APPENDIX 13

ENVIRONMENTAL IMPACT ASSESSMENT

Appendix 13-1 Typical Construction Equipment Used for Bridge Construction and Generated Noises, including Mitigation Measures

The following table shows the previously studied noise ranges of construction equipment (Rupert, 1979) and the adequate noise levels required by the United States Federal Highway Administration (FHWA).[1]

Equipment	Noise Level at 15 meters (dBA)	Required Noise Level (dBA)
Concrete Mixers	71-91	75
Pile Drivers	90-104	95
Rock Blasters	82-98	80
Backhoes	72-93	75
Tractors	73-96	75
Trucks	70-96	75
Generators	70-82	75

The above equipment are most likely used for bridge construction and estimated noise levels at various distance from the noise sources are described below. Since it is convenient to discuss the mitigation measures with the consideration of the impacts caused by construction equipment, feasible measures in terms of specific construction activities and equipment are also presented.

Concrete Mixers: The maximum noise level at 15 meters from the source is 90 dB, and the levels at further distance can be estimated using the rule of -6dB per doubling distance, resulting in 84 dB at 30 meters, 78 dB at 60 meters, 72 dB at 120 meters, and 68 dB at 240 meters. It can be understood from the rule that the concrete mixing site should be located at least 240 meters from the receptors.

Pile Drivers: Pile driving is required to construct bridges and viaducts. The noise caused by pile driving is an impact-type and can be as high as 104 dB at peak level at 15 meters. If the noise level is to be reduced below OEPP's standard of 70 dB, the distance from the noise source to the receptors will require 960 meters, which is unrealistic, because a major reason to design the viaducts is to avoid human resettlement in densely populated areas. Alternative mitigation measures could be a usage of quieter methods of pile driving, which are recently available. Although the cost for the alternative is higher, it has to be applied if the piling work is needed in the populated areas.

[1] As is the case of highway construction, these indicators are useful for application to bridge construction.

Earth Moving Equipment: Earth moving activity requires several types of machines, typically including backhoes, tractors, and trucks, and these equipment could generate the noise levels as loud as 90 dB at 15 meters. A combination of using these machines would further increase the noise levels. Possible counter measures to alleviate the noise levels for this types of equipment is two-fold; setting up the enclosures and barriers to protect receptors on temporary basis and selecting proper times for construction. The concept of proper times selection is to avoid "sensitive periods" and set major construction times to "non-sensitive periods". For example, the schools are not sensitive to noise during the night and weekend, so the main construction times near the schools can be chosen at these periods.

Generators: The noise produced by generators is usually not more than 82 dB at 15 meters. This means that the maximum estimated noise level of 70 dB can be achieved at 60 meters. The further distance or the installation of noise reducing equipment, e.g., enclosures or barriers, will be required if there are sensitive receptors nearby.

Appendix 13-2 Technical Names of Fish Species

1. Catlocarpio siamensis
2. Cirrhinus jullieni
3. Nibea soldado
4. Cirrhinus microlepis
5. Cosmochilus harmandi
6. Cyclocheilichthys apogon
7. Morulius chrysophekadion
8. Osteochilus vittatus
9. Paralaubuca typus
10. Probarbus jullieni
11. Puntius altus
12. Thynnichthys thynnoides
13. Mystus cavasius
14. Helicophagus waandersi
15. Pangasianodon gigas
16. Pangasius larnaudiei
17. Pangasius micronemus
18. Pangasius nasutus
19. Pangasius sanitwongsei
20. Pangasius siamensis
21. Pangasius sutchi
22. Kryptopterus apogon
23. Kryptopterus bleeekeri
24. Ktyptopterus cryptopterus
25. Wallago dinema
26. Wallagonia attu
27. Bagarius bagarius
28. Fluta alba
29. Synbranchus bengalensis
30. Macrognathus aculeatus

APPENDIX 14

PRELIMINARY DESIGN OF BRIDGE AND ROAD

Appendix 14.1 Comparison for Project Cost of PC Box and Extra-dosed Bridge

Million US $

	Item	PC Box Girder Bridge	Extra-Dosed Bridge
1)	Construction Cost	85.32	82.90
2)	Engineering Service Cost	5.97	5.80
3)	Land Acquisition Cost/		
	Compensation Cost	0.15	0.15
4)	Contingency	9.14	8.89
	Sub-Total	100.59	97.74
5)	Maintenance Cost	0.52	3.40
	Total	101.11	101.14

Maintenance Cost

Unit : US$

Year	PC Box Girder Bridge	Extra-Dosed Bridge
1		
2		
3		
4		
5		
6		
7		
8		
9		
10	260,000	260,000<1
11		
12		
13		
14		
15		
16		
17		
18		
10		
20	260,000	3,140,000<2
Total	520,000	3,400,000

<1: Figure consists of cost for asphalt overlay

<2: Figure consists of costs for overlay and replacement of cables

Appendix 14.2 The Strongest Winds Recorded in Kompong Cham

Unit: m/sec

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1985	10	10	12	20	20	14	16	9	9	9	11	13
1986	13	9	12	14	24	10	10	8	9	10	10	12
1987	12	12	8	10	13	-	11	-	-	-	-	-
1988	12	6	11	11	9	8	11	11	25	6	9	12
1989	12	8	-	8	-	9	9	6	8	11	12	12
1990	9	7	9	8	12	11	12	9	7	10	11	13
1991	11	9	9	9	13	11	7	9	9	9	11	25
1992	11	9	9	9	9	9	11	8	8	28	9	9
1993	-	-	-	-	-	-	7	24	12	9	9	13
1994	10	7	8	15	13	8	10	-	-	-	-	-
1995	11	-	-	-	8	6	6					

Source: Department of Hydrology, Ministry of Agriculture

Appendix 14.3 The Highest and Lowest Temperatures Recorded in Kompong Cham

Highest Temperatures

Unit: °C

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1985	30.2	32.6	33.6	33.7	32.0	31.6	31.3	31.6	30.1	30.1	30.0	29.0
1986	29.1	32.1	33.6	34.4	32.3	32.7	31.7	30.9	30.2	30.7	29.1	28.2
1987	30.0	31.5	34.6	34.6	-	-	-	-	-	-	-	-
1988	31.1	32.9	34.6	33.6	33.2	-	33.2	29.9	30.9	29.2	-	28.6
1989	31.8	31.8	32.1	32.8	32.6	32.6	31.8	32.3	31.1	31.0	30.8	30.3
1990	32.1	33.6	34.2	36.2	33.8	32.4	31.7	31.3	31.6	29.6	29.9	29.9
1991	31.9	33.8	35.0	35.7	34.3	32.8	31.1	31.0	30.7	30.0	29.3	30.2
1992	-	33.4	35.3	35.9	35.2	32.8	32.2	31.5	31.9	27.2	29.3	30.2
1993	-	-	-	-	-	-	-	-	-	-	-	-
1994	31.6	34.4	34.0	34.4	34.3	32.4	32.0	31.3	30.3	30.1	30.7	-
1995	31.2	32.8	-	-	34.6	34.1	32.4					

