2.5 Engineering Study

1) Summary

The first section of 1.4 km follows the existing PWD road alignment in hilly terrain and the remaining 7.7 km passes on flat terrain in a straight line. The applied minimum radius of curvature is 500 m. Vertical grade is moderate through the whole alignment. The maximum gradient is 1.9 % in hilly terrain.

The minimum height of embankment in flat terrain is planned to be 2.5 m to avoid flooding damages in rainy season. Embankment over 5 km on Chumphon city side is protected by block sodding against flooding.

Total thickness of pavement is 45 cm with surface course of 10 cm, base course of 15 cm and subbase course of 20 cm. Two reinforced concrete bridges are planned in a total length of 40 m.

An intersection with Route 41 is planned to be signalized and another intersection with Route 327 is planned to be not signalized.

NC-1	Description
Changwat	: Chumphon
Name or Location	: Chumphon City Link, J.Rt.4 - J.Rt.327
Road Class	: F1
Cross Section (m)	: 2.5 + 7.0 + 2.5 (6.0 : PWD)
Surface Type	: SA / ASC / SA
Bridge: New	: 2 sites, 40 m
Length: Total	: 9.1 km
New	: 7.7 km
Reconstruction	: 1.4 km (PWD)
AADT ('96/'01/'06)	: 8,300 / 13,200 / 18,700
Financial Cost	: 110.2 million baht (in 1990 price)
NPV	: 322 million baht (12% discount rate)
B/C	: 6.3 (12% discount rate)
EIRR	: 69.9 %

( ): Existing Condition

2) Design Standard and Conditions

(1) Design Criteria

Road Class : F1
Design Speed : 70 - 90 km/h

Geometric Design Criteria

Description	Design Speed (km/h)		
	90	80	70
Minimum Radius of Curvature (m)	280	220	160
Minimum Stopping Sight Distance (m)	150	120	100
Maximum Gradient (%)	6	7	7
Minimum Gradient for Drainage (%)	0.3	0.3	0.3

(2) Pavement Design Conditions

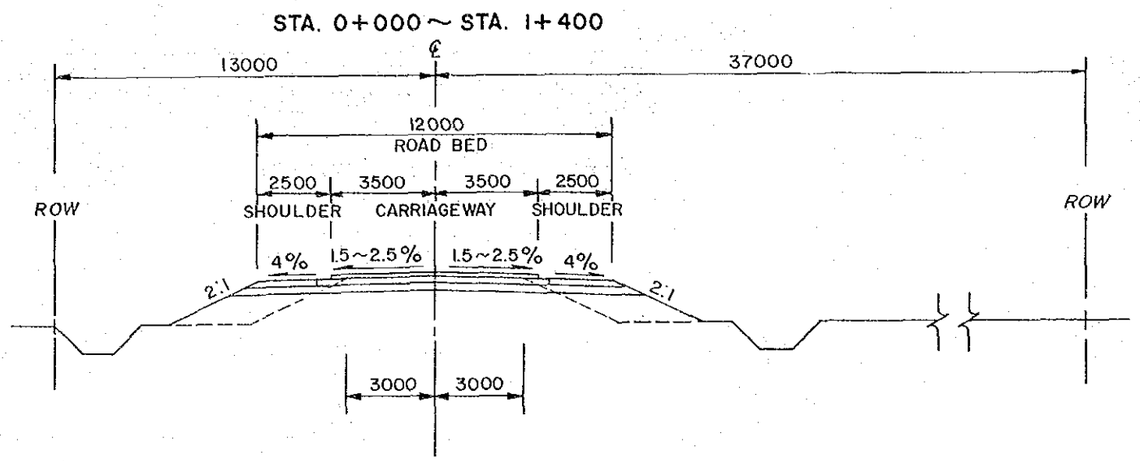
Design CBR : 6 %
Design Method : AASHTO
Design Period : 7 years

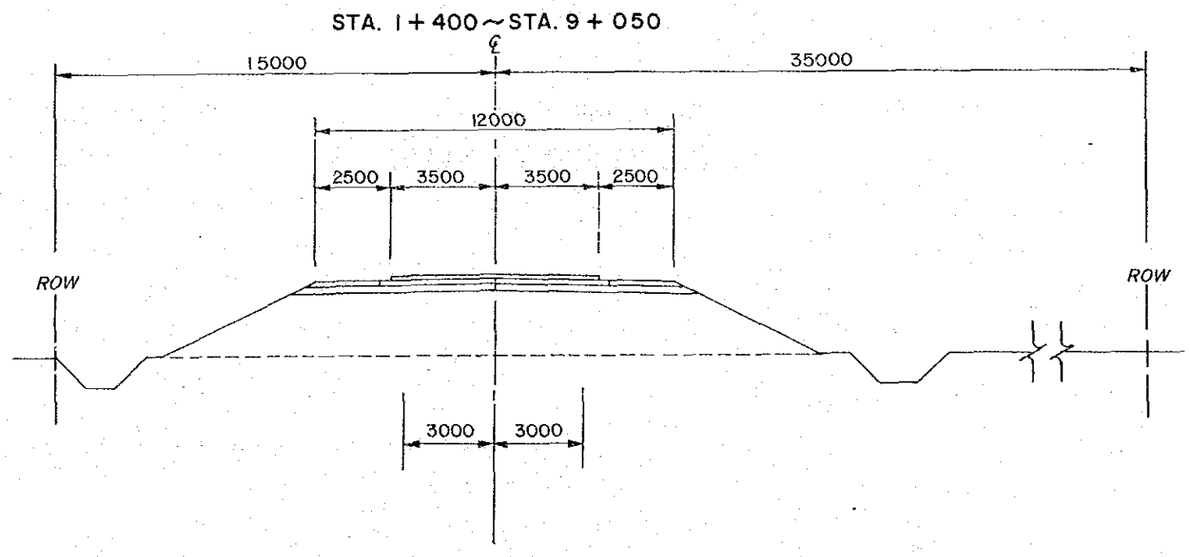
(3) Drainage Design Conditions

Rainfall Intensity : Rainfall Intensity Duration Curve at Chumphon Observatory

Return Period : Culvert--------10 years
: Minor Bridge---20 years

3) Typical Cross Section

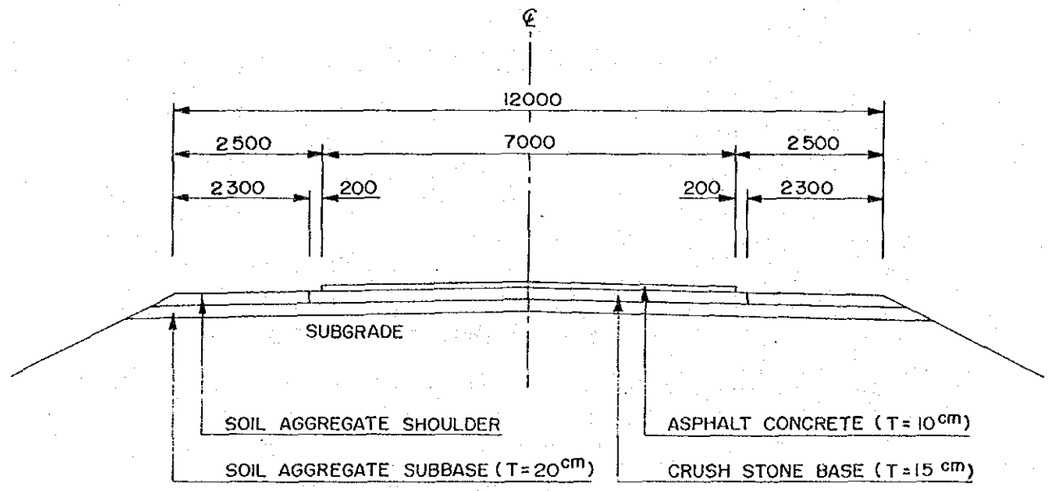




4) Pavement Design

New Road

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10^3 (7 years)	Thickness of Pavement Structure (cm)
6.0	6,475	Surface 10 Base 15 Subbase 20



2.6 Construction Cost

Table 2.5.1 CONSTRUCTION COST

1) CONSTRUCTION QUANTITIES AND COSTS

(Project NC -1 Length = 9.050 Km)
(Improved Length 9.050 Km)

