社会開発協力部報告書

# THE KINGDOM OF THAILAND

# DETAILED DESIGN REPORT
# FOR
# THE BANGKOK TELEPHONE NETWORK PROJECT

# (LOCAL CABLE NETWORK)

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AUGUST, 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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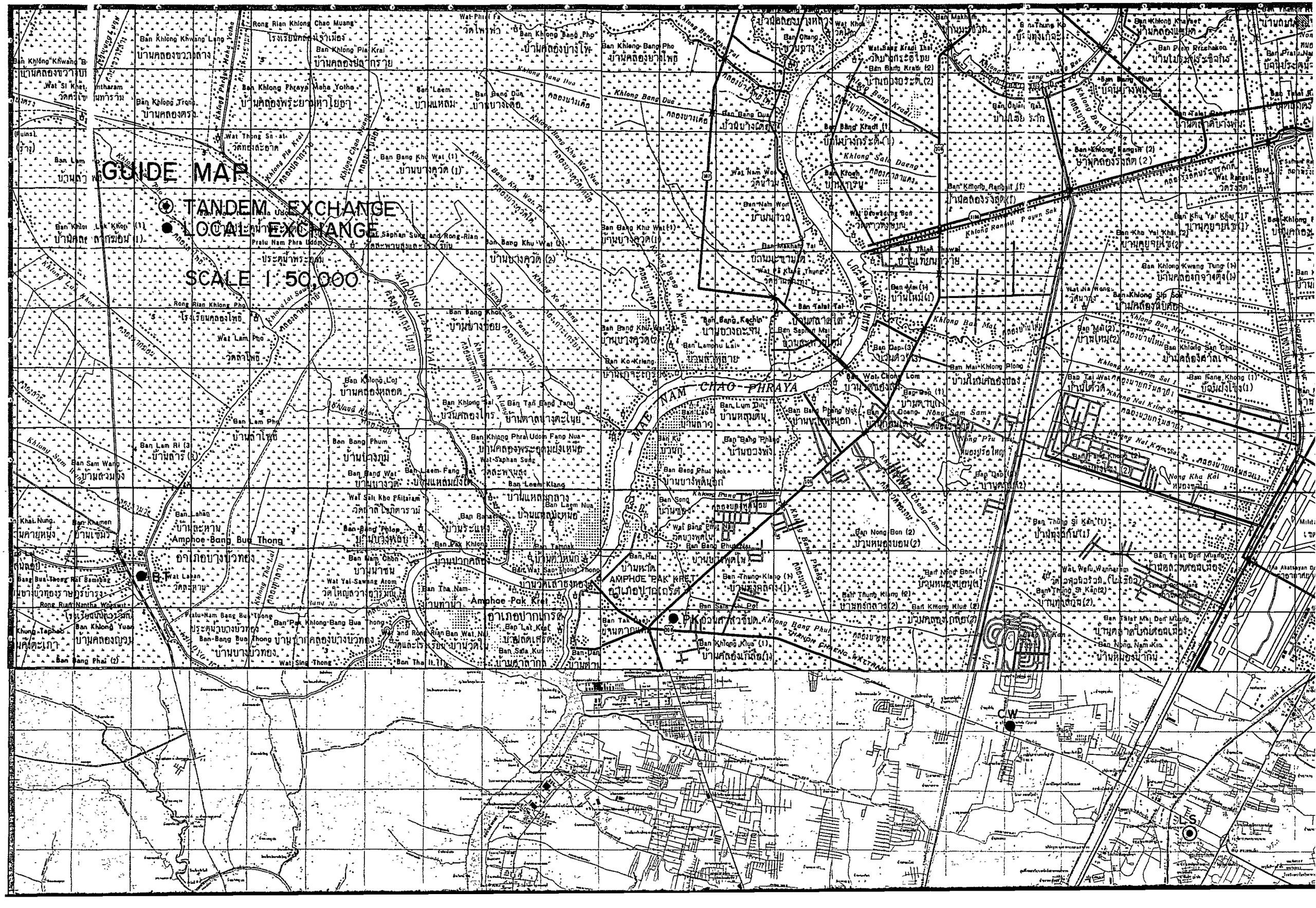
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LOCAL EXCHANGE
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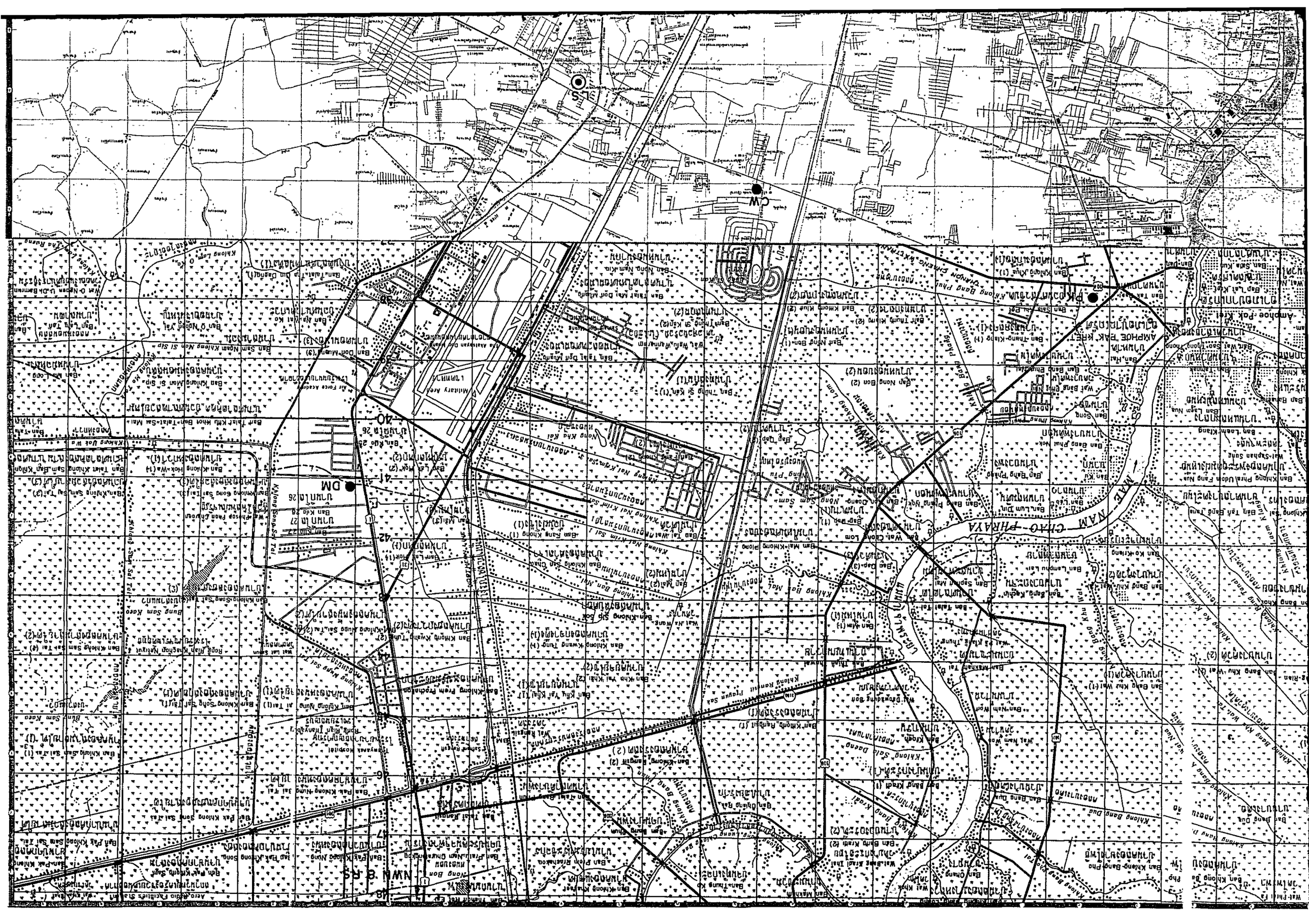


