

(b) Major Equipment in Cubicles

Outline of the equipment to be mounted on the new cubicles is given below.

The 11 kV main bus will be rated at 2,000A continuous current and 25 kA/one second withstand current.

The circuit breaker will be of indoor, draw-out type, vacuum type rated at 12 kV, 1200A for the incoming line of transformer secondary circuits and 800A for ring main line circuits, outgoing feeder lines and primary transformer circuits at the Royal Palace, and a 25 kA interrupting current.

The station service transformer in the 11 kV cubicle together with the disconnecting power fuse switch on its primary side will be three phase, 11 kV/400-230V, 50 kVA, dry epoxy-resin molded, self-cooled type as its a maintenance free operation and needs a high reliability against faults.

Current transformers and potential transformers 11 kV will be of molded type.

AC power is to be supplied from the station service transformer. The station service transformer cubicles will be equipped with 600V molded case circuit breakers on the front panel.

Batteries for the DC power source will be of high grade, Nickel-Cadmium alkaline enclosed seal type, 110 volt, 50 ampere-hour contained in a cubicle combined with battery charger of thyristor design for continuous use.

Control switches, meters, fault indicators, and protection relays, etc. will be mounted on the front panel of the cubicles.

4.4 Construction Plan

4.4.1 Construction Works

To maintain high reliability of the system operation, the following essential points have been taken into account for the construction of the facilities to be provided under the Project:

- i) New and extended distribution lines under the Project will be constructed with insulated conductors for both the 11 kV and low tension distribution lines, the erection method of insulated wires is much different from the bare conductor used on the existing lines. NEA has less experience in erection of these insulated wires.

- ii) Underground cable lines are to be constructed with optimum means to meet the specific of cable.
- iii) Shorter power shutdowns and safety measures are demanded for the replacement works of 11 kV cubicles at the switching stations.

In addition to the above, reliable local contractors for the construction of power distribution system are in shortage in Nepal, daily maintenance, repair, and construction works are done by NEA. Therefore, all construction works of the facilities under the Project will be executed exclusively by the local contractors under guidance of the Japanese Contractor, except the special works such as commissioning test, joint of cable, termination of cable head, other key works for the system to complete the Project which will be done by the Japanese specialists.

NEA is capable of implementing of the Project, but planning, designing, and supervising the Project works will be undertaken by the Japanese Consultant.

The works to be undertaken by the Consultant, Contractor, and NEA are mentioned below:

(1) Works undertaken by the Consultant

(a) Home works

- To prepare the detail design of switching stations, underground cable lines and distribution lines.
- To prepare the tender documents for procurement and erection of materials and equipment.
- To approve and comment on the design, specifications and drawings provided by the Contractor(s).
- To attend the pre-shipment inspection and test on the materials and equipment at the manufacturer's factories.
- To report and explain to JICA.

(b) Site works

- To prepare the working drawings of pole arrangement, etc.
- To adjust and check the construction schedule.
- To assist NEA in construction supervision.

- To approve the schedule of commissioning tests submitted by the Contractor(s).
- To attend the commissioning tests.
- To prepare the monthly reports on the construction.
- To prepare the completion report of the Project.

(2) Works undertaken by the Contractor

The works to be undertaken by the Contractor include designing, manufacturing, testing, painting, packing, transportation, and erection of the materials and equipment to be supplied under the Project.

As discussed with NEA, arrangement of necessary permission of the concerned authority for execution of the Project and dismantling and reconnecting of service wires to the consumers' are undertaken by NEA

As explained in Section 4.1.2, for getting permission from the Road Department, the Contractor is required to submit applications with work plans and to pay a deposit for finishing work on excavated roads prior to the commencement of excavation and restoration of public roads as required under the Project .

(3) Works undertaken by the NEA

- To assist in customs clearance of the equipment and materials in India.
- To obtain necessary permits for imports into Nepal and to bear the license fee.
- To get permission from the other authorities concerned for the construction works when needed.
- To coordinate with the inhabitants in the Project area on matters that may arise during the implementation of the Project.
- To dismantle and reconnect service wires to the consumers.
- To make the necessary arrangement for power shutdown according to the construction schedule.
- To provide a stock yard for imported materials and equipment.

- To design and construct a new building for the switching station at the Royal Palace.
- To bear all the expenses other than those to be borne by the Grant necessary for construction of the facilities as well as for the transportation and installation of the equipment.

4.4.2 Conditions on the Site Construction Works

The matters to be attended to for the site construction works are described below:

- a. Since acquisition of private and arable lands for the Project is difficult, new lines will be constructed along the road or on the existing lines routes.
- b. Power shall be shut down during the execution of improvement and reinforcement works for distribution lines and replacement of cubicles at switching stations. Power supply shall be resumed toward evening and special attention shall be paid to the work schedule and pre-information to the customers for the shutdown.
- c. For construction of underground cables, prior applications will be required to get the necessary permission from the Road Department. The finishing works including paving and asphaltting of roads will be done by the Road Department itself at the expense of the Contractor.
- d. For tree felling and trimming for distribution line works including exploration of the line route, prior applications for permission from the concerned authority are required.

4.4.3 Construction Supervision Plan

NEA normally forms an individual project team for execution of projects to be implemented under the financial assistance of foreign countries. The Distribution & Consumer Service Directorate of NEA which was responsible for assisting the Master Plan and Basic Design Study of the Project will establish a project office for execution of this Project.

The project office will administrate and coordinate the Project works. The design and construction supervision of the Project will be conducted by the Consultant. The works to be done by NEA such as dismantling and reconnecting of the service wires dismantling work of the existing lines and storage of the dismantled materials and equipment will also be managed by the project office, besides the project office has responsibility to execute the works mentioned in Section 4.4.1 Works Undertaken by NEA.

4.4.4 Procurement Plan of Materials and Equipment

Supply and erection of materials and equipment for the Project will be executed by a Japanese contractor(s).

All materials and equipment will be transported from Japan to Kathmandu by the following route:

Japan - transport by sea - India (Calcutta) - transport by land - Nepal (Kathmandu)

The customs procedures for the materials and equipment will be made at Birgunj near the border of Nepal and India.

4.4.5 Implementation Schedule

The Project will be implemented in two stages and the sub-projects for each stage are divided as follows:

Stage-1 Project

- (a) 11 kV underground cable between the Lainchaur substation and the K2 switching station
- (b) Extension and reinforcement of 11 kV main feeders
 - (b-1) Sundarijal feeder
 - (b-2) Boudha-Jorpati feeder
 - (b-3) Thankot feeder
 - (b-4) Baneswar feeder
 - (b-5) Nagarkot feeder
 - (b-6) Kathmandu central area (KTM-1)
- (c) Maintenance tools, measuring apparatus and vehicles

Stage-2 Project

- (a) 11 kV switching stations

- (b) Extension and reinforcement of 11 kV main feeders
 - (b-7) Airport feeder
 - (b-8) Pharping feeder
 - (b-9) Godawari feeders
 - (b-10) Kiritpur feeder
 - (b-11) Kathmandu central area (KTM-2 and KTM-3)

4.5 Scope of Work

This Project is to be implemented through close cooperation between the Government of Japan and the Government of the Kingdom of Nepal within the framework of grant aid from the Government of Japan. It is reasonable for the Governments of the two countries to share the Project between them as follows:

- (1) The work to be done by the Government of Japan
 - (a) Facilities
 - Supply and erection of the facilities for replacement of 11 kV cubicles at three switching stations described in Chapter 3.3.3.(1).
 - Supply and erection of the facilities for replacement of 11 kV underground cables line between the Lainchaur substation and the K2 switching station described in Chapter 3.3.3.(2).
 - Supply and erection of the facilities for extension and reinforcement of main 11 kV feeders described in Chapter 3.3.3.(3).
 - (b) Equipment
 - Supply of maintenance tools described in Chapter 3.3.3.(4).
 - Supply of vehicles described in Chapter 3.3.3.(4).
 - Supply and erection of VHF radio equipment for fixed stations described in Chapter 3.3.3.(4).
 - Supply mobile VHF radio equipment described in Chapter 3.3.3.(4).
 - Supply of measuring equipment described in Chapter 3.3.3.(4).

- (c) Other related to the above work
 - Transportation of facilities and equipment from Japan to Nepal.
 - Inland transportation of imported facilities, equipment and materials from disembarkation to the project site.
- (2) The work to be done by the Government of Nepal
 - (a) Site structure
 - To secure the right of way for the Project
 - To clear level and reclaim the site when needed
 - To construct access road to the sites when needed
 - (b) Infrastructures
 - To provide the facilities for city water distribution to the site when needed
 - (c) Preparatory work
 - To construct a building for 11 kV switching station at the Royal Palace
 - (d) Procedural work and expenses borne by the Nepal side
 - To assist in clearance of the equipment and materials in India
 - To obtain necessary permits for import into Nepal and bear the license fee such permit.
 - To get permission from the other authorities concerned for the construction work when needed.
 - Banking arrangement expenses.
 - To bear all the expenses other than those to be borne by the Grant necessary for construction of the facilities as well as for the transportation and installation of the equipment.
 - To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in the receipt country with respect to the supply of the product and service under the contract.

- To accord Japanese nationals whose services may be required in connection with the supply of the product and the services under the contract such facilities as may be necessary for their entry into the receipt country and stay therein for the performance of their work.
- To construct service wire connection to the consumers.
- To coordinate with the inhabitants living in the project areas on matters which may arise during the implementation of the Project.
- To take necessary power shutdown according to the construction schedule.
- To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.

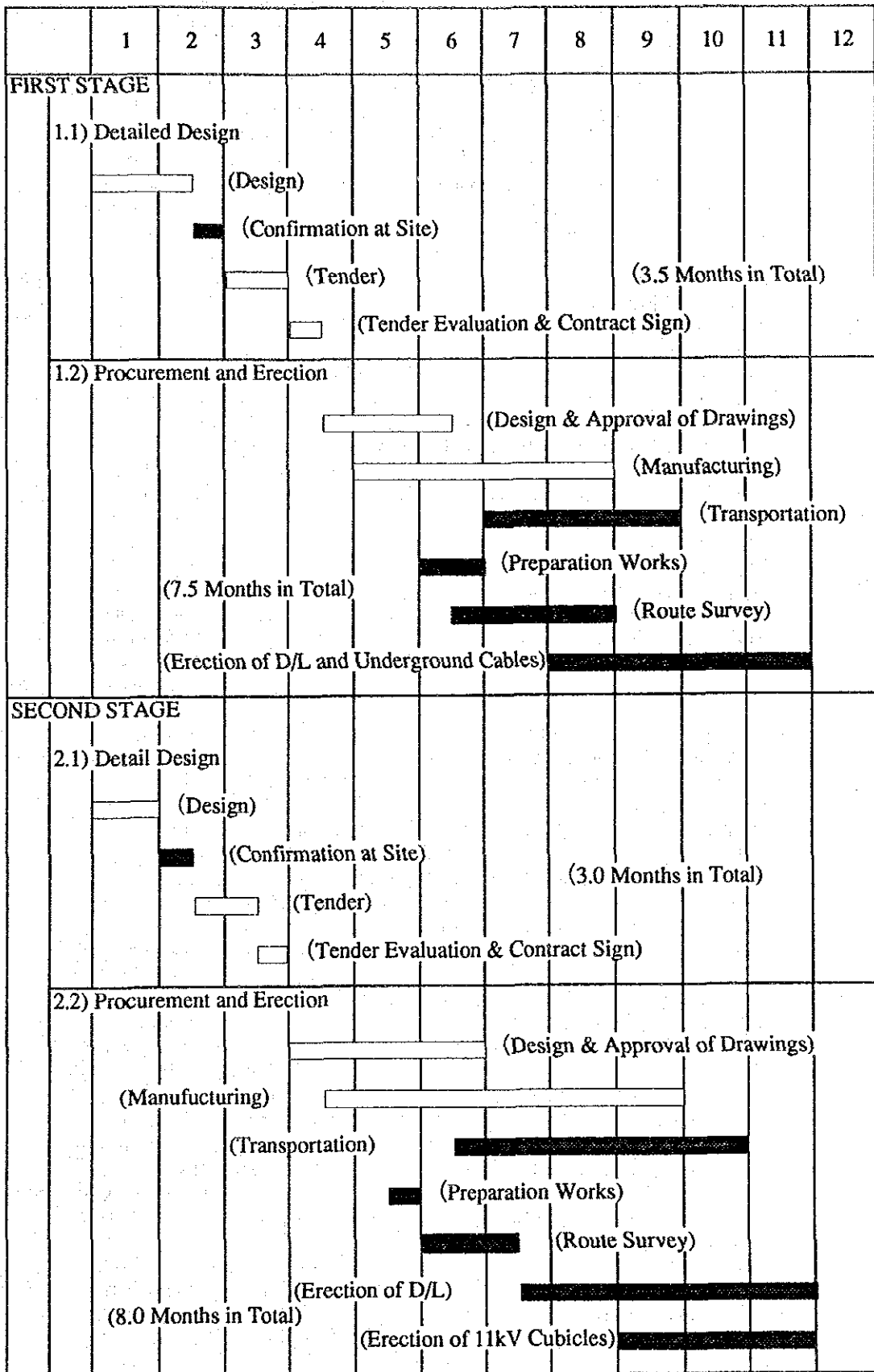
(3) Expenses to be borne by the Government of Nepal

- Construction cost of the building at the Royal Palace NRs. 614,000
- Banking arrangement fee 0.1 percent of the amount set forth in the E/N
- Authorization to pay Japanese Yen 3,000

It will also be necessary to include in the above that the fees cover the import duties, tax for the various subjects, and all other expenses for implementation of the Project.

It is desirable that the Government of Nepal provide a budget for the project and conduct the works on schedule so that the entire project will be implemented smoothly, and the facilities to be constructed under the Project will be utilised effectively.