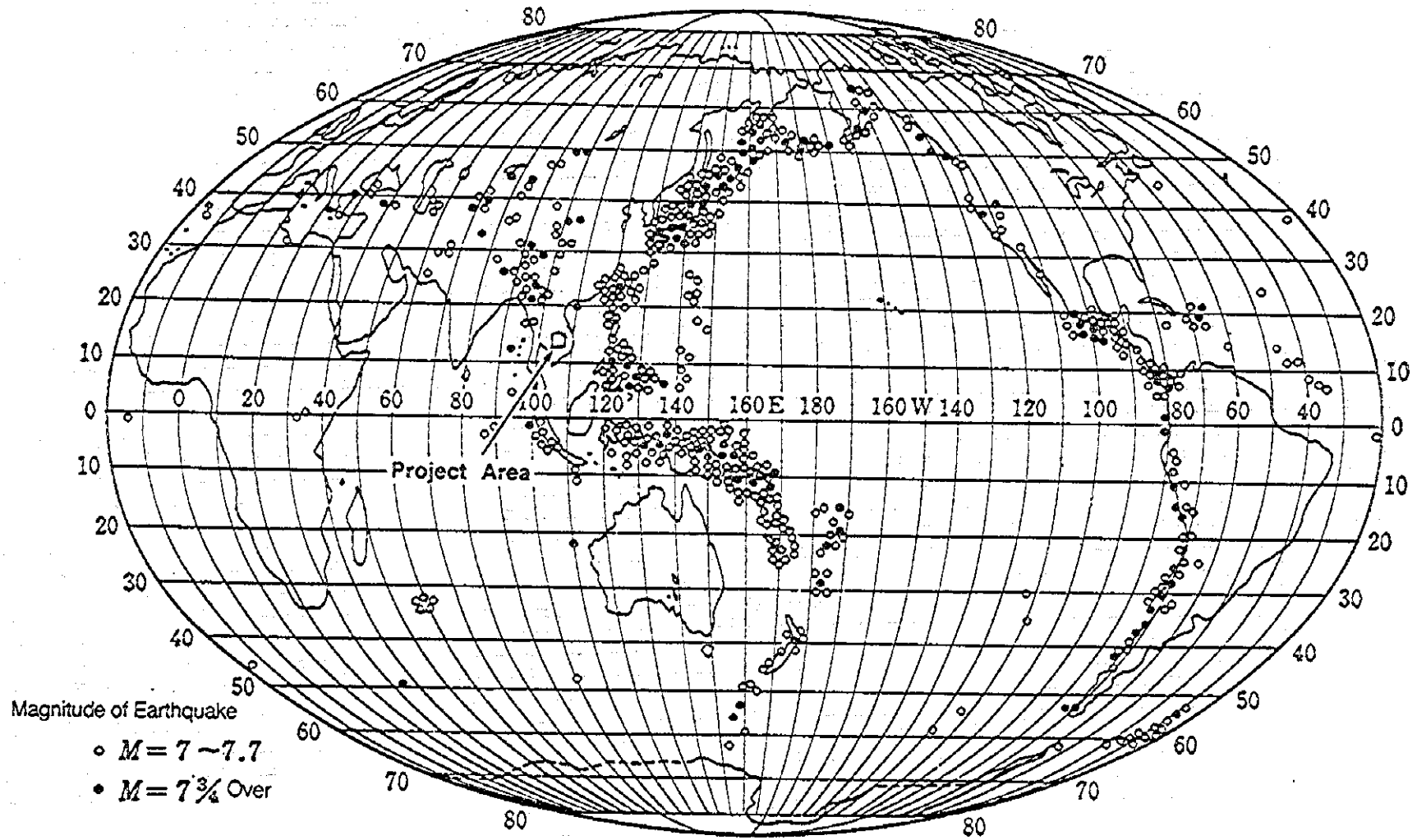
Source: Department of Hydrology, Ministry of Agriculture

Lowest Temperatures

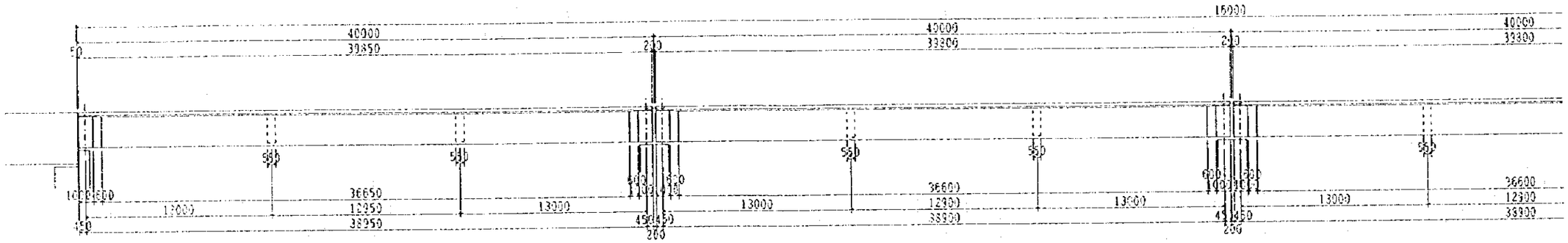
Unit: °C

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1985	21.5	24.0	24.8	25.4	25.1	25.3	24.6	25.3	25.4	24.7	24.4	22.2
1986	20.5	22.4	23.9	25.9	25.3	25.0	24.9	24.8	25.0	24.9	23.8	21.8
1987	21.6	21.1	25.0	24.8	-	-	-	-	-	-	-	-
1988	22.8	24.3	25.5	25.9	22.6	-	24.1	25.0	25.1	24.2	-	20.4
1989	23.2	21.9	23.8	25.4	24.8	28.2	24.7	-	-	-	-	-
1990	22.4	23.6	24.9	26.3	25.0	25.6	25.1	23.7	-	25.0	23.7	21.9
1991	22.6	23.3	24.7	26.1	25.9	25.3	24.2	25.2	25.4	25.1	23.3	22.2
1992	-	23.4	24.6	26.4	26.1	25.0	25.2	25.0	25.4	24.1	22.5	22.6
1993	-	-	-	-	-	-	-	-	-	-	-	-
1994	21.2	23.5	24.2	25.4	25.7	24.7	25.2	25.3	24.9	24.1	23.7	-
1995	21.8	22.0	-	-	25.4	25.6	25.0					

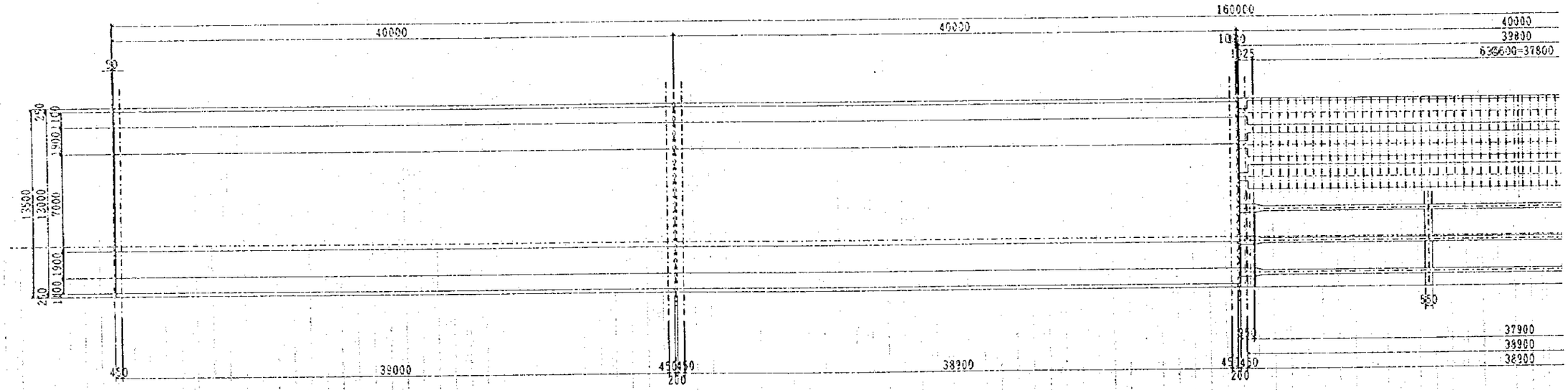
Source: Department of Hydrology, Ministry of Agriculture



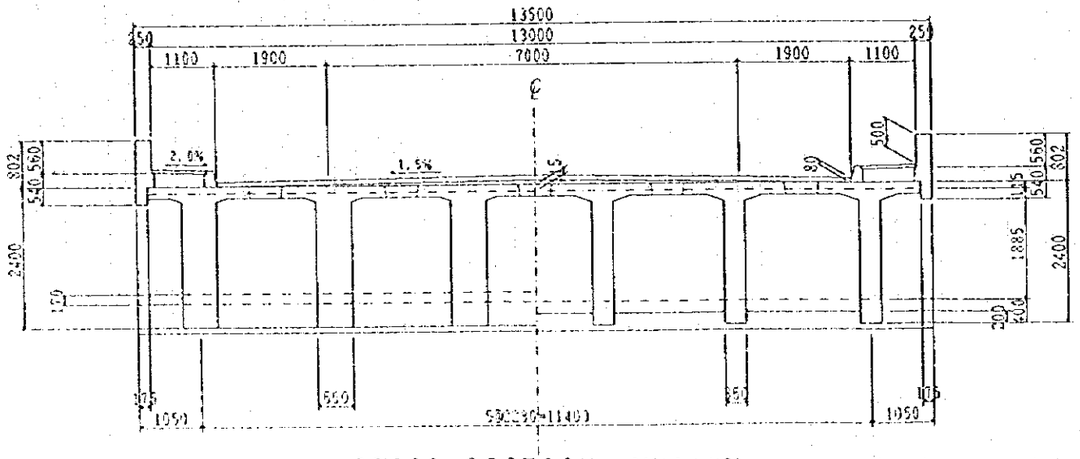
Appendix 14.4 Distribution Map of Earthquake Occurred in the World
(1904 - 1952 M>7 Gutenberg - Richter)



