

MINISTRY OF POSTS AND TELECOMMUNICATIONS
THE REPUBLIC OF ANGOLA
ANGOLA TELECOM

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR REHABILITATION
OF
TELEPHONE NETWORK IN LUANDA PHASE II
IN
THE REPUBLIC OF ANGOLA**

MARCH 2001

JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN TELECOMMUNICATIONS ENGINEERING
AND CONSULTING SERVICE

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PREFACE

In response to a request from the Government of the Republic of Angola, the Government of Japan decided to conduct a basic design study on the Project for Rehabilitation of Telephone Network in Luanda (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Angola a study team from October 12 to November 14, 2000.

The team held discussions with the officials concerned of the Government of Angola, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Angola in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of the friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Angola for their close cooperation extended to the teams.

March, 2001



Kunihiko Saito

President

Japan International Cooperation Agency

March, 2001

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Rehabilitation of Telephone Network in Luanda (Phase II) in the Republic of Angola.

This study was conducted by Japan Telecommunications Engineering and Consulting Services (JTEC), under a contract with JICA, during the period from September, 2000 to March, 2001. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Angola and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



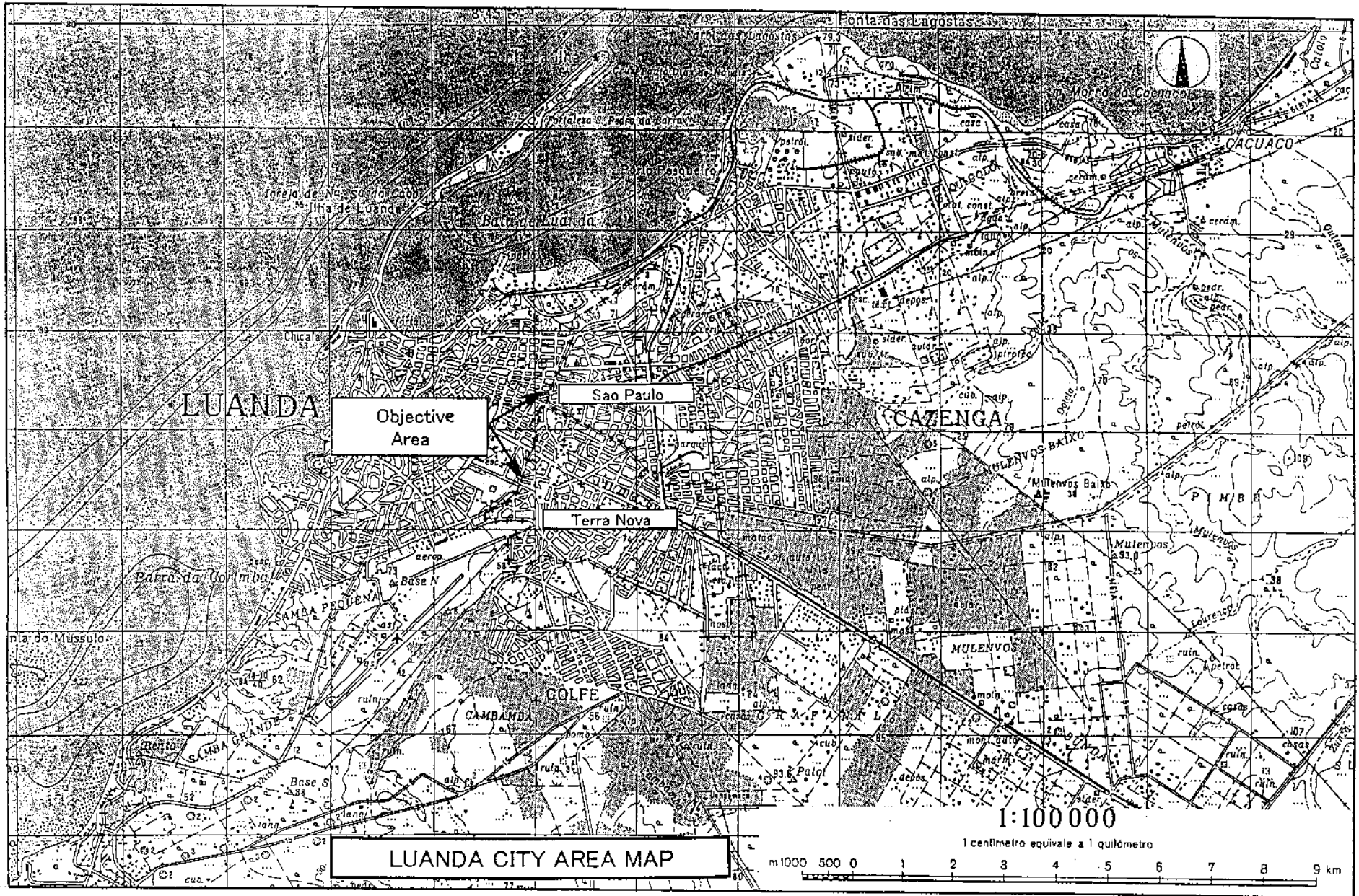
Suzuo Uchiyama
Project Manager,
Basic design study team on
the Project for Rehabilitation of
Telephone Network in Luanda (Phase II)
Japan Telecommunications
Engineering and Consulting Services
(JTEC)



THE REPUBLIC OF ANGOLA

ATLANTIC

OCEAN



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Abbreviations

| | |
|-----------------|---|
| ADB | African Development Bank |
| Angola Telecom. | Empresa de Telecomunicaciones de Angola |
| CCC | Cross Connection Cabinet |
| DB | Distribution Box |
| E/N | Exchange of Notes |
| FRP | Fiberglass Reinforced Plastic |
| GDP | Gross Domestic Product |
| MDF | Main Distribution Frame |
| KZ | Kwanza (Currency Unit in Angola) |
| OSP | Outside Plant |
| PE | Polyethylene |
| PE-LAP | PE Laminated Aluminum Tape |
| UNITA | National Union for the Total Independence of Angola |
| UTT | Unidad de Taxa de Telecomunicaciones |

Summary

Summary

The Republic of Angola with 13,000 thousands population is located at the southeast Africa, bordering Republic of the Congo on the north, Democratic Republic of the Congo on the northeast, Republic of Zambia on the east, Republic of Namibia on the south. Angola is about 3.4 times bigger than Japan in area and is constituted by 18 provinces, the center of which is Luanda, the capital.

The economy in the Republic of Angola was extremely exhausted for about 20 years due to the continuing civil wars since Angola won its independence from Portugal in the year of 1975. Since the national unified compromise government was established in April 1997, activities towards economic reconstruction and social restoration have been promoted throughout the country.

The Government of Angola has pointed out the following noteworthy policies in the formulation of its national plan "General Budget of the State for the Year 2000"

- To stabilize macro economy and to rehabilitate the infrastructures
- To introduce overseas funding scheme to stabilize the financial structure of the country

In particular, as the first priority for infrastructure restoration policy, the Government of Angola decided to restore the social infrastructures such as telecommunications networks, destroyed several hundred bridges, sanitary facilities, water and power supply plants and info-communications.

On the other hand, since the telecommunications facilities were destroyed due to the civil war aggravation, the total number of national telephone was decreased to 49,000 main sets in 1992 from the previous number of 72,000 sets, lowering a telephone density to 0.49 per 100 inhabitants. However, the situation of telecommunications service has been restored to pre-civil war level in September 2000 owing to the cease-fire and establishment of the national unified compromise government in 1997

The majority of the national telecommunications facilities are concentrated in Luanda City, the capital of Angola. The installed cables there have become worn and its paper insulation causes insulation drop and consequent faults due to the rainfall, resulting in deterioration of speech quality of telecommunications service. In addition, the cable distribution method has not been improved due to the complicated wiring system in Luanda City, making expansion of subscriber network facilities rather difficult under the present circumstances.

The Government of Angola requested the Government of Japan for Grant Aid to improve and replace the existing facilities and poor quality telephone networks in Sao Paulo and Terra Nova exchanges areas with new and reliable telephone networks of about ten thousand lines for each area as an urgent and first priority plan

In the past, the Project for Emergent Improvement for Telecommunications in Luanda for Alvalade exchange and Combatentes exchange areas was completed successfully by Japan's Grant Aid. In succession to the previous plan, this project will rehabilitate the access networks in Sao Paulo and Terra Nova where governmental organizations, public institutions (hospitals, schools etc.) and prominent enterprises are concentrated and are connected to the exchanges as the most important subscribers.

At the request of the Government of Angola, JICA decided to organize a study team of the project for rehabilitation of telephone network in Luanda Phase II and sent to Angola a basic design study team from October 12 to November 14, 2000. The study team examined not only the telecommunications situations both in the country and in Luanda City but also the background and contents of the project. At the same time, the team discussed with relevant officials of Angola and conducted a field survey on the objective areas of the project in Luanda City.

After the works in Japan which were conducted in line with the field study results, JICA sent to Angola a Draft Basic Design Study Report Explanation Team from January 11 to January 18, 2001. The Team described the outline and contents on the Draft Basic Design Study Report of the project and through a series of discussions both sides confirmed and agreed the validity of the project.

As a result of the basic design study, the objectives of the project has been formulated as follows:

The project objective is to rehabilitate the existing old and faulty access networks of San Paulo and Terra Nova exchanges, which accommodate many important subscribers of governmental organizations, public sectors and business offices. Thus, the project aims at building a reliable outside telephone facilities of 10,600 lines for San Paulo and 11,200 lines for Terra Nova by using the updated technology over a period of three years. The planned project also includes a soft component that should contribute to much smoother implementation of the project with more efficiency through the preparation of operation and maintenance manuals and the skill development training for Angola Telecom on new outside plants.

The scope of the project is planned according to the following basic concepts:

The numbers of telephone lines are decided to be 10,600 lines for Sao Paulo area and 11,200 lines for Terra Nova area as minimum requirement to restore the accommodation capability of the existing subscribe networks and fulfill current demand.

As for the cable distribution system, a new flexible cable distribution system using cross connection cabinet (CCCs) should be introduced in order to rehabilitate the existing cable network with the advanced technology .

For the outside cable improvement, it is necessary to rehabilitate primary and secondary cables by using new jelly-filled plastic cables for replacing the obsolete and faulty paper insulated cables.

The main facilities of the project consist of cable ducts, manholes, primary and secondary cables, poles, cross connection cabinets (CCCs) and distribution box (DB), as shown in the following table;

| Name of Exchange | Main Item | Unit | Quantity |
|------------------|--------------------|------|----------|
| Sao Paulo | Cable facilities | | |
| | MDF Pair | Pair | 10,600 |
| | Primary cable | Km | 11.2 |
| | CCC | ea. | 15 |
| | Secondary cable | Km | 111.8 |
| | Pole | ea. | 960 |
| | Civil work | | |
| | Manhole/handhole | ea. | 117 |
| | Duct | Km | 11.4 |
| Terra Nova | Cabling facilities | | |
| | MDF Pair | Pair | 11,200 |
| | Primary cable | Km | 13.9 |
| | CCC | ea. | 20 |
| | Secondary cable | Km | 110.1 |
| | Pole | ea. | 1,172 |
| | Civil work | | |
| | Manhole/handhole | ea. | 133 |
| | Duct | Km | 13.3 |

The soft component is planned in this project in order to improve the operation and maintenance works more smoothly and more effectively. For the purpose of strengthening the operation and maintenance work force in Angola Telecom, the operation and

maintenance manuals should be prepared in standard and uniform ways.

The contents of the soft component involve standardization for the operation/maintenance works for the access network and plant recording/ management, and introduction of administration systems for fault clearance as well as the introduction of target control system for the network management.

A whole implementation plan of the project is divided into three (3) stages. The stage 1 covers detailed designing and procurement of major materials. The stage 2 and the stage 3 are planned for the construction and installation periods of Sao Paulo telephone network and Terra Nova telephone network respectively.

The Project will bring the following direct benefits and effects:

(1) Fulfillment of Current Demand

21,800 telephone lines will be available for Sao Paulo and Terra Nova areas to obtain minimum telephone service level by improvement of the existing telephone lines which are unable to be used due to fault.

(2) Reduction of Customer Complaints

The annual complaint rate will be reduced to less than one third of the current rate for the number of complaints per 100 subscribers in average.

(3) Increase of Fault Clearance Rate within 24 hours

The fault clearance rate within 24 hours will rise greatly to 90 % from current 17.9 %.

In relation to the indirect benefits on this project, the network rehabilitation would eventually contribute to activation of socioeconomic activities in the project areas where important subscribers are used to make communications calls very frequently. In addition, the improvement of the telephone network will reduce a great deal of traffic volume of transportation that occurs as a substitution for telecommunications in shortage.