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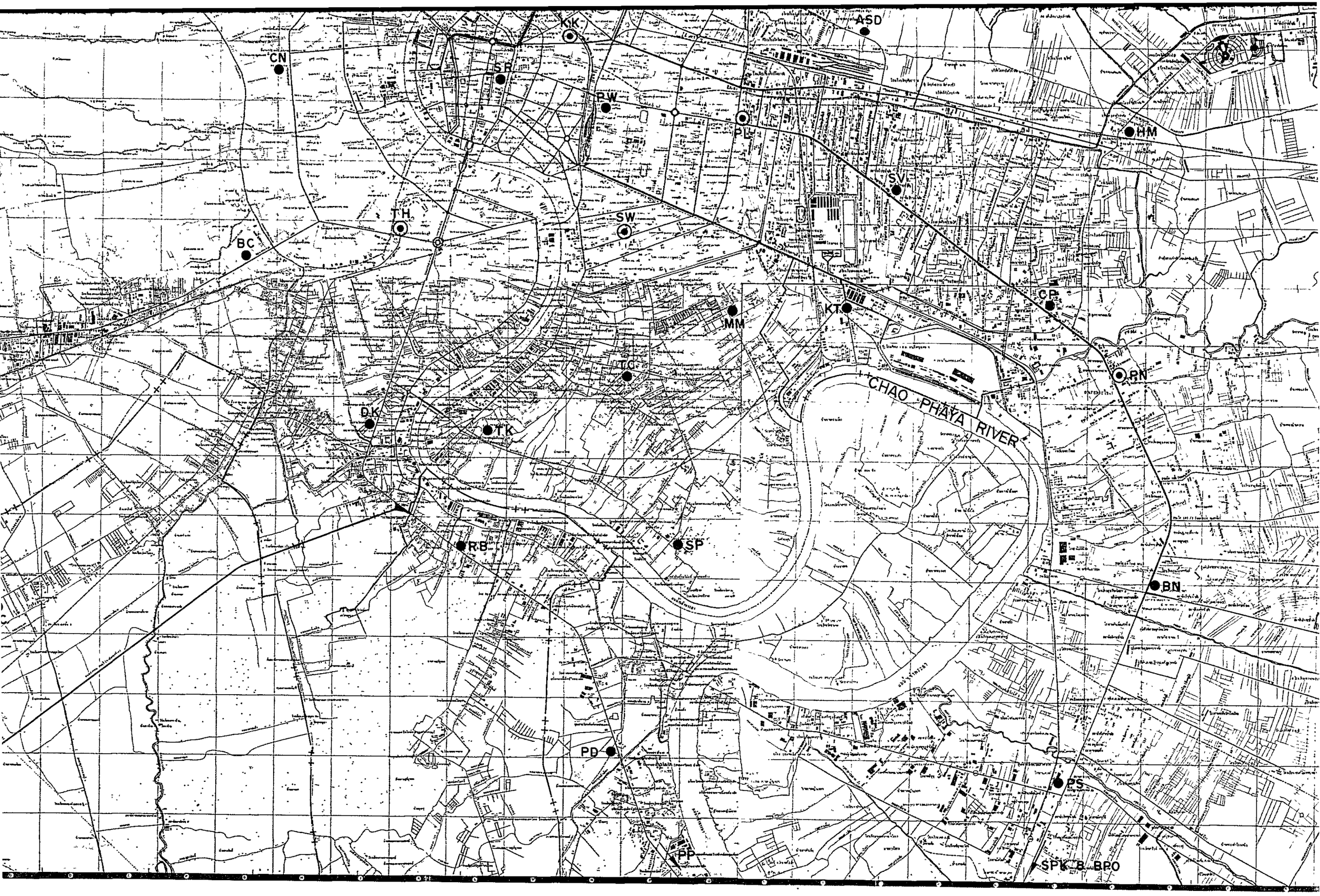
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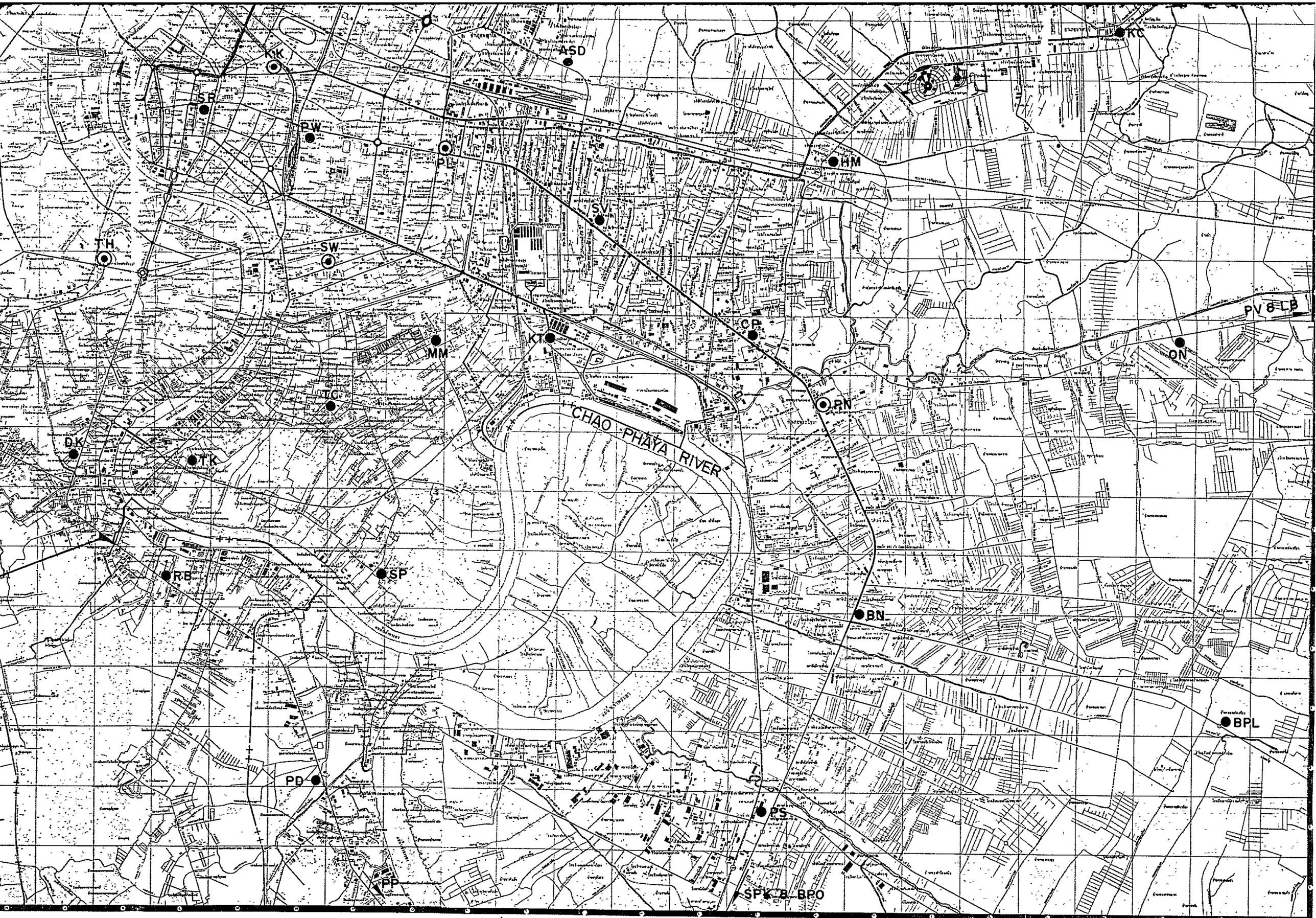
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# PREFACE

In response to the request of the Government of the Kingdom of Thailand, the Japanese Government decided to conduct a survey on the detailed design of local cable network of three telephone exchanges which constitutes part of the Bangkok Telephone Network Project and entrusted the Japan International Cooperation Agency with the survey. The J.I.C.A. sent to Bangkok a survey team headed by Mr. Nobuo YOSHIDA from October 24, 1979 to March 21, 1980.

The team had discussions with the officials concerned of the Government of the Kingdom of Thailand and conducted a field survey in the three telephone exchange areas in Metropolitan Bangkok. After the team returned to Japan, further studies were made and the present report has been prepared.

