IX PROJECT EXECUTION PLAN

IX. Project Execution Plan

1. Establishment of OCADS-II Project Head Office

P & T is expected to temporarily establish in the middle of 1977 the OCADS-II Project Head Office composed of three departments under an OCADS-II Project Chief Manager of an assistant telecommunication chief engineer for execution of the project. The staff members will be sent from P & T. The Chief Manager of the OCADS-II Project will be responsible for the execution of the project.

Before the establishment of the OCADS-II Project Head Office, the intra-ministrial bureau will advance the planning and operations of the project. At present, a tender specification (draft) is being prepared for each office or station.

It is to be noted that the project head office planned so far has, for the time being, no organization for coordination between different fields (Fig. IX·1·1).

2. Execution Bar Charts

According to the proposal of this project, P & T had initially planned and prepared execution bar charts of the respective offices or stations all in series assuming the project implementation period to be five (5) years on the basis of the ITU experts' recommendation. However, it has been determined, through discussion by the survey team and P & T, the project implementation period will be reduced to three (3) years for the following reasons, as shown in the installation bar chart given in Table IX·2·1.

1) It is desirable, for early return of the investment, to start STD service at an earlier time and secure returns through service improvement.
2) It is desirable to minimize the influence of future price rise to the project.
3) It is desirable to minimize the correction or change of the plan due to environmental change, etc., for effecting smooth execution of the implementation of the project.
4) The periodical condition set by the Japanese government for the

credit in yen is five (5) years, so that is not adequate to consider the maximum period of five (5) years from the beginning.

3. Switches

3-1 Installation by P & T under Its Direct Management

For the installation of crossbar switches in the present project, P & T has planned to execute the design of facilities, detailed design, installation test and others under direct management of P & T's technical personnel, considering that P & T has acquired sufficient techniques through the installation and maintenance of the OCADS-I Project preceding to the present project.

3-2 Installation Teams

Installation teams will be established in the Head Office of the project for the execution of installation of switches and related facilities. P & T has planned the scale and configuration of each installation team to consist of 14 members as standard as shown in Fig. IX.3.1 through its experience in the OCADS-I project.
The bar chart given in the initial proposed set out only one installation team, which was expected to circulate the sites of installation one after another to complete the project.

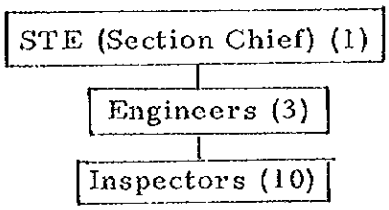


Fig. IX.3.1 Standard Configuration of Switch Installation Team

It is now expected, with the period reduction of the project, to establish two (2) or three (3) installation teams so as to effect installation at two (2) or three (3) different sites and expand the scale of each installation team as shown in Fig. IX·1·1.
Installation engineers presently assigned in Colombo and other

regions will be trained to form these installation teams.

3-3 Design of Facilities and Detailed Design

This include the assessment of tender specifications for the installation of switches, design of facilities, detailed design, etc. Not many engineers are well acquainted with design of facilities for new units of switches.

3-4 Shipping Management of Equipment and Materials Necessary for Installation

It is known, by referring to the shipping and carry-in bar chart of equipment and materials for installation (Table IX·2·2), which has been prepared from the bar chart of the present project (Table IX·2·1), that shipping and carry-in will continue over one year and a half. Procurement and carry-in of equipment and materials will be essential for smooth progress of the project.

4. Cables

4-1 Cable Construction in OCADS-II

Of the seven offices at which site survey has been conducted, cable expansion is planned for Jaffna, Kurunegala, Badulla, Ratnapura, and Colombo Central offices. The remaining two offices (AD and TC) are not included in these offices expected to undergo cable expansion.

P & T is now discussing the establishment of project teams to allow smooth execution of the OCADS-II project.

4-2 Construction Under Its Direct Management by P & T

Having sufficient experiences in cable construction by the expansion work of the OCADS-I and other plans, P & T plans to execute cable construction by P & T under its direct management.

4-3 Cable Construction Bar Chart

The cable construction schedule is shown in Table IX·4·1.

Table IX·4·1 Cable Construction Bar Chart

Office \ Year	1979	1980
JA	———	
KG	———	
BD	———	———
RN	———	———
CC	———	———

Cable expansion of Colombo Central Office is expected to be completed in about two(2) years and that of other stations in about one (1) year, depending on main items concerned.

4-4 Materials Necessary for Cable Construction

Of those materials necessary for cable construction, cables, cable jointing materials, dry air supplier, and metalic materials will be procured from overseas but poles, ducts, etc., will be procured domestically. In order to execute cable construction as scheduled, it is necessary to secure necessary materials without delay.

4-5 Considerations for Cable Construction

Cable expansion is expected to start in 1979 under direct management of respective offices, so that due consideration should be given to the provision of necessary personnel and adjustment.

5. Radio and Transmission

5-1 Establishment of OCADS-II Project Team

In the Radio and Transmission Department, a project team composed of a superintendent engineer and engineers has been assigned to be in charge of the project.

This project team is expected to be governed under the head office of the OCADS-II when established.

At present, this project team is in charge of the Indo-Sri Lanka Microwave System. As the OCADS-II project is scheduled to start upon completion of the Indo-Sri Lanka Microwave System, this project team will remain as it is to be engaged in the OCADS-II project.

Operations necessary at the early phase of the project, such as the preparation and assessment of the tender specifications of the OCADS-II, can readily be started if the project is authorized.

5-2 Execution of Installation and Others under Direct Management

The principle of executing installation work and of the OCADS-II from the standpoints of both experience and will to work. The bar chart for the installation is as given in Table IX·2·1.

5-3 Project Team

A substantial installation team or a project team is expected to consist of three (3) teams headed by three (3) engineers, as is the case with the Indo-Sri Lanka Microwave System. Although the detailed configuration of each team is not known, it may be presumed, in consideration of the relevant bar chart, that each team will be engaged in installation at assigned station if any.

The items of work to be executed by these teams will be limited to antenna pointing, waveguide installation and connection, installation of bays, wiring, and panel plugging and testing. That is, antenna tower erection and antenna lift-up will be accomplished by the State Development and Construction Corporation established under the Ministry of Irrigation, Power & Highways (IP & H).

Antenna pointing and optimization in cross polarization discrimination are not necessarily easy but may be somehow difficult. However, in the case of the OCADS-II project, mono- polarized antennas will be adopted in most cases, so that no particular anxiety need not be given.

5-4 Design of Facilities

If the experience of the preceding Indo Microwave System is utilized sufficiently in the present project, no particular problem

will be encountered in the OCADS-II as well. However, full efforts should be made for complete procurement of installation materials and others. It is recommended to establish advisory groups for solving problems and various types of coordination during installation.

5-5 Measuring Instruments for Installation Use

Measuring instruments and devices for adjusting antenna systems and special measuring instruments for circuit verification tests may not be necessarily required if the measuring accuracy is released or coased or checks are omitted. However, if such measuring instruments that can not be reused later as maintenance instruments are required, some measures should be taken by, for example, stating it as a contract condition.

First, it is very important to clearly know how many measuring instruments of those procured by the OCADS-I and the succeeding annual plans are really usable for installation under the direct management of P & T. It is also recommendable to reuse measuring instruments and materials intended for installation for the installation of the OCADS-II project as well.

