CHAPTER 6

EFFECT OF THE PROJECT AND CONCLUSION

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The reinforcement of 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 nation 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.

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.

The problems observed at present and expected in the future are shown in Table 6.1 together with the effect of their improvement plans.

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 the distribution lines in Kathmandu area will have a large effect on the country. Moreover, the completion of the project will bring significant benefit to the resident 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 the previous three transmission and distribution line projects in the 1980s, and financial capacity will be great help in making the Project successful.

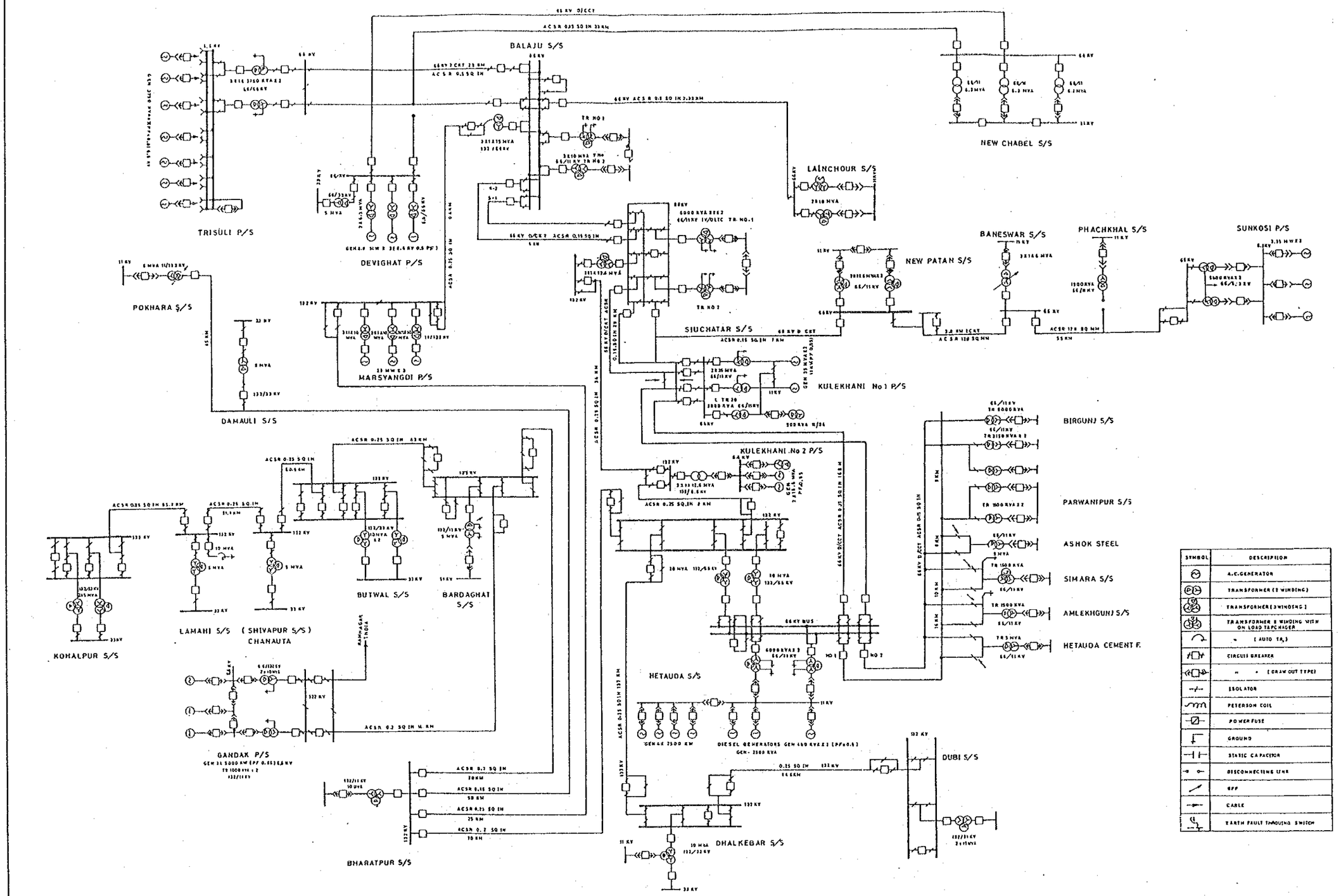
In addition, to secure the safety and proper operation of the power distribution system, it is recommended to make the frequent inspection of the distribution lines and the following maintenance works periodically.

- Restoration and reinforcement of the inclined distribution line poles with stay wires, for maintaining the specified clearance and tension of the conductors.
- Adjustment of the sag of conductors, for maintaining the specified clearance and tension of the conductors.
- Adoption of the service wires of adequate size against the consumers' power demand, for improvement of the voltage regulation at the consumers' end and reduction of the energy losses of the distribution network.
- Exclusion of the illegal use of electricity from the low-tension lines, for reduction of the energy losses of the distribution network.
- Adoption of the adequate connectors for connection of the service wires, for improvement of the voltage regulation at the consumers' end and reduction of the energy losses of the distribution network.
- Cutting and trimming the trees dangerous to the distribution lines.
- Replacement of the damaged insulators for lines conductors and stay wires.
- Restoration of the slackening stay wires.

Table 6.1 Present Problems in Power Distribution System and Effects by Implementation of The Project

	FACILITIES TO BE IMPROVED	PROBLEMS	EFFECTS BY IMPLEMENTATION
(1)	Additional Transformer in Siuchatar Substation	a) The load on the existing 37.8MVA main transformer rises to 190% of the rated capacity in fault condition of 132kV transmission lines during 1995/96.	a) An additional 37.8MVA main transformer is to be installed so as to reduce the load on the transformer to 95% during the fault condition of 132kV lines. The reliability of the distribution system will be dramatically improved.
(2)	Upgrading Maharajgunj Switching Station	a) Only 2 nos. of the existing feeders from Maharajgunj switching station feed the power to the northern part of Kathmandu, where there are important consumers such as a hospital. Each one of the two feeders feeds 2.4 thousand consumers. For this reason, in case of maintenance work or line fault, the interruption affects the wide range of consumers.	a) Through replacing old switchgears and reinforcing equipment, nos. of feeders are to be increased up to 8 nos. by the Project so that the nos. of consumers per one feeder can be reduced to 8 hundred only. In addition, one feeder is to be allocated for the exclusive use of the hospital.
(3)	Improvement of 11kV Distribution Line System	a) Voltage drop and loss of power are considerable in the existing lines due to inadequately small sized conductors. Recent numerous increase of demand exceeds system capacity and also causes shortage of distribution transformers. The nos. of consumers covered by each existing feeder are too large to maintain the reliability of electrical supply.	a) Sizes of conductors are to be upgraded and nos. of feeders are to be increased, so that the voltage drop and loss of power are considerably decreased and the distribution system becomes reliable. Especially the problems of voltage drop for more than 34 thousand consumers can be eliminated by installing additional distribution transformers.
		b) Usage of bare conductors for the existing distribution lines causes frequent ground fault.	b) Insulated wires are to be applied so that the frequent ground fault (mainly contact between bare conductors and trees) can be eliminated.
(4)	Supply of Maintenance Equipment for Distribution Lines	a) Shortage of maintenance equipment hinders adequate maintenance works.	a) Maintenance equipment is to be supplied so that satisfactory maintenance works can be performed.
(5)	Supply of Spare/Additional Distribution Equipment	b) Necessary protective devices such as sectionalizing switches and cutout switches are not installed on some part of the existing distribution system and this fact causes poor reliability of the system.	a) Spare/additional distribution equipment is to be supplied so that the reliability of the existing system can be improved by installing the supplied equipment. The nos. of consumers to be affected during line fault will be minimized.