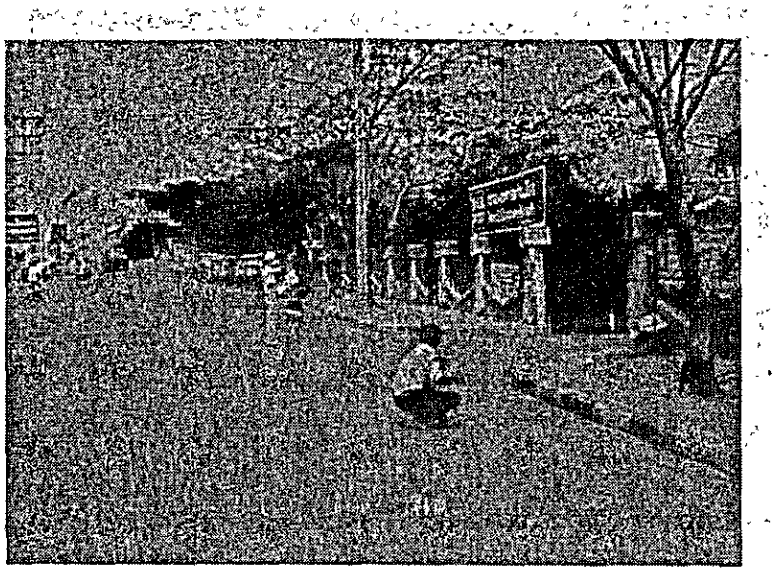
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Kingdom of Thailand for their close cooperation extended to the team.

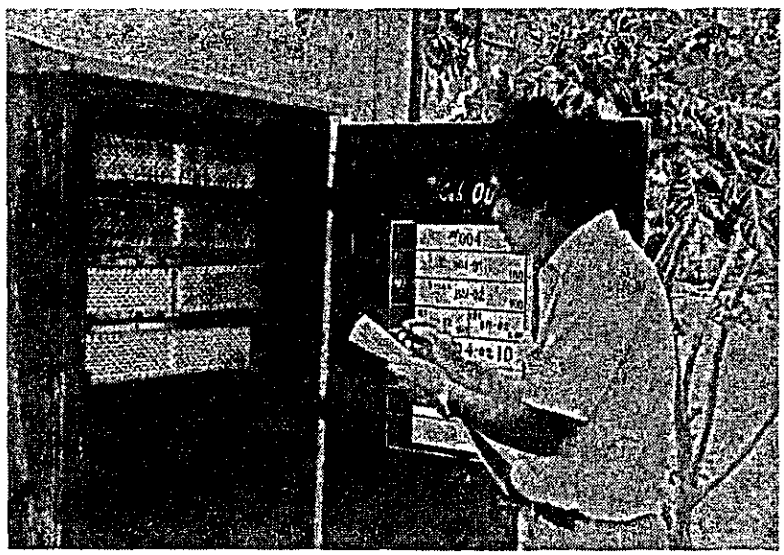
August , 1980

Keisuke Arita

Keisuke Arita
President
Japan International
Cooperation Agency

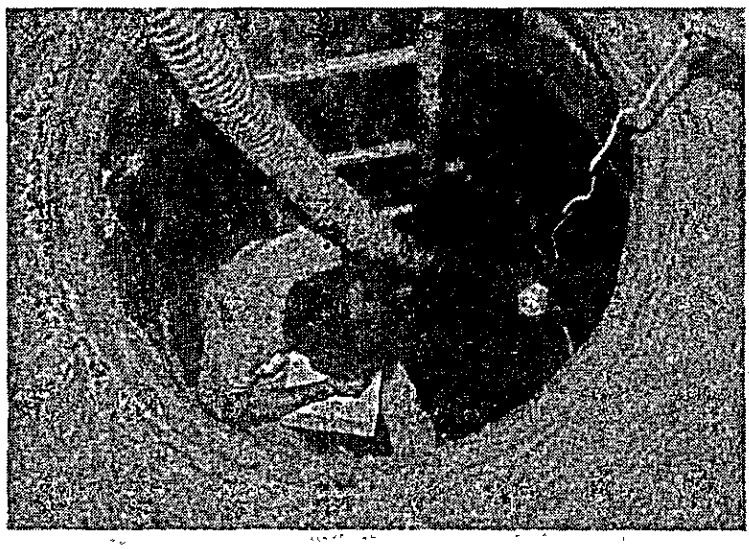


Field Survey (Rachburana Ex.)



Existing Cabinet Investigation

Meeting at TOT Office



MH Survey at Night Time

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PART IV DETAILED DESIGN OF EACH EXCHANGE

# PART I SUMMARY

# CHAPTER 1. PURPOSE AND BACKGROUND OF SURVEY

The Telephone Organization of Thailand (TOT) is carrying out its Third Telephone Development Project which is a part of the Fourth National Economic Development Plan for the Kingdom of Thailand. The Bangkok Telephone Network Project (1977-1984) constitutes a central portion of the said Telephone Development Project.

The survey was conducted for the purpose of executing the detailed local cable network designs for the three telephone exchanges of Klong Toei, Rachburana and Ekachai.

The expansion/construction work of these three exchanges is a part of the same kind of work for 13 exchanges that belong to Package II - Phase I of TOT's work schedule.

CHAPTER 2. SUBSTANCE OF MAIN WORK

The main contents of the survey work conducted by the survey team are as follows:

(1) Demand Survey and Preparation of Demand Distribution Map

Prior to the detailed design of cable and civil works, the boundary of each exchange service area was confirmed and the street by street survey was conducted for the purpose of obtaining field conditions data of the exchange areas.
Based on the survey result, the telephone demand forecast was made, indicating the demand distribution on the service area map.
The forecast values for the three exchange areas are given in Figure 1.2.1.

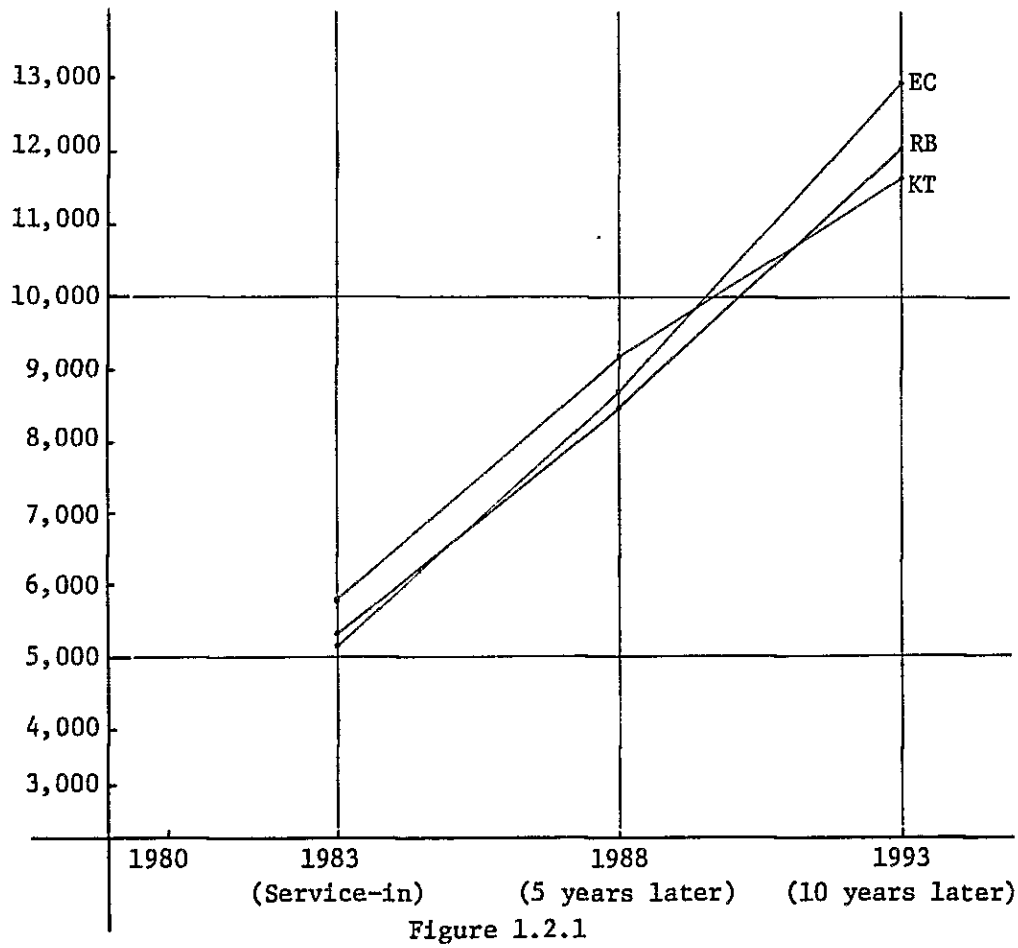



Figure 1.2.1

(2) Establishment of Cabinet Areas

Cabinet areas were established, using main roads, rivers, railways, etc., as boundaries so that they would need no change for a long period.

