

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF PUBLIC WORKS AND TRANSPORTS
KINGDOM OF CAMBODIA

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE IMPROVEMENT OF
THE ROAD CONSTRUCTION CENTER
IN
THE KINGDOM OF CAMBODIA**

JANUARY 1994

**CONSTRUCTION PROJECT CONSULTANTS, INC.
YACHIYO ENGINEERING CO., LTD.**

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PREFACE

In response to a request from the Supreme National Council of Cambodia, the Government of Japan decided to conduct a basic design study on the Project for the Improvement of the Road Construction Center and entrusted the study to the Japan International Cooperation Agency (JICA).

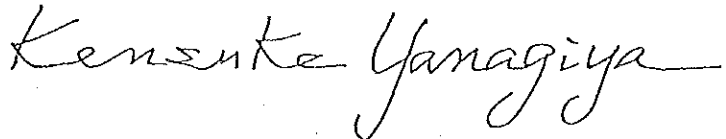
JICA sent to Cambodia a study team headed by Mr. Masao Takai, Director of Second Basic Design Study Division, Grant Aid Study and Design Department, JICA, from 11th August to 4th September, 1993.

The team held discussions with the officials concerned of the Government of Cambodia and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Cambodia from 13th November to 20th November, 1993 in order to discuss a draft report and the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Cambodia for their close cooperation extended to the teams.

January, 1994



Kensuke YANAGIYA
President
Japan International Cooperation Agency

January, 1994

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

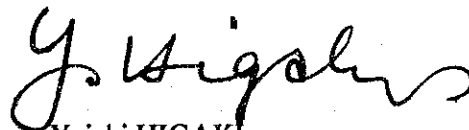
We are pleased to submit to you the basic design study report on the Project for the Improvement of the Road Construction Center in the Kingdom of Cambodia.

This study was conducted by the Joint Venture of Construction Project Consultants, Inc. and Yachiyo Engineering Co., Ltd., under a contract to JICA, during the period August 6, 1993 to January 31, 1994. In conducting the study, we have examined the feasibility and rationale of the Project with due consideration to the present situation of Cambodia, and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

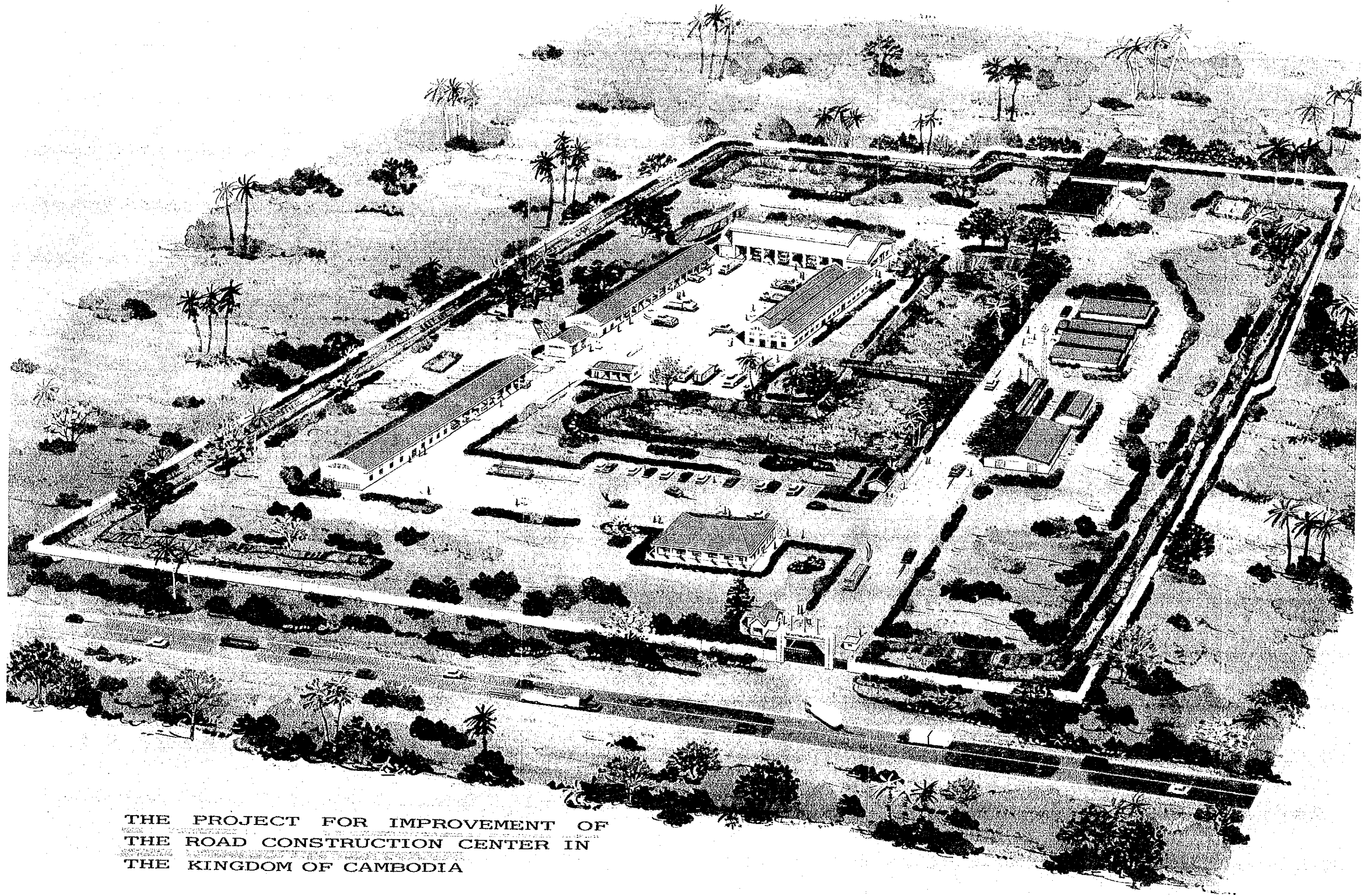
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs and the Ministry of Construction. We would also like to express our gratitude to the officials concerned of the Ministry of Public Works and Transports, the JICA Cambodia office, the Embassy of Japan in Cambodia for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the Project.