Table 4.1 Schedule for Implementation



	Description	Unit	Quantity
A)	Distribution Facilities		
a)	Steel Poles for 11kV Lines	Sets	418
a.1)	1CCT Triangle Configuration	Sets	62
a.2)	1CCT Triangle Configuration for Transformer	Sets	14
a.3)	1CCT Triangle Configuration for Sectionalizer	Sets	103
a.4)	1CCT Vertical Configuration	Sets	49
a.5)	2CCT Horizontal Configuration	Sets	215
b)	Steel Poles for Low Tension Lines	Sets	
c)	11kV HAL Insulated Wires		
c.1)	50 sq.mm	m	10,500
c.2)	100 sq.mm	m	136,000
d)	600V AL Insulated Wires		
d.1)	55 sq.mm	m	92,000
d.2)	90 sq.mm	m	19,000
e)	11kV Power Cables CV(AL)-TAZV		
e.1)	3C - 100 sq.mm	m	2,700
e.2)	3C - 200 sq.mm	m	600
f)	600V Power Cables (250, 100, 60 & 38 sq.mm)	m	874
g)	Grounding Wires (IV 8, 22, 38, 60 sq.mm)	m	2,146
h)	Pole Transformers with Cut-out Switch		
h.1)	50 kVA	Sets	27
h.2)	100 kVA	Sets	20
h.3)	200 kVA	Sets	11
i)	Lightening Arresters	Sets	291
j)	Distribution Boxes for Transformers	Sets	58
k)	11kV Sectionalizers	Sets	14
l)	11kV Auto-Recloser	Sets	2
m)	Service Wires	m	30,300
B)	11kV Underground Cable Facilities		
a)	11kV Cables CV(Cu)TAZV, 3C - 240 sq.mm	m	4,600
b)	Terminal Materials	Nos.	6
c)	Straight Joint	Nos.	17
d)	Communication Cables CPEV - MAZV, 0.65 - 6p	m	2,300
C)	Maintenance Tools, Vehicles and Measuring Apparatus		
a)	Maintenance Tools		
a.1)	Hydraulic Compressor (40-ton)	Sets	3
a.2)	Chain Block (5-ton)	Nos.	5
a.3)	Lever Block (1.5-ton)	Nos.	5
a.4)	Hand winch (1.5-ton)	Sets	5
a.5)	Snatch Block (1.5-ton)	Nos.	10
a.6)	Wire Tensioner (1.5-ton)	Nos.	15
b)	Vehicles		
b.1)	Working Truck with Auger	Sets	2
b.2)	Pick-up Truck (3-ton)	Sets	2
b.3)	Light Maintenance Vehicle (1-ton)	Sets	2
c)	Communication Equipment		
c.1)	VHF Transmitter & Radio	Sets	25
c.2)	VHF Antenna & Poles	Sets	5
d)	Measuring Apparatus		
d.1)	Megger	Nos.	15
d.2)	Earth Tester	Nos.	10
d.3)	Clamp Meter	Nos.	10
d.4)	Phase Tester	Nos.	10
d.5)	Voltage Detector	Nos.	10
d.6)	Cable Fault Locator	Set	1

Description		Unit	Quantity
A) Distribution Facilities			
a)	Steel Poles for 11kV Lines		
a.1)	1CCT Triangle Configuration	Sets	143
a.2)	1CCT Triangle Configuration for Transformer	Sets	23
a.3)	1CCT Triangle Configuration for Sectionalizer	Sets	11
a.4)	1CCT Vertical Configuration	Sets	0
a.5)	2CCT Horizontal Configuration	Sets	55
b)	Steel Poles for Low Tension Lines	Sets	200
c)	11kV HAL Insulated Wires		
c.1)	50 sq.mm	m	0
c.2)	100 sq.mm	m	52,000
d)	600V AL Insulated Wires		
d.1)	55 sq.mm	m	47,500
d.2)	90 sq.mm	m	0
e)	11kV Power Cables CV(AL)-TAZV		
e.1)	3C - 100 sq.mm	m	2,200
e.2)	3C - 200 sq.mm	m	1,000
f)	600V Power Cables (250, 100, 60 & 38 sq.mm)	m	201
g)	Grounding Wires (IV 8, 22, 38, 60 sq.mm)	m	904
h)	Pole Transformers with Cut-out Switch		
h.1)	50 kVA	Sets	2
h.2)	100 kVA	Sets	7
h.3)	200 kVA	Sets	4
i)	Lightening Arresters	Sets	156
j)	Distribution Boxes for Transformers	Sets	13
k)	11kV Sectionalizers	Sets	11
l)	11kV Auto-Recloser	Sets	0
m)	Service Wires	m	14,700
B) 11kV Switching Station Facilities			
a)	Royal Palace Switching Station		
a.1)	11kV Ring Main Circuit	Panel	1
a.2)	11kV Feeder Circuit	Panel	1
a.3)	Transformer Primary Circuit Circuit	Panel	1
a.4)	Transformer Secondary Circuit Circuit	Panel	2
a.5)	Station Service Low Tension Panel	Panel	1
a.6)	Low Tension Panel for Palace	Panel	1
a.7)	DG Panel	Panel	1
a.8)	Transformer, 1000kVA, 11/0.4-0.23kV	Sets	2
a.9)	Battery and Charger	Set	1
a.10)	600V CV(Cu) Power Cable (1C-500 sq.mm)	m	2,100
b)	Old Chabel Switching Station		
b.1)	11kV Ring Main Circuit	Panel	2
b.2)	11kV Feeder Circuit	Panel	4
b.3)	11kV Bus Coupler	Panel	1
b.4)	Station Service Low Tension Panel	Panel	1
b.5)	Outdoor Type Station Service Transformer (50kVA)	Set	1
b.6)	Battery and Charger	Set	1
c)	Old Patan Switching Station		
c.1)	11kV Ring Main Circuit	Panel	2
c.2)	11kV Feeder Circuit	Panel	4
c.3)	11kV Bus Coupler	Panel	1
c.4)	Station Service Transformer Panel	Panel	1
c.5)	Battery and Charger	Set	1
c.6)	Remote Control Panel	Panel	1

CHAPTER 5

EFFECT OF THE PROJECT AND CONCLUSION

CHAPTER 5

EFFECT OF THE PROJECT AND CONCLUSION

The reinforcement of the transmission and distribution systems was generally conducted under grant aids from the GOJ in the 1980s in order to meet increasing demand for electricity power in the Kathmandu Valley. As a result of the reinforcement of the system, power supply in the Valley has improved remarkably and the electrification ratio in the Kathmandu Valley reached 68.5% in 1991, while the national average was 9.1%. However, the Valley is still being faced with problems such as shortage of transformer capacity due to growing power demand, overaged facilities, excessive voltage drop on the distribution system, increasing electric energy losses, frequent tripping of circuit breakers caused by the wide extension of the system into mountainous areas, etc. Although several schemes are being implemented by IDA and other foreign government agencies for reinforcing 66 kV and 132 kV transmission lines and substations and improving service wire connection to the customers, these current projects do not include reinforcement of the distribution system, which is the major part of the Project.

The problems observed at present and expected in the future are shown in Table 5.1 together with the effect of their improvement plans.

HMGN has tried to supply electric power to as many people as possible by developing distribution lines in the country. Developing industries and upgrading livelihood and the achieved high electrification ratio in the Valley are the results and goals of such effort from HMGN and NEA. However, the latest power demand is still at a very high level.

Although population of the Valley in 1991 was approximately 1.1 million, which was about 6% of the total population in Nepal, 47% of electric energy was consumed in this area. Therefore, the development of a distribution line in the Kathmandu area will have a large effect on the country. Moreover, the completion of the project will bring significant benefit to the residents of the Kathmandu Valley. It will contribute to upgrading the living standards, developing tourism industry, help stabilizing the country's political and economical conditions, etc. The experienced staff of NEA, developed during the previous three transmission and distribution line projects in the 1980s, and its financial capacity will be a great help in making the Project successful.

Table 5.1 Present Problems in Power Distribution System and Effects by Implementation of This Project

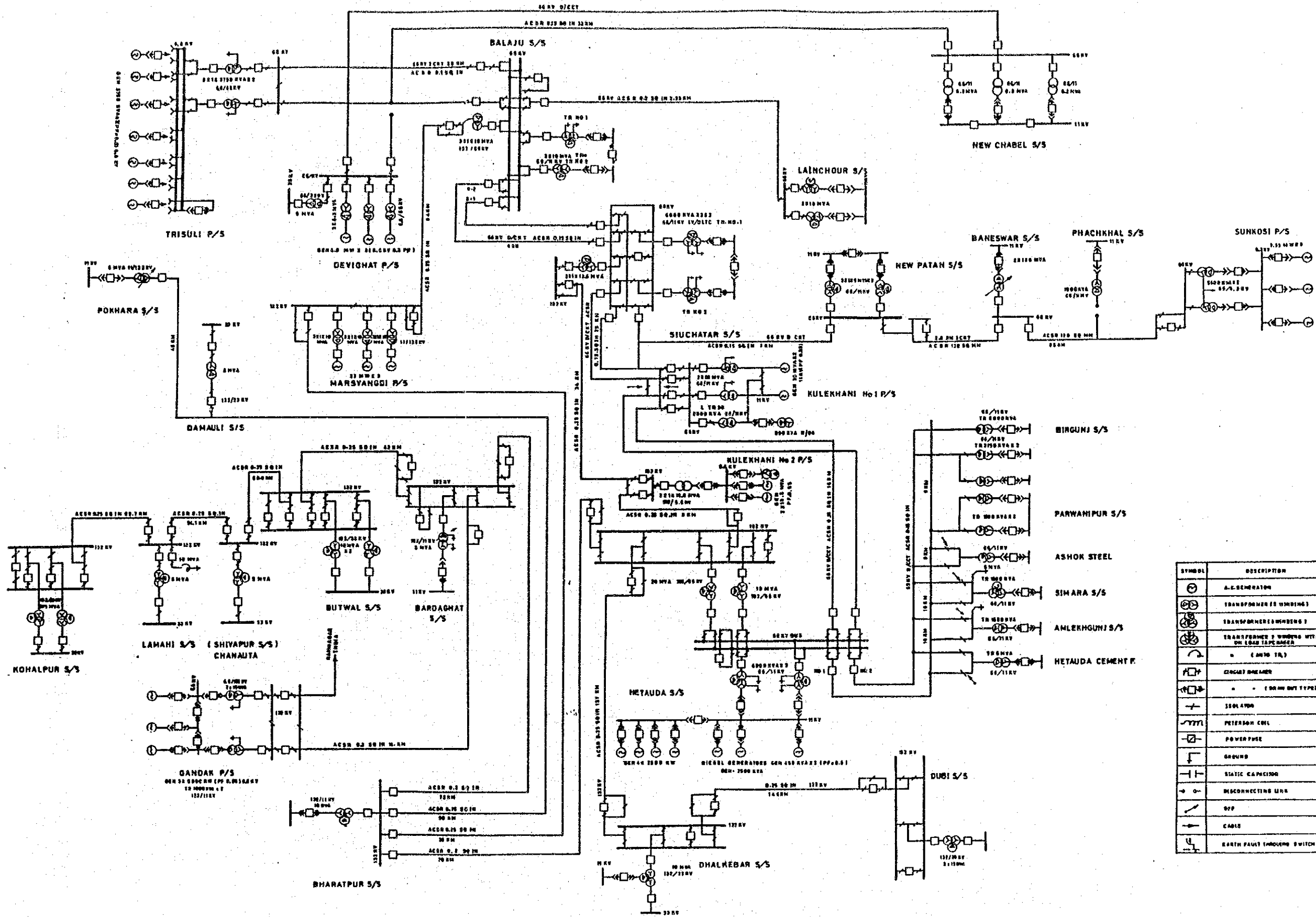
Facilities to be Improved	Problems	Effects by Implementation												
(1) Lainchaur - Royal Palace - K2 Underground Cables	<p>a) Due to the remarkable deterioration of cables which was constructed in 1960's, troubles on the cables have frequently occurred.</p> <p>b) Power supply to the central area had been hindered for long time by disconnection of cables in 1990 due to the difficulty of finding out its fault point and its repairing.</p>	<p>a) Increase of reliability due to adoption of Crosslinked Insulated Bynile Sheathed Steel Armoured Cables.</p> <p>b) As a result, decrease of hindrance of power supply to the central area due to troubles on the cables.</p>												
(2) 11kV Switching Cubicles	<p>a) There are possibilities of accident resulting in injury or death, and damage of other equipment due to fault of switching equipment.</p> <p>b) Due to the accident on a 11kV cubicle in Lainchaur substation occurred in 1990, two operators died and all other 66kV and 11kV equipment were burned out.</p>	<p>a) Further replacement is not needed in future with possible system expansion, because of adoption of equipment having enough capacity of 25kA.</p> <p>b) Easy maintenance due to adoption of circuit breaker of vacuum type.</p>												
<table border="1"> <thead> <tr> <th>Station</th> <th>Short CCT Capacity</th> <th>Short CCT Current</th> </tr> </thead> <tbody> <tr> <td>O. Patan</td> <td>13.1/7.9kA</td> <td>12.6kA</td> </tr> <tr> <td>O. Chabel</td> <td>7.9kA</td> <td>7.8kA</td> </tr> <tr> <td>R. Palace</td> <td>7.9kA</td> <td>9.1kA</td> </tr> </tbody> </table>			Station	Short CCT Capacity	Short CCT Current	O. Patan	13.1/7.9kA	12.6kA	O. Chabel	7.9kA	7.8kA	R. Palace	7.9kA	9.1kA
Station	Short CCT Capacity	Short CCT Current												
O. Patan	13.1/7.9kA	12.6kA												
O. Chabel	7.9kA	7.8kA												
R. Palace	7.9kA	9.1kA												
Remarks : Short circuit current was estimated on the system in 1990.														
(3) 11kV Distribution Lines	<p>a) Excessive voltage drop and losses due to usage of conductors in small scale.</p> <p>b) Increase of voltage drop due to rapid demand growth and shortage of power transmission capability.</p> <p>c) Frequent trip of circuit breaker due to usage of bare conductors.</p>	<p>a) Decrease of voltage drop and losses by upgrade of conductors, addition of feeder and separation of supply area.</p> <p>b) Decrease of trip of circuit breakers caused by line to line and ground faults due to adoption of insulated wires.</p>												