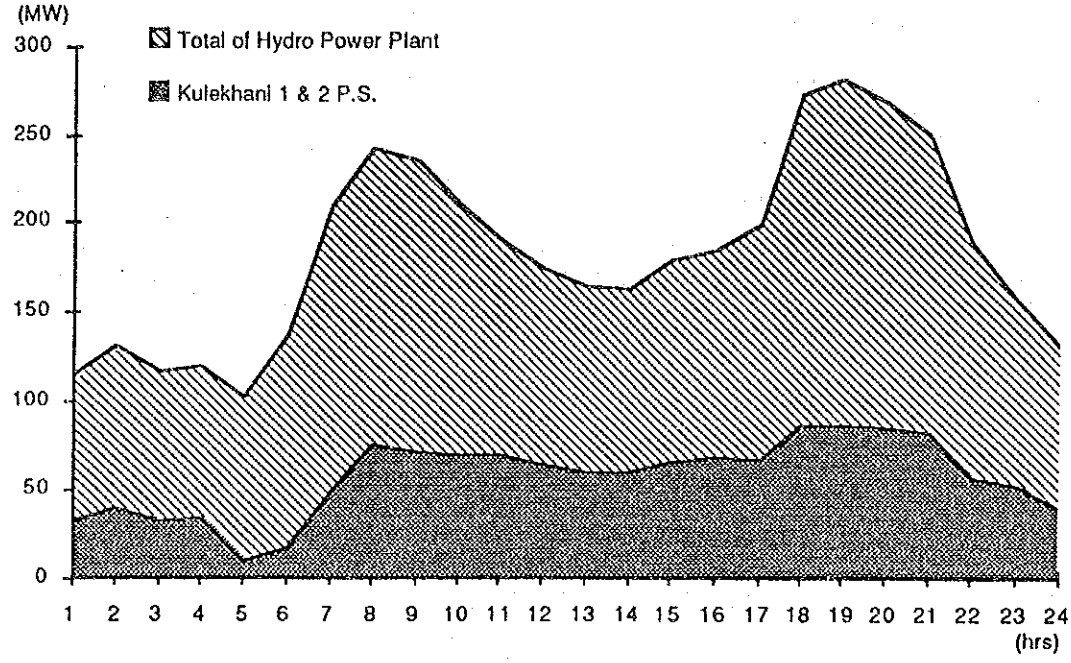
FIGURES



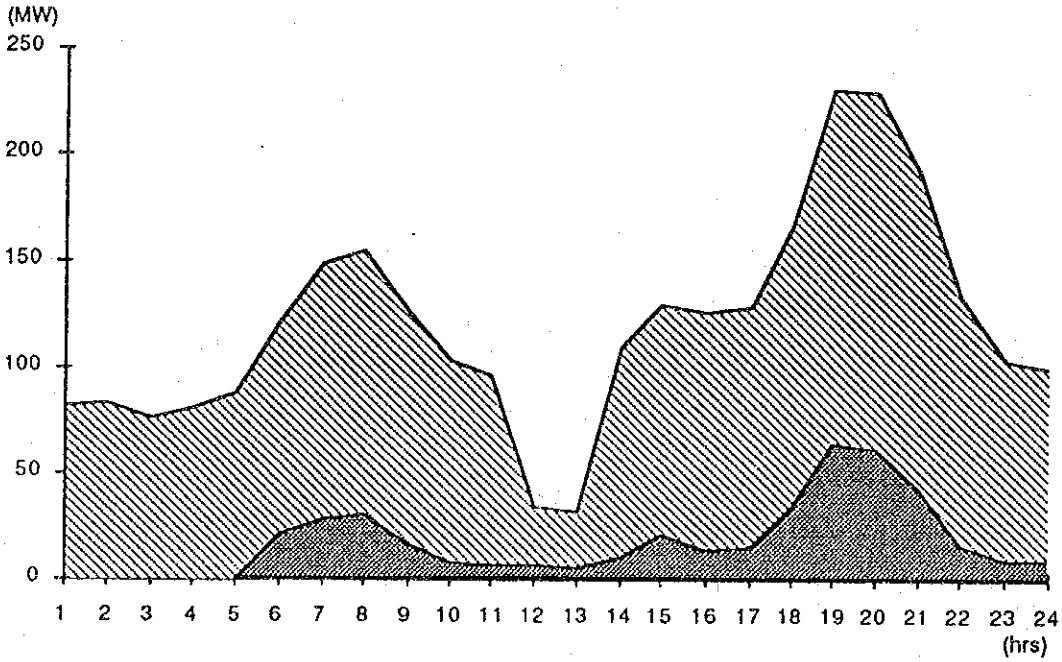
SYMBOL	DESCRIPTION
	A.C. GENERATOR
	TRANSFORMER (2 WINDING)
	TRANSFORMER (3 WINDING)
	TRANSFORMER 2 WINDING WITH ON LOAD TAP CHANGER
	(AUTO TR.)
	CIRCUIT BREAKER
	(DRAW OUT TYPE)
	ISOLATOR
	PETERSON COIL
	POWER FUSE
	GROUND
	STATIC CAPACITOR
	DISCONNECTING LINK
	BPP
	CABLE
	EARTH FAULT THROWING SWITCH

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY / JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE: Fig. 2.1 Power System Diagram of Central Nepal Power System

Daily Load Curve in 1991

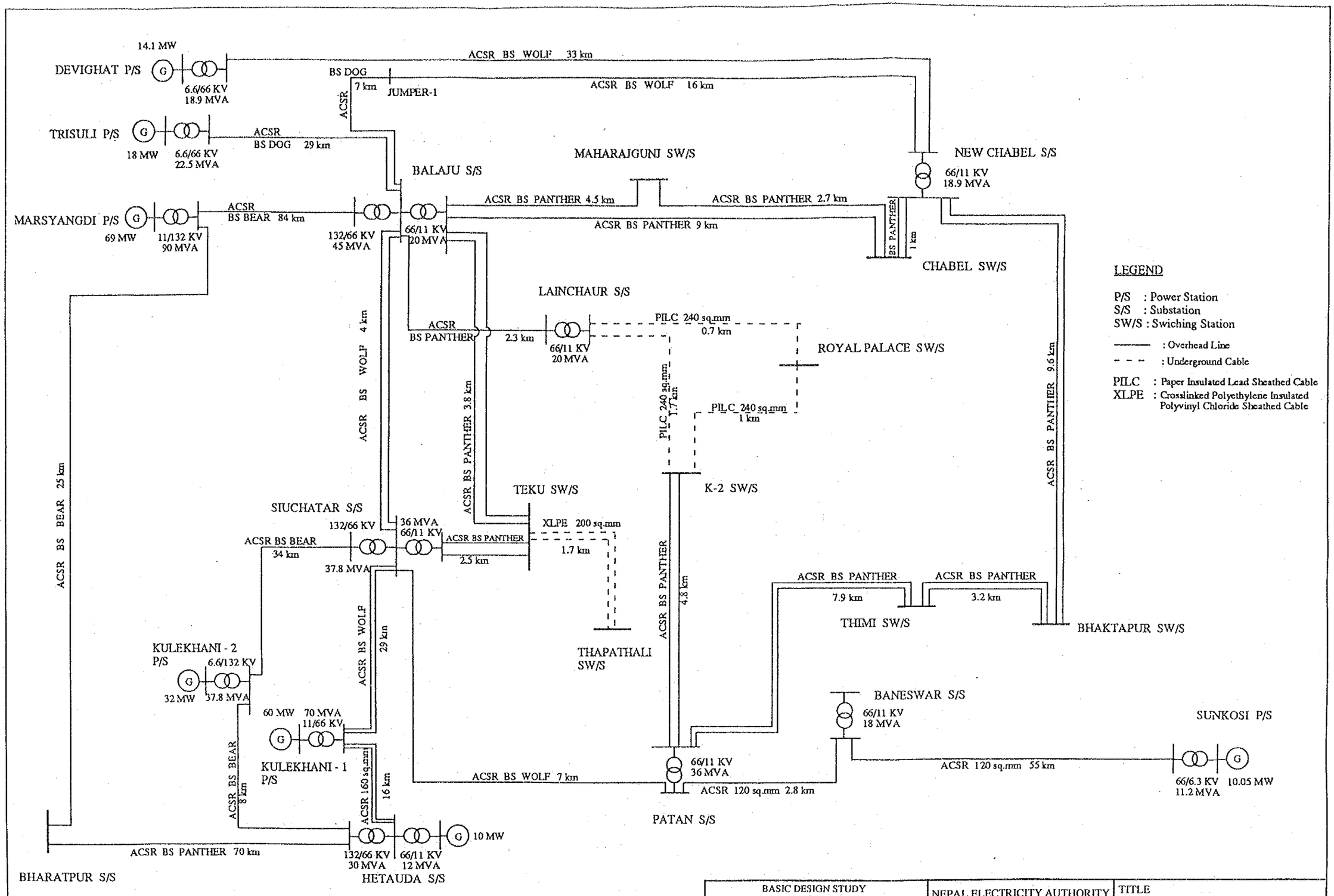


January 1991



August 1991

Fig. 2.2
Daily Load Curve



BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 3.1 Single Line Diagram of Existing Transmission and Distribution System

BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF THE
POWER TRANSMISSION AND DISTRIBUTION
SYSTEM IN THE KATHMANDU VALLEY (Phase II)

