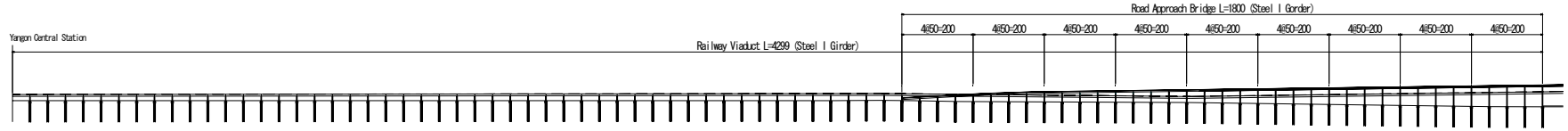
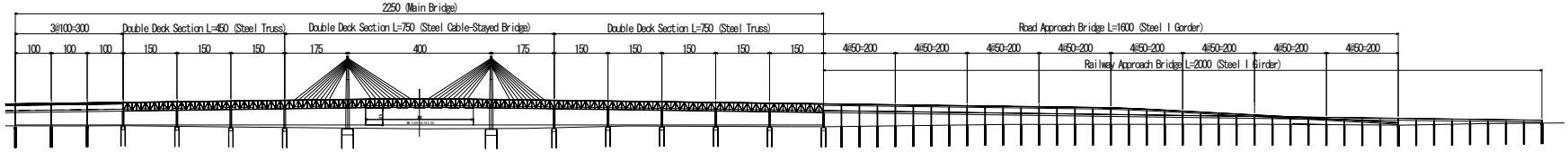
Appendix 8

Possible Superstructure Type for Study of Three Alternative Locations for Bago River Bridge

ALTERNATIVE 1: MONKEY POINT ROUTE

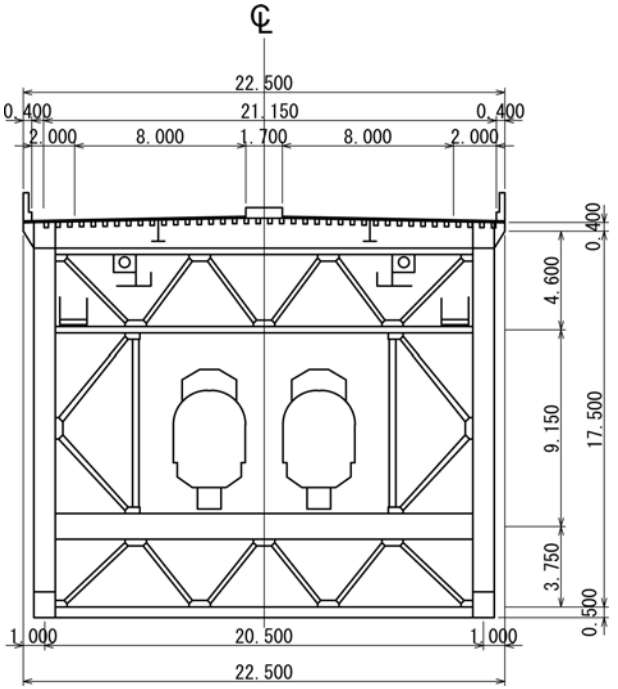
Double Deck Bridge (Road cum Railways Bridge)
Steel Plate Girder + Box Girder with Steel Plate Deck + Steel Truss + Steel Cable Stayed Bridge



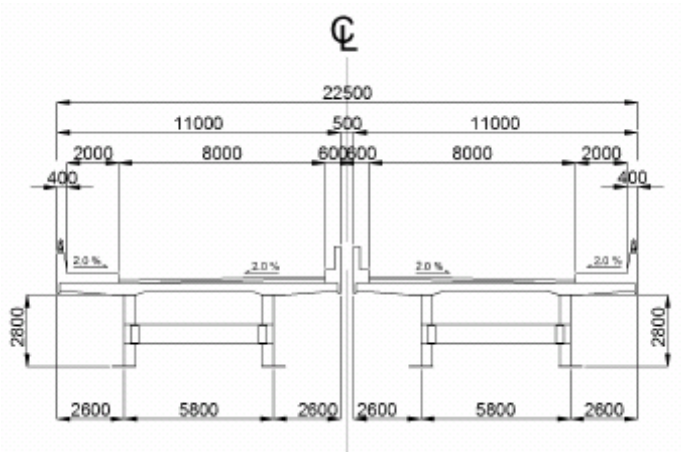


Cross Sections

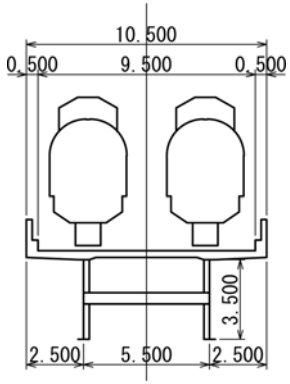
Double Decked Steel Truss
(incl. Cable Stayed Bridge Section)



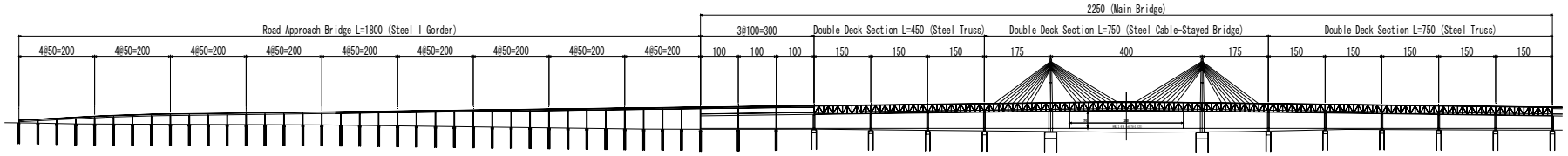
Steel Plate Girder
For Road

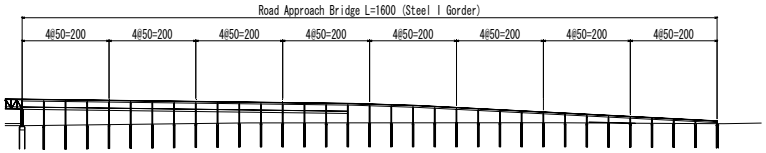


Steel Plate Girder
For Railways



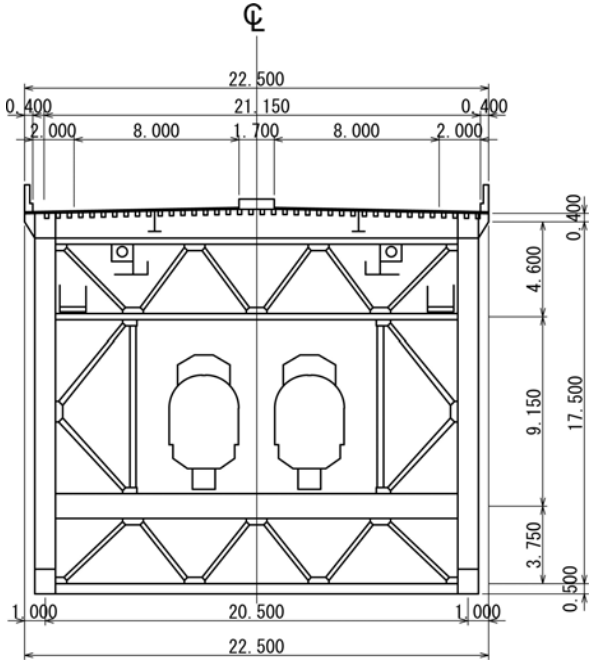
Double Deck Bridge (Road cum Railways Bridge): No Structure for Railways except Main Bridge Section
Steel Plate Girder + Box Girder with Steel Plate Deck + Steel Truss + Steel Cable Stayed Bridge



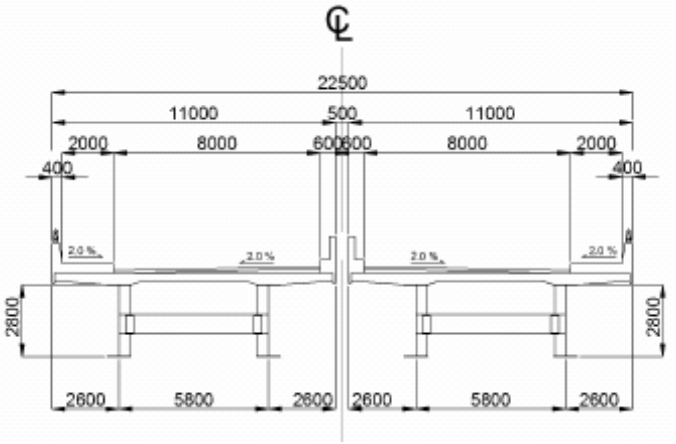


Cross Sections

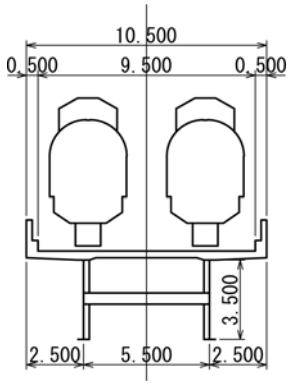
Double Decked Steel Truss
(incl. Cable Stayed Bridge Section)



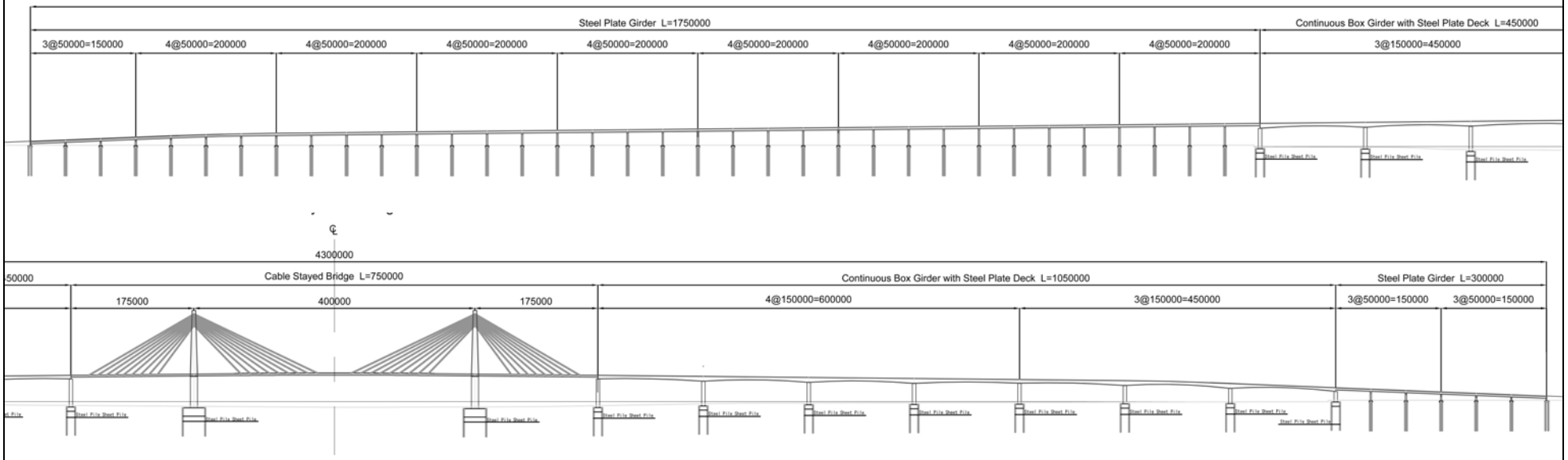
Steel Plate Girder
For Road



Steel Plate Girder
For Railways

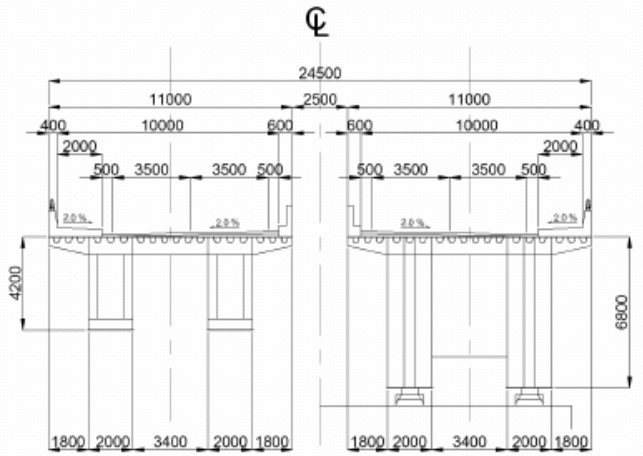


Single Deck Bridge
Steel Plate Girder + Continuous Box Girder with Steel Plate Deck + Cable Stayed Bridge

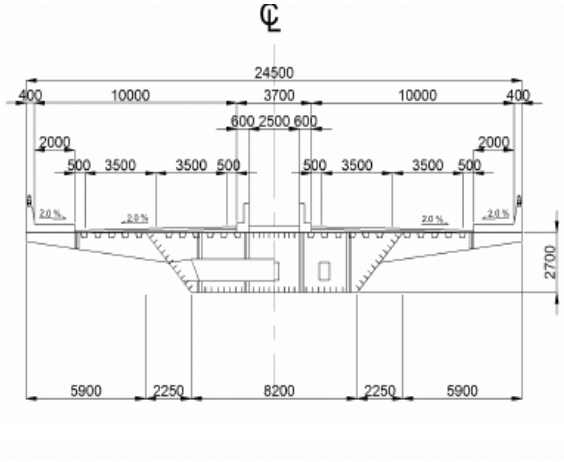


Cross Sections

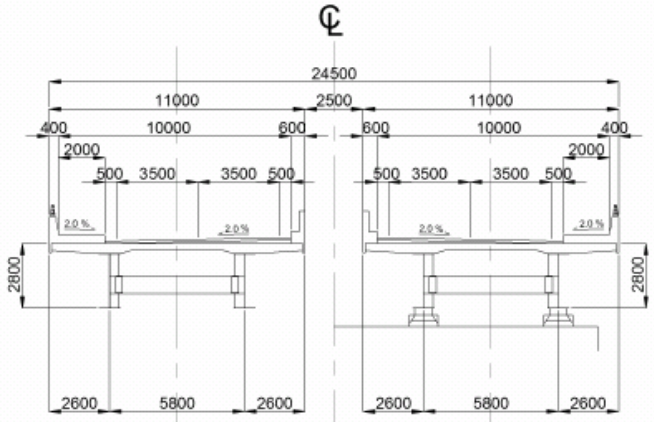
Continuous Box Girder with Steel Plate Deck



Cable Stayed Bridge

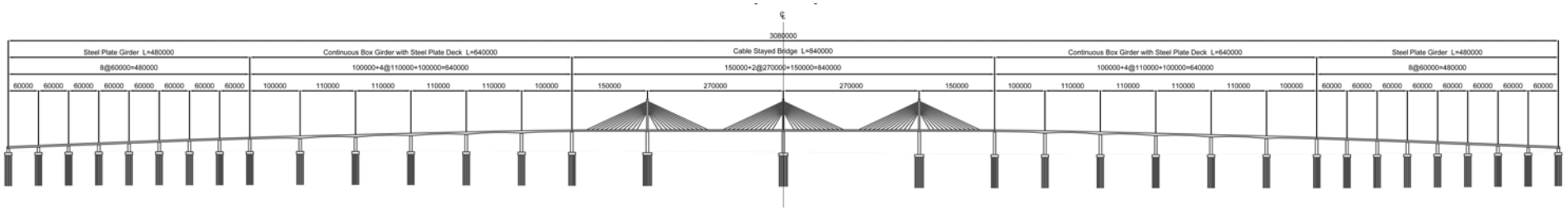


Steel Plate Girder



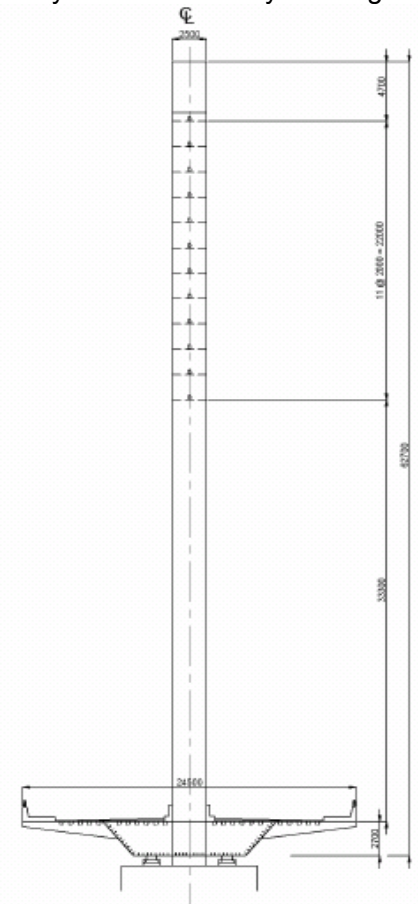
ALTERNATIVE 2: BAGO POINT ROUTE

Extradozed Bridge

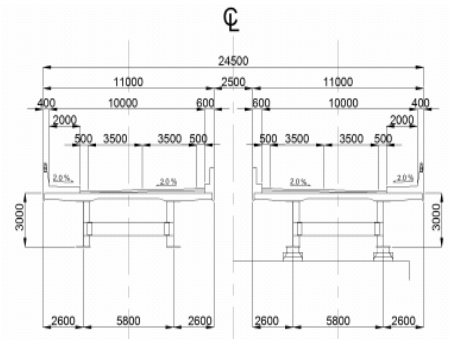


Cross Sections

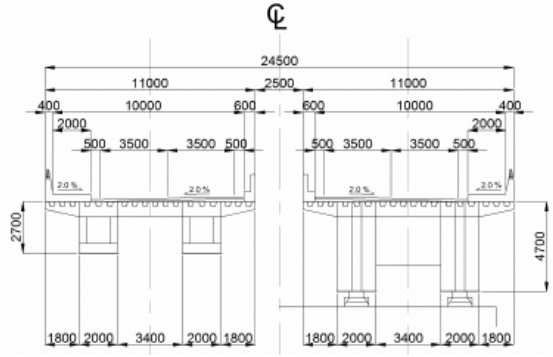
Pylon of Cable Stayed Bridge



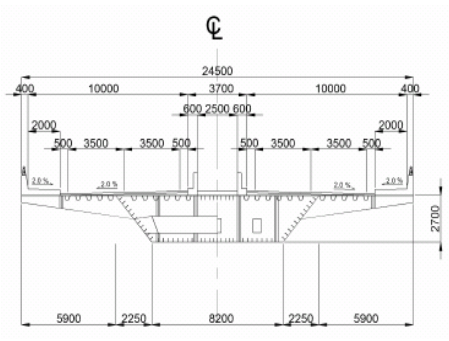
Steel Plate Girder



Continuous Box Girder with Steel Plate Deck

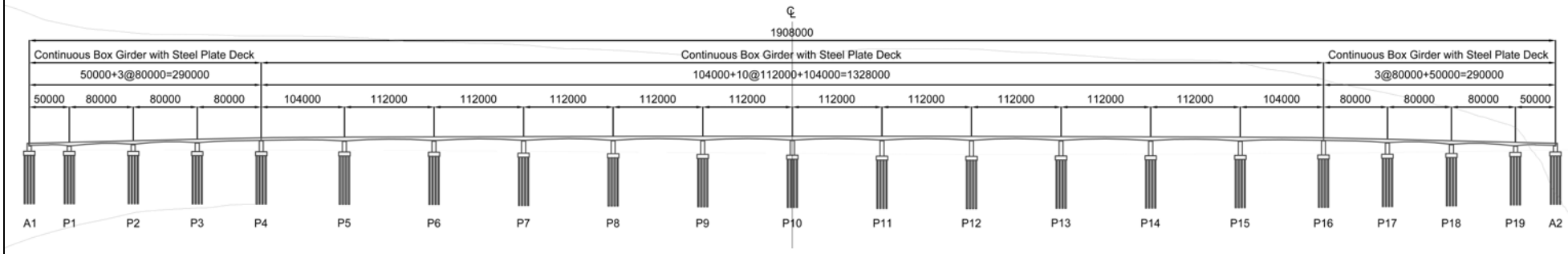


Cable Stayed Bridge

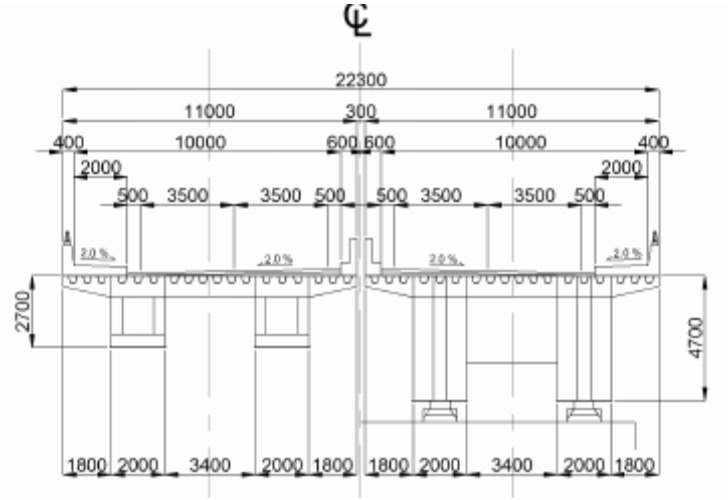


ALTERNATIVE 3: PROXIMITY OF THE EXISTING THANLYIN BRIDGE ROUTE

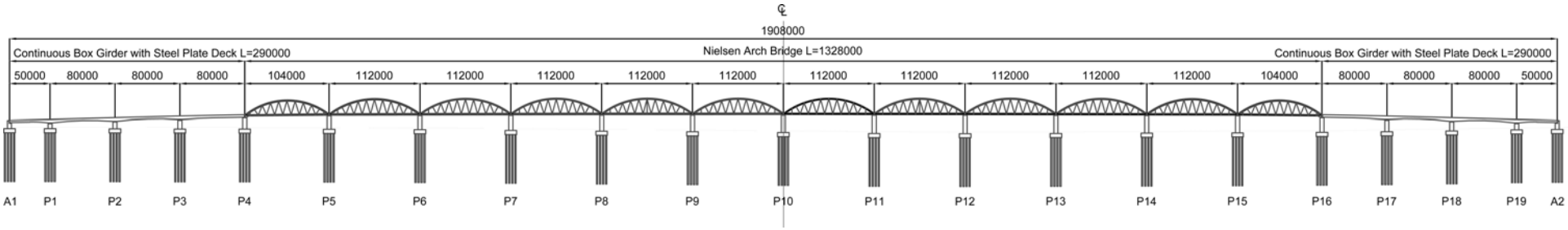
Continuous Box Girder with Steel Plate Deck Bridge



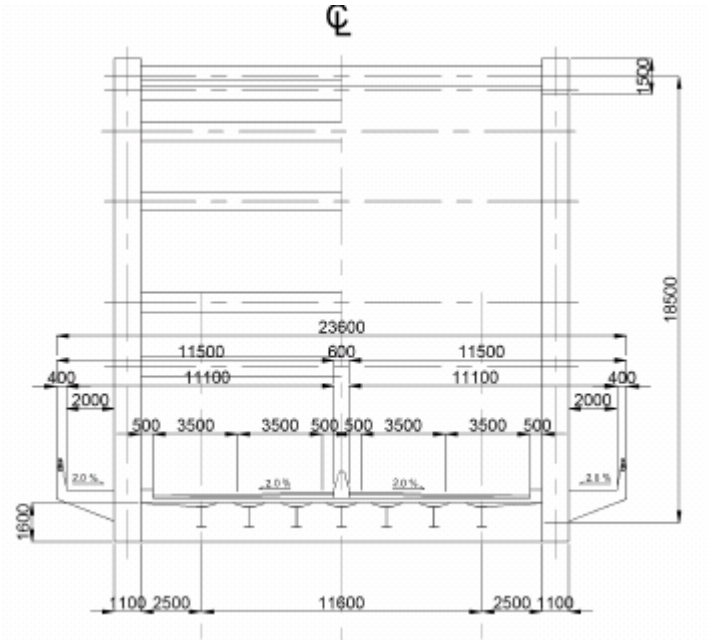
Cross Section



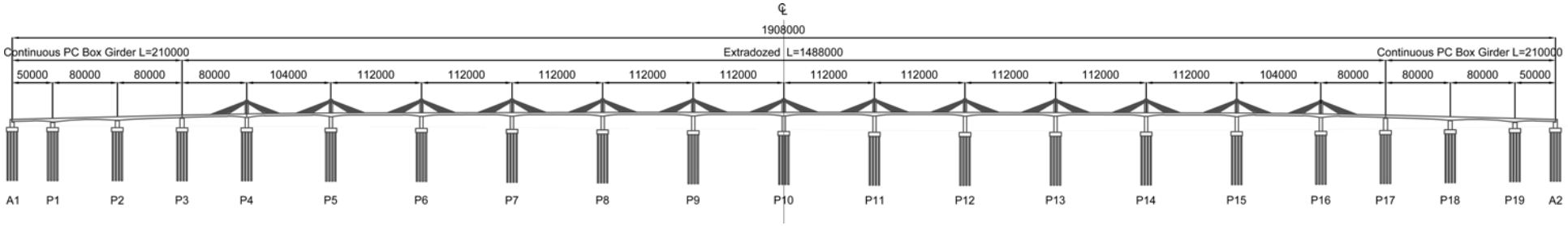
Nielsen Arch Bridge



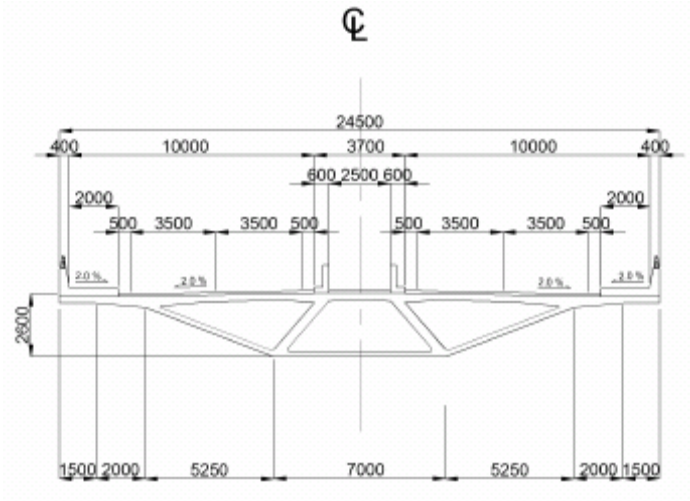
Cross Section

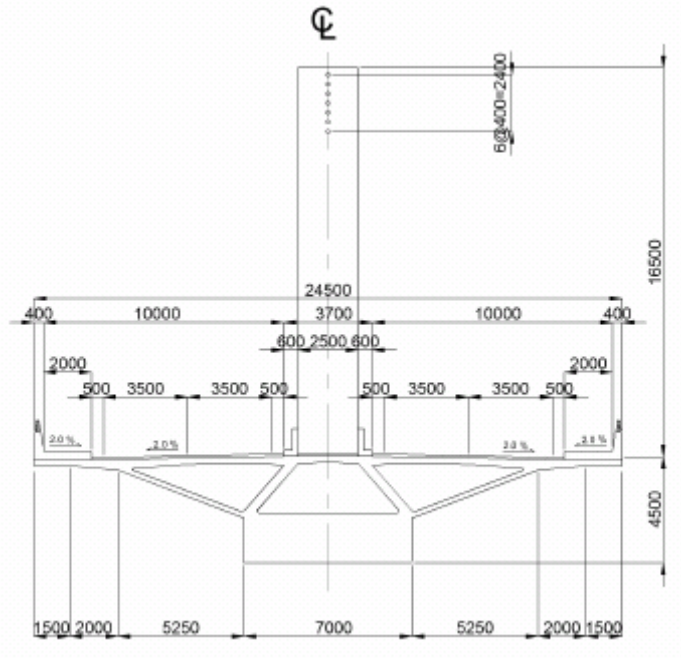


Extradozed Bridge

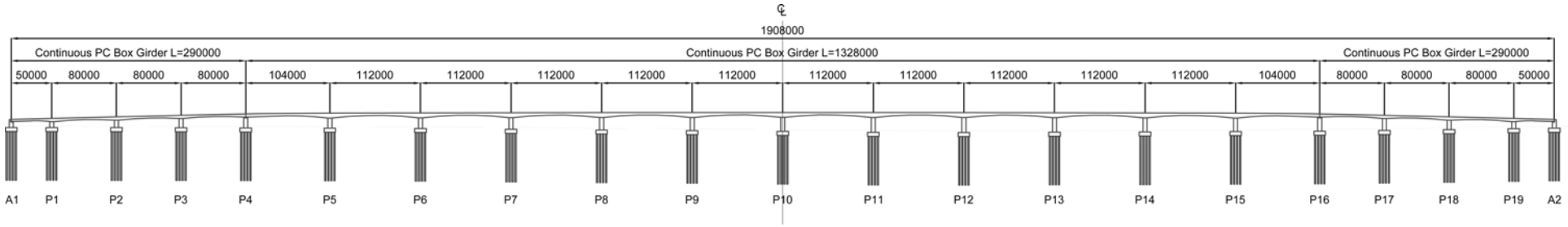


Cross Sections

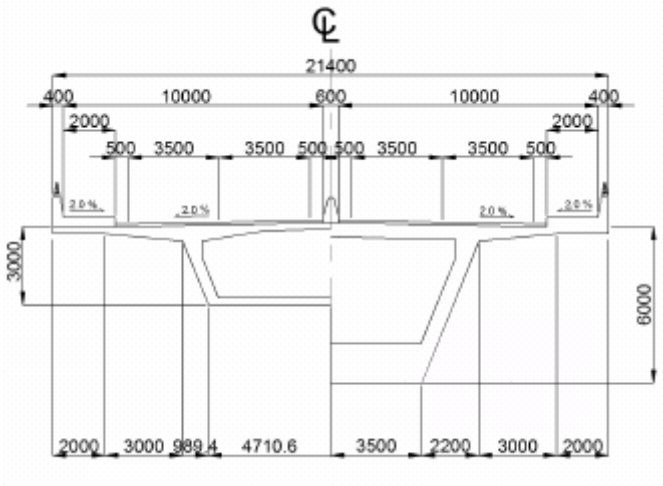




PC-Box Girder Bridge



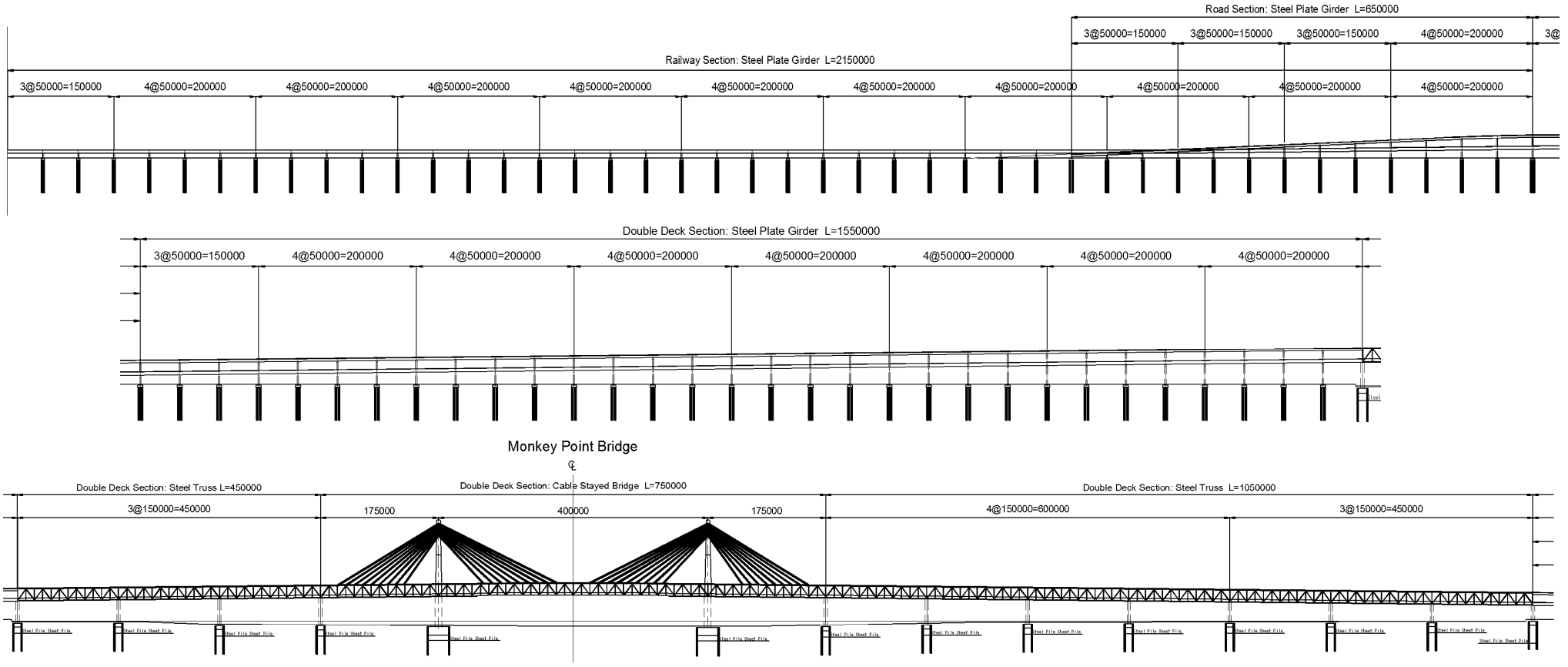
Cross Section

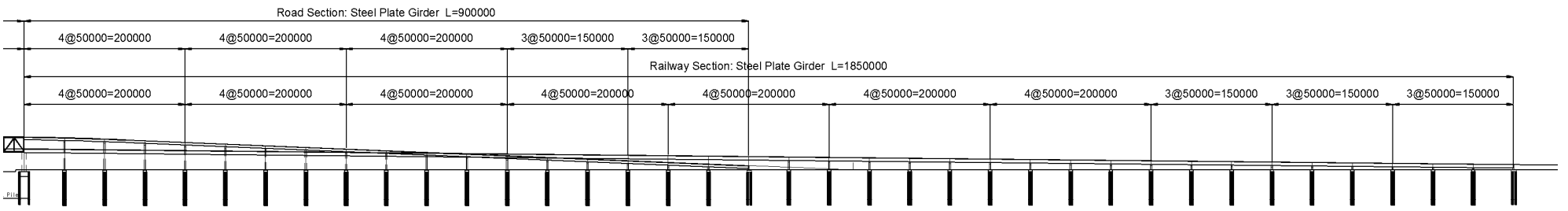


Appendix 9

Preliminary Cost Estimate for Study of Three Alternative Locations for Bago River Bridge