The project implementation skills of Angola side deem to be good enough to achieve the project without any difficulties, since Angola Telecom completed the previous project for Alvalade and Combatentes exchange areas with fruitful results.

Judging from the current evaluation results on the project that will have improved quality of facilities, the remarkable effects and benefits, the satisfactory technical level of Angola Telecom's maintenance personnel and the implementation of the soft component, the

planning of this project by Japan's Grant Aid is considered to be right and appropriate.

Although this project will bring about outstanding benefits to the Angola side, due attention has to be paid to the followings in order to complete the project more smoothly and more usefully:

Since Angola side undertakes its own parts of the project, it is recommendable for Angola Telecom to take quicker action for the budget preparation after the signing of E/N and to set up systems for smoother execution of works responsible for the Angola Telecom and for the smoother implementation of the Project on the schedule. Moreover, due attention must be paid to store the major materials without impairment, since they are used for Terra Nova exchange more than one year later from the procurement.

The overall benefits from the telephone network rehabilitation also depend on improvement of the drop wire and indoor cable wiring of which installation works should be undertaken by Angola Telecom responsibility.

In this connection, it is recommendable to set up an administration rule in Angola Telecom to make recording inevitable for maintenance/management of the installed facilities within the project framework.

This report covers the results of the basic design study on the project for rehabilitation for telephone network in Luanda Phase II mentioned above.

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Chapter 1 Background of the Project

Chapter 1 Background of the Project

With the view of restoration for those damages and destruction due to the long Civil War in Angola, the Government of Angola plans to rehabilitate as a key policy the basic telecommunications facilities in Capital Luanda which were damaged and destructed seriously.

The Government of Japan implemented successfully the construction works of improving the subscriber outside plants in the areas of Alvalade and Combatentes exchanges which are located in the downtown of Luanda City at the request of the Government of Angola in the fiscal years of 1998 and 1999(Phase I) through the Grant Aid Cooperation scheme.

In 2000, the Government of Angola formulates " Improvement Plan of the Subscriber Cable Network in Luanda" as one of the rehabilitation schemes for the improvement of the telecommunications services in Capital City. Out of the plans, the Government of Angola requested the Grant Aid Cooperation to the Government of Japan to rehabilitate the old and faulty telephone networks in the areas of 2 exchanges of Sao Paulo and Terra Nova in which important subscribers are accommodated in focus and prominent development are expected.

The contents of current request by the Government of Angola can be summarized as follows;

- (1) Request Time : May 1999
- (2) Request budget : about 3.2 billions Yen
- (3) Requested contents : Rehabilitation of Telephone Networks in the following
exchange areas;
Sao Paulo Exchange: 9,600 lines
Terra Nova Exchange: 11,800 lines

This Project is to rehabilitate the existing telephone networks of Sao Paulo Exchange and Terra Nova Exchange areas in line with the Angola side request.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concepts of the Project

The purpose of this Project consists in rehabilitation of the faulty and seriously deteriorated telephone networks of the existing telephone exchanges of Sao Paulo and Terra Nova with an approximate capacity of 10,000 telephone lines each in Luanda, capital city of Angola.

Following to the Phase I project for the improvement of access networks in Alvalade and Combatentes exchange areas that were completed with the grant aid of Japan's Government, the current Project has an objective of improving the both exchange areas' telephone networks of Sao Paulo and Terra Nova which accommodate the high priority clients in the centralized government offices, business office and public facilities (hospital, schools).

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

The essential conditions on the implementation have to be adopted for the designing of cable network in accordance with the technical standards and specifications of the outside plant for this project;

(1) Line Capacity of Telephone Network

The numbers of telephone lines are decided to be 10,600 lines for Sao Paulo area and 11,200 lines for Terra Nova area as minimum requirement to restore the accommodation capability of the existing subscriber networks and fulfill the current demand.

(2) Cable Wiring System

A free wiring system with use of a Cross Connection Cabinet (CCC) has been introduced to enhance the cable occupancy efficiency.

For short distance area from the telephone exchange, a direct cable feeding system by Primary cable is employed.

(3) Selection of Materials and Cables

For primary cable and secondary cable of the project, PE(polyethylene) insulated, jelly-filled, PE-LAP and polyethylene sheathed cables are to be used instead of the paper insulated cable that is prone to become faulty due to the poor insulation by water penetration.

As for the main materials of the Project (primary and secondary cables, CCC and MDF), the specifications of these material have be set to the same standard as stipulated in the previous project thus enabling the unification of material standard and specifications. Types of the cable including cable pairs and core sizes shall abide by the Angola Telecom standards.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

The majority of subscribers outside plant in Luanda City are of paper-insulated cable and they are so obsolete that exceeds their designed usage life time already. Therefore, there occur many cases of faults and troubles on the cables. In particular, much more faults would be reported from the customers to the exchange office on rainy days.

This project aims at reducing the fault ratio incurred by the damage cables, providing the better telecommunications services with the key subscribers of Governmental organizations, public plants (schools and hospitals) and business enterprises and improving the telephone penetration. As the result of the Project the rehabilitation of the subscriber telephone networks would be dramatically improved through the following effects;

- (1) Rehabilitation through the use jelly-filled PE insulated cables for primary and secondary cables.
- (2) Rehabilitation of underground facilities such as manholes, handholes and cable ducts
- (3) Free wiring method by use of CCC would help to improve the cable pair efficiency
- (4) For the direct-bullying section of secondary cables, the steel tape armored cable shall be used.
- (5) With view of higher efficiency of the project performance, an aerial cable system must be utilized in addition to the direct bully secondary cable system.

The number of cable pairs to be terminated at Main Distribution Frame (MDF) is designed to meet the subscriber capacity in accordance with the field survey conducted for the current Angola Telecom facility circumstances.

The scope of the Project for the objective areas of Sao Paulo and Terra Nova exchange areas account for 21,800 cable pairs in total and the breakdowns are as follows;

(1) Sao Paulo

The scope of the Project is to rehabilitate not only the primary cable but also the secondary cable including the underground facilities such as the conduit, manhole, and handhole for Sao Paulo exchange. The number of primary cable pairs terminated on MDF (Main Distribution Frame) accounts for 10,600 pairs as a maximum.

(2) Terra Nova

The scope of the Project is to rehabilitate not only the primary cable but also the secondary cable including the underground facilities such as the conduit, manhole, and handhole for Sao Paulo exchange. Total number of primary cable pairs terminated on MDF for Terra Nova Exchange is 11,200 pairs as a maximum.

The scope of the Project includes the provision of material and construction/installation of all facilities used for the cable sections between MDF and Distribution Box (DB). The main facilities are Ducts, Manholes, Handholes, Primary cables and Secondary cables, Wooden Poles, Cross Connection Cabinets (CCCs) and DBs.

The main facilities of the Project for each exchange are shown in Table 2.2.1-1.

| Name of Exchange | Main Item | Unit | Quantity |
|------------------|--------------------|------|----------|
| Sao Paulo | Cable facilities | | |
| | MDF Pair | Pair | 10,600 |
| | Primary cable | Km | 11.2 |
| | CCC | ea. | 15 |
| | Secondary cable | Km | 111.8 |
| | Pole | ea. | 960 |
| | Civil work | | |
| | Manhole/handhole | ea. | 117 |
| Terra Nova | Duct | Km | 11.4 |
| | Cabling facilities | | |
| | MDF Pair | Pair | 11,200 |
| | Primary cable | Km | 13.9 |
| | CCC | ea. | 20 |
| | Secondary cable | Km | 110.1 |
| | Pole | ea. | 1,172 |
| | Civil work | | |
| Manhole/handhole | ea. | 133 | |
| Duct | Km | 13.3 | |

(3) Soft Component

In an effort to strengthen the management and administration of the outside plant, soft component shall be implemented to elaborate manuals for smoother fulfillment of the project. The main contents of the manuals cover standardization of the operation and maintenance works, establishment of management method for the plant recording, control of fault occurrence and repair actions and the introduction of a target control system for operation and maintenance.

2-2-3 Basic Design Drawing

The basic design drawings of telephone networks on Sao Paulo Exchange are given in figures 2.2.3-1 through 2.2.3-4, and those of Terra Nova Exchange areas are shown in figures 2.2.3-5 to 2.2.3-8.

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1. KEY MAP

2. PRIMARY CABLE DIAGRAM

3. DUCT ROUTE PLAN

4. SECONDARY CABLE DIAGRAM

5. CABLE TERMINATION PLAN
IN CABLE VAULT AND MDF

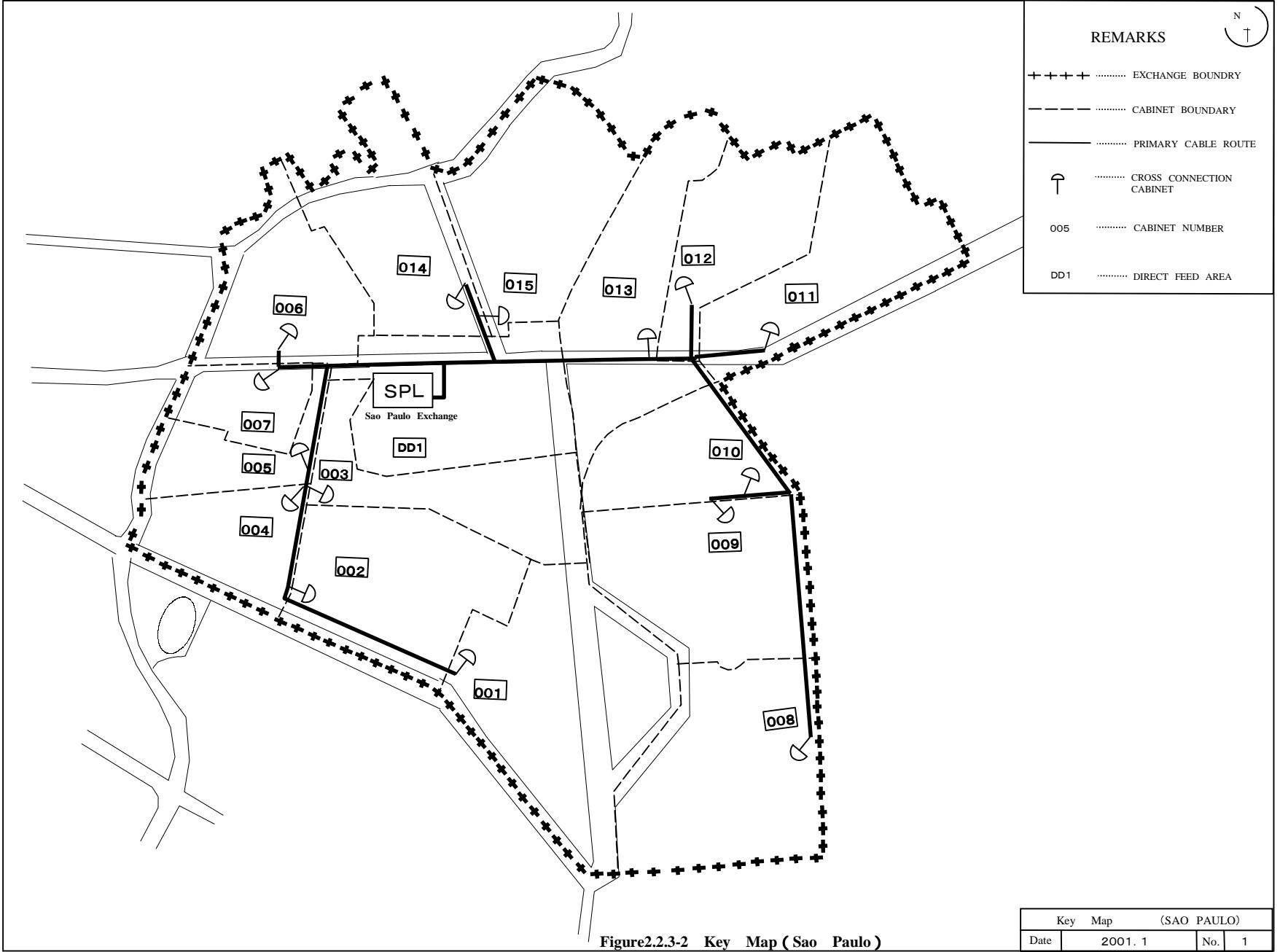
6. MANHOLE AND HANDHOLE
STANDARD

7. MANHOLE ACCESSORIES PLAN

DESIGN SYMBOL

| Symbols | | LEGEND |
|----------|------------|---|
| Existing | To install | Description |
| | | Telephone Exchange |
| | | Manhole |
| | | Handhole |
| | | 4 way having 100m length with I-0 Type Manholes |
| | | 4 way existing Ducts and 2 ways additional Ducts |
| | | CAB 007 : Cabinet Name 1200 : 1200 Pair-Capacity Type of Cabinet 400 : 400 Pair-Primary Cable 600 : 600 Pair Secondary Cable (The Number of Secondary Cable Pairs is described in Secondary Cable Diagram only) |
| | | 400 Pair-Cable in Duct |
| | | 1600 Pair Duct Cable with 200 Dead Pairs |
| | | No.001 Internal Distribution Box having 20 Pairs |
| | | No.010 Wall Mounted Distribution Box having 10 Pairs |
| | | No.020 Pole Mounted Distribution Box having 10 Pairs |
| | | Pole Mounted Distribution Box with Existing Pole |
| | | 100 Pair Cable in Duct |
| | | 100 Pair Direct Buried Cable |
| | | 200 Pair Direct Buried Cable with 20 Dead Pairs |
| | | 50 Reserved Pairs in Joint Point |
| | | Straight Joint Point |
| | | Branch Joint Point |
| | | Figure2.2.3-1 Design Symbol (Sao Paulo) |