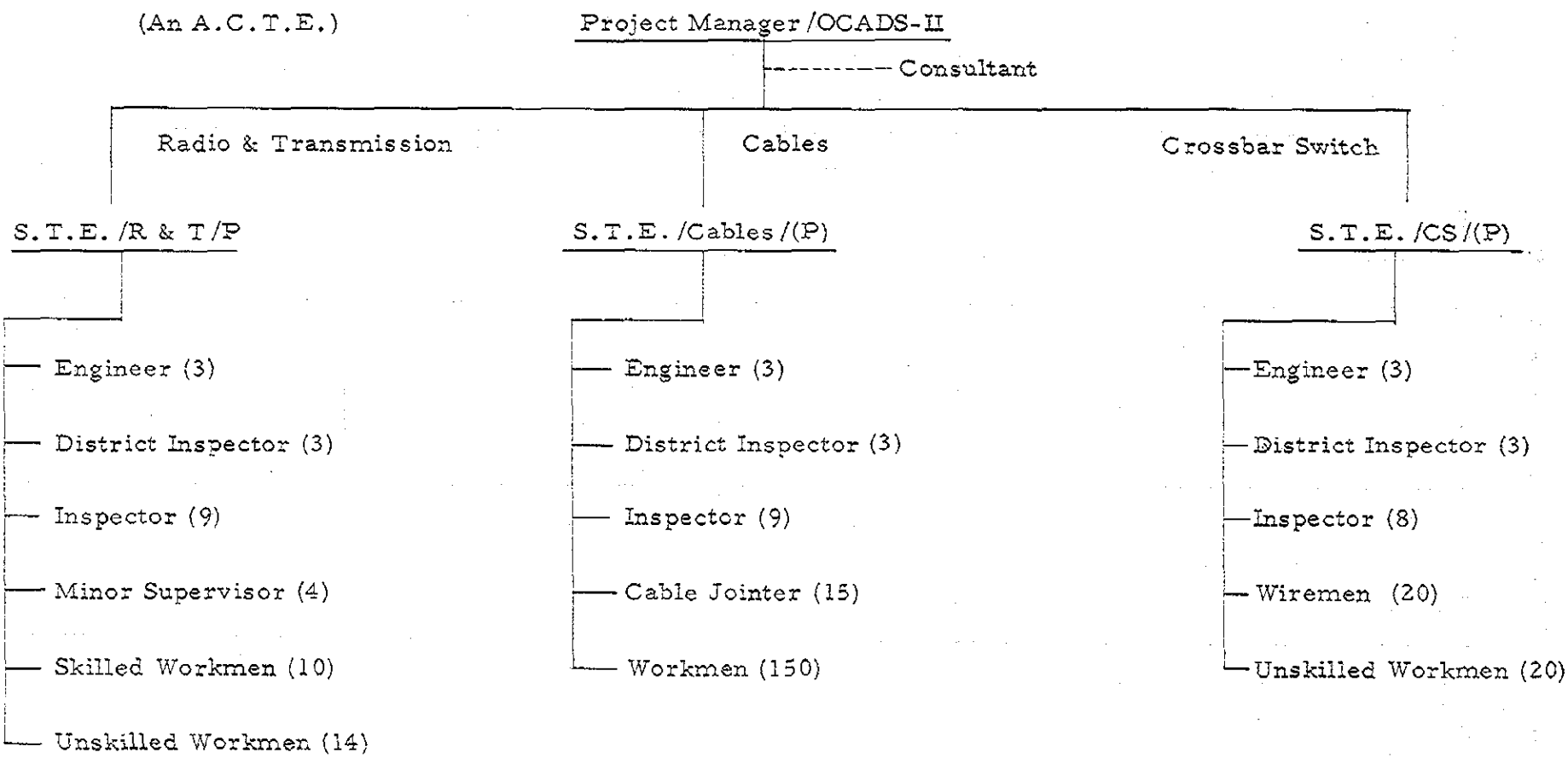


Fig. IX·1·1 OCADS-II Temporary Organization in P & T

Table IX·2·1 (1) Schedule for OCADS-II

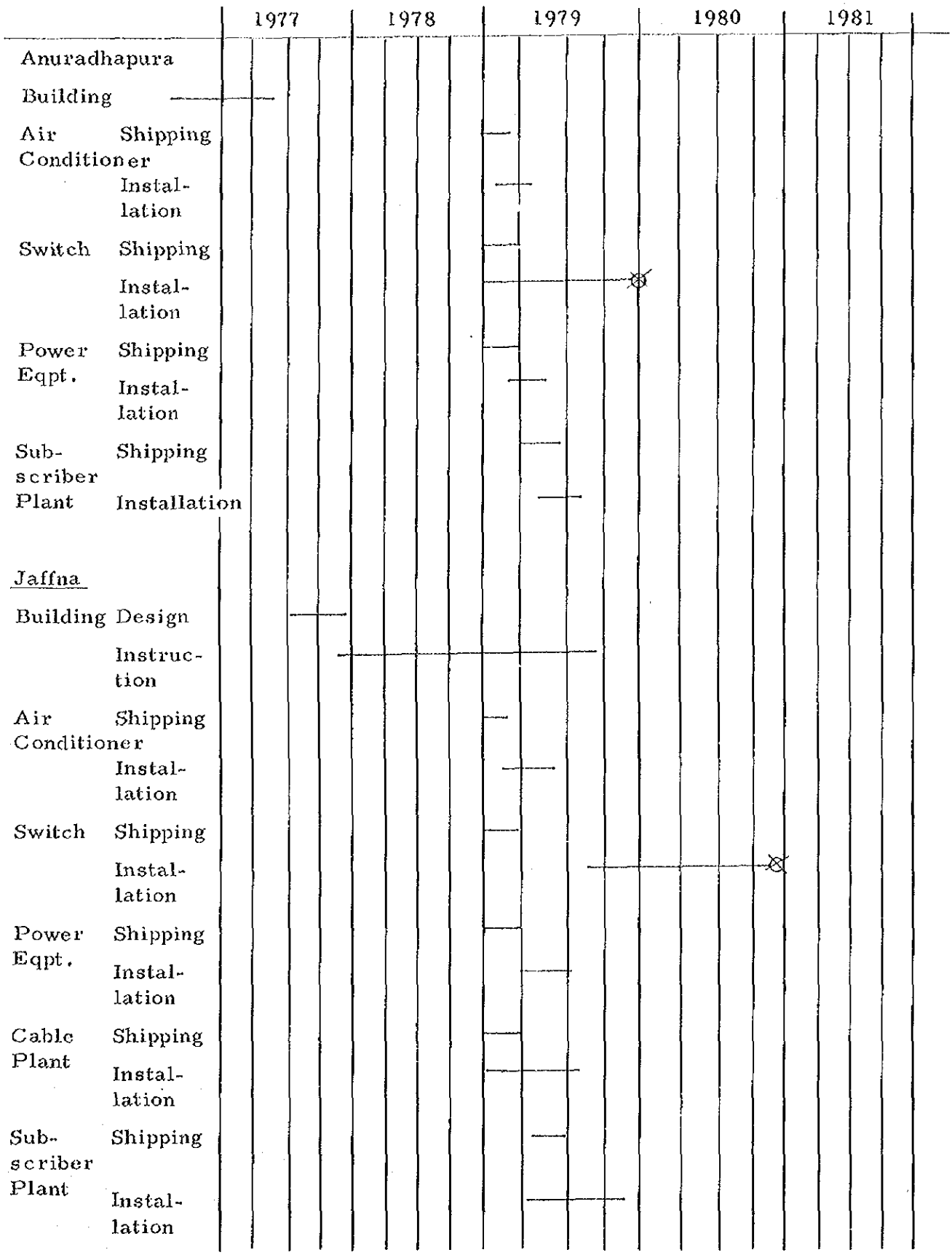


Table IX. 2.1 (2)

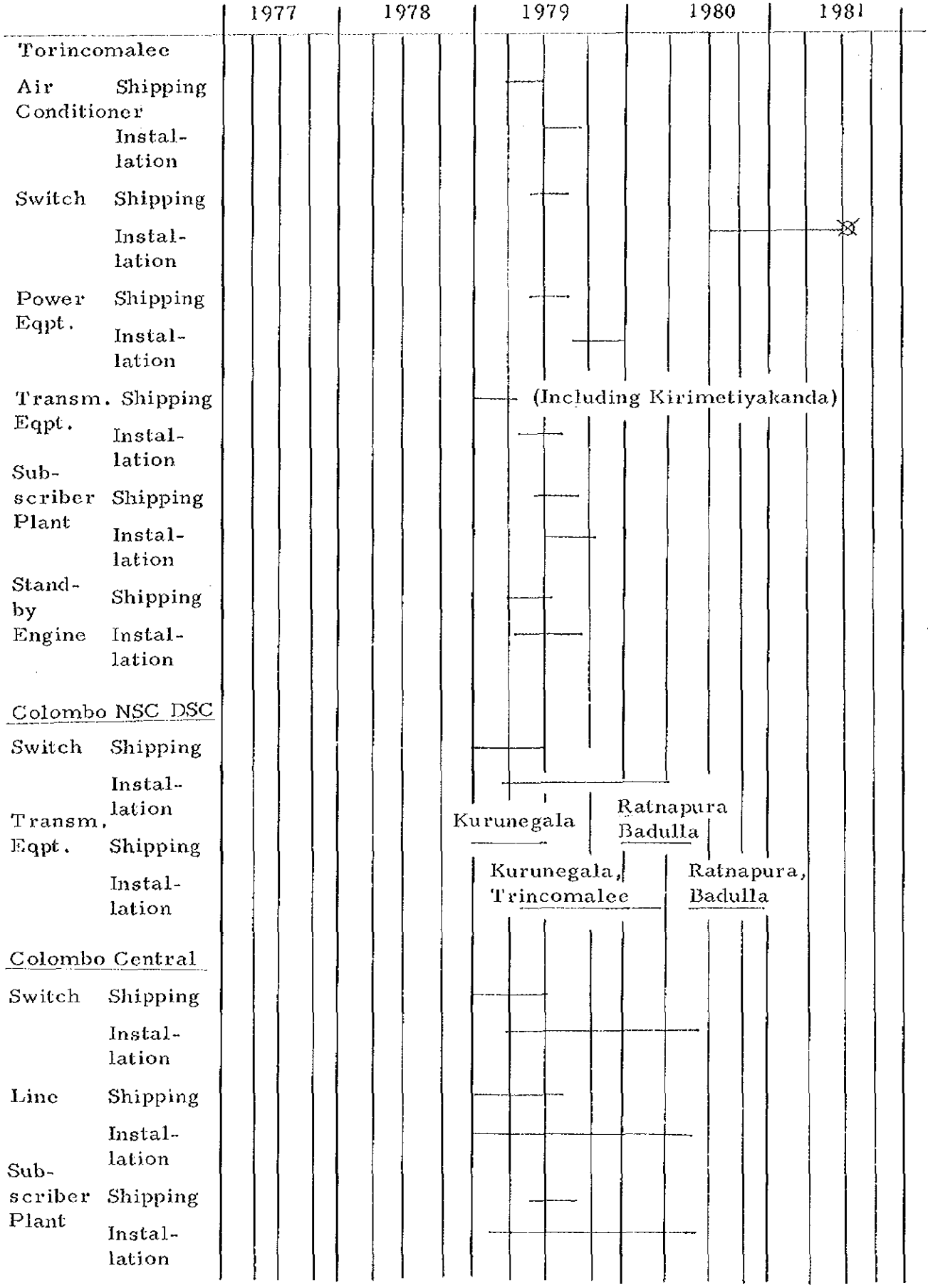

1977
1978
1979
1980
1981
Torincomalee
Air Conditioner
Shipping
Instal-lation
Switch
Shipping
Instal-lation
Power Eqpt.
Shipping
Instal-lation
Transm. Eqpt.
Shipping
(Including Kirimetiyakanda)
Instal-lation
Sub-scriber Plant
Shipping
Instal-lation
Stand-by Engine
Shipping
Instal-lation
Colombo NSC DSC
Switch
Shipping
Instal-lation
Transm. Eqpt.
Shipping
Kurunegala
Ratnapura
Badulla
Instal-lation
Kurunegala, Trincomalee
Ratnapura, Badulla
Colombo Central
Switch
Shipping
Instal-lation
Line
Shipping
Instal-lation
Sub-scriber Plant
Shipping
Instal-lation

Table IX.2.1 (3)

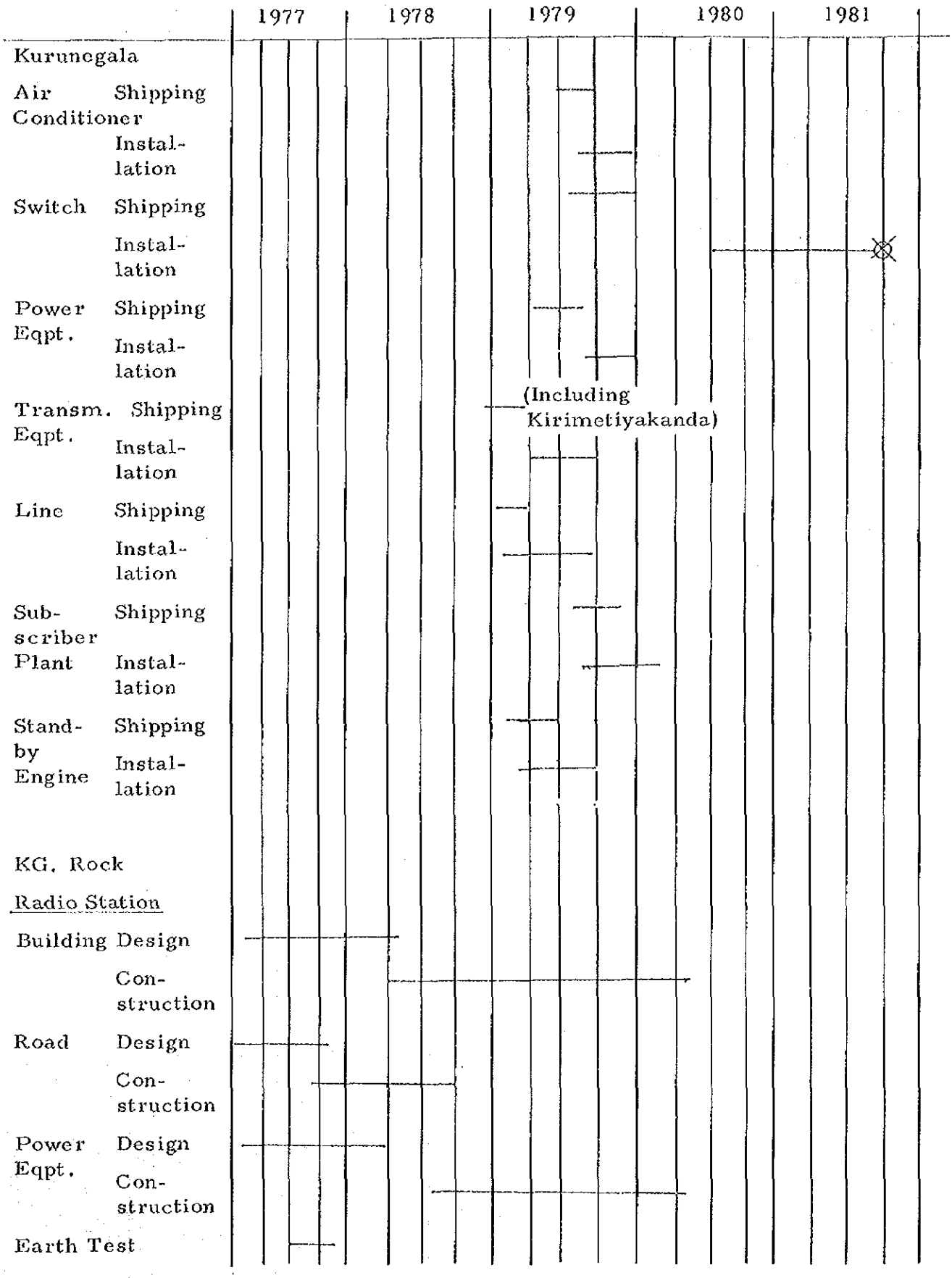

1977
1978
1979
1980
1981
Kurunegala
Air Conditioner
Shipping
Instal-lation
Switch
Shipping
Instal-lation
Power Eqpt.
Shipping
Instal-lation
Transm. Eqpt.
Shipping
(Including Kirimetiyakanda)
Instal-lation
Line
Shipping
Instal-lation
Sub-scriber Plant
Shipping
Instal-lation
Stand-by Engine
Shipping
Instal-lation
KG. Rock
Radio Station
Building
Design
Con-struction
Road
Design
Con-struction
Power Eqpt.
Design
Con-struction
Earth Test