Alternative 1: Monkey Point Route - Double Deck Bridge (1)

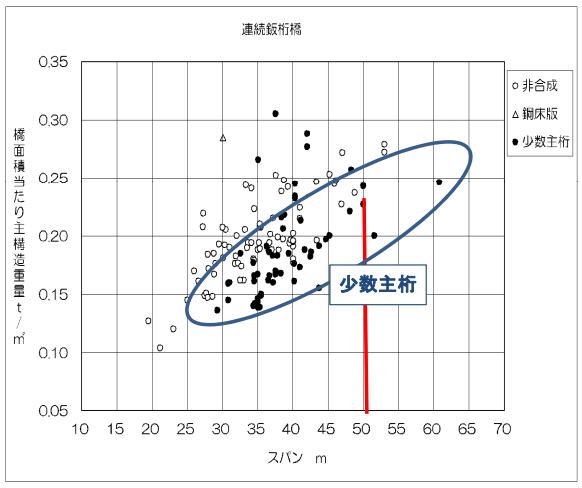




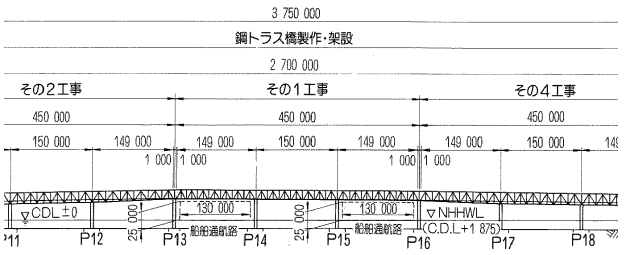
Cost is in JPY

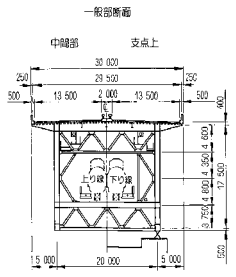
Bridge Type	Steel Truss		Steel Plate Girder Roadway Section	Steel Plate Girder Railway Section	Cable Stayed Bridge			Total	Remarks
Span	-	150 m	50 m	50 m	175 m	400 m			
No.	-	10	63	111	2	1			
Length	-	1500 m	3150 m	5550 m	350 m	400 m	Cable	7,800 m	
Width	-	16 m	16 m	10.5 m	16 m	16 m		-	(0.5m+3.5m+3.5m+0.5m)+ (0.5m+3.5m+3.5m+0.5m)
Unit Steel Weight	-	1,919 t/Span	0.23 t/m^2	0.23 t/m^2	2,239 t/Span	5,118 t/Span	0.03 t/m^2	-	※1
Steel Weight	-	19,194 t	11,592 t	13,403 t	4,479 t	5,118 t	613 t	54,399 t	
Unit Cost	-	400 $x10^3$/t	320 $x10^3$/t	320 $x10^3$/t	400 $x10^3$/t	400 $x10^3$/t	800 $x10^3$/t	-	※2
Superstructure Cost	-	7,677,600 $x10^3$	3,709,440 $x10^3$	4,289,040 $x10^3$	1,791,440 $x10^3$	2,047,360 $x10^3$	490,060 $x10^3$	20,004,940 $x10^3$	
Substructure Cost	-	-	-	-	-	-	-	20,004,940 $x10^3$	100% of Superstructure Cost
Bridge Construction Cost	-	-	-	-	-	-	-	40,009,879 $x10^3$	

※1 H22関東地整原単価より

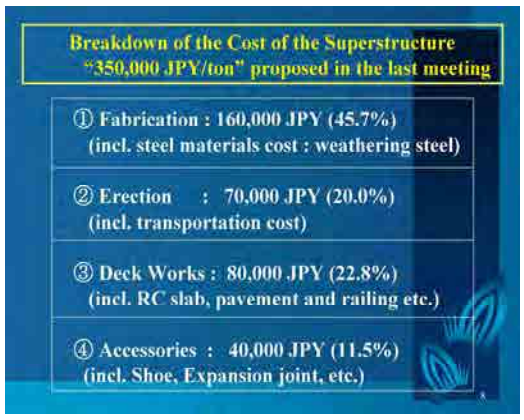


ダブルデッキトラスにつては、関西国際空港連絡橋実績より





※2 ミャンマー国内におけるヒンタダ橋建設積算単価より

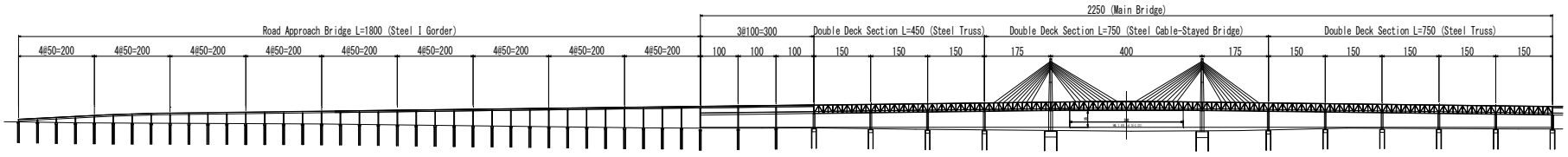


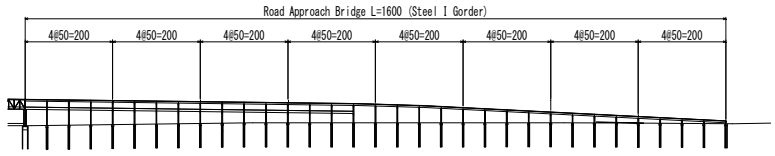
Total	ヒンタダ橋 350,000 JPY		
Breakdown			
①Fabrication	160,000	JPY	46%
②Erection	70,000	JPY	20%
③Deck Works	80,000	JPY	23%
④Accessories	40,000	JPY	11%

Total	Moonkey Point Bridge 400,000 JPY		
Breakdown			
①Fabrication	200,000	JPY	50%
②Erection	120,000	JPY	30%
③Deck Works	35,000	JPY	9%
④Accessories	45,000	JPY	11%

Total	Monkey Point Bridge (Steel Plate) 320,000 JPY		
Breakdown			
①Fabrication	120,000	JPY	38%
②Erection	75,000	JPY	23%
③Deck Works	80,000	JPY	25%
④Accessories	45,000	JPY	14%

Alternative 1: Monkey Point Route – Double Deck Bridge (2)

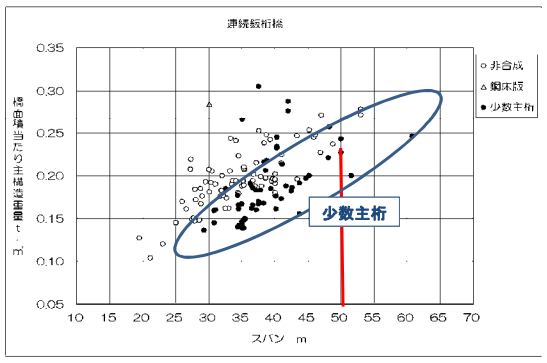




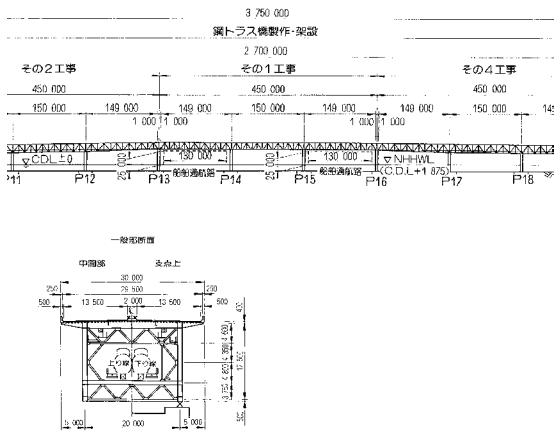
Cost is in JPY

Bridge Type	Steel Truss		Steel Plate Girder Roadway Section	Steel Plate Girder Railway Section	Cable Stayed Bridge			Total	Remarks
Span	–	150 m	50 m	– m	175 m	400 m	Cable		
No.	–	10	63		2	1			
Length	–	1500 m	3150 m	m	350 m	400 m		2,250 m	
Width	–	16 m	16 m	m	16 m	16 m		–	(0.5m+3.5m+3.5m+0.5m)+ (0.5m+3.5m+3.5m+0.5m)
Unit Steel Weight	–	1,919 t/Span	0.23 t/m^2	t/m^2	2,239 t/Span	5,118 t/Span	0.03 t/m^2	–	※1
Steel Weight	–	19,194 t	11,592 t	t	4,479 t	5,118 t	613 t	40,996 t	
Unit Cost	–	400 $x10^3$/t	320 $x10^3$/t	$x10^3$/t	400 $x10^3$/t	400 $x10^3$/t	800 $x10^3$/t	–	※2
Superstructure Cost	–	7,677,600 $x10^3$	3,709,440 $x10^3$	$x10^3$	1,791,440 $x10^3$	2,047,360 $x10^3$	490,060 $x10^3$	15,715,900 $x10^3$	
Substructure Cost	–	–	–	–	–	–	–	15,715,900 $x10^3$	100% of Superstructure Cost
Bridge Construction Cost	–	–	–	–	–	–	–	31,431,799 $x10^3$	

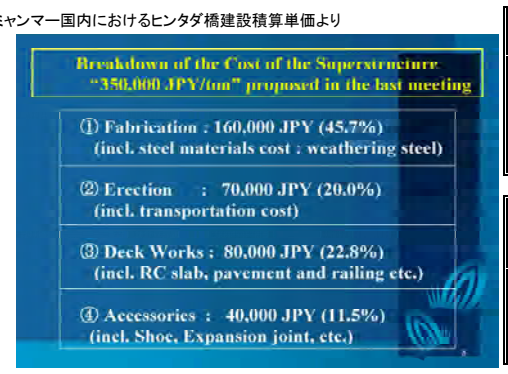
※1 H22関東地整原単価より



ダブルデッキトラスにつては、関西国際空港連絡橋実績より



※2 ミャンマー国内におけるヒンタダ橋建設積算単価より

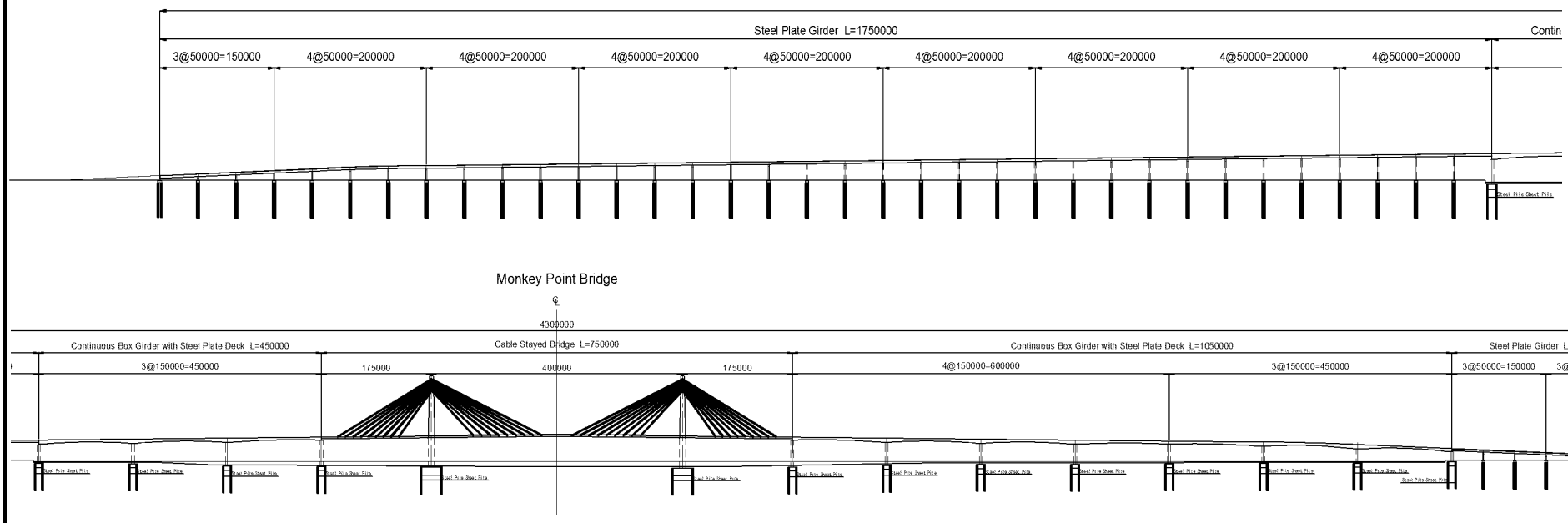


Total	ヒンタダ橋 350,000 JPY	
Breakdown		
①Fabrication	160,000 JPY	46%
②Erection	70,000 JPY	20%
③Deck Works	80,000 JPY	23%
④Accessories	40,000 JPY	11%

Total	Moonkey Point Bridge 400,000 JPY	
Breakdown		
①Fabrication	200,000 JPY	50%
②Erection	120,000 JPY	30%
③Deck Works	35,000 JPY	9%
④Accessories	45,000 JPY	11%

Total	Monkey Point Bridge (Steel Plate) 320,000 JPY	
Breakdown		
①Fabrication	120,000 JPY	38%
②Erection	75,000 JPY	23%
③Deck Works	80,000 JPY	25%
④Accessories	45,000 JPY	14%

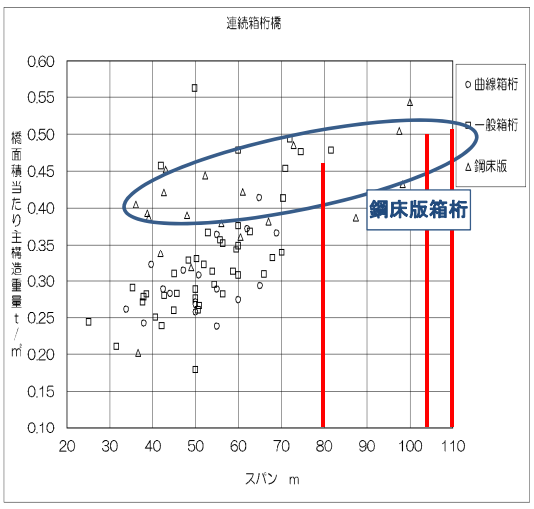
Alternative 1: Monkey Point Route - Single Deck Bridge

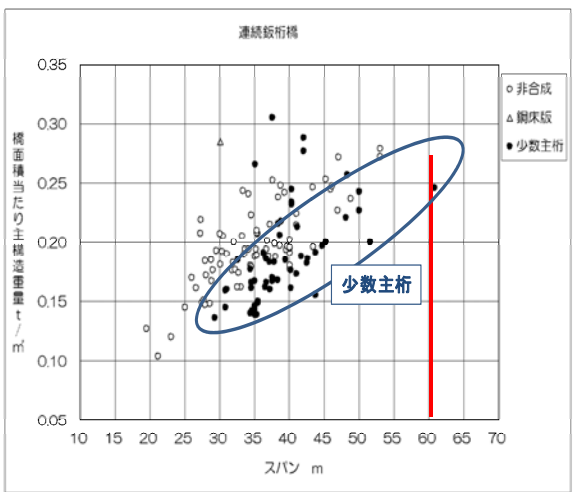


Cost is in JPY

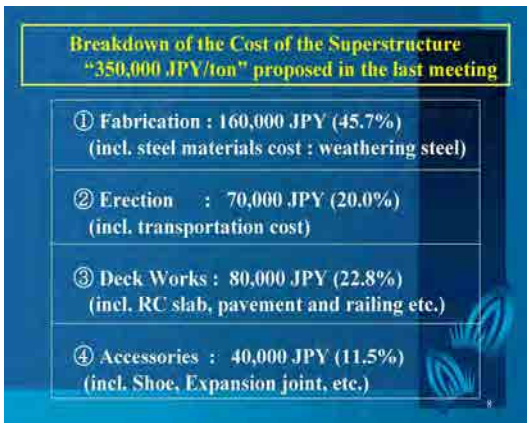
Bridge Type	Continuous Box Girder with Steel Plate Deck		Steel Plate Girder	Cable Stayed Bridge			Total	Remarks
Span	-	150 m	50 m	175 m	400 m	Cable	Total	
No.	-	10	41	2	1			
Length	-	1500 m	2050 m	350 m	400 m		4,300 m	
Width	-	16 m	16 m	16 m	16 m		-	(0.5m+3.5m+3.5m+0.5m)+ (0.5m+3.5m+3.5m+0.5m)
Unit Steel Weight	-	0.59 t/m^2	0.23 t/m^2	0.53 t/m^2	0.53 t/m^2	0.03 t/m^2	-	※1
Steel Weight	-	14,160 t	7,544 t	2,948 t	3,369 t	403 t	28,424 t	
Unit Cost	-	400 x10^3/t	320 x10^3/t	400 x10^3/t	400 x10^3/t	800 x10^3/t	-	※2
Superstructure Cost	-	5,664,000 x10^3	2,414,080 x10^3	1,179,136 x10^3	1,347,584 x10^3	322,560 x10^3	10,927,360 x10^3	
Substructure Cost	-	-	-	-	-	-	10,927,360 x10^3	100% of Superstructure Cost
Bridge Construction Cost	-	-	-	-	-	-	21,854,720 x10^3	

※1 H22関東地整原単価より





※2 ミャンマー国内におけるヒンタダ橋建設積算単価より

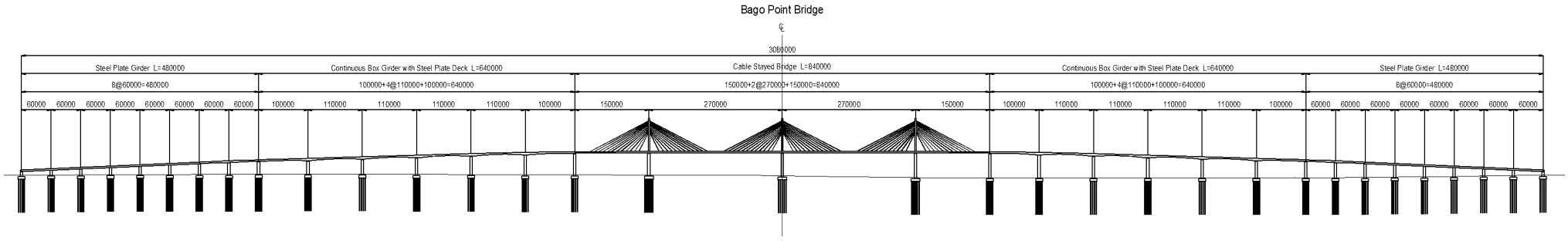


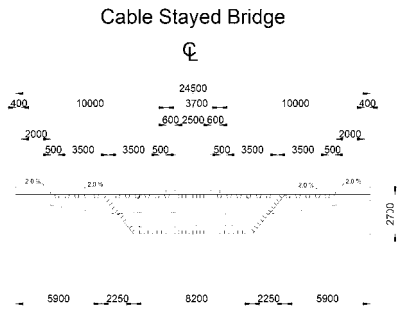
Total	ヒンタダ橋 350,000 JPY		
Breakdown			
①Fabrication	160,000	JPY	46%
②Erection	70,000	JPY	20%
③Deck Works	80,000	JPY	23%
④Accessories	40,000	JPY	11%

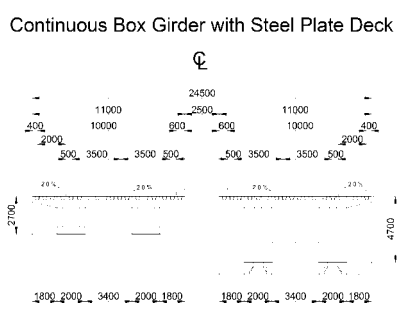
Total	Moonkey Point Bridge 400,000 JPY		
Breakdown			
①Fabrication	200,000	JPY	50%
②Erection	120,000	JPY	30%
③Deck Works	35,000	JPY	9%
④Accessories	45,000	JPY	11%

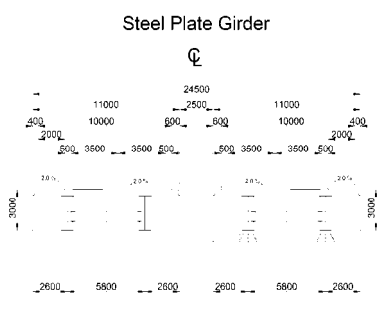
Total	Monkey Point Bridge (Steel Plate) 320,000 JPY		
Breakdown			
①Fabrication	120,000	JPY	38%
②Erection	75,000	JPY	23%
③Deck Works	80,000	JPY	25%
④Accessories	45,000	JPY	14%

Alternative 2: Bago Point Route





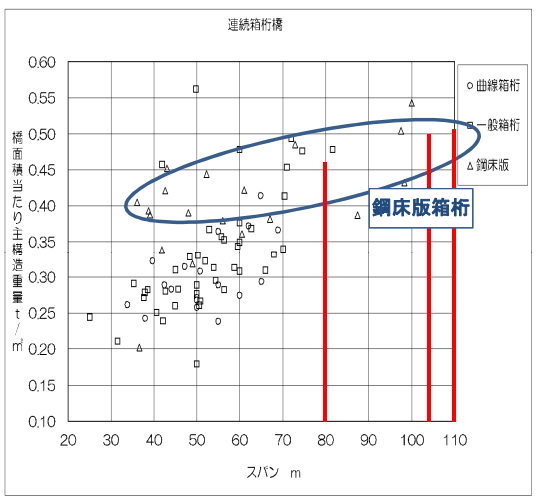


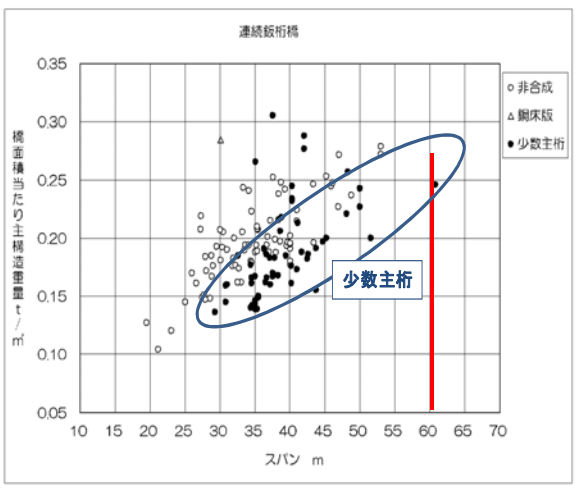


Cost is in JPY

Bridge Type	Continuous Box Girder with Steel Plate Deck		Steel Plate Girder	Cable Stayed Bridge			Total	Remarks
Span	100 m	110 m	60 m	150 m	270 m	Cable	Total	
No.	4	8	16	2	2			
Length	400 m	880 m	960 m	300 m	540 m		3,080 m	
Width	16 m	16 m	16 m	16 m	16 m		-	(0.5m+3.5m+3.5m+0.5m)+ (0.5m+3.5m+3.5m+0.5m)
Unit Steel Weight	0.49 t/m^2	0.51 t/m^2	0.27 t/m^2	0.53 t/m^2	0.53 t/m^2	0.03 t/m^2	-	※1
Steel Weight	3136 t	7,181 t	4,147 t	2,527 t	4,548 t	452 t	17,392 t	
Unit Cost	420 $x10^3/t$	420 $x10^3/t$	320 $x10^3/t$	420 $x10^3/t$	420 $x10^3/t$	800 $x10^3/t$	-	※2
Superstructure Cost	1,317,120 $x10^3$	3,015,936 $x10^3$	1,327,104 $x10^3$	1,061,222 $x10^3$	1,910,200 $x10^3$	361,267 $x10^3$	8,992,850 $x10^3$	
Substructure Cost	-	-	-	-	-	-	8,992,850 $x10^3$	100% of Superstructure Cost
Bridge Construction Cost	-	-	-	-	-	-	17,985,700 $x10^3$	

※1 H22関東地整原単価より





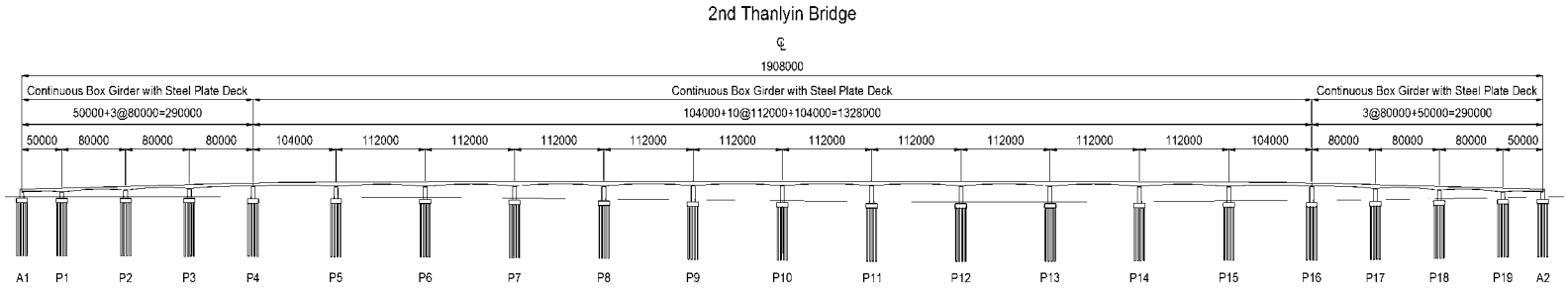
※2 ミャンマー国内におけるヒンタダ橋建設積算単価より

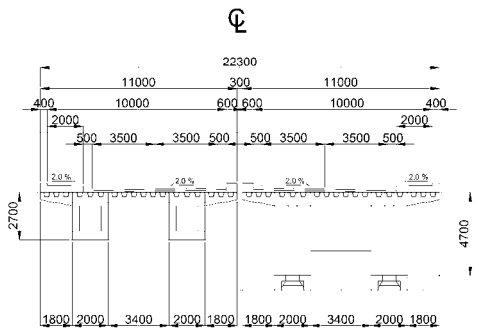
Total	ヒンタダ橋 350,000 JPY	
Breakdown		
①Fabrication	160,000 JPY	46%
②Erection	70,000 JPY	20%
③Deck Works	80,000 JPY	23%
④Accessories	40,000 JPY	11%

Total	Bago Point Bridge 420,000 JPY	
Breakdown		
①Fabrication	220,000 JPY	52%
②Erection	120,000 JPY	29%
③Deck Works	35,000 JPY	8%
④Accessories	45,000 JPY	11%

Total	Bago Point Bridge (Steel Plate) 320,000 JPY	
Breakdown		
①Fabrication	120,000 JPY	38%
②Erection	75,000 JPY	23%
③Deck Works	80,000 JPY	25%
④Accessories	45,000 JPY	14%

Alternative 3: Proximity of the existing Thanlyin Bridge Route

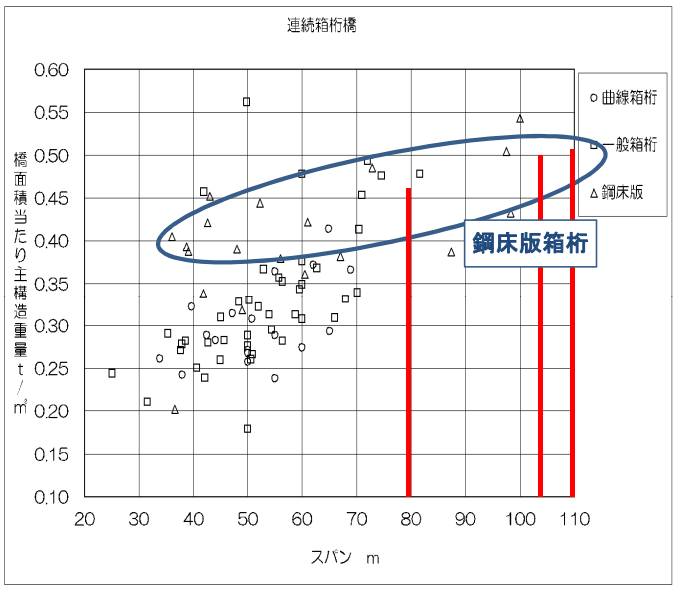




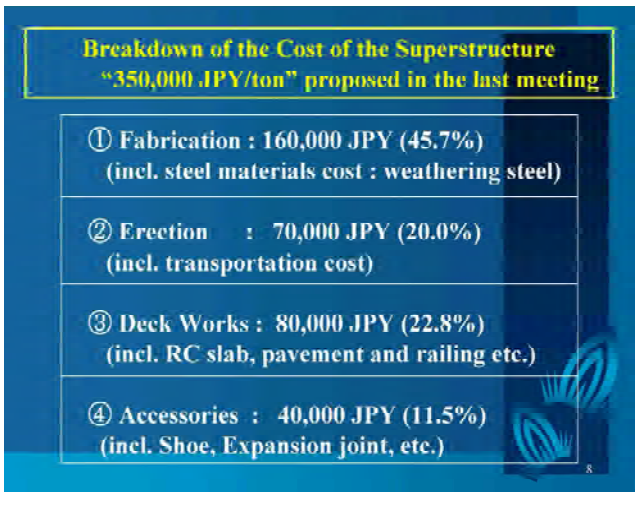
Cost is in JPY

Bridge Type	Continuous Box Girder with Steel Plate Deck				Total	Remarks
Span	50 m	80 m	104 m	112 m		
No.	2	6	2	10		
Length	100 m	480 m	208 m	1,120 m	1,908 m	
Width	16 m	16 m	16 m	16 m	-	(0.5m+3.5m+3.5m+0.5m)+ (0.5m+3.5m+3.5m+0.5m)
Unit Steel Weight	0.42 t/m^2	0.47 t/m^2	0.50 t/m^2	0.52 t/m^2	-	※1
Steel Weight	672 t	3,610 t	1,664 t	9,318 t	15,264 t	
Unit Cost	370 x10^3/t	370 x10^3/t	370 x10^3/t	370 x10^3/t	-	※2
Superstructure Cost	248,640 x10^3	1,335,552 x10^3	615,680 x10^3	3,447,808 x10^3	5,647,680 x10^3	
Substructure Cost	-	-	-	-	4,518,144 x10^3	80% of Superstructure Cost
Bridge Construction Cost	-	-	-	-	10,165,824 x10^3	

