

## **C. STRUCTURE**

**C-1. List of Data and Information for Road Structures**

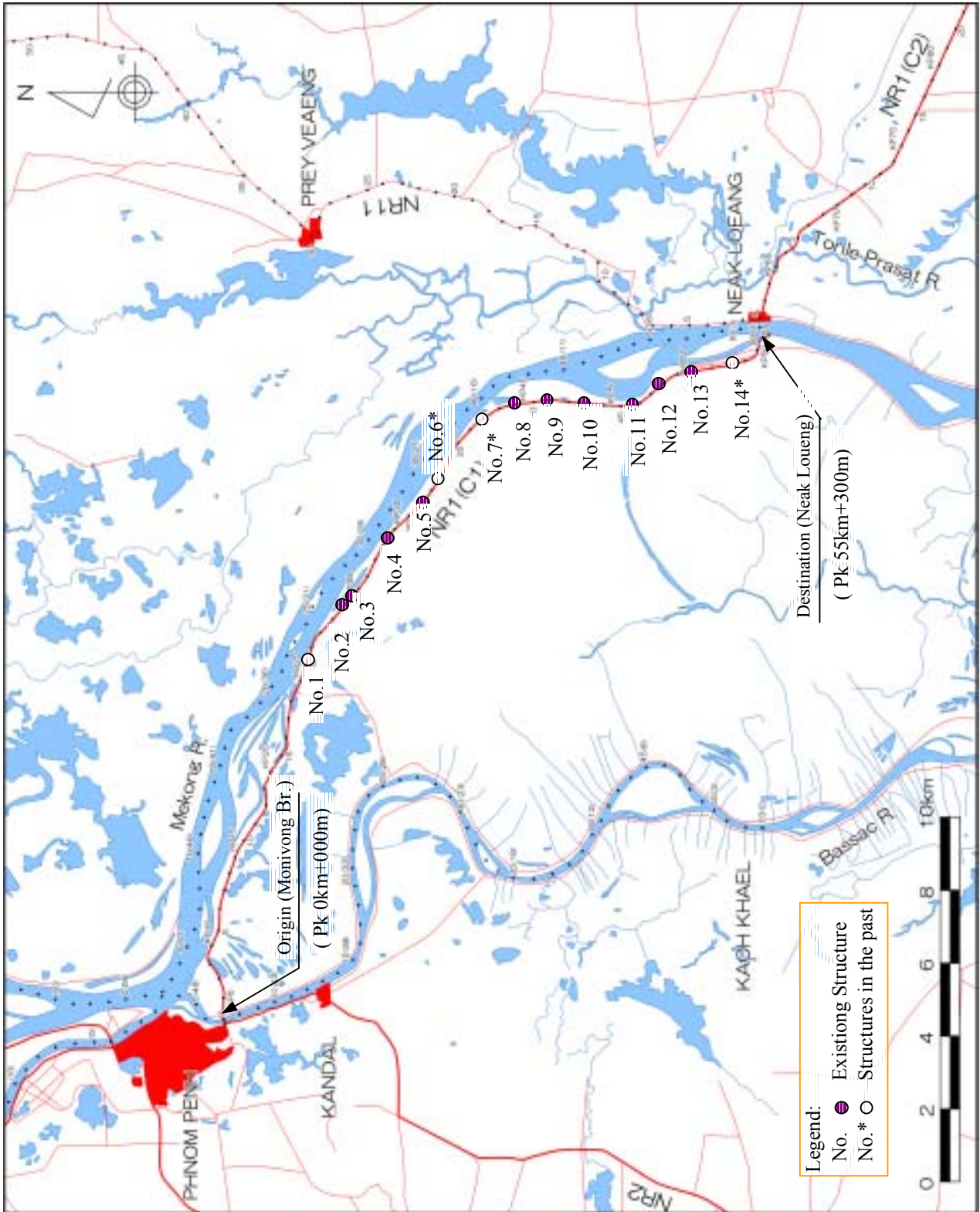
Area	Southeast Asia	The feasibility Study on the Improvement of National Road No.1 (Phnom Penh - Neak Loueng Section)		Study Type	Nos	Published By	Given By	Consultant	PCI & KEI
Country	The Kingdom of Cambodia	Project Name		Period of Work in Cambodia				Team Leader	Mr. Kenji Maruoka
1		Emergency Flood Rehabilitation Project Bridge Design Standards Manual (Hydraulic Design for Flood Rehabilitation of Rural Roads) February 2002	Document	Copy	1	MPWT	MPWT		
2		Seminar Document on the Maximum Load Limit of Transport Vehicle Trafficking on Road Network in the Kingdom of Cambodia 1999	Document	Copy	1	MPWT	MPWT		
3		Terms of Reference for Urgent Repair of No.15, and 17 Bridge on National Road 6A (Draft) April 2002	Document	Copy	1	MPWT	MPWT		
4		Traffic Volume Data in Kampong Cham Nippon Koei., Ltd 25 February 2002	Document	Copy	1	JICA Cambodian Office	JICA Cambodian Office		
5		Traffic Volume Survey Result Report on NR6A	Document	Copy	1	JICA Cambodian Office	JICA Cambodian Office		
6		Cambodian Resettlement Policy and Practices Review and Recommendations	Document	Copy	2	Ministry of Economy and Finance	JICA Cambodian Office		
7		Asian Highway Expert Group Meeting on Development of the Asian Highway Network 8-10 May 2002, Bangkok	Document	Copy	1	United Nations	Advisory Committee		
8		Proposed Asian Highway Route Map	Map	Copy	1	United Nations	Advisory Committee		
9		Asian Highway Catalogue	Catalogue	Copy	1	United Nations	Advisory Committee		
10		Special Assistance for Project Implementation of the Sihanoukville Port Urgent Rehabilitation Project Draft Final Report January 2002	Document	Copy	1	JBIC	JICA Cambodian Office		

No	Title	Type	Page	Original/Copy	Nos	Published By	Given By
11	Bridge Design Standard, CAM PW.04.102.99, Ministry of Public Works and Transport, 1999	Document		Copy	1	MPWT	MPWT
12	Road Design Standard, CAM PW.03.101.99, Ministry of Public Works and Transport, 1999	Document		Copy	1	MPWT	MPWT
13	Cambodian Bridge Standards Project, Draft Inception Report, 25 Nov. 1998, AusAID	Document		Copy	1	MPWT	MPWT
14	Manual for Assembly and Erection of Girder Spans, Australian Agency for International Development, Ministry of Public Works and	Document		Copy	1	MPWT	MPWT
15	Manual for Assembly and Erection of Truss Spans, Australian Agency for International Development, Ministry of Public Works and	Document		Copy	1	MPWT	MPWT
16	The Transport Master Plan of Phnom Penh Metropolitan Area, Progress Report, Nov.2000, Ministry of Public Works and Transport, Katahira & Engineers International	Document		Copy	1	MPWT	MPWT

Note:

MPWT: Ministry of Public Works and Transport, MRC: Mekong River Committee, ADB: Asia Development Bank, MOE: Ministry of Environment  
NICFEC: Natural and Imperial Committee for Free and Fair Election in Cambodia (Non-government Organization)

C-2. Inventory Sheet for the Structures



Location Map for Existing Structures

**NATIONAL ROAD NO.1**

**Structure Inventory**


Structure No.: 2

Structure Name: Pipe Culvert - Prek Loung

Survey Date: 03/06/2002

Engineer: CHUM SAM ATH

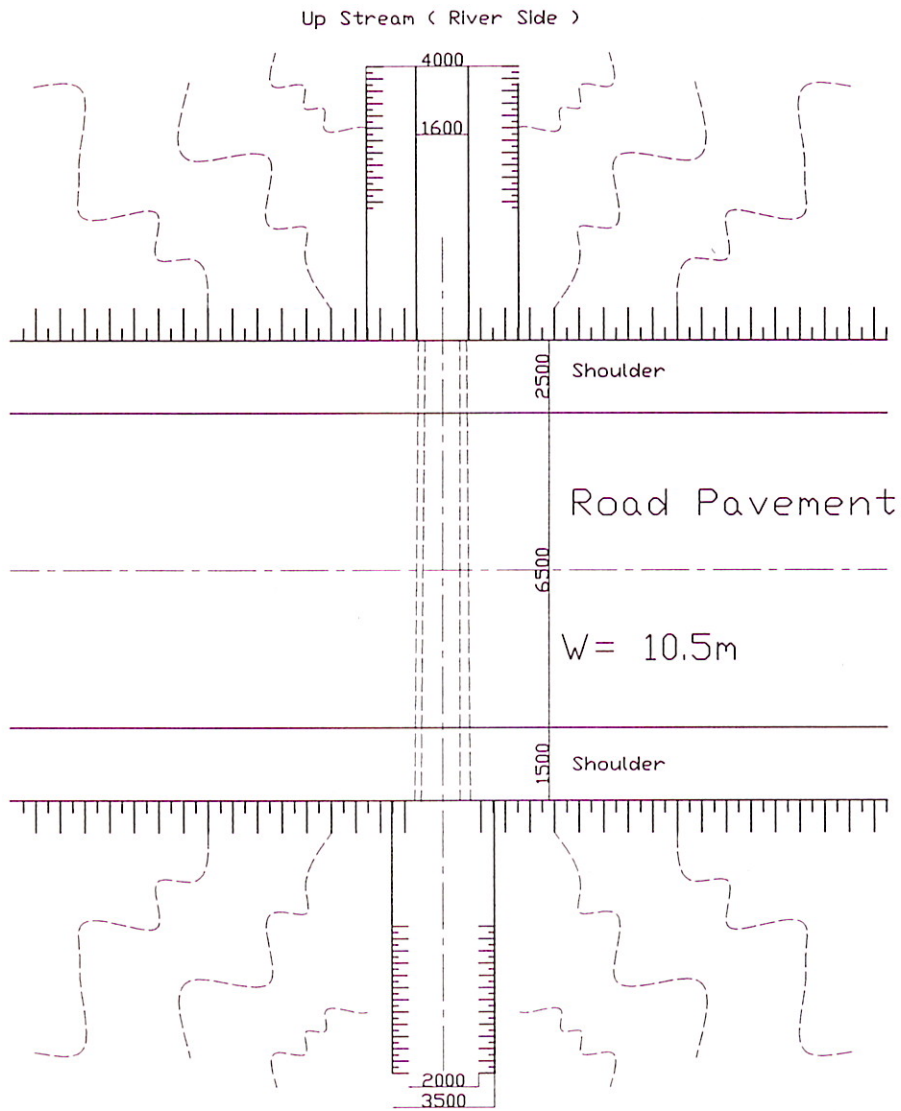
A. GENERAL INFORMATION									
(1)	Structure No.	2			(2) Structure Name	Prek Loung			
(3)	Station	Pk 24 <sup>+000</sup>			(4) Crossing Object	Water way			
(5)	Structure Type	Steel pipe			(6) Skew Angle	90°			
(7)	Length (meter) as a road	1.00m			(8) Affixed Utility	Cable optic			
(9)	Width (meter) as a road	Left Sidewalk= 2.50m		Pavement= 6.50m	Right Sidewalk= 1.50m		Total= 10.50m		
(10)	Number of Lanes	2			(11) Completion Year	Sihanouk Regime 1965			
(12)	Load Limit ( tf )	None			(13) Design Standard	Cambodian Standard			
B. SUPERSTRUCTURE									
(14)	Number of Opening (With/without Gate)	1 opening							
(15)	Opening Dimension	D500m (15mm THK)							
(16)	Pavement Condition	Wave							
	Comment	W=Wave, R=Rut, C=Crack, P=Pothole, O=Other						Can load capacity and adequate for traffic with water flow	Evaluation
(17)	Top Slab Condition	Not slab (Filling by soil only)							
	Comment	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired						None	Evaluation
(18)	Wall and Bottom Slab Condition	None							
	Comment	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired,						None	Evaluation
(19)	Guardrail Type	None							
	Comment	C=Concrete, S=Steel						None	Evaluation
(20)	Guardrail Condition	None							
	Comment	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired,						None	Evaluation
(21)	Foundation Type	Stone compaction for base of steel pipe only							
(22)	Foundation Condition	Settled							
	Comment	S=Settled, E=PILE EXPOSED - Height in meters, F=Foundation Scoured						Pavement cracking and settled. Shoulder both side settled	Evaluation
C. OTHERS									
(23)	Bearing Type	None							
(24)	Bearing Condition	None							
	Comment	C=Cracked Below, N=Not Positioned Properly, D=Defective, R=Rusty						None	Evaluation
(25)	Bearing Seat Condition	None							
	Comment	C=Cracked Below, R=Rebar Exposed, S=Spalling, W=Insufficient Width of Seat						None	Evaluation
(26)	Expansion Joint Type	None							
(27)	Expansion Joint Condition	None							
	Comment	R=Rusty, L=Loose, U=Uneven, C=Concrete Spalled						None	Evaluation
(28)	Falling Prevention Condition	None							
	Comment	D=Damaged, N=No device						None	Evaluation
(29)	Wing Wall Condition	None							
	Comment	C=Cracked, W=Wing Wall Scoured						None	Evaluation

D. RIVER CONDITION				
(30)	Flood Water Level	1.00 - 1.50m below road level		
(31)	Flow Direction	From River to Lake		
(32)	Dimension of River or Channel	Down ( $W_T=3.50m$ , $W_B=2.00m$ , $H=2.00m$ ), Up ( $W_T=6.00m$ , $W_B=4.00m$ , $H=1.30m$ )		
(33)	River Condition (upstream, downstream)	Downstream: in dry season no water and have some forest		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion,Box C=Concrete (length in meters), P=Piled Walls		
(35)	River Bank Condition	D and C		
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream		
	Comment	River bank is the natural soil, so easy to damaged by rain	Evaluation	C
(36)	River Bed Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion, C=Concrete (length in meters) P=Piled Walls		
(37)	River Bed Condition	D		
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream		
	Comment	The water can not flow easy and not do direction way to channel	Evaluation	D
(38)	Approach condition	None		
		S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)		
	Comment	None	Evaluation	
(39)	Condition of Approach Slab	None		
		C=Fair Condition, A=No Slab, D=Damaged Slab		
	Comment	None	Evaluation	
F. SLOPE PROTECTION				
(40)	No.			
	Slope Protection Type	None		
		N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls		
(41)	Slope Protection Condition	D		
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream		
	Comment	Damaged by water flow	Evaluation	C
<b>G. OVERALL EVLUATION</b>		Can serviceability, but need to rehabilitation		
H. OVERALL COMMENT				
	<p>1- This Pipe Culvert for drainage system in the raining season and protection of emergency flood.</p> <p>2- Position of steel pipe culvert is settled, because according to the appearance which pavement have cracking, base of steel pipe by crushed stone compaction only and it was scoured. Slope protection both side also scoured. So need to rehabilitation for availability.</p>			
				