Table IX·2·1 (4)

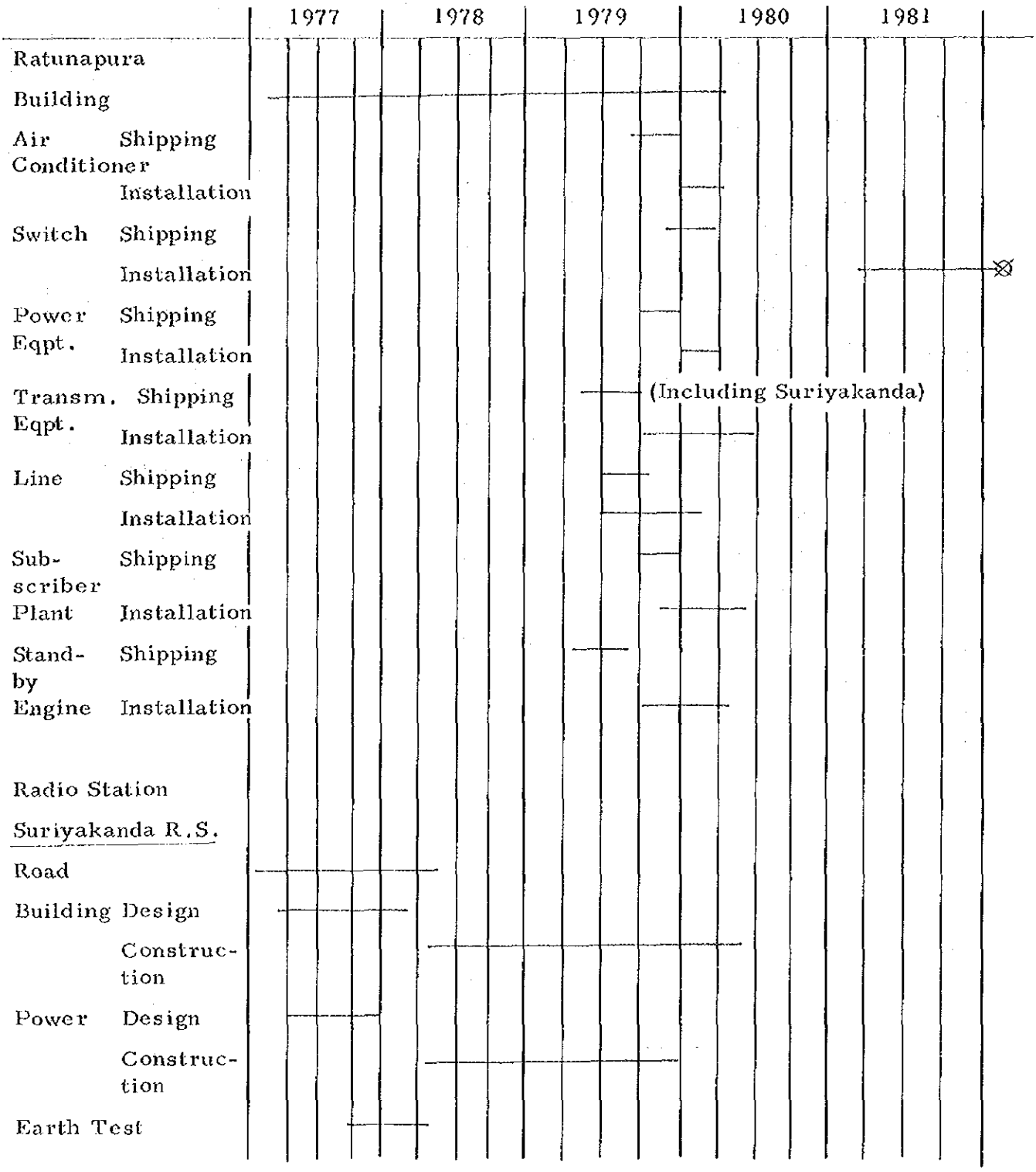

1977
1978
1979
1980
1981
Ratunapura
Building
Air Conditioner
Shipping
Installation
Switch
Shipping
Installation
Power Eqpt.
Shipping
Installation
Transm. Eqpt.
Shipping
(Including Suriyakanda)
Installation
Line
Shipping
Installation
Sub-scriber Plant
Shipping
Installation
Stand-by Engine
Shipping
Installation
Radio Station
Suriyakanda R.S.
Road
Building
Design
Construc-tion
Power
Design
Construc-tion
Earth Test

Table IX-2-1 (5)

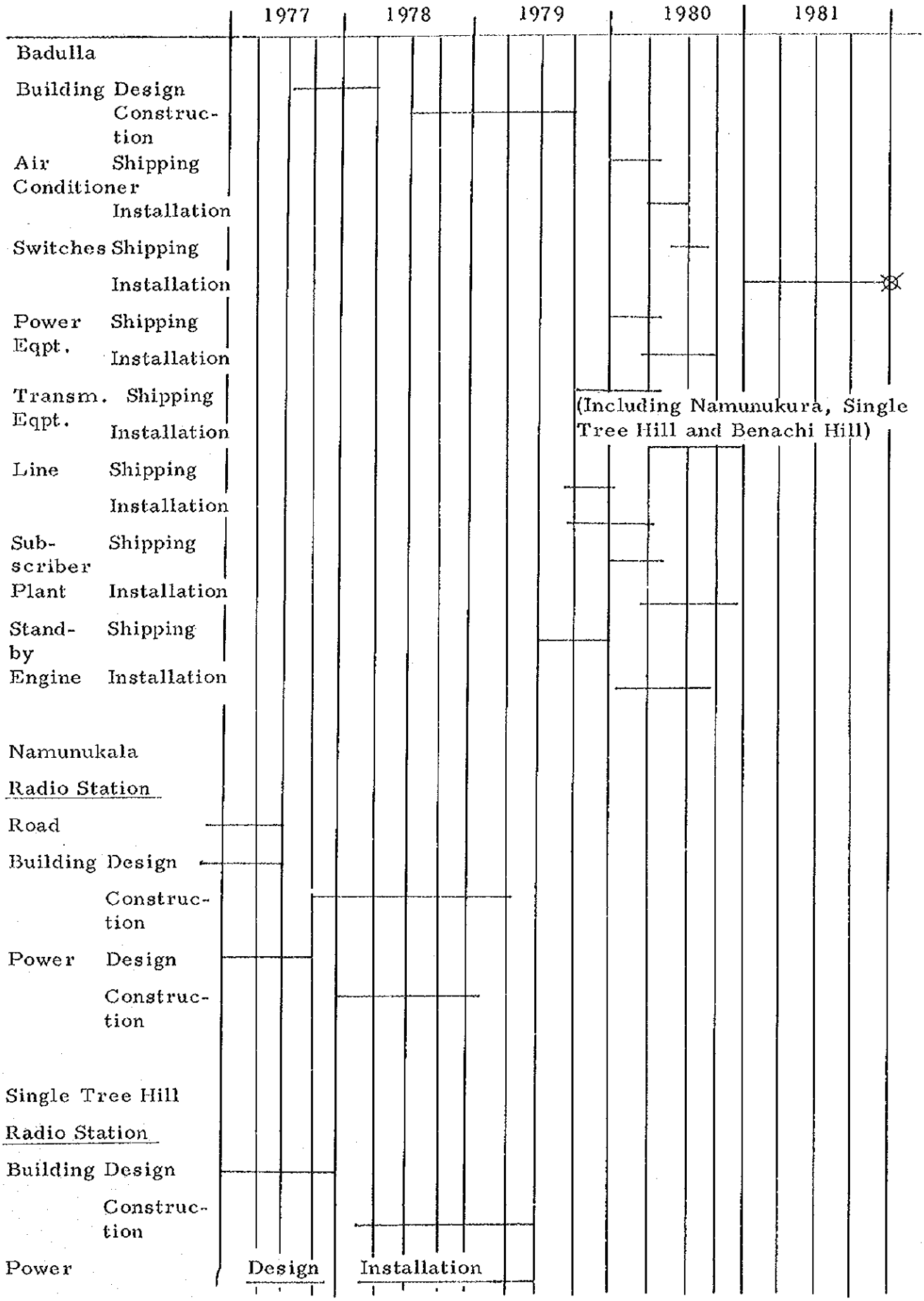

1977
1978
1979
1980
1981
Badulla
Building Design
Construc-tion
Air Conditioner Shipping
Installation
Switches Shipping
Installation
Power Eqpt. Shipping
Installation
Transm. Eqpt. Shipping
Installation
(Including Namunukura, Single Tree Hill and Benachi Hill)
Line Shipping
Installation
Sub-scriber Plant Shipping
Installation
Stand-by Engine Shipping
Installation
Namunukala
Radio Station
Road
Building Design
Construc-tion
Power Design
Construc-tion
Single Tree Hill
Radio Station
Building Design
Construc-tion
Power
Design
Installation