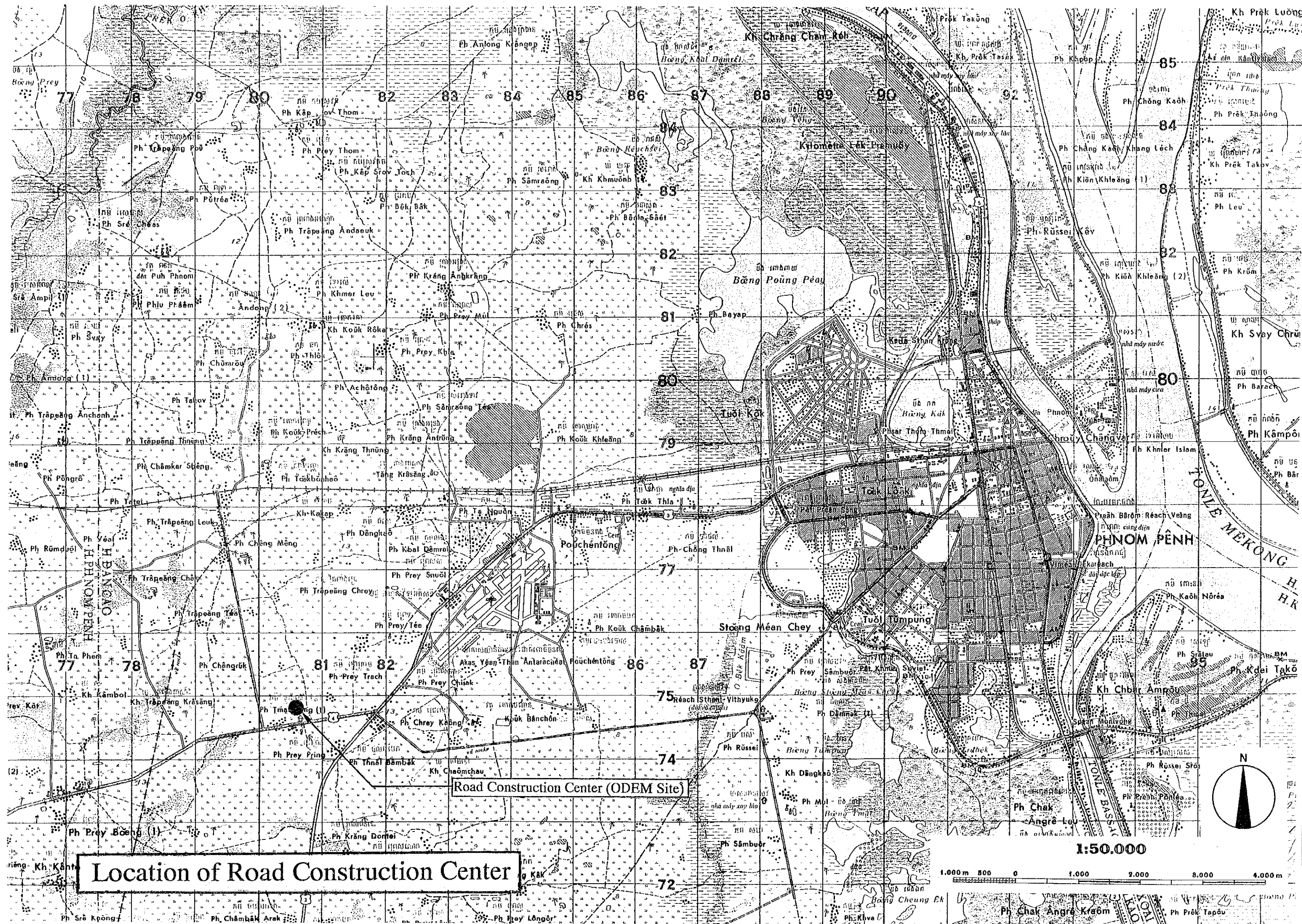
Very truly yours,



Yoichi HIGAKI
Project Manager,
Basic design study team on the Project for
the Improvement of the Road Construction Center
Construction Project Consultants, Inc.
Yachiyo Engineering Co., Ltd.

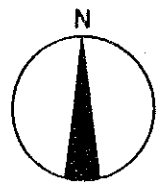
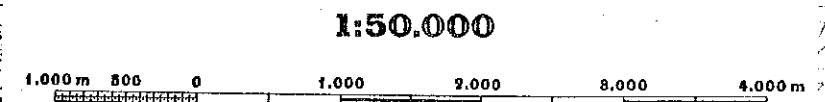


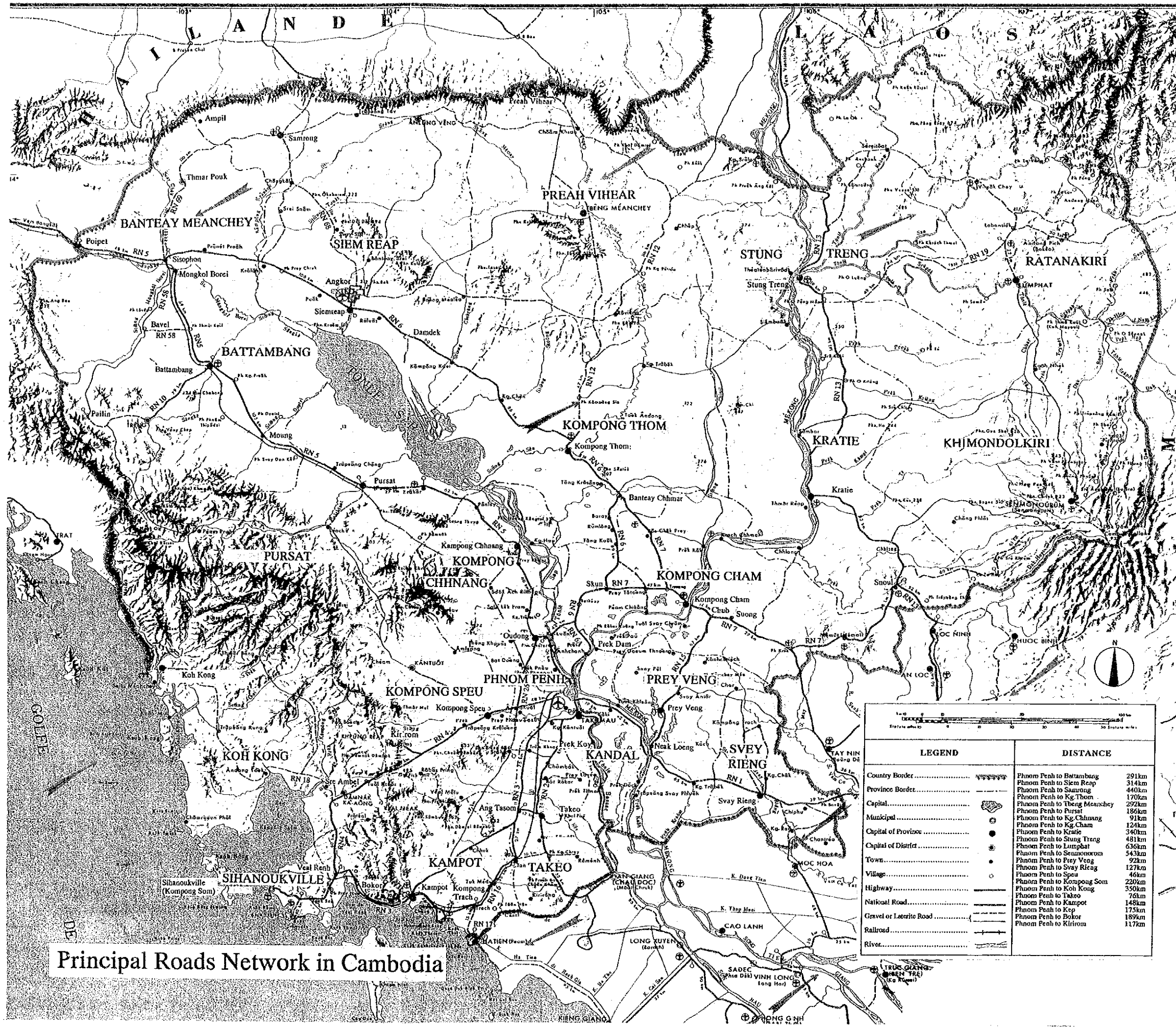
THE PROJECT FOR IMPROVEMENT OF
THE ROAD CONSTRUCTION CENTER IN
THE KINGDOM OF CAMBODIA