ITEM	Unit	Financial Unit Cost Baht	Quantity	Financial Total cost 1000 Baht	Economic cost %	Economic cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTH WORK					83		90	
Clearing & Grubbing	SQ.M	1	283,050	283				
Roadway Excavation(classified)	CU.M	85	0	0				
Embankment(Borrowed Material)	CU.M	100	318,133	31,813				
Slope Protection(Stripe Sodding)	SQ.M	6	94,177	565				
(Sodding)	SQ.M	9	0	0				
(Shot Concrete)	SQ.M	500	0	0				
(Concrete Block)	SQ.M	450	7,783	3,502				
Sand Mat (t=0.5m)	SQ.M	100	0	0				
Excavate Existing Thickness Over 10cm (2Lay)	SQ.M	14	0	0				
SUB TOTAL				36,164		30,016		27,014
SUBBASE AND BASE					83		50	
Subbase(Soil Aggregate)	CU.M	190	23,426	4,451				
Base Coarses(Crush Stone)	CU.M	270	10,001	2,700				
Shoulder(Soil Aggregate)	CU.M	190	6,622	1,258				
SUB TOTAL				8,409		6,980		3,490
SURFACE					83		50	
Asphaltic Prime coat	SQ.M	13	66,674	867				
Asphaltic Tack coat	SQ.M	7	63,070	441				
Asphalt concrete Surfacing	CU.M	1,900	6,307	11,983				
SUB TOTAL				13,292		11,032		5,516
STRUCTURES(Equivalent)					83		50	
RC Pipe Culvert(D= 600 m)	M	1,300	648	842				
(D= 800 m)	M	1,780	108	192				
(D=1000 m)	M	2,445	216	528				
(D=1200 m)	M	3,575	0	0				
(D=700m*2)	M	1,540	19	29				
RC Box Culvert(1-1.80*1.80 m)	M	4,200	45	189				
(1-2.10*2.10 m)	M	5,000	0	0				
(1-2.40*2.40 m)	M	5,900	0	0				
RC Bridge Wideing	SQ.M	9,600	0	0				
RC Bridge (W=14.0 m)	M	89,600	40	3,584				
PC Bridge (W=14.0 m)	M	140,000	0	0				
Bearing Unit Of Bridge	Ls	500,000	2	1,000				
SUB TOTAL				6,365		5,283		2,641
INTERSECTION					90		90	
T-Intersection (Signal)	Ls	800,000	1	800				
T-Intersection (Unsignal)	Ls	80,000	1	80				
SUB TOTAL				880		792		713
TOTAL (a)				65,110		54,103		39,375
Miscellaneous Works [(a)*7%]	Ls	1		4,558		3,787		2,756
CONTRACT AMOUNT (b)				69,667		57,890		42,131
PHYSICAL CONTINGENCIES [(b)*10%] (c)	Ls	1		6,967		5,789		4,213
ENGINEERING & SUPERVISION [((b)+(c))*10%] (d)	Ls	1		7,663	85	6,514	0	0
LAND ACQUISITION & COMPENSATION								
Land Acquisition (Average)	SQ.M	49	422,300	20,735	100	20,735	100	20,735
Compensation	Ls	5,200,000	1	5,200	100	5,200	100	5,200
TOTAL (e)				25,935		25,935		25,935
PROJECT COST [(b)+(c)+(d)+(e)]				110,232		96,128		72,279
AVERAGE COST PER KM				12,180				

2) MAINTENANCE COST

Project Road No, NC -1 Na= 9,300 Baht/Km/year
(Existing Road) Km= 1.162
Length = 1.410 Km

Laterite Surface

	ITEMS		Existing Condition	Existing Factor
1.	A.D.T	A1	101-150	0.13
2.	Width Of Embankment (Surface & Shoulder)	A3	6.0 m	0.00
3.	R-O-W Width	B1	20 m	0.00
4.	Traffic Service Operation Topography	B2	0 - 3 %	0.05
5.	Drainage Topography	B3	0 - 3 %	0.00
6.	Bridge Quantity (m/Km)	B4	1~20	0.02
7.	NO. Of Lanes		2	

Ks (Existing)= 1+0.7(A1+A3)+0.3(B1+B2+B3+B4) = 1.112
Maintenance cost + Overhead = KS * Km * Na * 1.28 = 15,382 Baht/Km/year
Total Cost (Financial) = Length *(Baht/Km/year)= 21,688 Baht/year
(Economic) = = 18,001 Baht/year

Project Road No, NC -1 Na= 8,200 Baht/Km/year
(Proposed Road) Km= 1.001
Length = 9.050 Km

Asphalt Pavement

	ITEMS		Proposed Road Condition	Proposed Road Factor
1.	Surface /Bace Type	X1	AC	0.00
2.	Subgrade CBR	X2	4 %	0.50
3.	A.D.T	X3	>5,700	2.25
4.	Service Life (year)	X4	NEW	0.00
5.	Pavement Width (m)	X5	7 m	0.19
6.	R-O-W Width (m)	Y1	50 m	0.05
7.	Shoulder,Access,Median Width (m)	Y2	2.50 m	0.05
8.	Traffic Service Operation Topography	Y3	0 - 3 %	0.00
9.	Drainage Topography	Y4	0 - 3 %	0.00
10.	Bridge Quantity (m/Km)	Y5	4	0.00
11.	NO. Of Lanes		2	

Ka = 1+0.5(X1+X2+X3+X4+X5+Y1+Y2+Y3+Y4+Y5)= 2.520
Maintenance cost + Overhead= Ka * Km * Na * 1.28 = 26,476 Baht/Km/year
Total Cost (Financial) = Length *(Baht/Km/year)= 239,611 Baht/year
(Economic) = = 198,877 Baht/year

Overlay Cost (2004) = = 8,270,976 Baht

3) CONSTRUCTION SCHEDULE

Project NC-1

(One Section)

year and Month / Work Items	First Year 1 2 3 4 5 6 7 8 9 10 11 12	Second Year 1 2 3 4 5 6 7 8 9 10 11 12
Land Acquisition	=========	
Preparatory Works	=========	
Earth Works	==========	
Pavement Works		==========
Bridge Works	==========	==========
Miscellaneous Works	==========	========= ======
Clearing -Up		=========
Percentage Of Disbursement (%)	38 %	62 %

4) ECONOMIC EVALUATION

Cost and Benefit Flows of the Project

Project; NC-1

(unit ; 1000 Baht)

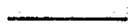
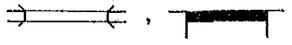
Year	Construction Cost	Maintenance Cost	Total Cost	VOC Saving	Time Saving	Balance	Sensi. Analysis
						Benefit=	0.80
						Cost=	1.20
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	61,170	0	61,170	0	0	(61,170)	(73,404)
1995	34,958	0	34,958	0	0	(34,958)	(41,949)
1996	0	181	181	20,077	46,660	66,556	53,173
1997	0	181	181	19,312	73,124	92,255	73,731
1998	0	181	181	18,547	99,587	117,953	94,290
1999	0	181	181	17,781	126,051	143,651	114,849
2000	0	181	181	17,016	152,514	169,350	135,407
2001	0	181	181	16,251	178,978	195,048	155,966
2002	0	181	181	14,344	143,182	157,345	125,804
2003	0	181	181	12,436	107,387	119,642	95,641
2004	0	8,452	8,452	10,529	71,591	73,668	55,554
2005	0	181	181	8,621	35,796	44,236	35,317
2006	0	181	181	6,714	0	6,533	5,154
2007	0	181	181	6,714	0	6,533	5,154
2008	0	181	181	6,714	0	6,533	5,154
2009	0	181	181	6,714	0	6,533	5,154
2010	0	181	181	6,714	0	6,533	5,154
Total	96,128	10,985	107,113	188,484	1,034,870	1,116,242	850,148
					IRR =	69.92%	52.76%
					NPV (i;12%	322043	
					B/C (i;12%	6.3	

2.7 Drawings

Drawing

SHEET NO.	LIST OF DRAWINGS
1.	Plan and Profile
2.	Plan of Intersection
3.	(A) Reinforced Concrete Slab Bridge
4.	Box Culvert
5.	Pipe Culvert