LONGITUDINAL SECTION SCALE:1/150

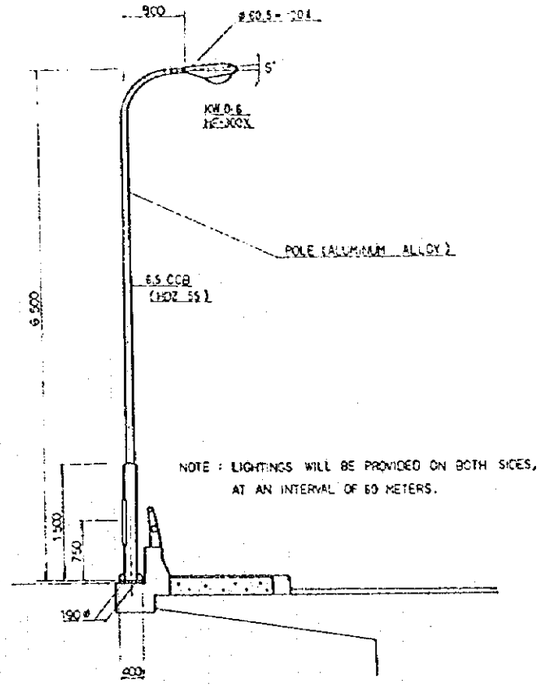


PLAN SCALE:1/150

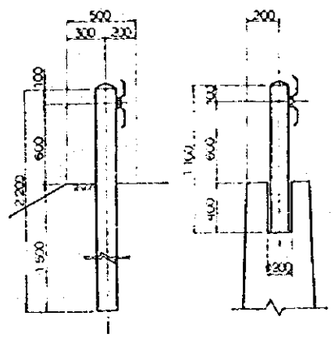


CROSS SECTION SCALE:1/150

THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN KINGDOM OF CAMBODIA	Appendix 14.5 Configuration of P.C. T-Girder
	JAPAN INTERNATIONAL COOPERATION AGENCY