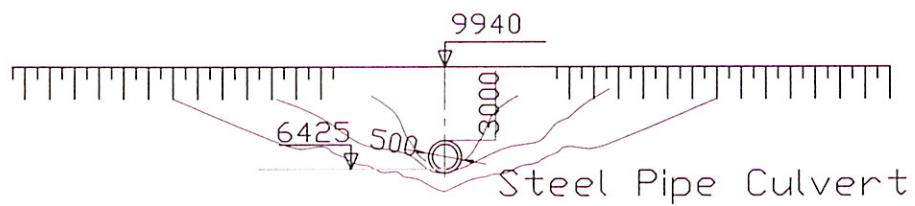
Sketch of Old Steel Pipe Culvert ( PREK LOEUNG )

Pk 24+000

PLAN



Road Pavement



NATIONAL ROAD No. 1

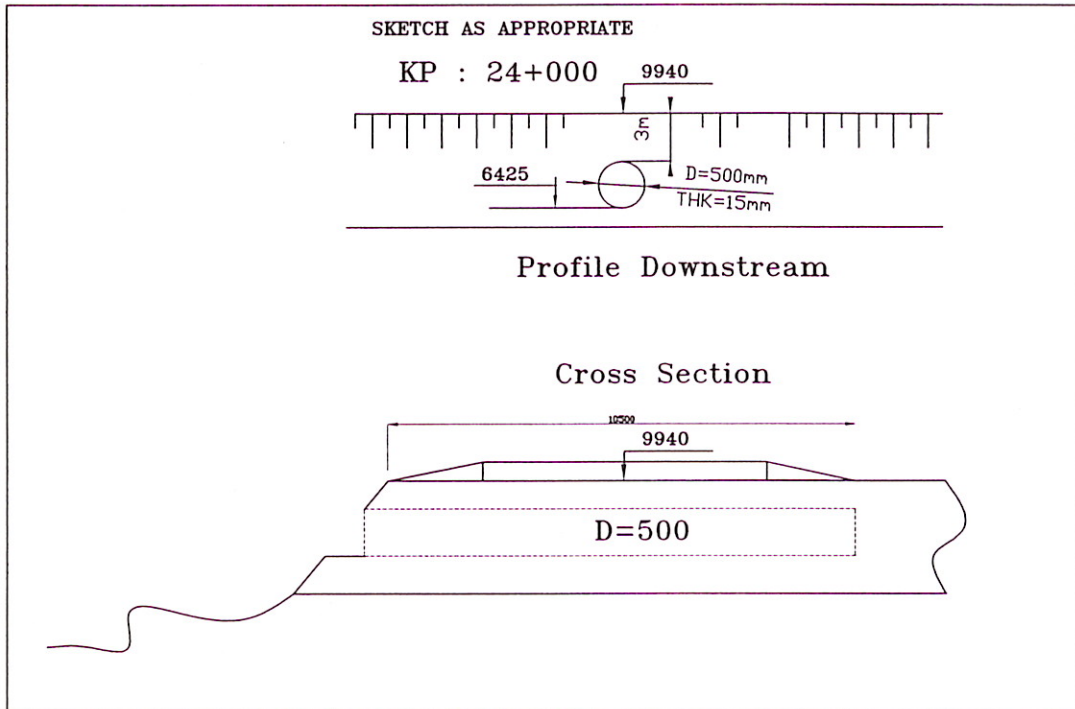
Road Inventory : Pipe Culvert Field Survey

No.2 \_\_\_\_\_ KP : 24+000 (Prek Loung)

Survey Date : 02 . JUN . 22

Engineer : Chum Sam ath

Function: Irrigation in the Sihanouk Regime



Description :

Steel pipe with D=0.5m and 3.5m below of road surface was constructed in the Sihanouk regime for irrigation



**NATIONAL ROAD NO.1**

Structure No.: 3

**Structure Inventory**

Structure Name: Pipe Culvert

Survey Date: 01/06/2002

Engineer: CHUM SAM ATH

A. GENERAL INFORMATION					
(1)	Structure No.	3	(2) Structure Name	Lou Rahat Kchal	
(3)	Station	Pk 24+840	(4) Crossing Object	Excavate channel in Pol Pot Regime	
(5)	Structure Type	Reinforced concrete	(6) Skew Angle	90°	
(7)	Length (meter) as a road	1.70m along the road	(8) Affixed Utility	Cable optic	
(9)	Width (meter) as a road	Left Sidewalk= 2.90m	Pavement= 6.70m	Right Sidewalk= 2.90m	Total
(10)	Number of Lanes	2	(11) Completion Year	Pol Pot Regime (1979)	
(12)	Load Limit ( tf )	None	(13) Design Standard	Chinese Standard	
B. SUPERSTRUCTURE					
(14)	Number of Opening (With/without Gate)	1 opening			
(15)	Opening Dimension	D1000mm			
(16)	Pavement Condition	Wave			
		W=Wave,	R=Rut,	C=Crack,	P=Pothole, O=Other
	Comment	Base of pavement no good compaction		Evaluation	C
(17)	Top Slab Condition	Good			
		C=Cracking, X=Repaired	R=Rebar Exposed,	S=Spalling,	SC=Scale
	Comment	Can load capacity		Evaluation	C
(18)	Wall and Bottom Slab Condition	Good			
		C=Cracking, X=Repaired,	R=Rebar Exposed,	S=Spalling,	SC=Scale
	Comment	Bottom slab and wall are good structure, because of Japanes's material			
(19)	Guardrail Type	None			
		C=Concrete,	S=Steel		
(20)	Guardrail Condition	None			
		C=Cracking, X=Repaired,	R=Rebar Exposed,	S=Spalling,	SC=Scale
	Comment	Because of short spand no need handrail		Evaluation	C
(21)	Foundation Type	Concrete base			
(22)	Foundation Condition	Good			
		S=Settled,	E=Pile Exposed - Height in meters,	F=Foundation Scoured	
	Comment	Durability		Evaluation	D
C. OTHERS					
(23)	Bearing Type	None			
(24)	Bearing Condition	None			
		C=Cracked Below,	N=Not Positioned Properly,	D=Defective,	R=Rusty
	Comment	None		Evaluation	
(25)	Bearing Seat Condition	None			
		C=Cracked Below,	R=Rebar Exposed,	S=Spalling,	W=Insufficient Width of Seat
	Comment	None		Evaluation	
(26)	Expansion Joint Type	None			
(27)	Expansion Joint Condition	None			
		R=Rusty,	L=Loose,	U=Uneven,	C=Concrete Spalled
	Comment	None		Evaluation	
(28)	Falling Prevention Condition	None			
		D=Damaged,	N=No device		
	Comment	None		Evaluation	
(29)	Wing Wall Condition	W and honeycomb			
		C=Cracked,	W=Wing Wall Scoured		
	Comment	Concrete no vibration and strenght of plastering fair		Evaluation	C

**NATIONAL ROAD NO.1**


Structure No.: 3

**Structure Inventory**

Structure Name: Pipe Culvert

Survey Date: 01/06/2002

Engineer: CHUM SAM ATH

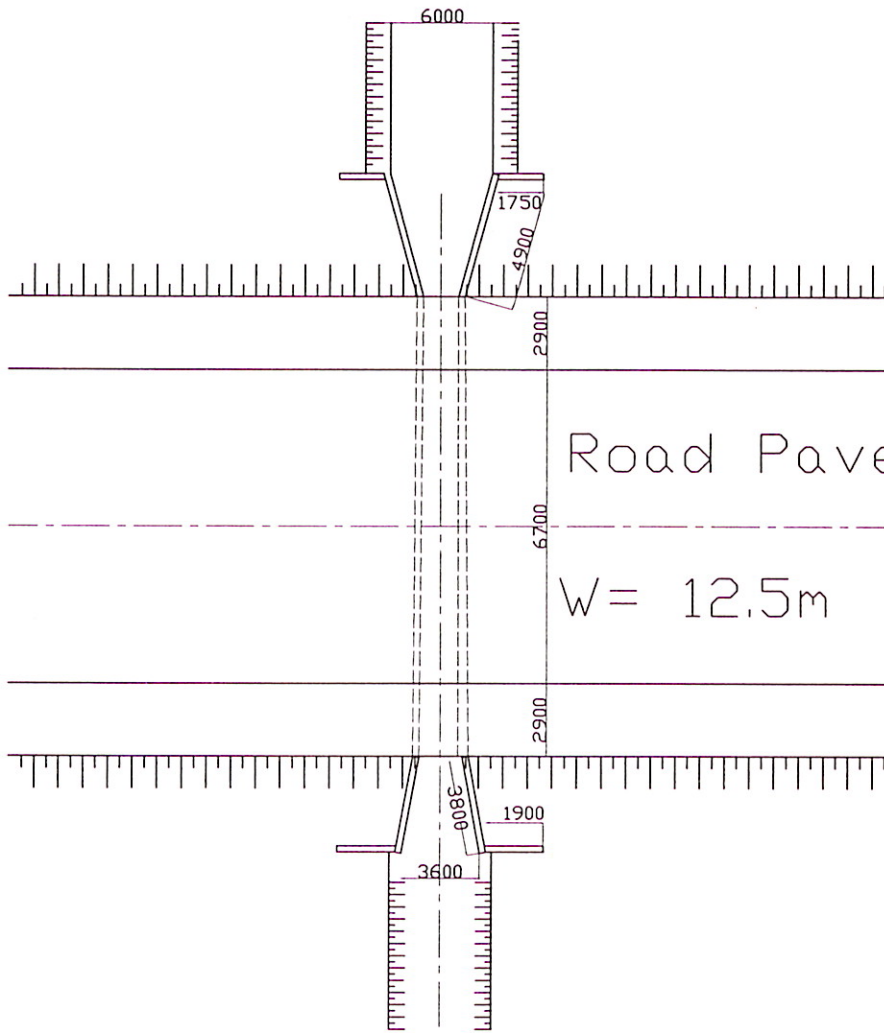
D. RIVER CONDITION			
(30)	Flood Water Level	Every level TWL=1.50m below road level, but in 1996 TWL=0.20m above road level (Flood eme	
(31)	Flow Direction	EAST to WEST (From River to Lake)	
(32)	Dimension of River or Channel	(W <sub>T</sub> =6.00m, W <sub>B</sub> =4.50m), H=1.50m	
(33)	River Condition (upstream, downstream)	In the dry season no water (down/up) but in the raining season height of level of water	
E. RIVER BANK AND APPROACH ROAD			
(34)	River Bank Protection Type	None	
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,Box C=Concrete (length in meters),
(35)	River Bank Condition	D	
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream	
	Comment	In dry season not repair, not prevention	Evaluation C
(36)	River Bed Protection Type	None	
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion, C=Concrete (length in meters)
(37)	River Bed Condition	D	
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream	
	Comment	In dry season not repair, not prevention	Evaluation C
(38)	Approach condition		
		S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)	
(39)	Condition of Approach Slab		
		C=Fair Condition, A=No Slab, D=Damaged Slab	
	Comment		Evaluation
F. SLOPE PROTECTION			
(40)	No.		
	Slope Protection Type	None	
(41)		N=None, P=Piled Walls	
		R=Riprap,	G=Gabion, C=Concrete,
(41)	Slope Protection Condition	D	
		D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream	
	Comment	No prevention in raining season	Evaluation C
<b>G. OVERALL EVLUATION</b>		Can use for irrigation and traffic, but need to rehabilitation	
H. OVERALL COMMENT			
<p>1- For structure need to repair (reconstruction), but the river condition must be new construction both river bank, bed and slope protection.</p> <p>2- Local people said that: this culvert constructed by Chinese Company (Sub-constructor) of government, not Japanese Company. So it is Chinese Standard.</p> <p>3- Top of water level (TWL)</p>			
			

Sketch of Old Pipe Culvert ( Lou Rohatkchal )

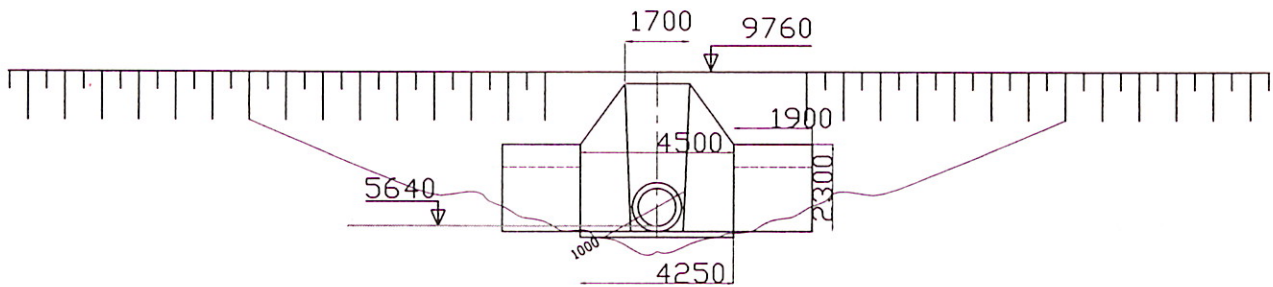
Pk 24+840

PLAN

Up Stream ( River Side )