In the establishment of cabinet areas, the optimum installation of feeder (primary) and distribution (secondary) cables and the effective use of existing facilities also were taken into account.

The service area and the number of cabinet areas established for each telephone exchange are shown in Table 1.2.1.

Table 1.2.1

| Exchange | Service Area (hectare) | Number of Cabinet Areas | Remarks |
|---|---|---|---|
| Klong Toei | 630 | 40 | |
| Rachburana | 4,050 | 37 | Excluding two provisional cabinet areas |
| Ekachai | 9,100 | 41 | |
| Total | 13,780 | 118 | |

(3) Design of Cable Network System

Underground and aerial cable systems are adopted in the design of local network.

The design works conducted for each system are as follows:

1) Design of Underground Cable System

The study for underground cable application, the selection of underground cable routes, the determination of the number of cable pairs and conductor sizes, and the cut-over design were conducted.

In the determination of conductor sizes for the demand in remote areas, the comparative study was made in consideration of the subscriber's loading system also.

2) Design of Aerial Cable System

The selection of aerial cable routes, the determination of the aerial cabling system and the number of cable pairs and conductor sizes, and the study of existing cables to be utilized were carried out. Because of the special importance of the availability of existing cables, the record of existing facilities was complemented, where necessary, with data obtained in the field survey.

(4) Design of Civil Works

The road occupancy locations of the proposed civil facilities were selected by negotiations with road authorities and other parties concerned.

Investigations were conducted concerning underground structures on cable route and bridges along which to lay cable lines.

This time, the volume of civil works design increased because all three exchanges were to be newly established and also because special TOT's conduit bridges had to be designed at many places in view of the topography of the areas.

(5) Surveys

Surveys were conducted for locations where manholes, pulling boxes, cross-connecting cabinets, poles and guys were to be newly built and for their relationships with the existing facilities.

(6) Investigation of Manholes

The investigation of manholes was made for the purpose of the selection of ducts for cable placing and the selection of cable jointing places, and also for the survey of existing cables in the manholes.

The night survey was carried out for several manholes located on heavy traffic roads.

## CHAPTER 3. AMOUNT OF ESSENTIAL WORKS

The amount of essential works calculated from the design drawings prepared on the basis of the foregoing surveys and investigations is shown in Table 1.3.1.

Table 1.3.1

| Item | Unit | Klong Toei | Rachburana | Ekachai | Total |
|---|---|---|---|---|---|
| Telephone pole erection | Pole | 23 | 147 | 819 | 989 |
| Guys | Line | 63 | 251 | 774 | 1,088 |
| Aerial cables | km | 13.9 | 59.3 | 109.2 | 182.4 |
| Underground cables | km | 10.6 | 18.0 | 29.1 | 57.7 |
| Cross-connecting cabinets | ea | 17 | 23 | 35 | 75 |
| Ready access terminals and terminal boxes | ea | 265 | 738 | 1,021 | 2,024 |
| Underground conduits | km | 3.9 | 7.9 | 15.2 | 27 |
| Manholes | ea | 6 | 32 | 76 | 114 |
| Pulling-boxes | ea | 21 | 20 | 35 | 76 |
| Bridges | ea | 0 | 4 | 6 | 10 |

# PART II INTRODUCTION

## CHAPTER 1. WHOLE ASPECT OF THAILAND TELEPHONE EXPANSION PROJECT

The Telephone Organization of Thailand (TOT) is proceeding ahead with the telephone network expansion project based on the long-term plan for the whole kingdom.

This project is called the "Economic Development Project 1977-1984 of TOT" and, having been formulated along the line of the Fourth National Economic Development Plan 1977-1981 for the whole kingdom, constitutes an integral part of this plan.

TOT has divided the project into two major segments. They are:

- Package I (1977-1982)
  - Phase I (13 Exchanges)
  - Phase II (19 Exchanges)
- Package II (1981-1984)
  - Phase I (15 Exchanges)
  - Phase II (13 Exchanges)

### 1.1 Contents of Package I - Phase I

(1) Service in Metropolitan Bangkok

1) Installation of additional 50,000 terminals at all 13 telephone exchanges
2) Installation of additional 50,700 pairs lead-in cables at local telephone exchanges
3) Installation of additional 82,000 pairs-km local junction cables
4) Installation of new subscriber's premise equipment

(2) Service in Rural Areas

1) Installation of additional 17,800 terminals at all 6 telephone exchanges
2) Installation of additional 20,800 pairs lead-in cables at local telephone exchanges
3) Installation of new subscriber's premise equipment

(3) Installation of new/additional 4,790 terminal equipment for long-distance telephone circuits

## 1.2 Contents of Package I - Phase II

(1) Service in Metropolitan Bangkok

1) Installation of additional 63,000 terminals at all 19 telephone exchanges
2) Installation of additional 114,700 pairs lead-in cables at local telephone exchanges
3) Installation of additional 186,650 pairs-km local junction cables
4) Installation of new subscriber's premise equipment

(2) Service in Rural Areas

1) Installation of additional 31,400 terminals at all 41 telephone exchanges
2) Installation of additional 45,900 pairs lead-in cables at local telephone exchanges
3) Installation of new subscriber's premise equipment

(3) Installation of new/additional 2,608 terminal equipment for long-distance telephone circuits

(4) Installation of new long-distance transmission system for long-distance telephone service to/from 210 distant places

## 1.3 Contents of Package II - Phase I

(1) Service in Metropolitan Bangkok

1) Installation of additional 60,000 terminals at all 15 telephone exchanges
2) Installation of additional 83,400 pairs lead-in cables at local telephone exchanges
3) Installation of additional 191,100 pairs-km local junction cables
4) Installation of new subscriber's premise equipment

(2) Service in Rural Areas

1) Installation of additional 27,400 terminals at all 39 telephone exchanges
2) Installation of additional 39,000 pairs lead-in cables at local telephone exchanges

3) Installation of new subscriber's premise equipment

(3) Installation of new/additional 9,388 terminal equipment for long-distance telephone circuits

(4) Installation of new long-distance transmission system for long-distance telephone service to/from 212 distant places

1.4 Contents of Package II - Phase II

(1) Service in Metropolitan Bangkok

1) Installation of additional 60,000 terminals at all 13 telephone exchanges

2) Installation of additional 97,100 pairs lead-in cables at local telephone exchanges

3) Installation of additional 209,550 pairs-km local junction cables

4) Installation of new subscriber's premise equipment

(2) Service in Rural Areas

1) Installation of additional 25,600 terminals at all 71 telephone exchanges

2) Installation of additional 29,400 pairs lead-in cables at local telephone exchanges

3) Installation of new subscriber's premise equipment

(3) Installation of new/additional 1,434 terminal equipment for long-distance telephone circuits

# CHAPTER 2. REQUEST FOR TECHNICAL COOPERATION AND ORGANIZATION OF SURVEY TEAM

The Telephone Organization of Thailand (TOT) is promoting the telephone networks expansion project for the whole kingdom, based on its Third Economic Development Project (1977-1984).

For the successful completion of this project, TOT had to complement the shortage of staff design engineers and found it necessary to acquire technical cooperation from an overseas administration.

Thus TOT, through the Government of Thailand, made a request to the Government of Japan for cooperation in the surveys and designs with respect to the Bangkok Telephone Networks Project.

