付　属　資　料

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付属資料１　調査手法：現地調査で行われた質問事項

【NEPCO／ETC に対する質問事項】

A．国内研修カリキュラムの内容に関する質問

１．カリキュラムは、国内の需要を満たすものであるか

２．ジョルダンの将来の中・長期の電力政策は、NEPCO 側として持っているか

３．カリキュラムと、履修分野は、将来のジョルダンの電力政策を踏まえたものであるか。

４．具体的にどのような成果が生まれているか

５．大学の同様のカリキュラムと比較して、どのような利点があるか。

６．カリキュラム達成に必要な機材はそろっているか

７．今後要求される分野と、それに対応する行使およびカリキュラムの充実度は？

８．研修修了者は、現在どのような職に就いているか

９．その職は、ETC での研修内容を反映するものであるか

１０．ETC 卒業生の電力関連事業における就職率はどうか

１１．ETC で卒業可能な習得度に達し得なかったできなかった学生のその後は

B．第三国研修に関する質問

１．第三国研修（TCTP）の受け入れ内容は？

２．第三国研修のカリキュラムは、第三国の需要を満たすものであるか？

３．第三国の中・長期にわたる電力政策を、NEPCO 側は十分に把握しているか

４．第三国研修のカリキュラムは、そのような中・長期電力開発政策をサポートするものであるか

５．カリキュラムの習得度は満足できるものであるか

６．研修を受ける国の事情によって、カリキュラムを変更しているか

C．リサーチ

１．ETC 卒業生（ジョルダン）の、卒業後の活動状況をリサーチ（どのような職に就いているか）

２．卒業生が、当該国電力事業の質の向上に役立った例はあるか

D．研修生の質と習得度に対する５段階評価

研修生の質

Poor　　Excellent

1　2　3　4　5

研修生の習得度

Poor　　Excellent

1　2　3　4　5

機材の充実度

資金運用面での充実度

カリキュラムは、ジョルダンおよび第三国の需要を満たしているか、また、第三国のニーズ

の変化に対応しきれているか
協力規模、期間は適当か
以下の分野のうち、最も力を入れているものは何か
Construction and mechanical maintenance · Metal machining and welding
Electric transformer maintenance
Construction and maintenance of interval
Construction and maintenance of transmission overhead lines
Construction and maintenance of distribution networks
Electrical house wiring
Medium voltage cable joining
Others (Please indicate the details)

E．民営化に関する質問

1．運営能力はあるか
2．資金は充分か
3．民営化により、JICA など、日本の公的資金を受け入れられなくなるケースは想定しているか。

ETC 以外での聞き取り調査においては、以下の質問事項が用意された。

【ジョルダン計画省（Ministry of Planning）】

A．ジョルダンにおける電力事業の優先度
B．ETC の意味と位置づけ
C．計画庁として、今後のジョルダンの電力分野における希望はあるか
D．新５カ年計画における、電力事業の位置は

【JICA ジョルダン事務所】

A．NEPCO／ETC への資金および技術協力に関する現状と問題点は
B．第三国研修の継続に関するコミットメントと、民営化の問題をどう解決するか

さらに、調査団では、ETC 卒業生の追跡調査も併せて行い、以下の４個所においてインタビューを実施した。

（1）NEPCO
（2）Hussain Thermal Power Station (HTPS)
（3）Amman Sub-Station
（4）Tareq Sub-Station

ETC 在学生および卒業生それぞれに対するインタビューには、以下のような質問事項が用意された。

【ETC在学生に対する質問事項】

ETCがジョルダン国内で果たす役割

ETCで何を重点的に学ぶつもりか

ジョルダン国内の電力関連事業において、現在及び今後要求される分野は何だと考えるか、以下の中から選べ（複数選択可能）

Construction and mechanical maintenance · Metal machining and welding

Electric transformer maintenance

Construction and maintenance of interval

Construction and maintenance of transmission overhead lines

Construction and maintenance of distribution networks

Electrical house wiring

Medium voltage cable joining

Others （Please indicate the details）

3．現在のカリキュラムは、ジョルダン国内の需要を満たすという点で適切であるか

4．カリキュラムの難度を5段階で自己評価すると

Hard　　Easy

2　　3　　4　　5

5．カリキュラムの習熟度を5段階で自己評価すると

Poor　　Excellent

1　　2　　3　　4　　5

6．卒業後、どのような分野で就業したいと考えているか

7．その目標を達成するために、現在のカリキュラムは適切であるか

8．卒業後の就職先は決まっているか

9．YESの場合、それはどこか

10．生活について

現在の宿舎に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

現在の食事に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

現在の日常生活に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

11．ETCに望むことがあれば以下に書け

【ETC 卒業生に対する質問事項】

A．ジョルダン国内電力関連事業の発展に対する ETC の役割

1．ETC に入学した際の志望分野は何か。

2．ジョルダン電力関連事業で、将来もっとも重要であると考える技術分野は、以下のうちどれか（複数可）

a. Mechanical maintenance・Metal machining and welding

b. Electric transfer maintenance

c. Maintenance of indoor and outdoor substation

d. Maintenance of transmission overhead lines

e. Maintenance of distribution networks

f. Electrical house wiring

g. Medium voltage cable jointing

h. Others （Please indicate the details）

3．ETC の現在のカリキュラムは、ジョルダンの将来の需要に十分応えていると考えるか？

4．ETC のコースの難度はどうか。

5．ETC における自己達成度はどうか。

6．ETC のカリキュラムは、現在の就業分野における目的達成のために適当であったか？

7．ETC に対する要望があれば書け。

【第三国研修に関する質問事項】

ETC が第三国で果たす役割

ETC で何を重点的に学ぶつもりか

母国内の電力関連事業において、現在及び今後要求される分野は何だと考えるか、以下の中から選べ（複数選択可能）

Construction and mechanical maintenance - Metal machining and welding

Electric transformer maintenance

Construction and maintenance of interval

Construction and maintenance of transmission overhead lines

Construction and maintenance of distribution networks

Electrical house wiring

Medium voltage cable joining

Others （Please indicate the details）

3．現在のカリキュラムは、母国の中・長期的需要を満たすという点で適切であるか

4．カリキュラムの難度を 5 段階で自己評価すると

Hard　　Easy

2　　3　　4　　5

5．カリキュラムの習熟度を 5 段階で自己評価すると

Poor　　Excellent

1　　2　　3　　4　　5

6．卒業後、どのような分野で就業したいと考えているか

7．その目標を達成するために、現在のカリキュラムは適切であるか

卒業後の就職先は決まっているか

先輩の卒業生は、ETC で習得した技術を生かしているか。具体例があれば書け。

10. 生活について

現在の宿舎に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

現在の食事に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

現在の日常生活に対する満足度は

Poor　　Excellent

1　　2　　3　　4　　5

11. ETC に望むことがあれば以下に書け

【質問表－英文】

Questionnaire (for domestic trainees)

A. The role of ETC on Jordanian development in the filed of Electricity

1. What do you intend to learn at ETC?
2. What do you think are the most important field among the Jordanian domestic electric development? Choose from below. (Multiple choice is possible) .
   a. Mechanical maintenance - Metal machining and welding.
   b. Electric transfer maintenance
   c. Maintenance of indoor and out door sub-station
   d. Maintenance of transmission overhead lines
   e. Maintenance of distribution networks
   f. Electrical house wiring
   g. Medium voltage cable joining
   h. operation of thermal power station
   i. Automatic control of thermal power station
   j. Electrical maintenance
   k. Diesel Engine operation and maintenance
3. Do you think the current curriculum taken by ETC is appropriate in terms of Jordanian electric development?

1. How difficult the courses provided by ETC? Evaluate in five scales.

Hard				Easy
1	2	3	4	5

5. How do you evaluate your own level of achievement?

Poor				Excellent
1	2	3	4	5

6. In which field do you wish to work after graduating ETC courses?

1. Is the current curriculum appropriate in achieving that goal?
2. Has your future job already decided?
3. If the answer is yes, please specify the name of the company or institution.
4. About life at ETC
   a. How the current situation of accommodation satisfy you?

Poor				Excellent
1	2	3	4	5

   b. How the current situation of food satisfy you?

Poor				Excellent
1	2	3	4	5

c. How the current situation in social life satisfy you?

Poor				Excellent
1	2	3	4	5

11. If you have any suggestion to ETC, please indicate in the following.

Questionnaire (for TCTP trainees)

The role of ETC on Jordanian development in the filed of Electricity

1. What do you intend to learn at ETC?
2. What do you think are the most important field among the domestic electric development of your country? Choose from below. (Multiple choice is possible) .
   a. Mechanical maintenance - Metal machining and welding.
   b. Electric transfer maintenance
   c. Maintenance of indoor and out door sub-station
   d. Maintenance of transmission overhead lines
   e. Maintenance of distribution networks
   f. Electrical house wiring
   g. Medium voltage cable joining
   h. operation of thermal power station
   i. Automatic control of thermal power station
   j. Electrical maintenance
   k. Diesel Engine operation and maintenance
3. Do you think the current curriculum taken by ETC is appropriate in terms of mid-term and long-term electric development of your country?
4. How difficult the courses provided by ETC? Evaluate in five scales.

   Hard Easy

   1 2 3 4 5
5. How do you evaluate your own level of achievement?

   Poor Excellent

   1 2 3 4 5
6. In which field do you wish to work after graduating ETC courses?
7. Is the current curriculum appropriate in achieving that goal?
8. Has your future job already decided?
9. If the answer is yes, please specify the name of the company or institution.
10. About life at ETC
    a. How the current situation of accommodation satisfy you?