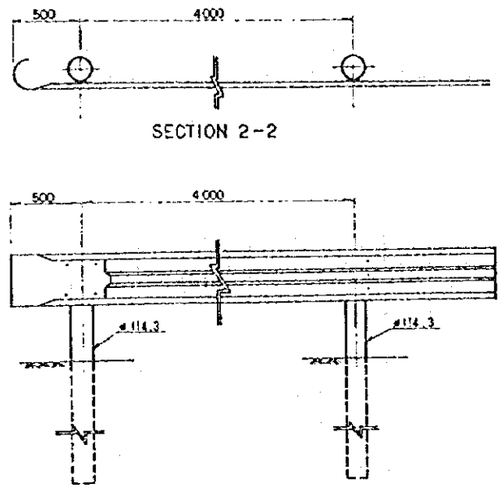


FRONT ELEVATION SCALE : 1/100



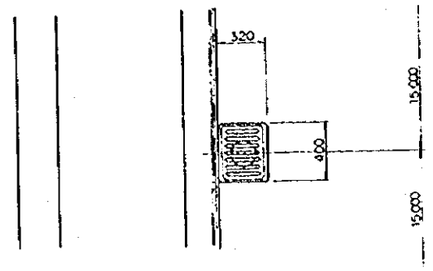
EMBANKMENT RETAININGWALL

SECTION

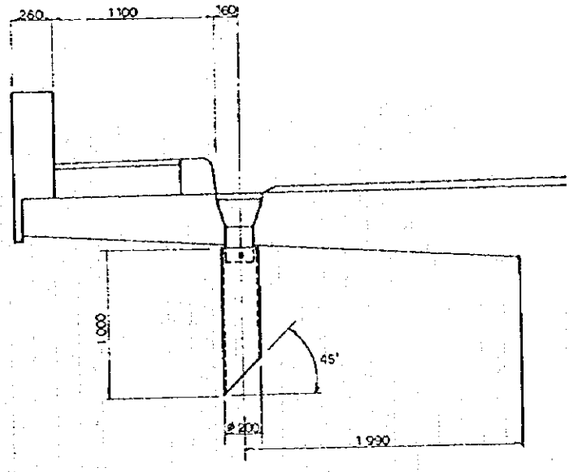


FRONT ELEVATION

GUARDRAIL
SCALE : 1/200



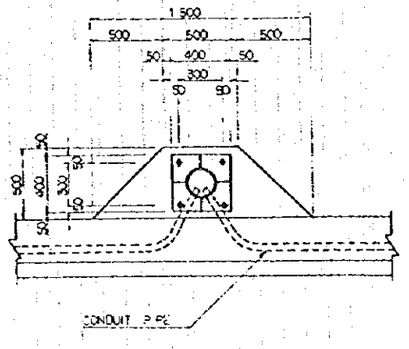
PLAN



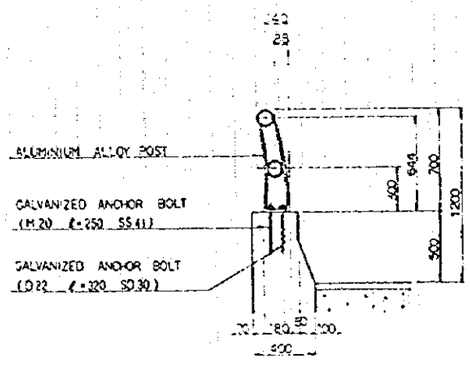
FRONT ELEVATION

NOTE : DRAIN PIPES WILL BE PROVIDE ON BOTH SIDES,
AT AN INTERVAL OF 15 METERS

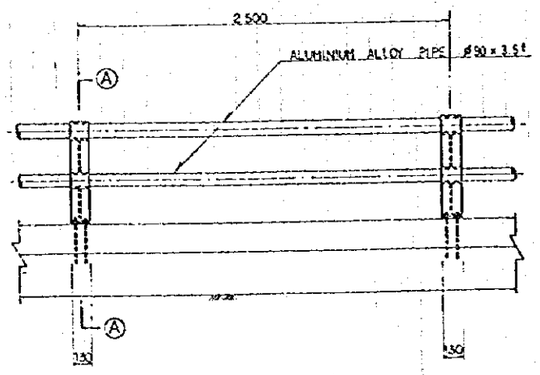
DRAIN PIPE
SCALE : 1/40



PLAN SCALE : 1/200



SECTION Ⓐ-Ⓐ

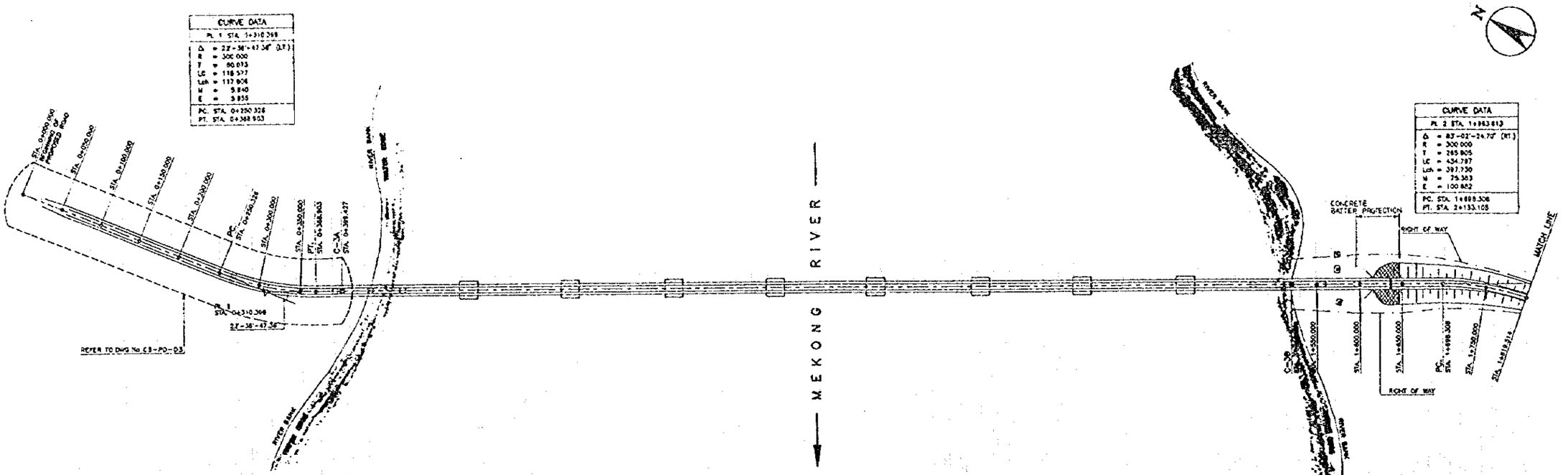


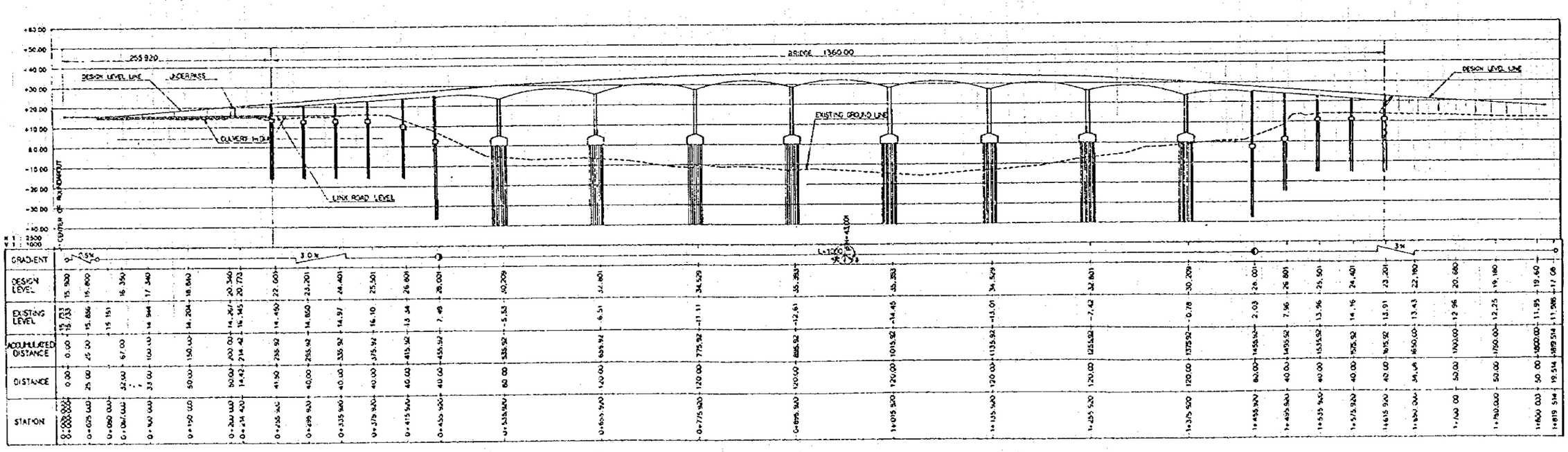
ELEVATION

LIGHTING

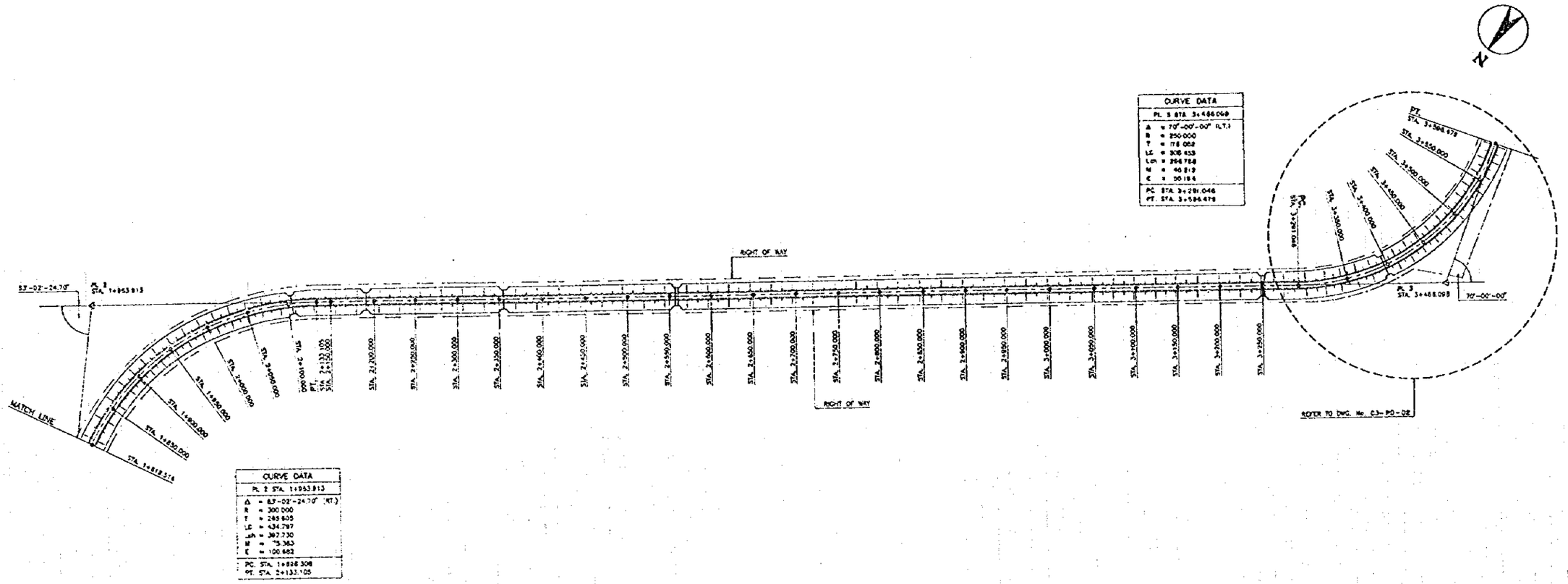
RAILING
SCALE 1/40

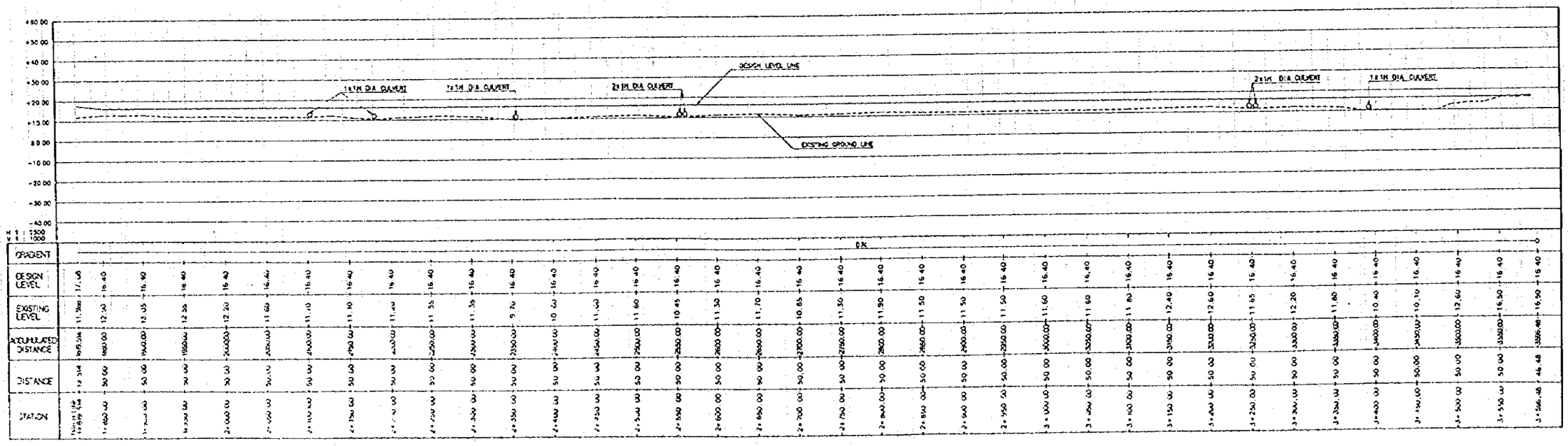
MINISTRY OF PUBLIC WORKS AND TRANSPORT THE KINGDOM OF CAMBODIA	THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN THE KINGDOM OF CAMBODIA	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., and PADECO CO., LTD	Appendix 14.6 Bridge Ancillaries : Lighting, Guardrail Railing, and Drainpipes	DATE '98, 1998	SHEET NO. 9/18