Road Pavement



NATIONAL ROAD No. 1

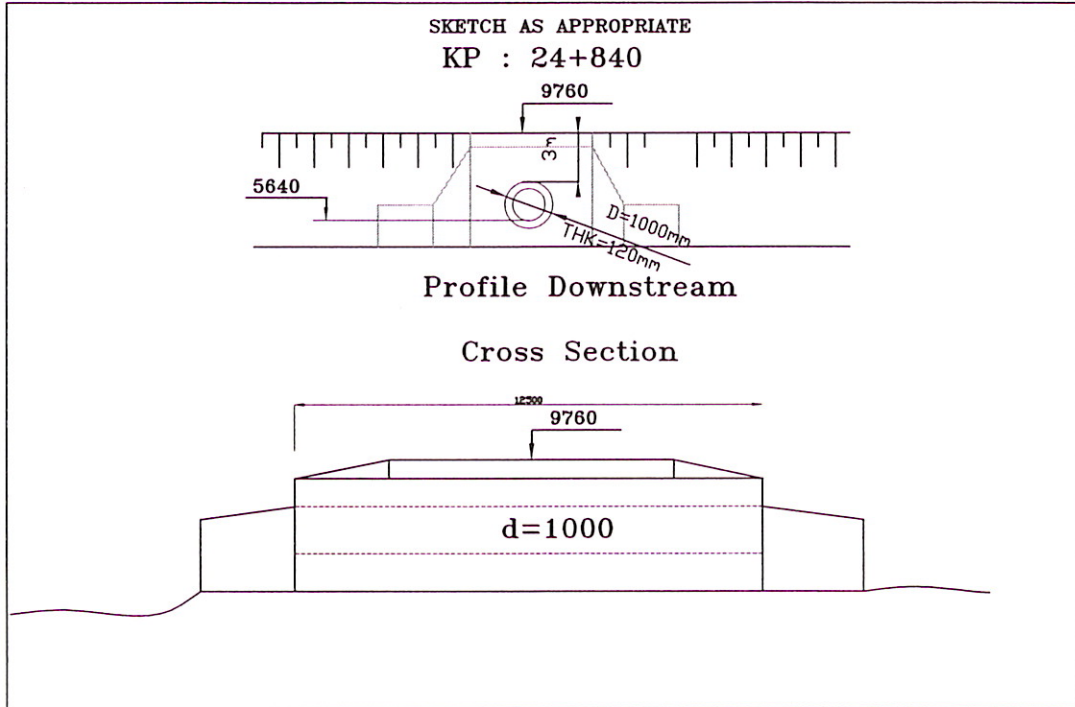
Road Inventory : Pipe Culvert Field Survey

No.: 3 KP : 24+840 (Rohat Kchal)

Survey Date : 02 . JUN . 22

Engineer : Chum Sam ath


Function : Irrigation in the Pol Pot Regime



Description :

Concrete pipe with D=1m and 3m below of road surface was constructed in the Pol Pot regime for irrigation

A. GENERAL INFORMATION				
(1)	Structure No.	4	(2) Structure Name	Prek Pol
(3)	Station	Pk 28 <sup>+450</sup>	(4) Crossing Object	New channel, but upstream have small dam
(5)	Structure Type	Reinforced concrete	(6) Skew Angle	90°
(7)	Length (meter) as a road	10.45m along the road	(8) Affixed Utility	Telephone cable on the slab
(9)	Width (meter) as a road	Left Sidewalk= 2.95 m      Pavement= 13.50 m      Others= 3.55 m      Total= 20.00 m		
(10)	Number of Lanes	2	(11) Completion Year	Open ceremony on 25-05-2002
(12)	Load Limit ( tf )	None	(13) Design Standard	Japanese Standard
B. SUPERSTRUCTURE				
(14)	Number of Opening (With/without Gate)	3 Opening with 3 Gates		
(15)	Opening Dimension	(2.75x5.00)m, (3.00x5.00)m, (2.75x5.00)m		
(16)	Pavement Condition	Good pavement		
	W=Wave,      R=Rut,      C=Crack,      P=Pothole,      O=Other			
	Comment	Good serviceability	Evaluation	A
(17)	Top Slab Condition	Good condition		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired			
	Comment		Evaluation	A
(18)	Wall and Bottom Slab Condition	Good condition		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment		Evaluation	A
(19)	Guardrail Type	R.C Parapet with round steel pipe handrail		
	C=Concrete,      S=Steel			
(20)	Guardrail Condition	Good condition		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment		Evaluation	A
(21)	Foundation Type	Reinforced concrete pile (300x300) <sup>mm</sup> x12.00m, 70pcs		
(22)	Foundation Condition	Good condition		
	S=Settled,      E=Pile Exposed - Height in meters,      F=Foundation Scoured			
	Comment		Evaluation	A
C. OTHERS				
(23)	Bearing Type	None		
(24)	Bearing Condition	None		
	C=Cracked Below,      N=Not Positioned Properly,      D=Defective,      R=Rusty			
	Comment	None	Evaluation	
(25)	Bearing Seat Condition	None		
	C=Cracked Below,      R=Rebar Exposed,      S=Spalling,      W=Insufficient Width of Seat			
	Comment	None	Evaluation	
(26)	Expansion Joint Type	None		
(27)	Expansion Joint Condition	None		
	R=Rusty,      L=Loose,      U=Uneven,      C=Concrete Spalled			
	Comment	None	Evaluation	
(28)	Falling Prevention Condition	None		
	D=Damaged,      N=No device			
	Comment	None	Evaluation	
(29)	Wing Wall Condition	None		
	C=Cracked,      W=Wing Wall Scoured			
	Comment		Evaluation	

D. RIVER CONDITION				
(30)	Flood Water Level	1.50 m below road level		
(31)	Flow Direction	From EAST to WEST (River to Irrigation)		
(32)	Dimension of River or Channel	(W <sub>T</sub> =23.80m, W <sub>B</sub> =10.80m), H=4.20m		
(33)	River Condition (upstream, downstream)	Upstream, downstream: have slope protection, channel from river		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	Upstream: 11.30 m for gabion box, 5.00 m for concrete wall		
		Downstream: 20.00 m for concrete wall, 30.00 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,Box	C=Concrete (length in meters),
(35)	River Bank Condition	Good, but some place of G wire mesh have corrotion and cracking in the joint with Riprap		
		D=Damaged,	S=Scoured,	C=Corroded, E=Enchroachment on Stream
	Comment	Need some repair		Evaluation B
(36)	River Bed Protection Type	Upstream: 5.00 m for gabion box, 11.30 m for concrete slab		
		Downstream: 16.30 m for concrete slab, 23.70 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,	C=Concrete (length in meters)
(37)	River Bed Condition	Good		
		D=Damaged,	S=Scoured,	C=Corroded, E=Enchroachment on Stream
	Comment	Possible to protect against heavy water flow		Evaluation A
(38)	Approach condition	Good		
		S= Sinking (height in cm),	AS=Scour Behind Abutment (length in meters)	
	Comment			Evaluation A
(39)	Condition of Approach Slab	None		
		C=Fair Condition,	A=No Slab,	D=Damaged Slab
	Comment			Evaluation
F. ABUTMENT SLOPE PROTECTION				
(40)	No.	Phnom Penh side	Neak Loueng side	
	Slope Protection Type	Gabion with wire mesh cover, Riprap with cement mortar joint		
	N=None, P=Piled Walls	R=Riprap,	G=Gabion,	C=Concrete,
(41)	Slope Protection Condition	Good condition		
		D=Damaged,	S=Scoured,	C=Corroded, E=Enchroachment on Stream
	Comment			Evaluation A
<b>G. OVERALL EVALUATION</b>		A (Good durability, Serviceability)		
H. OVERALL COMMENT				
<p>1 - This Water Gate is very important for regular water flow in the rainy season and flood protection for NR1.                  2 - This plays an important role in the dry season to keep the water in low-lying area with the gate shut down.                  3 - Road width is enough for future traffic volume.                  4 - As to gabion box for slope protection and river bank protection, wire mesh were corroded. Repair is required.</p>				
				



NATIONAL ROAD NO.1

Structure Inventory

(1/2)

Structure No.: 5

Structure Name: Water Gate (New)

Survey Date : 02/06/2002

Engineer : CHUM SAM ATH

A. GENERAL INFORMATION				
(1)	Structure No.	5	(2) Structure Name	Prek Takao
(3)	Station	Pk 31 <sup>+120</sup>	(4) Crossing Object	Both side stream are channel
(5)	Structure Type	Reinforced concrete	(6) Skew Angle	70°
(7)	Length (meter) as a road	10.55m	(8) Affixed Utility	Telephone cable
(9)	Width (meter) as a road	Left Sidewalk= 10.00 m    Pavement= 13.50 m    Right Sidewalk=0.00 m    Total= 23.50 m		
(10)	Number of Lanes	2	(11) Completion Year	2002
(12)	Load Limit ( tf )	None	(13) Design Standard	Japanese Standard
B. SUPERSTRUCTURE				
(14)	Number of Opening (With/without Gate)	3 Openings with 3 Gates		
(15)	Opening Dimension	(2.75x5.10)m, (3.00x5.10)m, (2.75x5.10)m		
(16)	Pavement Condition	Good condition		
	W=Wave,    R=Rut,    C=Crack,    P=Pothole,    O=Other			
	Comment	Good serviceability	Evaluation	A
(17)	Top Slab Condition	Good condition		
	C=Cracking,    R=Rebar Exposed,    S=Spalling,    SC=Scale X=Repaired			
	Comment		Evaluation	A
(18)	Wall and Bottom Slab Condition	Cracking (Filled with cement mortar in P-con form work)		
	C=Cracking,    R=Rebar Exposed,    S=Spalling,    SC=Scale X=Repaired,			
	Comment	Already repaired and in good condition	Evaluation	A
(19)	Guardrail Type	R.C Parapet with round steel pipe handrail		
	C=Concrete,    S=Steel			
(20)	Guardrail Condition	Vertical crack, P-con not to be filled with mortar after removal of separators		
	C=Cracking,    R=Rebar Exposed,    S=Spalling,    SC=Scale X=Repaired,			
	Comment	Need repair works	Evaluation	B
(21)	Foundation Type	R.C pile (300x300) <sup>mm</sup> x12.00m, 84pcs		
(22)	Foundation Condition	Good condition		
	S=Settled,    E=Pile Exposed - Height in meters,    F=Foundation Scoured			
	Comment		Evaluation	A
C. OTHERS				
(23)	Bearing Type	None		
(24)	Bearing Condition	None		
	C=Cracked Below,    N=Not Positioned Properly,    D=Defective,    R=Rusty			
	Comment	None	Evaluation	
(25)	Bearing Seat Condition	None		
	C=Cracked Below,    R=Rebar Exposed,    S=Spalling,    W=Insufficient Width of Seat			
	Comment	None	Evaluation	
(26)	Expansion Joint Type	None		
(27)	Expansion Joint Condition	None		
	R=Rusty,    L=Loose,    U=Uneven,    C=Concrete Spalled			
	Comment	None	Evaluation	
(28)	Falling Prevention Condition	None		
	D=Damaged,    N=No device			
	Comment	None	Evaluation	
(29)	Wing Wall Condition	None		
	C=Cracked,    W=Wing Wall Scoured			
	Comment		Evaluation	A



**NATIONAL ROAD NO.1**


Structure No.: 5

**Structure Inventory**

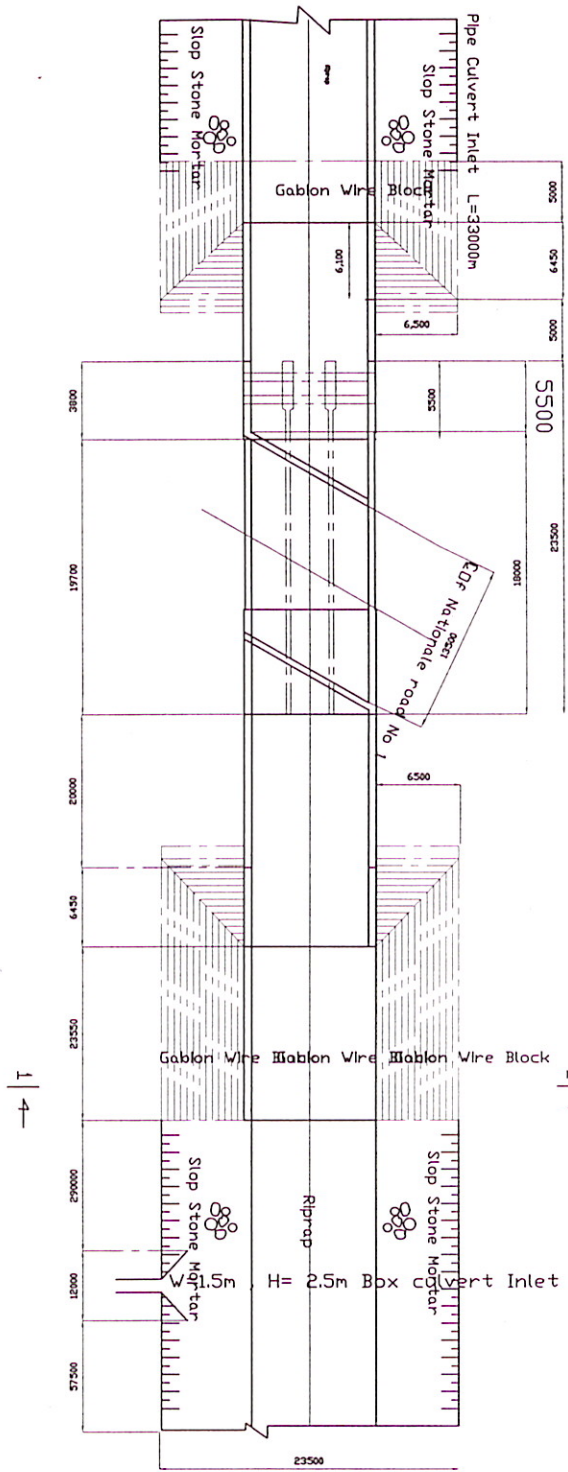
Structure Name: Water Gate (New)