Effects by Implementation of Project

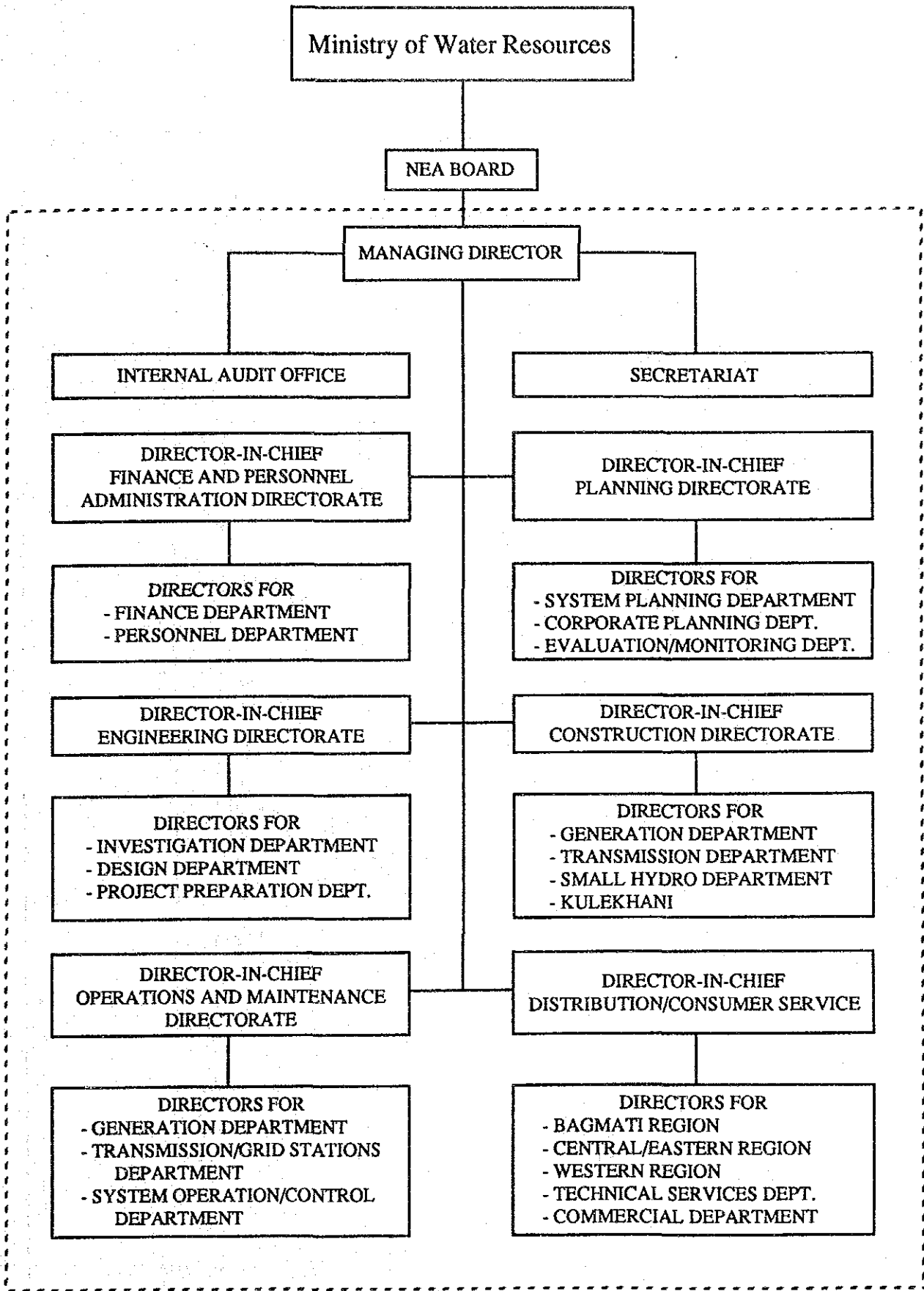
Name of Feeder	Countermeasure/Purposes	Length (km)	Voltage Drop(%)		System Losses(MWh/yr)		No of Trip Over C. Ground	
			Un-imp	Impl.	Un-imp	Impl.		
Boudha-Jorpati	Separation of supply area by addition of feeder	5.0	9.95	2.95	2,607	328	49	104
Sundarijal	Upgrade of conductors and replace of supports	34.0	13.19	4.32	592	150	31	35
Godawari-2	Separation of supply area by addition of feeder	40.4	11.56	4.43	1,115	212	20	151
Thankot	Separation of supply area by addition of feeder	31.5	10.39	2.67	1,094	196	31	88
Kirtipur	Change of supply area	17.5	8.79	4.03	782	247	13	4
Pharping	Separation of supply area by addition of feeder	34.4	9.26	2.78	563	58	51	69
Airport	Separation of supply area by addition of feeder	4.5	3.99	2.36	598	301	18	23
Baneswar	Separation of supply area by addition of feeder	4.3	5.51	3.40	393	220	24	38
Nagarkot	Separation of supply area by addition of feeder	27.2	9.86	2.61	402	68	24	53
Remarks :	<p>1) Voltage drop and losses in case of without implementation or with implementation in the above table are values estimated on the system in 1995/96.</p> <p>2) Numer of trippings are actual values in 1989.</p> <p>3) Sources : Final Report in Dec. 1991 by JICA</p>							

Remarks : Rated short circuit capacity of 11kV cubicles at Teku switching station will be below the expected short circuit current of the system in 1991. However, replacement of those equipment is not considered, because upgrading to 66kV substation is scheduled under PSEP.

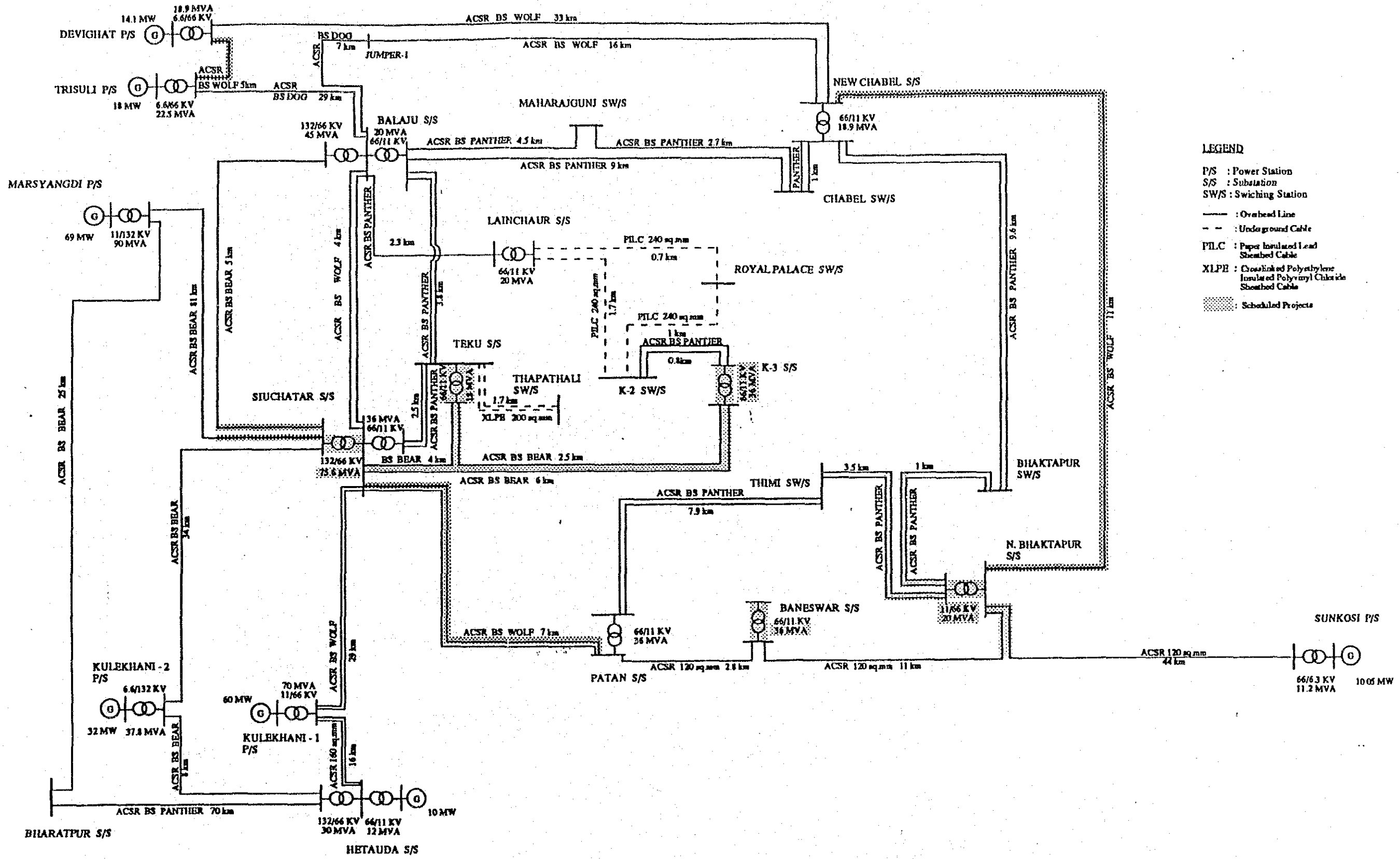
FIGURES



SYMBOL	DESCRIPTION
	A.C. GENERATOR
	TRANSFORMER WINDING
	TRANSFORMER WINDING I
	TRANSFORMER WINDING WITH ON LOAD TAPCHANGER
	CIRCUIT BREAKER
	CIRCUIT BREAKER (TYPE)
	ISOLATION
	PETERSON COIL
	POWER FUSE
	GROUND
	STATIC CAPACITOR
	DISCONNECTING LINK
	CABLE
	EARTH FAULT THROUGH SWITCH



BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER T/L AND D/L SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE Fig. 2.2 Nepal Electricity Authority Organization Chart
	JAPAN INTERNATIONAL COOPERATION AGENCY	



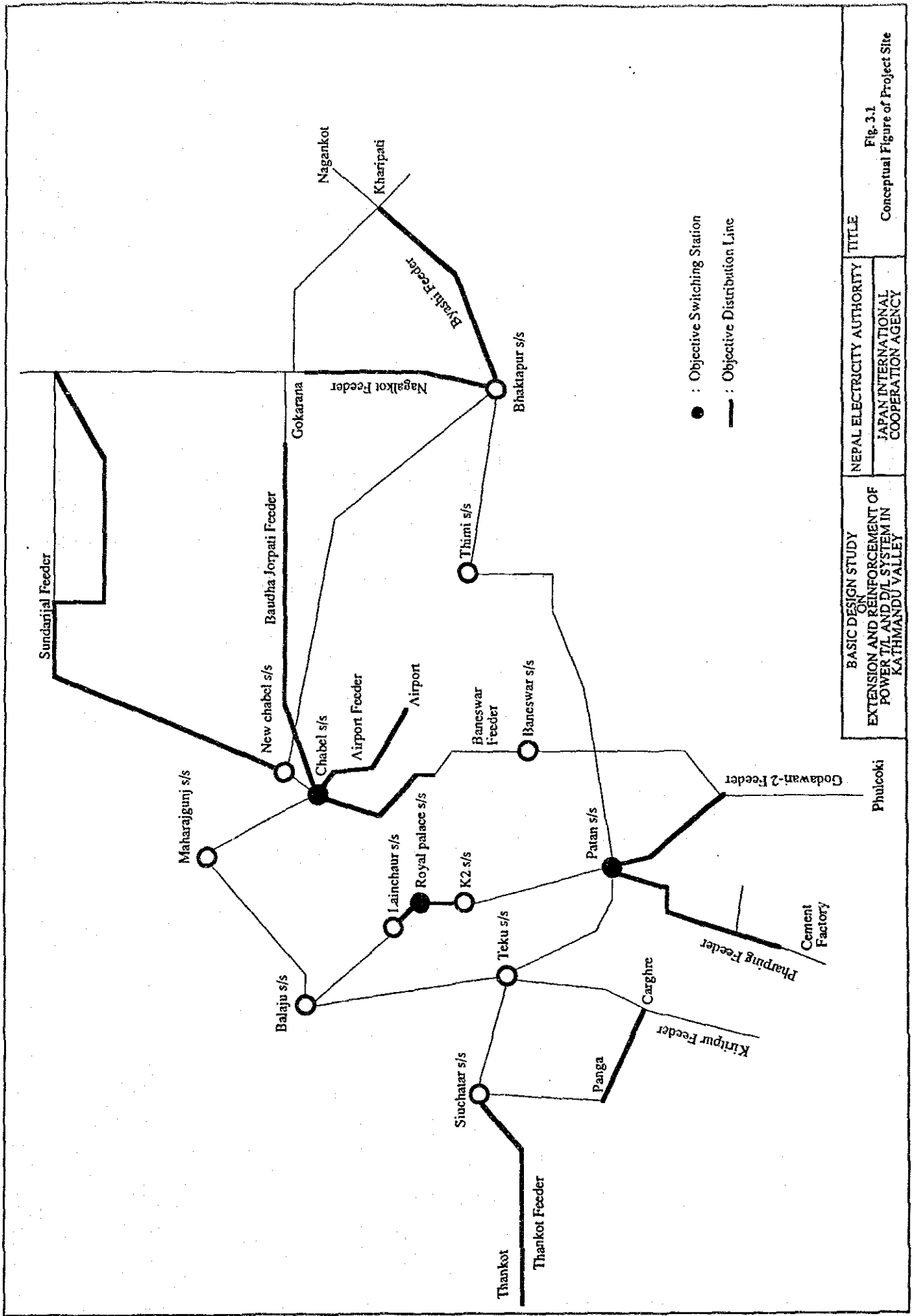
LEGEND

P/S : Power Station
 S/S : Substation
 SW/S : Switching Station

— : Overhead Line
 - - : Underground Cable

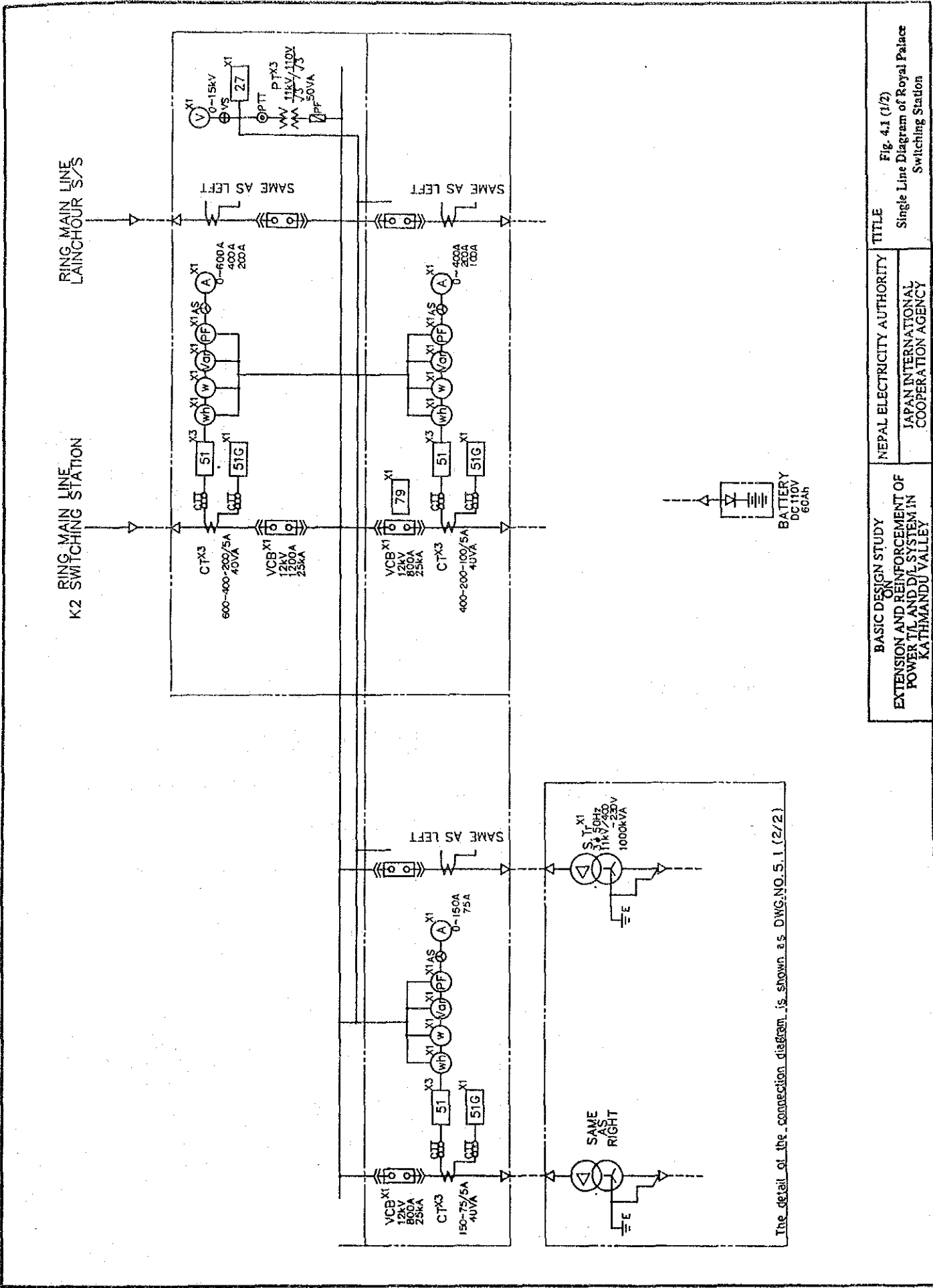
PILC : Paper Insulated Lead Sheathed Cable
 XLPE : Crosslinked Polyethylene Insulated Polyvinyl Chloride Sheathed Cable