※1 H22関東地整原単価より



※2 ミャンマー国内におけるヒンタダ橋建設積算単価より



Total	ヒンタダ橋 350,000 JPY	
Breakdown		
①Fabrication	160,000	JPY
②Erection	70,000	JPY
③Deck Works	80,000	JPY
④Accessories	40,000	JPY

46%	
20%	
23%	
11%	

Total	2nd Thanlyin Bridge 370,000 JPY	
Breakdown		
①Fabrication	220,000	JPY
②Erection	70,000	JPY
③Deck Works	35,000	JPY
④Accessories	45,000	JPY

59%
19%
9%
12%

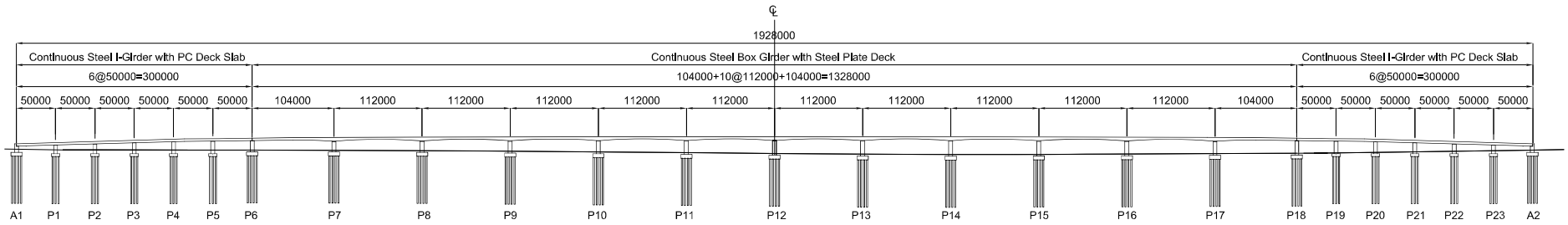
Appendix 10

Six (6) Alternative Bridge Types for Superstructure Type Selection

Yangon

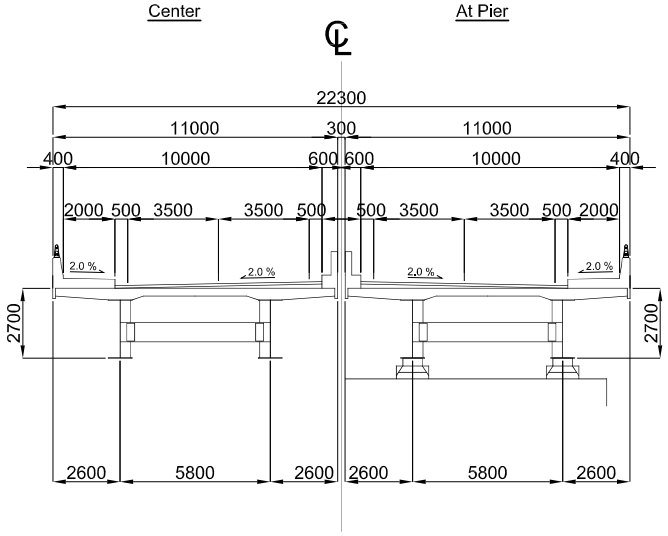
GENERAL VIEW

Thanlyin



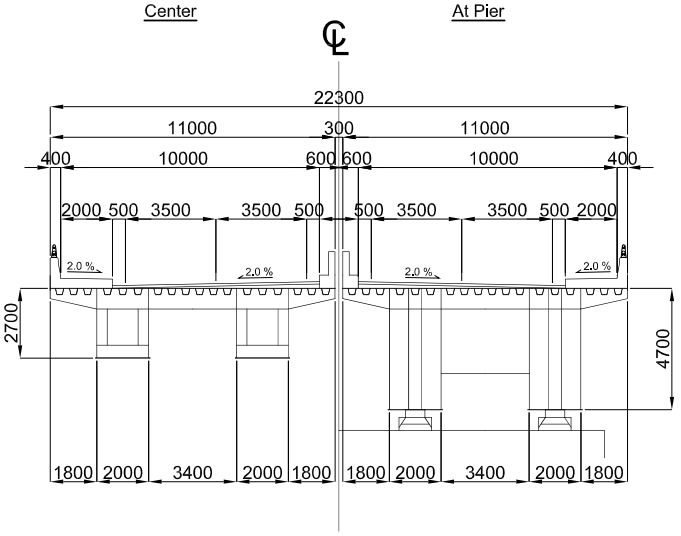
CROSS SECTION

Center At Pier



Continuous Steel I-Girder with PC Deck Slab

Center At Pier



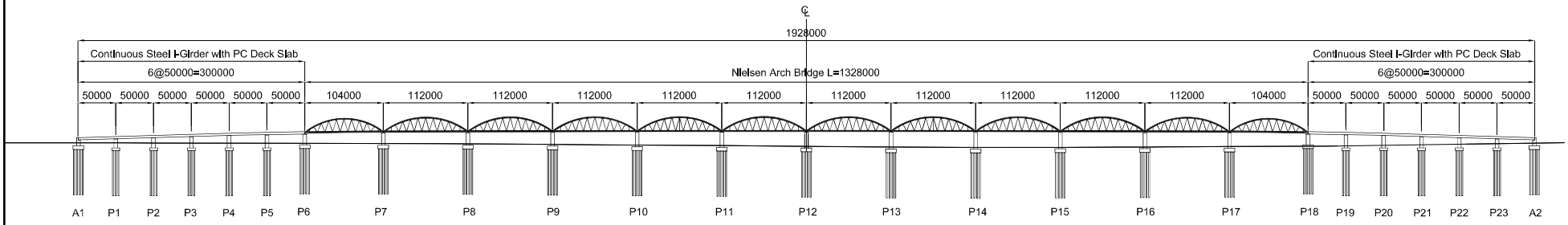
Continuous Steel Box Girder with Steel Plate Deck

JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: Alternative -A: Continuous Steel Box Girder with Steel Plate Deck SCALE DRAWING NO. SHEET NO.

Yangon

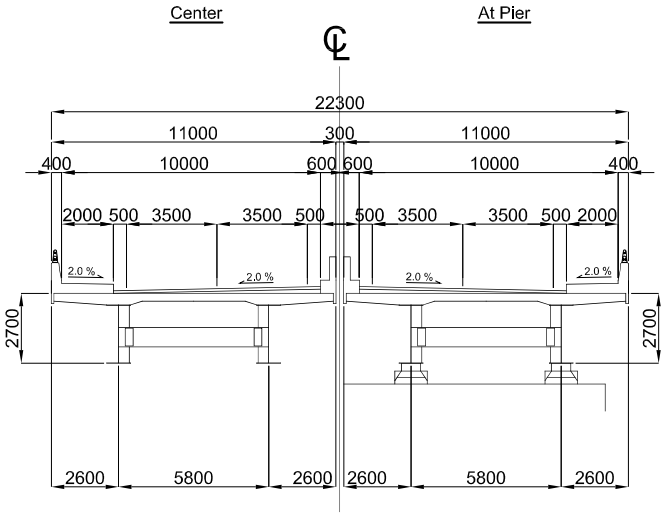
GENERAL VIEW

Thanlyin



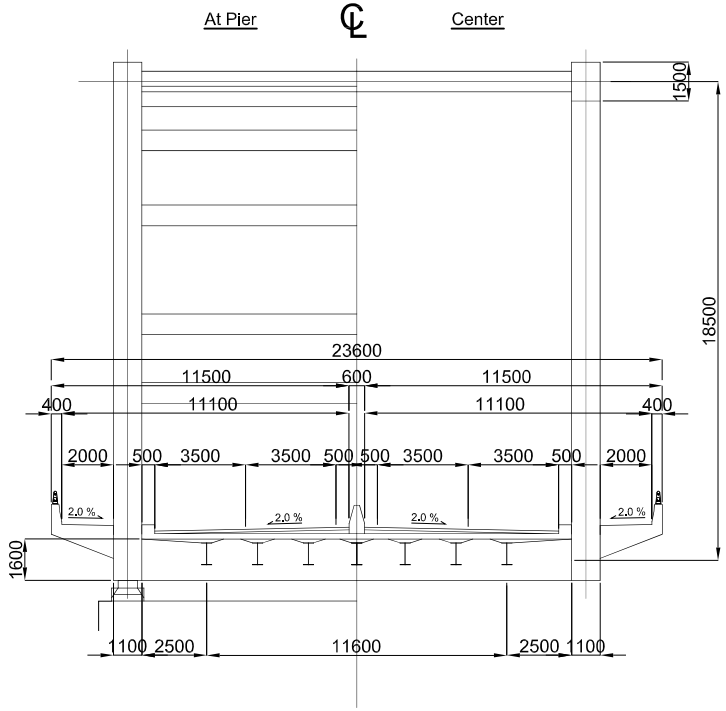
CROSS SECTION

Center At Pier



Continuous Steel I-Girder with PC Deck Slab

At Pier Center



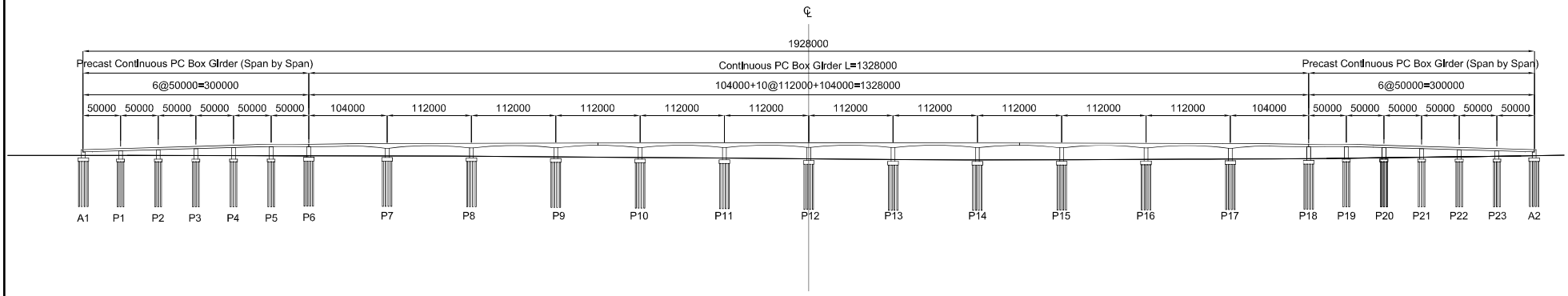
Continuous Steel I-Girder with PC Deck Slab

JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: Alternative -B: Nielsen Arch SCALE DRAWING NO. SHEET NO.

Yangon

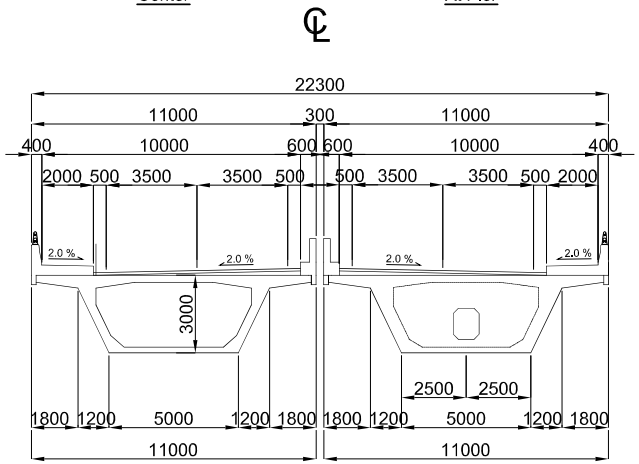
GENERAL VIEW

Thanlyin



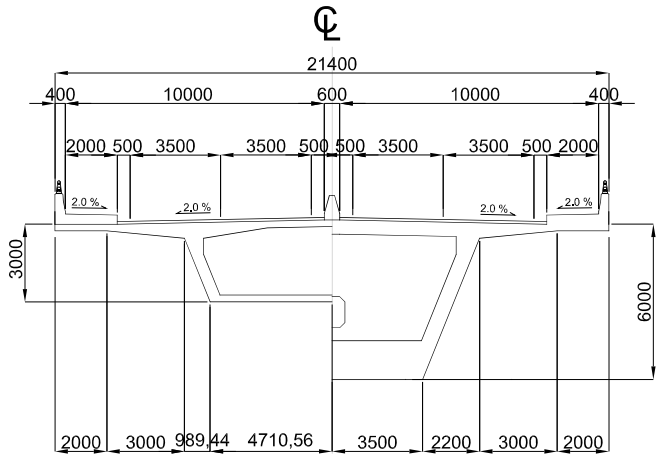
CROSS SECTION

Center At Pier



Precast Continuous PC Box Girder
(Span by Span)

Center At Pier



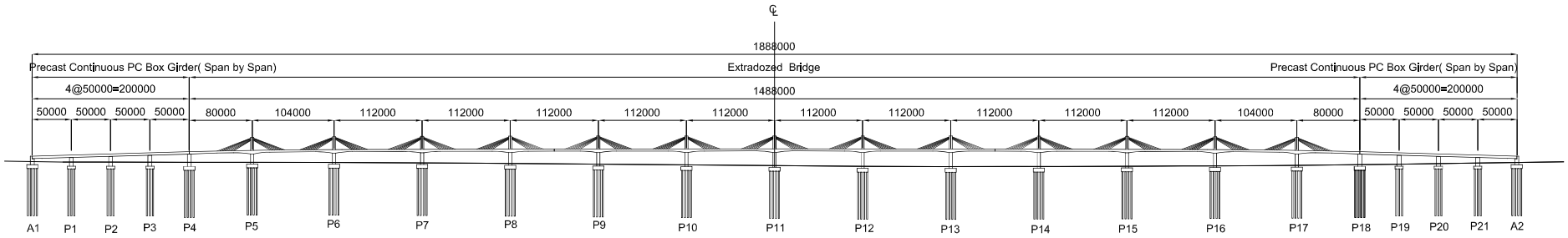
Continuous PC Box Girder

JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: Alternative -C: Continuous PC Box Girder SCALE DRAWING NO. SHEET NO.

Yangon

GENERAL VIEW

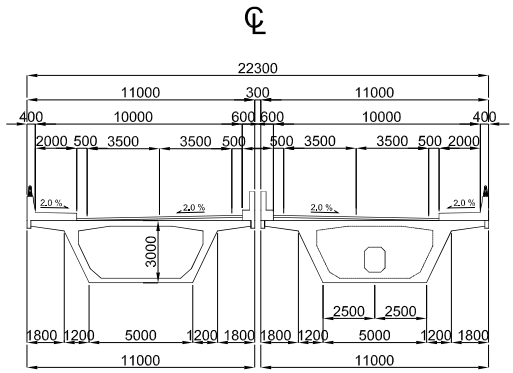
Thanlyin



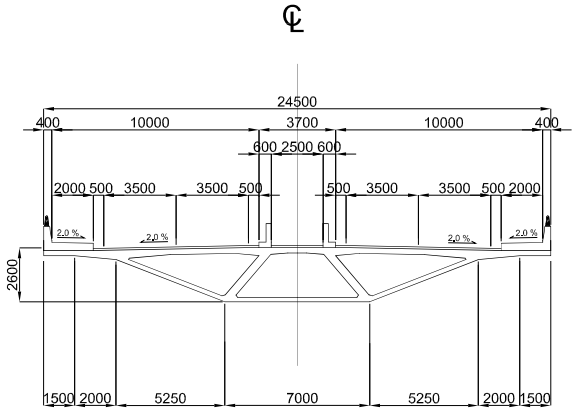
CROSS SECTION

Center

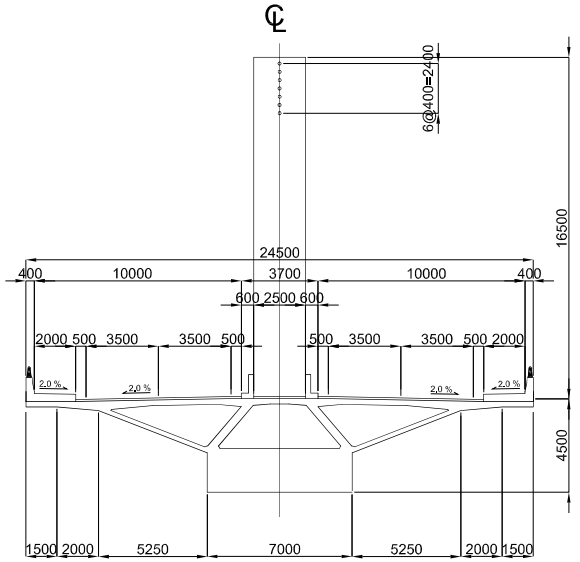
At Pier



Precast Continuous PC Box Girder
(Span by Span)



Extradozed Bridge (Center)



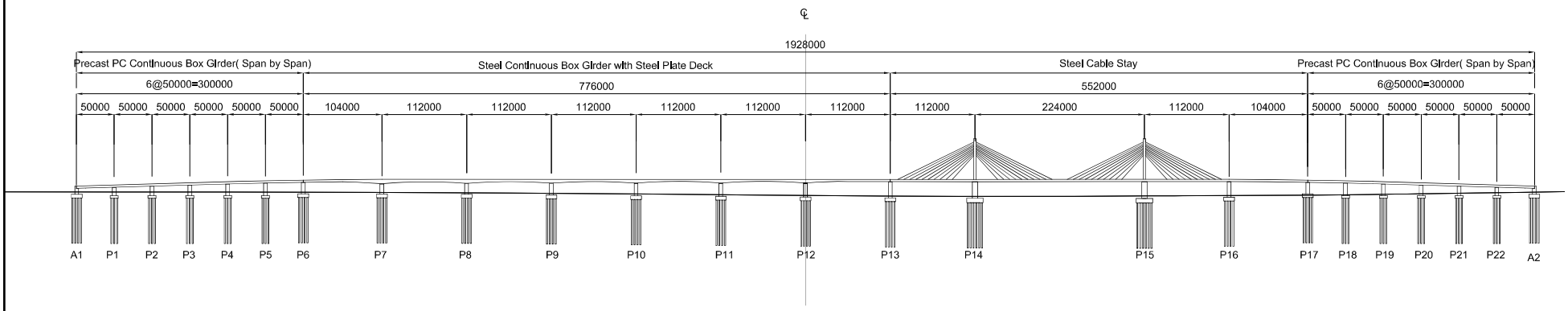
Extradozed Bridge (At Pylon)

JAPAN INTERNATIONAL COOPERATION AGENCY	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE
REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION			DRAWING TITLE: Alternative -D: Extradozed Bridge SCALE DRAWING NO. SHEET NO.

Yangon

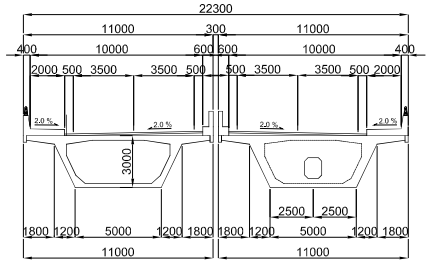
GENERAL VIEW

Thanlyin



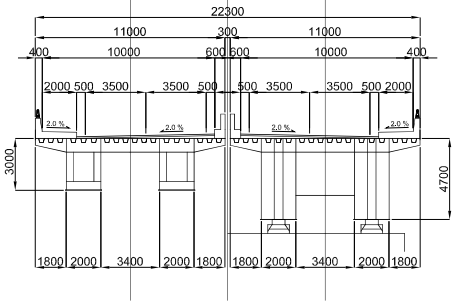
CROSS SECTION

Center At Pier



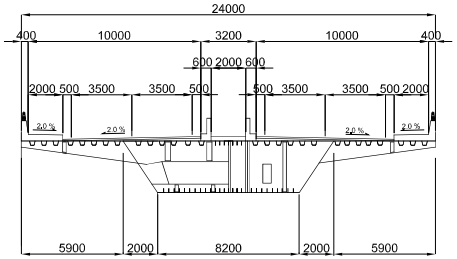
Precast PC Continuous Box Girder
(Span by Span)

Center At Pier

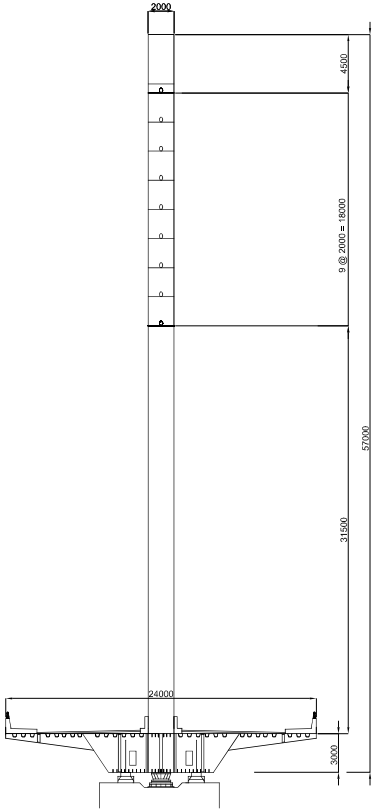


Steel Continuous Box Girder with Steel Plate Deck

Center At Tower



Cable Stayed Bridge



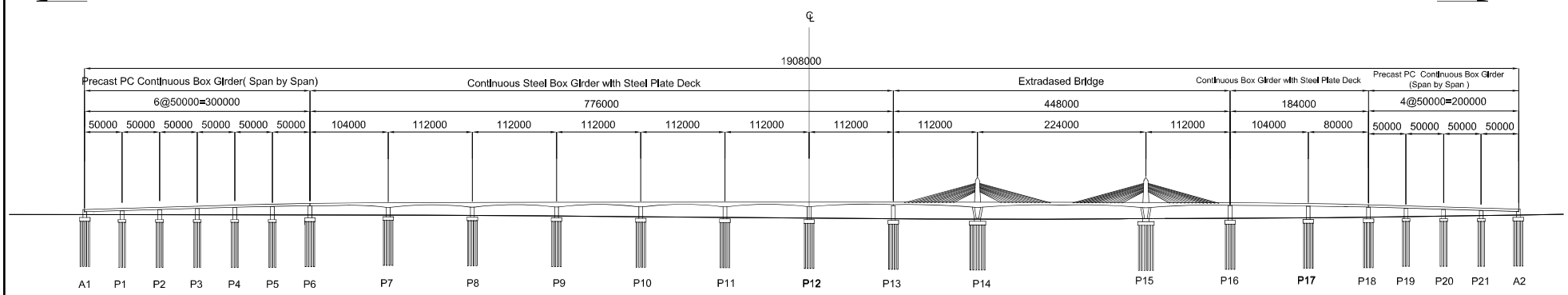
Cable Stayed Bridge
At Tower

JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: Alternative - E : Combination with Cable Stayed Bridge and Continuous Steel Box Girder with Steel Plate Deck SCALE DRAWING NO. SHEET NO.

Yangon

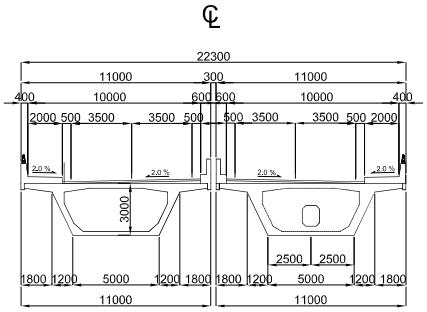
GENERAL VIEW

Thanlyin



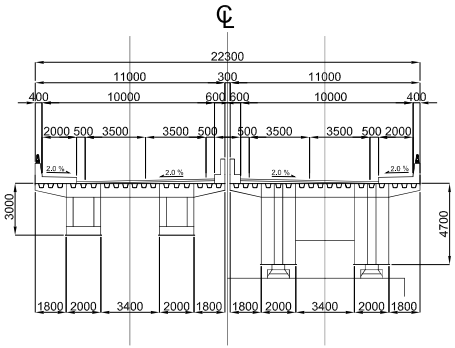
CROSS SECTION

Center At Pier



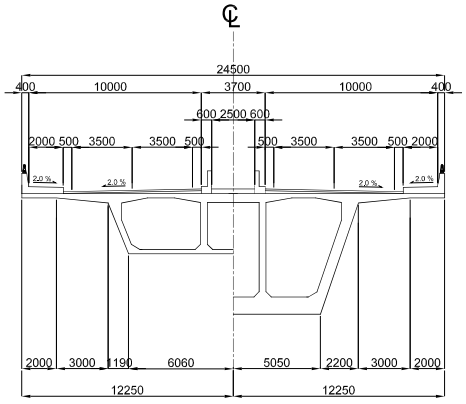
Precast PC Continuous Box Girder
(Span by Span)

Center At Pier

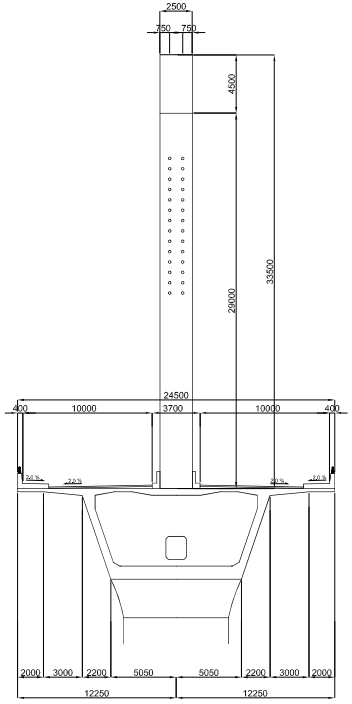


Continuous Steel Box Girder with Steel Plate Deck

Center At Pier



Extradosed Bridge



At Pylon

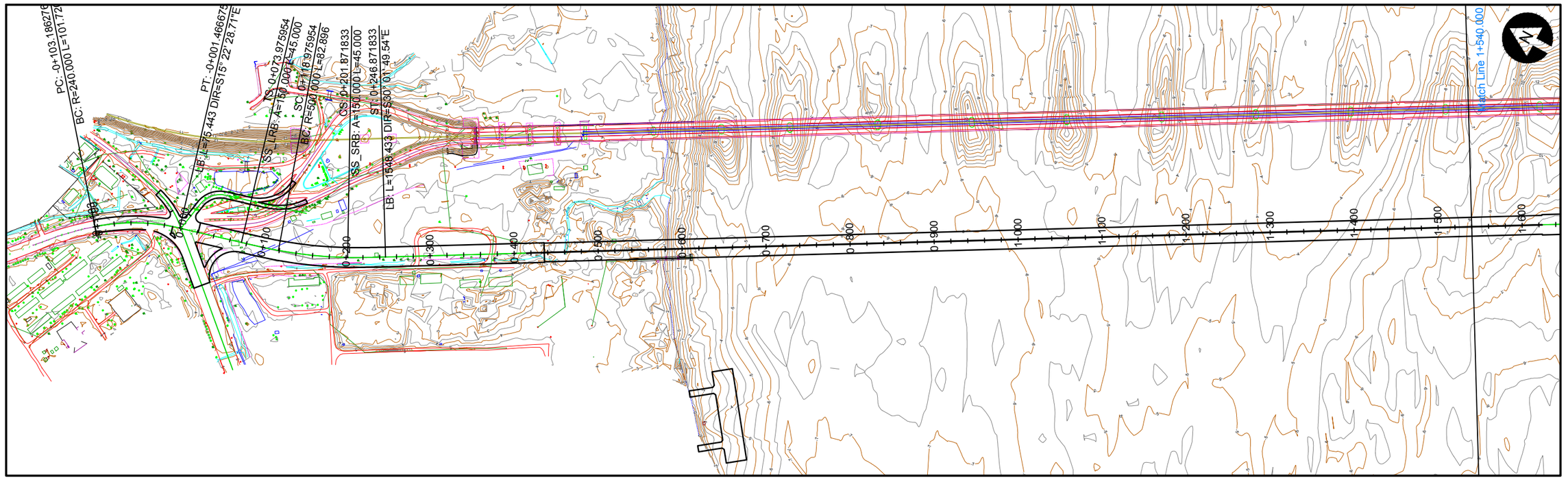
JAPAN INTERNATIONAL COOPERATION AGENCY	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE
REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION			DRAWING TITLE Alternative -F: Combination with Extradozed Bridge and Continuous Steel Box Girder with Steel Plate Deck SCALE DRAWING NO. SHEET NO.