Location of Road Construction Center

Road Construction Center (ODEM Site)

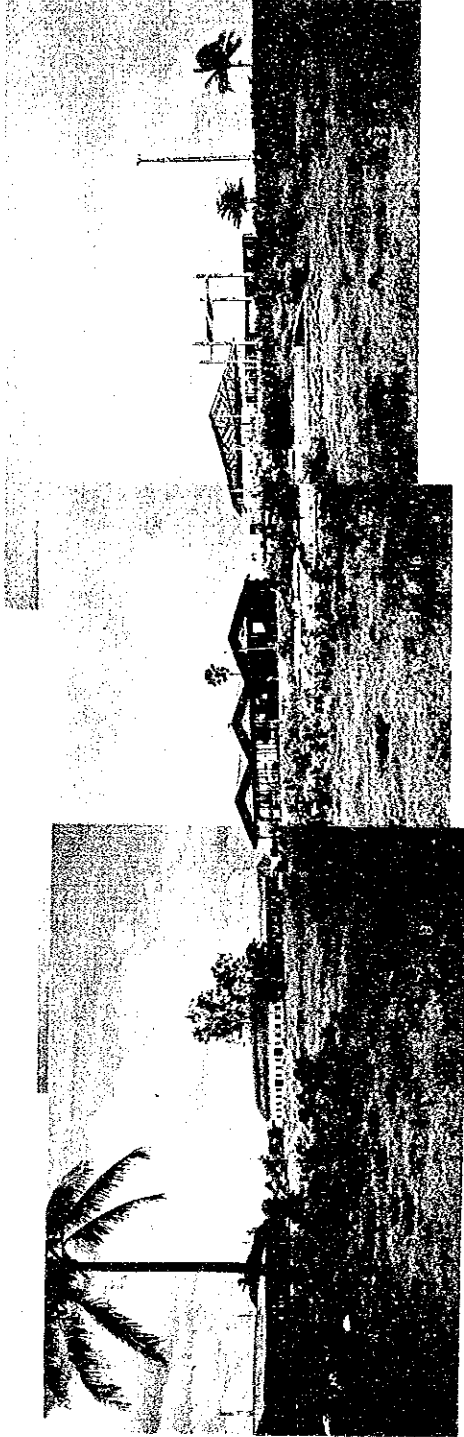




Principal Roads Network in Cambodia

LEGEND		DISTANCE	
Country Border		Phnom Penh to Battambang	291km
Province Border		Phnom Penh to Siem Reap	314km
Capital		Phnom Penh to Saourong	440km
Municipal		Phnom Penh to Kg. Thom	170km
Capital of Province		Phnom Penh to Tbeng Meanchey	292km
Capital of District		Phnom Penh to Pursat	186km
Town		Phnom Penh to Kg. Chhnang	91km
Village		Phnom Penh to Kg. Cham	124km
Highway		Phnom Penh to Kratie	340km
National Road		Phnom Penh to Stung Treng	481km
Gravel or Laterite Road		Phnom Penh to Lumphat	636km
Railroad		Phnom Penh to Senmonorom	543km
River		Phnom Penh to Prey Veng	92km
		Phnom Penh to Svay Rieng	127km
		Phnom Penh to Speu	46km
		Phnom Penh to Kompong Som	220km
		Phnom Penh to Koh Kong	350km
		Phnom Penh to Takeo	76km
		Phnom Penh to Kampong	148km
		Phnom Penh to Kp.	173km
		Phnom Penh to Bokor	189km
		Phnom Penh to Kirirom	117km

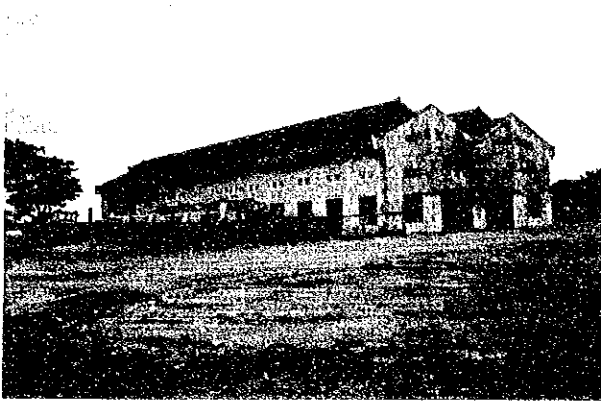
Photos of Road Construction Center (ODEM), etc.



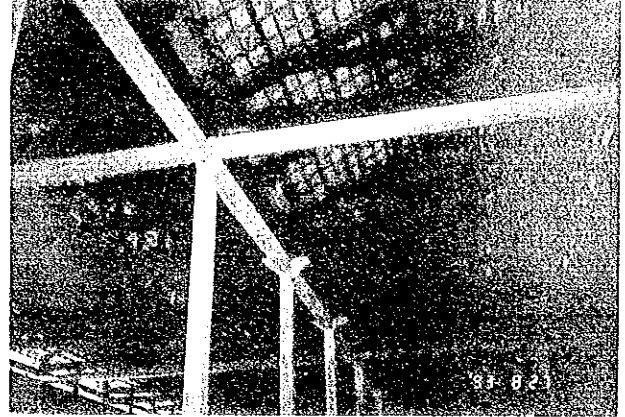
A View from North-eastern corner of the Compound



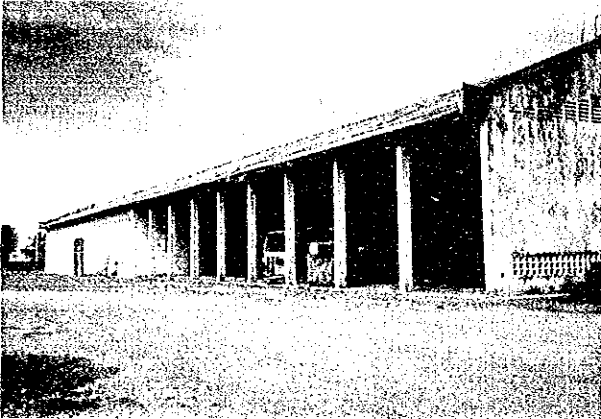
B View from South-eastern corner of the Compound. An elevated water tank and work shop (B) seen at the left side of the photo. Existing machine shop at the center, and the construction equipment and barracks at the right side.