7



| REMARKS | |
|-------------|--------------------------|
| -----+----- | EXCHANGE BOUNDRY |
| ----- | CABINET BOUNDARY |
| ----- | PRIMARY CABLE ROUTE |
| ↑ | CROSS CONNECTION CABINET |
| 005 | CABINET NUMBER |
| DD1 | DIRECT FEED AREA |

Figure2.2.3-2 Key Map (Sao Paulo)

| Key Map (SAO PAULO) | | | |
|---------------------|---------|-----|---|
| Date | 2001. 1 | No. | 1 |

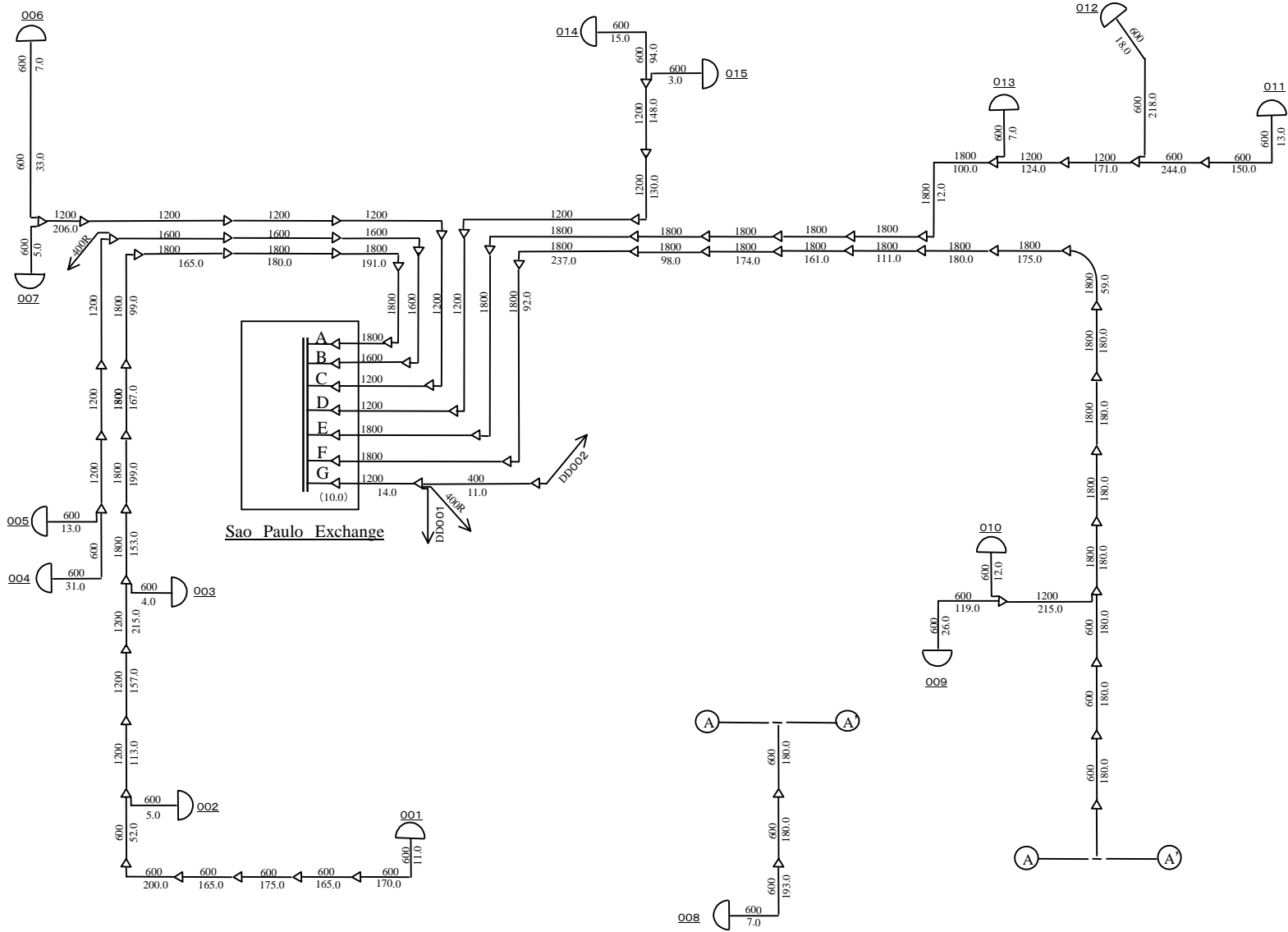


Figure 2.2.3-3 Primary Cable Diagram (Sao Paulo)

| Primary Cable Diagram (SAO PAULO) | | |
|-----------------------------------|---------|-------|
| Date | 2001. 1 | No. 2 |

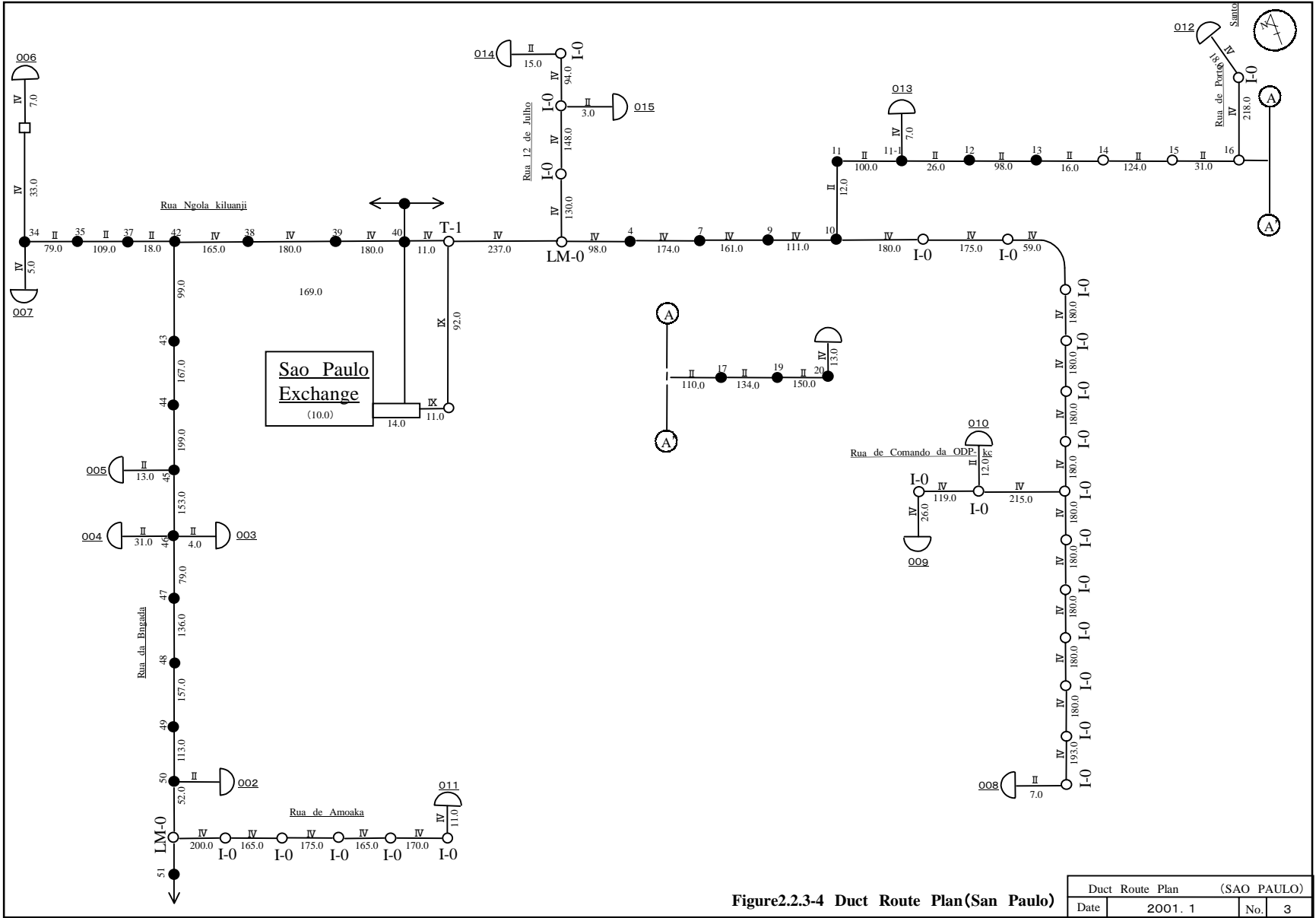


Figure2.2.3-4 Duct Route Plan(Sao Paulo)

| Duct Route Plan | | (SAO PAULO) | |
|-----------------|---------|-------------|---|
| Date | 2001. 1 | No. | 3 |

CONTENTS

1. KEY MAP

2. PRIMARY CABLE DIAGRAM



































3. DUCT ROUTE PLAN

4. SECONDARY CABLE DIAGRAM

5. CABLE TERMINATION PLAN
IN CABLE VAULT AND MDF

6. MANHOLE AND HANDHOLE
STANDARD

7. MANHOLE ACCESSORIES PLAN

| DESIGN SYMBOL | | |
|---|--|---|
| Symbols | | LEGEND |
| Existing | To install | Description |
|  |  | Telephone Exchange |
|  |  | Manhole |
|  |  | Handhole |
|  |  | 4 way having 100m length with I-0 Type Manholes |
|  | | 4 way existing Ducts and 2 ways additional Ducts |
|  |  | CAB 007 : Cabinet Name 1200 : 1200 Pair-Capacity Type of Cabinet 400 : 400 Pair-Primary Cable 600 : 600 Pair Secondary Cable (The Number of Secondary Cable Pairs is described in Secondary Cable Diagram only) |
|  |  | 400 Pair-Cable in Duct |
|  |  | 1600 Pair Duct Cable with 200 Dead Pairs |
|  |  | No.001 Internal Distribution Box having 20 Pairs |
|  |  | No.010 Wall Mounted Distribution Box having 10 Pairs |
|  |  | No.020 Pole Mounted Distribution Box having 10 Pairs |
| |  | Pole Mounted Distribution Box with Existing Pole |
|  |  | 100 Pair Cable in Duct |
|  |  | 100 Pair Direct Buried Cable |
|  |  | 200 Pair Direct Buried Cable with 20 Dead Pairs |
|  |  | 50 Reserved Pairs in Joint Point |
|  |  | Straight Joint Point |
|  |  | Branch Joint Point |
| | | Figure2.2.3-5 Design Symbol (Terra Nova) |

