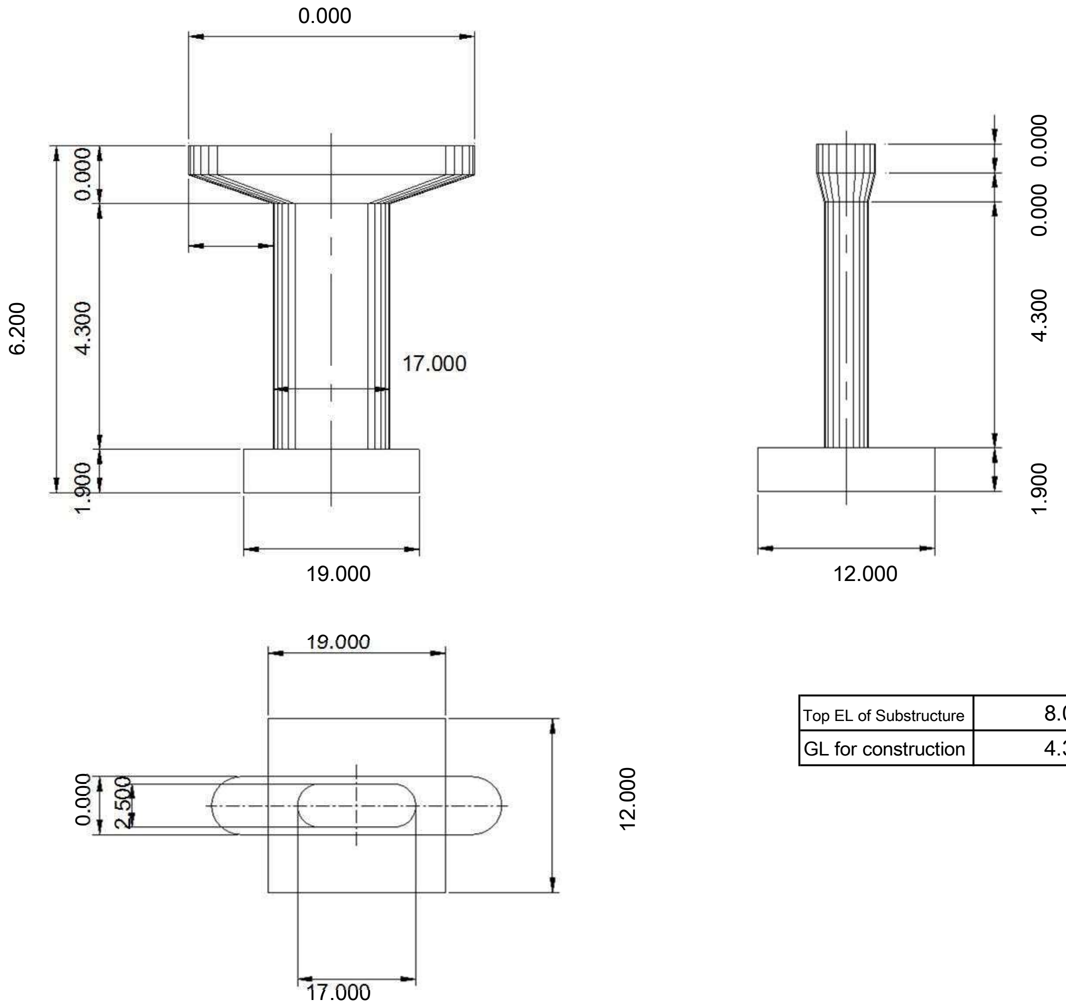
Summary Table

	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	1.6	
				Column	m^3	177.0	
				Sub Total	m^3	178.5	
		σck = 24 N/mm2		Pile Cap	m^3	433.2	
				Sub Total	m^3	433.2	
		-		Total	m^3	611.7	
	Formwork	Normal Type		Beam	m^2	3.5	
				Column	m^2	158.5	
				Pile Cap	m^2	117.8	
				Total	m^2	279.8	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	39,607	
				D25 ~ D16	kg	26,175	
				D10 - D13	kg	515	
				Total	kg	66,297	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	12,701	
				D10 - D13	kg	515	
				Total	kg	13,216	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	39,607	
				D25 ~ D16	kg	13,474	
				D10 - D13	kg	0	
				Total	kg	53,081	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	23.4	
	Lean Concrete Form	Normal Type			m^2	6.3	
	Crushed stone				m^2	234.2	
	Box out for bearing	Cylindrial form length1	φ185 x 0.88m		m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2	φ200 x 1.10m		m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3	φ100 x 0.10m		m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

<table>
<tr><th></th><th colspan="2">Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="11">Foundation</td><td colspan="2" rowspan="2">CIP Pile</td><td colspan="2" rowspan="2">Diameter
2000</td><td>Length</td><td>m</td><td>47.000</td><td></td></tr>
<tr><td>number</td><td>nos</td><td>12</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass for CIP & SPSP</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>116,028</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>51,276</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>336</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>167,640</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td colspan="3">σck = 24 N/mm2</td><td>m^3</td><td>1,772.1</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3"></td><td>m^2</td><td>0</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">Spacers and Sonic Pipes</td><td>kg</td><td>12,489</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3">Inside cofferdam, unsuitable</td><td>m^3</td><td>707.1</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>707.1</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">purchased soil</td><td>m^3</td><td>183.0</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3">unsuitable soil</td><td>m^3</td><td>707.1</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III　12.50m</td><td>kg</td><td>131,250</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>175</td><td></td></tr>
<tr><td colspan="3">Number of Wellding Joint (on site)</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>322.7</td><td></td></tr>
<tr><td colspan="3">Supporting</td><td colspan="3">Wedge type (under 80 kN/m2)</td><td>m^3</td><td>0.0</td><td></td></tr>
</table>

Schimatic Diagram

P24



Top EL of Substructure	8.057 m
GL for construction	4.300 m

Quantity Calculation P24

1. Concrete

1) Beam (σck = 24 N/mm2)

(0.000 × 0.000 × 0.000)-(0.000 /2)^2 x (4-π) x 0.000 = 0.0 m^3

1/2x(0.000 + 17.000) × 2.500) × 0 - 0.0 x 10^2 x [radians (37.717) = 0.0 m^3

- sin (radians(37.717))]

π × (0.000 ^2)/4 × 0.000 = 0.0 m^3

V1 = 0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4	=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0	=	0.0 m^3
				V2	=	1.6 m^3

3) Column (σck = 24 N/mm2)

{ (2.500) ^2 ÷ 4×π + (17.000 - 2.500) × 2.500 }× 4.300

= 177.0 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

19.000 × 12.000 × 1.900 = 433.2 m^3

(V4)

5) Total

σck = 30 N/mm2 ΣV = + + + = 0.0 m^3

σck = 24 N/mm2 ΣV = 0.0 + 1.6 + 177.0 + 433.2 = 611.7 m^3

2. Formwork

1) Beam

1/2 × (0.000 + 17.000) × 0.000 × 2 = 0.0 m^2

0.000 × 0.000 × 2 = 0.0 〃

π × 0.000 × 0.000 = 0.0 〃

1/2 × (0.000 + 0.000) × 8.500 × 2 = 0.0 〃

A1 = 0.0 m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5 m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0 m^2
						A2	=	3.5 m^2

3) Column

{ 2.500 ×π + (17.000 - 2.500) x 2}× 4.300 = 158.5 m^2

(A3)

4) Pile cap

(19.000 + 12.000) × 2 × 1.900 = 117.8 m^2

(A4)

5) Total

ΣA = 0.0 + 3.5 + 158.5 + 117.8 = 279.8 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P24

Area

19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.100 = 23.4 m^3)

4. Lean concrete formwork

0.100 × (19.200 + 12.200) × 2 = 6.3 m^2

5. Crushed stone

Area 19.200 × 12.200 = 234.2 m^2

Volume (V = 234.2 × 0.200 = 46.8 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0				
D41		0	0				
D38		0	0				
D35		0	0				
D29 - D32	D32	0	39,607				39,607
	D29	0	0				
	Sub Total	0	39,607	0	0	0	39,607
D25 ~ D16	D25	0	9,369			1,550	7,819
	D22	0	4,411			1,546	2,865
	D19	0	3,064			1,944	1,120
	D16	0	9,331			7,661	1,670
	Sub Total	0	26,175	0	0	12,701	13,474
D10 - D13		0	515			515	
Total		**0**	**66,297**	**0**	**0**	**13,216**	**53,081**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ85	mm			Anchor bar Length	L_0	=	0.780 m
Pipe diameter			185	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	0.880	m						
Total Length	L	=	0.880	×	4	(for one bearing)			=	3.500 m
For one pier	(		4	locations	)					
Total Length	L	=	3.500	×	4				=	14.000 m

Quantity for Type2

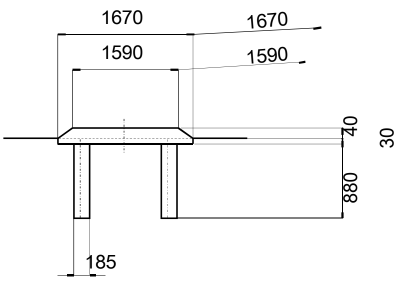
Anchor bar diameter			φ100	mm			Anchor bar Length	L_0	=	1.000 m
Pipe diameter			200	mm			Anchor bar Number	n	=	4 nos
Box-out Length	l	=	1.100	m						
Total Length	L	=	1.100	×	4	(for one bearing)			=	4.400 m
For one pier	(		2	locations	)					
Total Length	L	=	4.400	×	2				=	8.800 m

Quantity for Type3

Anchor bar diameter			φ0	mm			Anchor bar Length	L_0	=	0.000 m
Pipe diameter			100	mm			Anchor bar Number	n	=	0 nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0	(for one bearing)			=	0.000 m
For one pier	(		0	locations	)					
Total Length	L	=	0.000	×	0				=	0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.040 /6 \times \{ (2 \times 1.590 + 1.670) \times 1.590$
$+ (2 \times 1.670 + 1.590) \times 1.670 \} = 0.106\ m^3$

$V2 = 1.670 \times 0.030 \times 1.670 = 0.084$ 〃

$= 0.190\ m^3$

Total base mortal volume for Type 1

$V_{T1-1} = 0.190 \times 4 = 0.760\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.880

V3 = π/4 × (0.185 $)^2$× 0.880 × 4 = 0.095 〃

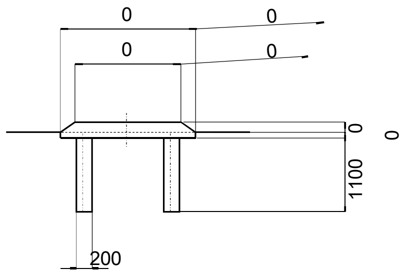
V4 = - π/4 × (φ85 $)^2$× 0.780 × 4 = -0.018 〃

(Volume of anchor bar) V = 0.077 m^3

Anchor bar for an abutment (4 locations)

V_{T1-2} = 0.077 × 4 = 0.308 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

V3 = π/4 × (0.200 $)^2$× 1.100 × 4 = 0.138 〃

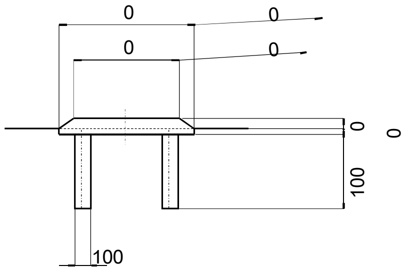
V4 = - π/4 × (φ100 $)^2$× 1.000 × 4 = -0.031 〃

(Volume of anchor bar) V = 0.107 m^3

Anchor bar for an abutment (2 locations)

V_{T2-2} = 0.107 × 2 = 0.214 m^3

Quantity for Tyep 3 P24



	mortar height
G9	
G10	
G11	
G12	
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a + a1)\times b + (2a1 + a)\times b1\}$

V1	=	0.000 /6× { (2	×	0.000	+	0.000	) ×	0.000					
		+ (2	×	0.000	+	0.000	) ×	0.000	}	=	0.000	m^3
V2	=	0.000	×	0.000	×	0.000				=	0.000	〃
										=	0.000	m^3

Total base mortal volume for Type 3

$V_{T3\text{-}1}$ = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter	φ0
Anchor bar number	0
Void diameter	φ100
Void length	0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

$V_{T3\text{-}2}$ = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

$V_{T1\text{-}1} + V_{T1\text{-}2} + V_{T2\text{-}1} + V_{T2\text{-}2} + V_{T3\text{-}1} + V_{T3\text{-}2}$ = **1.282** m^3

8. CIP Pile P24

(1)Diameter and number

D = 2.000 m L = 47.00 m n = 12 nos

Net Area = 3.142

2)Concrete = 3.142 47.00 12 = 1,772.1 m^3

3) Rebar (SD 345)

Item		Mass (kg) One Pile	On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	6,236	74,832
	D29	3,433	41,196
	Sub-total	9,669	116,028
D25 ~ D16	D25	0	0
	D22	4,273	51,276
	D19	0	0
	D16	0	0
	Sub-total	4,273	51,276
D13		28	336
Total		13,970	167,640

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				87	1,044
STK400,φ60.5,t=2.3	49.500	3	3.300	490	5,881
STK400,φ114.3,t=3.5	48.500	1	9.560	464	5,564
Total					12,489

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (19.000 + 1.0 × 2)x(12.000 + 1.0 × 2) = 294.0 m^2

Excavation Depth 2.700 m

294.00 × 2.700 = 793.8 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.700 - 0.40) x 12 = -86.7 〃

V = 707.1 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.500	× (	π	/4	×	2.500	^2 +	2.500	×	14.500	)	=	20.6 m^3
Pile cap	19.000	×	12.000		×	1.900						=	433.2 〃
Lean concrete	19.200	×	12.200		×	0.300						=	70.3 〃
										Volume of Structure		=	524.1 m^3

V = 707.1 - 524.1 = 183.0 m^3

3) Surplus soil volume (unsuitable soil)

V = 707.1 = 707.1 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	175	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	
12.500 ×	60.0 ×		175				=	131,250
0.000 ×	76.1 ×		0				=	0
0.000 ×	105.0 ×		0				=	0
						Σw	=	131,250

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w=	2	x(	0.000	+	2.500	)+	8.800	]x	0.000)	=	0.00	m^2

2) Pierstud

(Falsework height) H2= 4.300 m

w1=	14.500 x	4.300 x	2	=	124.70	m^2
w2=	π x	4.700 x	4.300	=	63.50	m^2
Sub-Total				=	188.20	m^2

3) Pile cap

w=	2	x(	19.000	+	12.000	)+	8.800	]x	1.900)	=	134.50	m^2
Total										=	322.70	m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

0 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

QUANTITY CALCULATION

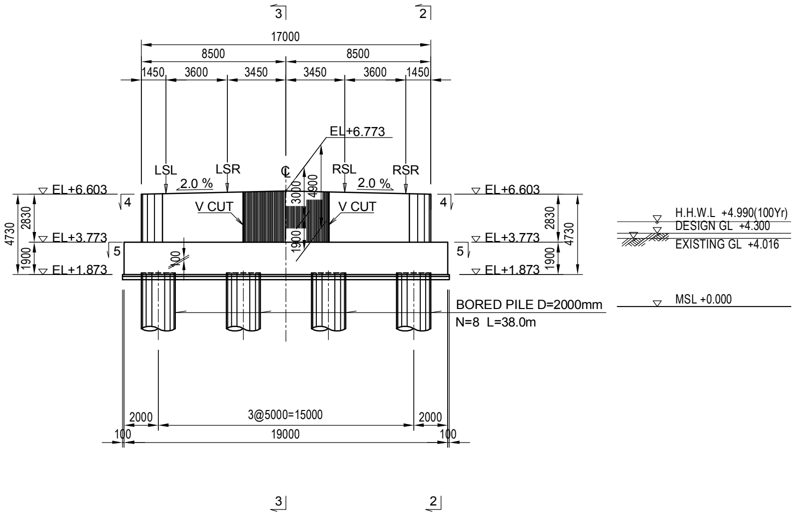
OF

PIER P25

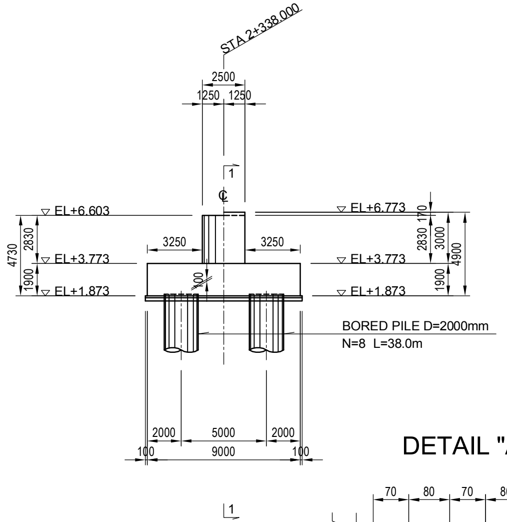
GENERAL VIEW OF P25 PIER

S =1:300

FRONT VIEW
1 - 1

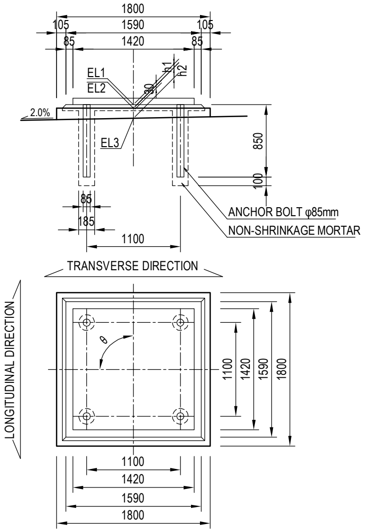


SIDE VIEW
2 - 2 3 - 3



DETAIL OF BEARING

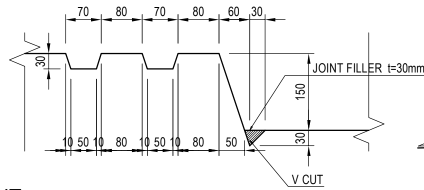
S =1:60



Unit : m	LSL	LSR	RSL	RSR
EL1	6.792	6.864	6.864	6.792
EL2	6.752	6.824	6.824	6.752
EL3	6.632	6.704	6.704	6.632
h1	0.040	0.040	0.040	0.040
h2	0.120	0.120	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

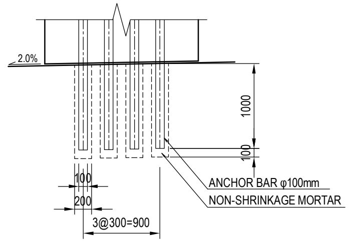
DETAIL "A"

S =1:10

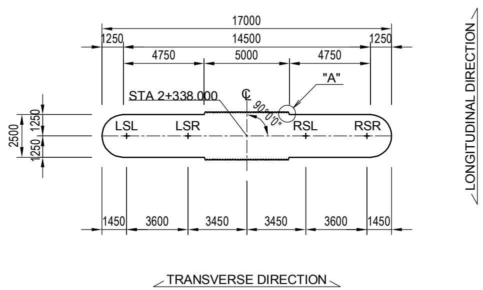


DETAIL OF ANCHOR BAR

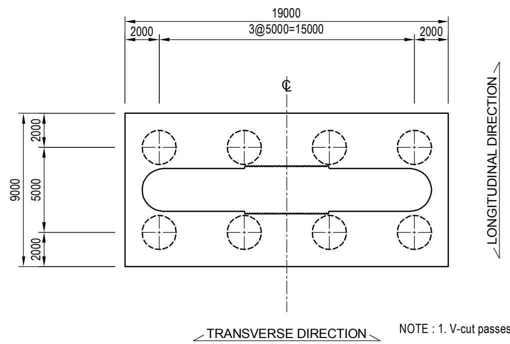
S =1:60



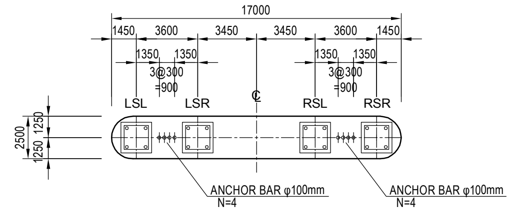
PLAN VIEW
4 - 4



PILE ARRANGEMENT
5 - 5



ARRANGEMENT OF BRIDGE SEAT



NOTE : 1. V-cut passes with joint filler shall be made on abutment wall. The V-cut passes shall be coutinued from a front side surface to a back side surface.
2. Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山 雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野 [illegible]	21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF P25 PIER

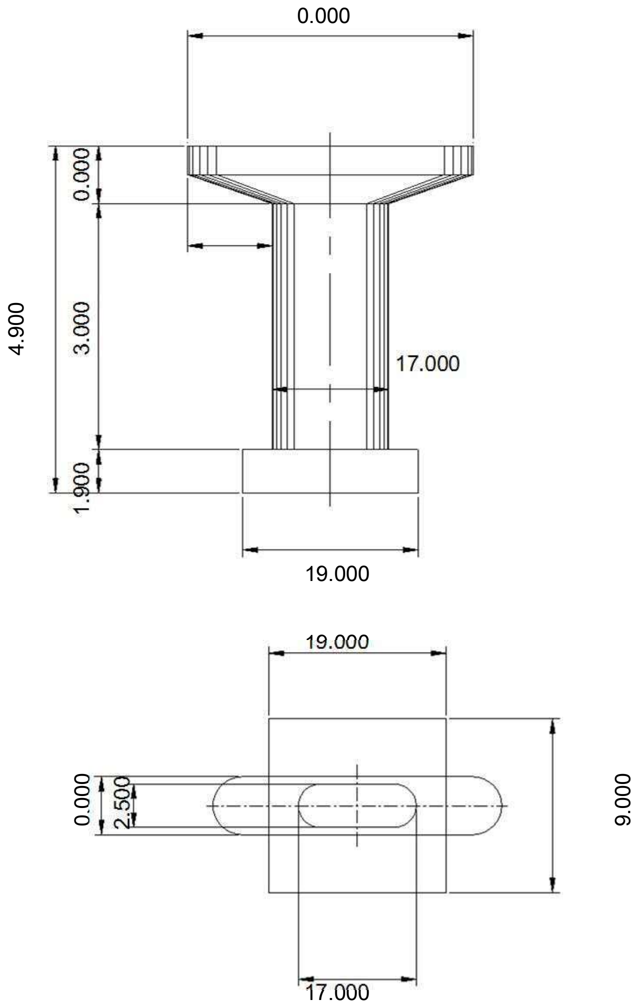
PACKAGE: 2

DWG No.: P2-PB-2061

Summary Table

	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	1.6	
				Column	m^3	123.5	
				Sub Total	m^3	125.0	
		σck = 24 N/mm2		Pile Cap	m^3	324.9	
				Sub Total	m^3	324.9	
		-		Total	m^3	449.9	
	Formwork	Normal Type		Beam	m^2	3.5	
				Column	m^2	110.6	
				Pile Cap	m^2	106.4	
				Total	m^2	220.5	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	18,534	
				D25 ~ D16	kg	14,543	
				D10 - D13	kg	357	
				Total	kg	33,434	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	10,838	
				D10 - D13	kg	357	
				Total	kg	11,195	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	18,534	
				D25 ~ D16	kg	3,705	
				D10 - D13	kg	0	
				Total	kg	22,239	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	17.7	
	Lean Concrete Form	Normal Type			m^2	5.7	
	Crushed stone				m^2	176.6	
	Box out for bearing	Cylindrial form length1		φ185 x 0.88m	m	14	
		Cylindrical form number1			nos	16	
		Cylindrial form length2		φ200 x 1.10m	m	8.8	
		Cylindrical form number2			nos	8	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	1.282	

<table>
<tr><th></th><th colspan="2">Description</th><th colspan="3">Specification dimensions</th><th>Unit</th><th>Quantity</th><th>Remark</th></tr>
<tr><td rowspan="11">Foundation</td><td colspan="2" rowspan="2">CIP Pile</td><td colspan="2" rowspan="2">Diameter 2000</td><td>Length</td><td>m</td><td>38.000</td><td></td></tr>
<tr><td>number</td><td>nos</td><td>8</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass for CIP & SPSP</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>52,472</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>20,840</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>28,512</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>224</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>102,048</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td colspan="3">σck = 24 N/mm2</td><td>m^3</td><td>955.2</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3"></td><td>m^2</td><td>0</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">Spacers and Sonic Pipes</td><td>kg</td><td>6,797</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3">Inside cofferdam, unsuitable</td><td>m^3</td><td>565.9</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>565.9</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">purchased soil</td><td>m^3</td><td>167.4</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3">unsuitable soil</td><td>m^3</td><td>565.9</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III 12.50m</td><td>kg</td><td>120,000</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>160</td><td></td></tr>
<tr><td colspan="3">Number of Wellding Joint (on site)</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>254.4</td><td></td></tr>
<tr><td colspan="3">Supporting</td><td colspan="3">Wedge type (under 80 kN/m2)</td><td>m^3</td><td>0.0</td><td></td></tr>
</table>