..... : Scheduled Projects

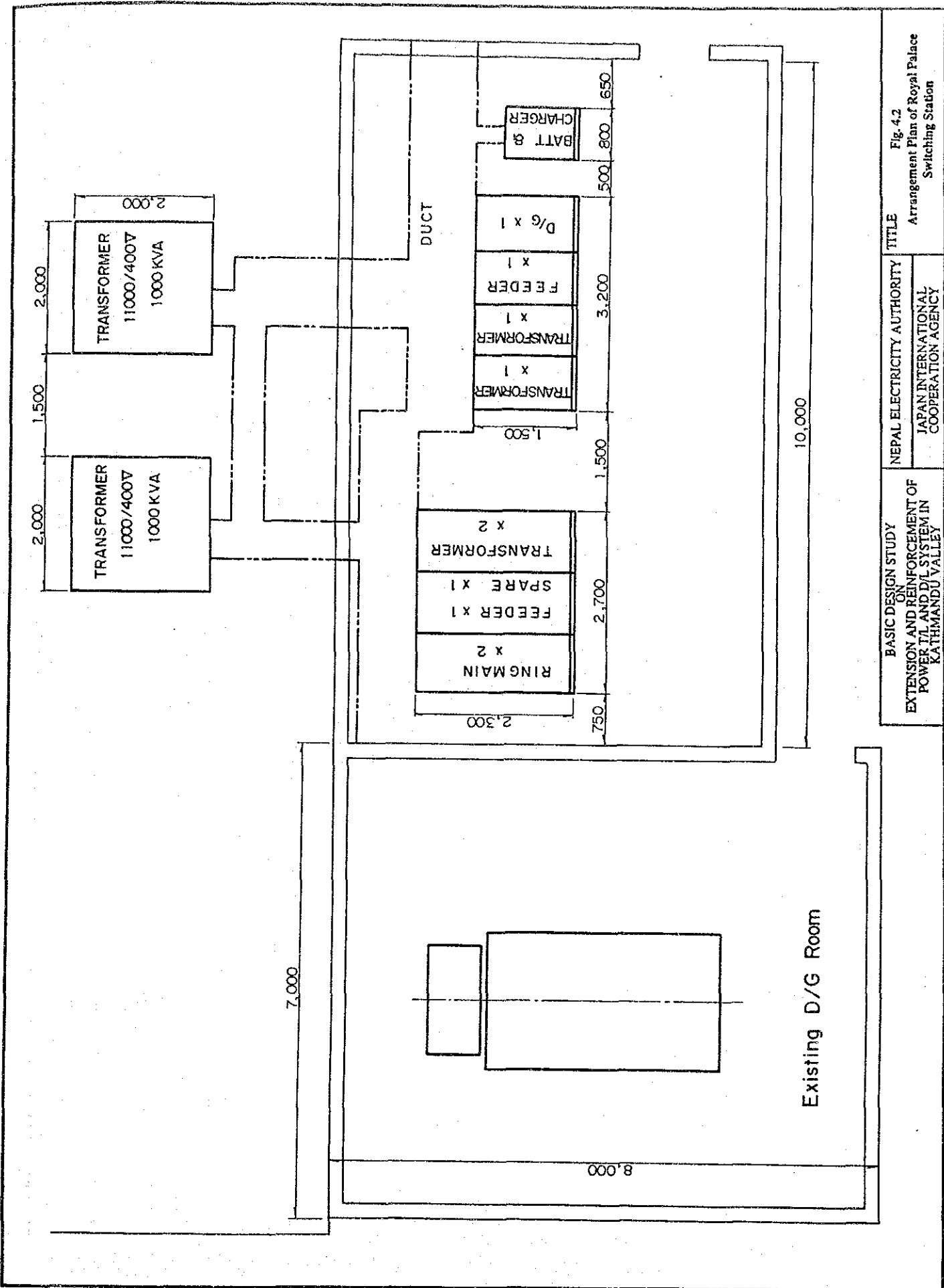


BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER T/L AND D/L SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE Conceptual Figure of Project Site
	JAPAN INTERNATIONAL COOPERATION AGENCY	

Fig. 3-1

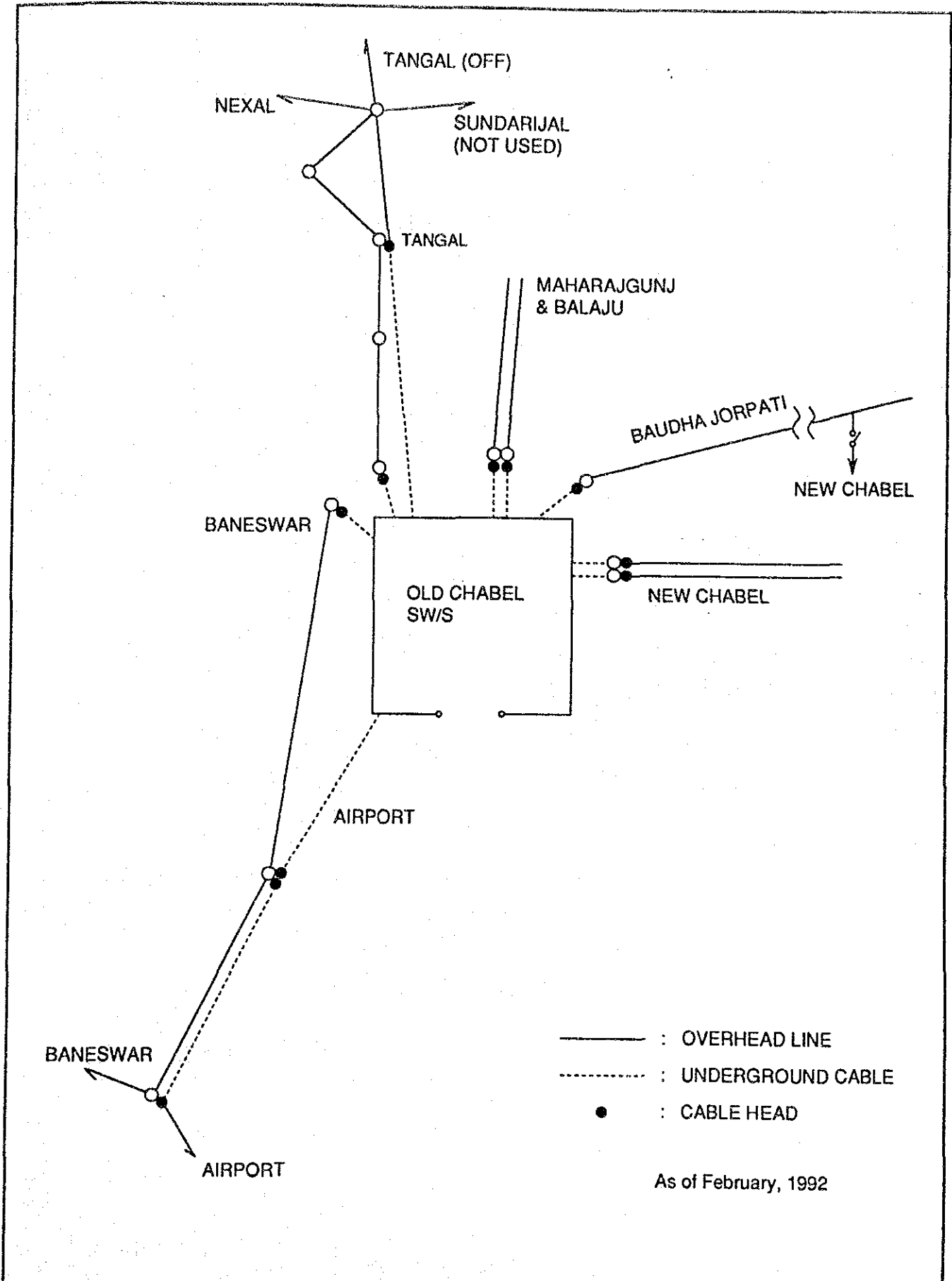


BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TL AND DL SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE Fig. 4.1 (1/2) Single Line Diagram of Royal Palace Switching Station
	JAPAN INTERNATIONAL COOPERATION AGENCY	



BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TL AND D/G SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE Arrangement Plan of Royal Palace Switching Station
	JAPAN INTERNATIONAL COOPERATION AGENCY	

Fig. 4.2



BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER T/L AND D/L SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE
	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 4.3 General Layout of Underground Cables for Feeders at Old Chabel Switching Station

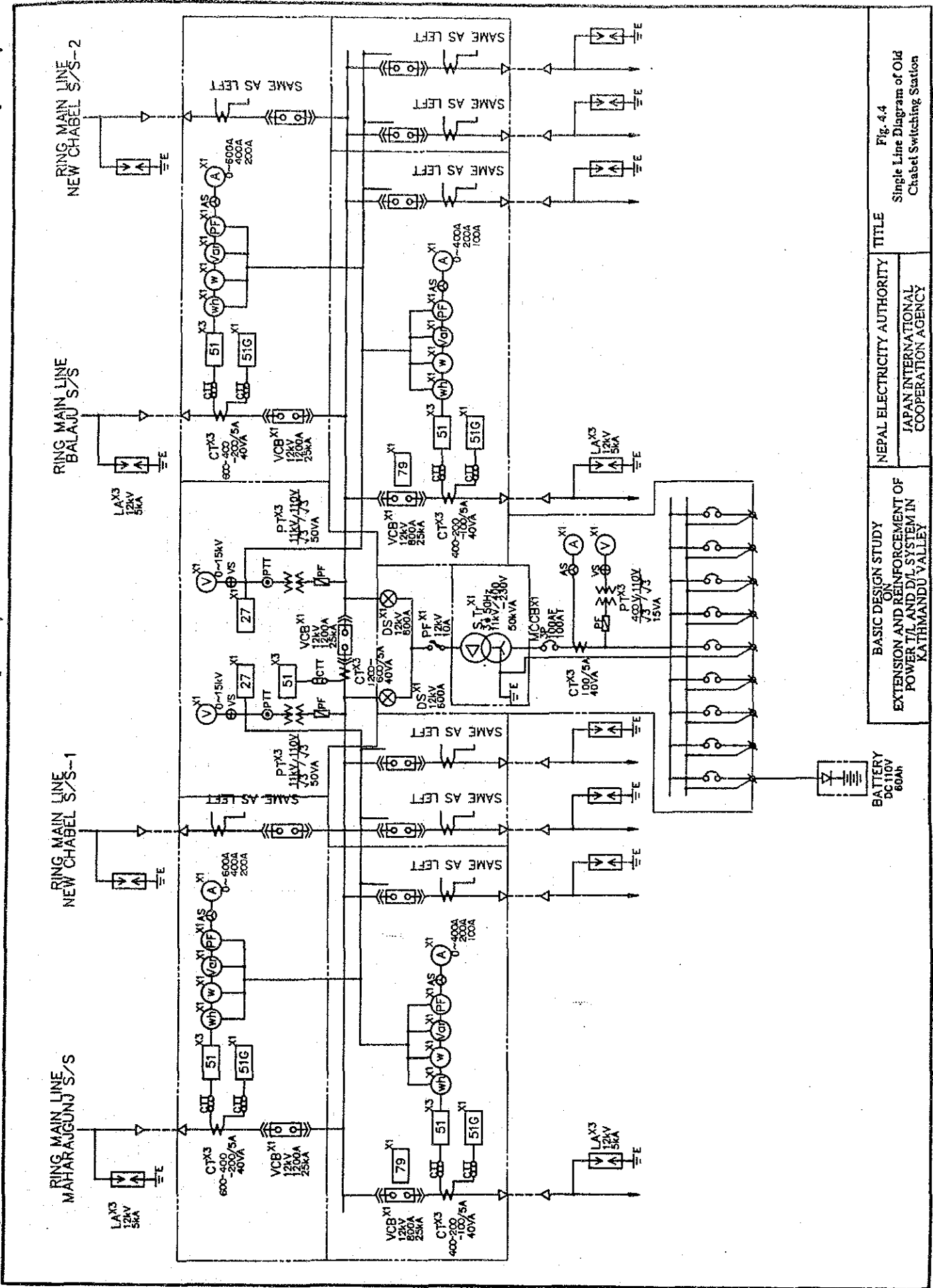
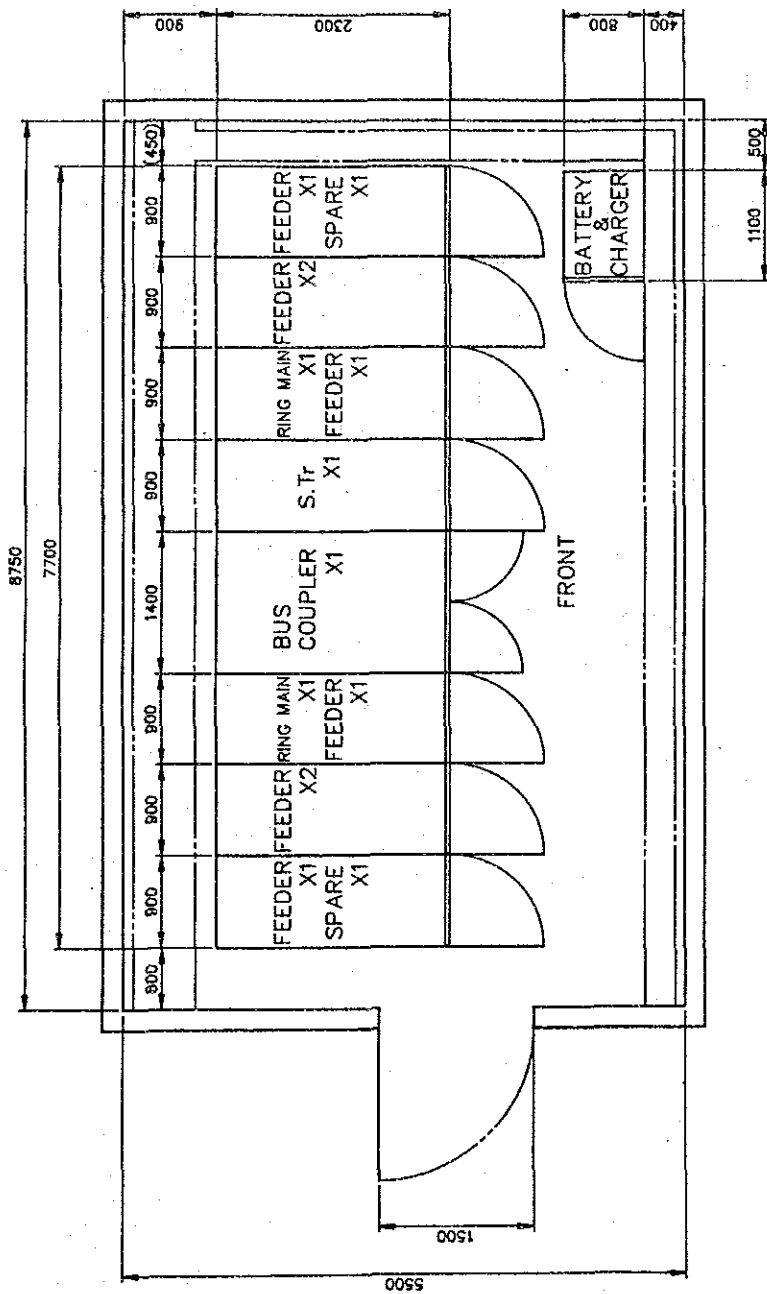