Western view of an existing machine shop improved to an operation quarter and warehouse of construction equipment and materials



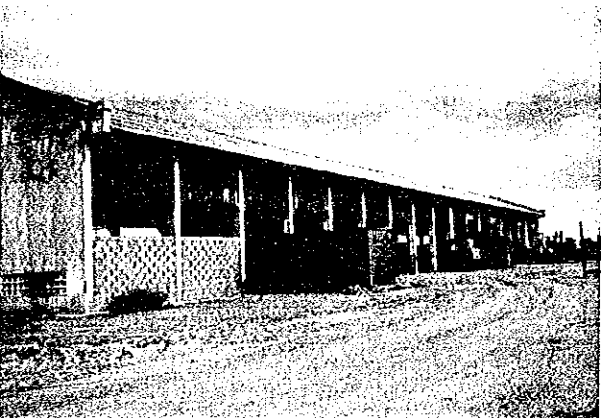
Ditto, but an inside view of RC pillars and wooden truss beam.



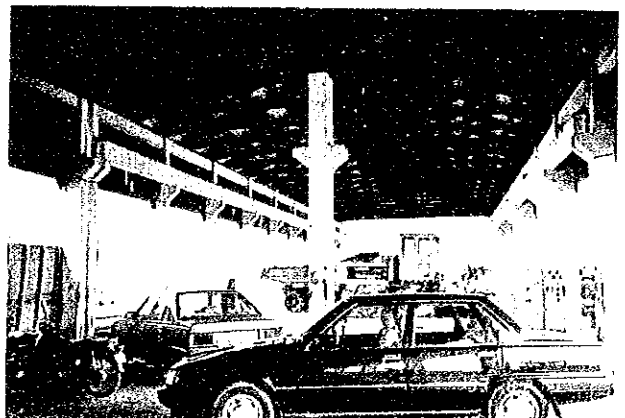
Eastern view of an existing garage and spare parts storage



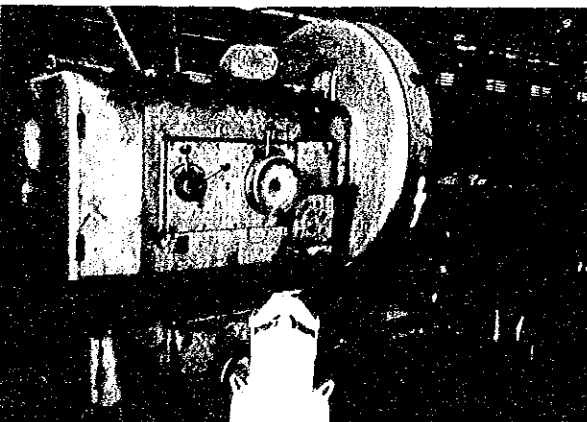
Ditto, but an inside view of wooden shelves of spareparts



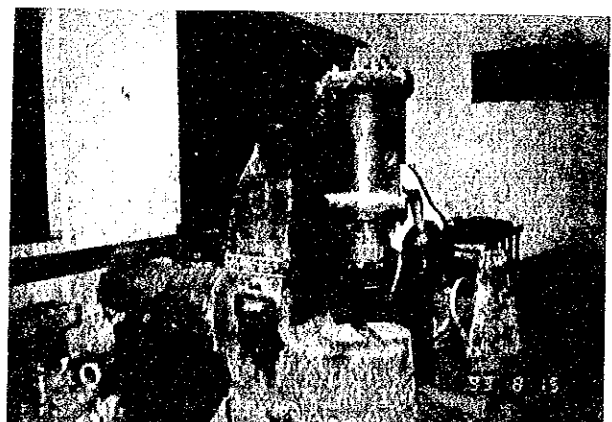
Eastern view of an existing workshop(B) to be improved



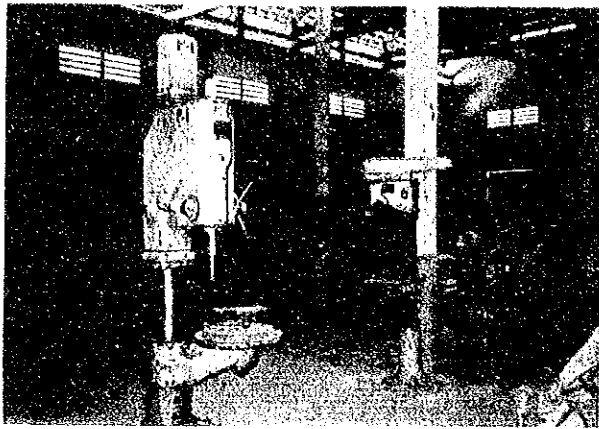
Ditto, but inside view of RC pillars and wooden truss beams



Existing machine shop, a scrapped lathe of then Soviet make



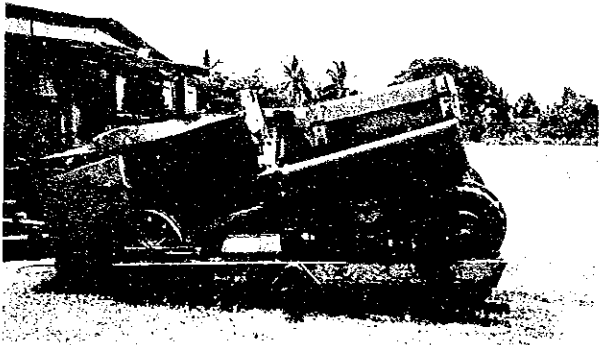
Ditto, but a scrapped fabricating machine



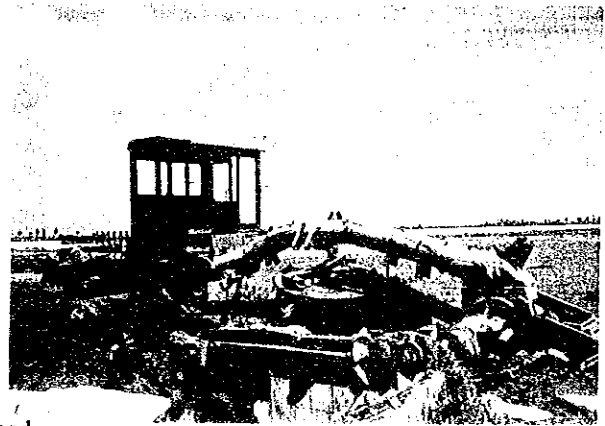
Ditto, but a scrapped boring machine



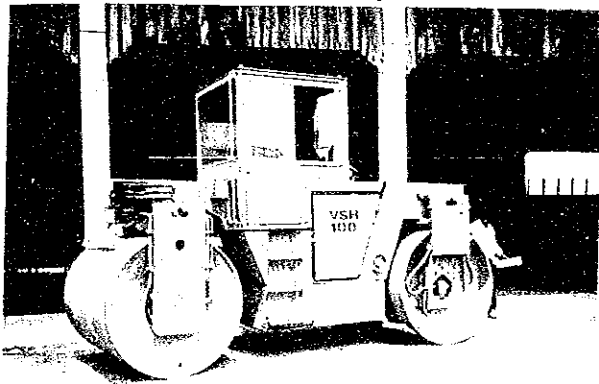
Ditto, but a scrapped generator of then Soviet make