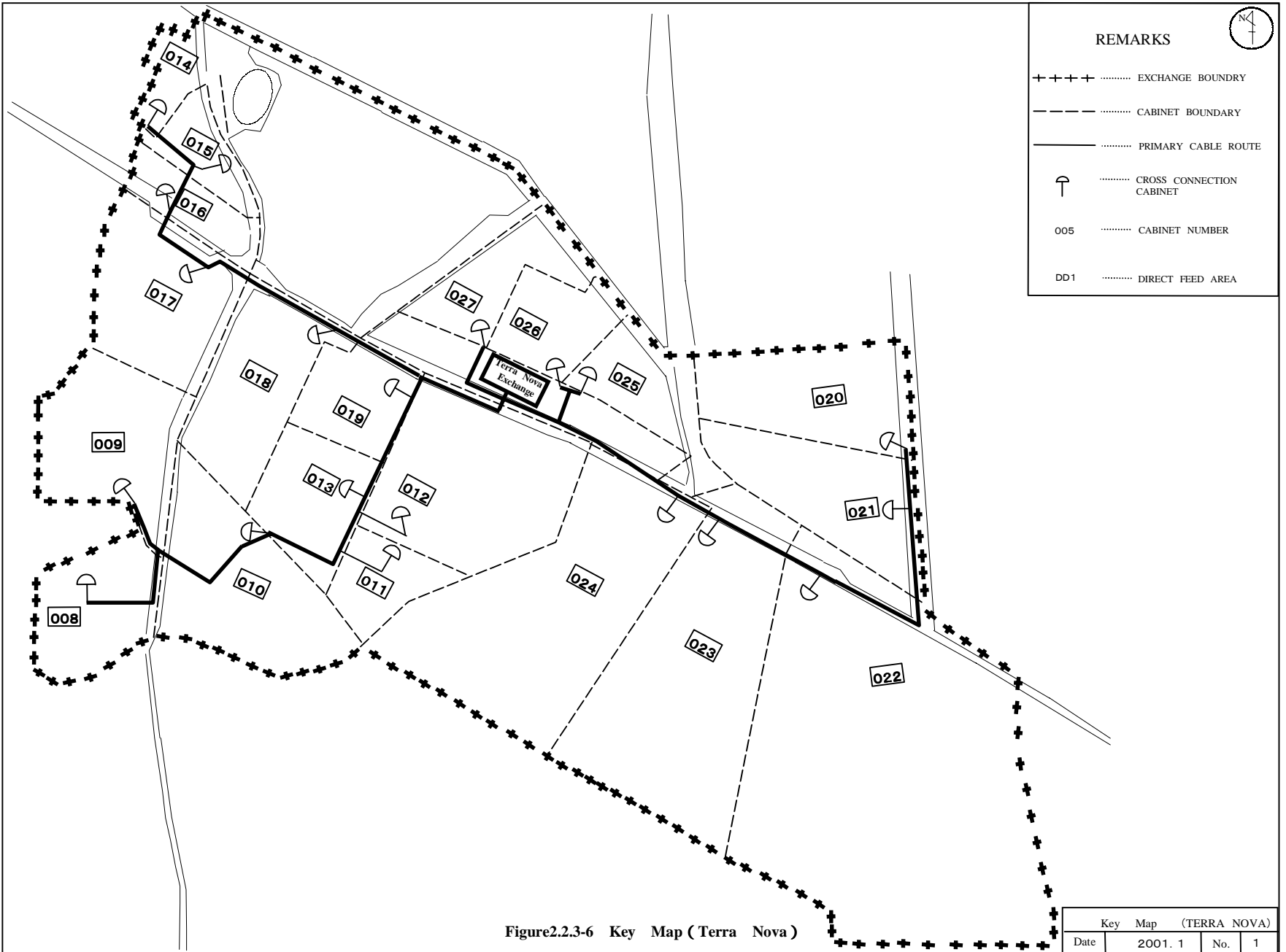


Figure2.2.3-6 Key Map (Terra Nova)

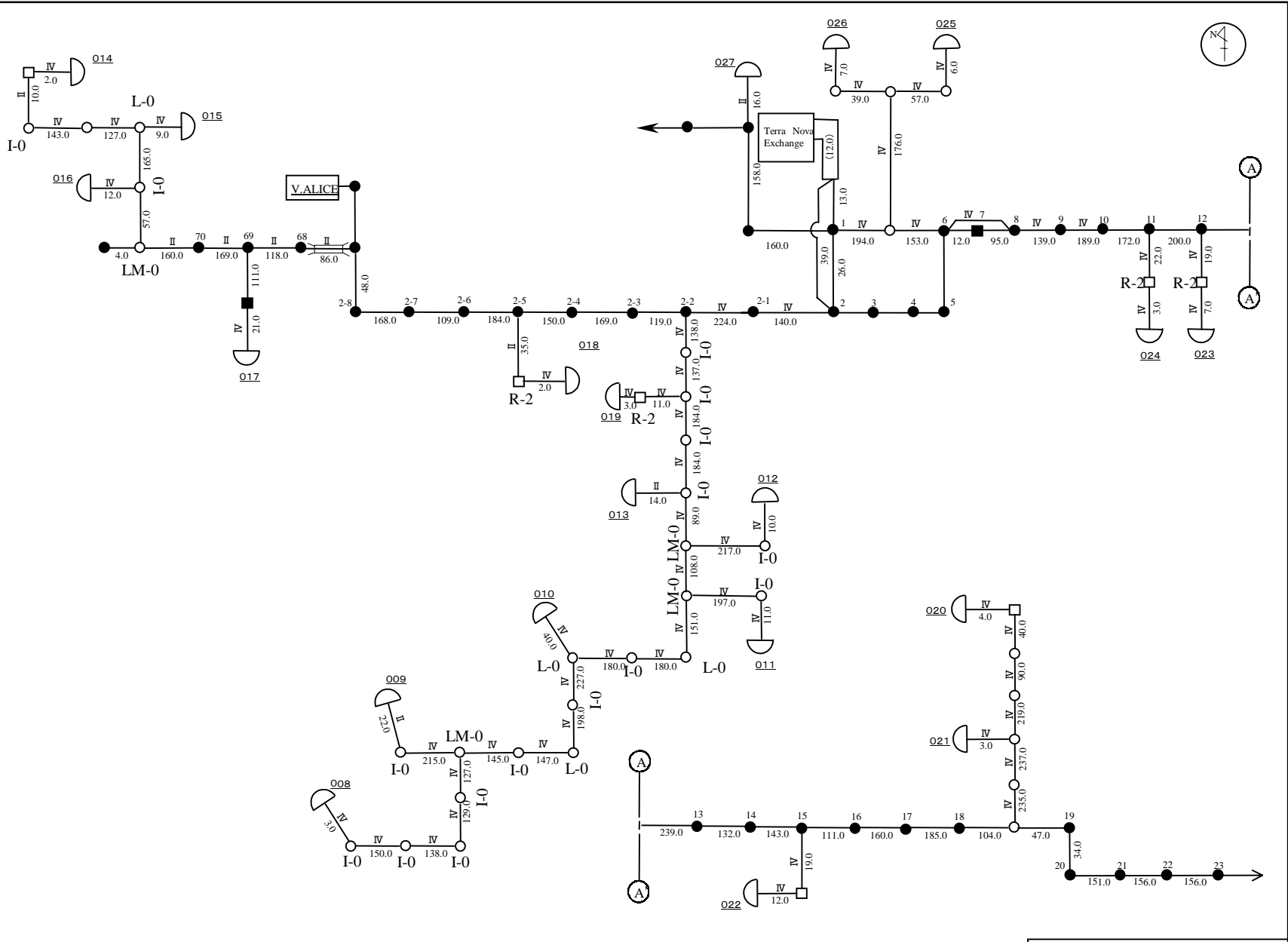


Figure2.2.3-8 Duct Route Plan(Terra Nova)

| Duct Route Plan | | (TERRA NOVA) |
|-----------------|---------|--------------|
| Date | 2001. 1 | No. 3 |

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The government authority for telecommunications planning is the Ministry of Posts and Telecommunications, and the operational body is Angola Telecom.

The implementation of this Project is undertaken by Angola Telecom under the authority of the Ministry of Posts and Telecommunications. In order to complete the Project smoothly, Angola Telecom is requested to nominate a project manager who is responsible to administrate the Project with respect to the coordination with correlated field in close cooperation with the consultant.

The Project should be implemented in such a way that the rehabilitation of the facilities in project areas of Sao Paulo and Terra Nova exchanges will be completed with a fruitful results and better performance. In this connection, the project implementation stage is divided into three stages with all main materials procurement for both exchanges as the first stage. The implementation stages will follow as the Stage II of construction work for Sao Paulo exchange area and Stage III for Terra Nova exchange area.

The obligation work to be done by Japanese side is implemented under turnkey basis, though local subcontractors may be employed since competent local construction companies can do works of laying, cable splicing, pole installation, manhole construction, underground duct construction, etc under the main contractor.

2-2-4-2 Implementation Conditions

The matters to be taken into consideration for the implementation are as follows:

(1) Right of Way Permission

It is prerequisite to complete relevant formalities, such as obtaining approval of road utilization / occupancy and permission of road excavation from either the relevant authority or Luanda City Council. Prior to starting the work, a special care must be taken so that no delay would be caused in the implementation time schedule. It is necessary for Angola Telecom to submit application document to

competent authorities with sufficient lead time in advance to starting the installation work.

(2) Installation Works during Rainy Seasons

A considerable amount of rainfall in Luanda in the rainy season, once a year, is likely to exercise unfavorable effects on the construction work of outside plant and civil work. For this Project, therefore, the construction work schedule should be drawn up deliberately so that the Project can be implemented efficiently and safely within the contracted period.

(3) Formation of Special Team for Project Implementation

Since the scope of the Project is large and its implementation period will last 3 years, it is recommendable to set up a special team in Angola Telecom, which will complete the project smoothly and effectively.

2-2-4-3 Scope of Work

Works to be undertaken by the Japanese side and the Angola side are described as follows;

(1) Work to be undertaken by the Japanese Side

- 1) Rehabilitation of primary and secondary cables from MDF to each DB, including procurement and installation work.
- 2) Provision of outside plant necessary for maintenance of the facilities after completion of this Project.

(2) Work to be undertaken by the Angola Side

- 1) Preparation of terminal and MDF to terminate primary cable. Necessary terminal numbers are 10,600 for Sao Paulo exchange and 11,200 for Terra Nova exchange.
- 2) Transfer of drop wires, jumper wiring in MDF and in cross-connection cabinets, in connection with the transfer of the existing subscribers to new facilities, after installation of new cables.
- 3) Removal of cables and all other facilities which have become out of use upon completion of this Project.

- 4) Permanent restoration of paved road for the temporal pavement by contractor.
- 5) Safekeeping of the products from abroad in the warehouse
- 6) Tax exemption and custom clearance of the products , including VAT.
- 7) Internal transportation from the port of disembarkation to the project site.
- 8) All possible measures to ensure the safety of Japanese Team.

2-2-4-4 Consultant Supervision

It will be adopted a combined supervisory system consisting of stationed supervision and spot supervision. An engineer capable of coordinating all the relevant technologies will be stationed to cover all the period of the Project, while spot supervisors specializing in respective fields will be dispatched on demand. Main items of Consultant Supervision are as follows;

- (1) Detailed designing and tender documentation and tender evaluation
- (2) Management of procurement and transportation for construction materials and tools
- (3) Management and inspection of pre-shipment during the third party inspection period
- (4) Supervision of cable work and civil work to be conformed to the tender specification
- (5) Progress control of each relevant work
- (6) Inspection of materials and equipment to be used for the construction works
- (7) Delivery/acceptance after completion of work

2-2-4-5 Procurement Plan

- (1) Major Materials

Almost all of the construction materials and tools, as well as cables, wires, etc. are not manufactured in Angola. Therefore, the principal materials for this Project should be of foreign type of third countries in the same way as the Phase I Project. Materials are shipped to Angola mainly by marine transportation and unloaded at Luanda Port. As for the inland transportation, no hazardous environment is foreseen since a depot for the Project can be located in the campus of Angola Telecom O/M Center in the vicinity of the harbor of Luanda City. As for the inland transportation, no hazardous environment is foreseen since a depot for the Project can be located in the campus of Angola Telecom O/M Center in the vicinity about 5 km far from the harbor of Luanda City.

(2) Materials to be procured locally

Among wide variety of materials necessitated for the implementation of this Project, cement, sand, gravel, crushed rock and iron bars are to be procured in Angola.

Cement and iron bars and other items procurable locally are almost the same in quality with those on the general market. Concrete poles, PVC pipes and Manhole covers, have been procured by Angola Telecom, will be locally procured. When the local materials do not satisfy the quality and date of delivery, foreign made materials will be procured.

2-2-4-6 Quality Control Plan

Quality control items and test methods for concrete and materials of road basement used in civil work of the Project are described below.

(1) Concrete

Concrete is made by mixing cement, water and aggregate. The aggregate is sand and gravel and is classified as fine, medium and coarse by size of particles.

1) Aggregate

The classification of aggregate is shown in Table 3.2.4.6-1.

Table 3.2.4.6-1 Aggregate Classification

| Designation | Category | Average Diameter (mm) |
|-------------|----------|-----------------------|
| Sand | Fine | 0.1 to 0.3 |
| | Medium | 0.6 to 2.0 |
| | Coarse | 2.0 to 5.0 |
| Gravel | Fine | 6 to 12 |
| | Medium | 10 to 20 |
| | Coarse | 18 to 30 |

2) Water

The water to be used for making concrete must be clean, fresh, free of organic substance, and other harmful substances. The use of seawater, acid water, salt water and wastewater is prohibited.

3) Cement

The cement to be used for making concrete must be of STANDARD PORTLAND type.

4) Mixing of concrete

Mixing of concrete is generally carried out by hand mixing or machine mixing. In civil work of the Project, concrete must be basically mixed by mechanical means. The duration of mixing is usually between 1.5 and 3 minutes. It is prohibited to add water to concrete after mixing.