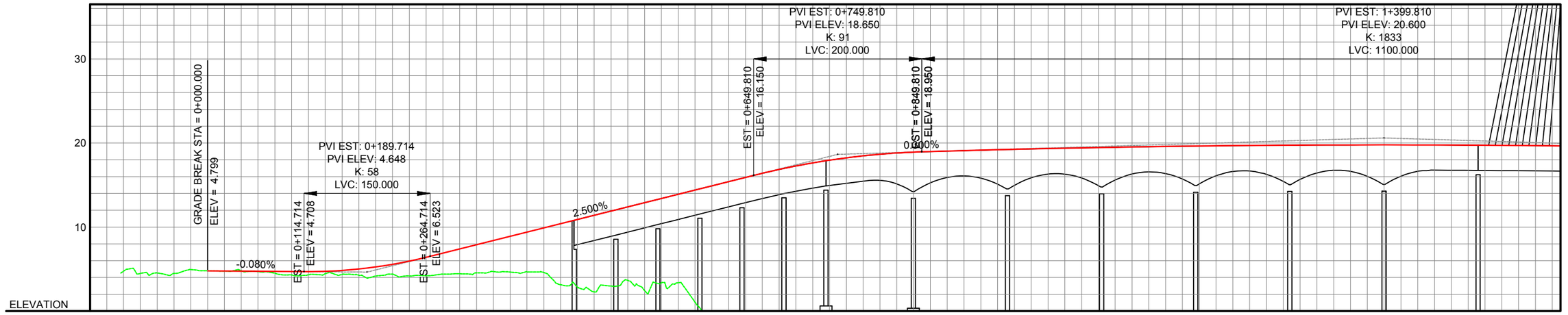
Appendix 11

Drawings

DRAWING LIST

SHEET NO.	DRAWING TITLE	DRAWING NO.
1	DRAWING LIST	GE-01
2	PLAN AND PROFILE (1/2)	RD-01
3	PLAN AND PROFILE (2/2)	RD-02
4	TYPICAL CROSS SECTION OF EARTHWORK SECTION	RD-03
5	GENERAL VIEW	BG-GP-01
6	STEEL CABLE STAYED BRIDGE	BG-SP-01
7	CONTINUOUS STEEL BOX GIRDER	BG-SP-02
8	CONTINUOUS PC BOX GIRDER (YANGON SIDE)	BG-SP-03
9	CONTINUOUS PC BOX GIRDER (THANLYIN SIDE)	BG-SP-04
10	SUBSTRUCTURE AND FOUNDATION (1/2)	BG-SP-05
11	SUBSTRUCTURE AND FOUNDATION (2/2)	BG-SP-06
12	ERECTION PROCEDURE (1/2)	BG-EP-01
13	ERECTION PROCEDURE (2/2)	BG-EP-02





GRADE
0+000.000 4.799 i = -0.080% L = 189.714 m 0+114.714 4.708
4.648
0+264.714 6.523 i = 2.500% L = 560.096 m 0+649.810 16.150
18.650
0+849.810 18.950 i = 0.300% L = 650.000 m
20.600

STATION	PROPOSED HEIGHT	EXISTING HEIGHT
-0+120		
-0+100		4.76
-0+080		4.49
-0+060		4.54
-0+040		4.48
-0+020		4.95
0+000	4.799	4.80
0+020	4.783	4.77
0+040	4.767	4.80
0+060	4.751	4.70
0+080	4.735	4.52
0+100	4.719	4.30
0+120	4.706	4.33
0+140	4.742	4.45
0+160	4.848	4.37
0+180	5.022	4.27
0+200	5.265	4.19
0+220	5.577	4.41
0+240	5.957	4.18
0+260	6.407	4.21
0+280	6.905	4.40
0+300	7.405	4.45
0+320	7.905	4.56
0+340	8.405	4.71
0+360	8.905	4.65
0+380	9.405	4.71
0+400	9.905	4.60
0+420	10.405	3.15
0+440	10.905	2.86
0+460	11.405	2.31
0+480	11.905	2.99
0+500	12.405	3.66
0+520	12.905	2.45
0+540	13.405	3.37
0+560	13.905	3.38
0+580	14.405	1.07
0+600	14.905	-1.48
0+620	15.405	-3.44
0+640	15.905	-3.79
0+660	16.399	-4.48
0+680	16.855	-5.17
0+700	17.266	-5.56
0+720	17.634	-5.95
0+740	17.957	-5.98
0+760	18.237	-6.08
0+780	18.473	-6.11
0+800	18.664	-6.07
0+820	18.812	-6.13
0+840	18.915	-6.07
0+860	18.980	-6.03
0+880	19.038	-6.08
0+900	19.094	-6.25
0+920	19.147	-6.25
0+940	19.198	-6.17
0+960	19.247	-6.16
0+980	19.294	-6.07
1+000	19.339	-5.78
1+020	19.382	-5.74
1+040	19.422	-5.56
1+060	19.460	-5.41
1+080	19.496	-5.26
1+100	19.530	-5.40
1+120	19.561	-4.96
1+140	19.591	-3.92
1+160	19.618	-4.40
1+180	19.643	-3.70
1+200	19.666	-3.94
1+220	19.687	-3.71
1+240	19.705	-4.07
1+260	19.722	-4.31
1+280	19.736	-4.31
1+300	19.748	-3.82
1+320	19.758	-3.76
1+340	19.765	-3.77
1+360	19.771	-3.96
1+380	19.774	-4.29
1+400	19.775	-4.76
1+420	19.774	-5.34
1+440	19.771	-5.96
1+460	19.765	-6.40
1+480	19.757	-6.58
1+500	19.748	-6.78
1+520	19.736	-7.19
1+540	19.721	-8.10
1+560	19.705	-8.74
1+580	19.686	-8.84
1+600	19.666	-7.98

CURVE ELEMENTS
R = ∞ L = 0.001 m
R=240.00 m L=101.72 m
R = ∞ L = 75.443 m
A = 150 m L = 45.000 m
R=500.00 m L=82.90 m
A = 150 m L = 45.000 m
R = ∞ L = 1,548.433 m

JAPAN INTERNATIONAL COOPERATION AGENCY

REPUBLIC OF THE UNION OF MYANMAR
PUBLIC WORKS, MINISTRY OF CONSTRUCTION

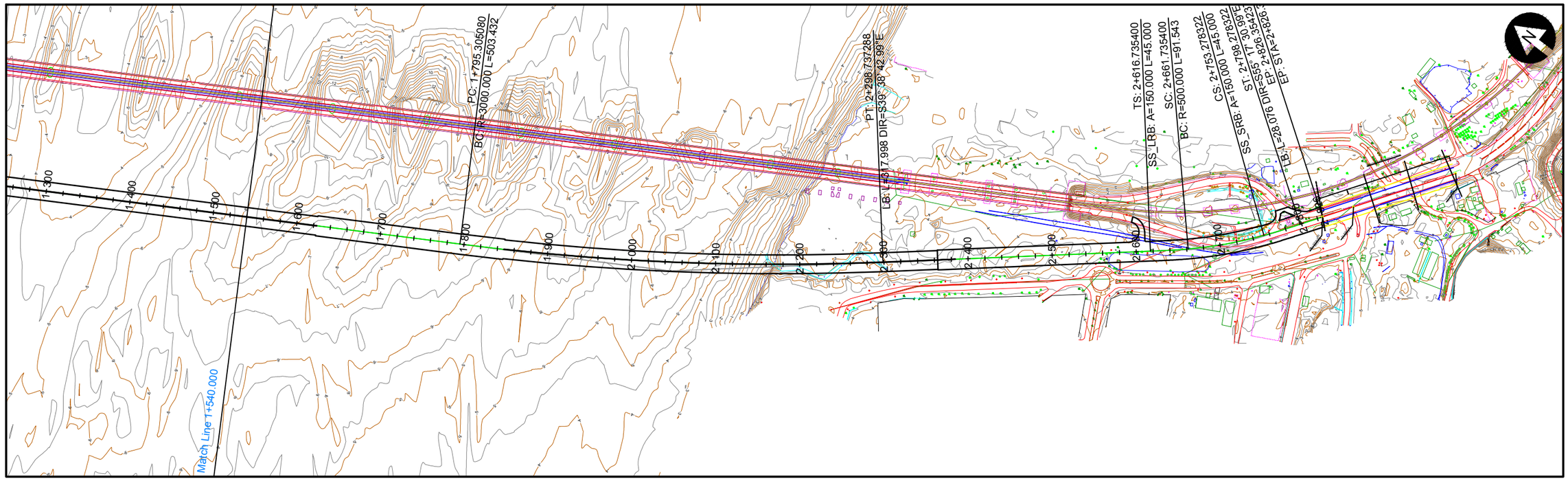
ALMEC CORPORATION
ORIENTAL CONSULTANTS CO., LTD
NIPPON KOEI CO., LTD

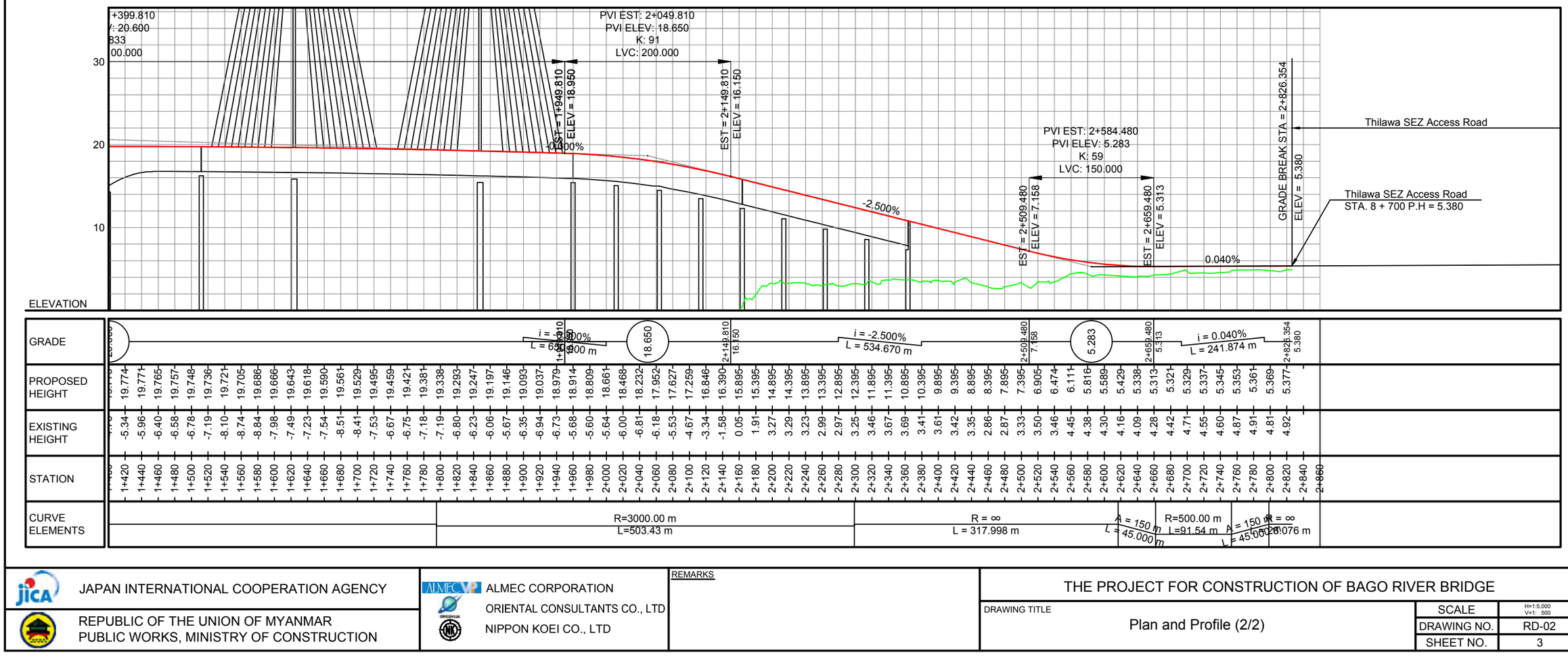
REMARKS

THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE

DRAWING TITLE
Plan and Profile (1/2)

SCALE	H=1:5,000 V=1: 500
DRAWING NO.	RD-01
SHEET NO.	2

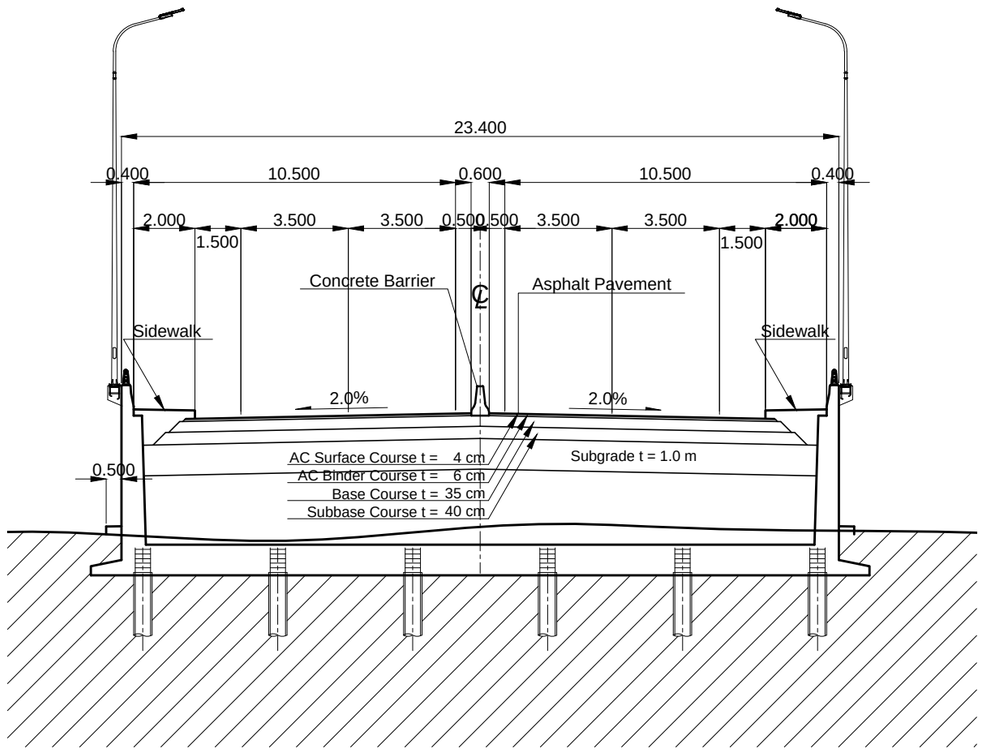




JICA	JAPAN INTERNATIONAL COOPERATION AGENCY	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE
	REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	DRAWING TITLE: Plan and Profile (2/2)

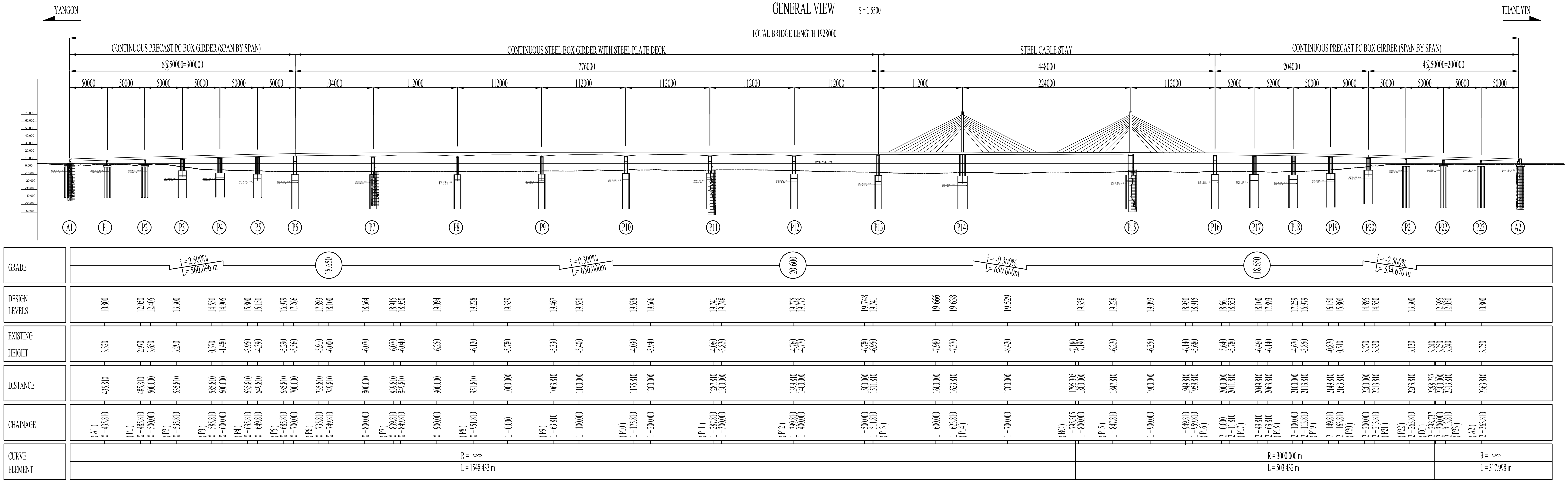
SCALE	H=1:5,000 V=1: 500
DRAWING NO.	RD-02
SHEET NO.	3

TYPICAL CROSS SECTION OF EARTHWORK SECTION

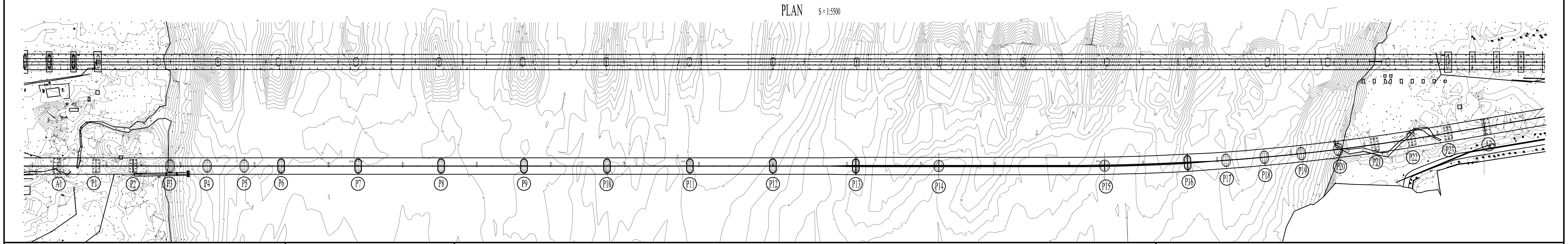


JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: Typical Cross Section of Earthwork Section	SCALE: 1: 200 DRAWING NO.: RD-03 SHEET NO.: 4

GENERAL VIEW S = 1:5500



PLAN S = 1:5500

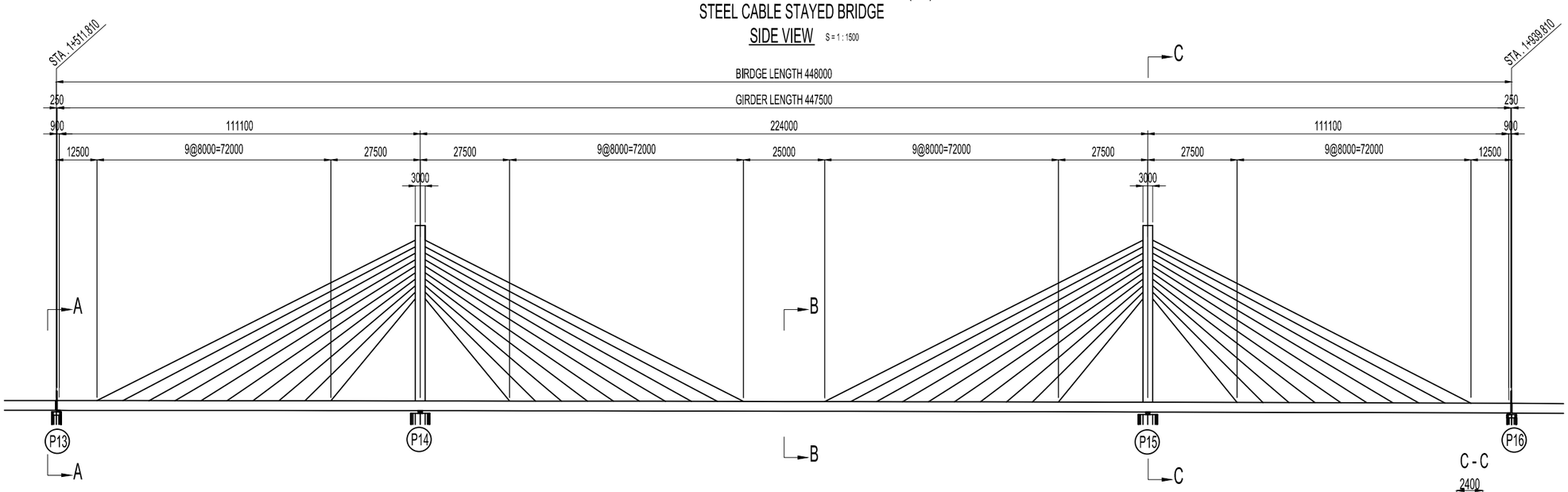


JAPAN INTERNATIONAL COOPERATION AGENCY	ALMEC CORPORATION	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE
REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD		DRAWING TITLE: THE BAGO RIVER BRIDGE GENERAL VIEW

SCALE	
DRAWING NO.	BG-GP-01
SHEET NO.	5

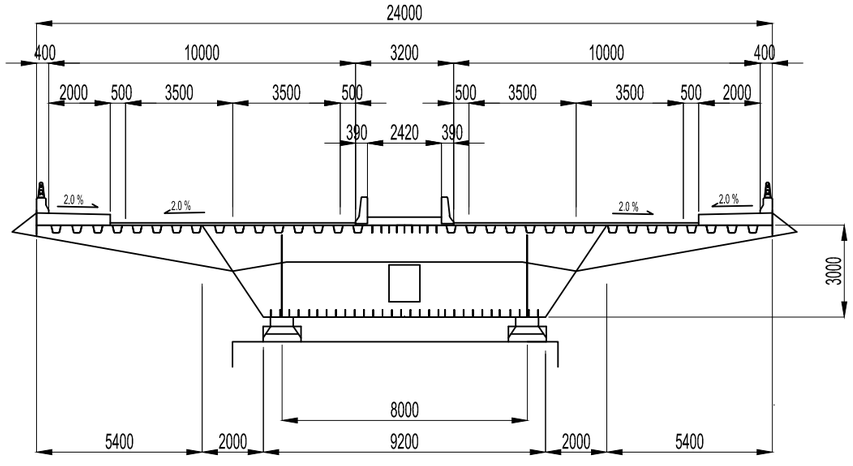
GENERAL PLAN OF SUPERSTRUCTURE (3/4)
STEEL CABLE STAYED BRIDGE

SIDE VIEW S = 1 : 1500

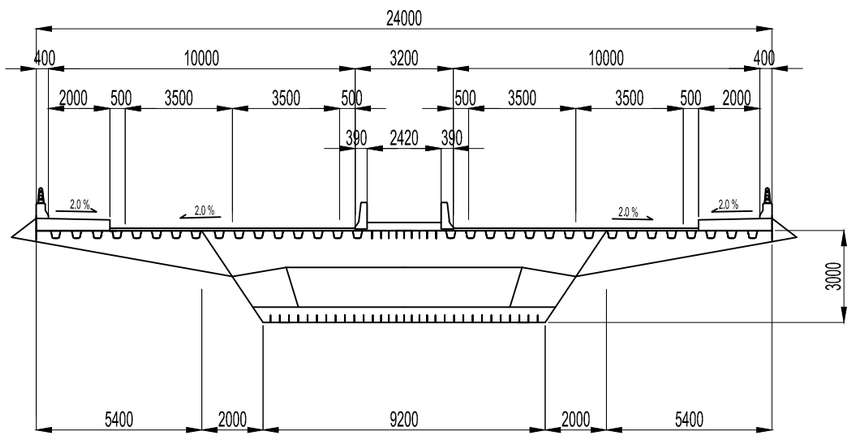


CROSS-SECTION S = 1:200 & S = 1:450

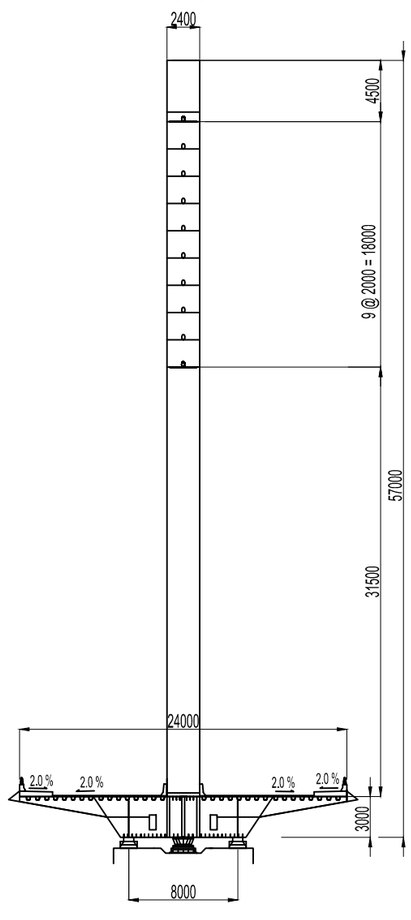
A - A



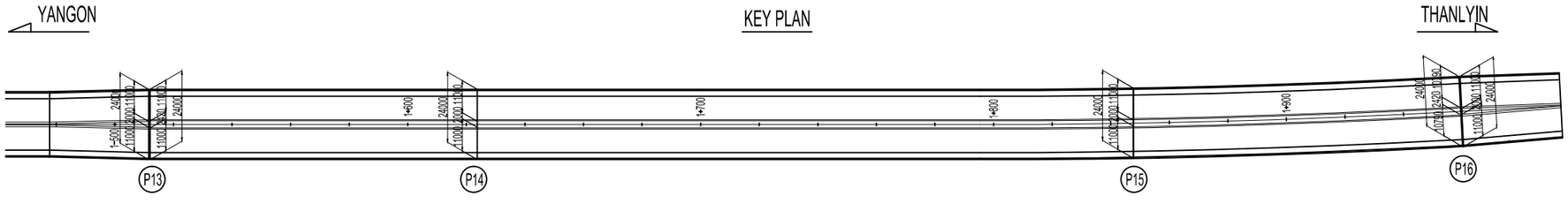
B - B



C - C



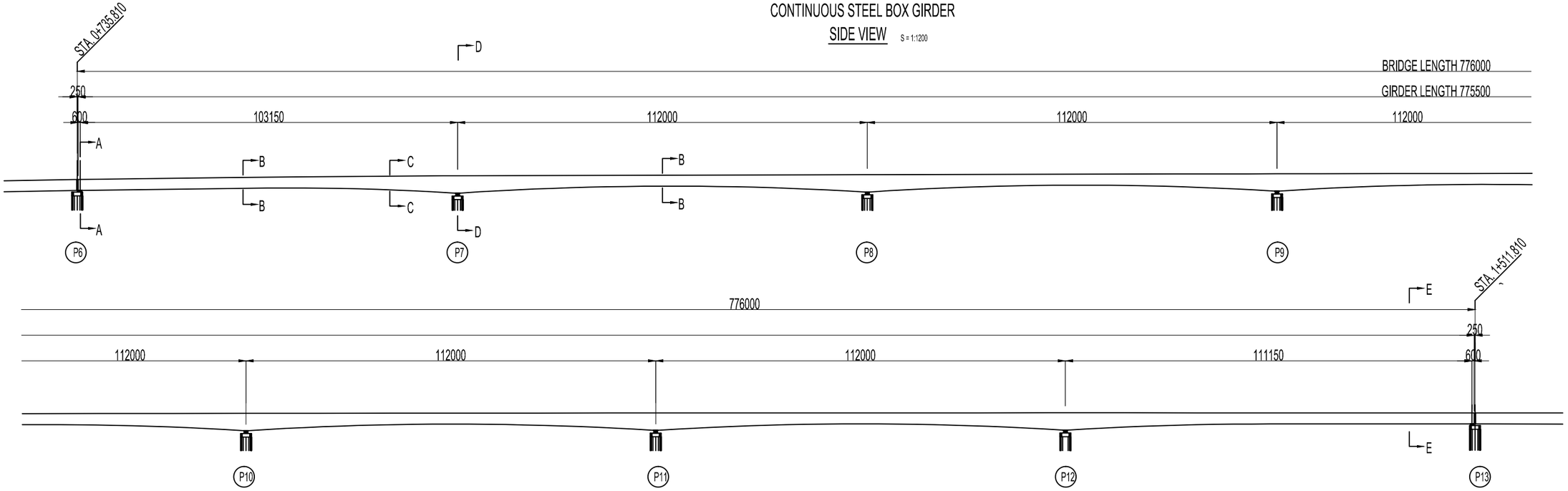
KEY PLAN



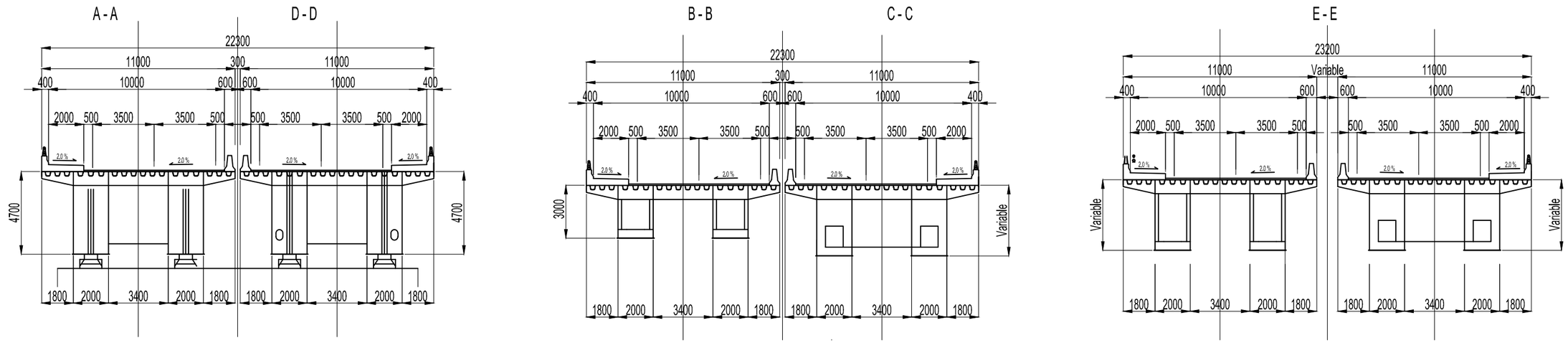
JAPAN INTERNATIONAL COOPERATION AGENCY	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE
REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION			DRAWING TITLE: STEEL CABLE STAYED BRIDGE SCALE DRAWING NO. BG - SP - 01 SHEET NO. 6