ABBREVIATION AND SYMBOLS FOR PROFILE AND PLAN

	: Alignment of Proposed Route
	: Proposed Bridge
	: Proposed Box Culvert
	: High Water Level
	: Water Level
No.	: Number
R	: Radius of Curvature
L	: Length of Curve
BR.RC.SP.SL L	: Reinforced Concrete Bridge (Bridge Length)
BR.PC.GRDR L	: Prestressed Concrete Bridge (Bridge Length)
BR.ST.SP.TR L	: Steel Bridge (Bridge Length)
RC-B m - n x a x b x i	: Box Culvert (No. of Locations - No. of Cells x Clear Span x Depth x Length)

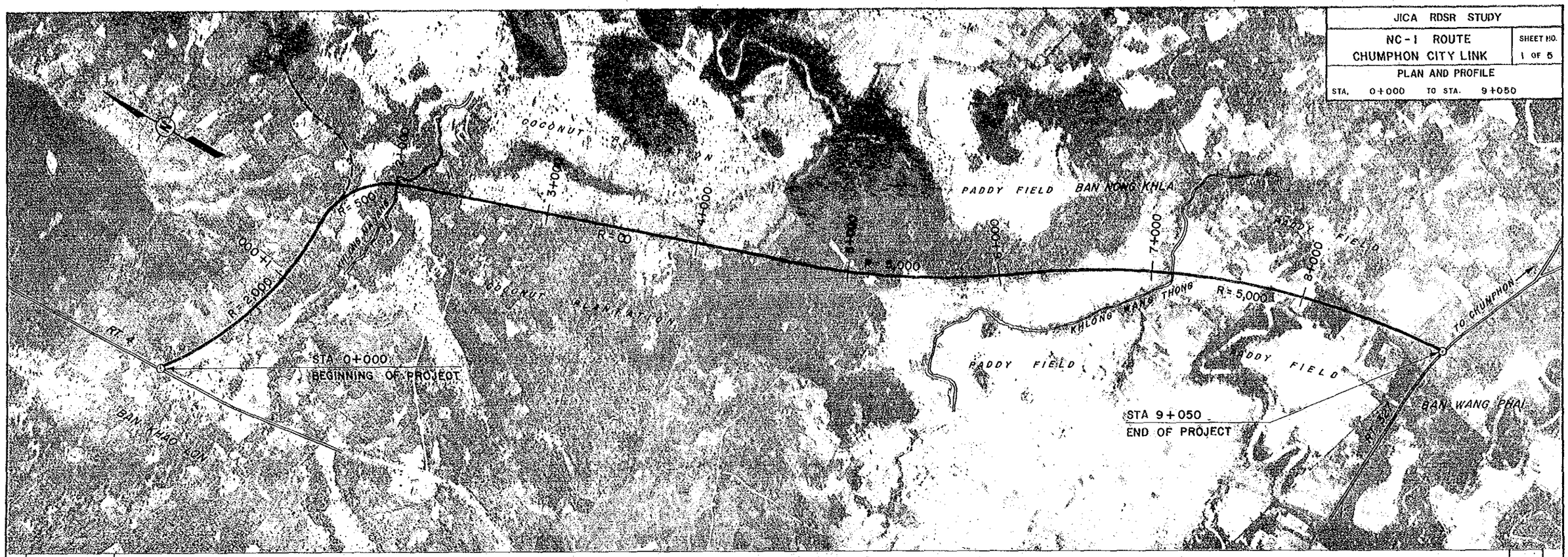
JICA RDSR STUDY

NC-1 ROUTE
CHUMPHON CITY LINK

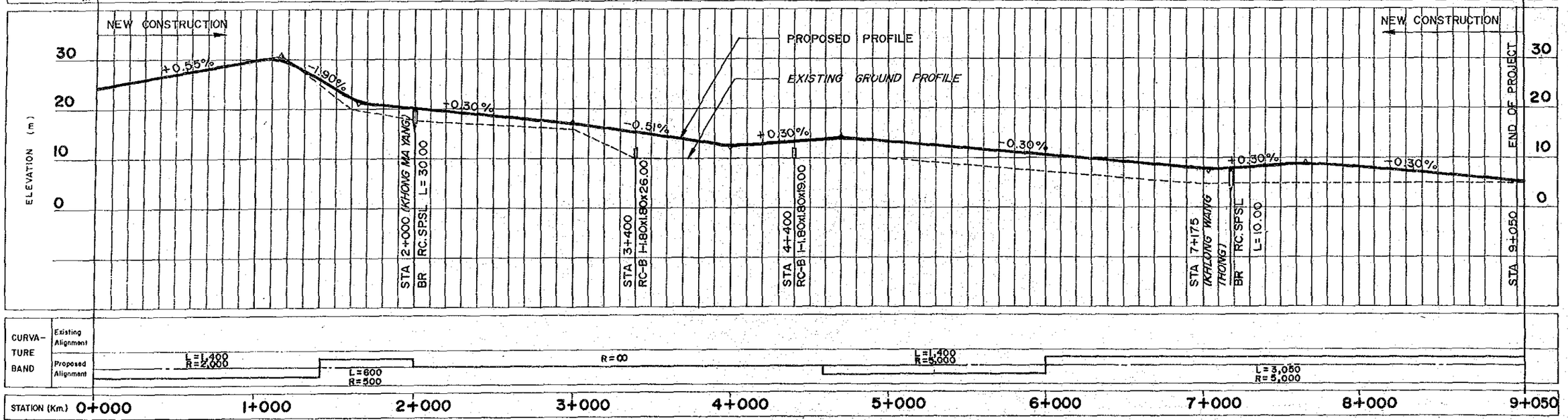
SHEET NO. 1 OF 5

PLAN AND PROFILE

STA. 0+000 TO STA. 9+050

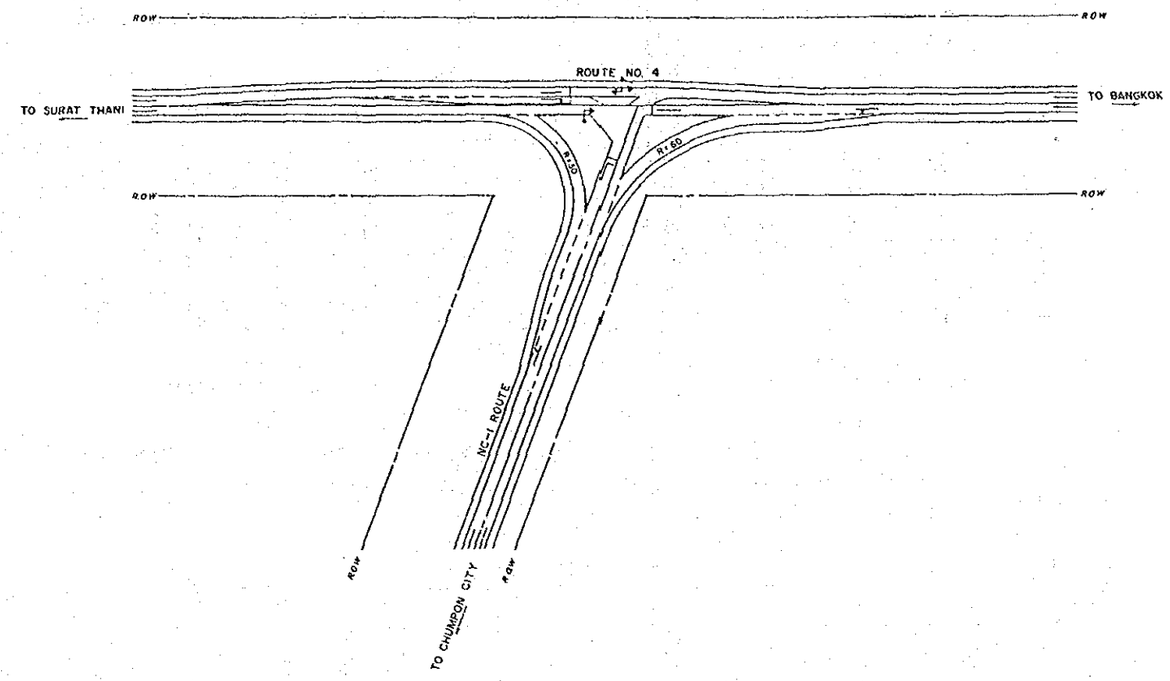


TERRAIN		FLAT
PAVEM'T	Type	AC PAVEMENT
	Existing Condition	—
FLOODING	Length(Km.) Hight (m.)	—
RIGHT OF WAY (m)	L	25.00
	R	25.00