NEPAL ELECTRICITY AUTHORITY

JAPAN INTERNATIONAL
COOPERATION AGENCY

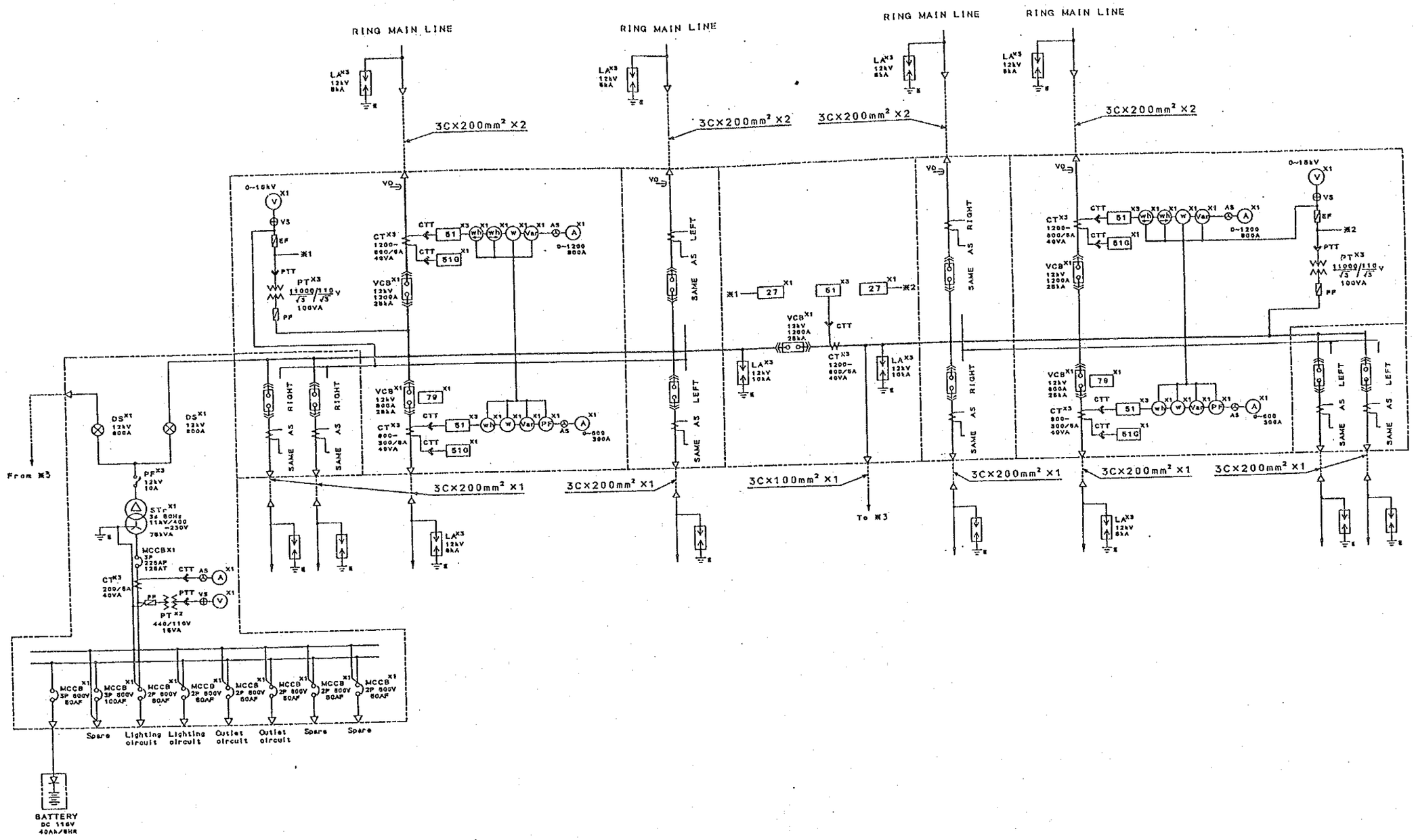
TITLE

Figure 4.1
Outline of The Project

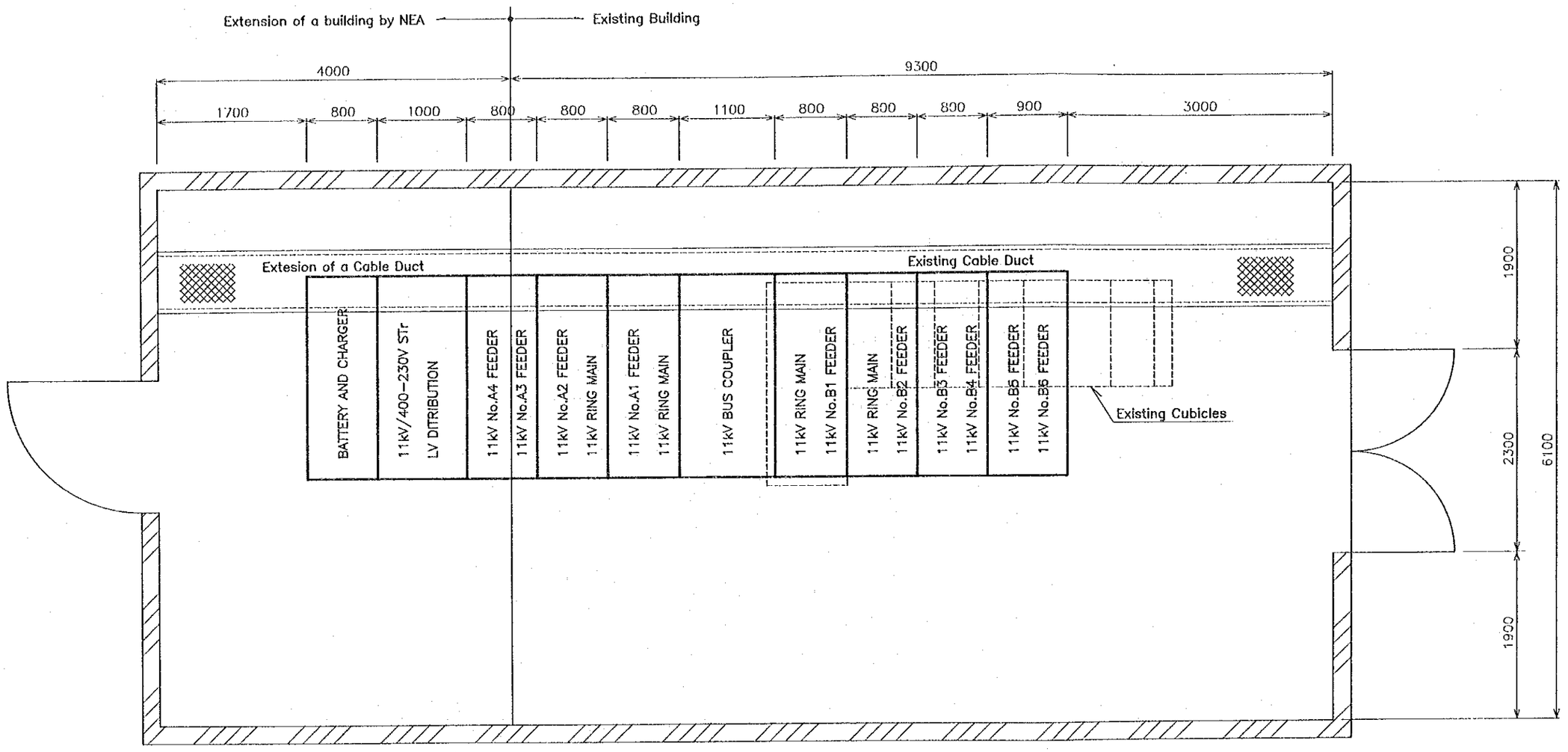
Budhanilkanta-1 F
Budhanilkanta-2 F
Ring Road-1 F
Chabel F
MAHARAJGANJ SS
Kanti Hasp F
Ring Road-2 F
CHABEL SS
BALAJU POLICE
BARAJU SS
KAMATI
BIJESHWORI
OPLLU BAZAR
Tribuwan Airport
BALAJU SILENDOI
NCCN GATE
Kamladi Feeder
MAHABAUDDHA SS
KE SS
Manabauddha Feeder
Dhobighat F
New Airport F
Baneswor F
MINT SS
BAHITI
CHHAUNI BYPAS
SOALTEE (NORTH)
BANESWAR SS
BAPHAL
THAPATHALI SS
Patsi Gnand Hospital
SOALTEE (HIMALAYAH.T)
RAVIBHAWAN
Papsi Cola F
KALANKI
SANEPA
KALANKI
Pulchok
BALKHU
MANGAL BAZAL
BALKUMARI
DHOBIGHATI
Imadol-1
Imadol-2
DHOBIGHATI-1
DHOBIGHATI-2
BHAJANGAL
PATAN S/S
NAYA BASTI

LEGEND

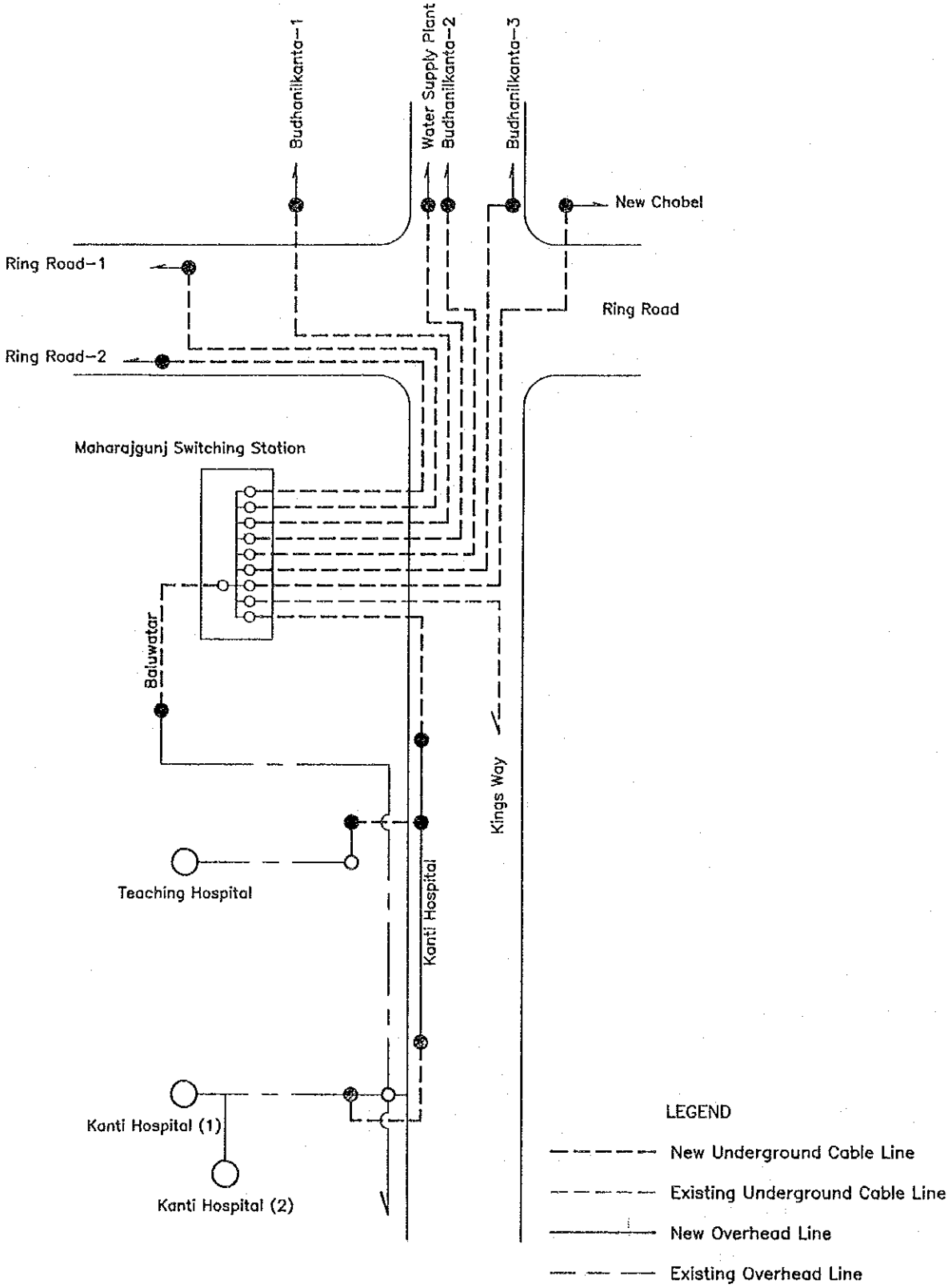
- OVERHEAD LINE
- UNDERGROUND CABLE
- TRANSFORMER
- LINE SECTIONALIZING SWITCHE



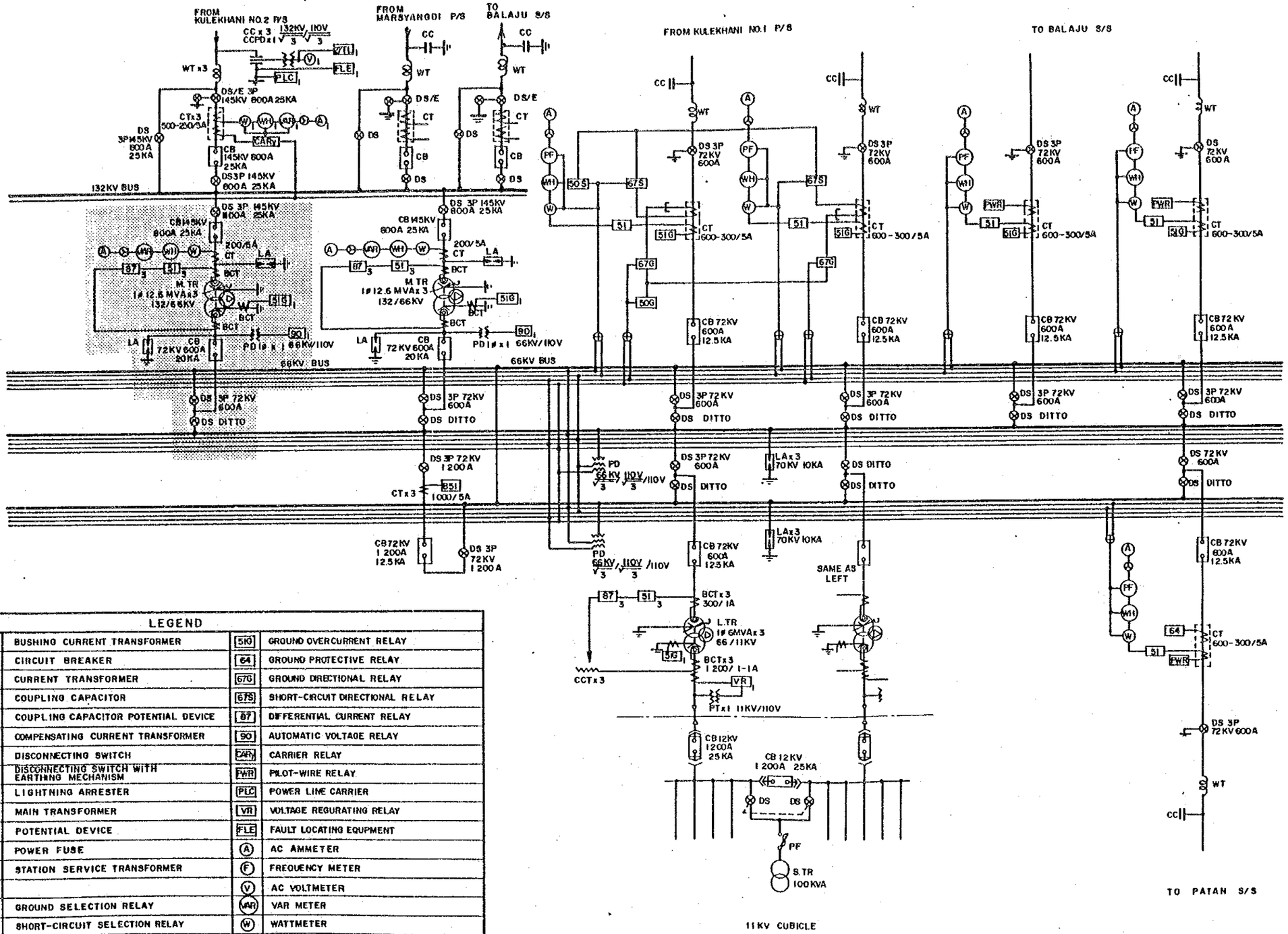
BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.1 Single Line Diagram Maharjgunj Switching Station



BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF THE POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN THE KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 5.2 General Arrangement of the Maharjgunj Switching Station



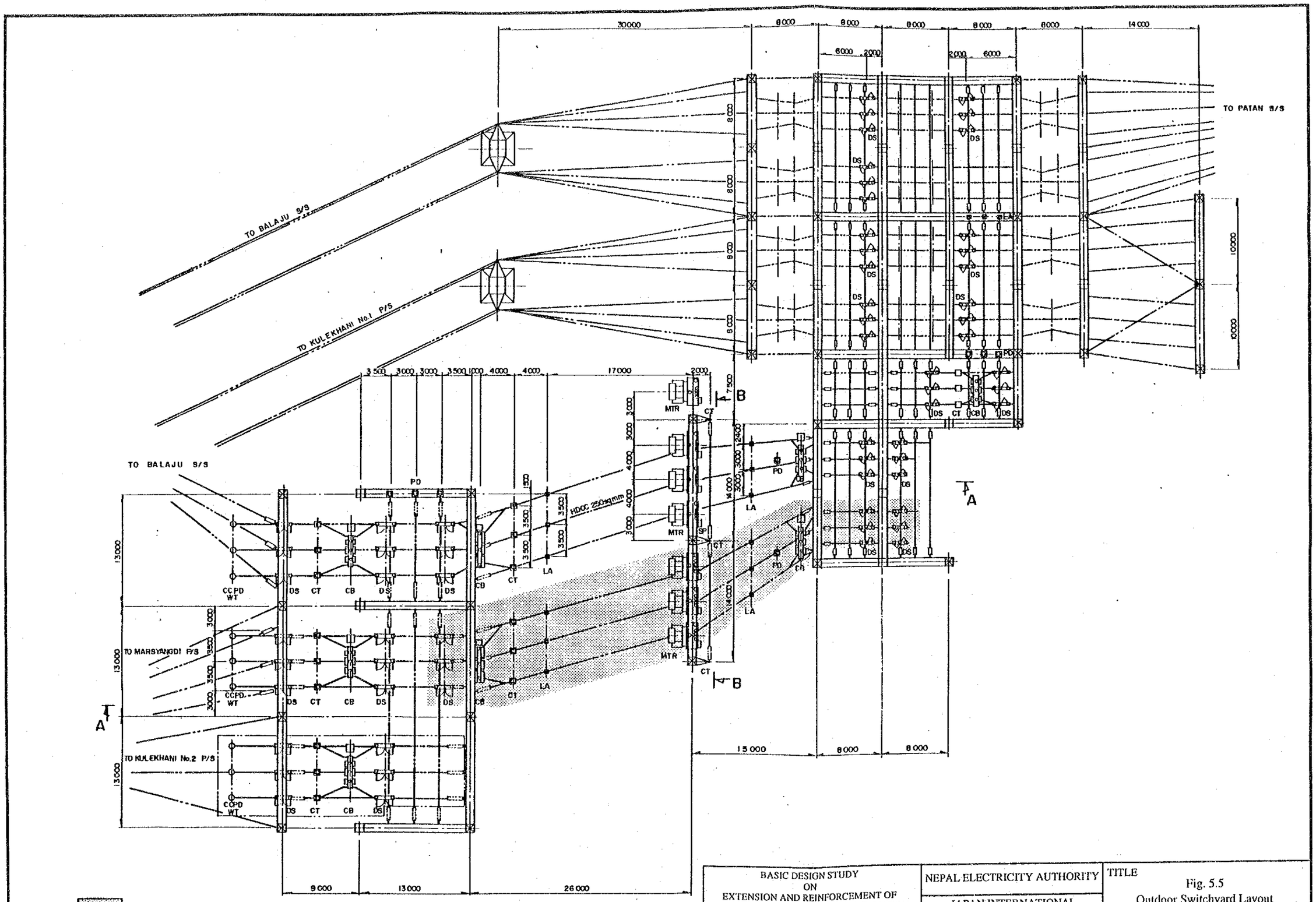
BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.3 Layout of New Distribution Network Maharajgunj S/S



LEGEND			
BCT	BUSHING CURRENT TRANSFORMER	51G	GROUND OVERCURRENT RELAY
CB	CIRCUIT BREAKER	64	GROUND PROTECTIVE RELAY
CT	CURRENT TRANSFORMER	67G	GROUND DIRECTIONAL RELAY
CC	COUPLING CAPACITOR	67S	SHORT-CIRCUIT DIRECTIONAL RELAY
CCPD	COUPLING CAPACITOR POTENTIAL DEVICE	87	DIFFERENTIAL CURRENT RELAY
CCT	COMPENSATING CURRENT TRANSFORMER	90	AUTOMATIC VOLTAGE RELAY
DS	DISCONNECTING SWITCH	CAR	CARRIER RELAY
DS/E	DISCONNECTING SWITCH WITH EARTHING MECHANISM	PWR	PILOT-WIRE RELAY
LA	LIGHTNING ARRESTER	PLC	POWER LINE CARRIER
MTR	MAIN TRANSFORMER	VR	VOLTAGE REGURATING RELAY
PD	POTENTIAL DEVICE	FLE	FAULT LOCATING EQUPMENT
PF	POWER FUSE	A	AC AMMETER
S.TR	STATION SERVICE TRANSFORMER	F	FREQUENCY METER
		V	AC VOLTMETER
50G	GROUND SELECTION RELAY	VAR	VAR METER
50S	SHORT-CIRCUIT SELECTION RELAY	W	WATTMETER
51	AC OVERCURRENT RELAY	WH	WATT HOUR METER

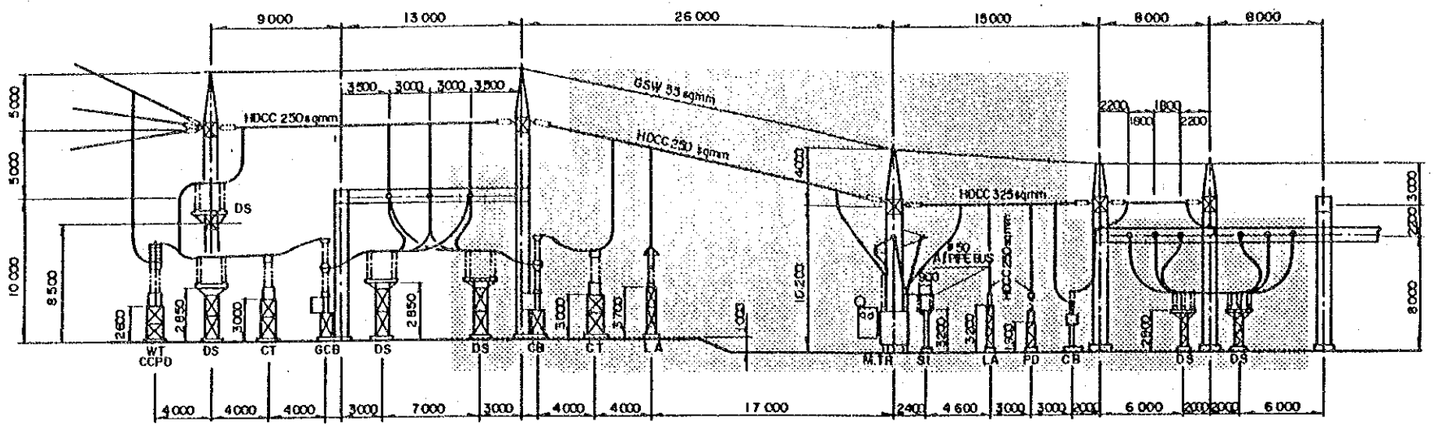
: Works under the Project

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE: Fig. 5.4 Single Line Diagram of Siuchatar S/S
	JAPAN INTERNATIONAL COOPERATION AGENCY	

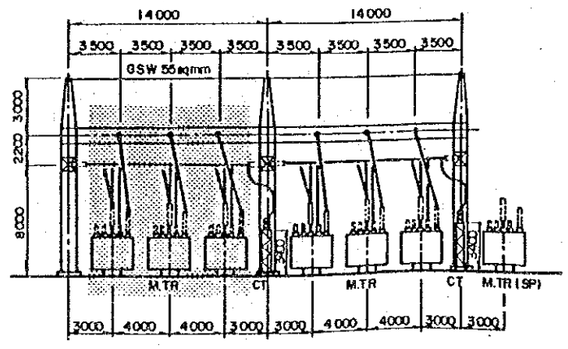


: Works under the Project

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.5 Outdoor Switchyard Layout of Siuchatar S/S (1)