GENERAL PLAN OF SUPERSTRUCTURE (2/4)
CONTINUOUS STEEL BOX GIRDER

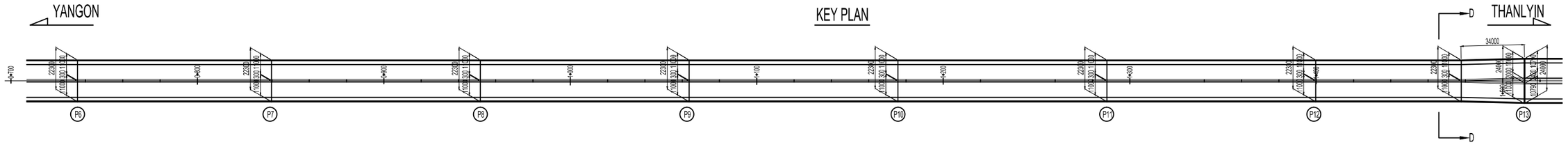
SIDE VIEW S = 1:1200



CROSS-SECTION S = 1:250



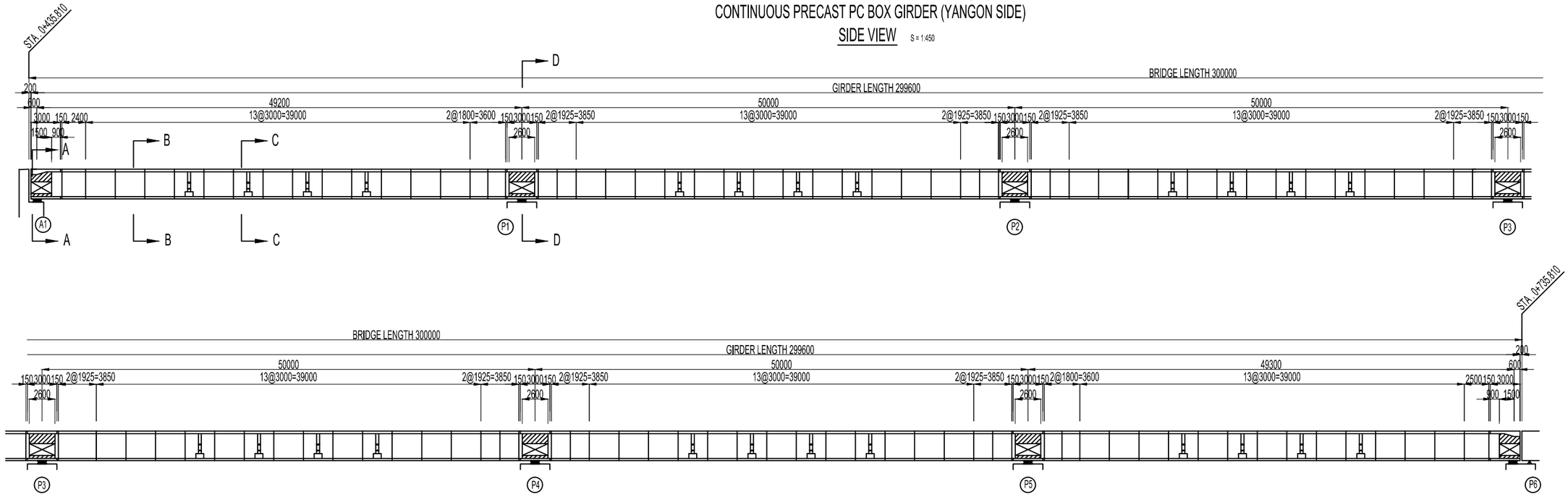
KEY PLAN



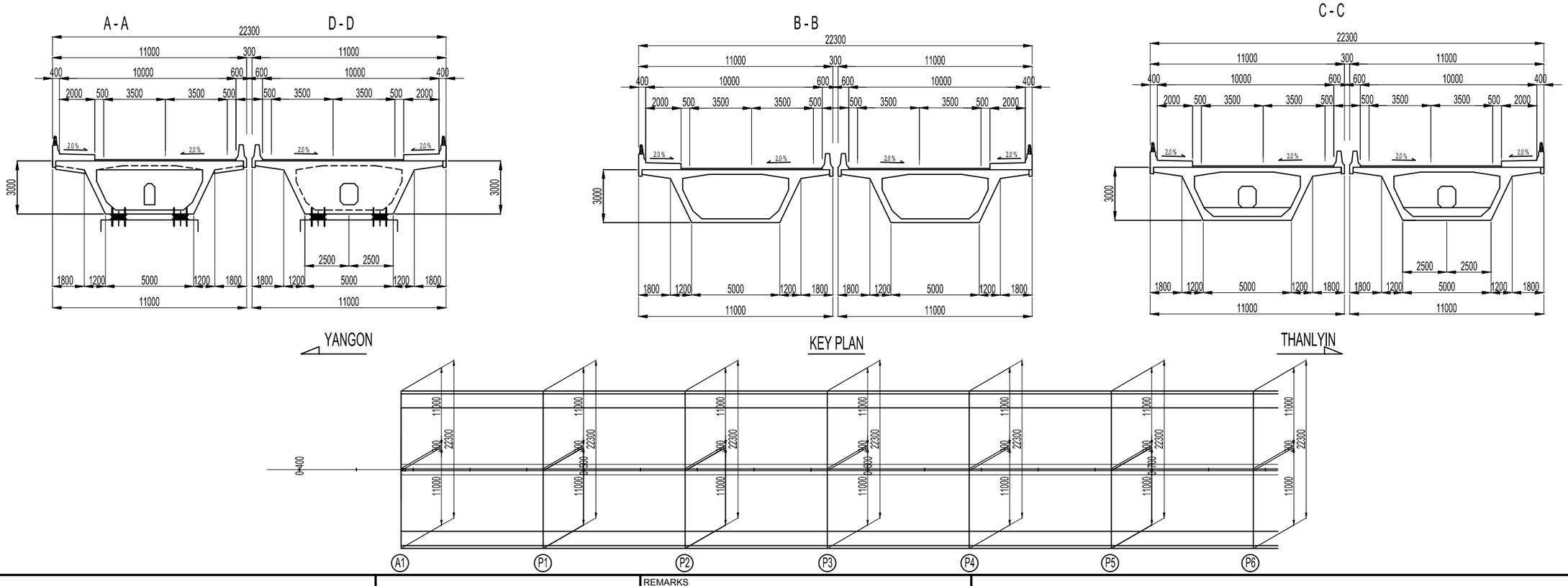
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: CONTINUOUS STEEL BOX GIRDER SCALE DRAWING NO. BG - SP - 02 SHEET NO. 7

GENERAL PLAN OF SUPERSTRUCTURE (1/4)
CONTINUOUS PRECAST PC BOX GIRDER (YANGON SIDE)

SIDE VIEW S = 1:450



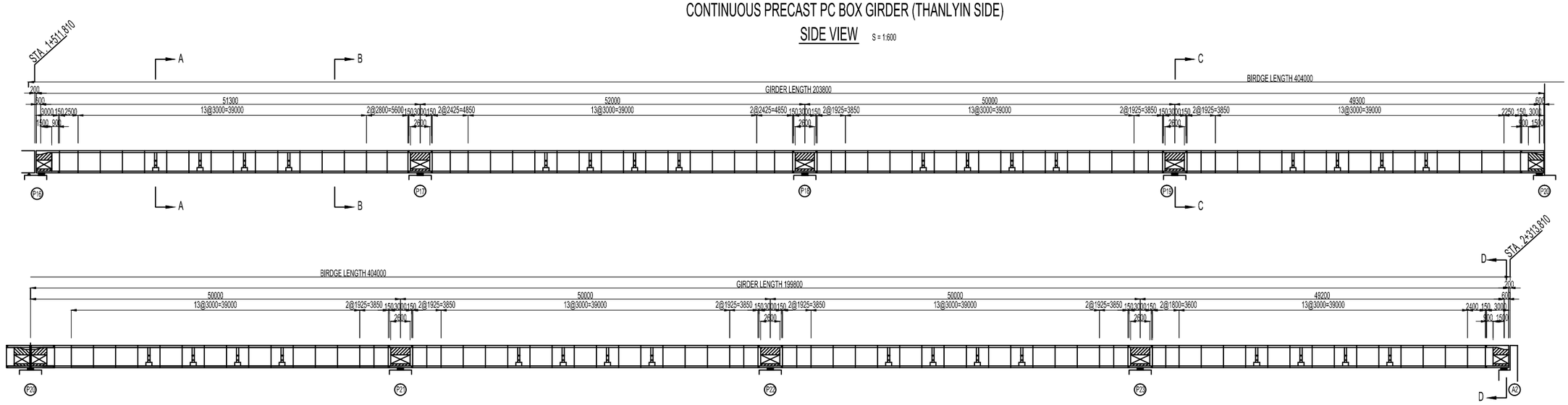
CROSS-SECTION S = 1:250



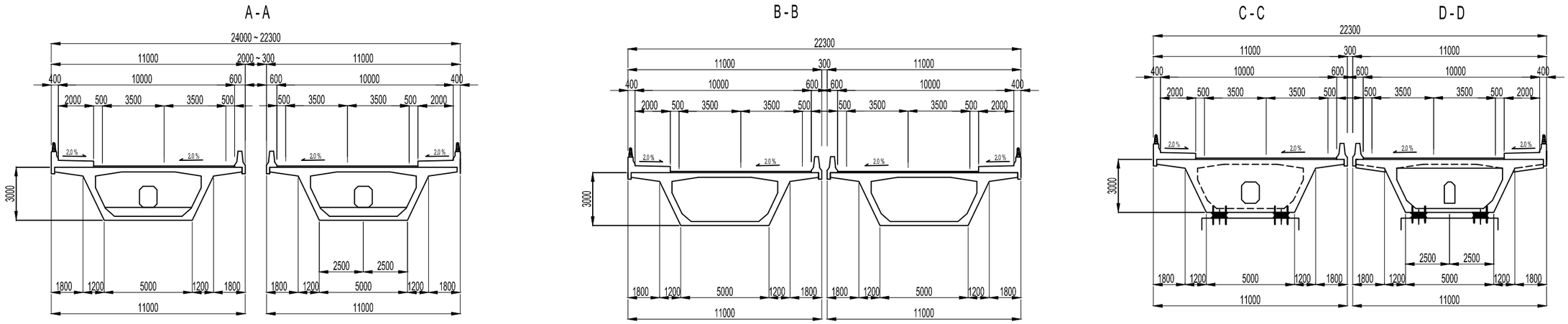
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: CONTINUOUS PC BOX GIRDER (YANGON SIDE) SCALE: DRAWING NO.: BG - SP - 03 SHEET NO.: 8

GENERAL PLAN OF SUPERSTRUCTURE (4/4)
CONTINUOUS PRECAST PC BOX GIRDER (THANLYIN SIDE)

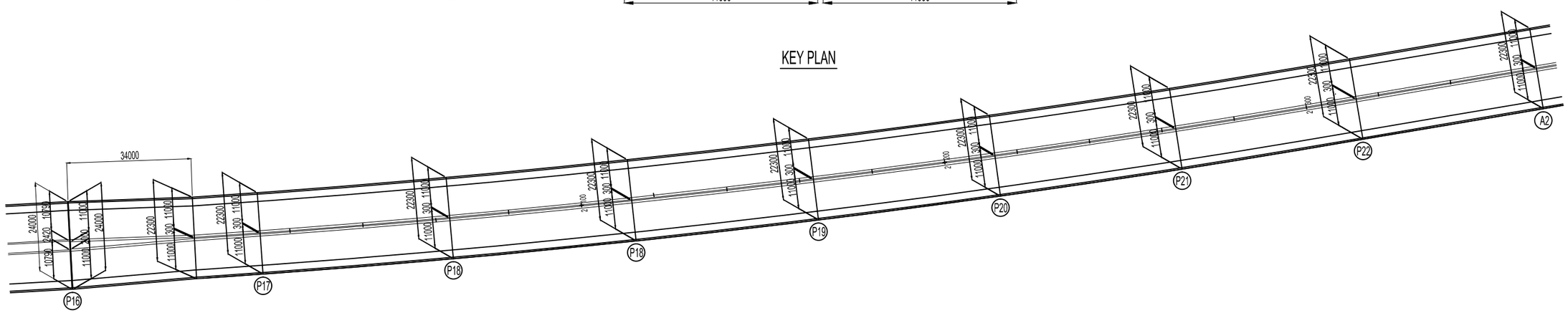
SIDE VIEW S = 1:600



CROSS-SECTION S = 1:250



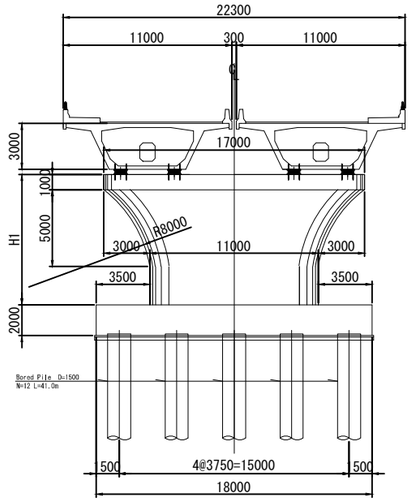
KEY PLAN

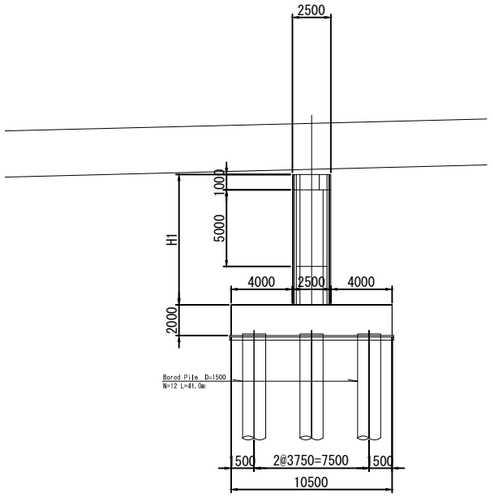


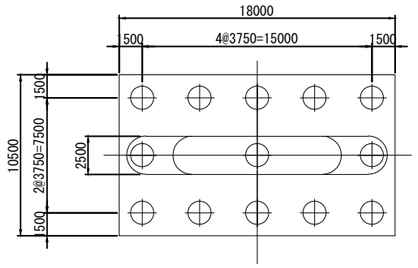
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS	THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE DRAWING TITLE: CONTINUOUS PC BOX GIRDER (THANLYIN SIDE) SCALE DRAWING NO. BG - SP - 04 SHEET NO. 9

SUBSTRUCTURE AND FOUNDATION (1/2)

P1, P2 & P21 - P23
Scale 1:400

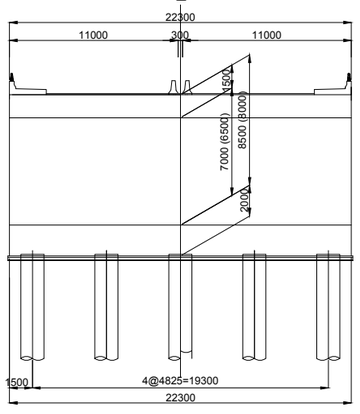


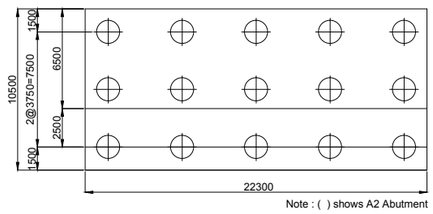




Pier	H (m)	Pier	H (m)
P1	6.5	P22	7.5
P2	7.5	P23	6.0
P21	8.5		

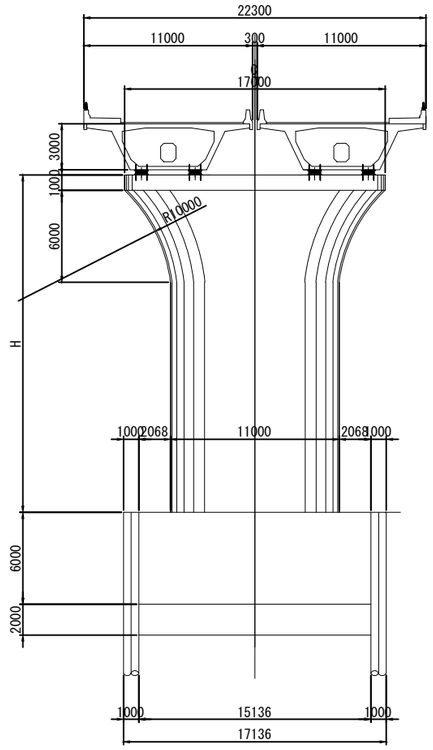
A1 & A2
Scale 1:400

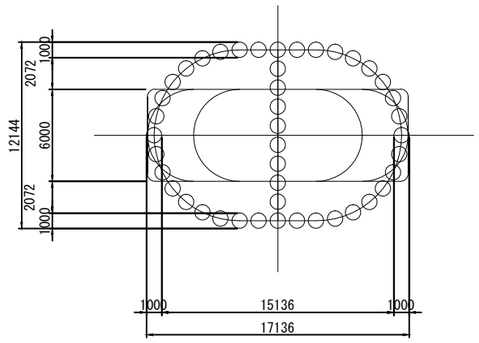


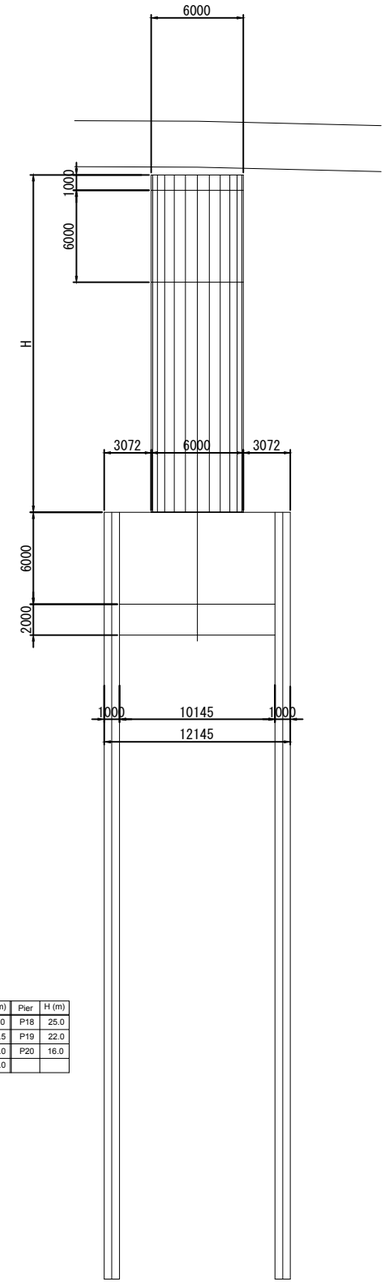


Note : ( ) shows A2 Abutment

P3 - P5, & P17 - P20
Scale 1:400







Pier	H (m)	Pier	H (m)
P3	16.0	P18	25.0
P4	20.5	P19	22.0
P5	23.0	P20	16.0
P17	25.0		

JAPAN INTERNATIONAL COOPERATION AGENCY
REPUBLIC OF THE UNION OF MYANMAR
PUBLIC WORKS, MINISTRY OF CONSTRUCTION

ALMEC CORPORATION
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NIPPON KOEI CO., LTD

REMARKS

THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE

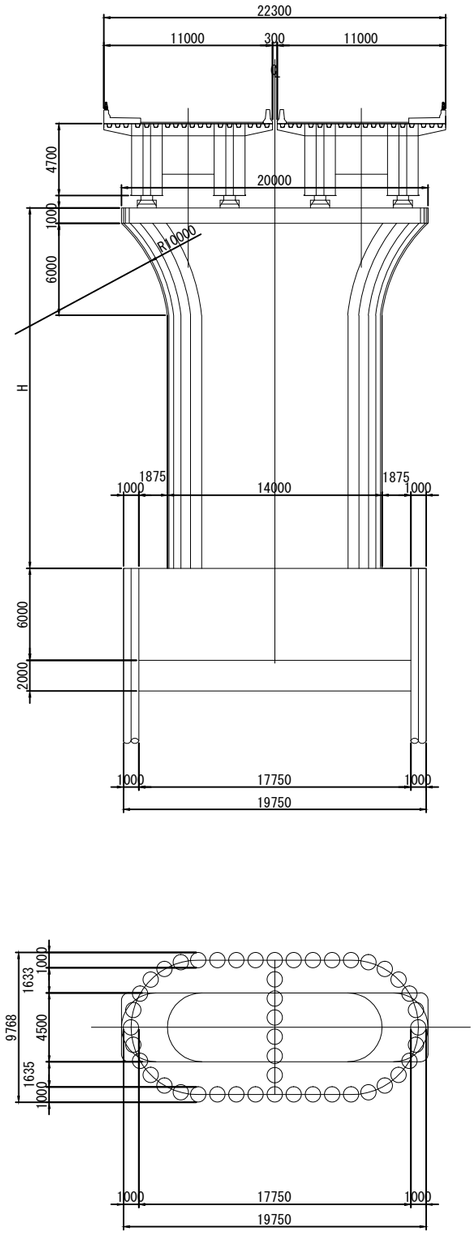
DRAWING TITLE
SUBSTRUCTURE AND FOUNDATION (1/2)

SCALE	
DRAWING NO.	BG - SP -05
SHEET NO.	10

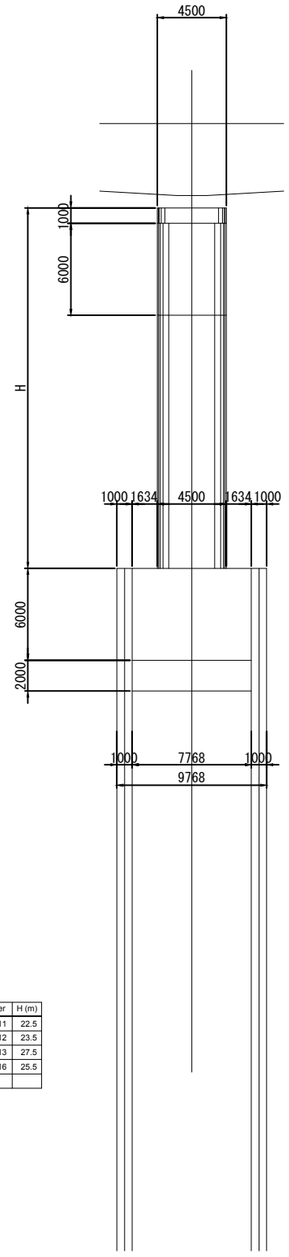
SUBSTRUCTURE AND FOUNDATION (2/2)

P6 - P13 & P16

Scale 1:400

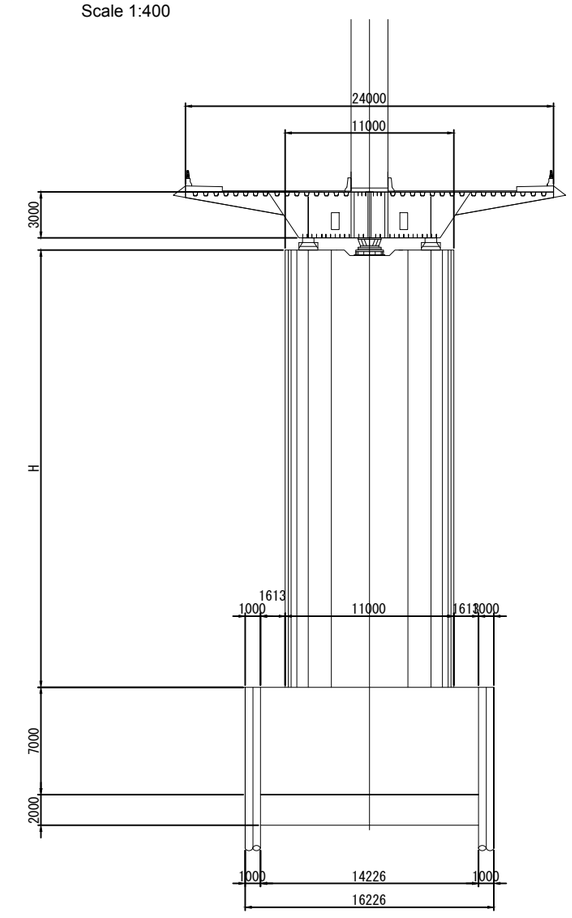


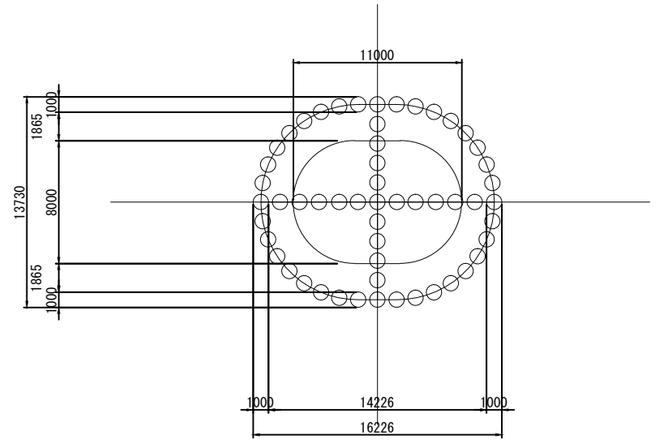
Pier	H (m)	Pier	H (m)
P6	24.5	P11	22.5
P7	23.5	P12	23.5
P8	24.0	P13	27.5
P9	23.5	P16	25.5
P10	22.5		

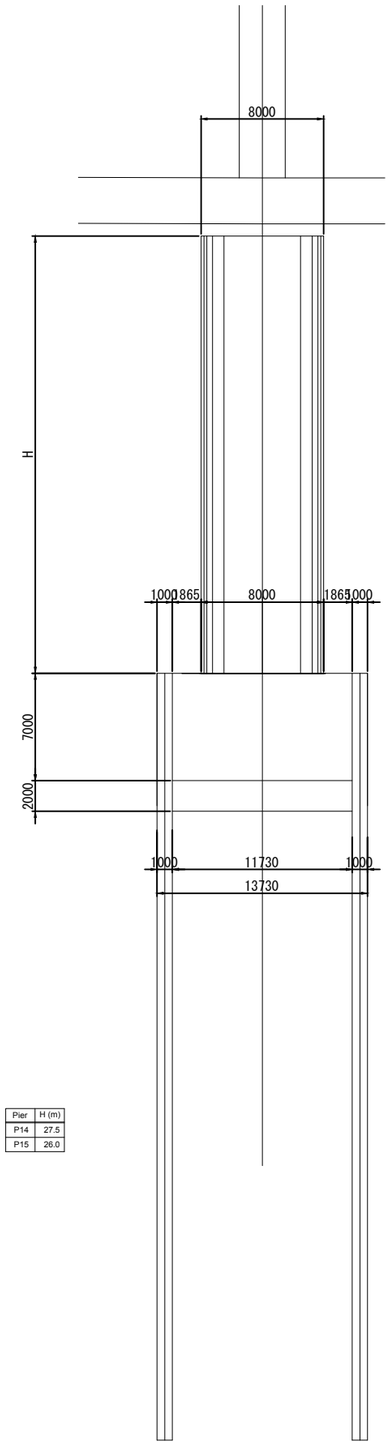


P14 & P15

Scale 1:400







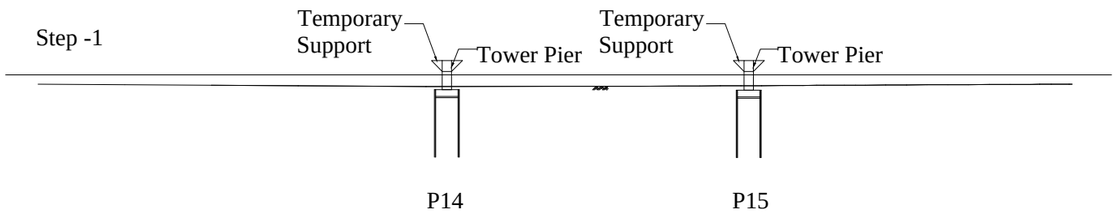
Pier	H (m)
P14	27.5
P15	26.0

JICA	JAPAN INTERNATIONAL COOPERATION AGENCY	ALMEC CORPORATION ORIENTAL CONSULTANTS CO., LTD NIPPON KOEI CO., LTD	REMARKS
	REPUBLIC OF THE UNION OF MYANMAR PUBLIC WORKS, MINISTRY OF CONSTRUCTION		

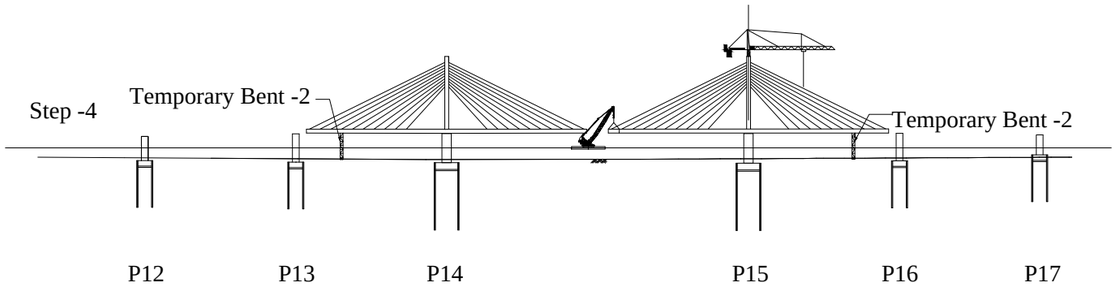
THE PROJECT FOR CONSTRUCTION OF BAGO RIVER BRIDGE

DRAWING TITLE: SUBSTRUCTURE AND FOUNDATION (2/2)

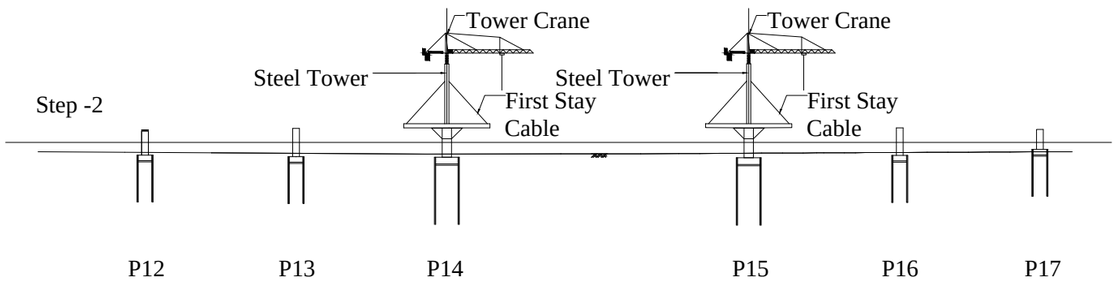
SCALE	
DRAWING NO.	BG - SP - 06
SHEET NO.	11



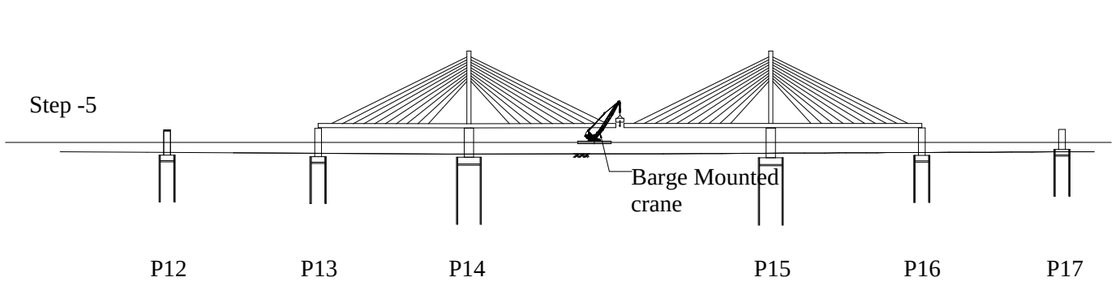
- Construct Foundations and Tower Piers P14 and P15
- Temporary supports are attached to the tower piers



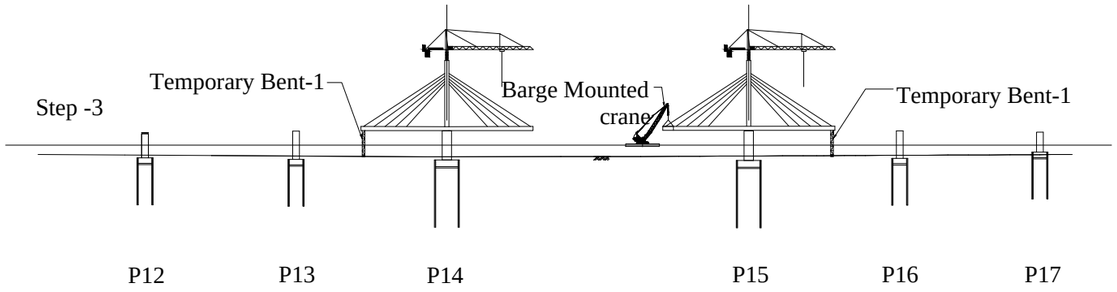
- Install Temporary bent -2
- Alternating erect steel girder blocks with balanced cantilever method using stay cables and barge mounted crane up to the end steel girder block
- Remove temporary bent-1



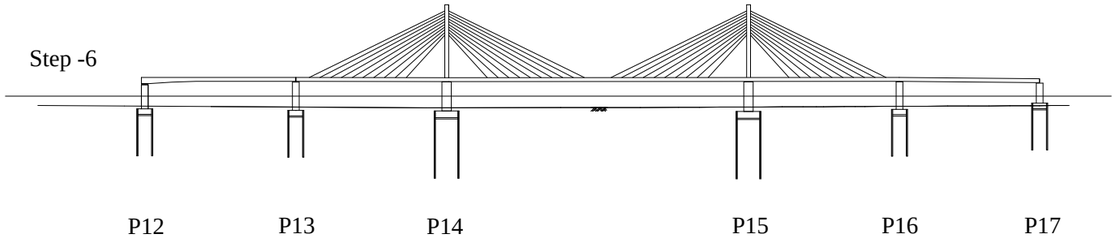
- Construct Steel Towers on Pier 14 and 15
- Erect steel girder of first girder block using stay cables and tower crane
- First steel girder blocks are connected to the tower and then girder blocks are extended to the first stay cable
- Construct remainder piers of both sides (P13 and P16)



- Finally set closure steel girder block by barge mounted crane
- Remove temporary bent-2



- Install temporary bent -1
- Alternating erect a steel girder block with balanced cantilever method using stay cables and Barge mounted crane



- Erection is completed

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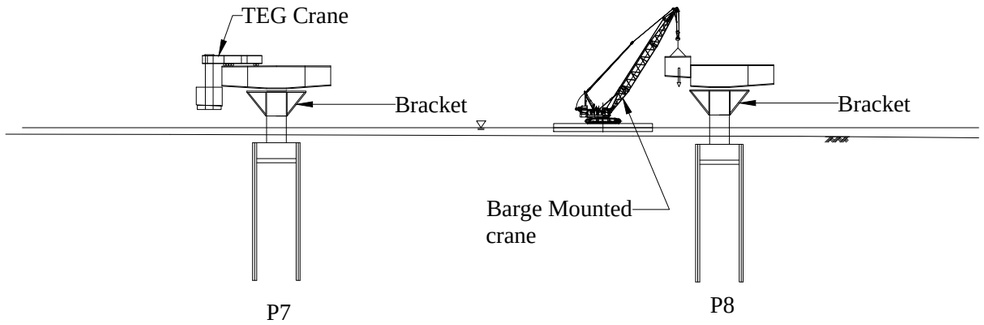
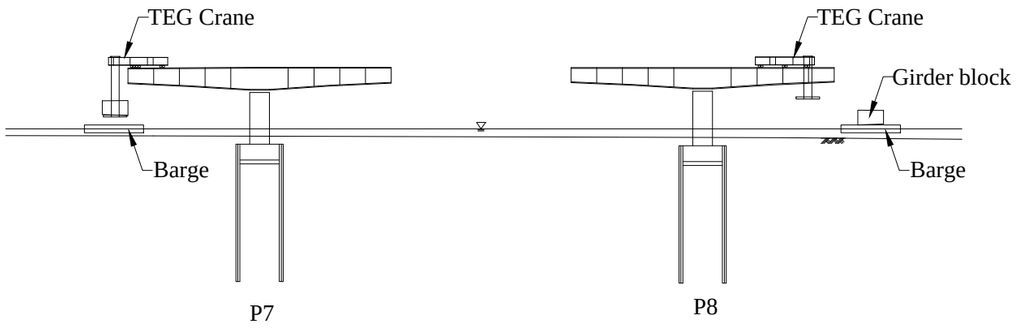
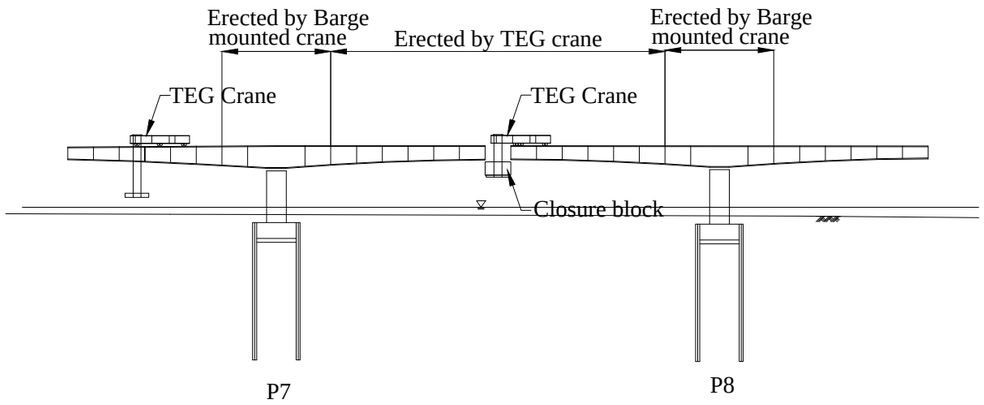


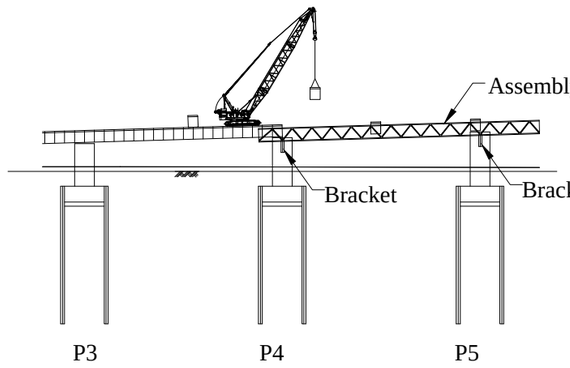
- Provide steel brackets to support steel girder blocks on the pier top.
- The girder blocks on the pier top are erected by barge mounted crane.
- Cantilever steel girder blocks are erected by TEG crane which is facilitated on the top of girder.