Table IX·2·2 Schedule of Equipment for OCADS-II Shipping & Delivery

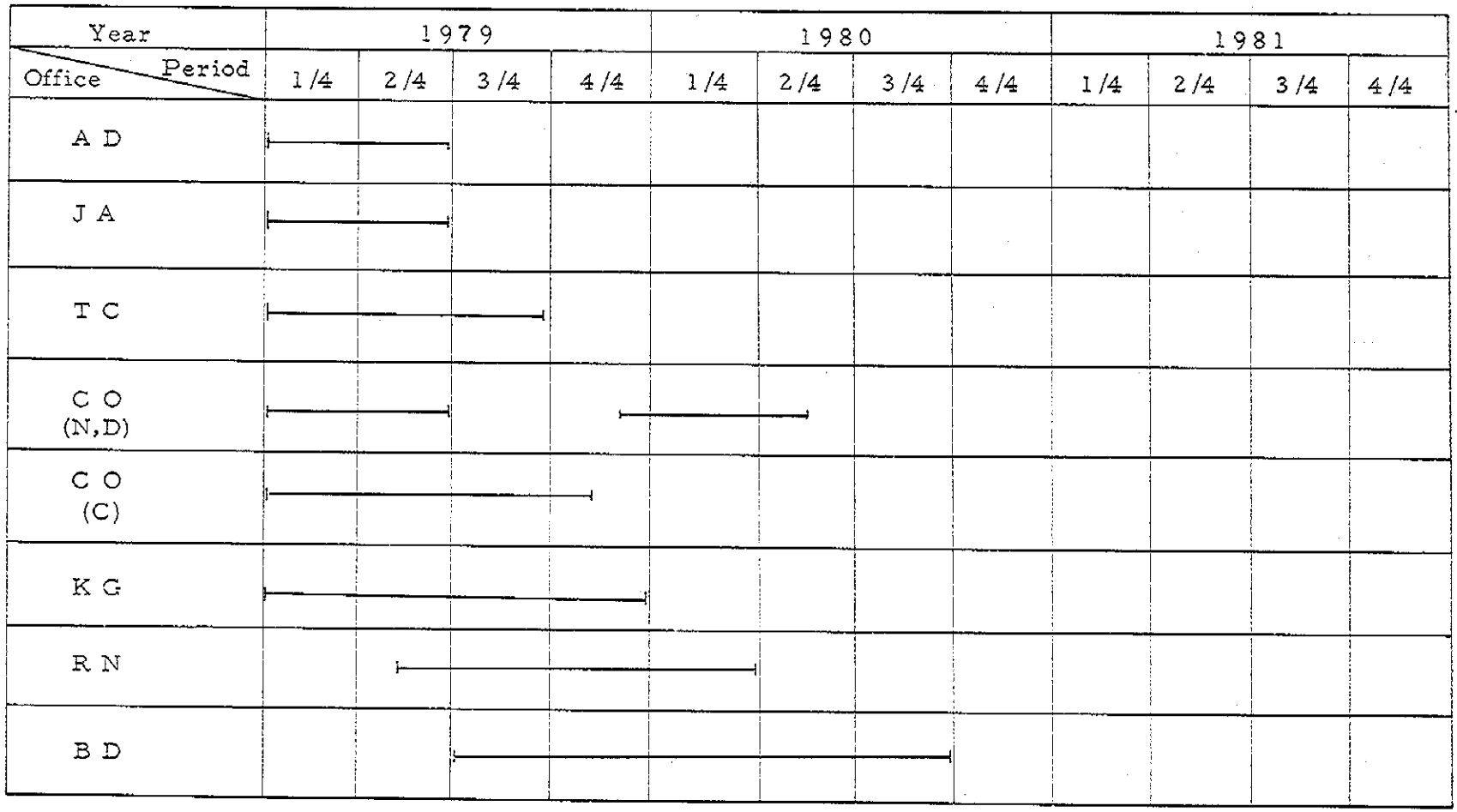
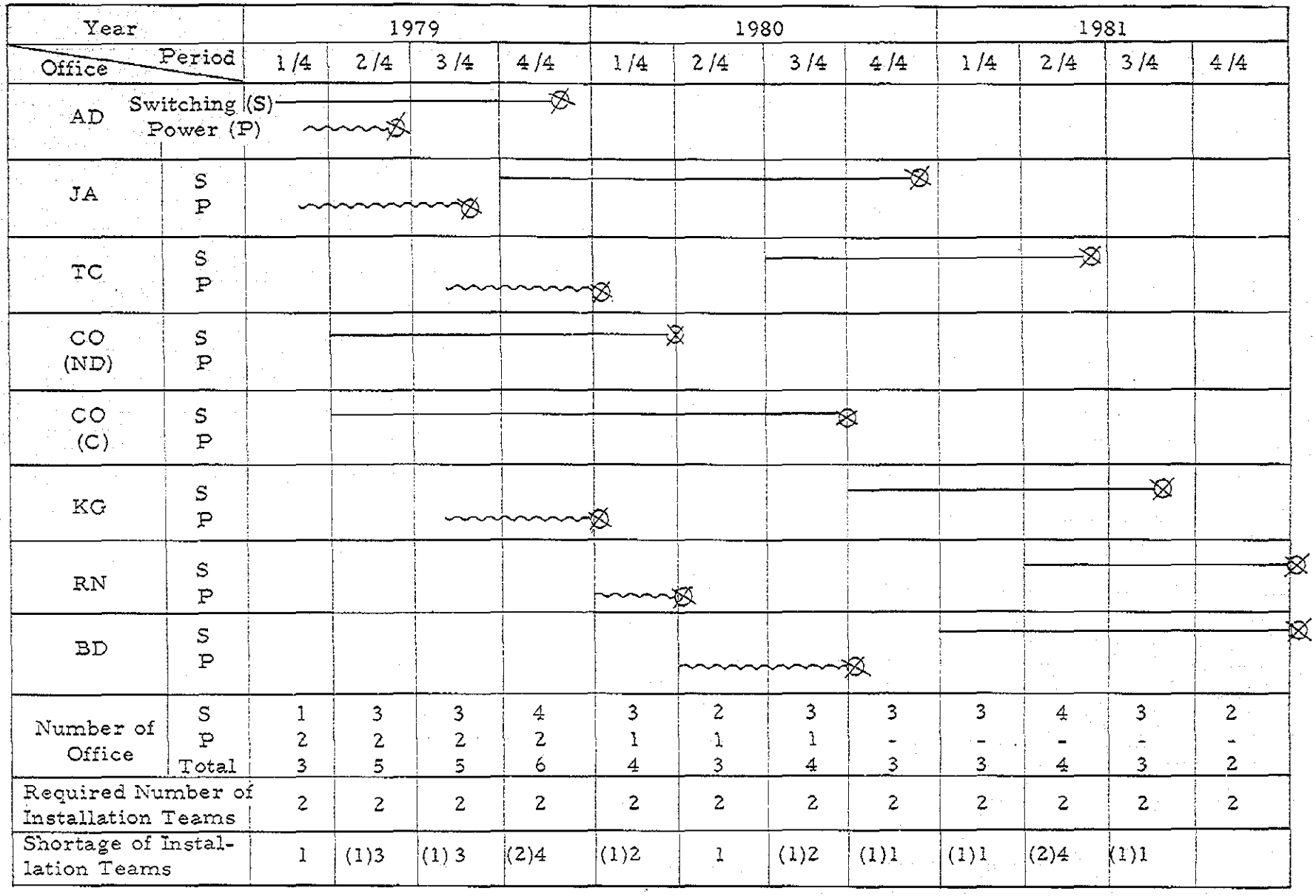


Fig. IX-3-1 Time Schedule & Installation Personnel for Switching



Office		1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4
Number of Office	S	1	3	3	4	3	2	3	3	3	4	3	2
	P	2	2	2	2	1	1	1	-	-	-	-	-
	Total	3	5	5	6	4	3	4	3	3	4	3	2
Required Number of Installation Teams		2	2	2	2	2	2	2	2	2	2	2	2
Shortage of Installation Teams		1	(1)3	(1)3	(2)4	(1)2	1	(1)2	(1)1	(1)1	(2)4	(1)1	

Figures in paranthese ( ) are shorted number of installation teams when installation of switching and power facilities are to be executed by the same team.

X. OPERATION AND MAINTENANCE

X. Operation and Maintenance

1. Switches

1-1 Automatic Switches

Operation and maintenance of automatic switches at Colombo Central Office at other offices in the Colombo Area are performed by the step-by-step and crossbar switch maintenance departments supervised by an ACTE in charge of maintenance in the Telecommunication Engineering Division of P & T. The step-by-step and crossbar switch maintenance departments, having such organizations and scales as shown in Fig. X·1·1, are engaged in operation and maintenance and also manage and guide local telecommunication bureaus in operation and maintenance.
Local automatic switch offices except Colombo are divided into 12 districts or areas each of which has a telecommunication engineering office supervised by the regional telecommunication engineer directly under the Assistant Chief telecommunication Engineer (Maintenance).
The operation and maintenance of local automatic exchanges offices are managed by these telecommunication engineering offices
The organizations of Jaffna Local Telecommunication Engineering Office is shown in Fig. X· 1·2 as an example.

1-2 Manual Operation

Manual operation for all local exchanges is managed and controlled by the telecommunication traffic division of the head office of P & T.
About 3000 personnel are engaged in manual operation. In local districts, these personnel are mostly assigned to DSC's.
Operation of manual dependent (end) exchanges is performed by personnel of post offices.

1-3 Operation and Maintenance of Facilities to Be Installed Newly

In the present project, common-controlled switches are to be installed at six (6) offices excluding Colombo Central Office. These switches will be crossbar type. In the OCADS-I project, crossbar switches were introduced to 13 offices At present, P &

T are engaged by itself in the operation and maintenance of these crossbar switches, having achieved excellent performance and maintenance servicing during the past three (3) years since the installation.

Accordingly, there will be no problem in the operation and maintenance of crossbar switches.

P & T has established a telecommunication training center for the spread and fixation of new techniques in telecommunication and set there a C460 crossbar switch for training use, contributing to increase in the number of maintenance engineers for crossbar switches.

Thus, it can be determined that P & T has set up ample structure for the maintenance and operation of crossbar switches.

Training & Research Center in Colombo

For the introduction of crossbar switches of the Colombo Central, no particular problem will arise if it is within the range of crossbar switches as the Colombo toll exchanges have already crossbar switches. If in case of electronic switching system introduced, various problems will be encountered as mentioned later herein.

2. Cables

Maintenance of cable facilities is conducted by those in charge of cables in respective areas or regions. P & T has about 400 personnel in charge of cables. Operation and maintenance of cable facilities after completion of the OCADS-II will be conducted sufficiently by these personnel of P & T as before.

3. Radio and Transmission

Fig. X-1-1 Maintenance & Development of Organization for Colombo Central & Cross-Bar Exchanges