Top EL of Substructure	6.773 m
GL for construction	4.300 m

1. Concrete

1) Beam (σck = 24 N/mm2)

(0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x 0.000	=	0.0 m^3
1/2x(0.000 +	17.000) ×	2.500) ×	0 -	0.0 x 10^2 x [radians (31.767) - sin (radians(31.767))]		=	0.0 m^3
π × (0.000 ^2)/4 ×	0.000					=	0.0 m^3
					V1	=	0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	1.800 ×	1.800 ×	0.120 ×	4		=	1.6 m^3
Type2	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	0		=	0.0 m^3
					V2	=	1.6 m^3

3) Column (σck = 24 N/mm2)

{ (2.500) ^2 ÷ 4×π + (17.000 - 2.500) × 2.500 }× 3.000

= 123.5 m^3 (V3)

4) Pile cap (σck = 24 N/mm2)

19.000 × 9.000 × 1.900 = 324.9 m^3 (V4)

5) Total

σck = 30 N/mm2	ΣV	=		+		+		+		=	0.0	m^3
σck = 24 N/mm2	ΣV	=	0.0	+	1.6	+	123.5	+	324.9	=	449.9	m^3

2. Formwork

1) Beam

1/2 × (0.000 + 17.000) ×	0.000	× 2		=	0.0	m^2
0.000 × 0.000 ×	2			=	0.0	〃
π × 0.000 ×	0.000			=	0.0	〃
1/2 × (0.000 + 0.000) ×	8.500	× 2		=	0.0	〃
			A1	=	0.0	m^2

2) Base for bridge bearings

Type1 (	1.800 +	1.800) ×	2 ×	0.120 ×	4		=	3.5	m^2
Type2 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0	m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000 ×	0		=	0	m^2
						A2	=	3.5	m^2

3) Column

{ 2.500 ×π + (17.000 - 2.500) x 2}× 3.000 = 110.6 m^2 (A3)

4) Pile cap

(19.000 + 9.000) × 2 × 1.900 = 106.4 m^2 (A4)

5) Total

ΣA = 0.0 + 3.5 + 110.6 + 106.4 = 220.5 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) P25

Area

19.200 × 9.200 = 176.6 m^2

Volume (V = 176.6 × 0.100 = 17.7 m^3)

4. Lean concrete formwork

0.100 × (19.200 + 9.200) × 2 = 5.7 m^2

5. Crushed stone

Area 19.200 × 9.200 = 176.6 m^2

Volume (V = 176.6 × 0.200 = 35.3 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51		0	0				
D41		0	0				
D38		0	0				
D35		0	0				
D29 - D32	D32	0	10,861				10,861
	D29	0	7,673				7,673
	Sub Total	0	18,534	0	0	0	18,534
D25 ~ D16	D25	0	3,647			3,647	
	D22	0	0				
	D19	0	4,101			1,524	2,577
	D16	0	6,795			5,667	1,128
	Sub Total	0	14,543	0	0	10,838	3,705
D10 - D13		0	357			357	
Total		**0**	**33,434**	**0**	**0**	**11,195**	**22,239**

P25

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter φ85 mm — Anchor bar Length L_0 = 0.780 m

Pipe diameter 185 mm — Anchor bar Number n = 4 nos

Box-out Length l = 0.880 m

Total Length L = 0.880 × 4 (for one bearing) = 3.500 m

For one pier (4 locations)

Total Length L = 3.500 × 4 = 14.000 m

Quantity for Type2

Anchor bar diameter φ100 mm — Anchor bar Length L_0 = 1.000 m

Pipe diameter 200 mm — Anchor bar Number n = 4 nos

Box-out Length l = 1.100 m

Total Length L = 1.100 × 4 (for one bearing) = 4.400 m

For one pier (2 locations)

Total Length L = 4.400 × 2 = 8.800 m

Quantity for Type3

Anchor bar diameter φ0 mm — Anchor bar Length L_0 = 0.000 m

Pipe diameter 100 mm — Anchor bar Number n = 0 nos

Box-out Length l = 0.100 m

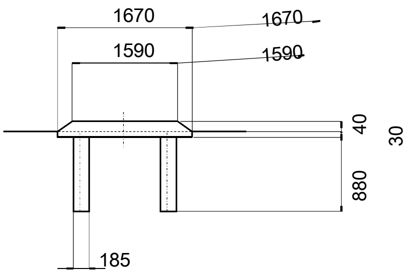
Total Length L = 0.100 × 0 (for one bearing) = 0.000 m

For one pier (0 locations)

Total Length L = 0.000 × 0 = 0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	40
G2	40
G3	40
G4	40
Ave	40

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.040 /6× { (2 × 1.590 + 1.670) × 1.590

+ (2 × 1.670 + 1.590) × 1.670 } = 0.106 m^3

V2 = 1.670 × 0.030 × 1.670 = 0.084 〃

= 0.190 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.190 × 4 = 0.760 m^3

Mortar for anchor bar Type 1

Anchor bar diameter φ85

Anchor bar number 4

Void diameter φ185

Void length 0.880

$V3 = \pi/4 \times (0.185)^2 \times 0.880 \times 4 = 0.095$ 〃

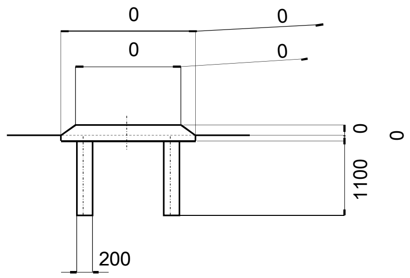
$V4 = -\pi/4 \times (\varphi 85)^2 \times 0.780 \times 4 = -0.018$ 〃

(Volume of anchor bar) $V = 0.077\ m^3$

Anchor bar for an abutment (4 locations)

$V_{T1\text{-}2} = 0.077 \times 4 = 0.308\ m^3$

Quantity for Tyep 2



	mortar height
G5	
G6	
G7	
G8	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{(2a + a1) \times b + (2a1 + a) \times b1\}$

$V1 = 0.000/6 \times \{(2 \times 0.000 + 0.000) \times 0.000$

$+ (2 \times 0.000 + 0.000) \times 0.000\} = 0.000\ m^3$

$V2 = 0.000 \times 0.000 \times 0.000 = 0.000$ 〃

$= 0.000\ m^3$

Total base mortal volume for Type 2

$V_{T2\text{-}1} = 0.000 \times 0 = 0.000\ m^3$

Mortar for anchor bar Type 2

Anchor bar diameter φ100

Anchor bar number 4

Void diameter φ200

Void length 1.1

$V3 = \pi/4 \times (0.200)^2 \times 1.100 \times 4 = 0.138$ 〃

$V4 = -\pi/4 \times (\varphi 100)^2 \times 1.000 \times 4 = -0.031$ 〃

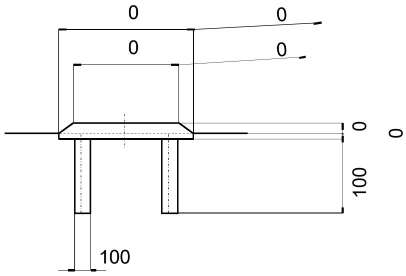
(Volume of anchor bar) $V = 0.107\ m^3$

Anchor bar for an abutment (2 locations)

$V_{T2\text{-}2} = 0.107 \times 2 = 0.214\ m^3$

Quantity for Tyep 3

P25



	mortar height
G9	
G10	
G11	
G12	
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6\times\{(2a+a1)\times b+(2a1+a)\times b1\}$

V1	=	0.000 /6× { (2	×	0.000	+	0.000	) ×	0.000				
		+ (2	×	0.000	+	0.000	) ×	0.000	}	=	0.000	m^3
V2	=	0.000	×	0.000	×	0.000				=	0.000	〃
										=	0.000	m^3

Total base mortal volume for Type 3

$V_{T3\text{-}1}$ = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter	φ0
Anchor bar number	0
Void diameter	φ100
Void length	0.100

V3 = π/4 × (0.100)^2× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0)^2× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

$V_{T3\text{-}2}$ = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

$V_{T1\text{-}1}$ + $V_{T1\text{-}2}$ + $V_{T2\text{-}1}$ + $V_{T2\text{-}2}$ + $V_{T3\text{-}1}$ + $V_{T3\text{-}2}$ = **1.282** m^3

8. CIP Pile P25

(1)Diameter and number

D = 2.000 m L = 38.00 m n = 8 nos

Net Area = 3.142

2)Concrete = 3.142 38.00 8 = 955.2 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		6559	52,472
D32 ~ D29	D32	0	0
	D29	2,605	20,840
	Sub-total	2,605	20,840
D25 ~ D16	D25	0	0
	D22	3,564	28,512
	D19	0	0
	D16	0	0
	Sub-total	3,564	28,512
D13		28	224
Total		12,756	102,048

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				71	568
STK400,φ60.5,t=2.3	40.500	3	3.300	401	3,208
STK400,φ114.3,t=3.5	39.500	1	9.560	378	3,021
Total					6,797

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (19.000 + 1.0 × 2)x(9.000 + 1.0 × 2) = 231.0 m^2

Excavation Depth 2.700 m

231.00 × 2.700 = 623.7 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.700 - 0.40) x 8 = -57.8 〃

V = 565.9 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.500	× (π /4 ×	2.500 ^2 +	2.500	×	14.500	)	=	20.6 m^3
Pile cap	19.000	×	9.000	×	1.900			=	324.9 〃
Lean concrete	19.200	×	9.200	×	0.300			=	53.0 〃
						Volume of Structure		=	398.5 m^3

V = 565.9 - 398.5 = 167.4 m^3

3) Surplus soil volume (unsuitable soil)

V = 565.9 = 565.9 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	160	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	

12.500	×	60.0	×	160		=	120,000
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	120,000

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕 H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w=	2	x(	0.000	+	2.500	)+	8.800	]x	0.000	)	=	0.00	m^2

2) Pierstud

(Falsework height) H2= 3.000 m

w1=	14.500	x	3.000	x	2	=	87.00 m^2
w2=	π	x	4.700	x	3.000	=	44.30 m^2
Sub-Total						=	131.30 m^2

3) Pile cap

w=	2	x(	19.000	+	9.000	)+	8.800	]x	1.900	)	=	123.10	m^2
Total											=	254.40	m^2

12. Supporting

【height Divis 〔Average height〕 ---- H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

0 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

QUANTITY CALCULATION

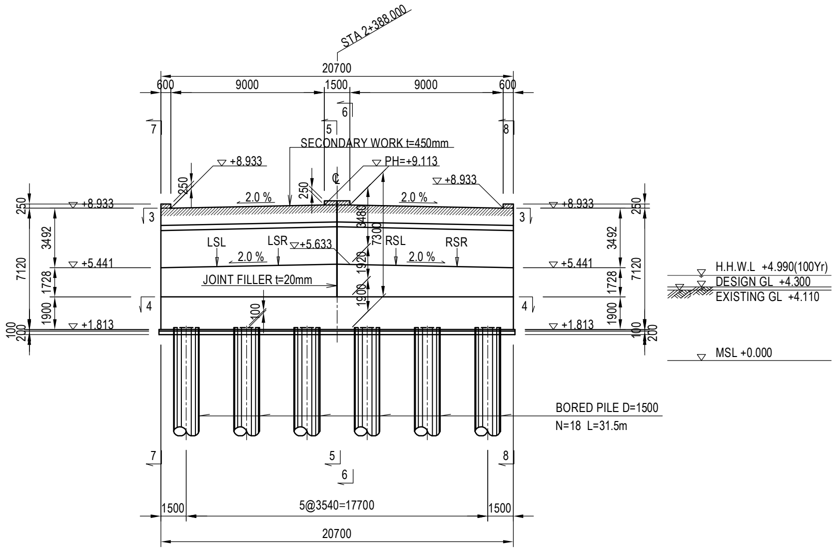
OF

ABUTMENT A2

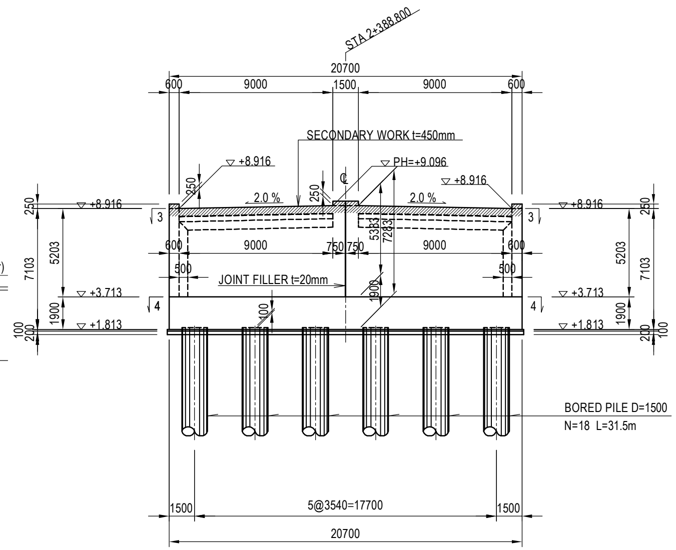
GENERAL VIEW OF A2 ABUTMENT(1)

S=1:300

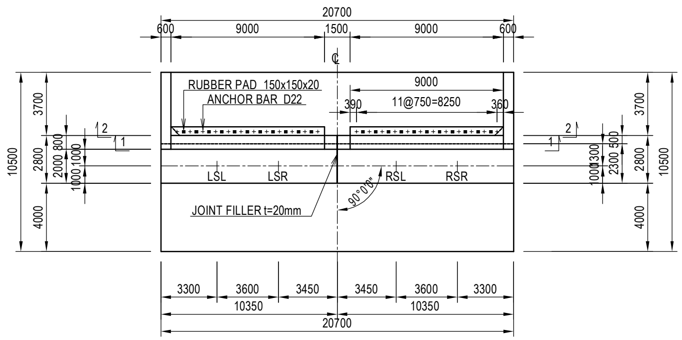
SECTION 1 - 1



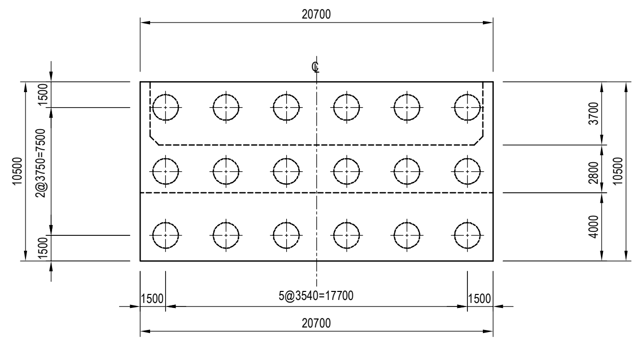
SECTION 2 - 2



SECTION 3 - 3



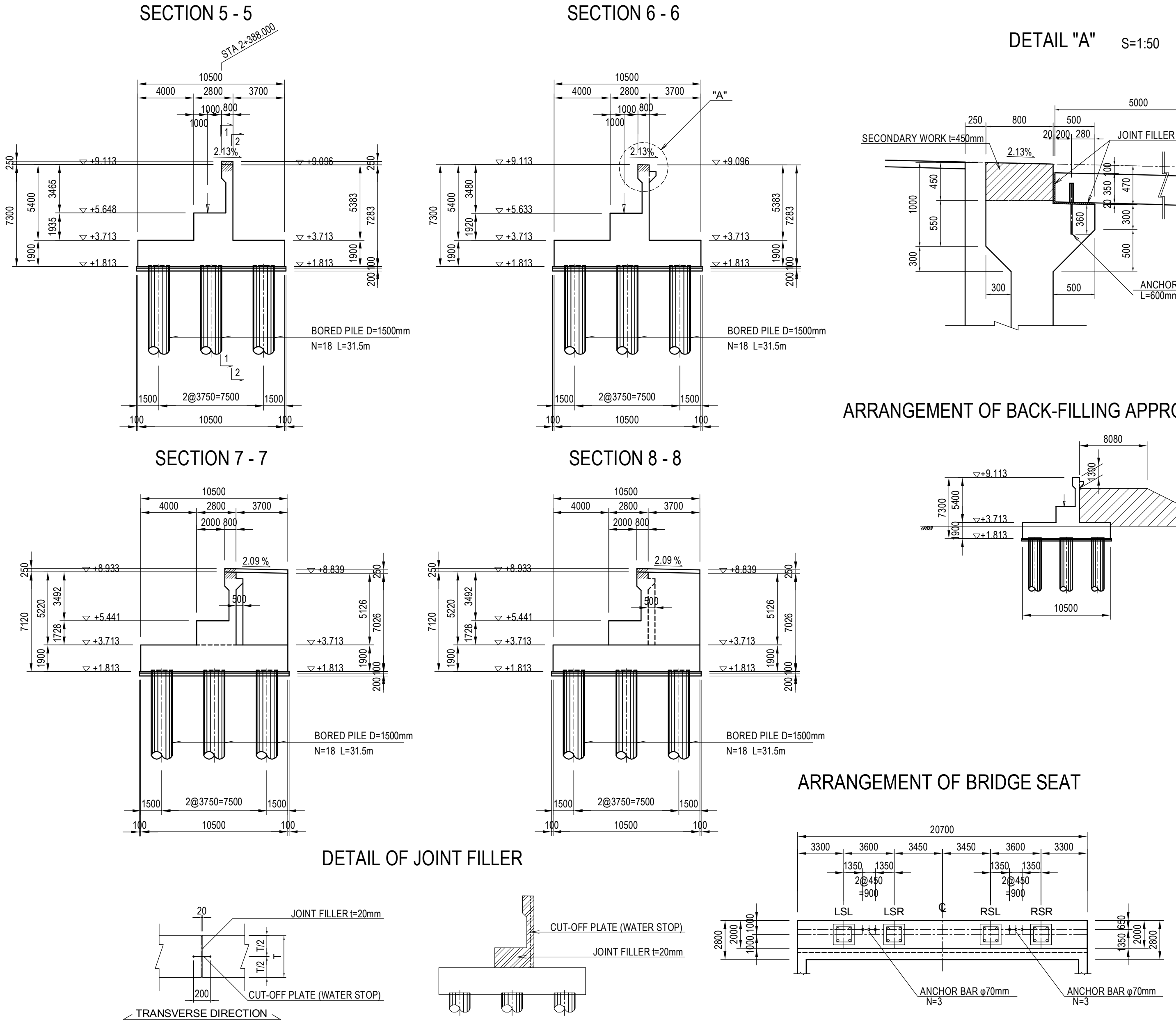
SECTION 4 - 4

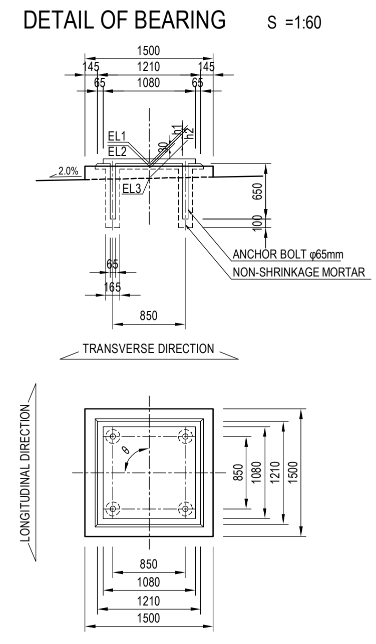


PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 尚弘	15 Jun.2017	GENERAL VIEW OF A2 ABUTMENT(1)	2
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P2-PB-2001

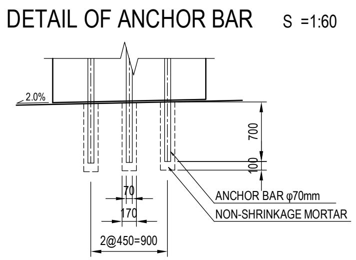
GENERAL VIEW OF A2 ABUTMENT(2)

S=1:300





Unit : m	LSL(RSL)	LSR(RSR)
EL1	5.627	5.699
EL2	5.597	5.669
EL3	5.507	5.579
h1	0.030	0.030
h2	0.090	0.090
θ	90d0'0"	90d0'0"



NOTES :
1. Weep holes shall be installed in abutment wall by 3 meter interval for discharge of water from backfilled soil.
2. The Contractor shall adjust gradients of top surface of a parapet wall to retain continuity in road profile.
3. Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME: DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT

FINANCED BY: JAPAN INTERNATIONAL COOPERATION AGENCY

COUNTERPART: REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE

JICA STUDY TEAM: NIPPON KOEI CO., LTD. / ORIENTAL CONSULTANTS GLOBAL CO., LTD. / METROPOLITAN EXPRESSWAY COMPANY LIMITED / CHODAI CO.,LTD. / NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE
PREPARED BY	M. OHYAMA	大山雅弘	15 Jun.2017
CHECKED BY	T. HAYAKAWA	早川和邦	20 Jun.2017
APPROVED BY	Y. SANO	佐野	21 Jun.2017

DRAWING TITLE: GENERAL VIEW OF A2 ABUTMENT(2)

PACKAGE: 2

DWG No.: P2-PB-2002

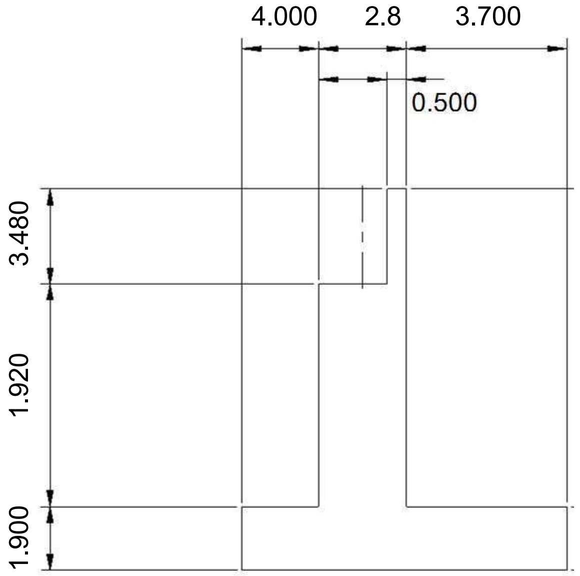
A2 Abutment

Summary Table

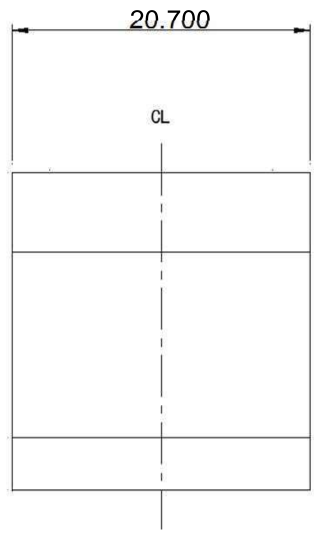
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Body	m^3	179.0	
		σck = 24 N/mm2		Pile cap	m^3	413.0	
				Total	m^3	592.0	
	Formwork	Normal Type		Body	m^2	332.5	
				Pile cap	m^2	118.6	
				Total	m^2	451.1	
				Post Cast	m^2	0.0	
	Rebar	SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	27578	
				D25 ~ D16	kg	15045	
				D10 - D13	kg	363	
				Total	kg	42986	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D32 ~ D29	nos	0	
				Total	nos	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	15584	
				D25 ~ D16	kg	6283	
				D10 - D13	kg	198	
				Total	kg	22065	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	11994	
				D25 ~ D16	kg	8762	
				D10 - D13	kg	165	
				Total	kg	20921	
	Lean concrete	σck = 18 N/mm2 , t = 10 cm			m^3	22.4	
	Lean concrete form	Normal Type			m^2	6.3	
	Crushed stone				m^2	223.6	
	Box out for bearing	Cylindrial form length		φ165 x 0.69m	m	11.04	
		Cylindrical form number			nos	16	
		Cylindrial form length		φ170 x 0.80m	m	4.8	
		Cylindrical form number			nos	6	
	Box out for bridge railing	Cylindrial form length		φ225 x 0.24m	m	1.42	
		Cylindrical form number			nos	6	
		Non-shrinkage mortar			m^3	0.712	