Existing construction equipment owned by RBD (National Road Rehabilitation Unit, Road Construction Unit etc), a scrapped bulldozer (T-130 type, Soviet made)



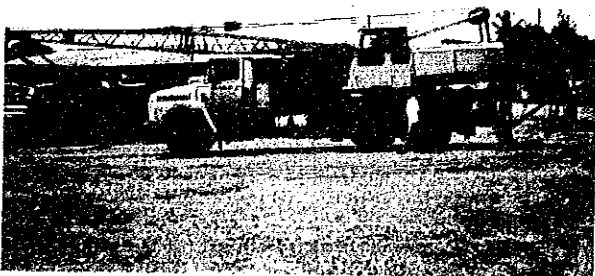
Ditto, a cannibalized motor grader, blade width 4m



Operable construction equipment, a tandem roller



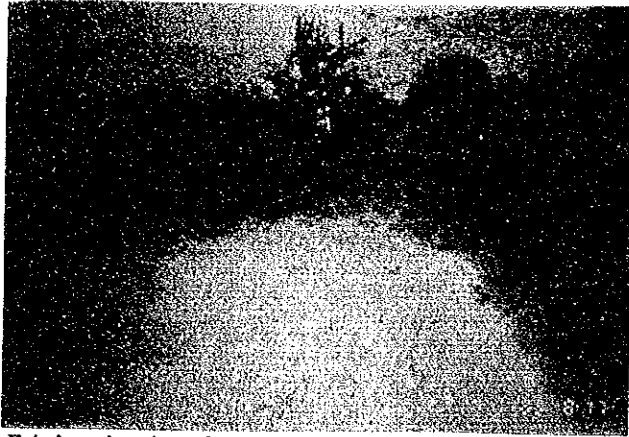
Ditto, but a wheel typed excavator



Ditto, but a truck crane



Ditto, but a dump truck



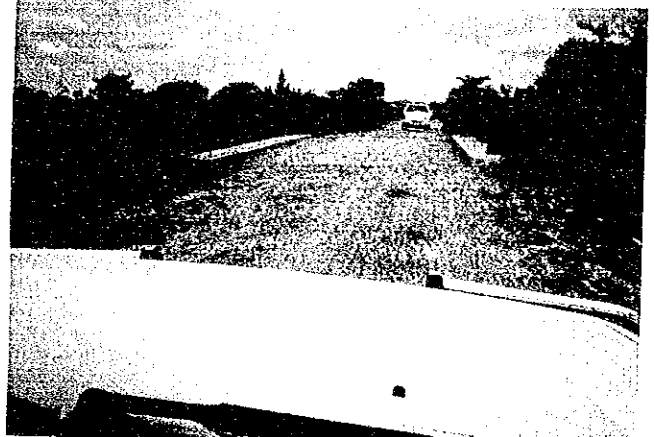
Existing situation of the principal national roads, RN1, damaged wooden deck of a I-steel bridge



Ditto, but for RN2, deteriorated road and temporary bailey bridge



Ditto, emergency repair of road surface by provision of gravel and lateritic materials, made by Japanese Battalion (PKO under UNTAC)



Ditto, but for RN3, deteriorated condition of asphaltic pavement (penetration macadam) around Kampot



Ditto, but for RN4, 2 lanes (7m+2@1.5m) of asphaltic pavement road constructed in the mid-1960 (donated by USAID)



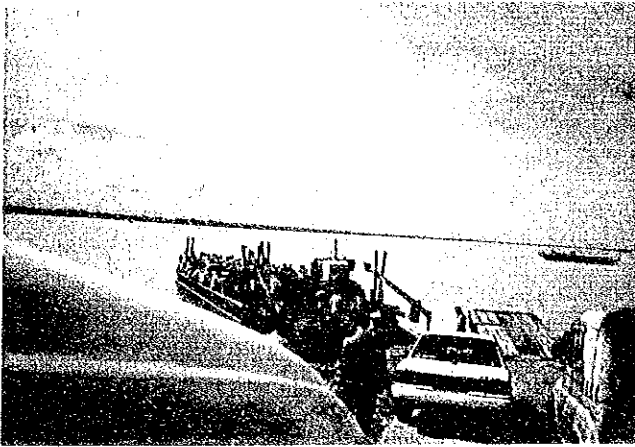
Ditto, but for RN5, emergency repair of potholes and damaged asphaltic pavement by RBD (RN5A Rehabilitation Unit), assisted by UNDP/AIDAB



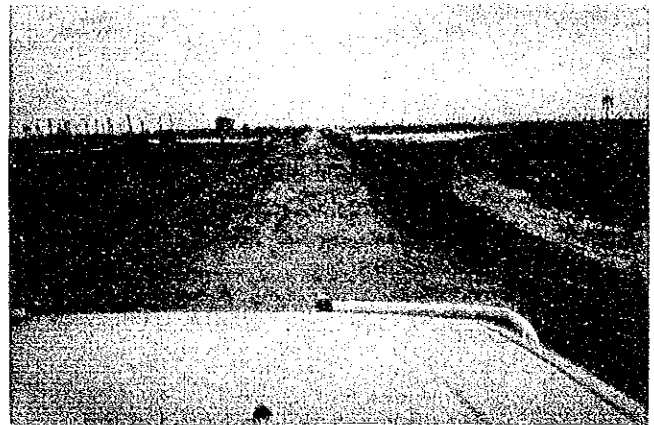
Ditto, a permanent steel girder bridge executed by RBD (Bridge Construction Company) technical assistance, materials and labour cost were provided by UNDP/AIDAB.



Ditto, but for RN5, erection of drainage pipe by RN5A Rehabilitation Unit



Existing situation of National Roads, Prek dam Ferry on Tonle Sap at RN5/6 Junction.



Ditto, but for RN7, lateritic road originally with asphaltic pavement. Deteriorated and broken part of the pavement were scarified and replaced by gravel/lateritic materials.