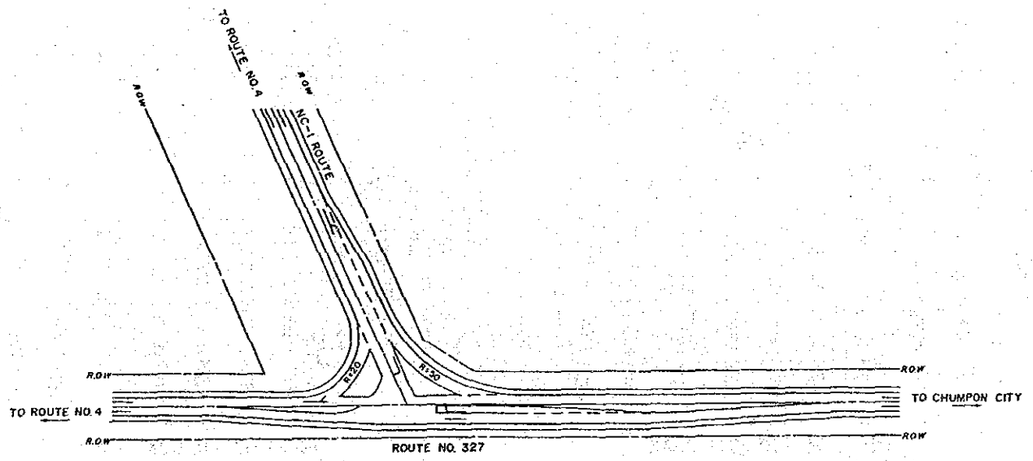


CURVATURE BAND	Existing Alignment	
	Proposed Alignment	L=1,400 R=2,000; L=600 R=500; R=∞; L=1,400 R=5,000; L=3,050 R=5,000
STATION (Km.)		0+000 1+000 2+000 3+000 4+000 5+000 6+000 7+000 8+000 9+050

JICA RDSR STUDY	
NC-1 ROUTE CHUMPON CITY LINK	SHEET NO 2 OF 5
PLAN OF INTERSECTION	

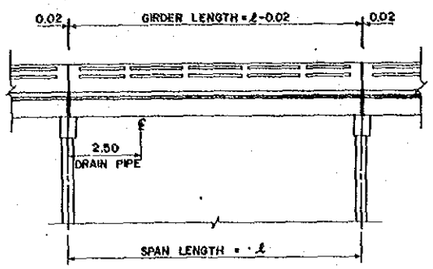


Intersection with Rt.41
Scale 1:2000

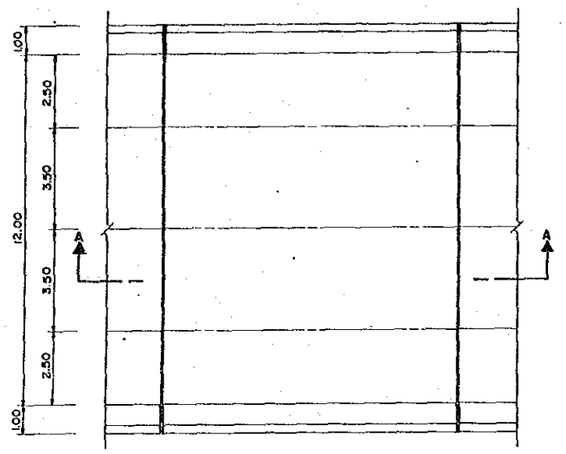


Intersection with Rt.327
Scale 1:2000

REINFORCED CONCRETE SLAB BRIDGE



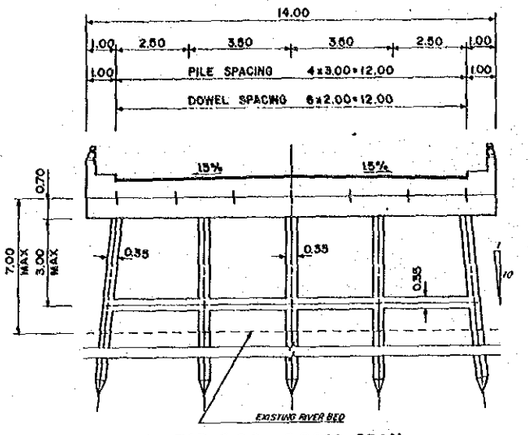
SECTION A–A
SCALE 1:200



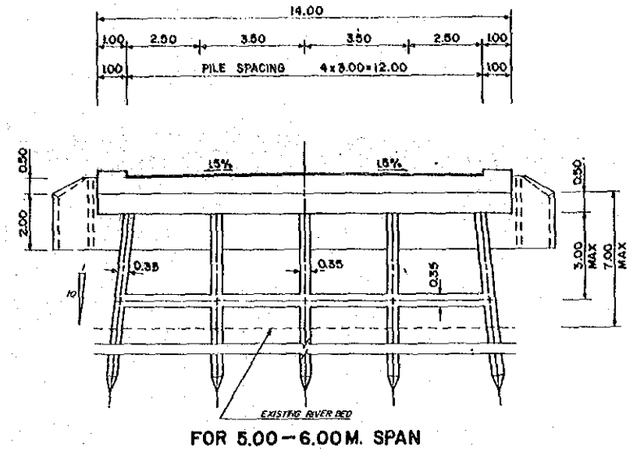
P L A N
SCALE 1:200

LIST OF BRIDGES

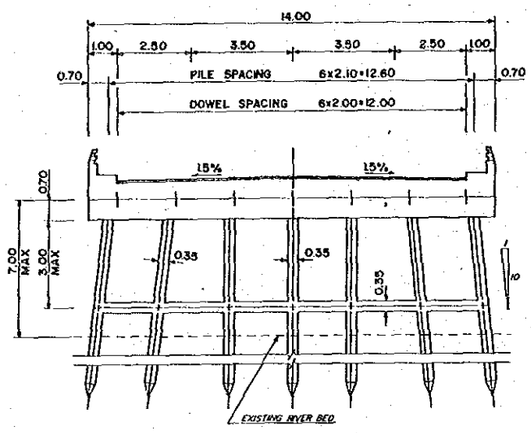
STATION	SPAN AND LENGTH(m)
2+000	3 x 10.00 = 30.00
7+175	1 x 10.00 = 10.00