       Poor Excellent

       1 2 3 4 5
    b. How the current situation of food satisfy you?

       Poor Excellent

       1 2 3 4 5

c. How the current situation in social life satisfy you?

Poor Excellent

1 2 3 4 5

11. If you have any suggestion to ETC, please indicate in the following.

付属資料２　聞取り調査用紙

INQUIRIES
(NEPCO, JEPCO, IDECO)
Hearing Items

(1) Effect of ETC Training
- Reduction of maintenance cost, staff and fault, etc.
- Rapid countermeasure against fault
- Improvement of thermal efficiency

(2) Technology Transfer by "JICA Project"
- Contribution to power utilities
- Contribution to electric industries

(3) Future Plan of Training
- Teaching materials
- Instructors
- Foreign experts

(4) Others

INQUIRIES
(ETC)
Hearing Items

(1) Contribution to Power Utilities and ETC by "JICA Technology Transfer Project"

(2) Activities of ETC Graduates in Power Industries

(3) Staffing (Instructors) of ETC

(4) Teaching Equipment and Materials

(5) Curriculums

(6) Number and qualification of trainees

(7) Activities of "JICA Technology Transfer Project" 's Counterparts

(8) Others

聞き取り調査項目
(JICA 派遣アドバイザー)

(1) ETC の運営状況

(2) ETC 訓練修了生の活動状況

(3) ETC インストラクター及びスタッフに対する JICA 専門家の技術移転の効果

(4) ETC インストラクター、ETC の研修生の技術水準

(5) ETC が NEPCO, JEPCO, IDECO の運営（技術面）を支えている効果

(6) ETC 運営に関する勧告

(7) その他

INQUIRIES
(INSTRUCTOR)

A. Personal Data

(1)	NAME	
(2)	AGE	
(3)	NATIONALITY	
(4)	SCHOOL CARRIER	
(5)	PECIALITY	
(6)	WORK EXPERIENCE	

B. Hearing Items

(1) Curriculum

(2) Training Material

(3) Simulator

(4) Number of Trainees

(5) Qualification of Trainees

(6) Number of Instructors (Sufficient or Not)

(7) Effect of Training

(8) Technology transfer from JICA experts

(9) Future Plan

(10) Others

INQUIRIES
(Counterpart Personnel)

A. Personal Data

(1)	NAME	
(2)	AGE	
(3)	NATIONALITY	
(4)	SCHOOL CARRIER	
(5)	SPECIALITY	
(6)	PRESENT POSITION	

B. Hearing Items

(1) Effect of Technology Transfer from Japanese Experts

(2) Quality and quantity of Technology Transfer

(3) Others

INQUIRIES
(TRAINEE)

A. Personal Data

(1)	NAME	
(2)	AGE	
(3)	NATIONALITY	
(4)	SCHOOL CARRIER	
(5)	SPECIALITY (Elect, Mech, Chemi)	
(6)	WORK EXPERIENCE	
(7)	PRESENT OCCUPATION	
(8)	GRADUATE AGE OF ETC	

B. Hearing Items

(1) Effect of Training
- Knowledge and technique for electric power
- Promotion and/or Salary up

(2) Training Period

(3) Training Contents

(4) Training Material

(5) Technical Level of Training (Theory, Technique)

(6) Number of Trainees in one group

(7) Dormitory

(8) Amusement (TV, Radio, Others)