Fig. 4.4
Single Line Diagram of Old
Chabel Switching Station

TITLE
NEPAL ELECTRICITY AUTHORITY
JAPAN INTERNATIONAL
COOPERATION AGENCY

BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF
POWER TL AND D/L SYSTEM IN
KATHMANDU VALLEY

BATTERY
DC 110V
80Ah

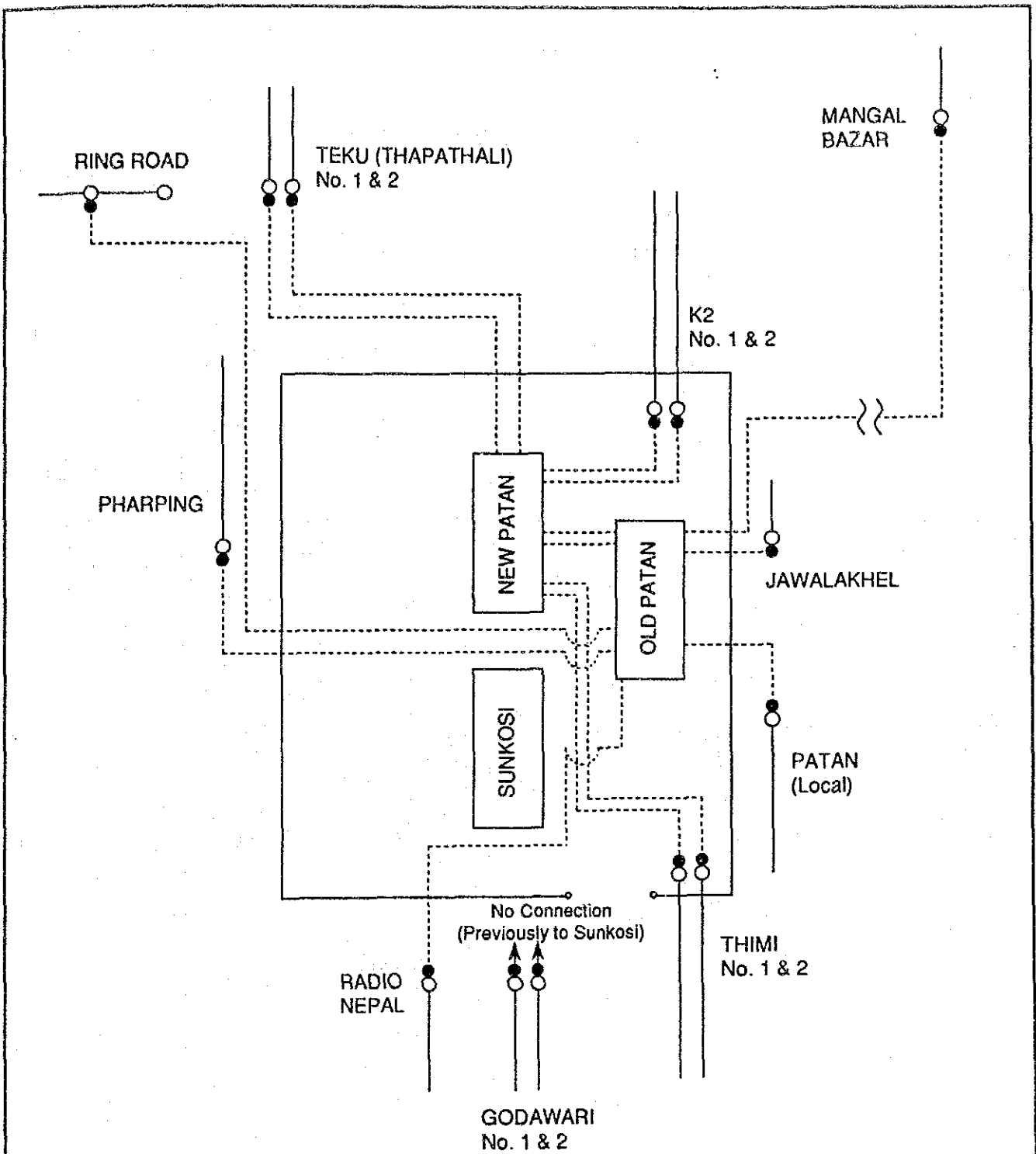


BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF
POWER TL AND DL SYSTEM IN
KATHMANDU VALLEY

NEPAL ELECTRICITY AUTHORITY
JAPAN INTERNATIONAL
COOPERATION AGENCY

TITLE
Arrangement Plan of Old Chabel
Switching Station

Fig. 4.5



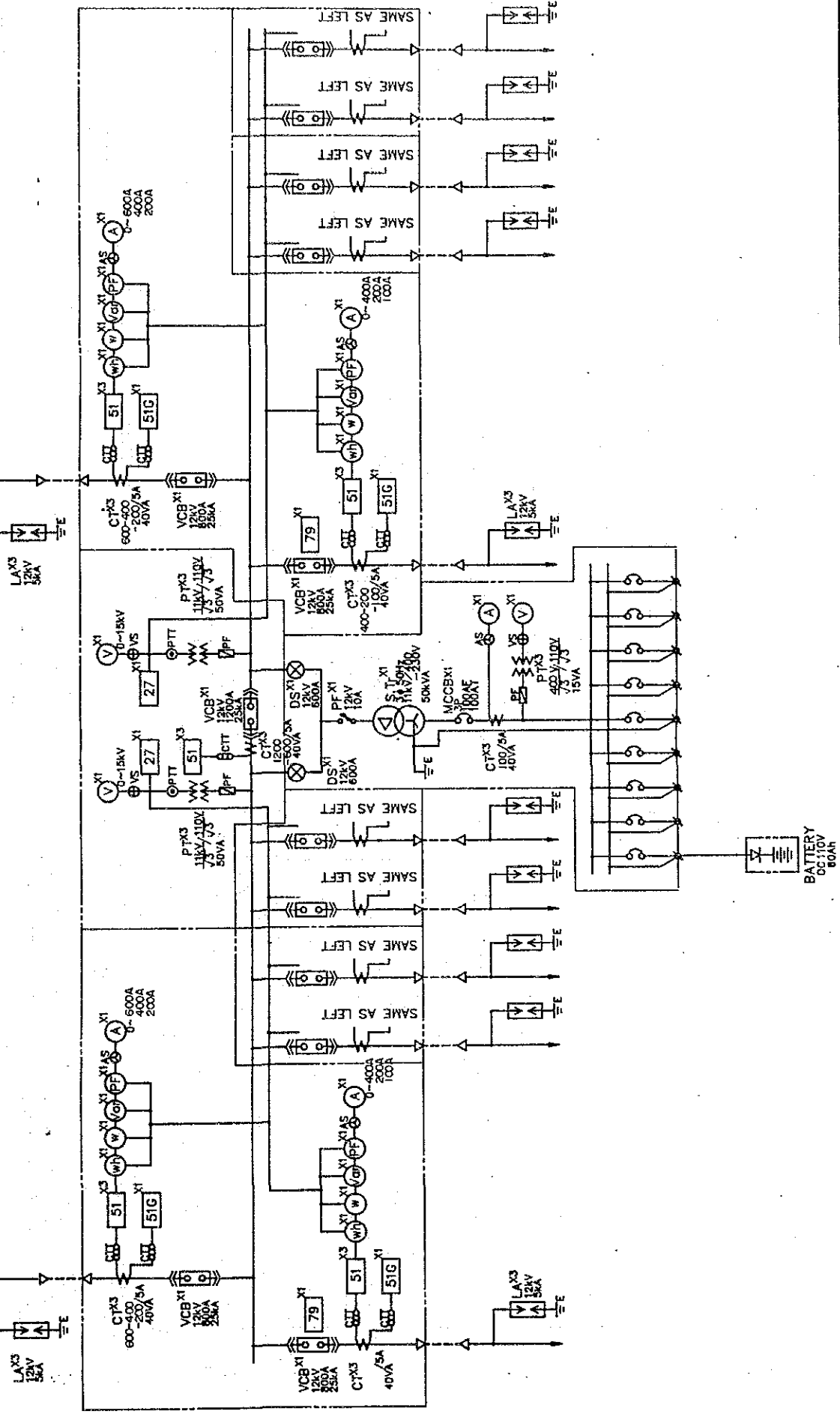
- : OVERHEAD LINE
- : UNDERGROUND CABLE
- : CABLE HEAD

As of February, 1992

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER T/L AND D/L SYSTEM IN KATHMANDU VALLEY	NEPAL ELECTRICITY AUTHORITY	TITLE Fig. 4.6 General Layout of Underground Cables for Feeders at Patan Substation
	JAPAN INTERNATIONAL COOPERATION AGENCY	

RING MAIN LINE
NEW PATAN S/S-1

RING MAIN LINE
NEW PATAN S/S-2



BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF
POWER T/L AND D/L SYSTEM IN
KATHMANDU VALLEY

NEPAL ELECTRICITY AUTHORITY
JAPAN INTERNATIONAL
COOPERATION AGENCY

Fig. 4.7
Single Line Diagram of Sunkosel
Switching Station

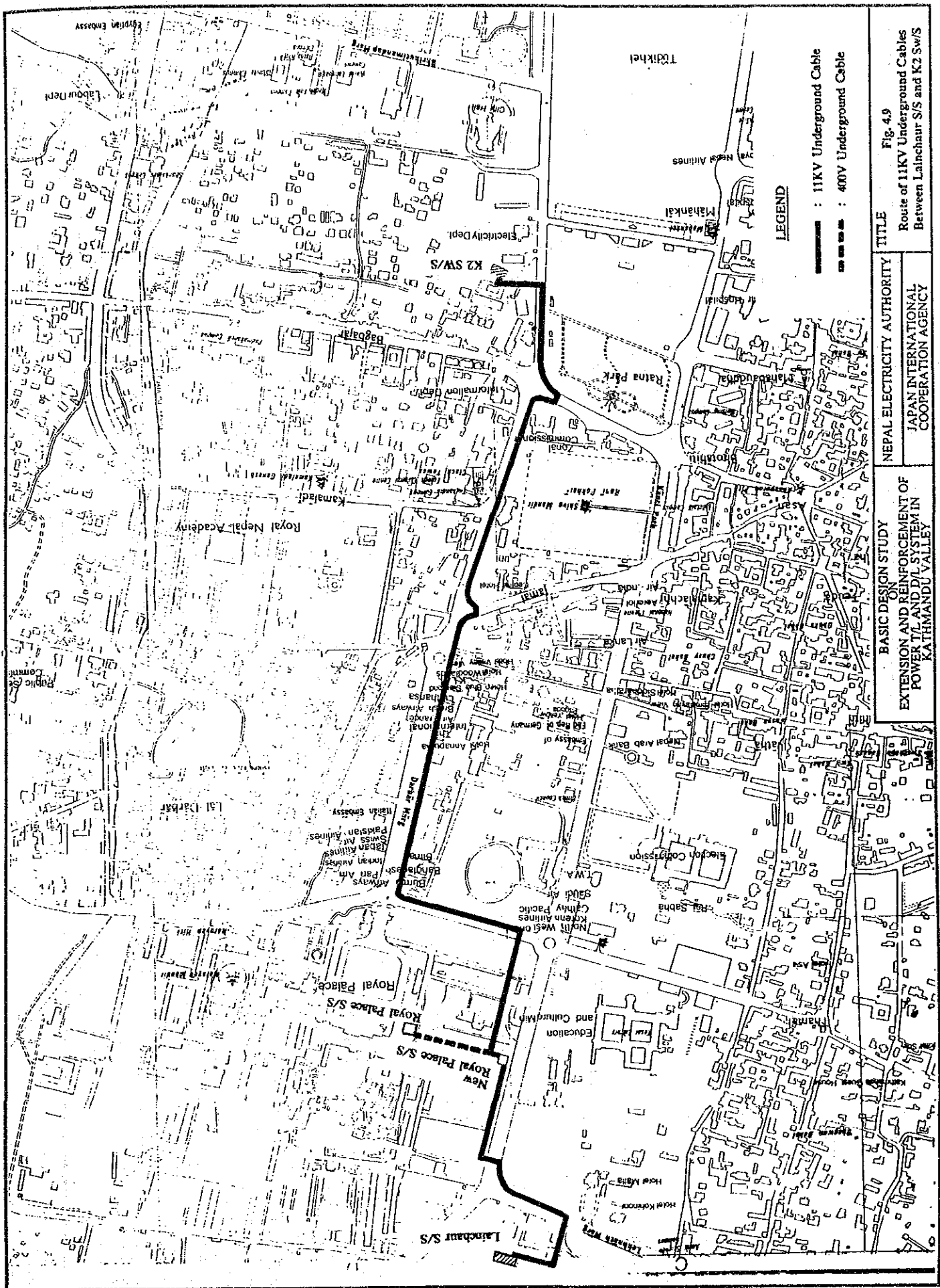
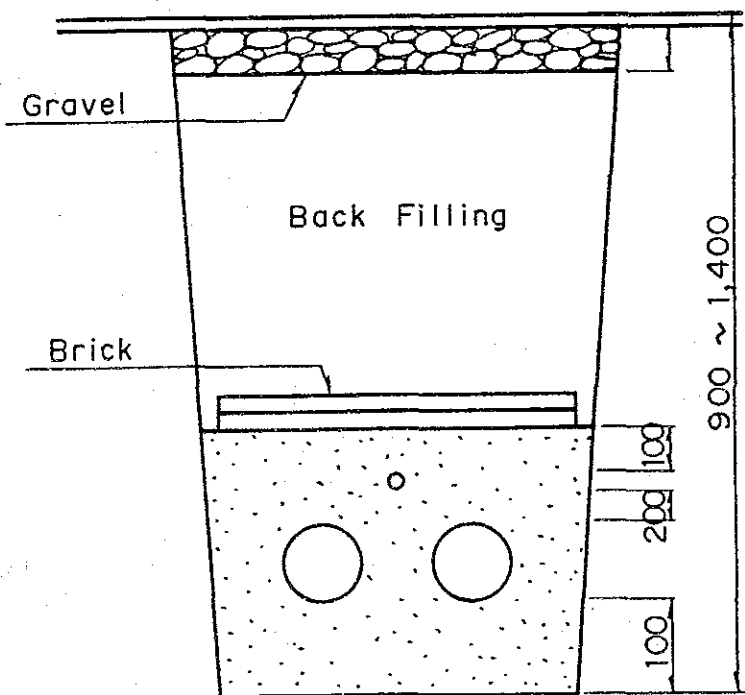
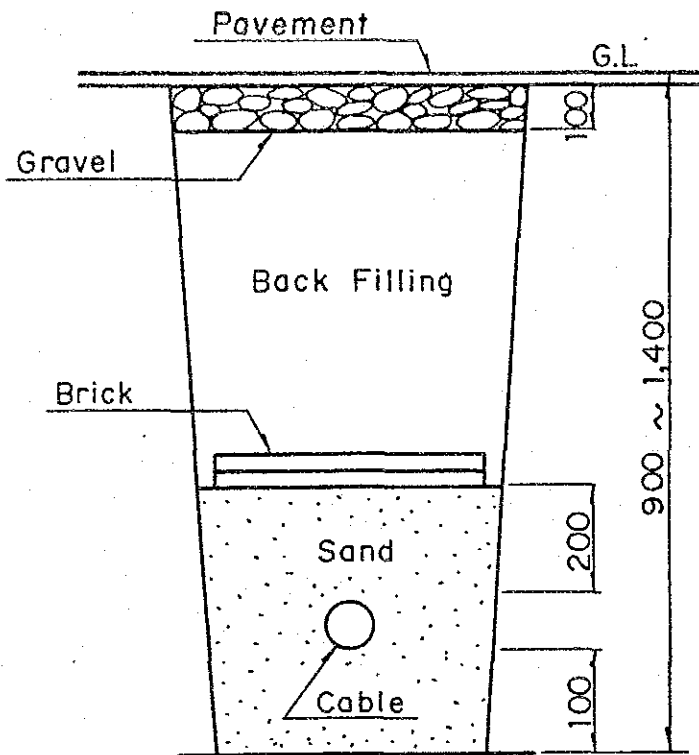