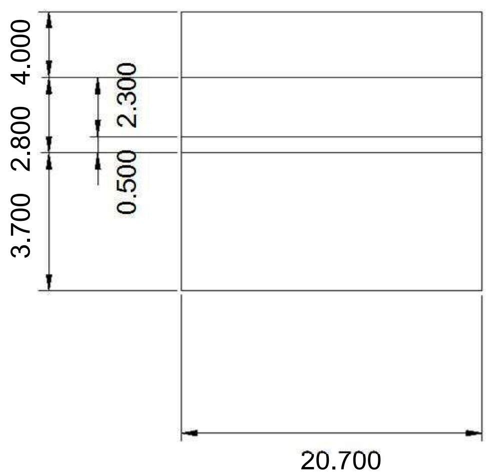
Foundation	CIP Pile	Diameter		Length	m	31.500	
		1500		Number	nos	18	
		Concrete		σck = 30N/mm2	m^3	1,001.9	
	Rebar	SD 345	Mass	D 38	kg	0	
				D 35	kg	75,060	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	52,110	
				D10 - D13	kg	252	
				Total	kg	127,422	
	Miscellaneous steel	spacers and sonic pipes			kg	1,784	
Earth Work	Foundation Excavation				m^2	718.2	
		Total			m^3	718.2	
	Backfill	Purchased soil			m^3	203.3	
	Surplus Soil				m^3	718.2	
	Ground Preparation				m^2	0.0	
Temp work	Steel sheet pile	Type III			kg	132,000	
		Number of Sheet Piles			nos	176	
		Number of Joint			nos	0	
	Mold Steel: Supporting Beam	H-×××			kg	0	
	Mold Steel: Brace	H-×××			kg	0	
	Mold Steel: Bond Timber	H-×××			kg	0	
	Mold Steel: Sub-member(A)	0.22			kg	0	
	Mold Steel: Sub-member(B)	0.04			kg	0	
	Mold Steel: Total				kg	0	
Approach slab	Concrete	σck = 24 N/mm2			m^3	31.4	
	Formwork	Normal Type			m^2	8.1	
	Rebar	SD345		D35	kg	0	
				D29 - D32	kg	2,958	
				D16 - D25	kg	2,640	
				D10 - D13	kg	326	
				Total	kg	5,924	
	Joint filler	t = 20 mm			m^2	14.4	
		t = 10 mm			m^2	2.6	
	Bearing pad	Rubber bearing			m^2	0.4	
		Pipe		SGP40A×220	kg	28	
		Cap		φ70×3.2.0	kg	2	
Falsework		Scaffloding (Handrail precede type) H<30m			m^2	462.5	

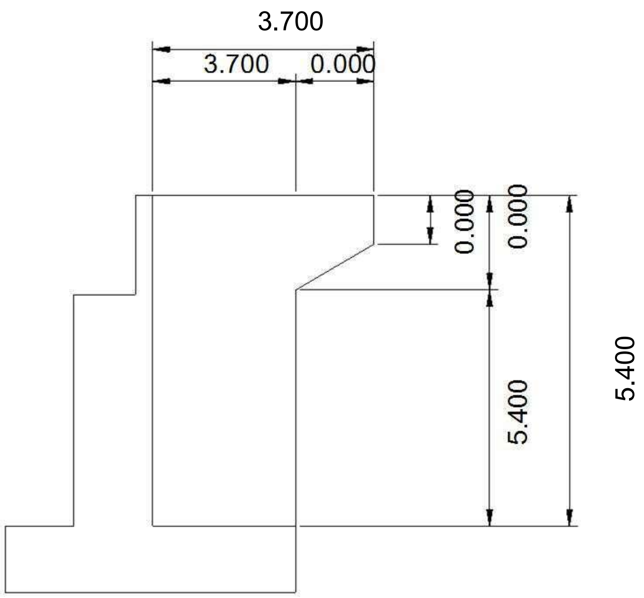
Schematic Diagram



Total height	7.300
Pile cap width	10.500
Pile cap depth	20.700







Wing wall thickness 0.600 m

Top EL of Substructure	9.113 m
GL for construction	4.300 m

Quantity Calculation A2

1. Concrete

1) Ballast wall ($\sigma ck = 24$ N/mm2)

3.480 × 0.500 × 20.700 = 36.0 m^3

2) Wall ($\sigma ck = 24$ N/mm2)

1.920 × 2.800 × 20.700 = 111.3 m^3

3) Pile cap ($\sigma ck = 24$ N/mm2)

1.900 × 10.500 × 20.700 = 413.0 m^3

4) Wing wall ($\sigma ck = 24$ N/mm2)

a) Left side: a projection part

1/2 × (0.000 + 0.000) × 0.000 × 0.600 = 0.0 m^3

Left side: side wall

3.700 × 5.400 × 0.600 = 12.0 m^3

b) Right side: (L & R are in a symmetric shape)

= 12.0 m^3

5) Cradle ($\sigma ck = 24$ N/mm2)

1/2 × (0.300 + 0.800) × 0.500 × 18.00 = 5.0 m^3

6) Haunch ($\sigma ck = 24$ N/mm2)

1/2 × 0.500 × 0.500 × 4.630 × 2 = 1.2 m^3

7) Base for bridge bearings ($\sigma ck = 24$ N/mm2)

1.500 × 1.500 × 0.090 × 4 = 0.8 m^3

0.000 × 0.000 × 0.000 × 0 = 0.0 m^3

8) Total concrete volume

ΣV = 36.0 + 111.3 + 413.0 + 12.0 + 12.0

+ 5.0 + 1.2 + 0.8 + 0.0 + 0.81 = 592.0 m^3

2. Formwork

1) Ballast wall

(0.500 + 20.700) × 3.480 × 2 = 147.6 m^2

2) Wall

(2.800 + 20.700) × 1.920 × 2 = 90.2 m^2

3) Pile cap

1.900 × (10.500 + 20.700) × 2 = 118.6 m^2

4) Wing wall A2

a) Left side a projection part

1/2(	0.000	+	0.000	) ×	0.000	×	2	=	0.0	m^2
	0.000	+	0.000	) ×	0.600			=	0.0	m^2

Left side a side wall

5.400	×	3.700	×	2		=	40.0	m^2
5.400	×	0.600				=	3.2	m^2
					A	=	43.2	m^2

b) Right (L & R are in a symmetric shape)

5) Cradle

	0.300	×	9.000	×	2.000				=	5.4	m^2
	0.707	×	9.000	×	2.000				=	12.7	m^2
1/2(	0.300	+	0.800	) ×	0.500	×	2		=	0.6	m^2
	-0.800	×	9.000	×	2.000				=	-14.4	m^2
								A	=	4.3	m^2

6) Haunch

(0.707 - 0.500)× 4.630 × 2 = 1.9 m^2

7) Base for bridge bearings

(1.500 + 1.500) × 2 × 0.090 × 4 = 2.2 m^2

8) Total Formwork Area

ΣA = 147.6 + 90.2 + 118.6 + 43.2 + 43.2
4.3 + 2.2 + 1.9 = 451.1 m^2

3. Rebar SD 345

	Diameter		Mass (kg)	Stud Welding (Number)	Body (kg)	Footing (kg)
Body	D38					
	D35				0	
	D32 - D29	D32	12,992		12,992	
		D29	14,586		2,592	11,994
		Sub total	27,578	0	15,584	11,994
	D25 ~ D16	D25	4,560		85	4,475
		D22	1,056		1,056	
		D19	3,640		1,162	2,478
		D16	5,789		3,980	1,809
		Sub total	15,045	0	6,283	8,762
	D10 - D13		363		198	165
	Total		42,986	0	22,065	20,921

4. Box-out for Bearings and Railling (Cylindrical form) A2

Quantity of box-out form for anchor bar Type 1

Anchor bar diameter			φ65	mm		Length	L_0	=	0.590	m
Pipe diameter			φ165	mm		Number	n	=	4	nos
Length	l	=	0.690	m						
Total Length	L	=	0.690	×	4			=	2.760	m
For an abutment	(		4	locations)						
Total Length	L	=	2.760	×	4			=	11.040	m

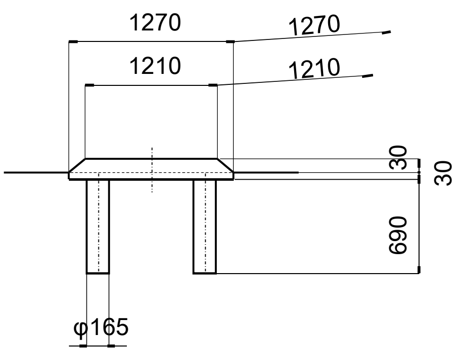
Quantity of box-out form for anchor bar Type 2

Anchor bar diameter			φ70	mm		Length	L_0	=	0.700	m
Pipe diameter			170	mm		Number	n	=	3	nos
Length	l	=	0.800	m						
Total Length	L	=	0.800	×	3			=	2.400	m
For an abutment	(		2	locations)						
Total Length	L	=	2.400	×	2			=	4.800	m

Quantity of box-out form for raillings

Railing post diameter			φ125	mm		Length	L_0	=	0.220	m
Pipe diameter			225	mm		Number	n	=	3	nos
Length	l	=	0.235	m						
Total Length	L	=	0.235	×	3			=	0.710	m
For right and left sides	(		2	locations)						
Total Length	L	=	0.710	×	2			=	1.420	m

Quantity of Non-shrinkage Mortar for Type 1



	mortar height
G1	30
G2	30
G3	30
G4	30
Ave	30.0

mm

Base mortar for one location A2

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.030 /6 \times (2 \times 1.210 + 1.270) \times 1.210$
$+ (2 \times 1.270 + 1.210) \times 1.270 \} = 0.046\ m^3$

$V2 = 1.270 \times 0.030 \times 1.270 = 0.048\ m^3$

$= 0.094\ m^3$

For an abutment

$V_{T1-1} = 0.094 \times 4 = 0.376\ m^3$

Mortar for anchor bar Type 1

Anchor bar diameter	φ65
Anchor bar number	4
Void diameter	φ165
Void length	0.690

$V3 = \pi/4 \times (0.165)^{\wedge 2} \times 0.690 \times 4 = 0.059\ m^3$

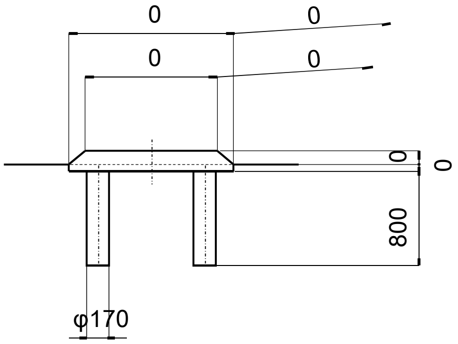
$V4 = -\pi/4 \times (0.065)^{\wedge 2} \times 0.590 \times 4 = -0.008\ m^3$

(Volume of anchor bar) $V = 0.051\ m^3$

Anchor bar for an abutment (4 locations)

$V_{T1-2} = 0.051 \times 4 = 0.204\ m^3$

Quantity of Non-shrinkage Mortar for Type 2



	mortar height	
G1		
G2		
G3		
G4		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

$V1 = 0.000 /6 \times (2 \times 0.000 + 0.000) \times 0.000$
$+ (2 \times 0.000 + 0.000) \times 0.000 \} = 0.000\ m^3$

$V2 = 0.000 \times 0.000 \times 0.000 = 0.000\ m^3$

$= 0.000\ m^3$

For an abutment

$V_{T2-1} = 0.000 \times 2 = 0.000\ m^3$

Mortar for anchor bar Type 2 A2

Anchor bar diameter φ70

Anchor bar number 3

Void diameter φ170

Void length 0.800

$V3 = \pi/4 \times (0.170)^{2} \times 0.800 \times 3 = 0.054\ m^3$

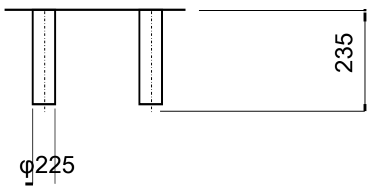
$V4 = -\pi/4 \times (0.07)^{2} \times 0.700 \times 3 = -0.008\ m^3$

(Volume of anchor bar) $V = 0.046\ m^3$

Anchor bar for an abutment (2 locations)

$V_{T2\text{-}2} = 0.046 \times 2 = 0.092\ m^3$

Quantity of Non-shrinkage Mortar for railling



	mortar height
G1	0
G2	0
G3	
G4	
Ave	0

mm

Base mortar: Non.

For an abutment

$V_{T3\text{-}1} = \quad = 0.000\ m^3$

Mortar for railing posts A2

Posts diameter φ125

Posts number 3

Void diameter φ225

Void length 0.235

$V3 = \pi/4 \times 0.225 \times 0.235 \times 3 = 0.028\ m^3$

$V4 = - \pi/4 \times (0.125)^{\wedge 2} \times 0.220 \times 3 = -0.008\ m^3$

(Volume of anchor bar) $V = 0.020\ m^3$

Posts for an abutment (2 locations)

$V_{T3-2} = 0.020 \times 2 = 0.040\ m^3$

Quantity of Non-shrinkage Mortar for railling

$V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = 0.712\ m^3$

6. Lean concrete (σck = 18 N/mm2 , t = 10 cm)

Area

$10.700 \times 20.900 = 223.6\ m^2$

Volume ($V = 223.6 \times 0.100 = 22.4\ m^3$)

7. Lean concrete formwork

$0.100 \times (10.700 + 20.900) \times 2 = 6.3\ m^2$

8. Crushed stone

Area $10.700 \times 20.900 = 223.6\ m^2$

Volume ($V = 223.6 \times 0.200 = 44.7\ m^3$)

9. CIP Pile

1) Pile Diameter and number

$D = 1.500$ m $L = 31.50$ m $n = 18$ nos

2) Concrete (σck = 30 N/mm2)

Net sectional area $A = 1.767\ m^2$

Concrete $V = 1.767 \times 31.50 \times 18 = 1{,}001.9\ m^3$

3) Rebar (SD 345) A2

	Diameter		Mass (kg) One Pile	Mass (kg) On Pier
Body	D38		0	0
	D35		4,170	75,060
	D32 - D29	D32	0	0
		D29	0	0
		Sub total	0	0
	D25 ~ D16	D25	1,239	22,302
		D22	148	2,664
		D19	1,508	27,144
		D16	0	0
		Sub total	2,895	52,110
	D10 - D13		14	252
	Total		7,079	127,422

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				60	1,080
STK400,φ60.5,t=2.3	2.500	3	3.300	25	446
STK400,φ114.3,t=3.5	1.500	1	9.560	14	258
Total					1,784

10. Approach slab

1) Concrete ($\sigma ck = 24$ N/mm2)

V = 5.000 × 8.980 × 0.350 x 2 nos = 31.4 m^3

(L) (T)

2) Formwork

A = (8.980 + 1.320 + 1.320)× 0.350 x 2 nos = 8.1 m^2

3) Bridge bearing (200×200×20 mm)

A = 0.150 × 0.150 × 11 x 2 nos = 0.4 m^2

4) Joint filler t = 20mm

((0.350 + 0.500)× 8.980 - 0.4) x 2 nos = 14.4 m^2

5) Joint filler t = 10mm

(3.680 + 0.000)× 0.350 x 2 nos = 2.6 m^2

6) Pipe (SGP 50A)

L = 220 mm n = 12 nos

W = 0.220 × 12 × 5.31 (Dia22) x 2 nos = 28 kg

Cap

φ70 t = 3.2 mm n = 12 nos

W = π/4× 0.070 × 0.070 × 3.2 × 7.85 × 12

x 2 nos = 2 kg

7) Rebar (SD 345) A2

	Diameter		MASS (kg)
Body	D38		
	D35		
	D32 - D29	D32	
		D29	2,958
		Sub total	2,958
	D25 ~ D16	D25	1,258
		D22	
		D19	
		D16	1,382
		Sub total	2,640
	D10 - D13		326
	Total		5,924

1) Excavation for foundation

Excavation within Cofferdam

Area	A	=	(	10.500	+	1.0	×	2)x(	20.700	+	1.0	×	2	)= 283.8 m^2

Excavation Depth 2.800 m

	283.8	×	2.800						=	794.5 m^3
		×		×						
Deduction of Pile Volume	1.500	^2 x	π/4	×(	2.800	- 0.40	) x	18	=	-76.3 m^3
								V	=	718.2 m^3

2) Backfill

Wall	0.600	×	20.700	×	2.800	=	34.8 m^3
Pile cap	10.500	×	20.700	×	1.900	=	413.0 m^3
Lean concrete	10.700	×	20.900	×	0.300	=	67.1 m^3
					Volume of Structure	=	514.9 m^3

V = 718.2 - 514.9 = 203.3 m^3

3) Surplus soil volume

V = 718.2 = 718.2 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

11. Temporary Cofferdam A2

1) Earth retaining method w= 0.4 Type-III

Steel Sheet Pile Type III	12.500	m	176	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	

12.500	×	60.0	×	176		=	132,000
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	132,000

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××				0.000
	H- ×××				0.000
	H- ×××				0.000
Brace	H- ×××				0.000
	H- ×××				0.000
Bond Timber	H- ×××				0.000
Total of Main Member					0.000
Sub-member(A)	0.0 × 0.22				0.000
Sub-member(B)	0.0 × 0.04				0.000
Total of Sub-Member					0.000
Total of Mold Steel					0.000

12. Falsework

【height Division】 〔Average heigh1H≦30m

(Falsework height) H= 5.400 m

	Wall (Front)	w1=	20.700	+	3.400	)x	5.400			=	130.10 m^2
	Wall (Rear)	w2=	19.500	-	3.400	)x	5.400			=	86.90 m^2
	Wall (Left)	w3=	6.500	+	0.500	)x	5.400			=	37.80 m^2
	Wall (Right)	w4=	6.500	+	0.500	)x	5.400			=	37.80 m^2
	Wing (Left)	w5=	3.700	-	0.500	)x	5.400			=	17.30 m^2
	Wing (Right)	w6=	3.700	-	0.500	)x	5.400			=	17.30 m^2
Pile cap	w7= [2 x(		10.500	+	20.700	)+	8.800	]x	1.900)	=	135.30 m^2
	Sub-Total									=	462.50 m^3

Total = 462.50 m^3

Package -1 On-Ramp Bridge

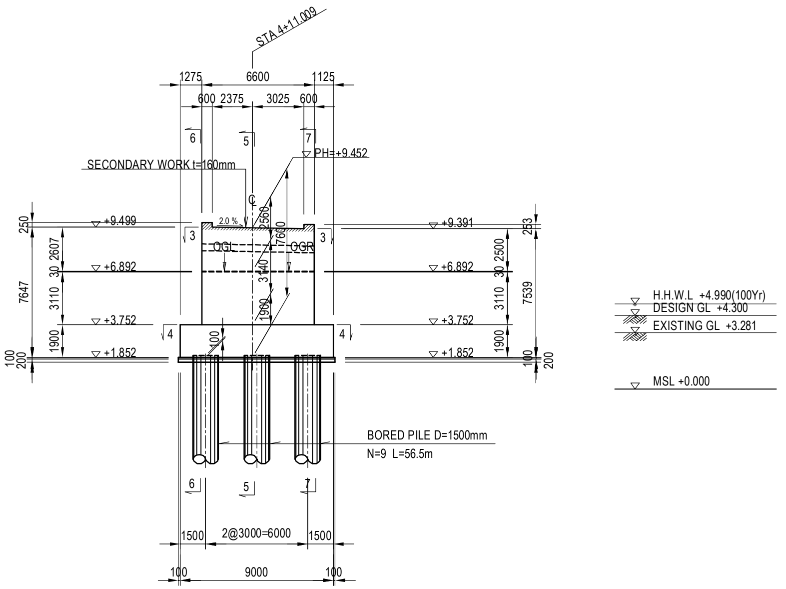
QUANTITY CALCULATION

OF

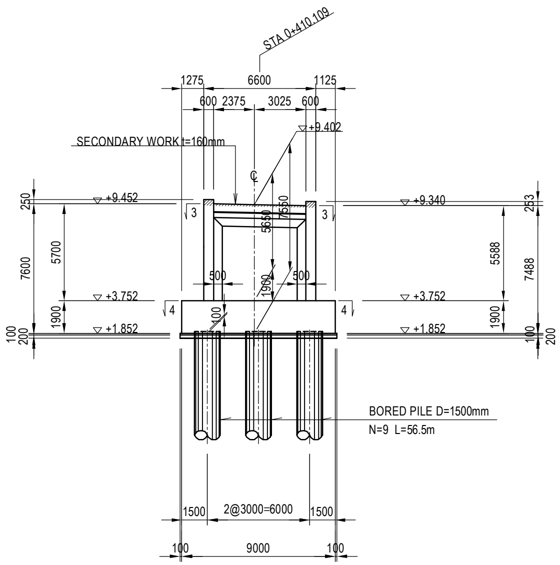
ABUTMENT AO1

GENERAL VIEW OF AO1 ABUTMENT(1) S =1:300

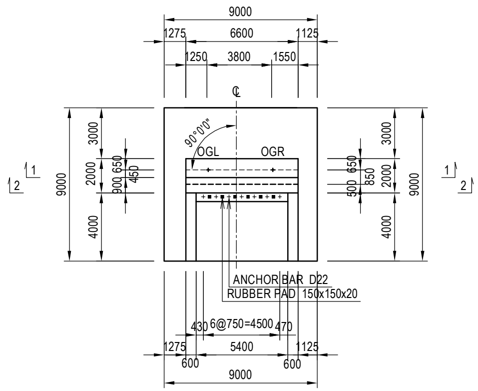
SECTION 1 - 1



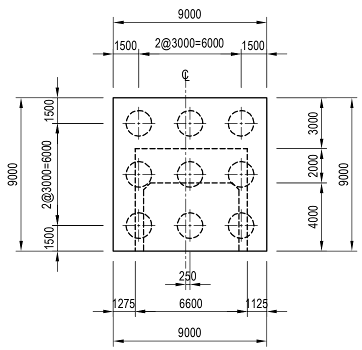
SECTION 2 - 2



SECTION 3 - 3



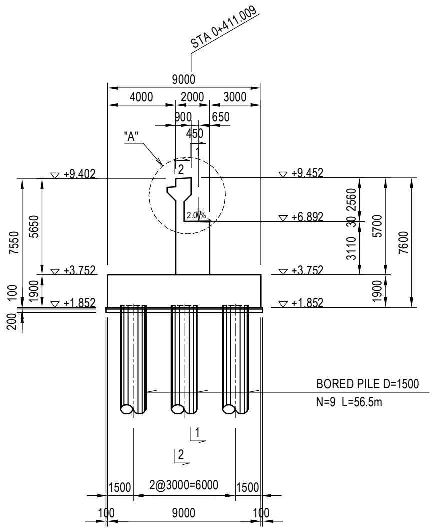
SECTION 4 - 4

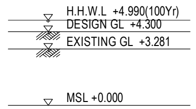


PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 尚弘	15 Jun.2017	GENERAL VIEW OF AO1 ABUTMENT(1)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-OR-2001

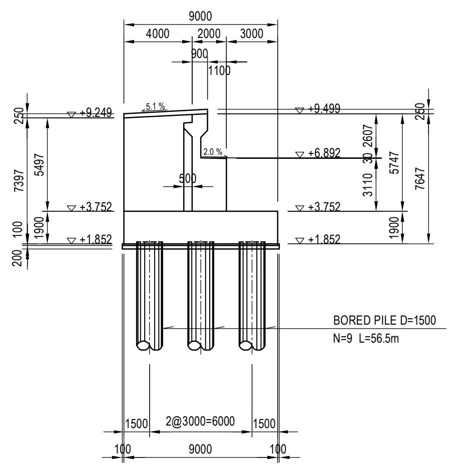
GENERAL VIEW OF AO1 ABUTMENT(2)　S =1:300

SECTION 5 - 5

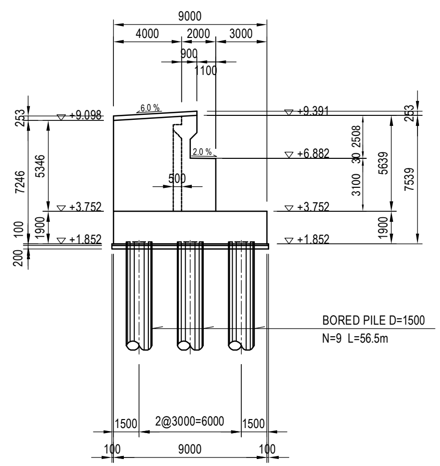




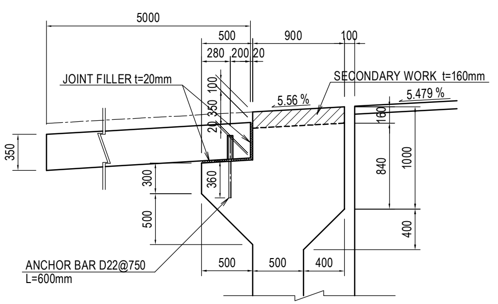
SECTION 6 - 6



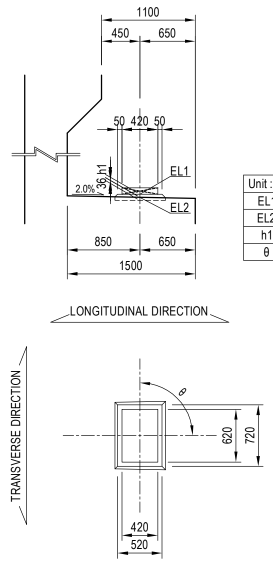
SECTION 7 - 7



DETAIL "A"　S =1:50

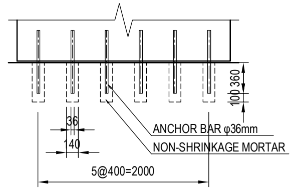


DETAIL OF BEARING　S =1:60

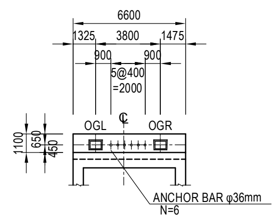


Unit : m	OGL	OGR
EL1	6.909	6.909
EL2	6.875	6.875
h1	0.034	0.034
θ	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR　S =1:60