5) Pouring concrete

Concrete must be poured according to the standardized methods. Some of main methods are shown below.

Concrete must be poured without interruption at a regular rate, in horizontal layers of a maximum thickness of 30cm.

Concrete must be poured from a height higher than 1 meter.

Wooden forms must be wetted in water, before the concrete is poured.

Pouring in heavy rain fall is prohibited.

(2) Road Basement

In case of digging roads in civil work of the Project, unpaved roadway and footway must be recovered to their original states after digging them. In restoration of dug roads, materials of road basement to be reused (for example, curbs) must be stored at places different from other materials.

2-2-4-7 Implementation Schedule

The Project implementation schedule is divided into three (3) stages, since the project scope is so big. The project period, after the signing of the Exchange of Notes (E/N) till the completion of implementation work at site, will take 13 months for Stage I of equipment and material procurement, 17 months for Stage II of the construction of Sao Paulo Exchange area and 17 months for the construction of Terra Nova area.

These three-stage schedules are shown in Table 2.2.4.7-1 through Table 2.2.4.7-3.

Table 2.2.4.7-1 Implementation Schedule (Stage-I)
 Procurement of Main Materials for Sao Paulo and Terra Nova

| Stage I | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------------------|---|---|---------------------------|---------------------------------|---|---|---|-----------------------------|-------------------------|--------------------|----|----|----|
| Design Stage | | | (Field Survey 1.5 Months) | | | | | | | | | | |
| | | | (Design 1.0 Month) | | | | | | | | | | |
| | | | | (Bidding/Evaluation 4.0 Months) | | | | | | | | | |
| Procurement Stage | | | | | | | (Manufacturing/ Procurement 3.5 Months) | | | | | | |
| | | | | | | | | (Transportation 1.5 Months) | | | | | |
| | | | | | | | | | (Acceptance 0.5 Months) | | | | |
| | | | | | | | | | | (Total 120 Months) | | | |

Table 2.2.4.7-2 Implementation Schedule (Stage II)
Sao Paulo Exchange Area

| Stage II | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|
| Design Stage | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Table 2.2.4.7-3 Implementation Schedule (Stage III)
Terra Nova Exchange Area

| Stage III | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|
| Design Stage | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

2-3 Obligation of Recipient Country

The project works that shall be done by Angola side are also big and long and the project performance will influence the progress in implementation schedule. Therefore, a project task force must be strengthened to complete smoothly the following obligations and responsibilities that shall be borne by Angola side.

- (1) Construction Works to be undertaken by Angola Side
 - 1) Preparation of terminal and MDF to terminate primary cable. Necessary terminal numbers are 10,600 for Sao Paulo exchange and 11,200 for Terra Nova exchange.
 - 2) Transfer of drop wires, jumper wiring in MDF and in cross-connection cabinets, in connection with the transfer of the existing subscribers to new facilities, after installation of new cables.
 - 3) Removal of cables and all other facilities which have become out of use upon completion of this Project.
 - 4) Permanent restoration of paved road for the temporal pavement by contractor.

- (2) Items to be done by Angola Side
 - 1) Safekeeping of the products from abroad in the warehouse
 - 2) Tax exemption and custom clearance of the products , including VAT.
 - 3) Internal transportation from the port of disembarkation to the project site.
 - 4) All possible measures to ensure the safety of Japanese Team.

- (3) Project Cost

Project cost to be borne by Angola Telecom is shown in Table 2.3-1

| Item | Sao Paulo | Terra Nova | Total |
|---|-----------|------------|---------|
| MDF and Terminal block | 15,362 | 20,973 | 36,335 |
| Subscriber Transfer | 121,792 | 163,920 | 285,712 |
| Permanent Restoration of Pavement | 207,709 | 308,895 | 516,604 |
| Removal of Disused Existing Outside Plant | 48,754 | 65,587 | 114,341 |
| Total | 393,617 | 559,375 | 952,992 |

(Note): Exchange rate: 1US\$=108.71 Yen

2-4 Operation and Maintenance Plan

(1) Management and Administration

The management and administration of this project are undertaken by the Outside Plant Engineering Department of Angola Telecom, and the operation and maintenance works are done by Luanda District.

(2) Project Cost

The operation and maintenance cost for the project can be estimated for the Project in accordance with the experience of Angola Telecom Budget allocation and results obtained from the data of Alvalade and Combatentes exchanges that were completed by March 2000

Table 2.4-1 Estimated Project Cost Unit: In US\$

| Item | Sao Paulo | Terra Nova | Total |
|-----------------|--------------|--------------|--------------|
| Cost Estimation | 173,000/year | 187,000/year | 360,000/year |

2-5 Soft Component

(1) Background and Necessity

1) Operation and Maintenance of Outside Plant

The outside plant in Rwanda city was out of date and cables which had been used for more than 30 years were causing a lot of failures and insufficient availability. The first rehabilitation project was executed to improve the situation, and, after that, other improvement plans were carried out in some areas for higher quality and higher availability.

Although, along with the outside plant rehabilitation, modern operation and maintenance technology was introduced, the proliferation of the technology is limited to the areas where rehabilitation was carried out. The Angola Telecom staff expertise in the maintenance technology is not so satisfactory as a whole. It is necessary to train the staff who operate and maintain the modern outside plant facilities to be installed in the project in San Paulo and Terra Nova telephone service area.

Angora Telecom still does not have systematic training scheme for staff to

share technological knowledge among them, in spite of training given to some counterparts in the first rehabilitation project. It is highly important to implement software component in the project to conduct lecture and practical training on cables introduced by the Project about specification, quality, and installation technology on connection and distribution, and to make fundamental manuals on operation and maintenance.

2) Maintenance and Management of Telephone Network

The failure rates on individual facilities, such as cable and drop wire and the failure rates classified by individual telephone office show that maintenance of Angora Telecom has reached a certain level. However, Angora Telecom has not yet established methods and technology to synthetically maintain and manage all facilities in the telephone network and to make operation and maintenance plans by collecting and analyzing failure data.

The first rehabilitation project also pointed out similar subjects for improvement of operation and maintenance technology on access network and for improvement of maintenance and management technology on telephone network.

Since it is important for Angora Telecom to build up maintenance and management system for all networks including telephone network, soft component is required to develop human resource through lecture and practical training on facility administration and modernized network management. Soft component is also required to make manuals to standardize the maintenance and management of telephone network.

Objectives of soft component are made as shown below, to keep telephone service sound and continuous in Sao Paulo and Terra Nova, which are brought in by the outside plant in the Project.

Enhancement of operation and maintenance capability for access network

Enhancement of maintenance and management capability for telephone network

(2) Benefit and effects

Following is the benefit and effects expected from the technical cooperation.

1) Benefit and effects related to operation and maintenance technology of outside plant

Upgrading daily operation and maintenance technology

Mastering technology and method on fault finding and repair

Improvement of handling techniques on measuring equipment and tools

Learning how to reduce failure rate by preventive maintenance

Making fundamental manuals concerning operation and maintenance of outside plant

2) Benefit and effects related to maintenance and management of telephone network

Mastering proper facility administration method (plant record)

Learning how to reduce network failure rate and number of complaints from subscribers

Learning how to improve operation and maintenance cost and telecommunication quality by objective management

Making standardized manuals concerning telephone network maintenance and management

(3) Activity Plan

1) Schedule

Implementation period of this Soft Component will be from June 2002 to July 2002 for one and half months. The project important matters are to purchase main equipment as early as possible for the first project year and to avoid installation work for rainy season in March and April every year.

The technical training of "Outside Plant Operation and Maintenance technology " and " Telephone Network Maintenance and Management" will be conducted efficiently for a short period from June to July in the second project year.

2) Staff

The technical cooperation requires following staff.

Japanese Experts

a. One telecommunications outside plant expert for "Outside Plant Operation and Maintenance Technology

b. One telecommunications network expert for "Telephone Network

Maintenance and Management"

Angola Counterparts

Every Japanese expert needs two counterparts from the following organizations.

- a. Special project team to be formed for the Project
- b. Operation and Maintenance Center
- c. Sao Paulo and Terra Nova telephone offices

3) Location for training

Operation and Maintenance of Outside Plant:

Sao Paulo and Terra Nova telephone offices in Rwanda city

Maintenance and Management of Telephone Network:

Maintenance and Management Center and Angola Telecom Headquarters

Chapter 3 Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effects

Sao Paulo and Terra Nova project areas have many existing subscriber lines, which are unable to be used due to fault. It takes long time to recover from service failure because of the obsolete facilities which have been not replaced for 30 to 40 years and consequently it is not possible to fulfil telephone demand with good telephone service.

The Project will increase the telephone penetration ratio per 100 inhabitants, reduce telephone failure rate and improve recovery time from failure.

(1) Direct Effects

1) Increase of Accommodation Capability of Subscribers

The capability to accommodate subscribers in the subscriber network will be increased as the result of execution of the Project by rehabilitation of the existing subscriber lines, many of which are unable to be used for the telephone service because of poor quality and many failures. The number of available telephone lines will be increased to be 21,800 in sum for the both project areas, which satisfy the telephone demand and raise the telephone penetration ratio in the areas.

| Name of Exchange | Maximum Capacity of Existing Facility | Maximum Capacity After Rehabilitation | Increase in Subscriber |
|------------------|---------------------------------------|---------------------------------------|------------------------|
| Sao Paulo | 3,184 | 8,840 | 5,656 |
| Terra Nova | 4,160 | 9,160 | 5,000 |

2) Reduction of Customer Complaints

The Angola Telecom receives 70 customer complaints per 100 subscribers per year in average. The complaint rate will be drastically reduced to one third of the current rate, after the completion of the Project.

3) Reduction of Recovery Time from Failure

The fault clearance ratio within 24 hours is currently 16% in the Sao Paulo and Terra Nova areas. The project will reduce the ratio to slightly less than 90%. The maintenance service to the subscribers will be improved greatly.

4) Improvement of Call Complication Ratio

The call complication ratio will be improved and telephone connection will be easily and surely made. As a result, Telephone calls will be increased by 20% in number in compare with present telephone calls.

(2) Indirect Effects

- 1) The improvement of telecommunications service in the areas, where government offices, enterprises, shops and other important facilities are concentrated, will contribute to vitalization of socioeconomic activities, since telecommunications work as nerve systems for such activities as production and transportation.
- 2) The volume of transportation, which is occurred as a substitution for telecommunications in shortage, will be lowered. The Table 4.1-1 shows the summary of the benefits and effects brought by the Project.

Table 3.1-1 Benefits and Effects by the Project

| Present State and Problems | Countermeasure by the Project (Cooperation Items) | Benefits and Effects |
|--|--|--|
| Since many subscribers network facilities are suffered from failures and have poor quality, it is difficult to comply with telephone demand and requirement for good telephone service by customers in the Project areas, Sao Paulo and Terra Nova (about 1.27 million | 21,800 subscriber lines will be installed in Sao Paulo and Terra Nova areas. Cross Connection Cabinets will be installed to achieve high usage of cable pairs. | The telephone penetration ration will be improved from current 0.53% to 1.23% per 100 inhabitants for the areas with the population of 1.27 million (households about 350 thousands). |
| Subscriber network facilities are 30 to 40 years old without replacement and causes a lot of failures which are difficult to repair. | The Cross Connection Cabinets will enable easier fault sectionalization. Circuits test and Maintenance & Operation will be improved. The paper insulated cables, which are main causes of failures, will be replaced with jelly-filled cables, which are reliable and of good quality | The customer complaints ratio will be reduced to one third from the current ratio of complaints per 100 subscribers per year. 90% of failures will be cleared within 24 hours. Only 17.9% of failures are pleasantly recovered within 24 hours |

3-2 Recommendations

The Project will contribute to many benefits by upgrading quality of civilian life in Sao Paulo and Terra Nova areas where it is difficult to meet the telephone demand due to the influence from the long civil wars and poor telephone facilities which are full of failures.

Therefore, the Project will be judged as significant for execution. However there are some matters to be attended to maximize the effects of the Project. Matters and countermeasures are described below.

(1) Cooperation with Other Donors

In order to restore the telecommunications from the influence of the civil wars,

which continued for more than 20 years, the Angola Telecom has imposed the top priority on the plan of network rehabilitation in Luanda, the Capital City. In this way, the Angola Telecom has been promoting overall rehabilitation of telephone networks, based on financial plans to seek aids from foreign countries for each of telephone network elements such as access network, long distance networks and international network. To be more concrete, Africa Development Bank is assisting for the satellite earth station facilities for long distance network, French Finance Corporation is financing for international submarine cable facilities for international telephone network, Norway is aiding for local telephone exchanges, and Japan is cooperating for subscriber network by the Grant Aid. In the circumstances, the Project should much more contribute to the overall rehabilitation of whole country networks, by synchronizing with other rehabilitation plans in an effort to pursue cooperation with other donors.