Survey Date : 02/06/2002

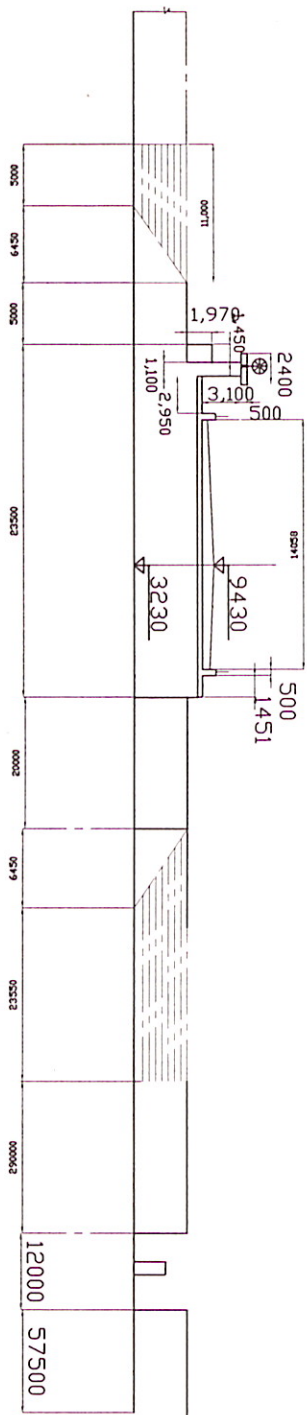
Engineer : CHUM SAM ATH

D. RIVER CONDITION				
(30)	Flood Water Level	2.70m below road level		
(31)	Flow Direction	From EAST to WEST (River to Irrigation)		
(32)	Dimension of River or Channel	(W <sub>T</sub> =23.50m, W <sub>B</sub> =14.30m), H=4.30m		
(33)	River Condition (upstream, downstream)	Upstream, downstream: have slope protection, channel from river		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	Upstream: 11.45 m for gabion box, 5.00 m for concrete wall Downstream: 20.00 m for concrete wall, 30.00 m for gabion box		
	N=None, R=Riprap (length in meters), G=Gabion,Box C=Concrete (length in meters), P=Piled Walls			
(35)	River Bank Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment		Evaluation	A
(36)	River Bed Protection Type	Upstream: 5.00 m for gabion box, 11.45 m for concrete slab Downstream: 26.45 m for concrete slab, 23.55 m for gabion box		
	N=None, R=Riprap (length in meters), G=Gabion, C=Concrete (length in meters), P=Piled Walls			
(37)	River Bed Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment	Possible to protect against heavy water flow	Evaluation	A
(38)	Approach condition	Good condition		
	S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)			
	Comment		Evaluation	A
(39)	Condition of Approach Slab	None		
	C=Fair Condition, A=No Slab, D=Damaged Slab			
	Comment		Evaluation	
F. ABUTMENT SLOPE PROTECTION				
(40)	No.	Phnom Penh side	Neak Loueng side	
	Slope Protection Type	Gabion with wire mesh cover, Riprap with cement mortar joint		
	N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls			
(41)	Slope Protection Condition	Some cracks occur at the joint with Riprap.		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment	Need following inspection	Evaluation	B
<b>G. OVERALL EVLUATION</b>		A (Good durability, Serviceability)		
H. OVERALL COMMENT				
<p>1 - This Water Gate is very important for regular water flow in the rainy season and flood protection for NR1.                  2 - This plays an important role in the dry season to keep the water in low-lying area with the gate shut down.                  3 - Road width is enough for future traffic volume.                  4 - As to gabion box for slope protection and river bank protection, wire mesh were corroded. Repair is required.</p> 				

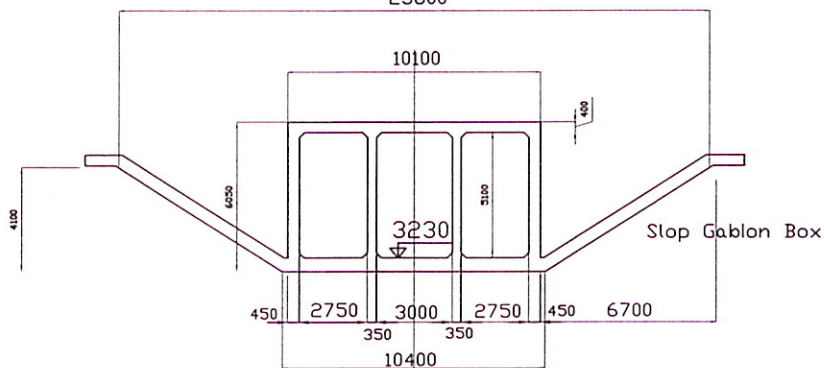
Water Gate Prek YDURN ( Prek Takao ) New  
 PK31+120  
 PLAN



Profile Water Gate  
 PK31+120



Cross Section 1 - 1  
 PK31+120  
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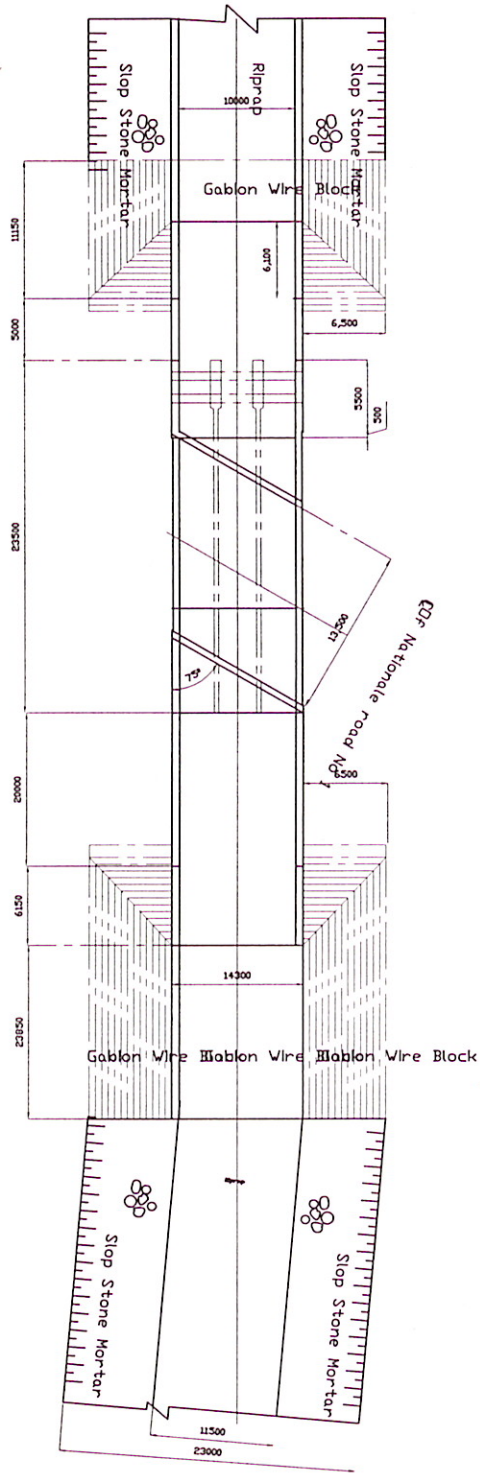
A. GENERAL INFORMATION				
(1)	Structure No.	8	(2) Structure Name	Prek Chrey
(3)	Station	Pk 38+923	(4) Crossing Object	Both side stream are channel
(5)	Structure Type	Reinforced concrete	(6) Skew Angle	75°
(7)	Length (meter) as a road	10.40m	(8) Affixed Utility	Telephone cable
(9)	Width (meter) as a road	Left Sidewalk= 10.00 m Pavement= 13.50 m Right Sidewalk=0.00 m Total= 23.50 m		
(10)	Number of Lanes	2	(11) Completion Year	2002
(12)	Load Limit ( tf )	None	(13) Design Standard	Japanese standard
B. SUPERSTRUCTURE				
(14)	Number of Opening (With/without Gate)	3 Openings with 3 Gates		
(15)	Opening Dimension	(2.75x5.00)m, (3.00x5.00)m, (2.75x5.00)m		
(16)	Pavement Condition	Good condition		
	W=Wave, R=Rut, C=Crack, P=Pothole, O=Other			
	Comment	Good serviceability	Evaluation	A
(17)	Top Slab Condition	Good condition		
	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired			
	Comment		Evaluation	A
(18)	Wall and Bottom Slab Condition	Cracking (Filled with cement mortar in P-con form work)		
	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired,			
	Comment	Already repaired and in good condition	Evaluation	A
(19)	Guardrail Type	R.C Parapet with round steel pipe handrail		
	C=Concrete, S=Steel			
(20)	Guardrail Condition	Good condition		
	C=Cracking, R=Rebar Exposed, S=Spalling, SC=Scale X=Repaired,			
	Comment		Evaluation	A
(21)	Foundation Type	Reinforced concrete pile (300x300) <sup>mm</sup> x12.00m, 84pcs		
(22)	Foundation Condition	Good condition		
	S=Settled, E=Pile Exposed - Height in meters, F=Foundation Scoured			
	Comment		Evaluation	A
C. OTHERS				
(23)	Bearing Type	None		
(24)	Bearing Condition	None		
	C=Cracked Below, N=Not Positioned Properly, D=Defective, R=Rusty			
	Comment	None	Evaluation	
(25)	Bearing Seat Condition	None		
	C=Cracked Below, R=Rebar Exposed, S=Spalling, W=Insufficient Width of Seat			
	Comment	None	Evaluation	
(26)	Expansion Joint Type	None		
(27)	Expansion Joint Condition	None		
	R=Rusty, L=Loose, U=Uneven, C=Concrete Spalled			
	Comment	None	Evaluation	
(28)	Falling Prevention Condition	None		
	D=Damaged, N=No device			
	Comment	None	Evaluation	
(29)	Wing Wall Condition	None		
	C=Cracked, W=Wing Wall Scoured			
	Comment		Evaluation	A

D. RIVER CONDITION				
(30)	Flood Water Level	1.55m below road level		
(31)	Flow Direction	From EAST to WEST (River to Irrigation)		
(32)	Dimension of River or Channel	(W <sub>I</sub> =23.00m, W <sub>B</sub> =11.50m), H=4.00m		
(33)	River Condition (upstream, downstream)	Upstream, downstream: have slope protection, channel from river		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	Upstream: 11.15 m for gabion box, 5.00 m for concrete wall Downstream: 20.00 m for concrete wall, 30.00 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,Box	C=Concrete (length in meters),
(35)	River Bank Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment			Evaluation
				A
(36)	River Bed Protection Type	Upstream: 5.00 m for gabion box, 11.15 m for concrete slab Downstream: 26.15 m for concrete slab, 23.85 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,	C=Concrete (length in meters)
(37)	River Bed Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment	Possible to protect against heavy water flow		Evaluation
				A
(38)	Approach condition	Good condition		
	S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)			
	Comment			Evaluation
				A
(39)	Condition of Approach Slab	None		
	C=Fair Condition, A=No Slab, D=Damaged Slab			
	Comment			Evaluation
F. ABUTMENT SLOPE PROTECTION				
(40)	No.	Phnom Penh side	Neak Loueng side	
	Slope Protection Type	Gabion with wire mesh cover, Riprap with cement mortar joint		
	N=None, P=Piled Walls	R=Riprap,	G=Gabion,	C=Concrete,
(41)	Slope Protection Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment			Evaluation
				A
G. OVERALL EVALUATION		A (Good durability, Serviceability)		
H. OVERALL COMMENT				
<p>1 - This Water Gate is very important for regular water flow in the rainy season and flood protection for NR1.</p> <p>2 - This plays an important role in the dry season to keep the water in low-lying area with the gate shut down.</p> <p>3 - Road width is enough for future traffic volume.</p> <p>4 - During the rainy seasons, river water flow hit the island located near the intake of channel and then its rebounded water comes directly to this irrigation channel. The alignment of channel downstream is curve and subject to the direct attack of flood flow. Hence, the gates must be closed to prevent direct flow with collapse of river bank and river bed protections. (In general, the gate must be opened during the rainy seasons.) To provide enough retarding capacity, slope protection type is to be investigated against flood flow.</p>				
				

Water Gate Prek Chrey ( New )

PK38+923

PLAN

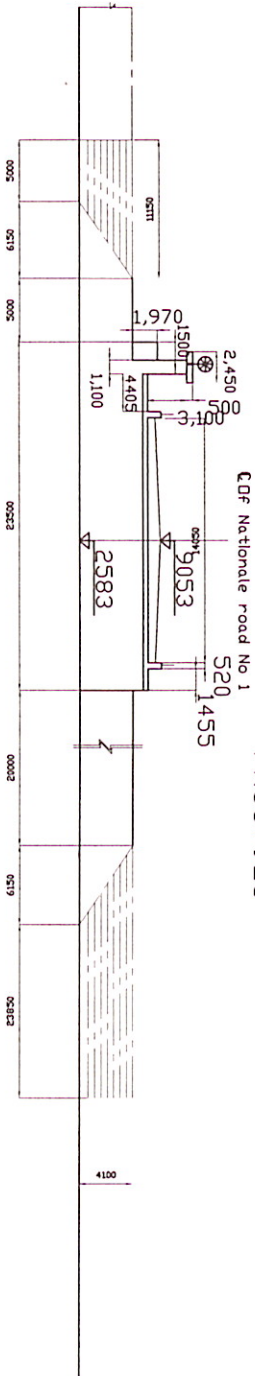


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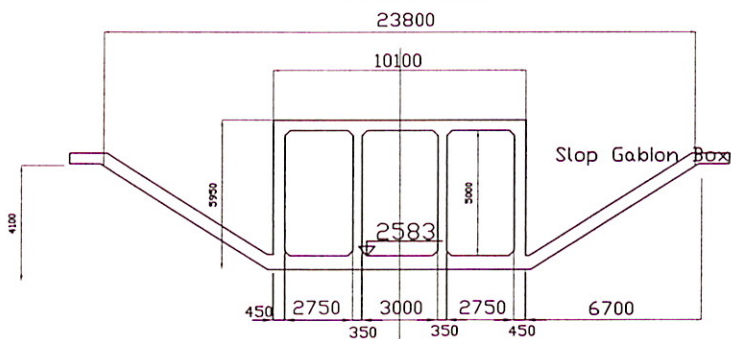
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Profile Water Gate