In response to such request, the Government of Japan entrusted the Japan International Cooperation Agency (JICA) with execution of surveys to make detailed designs.

JICA organized a preliminary survey mission headed by Mr. Mitsugu Iijima and dispatched it to the Kingdom of Thailand for the period from June 28 through July 15, 1978. The mission carried out discussions with officials concerned of the Government of Thailand and of TOT and compiled a draft of the scope of work for the detailed designs.

At the same time, the mission conducted the field surveys of telephone facilities in Bangkok and the northeastern part of Thailand.

On the basis of the preliminary survey results, JICA decided to dispatch a full-time survey mission to the Kingdom of Thailand in the 1978 fiscal year for the detailed design of five out of ten local exchanges requested by TOT, and to take up for consideration the rest of the exchanges in the 1979 fiscal year. In the 1979 fiscal year, JICA decided to execute the design work for three out of the remaining five exchanges as the result of careful consideration of TOT's repeated request. Thus, JICA assigned the Nippon Telecommunications Consulting Co., Ltd. (NTC) to execute the aforementioned work.

NTC, based on the contents of work assigned, organized a survey team headed by Mr. Nobuo Yoshida and composed of 6 other experts. (Refer to Table 2.1.1)

The survey team carried out the field survey for the period of approximately five months from October 24, 1979.

Table 2.1.1 Organization of Survey Team for Local Cable System of Bangkok

| Name | Assignment | Position in NTC | Survey Period |
|---|---|---|---|
| Nobuo YOSHIDA | Overall Supervising | Assistant Manager, Overseas Operation Division | October 24, 1979 to March 21, 1980 |
| Akio SHIRAISHI | Local Cable System Design | Ad Hoc Section Manager, Overseas Operation Division | Ditto |
| Tatsuo TAKAHASHI | Ditto | Overseas Operation Division | Ditto |
| Hisataka SAITO | Ditto | Ditto | Ditto |
| Hiroshi KUROHAMA | Ditto | Ditto | Ditto |
| Michinori MAEHIRO | Civil Work Design | Ad Hoc Section Manager, Overseas Operation Division | Ditto |
| Shigenori NISHIMOTO | Ditto | Overseas Operation Division | Ditto |

ANNEX

Scope of Work for the Detailed Design of Bangkok Telephone Networks Project 1979 is attached hereto.

SCOPE OF WORK

FOR

THE DETAILED DESIGN OF

BANGKOK TELEPHONE NETWORKS PROJECT 1979

## I. INTRODUCTION

The Government of Japan has, in response to the request of the Government of Thailand, decided to conduct a detailed design study for local network of three (3) exchange areas in Bangkok Metropolitan area in accordance with laws and regulations in force in Japan. Based on this decision, the Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of Technical Cooperation Programmes of the Government of Japan, will carry out the study in close cooperation with the authorities concerned of the Government of Thailand. The present document sets forth the Scope of Work for the Study.

## II. OUTLINE OF SURVEY/STUDY

1. The following field survey, accompanied with deskwork, for the three (3) exchange areas, i.e., (Rachburana, Ekachai, Klong Toei) will be carried out for a period of about five (5) months by the survey team composed of about seven (7) experts.

   (1) Demand Field Survey
   Subscriber forecasts at the micro-level will be conducted to collect data by which to design the cable distribution network. The final segment of this network design requires street-by-street forecasts.

   (2) Detailed Survey
   Detailed survey will be made, covering all newly proposed duct and cable routes. Study of the existing conduits and cables will be made on the basis of plant records.
   If necessary, on-the-spot survey of the existing facilities will be carried out.

   (3) Manhole Investigation
   Ducts to be used will be selected after the checking of cable placements and locations of cable splices in the existing manholes.

(4) Selection of New Routes

Cable routes will be decided according to the results of investigation of the existing facilities, the study of future plan, and the comparison of several proposed routes.

(5) Dividing of Cabinet Area

Dividing of cabinet areas will be carried out according to the cable routes and considering the demand survey results. Locations of cabinet boxes will then be decided.

(6) Survey of MDF and Cable Vault

Locations of riser cables to MDF and cable placements in cable vaults will be investigated.

(7) Field Measurement

Field measurement will be conducted for all proposed cable routes and some existing cable routes. Levels and cross-sections of roads will be measured to determine the locations of new conduit routes.

2. The final stage of the detailed design work, as indicated below, will be undertaken in Japan by the Survey Team.

Cable Work:

(1) Key Plan
(2) Transmission Sheet, Resistance Design Method
(3) Primary Cable General Plan
(4) Primary Cable Feeder Plan
(5) Secondary Cable General Plan
(6) Secondary Cable Detail
(7) MDF and Cable Vault Plan
(8) Gas Pressurization Plan
(9) Duct Scheme Plan
(10) Manhole Racking Diagram
(11) Cabinet Jointing Plan
(12) Loading Plan
(13) Amount of Work for Primary Cable
(14) Amount of Work for Secondary Cable

Civil Work:

(1) Guide Map

(2) Conduit Plan

(3) Plane

(4) Cross Section

(5) Manhole Diagram

(6) Special Design (if necessary)

## III. REPORT

The following documents will be prepared in English and submitted to the Government of Thailand within about five (5) months after the completion of studies in Thailand for the local networks.

| | | |
|---|---|---|
| (1) | Design Report | (20) copies |
| (2) | Drawings | (20) copies (plus 1 set of original tracing) |
| (3) | Amount of Work | (20) copies (in assembly unit) |
| (4) | List of Main Materials | (20) copies |

## IV. COLLABORATION OF THE GOVERNMENT OF THAILAND

1. The Government of Thailand will exempt the Survey Teams from taxes and duties on machinery, equipment and materials to be brought into Thailand by the Teams in the same way as the Government normally accords to the Colombo Plan experts.

2. The Government of Thailand will exempt the Team members from income tax and charges of any kind to be imposed on or in connection with the living allowances remitted from abroad and will exempt the Team members from import and export duties to be imposed on their personal effects.

3. The Government of Thailand will prepare necessary permits for implementation of outdoor work.

4. The Government of Thailand will assign its counterpart personnels to the Teams during the survey period and will arrange the necessary number of labourers. (Employment cost for labourers will be borne by the Teams.)

5. The Government of Thailand will provide the Teams with relevant data, information and materials necessary for the Survey shown in Annex-1. The Government will also make necessary arrangements for the Teams to take these data and materials back to Japan so as to use them in preparing the report.