ARRANGEMENT OF BRIDGE SEAT



NOTES : 1. Weep holes shall be installed in abutment wall by 3 meter interval for discharge of water from backfilled soil.
2. The Contractor shall adjust gradients of top surface of a parapet wall to retain continuity in road profile.
3. Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 雨弘	15 Jun.2017	GENERAL VIEW OF AO1 ABUTMENT(2)	1
				CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-OR-2002

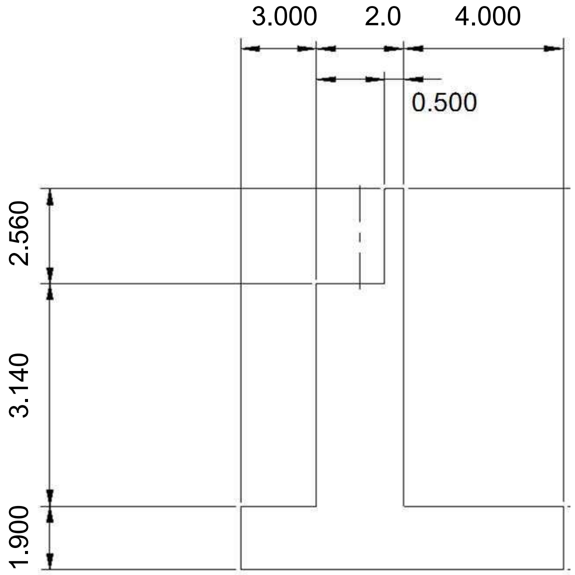
AO1 Abutment (On-Ramp) AO1

Summary Table

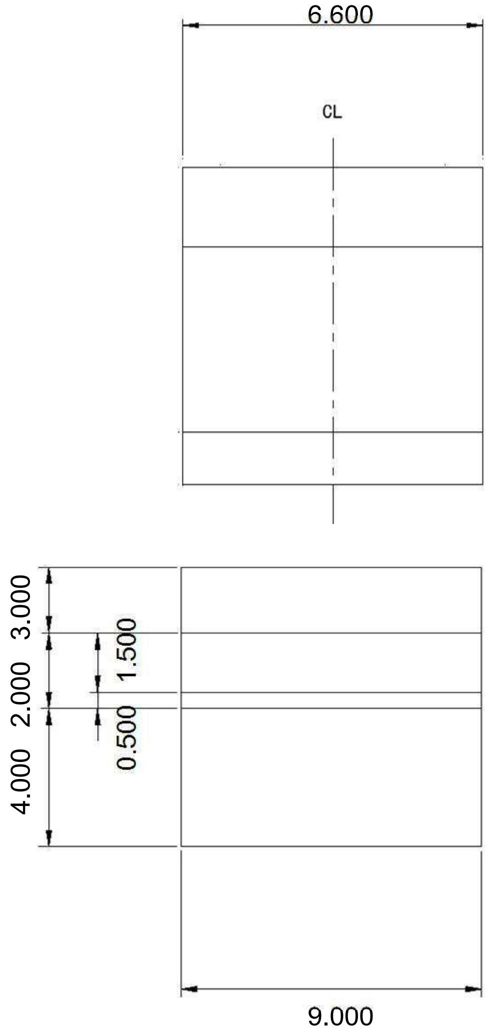
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Body	m^3	80.0	
		σck = 24 N/mm2		Pile cap	m^3	153.9	
				Total	m^3	233.9	
	Formwork	Normal Type		Body	m^2	191.5	
				Pile cap	m^2	68.4	
				Total	m^2	259.9	
				Post Cast	m^2	0.0	
	Rebar	SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	4139	
				D25 ~ D16	kg	9724	
				D10 - D13	kg	281	
				Total	kg	14144	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D32 ~ D29	nos	0	
				Total	nos	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	1558	
				D25 ~ D16	kg	6220	
				D10 - D13	kg	142	
				Total	kg	7920	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	2581	
				D25 ~ D16	kg	3504	
				D10 - D13	kg	139	
				Total	kg	6224	
	Lean concrete	σck = 18 N/mm2 , t = 10 cm			m^3	8.5	
	Lean concrete form	Normal Type			m^2	3.7	
	Crushed stone				m^2	84.6	
	Box out for bearing	Cylindrial form length		φ140 x 0.39m	m	2.34	
		Cylindrical form number			nos	6	
		Cylindrial form length		φ100 x 0.10m	m	0	
		Cylindrical form number			nos	0	
	Box out for bridge railing	Cylindrial form length		φ225 x 0.24m	m	1.42	
		Cylindrical form number			nos	6	
		Non-shrinkage mortar			m^3	0.105	

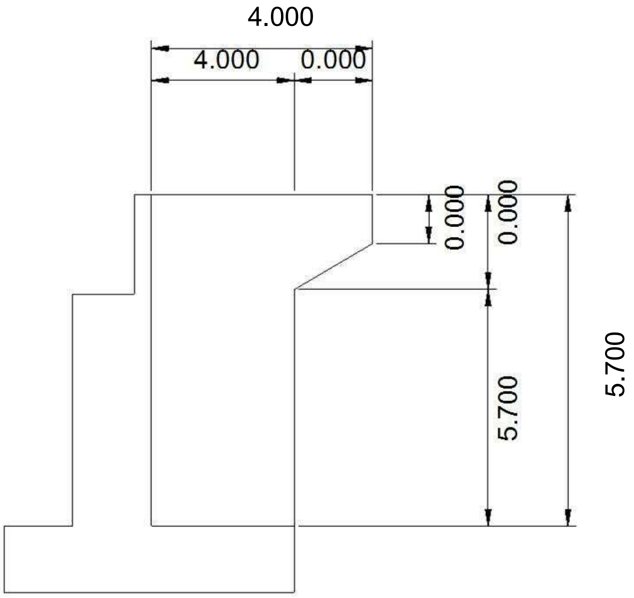
<table>
<tr><td rowspan="10">Foundation</td><td colspan="2" rowspan="3">CIP Pile</td><td colspan="2">Diameter</td><td>Length</td><td>m</td><td>56.500</td><td></td></tr>
<tr><td colspan="2">1500</td><td>Number</td><td>nos</td><td>9</td><td></td></tr>
<tr><td colspan="2">Concrete</td><td>σck = 24N/mm2</td><td>m^3</td><td>898.5</td><td></td></tr>
<tr><td colspan="2" rowspan="6">Rebar</td><td rowspan="6">SD 345</td><td rowspan="6">Mass</td><td>D 38</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D 35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D 32</td><td>kg</td><td>28,305</td><td></td></tr>
<tr><td>D25 ~ D16</td><td>kg</td><td>49,221</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>126</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>77,652</td><td></td></tr>
<tr><td colspan="2">Miscellaneous steel</td><td colspan="3">spacers and sonic pipes</td><td>kg</td><td>1,288</td><td></td></tr>
<tr><td rowspan="5">Earth Work</td><td colspan="2" rowspan="2">Foundation Excavation</td><td colspan="3"></td><td>m^2</td><td>290.1</td><td></td></tr>
<tr><td colspan="3">Total</td><td>m^3</td><td>290.1</td><td></td></tr>
<tr><td colspan="2">Backfill</td><td colspan="3">Purchased soil</td><td>m^3</td><td>104.2</td><td></td></tr>
<tr><td colspan="2">Surplus Soil</td><td colspan="3"></td><td>m^3</td><td>290.1</td><td></td></tr>
<tr><td colspan="2">Ground Preparation</td><td colspan="3"></td><td>m^2</td><td>0.0</td><td></td></tr>
<tr><td rowspan="9">Temp work</td><td colspan="2" rowspan="3">Steel sheet pile</td><td colspan="3">Type III</td><td>kg</td><td>82,500</td><td></td></tr>
<tr><td colspan="3">Number of Sheet Piles</td><td>nos</td><td>110</td><td></td></tr>
<tr><td colspan="3">Number of Joint</td><td>nos</td><td>0</td><td></td></tr>
<tr><td rowspan="6">Mold Steel</td><td>Supporting Beam</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Brace</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Bond Timber</td><td colspan="3">H-×××</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(A)</td><td colspan="3">0.22</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Sub-member(B)</td><td colspan="3">0.04</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>Total</td><td colspan="3"></td><td>kg</td><td>0</td><td></td></tr>
<tr><td rowspan="12">Approach slab</td><td colspan="2">Concrete</td><td colspan="3">σck = 24 N/mm2</td><td>m^3</td><td>9.4</td><td></td></tr>
<tr><td colspan="2">Formwork</td><td colspan="3">Normal Type</td><td>m^2</td><td>2.6</td><td></td></tr>
<tr><td colspan="2" rowspan="5">Rebar</td><td colspan="2" rowspan="5">SD345</td><td>D35</td><td>kg</td><td>0</td><td></td></tr>
<tr><td>D29 - D32</td><td>kg</td><td>873</td><td></td></tr>
<tr><td>D16 - D25</td><td>kg</td><td>795</td><td></td></tr>
<tr><td>D10 - D13</td><td>kg</td><td>91</td><td></td></tr>
<tr><td>Total</td><td>kg</td><td>1,759</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Joint filler</td><td colspan="3">t = 20 mm</td><td>m^2</td><td>4.5</td><td></td></tr>
<tr><td colspan="3">t = 10 mm</td><td>m^2</td><td>2.8</td><td></td></tr>
<tr><td colspan="2" rowspan="3">Bearing pad</td><td colspan="3">Rubber bearing</td><td>m^2</td><td>0.1</td><td></td></tr>
<tr><td colspan="2">Pipe</td><td>SGP40A×220</td><td>kg</td><td>8</td><td></td></tr>
<tr><td colspan="2">Cap</td><td>φ70×3.2.0</td><td>kg</td><td>1</td><td></td></tr>
<tr><td colspan="3">Falsework</td><td colspan="3">Scaffloding (Handrail precede type) H<30m</td><td>m^2</td><td>279.1</td><td></td></tr>
</table>

Schematic Diagram AO1



Total height	7.600
Pile cap width	9.000
Pile cap depth	9.000





Top EL of Substructure	9.452 m
GL for construction	4.300 m

Wing wall thickness 0.600 m

1. Concrete

1) Ballast wall ($\sigma ck = 24^{N/mm2}$)

2.560 × 0.500 × 6.600 = 8.5 m^3

2) Wall ($\sigma ck = 24^{N/mm2}$)

3.140 × 2.000 × 6.600 = 41.5 m^3

3) Pile cap ($\sigma ck = 24^{N/mm2}$)

1.900 × 9.000 × 9.000 = 153.9 m^3

4) Wing wall ($\sigma ck = 24^{N/mm2}$)

a) Left side: a projection part

1/2 × (0.000 + 0.000) × 0.000 × 0.600 = 0.0 m^3

Left side: side wall

4.000 × 5.700 × 0.600 = 13.7 m^3

b) Right side: (L & R are in a symmetric shape)

= 13.7 m^3

5) Cradle ($\sigma ck = 24^{N/mm2}$)

1/2 × (0.300 + 0.800) × 0.500 × 5.40 = 1.5 m^3

6) Haunch ($\sigma ck = 24^{N/mm2}$)

1/2 × 0.500 × 0.500 × 4.930 × 2 = 1.2 m^3

7) Base for bridge bearings ($\sigma ck = 24^{N/mm2}$)

0.000 × 0.000 × 0.000 × 0 = 0.0 m^3

0.000 × 0.000 × 0.000 × 0 = 0.0 m^3

8) Total concrete volume

ΣV = 8.5 + 41.5 + 153.9 + 13.7 + 13.7

+ 1.5 + 1.2 + 0.0 + 0.0 = 233.9 m^3

2. Formwork

1) Ballast wall

(0.500 + 6.600) × 2.560 × 2 = 36.4 m^2

2) Wall

(2.000 + 6.600) × 3.140 × 2 = 54.0 m^2

3) Pile cap

1.900 × (9.000 + 9.000) × 2 = 68.4 m^2

4) Wing wall AO1

a) Left side a projection part

1/2(	0.000	+	0.000	) ×	0.000	×	2	=	0.0	m^2
	0.000	+	0.000	) ×	0.600			=	0.0	m^2

Left side a side wall

5.700	×	4.000	×	2	=	45.6	m^2
5.700	×	0.600			=	3.4	m^2
				A	=	49.0	m^2

b) Right (L & R are in a symmetric shape)

5) Cradle

0.300	×	5.400	×	1.000	=	1.6	m^2
0.707	×	5.400	×	1.000	=	3.8	m^2
-0.800	×	5.400	×	1.000	=	-4.3	m^2
				A	=	1.1	m^2

6) Haunch

(0.707 - 0.500)× 4.930 × 2 = 2.0 m^2

7) Base for bridge bearings

(0.000 + 0.000) × 2 × 0.000 × 0.000 = 0.0 m^2

8) Total Formwork Area

ΣA = 36.4 + 54.0 + 68.4 + 49.0 + 49.0
+ 1.1 + 0.0 + 2.0 = 259.9 m^2

3. Rebar SD 345

	Diameter		Mass (kg)	Stud Welding (Number)	Body (kg)	Footing (kg)
Body	D38		0		0	0
	D35		0		0	0
	D32 - D29	D32	2,983		1,558	1,425
		D29	1,156		0	1,156
		Sub total	4,139	0	1,558	2,581
	D25 ~ D16	D25	2,558		1,654	904
		D22	2,457		2,022	435
		D19	2,126		918	1,208
		D16	2,583		1,626	957
		Sub total	9,724	0	6,220	3,504
	D10 - D13		281		142	139
	Total		14,144	0	7,920	6,224

4. Box-out for Bearings and Railling (Cylindrical form) AO1

Quantity of box-out form for anchor bar Type 1

Anchor bar diameter			φ40	mm	Length	L_0	=	0.290	m
Pipe diameter			φ140	mm	Number	n	=	6	nos
Length	l	=	0.390	m					
Total Length	L	=	0.390	× 6			=	2.340	m
For an abutment	(		1	locations)					
Total Length	L	=	2.340	× 1			=	2.340	m

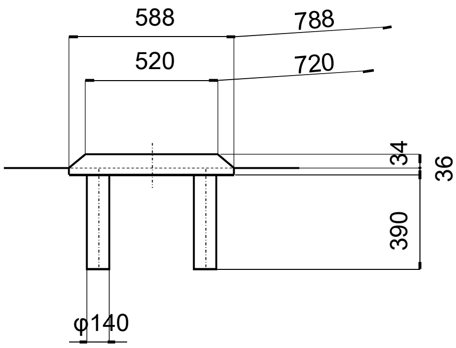
Quantity of box-out form for anchor bar Type 2

Anchor bar diameter			φ0	mm	Length	L_0	=	0.000	m
Pipe diameter			100	mm	Number	n	=	0	nos
Length	l	=	0.100	m					
Total Length	L	=	0.100	× 0			=	0.000	m
For an abutment	(		0	locations)					
Total Length	L	=	0.000	× 0			=	0.000	m

Quantity of box-out form for raillings

Railing post diameter			φ125	mm	Length	L_0	=	0.220	m
Pipe diameter			225	mm	Number	n	=	3	nos
Length	l	=	0.235	m					
Total Length	L	=	0.235	× 3			=	0.710	m
For right and left sides	(		2	locations)					
Total Length	L	=	0.710	× 2			=	1.420	m

Quantity of Non-shrinkage Mortar for Type 1



	mortar height
G1	34
G2	34
G3	
G4	
Ave	34

mm

Base mortar for one location AO1

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.034 /6× (2 × 0.520 + 0.588) × 0.720

+ (2 × 0.588 + 0.520) × 0.788 } = 0.014 m^3

V2 = 0.588 × 0.036 × 0.788 = 0.017 m^3

= 0.031 m^3

For an abutment

V_{T1-1} = 0.031 × 1 = 0.031 m^3

Mortar for anchor bar Type 1

Anchor bar diameter φ40

Anchor bar number 6

Void diameter φ140

Void length 0.390

V3 = π/4 × (0.140)^2 × 0.390 × 6 = 0.036 m^3

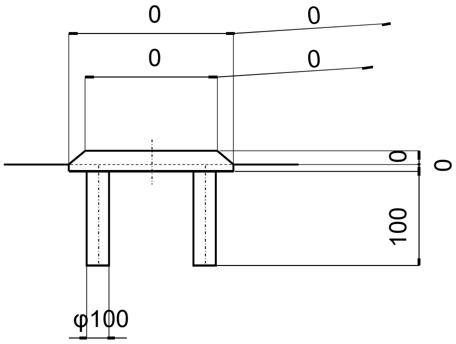
V4 = - π/4 × (0.04)^2 × 0.290 × 6 = -0.002 m^3

(Volume of anchor bar) V = 0.034 m^3

Anchor bar for an abutment (1 locations)

V_{T1-2} = 0.034 × 1 = 0.034 m^3

Quantity of Non-shrinkage Mortar for Type 2



	mortar height	
G1		
G2		
G3		
G4		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 m^3

= 0.000 m^3

For an abutment

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2 AO1

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

$V3 = \pi/4 \times (0.100)^{2} \times 0.100 \times 0 = 0.000 \ m^3$

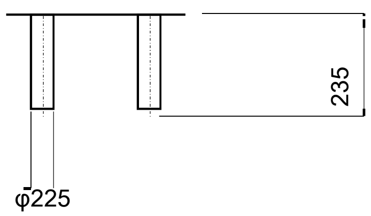
$V4 = - \pi/4 \times (0)^{2} \times 0.000 \times 0 = 0.000 \ m^3$

(Volume of anchor bar) $V = 0.000 \ m^3$

Anchor bar for an abutment (0 locations)

$V_{T2\text{-}2} = 0.000 \times 0 = 0.000 \ m^3$

Quantity of Non-shrinkage Mortar for railling



	mortar height	
G1		
G2		
G3		
G4		
Ave	0	mm

Base mortar: Non.

For an abutment

$V_{T3\text{-}1} = \qquad = 0.000 \ m^3$

Mortar for railing posts AO1

Posts diameter φ125

Posts number 3

Void diameter φ225

Void length 0.235

V3 = π/4 × 0.225 × 0.235 × 3 = 0.028 m^3

V4 = - π/4 × (0.125)^2 × 0.220 × 3 = -0.008 m^3

(Volume of anchor bar) V = 0.020 m^3

Posts for an abutment (2 locations)

V_{T3-2} = 0.020 × 2 = 0.040 m^3

Quantity of Non-shrinkage Mortar for railling

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = 0.105 m^3

6. Lean concrete (σck = 18 N/mm2 , t = 10 cm)

Area

9.200 × 9.200 = 84.6 m^2

Volume (V = 84.6 × 0.100 = 8.5 m^3)

7. Lean concrete formwork

0.100 × (9.200 + 9.200) × 2 = 3.7 m^2

8. Crushed stone

Area 9.200 × 9.200 = 84.6 m^2

Volume (V = 84.6 × 0.200 = 16.9 m^3)

9. CIP Pile

1) Pile Diameter and number

D = 1.500 m L = 56.50 m n = 9 nos

2) Concrete (σck = 30 N/mm2)

Net sectional area A = 1.767 m^2

Concrete V = 1.767 × 56.50 × 9 = 898.5 m^3

3) Rebar (SD 345) AO1

	Diameter		Mass (kg) One Pile	Mass (kg) On Pier
Body	D38		0	0
	D35		0	0
	D32 - D29	D32	0	0
		D29	3,145	28,305
		Sub total	3,145	28,305
	D25 ~ D16	D25	2,731	24,579
		D22	250	2,250
		D19	2,488	22,392
		D16	0	0
		Sub total	5,469	49,221
	D10 - D13		14	126
	Total		8,628	77,652

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				104	936
STK400,φ60.5,t=2.3	2.500	3	3.300	25	223
STK400,φ114.3,t=3.5	1.500	1	9.560	14	129
Total					1,288

10. Approach slab

1) Concrete ($\sigma ck = 24$ N/mm2)

V = 5.000 × 5.360 × 0.350 x 1 nos = 9.4 m^3

(L) (T)

2) Formwork

A = (5.360 + 1.020 + 1.020)× 0.350 x 1 nos = 2.6 m^2

3) Bridge bearing (200×200×20 mm)

A = 0.150 × 0.150 × 6 x 1 nos = 0.1 m^2

4) Joint filler t = 20mm

((0.350 + 0.500)× 5.360 - 0.1) x 1 nos = 4.5 m^2

5) Joint filler t = 10mm

(3.980 + 3.980)× 0.350 x 1 nos = 2.8 m^2

6) Pipe (SGP 50A)

L = 220 mm n = 7 nos

W = 0.220 × 7 × 5.31 x 1 nos = 8 kg

Cap

φ70 t = 3.2 mm n = 7 nos

W = π/4× 0.070 × 0.070 × 3.2 × 7.85 × 7

x 1 nos = 1 kg

7) Rebar (SD 345) AO1

	Diameter		MASS (kg)
Body	D38		
	D35		
	D32 - D29	D32	
		D29	873
		Sub total	873
	D25 ~ D16	D25	386
		D22	
		D19	
		D16	409
		Sub total	795
	D10 - D13		91
	Total		1,759

10. Earth work AO1

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(9.000 + 1.0 × 2)x(9.000 + 1.0 × 2)=		121.0 m^2
Excavation Depth	2.700 m			
	121.0 × 2.700		=	326.7 m^3
Deduction of Pile Volume	1.500 ^2 x π/4 ×(2.700 - 0.40) x 9		=	-36.6 m^3
		V	=	290.1 m^3

2) Backfill

Wall	0.500	×	6.600	×	2.000	=	6.6	m^3
Pile cap	9.000	×	9.000	×	1.900	=	153.9	m^3
Lean concrete	9.200	×	9.200	×	0.300	=	25.4	m^3
					Volume of Structure	=	185.9	m^3

V = 290.1 - 185.9 = 104.2 m^3

3) Surplus soil volume

V = 290.1 = 290.1 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

11. Temporary Cofferdam

AO1

1) Earth retaining method w= 0.4 Type-III

Steel Sheet Pile Type III	12.500	m	110	nos	Unit weight	60.0	kg/m
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m

12.500	×	60.0	×	110		=	82,500
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	82,500

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××				0.000
	H- ×××				0.000
	H- ×××				0.000
Brace	H- ×××				0.000
	H- ×××				0.000
Bond Timber	H- ×××				0.000
Total of Main Member					0.000
Sub-member(A)	0.0 × 0.22				0.000
Sub-member(B)	0.0 × 0.04				0.000
Total of Sub-Member					0.000
Total of Mold Steel					0.000

12. Falsework

【height Division】 〔Average heighｔH≦30m

(Falsework height) H= 5.700 m

	Wall (Front)	w1=	6.600	+	3.400)x	5.700			=	57.00 m^2
	Wall (Rear)	w2=	5.400	-	3.400)x	5.700			=	11.40 m^2
	Wall (Left)	w3=	7.000	+	0.500)x	5.700			=	42.80 m^2
	Wall (Right)	w4=	7.000	+	0.500)x	5.700			=	42.80 m^2
	Wing (Left)	w5=	4.000	-	0.500)x	5.700			=	20.00 m^2
	Wing (Right)	w6=	4.000	-	0.500)x	5.700			=	20.00 m^2
Pile cap	w7= [2 x(		9.000	+	9.000)+	8.800	]x	1.900)	=	85.10 m^2
	Sub-Total								=	279.10 m^3