Fig. 4.9
Route of 11KV Underground Cables
Between Lainchaur S/S and K2 S/W/S

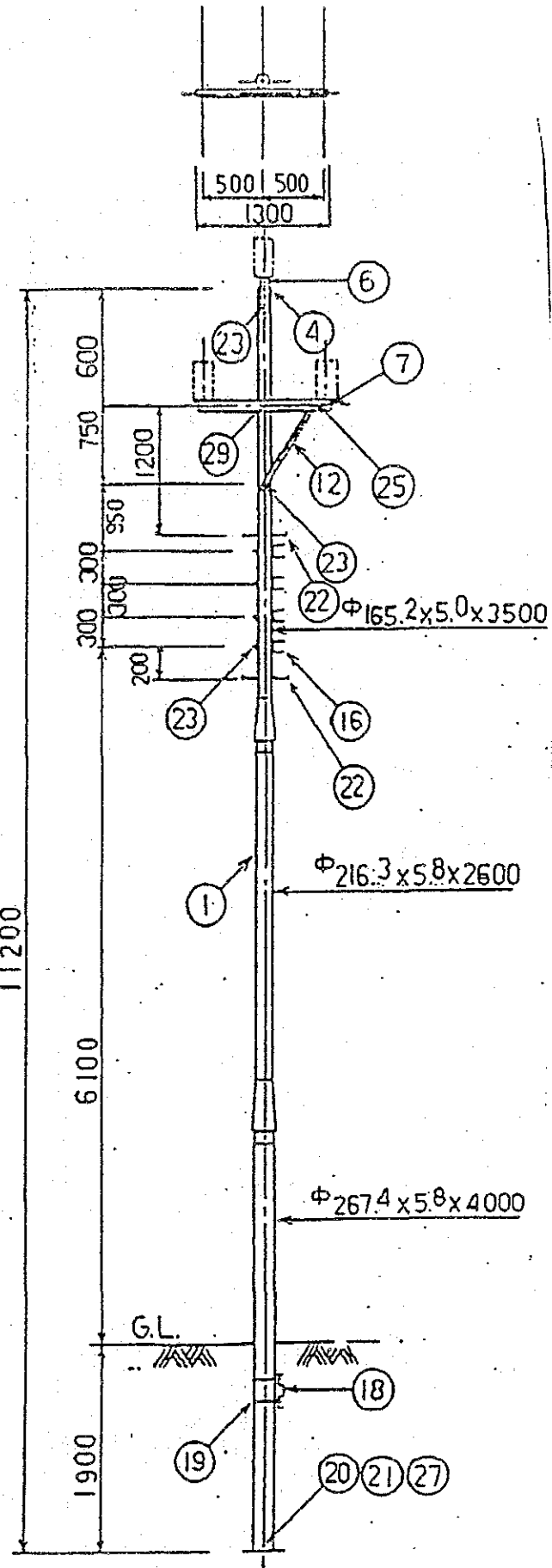
NEPAL ELECTRICITY AUTHORITY
 JAPAN INTERNATIONAL
 COOPERATION AGENCY

BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF
POWER TL AND D/L SYSTEM IN
KATHMANDU VALLEY

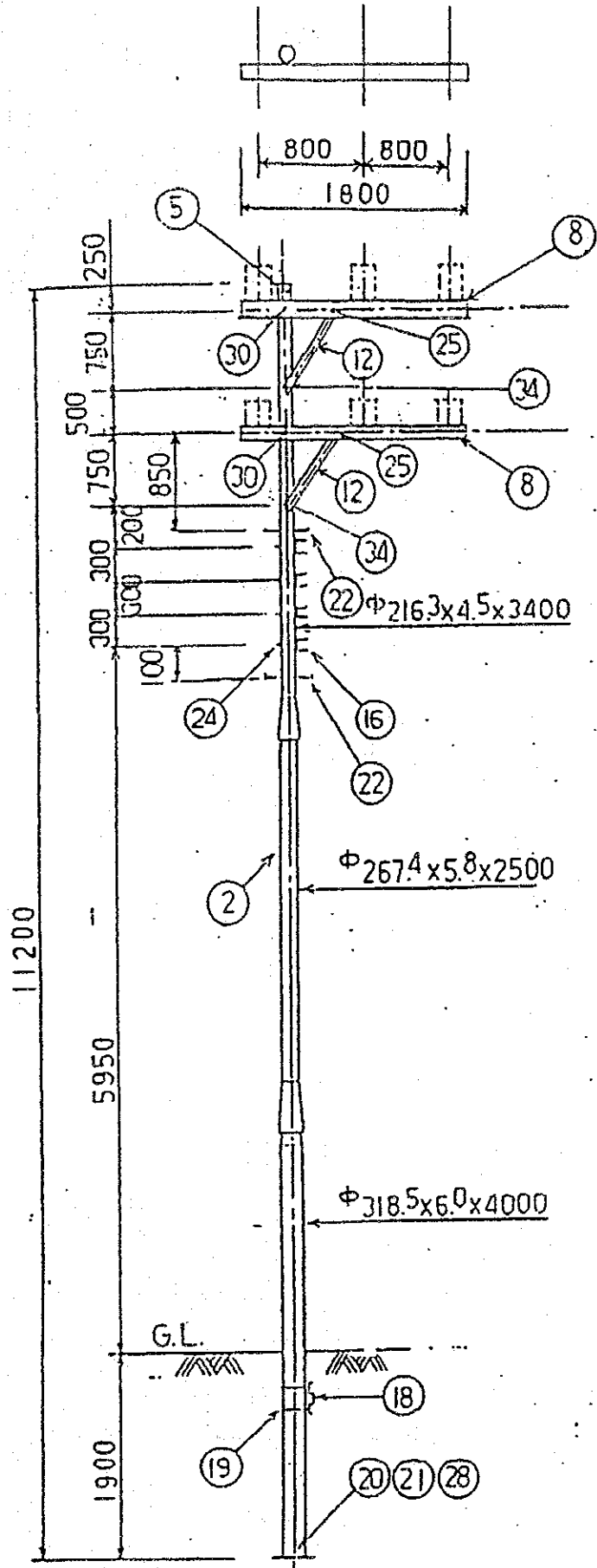
LEGEND
 — : 11KV Underground Cable
 - - - : 400V Underground Cable



<p>BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER T/L AND D/L SYSTEM IN KATHMANDU VALLEY</p>	<p>NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Fig. 4.10 Cable Trench</p>
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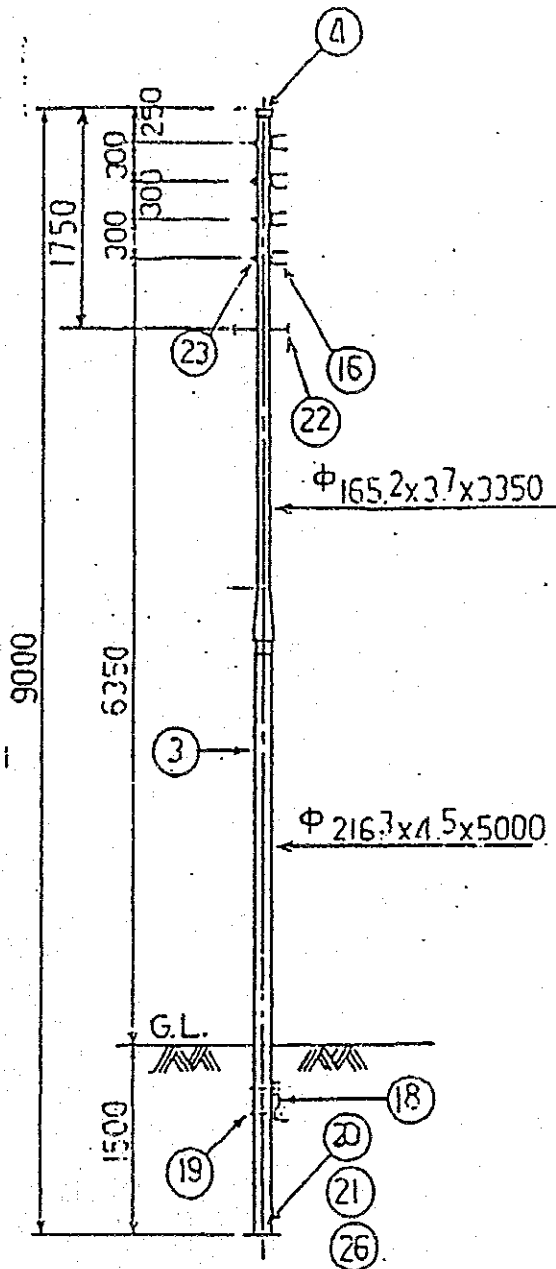
UNIT		mm
PART NO.	DESCRIPTION	REQ'D
1	STEEL POLE 11.2H (1)	1
4	POLE CAP (1)	1
6	A-CLAMP (1)	1
7	CROSSARM L=1300	1
12	BRACE	1
16	LV RACK SET	4
18	SUPPORT ANCHOR	1
19	U-BAND FOR SUPPORT ANCHOR	2
20	EYE BOLT M16x76	1
21	BASE PLATE	1
22	STEP BOLT	4
23	M12x200, P/AC, P/Br, P/Rk	7
25	M12x120, CA/Gr	1
27	M12x300, P/BASE	1
29	M16x300, P/CA	1



UNIT		mm	
PART NO.	DESCRIPTION	REQ'D	
2	STEEL POLE 11.2M (2)	1	
5	POLE CAP (2)	1	
8	CROSSARM L=1800	2	
12	BRACE	2	
16	LV RACK SET WITH SPOOL, INSULATOR	4	
18	SUPPORT ANCHOR	1	
19	U-BAND FOR SUPPORT ANCHOR	2	
20	EYE BOLT M16x76	1	
21	BASE PLATE	1	
22	STEP BOLT	4	
24	M12x260. P/B.r. P/Rk	6	
25	M12x120. CA/Rr	2	
28	M12x360. P/BASE	1	
30	M16x360. P/CA	2	

UNITY mm

PART NO.	DESCRIPTION	REQ'D
3	STEEL POLE 9.0M (3)	1
4	POLE CAP (1)	1
16	LV RACK SET WITH SPOOL INSULATOR	4
18	SUPPORT ANCHOR	1
19	U-BAND FOR SUPPORT ANCHOR	2
20	EYE BOLT M16x75	1
21	BASE PLATE	1
22	STEP BOLT	2
23	M12x200, P/WK	4
26	M12x250, P/BASE	1



APPENDIXES

MEMBER LIST OF STUDY TEAM

Team Leader	Mr. Toshikazu NAGASHIMA Director Study Review and Cordination Division Grant Aid Study and Design Department Japan International Cooperation Agency (JICA)
Project Planning (Sub-team Leader)	Mr. Yosiaki MIYAGAWA General Manager Plant Engineering Department Nippon Koei Co., Ltd.
Substation Planning	Mr. Tomoyasu FUKUCHI Plant Engineering Department Nippon Koei Co., Ltd.
Distribution System Planning	Mr. Yoshikazu SUNAGAWA Plant Engineering Department Nippon Koei Co., Ltd.
Operation and Maintenance	Mr. Hiroshi EBISAWA Plant Engineering Department Nippon Koei Co., Ltd.