(9) Sports

(10) Food

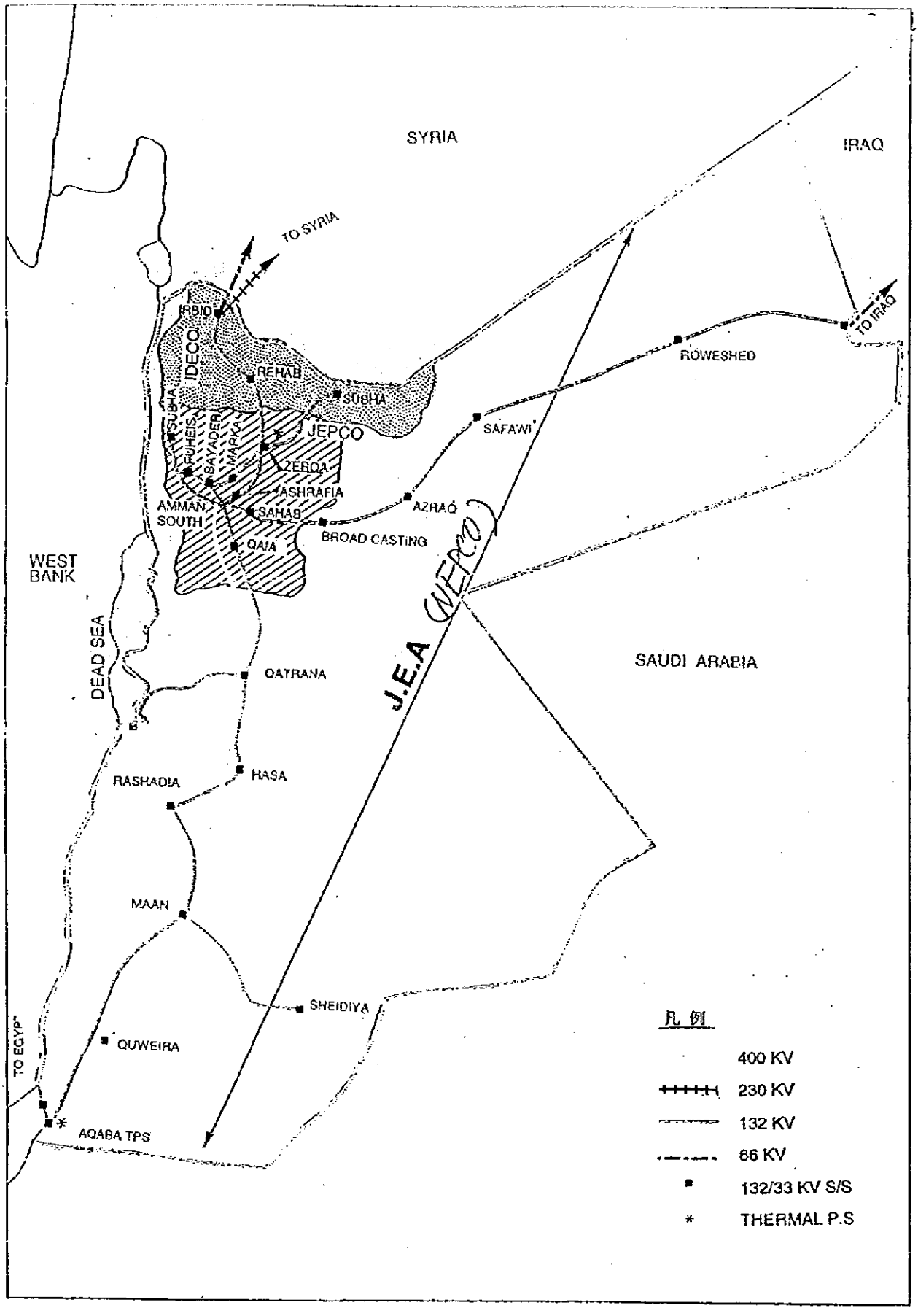
(11) Tranportation

(12) Obligatory Service

(13) Preliminary information on ETC

(14) Others

付属資料３　ヨルダン電力系統図、営業区域図



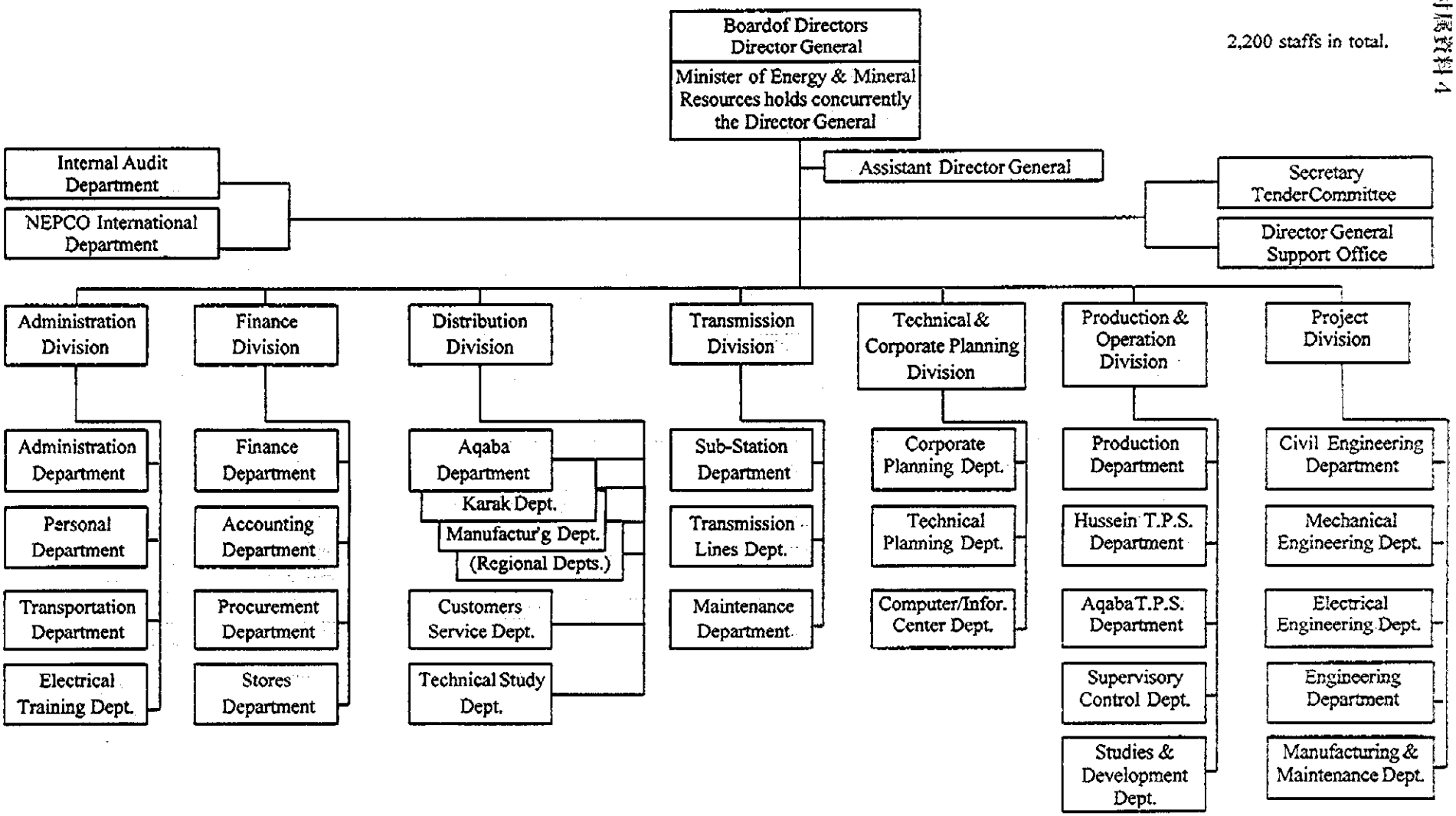


図-1　NEPCO 組織図（1997 年末現在）

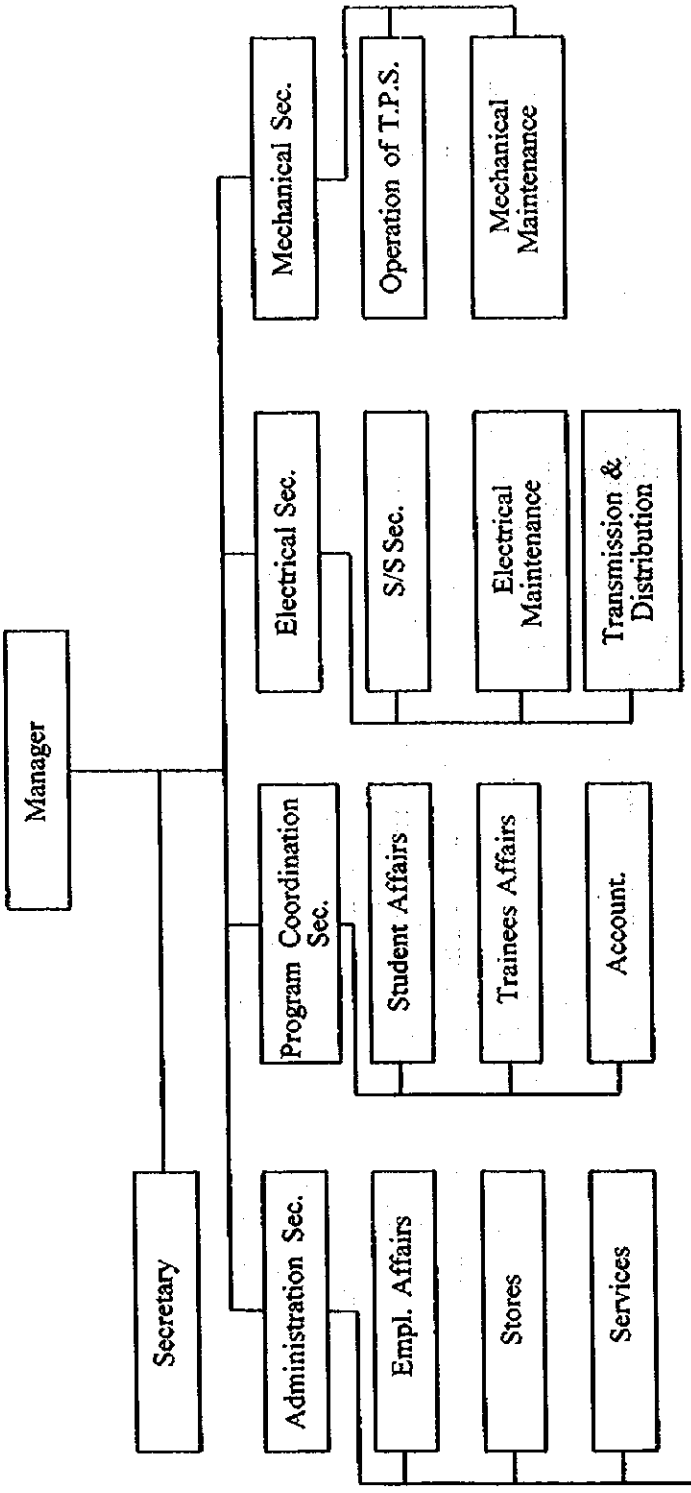


図-2　ETC 組織図（1998 年 1 月末現在）

付属資料6　90年度版カリキュラム

(1) 1st Semester

	Unit (Credit)
1. Mathematics	4
2. Physics	3
3. English	2
4. Activity	2
5. Safety	2
6. Drawing	3
7. Work Shop	3
8. Electrical Fundamentals I	3
9. Electrical Fundamentals I Laboratory	3
10. Wiring	3
Total	28

(2) 2nd Semester

	Unit (Credit)
1. English	2
2. Library	1
3. Activity	2
4. Drawing II	3
5. Strength of Materials	1
6. Strength of Materials Laboratory	3
7. Electrical Fundamentals II	3
8. Electrical Fundamentals II Laboratory	3
9. D.C. Machines Laboratory	5
10. Power Systems	2
Total	25

(3) 3rd Semester

1) Mechanical Maintenance Group

	Unit (Credit)
1. English	2
2. Thermodynamics	2
3. Hydraulics	2
4. Steam Generator I	2
5. Steam Generator Laboratory I	3
6. Chemistry	1
7. Chemistry Laboratory	3
8. Machine Elements	1
9. Machine Elements Laboratory	2
10. Automatic Control	1
11. Automatic Control Laboratory	3
12. Workshop	6
Total	28

2) Electrical Maintenance Group

	Unit (Credit)
1. English	2
2. Generator	2
3. Generator Laboratory	3
4. Automatic Control	2
5. Automatic Control Laboratory	3
6. Transformers	2
7. Transformers Laboratory	3
8. Steam Generator I	2
9. Steam Generator Laboratory I	3
10. Switch Gear and Protection	2
11. Switch Gear and Protection Laboratory	3
12. Practical	1
Total	28

3) Transmission Group

	Unit (Credit)
1. Basics of Transmission	15
2. Practical	13
Total	28

4) Substation and Distribution Group

	Unit (Credit)
1. English	2
2. Basics of Substation and Distribution	14
3. Switch Gear and Protection	2
4. Switch Gear and Protection Laboratory	3
5. Transformers	2
6. Transformers Laboratory	3
7. Surveying	2
Total	28

(4) 4th Semester

1) Mechanical Maintenance Group

	Unit (Credit)
1. Steam Generator II	2
2. Steam Generator Laboratory II	3
3. Automatic Control	2
4. Automatic Control Laboratory	3
5. On Job Training	15
Total	25

2) Electrical Maintenance Group

	Unit (Credit)
1. Motors	1
2. Motors Laboratory	1.5
3. Basics of Substation	2.5
4. Automatic Control	2
5. Automatic Control Laboratory	3
6. On Job Training	15
Total	25

3) Substation Group

	Unit (Credit)
1. Transformer and Substation	2
2. High Voltage Practical	1
3. On Job Training	22
Total	25

4) Transmission Group

	Unit (Credit)
1. Line Simulator	1
2. Line Simulator Laboratory	1.5
3. High Voltage Theory	1
4. High Voltage Laboratory	1.5
5. Protection	2
6. Protection Laboratory	3
7. On Job Training	15
Total	25

5) Distribution Group

	Unit (Credit)
1. Line Simulator	1
2. Line Simulator Laboratory	1.5
3. High Voltage Theory	1
4. High Voltage Laboratory	1.5
5. On Job Training	20
Total	25

6) Wiring Group

	Unit (Credit)
1. High Voltage Laboratory	2
2. On Job Training	23
Total	25

1ST SEMESTER (TIME TABLE)

DAY		8:00	9:00	10:00	11:00	12:00	13:00
		1	2	3	4	5	6
SATURDAY	A	ELECT.FUNDAMENTALS 1		REST	ELECT.LABORATORY 1		
	B	ELECT.FUNDAMENTALS 1		REST	WIRING		
SUNDAY	A	MATHEMATICS		REST	WIRING		
	B	MATHEMATICS		REST	WORKSHOP		
MONDAY	A	ELECFUND 1	PHYSICS	REST	DRAWING 1		
	B	ELECFUND 1	PHYSICS	REST	ENGLISH	ACTIVITY	
TUESDAY	A	PHYSICS		REST	ENGLISH	ACTIVITY	
	B	PHYSICS		REST	DRAWING 1		
WEDNESDAY	A	MATHEMATICS		REST	WORKSHOP		
	B	MATHEMATICS		REST	ELECT.LABORATORY 1		
THURSDAY	A	ENGLISH	SAFETY				
	B	ENGLISH	SAFETY				