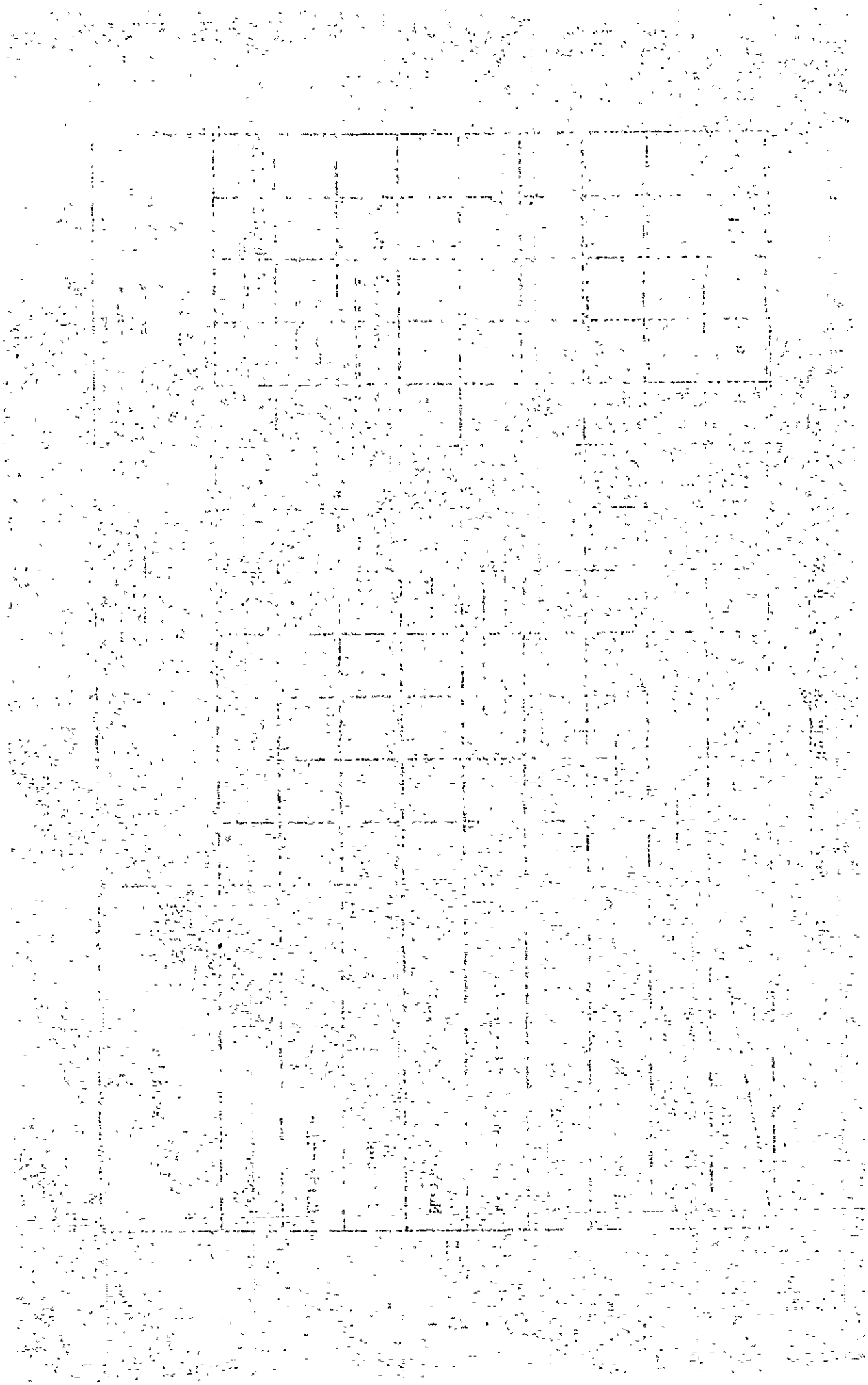
Annex-1

Documents to be supplied by T.O.T.

1) Maps of Great Bangkok
2) Long-term plan for conduit lines
3) Construction and installation Practices of T.O.T.
4) City planning of Great Bangkok
5) Plant Records of existing facilities concerned
6) Data and Records belonging to other authorities
7) Boundaries of each Exchange area
8) Subscriber forecast in each Exchange area
9) Proposed Exchange office layout
10) List of waiting subscribers and their distribution map
11) Standard method of local network design

## Work Schedule for Bangkok Telephone Network Project

| Item \ Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Demand Forecast Data, Existing Plant Study and Check | | | | | | | | | | | | |
| Field Demand Survey | | | | | | | | | | | | |
| Basic Plan | | | | | | | | | | | | |
| Field Survey (detailed) | | | | | | | | | | | | |
| Monhole Investigation | | | | | | | | | | | | |
| Drawing | | | | | | | | | | | DRAFT | |
| Estimation | | | | | | | | | | | | |
| Report | | | | | | | | | | | DRAFT | PRINT |
| Remarks | In Thailand<br>Cable Work<br>Civil Work | | | | | | | In Japan | | | | |



# PART III DETAILED DESIGN WORK

# CHAPTER 1. DESIGN OBJECTIVE EXCHANGES AND DEMAND FORECAST

## 1.1 Outline of Design Objective Exchanges

All three exchanges to be designed in this Project are new exchanges equipped with the latest digital switch.

(1) Klong Toei (KT) Exchange

The KT Exchange is a new End Office that belongs to Ploenchit (PL) Tandem Exchange. Its service area comprises segments separated from the existing Mahamek (MM) and Chaiyapruk (CP) exchange areas.
This exchange is equipped with 10,000 switch terminals and accommodates approximately 3,200 existing subscribers in total transferred from MM and CP Exchanges in the initial stage.
The inauguration of this exchange is scheduled for 1983.

(2) Rachburana (RB) Exchange

The RB Exchange is a new End Office that belongs to Thonburi (TH) Tandem Exchange. Its service area comprises segments separated from the existing Daokanong (DK), Bang Mod (BM) and Phrapradaeng (PD) exchange areas.
This exchange is equipped with 4,000 switch terminals and accommodates approximately 2,770 existing subscribers in total transferred from DK, BM and PD Exchanges in the initial stage.
The inauguration of this exchange is scheduled for 1983.

(3) Ekachai (EC) Exchange

The EC Exchange is a new End Office that belongs to Thonburi (TH) Tandem Exchange. Its service area comprises segments separated from the existing Daokanong (DK), Bang Mod (BM) and Phaseecharoen (PC) exchange areas.

This exchange is equipped with 4,000 switch terminals and accommodates approximately 1,190 existing subscribers in total transferred from DK, BM and PC Exchanges in the initial stage.

The inauguration of this exchange is scheduled for 1983.

## 1.2 Demand Forecast

Detailed field surveys for demand forecast were carried out in the service areas of the three exchanges, based on TOT's telephone demand forecast record. As the result of these surveys, the TOT's record was corrected and the demand distribution map was formulated.

The demand evaluation was made on the following bases: for 1983, the service-in year demand; for 1988, the demand five years later; for 1993, the demand ten years later.

### 1.2.1 General Survey

The result of field surveys was studied through the analysis of the past trend of population and the number of households in Metropolitan Bangkok.

### 1.2.2 Field Surveys

Field surveys were carried out, street by street, based on the city map of Bangkok (scale: 1/1,000).

The latest information of all kinds, including housing complex construction plans, was collected and plotted on the map.

This time, the large part of Ekachai (EC) and Rachburana (RB) exchange areas is situated in the suburbs of Thonburi, forming the suburban residential quarters, so that the accurate knowledge of housing complex plans was most important for the correct demand forecast.

(1) Classification of Service Area

Each service area was classified into five area categories. They were:

1) Residential Area

2) Business Area

3) Special Demand Area
Such as governmental offices, schools, temples, hospitals, factories, hotels, etc., where the telephone demand density by far differs from that in the surrounding areas.

4) Pre-construction Area
An area where the town planning was not yet completed at the time of the survey but where the construction of residential houses, factories, etc., is expected in the future so that the collective demand for telephones is likely to be generated.

5) Non-demand Area
An area that consisted of rice fields, plantations and orchards at the time of the survey, where the telephone demand is not expected in the future either.

(2) Classification of Telephone Demand

Telephone demand was forecasted for the following three categories and the forecast for each category was aggregated into the total demand.

1) General Demand
General demand means the ordinary telephone demand from common social units, such as individual residences, apartments, private shops, home-industry, schools and small temples.
In forecasting the demand from these objectives, the estimation work was carried out, using the increase rate of population and the number of households and also the telephone penetration factor after investigation of the number of houses by field survey and study of housing in the service area.

2) Special Demand

Special demand means the kind of demand difficult to estimate, i.e., the demand from such sources as governmental offices, universities, large hospitals, hotels, factories and commercial companies, where the demand potential is relatively big and, furthermore, PBX and PABX are also planned.

The forecast of such demand was made by means of visits to individual demand sources with the cooperation of TOT personnel. The result of forecast appears in the Demand Forecast by Exchanges.

3) Miscellaneous Demand

Miscellaneous demand means the demand for pay stations, local leased lines and so forth. Based on the past record, this category of demand is estimated at 3 percent of General Demand mentioned in 1) above.