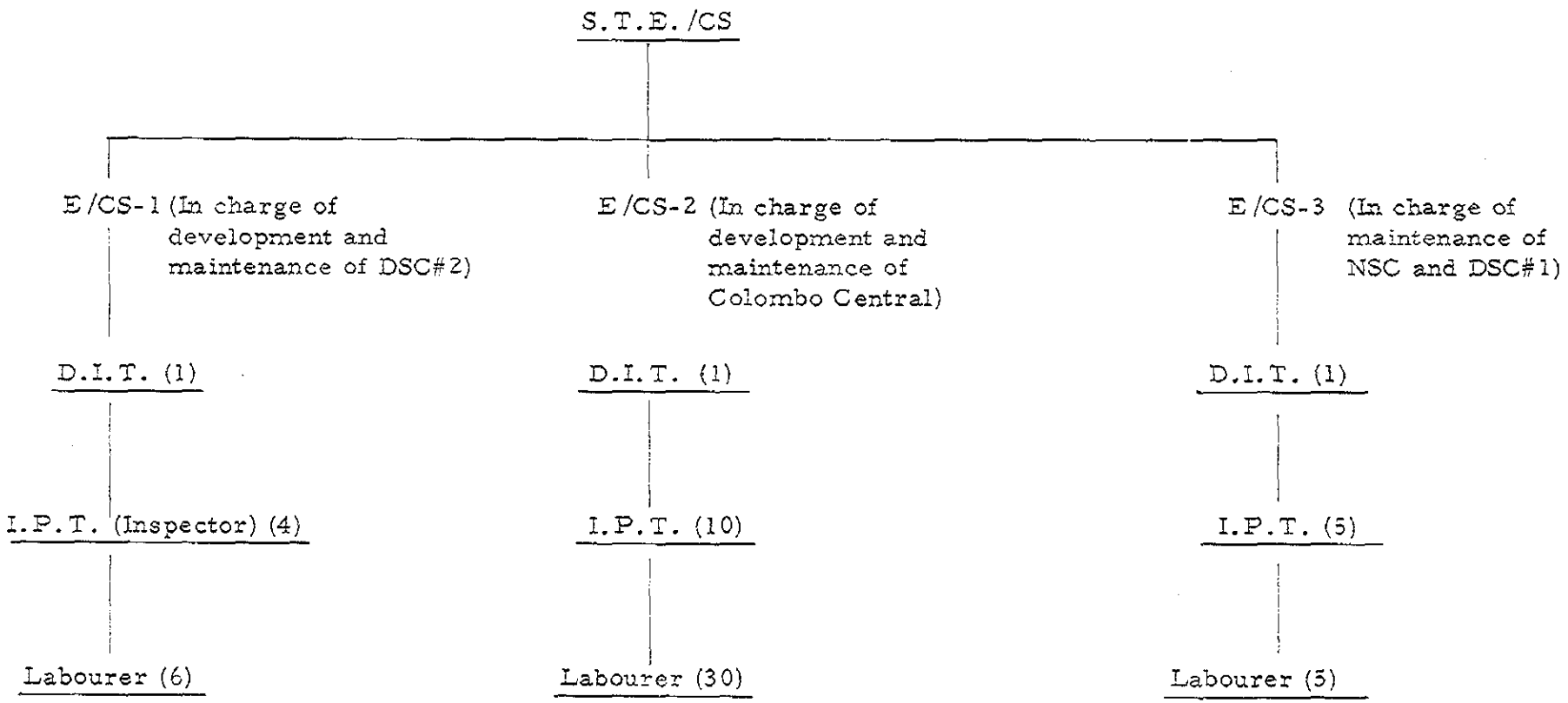
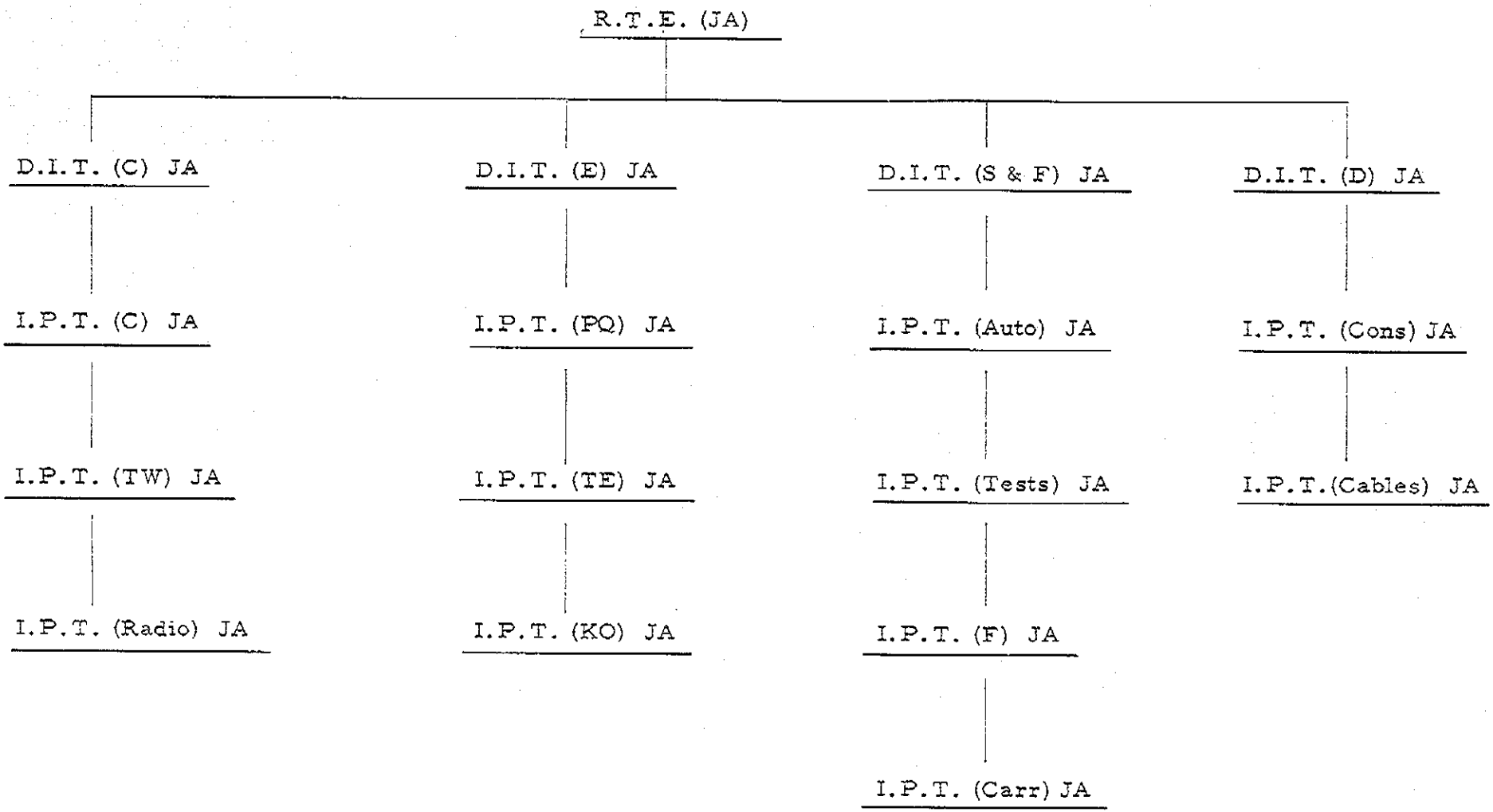


Fig. X.1.2 Organization (Jaffna Area)



3-1 Maintenance Organization for Radio and Transmission

For the operation and maintenance of radio and transmission facilities, stress is put soley to the maintenance of equipment and facilities since TV relay has not yet introduced and the rental system of circuits has not yet be developed. Maintenance of equipment is usually performed by personnel from attended stations as in Japan. However, since high-class measuring instruments are concentrated to Colombo area, personnel of the head office of P & T may sometimes visit local offices for maintenance with high-class measuring intruments.

The head office of P & T has the radio and transmission maintenance section.

Regional centers have maintenance personnel who work, in the daytime, at repeater stations which are thus attended in the day time. At each regional center, a regional engineer and district inspector (s) who stay at each district supervise skilled and unskilled workers.

3-2 Maintenance Area

For maintenance, the entire area is divided into regions each of which is still divided into districts. As far as radio links are concerned, maintenance is required at "station" and not "along the route" and is comparatively easy in this sense. In addition, fault imformation issued at a local repeater station is not only displayed in the repeater station concerned but also transferred to the transmission head quarter in Colombo to allow concentrative supervision.

This system of concentrative supervision is reported to be pursued from now on.

The relationship between the existing microwave bureau and maintenance supervising station is shown in Fig. X.3.1. The remote supervision and control items are given in Table X·3·1.

3-3 Maintenance Work

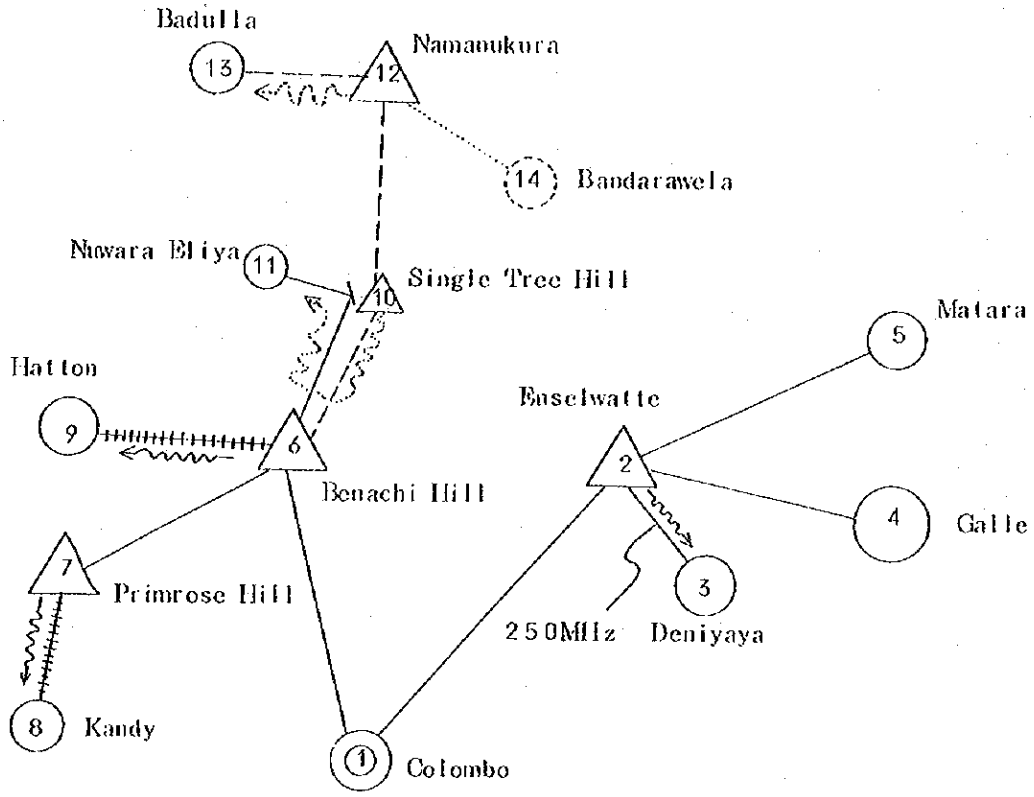
Stations which are attended in the daytime become unattended in the nighttime. Attended stations are radio terminal stations and

are located in city areas and district inspectors stay in the night-time at the terminal stations. In more detail, their residences are located in the sites of telephone offices they live there with their family.

Unattended stations atop mountains or hills have no residing maintenance personnel but a residing guardman who is engaged in surveillance and patrol and in case a serious influence may be given to the station and its facilities by lightning or fire, communication will be made with the applicable attended station by a magnet telephone or the like.

The items of work to be carried by maintenance personnel are periodical inspection and repair against faults. Although repair of faulty panels will usually be accomplished by sending them to the supplier, maintenance personnel may sometimes be required to effect repair themselves to tentatively recover, at least, basic functions.

In consideration of all these points, it may be determined that there will be no problem in the operation and maintenance to be conducted after completion of the OCADS-II.



Legned : ◎ -------- All-day attendent

○ --------- Daytime attendent

△ ---------- Unattendent

——— Existing microwave link

------ OCADS-II Microwave link

..... Future microwave link

-#####- Coaxial cable

~~~> } Local supervisory and control

Note : All stations can be remotely supervised and controlled from the station marked

Fig. X.3.1 An Example of Radio Station Supervisory & Control Network
~~~

Table X·3·1 Supervisory and Control Items of Radio & Cable Radio Station

(1) Visual/audible indication will be given in the remote supervisory station for the followings of the supervised station.

No.	Supervisory Items
(1)	System alarm
(2)	Transmitter alarm
(3)	Receiver alarm
(4)	Waveguide Pressure alarm
(5)	Commercial power failure
(6)	Stand-by engine ON
(7)	Under maintenance
(8)	Power plant faulty
(9)	Door Open
(10)	Air beacon ON
(11)	CCS Equipment faulty
(12)	Multiplex equipment faulty
(13)	Coaxial cable repeater faulty
(14)	Abnormal room temperature rise

(2) Control Items

a) Remote control

Engine operation

b) Manual control

Switching MODEM in radio link

XI CONSTRUCTION EXPENSES

XI. Construction Expenses

Construction (installation) expenses are estimated under the following conditions.

1. General

(1) Construction or installation shall be carried out under direct management of P & T.