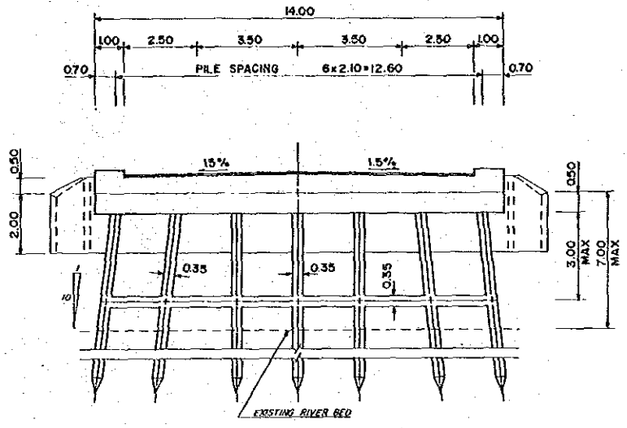
FOR 5.00 – 6.00M. SPAN



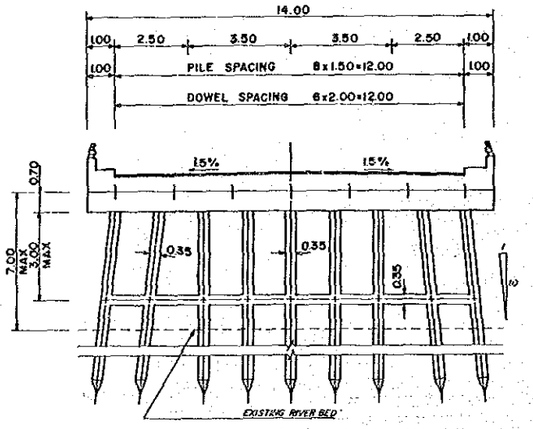
FOR 5.00 – 6.00M. SPAN



FOR 7.00 – 8.00M. SPAN

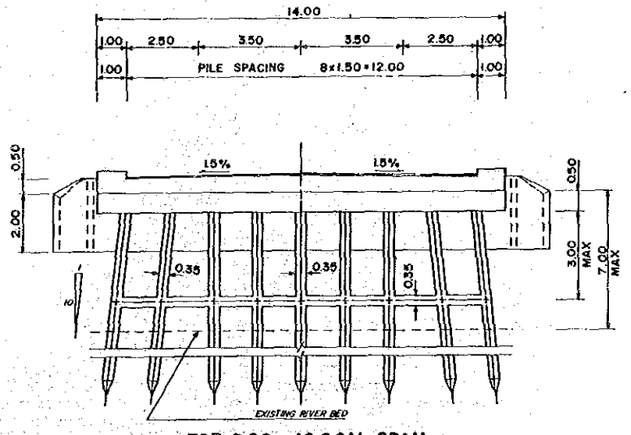


FOR 7.00 – 8.00M. SPAN



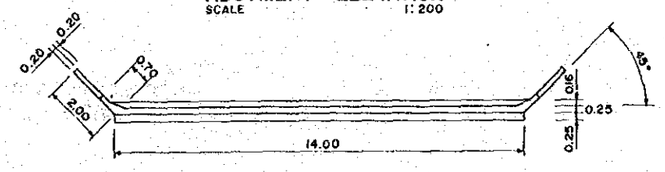
FOR 9.00 – 10.00M. SPAN

PILE BENT ELEVATION
SCALE 1:200



FOR 9.00 – 10.00M. SPAN

ABUTMENT ELEVATION
SCALE 1:200



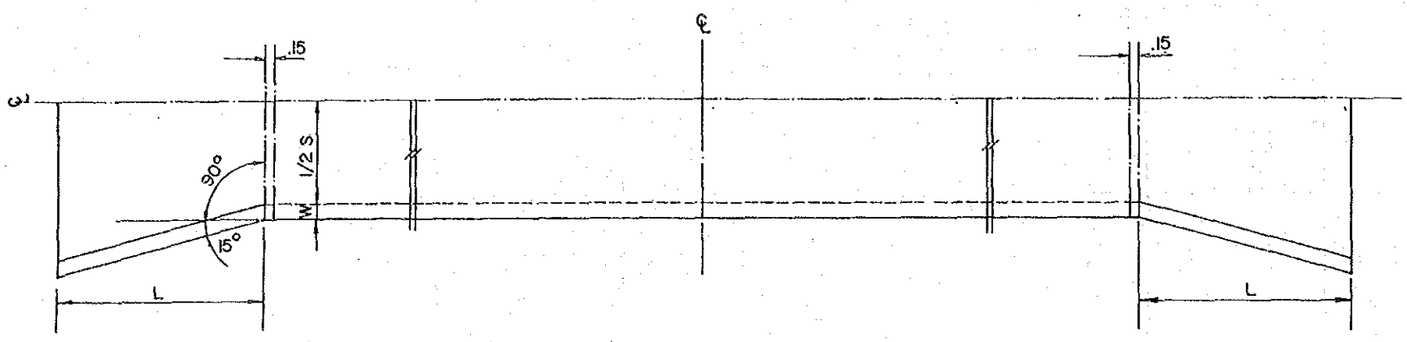
P L A N
SCALE 1:200

NOTES :

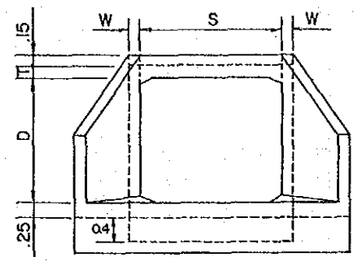
1. DESIGN STRESSES :
   a) CONCRETE , f_c = 70 KSC.
   b) STEEL , f_s = 1,400 KSC. (INTERMEDIATE GRADE)
   f_s = 1,200 KSC. (STRUCTURAL GRADE)
2. CONCRETE SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM² FOR .15 X .15 X .15 CUBE AT 28 DAYS. AND APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :
   PORTLAND CEMENT, MIN. 350 KG.
   SAND 0.43 M³
   CRUSHED ROCK OR GRAVEL 0.86 M³
   CONCRETE SLUMP, MAX 10 CM.
3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.5 CM. ELSEWHERE OF SLAB BRIDGE AND SIDEWALK SHALL BE 2.5 CM.
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS #4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHTO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHICH EXPOSED TO TRAFFIC. WHITE AND BLACK COLOUR SHALL BE PAINTED ALTERNATELY. WHITE COLOUR SHALL BE LIGHT REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
12. BAR MARK S101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES. IF THE LOCATIONS OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101. OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
13. ALL PIERS WHICH DO NOT HAVE LOG PROTECTION WALLS SHALL BE HAUNCH UNDER THE TOP CROSS BRACING.
14. IF ANY NOTES ON THE DRAWINGS OF PIERS CONTRADICT THE NOTES ON THIS DRAWING, THEY WILL BE SUPERSEDED BY THESE NOTES.
15. THIS DRAWING IS ADAPTED FROM DOH DWG NO. 3 AD5-106-14/1A IN CASE OF ANY DISCREPANCY BETWEEN SUCH DRAWINGS ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL UNDER THE APPROVAL OF THE ENGINEER.