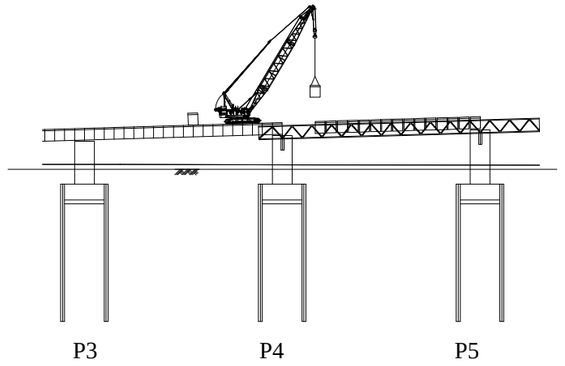
- Girder blocks are transported on the barge from the fabrication yard.
- The girder block is lifted up to their correct position and jointed by TEG Crane.
- These girder blocks are repeatedly erected with balanced cantilever method.



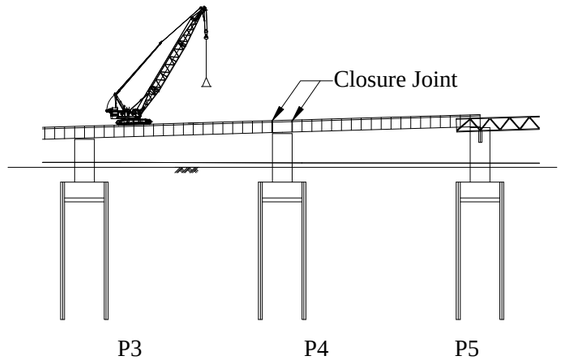
- Closure block at the center is carefully lifted up and set at the center portion by TEG Crane.



- Place the erection brackets on the next pier shaft.
- Move the truss girder to the next span and fix it on the erection brackets.



- The segments are transported to the respective span either by trailer or barge.
- The segments are placed on the sliding pads and sliding on the truss girder to position correct location.
- This is repeated until all segments are in place.



- All segments are adjusted on the truss girder and then partial post-tensining force is exerted.
- Adjacent spans of PC box girders are jointed with closure joint space.
- Closure joints are cast.
- Continuity presstressing cables are installed and tensioned to connect all spans as a continuous box girder.

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Appendix 12

Appendix 12.1 Results of Actual Environmental Survey

Table A12.1.1 List of Terrestrial Plant Species in Bago River Bridge Area

No.	Scientific Name	Family Name	Family Name	Vanicular Name	Habit*
1	*Acacia auriculiformis* A. Cunn.	Mimosaceae	Mimosaceae	Malaysia-padauk	ST
2	*Acacia mangium* Willd	Mimosaceae	Mimosaceae	Malaysia padauk-aphyu	T
3	*Acacia megaladena* Desv.	Mimosaceae	Mimosaceae	Subok	ST
4	*Achyranthes aspera* L.	Amaranthaceae	Amaranthaceae	Kyet-mauk-pyan, Kyet-mauk-sue-pyan, Naukpo	H
5	*Acmella calva* (DC.) R.K. Jansen	Asteraceae	Asteraceae	Shadon-po, Sein-nagat	H
6	*Aeschynomene indica* L.	Fabaceae	Fabaceae	Nay-bin	H
7	*Ageratum conyzoides* L.	Asteraceae	Asteraceae	Khwe-thay-pan	H
8	*Allamanda cathartica* L.	Apocynaceae	Apocynaceae	Shwewa pan	Cl, Cr
9	*Alternanthera nodiflora* R. Br.	Amaranthaceae	Amaranthaceae	Kanaphaw	H
10	*Alternanthera sessilis* (L.) R. Br.	Amaranthaceae	Amaranthaceae	Pazun-sar	H
11	*Amaranthus spinosus* L.	Amaranthaceae	Amaranthaceae	Hin-nu-nwe-subauk	H
12	*Ammannia baccifera* L.	Lythraceae	Lythraceae	-	S
13	*Ammannia* sp.	Lythraceae	Lythraceae	-	H
14	*Annona squamosa* L.	Annonaceae	Annonaceae	Awza	ST
15	*Artocarpus heterophyllus* Lam.	Moraceae	Moraceae	Pein -hne	T
16	*Axonopus compressus* (Sw.) P. Beauv.	Poaceae	Poaceae	-	G
17	*Azadirachta indica* A. Juss.	Meliaceae	Meliaceae	Tama, Tama-ga	T
18	*Bauhinia purpurea* L.	Caesalpiniaceae	Caesalpiniaceae	Swedaw	ST
19	*Bauhinia* sp.	Caesalpiniaceae	Caesalpiniaceae	Swedaw	ST
20	*Blumea hieracifolia* (D. Don) DC.	Asteraceae	Asteraceae	-	H
21	*Blumea* sp.	Asteraceae	Asteraceae	Kadu	S
22	*Bombax ceiba* L.	Bombacaceae	Bombacaceae	Let-pan	T
23	*Borassus flabellifer* L.	Arecaceae		Htan	T
24	*Bougainvillea spectabilis* Willd.	Nyctaginaceae		Sekku pan	S, Cl
25	*Bridelia* sp.	Euphorbiaceae		Seik-chay	ST
26	*Caesalpinia pulcherrima* (L.) Sw.	Caesalpiniaceae		Seinban-gale	S
27	*Canavalia* sp.	Fabaceae		-	Cl, Cr
28	*Capparis tenera* Dalzell	Capparaceae		Alo-lay	S

29	*Carica papaya* L.	Caricaceae	Thin baw	ST
30	*Cassia alata* L.	Caesalpiniaceae	Pwe-se-mezali	T
31	*Cassia fistula* L.	Caesalpiniaceae	Ngu	T
32	*Casuarina equisetifolia* Forst.	Casuarinaceae	Pinle-kabwe	T
33	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae	Hmo Pin	T
34	*Centratherum punctatum*	Asteraceae	-	H
35	*Cephalandra indica* Naud.	Cucurbitaceae	Kinmon	Cl, Cr
36	*Chloris barbata* Sw.	Poaceae	Myet-kha	
37	*Chromolaena odorata* (L.) R. M. King & H. Robinson	Asteraceae	Bizat	S
38	*Cleome burmanii* Wight & Arn	Capparaceae	Taw hingala	H
39	*Clitoria macrophylla* Wall.	Fabaceae	Taw-pe	Cl, Cr
40	*Cocos nucifera* L.	Arecaceae	Ohn-pin	T
41	*Codiaeum variegatum* (L.) Blume	Euphorbiaceae	Ywet-hla	S
42	*Coix lacryma-jobi* L.	Poaceae	Kyeik	G
43	*Colocasia esculenta* (L.) Schott	Araceae	Pein	H
44	*Commelina diffusa* Burm. F.	Commelinaceae	Myet kyut	H
45	*Commelina* sp.	Commelinaceae	Wet-kyut	H
46	*Corchorus* sp.	Tiliaceae	Taw-pilaw	S
47	*Cordia dichotoma* Forst.	Boraginaceae	Thanat	T
48	*Cordyline fruticosa* (L.) A. Chev.	Agavaceae	Zaw-ma	S
49	*Costus speciosus* Sm.	Costaceae	Phalan taung hmwe	H
50	*Crotalaria retusa* L.	Fabaceae	Taw-peiksan	H
51	*Cyperus iria* L.	Cyperaceae	-	G
52	*Cyperus* sp. (1)	Cyperaceae	-	G
53	*Cyperus* sp. (2)	Cyperaceae	-	G
54	*Delonix regia* (Bojer ex Hook.) Raf.	Caesalpiniaceae	Sein pan	T
55	*Desmodium triflorum* (L.) DC.	Fabaceae	Pe yaing	H
56	*Dichanthium caricosum* (L.) A. Camus	Poaceae	Myet-kha, Padaw	G
57	*Digitaria* sp.	Poaceae	-	G
58	*Diospyros* sp.	Ebenaceae	-	T
59	*Dracaena fragrans* (L.) Ker Gawl.	Dracaenaceae	Zawgi taunghway	S
60	*Echinochloa* sp.	Poaceae	-	G
61	*Eclipta alba* (L.) Hassk.	Asteraceae	Kyeik-hman	H
62	*Eleusine indica* L.	Poaceae	Sinngo-myet	G

63	*Erythrina* sp.	Fabaceae	Kathit	T
64	*Euphorbia hirta* L.	Euphorbiaceae	Kywekyaung hmin say	H
65	*Ficus glomerata* Roxb.	Moraceae	Ye thaphan	T
66	*Ficus hispida* L. f.	Moraceae	Kha-aung	ST
67	*Ficus religiosa* L.	Moraceae	Bawdi-nyaung	T
68	*Ficus rumphii* Blume	Moraceae	Nyaung	T
69	*Flemingia* sp.	Fabaceae	Kye-mi	S
70	*Flueggea leucopyrus* Willd.	Euphorbiaceae	Chinya-pyu, Kon-chinya	S
71	*Gardenia jasminoides* Ellis	Rubiaceae	Zizawa	S
72	*Hedyotis corymbosa* (L.) Lam	Rubiaceae	-	H
73	*Heliotropium indicum* L.	Boraginaceae	Sin-hnamaung-gyi	H
74	*Hibiscus rosa-sinensis* L.	Malvaceae	Khaung yan	S
75	*Hygrophila phlomoides* Nees	Acanthaceae	Migyaung kunbat	H
76	*Hyptis rhomboidea* Marts & Gal	Lamiaceae	-	S
77	*Ipomoea aquatica* Forssk.	Convolvulaceae	Kazun-ywet	Cl, Cr
78	*Ipomoea pilosa*Sweet.	Convolvulaceae	Kone-kazun-lay	Cl
79	*Ipomoea sagittata* Poir	Convolvulaceae	Kone-kazun	Cl
80	*Ipomoea* sp.	Convolvulaceae	-	Cl
81	*Ischaemum rugosum* Salisb.	Poaceae	-	G
82	*Ixora* sp.	Rubiaceae	Ponna-yeik	S
83	*Jatropha curcas* L.	Euphorbiaceae	Chan-siyo-kyetsu	ST
84	*Justicia gendarussa* Burm. f.	Acanthaceae	Pha-wa-net	S
85	*Kyllinga monocephala* Rottb.	Cyperaceae	-	G
86	*Lagerstroemia macrocarpa* Kurz	Lythraceae	Pyinma ywet kyi	T
87	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Pyinma	T
88	*Leucaena leucocephala* (Lam.) De Wit	Mimosaceae	Baw-sa-gaing	T
89	*Lindernia crustacea* F. Muell.	Scorphulariaceae	-	H
90	*Ludwigia prostrata* Roxb.	Onagraceae	Lay-hnin	S
91	*Mangifera indica* L.	Anacardiaceae	Tha-yet	T
92	*Mariscus compactus* (Retz.) Druce	Cyperaceae	-	G
93	*Melochia corchorifolia* L.	Sterculiaceae	Pilaw-akyi	S
94	*Merremia gemella* (Burm. f.) Hallier f.	Convolvulaceae	-	Cl, Cr
95	*Mikania micrantha* HBK	Asteraceae	Bizat-new, Yokekhama-shokehtwe	Cl, Cr
96	*Mimosa pudica* L.	Mimosaceae	Hti-ka-yone	H
97	*Mimosa rubicaulis* Lam.	Mimosaceae	Biat-hli-ka-yone	H

98	*Mimusops elengi* L.	Sapotaceae	Khaye	T
99	*Morinda citrifolia* L.	Rubiaceae	Yeyo	ST
100	*Moringa oleifera* Lam.	Moringaceae	Dantalon	T
101	*Mucuna pruriens* (L.) DC.	Fabaceae	Khwe-la-ya	Cl, Cr
102	*Muntingia calabura* L.	Tiliaceae	Tha gya thi	ST
103	*Musa* sp.	Musaceae	Nget-pyaw	T
104	*Nauclea* sp.	Rubiaceae	Ma-u	T
105	*Nerium oleander* L.	Apocynaceae	Nwethagee	S
106	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae	Kyahin-bin	Cl, Cr
107	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Kyaung-sha	T
108	*Passiflora foetida* L.	Passifloraceae	Taw-suka	Cl
109	*Pedilanthus latifolius* Millsp. & Britton	Euphorbiaceae	Gongaman	H
110	*Pennisetum pedicellatum* Trin.	Poaceae	Bottle-brush	G
111	*Phaulopsis parviflora* Willd	Acanthaceae	-	H
112	*Phyllanthus reticulatus* Poir.	Euphorbiaceae	Ye-chiya	S
113	*Phyllanthus urinaria* L.	Euphorbiaceae	Mye-zi-phyu	H
114	*Physalis minima* L.	Solanaceae	Bauk-pin	H
115	*Pithecellobium dulce* (Roxb) Benth.	Mimosaceae	Kala-magyi	T
116	*Plumeria obtusa* L.	Apocynaceae	Akyaw	ST
117	*Plumeria rubra* L.	Apocynaceae	Tayoke-saga	ST
118	*Polyathia longifolia* (Lam.) Benth.& Hook.f.	Annonaceae	Ye-tama	T
119	*Polygonum* sp.	Polygonaceae	-	S
120	*Psidium guajava* L.	Myrtaceae	Malaka	ST
121	*Pterocarpus indicus* Willd.	Fabaceae	Padauk	T
122	*Samanea saman* (Jacq.) Merr.	Mimosaceae	Kokko	T
123	*Scirpus* sp.	Cyperaceae	-	G
124	*Scoparia dulcis* L.	Scorphulariaceae	Darna-thu-kha	H
125	*Senna siamea* (Lam.) Irwin & Barneby	Caesalpiniaceae	Mazali	T
126	*Sida acuta* Burm. f.	Malvaceae	Wet-chay-pane	S
127	*Solanum indicum* L.	Solanaceae	Khayan-kazaw	S
128	*Spathodea campanulata* P. Beauv.	Bignoniaceae	Ye-pyut, African tulip	T
129	*Sphaeranthus indicus* L.	Asteraceae	Mwe soke	H
130	*Streblus asper* Lour.	Moraceae	Okhne	T
131	*Swietenia macrophylla* King	Meliaceae	Mahogani	T
132	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	Bizat-hpo	H

133	*Syngonium podophyllum* Schott	Araceae	-	H
134	*Tamarindus indica* L.	Caesalpiniaceae	Magyi	T
135	*Tectona grandis* L. f.	Verbenaceae	Kyun	T
136	*Terminalia catappa* L.	Combretaceae	Banda	T
137	*Tridax procumbens* L.	Asteraceae	Hmwezok-negya	H
138	*Urena lobata* L.	Malvaceae	Katsene	S
139	*Vernonia cinerea* Less.	Asteraceae	Kadu-pyan	H
140	*Vigna marina* (Burm.) Merr.	Fabaceae	Pe-dalat-yaing	Cl, Cr
141	*Ziziphus jujuba* Lam.	Rhamnaceae	Zee	ST

Source: JICA Survey Team

Table A12.1.2 List of mangrove species in study area

No.	Scientific Name	Family Name	Vanicular Name	Habit*
1	*Acanthus ilicifolius* L.	Acanthaceae	Khaya	S
2	*Avicennia officinalis* L.	Avicenniaceae	Thame	S/T
3	*Caesalpinia crista* L.	Caesalpiniaceae	Alo-lay	Cl
4	*Clerodendrum inerme* Gaertn.	Verbenaceae	Pinle-kyauk-pan	T
5	*Derris trifoliata* Lour.	Fabaceae	New-net	Cl
6	*Flagellaria indica* L.	Flagellariaceae	Myauk kyein	Cl
7	*Hibiscus tiliaceus* L.	Malvaceae	Thinban, Ye-ngan-shaw	ST
8	*Nypa fruticans* Wurmb	Arecaceae	Dani	ST
9	*Phragmites karka* Roxb.	Poaceae	Kyu	G
10	*Pluchea indica* (L.) Less.	Asteraceae	Khayu, Wabalu	S
11	*Pongamia pinnata* Pierre	Fabaceae	Thinn wun phyu	T
12	*Sonneratia apetala* Buch.- Ham.	Sonneratiaceae	-	T
13	*Sonneratia caseolaris* (L.) Engl.	Sonneratiaceae	Lamu	T
14	*Vitex trifolia* L.	Verbenaceae	Kyaung pan lay	ST
15	*Wedelia biflora* (L.) DC.	Asteraceae	-	S

Source: JICA Survey Team

Table A12.1.3 List of Identified Animal Species 1 - Butterfly Species

No.	Scientific name	Common name	Family	Siting place
1	*Phalacrocorax niger*	Little Cormorant	Phalacrocoracidae	aerial
2	*Egretta garzetta*	Little Egret	Ardeidae	river,grassland
3	*Bubulcus ibis*	Cattle Egret		river
4	*Ardeola grayii*	Indian Pond-Heron		river
5	*Actitis hypoleucos*	Common Sandpiper	Scolopacidae	river
6	*Milvus migrans*	Black Kite	Accipitridae	aerial
7	*Spilopelia chinensis*	Spotted Dove	Columbidae	tree,shrub land,building

8	*Columba livia*	Rock Pigeon		grassland
9	*Apus nipalensis*	House Swift	Apodidae	aerial
10	*Halcyon smyrnensis*	White-throated Kingfisher	Alcedinidae	mangrove
11	*Merops orientalis*	Green Bee-eater	Meropidae	mangrove
12	*Merops philippinus*	Blue-tailed Bee-eater		mangrove
13	*Aegithina tiphia*	Common Iora	Aegithinidae	mangrove
14	*Hirundo rustica*	Barn Swallow	Hirundinidae	aerial
15	*Pycnonotus blanfordi*	Streak-eared Bulbul	Pycnonotidae	mangrove
16	*Pycnonotus cafer*	Red-vented Bulbul		mangrove
17	*Pycnonotus jocosus*	Red-whiskered Bulbul		mangrove
18	*Orthotomus sutorius*	Common Tailorbird	Cisticolidae	mangrove
19	*Prinia inornata*	Plain Prinia		reedbed
20	*Copsychus saularis*	Oriental Magpie-Robin	Muscicapidae	mangrove
21	*Saxicola caprata*	Pied Bushchat		shrubland
22	*Acridotheres tristis*	Common Myna	Sturnida	ground
23	*Passer flaveolus*	Plain-backed Sparrow	Passeridae	shrubland
24	*Passer montanus*	Eurasian Tree Sparrow		ground,grassland

Source: JICA Survey Team

Table A12.1.4 List of Identified Animal Species 2 - Bird Species

Sr. No	Scientific Name	Common name	Family	Remark
1	*Euploea core godartii*	Crow	Danaidae	Common
2	*Danaus chrysippus*	Plain Tiger	Danaidae	Very Common
3	*Danaus genutia*	Common Tiger or Striped Tiger	Danaidae	Very Common
4	*Catopsilia pomona*	Emigrant	Peridae	Very Common
5	*Appias lyncida vasava*	Chocolates Albatross	Peridae	Common
6	*Ixias pyrene verna*	Whight Orange Tip	Pieridae	Common
7	*Catopsilia pyranthe pyranthe*	Mottled Emigrant	Pieridae	Common
8	*Catopsilia scylla comelius*	Orange Emigrant	Pieridae	Common
9	*Appias lyncida vasava*	Chocolates Albatross	Peridae	Common
10	*Hebomoia glaucippe*	Great Orange Tip	Pieridae	Common
11	*Eurema hecabe*	Common Grass Yellow	Pieridae	Very Common
12	*Leptosia nina nina*	Psyche	Peridae	Common
13	*Cathosia cyane euanthes*	Leopard Lacewing	Nyamphalidae	Common
14	*Hypolimnas misippus*	Danaid Eggfly	Nyamphalidae	Common
15	*Argyronome laodice*	Pallas's Fritillary	Nyamphalidae	Common
16	*Jamides cunilda nisanca*	Jamides	Lycaenidae	Common

Source: JICA Survey Team

Table A12.1.5 List of Identified Animal Species 3 - Amphibian Species

Sr. No.	Scientific name	Common name	Family	IUCN, 2013	Source
1	*Rana limnocharis*	Paddy frog	Ranidae	Least concern	Observed
2	*Polypedates leucomystax*	Common Tree frog	Rhacophoridae	Least concern	Interview
3	*Bufo melanosticttus*	Common toad	Bufonidae	Least concern	Observed
4	*Kaloula pulchra*	Painted bull frog	Microhylidae	Least concern	Observed

Source: JICA Survey Team

Table A12.1.6 List of Identified Animal Species 4-Reptile Species

Sr. No.	Scientific name	Common name	Family	IUCN, 2009 CITES, 2009	Source
1	*Ptyas korros*	Indo-chinese rat snake	Colubridae	Least Concern	Interview
2	*Ptyas mucosa*	Indian rat snake	Colubridae	Least Concern	Interview
3	*Xenochrophis piscator*	Checkered keelback	Colubridae	Least Concern	Interview
4	*Eutropis carinatus*	Common skink	Scincidae	Least Concern	Observed
5	*Calotes versicolor*	Garden fence lizard	Agamidae	Least Concern	Observed
6	*Calotes emma*	Tree dwelling lizard	Agamidae	Least Concern	Observed

Source: JICA Survey Team

Table A12.1.7 List of Identified Animal Species 5 - Fish Species

Sr. No.	Scientific Name	Common Name	Family
1	*Notopterus notopterus*	Grey featherback	Notopteridae
2	*Puntius spp*	Barb	Cyprinidae
3	*Amblypharyngodon mola*	Mola carplet	Cyprinidae
4	*Labeo calbasu*	Carp	Cyprinidae
5	*Cirrhinus mrigala*	Carp	Cyprinidae
6	*Clarias batrachus*	Walking catfish	Claridae
7	*Heteropneustes fossilis*	Stinging catfish	Heteropneustidae
8	*Anabas testudineus*	Climbing perch	Anabantidae
9	*Late calcarifer*	Giant sea perch	Centropomidae
10	*Mystus montanus*	Striped dwarf catfish	Bagridae
11	*Mystus vittatus*	Catfish	Bagridae
12	*Mystus bleekeri*	Catfish	Bagridae
13	*Mystus leucophasis*	Catfish	Bagridae
14	*Neotropius acutriostris*	Dwarf cat-fish	Schilbeidae
15	*Channa striatus*	Striped snake head	Channidae
16	*Channa orientalis*	Brown snakehead	Channidae
17	*Channa panaw*	Green snakehead	Channidae

18	*Macrognathus aral*	Lesser spiny eel	Mastacembelidae
19	*Macrognathus zebrinus*	Burmese spiny eel	Mastacembelidae
20	*Monopterus albus*	Asian swamp eel	Synbranchidae
21	*Monopterus cuchia*	Cuchia	Synbranchidae
22	*Oreochromic spp*	Mozambic cichlid	Cichlidae
23	*Boleophthalmus boddarti*	Boddart's goddle eye goby	Gobiidae
24	*Glossogobius giuris*	Gobifish	Gobiidae
25	*Polynemus paradiseus*	Mangoes fish	Polynemidae
26	*Cynoglossus lingua*	Long tonguesole	Cynoglossidae

Source: JICA Survey Team

Table A12.1.8 Benthos species recorded in the Project site

Sr.No	Species	Common Name	Family	Status
1	*Ocypoda routandas*	Crab	Ocypodidae	Common
2	*Scarteloas tenius*	Slender mudskipper	Gobiidae	Common
3	*Leptocarpus fluminicola*	Delta prawn	Palaemonidae	Common

Source: JICA Survey Team

Appendix 12.3 Results of Survey for Preparation of Abbreviated Resettlement Plan (ARP)

Table A12.3.1 Affected trees within ROW of Approach Roads

Sr. No.	WP No.	Coordination X			Coordination Y			Species of trees*	height (m)	diameter at breast height	shape of tree	living condition**
		De.	Mi.	Se.	De.	Mi.	Se.					
(1) Thaketa Township												
1	006	16	48	2.4	96	13	31.6	*Swietenia macrophylla*	10	0.8	V	Δ
2	007	16	48	2.1	96	13	31.3	*Swietenia macrophylla*	10	0.8	V	Δ
3	008	16	48	2.0	96	13	31.2	*Swietenia macrophylla*	10	0.8	V	Δ
4	009	16	48	1.9	96	13	31.1	*Swietenia macrophylla*	10	0.6	C	Δ
5	010	16	48	1.9	96	13	31.1	*Acacia auriculiformis A. Cunn.*	10	0.8	V	Δ
6	011	16	48	1.9	96	13	30.9	*Swietenia macrophylla*	4	0.5	C	Δ
7	012	16	48	1.8	96	13	30.9	*Swietenia macrophylla*	7	0.6	C	Δ
8	016	16	48	1.2	96	13	30.5	*Swietenia macrophylla*	7	0.5	C	Δ
9	020	16	48	1.4	96	13	31.7	*Swietenia macrophylla*	6	1	O	Δ
10	021	16	48	1.4	96	13	31.7	*Swietenia macrophylla*	5	0.5	C	Δ
11	022	16	48	1.4	96	13	31.8	*Swietenia macrophylla*	4	1	C	Δ
12	023	16	48	1.7	96	13	32.3	*Samanea saman (Jacq.) Merr.*	7	0.5	C	Δ
13	024	16	48	1.7	96	13	32.3	*Samanea saman (Jacq.) Merr.*	4	0.5	C	Δ
14	025	16	48	1.1	96	13	33.0	*Cocos nucifera*	8	1	C	Δ
15	026	16	48	1.1	96	13	33.0	*Mangifera indica (Mango)*	6	0.6	O	Δ
16	027	16	48	1.0	96	13	33.2	*Casuarina equisetifolia*	12	0.8	V	Δ
17	028	16	48	0.8	96	13	33.3	*Casuarina equisetifolia*	11	0.8	V	Δ
18	029	16	48	0.5	96	13	33.3	*Samanea saman (Jacq.) Merr.*	6	0.3	V	Δ
19	030	16	48	0.4	96	13	33.2	*Terminalia catappa L.*	10	0.8	O	Δ
20	031	16	48	0.4	96	13	33.1	*Pterocarpus macrocarpus*	6	0.3	V	Δ
21	032	16	48	0.0	96	13	32.7	*Samanea saman (Jacq.) Merr.*	6.5	0.4	V	Δ
22	034	16	48	0.1	96	13	33.4	*Samanea saman (Jacq.) Merr.*	5	1	O	Δ
23	038	16	47	55.9	96	13	34.8	*Acacia auriculiformis A. Cunn.*	6.8	0.5	V	Δ
24	039	16	47	55.1	96	13	35.2	*Acacia auriculiformis A. Cunn.*	11	0.6	V	Δ
25	040	16	47	54.9	96	13	35.5	*Acacia auriculiformis A. Cunn.*	7	0.6	V	Δ
26	041	16	47	54.5	96	13	35.6	*Acacia auriculiformis A. Cunn.*	8	0.6	V	Δ
27	042	16	47	54.4	96	13	35.7	*Acacia auriculiformis A. Cunn.*	7	0.8	V	Δ
28	043	16	47	54.5	96	13	35.5	*Terminalia catappa L.*	4	0.5	O	Δ
29	044	16	47	52.7	96	13	36.8	*Terminalia catappa L.*	11	0.7	C	Δ
30	045	16	47	52.8	96	13	36.8	*Terminalia catappa L.*	11	0.8	C	Δ
31	046	16	47	52.6	96	13	36.8	*Ficus glomerata (Country Fig)*	9	0.4	V	Δ