PK38+923



Cross Section 1 - 1  
PK38+923



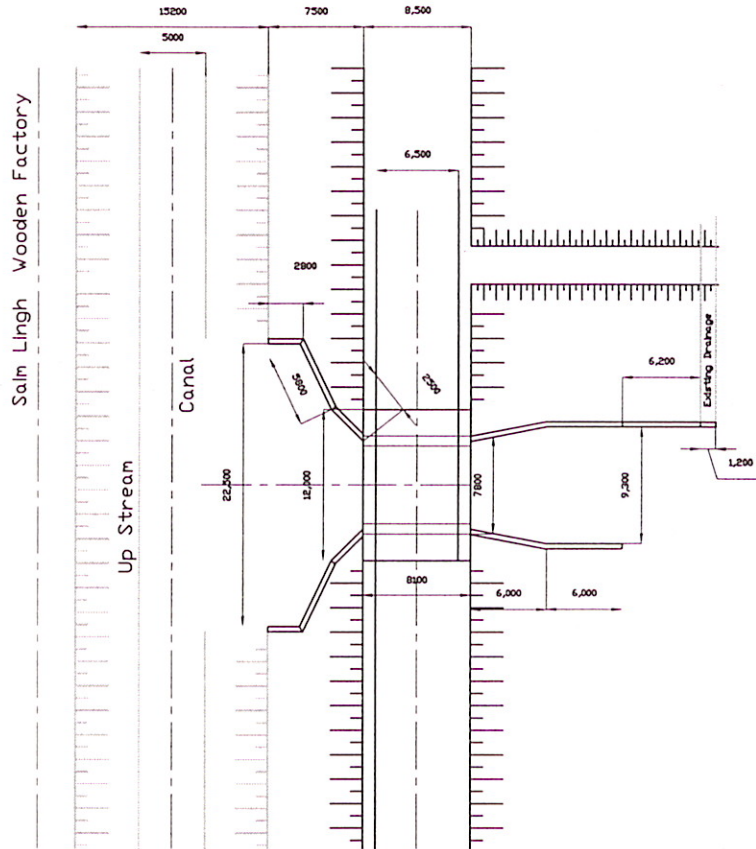
A. GENERAL INFORMATION					
(1)	Structure No.	9	(2) Structure Name	Samrong Kher	
(3)	Station	Pk 41 <sup>+040</sup>	(4) Crossing Object	Channel	
(5)	Structure Type	Reinforced concrete	(6) Skew Angle	90°	
(7)	Length (meter) as a road	12.00 m	(8) Affixed Utility	Cable optic on the slab	
(9)	Width (meter) as a road	Left Sidewalk= 0.00 m      Pavement= 7.10 m      Right Sidewalk= 0.00 m      Total= 7.10 m	(11) Completion Year	1977 in Pol Pot Regime	
(10)	Number of Lanes	2	(13) Design Standard	Chinese Standard	
(12)	Load Limit ( tf )	None			
B. SUPERSTRUCTURE					
(14)	Number of Opening (With/without Gate)	3 Openings without Gate			
(15)	Opening Dimension	(W=2.00m, H=4.50m)			
(16)	Pavement Condition	Wave and pothole			
		W=Wave,      R=Rut,      C=Crack,      P=Pothole,      O=Other			
	Comment	Less serviceability		Evaluation	B
(17)	Top Slab Condition	Rebar exposed, and cracking			
		C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired			
	Comment	Need repair work, Load capacity is restricted		Evaluation	D
(18)	Wall and Bottom Slab Condition	There are some cracks on the wall, Re-bar exposed on slab and beam			
		C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment	Need to repair above cracking line on the wall		Evaluation	D
(19)	Guardrail Type	Reinforced concrete			
		C=Concrete,      S=Steel			
(20)	Guardrail Condition	Cracking, Partially repaired			
		C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment	Bad serviceability, need repair work		Evaluation	D
(21)	Foundation Type	R.C (Because only ground slab can see and foundation can not see)			
(22)	Foundation Condition	Settled			
		S=Settled,      E=Pile Exposed - Height in meters,      F=Foundation Scoured			
	Comment	Need repair works		Evaluation	C
C. OTHERS					
(23)	Bearing Type	None			
(24)	Bearing Condition	None			
		C=Cracked Below,      N=Not Positioned Properly,      D=Defective,      R=Rusty			
	Comment	None		Evaluation	
(25)	Bearing Seat Condition	None			
		C=Cracked Below,      R=Rebar Exposed,      S=Spalling,      W=Insufficient Width of Seat			
	Comment	None		Evaluation	
(26)	Expansion Joint Type	None			
(27)	Expansion Joint Condition	None			
		R=Rusty,      L=Loose,      U=Uneven,      C=Concrete Spalled			
	Comment	None		Evaluation	
(28)	Falling Prevention Condition	None			
		D=Damaged,      N=No device			
	Comment	None		Evaluation	
(29)	Wing Wall Condition	Cracked, Scoured			
		C=Cracked,      W=Wing Wall Scoured			
	Comment	Not durability		Evaluation	C

D. RIVER CONDITION				
(30)	Flood Water Level	2.5m below road level		
(31)	Flow Direction	From EAST to WEST		
(32)	Dimension of River or Channel	(W <sub>I</sub> =11.50m, W <sub>B</sub> =6.50m), H=1.50m		
(33)	River Condition (upstream, downstream)	Upstream: now the water can't flow, because have a factory 逆向きでは		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion,Box C=Concrete (length in meters), P=Piled Walls		
(35)	River Bank Condition	Damaged, corroded, encroachment on stream		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment		Evaluation	C
(36)	River Bed Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion, C=Concrete (length in meters) P=Piled Walls		
(37)	River Bed Condition	Damaged and Corroded		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment	Bad serviceability, Dirty surface	Evaluation	C
(38)	Approach condition	Good		
		S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)		
	Comment		Evaluation	A
(39)	Condition of Approach Slab	None		
		C=Fair Condition, A=No Slab, D=Damaged Slab		
	Comment		Evaluation	
F. SLOPE PROTECTION				
(40)	No.	A1	A2	
	Slope Protection Type	None		None
		N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls		
(41)	Slope Condition	Damaged and Scoured		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment	Protection required	Evaluation	B
G. OVERALL EVALUATION		D (Not enough on durability and serviceability)		
H. OVERALL COMMENT				
<p>1- This structure was built in 1977 in Pol Pot Regime, so everything became damaged</p> <p>2- There are some problem with local people, because downstream rice field can not job (Late job of farmer in the rainy season) 意味不明</p> <p>3- On the left bank (upstream), channel was filled for the factory. No flow.</p> <p>4- Downstream telephone cable on the slab.</p>				
				

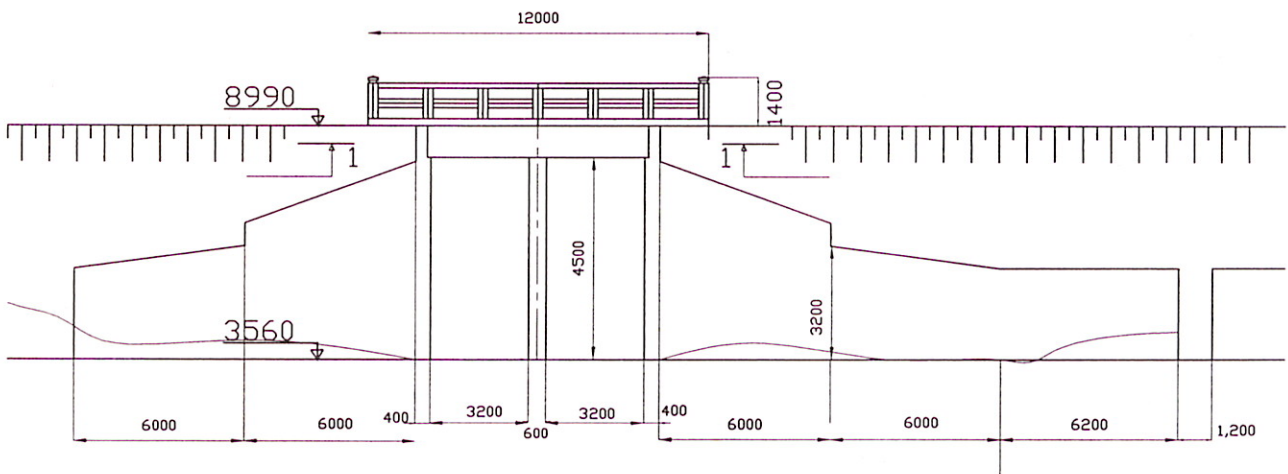


Sketch of Old Water gate ( Prek Samrong Thom)  
Pk 41+040

PLAN



Side View

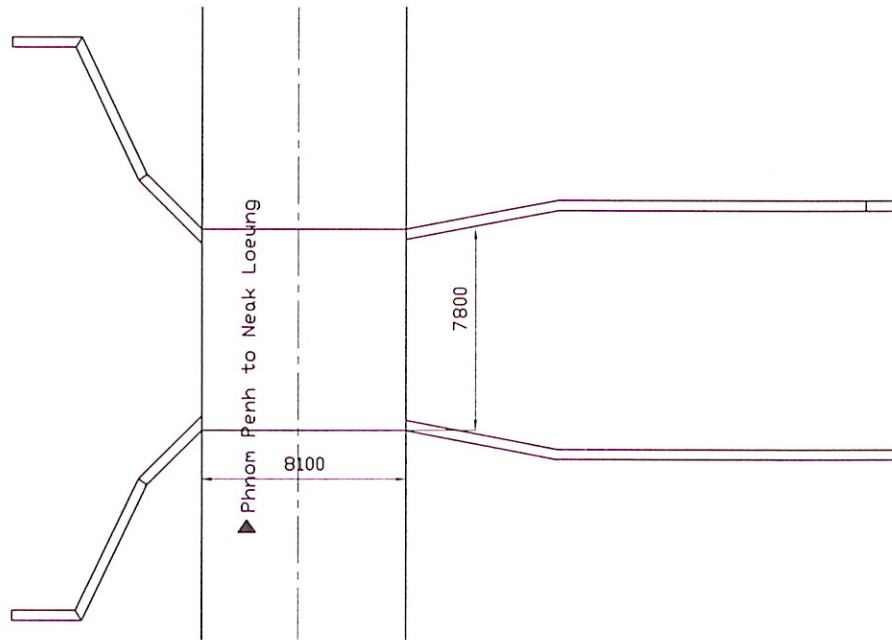




Sketch of Old Water gate (Prek Samrong Thom)

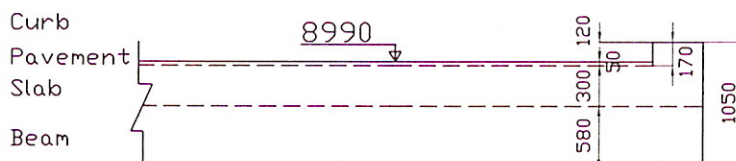
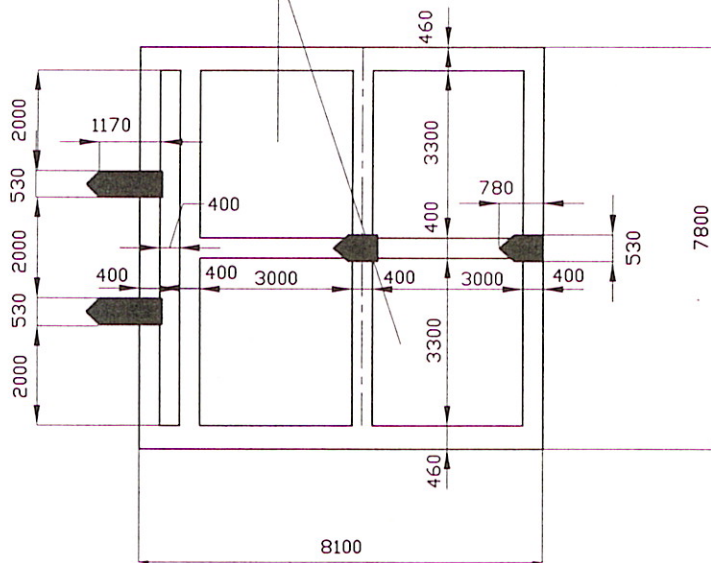
Pk 41+040