JICA RDSR STUDY	
NC-1 ROUTE CHUMPON CITY LINK	SHEET NO. 4 OF 5
BOX CULVERT	

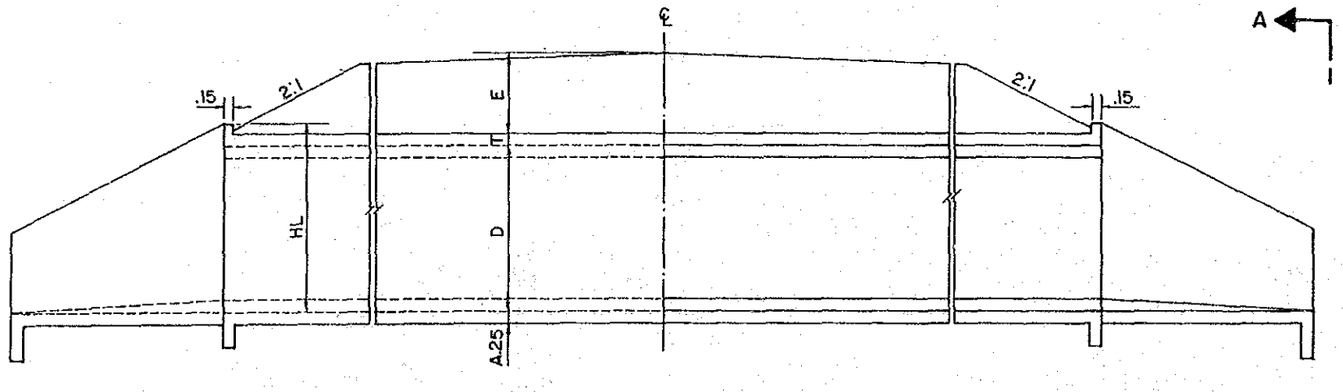
BOX CULVERT



HALF LONGITUDINAL PLAN

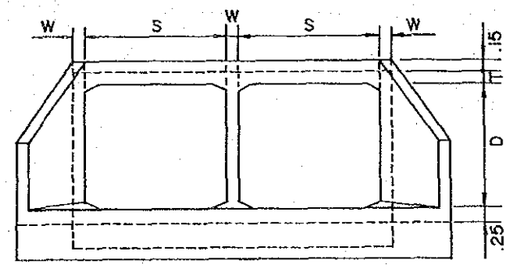


SINGLE TYPE



HALF LONGITUDINAL ELEVATION

HALF LONGITUDINAL SECTION

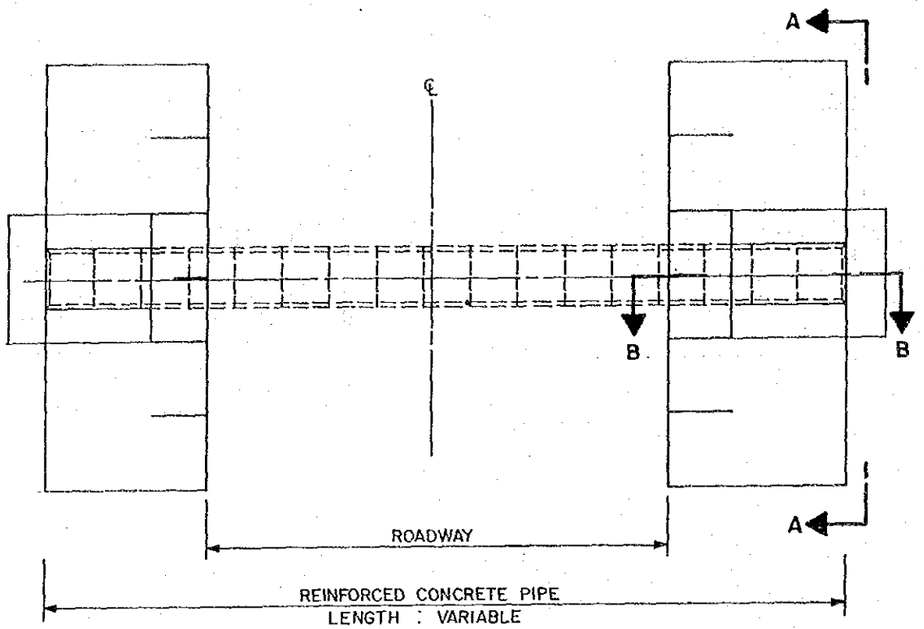


DOUBLE TYPE

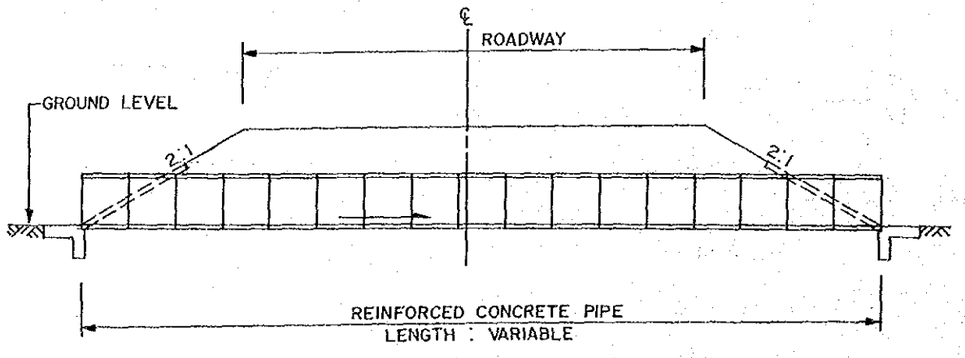
SECTION A-A

PIPE CULVERT

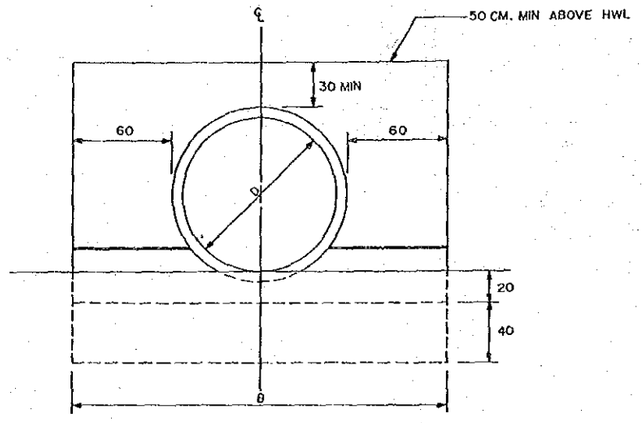
JICA RDSR STUDY	
NC-1 ROUTE CHUMPON CITY LINK	SHEET NO. 5 OF 5
PIPE CULVERT	



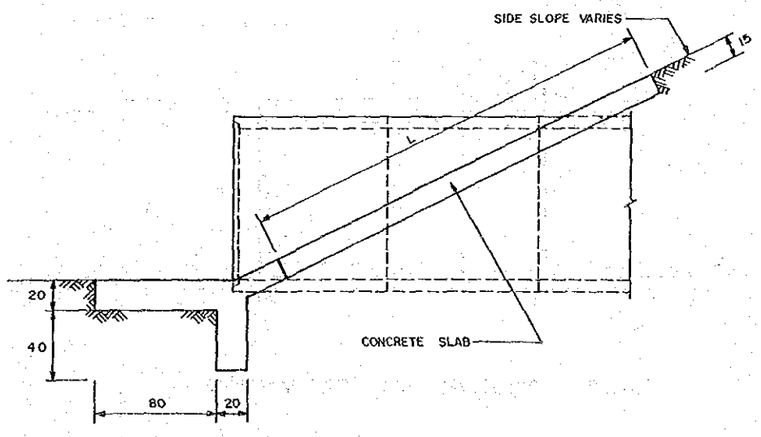
PLAN



PROFILE



SECTION A-A



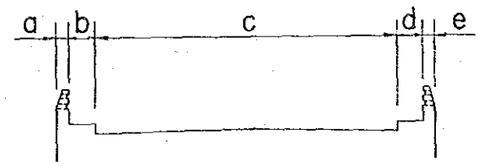
SECTION B-B

List of Bridge

LIST OF BRIDGES (NC-1:F1)

Station	Materials	Structural System	Width (a+b+c+d+e:m)	Span and Length (m)	Remarks	(Fig.)
2+000	RC	SP.SL	0.3+0.7+12.0+0.7+0.3=14.0	3*10.0=30.0	New construction	
7+175	RC	SP.SL	0.3+0.7+12.0+0.7+0.3=14.0	1*10.0=10.0	New construction	

Note: (1) Materials
RC: Reinforced Concrete Bridge
(2) Structural System
SP.SL: Simply Supported Slab



List of Culvert

LIST OF BOX AND PIPE CULVERT

STATION	CULVERT TYPE	CULVERT SIZE (m)		NO. of LOCATIONS	CULVERT LENGTH (m)		
		PIPE	BOX				
		NO. of ROW x DIAMETER	NO. of CELLS (CLEAR SPAN x DEPTH)		EXISTING	EXTENDED CONST-RUCTION	NEW CONST-RUCTION
0+000-3+000	Pipe	1x⊙0.60		15			20.0
3+000-5+000	Pipe	1x⊙1.00		4			30.0
	Pipe	1x⊙0.80		2			30.0
	Pipe	1x⊙0.60		2			30.0
3+400	Box		1(1.80x1.80)	1			26.0
4+400	Box		1(1.80x1.80)	1			19.0
5+500-7+500	Pipe	1x⊙0.60		10			24.0
7+500-9+000	Pipe	1x⊙1.00		4			24.0
	Pipe	1x⊙0.80		2			24.0
	Pipe	1x⊙0.60		2			24.0

Chapter 3

Surat Thani Additional Lane (AD-1)

3. Surat Thani Additional Lane (AD-1)

3.1 Natural Conditions and Land Use

The project is to construct additional two lanes along Route 401 around Surat Thani city from the intersection with Route 41 in the west to the one with Route 4142 in the east over a total distance of 41 kilometers. A part of the project highway passes through the Tapi River basin which tends to have soft ground especially near the estuary.

The area receives the north-east monsoon during the period of November - January. Mean annual rainfall is 1,600 mm. The project highway is located in a flatland. General Geology belongs to clay silt.

Agricultural land use is prevailing in the project area, accounting for 95 % of the whole area. Paddy field is the most popular land use along the highway. Residential land use has been developing in a corridor between Phumphin and Surat Thani.

Residential Land	5 %
Paddy Field	50 %
Rubber Plantation	10 %
Orchard & Vegetable	35 %

Land price is in the range of B20,000 - 1,000,000 per rai with annual rate of hike at around 10 % in recent years. The highest land price was marked in the outskirts of Surat Thani municipality.