(2) Detailed design has not been made and estimation has been effected in consideration of standard or typical situations.

(3) Construction (installation) expenses have been estimated on the basis of the prices of facilities for delivery to NTT in consideration of overseas prices.

(4) The pure reserve fund is made 5%.

(5) The price rise is estimated to be 4% per year.

(6) The amount of fund proposed by the Government of Sri Lanka in the domestic currency is adopted as it is.

2. Switches

All switches are estimated for crossbar switches. In addition to switching equipment, various distribution frames, test equipment, test boards, tie-cables, constant-voltage rectifiers, batteries, installation materials, test equipment for installation, etc., are estimated. Also, power equipment used in DSC's for radio and transmission use are estimated.

The stand-by engine generator is estimated separately. Estimation is made by first calculating the average unit price per switch bay including all above-mentioned items of equipment and then multiplying the unit price thus obtained per bay by the number of bays to be supplied and by quoting service charge of two (2) supervisors for one (1) year, and training fee for eight (8) trainees in Japan for a period of four (4) months.

3. Radio & Transmission

Regarding radio, estimation is made for radio repeater stations each comprising transmitter-receiver, antenna, connector, feeder,

supervisory and control equipment, steel tower, measuring instruments, spare panels, tools, materials, etc.

Regarding transmission equipment, estimation is made for various transformers, carrier supply equipment, various distribution frames, supergroup and group through filters, measuring instruments, spare panels, etc. Power plants of radio repeater stations are included. However, stand-by engine and carrier cable are not included in this item but in other items.

Estimation is made by first calculating average unit prices per one relay span including the above-mentioned items, per channel of channel translating equipment, per supergroup of supergroup translating equipment, etc., and then multiplying these unit prices by the number of spans and others.

Estimation of training fee is made for six (6) personnels for a period of four (4) months in Japan.

4. Cable & Subscriber Plants

Regarding cable & Subscriber plants, estimation is made for cables, cable jointing materials, cabinets, terminal boxes, pressurized gas suppliers for five (5) stations telephone sets, STD call boxes etc. Those procurable in Sri Lanka, such as poles and ducts, are included in the domestic currency portion. Not only cables for local use but those for cable carrier system use including pressurized gas supplier are estimated.

Estimation is made by first calculating the average unit prices per item or cable length at each office and then multiplying the unit prices by number of items or total cable length. It is also made by quoting training fee for four (4) personnels for a period of four (4) months in Japan.

5. Others

Airconditioning equipment are estimated for eight (8) offices or stations and stand-by engines for six (6) offices or stations. As to air-conditioning, estimation of training fee is made for two (2) personnels

for four (4) months in Japan. Motor vehicules and expenses for trip for factory test and inspection are estimated in miscellaneous.

Table XI・1・1 Construction Cost of OCADS-II

	Foreign Currency		Local Currency
	Japanese Yen (Million Yen)	U.S. Dollars (Thousand $)	S.L. Rupees (Thousand Rs.)
SWITCHING	992	3,421	1,743
TRANSMISSION	423	1,459	1,144
CABLES	182	628	3,600
SUBSCRIBER PLANTS	63	217	1,200
BUILDING (INCLUDING AIR CONDITIONING)	31	107	3,319
STAND-BY ENGINE	36	124	168
MISCELLANEOUS	10	34	296
RESERVE FUND	201	693	604
TOTAL	1,938	(6,683)	12,074
FEECS			31,630

Foreign Exchange Rate : 1US $=290 Yen.
1US$=7.282 Rs.
1Rs.=39.826 Yen.

The construction costs per year are as shown in Table XI.1.2.

Table XI.1.2 Construction Cost Per Year/OCADS-II

Sri Lanka Fiscal Year	Foreign Currency		Local Currency
	Japanese Yen (Million Yen)	U.S.Collars (Thousand Dollars)	Rupees (Thousand Rupees)
Jan. -Dec.			
1977	0	0	211
1978	58	200	2,277
1979	1,277	4,403	27,799
1980	370	1,276	8,725
1981	32	110	808
Reserve fund	201	693	3,885

Japanese Fiscal Year	Foreign Currency	
	Japanese Yen (Million Yen)	U.S.Dollars (Thousand Dollars)
Apr. -Mar.		
1978	828	2,855
1979	738	2,545
1980	139	479
1981	32	110
Reserve fund	201	693

Note 1 : Local Currency includes Feecs.

Note 2 : Estimation is not employing Down-payment system.

XII. REVENUE AND EXPENDITURE

XII. Revenue and Expenditure

1. General

Since Sri Lanka employs an accounting system on a cash basis, evaluation of business achievements and financial state of the telecommunication service in the country is somehow limited.

The major features of the accounting system for the post and telecommunication services are as follows, that is, capital expenditure for the procurement of equipment and facilities necessary for these services are treated as a loan from the Government and amortization of both principle and interest is paid by an interest rate determined by the Government. (Annual amortization payment is determined on the basis of service life of the equipment or facilities. The amounts of amortization for both principle and interest are also called "annuities" and are included in annual ordinary expenditure.)

All buildings are constructed by the budget of the Ministry of Construction and post and telecommunication services are charged given rental expenses and repair and maintenance costs.

2. Revenue and Expenditure

The balance of telephone service has tended to be improved since 1968 when the CADS was completed and the tendency seems to have been fixed since 1973 when the OCADS-I was completed.

Table XII·2·1 gives annual balance (difference between revenue and expenditure) of the post and telecommunication services.

Table XII·2·1 Annual Balance of Post and Telecommunication Services

(Million rupees)

	Total (up to Oct., 1, 1968)	'68-'69	'69-'70	'70-'71	'71-'72 (15 months)	'73	'74	'75
Telegraph:	-38.5	-2.2	-1.7	-1.8	-7.3	-3.2	-12.5	-8.0
Telephone:	-11.1	-0.6	-0.3	+7.5	+17.2	+14.2	+7.0	+16.5
Post:	+57.4	+3.6	-2.4	-5.1	+16.4	+2.9	+21.3	+0.1

Remarks: The fiscal year has been changed to the calendar year since 1973. (Before that, the fisical year was started Oct. 1 and ended Sept. 30.)

The revenue/expenditure for respective items of telephone service are given in Table XII·2·2.

Table XII·2·2 Revenue/Expenditure of Respective Items of Telephone Service

(million rupees)

	'74	'75
Revenue	61.2 (100.0)	71.0 (100.0)
Rental	19.0 (31.1)	19.8 (27.9)
Call charge	38.1 (62.2)	44.5 (62.6)
International call charge	2.2 (3.6)	1.8 (2.5)
Others	1.9 (3.1)	5.0 (7.0)
Expenditure	54.2 (100.0)	54.5 (100.0)
Operating and administration Costs	29.5 (54.4)	29.9 (54.8)
Annuities	19.4 (35.8)	20.5 (37.4)
Others	5.4 (9.8)	4.1 (7.3)
Surplus	+7.0	+16.5
Rate of earnings/expenditure	88.6	76.9

Although the expenditure for the procurement of equipment and facilities necessary for the operation of post and telephone services is treated as a loan from the Government, it leaves liabilities in post and telecommunication service. The trends of the annual liabilities and amortization are shown in Table XII·2·3.

Table XII-2-3

(million rupees)

	Total (Up to Oct. 1, 1968)	'68 - '69	'69 - '70	'70 - '71	'71 - '72	'73	'74	Total
Debt in Each Fisical Year	121.4	9.1	10.5	28.5	24.5	30.7	17.9	242.8
Accumulated redemption (Up to Dec. 31, 1974)	97.8	3.1	2.7	5.4	2.3	0.5	-	111.8
Balance as of Jan. 1, 1975	23.6	6.0	7.8	23.1	22.3	30.2	17.9	130.9
Annuities of 1975	5.0	1.1	1.3	4.3	3.5	3.6	2.3	21.2
Interest	1.1	0.4	0.5	2.3	2.2	3.0	1.8	11.4
Capital	3.9	0.7	0.8	2.0	1.3	0.6	0.5	9.8

Remarks: Of the above-mentioned liabilities, those for telephone business is about 97%.

XIII. CHARGING SYSTEM (TELEPHONE CHARGE)

XIII. Charging System (Telephone Charge)

The charging system in telephone service consists mainly of call charge, rental, and installation charge. Call charge is still divided into local call and toll call charges. The periodic pulse metering method is used for toll calls in STD calls.

The charging system is outlined hereunder.

1. Rental (per year)

1-1 All STD Areas

Business: 600 rupees

Residential: 200 rupees

1-2 Other Areas

Business: 500 rupees

Residential: 200 rupees

1-3 Additional fee (for every 1/4 mile exceeding 3 miles from the office)

Business: 25 rupees

Residential: 25 rupees

2. Connection (Installation) Charge

200 rupees upon installation

3. Call Charges

3-1 Toll Call Charge

Toll call charge is as follows per 3 minutes.

Distance	Daytime (6:00 a.m. - 9:00 p.m.)	Nighttime (9:00 p.m. - 6:00 a.m.)
0 - 5 miles	0.25 rupees	0.25 rupees
5 - 15 miles	0.50 rupees	0.25 rupees
15 - 40 miles	1.00 rupees	0.50 rupees
40 - 110 miles	2.00 rupees	1.00 rupees
110 -	3.50 rupees	1.75 rupees

3-2 Local Call Charge

25 cents/call

3-3 STD Call Charge

(1) Within the same DSC:

1) STD call

25 cents/100 seconds

2) Operator-handled call

90 cents for first 3 minutes

45 cents for every 3 minutes exceeding the first 3 minutes

(2) Call between different DSC's

The offices covered by the OCADS-I are classified into 5 groups by distance.

1) STD Call

25 cents for a given duration applicable to the distance group.

Distance group		Duration	
		Daytime	Nighttime
A	(- 20 miles)	50 seconds	100 seconds
B	(20 - 50 miles)	30 seconds	60 seconds
C	(50 - 70 miles)	18 seconds	36 seconds
D	(70 - 120 miles)	15 seconds	30 seconds
E	(120 miles -)	10 seconds	20 seconds

2) Operator-handled call

Distance group	Daytime		Nighttime	
	First 3 minutes	Every additional 3 minutes	First 3 minutes	Every additional 3 minutes
A	1.40 rupees	0.90 rupees	0.95 rupees	0.45 rupees
B	2.00 rupees	1.50 rupees	1.25 rupees	0.75 rupees
C	3.00 rupees	2.50 rupees	1.75 rupees	1.25 rupees
D	3.50 rupees	3.00 rupees	2.00 rupees	1.50 rupees
E	5.00 rupees	4.50 rupees	2.75 rupees	2.25 rupees

XIV. ECONOMICAL EVALUATION OF OCADS-II

XIV. Economical Evaluation of OCADS-II

The OCADS-II project is intended for enhancing telecommunication service for the promotion of convenience to people of Sri Lanka by the adoption and expansion of STD.

With the development of economical and social schemes the role of telecommunication service will become more important as a means for the transmission of information. Thus the present project is a very advantageous from the standpoint of national economy.

In making economical evaluation, therefore, investment evaluation will be attempted from the standpoint of national economy, benefit and expenditure to be broughtout by the execution of the project will be evaluated and, at the same time, financial analysis within the frame of P & T will be conducted.

1. Evaluation from National Economy

For the evaluation standard, internal rate of return (IRR) will be used.

1-1 Benefits

Promotion in benefits in national economy by the expansion and improvement of telecommunication facilities can be said quantitative and qualitative development in information values. However, since it is rather difficult to, for the time being, to measure by scale information values, earnings from telephone charges are considered as benefits obtained.