## 1.3 Demand Forecast by Exchanges

The demand forecast by exchanges by years is as follows:

Demand Forecast by Exchanges

| | Klong Toei | | Rachburana | | Ekachai | |
|---|---|---|---|---|---|---|
| General Demand | | | | | | |
| 1983 | 4,950 | 100% | 5,050 | 100% | 4,960 | 100% |
| 1988 | 7,980 | 161 | 8,090 | 160 | 8,330 | 168 |
| 1993 | 10,040 | 203 | 11,500 | 228 | 12,370 | 249 |
| Special Demand | | | | | | |
| 1983 | 640 | 100% | 60 | 100% | 70 | 100% |
| 1988 | 900 | 141 | 70 | 117 | 90 | 129 |
| 1993 | 1,190 | 186 | 80 | 133 | 140 | 200 |
| *Public Telephones and Others | | | | | | |
| 1983 | 150 | 100% | 160 | 100% | 160 | 100% |
| 1988 | 240 | 160 | 250 | 156 | 260 | 163 |
| 1993 | 310 | 207 | 350 | 219 | 380 | 238 |
| Total | | | | | | |
| 1983 | 5,740 | 100% | 5,270 | 100% | 5,190 | 100% |
| 1988 | 9,120 | 159 | 8,410 | 160 | 8,680 | 167 |
| 1993 | 11,540 | 201 | 11,930 | 226 | 12,890 | 248 |

Notes: 1. 1983: Year of Service-in
1988: Five years after Service-in
1993: Ten years after Service-in

2. *The number of public telephones and others is estimated at 3 percent of the numerical value of General Demand.

# CHAPTER 2. DESIGN POLICY

The engineering criteria and the design policy, used this time, do not substantially differ from those used in the previous survey.

Therefore, those engineering criteria and design policy are not described again in this Report.

The essential and new items considered in the design work, this time, are introduced in the following.

## 2.1 Items Relating to Local Cable System Design

### 2.1.1 Provisioning Period (reserve capacity) for Local Cable Network

(1) The size of primary cable (feeder cable) was determined on the basis of estimated demand five years later.

(2) The size of secondary cable (distribution cable) was determined on the basis of estimated demand ten years later.

(3) The distribution block area of cross-connecting cabinet was determined on the basis of estimated demand ten years later.

### 2.1.2 Types of Cable and Cabinet to be Used

The types of cable to be used in accordance with the purpose of use are as follows:

(1) Foam/Skin Insulation Alpeth Sheathed Filled Cable (AP-FSF) (TOT Specification No. OC-204-01)

This cable is employed for the primary cable in underground conduit.

The cable structure is as follows:

1) Conductor Insulation

Conductors are covered with a dual extrusion of foam/skin polyethylene insulating compound.

2) Electrical Characteristics

Electrical characteristics are the same as those of stalpeth cable used at present.

3) Filling Compound and Structure

The filling compound is intended to completely coat the insulated conductors and fill the interstices between pairs and units. The cable structure is completed by the application of suitable core wrapping material, flooding compound, coated aluminum shield, and overall jacket.

4) The number of pairs and the gauge size of conductor are shown in the following table:

Number of Pairs (AP-FSF)

| (ϕmm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.4 | 300 | 400 | 600 | 900 | 1200 | 1500 | 1800 | 2100 | 2400 | 2700 |
| 0.5 | 300 | 400 | 600 | 900 | 1200 | 1500 | 1800 | - | - | - |
| 0.65 | 300 | 400 | 600 | 900 | 1200 | - | - | - | - | - |
| 0.9 | 300 | 400 | 600 | - | - | - | - | - | - | - |

(2) Polyethylene Insulation Alpeth Sheathed Cable (AP)
(TOT Specification No. OC-104-03)

This cable is employed for the primary aerial cable and secondary cable.

The number of pairs and the gauge size of conductor are shown in the following table:

Number of Pairs (AP)

| (ϕmm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.4 | 10 | 25 | 50 | 100 | 200 | 300 | 400 | 600 | 900 |
| 0.5 | 10 | 25 | 50 | 100 | 200 | 300 | 400 | 600 | - |
| 0.65 | 10 | 25 | 50 | 100 | 200 | 300 | 400 | - | - |
| 0.9 | 10 | 25 | 50 | 100 | 200 | 300 | - | - | - |

(3) Figure 8 Alpeth Sheathed Cable
(TOT Specification No. OC-108-03)

This cable is employed for the secondary aerial cable. The number of pairs and the gauge size of conductor are shown in the following table:

| | Number of Pairs (AP-8) | | | |
|---|---|---|---|---|
| (ϕmm) | | | | |
| 0.4 | 10 | 25 | 50 | 100 |
| 0.5 | 10 | 25 | 50 | 100 |
| 0.65 | 10 | 25 | 50 | 100 |
| 0.9 | 10 | 25 | 50 | - |

(4) Cross-Connecting Pedestal Cabinet
(TOT Specification No. OA-112-02)

This cabinet is employed for the proposed cabinet in this project and its capacity is 900 pairs.

### 2.1.3 Criteria for Use of Ready Access Terminal Box and Terminal Box with Stub

The terminal box to be used on the aerial cable line comprises two types: ready access terminal box and terminal box with stub. The criteria for their use are as follows:

(1) The ready access terminal box is used in the section where the number of aerial cables installed is small and in the area where the cable plant is least likely to suffer damage by being bitten by ants.

(2) The terminal box with stub is used in the section where the number of aerial cables installed is large and in the area where the cable plant is apt to be bitten by ants and suffer damage.

## 2.2 Items Relating to Civil Works Design

### (1) Road Occupancy Location of Underground Facilities

The road occupancy locations of underground facilities on main cable routes were selected by negotiations with road authorities and other parties concerned.
For pulling boxes, the road occupancy locations were selected on the side of houses of sidewalks in order not to interfere with the sewerage system to be established in the future.

### (2) Type of Conduit in Special Section

PVC pipe is used for underground conduit in steel pipes to be laid by the iron sleeve pushing method.
For underground conduit to be installed in the waterpool, asbestos pipe is used in principle. In the curved section, however, PVC pipe is used, reinforced with concrete.

### (3) Manhole in Front of Exchange

For the manhole in front of exchange, special manhole is adopted in consideration of underground structures under the control of other authorities, as well as the manhole location and the direction of cable laying.
For the manhole strength calculation, the computer was used.

## CHAPTER 3. METHOD OF INTEGRATION

### 3.1 Total Work Processes

(1) The total work processes were calculated on the basis of TOT's assembly units.

(2) Work processes were divided into primary cable work and secondary cable work.
The primary cable work is limited to the establishment of cross-connecting cabinets and the primary cable termination to the cabinets. The secondary cable work is from the secondary cable termination to the cabinets to the fixing of ready access terminal boxes or terminal boxes with stub.
For civil works, the main work process only was included in the calculation of work processes. This is because the construction work is to be sub-contracted.

### 3.2 Quantities of Materials Required

Quantities of materials required for primary cable work are calculated only for main materials because the work is to be sub-contracted.

For jelly filled cable splicing materials, the quantities required were calculated according to the types of splicing. This was because the standard practice for this splicing has not yet been established.

Quantities of materials required for secondary cable work were calculated, based on the work processes now adopted by TOT.

Quantities of materials required for civil works are not calculated because the works are to be sub-contracted.

# PART IV DETAILED DESIGN OF EACH EXCHANGE

# CHAPTER 1. KLONG TOEI TELEPHONE EXCHANGE

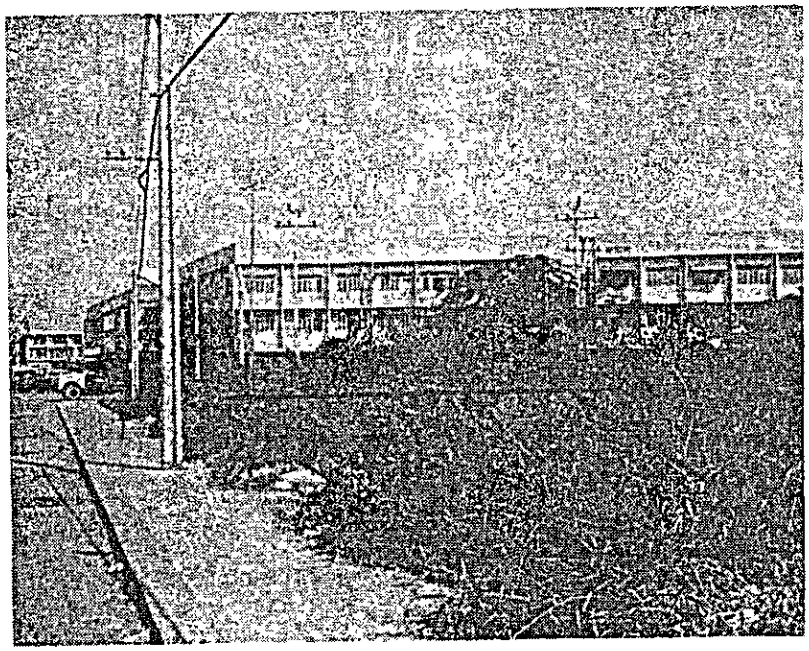
CONTENTS

CHAPTER 1. KLONG TOEI TELEPHONE EXCHANGE

## 1.1 Service Area

The Klong Toei Telephone Exchange is a new exchange whose service area consists of a newly transferred part of the service areas of the existing Mahamek and Chaiyapruk Exchanges.