AD-1-2: The alternative route is planned in the northern part of the existing Route 401 directing to Surat Thani Airport. Most of the land along the route is used for paddy production. Land price is in the range of B16,000 - 40,000 per rai.

3.2 Socio-Economic Conditions

Population in the project area reached 271,900 persons in 1989 as shown in Table 3.2.1. Phumphin had the highest population density of 343 persons per square kilometer, followed by Surat Thani and Kanchanadit. During the period 1980 - 1989, Phumphin attained the highest population growth rate of 2.4 %.

Agriculture sector had the highest employment share of 66 %, followed by service sector of 19 % and manufacturing sector of as high as 15 %. Employment share of manufacturing sector was outstandingly high when compared with those of the other project areas.

Table 3.2.1 POPULATION IN AD-1 CORRIDOR

	Phumphin	M. Surat Thani	Kanchanadit
Area (km2)	242.5	1,201.0	1,650.0
Total Pop. (1989)	83,217	112,646	76,102
Pop.Density(per km2)	343	94	46
Pop.Growth Rate (% per annum)			
1980-89	2.44	1.78	1.72

3.3 Traffic Conditions

The project covers a section of about 41 kilometers from the intersection between Route 41 and 4153 to the intersection between Route 401 and 4142, including Route 4153 (F3 Standard), 4008 (SD) and 401 (SD/S1/S3) but excluding the newly completed four lane highway section (SD about 9 kilometers) of Route 4008 and 401. The present AADT surpassed the design traffic capacity on about three-fourth of the project highway section.

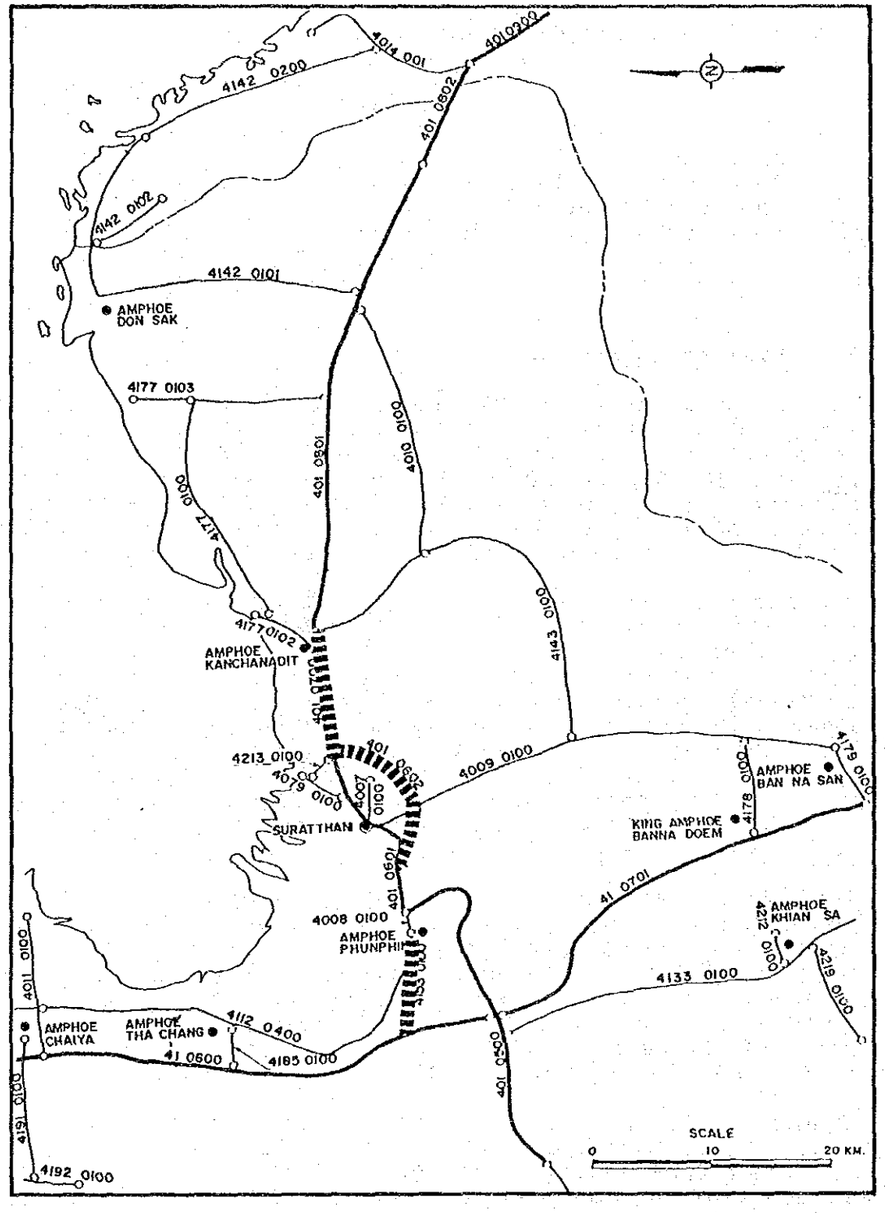
The roadside OD survey carried out near the Tha Thong Bridge on Route 401 revealed that 22 % of trucks on the highway carried construction materials, 20 % manufactured products, 10 % minerals, and 9 % petroleum products. Most of the construction materials comprising mainly sand and gravel were carried by 6 and 10 wheeled trucks. Nearly 100 % of minerals and 50 % of petroleum products were carried by 10 wheeled trucks. As to trip purposes of passengers, 58 % of cars was for private purpose trip and 34 % for work and business trip. Percentage share of tourism purpose trip was the third highest following Phuket and Phangnga though the share was as low as 8 %.

The project aims to increase the traffic capacity of the above mentioned sections by constructing additional two lanes along the existing highways (Project No. AD-1-1). As an alternative to the project, however, the study takes account of the new highway proposed by the Department of Town and Country Planning (DTCP) connecting Surat Thani Airport directly to Surat Thani city to the north of the existing highways. It is assumed in this case that the existing highways remain as they are now (Project No. AD-1-2).

The future traffic volume of AD-1-1 was estimated as shown in Fig. 3.3.1. Traffic volume in 1996 was estimated at 16,100 AADT on Route 4153 and 4008, 9,000 - 10,700 AADT on Surat Thani Bypass, and 14,000 AADT on the immediate east section of Surat Thani Bypass on Route 401. The increasing traffic volume on Route 4153 implies that the improvement of Route 4153 will induce substantial traffic diversion from Route 401 which crosses mountain area.

The future traffic volume of AD-1-2 was estimated as shown in Fig. 3.3.2. Traffic volume in 1996 was estimated at 7,400 - 7,500 AADT on the new DTCP highway and 6,000 AADT on Route 4153.