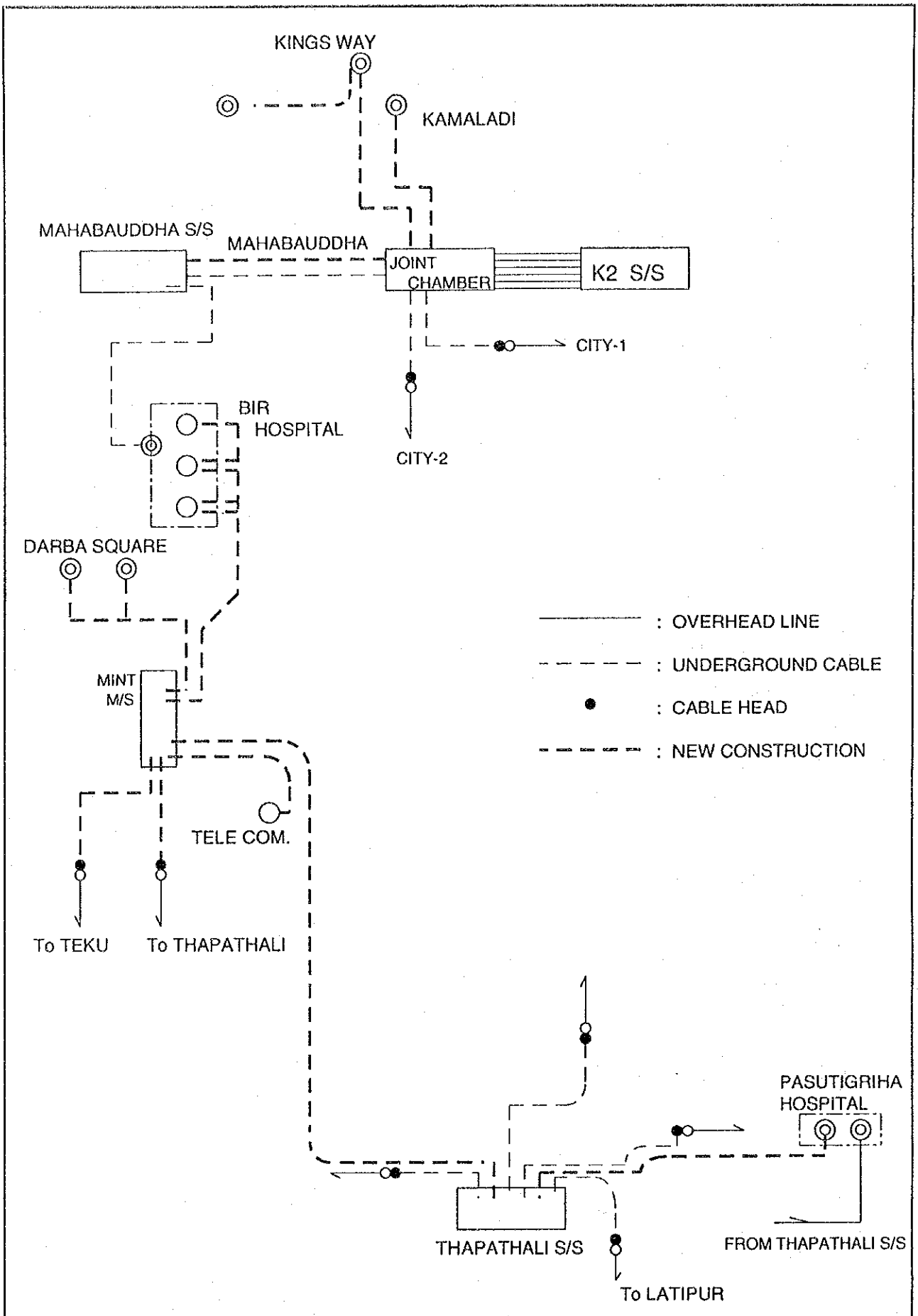
SECTION A – A



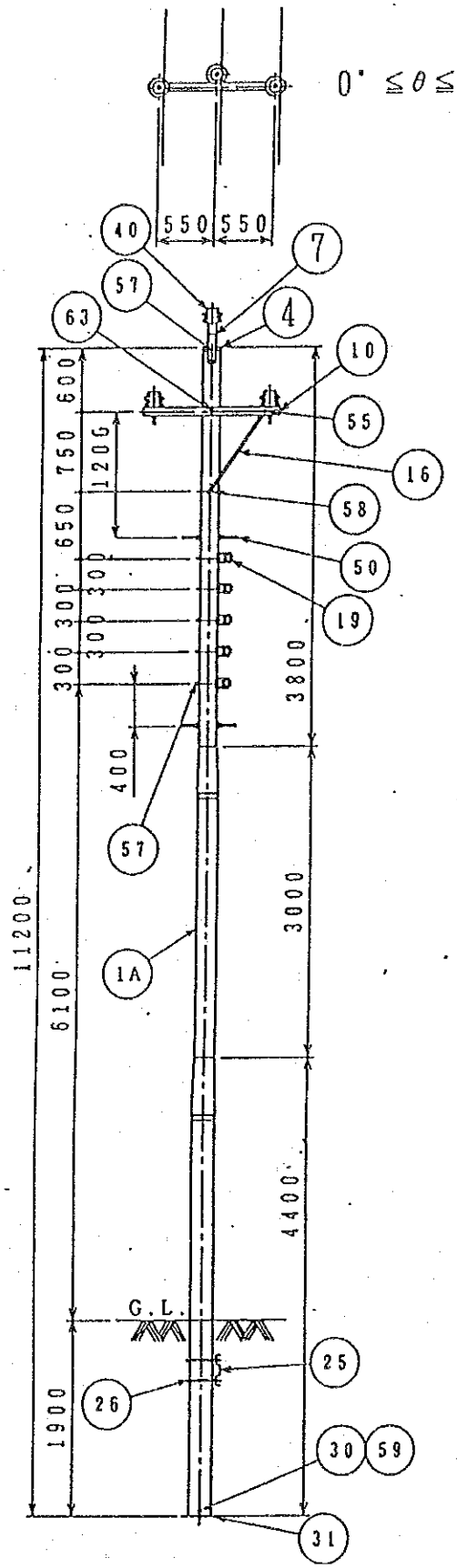
SECTION B – B

: Works under the Project

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.6 Outdoor Switchyard Layout of Siuchatar S/S (2)

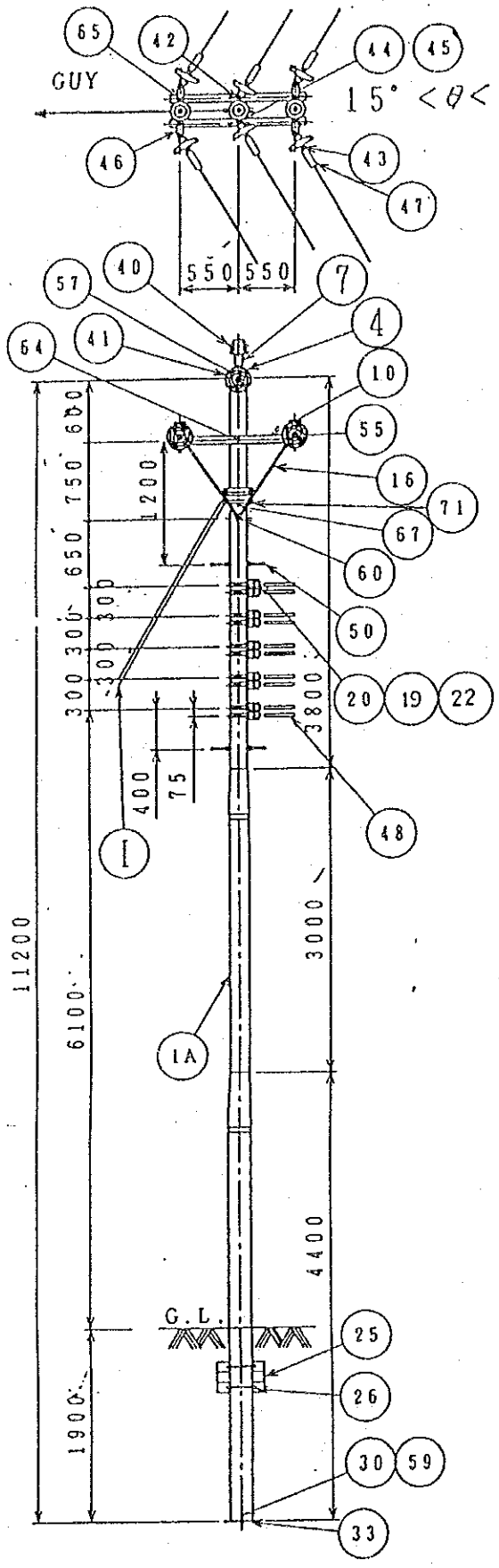


BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE
	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.7 KTM-Central Layout of Underground Network



1A	STEEL POLE (I) 11.2M	1
4	POLE CAP (I) 165.2	1
7	A-CLAMP	1
10	CROSSARM L=1300	1
16	BRACE (I) L=945	1
19	LV RACK SET	5
25	SUPPORT ANCHOR	1
26	U-BAND FOR S.A. (I)	2
30	EYE BOLT M16×76	1
31	BASE PLATE (I)	1
40	PIN INSULATOR	3
50	STEP BOLT	4
55	M12×120 (CROSSARM/BRACE)	1
57	M12×200 (A-CLAMP/P, LV RACK/P)	7
58	M12×220 (BRACE/P)	1
59	M12×240 (BASE PLATE/P)	1
63	M16×300 (CROSSARM/P)	1

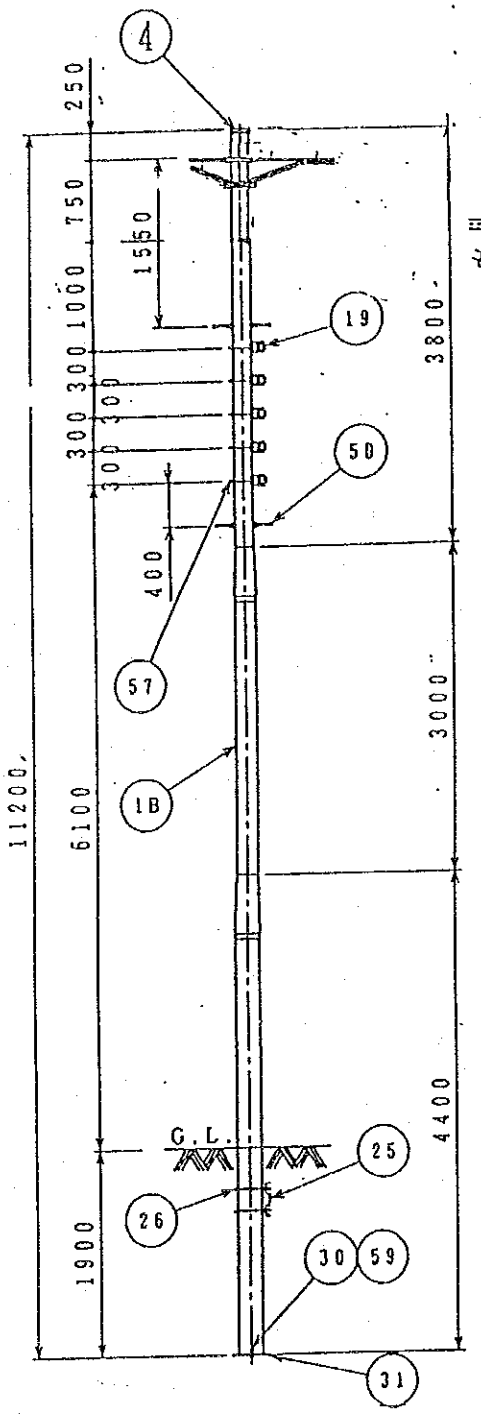
BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE
	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.8 11 kV Straight Type Pole