The new exchange office is located at one corner of the intersection of Sun Torn Kosa Road and Art Narong Road.



Klong Toei Exchange Site

The western part of the new service area adjoins the service area of Mahamek Exchange by Soi Yen Arkado I Road and Klong Kvang River.

The northern part abuts on the Ploenchit and Chaiyapruk Exchange areas by Rama IV Road and the eastern part borders the Parakanong Exchange area by Klong Parakanong River. The southern part faces the Chao Phraya River.

The whole service area covers approximately 630 hectares and is comparatively small.

## 1.2 Demand Potential and Locational Features

The Klong Toei Exchange service area consists of the shopping district along Rama IV and Sun Torn Kosa Roads with the earlier developed residential zone at the back, and Klong Toei harbour facilities facing the Chao Phraya River.

The slums exist in the Klong Toei port area. A part of the slums has already been withdrawn and is being reclaimed as harbour facilities. For the rest of the area also, the reclamation plan is available.

In this design, the forecasted telephone demand in this area after the full reclamation is used.

The demand forecast by major categories is given in Table 4.1.1 and the breakdown of special demand forecast in Table 4.1.2.

Table 4.1.1 Demand Forecast

| | 1983 | 1988 | 1993 |
|---|---|---|---|
| General Demand | 4,950 | 7,980 | 10,040 |
| Special Demand | 640 | 900 | 1,190 |
| Demand for Public Telephones and Others | 150 | 240 | 310 |
| Total | 5,740 | 9,120 | 11,540 |
| Growth Rate | 100% | 159% | 201% |

Table 4.1.2 Special Demand Forecast

| Demand Source | 1983 | 1988 | 1993 |
|---|---|---|---|
| Port Authority of Thailand | 70 | 130 | 200 |
| Head Office of Custom | 100 | 130 | 150 |
| Piratanakittaktai Co., Ltd. | 6 | 7 | 10 |
| Joo Seng Dee Co., Ltd. | 10 | 15 | 20 |
| Tep Tanin Co., Ltd. | 5 | 13 | 15 |
| Metropolitan Electricity Authority | 20 | 25 | 30 |
| SHELL | 19 | 25 | 55 |
| Colgate Palmolive (Thailand) Co., Ltd. | 17 | 20 | 25 |
| Thai Building | 70 | 100 | 120 |
| Tavich Building | 200 | 225 | 230 |
| ESSO GAS | 25 | 30 | 33 |
| Bus Transportation Organization | 10 | 15 | 25 |
| Bangkok College | 5 | 10 | 13 |
| I.C.P Bangkok Co., Ltd. | 4 | 5 | 7 |
| The Livestock Trading Operation Ltd. | 8 | 10 | 13 |
| Siam City Bank | 8 | 13 | 20 |
| New Port Area | 10 | 50 | 100 |
| Public Apartment | 46 | 69 | 115 |
| Total | 633<br>(640) | 892<br>(900) | 1,181<br>(1,190) |

Note: Figure in parentheses consists of the base unit raised to the tenth unit.

## 1.3 Primary Cable Network Design

### 1.3.1 Entrance Cable

The kinds of Klong Toei Exchange entrance cables are as follows:

| Cable No. | Kind of Cable (A) | Demand in 1988 (B) | Rate (A)/(B) | Remarks |
|---|---|---|---|---|
| 01 | 2700-.4 AP-FSF | 1,370 | 197% (131%) | Spare 900 Pairs at MH #003 |
| 02 | 2700-.4 AP-FSF | 1,780 | 152% | |
| 03 | 2700-.4 AP-FSF | 2,070 | 130% | |
| 04 | 2700-.4 AP-FSF | 2,370 | 114% | |
| 05 | 2400-.4 AP-FSF | 1,530 | 157% (118%) | Spare 600 Pairs at MH #018 |
| Total | 13,200 | 9,120 | 145% (128%) | |

Note: Figure in parentheses is the ratio of the number of entrance cable pairs excluding spare pairs to the demand in 1988.

The total number of entrance cable pairs is 13,200 pairs and the rate of the number of entrance cable pairs to telephone demand in 1983 is 145 percent.

900 pairs out of the 13,200 pairs are reserved at MH #003 to meet sporadic variation of telephone demand, and 600 pairs at MH #018 for the same purpose.

These spare pairs are used as loop-circuits for cut-over at the time of the exchange service-in.

### 1.3.2 Design of MDF

The design of MDF is made in the same way as in other existing and new standard exchanges because the design of the exchange building and the disposition of switching equipments have not yet been determined. That is to say:

(1) MDF is to be the combined distribution type.

(2) On the line side, the 258R terminal board of 600 pairs per vertical is to be installed.

(3) At MDF, from the far end, firstly the junction cables and then the local cables are to be terminated.

### 1.3.3 New Cable Installation in Various Directions

New cable installation work is scheduled in new Klong Toei Exchange service area which at present belongs to Mahamek Exchange.

In this design, the primary and secondary cables, cross-connecting cabinets, terminal boxes, etc., to be installed in the abovementioned cable expansion work are dealt with as the existing facilities, based on the relevant drawings.

(1) Rama IV Road, Sun Torn Kosa Road and New Exchange Neighbourhood

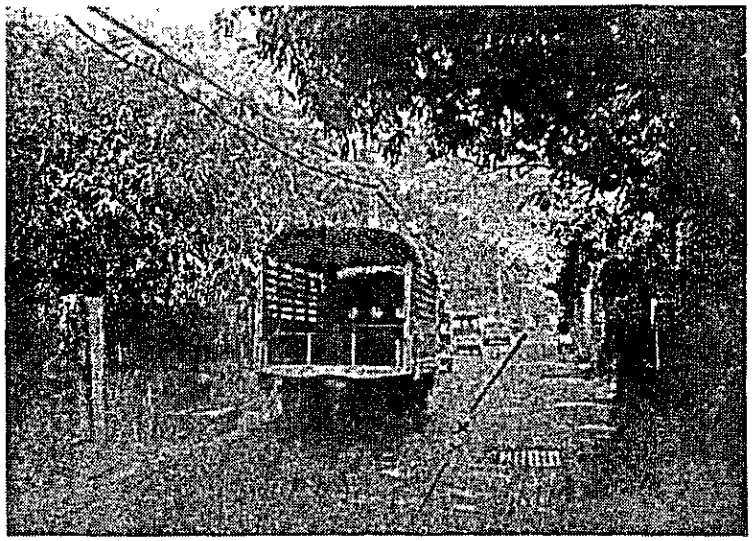
This area is fed by primary cables of 5,400 pairs in total. That is, (01) and (03) cables are respectively 2,700 pairs.

The 900 pairs in (01) cable are reserved at MH #003 to meet sporadic demand variation in this area and are also to be used as the loop circuits at the time of the exchange cut-over.

(2) Leab Menum Chao Phraya Road and Sribumphen Road Area

This area is fed by (02) primary cable of 2,700 pairs. Cabinets #037 and #038 are replaced with new cabinets.

The aerial cable system is used along Yenagad I Road because the road is narrow and the traffic volume is large.



Yenagad I Road

(3) Art Narong Road, Kasemrat Road, Rama IV Road Area and Port Area

These areas are fed by primary cables of 5,100 pairs in total, that is, (04) 2,700 pairs and (05) 2,400 pairs cables.

The 600 pairs in (05) Cable are reserved at MH #018 to meet sporadic demand variation in these areas and are also to be used as the loop-circuits at the time of the exchange cut-over.