(2) Preparation for Budget by Angola Telecom

It is recommendable for Angola Telecom to take quicker action for the budget preparation, which is essential for the Project, as early as possible after the signing of E/N, to execute the Project without delay.

(3) Manning Plan for Implementation of Software Components

It is important to carry out the software component on making the maintenance and administration manual for outside plant, which is strongly required by Angola Telecom. In this connection, Angola side should assign proper staffs for the software components that are planned along the Project.

(4) Special Team for installation of Drop Wire and Indoor Wire

It is recommendable for Angola Telecom to set up special teams, which totally handle the drop wire and indoor cable installation including managing, installation, and testing from telephone office, because work volume is anticipated as large and tight cooperation is necessary between outside plant staff and in-office staff for testing and registering many new subscribers.

(5) Proper Storage of Materials for the Project

In the Project, all materials will be procured in advance in the First Stage for installation in the Second Stage for Sao Paulo area and in the Third Stage for Terra Nova area. Therefore, Angola Telecom should prepare large store place for the materials to be sent in bulk. Especially more attention than Phase I Project should be paid to the materials for Terra Nova area, as they are used more than one year later from the procurement.

Therefore, some actions such as numbering each of cable coils should be taken and periodical store checking is considered to be necessary to prevent the materials from being lost until the materials are used especially in the Third Stage of the Project.

Appendix

Appendix 1 Member List of the Study Team

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

(October 12, 2000 to November 14, 2000)

Members of JICA Study Team (Site Survey)

| Name | Duty/Position | Remarks |
|----------------------|---|---|
| Mr. Atsumu Iwai | Team Leader | Third Project Management Division, Grant Aid Management Department, JICA |
| Mr. Akihito Takeuchi | Technical Advisor | Chief, Technology Development Division, Communications Policy Bureau, Ministry of Posts and Telecommunications |
| Mr. Suzuo Uchiyama | Chief Consultant/ Telecommunication Network Planner | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Kuniichi Uetake | Outside Plant Planner 1 | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Katsuya Asaka | Outside Plant Planner 2 | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Masazumi Okamoto | Procurement/ Implementation Planner | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Yasuhiro Sonobe | Interpreter | Japan Telecommunications Engineering and Consulting Service (JTEC) |

**Basic Design Study on the Project for Rehabilitation of Telephone Network in Luanda
(Phase-2)**

(January 11, 2001 to January 18, 2001)

Members of JICA Study Team (Draft Report Explanation)

| Name | Duty/Position | Remarks |
|-----------------------|---|--|
| Mr. Katsutoshi Komori | Team Leader | Third Project Management Division, Grant Aid Management Department, JICA |
| Mr. Suzuo Uchiyama | Chief Consultant/ Telecommunication Network Planner | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Kuniichi Uetake | Outside Plant Planner 1 | Japan Telecommunications Engineering and Consulting Service (JTEC) |
| Mr. Yasuhiro Sonobe | Interpreter | Japan Telecommunications Engineering and Consulting Service (JTEC) |

Appendix 2 Study Schedule

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

(October 12, 2000 to November 14, 2000)

Site Survey Schedule(1/2)

| Date (2000) | Movement | Accommodation | Activities | |
|-------------|-----------|-------------------------------|------------|--|
| Oct. | 12 (Thu.) | Arrival at Luanda | Luanda | Courtesy visit to Angola Telecom, and explanation of Inception Report |
| | 13 (Fri.) | | Luanda | Explanation of Inception Report to Angola Telecom |
| | 14 (Sat.) | | Luanda | Site survey (Sao Paulo, Terra Nova & O/M centre) |
| | 15 (Sun.) | | Luanda | Team meeting |
| | 16 (Mon.) | | Luanda | Discussion with Angola Telecom, Courtesy visit to Ministry of Foreign Affairs |
| | 17 (Tue.) | | Luanda | Discussion with Angola Telecom, courtesy visit to Ministry of Posts and Telecommunications |
| | 18 (Wed.) | | Luanda | Discussion with Angola Telecom, signing of minutes of meeting |
| | 19 (Thu.) | Leader, & Advisor left Luanda | Luanda | Site survey and data collection |
| | 20 (Fri.) | | Luanda | Site survey and data collection |
| | 21 (Sat.) | | Luanda | Site survey and data collection |
| | 22 (Sun.) | | Luanda | Survey team meeting |
| | 23 (Mon.) | | Luanda | Meeting with Angola Telecom, site survey and data collection |
| | 24 (Tue.) | | Luanda | Site survey and data collection |
| | 25 (Wed.) | | Luanda | Site survey and data collection |
| | 26 (Thu.) | | Luanda | Site survey and data collection |
| | 27 (Fri.) | | Luanda | Site survey and data collection |
| | 28 (Sat.) | | Luanda | Site survey and data collection |
| | 29 (Sun.) | | Luanda | Survey team meeting |
| | 30 (Mon.) | | Luanda | Meeting with Angola Telecom, site survey and data collection |
| | 31 (Tue.) | | Luanda | Site survey and data collection |
| Nov. | 1 (Wed.) | | Luanda | Site survey and data collection |
| | 2 (Thu.) | | Luanda | Site survey and data collection |
| | 3 (Fri.) | | Luanda | Site survey and data collection |
| | 4 (Sat.) | | Luanda | Site survey and data collection |
| | 5 (Sun.) | | Luanda | Survey team meeting |

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

(October 12, 2000 to November 14, 2000)

Site Survey Schedule(2/2)

| Date (2000) | | Movement | Accommodation | Activities |
|-------------|-----------|-------------|---------------|--|
| Nov. | 6 (Mon.) | | Luanda | Meeting with Angola Telecom, site survey and data collection |
| | 7 (Tue.) | | Luanda | Site survey and data collection |
| | 8 (Wed.) | | Luanda | Site survey and data collection |
| | 9 (Thu.) | | Luanda | Site survey and data collection |
| | 10 (Fri.) | | Luanda | Site survey and data collection |
| | 11 (Sat.) | | Luanda | Site survey and data collection |
| | 12 (Sun.) | | Luanda | Survey team meeting |
| | 13 (Mon.) | | Luanda | Meeting with Angola Telecom, and reporting of site survey |
| | 14 (Tue.) | Left Luanda | | Moving |

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

(January 11, 2001 to January 18, 2001)

Schedule of Draft Report Explanation

| Date (2001) | Movement | Accommodation | Activities |
|----------------|-------------------|---------------|---|
| Jan. 11 (Thu.) | Arrival at Luanda | Luanda | Courtesy visit to Angola Telecom, and explanation of Draft Report |
| 12 (Fri.) | | Luanda | Explanation of Draft Report to Angola Telecom |
| 13 (Sat.) | | Luanda | Discussion with Angola Telecom, site survey (Sao Paulo & O/M centre) |
| 14 (Sun.) | | Luanda | Team meeting |
| 15 (Mon.) | | Luanda | Courtesy visit to Ministries of Posts and Telecommunications, and Foreign Affairs, discussion with Angola Telecom |
| 16 (Tue.) | | Luanda | Discussion with Angola Telecom, site survey and data collection |
| 17 (Wed.) | | Luanda | Discussion with Angola Telecom, signing of minutes of meeting, site survey and data collection |
| 18 (Thu.) | Left Luanda | | Courtesy visit to Ministror of Posts & Telecommunications |

Appendix 3 List of Parties Concerned in Angola

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

List of Parties Concerned in Angola (Site Survey)

| Name | Position |
|--|--|
| Ms. Ana Maria Teles Carreira | Directora da Asia e Oceania |
| Mr. Estevao Jai | Tereiro Secretario da Asia e Oceania |
| Mr. Antonio Pedro Benge | Director, Cabinet for International Exchange |
| Mr. Jose Gualberto de Matos B Eng., MBA | Administrador e Director General Angola Telecom |
| Mr. V. Simoes Alexandre | Deputy Director General, Angola Telecom |
| Mr. Jose Octavio | General Manager for Planning & Engineering |
| Eng.Lundoloca Casteiro Garcia | Chief of Access Network |
| Mr. Oliveira Barradas | Programa de Recuperaco de Redes |
| Mr.Victor Manuel Baltazar de Sousa | Director de Apoio |
| Mr. Jose Antonio Smith | Director da DRL |
| Mr. Raul Afonso F. Ramalhoso | Chef. Div. B |
| Mr. Monteiro Quimuango | Chefe do Centre de Operacoes, DRL |
| Mr. Jose Paulo Joan David | Chefe da Div. Exprotacion Commercial Telecom |
| Mr. Manuel Jose da Silva | Chefe do Centro de Alvalade |
| Mr. Antonio Jose da Luz Avelino | Unidades Tecnica de Redes(DEPE) |
| Mr. Calos Marques Enriques | Unidades Tecnica de Redes(DEPE) |
| Mr. Joao Crus | Chefe da Base de DRL |
| Mr. Sercal | Counterpart of Combatentes Exchange Area |
| Mr. Piedade | Counterpart of Albalade Exchange Area |
| Mr. Jose Carvarlho da Rocha | Director do Instituto Nacional de Telecomunicacoes |

**Basic Design Study on the Project for Rehabilitation of Telephone Network
in Luanda (Phase-2)**

List of Parties Concerned in Angola (Draft Report Explanation)

| Name | Position |
|--|---|
| Ministry of Foreign Affairs | |
| Mr. Mirano Eduardo Tomas | Deputy Director da Asia e Oceania |
| Mr. Antonio Eduardo Fereira | Manager da Asia e Oceania |
| Ministry of Posts and Telecommunications | |
| Mr. Licino Tavares Ribeiro | Minister of Posts and Telecommunications |
| Mr. Frederico Safeca | National Director of Telecommunications |
| Mr. Antonio Pedro Benge | Director, Cabinet for International Exchange |
| Mr. Miguel Neto | Head of International Relations Department |
| Angola Telecom | |
| Mr. Jose Gualberto de Matos B Eng., MBA | Administrador e Director General Angola Telecom |
| Mr. V. Simoes Alexandre | Deputy Director General, Angola Telecom |
| Mr. Francisces Esperanca | Deputy Director General for Finance |
| Mr. Jose Fernandes | General Manager for Institutional Relations |
| Mr. Jose Freitas | Manager for Communications and Press Relations |
| Mr. Jose Octavio | General Manager for Planning & Engineering |
| Eng.Lundoloca Casteiro Garcia | Chief of Access Network |
| Mr. Oliveira Barradas | Programa de Recuperaco de Redes |
| Mr. Laurengo Piedade | Access Network Engineer |
| Mr. Jose Garcia de Freitas | Director of Communications and Image |
| Mr.Victor Manuel Baltazar de Sousa | Director de Apoio |
| Mr. Guilherme Silva | In Charge of Sao Paulo Exchange |
| Mr. Joao Martins | In Charge of Terra Nova Exchange |
| Mr. Sercal | Chief of Outside Plant of O/M Center |

Appendix 4 Minutes of Discussion

MINUTES OF DISCUSSION
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR REHABILITATION OF TELEPHONE NETWORK IN LUANDA
PHASE II
IN
THE REPUBLIC OF ANGOLA


In response to a request from the Government of Republic of Angola (hereinafter referred to as "the Angola"), the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Telephone Network in Luanda Phase II (hereinafter referred to as "the Project").

JICA sent to Angola the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Atsumu Iwai, Third Project Management Division, Grant Aid Management Department, JICA, and is scheduled to stay in the country from October 12, 2000 to November 14, 2000.

The Team held discussions with the officials concerned of the Government of Angola and conducted a field survey at the study area.

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

Luanda, October 18, 2000



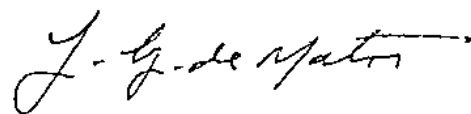
Atsumu Iwai

Leader

Basic Design Study Team

Japan International Cooperation Agency

Japan



Jose Gualberto de Matos

Administrador e Director Geral

ANGOLA TELECOM

Republic of Angola

ATTACHMENT

1. Objective of the Project

The objective of the Project is to rehabilitate the existing outside cable network in Sao Paulo and Terra Nova areas; thus, building new reliable telecommunications network in Luanda city.

2. Project Sites

The sites of the Project are Sao Paulo and Terra Nova in Luanda City. (See Annex-1)

3. Responsible and Implementing Agency

3-1. The Responsible Agency is Ministry of Posts and Telecommunications.

3-2. The Implementing Agency is Angola Telecom.

4. Items Requested by the Government of Angola

After discussions with the Team, the items described in Annex-2 were finally requested by Angola side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5-1. Angola side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-3.