PLAN




Scale and Exposed Re-Bar Under slab

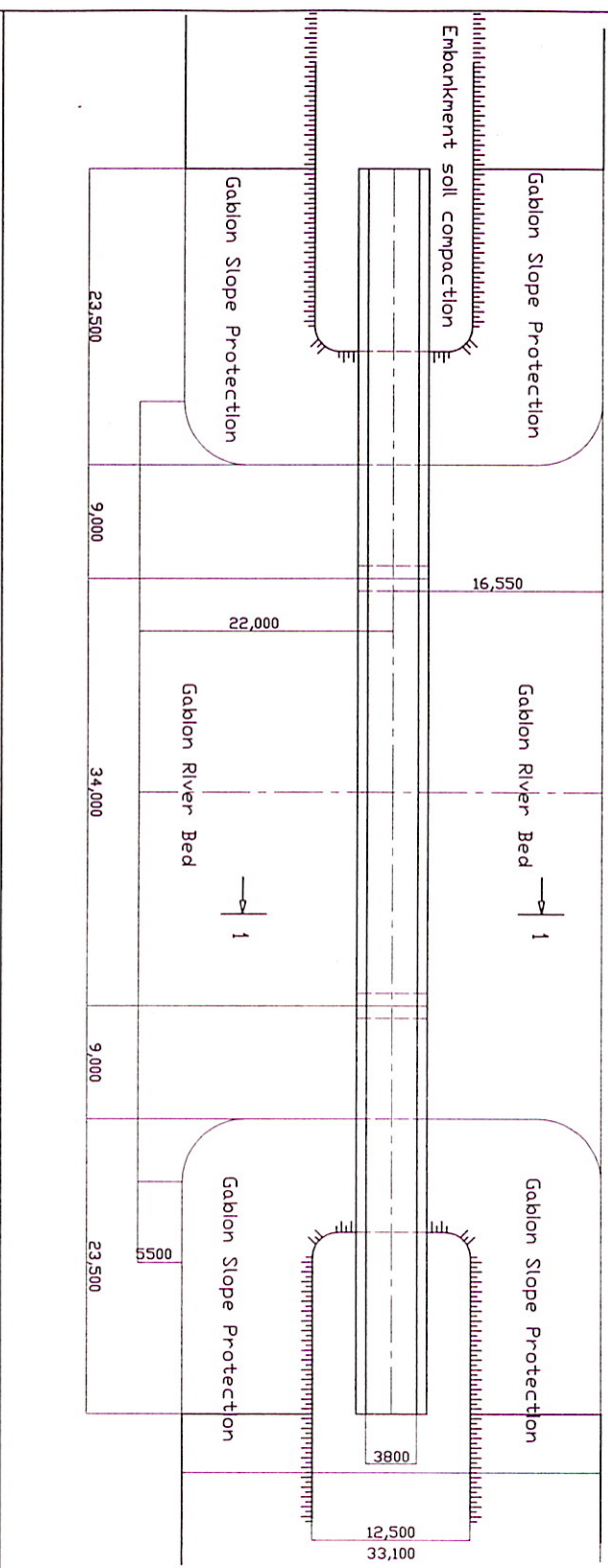
1-1 Section



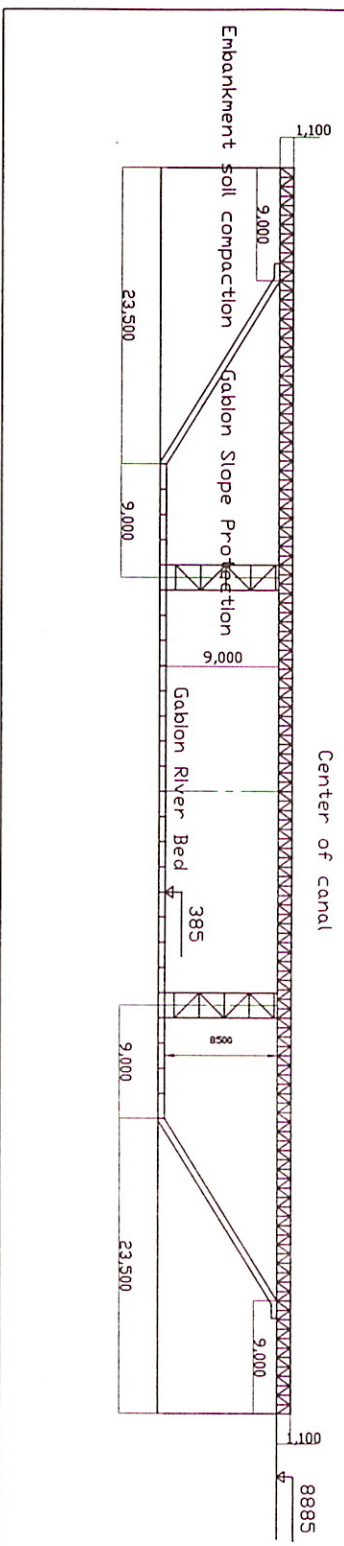
A. GENERAL INFORMATION										
(1)	Structure No.	10			(2)	Bridge Name	No name (Just build)			
(3)	Station	42+850			(4)	River Name				
(5)	Bridge Type	Bailey Bridge			(6)	Skew Angle	90°			
(7)	Length (meter)	99m			(8)	Affixed Utility	Telephone line			
(9)	Width (meter)	Left Sidewalk=      Pavement=3.8m      Right Sidewalk=      Total=3.8m								
(10)	Number of Lanes	2			(11)	Completion Year	2000			
(12)	Load Limit (tf)	16 ton			(13)	Design Standard	U.S.A. Standard			
B. SUPERSTRUCTURE										
(14)	Span No.	S1	S2	S3						
(15)	Span Length	32.50 m	34.00 m	32.50 m						
(16)	Number of Main Girders	2	2	2						
(17)	Pavement Condition	Good condition								
	Comment	No pavement, Steel deck							Evaluation	A
(18)	Girder Condition	Good condition but with load capacity 16 ton, Steel girder								
	(Concrete)	C=Cracking,      R=Rebar Exposed,      X=Repaired								
	(Steel)	C=Cracking,      R=Rusty,      D=Deformed,      X=Repaired								
(19)	Slab Type	Steel plate								
	Slab Condition	Good structure								
(20)	Comment	C=Cracking,      R=Rebar Exposed,      S=Spalling,      X=Repaired,      O=Other							Evaluation	A
	Guardrail Type	Steel (Girders serve as guard rails)								
(21)	Guardrail Condition	Good								
	Comment	None								
	Comment								Evaluation	
C. SUBSTRUCTURE										
(23)	Abutment/Pier No.	No Abutments and 2 Piers								
(24)	Abutment/Pier Type	Existing ground with local compaction for Abutment, H-steel Pier								
(25)	Abutment/Pier Condition	Existing ground for Abutment was eroded by floods and under refill and compaction, H-steel piles were tilt for Pier.								
	Comment	C=Cracked,      R=Rebar Exposed,      T=Tilted,      S=Spalled on Vertical Side							Evaluation	D
	Foundation Type	Double I steel								
(26)	Foundation Condition	Bad condition with tilt piles for Pier. Piles were exposed due to scour.								
	Comment	S=Settled,      E=Pile Exposed-Height in meters,      F=Foundation Scoured							Evaluation	D
	Bearing Type	None								
(27)	Bearing Condition	None								
	Comment	C=Cracked Below,      N=Not Positioned Properly,      D=Defective,      R=Rusty							Evaluation	
	Bearing Seat Condition	None								
(28)	Bearing Seat Condition	None								
	Comment	C=Cracked Below,      R=Rebar Exposed,      S=Spalling,      W=Insufficient Width of Seat							Evaluation	
	Expansion Joint Type	None								
(29)	Expansion Joint Condition	None								
	Comment	R=Rusty,      L=Loose,      U=Uneven,      C=Concrete Spalled at End of Span							Evaluation	
	Falling Prevention Condition	None								
(30)	Falling Prevention Condition	None								
	Comment	D=Damaged,      N=No device							Evaluation	
	Wing Wall Condition	None								
(31)	Wing Wall Condition	None								
	Comment	C=Cracked,      W=Wing Wall Scoured							Evaluation	
	Comment	None							Evaluation	

D. RIVER CONDITION			
(35)	Flood Water Level	1.00m below road level	
(36)	Flow Direction	From EAST to WEST (From River to Fields)	
(37)	Dimension of River or Channel	No dimension, because there is no canal	
(38)	River Condition (upstream, downstream)	No channel, Field both upstream and downstream	
E. RIVER BANK AND APPROACH ROAD			
(39)	River Bank Protection Type	None	
		N=None, G=Gabion, P=Piled Walls C=Concrete (Length in meters), O=Other (Length in meters)	
(40)	River Bank Condition	None (River doesn't exist.)	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment		Evaluation
(41)	River Bed Protection Type	None (River doesn't exist.)	
		N=None, R=Riprap (Length in meters), G=Gabion, P=Piled Walls C=Concrete (Length in meters)	
(42)	River Bed Condition	Seriously scoured	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment	River bed protection is required.	Evaluation
			D
(43)	Approach Condition	Scoured	
		S=Sinking (height in cm), AS=Scour Behind Abutment (length in meters)	
	Comment		Evaluation
			D
(44)	Condition of Approach Slab	None	
		C=Fair Condition, A=No Slab, D=Damaged Slab	
	Comment		Evaluation
F. ABUTMENT SLOPE PROTECTION			
(45)	Abutment No.	A1	A2
	Slope Protection Type	None (Gabion box is under construction for slope protection)	
		N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls, O=Other	
(46)	Slope Protection Condition	Eroded, Scoured	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment		Evaluation
			D
G. OVERALL EVALUATION			
		D (This bridge is subject to load limit. Road width is not enough for future traffic. This structure type is not appropriate against flood effect.)	
H. OVERALL COMMENT			
	<p>1 - There was a box culvert before. However, due to serious flood damage, the Government cut the embankment here and constructed a Bailey Bridge.</p> <p>2 - Load capacity 16 ton and speed limit of 5km/h</p> <p>3 - Serious flood damages around this bridge every year.</p> <p>4 - This bridge is reconstructed by Ministry of Public Work and Transport (MPWT)</p>		
			

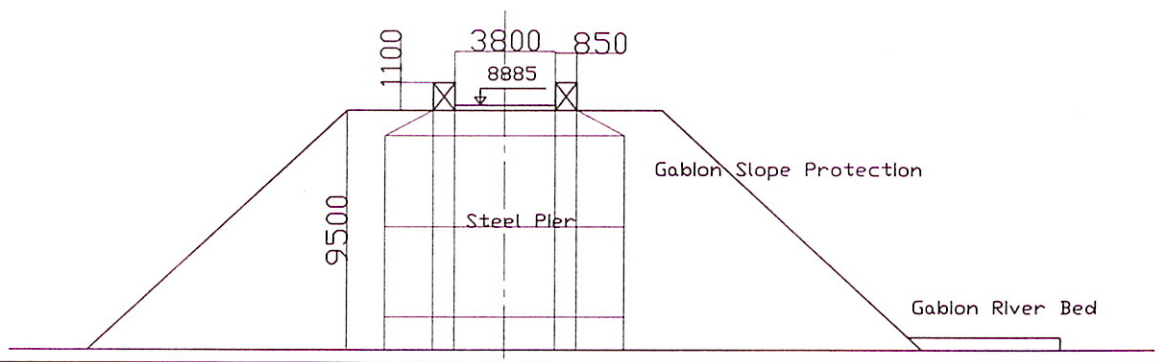
BALEY BRIDGE Pk 42+850  
PLAN



BALEY BRIDGE Pk 42+850 ( Pua Meav )  
SIDE VIEW



BALEY BRIDGE Pk 42+850  
Cross Section 1 - 1



A. GENERAL INFORMATION				
(1)	Structure No.	11	(2) Structure Name	Prek Thmey
(3)	Station	Pk 45+776	(4) Crossing Object	Both side stream are channel
(5)	Structure Type	R.C. Water Gate	(6) Skew Angle	90°
(7)	Length (meter) as a road	10.40m along the road	(8) Affixed Utility	Telephone cable
(9)	Width (meter) as a road	Left Sidewalk= 2.95 m      Pavement= 13.50 m      Others= 3.55 m      Total= 20.00 m		
(10)	Number of Lanes	2	(11) Completion Year	Open ceremony on 23/05/2002
(12)	Load Limit ( tf )	None	(13) Design Standard	Japanese Standard
B. SUPERSTRUCTURE				
(14)	Number of Opening (With/without Gate)	3 Opening with 3 Gates		
(15)	Opening Dimension	(2.75x4.90)m, (3.00x4.90)m, (2.75x4.90)m		
(16)	Pavement Condition	Good pavement		
	W=Wave,      R=Rut,      C=Crack,      P=Pothole,      O=Other			
	Comment	Good serviceability	Evaluation	A
(17)	Top Slab Condition	Good condition		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired			
	Comment		Evaluation	A
(18)	Wall and Bottom Slab Condition	Cracking (Filled with cement mortar in P-con form work)		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment	Already repaired and in good condition	Evaluation	A
(19)	Guardrail Type	R.C Parapet with round steel pipe handrail		
	C=Concrete,      S=Steel			
(20)	Guardrail Condition	Good condition		
	C=Cracking,      R=Rebar Exposed,      S=Spalling,      SC=Scale X=Repaired,			
	Comment		Evaluation	A
(21)	Foundation Type	R. C pile (300x300) <sup>mm</sup> x12.00m, 70pcs		
(22)	Foundation Condition	Good condition, not settled, not foundation scoured		
	S=Settled,      E=Pile Exposed - Height in meters,      F=Foundation Scoured			
	Comment		Evaluation	A
C. OTHERS				
(23)	Bearing Type	None		
(24)	Bearing Condition	None		
	C=Cracked Below,      N=Not Positioned Properly,      D=Defective,      R=Rusty			
	Comment	None	Evaluation	
(25)	Bearing Seat Condition	None		
	C=Cracked Below,      R=Rebar Exposed,      S=Spalling,      W=Insufficient Width of Seat			
	Comment	None	Evaluation	
(26)	Expansion Joint Type	None		
(27)	Expansion Joint Condition	None		
	R=Rusty,      L=Loose,      U=Uneven,      C=Concrete Spalled			
	Comment	None	Evaluation	
(28)	Falling Prevention Condition	None		
	D=Damaged,      N=No device			
	Comment	None	Evaluation	
(29)	Wing Wall Condition	None		
	C=Cracked,      W=Wing Wall Scoured			
	Comment		Evaluation	

D. RIVER CONDITION				
(30)	Flood Water Level	3.2m below road level		
(31)	Flow Direction	From EAST to WEST (River to Irrigation)		
(32)	Dimension of River or Channel	(W <sub>I</sub> =20.20m, W <sub>B</sub> =8.80m), H=4.00m		
(33)	River Condition (upstream, downstream)	Upstream, downstream: have slope protection, channel from river		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	Upstream: 11.15 m for gabion box, 5.00 m for concrete wall Downstream: 20.00 m for concrete wall, 30.00 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,Box	C=Concrete (length in meters),
(35)	River Bank Condition	Good, but some place of G wire mesh have corrotion and cracking in the joint with Riprap		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment	Need some repair	Evaluation	B
(36)	River Bed Protection Type	Upstream: 5.00 m for gabion box, 11.15 m for concrete slab Downstream: 26.15 m for concrete slab, 23.85 m for gabion box		
	N=None, P=Piled Walls	R=Riprap (length in meters),	G=Gabion,	C=Concrete (length in meters)
(37)	River Bed Condition	Good condition		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment	Good serviceability for water flow	Evaluation	A
(38)	Approach condition	Good		
	S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)			
	Comment		Evaluation	A
(39)	Condition of Approach Slab	None		
	C=Fair Condition, A=No Slab, D=Damaged Slab			
	Comment		Evaluation	
F. ABUTMENT SLOPE PROTECTION				
(40)	No.	Phnom Penh side	Neak Loueng side	
	Slope Protection Type	Gabion with wire mesh cover, Riprap with cement mortar joint		
	N=None, P=Piled Walls	R=Riprap,	G=Gabion,	C=Concrete,
(41)	Slope Protection Condition	Good condition (some G mesh wire corroded)		
	D=Damaged, S=Scoured, C=Corroded, E=Enchroachment on Stream			
	Comment		Evaluation	A
<b>G. OVERALL EVLUATION</b>		A (Good durability, Serviceability)		
H. OVERALL COMMENT				
<p>1 - This Water Gate is very important for regular water flow in the rainy season and flood protection for NR1.                  2 - This plays an important role in the dry season to keep the water in low-lying area with the gate shut down.                  3 - Road width is enough for future traffic volume.                  4 - As to gabion box for slope protection and river bank protection, wire mesh were corroded. Repair is required.</p> 				