2ND SEMESTER (TIME TABLE)

DAY		8:00	9:00	10:00	11:00	12:00	13:00
		1	2	3	4	5	6
SATURDAY	A	ST. of MA	ELE.FUND2	REST	STRENGTH OF MATERIALS LAB.		
	B	ST. of MA	ELE.FUND2	REST	ELECT.LABORATORY 2		
SUNDAY	A	ELECT.FUNDAMENTALS 2		REST	DRAWING 2		
	B	ELECT.FUNDAMENTALS 2		REST	D.C. MACHINES LABORATORY		
MONDAY	A	ENGLISH		REST	ELECT. LABORATORY 2		
	B	ENGLISH		REST	STRENGTH OF MATERIALS LABO.		
TUESDAY	A	POWER SYSTEMS		REST	D.C. MACHINES LABORATORY		
	B	POWER SYSTEMS		REST	LIBRARY	ACTIVITY	
WEDNESDAY	A	D.C.MACHINES		REST	LIBRARY	ACTIVITY	
	B	D.C.MACHINES		REST	DRAWING 2		

3RD SEMESTER (TIME TABLE)

DAY	TIME / PERIOD / SECTION	8:00	9:00	10:00	11:00	12:00	13:00
		1	2	3	4	5	6
SAT	MECH.MAINTE	HYDRAULICS		REST	THERMODYNAMICS		ENGLISH
	ELEC.MAINTE.	SWGR & PROTECTION		REST	ELECT.LABORATORY 2		
	TRANSMISSION	BASICS OF TRANS.		REST	BASICS OF TRANSMISSION		
	SUBST.DISTR.	SWGR & PROTECTION		REST	ENGLISH	SURVEYING	
SUN	MECH.MAINTE	CHEMISTRY	REST	CHEMISTRY LABORATORY			ENGLISH
	ELECT.MAINTE.	GENERATORS		REST	GENERATORS LABORATORY		
	TRANSMISSION	BASICS OF TRANS.		REST	BASICS OF TRANSMISSION		
	SUBST.DISTR.	ENGLISH	REST	BASICS OF SUBSTATIONS & DISTRIBUTION			
MON	MECH.MAINTE.	MECH.ELE.	AUTO.CON.	REST	AUTO.CON.	WORKSHOP	
	ELEC.MAINTE.	AUTOMATIC CONTROL		REST	AUTOMATIC CONTROL LABORATORY		
	TRANSMISSION	BASICS OF TRANS.		REST	BASICS OF TRANSMISSION		
	SUBST.DISTR.	BASICS OF SUB. & DIS.		REST	BASICS OF SUB. & DIST.		
TUE	MECH.MAINTE.	MECHA.ELEMENTS LABO		REST	WORKSHOP		
	ELEC.MAINTE.	TRANSFORMERS		REST	PRACTICAL	ENGLISH	
	TRANSMISSION	PRACTICAL		REST	PRACTICAL		
	SUBST.DISTR.	TRANSFORMERS		REST	SWGR & PROT. & TRANSFO.LABO.		
WED	MECH.MAINTE.	STEAM GENERATOR 1		REST	STEAM GENERATOR LABORATORY 1		
	ELEC.MAINTE.	STEAM GENERATOR 1		REST	TRANSFORMERS LABORATORY		
	TRANSMISSION	PRACTICAL		REST	PRACTICAL		
	SUBST.DISTR.	BASICS OF SUB. & DIS.		REST	BASICS OF SUB. & DISTRIBUTION		
THU	MECH.MAINTE.	WORKSHOP					
	ELEC.MAINTE.	STEAM GENERATOR LABO. 1					
	TRANSMISSION	PRACTICAL					
	SUBST.DISTR.	TRANSFORMERS & SWGR. & PROT. LABO.					

4TH SEMESTER (TIME TABLE)

DAY	TIME / PERIOD / SECTION	8:00	9:00	10:30	11:00	12:00	13:00
		1	2	3	4	5	6
SAT	MECH.MAINTE.	AUTOMATIC CONTROL		REST	AUTOMATIC CONTROL LABO.2		
	ELEC.MAINTE.	MOTORS, BASICS OF SUBST.		REST	MOTORS LABO. BASICS OF SUBSTATIONS		
	TRANSMISSION	LINE SIMULATOR H.V.THEORY		REST	SIMULATOR LABO. H.V.LABO.		
	SUBSTATION DISTRIBUTION WIRING	ON JOB TRAINING		REST	ON JOB TRAINING		
SUN	MECH.MAINTE.	STEAM GENERATOR 2		REST	STEAM GENERATOR LABO.2		
	ELEC.MAINTE.	AUTOMATIC CONTROL 2		REST	AUTOMATIC CONTROL LABO.2		
	TRANSMISSION	PROTECTION		REST	PROTECTION LABO.		
	SUBSTATION	TRANS. S/S	O.J.T.	REST	ON JOB TRAINING		
	DISTRIBUTION WIRING	ON JOB TRAINING		REST	ON JOB TRAINING		
MON	MECH.MAINTE. ELEC.MAINTE. TRANSMISSION WIRING	ON JOB TRAINING		REST	ON JOB TRAINING		
	SUBSTATION	ON JOB TRAINING		REST	ON JOB TRAINING		H.V.PRACT
	WIRING	H.V. LABORATORY		REST	ON JOB TRAINING		
TUE	MECH.MAINTE. ELEC.MAINTE. TRANSMISSION WIRING	ON JOB TRAINING		REST	ON JOB TRAINING		
	SUBSTATION	TRANS. S/S	O.J.T.	REST	ON JOB TRAINING		
	DISTRIBUTION	LINE SIMULATOR H.V. THEORY		REST	SIMULATOR LABO. H.V. LABO		
WED	MECH.MAINTE. ELEC.MAINTE. TRANSMISSION SUBSTATION DISTRIBUTION WIRING	ON JOB TRAINING		REST	ON JOB TRAINING		

付属資料７　1997年現在使用中のカリキュラム

(1) 変電所関係

1) The Orientation Program
   1- Identification of Jordan (the Jordanian society, the history and the culture)
   2- Identification of NEPCO
   3- Identification of ETC
   4- Short trip in both Amman & Zarqa cities

2) The Technical program
   1- Substation
      1.1- Rule of substation in the supply of electrical energy
      1.2- Construction of transmission substation
      1.3 Construction of distribution substation
      1.4- Duty of substation technician
      1.5- Substation safety rules

   2- The principle of work of main equipment in S/S
      2.1- Transformers
      2.2- Switchgears
      2.3- D.C. Circuits
         2.3.1- Batteries
         2.3.2- Rectifiers
         2.3.3- Charger
      2.4- Protection & Control Circuits

   3- Construction of 33/1 & 132/33 kV Outdoor substation
      3.1- Isolator switches construction
      3.2- Instrument transformers construction
      3.3- Surge arrester construction
      3.4- Support insulator construction
      3.5- Busbar construction
      3.6- Control panel wiring
      3.7- Earthing installation

   4- Maintenance of Outdoor Substation
      4.1- Isolators maintenance
      4.2- Instrument transformers maintenance
      4.3- Main transformer maintenance
      4.4- On load tap changer maintenance
      4.5- Circuit breaker maintenance
      4.6- Porcelain insulators cleaning

3) Visits
- ★ Supervisory Control Center
- ★ Amman South S/S
- ★ Marka Power Station
- ★ Hussein Thermal Power Station
- ★ Energy & Electricity Information & Advisory Center
- ★ Ashrafiyah S/S

4) Evaluation and Closing Ceremony

(2) 発電所保守関係

1) Theoretical Program
1- AC fundamentals
2- DC fundamentals
3- Elector magnetism
4- Drawing
5- English
6- AC machines
7- DC machines
8- Transformers & regulations
9- Regulations control
10- Protections & protective relays
11- Measurement and measuring instruments

Training course hours (in ETC)

Subjects	Hours
Theoretical program	480
Practice	480
Total	930

2) On job training (52 weeks)
1- Excitation system in its auxiliaries
2- 3.3kv/416v SWGR & transformer system
3- Battery charger systems
4- Motor maintenance and rewinding
5- Generator protection system

(3) 火力発電所制御

1) Automatic control (theoretical)
1- Pressure, temperature, level & flow sensors
2- Close & open loop control
3- Measuring equipment's
4- Pressure, temperature, level & flow processing

2) Automatic control (practical)
1- Pressure, temperature level & flow experiments (auto lab.)
2- Piping & instrument diagrams analyzing
3- Flowcharts reading
4- N-9- system analyzing & troubleshooting
5- Logic circuits application through left control circuit exp.
6- Application of control processing through simulator

3) English language

4) Electric protection (theoretical)
General theory
Principals

Generator protection

5) Electric protection (practical)
Characteristics & testing of:
- Over current RLY
- Over voltage RLY
- Under voltage RLY
- Earth fault RLY

6) Steam generation (theoretical)
1- Thermal power plant
2- Boilers & boiler auxiliaries
3- Turbine & turbine auxiliaries
4- Turbine & turbine control & protection
5- Thermal unit control

7) Thermal power station systems (practical)
1- Fuel system
2- Feed system
3- Condense system
4- Boiler system & operation
5- Turbine system & operation
6- Application on thermal P.S. simulator

8) Onsite training

(4) 送電線関係

1) The orientation program
1- Identification of Jordan (the Jordanian society, the history and the culture)
2- Identification of JEA
3- Identification of ETC
4- Shot trip in both Amman and Zarqa cities