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Phone : (3) 3238-8298

SCHEDULE OF SITE SURVEY

No.	Date	Movement	Stay	Activities
1	Feb. 2 (Sun)	Narita to BKK	Bangkok	
2	3 (Mon)	Arrive in KTM	Kathmandu	Meeting with JICA/KTM
3	4 (Tue)			Courtesy call on NEA Discussion with NEA on survey schedule
4	5 (Wed)			Reconnaissance survey of site Courtesy call on Japanese Ambassador
5	6 (Thu)			Courtesy call on the ministry of water resources and MD of NEA Discussion with NEA on inception report
6	7 (Fri)			Discussion with NEA on inception report
7	8 (Sat)			Review of collected data
8	9 (Sun)			Survey of cable route in royal palace and D/L line routes
9	10 (Mon)			Discussion with NEA on minutes of discussion Report to MD of NEA
10	11 (Tue)			Signing of minutes of discussion Report to Japanese Embassy and JICA/KTM
11	12 (Wed)	KTM to BKK (Team Leader)	Bangkok (Team Leader)	Plan survey of switching station Survey of D/L line routes
12	13 (Thu)	Arrive in Narita (Team Leader)		Discussion with NEA on technical matters Plan survey of switching station Survey of D/L line routes

APPENDIX 1-2 (2/2)

13	14 (Fri)			Data collection Plan survey of switching station Survey of D/L line routes Survey of cable route including Royal Palace
28	29 (Sat)			Discussion with NEA on technical matters
29	Mar. 1 (Sun)			Check/arrangement of survey results Discussion with NEA on minutes of meeting on technical matters
30	2 (Mon)			Check/arrangement of survey results
31	3 (Tue)			Check/arrangement of survey results Discussion with NEA on minutes of meeting Guide officials of J. Embassy to project sites
32	4 (Wed)			Finalization of minutes of meeting
33	5 (Thu)			Signing of minutes of meeting Report to Japanese Embassy and JICA/KTM
34	6 (Fri)	KTM - BKK	Bangkok	
35	7 (Sat)	Arrive in Narita		

MEMBER LIST OF CONCERNED PARTIES
OF RECIPIENT COUNTRY

Ministry of Water Resources

Mr. G.N. Riamal	Acting Secretary
Mr. H.M. Shrestha	Chief Project Coordinator

Nepal Electricity Authority

Mr. K.C. Thakur	Managing Director
Mr. R.C.L. Pradhan	Director-in-Chief
	Distribution and Consumer Services Directorate
Mr. T.B. Pradhananga	Director-in-Chief, Planning Directorate
Mr. B.M. Singh	Director-in Chief
	Operation and Maintenance Directorate
Dr. M.R. Tuladhar	Director, Technical Service
Mr. S.B. Pun	Director, Bagmati
Mr. N.T. Bhutia	Director, System Planning
Mr. B.B. Dhungana	Director, Power Sector Efficiency Project
Mr. M.P. Pyakuryal	Director, Transmission Grid
Mr. L.M. Dixit	Director-in-Chief, Engineering Directorate
Mr. R.C. Chaudhary	Director-in-Chief, Construction Directorate
Mr. H.O. Shrestha	Director-in-Chief, Corporate Planning
Mr. R.K. Bajracharya	Director-in-Chief, Commercial
Mr. P.N. Sharma	Manager, Kathmandu Division
Mr. M.P. Upadhaya	Manager, Lalitpur-Bhaktapur-Kavre Division
Mr. H.S.M. Pradhan	Manager, Transmission Grid, Naya Baneswar S/S
Mr. K.G. Shrestha	Manager, Power Sector Efficiency Project
Mr. G.K. Shresta	Manager, 6th Power Project D.C.S.
Mr. R.N. Pradhan	Manager, Kulekhani I & II P/H

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
THE PROJECT FOR EXTENSION AND REINFORCEMENT
OF
POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU
VALLEY
IN THE KINGDOM OF NEPAL

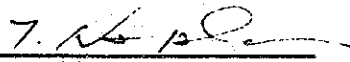
In response to the request of the Government of the Kingdom of Nepal, the Government of Japan decided to conduct a Basic Design Study on the Project for Extension and Reinforcement of Power Transmission and Distribution System in Kathmandu Valley (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).


JICA sent to Nepal a study team, which is headed by Mr. Toshikazu Nagashima, Director, Study Review and Coordination Div., Grant Aid Study and Design Dept., JICA and is scheduled to stay in the country from February 3 to February 12, 1992.

The team held discussion with officials concerned of Nepal and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study Report.

Kathmandu, February 11, 1992


Mr. Toshikazu Nagashima
Leader
Basic Design Study Team


Mr. K.C. Thakur
Managing Director
Nepal Electricity Authority

ATTACHMENT

1. Objective

The objective of the Project is to extend and reinforce the power transmission and distribution system in Kathmandu Valley and thus contributing to the improvement of the distribution system for the enhancement of living conditions of the inhabitants in the Project area.

2. Project Site

The Project site is located in Kathmandu Valley which appears in Annex I.

3. Responsible Organization, Executive Organization

- | | |
|-------------------------------|---------------------------------|
| (1) Responsible organization: | The Nepal Electricity Authority |
| (2) Executive organization: | The Nepal Electricity Authority |

4. Items Requested by the Government of Nepal

After discussion with the Basic Design Study Team, the following items were finally requested by the Nepal side.

- (1) Augmentation of 11 kV Old Patan, Royal Palace and Old Chabel switching stations.
- (2) Construction of 11 kV underground cable line between the Lainchaur substation and K2 switching station.
- (3) Reinforcement and improvement of the following 11 kV main feeders.
 - (3- 1) Boudha-Jorpati feeder
 - (3- 2) Sundarijal feeder
 - (3- 3) Godawari-1 and Godawari-2 feeders
 - (3- 4) Thankot feeder
 - (3- 5) Kirtipur feeder
 - (3- 6) Pharping feeder
 - (3- 7) Airport feeder from the New Chabel substation
 - (3- 8) Baneswar feeder
 - (3- 9) Nagarkot feeder
 - (3-10) Center of the Kathmandu town
- (4) Maintenance tools and the other equipments, described in Annex -II.

However, the final components of the Project will be decided after further studies.

5. Japan's Grant Aid System

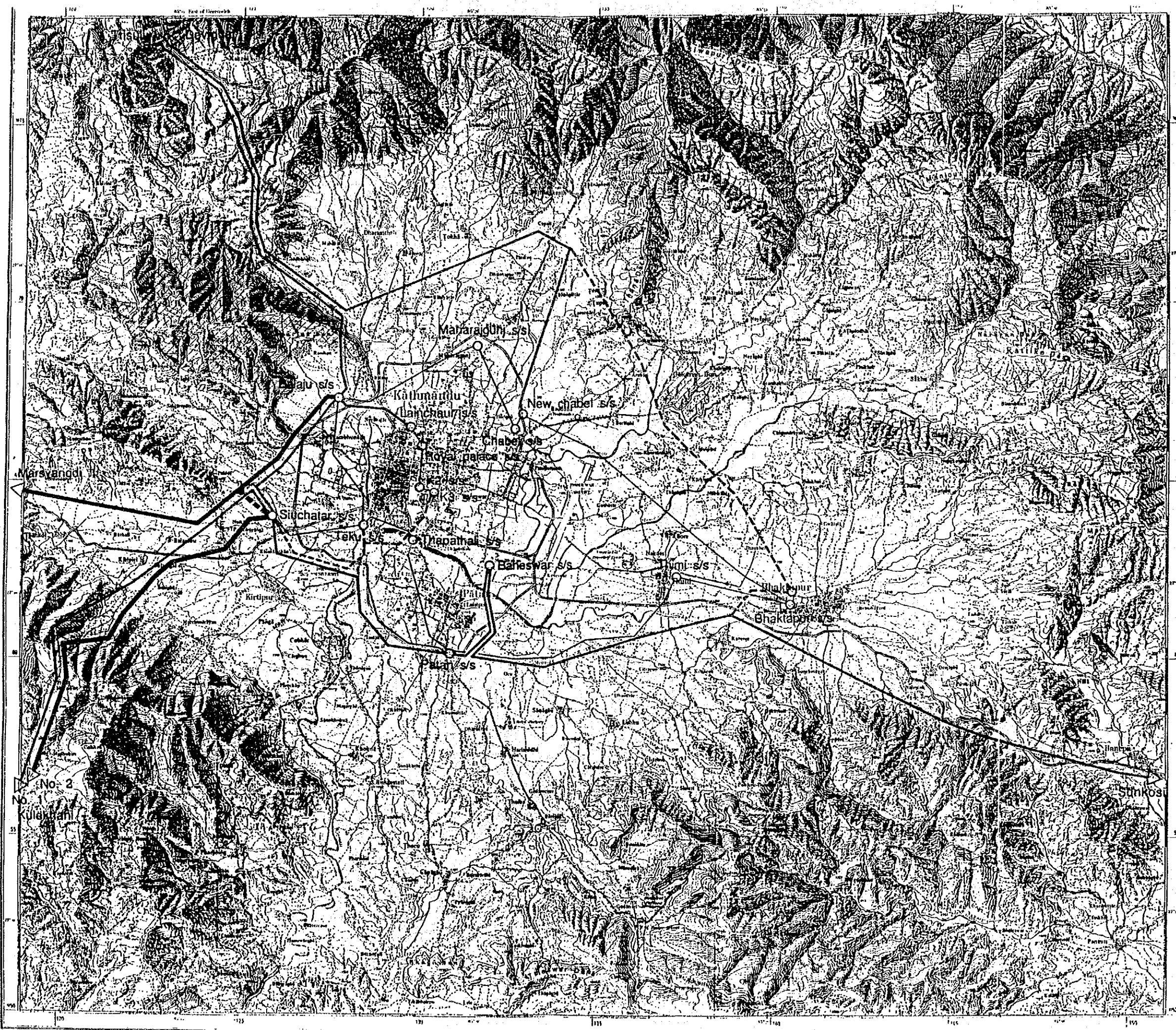
- (1) The Nepal Electricity Authority has understood the system of Japanese Grant Aid explained by the team.
- (2) The Nepal Electricity Authority will take necessary measures, described in Annex III for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project. The measures described in Annex-III are subjected to the approval of the Government of Nepal.

6. Schedule of the Study

- (1) The team will proceed to further studies in Nepal until 6th March, 1992.
- (2) JICA will complete the final report and send it to the Government of Nepal by the end of July, 1992

T.N.

RCY



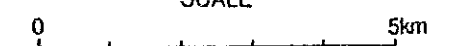
APPENDIX 1-4 (4/7)



LEGEND

- 132KV LINE
- 66KV LINE
- 11KV LINE
- 132KV LINE (PLANNED BY 1995)
- 66KV LINE (PLANNED BY 1995)
- Motorable roads
- Jeepable roads
- Farmac thoroughfare
- Roads under construction
- Canals
- Mangroves/lowlands
- E.g. swamps, flood plain
- Railway
- Pipelines with system
- Water ways
- Dikes, embankment, barrages
- 200 m - 456 m
- 40 m - 131 m Contour
- 20 m - 65 m
- Scarps, terraces
- Woodland

SCALE



T.N

[Signature]

KATHMANDU VALLEY

ANNEX II

MAINTENANCE TOOLS AND EQUIPMENT

Item	Q'ty
(a) Maintenance Tools	
(a-1) Hydraulic Compressor	3 sets
(a-2) Chain Block (5-ton)	5 nos
(a-3) Lever Block (1-ton)	5 nos
(a-4) Hand Winch (1-ton)	5 sets
(a-5) Snatch Block (100 mm)	10 nos
(a-6) Wire Tensioner (1.5-ton)	15 nos
(b) Vehicles	
(b-1) 4-WD Working Truck	2 units
(b-2) Pick-up Truck (3-ton)	2 units
(b-3) Light Maintenance Vehicle	2 units
(c) Communication Equipment	
(c-1) VHF Transmitter & Radio	25 sets
(c-2) VHF Antenna & Poles	5 sets
(d) Measuring Equipment	
(d-1) Megger	15 nos
(d-2) Earth Tester	10 nos
(d-3) Clamp Tester	10 nos
(d-4) Phase Tester	10 nos
(d-5) Voltage Detector	10 nos
(d-6) Cable Fault Locator	1 set

T. W

PCY

ANNEX III

UNDERTAKING BY THE GOVERNMENT OF NEPAL

Necessary measures to be taken by both the Government of Nepal and the Nepal Electricity Authority are as described below, in case Japan's Grant Aid is executed.

(A) Undertaking by the Government of Nepal

- (a- 1) To bear the following commission to the Japanese foreign exchange bank for the banking service based on the Banking Application.
 - (1) Advising commission of Authorization to Pay
 - (2) Payment commission
- (a- 2) To assist in clearance of the equipment and materials in India.
- (a- 3) To obtain necessary permits for import into Nepal and bear the license fee such permits.
- (a- 4) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.
- (a- 5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the contract.
- (a- 6) To bear all the expenses other than those to be borne by the Grant necessary for construction of the facilities as well as for the transportation and installation of the equipment.

(B) Undertaking by the Nepal Electricity Authority

- (b- 1) To secure ^{the right of way} ~~a lot of land~~ for the Project. *Edc*
- (b- 2) To clear, level, and reclaim the site when needed.
- (b- 3) To construct access roads to the sites when needed.
- (b- 4) To get permission from the other authorities concerned for the construction work when needed.
- (b- 5) To provide the facilities for city water distribution to the site when needed.
- (b- 6) To assist in clearance of the equipment and materials in India.
- (b- 7) To obtain necessary permits for import into Nepal and bear the license fee such permits.

7.N

Edc

- (b- 8) To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.
- (b- 9) To bear all the expenses other than those to be borne by the Grant necessary for construction of the facilities as well as for the transportation and installation of the equipment.
- (b-10) To construct service wire connection to the consumers.
- (b-11) To coordinate with the inhabitants living in the Project areas on matters which may arise during the implementation of the Project.
- (b-12) To take necessary power shutdown according to the construction schedule.

7.N

see

BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION
AND
DISTRIBUTION SYSTEM IN KATHMANDU VALLEY

MINUTES OF MEETING
ON
TECHNICAL MATTERS

In addition to the Minutes of Discussion which have been concluded through a series of discussion between the officials of NEA (hereinafter called as NEA) and a JICA Basic Design Study Team (hereinafter called as the Team) headed by Mr. T. Nagasima of JICA, and duly signed on February 11th of 1992, the following technical matters have also been discussed as a result of further field survey, technical analyses and studies, and mutually confirmed by both the parties.

1) Royal Palace

In order to establish continuous stable power supply to the Royal Palace in future, the following design modification have been discussed and mutually confirmed through a series of discussion and joint inspection /survey in the Royal Palace.

- a) The originally planned 11 kV underground cables between the Lainchaur substation and K2 switching station will be drawn in to the Royal Palace switching station in order to avoid outage of power supply to the Royal Palace due to recurring trouble in the existing underground cables which were constructed about 25 years ago.
- b) For making clear the maintenance/operation section by NEA and to minimize the power supply interruption to the Royal Palace during the construction, NEA has an intention to construct a new switching building near the existing diesel house inside the Royal Palace
- c) As a result of the above modification, two alternative 11 kV underground cable routes are considered as shown in Figure-1 and -2 attached here to.

REP



- d) In addition to the above design modification, replacement of the existing 11/0.4-0.23 kV transformers (2x1000 kVA) and low tension distribution panel has been requested by NEA. These existing equipment were also installed about 25 years ago.
 - e) In case that a new switching station will be constructed, scope of works for the Royal Palace switching station will be as given in Table - 1 attached hereto.
 - f) Cable route in the Royal Palace will be decided as soon as possible consulting with officials of the Royal Palace and inform to the Team by the end of March, 1992 at the latest.
 - g) If a new switching station building is constructed, detail design of the building and its construction will be done by NEA on the basis of general layout plan to be prepared by the Team.
- 2) 11kV Underground Cables between Lainchaur Substation and K2 Switching Station
- a) In order to minimize traffic obstruction during erection works, the original cable route will be changed as given in Figure-3.
 - b) NEA is requested to make a plain table survey (scale :1/500) of the revised cable route including the route in the Royal Palace and to send the results of survey to the Team by the end of May, 1992.
- 3) Underground Cable Erection on Road
- a) Prior application with drawings(s) for cable laying will be required to be submitted by the contractor for each section one month in advance.
 - b) Excavation, back-filling and compacting works shall be done by the contractor , but the finishing works including paving and asphaltting of road where necessary will be done by the Road Department at prevailing cost borne by the contractor.
- (4) Outage of Power Supply to the Customers during Erection of Distribution Line
- (a) The contractor is required to provide necessary information such as area, date, time, etc. on each distribution erection section at least 10 days prior to the erection work.

(b) NEA will announce the customers through newspaper(s) in accordance with the contractor's prior application.