The supply and demand state in the telephone service of the country is such that demand is expected to exceed supply for a while, so that it can be considered that users enjoy more benefits than costs (telephone charges).

Earnings obtained by telephone charge can thus be considered as benefits brought about by telephone service. Ernings by telephone charge are estimated in consideration of increase in the number of subscribers, traffic increase to be caused by the adoption of STD, etc. By deducting the estimated earnings of the existing facilities from the value of earnings thus calculated, we obtain increase in

produced by execution of the present project.

1-2 Costs

The construction cost of the present project and part of the estimated cost of the Indo-Sri Lanka Microwave System (which is included since the microwave system is expected to be used as transmission line of the present project) are included for the purpose of evaluation. (See Table XIV·1·1). The administration and operating expenses and maintenance expenses necessary for the operation and maintenance of the present system have been made respectively 3.5% and 12% of the total construction expense by referring to the ratios of these expenses to the fixed assets of telephone service.

1-3 Results of Estimation

By calculating the internal rate of return (IRR) of the OCADS-II under the above-mentioned conditions, we have an estimated IRR of 15.1%.

Accordingly, it can be concluded that the present project is sufficiently feasible from the standpoints of national economy.

2. Financial Analysis in the Frame of Telephone Business

Financial analysis has been made for the OCADS-II from the standpoint of business.

The costs comprise the administration/operation cost, maintenance cost, construction cost to be paid by the domestic currency including FEECS, and annuity. The FEECS is made 65% of the foregin current portion and included in the years of foreign currency payment. The annuities calculated on the condition of payment on amortization basis at an interest rate of 10% for a period of 17 years will be charged every year.

Benefit is evaluated to be similar to national economy. Taking all these into account, we have obtained the result shown in Table XIV·2.

The balance sheet (accumulated residue) is expected to become black in six (6) years (1987) after completion of the project. Since an accumulated

residue of more than 200,000,000 rupees can be anticipated during the period of the service life of facilities, an internal reserve will be available as earned surplus for the reproduction of the business by the present project

Thus, this project can be determined feasible as a business as well.

Table XIV·1 Internal Rate of Return of the Project

(Unit: 1000 Rs)

Sri Lanka Fiscal Year	Construction Expense	Administration Operation	Maintenance	Total (C)	Benefit (B)	(B) - (C)	15% Discount	16% Discount
1977	2,902	102	348	3,352	-	△ 3,352	△ 5,098	△ 5,232
1978	16,278	671	2,302	19,251	-	△ 19,251	△ 25,459	△ 25,904
1979	42,099	2,145	7,353	51,597	-	△ 51,597	△ 59,337	△ 59,853
* 1980	13,901	2,631	9,022	25,554	112	△ 25,442	△ 25,442	△ 25,442
1981	1,607	2,688	9,214	13,509	12,783	△ 726	△ 631	△ 626
1982		2,688	9,214	11,902	22,144	10,242	7,744	7,611
1983		2,688	9,214	11,902	27,913	16,011	10,527	10,258
1984		2,688	9,214	11,902	33,683	21,781	12,453	12,030
1985		2,688	9,214	11,902	39,325	27,423	13,634	13,057
1986		2,688	9,214	11,902	39,581	27,679	11,966	11,361
1987		2,688	9,214	11,902	39,581	27,679	10,406	9,794
1988		2,688	9,214	11,902	39,581	27,679	9,048	8,443
1989		2,688	9,214	11,902	39,581	27,679	7,868	7,278
1990		2,688	9,214	11,902	39,581	27,679	6,842	6,274
1991		2,688	9,214	11,902	39,581	27,679	5,949	5,409
1992		2,688	9,214	11,902	39,581	27,679	5,173	4,663
1993		2,688	9,214	11,902	39,581	27,679	4,499	4,020
1994		2,688	9,214	11,902	39,581	27,679	3,912	3,465
1995		2,688	9,214	11,902	39,581	27,679	3,402	2,987
1996		2,688	9,214	11,902	39,581	27,679	2,958	2,575
Total							414	△ 7,832

$$15\% + \frac{414}{414 + 7832} \fallingdotseq 15.1\%$$

* Reference Year

Table XIV·2 Surplus between Benefit & Cost in the Frame of P & T

(Unit : 1000 Rs)

Fiscal year	Administration / Operation	Maintenance	Annuity	Construction by Domestic Currency (Including Feecs)	Total (C)	Benefit (B)	(B) - (C)	Accumulated Residue
1977	102	348	-	734	1,184	-	△ 1,184	△ 1,184
1978	671	2,302	169	3,653	6,795	-	△ 6,795	△ 7,979
1979	2,145	7,353	531	28,478	38,521	-	△ 38,521	△ 46,500
1980	2,631	9,022	5,047	9,900	28,600	112	△ 28,488	△ 74,988
1981	2,688	9,214	6,443	1,150	19,495	12,783	△ 6,712	△ 81,700
1982	2,688	9,214	6,605		18,507	22,144	3,637	△ 78,063
1983	2,688	9,214	6,605		18,507	27,913	9,406	△ 68,657
1984	2,688	9,214	6,605		18,507	33,683	15,176	△ 53,481
1985	2,688	9,214	6,605		18,507	39,325	20,818	△ 32,663
1986	2,688	9,214	6,605		18,507	39,581	21,074	△ 11,589
1987	2,688	9,214	6,605		18,507	39,581	21,074	9,485
1988	2,688	9,214	6,605		18,507	39,581	21,074	30,559
1989	2,688	9,214	6,605		18,507	39,581	21,074	51,633
1990	2,688	9,214	6,605		18,507	39,581	21,074	72,707
1991	2,688	9,214	6,605		18,507	39,581	21,074	93,781
1992	2,688	9,214	6,605		18,507	39,581	21,074	114,855
1993	2,688	9,214	6,605		18,507	39,581	21,074	135,929
1994	2,688	9,214	6,605		18,507	39,581	21,074	157,003
1995	2,688	9,214	6,436		18,338	39,581	21,243	178,246
1996	2,688	9,214	6,074		17,976	39,581	21,605	199,851
1997	2,688	9,214	1,558		13,460	39,581	26,121	225,972

XV. SUGGESTIONS

XV. Suggestions

1. Control of Increase of NSC Switching Facilities

In the radial (star-shaped) network having Colombo NSC at its center, calls between different DSC's are connected through circuits connected with the NSC. In the OCADS-I, which was the first phase in the introduction of STD, only basic trunk circuits were provided for the DSC's. For the OCADS-II, traffic forecast and circuit estimation are conducted under the same principle, so that the switching facilities of the NSC will be required to have a sufficient capacity for carrying trunk calls originated through all DSC's. However, if calls can be connected not through the NSC but through traversal trunk circuits depending on the actual flow state, the scale of the NSC switching facilities to be expanded will be reducible accordingly, allowing the construction of economical network. The spread of telephones is rather oriented to those subscribers who are socially in very important positions and local toll traffic has some strong directionality toward Colombo. If these tendencies are known quantitatively, circuits, between DSC's and Colombo NSC can be connected directly to Colombo DSC or Colombo Central, which will allow reduction of the increase in NSC switching facilities. However, this requires more detailed traffic data and data on the present status of other relevant office switches. So, careful examination should be effected before adopting this method.

2. Effective Use of Switch at Colombo DSC

The distribution of telephone demand in Sri Lanka is rather concentrated to great Colombo DSC area or Colombo DSC area (to be exact, which are slightly different from each other) and the density of telephone demand is extremely high, so that most toll traffic in the country is directed to or originated from this area. Since the CADS project, subscribers in this area have enjoyed the service in the STD network for the longest time in the country and interconnection of dependent offices is made via the Colombo DSC installed in the OCADS-I project.

This DSC has undergone repeated expansion of facilities to cope with

abrupt increase of traffic, and the increase in processed traffic with the lapse of time is expressed in terms of increase in the frequency of operation of the common control equipment, as shown in Fig. VI·1·2. The former condition of difficulty in effecting the dialling of "0" has been considerably improved. It is understood from the figure that the condition of the unavailability of "0" origination used to be really bad. It can be estimated from the result that the traffic forecast for traffic via the DSC was not sufficient and ineffective and unsuccessful calls repeated due to the shortage of switching facilities, leading to congestion. When overload condition is continued for long periods of time, the service life of the switching facilities will be much shortened. A proper scale of switching facilities is necessary for effecting economical. effective use of switches.

This DSC is expected to still require the increase of switching capacity in future too, so that the future scale of the DSC will become very large. Analysis of the number of calls in the present state where unsuccessful or ineffective calls has been much decreased in number will allow confirming the directionality of calls originated from within the DSC. By this, it will become necessary to lighten the load of the switching facilities of the DSC by adopting traversal trunks between major dependent offices. In such cases, however, the trunk facilities of the dependent offices will be diversified and facilities related to charging equipment will be required. Also, the introduction of traversal trunks must be examined on the basis of economical comparison with due consideration for junction cables and toll cables as well.

3. Suggestions on Traffic Management

(1) Arrangement of traffic organizations

(a) To keep telecommunication service in a good condition and satisfy calling demand of subscribers.

(b) To let the existing facilities to exhibit their utmost capabilities so as to effect efficient revulsion of investment for the installation of facilities.

(c) To effect efficient revulsion of investment for the operation,

maintenance and others of the telecommunication network by fulfilling traffic demand.

(d) To effect proper demand forecast in order to conduct appropriate, efficient investment for facilities to be expanded in future.

(e) To arrange traffic data and related data necessary for demand forecast so as to be applicable to the forecast base.

(f) To take proper measures and allow important calls to be connected as desired when the occurrence of abnormal traffic can be presumed in the event of an emergency.

(g) To arrange organizations necessary for the above-mentioned items.

(h) To standardize operations and work for smooth accomplishment.

(i) To train personnel necessary for effecting systematic traffic operations.

Operations related to traffic can be classified in various ways. The following is an example of the classification of traffic operations.

(a) Operation of equipment related to traffic

(b) Measurement of traffic

(c) Analysis of traffic

(d) Collection and filing of data for traffic forecast

(e) Traffic forecast

(f) Check of facilities for shortage and planning of expansion of facilities

(g) Supervision of network and taking measures in emergencies

(h) Taking measures for the reduction of ineffective calls and securing earning

Preparation of standards for operations related to traffic

(i) Management and improvement of traffic operations

(j) Guidance and training of personnel in charge of traffic.

The estimated relationship between the existing organization related to traffic and operations to be carried out is shown in Table XV·3·1.

Although survey has been conducted on the actual traffic condition and

the result of traffic forecast, organizations for traffic operations are rather mixed and complicated and required data has not been obtained necessarily.

For the future expansion and development of the telecommunication network, the arrangement of organizations related to these operations is desirable.

In order to effect smooth accomplishment of these operations, unification of organization may be necessary, which is, however, rather difficult for the time being from the standpoints of the required number of personnel, financial situation, traning system, etc. Under these circumstances, therefore, it may be the most proper method of improvement to partially rearrange the existing organizations, plan annual aims of improvement, or re-form the organizations and their contents of operations by years of time. It is recommended for the time being, that P & T should effect improvement in the contents of operations or rearrangement of related organizations (including examination of share in operations) especially of those organizations or items marked ◎ in Table XV·3·1 which are given high priority.

(2) Guidance and training of those personnel engaged in traffic

In order to improve the organizations related to traffic, it is necessary to assign experts in the field of traffic to various stages of the organizations and to various offices or bureaus. These experts should be trained at a training center or centers by well-planned schedules without impeading their daily activities.