2) The technical program
1- Introduction
1.1- Transmission safety rules
1.2- Standard and code of practice
1.3- Personal protective clothing
1.4- Safety tools and equipment
1.5- Duties and responsibilities of linesman

2- Networks classification
2.1- The comparison between transmission and distribution overhead lines
2.2- JEA transmission overhead lines
2.3- Cost comparisons O.H. transmission lines & underground cables

3- Surveying O.H. transmission lines
3.1- Use of different survey instruments
3.2- Setting out tower bases
3.3- Excavation of tower foundations

4- Towers design
4.1 Mechanical loads on O.H. transmission lines
4.2- Rigging and lifting
4.3 Back stays

5- Conductors of O.H. transmission lines
   5.1- Conductors fittings
   5.2- Running-out and tensioning conductors
   5.3- Saging conductors
   5.4- Conductor clearances
   5.5- Insulators & fittings
   5.6 -Insulators erection
   5.7 Joints

6- Tower map (drawing) reading
   6.1- Tower assembly using drawings
   6.2- Planting of stubs
   6.3- Tower erection using derrick
   6.4- Tower erection using crane

7- Tools & equipment of O.H. transmission lines
   7.1- Safe working practices on O.H.T.L.
   7.2- Maintenance procedures on O.H.T.L.
   7.3 Tower climbing

8- Maintenance of O.H. transmission lines
   8.1- Changing damaged brasing
   8.2- Changing complete set of insulators tension-suspension
   8.3- Changing single-double insulators tension-suspension
   8.4- Repairing damaged conductors with repair sleeves midspan joints
   8.5- Changing damper-spacers

3) Visits
- Supervisory Control Center
- Amman South S/S
- Marka Power Station
- Hussein Thermal Power Station
- Energy & Electricity Information & Advisory Center

4) Evaluation and Closing Ceremony

(5) 配電関係

1) The Orientation program
   1- Identification of Jordan (the Jordanian society, the history and the culture)
   2- Identification of JEA
   3- Identification of ETC
   4- Short trip in both Amman & Zarqa cities

2) The Technical program
   Introduction
   1- Describe and identify overhead lines
   2- Explain why regulations, standards and codes of practice have been introduced.
   3- Explain the need to conform with the distribution safety rules.
   4- Identify and select protective clothing, equipment and tools
   5- Inspect. clean and maintain tools and equipment
   6- Climb poles and handle ropes

3) Overhead lines light construction
   1- Dress Poles
   2- Erect poles and stays
   3- Run out, joint. sag. make-off and bind-in conductors

4- Install and test earthing systems
5- Carry out pre-commissioning checks

4) Services
1- Place shrouding and fit. take-off fittings
2- Fix brackets, run conductors install terminating equipment
3- Install earth and bonding
4- Complete connections at supply pole
5- Test polarity, seal and secure live equipment
6- Inspect, recover or renew all types of services

5) Overhead lines heavy construction
1- Dress single and "H" poles structures
2- Erect single and "H" poles and stays
3- Run out, joint, make-off and bind-in conductors
4- Erect pole mounted equipment
5- Carry out pre-commissioning checks

6) Maintenance of overhead lines and pole mounted equipment
1- Carry out the work detailed in maintenance manuals or instructions
2- Undertake line patrols and complete the line patrol report
3- Test and carry out preventive work on poles to ensure they are in satisfactory condition.
4- Take down and remove redundant conductors
5- Cut and clear undergrowth trees

7) Operation of O.H. distribution lines
1- Explain the purpose of the distribution rules
2- Define the categories of competence allowed for in the distribution rules and explain their responsibilities.
3- Define terms used in operational safety work and list the stages in issuing permit to-work.
4- Use distribution network and diagrams to check on operational activities.
5- Explain the reasons for system control and the role it plays in maintaining supply.
6- Describe the principle function of protective devices as used in distribution overhead lines.

8) L.V. Live line working
1- Inspect and maintain tools and equipment
2- Work in a competent manner on live .V. circuits
3- Utilizing wherever necessary the appropriate equipment provided to optimize personal safety and security.
4- Demonstration-connect service cable
5- Demonstration-connect and disconnect jumpers
6- Demonstration-erection and maintenance of street light units

9) Carry out projects
1- L.V. Project
2- M.V. Project

10) Visits
- Supervisory Control Center
- Amman South S/S
- Marka Power Station
- Hussein Thermal Power Station
- Energy & Electricity Information & Advisory Center
- Jordan Valley Distribution District

11) Evaluation and Closing Ceremony

(6) 火力発電所運転

1) The Orientation program
   1- Identification of Jordan (the Jordanian society, the history and the culture)
   2- Identification of JEA
   3- Identification of ETC

2) The Technical program
   1- Basics
      1.1- Pressure
      1.2- Flow
      1.3- Heat and temperature
      1.4- Water properties

   2- Combustion
      2.1- Air
      2.2- Fuel
      2.3- Flue gases
      2.4- Fuel additives

   3- Steam-water cycle
      3.1- Steam turbine
      3.2- Condenser
      3.3- Condensate cycle
      3.4- Feed water cycle
      3.5- Boiler

   4- Station service systems
      4.1- Cooling water
      4.2- Plant air
      4.3- Water treatment plant

   5- Lubrication
      5.1 Bearings
      5.2- Lubrication oil
      5.3- Purification
      5.4- Greasing

   6- Mechanical elements
      6.1- Valves
      6.2- Steam traps
      6.3- Pumps
      6.4- Compressors
      6.5- Fans

   7- Safety rules & fire fighting

   8- Control and instrumentation
      8.1- Pressure control
      8.2- Temperature control
      8.3- Flow control
      8.4- Level control
      8.5- Control system
         8.5.1- Feed water control systems
         8.5.2- Fuel control systems
         8.5.3- Combustion control system
         8.5.4- Air control system

8.6- Protection
8.6.1- Boiler protection
8.6.2- Turbine protection
8.6.3- Electrical protection

9- Steam unit operation
9.1- Cold start
9.2- Warm start
9.3- Hot start

10- Malfunctions on steam unit

11- Training visits to Hussein Thermal Power Station

12- Simulator Training in ETC

13- English language

3) On-Off job training in Hussein Thermal Power Station

(7) 火力発電所機械保守

1) The orientation program
1- Identification of NEPCO & ETC
2- Identification of students roles

2) The technical program
1- Theoretical part
1.1- Mechanical maint.
1.1.1- Lubrication oil & grease
1.1.2- Bearings
1.1.3- Mechanical elements (polts, chait, belts, gears)
1.1.4- Pumps
1.1.5- Compressors
1.1.6- Valves & steam traps
1.1.7- Rotating equipment alignment

2- Steam generation
2.1- Thermal plant
2.2- Boilers and auxiliaries
2.3- Turbine and auxiliaries
2.4- Boilers & turbine control and protection

3- Hydramech.
3.1- Physical propeitiesot liquids
3.2- Hydrostatic pressure & properitiesot
3.3- Continuity equation
3.4- Bernoulli's equation
3.5- Pumping plant

4- English language

5- Practical part
5.1- Mechanical maintenance of
5.1.1- Pumps
5.1.2- Valves & traps
5.1.3- Fans
5.1.4- Compressors
5.1.5- Journal & ball bearing

6- Machine performance
   6.1- Pumps performance & testing
   6.2- Compressor performance & testing
   6.3- Fans performance & testing
   6.4- Measuring equipment & vibration instrument using

7- Work shop
   7.1- Safety & health
   7.2- Care and use of measuring equipment as steel and linen tapes, rules, micrometers & venire gauges, in side and outside calipers, feeler gages & thread gauges.
   7.3- Application and care of hard tools
   7.4- Work shop process
   7.5- Oxy-acetylene welding
   7.6- Care & use of machine tools as center lath metal power saw, machines, milling machine.
   7.7- Electrical are welding.

8- The power plant systems
   - Power plant drawing reading
   - Row water system
   - Fuel oil system
   - Combustion air system
   - Compressed air system
   - Steam & condensate system
   - Water treatment system
   - Cooling water system
   - Boiler & auxiliaries
   - Turbine & auxiliaries

時間表

Weekly Time Table

Week No.1

Session / Day	1st	2nd
Saturday	Types of s/s	Introduction to T.P.S.
Sunday	Symbols used in s/s	Role of s/s in network
Monday	Safety	Safety
Tuesday	Ring & Radial	Systems
Wednesday	Lub. oil & gears	Materials used in s/s
Thursday		

Weekly Time Table

Week No.2

Session / Day	1st	2nd
Saturday	Insulating oil	Ditto
Sunday	Insul. oil handling	Testing
Monday	Main. of swgrs	Cons. & inst. of swgrs
Tuesday	Insulation of swgrs	Ditto
Wednesday	Maint. of desconnector	Ditto
Thursday		

Weekly Time Table

Week No.3

Session / Day	1st	2nd
Saturday	Maint. of fuse SW	Ditto
Sunday	Maint. of hardgas sw	Ditto
Monday	Maint. of 11kV CDB	Ditto
Tuesday	Maint. of 33 kV CB	Ditto
Wednesday	Ditto	Ditto
Thursday		

Weekly Time Table

Week No.4

Session / Day	1st	2nd
Saturday	Transf. cons. & maint.	Ditto
Sunday	Transf. maint.	Ditto
Monday	Distrib. brd. const.	Maintenance
Tuesday	Instrument transf.	Ditto
Wednesday	Protection	Instrum. device
Thursday		

Weekly Time Table

Week No.5

Session / Day	1st	2nd
Saturday	Rly. test primary	Second injection
Sunday	Power cable & joints	Ditto
Monday	Mlty core cable	Stripping & wiring
Tuesday	Ditto	Ditto
Wednesday	Ditto	Ditto
Thursday		

Weekly Time Table

Week No.6

Session / Day	1st	2nd
Saturday	Board wiring	Ditto
Sunday	Measur. of earth res.	s/s earthing
Monday	Review	Routing s/s inspc.
Tuesday	Final test	Ditto
Wednesday	Ditto	Ditto
Thursday		

付属資料８　ETC 側に提出した覚え書き（Preliminary Report）

Preliminary Report

This short preliminary report has been prepared and presented at the request of the Electric Training Center. Although the content will be in line with the Mission report presented upon arrival of the present team to Japan, and the final and official report to be presented to the government of Japan later, it will not form any part of the final official documents. Analysis are based on the Leader's personal view.