5-2. Angola side will take the necessary measures, as described in Annex-4, Annex-5 and Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1. The consultants will proceed to further studies in Angola until November 14, 2000.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents in January 2001.

6-3. In case that the contents of the report are accepted in principle by the Government of Angola, JICA will complete the final report and send it to the Government of Angola by April 2001.

7. Safety Measures

7-1. Angola side will take all possible measures to secure the safety of the Team during the field survey.

W. W.



8. Other Relevant Issues

8-1. Both sides confirmed that as a result of improvement of outside plants rehabilitated by Phase I Project on two exchanges areas (Alvalade and Combatantes), the fault claim ratio in the areas has been halved from the original 70% ratio, and the fault repair time has been improved to four times shorter. However, to further decrease the fault claim ratio, Angola side shall replace the damaged wires in buildings and houses, and replace the existing drop wires to fault-proof drop wires. The same improvement method shall be taken by Angola side in Sao Paulo and Terra Nova areas on condition that Phase II Project is implemented.

8-2. The Team observed that the operation and maintenance of Phase I Project are currently being properly executed. However, to further develop the operation and maintenance system, Angola side requested the Team the technical assistance such as counterpart training in the fields of management of human resource development and maintenance operation, computer operation training, cable connection, and measurement equipment operation.

8-3. Both sides confirmed that the outside plants in both exchange areas in Phase I Project have been already saturated in some cabinet areas due to the unforeseen sharp increase in telephone demand. Both sides agreed that this situation shall be carefully reflected when examining the telephone subscriber demand of Phase II Project.

C. L. V.

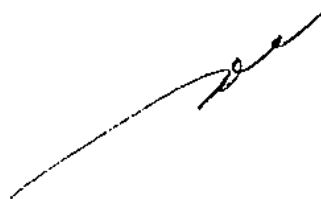
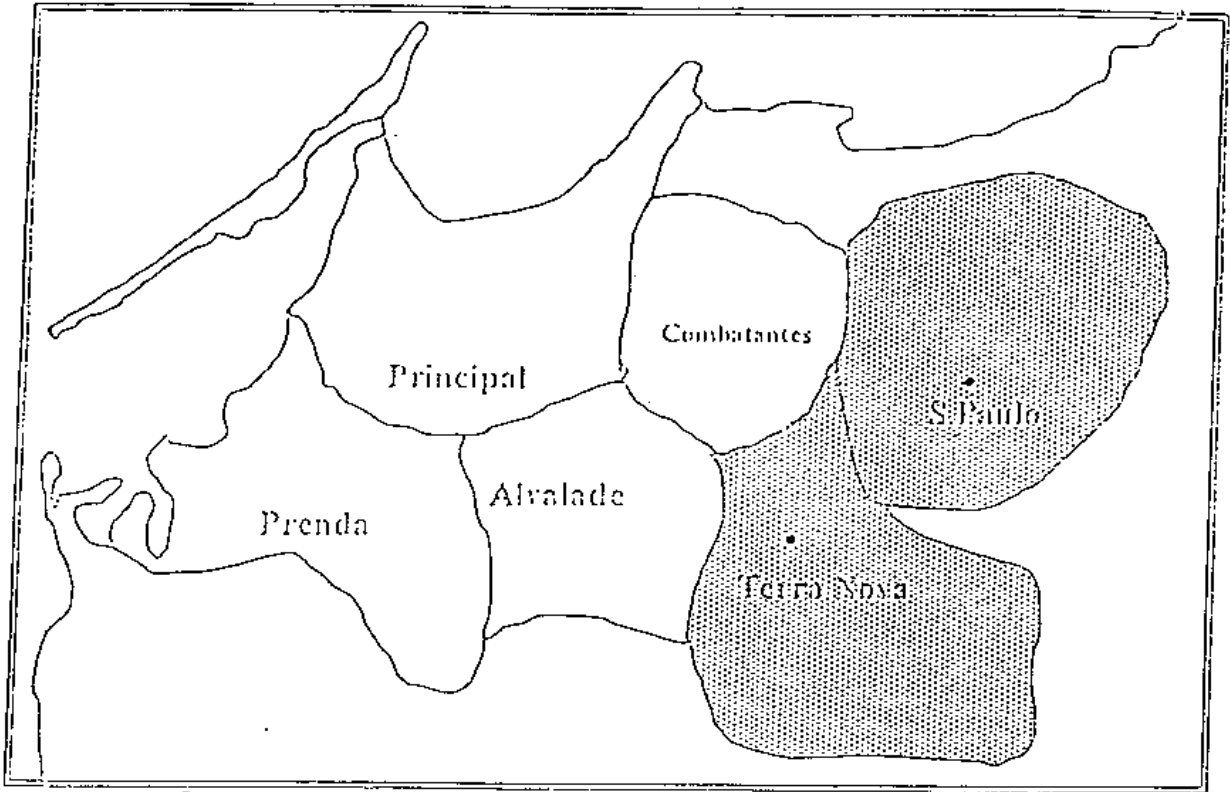


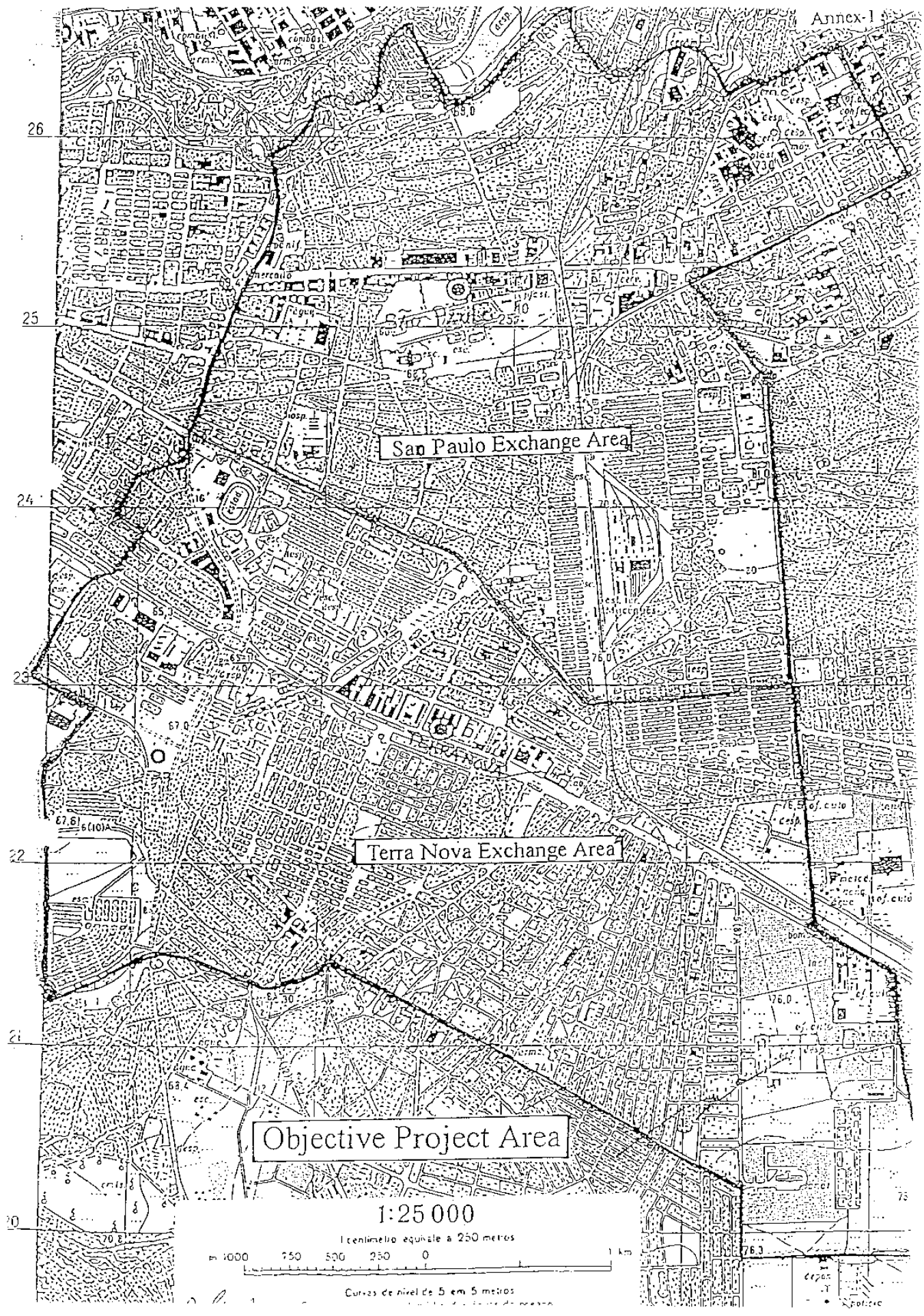
Figure 1 Objective Area

Luanda



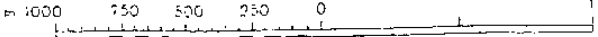
A. Curi

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1:25 000

1 centimetro equivale a 250 metros



Curvas de nivel de 5 em 5 metros

Legend:
Estrada
Estação

Items Requested by Angola Side

As a result of the series of discussions, Angola side finally requested the following items.

1. Objective areas and priority order
 - (1) First priority : Sao Paulo exchange area
 - (2) Second priority : Terra Nova exchange area

2. Method of rehabilitation
 - (1) Primary and secondary cables rehabilitation using jelly filled plastic cable
 - (2) Installation of underground facilities such as ducts, manholes and handholes
 - (3) Introduction of flexible cable network configuration using cross connection cabinets

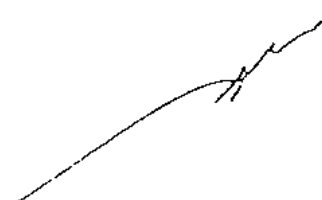
3. Application of network structure
 - (1) Duct cable structure for primary cable network
 - (2) Duct cable, direct buried cable and aerial cable structures for secondary cable network

4. Supply of materials and construction/installation works for the following facilities between Main Distribution Frame (MDF) and Distribution Box (DB), in order to rehabilitate the existing telephone networks in Sao Paulo and Terra Nova areas in Luanda city.
 - (1) Manholes and Handholes
 - (2) Ducts between Manholes/Handholes
 - (3) Primary Cables and Secondary Cables
 - (4) Cross Connection Cabinet and Distribution Boxes
 - (5) Poles

5. Supply of materials, tools and measuring equipment for maintenance of completed new telephone networks
 - (1) Spare Materials for Maintenance
 - (2) Tools and Measuring Equipment

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

A. Silva



JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

- Application (Request made by the recipient country)
- Study (Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet)
- Determination of Implementation (The Note exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study) using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the study

The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows :

- a) Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project.
- e) Estimation of costs of the Project.

A. Shiro

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The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The selected firm(s) carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, ect., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals." (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"



The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

7) "Proper Use"

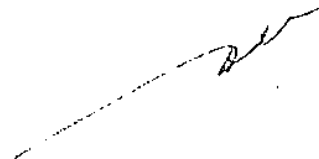
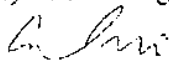
The recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.



Major Undertakings to be taken by Each Government

| NO | Items | To be covered by Grant Aid | To be covered by Recipient side |
|----|--|----------------------------|---------------------------------|
| 1 | To bear the following commissions to a bank of Japan for the banking services based upon the B/A | | |
| | 1) Advising commission of A/P | | ● |
| | 2) Payment commission | | ● |
| 2 | To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country | | |
| | 1) Marine(Air) transportation of the products from Japan to the recipient country | ● | |
| | 2) Tax exemption and custom clearance of the products at the port of disembarkation | | ● |
| | 3) Internal transportation from the port of disembarkation to the project site | | ● |
| 3 | To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work | | ● |
| 4 | To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract | | ● |
| 5 | To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid | | ● |
| 6 | To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment | | ● |

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In addition to the items described in Annex-4, Angola side shall undertake the necessary measures as follows on condition that the Japanese Grant Aid is implemented

1 General

- (1) To provide data and information necessary for implementation of the Project.
- (2) To allocate the necessary budget and personnel for execution, operation and maintenance of the Project.
- (3) To provide storage and yards in the sites where required to store materials, measuring equipment, tools and/or construction machines.

2 Preparation for installation/construction

- (1) To obtain permissions from relevant authorities for road occupation and excavation for installation of underground facilities and aerial cables.
- (2) To obtain agreement of the owner or user on installation of distribution boxes (DP), Cross Connection Cabinets (CCC), poles, cables and land excavation in their premises.
- (3) To procure and install the Main Distribution Frames (MDF) and terminal blocks in Sao Paulo and Terra Nova exchanges.
- (4) To procure and install drop wires for the transfer of the existing subscribers.