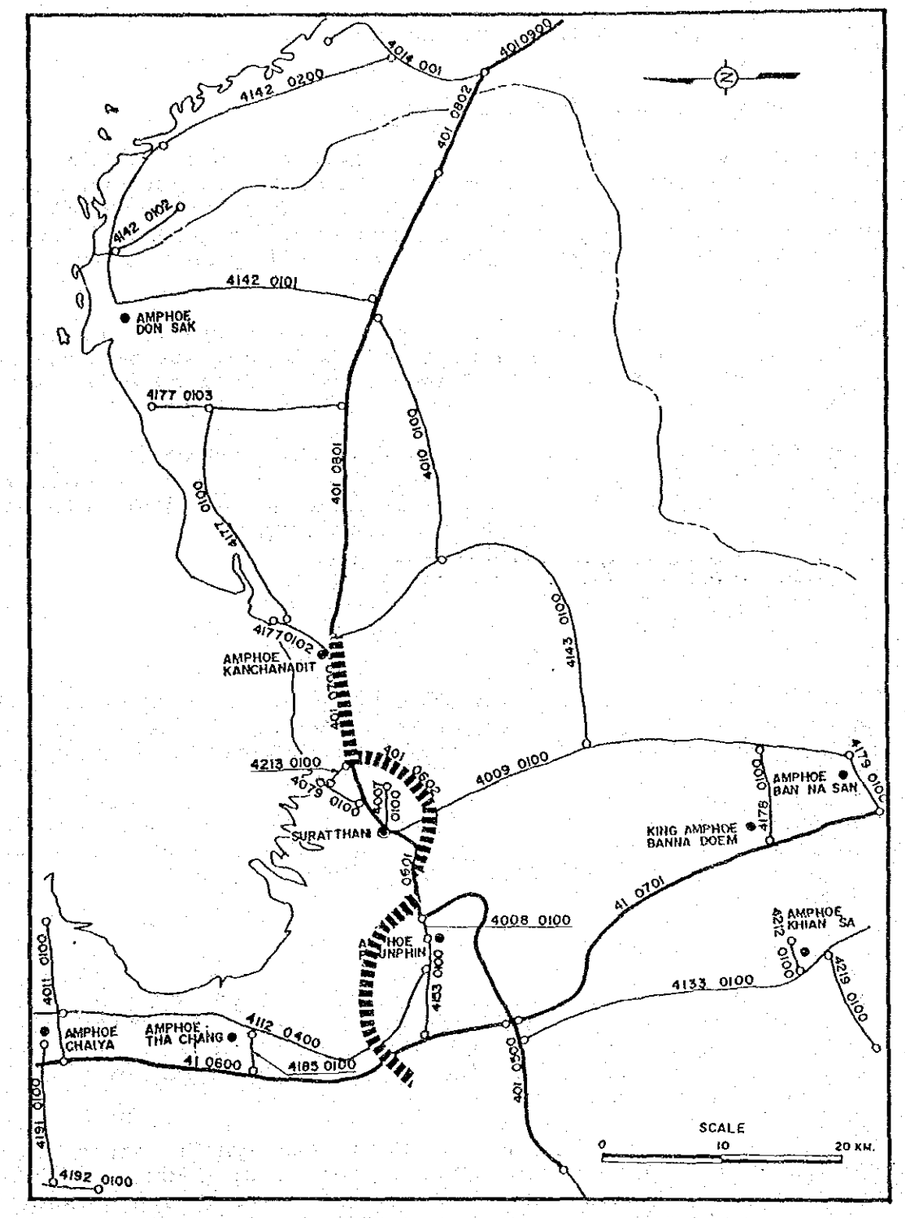
3.3 Surat Thani Additional Lane (AD-1)



LEGEND :

PROJECT ROUTE — PROVINCIAL HIGHWAYS
DIVIDED HIGHWAYS — CHANGWAT , AMPHOE
NATIONAL HIGHWAYS

Fig. 3.1.1 SURAT THANI ADDITIONAL LANE (AD-1-1)



LEGEND :

PROJECT ROUTE — PROVINCIAL HIGHWAYS
DIVIDED HIGHWAYS — CHANGWAT , AMPHOE
NATIONAL HIGHWAYS

Fig. 3.1.2 SURAT THANI ALTERNATIVE ROUTE (AD-1-2)

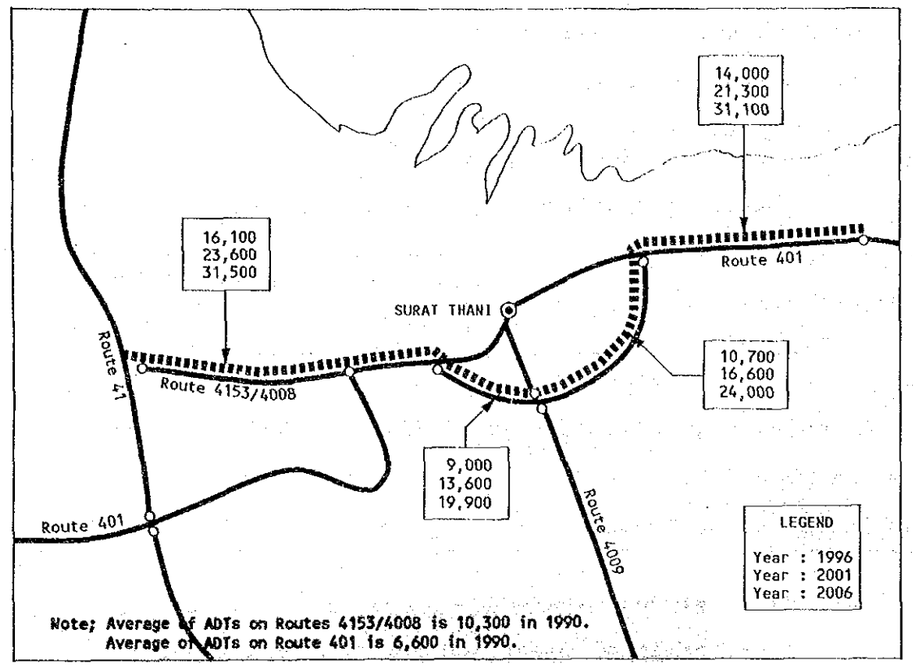


Fig. 3.3.1 TRAFFIC VOLUME ON AD-1-1

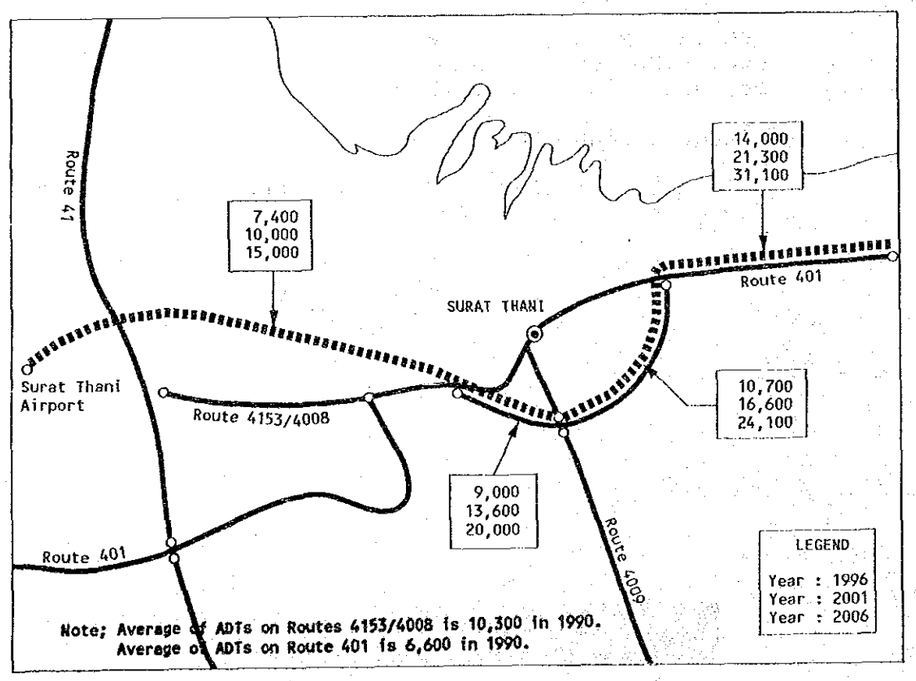


Fig. 3.3.2 TRAFFIC VOLUME ON AD-1-2

3.4 Project Evaluation

1) AD-1-1

The EIRR was calculated at as high as 57.3 % though it was 34.2 % in the pre-feasibility study. This is mainly due to the shortening of the project length from 60.3 kilometers to 32.0 kilometers just concentrating on the sections adjacent to Surat Thani city with greater traffic than the sections distant from the city.

This project is judged viable. Due to a substantial amount of land acquisition cost, however, the viability would be influenced to a considerable extent by the land price hike in the future if the implementation delays.

The highway lies in a flat land mostly with paddy and orchard fields. No significant effects on environment is envisaged because the highway follows the existing alignment without any intrusion into new land. Pavement of soil aggregate shoulders, near city area in particular, will be a good way to reduce accidents by leading motorcycle traffic to the shoulders.

2) AD-1-2

The unique purpose of this project compared with that of AD-1-1 is to offer better transport linkage between Surat Thani Airport and Surat Thani city. The EIRR was calculated at 58.1 %, slightly higher than that of AD-1-1. This alternative project is judged viable as well.

It is likely that better linkage between the airport and the city would contribute to stimulate economic development in the vicinity of Surat Thani city. AD-1-2 would be preferable to AD-1-1 in view of the possible contribution to the economic development.

The new section lies in a flat terrain in the Ta Pi river basin. No significant effects on environment is envisaged though drainage system should be well developed so as not to disturb water flow.