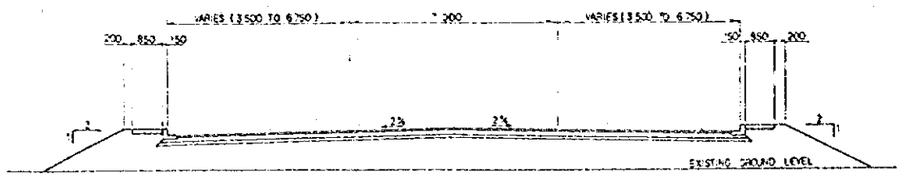


MINISTRY OF PUBLIC WORKS AND TRANSPORT THE KINGDOM OF CAMBODIA	THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN THE KINGDOM OF CAMBODIA	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., and PADECO CO., LTD	Appendix 14.7 Longitudinal Profiles (1)	SCALE: H 1:2500, V 1:1000 / DATE: APRIL 1996 / SHEET NO.: 10/18



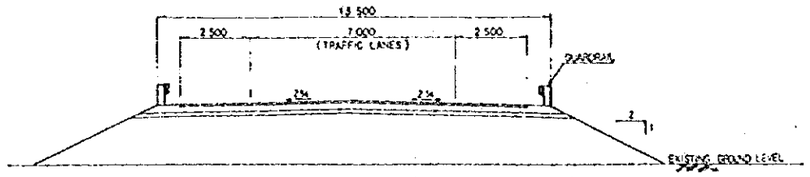


MINISTRY OF PUBLIC WORKS AND TRANSPORT THE KINGDOM OF CAMBODIA	THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN THE KINGDOM OF CAMBODIA	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., and PADECO CO., LTD	Appendix 14.7 Longitudinal Profiles (2)	SCALE H 1:2500 V 1:1000	DATE APRIL, 1996	SHEET NO. 11/18



TYPICAL ROAD SECTION STA 0+020 TO STA 0+057

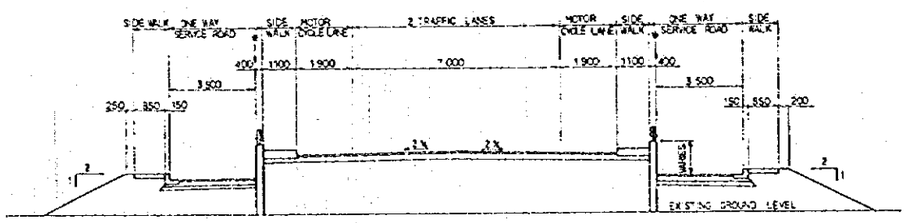
SCALE 2m 0 1m 2m 3m 4m



TYPICAL ROAD CROSS SECTION STA 1+615.92 TO STA 1+815.92

NOTE : THE ROAD TAPERS DOWN TO THE WIDTH SHOWN BELOW BETWEEN STA 1+815.92 & STA 1+865.92

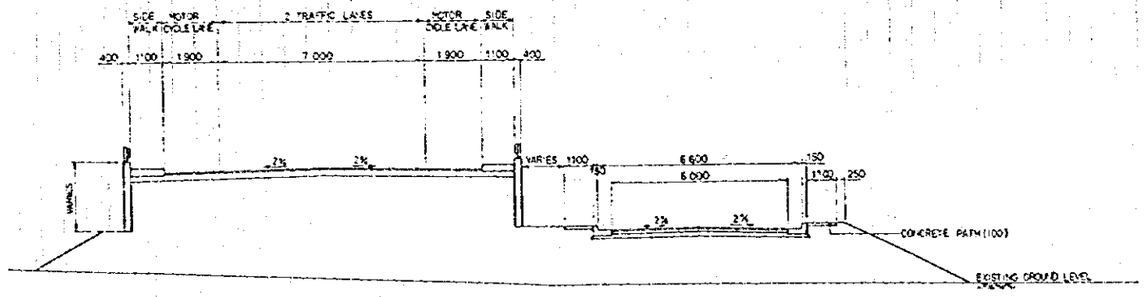
SCALE 2m 0 1m 2m 3m 4m



TYPICAL ROAD SECTION STA 0+057 TO STA 0+214

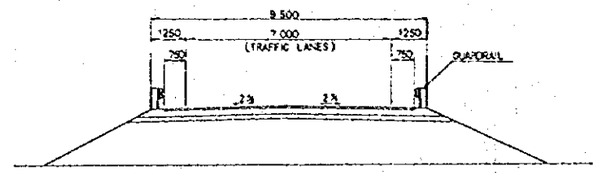
SCALE 2m 0 1m 2m 3m 4m

NOTE : DENOTES THE LOCATION OF A MEDIAN (VARIABLE WIDTH) WHICH IS TO BE PROVIDED FROM STA 0+140 STA 0+214 BETWEEN THE ELEVATED ROAD AND THE SERVICE ROADS



TYPICAL ROAD SECTION STA 0+214 TO STA 0+255.92

SCALE 2m 0 1m 2m 3m 4m

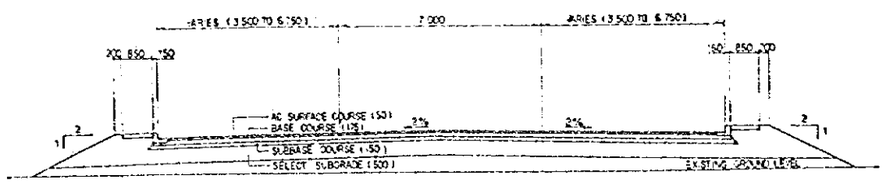


TYPICAL ROAD CROSS SECTION STA 1+865.92 TO STA 3+596.5

SCALE 2m 0 1m 2m 3m 4m

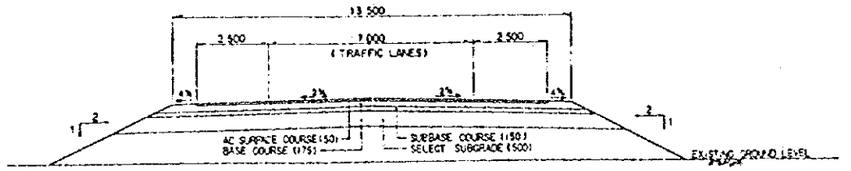
NOTE : ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED

MINISTRY OF PUBLIC WORKS AND TRANSPORT THE KINGDOM OF CAMBODIA	THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN THE KINGDOM OF CAMBODIA	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., and PADECO CO., LTD	Appendix 14.8 Typical Road Cross Sections	SCALE	DATE	SHEET NO.
				AS SHOWN	APRIL, 1996	16/18



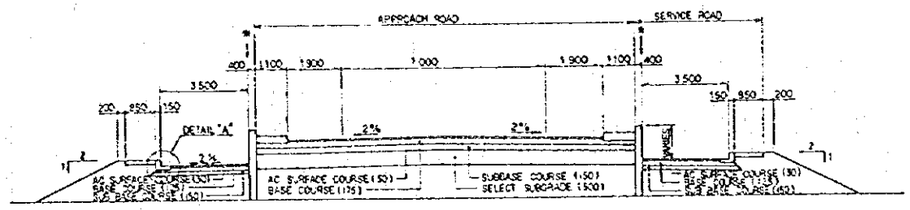
TYPICAL PAVEMENT SECTION – WEST BANK APPRACH ROAD STA. 0+010 TO STA. 0+057

SCALE



TYPICAL PAVEMENT CROSS SECTION – EAST BANK APPROACH ROAD
0-200M FROM END OF VIADECT (TYPE-I)