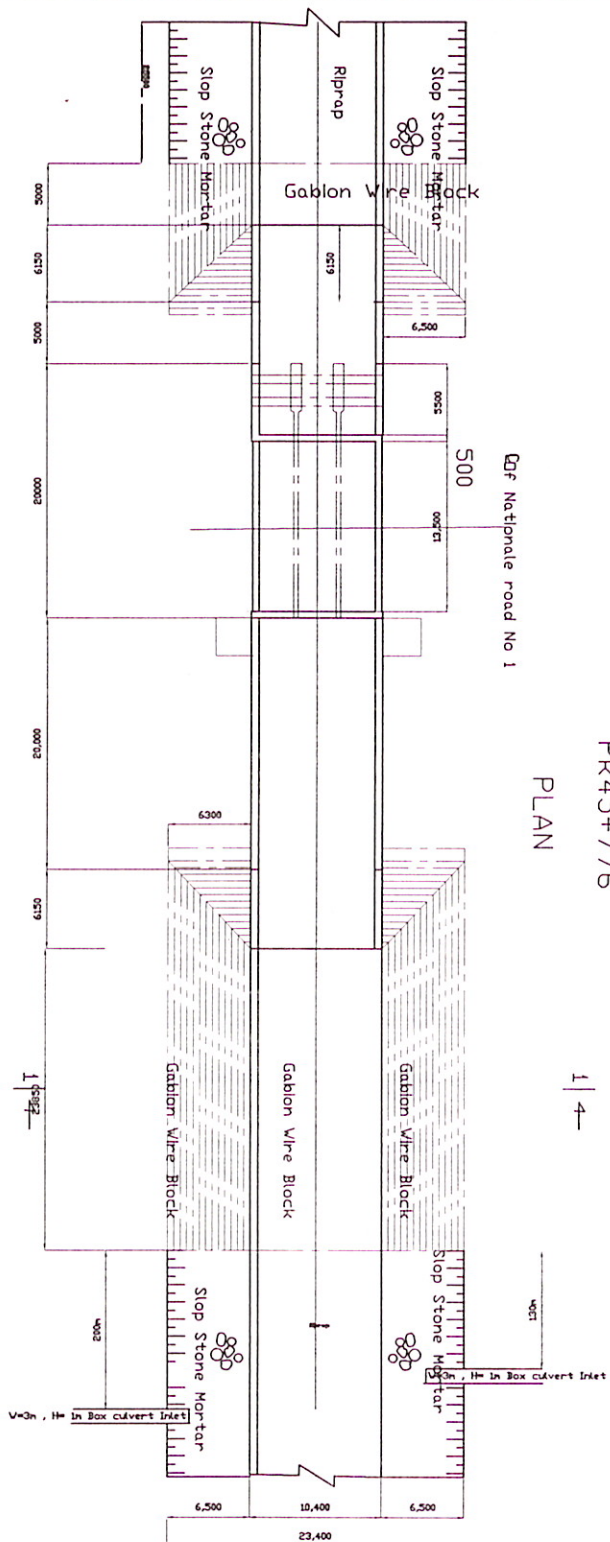


Water Gate Koki Thom

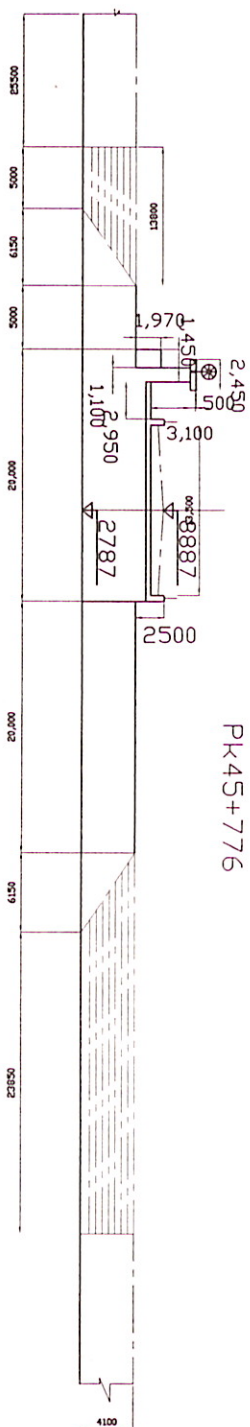
PK45+776

PLAN

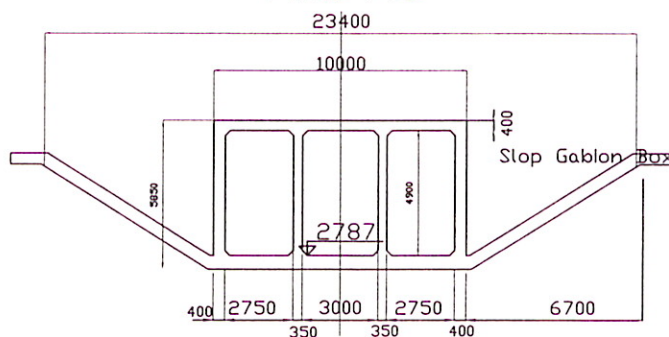
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Profile Water Gate  
PK45+776





Cross Section 1 - 1  
Pk45+776

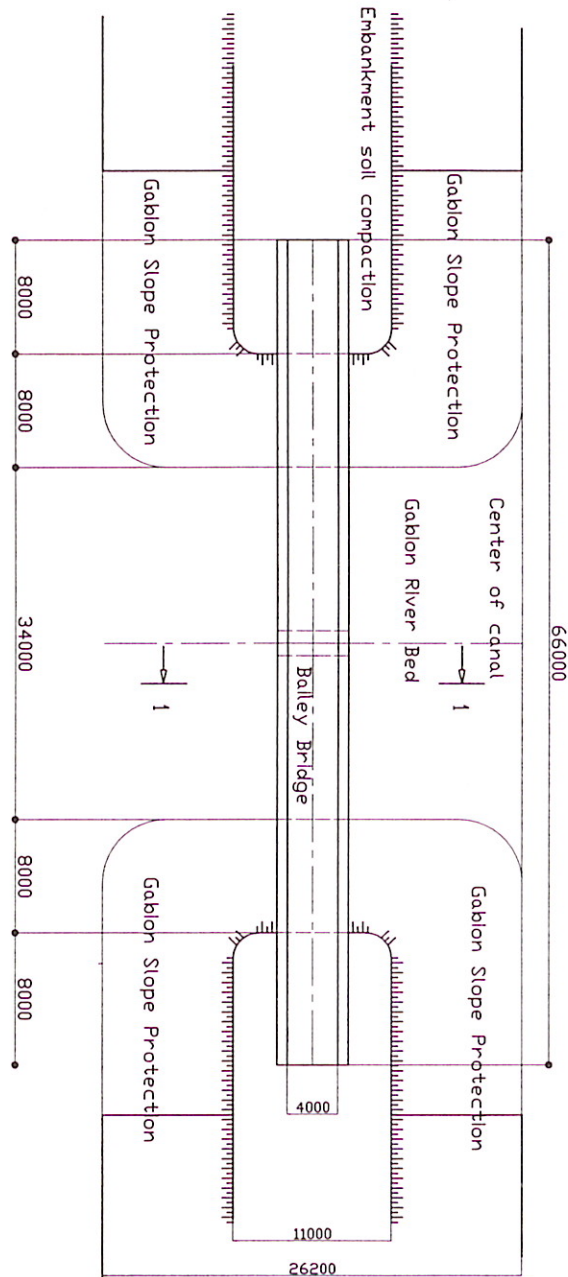


A. GENERAL INFORMATION										
(1)	Structure No.	12			(2)	Bridge Name	O. CHHOUK			
(3)	Station	Pk 47+967			(4)	River Name	O. CHHOUK			
(5)	Bridge Type	Bailey bridge			(6)	Skew Angle	90°			
(7)	Length (meter)	66m			(8)	Affixed Utility	Both side are agricultural field			
(9)	Width (meter)	Left Sidewalk= 0.00m		Pavement= 4m		Right Sidewalk= 0.00m		Total= 4m		
(10)	Number of Lanes	2			(11)	Completion Year	2000			
(12)	Load Limit (tf)	16 ton			(13)	Design Standard	U.S.A. Standard			
B. SUPERSTRUCTURE										
(14)	Span No.	S1	S2							
(15)	Span Length	33.0 m		33.0 m						
(16)	Number of Main Girders	2		2						
(17)	Pavement Condition	Good condition								
	W=Wave R=Rut C=Crack P=Pothole O=Other									
(18)	Comment	No pavement, Steel deck						Evaluation	A	
	Girder Condition	Good condition but with load capacity 16 ton, Steel girder								
(18)	(Concrete)	C=Cracking,		R=Rebar Exposed,		S=Spalling,		X=Repaired		
	(Steel)	C=Cracking,		R=Rusty,		D=Deformed,		X=Repaired		
(18)	Comment							Evaluation	D	
	(19)	Slab Type	Steel plate							
(20)	Slab Condition	Good structure								
	C=Cracking, R=Rebar Exposed, S=Spalling, X=Repaired, O=Other									
(21)	Comment							Evaluation	A	
	Guardrail Type	Steel (Girders serve as guard rails)								
(22)	C=Concrete, S=Steel									
	Guardrail Condition	Good								
(22)	D=Damaged									
	Comment	None						Evaluation		
C. SUBSTRUCTURE										
(23)	Abutment/Pier No.	No Abutment and 1 Pier								
(24)	Abutment/Pier Type	Existing ground with local compaction for Abutment, H-steel Pier								
(25)	Abutment/Pier Condition	Existing ground for Abutment was eroded by floods and under refill and compaction, H-steel piles were tilt for Pier.								
	C=Cracked, R=Rebar Exposed, T=Tilted, S=Spalled on Vertical Side									
(26)	Comment							Evaluation	D	
	Foundation Type	Double I steel								
(27)	Foundation Condition	Bad condition with tilt piles for Pier. Piles were exposed due to scour.								
	S=Settled, E=Pile Exposed-Height in meters, F=Foundation Scoured									
(28)	Comment							Evaluation	D	
	Bearing Type	None								
(29)	Bearing Condition	None								
	C=Cracked Below, N=Not Positioned Properly, D=Defective, R=Rusty									
(30)	Comment							Evaluation		
	Bearing Seat Condition	None								
(30)	C=Cracked Below, R=Rebar Exposed, S=Spalling, W=Insufficient Width of Seat									
	Comment	None						Evaluation		
(31)	Expansion Joint Type	None								
(32)	Expansion Joint Condition	None								
	R=Rusty, L=Loose, U=Uneven, C=Concrete Spalled at End of Span									
(33)	Comment							Evaluation		
	Falling Prevention Condition	None								
(33)	D=Damaged, N=No device									
	Comment	None						Evaluation		
(34)	Wing Wall Condition	None								
	C=Cracked, W=Wing Wall Scoured									
(34)	Comment	None						Evaluation		

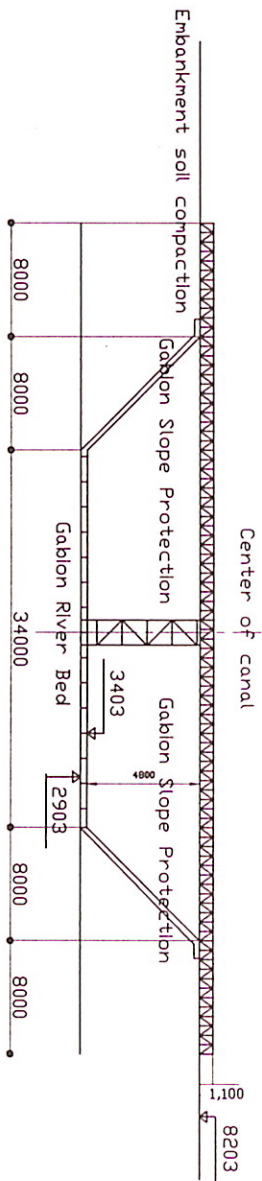


D. RIVER CONDITION			
(35)	Flood Water Level	1.50 m below road level	
(36)	Flow Direction	From EAST to WEST (From River to Fields)	
(37)	Dimension of River or Channel	No dimension, because there is no canal	
(38)	River Condition (upstream, downstream)	No channel, Field both upstream and downstream	
E. RIVER BANK AND APPROACH ROAD			
(39)	River Bank Protection Type	None	
		N=None, R=Riprap (Length in meters), G=Gabion, P=Piled Walls C=Concrete (Length in meters), O=Other (Length in meters)	
(40)	River Bank Condition	None (River doesn't exist.)	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment		Evaluation
(41)	River Bed Protection Type	None (River doesn't exist.)	
		N=None, R=Riprap (Length in meters), G=Gabion, P=Piled Walls C=Concrete (Length in meters)	
(42)	River Bed Condition	Seriously scoured	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment	River bed protection is required.	Evaluation D
(43)	Approach Condition	Scoured	
		S=Sinking (height in cm), AS=Scour Behind Abutment (length in meters)	
	Comment		Evaluation D
(44)	Condition of Approach Slab	None	
		C=Fair Condition, A=No Slab, D=Damaged Slab	
	Comment		Evaluation
F. ABUTMENT SLOPE PROTECTION			
(45)	Abutment No.	A1	A2
	Slope Protection Type	None (Gabion box is under construction for slope protection)	
		N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls, O=Other	
(46)	Slope Protection Condition	Eroded, Scoured	
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream	
	Comment		Evaluation D
G. OVERALL EVALUATION		D (This bridge is subject to load limit. Road width is not enough for future traffic. This structure type is not appropriate against flood effect.)	
H. OVERALL COMMENT			
<p>1 - There was a box culvert before. However, due to serious flood damage, the Government cut the embankment here and constructed a Bailey Bridge.</p> <p>2 - Load capacity 16 ton and speed limit of 5km/h</p> <p>3 - Serious flood damages around this bridge every year.</p>			
			

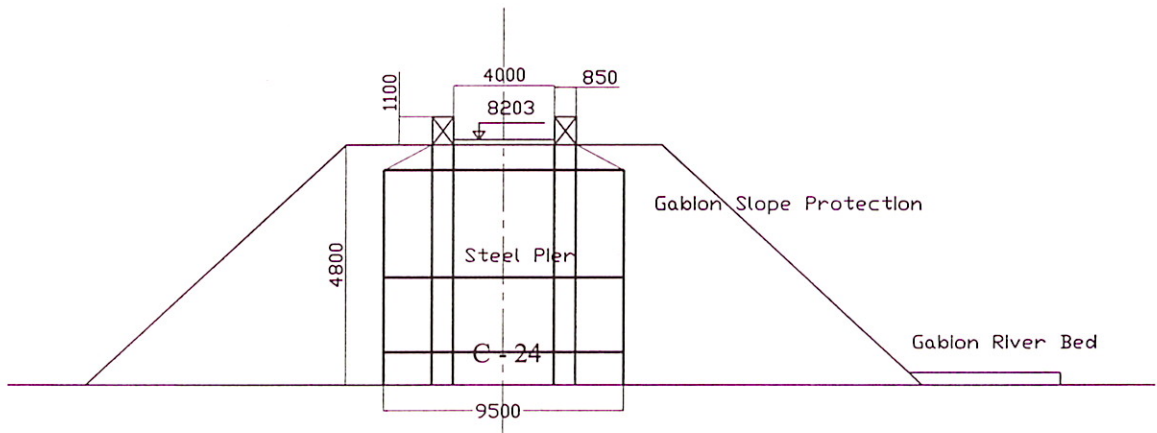
BAILEY BRIDGE Pk 47+967 ( D Chouk )  
PLAN