Abstract: JICA Evaluation Mission for the Jordanian Electric Training Center has made inquiries to the person involved in the program and checked objectively, the condition of Center's activities as to whether the program offered has resulted in effective improvement of both Jordanian and the third countries' situation in the field of Electricity in general. The Mission had special focus on the level of achievement in the field of technological transfer by Japanese professionals sent to ETC, and the level of achievement at ETC itself in transferring technical knowledge and method through its own curriculum. The result of the research made is to be shown in the following.

Kohei Hashimoto
Leader, JICA Evaluation Mission
22 February, 1998

JICA Evaluation Mission
Preliminary Report

Kohei Hashimoto
Leader, JICA Evaluation Mission
22 February, 1998

Level of technological transfer from the Japanese specialists has been satisfactory. But the question remains as to how to catch up the local needs both of Jordan and the third countries. In the case of Jordan, technological transfer having been offered to the ETC is well enough for Hussain Thermal Power Station, but inadequate for the newly constructed power stations in Aqaba where modern system is employed. As ETC claims, the technological transfer has to be in line with the new local needs.
Accordingly, equipment which have been used at ETC for the purpose of training have to be changed and modified according to the local demand to meet the new requirement.
Flexibility in setting curriculum at the ETC is highly appreciated. It is designed to meet the sudden change of demand coming out from both Jordan and third countries.
What lacks in setting curriculum at ETC seems to be the lack of information from the third countries, hence ETC cannot get hold of the needs each country have in the field of electricity development.
It follows that the market research for ETC is necessary not only from the view point of enriching the curriculum to meet the demand, but also to help them financially independent after the expected privatization in near future.
The level of achievement of trainees is yet to be analyzed. In this, ETC has agreed to compile the questionnaires we have prepared (for both current trainees and ex-trainees of the local Jordanian program) and send them back to Japan through JICA. General impression is that trainees completed the courses at ETC are at high standard, and actively involved in the related field.
ETC occupies unique position not only in Jordan but also in the Arab world providing practical side of the training. For any field of industry need balanced development in both theoretical and practical field, institute such as ETC has to be encouraged in the years to come.
In addition to this, NEPCO has been working on an independent workshop on cutting loss of electricity. This workshop is a joint NEPCO-JEPCO-IDECO project which involves a Japanese specialist. The project is in its final stage, and a report has already

been produced. To prevent this project to loose its momentum, early-stage implementation is recommended.

Appendix

A. Locations Visited by the JICA Evaluation Team:

NEPCO Headquarters
ETC
HTPS
Amman South Substation
Amman Control Center
Tareq Substation

B. Request made from ETC (apart from the requests made to the JICA Aftercare Co-operation.

Software program necessary for the operation of thermo-circuit management
Equipment for vibration analysis
Equipment for high pressure pipe welding
Equipment for new digital electric circuit
Equipment necessary for high voltage transmission live line maintenance
Equipment necessary for protection relay

Request made from Amman South Substation (apart from the requests made to the JICA Aftercare Co-operation.

One set of circuit breaker for ETC

付属資料９　写真集

写真説明

(1) ETC 正面玄関

(2) ETC 正面玄関のプレート

(3) 実験棟

(4) 教室、40 人位収容、清潔に使用されている。

(5) 化学実験室、整備が行きとどいている。

(6) スチーム火力発電所運転訓練シュミレーター

(7) 30kV モデル変電所

(8) 変電所用操作・リレー盤（NEPCO の自己資金による調達、古い）

(9) OCB（NEPCO の自己資金による調達、1920 年代製）

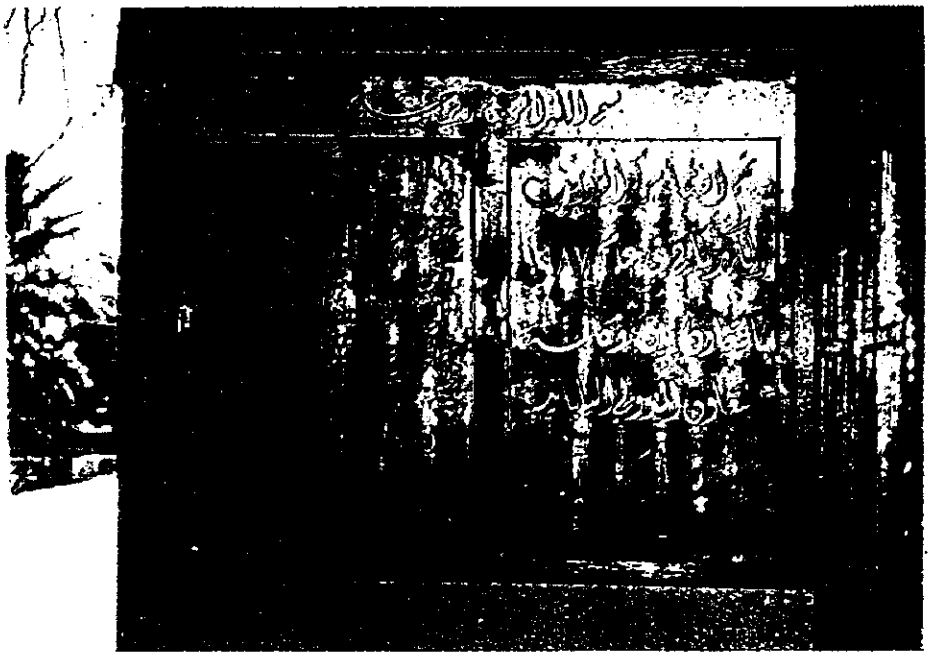
(10) 据置型端子圧着器（送電線用）

(11) 訓練中の研修生、20 m の高所

(12) ガス絶縁変電所、屋内型、NEPCO 直営にて据付中

(1)

(2)



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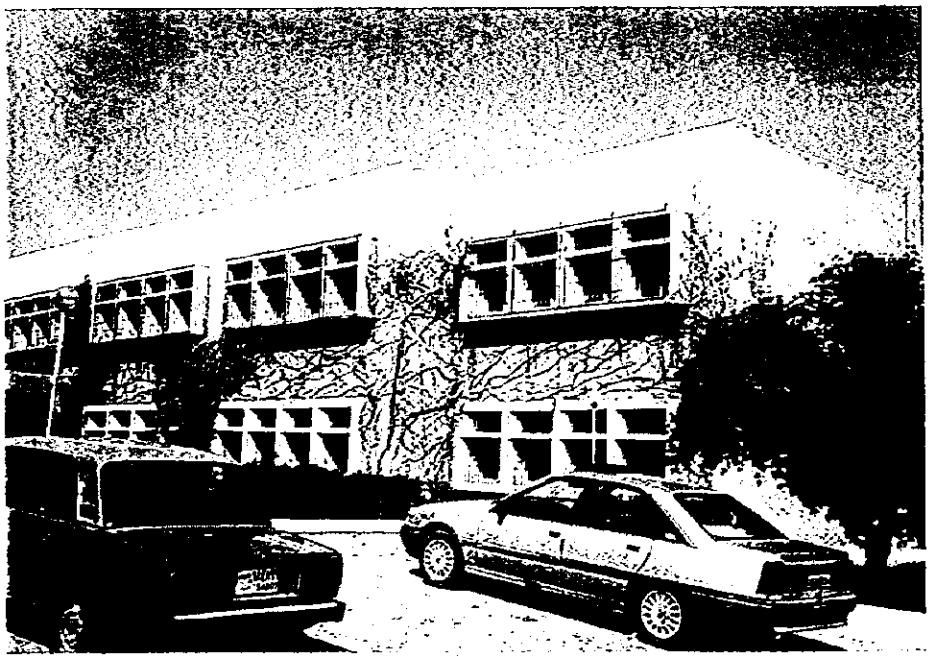