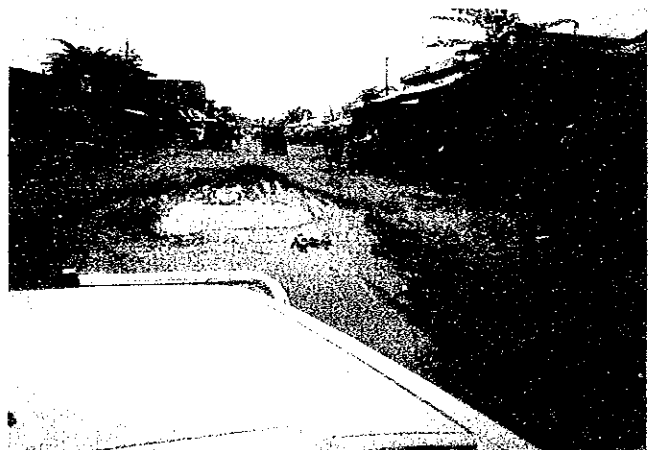
Ditto, a temporary bailey bridge. Increased traffic loads on rotted members of the panels may cause soon collapse of the bridge



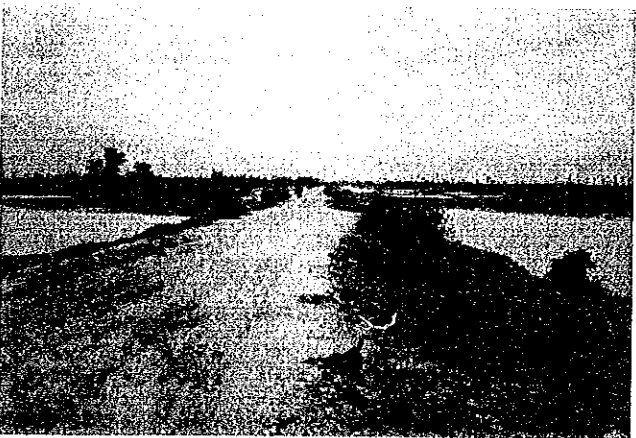
Ditto, but for RN6. Road surface is corrugated due to inundation by a flood in 1991



Ditto, Tonle Bet ferry (Mekong River) on RN7.



Ditto, lateritic road condition in Suon town. (originally constructed as an asphaltic road)



Ditto, but for RN15, deteriorated pavement (penetration macadam) and collapsed shoulder, seen forward a I-steel temporary bridge



Ditto, but for RN26, condition of lateritic road near RN4 Junction.

SUMMARY

SUMMARY

Cambodia is located in the Indo-China Peninsula bordered by Thailand in the west, Laos in the east and facing the Thailand Bay to the south. The total area of 182,000 km² is almost a half of Japan. Population is estimated at around 9 million.

During the civil war which started in 1970, socio-economic infrastructure had been seriously deteriorated due to destruction and neglect of maintenance. The Royal Government of Cambodia places the highest priority on urgent recovery of roads and bridges which were devastated without adequate management and technical expertise, and inputs and resources for repair and maintenance thereof. Most of the existing roads are characterized by deteriorated pavement, narrow carriage way, low embankment, and poor compaction etc. In every rainy seasons, several road sections in flat area are affected by floods. These seasonal disasters require not only emergency recovery measures, but also medium and long term restration and reconstruction programme. Security situation being improved significantly, several emergent recovery programmes have being implemented by international donor agencies or countries. In connection with the road rehabilitation and reconstruction programmes, supply of appropriate type and number of equipment is considered essential for the smooth implementation. Also, coherent maintenance system with well organized workshop facilities is indespensable for the effective operation of these equipment.

The Ministry of Public works and Transports (MPTW) was separated from the Ministry of Communication, Transport and Posts (MCTP) with start of the new government. In connection with restructuring of MWPT, the Roads and Bridges Department (RBD), which has controled road maintenance of the national road networks, is being strengthened of its organization and capacity for effective execution of road recovery works.

The Road Construction Center to be rehabilitated under the Project was established in the late 1950s as a construction equipment center (Office des Engins et Mecaniques: ODEM). During the period 1974-1991 it was reorganized as an autonomous body, Heavy Equipment Repairing Company, where repairing works for the equipment of national road rehabilitation units, road construction company and other autonomous companies were executed on commercial basis.

However, due to aged facilities and maintenance equipment there has been no activities since 1991. The equipment possessed by RBD and autonomous companies under RBD are being transferred to the Road Construction Center. Of a total of 280 equipment 200

seemed to be operable. Almost all the equipment are origin of USSR or East European countries, which already are expired their economic lives and procurement of spare parts are actually impossible. Moreover, due to neglect of operation and maintenance, destruction, burglary, etc. during 1991 and 1993, number of unoperable equipment is increasing.

In order to expedite the recovery programmes, Cambodia has requested Japanese grant aid for the Project for the Improvement of the Road Construction Center (hereinafter referred to as "the Project"), which is expected to play a mandatory role in an implementation of the road recovery projects, and equipment rehabilitation/renovation schemes. In response to the request, the Government of Japan conducted a Preliminary Study on the Project in November and December 1992. From the result of study the Government of Japan understood its necessity and emergency, and decided to hold a basic design study. Japan International Cooperation Agency (JICA) sent the Basic design study team to Cambodia from 12th August to 3rd September, in 1993.

The study team held a series of discussions with the officials concerned on contents of the request, and conducted investigation on the project site, condition survey of the roads controlled by the Road Construction Center, collection and analysis of data related to road sector, construction sector, etc.

Based on the investigation of field study, the team had carried out analysis in Japan in order to finalize the most optimal size and dimensions of the facilities to be improved and the equipment to be introduced, implementation programme, etc. and prepared a Draft Final Report. JICA then sent the Draft Final Report Explanatory Mission to Cambodia from 11th November to 20th November, 1993, to discuss and explain the contents of the Draft Final Report, on which basic agreement was made between the team and the Royal Government of Cambodia.

Objectives of the Project are:

- 1) To accelerate RBD's road recovery project through the improvement of work efficiency,
- 2) To improve productivity of RBD's mechanized units,
- 3) To improve work quality.

To realize the above objectives the Project has the following component:

- 1) Improvement of the Road Construction Center including workshops and other related facilities, and provision of workshop equipment,
- 2) Provision of road construction equipment,
- 3) Strengthening of organization and improvement of technical skills through OJT.

The outline of the Project is as follows:

(1) Improvement of Buildings and Facilities

Item	Shop / Room	Planned Area	Remarks
1	Workshop (A)	1,415m ²	New construction/reinforced concrete structure, one story building, steel truss roof structure
2	Workshop (B)	960m ²	Rehabilitation of existing workshop building/ flooring, reinforcement of existing pillar & beam, roofing
3	Operation Quarter & Warehouse	1,200m ²	Rehabilitation of existing machine shop building/ flooring, reinforcement of existing pillar & beam, roofing
4	Garage & Parts Storage	960m ²	Rehabilitation of existing warehouse building/flooring, reinforcement of existing pillar & beam, roofing including truss

Item	Shop / Room	Planned Area	Remarks
5	Administration Office	540m ²	New construction/reinforced concrete structure, one story building
6	Other Ancillary Facilities		Rehabilitation/construction of existing facilities
7	Water Supply Facility		New installation
8	Power Supply Facility		New installation
9	Sewage Facility		New installation
10	In-Site Road		Concrete paving
11	Equipment Yard		Gravelling