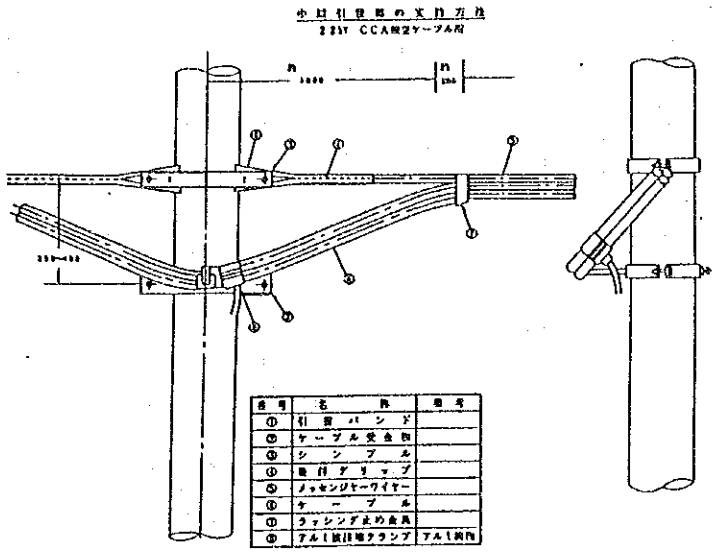


1A	STEEL POLE (I) 11.2M	1
4	POLE CAP (I) 165.2	1
7	A-CLAMP	1
10	CROSSARM L=1300	2
16	BRACE (I) L=945	4
19,20,22	LV RACK SET WITH BAND (I)	10
25	SUPPORT ANCHOR	1
26	U-BAND FOR S.A. (I)	2
30	EYE BOLT M16×76	1
33	BASE PLATE (3)	1
40	PIN INSULATOR	3
41	DISC INSULATOR	6
42	ANCHOR SHACKLE	6
43	CLEVIS EYE	6
44	EYE BOLT M12×200	1
45	EYE NUT M12	1
46	DOUBLE ARMING PLATE	2
47	CLAMP (1)	6
48	CLAMP (2)	10
50	STEP BOLT	4
55	M12×120 (CROSSARM/BRACE)	4
57	M12×200 (A-CLAMP/P)	1
59	M12×240 (BASE PLATE/P)	1
60	M12×260 (BRACE/P)	1
64	M16×360 (CROSSARM/P)	1
65	M20×120 (D.A.P./CROSSARM)	4
67	M20×200 (STAY BAND STOPPER)	1
71	STAY BAND (I)	2
I	STAY WIRE ASSEMBLY (I)	2SET
70	RECTANGULAR EYE	2
73	STAY WIRE (I)	
75	GUY ANCHOR NO.4	2
77	GRIP FOR THIM.(55sq.mm	4
79	GRIP FOR INSU.(55sq.mm	4
81	TURNBUCKLE 5/8	2
83	STAY INSULATOR (I)	2

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.9 11 kV Angle Type Pole

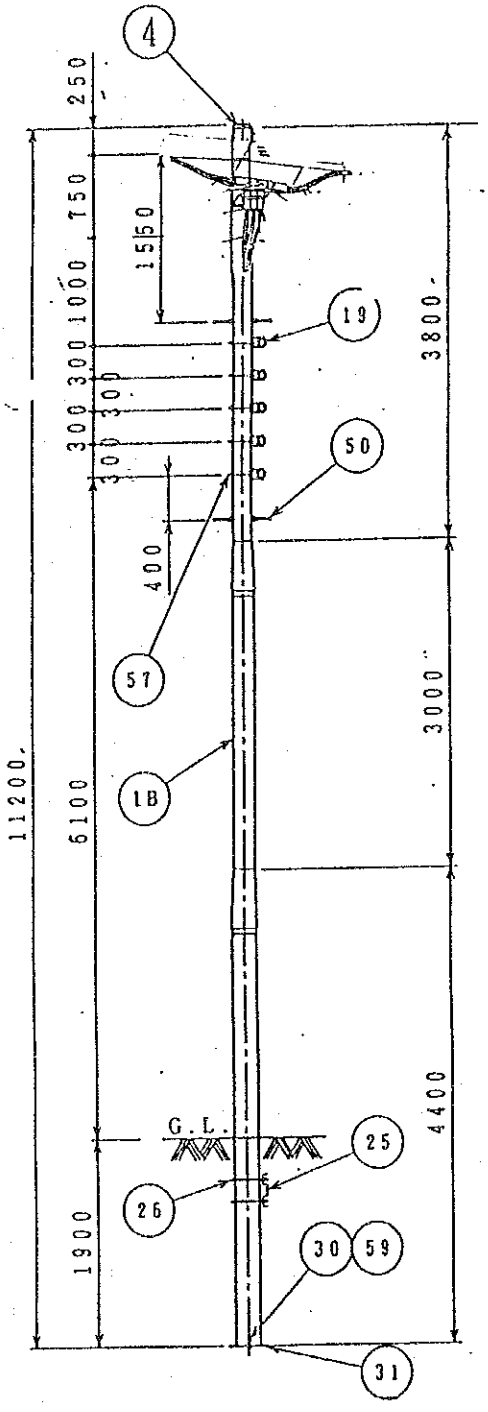
$0^\circ \leq \theta \leq 5^\circ$

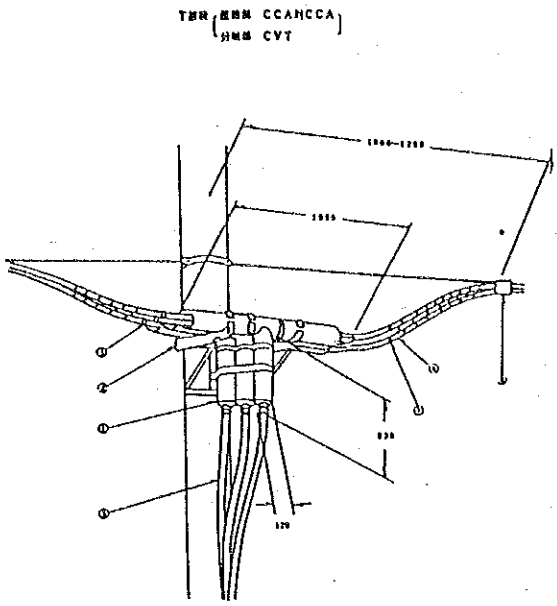




1B	STEEL POLE(2) 11.2M	1
4	POLE CAP (I) 165.2	1
19	LV RACK SET	5
25	SUPPORT ANCHOR	1
26	U-BAND FOR S.A. (I)	2
30	EYE BOLT M16×76	1
31	BASE PLATE (I)	1
50	STEP BOLT	4
57	M12×200 (LV RACK/P)	5
59	M12×240 (BASE PLATE/P)	1

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.10 11 kV ABC Cable Straight Type Pole



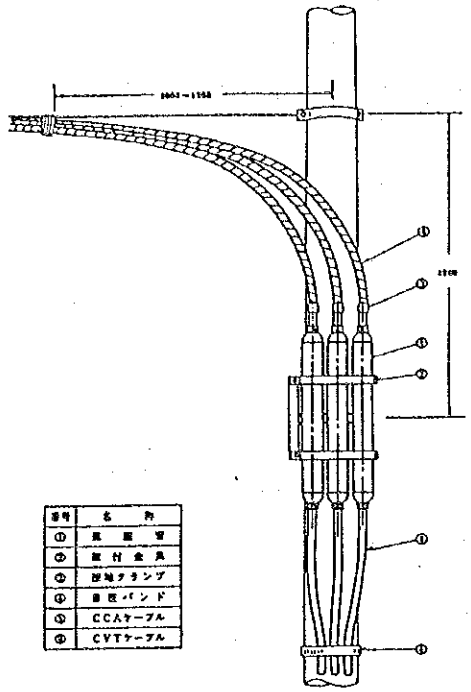


番号	名称
①	保護管
②	取付金具（ボルト付）
③	締付クランプ
④	CCAケーブル
⑤	CVTケーブル
⑥	ラッシング管の金具
⑦	絶縁被覆ら旋入テープ（中間）

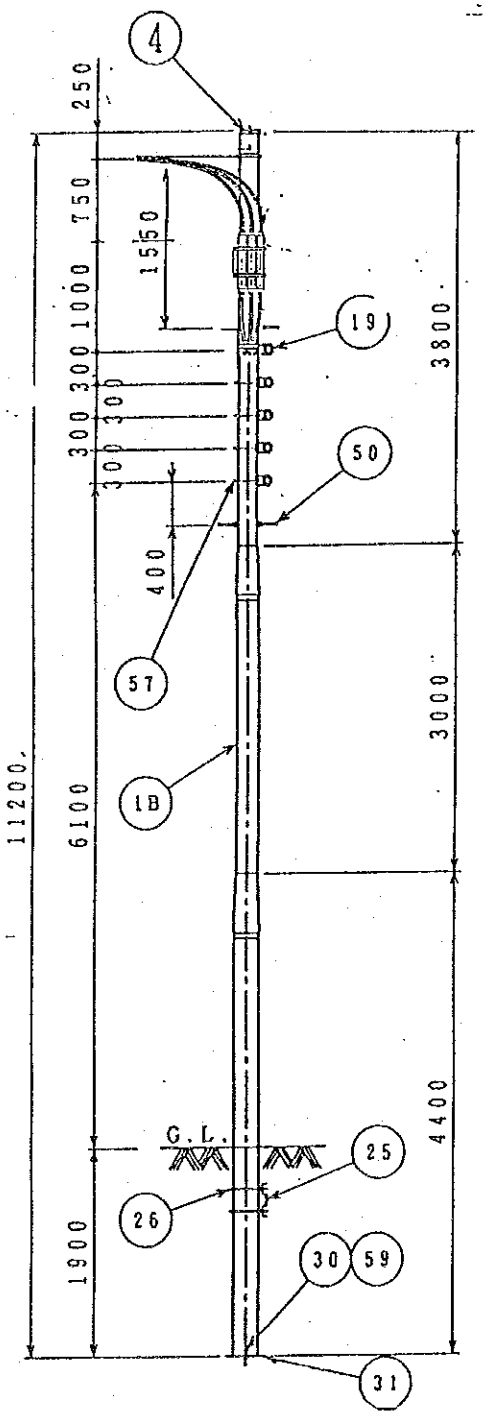
18	STEEL POLE(2) 11.2M	1
4	POLE CAP (I) 165.2	1
19	LV RACK SET	5
25	SUPPORT ANCHOR	1
26	U-BAND FOR S.A. (I)	2
30	EYE BOLT M16×76	1
31	BASE PLATE (I)	1
50	STEP BOLT	4
57	M12×200 (LV RACK/P)	5
59	M12×240 (BASE PLATE/P)	1

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Fig. 5.11 11 kV ABC Cable T-branch Type Pole