(3) Collection and filing of data for traffic forecast

It well analyzed and arranged data of traffic is available from those facilities covered by the OCADS-I project, it may somehow simplify or lighten the load on forecast operations or contribute to raising accuracy of forecast. As a result, installation or expansion of facilities can be examined for being planned. It is desirable to analyze and arrange data systematically and, if possible, preserve data in form of printed matters.

(4) Measurement and analysis of traffic

Measurement of traffic is essential not only for supervision of service quality but also for obtaining information on the operating condition of facilities, customs and habits of subscribers, and traffic characteristics. However it is rather difficult, because of the shortage of hands and fund, to grasp true state of traffic and, in general, estimation is employed through periodical sample survey or examination which may be conducted several times a year. Although subscriber traffic, duration of call, etc., are observed when necessary, it is necessary to further develop these measurements and survey conducted upon occasion and discuss as to whether data used as standard or typical data since the OCADS-I is still workable or not for the detailed design of the OCADS-II. It is also desirable to analyze traffic data obtained in detail and accurately grasp the actual condition of traffic.

Table XV.3.1 Share in the Work Regarding Traffic (Draft)

Items of Work	Responsible Organization		
	TTD	TED	TC
1. Operation of traffic equipment	○	○	
2. Traffic measurement	◎		
3. Traffic analysis	◎		
4. Check of quantities of facilities and implementation of expansion plan	○	◎	
5. Collection and filing of forecast information	◎	△	
6. Traffic forecast	◎		
7. Network supervision and countermeasures in emergencies	○	△	
8. Countermeasures for ineffective calls	○	△	
9. Standardization of work related to traffic	○	△	
10. Administration and improvement of traffic work	◎	△	
11. Guidance and training of personnel	◎	◎	◎

4. Introduction of Electronic Switch

(1) Desire of P & T for introduction of electronic switch

For the expansion of terminals of Colombo Central proposed in the initial proposal submitted to Japanese government, P & T expressed a desire, in the stage of site survey, for the introduction of electronic switch. P & T explained, as the reason for the introduction of electronic switch, that they may be able to extend the time when the office building will have no space to afford for the expansion of facilities.

Introduction of electronic switch may be intended for the following purposes.

(a) To develp technical standard by the introduction of electronic switch

(b) To reduce maintenance personnel by the introduction of electronic switch which is considered to involve comparatively less faults.

(c) To increase the number of switching terminals by the introduction of electronic switch which may allow efficient use of the existing office building and increase the capacity of the office building.

(d) To utilize the opportunity of the present project for the introduction of electronic switch since no other offices are so larger than Colombo Central.

The desire of P & T for the introduction of electronic swith is very strong. In the case of the installation on Mt. Laviaia of which the tender was closed in the end of April 1977, only common control type switching system was set out and they are ready to accept either crossbar or electronic switch whichever desirable by the judgement of the tenderer.

P & T intends, by using the opportunity of the installation at Mt. Lavinia, to learn techniques on electronic switch.

As is clear in the minutes of meeting we had at the site, P & T requested the Japanese side to approve the trial of clearly stating, in the tender specification, of either crossbar or electronic switch whichever recommendable by the tenderer for the modification of

switching facilities at Colombo Central in the OCADS-II project.

(2) Problem on cost

Calculation made, in consideration of the introduction of electronic switch, for the comparison of cost between crossbar and electronic switch if introduced will be much higher than the cost of crossbar switch.

In the case of the installation of crossbar switch, installation will be accomplished by P & T under its direct management and foreign currency will be required only for necessary equipment and materials. In the case of the installation of electronic switch, installation by P & T will not be achievable and not only equipment and materials but also personnel expenses to be required for the installation on a turn-key basis will be charged.

P & T stated that the price of electronic switch will gradually lower. Actually, the cost for hardware may somehow lower in future because of the progress of IC techniques but personnel expenses charged on turn-key basis will considerably be raised in future.

(3) Problem of investment effect on electronic switch

Electronic switch are said to allow various new services, efficient maintenance, etc., as a switch having stored program control system using software. However, in Sri Lanka, it will be rather much ahead when desire for data communication and other new types of services will be spread among people and, for the time being, such a desire or necessity will not be urgent.

Filfullment of telephone demand which is to be achieved by the expansion and arrangement of the telecommunication network and promotion of international telecommunication which are the aims of the investment plan can be attained sufficiently by crossbar system.

(4) Problem in technical transfer necessary for maintenance

Now let us consider the introduction of a new technique from the standpoint of technical transfer. If restriction in time is rather moderate, it is possible to train necessary engineers by sufficient time. However, in the case of electronic switch, the restriction in time is rather exacting and it is difficult to train necessary personnel

for the maintenance of electronic switch in short periods of time. So, in case electronic switch is introduced this time, its maintenance will be performed by experts sent from overseas to reside at the site for considerably long periods of time.
Thus the total cost will be much high.

(5) Problem of training system

In case personnel is trained in order to catch up with the completion of installation and start of the service of the present project, engineers to be trained must be sent to overseas for training since they have no electronic switching facilities usable for educational use in this country.
Even in Japan, personnel for the maintenance of electronic switch has to be trained over one year. So, if it is tried to train personnel having no background of data telecommunication and let the personnel acquire required technical knowledge started with the fundamentals of data processing, hardware, and software and master the installation and maintenance as well, a period of about two years will be required person.
Moreover, suppose 6 - 10 personnel are assigned for the maintenance of one unit of electronic switch, it may be rather difficult, in consideration of keeping the maintenance system of the existing facilities, to pick up so many personnel as will be required from their working sites for training and, at the same time, provide number of personnel for the installation of crossbar switches at other sites in the OCADS-II.
Accordingly, the introduction of electronic switch at Colombo Central should be, if attempted, made after solving all these problems to be encountered.

5. Arrangement/Replacement of MDF at Colombo Central

P & T is expected to replace the existing step-by-step switch (for LS use) with common control switch in order to increase the number of terminals accommodated in the local switching equipment room on the second floor for effective use of the office building of the

existing Colombo Central. For this purpose, a space will be provided in the local switching equipment room on the second floor in the OCADS-II project.

P & T seems to have a desire of increasing the switching capacity to more than 40,000 terminals.

In order to achieve this capacity, it will be necessary infuture to double the MDF capacity of 200 verticals with each vertical being composed of 400 circuits on both line and intra-office sides

6. Relation with Indo-Sri Lanka Microwave System

The OCADS-II and Indo-Sri Lanka Microwave System will be closely connected with each other.

In case the installation of the Indo-Sri Lanka Microwave System should be delayed, the following problems will be caused.

(1) Of the six offices or stations expected to be incorporated in the STD network by the OCADS-II, Anuradhapura, Kurunegala, Trincomalee and Jaffna, offices will be delayed in being incorporated in the STD network.

(2) The installation of radio facilities in the OCADS-II is expected to be executed after completion of the Indo-Sri Lanka Microwave System because of the convenience of installation. In case the completion of the Indo-Sri Lanka Microwave System should be delayed, the installation of the radio facilities to be executed in the OCADS-II will be delayed accordingly. As a result, Badulla, Ratnapura, Kurunegala, and Trincomalee offices will be delayed in being incorporated into the STD network until the installation of the radio facilities in the OCADS-II which will be started after completion of the Indo-Sri Lanka Microwave System is completed.

7. On Office Buildings

Described hereunder are comments on telephone offices made through site survey in Sri Lanka. These comments are rather based on the principles employed by NTT of Japan regarding office buildings. So, whether these comments are helpful or not in Sri Lanka should be

determined in consideration of actual conditions and circumstances of Sri Lanka.

(1) Telephone office buildings should be such that should assure safety against all possible dissasters. From this point of view, it can be said that office building in Sri Lanka lack considerations against fire. Urban fire is reported to hardly occur in Sri Lanka, and consideration for protection against fire by fire limit and other fire resistance means is scarcely given even to multistoried buildings in Colombo. Although they may use different materials for their buildings and have different economical state and historical background than we have in Japan and to what extent consideration should be given to fire limit and fire resistance may not be determined simply, yet it is desirable at least to put equipment rooms which play the most important role in telephone offices in safe, firelimit condition.

Let us consider dissasters by water. Electricity, especially weak currents are subject to water.

Trincomalee and Anuradhapura offices have a lavatory or water closet above the switching equipment room. In case overflow occurs, which may easily be caused by the disconnection of overflow joint due to choking of the drain pipe, the influence will given first to the switching equipment room. Water supply and drain pipes should not be passed on equipment rooms.

Telephone office buildings should secure more safety as shelters than other types of buildings. This is from the standpoint of stressing the importance of information reporting.

Thus, telephone office buildings should assure higher performance than ordinary buildings.

(2) Standard planning method will contribute to stabilizing the quality of telephone buildings

If there is standard type of building for DSC's as in rural exchanges (dependent offices), standardization can be applied to the installation and maintenance of communication equipment, which will contribute to the stabilization of communication quality. For the building scale of DSC's however, it is rather impractical to establish

standard type of building since different DSC may have different site condition, different personnel configuration, different number of terminals, etc. However, it may be possible to partially standardize the direction of bay against the direction of the cable trench, the positional relationship among the power room, switching equipment room, and test room, the way of expansion of equipment room when necessary, wiring and connection, etc.

(3) Future expansion office buildings should be considered.

Althrough it may appear that expansion of office buildings is not necessary for the time being, demand forecast always comprises uncertain factors. It is necessary to provide such office building systems that will allow future expansion especially when there is some space in the site.

This does not give influence to the construction cost upon starting construction but may be extremely helpful in future. Indeed, this will be very useful as well as standardization mentioned in item (2) above.

XVI. RECOMMENDATIONS AND CONCLUSION

XVI. Recommendations and Conclusion

The survey team has determined that the OCADS-II project is feasible on the assumption that the following will be satisfied.

1. Provision of Personnel for Installation of Switches

The installation time schedule and required number of installation teams are given in Table IX·3·1. If installation is conducted by power supply and switch installation teams formed separately, the number of installation teams will be shorted through-out installation.

Even if the installation of power supply and switches is to be carried by one installation team, the present installation team plan is still insufficient. So, due consideration should be given to the provision of required installation personnel.

2. Provision of Personnel for Design of Facilities and Detailed Design

Some personnel have been engaged in the OCADS-I and other installation operations and have acquired a considerable experience, but not so many engineers are well experienced in the design of facilities or detailed design.

Since all installation operations in the OCADS-II will be executed under direct management of P & T, so that a considerable number of personnel experienced in the design of facilities and detailed design should be assigned. Accordingly, measure should be taken as soon as possible to secure and train these experienced personnel.

3. Establishment of Adjustment and Advisory Groups

The present project ranges, geometrically, over wide areas and involves, technically, various fields including various bureaus and governmental offices outside P & T and overseas. The present project may be said the first total project on the telecommunication network in Sri Lanka to be implemented under the direct management of P & T at a high technical level. Smooth accomplishment of the present project will require a group intended for coordination among various items of the project, such as the installation schedule, personnel management,

and preparation & delivery of equipment and materials, and a group for giving advices for solving problems or troubles which may occur at the sites of installation. These group should be established in the head office of the OCADS-II Project.

4. Technical Cooperation by Japan

The accomplishment of the above-mentioned recommendations will require not only the efforts of the Government of Sri Lanka but also technical cooperation by Japan. If so requested by the Government of Sri Lanka, the Japanese government should offer generous cooperation to implement the project.