BAILEY BRIDGE Pk 47+967 ( D Chouk )  
SIDE VIEW



BAILEY BRIDGE Pk 47+967  
Cross Section 1 - 1



A. GENERAL INFORMATION									
(1)	Structure No.	13			(2)	Structure Name	Prek Bak Kampong Phnom		
(3)	Station	Pk 50+015			(4)	Crossing Object	Channel		
(5)	Structure Type	Reinforced concrete			(6)	Skew Angle	90° with center of road		
(7)	Length (meter) as a road	12.30m			(8)	Affixed Utility	Cable optic on the slab		
(9)	Width (meter) as a road	Left Sidewalk= 0.00m	Pavement= 5.80m	Right Sidewalk= 0.00m	Total= 5.80m				
(10)	Number of Lanes	2			(11)	Completion Year	1976 Pol Pot Regime		
(12)	Load Limit ( tf )	None			(13)	Design Standard	Chinese Standard		
B. SUPERSTRUCTURE									
(14)	Number of Opening (With/without Gate)	3 Openings without Gate							
(15)	Opening Dimension	(W=2.10m, H=4.00m)							
(16)	Pavement Condition	Wave, Big hole covered by steel plate for traffic							
		W=Wave,	R=Rut,	C=Crack,	P=Pothole,	O=Other			
	Comment	Bad serviceability, Need rehabilitation						Evaluation	C
(17)	Top Slab Condition	Cracking, Rebar exposed, Big hole covered by steel plate for traffic							
		C=Cracking,	R=Rebar Exposed,	S=Spalling,	SC=Scale	X=Repaired			
	Comment	Need repair work, Load capacity is restricted						Evaluation	D
(18)	Wall and Bottom Slab Condition	Cracking and rebar exposed, Gun shot hole on bottom slab							
		C=Cracking,	R=Rebar Exposed,	S=Spalling,	SC=Scale	X=Repaired,			
	Comment	Less durability						Evaluation	C
(19)	Guardrail Type	Reinforced concrete							
		C=Concrete,	S=Steel						
(20)	Guardrail Condition	Cracking, Repaired partially							
		C=Cracking,	R=Rebar Exposed,	S=Spalling,	SC=Scale	X=Repaired,			
	Comment	Bad serviceability						Evaluation	C
(21)	Foundation Type	R.C (Because only ground slab can see and foundation can not see)							
(22)	Foundation Condition	Foundation scoured							
		S=Settled,	E=Pile Exposed - Height in meters,	F=Foundation Scoured					
	Comment	Bad serviceability						Evaluation	B
C. OTHERS									
(23)	Bearing Type	None, Rigid with abutments and columns							
(24)	Bearing Condition	None							
		C=Cracked Below,	N=Not Positioned Properly,	D=Defective,	R=Rusty				
	Comment	None						Evaluation	
(25)	Bearing Seat Condition	None							
		C=Cracked Below,	R=Rebar Exposed,	S=Spalling,	W=Insufficient Width of Seat				
	Comment	None						Evaluation	
(26)	Expansion Joint Type	None, Rigid with abutments and columns							
(27)	Expansion Joint Condition	None							
		R=Rusty,	L=Loose,	U=Uneven,	C=Concrete Spalled				
	Comment	None						Evaluation	
(28)	Falling Prevention Condition	None							
		D=Damaged,	N=No device						
	Comment	None						Evaluation	
(29)	Wing Wall Condition	C	W						
		C=Cracked,	W=Wing Wall Scoured						
	Comment	Need rehabilitation						Evaluation	B

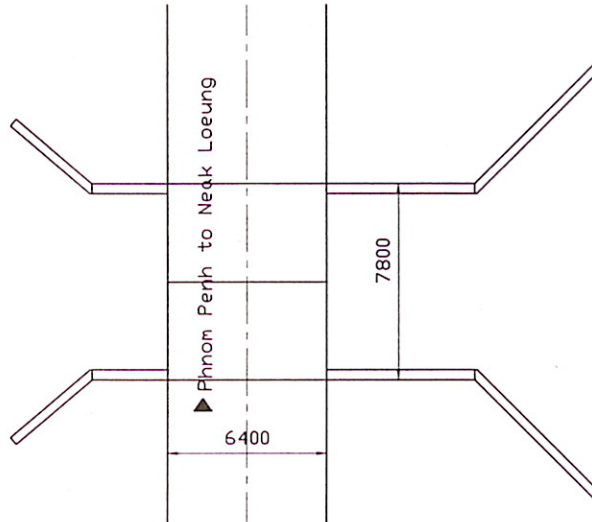
D. RIVER CONDITION				
(30)	Flood Water Level	1.50 m below road level		
(31)	Flow Direction	From EAST to WEST (From River to Fields)		
(32)	Dimension of River or Channel	Upstream: (4.5+8.5) x 2.5, Downstream: (7.5+13.0) x 2.0		
(33)	River Condition (upstream, downstream)	Damaged on both upstream and downstream		
E. RIVER BANK AND APPROACH ROAD				
(34)	River Bank Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion,Box C=Concrete (length in meters), P=Piled Walls		
(35)	River Bank Condition	Damaged, corroded, encroachment on stream		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment		Evaluation	C
(36)	River Bed Protection Type	None		
		N=None, R=Riprap (length in meters), G=Gabion, C=Concrete (length in meters) P=Piled Walls		
(37)	River Bed Condition	Damaged		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment	Bad serviceability, Dirty surface	Evaluation	C
(38)	Approach condition	Good		
		S= Sinking (height in cm), AS=Scour Behind Abutment (length in meters)		
	Comment		Evaluation	A
(39)	Condition of Approach Slab	None		
		C=Fair Condition, A=No Slab, D=Damaged Slab		
	Comment		Evaluation	
F. ABUTMENT SLOPE PROTECTION				
(40)	No.	A1	A2	
	Slope Protection Type	None		None
		N=None, R=Riprap, G=Gabion, C=Concrete, P=Piled Walls		
(41)	Slope Condition	Damaged		
		D=Damaged, S=Scoured, C=Corroded, E=Encroachment on Stream		
	Comment	Protection required	Evaluation	B
G. OVERALL EVALUATION		D (Not enough on durability and serviceability)		
H. OVERALL COMMENT				
<p>1- This Water Gate is an old structure which was constructed in the Pol Pot Regime for irrigation drainage to the rice field and also flood emergency protection in the rainy season.</p> <p>2- Slab of structure was gun shoting hole, now close by steel plate.</p> <p>3- Upstream small canal presents only in flood seasons.</p>				
				



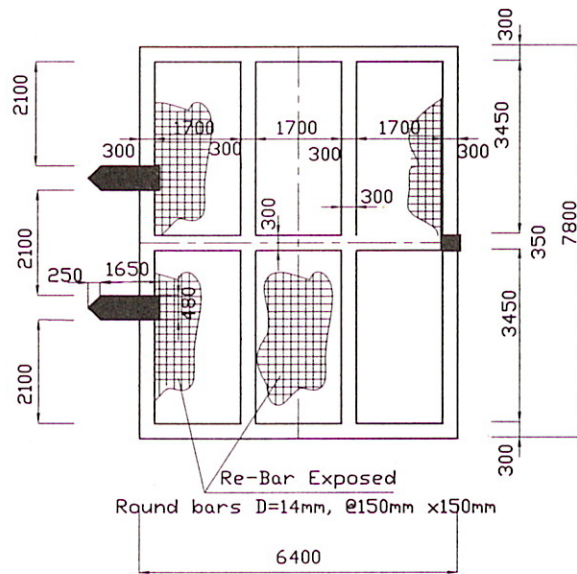
Sketch of Old Water gate ( Kampong Phnom )

Pk 50+015

PLAN



1-1 Section





### C-3. Photographs of Existing Conditions for Road Structures

#### Photograph - Existing Conditions of Road Structures on NR No.1 for Project

No.1

	<p>Origin Point at Monivong Bridge</p> <p>Bridge Length: 270m (75+120+75)          Bridge Width: Total 13.4m          (carriage 11.0m+ sidewalk 2*1.2m)</p> <p>Type: Continuous Pre-stressed Concrete          Box Girder</p> <p>Eroded Approach Embankment</p>
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	<p>Pk 1+000</p> <p>Commercial Area at Both Side          Pavement Width 7m</p>
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	<p>Pk 5+700</p> <p>Local Commercial Houses          Pavement Width 6m</p>
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	<p>Pk 6+945</p> <p>Branch Point of Tiger Beer Factory          Pavement Width 6.5m</p>
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**Photograph - Existing Conditions of Road Structures on NR No.1 for Project**





No.2

	<p>Pk 9+100</p> <p>Damaged Pavement at Shoulder</p>
	<p>Pk 13+900</p> <p>Local Commercial Area Hospital Pavement Width 6m</p>
	<p>Pk 18+000</p> <p>Critical Damaged Pavement Area and Heavy Vehicle</p>
	<p>Pk 20+640 Sdav anlaing</p> <p>Culvert Location from Interview Result</p> <p>There was pipe culvert in past time (Not Found)</p>





**Photograph - Existing Conditions of Road Structures on NR No.1 for Project**

No.3

	<p>Pk 24+000</p> <p>Pipe Culvert, Down-stream Side (Old, Sihanouk Regime)</p> <p>Pipe Length: 10.5m</p>
	<p>Pk 24+840</p> <p>Pipe Culvert, Down-stream Side (Old, Pol Pot Regime, 1979)</p> <p>Pipe Length: 12.5m</p>
	<p>Pk 28+450</p> <p>Water Gate (3) by Japan Grant Aid, 2002</p> <p>Carriage Way Width 13.5m (New Pavement)</p>
	<p>Pk 31+120</p> <p>Water Gate (3) by Japan Grant Aid, 2002</p> <p>Carriage Way Width 13.5m (New Pavement)</p>





**Photograph - Existing Conditions of Road Structures on NR No.1 for Project**

No.4

	<p>Pk 32+800 Prek Takeo</p> <p>Culvert Location from Interview Result (Not found currently)                  There was pipe culvert(1.0m) before 1979                  Pipe culvert was collapsed by flood in 1979                  Detour road was constructed by Vietnam Soldier. (Now road is S-curve)</p>
	<p>Pk 36+900 Spean Dek</p> <p>There was steel bridge (10-15m) in past time. In 1994, the bridge was demolished, and embanked at this location.                  Detour Road at Up-stream side</p>
	<p>Pk 38+923</p> <p>Water Gate (3)                  by Japan Grant Aid, 2002</p> <p>Carriage Way Width 13.5m                  (New Pavement)</p>
	<p>Pk 41+040</p> <p>Water Gate, Pol Pot Regime, 1977</p> <p>Pavement Width 5m                  (Carriage Way Width 7.1m)                  Housing Site at Up-stream Side                  (No Function for Water way)</p>





**Photograph - Existing Conditions of Road Structures on NR No.1 for Project**

No.5

	<p>42+300 to 400</p> <p>Most Flood Area in year 2000 Candidate Location for Structure</p>
	<p>Pk 42+850</p> <p>Bailey Bridge, Length 99m, Width 4m</p> <p>Under Improvement for Pier, River-bed (Traffic using Detour Road)</p> <p>Temporary Opened in year 2000</p>
	<p>Pk 45+776</p> <p>Water Gate(3)</p> <p>by Japan Grant Aid, 2002</p> <p>Pavement Width 13.5m</p>
	<p>Pk 47+967</p> <p>Bailey Bridge, Length 66m, Width 4m</p> <p>Under Improvement for Pier, River-bed (Traffic using Detour Road)</p> <p>Temporary Opened in year 2000</p>

**Photograph - Existing Conditions of Road Structures on NR No.1 for Project**

No.6

	<p>Pk 50+015</p> <p>Water Gate, Pol Pot Regime, 1976 Pavement Width 5.8m (=Carriage Way)</p> <p>Defected, Damaged Concrete Structure Broken Surface and Concrete Slab, Placed Steel Plates on Road Surface</p>
	<p>Pk 52+100 Spean Wat</p> <p>Culvert Location from Interview Result (Not Found)</p> <p>There was steel bridge (10-15m) in 1986. After demolished bridge, pipe culverts (1.0m*4) were installed in 1986. Finally, pipe culverts were demolished due to constructed housing land in 1999. (No function at up-stream side)</p>
	<p>Pk 53+700</p> <p>Canal at Both Side of Road Candidate Location for Culvert</p>
	<p>Pk 55+300</p> <p>Destination Point at Neak Loueng</p> <p>Ferry Port</p>



**Photograph - Existing Conditions of Road Structures on Other Projects**

No.7



NR1 (C-2) Stoeng Slot Br.  
  
Constructed 1986  
Pre-stressed Concrete Girder  
for 2 lanes



Secondary Road from NR1(C-2)  
  
Steel Bridge  
Narrow width



NR 11  
  
Steel Bridge  
Narrow width



NR 11  
  
Road Conditions  
Not paved

**Photograph - Existing Conditions of Road Structures on Other Projects**

No.8



NR 11

Improved Steel Bridge & Approach



NR 11

Critical Eroded/ Damaged Paved Road



NR 11

Eroded Approach Embankment  
at Bridge



Branch Road of NR 11

Reinforced Concrete Bridge  
Submerged Bridge Type

#### C-4. Study on Girder Structure above Piers

Proposed bridge has PC I-shaped girder for superstructure. It could be spliced above piers or left as simple girder as it is. Method to splice the girders is by cast-in-situ RC with PC cable crosswise. This appendix compares features between simple girder and splice girder for the project.

Conditions for the comparison are shown below:

- Main girder has same structure (length, height, width etc.) in both methods.
- Bearing is same in both methods. It will be rubber pad bearing.
- Horizontal force against earthquake and temperature are supported by only one pier of the Splice Girder Bridge.
- Splice girder needs to be calculated with statistically indicated force (creep, shrinkage etc.)
- Method to splice girder is by cast-in-situ RC with PC cable crosswise.
- Splice girder can be considered as continuous girder after the splice work is done. Loading for designing differs in splice girder. Main dead load (main girder, cross beam, slab etc.)
- Cost estimation is done on bridge No.2 (L = 4@25.0 meters)

Features in both methods are described in the table below.

	Simple Girder	Splice Girder
Structure	Each girder is individual. Each girder is supported by move and fix bearings Expansion joint is required between girders.	Girders are spliced and surface is continuous. Supported by rubber pad bearings. Anchor bar adjusts the movement. All girders are supported on one pier horizontally. Expansion joint is not required between girders.
Designing	Loading as simple beam	Loading as simple beam before splicing Loading as continuous beam after splicing. Dead load (girder, cross beam, slab etc.): simple beam Dead load (pavement, splice cross beam): continuous girder Live load : continuous girder Statistically indicated force is loaded.
Ease of construction	Installing expansion joint is required.	Extra pre-stressed cable work is required for splicing (Crosswise above piers)
Construction cost	US\$ 1,801,800 / bridge	US\$ 1,806,500 / bridge
Construction Period	Slightly shorter	Slightly longer
Ease of Maintenance	Maintenance of expansion joint is required.	Easy, no maintenance of expansion joint above piers is required.
Smoothness of surface	Not good for expansion joint	Very good
Environmental aspect	Noise and vibration on expansion joint	Quite and sound
Evaluation	<b>Not good</b>	<b>Good</b>

It can be concluded that the splice girder has superior system for the project road, especially after the completion of construction. No requirement for expansion joint can save maintenance fond and make vehicles comfortable to run across.