$0^\circ \leqq \theta \leqq 5^\circ$

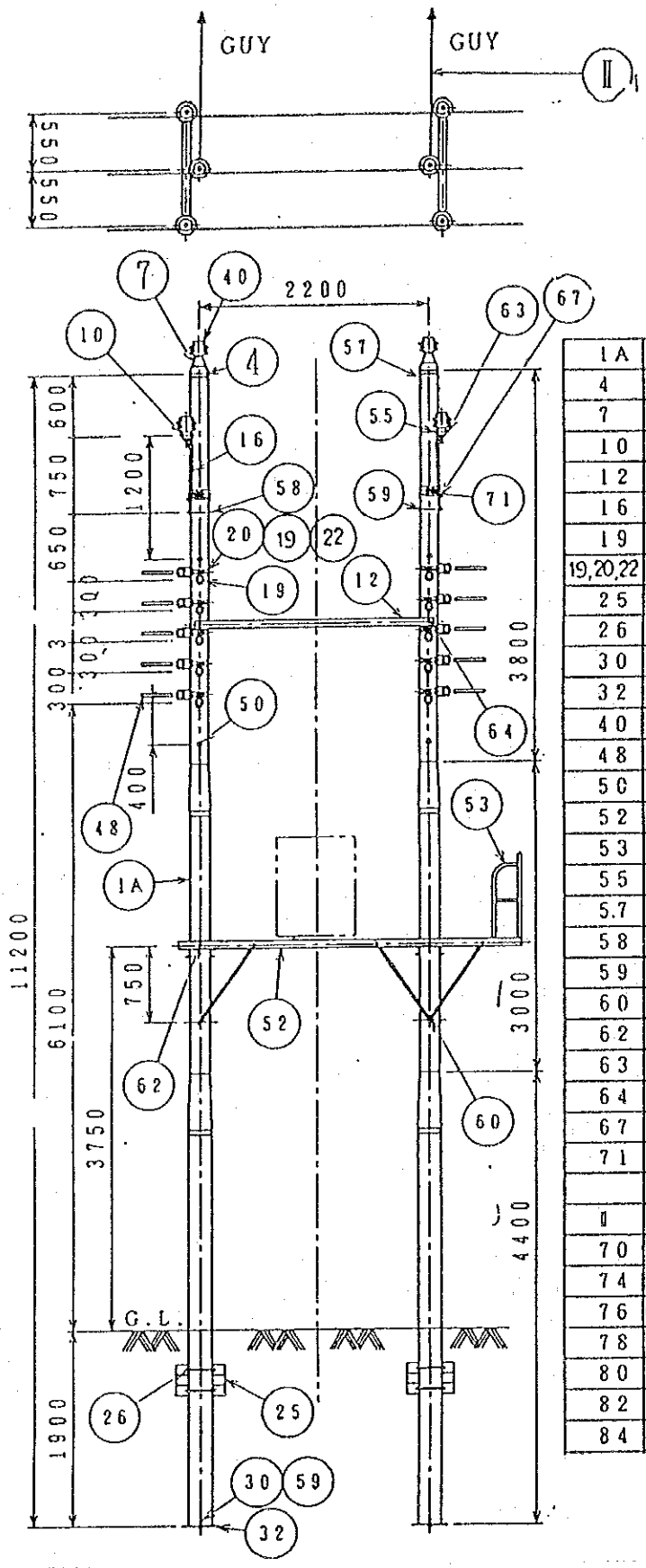


番号	名 称
①	高圧管
②	取付金具
③	引留クランプ
④	自在バンド
⑤	CCAケーブル
⑥	CVTケーブル



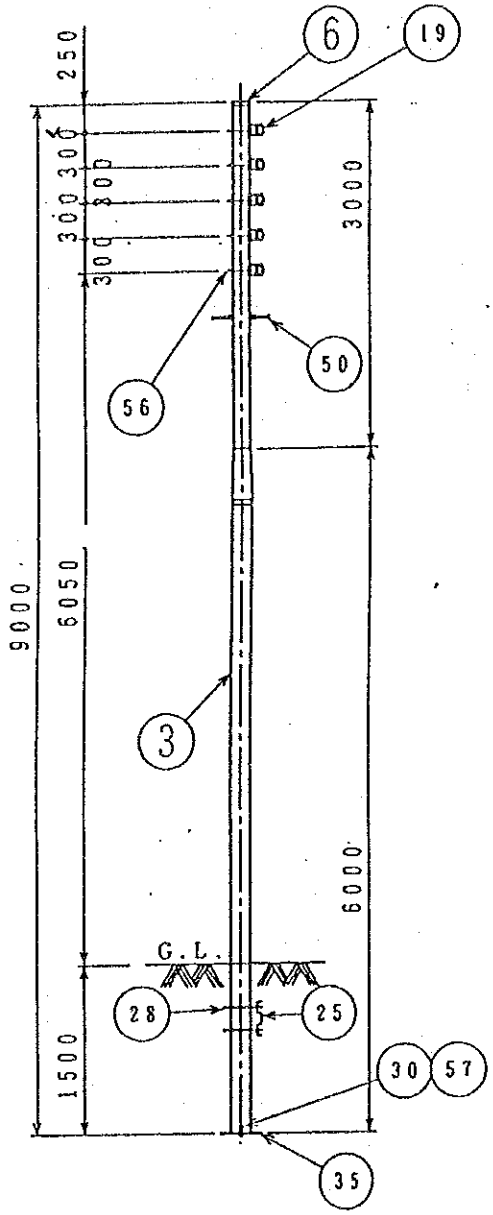
1B	STEEL POLE (2) 11.2M	1
4	POLE CAP (1) 165.2	1
19	LV RACK SET	5
25	SUPPORT ANCHOR	1
26	U-BAND FOR S.A. (1)	2
30	EYE BOLT M16×76	1
31	BASE PLATE (1)	1
50	STEP BOLT	4
57	M12×200 (LV RACK/P)	5
59	M12×240 (BASE PLATE/P)	1

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE Fig. 5.12 11 kV ABC Cable Standing Type Pole
	JAPAN INTERNATIONAL COOPERATION AGENCY	



1A	STEEL POLE (1) 11.2M	2
4	POLE CAP (1) 165.2	2
7	A-CLAMP	2
10	CROSSARM L=1300	2
12	CROSSARM L=2300	2
16	BRACE (1) L=915	8
19	LV RACK SET	10
19,20,22	LV RACK SET WITH BAND (1)	10
25	SUPPORT ANCHOR	2
26	U-BAND FOR S.A. (1)	4
30	EYE BOLT M16×76	2
32	BASE PLATE (2)	2
40	PIN INSULATOR	6
48	CLAMP (2)	20
50	STEP BOLT	8
52	T/R STRUCTURE	1SET
53	PLATFORM SET	1SET
55	M12×120 (CROSSARM/BRACE)	8
57	M12×200 (A-CLAMP/P, LV RACK/P)	14
58	M12×220 (BRACE/P)	2
59	M12×210 (BASE PLATE/P, BRACE/P)	3
60	M12×260 (BRACE/P)	1
62	M16×220 (T/R STRUCTURE/P)	2
63	M16×300 (CROSSARM/P)	2
64	M16×360 (CROSSARM/P)	2
67	M20×200 (STAY BAND STOPPER)	2
71	STAY BAND (1)	2
Ⅱ	STAY WIRE ASSEMBLY (2)	2SET
70	RECTANGULAR EYE	2
74	STAY WIRE (2)	
76	GUY ANCHOR NO.6	2
78	GRIP FOR THIM.55sq.mm	4
80	GRIP FOR INSU.55sq.mm	4
82	TURNBUCKLE 3/4	2
84	STAY INSULATOR (2)	2

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE
	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.13 Transformer Pole



$0^\circ \leqq \theta \leqq 5^\circ$

3	STEEL POLE (4) 9.0M	1
6	POLE CAP (3) 139.8	1
19	LV RACK SET	5
25	SUPPORT ANCHOR	1
28	U-BAND FOR S.A. (3)	2
30	EYE BOLT M16×76	1
35	BASE PLATE (5)	1
50	STEP BOLT	2
56	M12×180 (LV RACK/POLE)	5
57	M12×200 (BASE PLATE/POLE)	1

BASIC DESIGN STUDY ON EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEM IN KATHMANDU VALLEY (Phase II)	NEPAL ELECTRICITY AUTHORITY	TITLE
	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.14 L.T Type Pole

APPENDIX

MEMBER LIST OF STUDY TEAM

Hidetoshi ISHIOKA	Team Leader Japan International Cooperation Agency (JICA)
Yoshikazu SUNAGAWA	Project Planning Engineer Nippon Koei Co., Ltd.
Umeo HASEGAWA	Substation Planning Engineer Nippon Koei Co., Ltd.
Toshiyuki ARITA	Distribution System Planning Engineer Nippon Koei Co., Ltd.
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SCHEDULE OF SITE SURVEY

No.	Date	Movement	Accommodation	Activities
1	Nov. 19 (Fri)	Narita to Bangkok (Project Planning Engineer) (D/L Planning Engineer)	Bangkok	
2	20 (Sat)	Arrive in Kathmandu	Kathmandu	
3	21 (Sun)			Discussion with Distribution and consumers service Directorate, NEA
4	22 (Mon)			Meeting with JICA/KTM Arrival report to Japanese Embassey Discussion with Distribution and consumers service Directorate, NEA
5	23 (Tue)	Narita to Bangkok (S/S Engineer) (D/L System Engineer)	Bangkok	Site Survey
6	24 (Wed)	Arrive in Kathmandu	Kathmandu	Site Survey Arrival report to NEA Internal meeting
7	25 (Thu)			Technical site survey and studies
8	26 (Fri)			Technical site survey and studies
9	27 (Sat)			Review of collected data
10	28 (Sun)	Arrive in Kathmandu (Team Leader)	Kathmandu	Meeting with JICA/KTM Technical site survey and studies
11	29 (Mon)			Courtesy call on the Japanese Embassey, NEA and the Ministry of Water Resources Technical site survey and studies
12	30 (Tue)			Technical site survey and studies
13	Dec. 1 (Wed)			Discussion with Distribution and Consumer Service Directorate
14	2 (Thu)			Discussion with Distribution and Consumer Service Directorate
15	3 (Fri)			Signing of the minutes of discussion Report to the Japanese Embassey and JICA/KTM
16	4 (Sat)	Kathmandu to Bangkok	Bangkok	Review of collected data
		(Team Leader)		
17	5 (Sun)	Arrive in Narita		Discussion with Distribution and Consumer Services Directorate
18	6 (Mon)			Technical site survey and studies

No.	Date	Movement	Accommodation	Activities
19	7 (Tue)			Technical site survey and studies
20	8 (Wed)			Technical site survey and studies
21	9 (Thu)			Technical site survey and studies
22	10 (Fri)			Technical site survey and studies
23	11 (Sat)			Review of collected data
24	12 (Sun)	Kathmandu to Bangkok (S/S Engineer) (D/L System Engineer)	Bangkok	Technical site survey and studies
25	13 (Mon)	Arrive in Narita		Technical site survey and studies
26	14 (Tue)			Technical site survey and studies
27	15 (Wed)			Technical site survey and studies
28	16 (Thu)			Report to Japanese Embassey and JICA/KTM
29	17 (Fri)	Kathmandu to Bangkok (Project Planning Engineer) (D/L Planning Engineer)	Bangkok	
30	18 (Sat)	Arrive in Narita		