Total = 279.10 m^3

Package -1 On-Ramp Bridge

QUANTITY CALCULATION

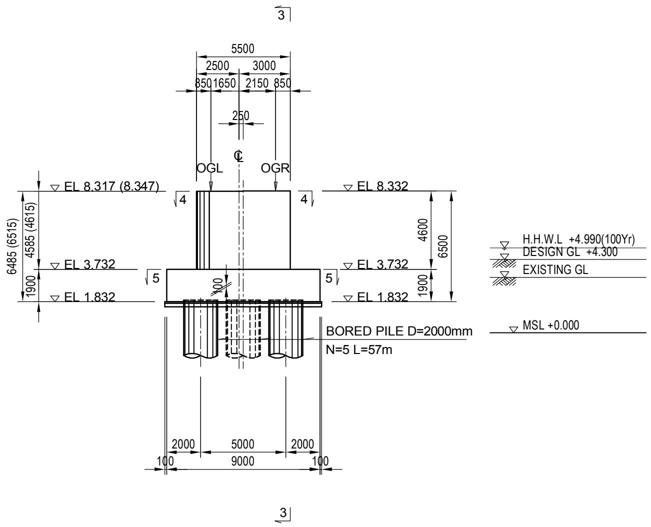
OF

PIER PO1

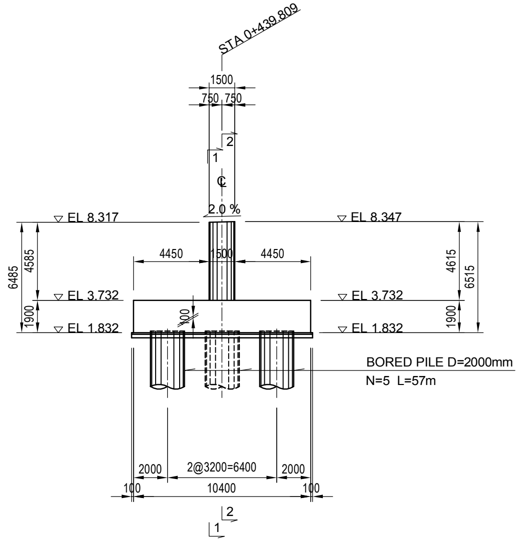
GENERAL VIEW OF PO1 PIER

S =1:300

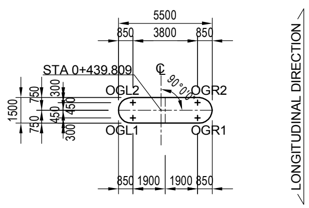
FRONT VIEW
1 - 1   2 - 2



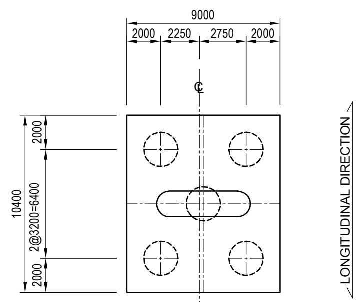
SIDE VIEW
3 - 3



PLAN VIEW
4 - 4

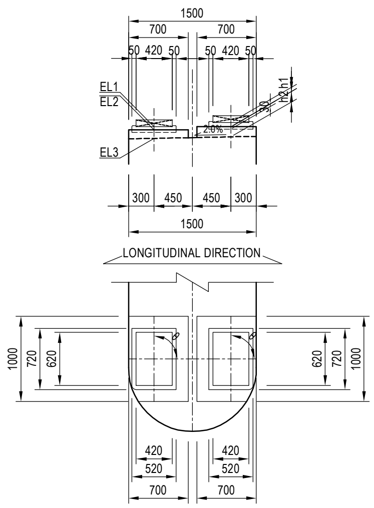


PILE ARRANGEMENT
5 - 5



DETAIL OF BEARING

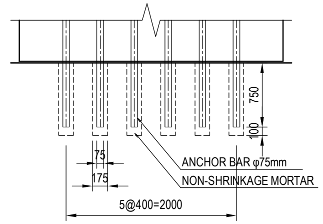
S =1:60



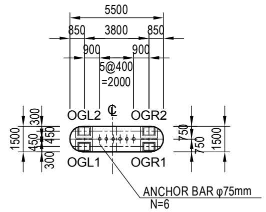
Unit : m	OGL1	OGR1	OGL2	OGR2
EL1	8.461	8.461	8.510	8.510
EL2	8.423	8.423	8.461	8.461
EL3	8.323	8.323	8.341	8.341
h1	0.038	0.038	0.049	0.049
h2	0.100	0.100	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR

S =1:60



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings, baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 [illegible]	15 Jun.2017	GENERAL VIEW OF PO1 PIER	1
				CHECKED BY	T. HAYAKAWA	[illegible]	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	[illegible]	21 Jun.2017		P1-OR-2011

Summary Table

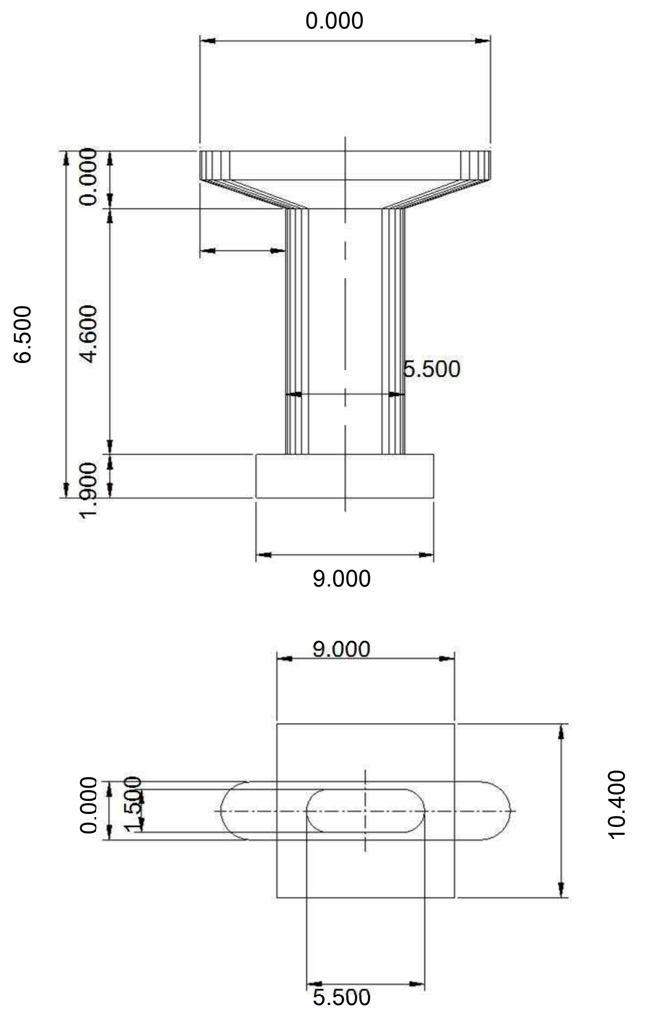
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	0.3	
				Column	m^3	35.7	
				Sub Total	m^3	36.0	
		σck = 24 N/mm2		Pile Cap	m^3	177.8	
				Sub Total	m^3	177.8	
		-		Total	m^3	213.9	
	Formwork	Normal Type		Beam	m^2	0.7	
				Column	m^2	58.5	
				Pile Cap	m^2	73.7	
				Total	m^2	132.9	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	14,349	
				D25 ~ D16	kg	9,222	
				D10 - D13	kg	0	
				Total	kg	23,571	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	5,726	
				D25 ~ D16	kg	3,585	
				D10 - D13	kg	0	
				Total	kg	9,311	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	8,623	
				D25 ~ D16	kg	5,637	
				D10 - D13	kg	0	
				Total	kg	14,260	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	9.8	
	Lean Concrete Form	Normal Type			m^2	4.0	
	Crushed stone				m^2	97.5	
	Box out for bearing	Cylindrial form length1		φ100 x 0.10m	m	0	
		Cylindrical form number1			nos	0	
		Cylindrial form length2		φ175 x 0.85m	m	5.1	
		Cylindrical form number2			nos	6	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	0.239	

PO1

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	57.000	
					number	nos	5	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	59,745	
					D25 ~ D16	kg	25,335	
					D10 - D13	kg	140	
					Total	kg	85,220	
	Concrete		σck = 24 N/mm2			m^3	895.5	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	6,262	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	344.2	
			Total			m^3	344.2	
	Backfill		purchased soil			m^3	132.4	
	Surplus Soil		unsuitable soil			m^3	344.2	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 12.50m			kg	87,750	
			Number of Sheet Piles			nos	117	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	180.7	
Supporting			Wedge type (under 80 kN/m2)			m^3	0.0	

Schimatic Diagram

PO1



Top EL of Substructure	8.332 m
GL for construction	4.300 m

Quantity Calculation PO1

1. Concrete

1) Beam (σck = 24 N/mm2)

(	0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x	0.000	=	0.0	m^3
1/2x(	0.000 +	5.500) ×	1.500) ×	0 -	0.0	x 0.3^2 x [radians (48.2) - sin (radians(48.2))]		=	0.0	m^3
π × (	0.000 ^2)/4 ×	0.000						=	0.0	m^3
							V1	=	0.0	m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	0.700 ×	1.000 ×	0.100 ×	2	=	0.1	m^3
Type2	0.700 ×	1.000 ×	0.120 ×	2	=	0.2	m^3
Type3	0.000 ×	0.000 ×	0.000 ×	2	=	0.0	m^3
				V2	=	0.3	m^3

3) Column (σck = 24 N/mm2)

{ (1.500) ^2 ÷ 4×π + (5.500 - 1.500) × 1.500 }× 4.600

= 35.7 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

9.000 × 10.400 × 1.900 = 177.84 m^3

(V4)

5) Total

σck = 24 N/mm2	ΣV	=		+		+			=	0.0	m^3
σck = 24 N/mm2	ΣV	=	0.0	+	0.3	+	35.7	+	177.8	=	213.9	m^3

2. Formwork

1) Beam

1/2	× (	0.000 +	5.500) ×	0.000	× 2		=	0.0	m^2
	0.000	×	0.000	× 2			=	0.0	〃
	π	×	0.000	× 0.000			=	0.0	〃
1/2	× (	0.000 +	0.000) ×	2.750	× 2		=	0.0	〃
						A1	=	0.0	m^2

2) Base for bridge bearings

Type1 (	0.700 +	1.000) ×	2 ×	0.100	2	=	0.3	m^2
Type2 (	0.700 +	1.000) ×	2 ×	0.120	2	=	0.4	m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000	2	=	0	m^2
					A2	=	0.7	m^2

3) Column

{ 1.500 ×π + (5.500 - 1.500) x 2}× 4.600 = 58.5 m^2

(A3)

4) Pile cap

(9.000 + 10.400) × 2 × 1.900 = 73.7 m^2

(A4)

5) Total

ΣA = 0.0 + 0.7 + 58.5 + 73.7 = 132.9 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) PO1

Area

9.200 × 10.600 = 97.5 m^2

Volume (V = 97.5 × 0.100 = 9.8 m^3)

4. Lean concrete formwork

0.100 × (9.200 + 10.600) × 2 = 4 m^2

5. Crushed stone

Area 9.200 × 10.600 = 97.5 m^2

Volume (V = 97.5 × 0.200 = 19.5 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51						0	
D41						0	
D38						0	
D35						0	
D29 - D32	D32		11,968			5,726	6,242
	D29		2,381			0	2,381
	Sub Total		14,349			5,726	8,623
D25 ~ D16	D25		3,442			376	3,066
	D22		1,138			0	1,138
	D19		681			0	681
	D16		3,961			3,209	752
	Sub Total		9,222			3,585	5,637
D10 - D13						0	
Total			**23,571**			**9,311**	**14,260**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter		φ0	mm			Anchor bar Length	L_0	=	0.000	m
Pipe diameter		100	mm			Anchor bar Number	n	=	0	nos
Box-out Length	l	= 0.100	m							
Total Length	L	= 0.100	×	0	(for one bearing)			=	0.000	m
For one pier	(	0	locations)							
Total Length	L	= 0.000	×	0				=	0.000	m

Quantity for Type2

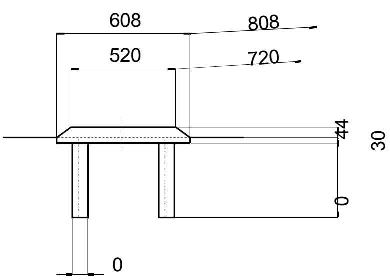
Anchor bar diameter		φ75	mm			Anchor bar Length	L_0	=	0.750	m
Pipe diameter		175	mm			Anchor bar Number	n	=	6	nos
Box-out Length	l	= 0.850	m							
Total Length	L	= 0.850	×	6	(for one bearing)			=	5.100	m
For one pier	(	1	locations)							
Total Length	L	= 5.100	×	1				=	5.100	m

Quantity for Type3

Anchor bar diameter		φ0	mm			Anchor bar Length	L_0	=	0.000	m
Pipe diameter		100	mm			Anchor bar Number	n	=	0	nos
Box-out Length	l	= 0.100	m							
Total Length	L	= 0.100	×	0	(for one bearing)			=	0.000	m
For one pier	(	0	locations)							
Total Length	L	= 0.000	×	0				=	0.000	m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	38
G2	38
G3	49
G4	49
Ave	44

mm

Base mortar for one location

Formula(Square frustum of pyramid)

$V = h/6 \times \{ (2a + a1) \times b + (2a1 + a) \times b1 \}$

V1 = 0.044 /6× { (2 × 0.520 + 0.608) × 0.720
+ (2 × 0.608 + 0.520) × 0.808 } = 0.019 m^3

V2 = 0.608 × 0.030 × 0.808 = 0.015 〃

= 0.034 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.034 × 4 = 0.136 m^3

PO1

Mortar for anchor bar Type 1

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100)^2× 0.100 × 0 = 0.000 〃

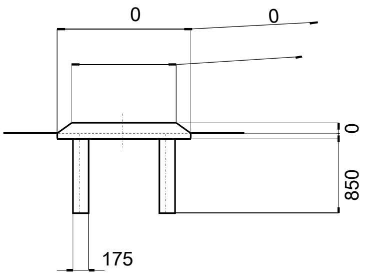
V4 = - π/4 × (φ0)^2× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T1-2} = 0.000 × 0 = 0.000 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ75

Anchor bar number 6

Void diameter φ175

Void length 0.85

V3 = π/4 × (0.175)^2× 0.850 × 6 = 0.123 〃

V4 = - π/4 × (φ75)^2× 0.750 × 6 = -0.020 〃

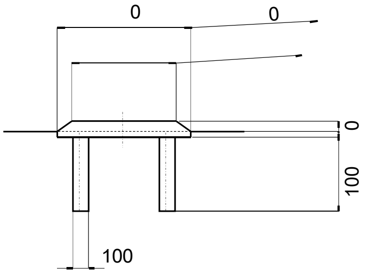
(Volume of anchor bar) V = 0.103 m^3

Anchor bar for an abutment (1 locations)

V_{T2-2} = 0.103 × 1 = 0.103 m^3

Quantity for Tyep 3

PO1



	mortar height	
G9		
G10		
G11		
G12		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **0.239** m^3

8. CIP Pile PO1

(1)Diameter and number

D = 2.000 m L = 57.00 m n = 5 nos

Net Area = 3.142

2)Concrete = 3.142 57.00 5 = 895.5 m^3

3) Rebar (SD 345)

Item		Mass (kg)	
		One Pile	On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	7,717	38,585
	D29	4,232	21,160
	Sub-total	11,949	59,745
D25 ~ D16	D25	0	0
	D22	5,067	25,335
	D19	0	0
	D16	0	0
	Sub-total	5,067	25,335
D13		28	140
Total		17,044	85,220

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				104	520
STK400,φ60.5,t=2.3	59.500	3	3.300	589	2,945
STK400,φ114.3,t=3.5	58.500	1	9.560	559	2,796
Total					6,262

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	9.000	+	1.0	×	2)x(	10.400	+	1.0	×	2) =	136.4 m^2

Excavation Depth 2.800 m

	136.40	× 2.800							=	381.9 m^3
Deduction of Pile Volume	2.000 ^2 x	π/4	×(	2.800	-	0.40) x	5		=	-37.7 〃
								V	=	344.2 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (π /4	×	1.500 ^2 +	1.500	×	4.000	)	=	4.7	m^3
Pile cap	9.000	×	10.400	×	1.900				=	177.8	〃
Lean concrete	9.200	×	10.600	×	0.300				=	29.3	〃
							Volume of Structure		=	211.8	m^3

V = 344.2 - 211.8 = 132.4 m^3

3) Surplus soil volume (unsuitable soil)

V = 344.2 = 344.2 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m		117	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m			nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m			nos	Unit weight	105.0	kg/m	
12.500	×	60.0	×	117				=	87,750
0.000	×	76.1	×	0				=	0
0.000	×	105.0	×	0				=	0
							Σw	=	87,750

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height〕H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w=	0	x(	0.000	+	1.500	)+	8.800	]x	0.000)	=	0.00	m^2

2) Pierstud

(Falsework height) H2= 4.600 m

w1=	4.000 x	4.600 x	2	=	36.80	m^2
w2=	π x	3.700 x	4.600	=	53.50	m^2
Sub-Total				=	90.30	m^3

3) Pile cap

w=	2	x(	9.000	+	10.400	)+	8.800	]x	1.900)	=	90.40	m^2

Total = 180.70 m^3

12. Supporting

【height Divis 〔Average height〕----H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

QUANTITY CALCULATION

OF

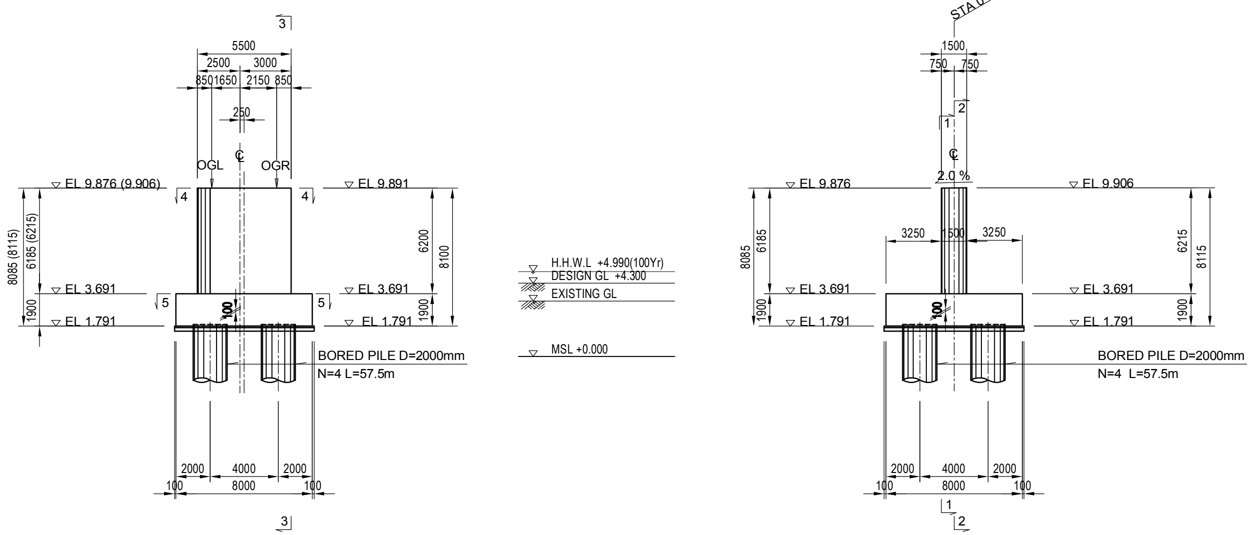
PIER PO2

GENERAL VIEW OF PO2 PIER

S =1:300

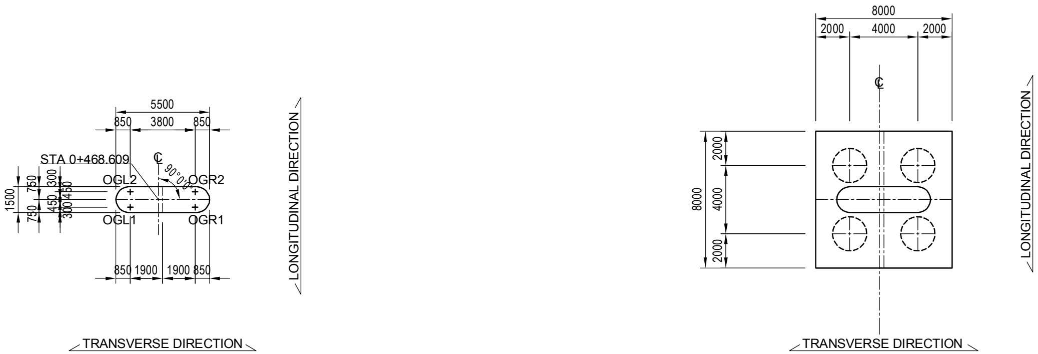
FRONT VIEW
1 - 1 2 - 2

SIDE VIEW
3 - 3



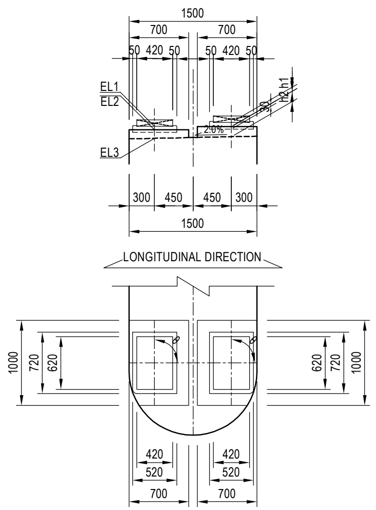
PLAN VIEW
4 - 4

PILE ARRANGEMENT
5 - 5



DETAIL OF BEARING

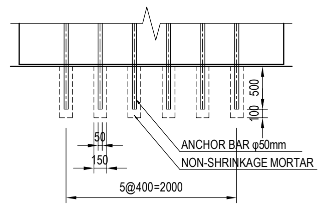
S =1:60



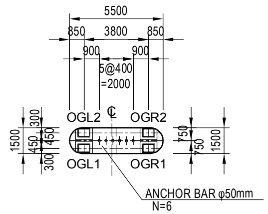
Unit : m	OGL1	OGR1	OGL2	OGL2
EL1	10.019	10.019	10.064	10.064
EL2	9.982	9.982	10.020	10.020
EL3	9.882	9.882	9.900	9.900
h1	0.037	0.037	0.044	0.044
h2	0.100	0.100	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR

S =1:60



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM		NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.	PREPARED BY	M. OHYAMA	大山 雨弘	15 Jun.2017	GENERAL VIEW OF PO2 PIER	1
				CHECKED BY	T. HAYAKAWA	早川 和邦	20 Jun.2017		DWG No.
				APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-OR-2021

Summary Table

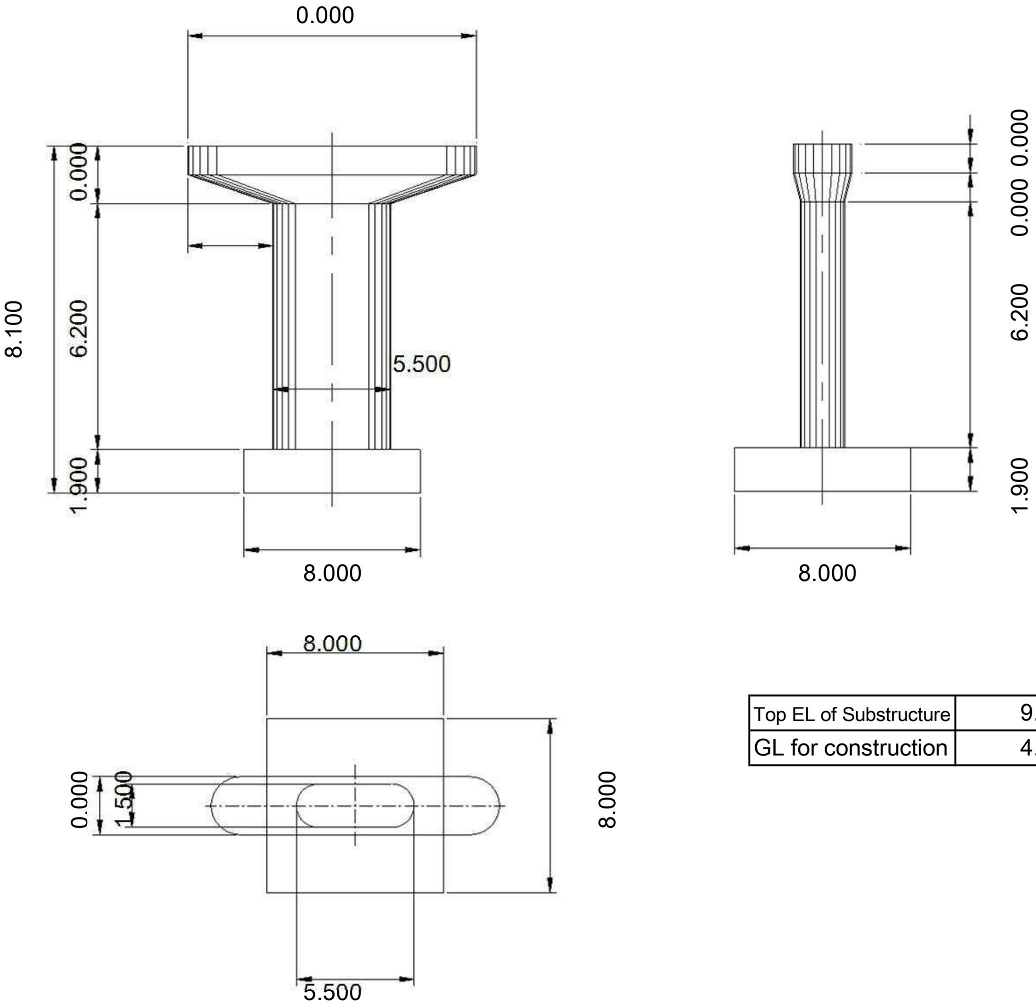
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	0.3	
				Column	m^3	48.2	
				Sub Total	m^3	48.5	
		σck = 24 N/mm2		Pile Cap	m^3	121.6	
				Sub Total	m^3	121.6	
		-		Total	m^3	170.1	
	Formwork	Normal Type		Beam	m^2	0.7	
				Column	m^2	78.8	
				Pile Cap	m^2	60.8	
				Total	m^2	140.3	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	1,726	
				D25 ~ D16	kg	9,534	
				D10 - D13	kg	0	
				Total	kg	11,260	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	6,345	
				D10 - D13	kg	0	
				Total	kg	6,345	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	1,726	
				D25 ~ D16	kg	3,189	
				D10 - D13	kg	0	
				Total	kg	4,915	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	6.7	
	Lean Concrete Form	Normal Type			m^2	3.3	
	Crushed stone				m^2	67.2	
	Box out for bearing	Cylindrial form length1		φ100 x 0.10m	m	0	
		Cylindrical form number1			nos	0	
		Cylindrial form length2		φ150 x 0.60m	m	3.6	
		Cylindrical form number2			nos	6	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	0.186	