32	047	16	47	52.6	96	13	36.9	*Terminalia catappa L.*	9	0.5	V	Δ
33	048	16	47	52.1	96	13	37.2	*Terminalia catappa L.*	12	1	O	Δ
34	070	16	47	51.2	96	13	37.7	*Terminalia catappa L.*	5	0.8	V	Δ
35	071	16	47	48.4	96	13	39.4	*Bonbax ceiba*	7	0.3	V	Δ
36		Around N 16 47 47.9, E 96 13 39.8; swampy area						*Mangrove*	5	0.5	V	○
37								*Mangrove*	5	0.5	V	○
38								*Mangrove*	8	0.5	V	○
39								*Mangrove*	8	0.5	V	○
40								*Mangrove*	7	0.6	V	○
41								*Mangrove*	5	0.4	O	○
42								*Mangrove*	10	0.6	O	○
43	072	16	47	47.5	96	13	39.8	*Mangrove*	10	1	O	○
44	073	16	47	47.3	96	13	40.1	*Bonbax ceiba*	5	0.3	C	x
45	074	16	47	46.2	96	13	40.6	*Mangrove*	5	0.5	O	○
46		16	47	46.2	96	13	41.2	*Mangrove*	5	0.5	O	○
(2) Thanlyin Township												
47	078	Around N 16 47 1.9, E 96 14 9.3; swampy area						*Mangrove*	4.5	0.5	O	○
48								*Mangrove*	5	1	O	○
49								*Mangrove*	6	0.5	O	○
50		16	47	0.1	96	14	11.2	*Samanea saman (Jacq.) Merr.*	7	1.5	O	Δ
51		16	46	59.8	96	14	10.9	*Albizia procera*	8	0.9	V	Δ
52		Around N 16 46 57.4, E 96 14 13.4; swampy area						*Samanea saman (Jacq.) Merr.*	15	1	O	Δ
53								*Albizia procera*	17	0.9	V	Δ
54								*Terminalia catappa L.*	7	0.3	C	Δ
55	097	16	46	52.9	96	14	17.3	*Samanea saman (Jacq.) Merr*	3	0.2	C	x
56	098	16	46	53.3	96	14	17.0	*Samanea saman (Jacq.) Merr*	4	0.5	O	Δ
57	099	16	46	53.7	96	14	16.7	*Albizia procera*	4	0.3	Y	Δ
58	100	16	46	53.6	96	14	16.6	*Albizia procera*	4	0.4	Y	Δ
59	101	16	46	53.6	96	14	16.5	*Samanea saman (Jacq.) Merr*	5	0.5	Y	Δ
60	102	16	46	53.8	96	14	16.4	*Albizia procera*	7	0.3	C	Δ
61	103	16	46	54.0	96	14	16.8	*Ficus rumphii Blume*	6	2.6	O	Δ
62	104	16	46	54.1	96	14	16.7	*Ficus rumphii Blume*	7	1	Y	Δ
63	105	16	46	54.4	96	14	16.1	*Ficus glomerata/Ficus racemosa*	8	1.2	O	Δ
64	106	16	46	54.3	96	14	16.0	*Samanea saman (Jacq.) Merr.*	6	0.8	O	Δ
65	107	16	46	54.4	96	14	16.0	*Samanea saman (Jacq.) Merr.*	6	0.9	Y	Δ
66	108	16	46	54.7	96	14	15.9	*Samanea saman (Jacq.) Merr.*	7	1.2	Y	Δ
67	109	16	46	54.8	96	14	15.9	*Samanea saman (Jacq.) Merr.*	10	3	Y	Δ
68	110	16	46	54.9	96	14	15.9	*Samanea saman (Jacq.) Merr.*	12	1.2	Y	Δ

69	117	16	46	52.7	96	14	17.2	*leucaenna leucocephala*	7	0.2	C	Δ
70	118	16	46	52.4	96	14	17.2	*Samanea saman (Jacq.) Merr.*	7	0.8	V	Δ
71	119	16	46	52.1	96	14	17.4	*Terminalia catappa L.*	7	0.8	C	Δ
72	120	16	46	52.1	96	14	17.5	*Ficus rumphii Blume*	6	0.9	V	Δ
73	121	16	46	52.1	96	14	17.7	*Mimusops elengi L.*	4	0.3	O	Δ
74	122	16	46	52.1	96	14	17.8	*Terminalia catappa L.*	6	0.3	O	Δ
75	123	16	46	52.0	96	14	18.0	*Swietenia macrophylla*	8	0.5	C	Δ
76	124	16	46	51.8	96	14	18.2	*casuarina equisetifolia*	10	0.8	V	Δ
77	125	16	46	51.8	96	14	18.3	*Samanea saman (Jacq.) Merr.*	9	2.5	O	Δ
78	126	16	46	52.1	96	14	18.5	*Ziziphus jujuba Lam.*	5	0.5	O	Δ
79	127	16	46	52.0	96	14	18.4	*Ziziphus jujuba Lam.*	4	0.2	O	Δ
80	128	16	46	52.6	96	14	18.0	*Cocos nucifera*	3	0.2	C	Δ
81	131	16	46	51.9	96	14	17.5	*Terminalia catappa L.*	7	0.4	C	Δ
82	176	16	46	49.1	96	14	20.3	*Polyathia longifolia (Lam.) Benth.& Hook.f.*	7	0.3	O	Δ
83	177	16	46	49.1	96	14	20.2	*leucaenna leucocephala*	8	0.3	V	Δ
84	178	16	46	49.7	96	14	19.9	*Cocos nucifera*	10	0.8	C	Δ
85	179	16	46	50.3	96	14	19.7	*Samanea saman (Jacq.) Merr.*	15	1	O	O
86	180	16	46	50.3	96	14	19.4	*Samanea saman (Jacq.) Merr.*	7	0.8	O	Δ
87	184	16	46	51.3	96	14	18.7	*Ficus rumphii Blume*	10	1.5	V	Δ
88	185	16	46	51.4	96	14	18.8	*Mangifera indica (Mango)*	6	0.6	O	Δ
89	186	16	46	51.6	96	14	18.6	*casuarina equisetifolia*	12	1	V	Δ
90	187	16	46	49.2	96	14	20.6	*Delonix regia*	10	1	V	Δ
91	188	16	46	49.2	96	14	20.7	*Lagerstroemia reginae*	6	0.5	V	Δ
92	189	16	46	48.9	96	14	20.8	*Acacia auriculiformis A. Cunn.*	7	0.5	V	Δ
93	190	16	46	48.6	96	14	20.9	*Acacia auriculiformis A. Cunn.*	7	0.9	V	Δ
94	191	16	46	47.7	96	14	22.1	*Acacia auriculiformis A. Cunn.*	7	0.6	V	Δ
95	192	16	46	47.6	96	14	22.2	*Acacia auriculiformis A. Cunn.*	6	0.7	V	Δ
96	193	16	46	47.5	96	14	22.3	*Acacia auriculiformis A. Cunn.*	6	0.5	V	Δ
97	194	16	46	47.4	96	14	22.6	*Bauhinia monandra*	6	0.5	V	Δ
98	195	16	46	47.4	96	14	22.8	*Bauhinia monandra*	5	0.3	C	Δ
99	196	16	46	47.3	96	14	22.9	*Bauhinia monandra*	5	0.3	V	Δ
100	197	16	46	47.3	96	14	22.9	*Samanea saman (Jacq.) Merr.*	10	1	O	Δ
101	198	16	46	47.2	96	14	22.9	*Acacia auriculiformis A. Cunn.*	7	0.3	V	Δ
102	199	16	46	47.1	96	14	23.0	*Bauhinia monandra*	8	0.3	V	Δ
103	200	16	46	47.2	96	14	23.2	*Bauhinia monandra*	8	0.4	V	Δ
104	201	16	46	47.1	96	14	23.2	*Acacia auriculiformis A. Cunn.*	9	0.3	V	Δ
105	202	16	46	47.0	96	14	23.4	*Acacia auriculiformis A. Cunn*	7	0.5	C	Δ
106	203	16	46	47.3	96	14	23.4	*Areca catechu (Area Nut Palm, Betel Nut)*	4	1.7	C	Δ

107	204	16	46	47.5	96	14	23.2	*Areca catechu (Area Nut Palm, Betel Nut)*	4	1.7	C	Δ
108	205	16	46	47.2	96	14	23.7	*Areca catechu (Area Nut Palm, Betel Nut)*	2.5	1.5	C	Δ
109	206	16	46	47.9	96	14	23.7	*Areca catechu (Area Nut Palm, Betel Nut)*	4.5	1.7	C	Δ
110	207	16	46	47.6	96	14	23.6	*Areca catechu (Area Nut Palm, Betel Nut)*	4	1.7	C	Δ
111	208	16	46	47.0	96	14	23.8	*Areca catechu (Area Nut Palm, Betel Nut)*	3	0.7	C	Δ
112	209	16	46	46.1	96	14	24.5	*Hedera helix*	2	0.1	O	Δ
113	212	16	46	46.5	96	14	23.6	*Elaeis guineensis*	4	1.5	O	Δ
114	213	16	46	46.7	96	14	23.8	*Areca catechu (Area Nut Palm, Betel Nut)*	3	0.5	C	Δ
115	214	16	46	46.7	96	14	23.7	*Areca catechu (Area Nut Palm, Betel Nut)*	3	0.4	C	Δ
116	215	16	46	46.3	96	14	25.1	*Areca catechu (Area Nut Palm, Betel Nut)*	3.5	0.1	C	Δ
117	216	16	46	46.4	96	14	24.9	*Areca catechu (Area Nut Palm, Betel Nut)*	3.5	0.1	C	Δ
118	217	16	46	46.5	96	14	24.8	*Areca catechu (Area Nut Palm, Betel Nut)*	3.5	0.1	C	Δ
119	218	16	46	46.6	96	14	24.7	*Areca catechu (Area Nut Palm, Betel Nut)*	3.5	0.1	C	Δ
120	219	16	46	46.7	96	14	24.5	*Areca catechu (Area Nut Palm, Betel Nut)*	3.5	0.1	C	Δ
121	220	16	46	46.8	96	14	24.4	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.1	C	Δ
122	230	16	46	45.7	96	14	25.3	*Polyathia longifolia (Lam.) Benth.& Hook.f*	7	0.3	P	Δ
123	231	16	46	45.6	96	14	25.2	*Areca catechu (Area Nut Palm, Betel Nut)*	7	1	C	Δ
124	233	16	46	45.0	96	14	26.0	*Acacia auriculiformis A. Cunn*	8	0.5	O	Δ
125	234	16	46	44.9	96	14	26.1	*Ficus rumphii Blume*	4	1	O	Δ
126	235	16	46	44.9	96	14	26.4	*Acacia auriculiformis A. Cunn*	8	1	V	Δ
127	236	16	46	44.3	96	14	27.2	*Samanea saman (Jacq.) Merr.*	7	0.5	V	Δ
128	237	16	46	45.0	96	14	25.9	*Samanea saman (Jacq.) Merr.*	8	0.5	V	Δ
129	240	16	46	44.7	96	14	26.3	*Terminalia catappa L.*	7	0.5	C	Δ
130	242	16	46	43.8	96	14	27.8	*Samanea saman (Jacq.) Merr.*	6	0.3	V	Δ
131	243	16	46	43.8	96	14	28.0	*Delonix regia*	10	0.9	V	Δ
132	244	16	46	43.5	96	14	28.3	*Delonix regia*	11	0.4	V	Δ
133	245	16	46	43.5	96	14	28.5	*Delonix regia*	11	0.5	V	Δ
134	246	16	46	43.4	96	14	28.6	*Delonix regia*	12	0.6	V	Δ
135	247	16	46	43.3	96	14	28.7	*Delonix regia*	10	0.8	V	Δ
136	248	16	46	43.2	96	14	28.7	*Lagerstroemia reginae*	7	0.4	O	Δ
137	249	16	46	43.2	96	14	28.9	*Delonix regia*	11	0.3	O	Δ
138	250	16	46	43.2	96	14	29.0	*Delonix regia*	11	0.3	V	Δ
139	251	16	46	43.5	96	14	29.2	*Areca catechu (Area Nut Palm, Betel Nut)*	3	0.1	C	Δ
140	252	16	46	43.6	96	14	29.1	*Areca catechu (Area Nut Palm, Betel Nut)*	3	0.1	C	Δ
141	253	16	46	43.7	96	14	28.7	*Areca catechu (Area Nut Palm, Betel Nut)*	1	0.01	C	Δ
142	254	16	46	43.8	96	14	28.6	*Areca catechu (Area Nut Palm, Betel Nut)*	1	0.01	C	Δ
143	255	16	46	44.1	96	14	28.3	*Areca catechu (Area Nut Palm, Betel Nut)*	1	0.01	C	Δ
144	256	16	46	44.3	96	14	28.1	*Areca catechu (Area Nut Palm, Betel Nut)*	1	0.01	C	Δ

145	257	16	46	45.5	96	14	26.2	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.02	C	Δ
146	258	16	46	45.4	96	14	26.2	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.02	C	Δ
147	259	16	46	45.3	96	14	26.4	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.02	C	Δ
148	260	16	46	45.1	96	14	26.5	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.02	C	Δ
149	261	16	46	45.0	96	14	26.6	*Areca catechu (Area Nut Palm, Betel Nut)*	2	0.02	C	Δ
150	264	16	46	45.6	96	14	26.6	*Delonix regia*	7	0.4	V	Δ
151	268	16	46	44.4	96	14	28.3	*Acacia auriculiformis A. Cunn.*	6	0.6	V	Δ
152	269	16	46	44.1	96	14	28.8	*Swietenia macrophylla*	6	0.4	V	Δ
153	270	16	46	43.9	96	14	29.1	*Delonix regia*	4	0.1	V	Δ
154	272	16	48	0.3	96	13	34.9	*casuarina equisetifolia*	15	0.4	V	Δ
155	273	16	48	0.5	96	13	34.9	*Swietenia macrophylla*	8	0.3	C	Δ
156	274	16	48	0.6	96	13	34.8	*Swietenia macrophylla*	6	0.4	O	Δ
157	276	16	48	0.5	96	13	34.7	*casuarina equisetifolia*	12	0.5	V	Δ
158	277	16	48	0.8	96	13	34.7	*Samanea saman (Jacq.) Merr.*	10	0.2	O	Δ
159	278	16	48	0.9	96	13	34.6	*Samanea saman (Jacq.) Merr.*	10	0.3	V	Δ
160	279	16	48	0.8	96	13	34.5	*Terminalia catappa L.*	7	0.07	V	Δ

Note 1: Shape of tree. V – V-shaped, C – Columnar, P – Pyramidal, O - Oval

Source: JICA Survey Team

Appendix 12.4 Confirmation of Environmental and Social Considerations for the Proposed Project by JICA Environmental Checklist

Table A12.4.1 Confirmation of JICA Checklist for bridge and road construction

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Example)
1. Permits and Explanation	(1) EIA and Environmental permits	(a) Have EIA reports been already prepared in official process?	(a) N	(a) 1) In Myanmar Environmental Conservation Law (2012) was enacted. However, legislation regarding EIA is not established at present. Environmental Impact Assessment Procedures (draft, 2013) proposed by MOECAF stipulates EIA in detail. However, at present it is under discussion with concerned ministries and organizations. 2) Through hearing MOECAF officer, at present, in the case of official development scheme by the foreign public sector including foreign donors, the approval for the project implementation is attained through several processes (i) At first, the project proponent shall submit project proposal documents together with a feasibility study report including the results of Environmental Impact Assessment (EIA)/Social Impact Assessment (SIA) to the Foreign Economic Relations Department (FERD) of Ministry of National Planning and Economic Development (MNPED). EIA report should be prepared by third parties including foreign consultants. Thus, the IEE report prepared by JICA consultants team is applicable to submission of PW to FERD for obtaining Environmental Clearance Certificate (ECC).
		(b) Have EIA reports been approved by authorities of the host country's government?	(b) N	(b) At present, EIA report was not submitted to obtain approval from MOECAF. In the case of official development scheme by the foreign public sector including foreign donors, (i) At first, the project proponent shall submit project proposal documents together with a feasibility study report including the results of Environmental Impact Assessment (EIA)/Social Impact Assessment (SIA) to the Foreign Economic Relations Department (FERD) of Ministry of National Planning and Economic Development (MNPED).
		(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	(c)	(c) When the project proponent (Public Works) submit applications to FERD for approval of the project implementation together with environmental approval, there is some possibility that incidental conditions are imposed by concerned organizations.

		(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(d) N	(d)1) Environmental Clearance Certificate given by MOECAF does not cover matters of land acquisition and resettlement, and protection of indigenous peoples. 2) Land acquisition and resettlement is under the control of responsible organizations such as YCDC City Planning and Land Administration Department, Award Committee, District Administrator. 3) As for protection of indigenous peoples is under 4) As for removal, relocation or replanting of trees including mangroves, it is firstly required to obtain permission from Forest Department of MOECAF. After then the relevant trees can be treated by YCDC Playgrounds, Parks and Gardening Department by paying necessary charges.
	(2) Explanation to the Public	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?	(a) Y	(a) 1) Through Steering Committee and stakeholder meeting on January 24th,2014 contents and the potential impacts have been adequately explained to the local stakeholders including Project Affected persons (PAPs) and understanding is obtained. In the stakeholder meeting following questions and comments were proposed: (i) selection of three options for river crossing routes and (ii) location of the bridge site toward existing Thanlyin Bridge, (iii) To cope with installed utilities. Corresponding answers were given to them at the meeting and through individual consultation. 2) In addition, through Steering Committee and stakeholder meeting of YUTRA scope and outline of the project were explained several times.
		(b) Have the comments from the stakeholders (such as local residents) been reflected to the project design?	(b) Y	(b)The comments were reflected to design of bridge and approach roads and plan of countermeasures for construction work.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Following alternatives were examined.1) Comparison among three options of river crossing routes. 2) Comparison of bridge site locations upstream and downstream side toward existing Thanlyin Bridge. 3) Comparison with zero option.
2. Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigation measures taken?	(a) Y	(a) 1) Air quality standards are not established in Myanmar. According to result of actual air quality measurement values of air quality near the approach roads are within the range of the environmental standard of Japan and WHO Guidelines.. 2) Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. This may also result in an increase in emission load of air pollutants such as PM, NOx, etc. 2) Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road. Thus, following measures will be taken: (i) Proper management for control of vehicle exhaust emission and establish inspection system of exhaust gas emission. (ii) To make green belt with trees and/or vegetation covers. (iii)) Air quality monitoring along the road

		(b) If air quality already exceed country's standards near the route, is there a possibility that the project will make air pollution worse?	(b) Y	(b) 1) According to air quality measurements, observed values of air pollutants are rather lower level and indicate that air pollution is not progressing. 2) Improvement of traffic congestion may give rise to an increase in the number of vehicles traveling. However, this may also result in an increase in emission load of air pollutants such as PM, NOx, etc. 3) Poor emission control of many vehicles due to lack of maintenance and inspection may accelerate to spew out air pollutants (PM, NOx, etc.) along the road.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	(a) N	(a) 1) At present ambient water quality standards are not established in Myanmar. 2) According to the project plan, following measures are prepared: (i) Proper management for control of vehicle exhaust emission and establish inspection system of exhaust gas emission. (ii) To make green belt with trees and/or vegetation covers in order to shelter vehicle exhaust emissions. (III) Air quality monitoring along the road. 3) Thus, expected impacts on water pollution will be minimized.
		(b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?	(b) N	(b) Surface runoff from roads will be discharged through gutter and/or drainage and flown into the river. Thus, there is little possibility to contaminate groundwater.
		(c) Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards?	(c) N	Facilities such as parking area/service areas are not included in the project plan.

	(3) Noise and Vibration	(a) Do noise and vibrations from vehicle and train traffic comply with the country's standards?	(a) Y	(a) 1) Noise and vibration standards from vehicle and train traffic are not established in Myanmar. However, according to the actual measurement result, measurement values of noise near the access roads are within the range of the environmental standard of Japan and WHO Guidelines. 2) Increase in generation of noise and vibration due to increase in traffic volume is expected. Thus, following measures will be prepared: (i) Preventive measures for noise pollution (avoiding abuse of horn, good maintenance of vehicles, regulation of over-loading. (ii) To make green belt with trees and/or vegetation covers in order to shelter vehicle noise. (iii) Noise monitoring along roads.
		(b) Do low frequency sound from the vehicle and train traffic comply with the country's standards?	(a) Y	There is no standard for low frequency sound in Myanmar. However, measures to reduce generation of low frequency sound will be incorporated in the project plan. It is assumed that the impact of low frequency sound by vehicle traffic is small as of the noise, but the actual measurement data does not exist at all. There is no standard for low frequency sound in Myanmar. A new measurement is also technically difficult in Myanmar.
	(4) Waste	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	(b) N	Facilities such as parking area/service areas are not included in the project plan.
		(a) In the case of that large volumes of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	(c)Y	1) According to construction plan, considerable volume of excavated/dredged materials are expected to generate from construction work of bridge section. Waste management plan of these materials are as follows: will be stored and transported in bridge Thus, impact due to waste will be minimized.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(d) N	There are no odor sources.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the	(e) N	(a) There are no protected areas in and around the project area.

		country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?		
	(2) Ecosystem and biota	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	(a) Y	(a) No. There are neither primeval forests nor tropical rain forests. Some mangrove communities and tidal flat are distributed near bridge site. However, they are with a small scale and are scattered in comparison with mangrove communities distributed along river bank of upper stream.
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	(a) Y	(a) ～(c) 1) In the project site there are following two plant species which categorized as threatened plant species in IUCN Red List. (i) *Delonix regia* (Bojer ex Hook) Raf.- Seinban tree and (ii) *Swieteniamacrophylla* King – Mahogany tree 2) However, both species are sub-categorized as vulnerable ones, which means in the condition of less threatened than critically endangered or endangered species in the Red List. In fact two tree species are planted and found commonly at parks, greenery area and along the roads in Yangon City. 3) According to instruction from Forest Department, MOECAF, removal and/or relocation or replanting trees including these two species, at first to submit application letter including data of tree species, location and numbers of trees, to the Department for obtaining permission. In the project plan, these trees will be avoided to cut and to relocate as much as possible. If cutting is unavoidable, it is required to replant twice numbers of trees with paying necessary charge to YCDC-PPGD.
		(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(b) Y	
		(d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock?	(c) Y	
		(e) Is there a possibility that installation of bridge and access roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of	(a) N	There are neither natural forest nor wetland. Desertification is unlikely considering located in tropical monsoon area. In addition, project area is urbanized and developed area and some exotic species have already been introduced.

		ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?		
		(f) In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	(b) N	
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	(a) Y	(a) 1) There is some awareness of river scouring at the bridge site. Scour action will be especially strong during rainy season. In order to avoid or minimize it, preventive measures against souring such as Steel Pipe Sheet Pile Foundation is prepared in the project plan. For it is considered the optimal solution for the mainstream of the foundation type in terms of its applicability to deep-water construction and anti-scouring properties. 2) Monitoring of scouring.
		(b) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	(b) Y	(b) There is a possibility that bridge piers may change somewhat the flow of the Bago River. However, span length is sufficiently secured as a route of inland transportation by water. The impacts for the flow are assumed to be minor.
	(4) Topography and Geology	(a) Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?	(a)	(a) No. There is flat land except for the river. Bank roads were constructed on the embankment. It is quite low possibility of landslides.
		(b) Is there a possibility that civil works, such as cutting and filling will cause slope	(b) Y	(b) No. It is considered that soil embankment works are performed properly without collapse. The EIA report to be conducted will propose concrete measures to prevent collapse.

		failures or landslides? Are adequate measures considered to prevent slope failures or landslides?		
		(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(c) Y	(c) The EIA report to be conducted will propose counter measures to prevent soil runoff from fill areas and borrow sites.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	(a) Y	(a) 1) All the Right of Way (ROW) for planned bridge and approach roads are public land and owned by government such as Myanmar Railway Authority, Ministry of Construction, YCDC and YRDC). Thus, displacement of houses and people is not expected. 2) However, encroachment of a few stalls and two small religious praying facilities on ROW is found. Therefore, the above structures are required to removal, relocation, filling of income and/or assistance to restoration of existing living condition. 3) About 160 trees within ROW of approach roads will be affected. 4) Some land for construction related facilities (construction office, worker's camp, storage of construction materials and waste) will be affected. 5) Abbreviated Resettlement Plan (ARP) according to JICA Guidelines will be prepared, although with a small scale.
		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	(b) Y	(b) According to ARP necessary compensation and resettlement assistance will be given.
		(c) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	(c) Y	(c) ARP will be developed based on socioeconomic studies on resettlement.

		(d) Is the compensations going to be paid prior to the resettlement?	(d) N	(d) According to ARP compensations will be paid prior to the resettlement.
		(e) Is the compensation policies prepared in document?	(e) Y	(e) Compensation and assistance policies will be prepared in document.
		(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?	(f) N	(f) The resettlement plan will pay particular attention to vulnerable groups, although ethnic minorities and indigenous peoples are not found in the project area.
		(g) Are agreements with the affected people obtained prior to resettlement?	(g) N	If Public Works decide the implementation of the proposed project in future, agreement with affected people should be obtained prior to resettlement by referring to results of the Preparatory Survey.
		(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?	(h) N	If Public Works decide the implementation of the proposed project in future, the organizational framework to properly implement the resettlement should be established by referring to results of the Preparatory Survey.
		(i) Are any plans developed to monitor the impacts of resettlement?	(i) N	If Public Works decide the implementation of the proposed project in future, monitoring plans to examine the impacts of resettlement should be established by referring to results of the Preparatory Survey.
		(j) Is the grievance redress mechanism established?	(j) Y	If Public Works decide the implementation of the proposed project in future, grievance redress mechanism should be established by referring to results of the Preparatory Survey.
	(2) Living and Livelihood	(a) Where bridges and access roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the	(a) Y	(a) Improvement of Traffic condition between Yangon City area, and Thanlyin Township and Thilawa SEZ will greatly enhance economic and industrial development of Greater Yangon as well as improvement of people's access to social services.

		project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?		
		(b) Is there a possibility that the project will adversely affect the living conditions of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(b) Y	(b) The project route is linked to future transport network plan to improve traffic and living condition of people, which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA). Thus, the project may not cause adverse impacts to inhabitants of surrounding areas.
		(c) Is there a possibility that diseases, including communicable diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?	(c) Y	(c)1) Road construction workers and truck drivers are considered as having high potential for the spread of sexually transmitted diseases (STDs) and HIV/AIDS due to their mobility. It was reported infection with HIV/AIDS and venereal disease at worker's camp during road construction stage in other developing countries. 2) (i) Education of and campaign of prevention and cure of HIV/AIDS to residents and construction workers. (ii) Monitoring of cases of HIV/AIDS before, during and after the construction stage, if necessary.
		(d) Is there a possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increases in traffic congestion and traffic accidents)?	(b) N	(d) The project route is linked to future transport network plan to improve traffic and living condition of people, which were proposed by Greater Yangon Urban Transport Master Plan Study (YUTRA). Thus, the project may not cause adverse impacts to inhabitants of surrounding areas.
		(e) Is there a possibility that bridge and access roads will impede the movement of	(c) N	(e) 1) Bago River Bridge is planned for passenger use and not for freight use. Therefore, traffic condition between Yangon City area and Thanlyin will be greatly improved. 2) Sidewalks with 2 m width will be installed in both side of bridge and approach roads. Thus, non-mechanized transport

		inhabitants?		will be ensured. 3) Approach roads will be linked to existing road at grade and will not impede the movement of inhabitants.
		(f) Is there a possibility that bridge and access roads will cause a sun shading and radio interference?	(d) Y	(d) Site of Bago River Bridge and approach roads are surrounded by scattered area and Bago River. Thus, adverse impact on sunlight shading and radio frequency is not expected.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) No. There are no cultural and heritage sites in and around the project area, although many religious facilities such as pagodas, temples, churches are distributed in Greater Yangon.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(b) Y	(a) 1) Existing bridge landscape in and around Bago River produced by Thanlyin Bridge will be somewhat changed by appearance of Bago River Bridge, which is planned to construct nearby at about 140m downstream of existing Thanlyin Bridge. Thus, it is required to make bridge design to establish new attractive landmark and to harmonize with the Thanlyin Bridge. 2) In the bridge structure design of Bago River Bridge it will be considered to generate new aesthetic value and harmonize with existing Thanlyin Bridge. In approach road design it will be considered to contribute roadside aesthetic scenery by arrangement green belt with trees and vegetation covers.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(c) N	(a)(b) There is no ethnic minorities and indigenous peoples in the project area.
		(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) Y	

	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	(b) Y	(a) Mitigation measures to abide Law on labor and the proposed Law on Occupational Health and safety will be taken.
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	(c) Y	b) (i) Any worker and personnel who enter into construction sites have to bear safety shoes and hats for construction works. (ii) Site manager of the contractor must conduct morning assembly every day by collecting all the laborers and give instructions to them on safety control of construction site and thoroughly conduct safety management of the site. (iii) In the construction site where heavy machines for construction are operated, intrusiveness except concerned parties should be banned. (iv) Consider safety handling and storage in airtight containers of hazardous and dangerous materials.
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	(d)Y	(c) Preparation of environmental and safety management plan, and conducting education of traffic safety and public and occupational health to workers and staff. (d) Proper management and education of guards and/or relevant personnel not to infringe safety and security of residents and staff and workers
		(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)Y	In the project plan measures to control security guards not to violate safety of project site and residents, is incorporated, if any.