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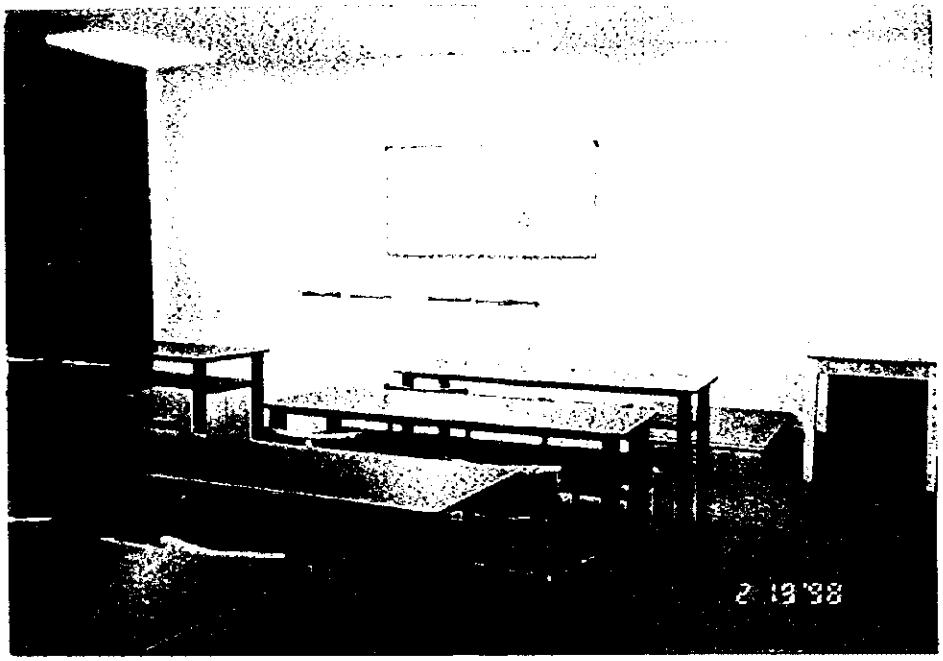

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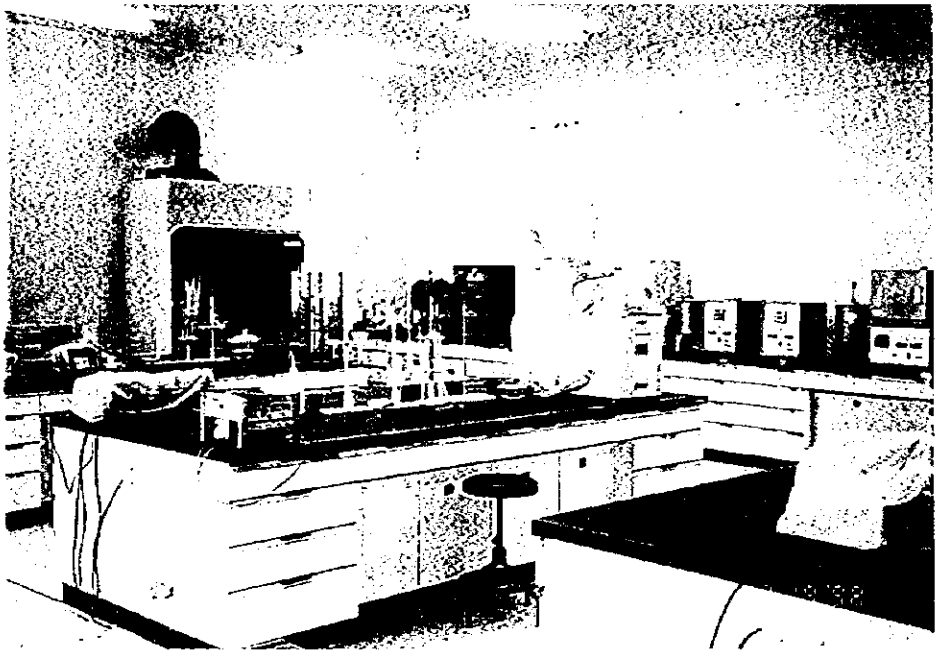

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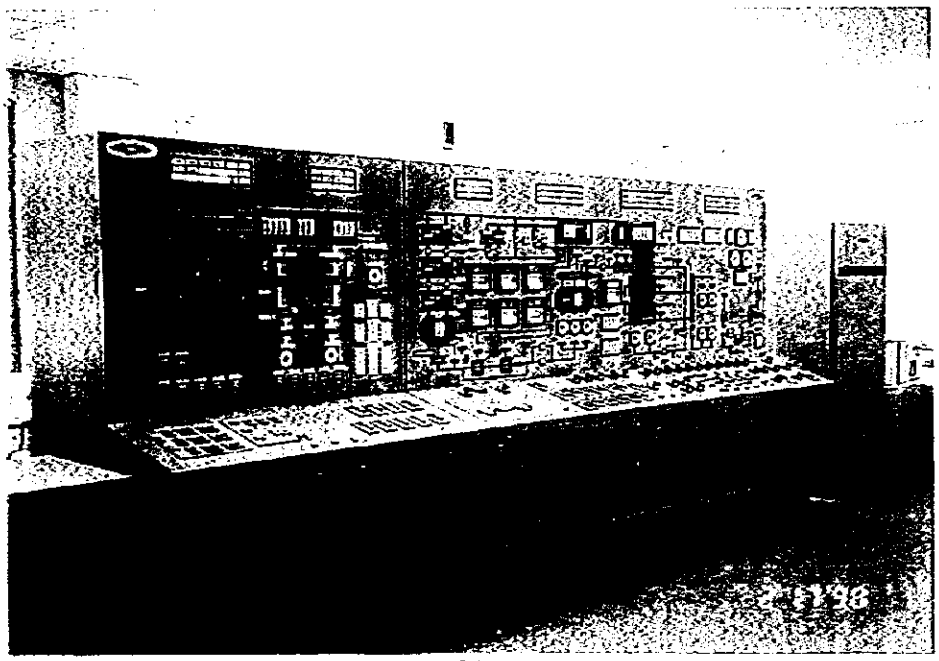

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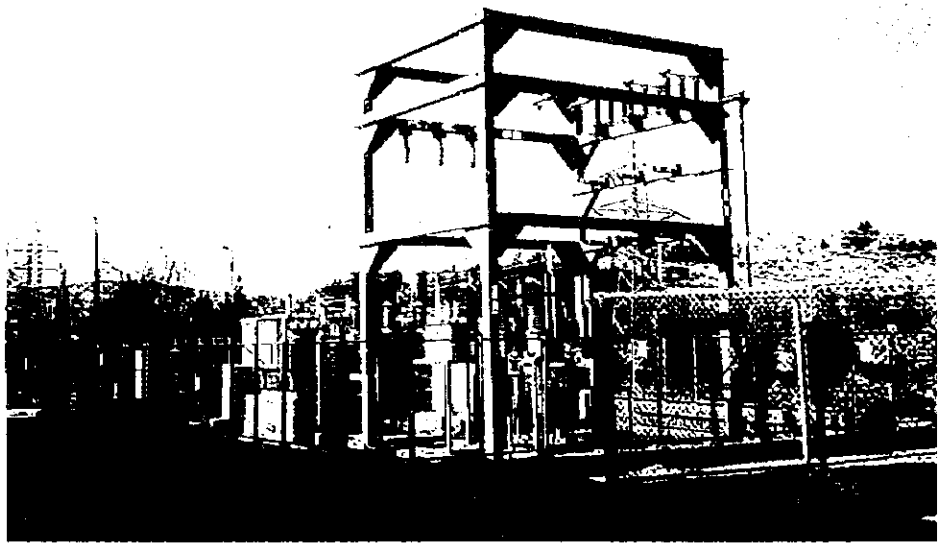

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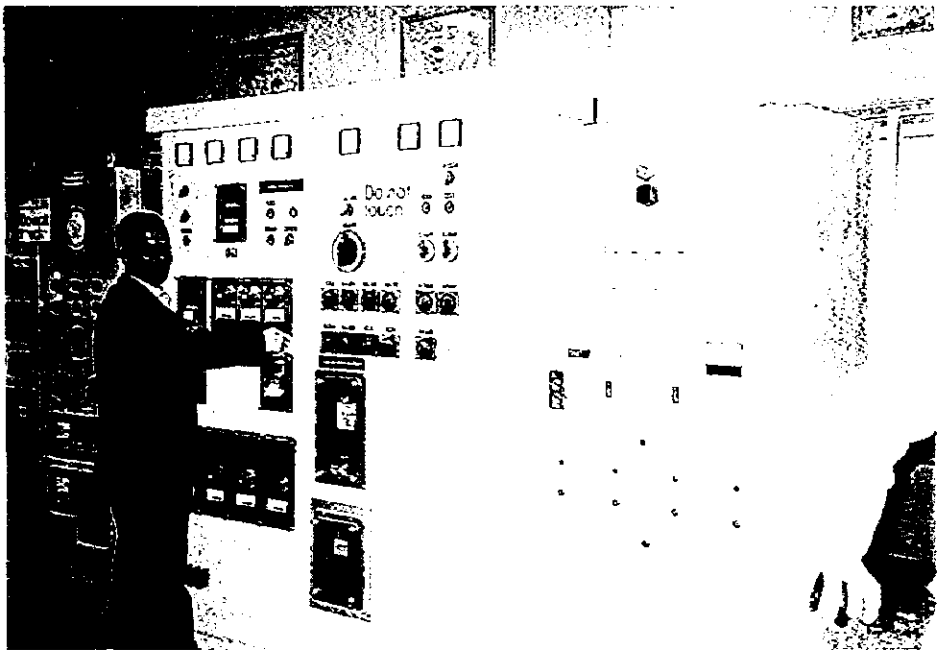