PO2

	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	57.500	
					number	nos	4	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	39,220	
					D25～D16	kg	20,272	
					D10 - D13	kg	112	
					Total	kg	59,604	
	Concrete		$\sigma ck = 24$ N/mm2			m^3	722.7	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	5,048	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	249.8	
			Total			m^3	249.8	
	Backfill		purchased soil			m^3	103.3	
	Surplus Soil		unsuitable soil			m^3	249.8	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 12.50m			kg	75,000	
			Number of Sheet Piles			nos	100	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	199.2	
Supporting			Wedge type (under 80 kN/m2)			m^3	0.0	

Schimatic Diagram

PO2



Top EL of Substructure	9.891 m
GL for construction	4.300 m

Quantity Calculation PO2

1. Concrete

1) Beam (σck = 24 N/mm2)

(0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x	0.000	=	0.0 m^3
1/2x(0.000 +	5.500) ×	1.500) ×	0 -	0.0 x	0.3^2 x [radians (48.2) - sin (radians(48.2))]		=	0.0 m^3
π × (0.000	^2)/4	× 0.000					=	0.0 m^3
						V1	=	0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	0.700 ×	1.000 ×	0.100 ×	2	=	0.1 m^3
Type2	0.700 ×	1.000 ×	0.120 ×	2	=	0.2 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	2	=	0.0 m^3
				V2	=	0.3 m^3

3) Column (σck = 24 N/mm2)

{ (1.500) ^2 ÷ 4×π + (5.500 - 1.500) × 1.500 }× 6.200

= 48.2 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

8.000 × 8.000 × 1.900 = 121.6 m^3

(V4)

5) Total

σck = 24 N/mm2	ΣV	=		+		+			=	0.0 m^3
σck = 24 N/mm2	ΣV	=	0.0	+	0.3	+	48.2	+ 121.6	=	170.1 m^3

2. Formwork

1) Beam

1/2 × (	0.000 +	5.500) ×	0.000	× 2		=	0.0 m^2
0.000 ×	0.000 ×	2				=	0.0 〃
π ×	0.000 ×	0.000				=	0.0 〃
1/2 × (	0.000 +	0.000) ×	2.750	× 2		=	0.0 〃
					A1	=	0.0 m^2

2) Base for bridge bearings

Type1 (	0.700 +	1.000) ×	2 ×	0.100	2		=	0.3 m^2
Type2 (	0.700 +	1.000) ×	2 ×	0.120	2		=	0.4 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000	2		=	0 m^2
						A2	=	0.7 m^2

3) Column

{ 1.500 ×π + (5.500 - 1.500) x 2}× 6.200 = 78.8 m^2

(A3)

4) Pile cap

(8.000 + 8.000) × 2 × 1.900 = 60.8 m^2

(A4)

5) Total

ΣA = 0.0 + 0.7 + 78.8 + 60.8 = 140.3 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) PO2

Area

8.200 × 8.200 = 67.2 m^2

Volume (V = 67.2 × 0.100 = 6.7 m^3)

4. Lean concrete formwork

0.100 × (8.200 + 8.200) × 2 = 3.3 m^2

5. Crushed stone

Area 8.200 × 8.200 = 67.2 m^2

Volume (V = 67.2 × 0.200 = 13.4 m^3)

6. Rebar PO2

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51						0	
D41						0	
D38						0	
D35						0	
D29 - D32	D32					0	
	D29		1,726			0	1,726
	Sub Total		1,726			0	1,726
D25 ~ D16	D25		3,400			3,400	
	D22		813			0	813
	D19		1,931			0	1,931
	D16		3,390			2,945	445
	Sub Total		9,534			6,345	3,189
D10 - D13						0	
Total			**11,260**			**6,345**	**4,915**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter			φ0	mm		Anchor bar Length	L_0	=	0.000	m
Pipe diameter			100	mm		Anchor bar Number	n	=	0	nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0 (for one bearing)			=	0.000	m
For one pier	(		0	locations)						
Total Length	L	=	0.000	×	0			=	0.000	m

Quantity for Type2

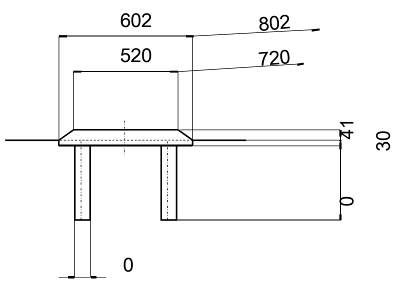
Anchor bar diameter			φ50	mm		Anchor bar Length	L_0	=	0.500	m
Pipe diameter			150	mm		Anchor bar Number	n	=	6	nos
Box-out Length	l	=	0.600	m						
Total Length	L	=	0.600	×	6 (for one bearing)			=	3.600	m
For one pier	(		1	locations)						
Total Length	L	=	3.600	×	1			=	3.600	m

Quantity for Type3

Anchor bar diameter			φ0	mm		Anchor bar Length	L_0	=	0.000	m
Pipe diameter			100	mm		Anchor bar Number	n	=	0	nos
Box-out Length	l	=	0.100	m						
Total Length	L	=	0.100	×	0 (for one bearing)			=	0.000	m
For one pier	(		0	locations)						
Total Length	L	=	0.000	×	0			=	0.000	m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	37
G2	37
G3	44
G4	44
Ave	41

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.041 /6× { (2 × 0.520 + 0.602) × 0.720
+ (2 × 0.602 + 0.520) × 0.802 } = 0.018 m^3

V2 = 0.602 × 0.030 × 0.802 = 0.014 〃

= 0.032 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.032 × 4 = 0.128 m^3

PO2

Mortar for anchor bar Type 1

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100)^2× 0.100 × 0 = 0.000 〃

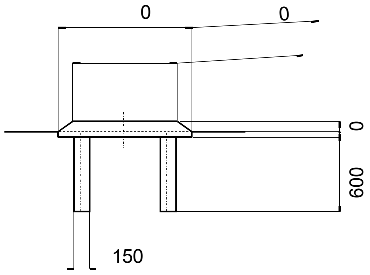
V4 = - π/4 × (φ0)^2× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T1-2} = 0.000 × 0 = 0.000 m^3

Quantity for Tyep 2



	mortar height	
G5		
G6		
G7		
G8		
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

\+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ50

Anchor bar number 6

Void diameter φ150

Void length 0.6

V3 = π/4 × (0.150)^2× 0.600 × 6 = 0.064 〃

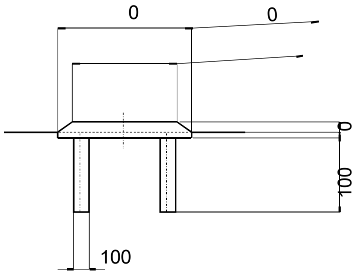
V4 = - π/4 × (φ50)^2× 0.500 × 6 = -0.006 〃

(Volume of anchor bar) V = 0.058 m^3

Anchor bar for an abutment (1 locations)

V_{T2-2} = 0.058 × 1 = 0.058 m^3

Quantity for Tyep 3 PO2



	mortar height
G9	
G10	
G11	
G12	
Ave	0	mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.000 /6× { (2 × 0.000 + 0.000) × 0.000

+ (2 × 0.000 + 0.000) × 0.000 } = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2$× 0.100 × 0 = 0.000 〃

V4 = - π/4 × (φ0 $)^2$× 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **0.186** m^3

8. CIP Pile PO2

(1)Diameter and number

D = 2.000 m L = 57.50 m n = 4 nos

Net Area = 3.142

2)Concrete = 3.142 57.50 4 = 722.7 m^3

3) Rebar (SD 345)

Item		Mass (kg) One Pile	Mass (kg) On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	0	0
	D29	9,805	39,220
	Sub-total	9,805	39,220
D25 ~ D16	D25	0	0
	D22	5,068	20,272
	D19	0	0
	D16	0	0
	Sub-total	5,068	20,272
D13		28	112
Total		14,901	59,604

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				104	416
STK400,φ60.5,t=2.3	60.000	3	3.300	594	2,376
STK400,φ114.3,t=3.5	59.000	1	9.560	564	2,256
Total					5,048

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A	=	(	8.000	+	1.0	×	2)x(	8.000	+ 1.0	×	2) =	100.0 m^2
Excavation Depth		2.800 m										
		100.00	×	2.800							=	280.0 m^3
Deduction of Pile Volume		2.000 ^2 x	π/4	×(	2.800	-	0.40) x	4			=	-30.2 〃
										V	=	249.8 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (π /4	×	1.500 ^2 +	1.500	×	4.000	)	=	4.7 m^3
Pile cap	8.000	×	8.000	×	1.900				=	121.6 〃
Lean concrete	8.200	×	8.200	×	0.300				=	20.2 〃
							Volume of Structure		=	146.5 m^3

V = 249.8 - 146.5 = 103.3 m^3

3) Surplus soil volume (unsuitable soil)

V = 249.8 = 249.8 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	100	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	
12.500 ×	60.0	×	100				=	75,000
0.000 ×	76.1	×	0				=	0
0.000 ×	105.0	×	0				=	0
						Σw	=	75,000

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w= 0 x(0.000 + 1.500)+ 8.800]x 0.000) = 0.00 m^2

2) Pierstud

(Falsework height) H2= 6.200 m

w1= 4.000 x 6.200 x 2 = 49.60 m^2

w2= π x 3.700 x 6.200 = 72.10 m^2

Sub-Total = 121.70 m^3

3) Pile cap

w= 2 x(8.000 + 8.000)+ 8.800]x 1.900) = 77.50 m^2

Total = 199.20 m^3

12. Supporting

【height Divis 〔Average height〕----H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

QUANTITY CALCULATION

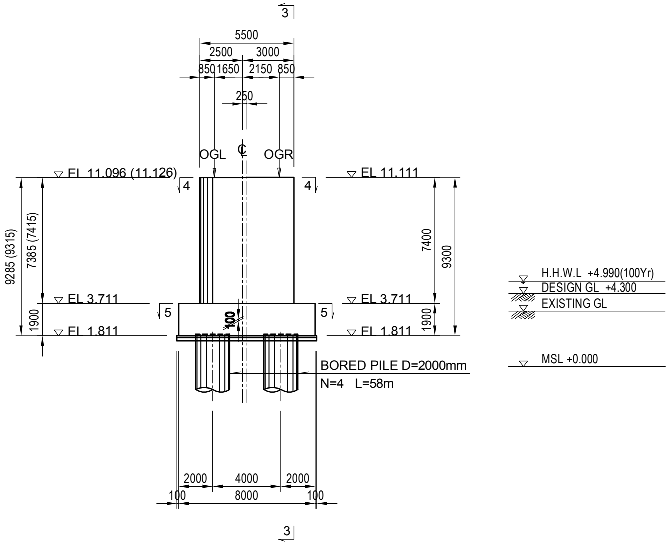
OF

PIER PO3

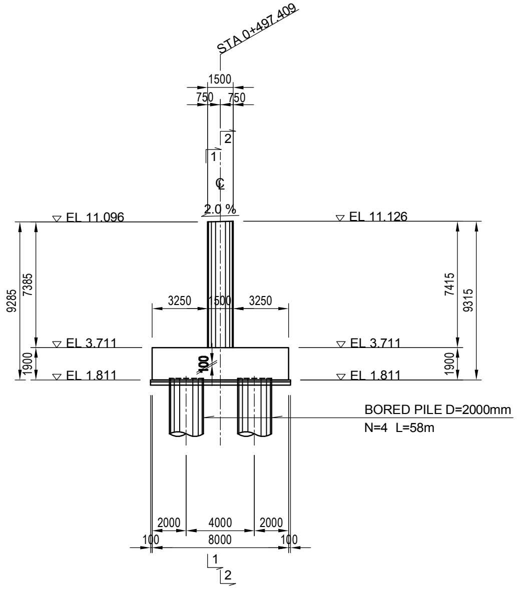
GENERAL VIEW OF PO3 PIER

S =1:300

FRONT VIEW
1 - 1   2 - 2

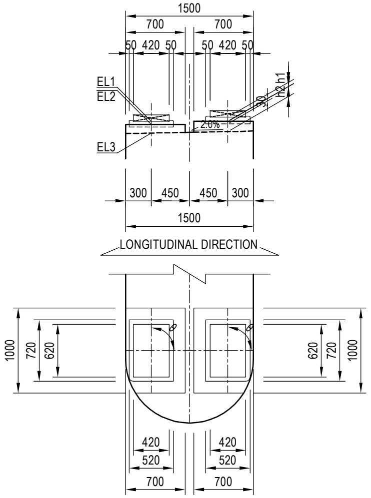


SIDE VIEW
3 - 3



DETAIL OF BEARING

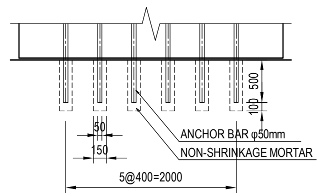
S =1:60



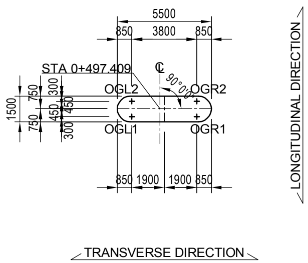
Unit : m	OGL1	OGR1	OGL2	OGL2
EL1	11.241	11.241	11.278	11.278
EL2	11.202	11.202	11.240	11.240
EL3	11.102	11.102	11.120	11.120
h1	0.039	0.039	0.038	0.038
h2	0.100	0.100	0.120	0.120
θ	90d0'0"	90d0'0"	90d0'0"	90d0'0"

DETAIL OF ANCHOR BAR

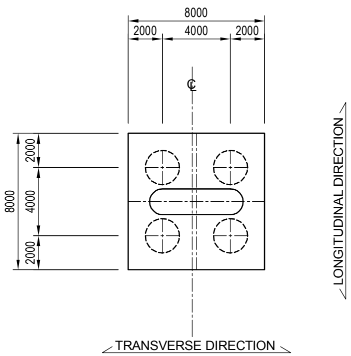
S =1:60



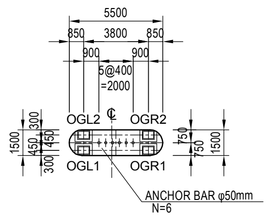
PLAN VIEW
4 - 4



PILE ARRANGEMENT
5 - 5



ARRANGEMENT OF BRIDGE SEAT



Notes : Regardless of existences of indications on the Drawings,
baseplates of bridge bearings shall be embedded into leveling mortar by 10 mm and the
leveling motar shall be embedded into concrete pedestal or top surface of substructures by 30 mm.

PROJECT NAME	FINANCED BY	COUNTERPART	JICA STUDY TEAM
DETAILED DESIGN ON BAGO RIVER BRIDGE CONSTRUCTION PROJECT	JAPAN INTERNATIONAL COOPERATION AGENCY	REPUBLIC OF THE UNION OF MYANMAR MINISTRY OF CONSTRUCTION DEPARTMENT OF BRIDGE	NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS GLOBAL CO., LTD. METROPOLITAN EXPRESSWAY COMPANY LIMITED CHODAI CO.,LTD. NIPPON ENGINEERING CONSULTANTS CO.,LTD.

	NAME	SIGNATURE	DATE	DRAWING TITLE	PACKAGE
PREPARED BY	M. OHYAMA	大山 陽弘	15 Jun.2017	GENERAL VIEW OF PO3 PIER	1
CHECKED BY	T. HAYAKAWA	早川 知邦	20 Jun.2017		DWG No.
APPROVED BY	Y. SANO	佐野 裕一	21 Jun.2017		P1-OR-2031

Summary Table

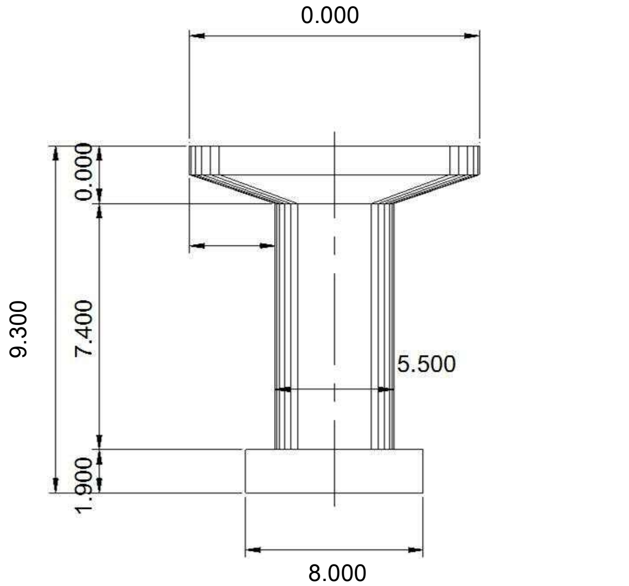
	Description	Specification dimensions			Unit	Quantity	Remark
Substructure	Concrete	σck = 24 N/mm2		Beam	m^3	0.3	
				Column	m^3	57.5	
				Sub Total	m^3	57.8	
		σck = 24 N/mm2		Pile Cap	m^3	121.6	
				Sub Total	m^3	121.6	
		-		Total	m^3	179.4	
	Formwork	Normal Type		Beam	m^2	0.7	
				Column	m^2	94.1	
				Pile Cap	m^2	60.8	
				Total	m^2	155.6	
	Rebar	SD 390	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
			Stud Joint	D38	nos	0	
				D35	nos	0	
				D29 - D 32	nos	0	
				Total	nos	0	
		SD 345	Total Mass	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	5,451	
				D25 ~ D16	kg	10,155	
				D10 - D13	kg	0	
				Total	kg	15,606	
		SD 390	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	0	
				D10 - D13	kg	0	
				Total	kg	0	
		SD 345	Mass for Body	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	5,451	
				D25 ~ D16	kg	3,829	
				D10 - D13	kg	0	
				Total	kg	9,280	
		SD 345	Mass for Footing	D 38	kg	0	
				D 35	kg	0	
				D29 - D 32	kg	0	
				D25 ~ D16	kg	6,326	
				D10 - D13	kg	0	
				Total	kg	6,326	
	Lean Concrete	σck = 18 N/mm2 , t = 10 cm			m^3	6.7	
	Lean Concrete Form	Normal Type			m^2	3.3	
	Crushed stone				m^2	67.2	
	Box out for bearing	Cylindrial form length1		φ100 x 0.10m	m	0	
		Cylindrical form number1			nos	0	
		Cylindrial form length2		φ150 x 0.60m	m	3.6	
		Cylindrical form number2			nos	6	
		Cylindrial form length3		φ100 x 0.10m	m	0	
		Cylindrical form number3			nos	0	
		Total Non-shrinkage mortar Volume			m^3	0.182	

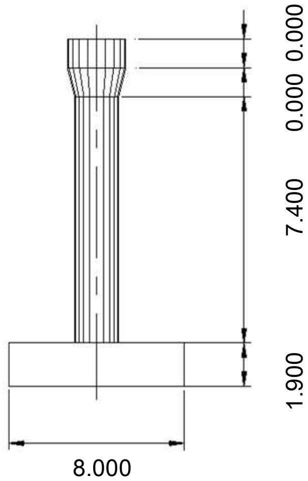
PO3

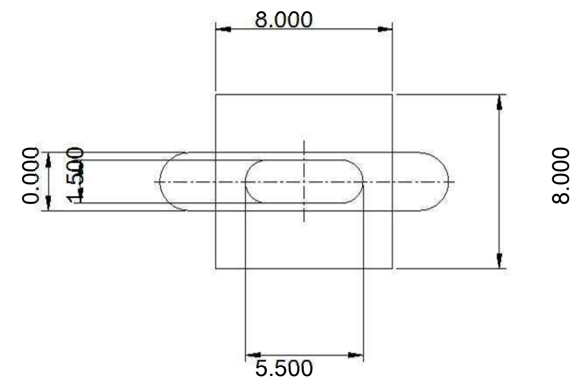
	Description		Specification dimensions			Unit	Quantity	Remark
Foundation	CIP Pile		Diameter 2000		Length	m	58.000	
					number	nos	4	
	Rebar		SD 345	Mass for CIP & SPSP	D 38	kg	0	
					D 35	kg	0	
					D29 - D 32	kg	39,440	
					D25 ~ D16	kg	20,520	
					D10 - D13	kg	112	
					Total	kg	60,072	
	Concrete		σck = 24 N/mm2			m^3	728.9	
	Formwork					m^2	0	
	Miscellaneous steel		Spacers and Sonic Pipes			kg	5,107	
Earth Work	Foundation Excavation		Inside cofferdam, unsuitable			m^3	249.8	
			Total			m^3	249.8	
	Backfill		purchased soil			m^3	103.3	
	Surplus Soil		unsuitable soil			m^3	249.8	
	Ground Preparation					m^2	0.0	
Temp work	Steel sheet pile		Type III 12.50m			kg	75,000	
			Number of Sheet Piles			nos	100	
			Number of Wellding Joint (on site)			nos	0	
	Mold Steel	Supporting Beam	H-×××			kg	0	
		Brace	H-×××			kg	0	
		Bond Timber	H-×××			kg	0	
		Sub-member(A)	0.22			kg	0	
		Sub-member(B)	0.04			kg	0	
		Total				kg	0	
Falsework			Scaffloding (Handrail precede type) H<30m			m^2	222.7	
Supporting			Wedge type (under 80 kN/m2)			m^3	0.0	

Schimatic Diagram

PO3







Top EL of Substructure	11.111 m
GL for construction	4.300 m

Quantity Calculation PO3

1. Concrete

1) Beam (σck = 24 N/mm2)

(	0.000 ×	0.000 ×	0.000)-(	0.000	/2)^2 x (4-π)	x	0.000		=	0.0 m^3
1/2x(	0.000 +	5.500) ×	1.500) ×	0 -	0.0	x	0.3^2 x [radians (48.2) - sin (radians(48.2))]		=	0.0 m^3
π × (	0.000 ^2)/4 ×	0.000							=	0.0 m^3
								V1	=	0.0 m^3

2) Base for bridge bearings (σck = 24 N/mm2)

Type1	0.700 ×	1.000 ×	0.100 ×	2		=	0.1 m^3
Type2	0.700 ×	1.000 ×	0.120 ×	2		=	0.2 m^3
Type3	0.000 ×	0.000 ×	0.000 ×	2		=	0.0 m^3
					V2	=	0.3 m^3

3) Column (σck = 24 N/mm2)

{ (1.500) ^2 ÷ 4×π + (5.500 - 1.500) × 1.500 }× 7.400

= 57.5 m^3

(V3)

4) Pile cap (σck = 24 N/mm2)

8.000 × 8.000 × 1.900 = 121.6 m^3

(V4)

5) Total

σck = 24 N/mm2	ΣV =		+		+			=	0.0 m^3
σck = 24 N/mm2	ΣV =	0.0	+	0.3	+	57.5	+ 121.6	=	179.4 m^3

2. Formwork

1) Beam

1/2 × (	0.000 +	5.500) ×	0.000 ×	2		=	0.0 m^2
0.000 ×	0.000 ×	2				=	0.0 〃
π ×	0.000 ×	0.000				=	0.0 〃
1/2 × (	0.000 +	0.000) ×	2.750 ×	2		=	0.0 〃
					A1	=	0.0 m^2

2) Base for bridge bearings

Type1 (	0.700 +	1.000) ×	2 ×	0.100	2		=	0.3 m^2
Type2 (	0.700 +	1.000) ×	2 ×	0.120	2		=	0.4 m^2
Type3 (	0.000 +	0.000) ×	2 ×	0.000	2		=	0 m^2
						A2	=	0.7 m^2

3) Column

{ 1.500 ×π + (5.500 - 1.500) x 2}× 7.400 = 94.1 m^2

(A3)

4) Pile cap

(8.000 + 8.000) × 2 × 1.900 = 60.8 m^2

(A4)

5) Total

ΣA = 0.0 + 0.7 + 94.1 + 60.8 = 155.6 m^2

3. Lean concrete (σck = 18 N/mm2 , t = 10 cm) PO3

Area

8.200 × 8.200 = 67.2 m^2

Volume (V = 67.2 × 0.100 = 6.7 m^3)