(2) Procurement of Equipment

1) Workshop Equipment

Item	Name
1	Chassis Repair Equipment & Tools
2	Engine Repair Equipment & Tools
3	Fuel Component Repair and Testing Equipment & Tools
4	Electric Component Repair & Testing Equipment & Tools
5	Battery Service Equipment & Tools
6	Power Train Repair Equipment & Tools
7	Machine Tool
8	Welding and Fabrication Equipment & Tools
9	Undercarriage Repair Equipment & Tools
10	Air Compressor
11	Tire Repair Equipment & Tools
12	Cleaning Equipment & Tools
13	General & Special Tools
14	Parts Rack

2) Construction Equipment

Item	Emergency Repair Unit (ERU)	Spec.	Q'ty
Emergency Repair Unit (ERU)			
1.	Bulldozer with ripper	21 t class	4
2.	Motor Grader	3.7 m class	4
3.	Wheel Loader	12 t class	4
4.	Hydraulic Excavator	19t class	2
5.	Tandem Roller	10 t class	2
6.	Vibration Roller	10 t class	4
7.	Dump Truck	10 t class	8
8.	Asphalt Distributor	6,000 lr.	2
9.	Asphalt Sprayer		4
10.	Rammer		4
11.	Hand Guided Vibration Roller	1 t	4
12.	Water Tanker	8,000 lr	4
13.	Fuel Tanker	8,000 lr	4
14.	Pick up		4
15.	Station Wagon		4
16.	Chip Spreader		2
Drainage Unit, Aggregate Production Unit, Transport Unit, Mobile Workshop Unit			
1.	Hydraulic Truck Crane	30 t class	1
2.	Trailer & Tractor	25 t class	1
3.	Mobile Workshop		1
4.	Wheel Loader	16 t class	2
5.	Tractor Shovel	18 t class	1
6.	Portable Stone Crusher	30 - 40 t/h	1
7.	Pick up		2
8.	Station Wagon		1
9.	Flatbed Truck		2
10.	Crawler Drill		1
11.	Portable Air Compressor	17m ³ /min	1
12.	Portable Air Compressor	5 m ³ /min.	2
13.	Generator	50 KVA	2
14.	Concrete Cutter		1
15.	Hand Guided Line Marker		1
16.	Concrete Mixer	1.0 m ³	4
17.	Concrete Vibrator		8
18.	Asphalt Kettle	6m ³	2
19.	Water Pump		4
20.	Radio Set		11

Executing agency of the Project is the Roads and Bridges Department (RBD) under the control of the Ministry of Public Works and Transports (MWPT). RBD has staff and labourers of 386 for road construction field and those of 88 for mechanical field as of October, 1993. After completion of the Project RBD will participate in the projects of foreign donor agencies or countries such as Asian Development Bank (ADB), International Development Association (IDA), United States Agency for International Development (USAID), etc., on force account basis using the equipment to be supplied under the Project. For finance for the operation cost of equipment and running cost of workshop, it is expected that the fund from such projects will be available. Moreover, sale of aggregates to be produced by crushing plant and services to be supplied by the workshop form an important part of income of RBD. Thus, it is confirmed that RBD's technical and financial capacity is enough for the smooth operation after completion of the Project.

The Project will be extended over two Japanese fiscal years. Anticipated Project period is as follows:

1st Fiscal Year

Detailed Design:	3 months
Construction of Facilities:	10 months
Procurement of Equipment:	10 months

2nd Fiscal Year

Detailed Design:	3 months
Construction of Facilities:	12 months
Procurement of Equipment:	12 months

The Project will reorganise and reinforce the Road Construction Center which is expected to play a mandatory role in an implementation of the road recovery projects, and equipment rehabilitation/renovation schemes, consequently enable the RBD in particular to accelerate its emergency repair programme of the important sections of national roads RN1, RN2, RN3, RN5, RN6, RN7, RN15 and RN26 in the area close to the metropolitan circle. It will effect an emergency repair work of about 500km of asphalt paved roads and 100km of lateritic roads. The Project will contribute to secure an access to the central market from agricultural producing areas around the periphery of the capital, thus leading to an economic recovery of the country. It is also expected to enhance the advancement of skills of the technical staff through on-the-job training which will be provided after completion of the Project, consequently to enable to provide professionals in the influence area of the Project.

- To stimulate economic activities by providing reliable road facility, thus saving transport cost between agricultural producing area and the capital.
- To realize price stability by saving distribution cost.
- To facilitate rural population to access to social services such as medical service, education, etc.
- To promote displaced people to settle down in permanent abode.

In conclusion, the Project will contribute significantly to increase the social stability and public welfare, thus early implementation of the Project under Japan's grant aid is strongly recommended.

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CHAPTER I INTRODUCTION

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1.1 The Basic Design Study Team

Political and social stability in Cambodia has been markedly restored recently after two decades of hostilities, political turmoils and economic decline. While the Government of Cambodia places the highest priority on the urgent recovery of roads and bridges which had been destroyed and deteriorated due to neglect of maintenance, lack of adequate management and technical expertise, and essential inputs and resources for repair, maintenance and development of infrastructures. To expedite the recovery programme of the sub-sector, the Supreme National Council (SNC) of Cambodia has requested Japanese grant aid for the Project for the Improvement of the Road Construction Center (hereinafter referred to as "the Project") which will play a key role for implementing the road recovery programme. In response to the request, the Government of Japan made Preliminary Study on the Project in November and December 1992. From the result of the study, the Government of Japan understood its necessity and emergency, and deemed the Project's objective roughly appropriate for Japanese grant aid, and decided to hold a Basic Design Study. Japan International Cooperation Agency (JICA) sent the study team, headed by Mr. Masao Takai, Director of Second Basic Design Study Division, Grant Aid Study and Design Department, JICA, from 11th August to 4th September, 1993.

1.2 Contents of the Basic Design Study

The study team conducted investigation on the following subjects and made confirmation of the content of the requested project and its background, with the cooperation of the Government of Cambodia.

- (1) Appropriateness, necessity and priority of the Project under the national development plan and its sectoral development plan,
- (2) Present situation of road sub-sector,
- (3) Present situation of multi-and bilateral assistance in the sub-sector,
- (4) Undertakings of the Cambodian side for the Project and implementation programme embraced by the responsible/executing organization including management plan, operation plan, maintenance system, financial plan, staff training programme etc.,

- (5) Related projects, the terms of reference, project period, maintenance system, etc.,
- (6) Project site including buildings, facilities, workshop equipment, construction equipment, related roads, etc.,
- (7) Collection and analysis of data related to construction of roads, bridges and facilities,
- (8) Design criteria of the facilities,
- (9) Proposed configuration based on the preliminary study.

Based on the investigation of field study, the team had carried out analysis in Japan in order to finalize the most optimal size and dimensions of the facilities to be improved and the equipment to be introduced, implementation programme, etc. and prepared a Draft Final Report, on which further discussions with the relevant officials were held at the team's second visit to Cambodia. This "Basic Design Study Report" describes the results of the above mentioned investigation and analysis.