5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	(b) Y	1) Air pollution : (i) Use construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. (ii) Safety driving and control of vehicle speed (iii) Enlightenment and education of construction workers for prevention or minimize air pollutants generation. (iv) Monitoring of air quality. 2) Water pollution: 1) Proper treatment of water pollutants generated from construction work to comply with wastewater regulation by YCDC. 2) Surface run-off from the construction site shall be directed to silt traps or sedimentation basin before reuse or discharge with help of channels. 3) To shelter scattering river mud from dredging work by using submerged fence in order to avoid increase in turbidity. 3) Soil contamination: (i)To keep clean storage sites of construction equipment, (ii) To install storage tank for preventing spill and leakage of lubricating oil and asphalt emulsifier etc. (iii) Training of workers for proper handling of toxic materials. 4) Bottom sediment pollution: (1) To shelter scattering river mud from dredging work by using submerged fence. 2) Monitoring of bottom sediment pollution. Following measures will be taken: (i) Blowers and pumps should be installed in buildings. (ii) Working during sensitive hours and locating construction machines close to sensitive receptors shall be avoided. (iii) Use equipment with low-noise and vibration. (iv) Installation of soundproof walls/acoustic enclosures and provision of buffer zones. 5) (i) Consider ways to minimize waste generation in the construction work plan. (ii) Enlightenment and education of construction workers for waste management based on 3R principle (reduce, reuse, recycle). (iii) Construction waste and waste from worker's camp will be carried out by proper segregation, collection, treatment, reuse and recycle. Then remained waste will be transferred to designated dumping site for final disposal. 6) (i) Working during sensitive hours and locating construction machines close to sensitive receptors shall be avoided. (ii) Use equipment with low-noise and vibration. (iii) Installation of soundproof walls/acoustic enclosures and provision of buffer zones. (iv) Setting staff in charge of complaints. 7) (i) To use construction vehicles and machines with good maintenance. (ii) To shelter scattering river mud from dredging work by using submerged fence made of plastics.
		(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	(a) Y	1) Terrestrial ecosystem - (i) To avoid places where valuable two plant species are distributed. If it is unavoidable, prior consultation with YCDC-PPGD and MOECAF and permission to replanting. (ii) planted trees along the road contribute to the greenery and visual amenity providing relaxation and recreation area to local residents. Thus, cutting or removal of trees along the roads may spoil greenery environment and amenity. (iii) To make green belt with trees and/or vegetation covers. 2) Mangrove communities - 1) If removal of mangrove trees are unavoidable, obtain permission of relocation or replanting from YCDC-PPGD. 2) Monitoring change in

				riverine environment including mangrove communities near the project site.
		(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(c) Y	(c) 1) Public health and sanitation: (i) Use construction machines and vehicles equipped with good exhaust emission system and filled with good quality fuel and oil. (ii) Prevent dust generation by sprinkling road surface. (iii) Equip sheet cover to prevent spilling over construction waste and debris from the bed of truck. (vi) Enlightenment and education of safety and sanitation for construction workers. (v) Set up a section in charge of complaints from peoples. (vi) Health examination on peoples who complain of health problem, if necessary. 3) Infectious diseases such as HIV/AIDS: (i) Education of and campaign of prevention and cure of HIV/AIDS to residents and construction workers.(ii) Monitoring of cases of HIV/AIDS before, during and after the construction stage, if necessary.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	(a) Y	(a) In the project plan environmental monitoring program is incorporated in the project plan.
		(b) What are the items, methods and frequencies of the monitoring program?	(b)	(b) In the environmental monitoring plan, items relating to expected negative impacts as well as necessary permissions are selected and indicator, methods and frequencies as well as responsible institutions are described.
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	(c) Y	In "EIA Procedures (draft)" MOECAF is responsible to implement the monitoring. However, at present institutional arrangement for monitoring framework including budget is not established in MOECAF. Thus, in the project plan the monitoring will be implemented under adequate monitoring framework referring to the JICA Guidelines by the proponent (Public Works) itself.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the	(d)	At present any detail regulatory requirements pertaining to the monitoring report system is not established in Myanmar. In the project plan details of monitoring implementation and report system is proposed referring to the JICA Guidelines.

		proponent to the regulatory authorities?		
6 Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).	(a)	(a) Not necessary
		(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(b)	(b) Not necessary
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)	(a) Not necessary

Source: JICA Survey Team

Appendix 13

Breakdown of the Cost Estimation

Precondition

Common terms for Appraisal

Name of Local Currency		Nov. 2013 to Jan. 2014		
		Kyat		
(1) Yen/$	US$ 1 =	103.45	Yen	
(2) LC/$	US$ 1 =	981.6	Kyat	
(3) Yen/Kyat	Kyat 1 =	0.104	Yen	

Price Escalation

(1) FC	1.3%	LC	3.7%

Physical Contingency

Construction	5.0%	Consultant	5.0%

Base Year for Cost Estimation:		Schedule		
2014/1		Start	2014/4	End 2022/3

Billing Rate of Consultant

	FC Yen	LC Kyat
Pro-(A)	2,753,000	0
Pro-(B)	0	2,244,000
Supporting Sta	0	1,000,000

Others

Rate of Tax

Commercial Ta	5.0%	Import Tax	5.0%

Rate of Administration Cost

5.0%

Rate of Interest During Construction

Construction	0.01%	Consultant	0.01%

Rate of Commitment Charges

0.0%

Payment Method for Interest during construction and Commitment charge

not loan covered

Fiscal Year

Apr - Mar

Implementation Schedule for ICB

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Month
										0
Pledge										0
Signing of Loan Agreement										0
										0
Consulting Services										0
										0
Procurement of Consultants (4)										4
- Preparation of TOR, short-List, Letter of invitation (1)										1
- JICA concurrence to TOR, Short-List, letter of invitation (1)										1
- Issurance of letter of invitation to Short-listed consultants (1)										1
- Proposal submission by Consultants (2)										2
- Evaluation of Consultat Proposal (1)										1
- JICA Approval of Evaluation of Consultant (1)										1
- Singing Consultant Contract (1)										1
- JICA Singing Consultant Contract (1)										1
										0
Detailed Design (12)										12
										0
Selection of Contractor (ICB with P/Q) (12)										12
- Preparation of PQ documents including PQ criteria (3)										3
- Advertisement (Invitation to PQ) and submission of PQ (2)										2
- PQ evaluation, Approval of PQ evaluation JICA's Concurrence of result of PQ (2)										2
- Preparation of Tender Documents (incl. JICA's Concurrence) (3)										3
- Tender Period (2)										2
- Evaluation of Technical Proporsal (incl. JICA's Concurrence) (2)										2
- Evaluation of Financial Proporsal (incl. JICA's Concurrence) (2)										2
- JICA's Review of Contract (2)										2
- Draft Review is reviewed by GOM (2)										2
- JICA's Concurrence of Contract and Signing of Contract (1)										1
										0
Construction Supervision (29)										28
										0
Defect Liability Period (12)										12
Land Acquisition	0	0	0	12	0	0	0	0	0	12
Construction	0	0	0	0	8	12	8	0	0	28

Cost breakdown for package

Item no.	Item	Cost LCB (USD)	Cost ICB (USD)	Total cost (USD)
1	Substructure (Reverse T-shaped Abutment)	582,102	700,813	1,282,915
2	Substructure (Pier on land)	1,196,710	1,442,080	2,638,790
3	Substructure (Pier on river)	7,045,358	37,930,787	44,976,145
4	Steel cable stayed bridge (Superstructure)	752,049	38,373,365	39,125,414
5	Steel box girder bridge (Superstructure)	818,675	32,422,795	33,241,470
6	PC Precast Box Girder (Superstructure)	1,666,802	19,327,501	20,994,303
7	Approach road	14,916,674	4,003,967	18,920,641
8	Miscellaneous work	10,264,200	7,544,200	17,808,400
9	Indirect cost {sum(1~8)*20%}	7,448,514	28,349,102	35,797,616
Total construction cost		44,691,084	170,094,610	214,785,694

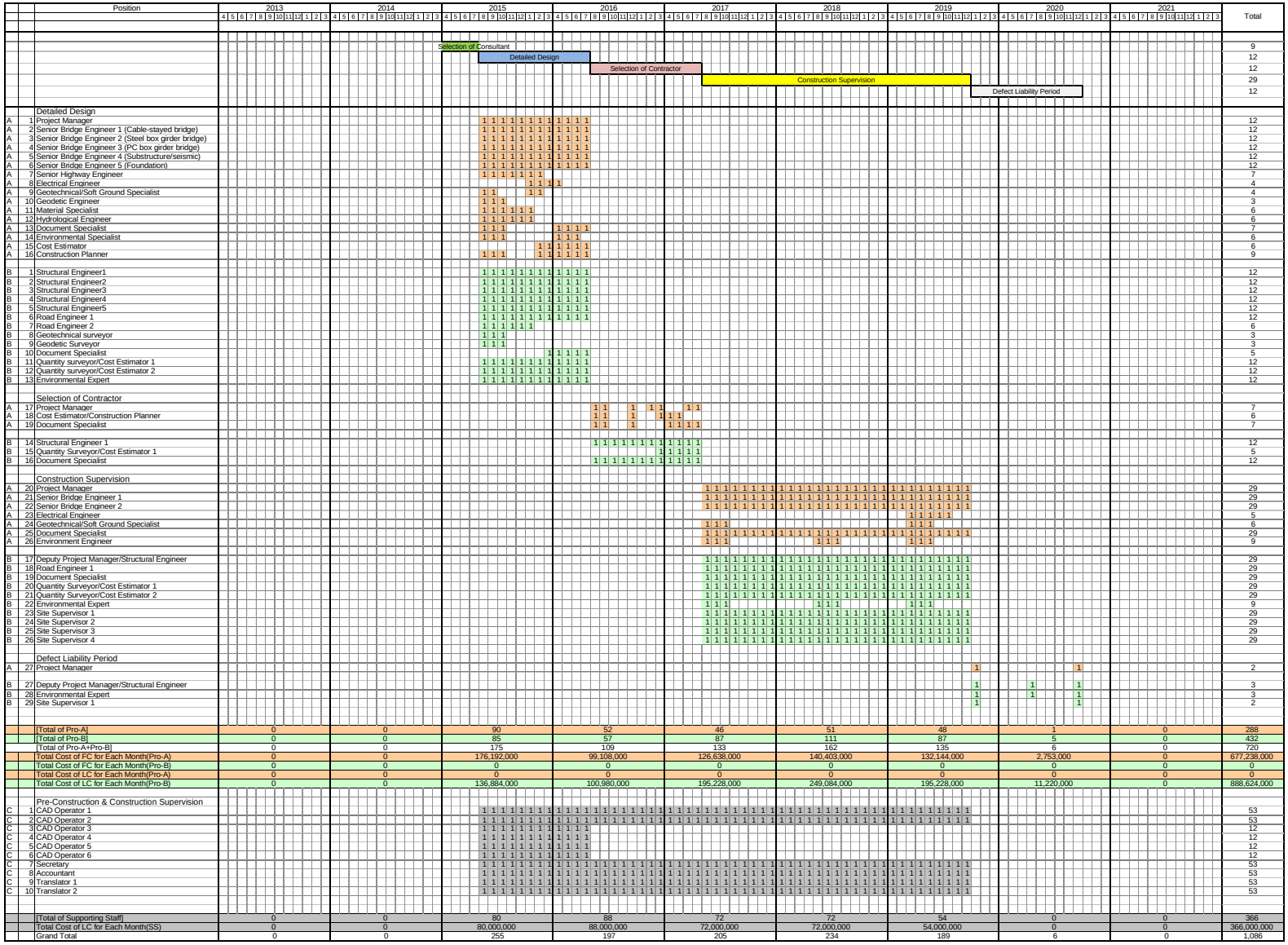
Construction Cost of Bago River Bridge

Item No.	Item	Description	Unit	Qty	Unit Cost (USD)	Cost (USD)
1	Substructure (Reverse T-shaped Abutment)					
	Bored pile	D=1500, Laverage=50m	nos	30	20,000	600,000
	Footing					
	Concrete	Class A (30N/mm^2)	m^3	936.6	150	140,490
	Re-bar	SD345 or equivalent	t	112.4	1,800	202,305
	Formwork		m^2	262.4	68	17,843
	Wall, parapet					
	Concrete	Class A (30N/mm^2)	m^3	638.9	150	95,836
	Re-bar	SD345 or equivalent	t	95.8	1,800	172,503
	Formwork		m^2	793.2	68	53,938
	Subtotal of Abutment					1,282,915
2	Substructure (Pier on land)					
	Bored pile	D=1500, Laverage=50m	nos	65	20,000	1,300,000
	Footing					
	Concrete	Class A (30N/mm^2)	m^3	1,890.0	150	283,500
	Re-bar	SD345 or equivalent	t	227.0	1,800	408,600
	Formwork		m^2	570.0	68	38,760
	Pier column					
	Concrete	Class A (30N/mm^2)	m^3	1,252.7	150	187,906
	Re-bar	SD345 or equivalent	t	187.9	1,800	338,220
	Formwork		m^2	1,203.0	68	81,804
	Subtotal of Pier on land					2,638,790
3	Substructure (Pier on river)					
	Steel sheet pipe pile foundation					
	Falsework	H-400	ton	689	1,600	1,102,400
	Steel sheet pipe pile (pile driving)	D=1000, Laverage=50m, P3-P6, P16-P20	nos	308	32,000	9,856,000
		D=1000, Laverage=50m, P7-P15	nos	506	33,600	17,001,600
	Connection treatment		nos	814	200	162,800
	Excavation inside of the well		m^3	14,739	4	58,956
	Excavation inside of the pipe pile		m^3	25,966	11	285,622
	Welding of the dowel		nos	814	1,200	976,800
	Cut-off the pipe		nos	814	100	81,400
	Footing					
	Concrete	Class A (30N/mm^2)	m^3	4,694	150	704,116
	Re-bar	SD345 or equivalent	t	564.0	1,800	1,015,200
	Pier column					
	Concrete	Class A (30N/mm^2)	m^3	30,094	150	4,514,100
	Re-bar	SD345 or equivalent	t	4,514.0	1,800	8,125,200
	Formwork		m^2	16,058	68	1,091,951
	Subtotal of Pier on river					44,976,145
4	Steel cable stayed bridge (superstructure)	including fabrication and erection				
	Steel Plate					
	Tower	SM490, SM400	t	578	6,720	3,880,800
	Main girder (single box)	SM490, SM400	t	5,775	4,800	27,720,000
	Stay cable	Parallel wire strand	t	357	11,200	3,998,400
	Field Painting	Class C-5	L.S.	1	200,000	200,000
	Bearing					
	300t	Rubber bearing	nos	4	17,500	70,000
	500t	Rubber bearing	nos	4	50,000	200,000
	5,000t	Steel pivot bearing	nos	2	475,000	950,000
	Anchor frame	for steel pivot bearing, W=60t	nos	2	210,000	420,000
	Expansion joint	Steel finger type, W=24m, Unit weight W=15t/nos	nos	2	187,500	375,000
	Fairing	L=448m, Unit weight W=0.05t/m	nos	45	4,000	180,000
	Handrail	Steel pipe, H=500mm (on the top of the concrete barrier)	m	896	500	448,000
	Drain Pit	FC	nos	178	500	89,000
	Concrete barrier					
	Concrete	Class A (30N/mm^2)	m^3	188	150	28,230
	Re-bar	SD345 or equivalent	t	18.8	1,800	33,876
	Formwork		m^2	1,478	66	97,548
	Pavement (carriageway)	Guss asphalt, t=80mm	m^2	1,344	110	147,840
	Pavement (pedestrian)	Gravel/asphalt, t=40mm	m^2	7,168	40	286,720
	Subtotal of steel cable stayed bridge					39,125,414

5	Steel box girder bridge (superstructure)	including fabrication and erection				
	Steel Plate (box girder)	SM490, SM400	t	7,123	4,400	31,341,640
	Field Painting	Class C-5	L.S.	1	50,000	50,000
	Bearing					
	50t	Rubber bearing	nos	8	5,000	40,000
	120t	Rubber bearing	nos	12	12,000	144,000
	150t	Rubber bearing	nos	12	14,000	168,000
	Expansion joint	Steel finger type, W=10m, Unit weight W=5t/nos	nos	2	50,000	100,000
	Handrail	Steel pipe, H=500mm (on the top of the concrete barrier)	m	1,104	500	552,000
	Drain Pit	FC	nos	220	500	110,000
	Concrete barrier					
	Concrete	Class A (30N/mm^2)	m^3	232	150	34,770
	Re-bar	SD345 or equivalent	t	23	1,800	41,724
	Formwork		m^2	1,822	68	123,896
	Pavement (carriageway)	Guess asphalt	m^2	1,656	110	182,160
	Pavement (pedestrian)	Gravel/asphalt	m^2	8,832	40	353,280
	Subtotal of steel box girder bridge					33,241,470
6	PC Precast Box Girder (Superstructure)					-
	Fabrication yard construction		L.S.	1	1,880,000	1,880,000
	Girder erection		L.S.	1	9,000,000	9,000,000
	Precast segment		nos	496	5,000	2,480,000
	Bearing					
	500t	Rubber bearing	nos	24	50,000	1,200,000
	1,000t	Rubber bearing	nos	44	100,000	4,400,000
	Expansion joint	Steel finger type, W=10m, Unit weight W=5t/nos	nos	8	50,000	400,000
	Handrail	Steel pipe, H=500mm (on the top of the concrete barrier)	m	1,408	500	704,000
	Drain Pit	FC	nos	134	500	67,000
	Concrete barrier					
	Concrete	Class A (30N/mm^2)	m^3	296	170	50,252
	Re-bar	SD345 or equivalent	t	30	2,000	59,200
	Formwork		m^2	2,323	75	176,571
	Pavement (carriageway)	Asphalt	m^2	2,112	60	126,720
	Pavement (pedestrian)	Gravel/asphalt	m^2	11,264	40	450,560
	Subtotal of Precast PC box girder bridge					20,994,303
7	Approach road					
	Pavement					
	Subgrade course	t=1000mm	m^2	27,488	60	1,649,280
	Subbase course	Aggregate, t=400mm	m^2	27,488	67	1,841,696
	Base course	Aggregate, t=350mm	m^2	27,488	70	1,924,160
	Binder course	Coarse asphalt concrete, t=60mm	m^2	27,488	16	439,808
	Surface course	Fine asphalt concrete, t=40mm	m^2	27,488	16	439,808
	Retaining wall					
	Concrete	Class B (24N/mm^2)	m^3	12,249	170	2,082,330
	Re-bar	SD345 or equivalent	t	980	2,000	1,960,000
	Formwork		m^2	6,858	75	521,208
	RC pile	D=500, Laverage=50m	nos	444	8,000	3,552,000
	Embankment					
	Filling	Bulldozer	m^3	46,998	60	2,819,880
	Cutting	Bulldozer	m^3	41,231	41	1,690,471
	Subtotal of approach road					18,920,641
						-
8	Miscellaneous					
	Temporary work					
	Temporary Jetty and staging		m^2	12,007	1,200	14,408,400
	Clearing and Levelling of construction yard		m^2	170,000	20	3,400,000
	Lighting and Electrical Wireing		m	1,928	450	867,600
	Subtotal of miscellaneolus work					17,808,400

178,988,078

Manning Schedule for the Consulting Services



Cost Breakdown for the Consulting Services

US $ = yen 103.45
Kyat = yen 0.104

	Unit	Qty.	Foreign Portion (Yen) Rate	Foreign Portion (Yen) Amount ('000)	Local Portion Kyat Rate	Local Portion Kyat Amount ('000)	Combined Total ('000) Yen
A Remuneration							
1 Professional (A)	M/M	288	2,351,521	677,238	0	0	677,238
a) Detailed Design		*130*	*2,753,000*	*357,890*			*357,890*
b) Selection of Contractor		*20*	*2,753,000*	*55,060*			*55,060*
c) Construction Supervision		*136*	*2,753,000*	*374,408*			*374,408*
d) Defect Liability Period		*2*	*2,753,000*	*5,506*			*5,506*
2 Professional (B)	M/M	432	0	0	2,057,000	888,624	92,417
a) Detailed Design		*125*			*2,244,000*	*280,500*	*29,172*
b) Selection of Contractor		*29*			*2,244,000*	*65,076*	*6,768*
c) Construction Supervision		*270*			*2,244,000*	*605,880*	*63,012*
d) Defect Liability Period		*8*			*2,244,000*	*17,952*	*1,867*
3 Supporting Staffs	M/M	366	0	0	1,000,000	366,000	38,064
a) Detailed Design		*84*			*1,000,000*	*84,000*	*8,736*
b) Selection of Contractor		*72*			*1,000,000*	*72,000*	*7,488*
c) Construction Supervision		*120*			*1,000,000*	*120,000*	*12,480*
Subtotal of A		1086		677,238		1,254,624	807,719
B Direct Cost							
[Detailed Design]							
1 Air Ticket for Expatriate	no	16	200,000	3,200		0	3,200
2 Miscellaneous Travel Expenses in Japan	no	16	30,000	480		0	480
3 Allowances	month	130	300,000	39,000		0	39,000
4 Strucutral analysis	L.S.	1	60,000,000	60,000		0	60,000
5 Wind tunnel test	L.S	1	20,000,000	20,000		0	20,000
6 International Communication	month	12	30,000	360		0	360
7 Service Vehicle	month	24		0	3,600,000	86,400	8,986
8 Domestic Communication	month	12		0	1,213,000	14,556	1,514
9 Office Supplies & Equipment Maintenance	month	12		0	300,000	3,600	374
10 Office Equipment/Furniture	L.S.	1		0	79,657,000	79,657	8,284
11 Printing, papers, Reports and Documents	month	12		0	300,000	3,600	374
12 Sublet Works (topo with scale 1:500)	ha	50	18,000	900		0	900
13 Sublet Works (geo)	point	10	850,000	8,500		0	8,500
14 Sublet Works (env, incl. 12months period sampling)	L.S.	1	12,000,000	12,000		0	12,000
[Pre-Construction]							
1 Air Ticket for Expatriate	no	10	200,000	2,000		0	2,000
2 Miscellaneous Travel Expenses in Japan	no	10	30,000	300		0	300
3 Allowances	month	20	300,000	6,000		0	6,000
4 International Communication	month	9	30,000	270		0	270
5 Service Vehicle	month	9		0	3,600,000	32,400	3,370
6 Domestic Communication	month	9		0	864,000	7,776	809
7 Office Supplies & Equipment Maintenance	month	9		0	300,000	2,700	281
8 Printing, papers, Reports and Documents	month	9		0	300,000	2,700	281
9 Technology Transfer - Overseas training	L.S.	1	7,827,027	7,827			
[Construction Supervision, Defect Liability Period]							
1 Air Ticket for Expatriate	no	11	200,000	2,200		0	2,200
2 Miscellaneous Travel Expenses in Japan	no	11	30,000	330		0	330
3 Allowances	month	136	300,000	40,800		0	40,800
4 International Communication	month	31	30,000	930		0	930
5 Field Allowances for Local Staff (A)	month	87		0	120,000	10,440	1,086
6 Field Allowances for Local Staff (B)	month	80		0	90,000	7,200	749
7 Service Vehicle	month	93		0	3,600,000	334,800	34,819
8 Domestic Communication	month	31		0	1,067,000	33,077	3,440
9 Office Supplies & Equipment Maintenance	month	31		0	300,000	9,300	967
10 Office Equipment/Furniture	L.S.	1		0	79,657,000	79,657	8,284
11 Printing, papers, Reports and Documents	month	31		0	600,000	18,600	1,934
12 Technology Transfer - On the job training	L.S.	1	1,733,305	1,733			
Subtotal of B				206,830		726,463	272,822
Total				884,068		1,981,087	1,080,541
Total in USD				8,546		2,018	10,445

Domestic communication (per month)

Detail design

Item	Quantity	Unit price (USD)	Total (USD)
Call fee	25	30	750
Internet fee	1	560	560
			1,310
		MMK	1,285,896
		Roundup	1,213,000

Pre-constrution

Item	Quantity	Unit price (USD)	Total (USD)
Call fee	12	30	360
Internet fee	1	560	560
			920
		MMK	903,072
		Roundup	864,000

Constrution stage

Item	Quantity	Unit price (USD)	Total (USD)
Call fee	25	30	750
Internet fee	1	560	560
			1,310
		MMK	1,285,896
		Roundup	1,067,000

Office Equipment/Furniture

	Quantity	Unit price (USD)	Amount (USD)
Printer/Copier A4 Color	2	4,680	9,360
Printer/Copier A3 Color	1	10,000	10,000
A4 printer (B/W)	2	100	200
Table&Chair (Set)	30	150	4,500
Table&Chair (Set) for meeting	8	150	1,200
Cabinet	10	100	1,000
Drinking water machine	2	100	200
Ploter	1	2,000	2,000
Note PC with autoCAD	10	3,150	31,500
Note PC without autoCAD	6	650	3,900
Server PC	1	650	650
Microsoft office	16	290	4,640
SIM card	30	100	3,000
Aircondition	5	1,200	6,000
Office partition	1	3,000	3,000
		Total	81,150
		MMK	79,656,840
		Roundup	79,657,000

Technology Transfer

1. Overseas Training — attendance: 20 Counterparts, 3 Consultants

Day	Program	Stage	Accommodation	Rentacar
1	Travel day YGN to TYO	(YGN)		
2	Travel day and rest day	TYO	1	1
3	Guidance	TYO	1	1
4	Lecture 1 (Bridge construction)	TYO	1	1
5	Lecture 2 (Bridge maintenance)	TYO	1	1
6	Lecture 3 (Road operation)	TYO	1	1
7	Site survey	TYO	1	1
8	Site survey	TYO	1	1
9	Rest day	TYO	1	1
10	Closing meeting	TYO	1	1
11	Travel day TYO to YGN	YGN		1
			9	10

No	Item	Unit price (USD)	Nos	Price (USD)
1	Air fare (YGN<->TYO, Class C)	2,000	20	40,000
2	Travel insurance	50	20	1,000
3	Accommodation	100	180	18,000
4	Rentacar (Micro bus with driver)	600	10	6,000
5	Table exchanges (Lunch)	20	168	3,360
6	Interpreter (Burmese)	400	8	3,200
7	Printings and supplies	100	20	2,000
8	Allowances for consultants	100	21	2,100
	TOTAL			75,660

2. On-the-job training — attendance: 30 Counterparts, 3 Consultants

Day	Program	Stage	Accommodation	Rentacar
1	Travel day NRT to YGN	YGN	1	1
2	Lecture 1	YGN	1	1
3	Lecture 2	YGN	1	1
4	Lecture 3 / Field survey 1	YGN	1	1
5	Lecture 4 / Field survey 2	YGN	1	1
6	Lecture 5 and travel day YGN->	(YGN)	1	1
7	-> NRT	TYO		
			6	6

No	Item	Unit price (USD)	Nos	Price (USD)
1	Air fare (YGN<->TYO, Class Y)	2,500	3	7,500
2	VISA (on arriva,l business)	50	3	150
3	Accommodation	100	18	1,800
4	Rentacar (Sedan with driver)	60	6	360
5	Table exchanges	5	231	1,155
6	Printings and supplies	100	33	3,300
7	Travel cost (domestic)	130	3	390
8	Allowances for consultants	100	21	2,100
	TOTAL			16,755

Annural Distribution of Cost

Item	Total			2013			2014			2015			2016			2017			2018			2019			2020			2021		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
Construction cost	100.0000%	100.0000%	0%	0%	0%		0%	0%		0%	0%		0%	0%		41%	41%		32%	32%		21%	21%		5%	5%		0%	0%	
Land Acquisition					0%			0%			0%			100%			0%			0%			0%			0%			0%	
Consultant	100.1519%	100.2616%	0%	0%	0%	0%	0%	0%	0%	48%	44%	0%	10%	11%	0%	13%	14%	0%	15%	17%	0%	14%	14%	0%	1%	1%	0%	0%	0%	0%

	AP	RM	Timing of RM Payment
Civil	20%	5%	End of Defect Liability Period
Consul	30%	0%	***

Annual Fund Requirement

Base Year for Cost Estimation: Jan, 2014
Price Escalation: FC: 1.3% LC:
Physical Contingency 5.0%
Physical Contingency for Consultant 5.0%

Unit: thousand USD

Item	Total			2015			2016			2017			2018			2019			2020		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
A. ELIGIBLE PORTION																					
Ⅰ) Procurement / Construction	187,839	54,098	241,938	0	0	0	0	0	0	76,914	21,679	98,594	60,451	17,443	77,893	40,824	12,059	52,883	9,650	2,918	12,567
Construction	170,095	44,691	214,786	0	0	0	0	0	0	70,468	18,515	88,983	54,673	14,365	69,038	36,449	9,577	46,026	8,505	2,235	10,739
Base cost for JICA financing	170,095	44,691	214,786	0	0	0	0	0	0	70,468	18,515	88,983	54,673	14,365	69,038	36,449	9,577	46,026	8,505	2,235	10,739
Price escalation	8,800	6,831	15,631	0	0	0	0	0	0	2,784	2,132	4,916	2,899	2,247	5,146	2,432	1,908	4,339	685	544	1,230
Physical contingency	8,945	2,576	11,521	0	0	0	0	0	0	3,663	1,032	4,695	2,879	831	3,709	1,944	574	2,518	460	139	598
Ⅱ) Consulting services	9,268	2,329	11,598	4,357	965	5,322	951	241	1,192	1,217	335	1,553	1,399	420	1,818	1,295	346	1,642	49	23	72
Base cost	8,546	2,018	10,564	4,096	886	4,982	882	213	1,096	1,115	286	1,402	1,265	346	1,610	1,157	275	1,431	43	18	61
Price escalation	268	195	463	53	33	86	23	16	39	44	33	77	67	54	121	77	55	132	3	4	8
Physical contingency	441	111	552	207	46	253	45	11	57	58	16	74	67	20	87	62	16	78	2	1	3
Total (Ⅰ+Ⅱ)	197,108	56,428	253,535	4,357	965	5,322	951	241	1,192	78,132	22,015	100,147	61,849	17,862	79,712	42,120	12,405	54,525	9,699	2,941	12,639
B. NON ELIGIBLE PORTION																					
a Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b Land Acquisition	0	15	15	0	0	0	0	15	15	0	0	0	0	0	0	0	0	0	0	0	0
Base cost	0	13	13	0	0	0	0	13	13	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
c Administration cost	0	12,677	12,677	0	266	266	0	60	60	0	5,007	5,007	0	3,986	3,986	0	2,726	2,726	0	632	632
d Commercial Tax	0	12,677	12,677	0	266	266	0	60	60	0	5,007	5,007	0	3,986	3,986	0	2,726	2,726	0	632	632
e Import Tax	0	9,392	9,392	0	0	0	0	0	0	0	3,846	3,846	0	3,023	3,023	0	2,041	2,041	0	482	482
Total (a+b+c+d+e)	0	34,761	34,761	0	532	532	0	135	135	0	13,860	13,860	0	10,994	10,994	0	7,494	7,494	0	1,746	1,746
TOTAL (A+B)	197,108	91,189	288,296	4,357	1,497	5,854	951	375	1,326	78,132	35,875	114,007	61,849	28,856	90,705	42,120	19,898	62,018	9,699	4,687	14,386
C. Interest during Construction	55	0	55	1	0	1	1	0	1	11	0	11	19	0	19	24	0	24	0	0	0
Interest during Construction(Const.)	50	0	50	0	0	0	0	0	0	10	0	10	18	0	18	23	0	23	0	0	0
Interest during Construction (Consul.)	4	0	4	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	0	0	0
GRAND TOTAL (A+B+C+D)	197,162	91,189	288,351	4,357	1,497	5,854	952	375	1,327	78,143	35,875	114,018	61,868	28,856	90,724	42,144	19,898	62,042	9,699	4,687	14,386
D. JICA finance portion (A)	197,108	56,428	253,535	4,357	965	5,322	951	241	1,192	78,132	22,015	100,147	61,849	17,862	79,712	42,120	12,405	54,525	9,699	2,941	12,639

Administration Cost = 5.0% Consul basecost / Total Project Cost
Commercial Tax 5.0%
Import Tax= 5.0%

Breakdown of Cost	Foreign Currency Portion (million YEN)			Local Currency Portion (million USD)			Total (million USD)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Construction	170,095	170,095	0	44,691	44,691	0	214,786	214,786	0
Price Escalation	8,800	8,800	0	6,831	6,831	0	15,631	15,631	0
Physical Contingency	8,945	8,945	0	2,576	2,576	0	11,521	11,521	0
Consulting Services	9,268	9,268	0	2,329	2,329	0	11,598	11,598	0
Land Acquisition	0	0	0	15	0	15	15	0	15
Administration Cost	0	0	0	12,677	0	12,677	12,677	0	12,677
Commercial Tax	0	0	0	12,677	0	12,677	12,677	0	12,677
Import Tax	0	0	0	9,392	0	9,392	9,392	0	9,392
Interest during constructi	55	0	55	0	0	0	55	0	55
Total	197,162	197,108	55	91,189	56,428	34,761	288,351	253,535	34,815

Breakdown of Cost	Total (million USD)	JICA Portion (million USD)	Others (million USD)
2013	0	0	0
2014	0	0	0
2015	5,854	5,322	533
2016	1,327	1,192	135
2017	114,018	100,147	13,871
2018	90,724	79,712	11,012
2019	62,042	54,525	7,518
2020	14,386	12,639	1,746
Total	288,351	253,535	34,815