4. Lean concrete formwork

0.100 × (8.200 + 8.200) × 2 = 3.3 m^2

5. Crushed stone

Area 8.200 × 8.200 = 67.2 m^2

Volume (V = 67.2 × 0.200 = 13.4 m^3)

6. Rebar

Diameter		Mass SD390 (kg)	Mass SD345 (kg)	Stud welding (Number)	Body SD390 (kg)	Body SD345 (kg)	Footing (kg)
D51						0	
D41						0	
D38						0	
D35						0	
D29 - D32	D32		5,451			5,451	
	D29					0	
	Sub Total		5,451			5,451	0
D25 ~ D16	D25		4,050			376	3,674
	D22		1,051			0	1,051
	D19		1,154			0	1,154
	D16		3,900			3,453	447
	Sub Total		10,155			3,829	6,326
D10 - D13						0	
Total			**15,606**			**9,280**	**6,326**

7. Box-out for Bearings (Cylindrical form)

Quantity for Type1

Anchor bar diameter φ0 mm Anchor bar Length L_0 = 0.000 m

Pipe diameter 100 mm Anchor bar Number n = 0 nos

Box-out Length l = 0.100 m

Total Length L = 0.100 × 0 (for one bearing) = 0.000 m

For one pier (0 locations)

Total Length L = 0.000 × 0 = 0.000 m

Quantity for Type2

Anchor bar diameter φ50 mm Anchor bar Length L_0 = 0.500 m

Pipe diameter 150 mm Anchor bar Number n = 6 nos

Box-out Length l = 0.600 m

Total Length L = 0.600 × 6 (for one bearing) = 3.600 m

For one pier (1 locations)

Total Length L = 3.600 × 1 = 3.600 m

Quantity for Type3

Anchor bar diameter φ0 mm Anchor bar Length L_0 = 0.000 m

Pipe diameter 100 mm Anchor bar Number n = 0 nos

Box-out Length l = 0.100 m

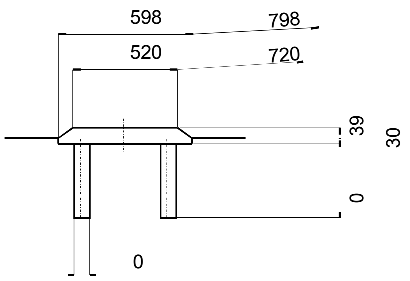
Total Length L = 0.100 × 0 (for one bearing) = 0.000 m

For one pier (0 locations)

Total Length L = 0.000 × 0 = 0.000 m

Non-shrinkage Mortar for bearings

Quantity for Tyep 1



	mortar height
G1	39
G2	39
G3	38
G4	38
Ave	39

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1 = 0.039 /6× { (2 × 0.520 + 0.598) × 0.720

\+ (2 × 0.598 + 0.520) × 0.798 } = 0.017 m^3

V2 = 0.598 × 0.030 × 0.798 = 0.014 〃

= 0.031 m^3

Total base mortal volume for Type 1

V_{T1-1} = 0.031 × 4 = 0.124 m^3

PO3

Mortar for anchor bar Type 1

Anchor bar diameter φ0

Anchor bar number 0

Void diameter φ100

Void length 0.100

V3 = π/4 × (0.100 $)^2\times$ 0.100 × 0 = 0.000 〃

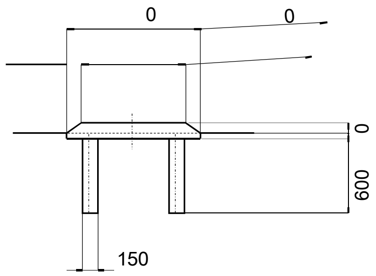
V4 = - π/4 × (φ0 $)^2\times$ 0.000 × 0 = 0.000 〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T1-2} = 0.000 × 0 = 0.000 m^3

Quantity for Tyep 2



	mortar height
G5	
G6	
G7	
G8	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h/6×｛（2a + a1）×b +（2a1+ a）×b1｝

V1 = 0.000 /6×｛（2 × 0.000 + 0.000 ）× 0.000

+ （2 × 0.000 + 0.000 ）× 0.000 ｝ = 0.000 m^3

V2 = 0.000 × 0.000 × 0.000 = 0.000 〃

= 0.000 m^3

Total base mortal volume for Type 2

V_{T2-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar Type 2

Anchor bar diameter φ50

Anchor bar number 6

Void diameter φ150

Void length 0.6

V3 = π/4 × (0.150 $)^2\times$ 0.600 × 6 = 0.064 〃

V4 = - π/4 × (φ50 $)^2\times$ 0.500 × 6 = -0.006 〃

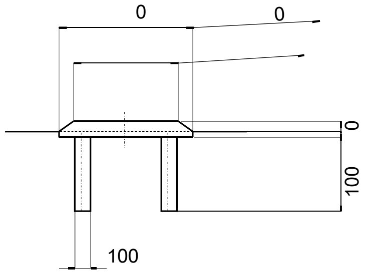
(Volume of anchor bar) V = 0.058 m^3

Anchor bar for an abutment (1 locations)

V_{T2-2} = 0.058 × 1 = 0.058 m^3

Quantity for Tyep 3

PO3



	mortar height
G9	
G10	
G11	
G12	
Ave	0

mm

Base mortar for one location

Formula(Square frustum of pyramid)

V = h /6× { (2 a + a 1) × b + (2 a 1 + a) × b 1 }

V1	=	0.000	/6× { (2	×	0.000	+	0.000	) ×	0.000			
			+ (2	×	0.000	+	0.000	) ×	0.000 }	=	0.000	m^3
V2	=	0.000	×	0.000	×	0.000				=	0.000	〃
										=	0.000	m^3

Total base mortal volume for Type 3

V_{T3-1} = 0.000 × 0 = 0.000 m^3

Mortar for anchor bar

Anchor bar diameter	φ0
Anchor bar number	0
Void diameter	φ100
Void length	0.100

V3	=		π/4	× (	0.100	$)^2$×	0.100	×	0	=	0.000	〃
V4	=	-	π/4	× (	φ0	$)^2$×	0.000	×	0	=	0.000	〃

(Volume of anchor bar) V = 0.000 m^3

Anchor bar for an abutment (0 locations)

V_{T3-2} = 0.000 × 0 = 0.000 m^3

Total of non shrinkage mortar

V_{T1-1} + V_{T1-2} + V_{T2-1} + V_{T2-2} + V_{T3-1} + V_{T3-2} = **0.182** m^3

8. CIP Pile PO3

(1)Diameter and number

D = 2.000 m L = 58.00 m n = 4 nos

Net Area = 3.142

2)Concrete = 3.142 58.00 4 = 728.9 m^3

3) Rebar (SD 345)

Item		Mass (kg) One Pile	Mass (kg) On Pier
D38		0	0
D35		0	0
D32 ~ D29	D32	0	0
	D29	9,860	39,440
	Sub-total	9,860	39,440
D25 ~ D16	D25	0	0
	D22	5,130	20,520
	D19	0	0
	D16	0	0
	Sub-total	5,130	20,520
D13		28	112
Total		15,018	60,072

Miscellaneous steel (kg)

Item	Length	number per pile	unit weight	weight per pile	per pier
CIP Spacer				109	436
STK400,φ60.5,t=2.3	60.500	3	3.300	599	2,396
STK400,φ114.3,t=3.5	59.500	1	9.560	569	2,275
Total					5,107

9. Earth work

1) Excavation for foundation

Excavation within Cofferdam

Area A = (8.000 + 1.0 × 2)x(8.000 + 1.0 × 2) = 100.0 m^2

Excavation Depth 2.800 m

100.00 × 2.800 = 280.0 m^3

Deduction of Pile Volume 2.000 ^2 x π/4 ×(2.800 - 0.40) x 4 = -30.2 〃

V = 249.8 m^3

2) Backfill with purchased soil

Deduction for completed structure

Column	0.600	× (π /4 ×	1.500 ^2 +	1.500 ×	4.000)	=	4.7 m^3
Pile cap	8.000	×	8.000	×	1.900	=	121.6 〃
Lean concrete	8.200	×	8.200	×	0.300	=	20.2 〃
					Volume of Structure	=	146.5 m^3

V = 249.8 - 146.5 = 103.3 m^3

3) Surplus soil volume (unsuitable soil)

V = 249.8 = 249.8 m^3

4) Area of ground preparation for foundation

A = × - π /4 × ^{2}× = 0.0 m^2

1) Earth retaining method w= 0.4 (Type III)

Steel Sheet Pile Type III	12.500	m	100	nos	Unit weight	60.0	kg/m	
Steel Sheet Pile Type IV		m		nos	Unit weight	76.1	kg/m	
Steel Sheet Pile Type V		m		nos	Unit weight	105.0	kg/m	

12.500	×	60.0	×	100		=	75,000
0.000	×	76.1	×	0		=	0
0.000	×	105.0	×	0		=	0
					Σw	=	75,000

Number of joints N = 0 + 0 + 0 = 0 nos

2) Mold Steel

Name	Specification	Length (m)	nos	Unit weight (kg/m)	Total weight (kg)
Supporting Beam	H- ×××		0		0
	H- ×××		0		0
	H- ×××		0		0
Brace	H- ×××				0
	H- ×××				0
Bond Timber	H- ×××				0
	H- ×××				0
	H- ×××				0
Intermidiate Pile	H- ×××	0.000	0		0
Total of Main Member					0
Sub-member(A)	0 × 0.22				0
Sub-member(B)	0 × 0.04				0
Total of Sub-Member					0
Total of Mold Steel					0

11. Falsework

【height Division】 〔Average height H≦30m

1) Beam

(Falsework height) H1= 0.000 m

w=	0	x(	0.000	+	1.500	)+	8.800	]x	0.000)	=	0.00	m^2

2) Pierstud

(Falsework height) H2= 7.400 m

w1=	4.000 x	7.400 x	2	=	59.20	m^2
w2=	π x	3.700 x	7.400	=	86.00	m^2
Sub-Total				=	145.20	m^3

3) Pile cap

w=	2	x(	8.000	+	8.000	)+	8.800	]x	1.900)	=	77.50	m^2

Total = 222.70 m^3

12. Supporting

【height Divis 〔Average height〕----H≦30m

【Average height 】

1/2 × (0.000 + 0.000) = 0.00 m

【Support capacity】

Average beam height

1/2 × (0.000 + 0.000) = 0.00 m

2.500 < t

Support capacity

80 kN/m2 < w

【Supporting area】

A1= 0.00 x 0 = 0.00 m^2

A2= 0.00 x 0 = 0.00 m^2

【Supporting volume】

V1= 0.00 x 0.000 = 0.00 m^3

V2= 1/2 × (0.000 + 0.000)x 0.000 = 0.00 m^3

Total = 0.00 m^3

CHAPTER 3

QUANTITY OF STEEL PIPE SHEET PILE FOUNDATIONS

QUANTITY OF STEEL PIPE SHEET PILE FOUNDATION

OF

PIER P20

1. Steel Pipe Sheet Pile Foundation (P20)

1.1 Steel Weight

(1) Steel Pipe Sheet Pile & Steel Pipe Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (m)	Number of Pile (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.500	30	409	153,375	(SKY400)
	φ1200	14	11.000	30	409	134,970	(SKY490)
	φ1200	14	30.500	30	409	374,235	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	21.500	6	409	52,761	(SKY400)
	φ1200	14	30.500	6	409	74,847	(SKY400)
Joint Pile (Outside)	φ165.2	11	52.5	60	41.8	131,670	SKY400
Joint Pile (Diaphragm)	φ165.2	11	50.5	14	41.8	29,553	SKY400
					Total	951,411	

(2) Steel Plate

Item	Dimensions and Standards (mm)		Number (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Reinforcing Band	PL300 * 9 * 3798		36	80.5	2,898	SS400
Toe Shoe	PL153 * 12 * 159		74	2.29	169	SS400
Lifting Lug	Max Lifting Load	Under 5～10ton	0	5	0	SS400
	Max Lifting Load	Under 10～20ton	144	13	1,872	SS400
				Total	4,939	

1.2 steel removals

(1) Steel Pipe Sheet Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (nos)	Number of Pile (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.000	30	409	147,240	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	14.500	6	409	35,583	(SKY400)
Joint Pile (Outside)	φ165.2	11	11.700	60	41.8	29,344	SKY400
Joint Pile (Diaphragm)	φ165.2	11	14.200	14	41.8	8,310	SKY400
	Total			36		220,476	

(2) Steel Plate

Item		Weight (kg)	
Lifting Lug	Lifting Lug	1,872	

1.3 Spread Sand

Thickness : 0.500 m

A = (17.164 - 11.373) * (11.373 - 1.200)
+ π/4 * (11.373 - 1.200)^2
- π/4 * 1.200 ^2 * 30 / 2
- π/4 * 1.200 ^2 * (6 + 0) = 116.45 m^2

V = 116.45 * 0.50 = 58.22 m^3

1.4 Bottom Slab Concrete

fc' = 21 Mpa

Thickness : 2.000 m

A = (17.164 - 11.373) * (11.373 - 1.200)
+ π/4 * (11.373 - 1.200)^2
- π/4 * 1.200 ^2 * 30 / 2
- π/4 * 1.200 ^2 * (6 + 0) = 116.45 m^2

V = 116.45 * 2.00 = 232.90 m^3

1.5 Footing Concrete

fc' = 24 Mpa

Thickness : 4.000 m

A = (17.164 - 11.373) * (11.373 - 1.200)
+ π/4 * (11.373 - 1.200)^2
- π/4 * 1.200 ^2 * 30 / 2 = 123.23 m^2

V = 123.23 * 4.00 = 492.94 m^3

1.6 Concrete filling to steel pipe pile

(1) Outside Steel Pipe Wall fc' = 18 Mpa

V = π/4 * (1.20 - 0.014 * 2)^2 * 8.000 * 30 = 258.91 m^3

(2) Diaphragm Steel Sheet Pipe Wall fc' = 18 Mpa

V = π/4 * (1.200 - 0.014 * 2)^2 * 1.300 * 6
+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 8.41 m^3

Total = 267.33 m^3

1.7 Excavation inside the well

Existing GL	-6.554	m
EL. of Top of Footing	-7.532	m
EL. of Bottom of Sand Mat	-14.032	m
Excavation height	7.478	m

A = (17.164 - 11.373) * (11.373 - 1.200)
+ π/4 * (11.373 - 1.200)^2
- π/4 * 1.200 ^2 * 30 / 2 = 123.23 m^2

V = 123.23 * 7.48 = 921.55 m^3

1.8 Excavation inside of pipe pile

(1) Outside Steel Pipe Wall

Existing GL	-6.554	m
EL. of Excavation inside of pipe pile	-15.532	m
Excavation height	8.978	m

V = π/4 * (1.200 - 0.014 * 2)^2 * 8.978 * 30 = 290.57 m^3

(2)Diaphragm Steel Sheet Pipe Wall

V = π/4 * (1.200 - 0.014 * 2)^2 * 6.178 * 6
+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 39.99 m^3

Total = 330.56 m^3

1.9 Reinforcement of Footing

DIAMETER	WEIGHT(kg)	**BOQ Group**
D13	0	**0**
D16	664	**4,359**
D19	3,695	
D29	9,873	**21,923**
D32	12,050	
D35	14,860	**14,860**
TOTAL	41,142	**41,142**

1.10 Connection of Diaphragm Steel Sheet Pipe

Bar Diameter		Unit Weight (kg/m)	Length (m)	Number of Bar	Total Weight (kg)	Description	Number of Joint
D10～D13	D13	0.995	4.27	36	153.0	SD345	0
	D13	0.995	3.46	24	82.6	SD345	0
D16～D19	D19	2.25	2.17	144	703.1	SD345	0
							0
							0
Total					938.7	ｋｇ	

kg

1.11 Welding of the dowel

Item	Stud Ba	Length （m）	Number of Bar (nos)	Unit Weight (kg/m)	Total Weight (kg)	Description	Number of welding of Stad Bar
Moment bar	D22	1.0	960	3.04	2,918.4	SM490A-SD	960
Shear Bar	D22	0.7	2280	3.04	4,851.8	SM490A-SD	2,280
				Total	**7,770.2**	Total	**3,240**

Total

1.12 Cleaning inside joint pipe

・Total length

Outside Steel Pipe Wall	L1 =	52.500	m *	60	nos	=	3150.00 m
Diaphragm Steel Sheet Pipe Wall	L2 =	50.500	m *	14	nos	=	707.00 m
for one foundation						=	3857.00 m

・Volume

for one foundation 3857.00 * 2.5 / 100 = 96.43 m^3

1.13 Mortar filling inside joint pipe

・Total length

Outside Steel Pipe Wall	L1 =	40.800	m *	60	nos	=	2448.00 m
Diaphragm Steel Sheet Pipe Wall	L2 =	36.300	m *	14	nos	=	508.20 m
for one foundation						=	2956.20 m

・Volume

for one foundation 2956.20 * 2.5 / 100 = 73.91 m^3

1.14 Sealing inside joint pipe

・Total length

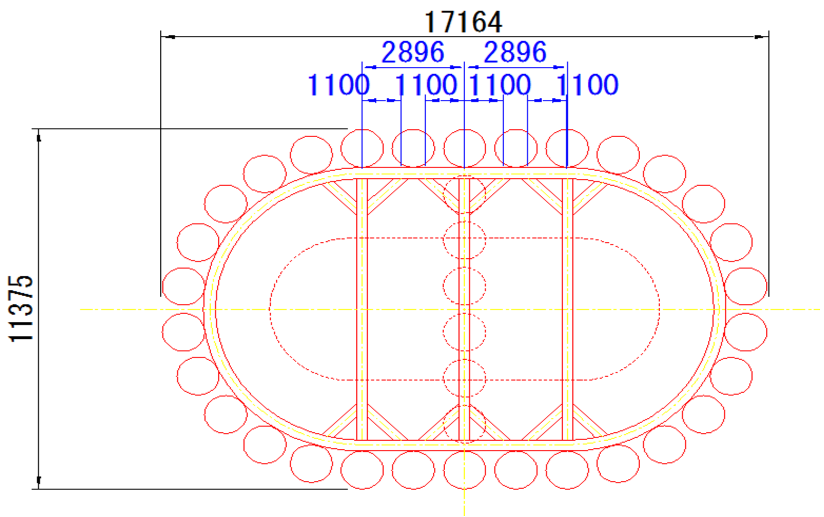
Outside Steel Pipe Wall	L1 =	11.700	m *	60	nos	=	702.00 m
for one foundation						=	702.00 m

・Volume

for one foundation 702.00 * 2.5 / 100 = 17.55 m^3

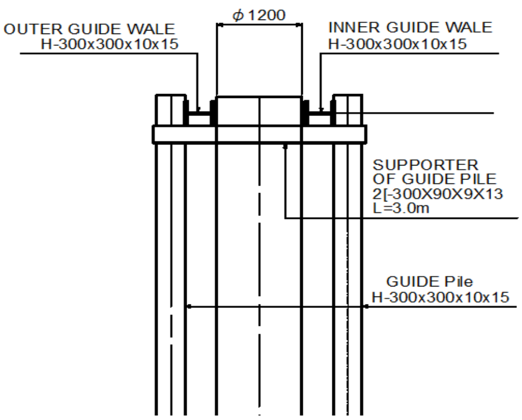
Quantity for Wales & Braces (P20)

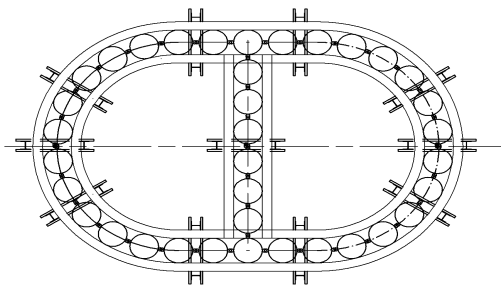
Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg/n)	Total weight (kg)	Description
Wales	H	350x350x12x19	5.79	2	135.0	781.8	1,564	SS400
	H	350x350x12x19	13.55	2	135.0	1,828.6	3,657	SS400
	H	300x300x10x15	5.79	4	93.0	538.6	2,154	SS400
	H	300x300x10x15	13.62	4	93.0	1,267.0	5,068	SS400
						sub total	12,443	kg
Braces	H	350x350x12x19	8.27	2	135.0	1,116.9	2,234	SS400
	H	300x300x10x15	8.37	4	93.0	778.7	3,115	SS400
						sub total	5,349	kg
Angle Braces	H	350x350x12x19	1.50	8	135.0	202.5	1,620	SS400
	H	300x300x10x15	1.50	16	93.0	139.5	2,232	SS400
						sub total	3,852	kg
	for one foundation							
		Main Member (H 300~H350)			21,644	kg	22.00 t	
		Deputy member (Main Mamberx0.04)			866	kg	1.00 t	
		Total			22,510	kg	23.00 t	



Guide Frame for SPSP (P20)

Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg)	Total weight (kg)	Description
Guide Wale	H	300x300x10x15	5.8	2	93.0	538.6	1,077	SS400
	H	300x300x10x15	13.5	2	93.0	1252.4	2,505	SS400
	H	300x300x10x15	5.8	2	93.0	538.6	1,077	SS400
	H	300x300x10x15	18.5	2	93.0	1719.9	3,440	SS400
	H	300x300x10x15	9.0	2	93.0	834.5	1,669	SS400
						sub total	9,768	kg
Supporter	2[	300x90x9x13	3.0	22	38.1	114.3	2,515	SS400
						sub total	2,515	kg
Guide Pile	H	300x300x10x15	39.0	22	93.0	3627.0	79,794	SS400
						sub total	79,794	kg
	for one foundation							
		Guide Wale			9,768	kg	9.768	t
		Supporter			2,515	kg	2.515	t
		Guide Pile			79,794	kg	79.794	t
		Deputy member (Main Mamberx0.04)			3,683	kg	3.683	t
		Total			95,760	kg	96	t





QUANTITY OF STEEL PIPE SHEET PILE FOUNDATION

OF

PIER P21

1. Steel Pipe Sheet Pile Foundation (P21)

1.1 Steel Weight

(1) Steel Pipe Sheet Pile & Steel Pipe Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (m)	Number of Pile (本)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.500	28	409	143,150	(SKY400)
	φ1200	14	8.500	28	409	97,342	(SKY490)
	φ1200	14	35.500	28	409	406,546	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	19.000	4	409	31,084	(SKY400)
	φ1200	14	35.500	4	409	58,078	(SKY400)
Joint Pile (Outside)	φ165.2	11	55.000	56	41.8	128,744	SKY400
Joint Pile (Diaphragm)	φ165.2	11	53.000	10	41.8	22,154	SKY400
					Total	887,098	

(2) Steel Plate

Item	Dimensions and Standards (mm)		Number (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Reinforcing Band	PL300 * 9 * 3798		32	80.5	2,576	SS400
Toe Shoe	PL153 * 12 * 159		66	2.29	151	SS400
Lifting Lug	Max Lifting Load	Under 5～10ton	0	5	0	SS400
	Max Lifting Load	Under 10～20ton	128	13	1,664	SS400
				Total	4,391	

1.2 steel removals

(1) Steel Pipe Sheet Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (m)	Number of Pile (本)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.000	28	409	137,424	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	14.400	4	409	23,558	(SKY400)
Joint Pile (Outside)	φ165.2	11	11.700	56	41.8	27,387	SKY400
Joint Pile (Diaphragm)	φ165.2	11	14.100	10	41.8	5,894	SKY400
	Total			32		194,264	

(2) Steel Plate

Item		Weight (kg)	
Lifting Lug	Lifting Lug	1,664	

1.3 Spread Sand

Thickness = 0.500 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2
- π/4 * 1.200 ^2 * (4 + 0) = 85.62 m^2

V = 85.62 * 0.50 = 42.81 m^3

1.4 Bottom Slab Concrete

fc' = 21 Mpa

Thickness = 2.000 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2
- π/4 * 1.200 ^2 * (4 + 0) = 85.62 m^2

V = 85.62 * 2.00 = 171.24 m^3

1.5 Footing Concrete

fc' = 24 Mpa

Thickness : 4.000 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2 = 90.14 m^2

V = 90.14 * 4.00 = 360.57 m^3

1.6 Concrete filling to steel pipe pile

(1) Outside Steel Pipe Wall fc' = 18 Mpa

V = π/4 * (1.20 - 0.014 * 2)^2 * 8.000 * 28 = 241.65 m^3

(2)Diaphragm Steel Sheet Pipe Wall fc' = 18 Mpa

V = π/4 * (1.200 - 0.014 * 2)^2 * 1.300 * 4
+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 5.61 m^3

Total = 247.26 m^3

1.7 Excavation inside the well

Existing GL	-6.155	m
EL. of Top of Footing	-7.555	m
EL. of Bottom of Sand Mat	-14.055	m
Excavation height	7.900	m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2 = 90.14 m^2

V = 90.14 * 7.90 = 712.12 m^3

1.8 Excavation inside of pipe pile

(1) Outside Steel Pipe Wall

Existing GL	-6.155	m
EL. of Excavation inside of pipe pile	-15.555	m
Excavation height	9.400	m