MEMBER LIST OF CONCERNED PARTIES OF RECIPIENT COUNTRY

Ministry of Water Resources

Mr. S.N. Upadhaya	Secretary

Department of Roads

Dr. S.B.S. Tuladhar	Senior Divisional Engineer and Head

Nepal Electricity Authority

Mr. Ajit N.S. Thapa	Managing Director
Mr. S.B. Pun	Director-in-Chief Construction Directorate
Mr. R.S. Pandy	Director-in-Chief Distribution and Consumer Services Directorate
Mr. B.B. Dhungana	Director-in-Chief, Planning Directorate
Mr. N.T. Bhutia	Director-in Chief Operation and Maintenance Directorate
Dr. M.R. Tuladhar	Director, Technical Service
Mr. M.P. Upadhyay	Director, Bagmati Region
Mr. R.K. Bajracharya	Director, System Planning
Mr. B.B. Dhungana	Director, Power Sector Efficiency Project
Mr. B.C. Thakurl	Director, Transmission Grid
Mr. R.B. Shrestha	Director-in-Chief, Engineering Directorate
Mr. B.B. Dhungana	Director-in-Chief, Corporate Planning
Mr. P.N. Sharma	Manager, Kathmandu Division
Mr. M.P. Upadhaya	Manager, Kathmandu-Bhaktapur Division
Mr. Laxman Dangal	Manager, Transmission Gird, 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
Mr. P.P. Mainali	Manager, Kathmandu West Division
Mr. D.S. Paudel	Manager, Lalitpur Division

APPENDIX 1-4

MINUTES OF DISCUSSION

MINUTE OF DISCUSSION

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

In response to a request from His Majesty's 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, Phase-II (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. Hidetoshi Ishioka, First Basic Design Study Division, Grant Aid Study & Design Department, JICA and is scheduled to stay in the country from November 21 to December 16, 1993.

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

In the course of discussion 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, December 3, 1993

Mr. Hidetoshi Ishioka
Leader
Basic Design Study Team

Mr. Ajit N.S. Thapa
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) Addition of 132/66kV transformers at the Siuchatar substation.

(2) Reinforcement and Improvement of 11kV other feeders.

(2-1) Center of the Kathmandu town
(2-2) Extension of Dharmasthali feeder
(2-3) Baralgau - Gokarneswar feeder
(2-4) Connection of Nayabazar and Budhanilakantha feeders on the ring road
(2-5) Renovation of Nagarkot - Bramhakhel feeder
(2-6) Other feeders in the Kathmandu Central division
(2-7) Other feeders in the Kathmandu East division
(2-8) Other feeders in the Kathmandu West division
(2-9) Other feeders in the Lalitpur division
(2-10) Other feeders in the Bhaktapur division

(3) Reinforcement and Improvement of low-tension lines in each division.

(4) Maintenance tools and the other equipments, described in Annex-II.

(5) Replacement of 11kV switchgear equipment at the Maharajgunj switching station

(6) Supply of necessary spare parts, described in Annex-III.

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-IV for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project. The measure described in Annex-IV 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 16th December, 1993.

(2) JICA will complete the final report and send it to the Government of Nepal by the end of April 1993.

ANNEX II MAINTENANCE TOOLS AND EQUIPMENT

		To be supplied under Phase-II
(a) Tools :		
(a-1)	Hydraulic compressor for conductor joints	2 sets
(a-2)	Snatch block : 100 mm dia.	15 nos
(a-3)	Wire tensioner : 1.5 ton	5 nos
(a-4)	Wire tensioner : 5 ton	2 nos
(a-5)	Tension meter : 1 ton	5 sets
(a-6)	Tension meter : 5 ton	1 sets
(a-7)	Aluminum pulley : 300 mm dia.	50 pcs
(a-8)	Aluminum pulley : 120 mm dia.	50 pcs
(b) Vehicles		
(b-1)	4 WD working truck with insulated elevator bucket	3 nos
(b-2)	3 ton pick-up truck	3 nos
(b-3)	Light maintenance vehicle	3 nos

ANNEX III LIST OF NECESSARY SPARES

(1) Sectionalizing Switches

(2) Drop Out Fuse Switches on the primary circuit of transformer

(3) Lightning Arresters

(4) Molded Case Circuit Breakers for distribution boxes

ANNEX IV 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 of 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 up to the site and installation of the equipment.

(B) Undertaking by the Nepal Electricity Authority

(b-1) To secure the right of way for the Project.

(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 of such permits.

(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 up to the site 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.

APPENDIX 1-5

MINUTES OF MEETING ON TECHNICAL MATTERS

BASIC DESIGN STUDY
ON
EXTENSION AND REINFORCEMENT OF POWER TRANSMISSION
AND
DISTRIBUTION SYSTEM IN KATHMANDU VALLEY, PHASE-II

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 Nepal Electricity Authority (hereinafter called as NEA) and a JICA Basic Design Study Team (hereinafter called as the Team) headed by Mr. H. Ishioka of JICA, and duly signed on December 3rd of 1993, 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) Augmentation of Transformer at Siuchatar substation

Additional transformers, 3 units x single phase 12.6MVA with related switchgear and control equipment with transducers for sending the signal to the load dispatching center in the same as the existing transformer circuit will be installed at the Siuchatar substation under the Project.

The works of rearrangement of 132kV transmission line bays, as in a line Kulekhani T/L bay - Marsyangdi T/L bay - Balaju T/L bay, shall be done by NEA, and all necessary equipment and facilities related to the works shall also be supplied and installed by NEA under the Power Sector Efficiency Project.

2) Replacement of 11kV Switchgear Equipment at Maharajgunj Switching Station

The existing 11kV switchgear cubicles for the ring main feeders of 2-circuits and distribution feeders of 2-circuits at the Maharajgunj switching station will be replaced with the following new cubicles:

Ring main feeder	2 or 4-circuits, to be examined in the further study
Distribution feeder	7-circuits including one spare circuits and one bus coupler
Low tension circuits	1 set including station service transformer

The extension of the switchgear building will be done by NEA, if any.

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 asphalting 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 the Project Works

a) The contractor is required to provide necessary information such as area, date, time, etc. on each Project work at least 14 days prior to the 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 aluminium conductors (HAI) will be used for the all planned distribution lines. HAI conductors for 11kV lines will be of 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

Distribution transformers will be of outdoor use, three-phase, oil immersed pole mounted type with a voltage ratio of 11kV/400-230V. The rating of the transformers classified into two different type of 100 kVA and 200kVA will be considered for the project.

8) Pad-mounted Transformer Cubicles

Pad-mounted transformer cubicles and low tension aerial bundle cables will be considered at the densely populated and residence areas in the Bhaktapur, Patan and Kathmandu central areas.

9) Service Wire Connection

(a) According to the Minutes of Discussion signed on December 3rd, 1993 (Annex IV, b-10), all service wires to be dismantled by the contractor during erection will be reconnected 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.

10) 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 The Koteswor site near airport for the Project phase-I is also preferable as stock yard for the Project phase-II.

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

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

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

(1) Additional of 132/66kV transformers at the Siuchatar substation.

(2) Reinforcement and improvement of 11kV other feeders.

(2-1) Center of the Kathmandu town
(2-2) Extension of Dharmasthali feeder
(2-3) Baralgau - Gokarneswar feeder
(2-4) Connection of Nayabazar and Budhanilakantha feeders on the ring road
(2-5) Renovation of Nagarkot - Bramhakhel feeder
(2-6) Other feeder in the Kathmandu Central division
(2-7) Other feeder in the Kathmandu East division
(2-8) Other feeder in the Kathmandu West division
(2-9) Other feeder in the Lalitpur division
(2-10) Other feeder in the Bhaktapur division

(3) Reinforcement and improvement of low-tension lines in each division.

(4) Maintenance tools and the other equipment, described in Annex-II of the Minutes of Discussion.

(5) Replacement of 11kV switchgear equipment at the Maharajgunj switching station.

(6) Supply of necessary spare parts, described in Annex-III of the Minutes of Discussion.

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

December 16, 1993

Mr. Y Sunagawa
Team Leader
JICA Study Team

Mr. R.S. Pandey
Director-in-Chief
Distribution & Consumer
Service Directorate, NEA

APPENDIX 2-1

PROJECT COMPONENTS FOR PHASE-I

Project components for Phase-I

The components of the Project Phase-I implemented in 1993 and 1994 are shown in below.

(1) Augmentation of 11 kV switching station

The rated breaking capacity of the 11 kV cubicles at the Royal Palace, Old Patan and Old Chabel switching stations is lower than the computed short-circuit current of the present system. These cubicles will be replaced with new ones having ample breaking capacity against the estimated short-circuit current, in order to avoid recurrence of accidents such as the death of operators and fire caused by the bursting of the circuit breaker from the fault current of a short-circuit on the system at the Lainchaur substation.

The replacement of cubicles will contribute greatly to reliable power supply to the Kathmandu Valley.

(2) Laying underground cables between the Lainchaur substation and the K2 switching station

Power demand in the most populated central area of Kathmandu is delivered from the K2 switching station of which electric power is supplied through 11 kV underground cables lines from the Lainchaur substation and 11 kV double circuit overhead lines from the New Patan substation.

The power supply in the center of Kathmandu is unreliable due to the deterioration of the existing underground cables which were constructed in the early 1960s. In case some trouble occurs on the cable line, the power demand in the central area will be supplied from the New Patan substation. Under this condition, load shedding will be necessary to avoid overloading the main transformers in the New Patan substation and 11 kV overhead lines in this area.

Replacement of the underground cable lines between the Lainchaur substation and the K2 switching station will improve and maintain stable and reliable power supply to the center of Kathmandu.

(3) Reinforcement and improvement of main 11 kV feeders

Urgent extension and reinforcement of the following 11 kV feeders of about 61 km and related low tension lines of about 39 km were requested:

(a)	Boudha - Jorpati feeder	Separation of supply area in rural and city areas with an additional new feeder
(b)	Sundarijar feeder	Upgrading of existing conductors and modification of a part of the line route
(c)	Godawari-1 &-2 feeders	Separation of the supply area with an additional new feeder and change of supply station
(d)	Thankot feeder	Addition of another line for the high demand density area and upgrading of existing conductors
(e)	Kiritpur feeder	Adjustment the share of demand from the existing substation
(f)	Pharping feeder	Separation of demand for factory and domestic consumers with an additional new feeder
(g)	Airport feeder	Upgrading of existing conductors
(h)	Baneswar feeder	Upgrading of existing conductors
(I)	Nagarkot feeder	Separation of the supply area and upgrading of existing conductors
(j)	System improvement in downtown	Extension of branch lines and installation of additional transformers

(4) Procurement of tools, instrument and vehicles for operation and maintenance work

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-3) Phase tester	10 nos.
	(d-4) Voltage detector	10 nos.
	(d-5) Cable fault locator	1 nos.