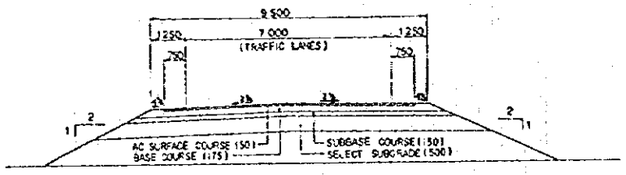
SCALE



TYPICAL PAVEMENT SECTION – WEST BANK (APPROACH & SERVICE ROADS)
STA 0+057 TO STA 0+214

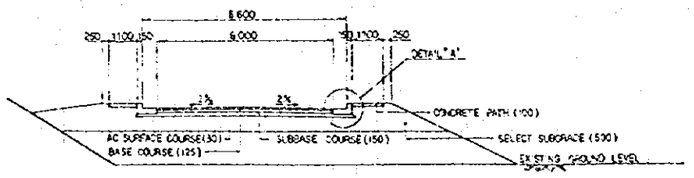
NOTE * DENOTES THE LOCATION OF A MEDIAN (VARIABLE WIDTH) TO BE PROVIDED FROM STA. 0+147 TO STA. 0+214

SCALE



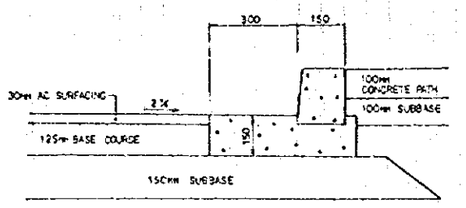
TYPICAL PAVEMENT CROSS SELCTION-EAST BANK APPROACH ROAD
200+M FROM END OF VIADUCT (TYPE-I)

SCALE



ROAD AND PAVEMENT CROSS SECTION WEST BANK LINK ROAD

SCALE



DETAIL "A" SCALE

NOTE ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED

MINISTRY OF PUBLIC WORKS AND TRANSPORT THE KINGDOM OF CAMBODIA	THE FEASIBILITY STUDY ON CONSTRUCTION OF THE MEKONG BRIDGE IN THE KINGDOM OF CAMBODIA	JAPAN INTERNATIONAL COOPERATION AGENCY NIPPON KOEI CO., and PADECO CO., LTD	Appendix 14.9 Road Pavement Layout	SCALE	DATE	SHEET NO.
				AS SHOWN	APRIL, 1996	17/18

APPENDIX 15

CONSTRUCTION PLAN AND COST ESTIMATEION

Appendix 15.1 Assumed Workable Days in Kompong Cham

Month	Day	Sunday and Holiday	Rainy Day for Bridge	Rainy day for Road	Workable Day	
					Bridge	Road
Jan.	31	6	0	0	25	25
Feb.	28	4	0	0	24	24
Mar.	31	5	0	0	26	26
Apr.	30	7	1	2	22	21
May	31	6	2	4	23	21
Jun.	30	5	1	5	24	20
July	31	5	2	5	24	21
Aug.	31	4	3	6	24	21
Sep.	30	7	4	7	19	16
Oct.	31	8	3	7	20	16
Nov.	30	9	1	3	20	18
Dec.	31	6	0	0	25	25
	365	72	17	39	276	254

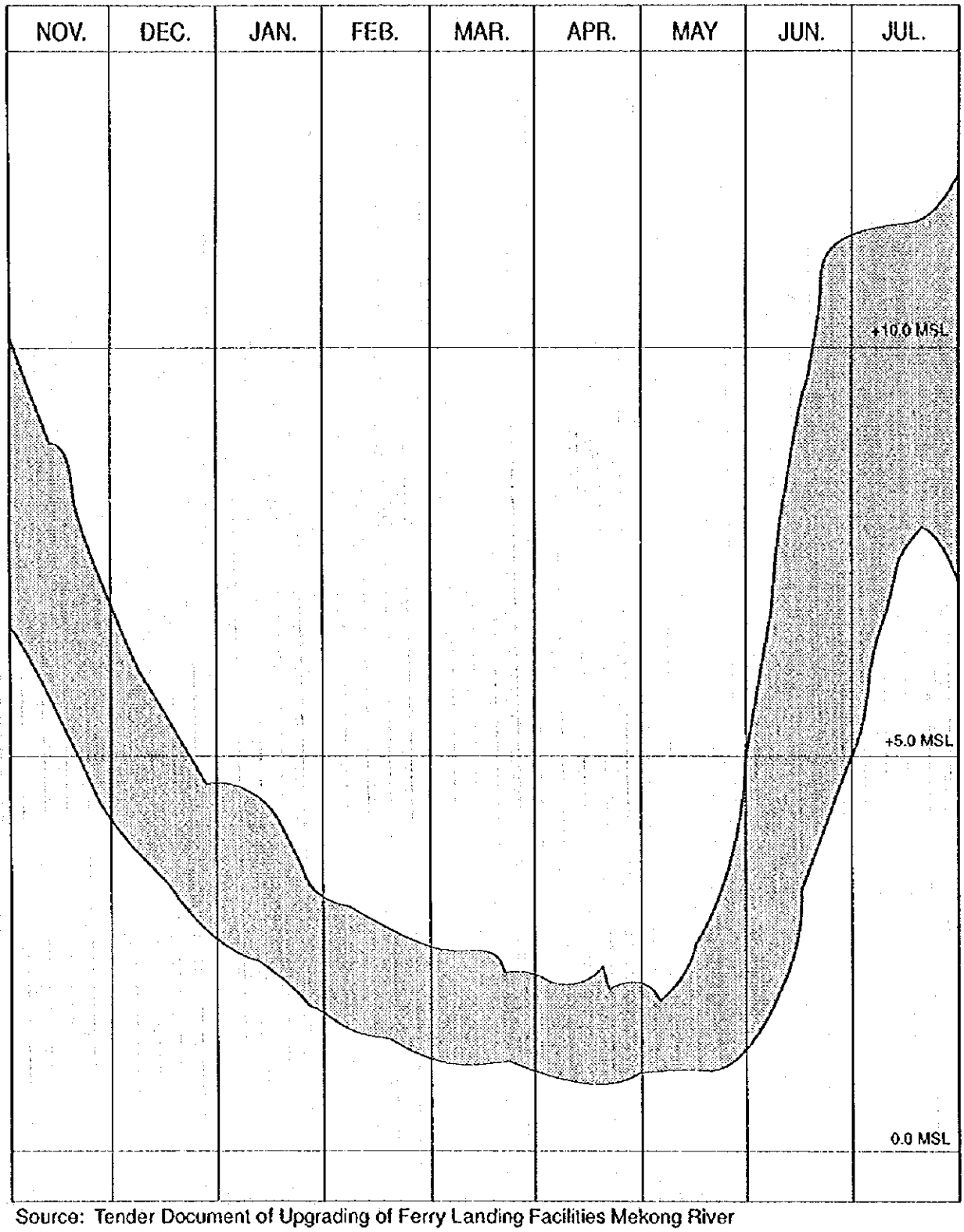
Remarks: Rainy days are calculated as below.

Bridge Works = (Rainy days over 20mm x 1/2) + (Rainy days, 20-10mm x 1/3)

Road Works = (Rainy days over 10mm x 1/2) + (Rainy days,Under 10mm x 1/4)

Workable days = (Days in each month) - (Sunday and Holiday) - (Rainy days)

Appendix 15.2 Variation for Low Water Level at the Selected Route in Kompong Cham



Source: Tender Document of Upgrading of Ferry Landing Facilities Mekong River

Appendix 15.3 Unit Prices of Labourer

Ref. No.	Labour	Nationality	Foreign (US$)	Local (US$)
L1	Speciality	Thaailand	300	
L2	Foreman(L)	Cambodia		16.5
L3	Mechanic	Cambodia		9
L4	Electrician	Cambodia		9
L5	Rigger	Cambodia		9
L6	Welder	Cambodia		8
L7	Carpenter	Cambodia		7
L8	Bridge Worker	Cambodia		8
L9	Re-bar worker	Cambodia		7
L10	Blasting Worker	Cambodia		8
L11	Conc,worker	Cambodia		7
L12	Skilled Labour	Cambodia		7
L13	Common Labour	Cambodia		3