Members of the survey team, survey schedule and the minutes of discussion are attached to in the Appendices hereof.

CHAPTER II BACKGROUND OF THE PROJECT

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2.1 General

During the first decade of independence from 1953 to 1962, Cambodia was one of the countries of the most promising economics in the Indo-China Peninsula. However, in the period from 1963 to 1969, economic growth was seriously affected by stagnation of agriculture and too prompt nationalization of foreign trade and banking enterprises. By 1969, political turmoil had continued and in 1970, a new administration emerged (Khmer Republic administration). During the period of 1970-1975, hostility between the then administration and Khmer Rouge faction escalated, hence the production and exports fell drastically, and the financial sector utterly collapsed. For the next period of 1975-1979, under the Democratic Kampuchean Government (Pol Pot regime) the Cambodia's economy was thoroughly destructed.

The task of rehabilitation and reconstruction of the country began immediately after an establishment of the People's Republic of Kampuchea in 1979. Between 1979 and 1981 a relatively large amount of emergency humanitarian aid was issued by international communities. Since 1982 when an emergency declaration was over, Cambodia received assistance only from limited number of international institutions and non-governmental organizations (NGOs). Up to 1988 aid was also received from the Soviet Union and other member countries of the former Council for Mutual Economic Assistance (CMEA), while very little from western countries.

Despite her international isolation, absence of external development inputs and civil wars, Cambodia has attained significant progress to rebuild the country. Health and education services have been restored. A functioning civil administration has been in place. Rice production is nearing a self-sufficiency and exports are estimated to have reached at some \$50 million. Further, wide-ranging economic policy reforms directed towards transforming an economy from a centralized to a market-oriented system have been instituted by the then administration since 1985.

Cambodia, nevertheless, remains a poor country having one of the lowest per capita GDPs in the world. The country's social infrastructures seriously require substantial reinforcement and reconstruction. Productive capacity in both agriculture and industry have not yet been restored to the level of pre-war period. The financial system remains underdeveloped, and growing macroeconomic instability threatens the program of economic restorations and reform. In the light of the drastic cut-off of

assistance from the Soviet Union and other members of the then CMEA after 1989, Cambodia also faces extreme shortages of inputs and resources, especially of fuel, fertilizer, equipment and spare parts, and lack of trained personnel. The situation has been aggravated by the extensive flooding in the country in September-October 1991, which has adversely affected agricultural production and damaged infrastructures.

Signing of a series of treaties (Paris Peace Accord) in October 1991 has set the stage for political settlement of the long-standing conflict in Cambodia. The Supreme National Council of Cambodia (SNC) in which all four Cambodian factions presented became a unique legitimate body representing Cambodia in the conduct with external relations. With an establishment of SNC, the Paris Accord also produced United Nations Transitional Authority in Cambodia (UNTAC). UNTAC was responsible for ensuring peace and human rights, implementation of domestic policies, police power, military power, repatriation of refugees, reconstruction, and materialization for holding of free and fair election.

General election took place in July 1993. During the transitional period after the election, the Ministry of Communication, Transport and Posts, (MCTP) was divided into three ministries, that is, the Ministry of Public Works, Ministry of Telecommunication, and Ministry of Transport. With the inauguration of new Government after the establishment of Constitution in September 1993, the Ministry of Public Works was reorganized into the Ministry of Public Works and Transports (MPWT). Road sub sector is now under the auspices of the MPWT.

Population in 1992 is estimated at around 9 million (49 person/km²). A tenth of the population reside in Phnom Penh. Population by province is given in Table 2-1.

GDP per capita in 1990 was estimated at US\$ 150 to US\$ 200 which represent a half of that of pre-war period. Average yearly growth rate on physical out-put during the period 1985-1989 was at 6.5%, in which agriculture and industry were 5% and 20%, respectively. Sectorial contribution to GDP is as follows:

- agriculture (cereals, livestock, fishery, forestry)	45%
- manufacture	12%
- construction	13%
- commerce	10%
- others	20%

Estimated population by Province is given in Table 2-1.

Table 2-1 Population by Province

(Unit: 1,000)

Province or City	1981	1986	1992
Phnom Penh	329	561	950
Kandal	720	762	863
Kompong Cham	1,066	1,205	1,365
Svay Rieng	292	329	373
Prey Veng	672	758	858
Takeo	531	598	677
Kompong Thom	379	427	484
Siem Reap	477	538	592
Banteay Meanchey	N.A.	N.A.	424
Battambang	718	810	510
Pursat	175	197	224
Kompong Chhnang	221	249	282
Sihanoukville	53	59	67
Kampot	354	399	451
Koh Kong	26	29	33
Kompong Speu	340	383	434
Preah Vihear	69	78	89
Ratanakiri	45	51	58
Stung Treng	39	44	50
Mondulkiri	16	18	20
Kratie	157	177	200
Total	6,682	7,672	9,001

Source: Cambodia, Agenda for Rehabilitation & Reconstruction, June 1992, World Bank

2.2 Outline of the Road Sector

2.2.1 Transport System

Total traffic volume as of 1987 counts at 1,700 thousand persons and 530 thousand tons for passenger and freight, respectively. Of which road transport shares 800 thousand persons (46%) and 270 thousand tons (51%) for passenger and freight, respectively. Trends of passenger and cargo traffic are shown in Table 2-2 and Table 2-3, respectively. As shown in these tables, road transport share in the national transport system has increased year by year.

Table 2-2 Trend of Passenger Traffic by Transport Mode

(Unit: 1000)

Year	Total		Transport mode					
			Railway		Road		Waterway	
	Persons	P-Km	Persons	P-Km	Persons	P-Km	Persons	P-Km
1980	-	-	-	-	-	-	-	-
1981	-	222788	-	174047	-	42851	-	5890
1982	1048	134788	-	174047	-	42851	37	5485
1983	955	111582	404	31972	523	75509	28	4101
1984	1080	120845	631	55185	429	61915	20	3744
1985	1284	139514	714	64533	561	73315	9	1665
1986	1695	168082	990	73384	700	93743	5	955
1987	1684	163760	905	52496	774	100640	5	522

Source: Kampuchean Needs Assessment Study, UNDP, August 1989

Table 2-3 Trend of Cargo by Transport Mode

(Unit: 1000)

Year	Total		Transport mode					
			Railway		Road		Waterway	
	Tons	P-Km	Tons	P-Km	Tons	P-Km	Tons	P-Km
1980	407	87088	168	36030	169	40852	50	10186
1981	303	61645	83	19080	175	33513	44	9052
1982	287	47357	101	20047	140	21616	46	5694
1983	344	59288	108	24388	184	24110	52	10790
1984	366	52441	128	27758	191	23701	47	10982
1985	411	88056	145	31683	188	33445	78	22998
1986	445	96542	134	26755	216	36519	95	31268
1987	528	108514	150	30495	270	44601	108	31418

Source : Kampuchean Needs Assessment Study, UNDP, August 1989

Note : P-Km = Person - Kilometer