(5) Dismantling of the Existing Distribution Lines

The existing distribution line only on the route of planned lines to be upgraded or newly constructed will be dismantled by the contractor, but other parts of the existing line which will not be necessary after erection will be dismantled by NEA.

(6) Conductors for Overhead Lines

Hard aluminum conductors (HAl) will be used for the all planned distribution lines. HAl conductors for 11kV lines will be half-insulated and full -insulated for low tension ones in order to eliminate earth and short-circuit faults. Necessary materials and tools for connecting with existing lines will also be supplied under the Project.

(7) Distribution Transformers

Three kinds of unit capacity, i.e. 50 kVA, 100 kVA and 200 kVA, will be considered for the Project.

(8) Service Wire Connection

(a) According to the Minutes of Discussion signed on February 11th, 1992 (Annex III, b-10), reconnection of all service wires to be dismantled by the contractor during erection will be done by NEA's counterpart staff.

(b) Necessary materials and tools for connecting service wires to the newly installed full-insulated low tension lines will be supplied under the Project.

(9) Stock Yard

(a) Stock yard for imported materials and equipment having enough space more than 3,000 sq.m will be provided by the Government of Nepal/NEA taking into account accessibility of heavy truck to the yard for the contractor.

(b) Among areas jointly inspected on February 28th, 1992, Koteswar site near airport is the most preferable as stock yard for the Project.

REMP



(c) Stock yard(s) for the dismantled distribution line materials is also required to be provided by NEA.

(10) Addition of 11 kV Underground Cables between Lainchaur Substation and K2 Switching Station .

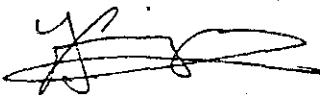
(a) NEA requested to install two circuits of 11kV underground cables having power carrying capacity not less than that of existing ones instead of one circuit of cables (copper conductor, 325 sq.mm).

(b) The Team will reply NEA on this matter after consulting with JICA, Tokyo.

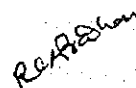
(11) Priority of Sub-project and Scope of Works

As explained in the Inception Report, the final components of the Project will be decided by the GOJ after studying the results of the Basic Design Study.

(12) NEA will take necessary measures described in this minutes of meeting for smooth implementation of the Project. The measures are subjected to the approval of the Government of Nepal.



Mr. Y. Miyagawa
Team Leader
JICA Study Team



Mr. R.C.L. Pradhan
Director-in Chief
Distribution and Consumer
Service Directorate

March 5th, 1992

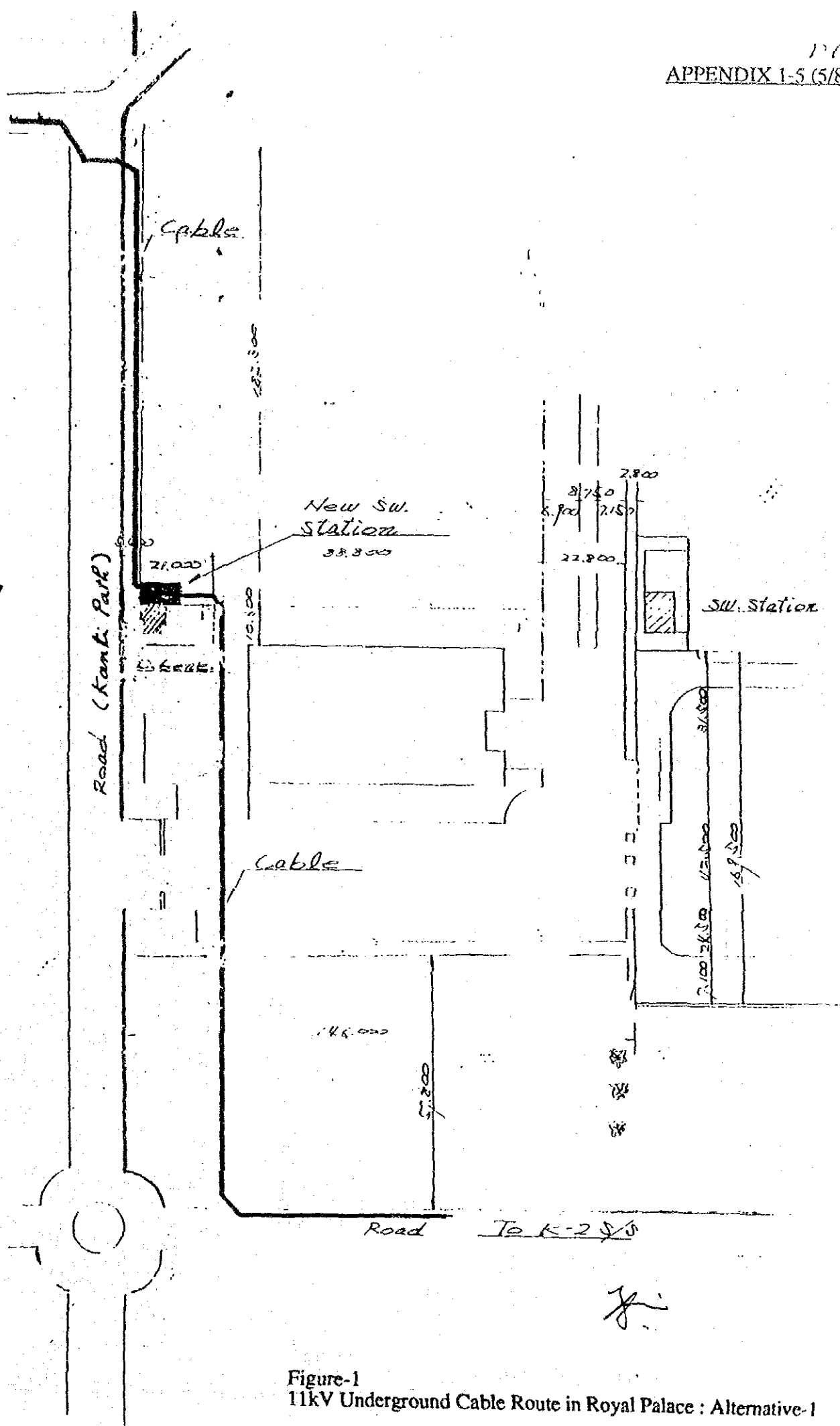


Figure-1
11kV Underground Cable Route in Royal Palace : Alternative-1

Ref

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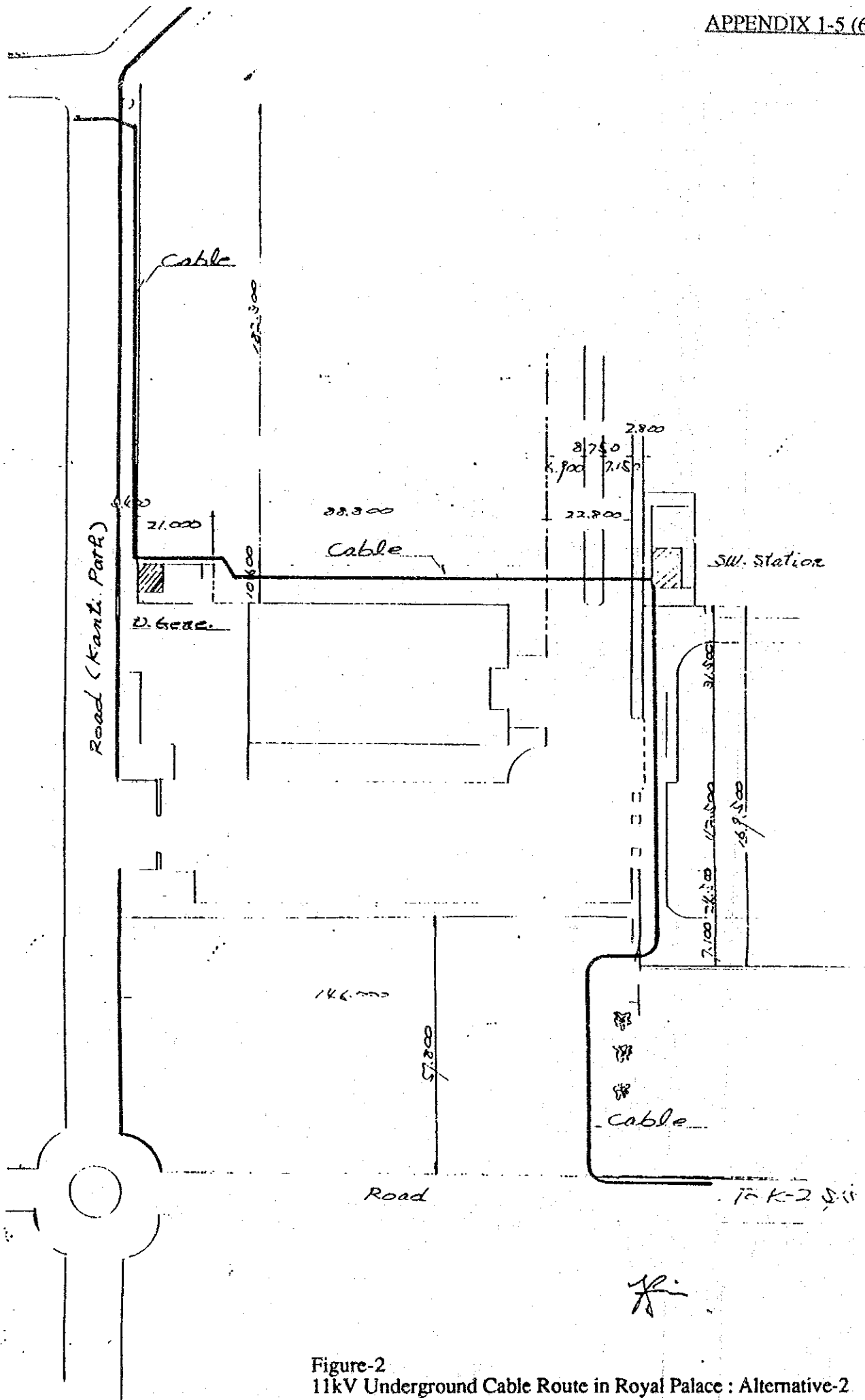


Figure-2
11kV Underground Cable Route in Royal Palace : Alternative-2

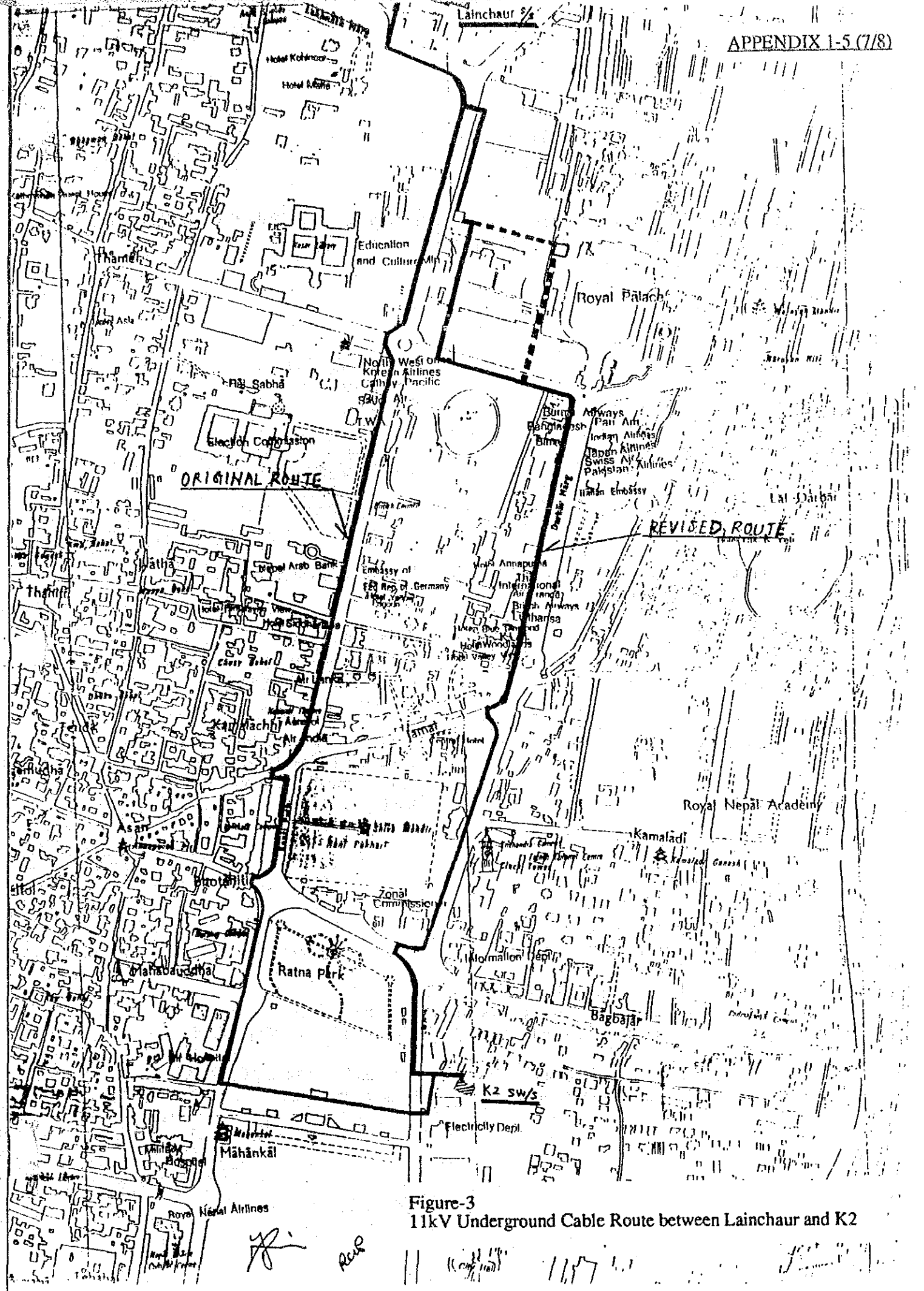


Figure-3
11kV Underground Cable Route between Lainchaur and K2

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(10/11/77)

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KTM-BD-1X

Table-1 Scope of Works for Modification of Royal Palace

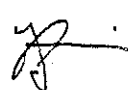
In case that a new switching station will be constructed in the Royal Palace, equipment and materials to be provided under the Project are as follows:

1) 11kV switchgear panels	2 x incoming line 2 x transformer 2 x feeder
2) Low tension and DC source	1 x battery & charger 1 x LT cubicle
3) 11/0.4-0.23kV transformer	2 x 1000kVA
4) 11kV underground cable (Ring Main)	Drawn into Palace
5) 11kV UGC for feeder	a) Connection with main transformers b) 300m UGC for feeder lines
6) Low tension UGC	For connection with low tension cubicles and existing low tension distribution cables

(Notes)

- (1) The following are supply only.
 - a) Low tension cubicles to be installed inside the existing Royal Palace switching station
 - b) 11kV UGC for feeder lines
 - c) Low tension UGC for interconnection between main transformers and low tension cubicles which will be installed in the existing switching station.
- (2) Building for new switching station will be designed and constructed by NEA. However, general layout of the station will be made by the Team.

RUP



JICA