Appendix 15.4 Unit Prices of Equipment

Ref. No.	Plant & Equipment	Capacity	Procurement Country	Foreign(US$)	Local(US$)
E1	Bulldozer	21t	Thailand	40.87	19.14
E2	Bulldozer	16t	Thailand	24.48	14.20
E3	Wheel Loader	1.4m3	Thailand	18.77	10.88
E4	Wheel Loader	3.0m3	Thailand	43.69	18.30
E5	Dump Truck	11t	Thailand	16.16	11.75
E6	Backhoe	1.2m3	Thailand	58.59	20.56
E7	Backhoe	0.6m3	Thailand	31.72	14.21
E8	Vibrating Roller	3t	Thailand	8.25	6.52
E9	Macadam Roller	10t	Thailand	11.30	11.51
E10	Tire Roller	8-20t	Thailand	11.93	9.71
E11	Motor Grader	4m	Thailand	29.58	9.52
E12	Asphalt Finisher	2.4-5m	Thailand	56.48	18.79
E13	Asphalt Sprayer	200l	Thailand	1.00	5.72
E14	Crawler Crane	50t	Thailand	70.26	23.54
E15	Crawler Crane	100t	Japan	169.48	43.38
E16	Crawler Crane	150t	Japan	222.64	38.60
E17	Truck Crane	25t	Thailand	40.75	13.23
E18	Agitator Truck	5m3	Thailand	15.06	15.37
E19	Concrete Pump	60m3/h	Thailand	61.31	17.10
E20	Water Bowser	3.8kl	Thailand	10.24	16.11
E21	Trailer	32t	Thailand	31.74	19.50
E22	Asphalt Plant	60t/hr	Thailand	360.01	71.07
E23	Crushing Plant	60t/h	Thailand	187.61	35.26
E24	Generator	100Kva	Thailand	4.93	4.75
E25	Generator	300Kva	Thailand	13.63	15.12
E26	Air Compressor	7m3	Thailand	5.04	3.69
E27	Crawler Drill	5t	Thailand	16.31	7.86
E28	Hydro. Breaker	200Kg	Thailand	6.39	0.49
E29	Rammer	60Kg	Thailand	0.78	3.64
E30	Water Pump	4" dia.	Thailand	0.57	1.10
E31	Water Pump	6" dia.	Thailand	0.86	2.55
E32	Concrete Vibrator	45mm	Thailand	0.39	3.94
E33	Vibration Hummer		Japan	314.00	
E34	Lane Marker	2lit/min	Thailand	9.84	5.32
E35	Erection Girder	100t	Japan	253.00	
E36	Traveller Wagon	24m	Thailand	728.00	
E37	Grout Mixer,5.4kw	5.4Kw	Thailand	6.93	
E38	Grout Pump,2.2kw	2.2Kw	Thailand	10.20	
E39	Reverse Drill (RCD)	110 kw	Thailand	68.37	10.12
E40	Batching Plant on Barge	100m3/h	Japan	439.98	96.93
E41	Barge	800 t	Thailand	548.00	
E42	Barge	400 t	Thailand	415.00	
E43	Flat Barge	200 t	Thailand	219.00	
E44	Sludge Tank	20 m3	Thailand	71.00	
E45	Tag Boat	500 PS	Thailand	487.00	
E46	Tag Boat	200 PS	Thailand	170.00	
E47	Cargo Truck 4t w/Crane	180Ps	Thailand	10.90	8.18
E48	Center Hole Jack	200t x200	Japan	50	
E49	Jack Pump	15Kw	Japan	140	

Appendix 15.5 Unit Prices of Materials (1)

Ref. No.	Material	Unit	Procurement Country	Foreign	Local
M1	Cement	Bag	Cambodia		5.8
M2	Concrete Admixture (NL-1440)	lit	Thailand	3.5	
	Mixed Concrete				
M3	Concrete for PC Box Girder	m3	Cambodia		96
M4	Concrete for Pile	m3	Cambodia		93
M5	Concrete for Pile Cap	m3	Cambodia		87
M6	Concrete for Pier Structure	m3	Cambodia		85
M7	Concrete for PC T-girder	m3	Cambodia		92
M8	Concrete for Structure	m3	Cambodia		82
M9	Concrete for Levelling	m3	Cambodia		80
M10	RC Pipe,600mm	ea	Cambodia		28
M11	RC Pipe,1000mm	ea	Cambodia		70
M12	RC Pipe,1,500mm	ea	Cambodia		130
M13	Structural Steel	Ton	Thailand	580.0	
M14	Steel Pipe Pile 2,000x16mm	m	Japan	900.0	
M15	Round Re-bar	Ton	Cambodia		475
M16	Deformed RE-bar	Ton	Cambodia		515
M17	Sand(Purchase)	m3	Cambodia		8.00
M18	Crushed Stone(Purchase)	m3	Cambodia		20.00
M19	Barbed wire	kg	Thailand	0.8	
M20	Straight Asphalt	Ton	Thailand	87.0	
M21	Asphalt Emulsion	lit	Thailand	0.8	
M22	Rubble Stone	m3	Cambodia		18.70
M23	Electric Power	Kwh	Cambodia		0.10
M24	Dynamite	Kg	Thailand	17.5	
M25	AN-FO	Kg	Thailand	3.2	
M26	Detonator	No	Thailand	3.8	
M27	Epoxy Resin	lit.	Thailand	22.9	
M28	Plywood,1/2"	m2	Cambodia		18
M29	Timber,(plank)	m3	Cambodia		160
M30	Timber,(Square)	m3	Cambodia		170
M31	Guard Rail (Gr-A-4E)	m	Japan	78.0	
M32	Lighting Pole 6m(Br-Type)	Nos	Thailand	2,160.0	
M33	Lighting Pole 6m(Er-Type)	Nos	Thailand	2,900.0	
M34	Lighting Fixture	Nos	Thailand	240.0	
M35	Gabion Wire for (1.2x1.0x0.5m)	Nos	Cambodia		7.5
M36	Tuff(Sodding)	m2	Cambodia		0.3
M37	Road Painting	Lit	Japan	5.6	
M38	Primer	Lit	Japan	3.2	
M39	Glass Bead	kg	Japan	2.0	
M40	PS strand 12-12.7	Ton	Thailand	1,000.0	
M41	PC Strand 1-21.8	Ton	Thailand	1,000.0	
M42	Sheath 65mm	m	Thailand	3.4	

Appendix 15.5 Unit Prices of Materials (2)

Ref. No.	Material	Unit	Procurement Country	Foreign	Local
M43	Sheath 35mm,38mm dia.	m	Thailand	1.4	
M44	Anchor for C12T13M	Set	Japan	150.0	
M45	Anchor for 12T13(M199)	Set	Japan	150.0	
M46	Steel Rib-frame	Ton	Japan	3,070.0	
M47	Metal Form	m2	Thailand	44.0	
M48	Stainless Plate	m2	Japan	170.0	
M49	Form Oil	lit	Thailand	1.1	
M50	Separator	No.	Thailand	0.3	
M51	Roof of Wagon	No.	Thailand	21,000.0	
M52	Bentonite	Kg	Thailand	4.5	
M53	H.T.Bolt	No.	Japan	2.0	
M54	Sheath Bar	No	Japan	0.6	
M55	Grout Hose	No	Japan	1.9	
M56	Aluminum Powder	Kg	Thailand	20.0	
M57	Anchor For 1T19.3	No	Japan	36.6	
M58	Anchor for 1T21.8	No.	Japan	40.4	
M59	Curing Compound	lit	Cambodia		4.2
M60	Filler Board	m2	Thailand	8.4	
M61	Filler	Kg	Thailand	13.5	
M62	PC Bar 32mm dia.	Ton	Thailand	1,000.0	
M63	PC Bar 26mm dia.	Ton	Thailand	1,000.0	
M64	Anchor for 32mm dia.	No.	Japan	27.8	
M65	Anchor for 26mm dia.	No.	Japan	16.5	
M66	PC Strand 12 T 15.2	Ton	Thailand	1,000.0	
M67	Sheath 80mm	No.	Japan	39.2	
M68	Anchor for C12T15M	No.	Japan	270.0	
M69	Anchor for 1T-21.8	No.	Japan	38.3	
M70	Rubber Expansion Joint	m	Thailand	374.0	
M71	Steel Expansion Joint	Ton	Japan	4,620.0	
M72	Rubber Bearing,500t	No.	Thailand	30,000.0	
M73	Rubber Bearing,310x260x50	No.	Thailand	212.0	
M74	Drain Pit (J)	No.	Japan	573.0	
M75	Distribution Board	No.	Japan	24,300.0	
M76	Isolator Switch	No.	Japan	1,520.0	
M77	PVC/PVC/25mm2 -3c	m	Japan	0.6	
M78	PVC/PVC/3.5mm2 -3.5c	m	Japan	5.4	
M79	Steel Conduit 36mm dia.	m	Thailand	4.5	
M80	PVC Pipe 70mm	m	Thailand	6.5	
M81	Aluminum Pipe,90mm dia.	m	Thailand	8.5	
M82	Aluminum Post with Anchor	No.	Thailand	25.5	