V = π/4 * (1.200 - 0.014 * 2)^2 * 9.400 * 28 = 283.94 m^3

(2)Diaphragm Steel Sheet Pipe Wall

V = π/4 * (1.200 - 0.014 * 2)^2 * 6.600 * 4
+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 28.48 m^3

Total = 312.42 m^3

1.9 Reinforcement of Footing

DIAMETER	WEIGHT(kg)	**BOQ Group**
D13	0	**0**
D16	797	**4,336**
D19	3,539	
D29	7,061	**24,343**
D32	17,282	
D35	0	**0**
TOTAL	28,679	**28,679**

1.10 Connection of Diaphragm Steel Sheet Pipe

Bar Diameter		Unit Weight (kg/m)	Length (m)	Number of Bar	Total Weight (kg)	Description	Number of Joint
D10～D13	D13	0.995	4.26	24	101.7	SD345	0
	D13	0.995	3.46	16	55.1	SD345	0
D16～D19	D16	1.56	2.02	96	302.5	SD345	0
							0
							0
Total					459.3	kg	

1.11 Welding of the dowel

Item	Stud Bar	Length (m)	Number of Bar (nos)	Unit Weight (kg/m)	Total Weight (kg)	Description	umber of weldi of Stad Bar
Moment bar	D22	1.0	896	3.04	2,723.8	SM490A-SD	896
Shear Bar	D22	0.7	2128	3.04	4,528.4	SM490A-SD	2,128
				Total	7,252.2	Total	3,024

1.12 Cleaning inside joint pipe

・Total length

Outside Steel Pipe Wall	L1 =	55.000	m *	56	nos	= 3080.00	m
Diaphragm Steel Sheet Pipe Wall	L2 =	53.000	m *	10	nos	= 530.00	m
for one foundation						= 3610.00	m

・Volume

for one foundation 3610.00 * 2.5 / 100 = 90.25 m^3

1.13 Mortar filling inside joint pipe

・Total length

Outside Steel Pipe Wall	L1 =	43.300	m *	56	nos	= 2424.80	m
Diaphragm Steel Sheet Pipe Wall	L2 =	38.800	m *	10	nos	= 388.00	m
for one foundation						= 2812.80	m

・Volume

for one foundation 2812.80 * 2.5 / 100 = 70.32 m^3

1.14 Sealing inside joint pipe

・Total length

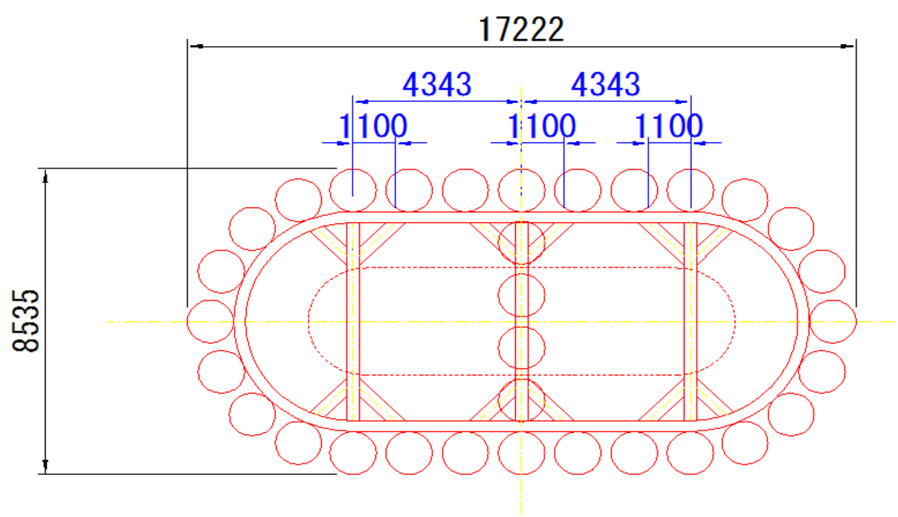
Outside Steel Pipe Wall	L1 =	11.700	m *	56	nos	= 655.20	m
for one foundation						= 655.20	m

・Volume

for one foundation 655.20 * 2.5 / 100 = 16.38 m^3

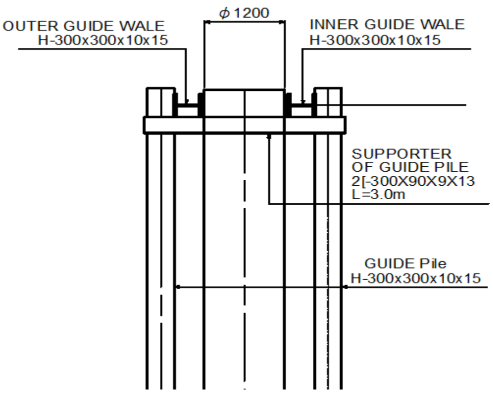
Quantity for Wales & Braces (P21 & P22)

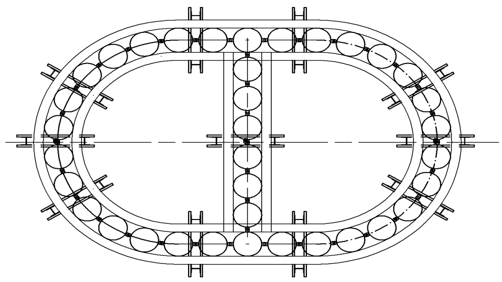
Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg/n)	Total weight (kg)	Description
Wales	H	350x350x12x19	8.69	4	135.0	1,172.7	4,691	SS400
	H	350x350x12x19	9.09	4	135.0	1,226.8	4,907	SS400
	H	300x300x10x15	8.69	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	9.17	2	93.0	852.4	1,705	SS400
						sub total	12,919	kg
Braces	H	350x350x12x19	5.44	4	135.0	733.7	2,935	SS400
	H	300x300x10x15	5.54	2	93.0	514.8	1,030	SS400
						sub total	3,965	kg
Angle Braces	H	350x350x12x19	1.50	16	135.0	202.5	3,240	SS400
	H	300x300x10x15	1.50	8	93.0	139.5	1,116	SS400
						sub total	4,356	kg
	for one foundation							
		Main Member (H 300~H350)			21,240 kg		21.00 t	
		Deputy member (Main Mamberx0.04)			850 kg		1.00 t	
		Total			22,090 kg		22.00 t	



Guide Frame for SPSP (P21~P22)

Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg)	Total weight (kg)	Description
Guide Wale	H	300x300x10x15	8.7	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	9.0	2	93.0	837.8	1,676	SS400
	H	300x300x10x15	8.7	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	14.0	2	93.0	1305.3	2,611	SS400
	H	300x300x10x15	6.1	2	93.0	570.6	1,141	SS400
						sub total	8,660	kg
Supporter	2[	300x90x9x13	3.0	22	38.1	114.3	2,515	SS400
						sub total	2,515	kg
Guide Pile	H	300x300x10x15	36.5	22	93.0	3394.5	74,679	SS400
						sub total	74,679	kg
	for one foundation							
		Guide Wale			8,660 kg		8.660 t	
		Supporter			2,515 kg		2.515 t	
		Guide Pile			74,679 kg		74.679 t	
		Deputy member (Main Mamberx0.04)			3,434 kg		3.434 t	
		Total			89,288 kg		90 t	
	for Two foundation							
		0			17,320 kg		17.320 t	
		0			5,030 kg		5.030 t	
		0			149,358 kg		149.358 t	
		Deputy member (Main Mamberx0.04)			6,868 kg		6.868 t	
		Total			178,576 kg		179 t	





Package -2　PC Box Girder Bridge

QUANTITY OF STEEL PIPE SHEET PILE FOUNDATION

OF

PIER P22

1. Steel Pipe Sheet Pile Foundation (P22)

1.1 Steel Weight

(1) Steel Pipe Sheet Pile & Steel Pipe Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (m)	Number of Pile (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.500	28	409	143,150	(SKY400)
	φ1200	16	8.500	28	467	111,146	(SKY400)
	φ1200	14	30.500	28	409	349,286	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	19.000	4	409	31,084	(SKY400)
	φ1200	14	30.500	4	409	49,898	(SKY400)
Joint Pile (Outside)	φ165.2	11	50.000	56	41.8	117,040	SKY400
Joint Pile (Diaphragm)	φ165.2	11	48.000	10	41.8	20,064	SKY400
					Total	821,668	

(2)Steel Plate

Item	Dimensions and Standards (mm)		Number (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Reinforcing Band	PL300 * 9 * 3798		32	80.5	2,576	SS400
Toe Shoe	PL153 * 12 * 159		66	2.29	151	SS400
Lifting Lug	Max Lifting Load	Under 5～10ton	0	5	0	SS400
	Max Lifting Load	Under 10～20ton	128	13	1,664	SS400
				Total	4,391	

1.2 steel removals

(1) Steel Pipe Sheet Pile

Item	Diameter (mm)	thickness (mm)	Pile Length (nos)	Number of Pile (nos)	Unit Weight (kg/m)	Weight (kg)	Description
Outside Steel Pipe Wall	φ1200	14	12.000	28	409	137,424	(SKY400)
Diaphragm Steel Sheet Pipe Wall	φ1200	14	14.400	4	409	23,558	(SKY400)
Joint Pile (Outside)	φ165.2	11	11.700	56	41.8	27,387	SKY400
Joint Pile (Diaphragm)	φ165.2	11	14.100	10	41.8	5,894	SKY400
	Total			32		194,264	

(2) Steel Plate

Item		Weight (kg)	
Lifting Lug	Lifting Lug	1,664	

1.3 Spread Sand

Thickness : 0.500 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2
- π/4 * 1.200 ^2 * (4 + 0) = 85.62 m^2

V = 85.62 * 0.50 = 42.81 m^3

1.4 Bottom Slab Concrete   fc' = 21 Mpa

Thickness : 2.000 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2
- π/4 * 1.200 ^2 * (4 + 0) = 85.62 m^2

V = 85.62 * 2.00 = 171.24 m^3

1.5 Footing Concrete   fc' = 24 Mpa

Thickness : 4.000 m

A = (17.222 - 8.535) * (8.535 - 1.200)
+ π/4 * (8.535 - 1.200)^2
- π/4 * 1.200 ^2 * 28 / 2 = 90.14 m^2

V = 90.14 * 4.00 = 360.57 m^3

1.6 Concrete filling to steel pipe pile

(1) Outside Steel Pipe Wall   fc' = 18 Mpa

V = π/4 * (1.20 - 0.016 * 2)^2 * 8.000 * 28 = 240.01 m^3

(2) Diaphragm Steel Sheet Pipe Wall fc' = 18 Mpa

V = π/4 * (1.200 - 0.014 * 2)^2 * 1.300 * 4

+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 5.61 m^3

Total = 245.62 m^3

1.7 Excavation inside the well

Existing GL	-4.610	m
EL. of Top of Footing	-7.492	m
EL. of Bottom of Sand Mat	-13.992	m
Excavation height	9.382	m

A = (17.222 - 8.535) * (8.535 - 1.200)

+ π/4 * (8.535 - 1.200)^2

- π/4 * 1.200 ^2 * 28 / 2 = 90.14 m^2

V = 90.14 * 9.38 = 845.71 m^3

1.8 Excavation inside of pipe pile

(1) Outside Steel Pipe Wall

Existing GL	-4.610	m
EL. of Excavation inside of pipe pile	-15.492	m
Excavation height	10.882	m

V = π/4 * (1.200 - 0.016 * 2)^2 * 10.882 * 28 = 326.47 m^3

(2)Diaphragm Steel Sheet Pipe Wall

V = π/4 * (1.200 - 0.014 * 2)^2 * 8.082 * 4

+ π/4 * (0.000 - 0.000 * 2)^2 * 1.300 * 0 = 34.88 m^3

Total = 361.35 m^3

1.9 Reinforcement of Footing

DIAMETER	WEIGHT(kg)	**BOQ Group**
D13	0	**0**
D16	797	**4,336**
D19	3,539	
D29	7,061	**24,343**
D32	17,282	
D35	0	**0**
TOTAL	28,679	**28,679**

1.10 Connection of Diaphragm Steel Sheet Pipe

Bar Diameter		Unit Weight (kg/m)	Length (m)	Number of Bar	Total Weight (kg)	Description	Number of Joint
D10～D13	D13	0.995	4.26	24	101.7	SD345	0
	D13	0.995	3.46	16	55.1	SD345	0
D16～D19	D16	1.56	2.02	96	302.5	SD345	0
							0
							0
Total					459.3	kg	

1.11 Welding of the dowel

Item	Stud Ba	Length (m)	Number of Bar (nos)	Unit Weight (kg/m)	Total Weight (kg)	Description	Number of welding of Stad Bar
Moment bar	D22	1.0	896	3.04	2,723.8	SM490A-SD	896
Shear Bar	D22	0.7	2128	3.04	4,528.4	SM490A-SD	2,128
				Total	7,252.2	Total	3,024

1.12 Cleaning inside joint pipe

・Total length

Outside Steel Pipe Wall L1 = 50.000 m * 56 nos = 2800.00 m

Diaphragm Steel Sheet Pipe Wall L2 = 48.000 m * 10 nos = 480.00 m

for one foundation = 3280.00 m

・Volume

for one foundation 3280.00 * 2.5 / 100 = 82.00 m^3

1.13 Mortar filling inside joint pipe

・Total length

Outside Steel Pipe Wall L1 = 38.300 m * 56 nos = 2144.80 m

Diaphragm Steel Sheet Pipe Wall L2 = 33.800 m * 10 nos = 338.00 m

for one foundation = 2482.80 m

・Volume

for one foundation 2482.80 * 2.5 / 100 = 62.07 m^3

1.14 Sealing inside joint pipe

・Total length

Outside Steel Pipe Wall L1 = 11.700 m * 56 nos = 655.20 m

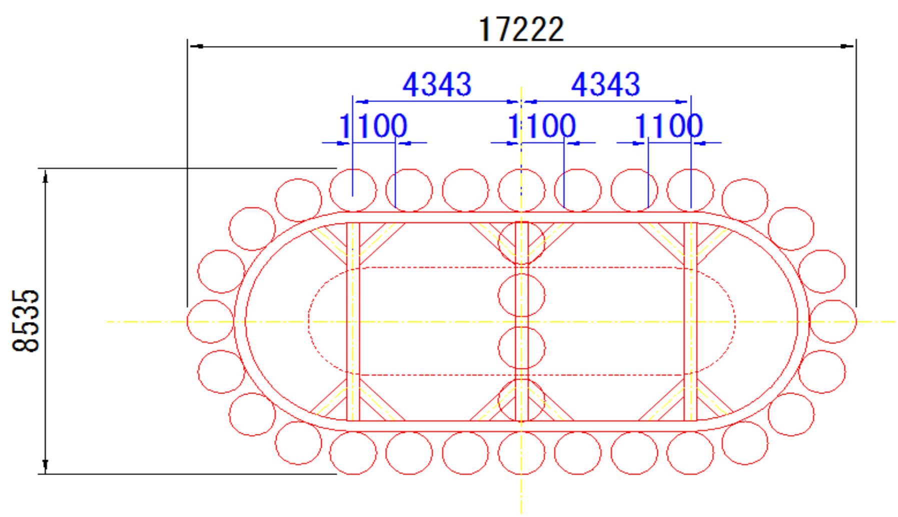
for one foundation = 655.20 m

・Volume

for one foundation 655.20 * 2.5 / 100 = 16.38 m^3

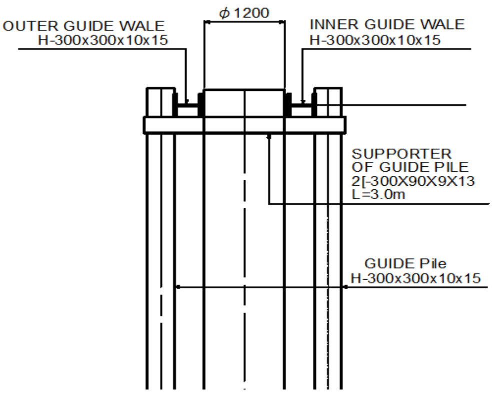
Quantity for Wales & Braces (P21 & P22)

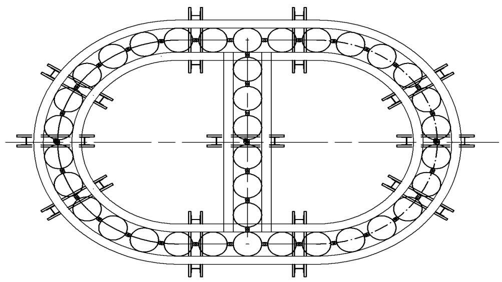
Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg/n)	Total weight (kg)	Description
Wales	H	350x350x12x19	8.69	4	135.0	1,172.7	4,691	SS400
	H	350x350x12x19	9.09	4	135.0	1,226.8	4,907	SS400
	H	300x300x10x15	8.69	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	9.17	2	93.0	852.4	1,705	SS400
						sub total	12,919	kg
Braces	H	350x350x12x19	5.44	4	135.0	733.7	2,935	SS400
	H	300x300x10x15	5.54	2	93.0	514.8	1,030	SS400
						sub total	3,965	kg
Angle Braces	H	350x350x12x19	1.50	16	135.0	202.5	3,240	SS400
	H	300x300x10x15	1.50	8	93.0	139.5	1,116	SS400
						sub total	4,356	kg
	for one foundation							
		Main Member (H 300~H350)			21,240	kg	21.00 t	
		Deputy member (Main Mamberx0.04)			850	kg	1.00 t	
		Total			22,090	kg	22.00 t	



Guide Frame for SPSP (P21~P22)

Item	Type	Dimension (mm)	Length (m)	Quantity	Unit Weight (kg/m)	Weight (kg)	Total weight (kg)	Description
Guide Wale	H	300x300x10x15	8.7	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	9.0	2	93.0	837.8	1,676	SS400
	H	300x300x10x15	8.7	2	93.0	807.9	1,616	SS400
	H	300x300x10x15	14.0	2	93.0	1305.3	2,611	SS400
	H	300x300x10x15	6.1	2	93.0	570.6	1,141	SS400
						sub total	8,660	kg
Supporter	2[	300x90x9x13	3.0	22	38.1	114.3	2,515	SS400
						sub total	2,515	kg
Guide Pile	H	300x300x10x15	36.5	22	93.0	3394.5	74,679	SS400
						sub total	74,679	kg
	for one foundation							
		Guide Wale			8,660	kg	8.660	t
		Supporter			2,515	kg	2.515	t
		Guide Pile			74,679	kg	74.679	t
		Deputy member (Main Mamberx0.04)			3,434	kg	3.434	t
		Total			89,288	kg	90	t
	for Two foundation							
			0		17,320	kg	17.320	t
			0		5,030	kg	5.030	t
			0		149,358	kg	149.358	t
		Deputy member (Main Mamberx0.04)			6,868	kg	6.868	t
		Total			178,576	kg	179	t





APPENDIX

placing, to the dimensions as shown in the Drawings, and then thoroughly rammed by a mechanical rammer. Smaller stone pieces of a minimum size of 3 cm shall then be placed between the larger stones and the upper surface brought up to the finished level as shown in the Drawings or as instructed by the Engineer. The complete surface shall then be thoroughly compacted to the satisfaction of the Engineer using a mechanical rammer or a vibrating roller.

(c) The Contractor may propose an alternative to the above process, based on the use of graded, and crushed stone with a maximum size of less than 5 cm. The Engineer's acceptance of this alternative and the maximum thickness to be laid in one layer will depend on the proposed compacting plan and its suitability to the available restricted working area.

3. Measurement and Payment

3.1 Method of Measurement

(a) Structural Excavation and Blinding Stone will not be measured for payment under any item in which the Basis of Payment states that such work is included in the pay item.

(b) The quantity of structural excavation to be paid for shall be the number of cubic meters of material measured in its original position, and shall be computed as described herein.

(c) When specific detail is not shown in the Drawings or this specification, the volume of earth to be measured for structural excavation shall consist of a prism bounded by the following planes:

- Upper plane: the plane reproduced by the projection of the perimeter of the base of the structural member and passing through the cleared ground along the perimeter above which plane excavation shall be considered as site clearing, and below which excavation shall be considered as structure and shall be measured and paid for accordingly;
- Lower plane: the horizontal plane at the base of the foundation, which shall be taken as the lower surface of the structural concrete, levelling concrete or blinding stone as shown in the Drawings or instructed by the Engineer; and
- Vertical plane: the plane that coincides with the perimeter of the base of the structural member. Any additional width of excavation necessary for the installation of blinding stone or levelling concrete or structural concrete exceeding the area of the lower plane shall not be measured for payment and the cost of this excavation shall be deemed included in the unit price for the measured quantity as described above.
- Excavation for cofferdam seal to be excluded from the measurement.
- Upper plane, lower plane and vertical plans for structural excavation shall be referred to the following tables unless otherwise instructed by the Engineer:

(d) The above method of measurement shall be used irrespective of whether the structural excavation is carried out with or without the use of a cofferdam. Measurement for structural excavation shall not include material removed to suit the Contractor's working method, or material below the footing grade and beyond the specified limits of the excavation, or to compensate for anticipated swell or as a result of effective swell during pile driving or additional material

(e) If the Engineer requires excavation after the embankment has been placed, this excavation in the embankment shall be measured for payment as structural excavation, unless otherwise provided in these Specifications.

(f) The volume of blinding stone measured for payment shall be the number of cubic meters of stone completed in accordance with these Specifications and calculated using the nominal dimensions as shown in the Drawings or as instructed by the Engineer.

(g) Regardless of its quantity or nature, removal of the remaining soil or materials after completion of the Works measured by this section, shall not be measured for separate payment and the cost of this removal shall be deemed included in the unit price for the measured quantity as described hereto.

(h) Structural excavation and blinding stone for pipe and box culverts shall neither be measured nor paid under this Specification Section and shall be deemed included in the rates and prices for Specification Section 04310 “Concrete Pipe Culverts” and/or Section 04320 “Concrete Box Culverts”.

3.2 Basis of Payment

The accepted quantities, measured as provided above, shall be paid at the contract price per unit of measurement for the pay items of the Bill of Quantities listed below.

Payment shall be for full compensation for the work prescribed in this Section including all preparation, assembly, installation, excavation, cofferdam installation, removal, ripping, blasting, haulage, placing and compaction for backfilling and reuse or satisfactory disposal (waste) of site excavation, for shaping and completion of all surfaces, works for planning and updating, and for furnishing all labour, materials, tools, equipment and any incidentals necessary to complete the work as shown in the Drawings and as required in accordance with these Specifications and/or as directed by the Engineer.

Pay Item	Description	Unit
03200-01	Structural Excavation for Suitable Soil	m3
03200-02	Structural Excavation with Cofferdam for Suitable Soil	m3
03200-03	Structural Excavation for Unsuitable Soil	m3
03200-04	Structural Excavation with Cofferdam for Unsuitable Soil	m3
03200-05	Backfill with Borrow Material	m3
03200-06	Blinding Stone	m3

Package 1

Item	A1	P1	P2	P3	P4	P5	AO1	PO1	PO2	PO3		
Pile cap size: Longitudinal	12.00	12.00	12.00	14.00	12.00	12.00	9.00	10.40	8.00	8.00	−	−
Pile cap size: Transversal	21.00	19.00	19.00	19.00	16.00	28.00	9.00	9.00	8.00	8.00	−	−
Lean concrete : Longitudinal	12.20	12.20	12.20	14.20	12.20	12.20	9.20	10.60	8.20	8.20	−	−
Lean concrete : Transversal	21.20	19.20	19.20	19.20	16.20	28.20	9.20	9.20	8.20	8.20	−	−
Ground EL : for construction	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	4.30	−	−
Ground EL : Existing	3.22	3.25	3.03	3.16	3.26	3.15	3.28	2.94	2.96	3.08	−	−
Excavated ground EL	1.59	1.52	1.51	1.56	1.57	1.31	1.55	1.53	1.49	1.51	−	−
Excavation depth	2.71	2.78	2.79	2.74	2.73	2.99	2.75	2.77	2.81	2.79	−	−
Excavation Volume for payment	691.4	641.6	645.0	738.2	531.3	1,017.0	227.6	264.5	184.3	183.0		
											−	−

Package 2

Item							P23	P24	P25	A2		
Pile cap size: Longitudinal							12.00	12.00	9.00	10.50	−	−
Pile cap size: Transversal							16.00	19.00	19.00	20.70	−	−
Lean concrete : Longitudinal							12.20	12.20	9.20	10.70	−	−
Lean concrete : Transversal							16.20	19.20	19.20	20.90	−	−
Ground EL : for construction							−0.04	4.30	4.30	4.30	−	−
Ground EL : Existing							−0.04	4.12	4.02	4.11	−	−
Excavated ground EL							−4.96	1.56	1.57	1.51	−	−
Excavation depth							4.92	2.74	2.73	2.79	−	−
Excavation Volume for payment							957.9	633.9	474.0	614.5		
											−	−