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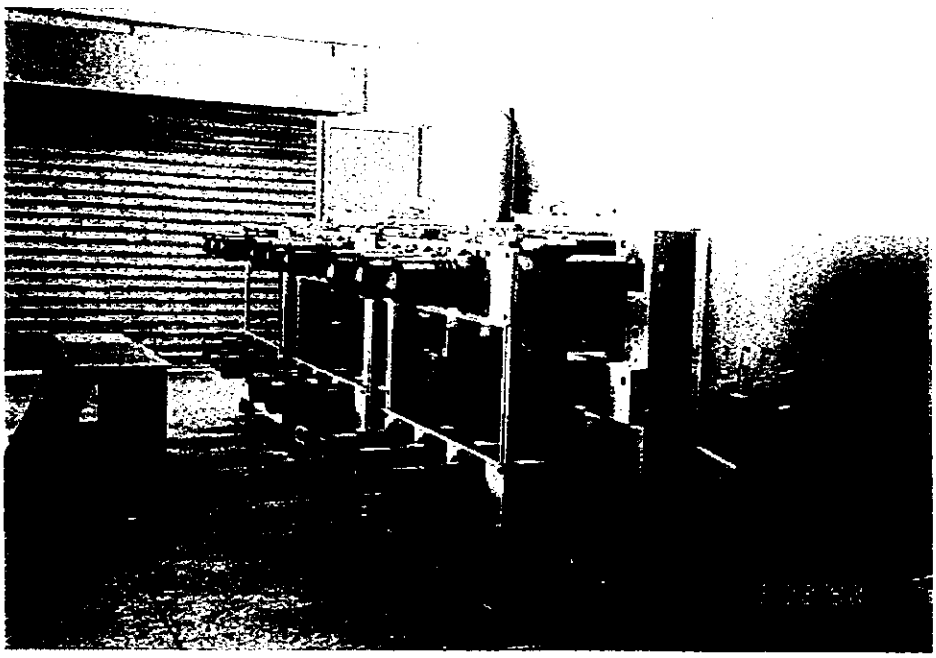

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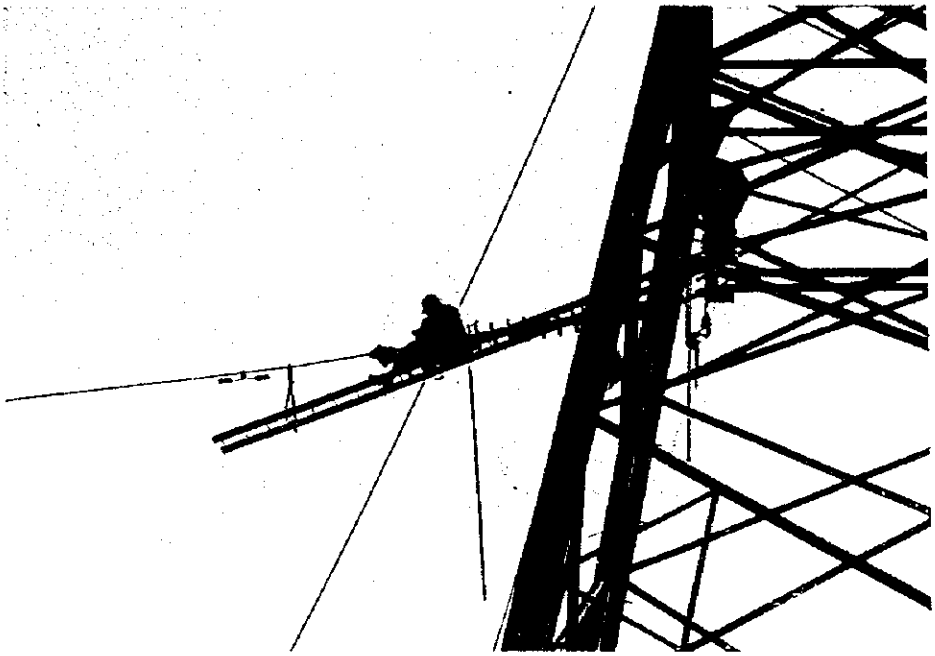

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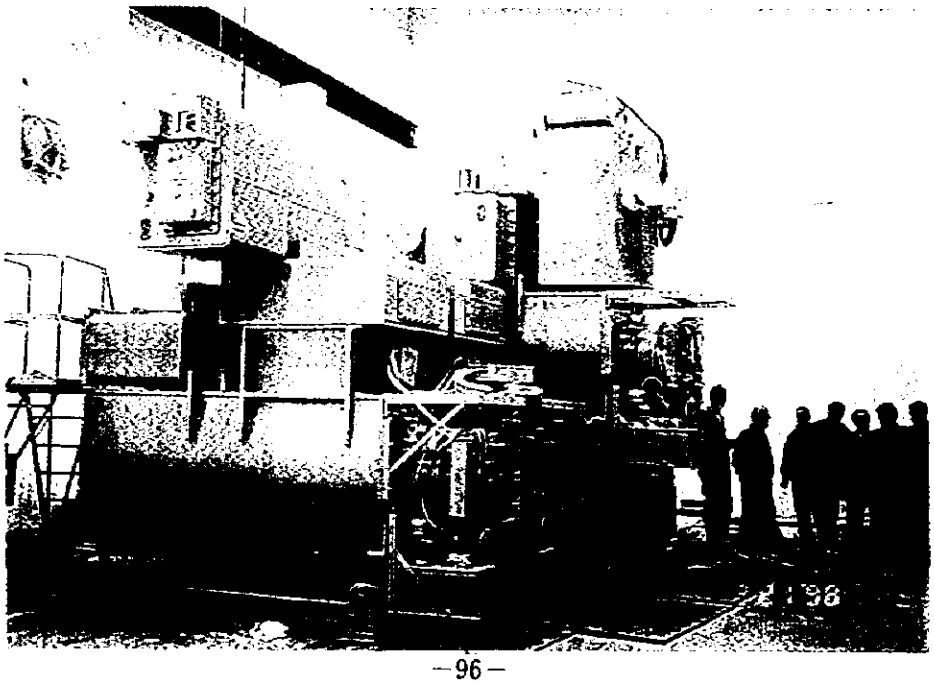

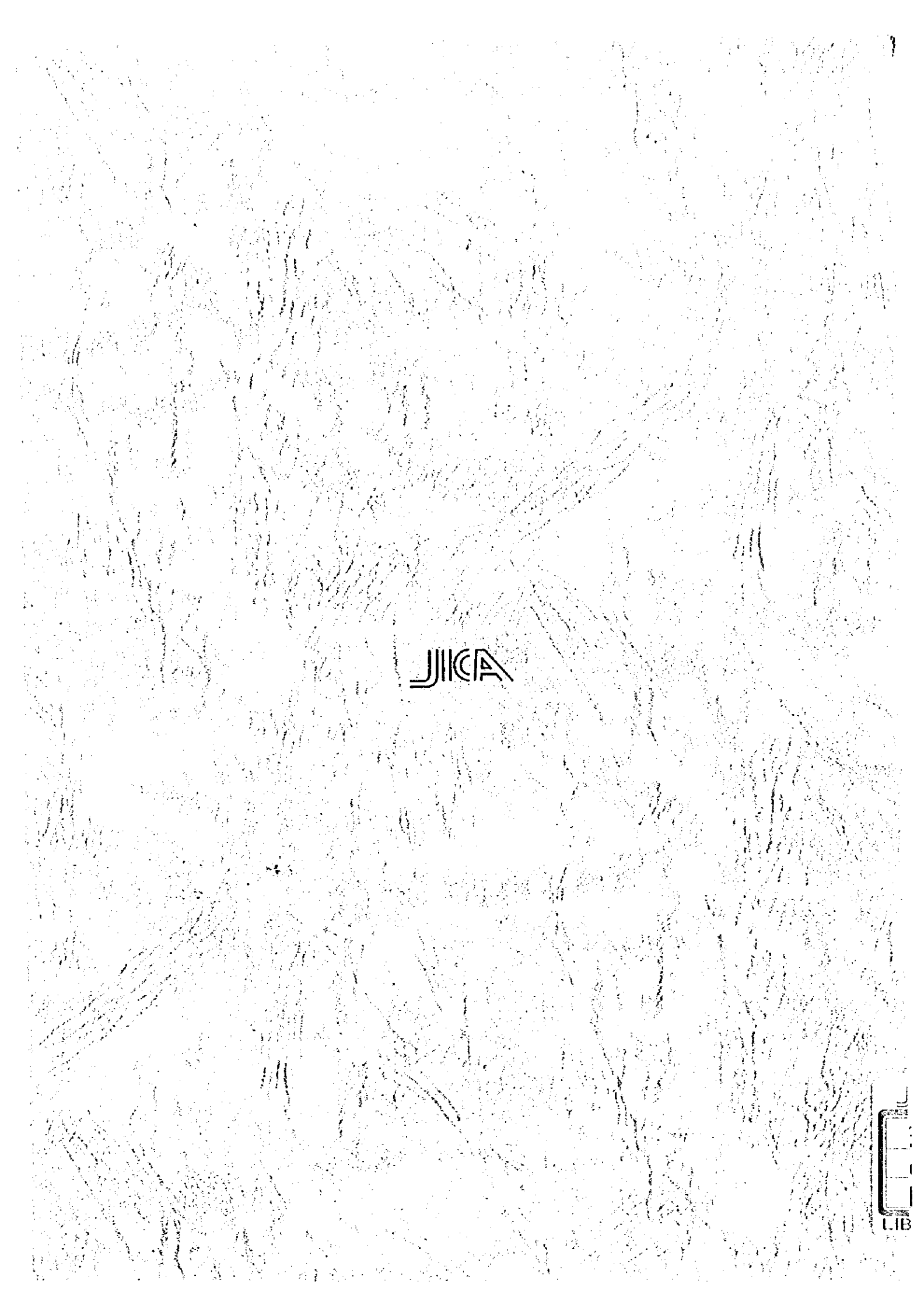
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