Appendix 15.6

Summary of Construction Cost

PROJECT : THE FEASIBILITY STUDY ON THE MEKONG RIVER BRIDGE IN CAMBODIA

SUMMARY OF COST ESTIMATE

(US$)

ITEM	DESCRIPTION	QTY	UNIT	FOREIGN CURRENCY		LOCAL CURRENCY	
				UNIT RATE	AMOUNT	UNIT RATE	AMOUNT
(A)	Preparatory Works						
A-1	Development of Camp Yard	1	LS		202,000		185,000
A-2	Site Preparation	1	LS		196,000		669,000
A-3	Transportation Cost	1	LS		9,121,000		552,000
	Sub-total				9,519,000		1,406,000
(B)	Temporary Works						
B-1	Temporary Quay (Jetty)	1	LS		53,000		49,000
B-2	Rental Cost of Self-elevated Platform for Temporary Staging	1	LS		2,044,000		125,000
	Sub-total				2,097,000		174,000
(C)	Main Bridge						
C-1	Superstructure						
C-1-1	Concrete for PC Box Girder	13729	m3	119.00	1,634,000	101.00	1,387,000
C-1-2	Formwork for PC Box Girder	37,720	m2	197.00	7,431,000	59.00	2,225,000
C-1-3	Reinforcing Bar for PC Box Girder	1,647	ton	149.00	245,000	978.00	1,611,000
C-1-4	PC Works						
(a)	Main Cable 12 T 15.2	800	ton	4,304.00	3,443,000	1,383.00	1,106,000
(b)	Lateral Cable 1 T 21.8	67	ton	6,694.00	448,000	2,168.00	145,000
(c)	Vertical PC Bar, dia. 32mm	63	ton	4,749.00	299,000	1,541.00	97,000
	Sub-total				13,500,000		6,571,000
C-2	Foundation and Substructure						
C-2-1	Cast-placed Conc. Pile 2.0m dia.	5,120	m	1,835.00	9,395,000	760.00	3,891,000
C-2-2	Concrete for Pile Cap	12,552	m3	50.00	628,000	67.00	841,000
C-2-3	Concrete for Pier Structure	4,352	m3	103.00	448,000	101.00	440,000
C-2-4	Formwork for Pile Cap	5,320	m2	149.00	793,000	49.00	261,000
C-2-5	Formwork for Pier Structure	4,568	m2	35.00	160,000	45.00	206,000
C-2-6	Reinforcing Bar	2,705	ton	480.00	1,298,000	987.00	2,670,000
	Sub-total				12,722,000		8,309,000
C-3	Bridge Ancillary Works						
C-3-1	Expansion joint	27	m	2,314.00	62,000	80.00	2,000
C-3-2	Movable Shoes	4	Nos	37,977.00	152,000	141.00	1,000
C-3-3	Footpath and Kerb	2,000	m	15.00	30,000	109.00	218,000
C-3-4	Drain Pits	134	No.	752.00	101,000	66.00	9,000
C-3-5	Handrailing	2,000	m	34.00	68,000	9.00	18,000
C-3-6	Asphalt Surface	10,800	m2	9.21	99,000	2.98	32,000
	Sub-total				512,000		280,000
	Total of (C)				26,734,000		15,160,000
	SUB - TOTAL				38,350,000		16,740,000

PROJECT : THE FEASIBILITY STUDY ON THE MEKONG RIVER BRIDGE IN CAMBODIA

SUMMARY OF COST ESTIMATE

(US$)

ITEM	DESCRIPTION	QTY	UNIT	FOREIGN CURRENCY		LOCAL CURRENCY	
				UNIT RATE	AMOUNT	UNIT RATE	AMOUNT
(D)	Approach Bridge						
D-1	Superstructure						
D-1-1	PC T-Girder L=40.0m	54	Nos	21,502.00	1,161,000	19,912.00	1,075,000
D-1-2	Erection of Girders	54	Nos	1,483.00	80,000	471.00	25,000
D-1-3	Lateral Cable 1 T 21.8	22	ton	8,591.00	189,000	1,468.00	32,000
D-1-4	Concrete for Slab	569	m3	33.00	19,000	146.00	83,000
D-1-5	Formwork for Slab	2437	m2	25.00	61,000	28.00	68,000
D-1-6	Reinforcing Bar for Slab	34	ton	765.00	26,000	208.00	7,000
	Sub-total				1,536,000		1,290,000
D-2	Foundation and Substructure						
D-2-1	Cast-placed Conc. Pile 1.0m dia.	2,078	m	193.00	401,000	192.00	399,000
D-2-2	Concrete for Pile Cap	758	m3	8.00	6,000	111.00	84,000
D-2-3	Concrete for Pier Structure	2,256	m3	8.00	18,000	111.00	250,000
D-2-4	Formwork for Pile Cap	394	m2	28.00	11,000	22.00	9,000
D-2-5	Formwork for Pier and Abutment	298	m2	36.00	11,000	26.00	8,000
D-2-6	Reinforcing Bar	210	ton	765.00	161,000	208.00	44,000
D-2-7	Structural Excavation & Backfill	1,400	m3	1.94	3,000	1.31	2,000
	Sub-total				611,000		796,000
D-3	Bridge Ancillary Works						
D-3-1	Expansion joint	27	m	2,314.00	62,000	80.00	2,000
D-3-2	Movable Shoes	108	Nos	280.00	30,000	32.00	3,000
D-3-3	Footpath and Kerb	360	m	15.00	5,000	109.00	39,000
D-3-4	Handrailing	360	m	34.00	12,000	9.00	3,000
D-3-5	Asphalt Concrete Surface	3,888	m2	9.21	36,000	2.98	12,000
	Sub-total				145,000		59,000
	Total of (D)				2,292,000		2,145,000
(E)	Approach Rod						
E-1	Embankment and Pavement						
E-1-1	Clearing and Striping	96,900	m2	0.68	66,000	0.64	62,000
E-1-2	Embankment	254,100	m3	3.30	839,000	3.08	783,000
E-1-3	Sub-base Course	4,400	m3	4.75	21,000	4.40	19,000
E-1-4	Base Course	4,840	m3	33.90	164,000	15.81	77,000
E-1-5	Asphalt Concrete Pavement	29,800	m2	9.15	273,000	2.92	87,000
E-1-6	Slope Protection(Sodding)	47,100	m2	0.00	0	0.94	44,000
E-1-7	Slope Protection(Concrete)	2,470	m2	4.28	11,000	33.81	84,000
E-1-8	Road Marking	1,380	m2	7.52	10,000	2.07	3,000
	Sub-Total				1,384,000		1,159,000
	SUB-TOTAL				3,676,000		3,304,000

PROJECT : THE FEASIBILITY STUDY ON THE MEKONG RIVER BRIDGE IN CAMBODIA

SUMMARY OF COST ESTIMATE

(US$)

ITEM	DESCRIPTION	QTY	UNIT	FOREIGN CURRENCY		LOCAL CURRENCY	
				UNIT RATE	AMOUNT	UNIT RATE	AMOUNT
E-2	Road Structure						
E-2-1	Guard rail						
a)	For Embankment	4000	m	78.00	312,000	6.00	24,000
b)	For Retaining Wall	400	m	63.75	26,000	6.00	2,000
E-2-2	Sidewalk and Kerb	1500	m	3.45	5,000	35.19	53,000
E-2-3	Pipe Culvert	306	m	6.36	2,000	58.75	18,000
E-2-4	Drainage Shute	2	No.	13.84	0	534.45	1,000
E-2-5	Intersection (Roundabout)	1	LS		1,000		22,000
E-2-6	Box Curvert	1	No.	50,000.00	50,000	61,700.00	62,000
E-2-7	Retaining Wall	1	LS		239,000		300,000
E-2-8	Approach Slab	2	Nos.	2,141.70	4,000	3,075.35	6,000
	Sub-Total				639,000		488,000
	Total of (E)				2,023,000		1,647,000
(F)	Ancillary Works						
F-1-1	Lighting (Poles) Works		Ls		330,000		34,000
F-1-2	Stone Placing for Scoring	30,000	m3	10.54	316,000	25.12	754,000
F-1-3	Gabion	5,000	m2	4.44	22,000	28.92	145,000
	Total (F)				668,000		933,000
	SUB - TOTAL				1,307,000		1,421,000
	TOTAL				43,333,000		21,465,000

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