3 Transfer of Existing Subscribers

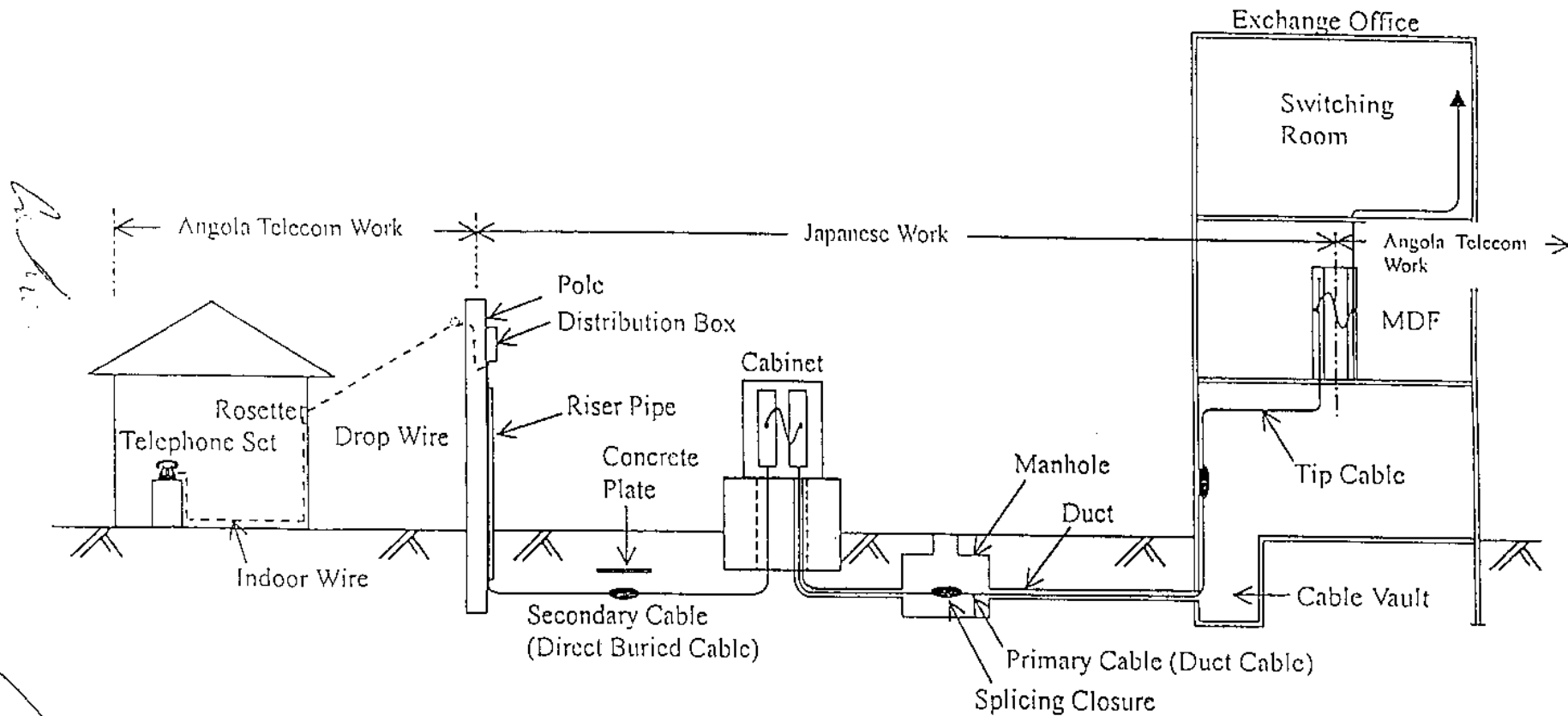
- (1) To investigate the subscribers' premises and prepare subscriber transfer sheets for the transfer of the existing subscribers.
- (2) To install jumper wires of MDF and in cross connection cabinets for the transfer of the existing subscribers.
- (3) To install drop wires or indoor wires for the transfer of the existing subscribers.
- (4) To conduct the calling test for each transferred existing subscribers.

4 Recovering

- (1) To remove the existing cables, poles cross connection cabinets, distribution boxes, jumper wires, etc., which are disused after completion of the transfer of the existing subscribers.
- (2) To rearrange the existing cables in manholes and cable vault where necessary, under the technical assistance and guidance by the Japanese side.

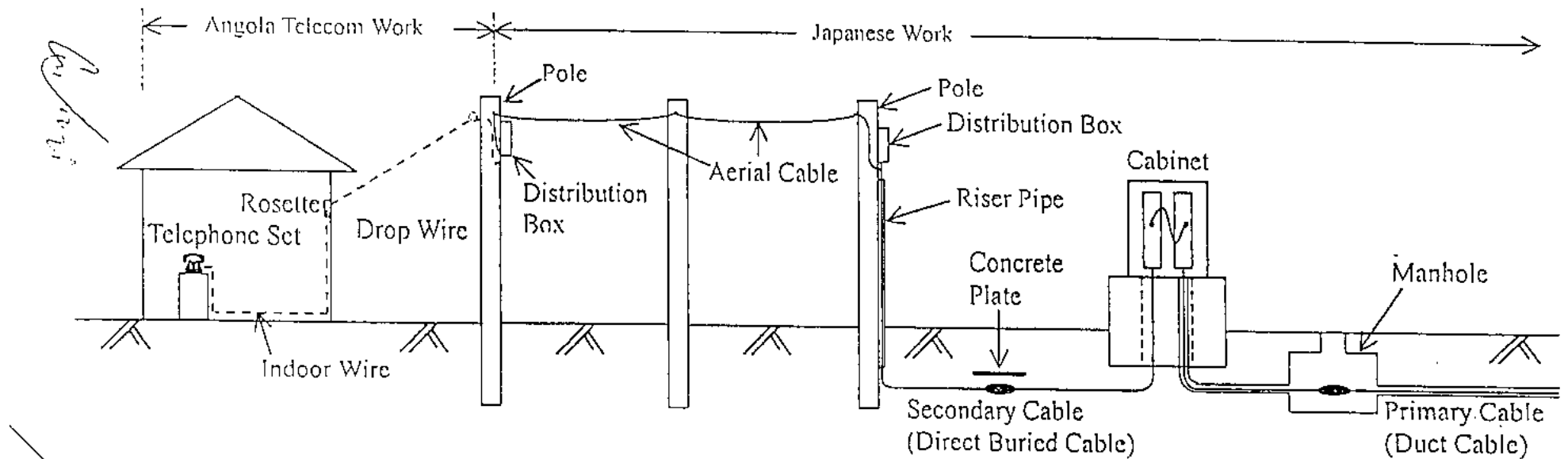
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- Note:
1. Angola Telecom shall install Jumper Wires(\sim) on MDF and in Cabinet.
 2. Angola Telecom shall install Terminal Blocks on MDF for termination of Primary Cable (Tip Cable).

Figure-1 Configuration of Telephone Network and Demarcation of Works between Both Sides (1/2)



- Note:
1. Angola Telecom shall install Jumper Wires (∇) on MDF and in Cabinet.
 2. Angola Telecom shall install Terminal Blocks on MDF for termination of Primary Cable (Tip Cable).

Figure-1 Configuration of Telephone Network and Demarcation of Works between Both Sides (2/2)

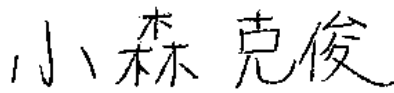
MINUTES OF DISCUSSIONS
ON BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF TELEPHONE NETWORK IN LUANDA
PHASE II
IN THE REPUBLIC OF ANGOLA
(EXPLANATION OF DRAFT REPORT)

In October 2000, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for Rehabilitation of Telephone Network in Luanda Phase II (hereinafter referred to as "the Project") to the Republic of Angola (hereinafter referred to as "Angola"), and through discussions, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

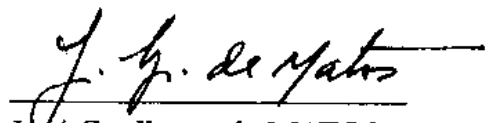
In order to explain and to consult Angola on the components of the draft report, JICA sent to Angola the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Katsutoshi KOMORI, Third Project Management Division of Grant Aid Management Department, JICA, and is scheduled to stay in Angola from 11th January 2001 to 18th January 2001.

As the results of discussions, both sides have confirmed the main items described in the attached sheets.

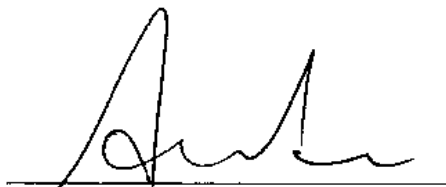
Luanda, 17th January 2001



Katsutoshi KOMORI
Leader
Basic Design Study Team
JICA



José Gualberto de MATOS
Director General
ANGOLA TELECOM



António Pedro BENGÉ
Director, Cabinet for International Exchange
Ministry of Posts and Telecommunications
Republic of Angola

ATTACHMENT

1. Components of the Draft Report

The Government of Angola has agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

The Angola side has understood the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Angola as explained by the Team and described in Annex-3, Annex-4, Annex-5 and Annex-6 of the Minutes of Discussions signed by both sides on October 18, 2000.

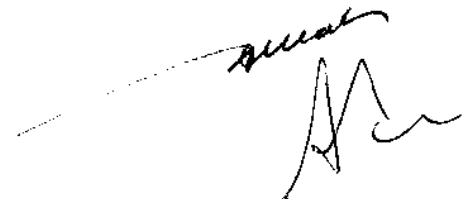
3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed item and send it to the Government of Angola by May 2001.

4. Other Relevant Issues

- (1) The Angola side shall allocate the necessary budget and personnel for implementation of the Project.
- (2) The Angola side especially confirmed that the Angola side had the responsibility for the following items:
 - a) Preparation of terminal and MDF to terminate primary cable
 - b) Replacement of drop wires and jumper wiring in MDF and in cross-connection cabinets after installation of new cables
 - c) Removal of cables and all other facilities that have become out of use upon completion of this Project
 - d) Permanent restoration of road paved temporarily by the Japanese side
 - e) Safekeeping of the materials to be granted in the Project and especially proper custody of the materials for Terra Nova exchange until the commencement of construction work
- (3) The Angola side shall take all possible measures to secure the safety of the Japanese staff concerned to the Project during its study and implementation on condition that the Grant Aid by the Government of Japan is extended.
- (4) The Angola side shall take the necessary permission to construct outside plants along the roadway and footway before the commencement of construction work.
- (5) Based on the Angola side's request, both sides agreed and accepted the consultant's services concerning preparation of technical manuals and reference documents on operation and maintenance of the outside plant as one of the components of the Grant Aid.

K. Komari

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Appendix 5 Estimated Cost to be Borne by Angola Telecom

Project Cost to be Borne by Angola Telecom

(Unit: US\$)

| Items | Sao Paulo | Terra Nova | Total |
|---|-----------|------------|---------|
| MDF and Terminal Block | 15,370 | 20,940 | 36,310 |
| Subscriber Transfer | 121,830 | 163,900 | 285,730 |
| Permanent Restoration of Pavement | 207,680 | 308,880 | 516,560 |
| Removal of Disused Existing Outside Plant | 48,730 | 65,560 | 114,290 |
| Total | 393,610 | 559,280 | 952,890 |

Estimated Operation and Maintenance Cost

(Unit: US\$)

| Items | Sao Paulo | Terra Nova | Total |
|----------------|--------------|--------------|--------------|
| Estimated Cost | 224,900/year | 243,100/year | 468,000/year |

Appendix 6 Other Relevant Data

Received Document List

| Classification | Std.No. | Established by | Item | Language | Date |
|---------------------|-------------|-----------------------|---|------------|------------|
| Material Spec. | E 48-1013 | Angola Telecom | CABLE ELALC | English | 03Nov.'00 |
| Material Spec. | E 48-1015 | Angola Telecom | CABLE ELKX | English | 03Nov.'00 |
| Material Spec. | E 48-3001 | Angola Telecom | CABINET CROSS-CONNECTION (CCP) | English | 03Nov.'00 |
| Material Spec. | E 48-3002 | Angola Telecom | DISTRIBUTION POINT -EXTERNAL | English | 03Nov.'00 |
| Material Spec. | SADCC 201 | SADCC | HARDWOOD TELEPHONE POLES | English | 03Nov.'00 |
| Material Spec. | E 49-5002 | Angola Telecom | CONCRETE TILE | English | 03Nov.'00 |
| Material Spec. | E 49-5001 | Angola Telecom | PLASTIC WARNING TAPE | English | 03Nov.'00 |
| Technical Spec. | J 49-0001 | Angola Telecom | NORMAS DE CONSTRUÇÃO CIVIL APLICÁVEIS À CONSTRUÇÃO DE REDES TELEFÓNICAS | Portuguese | 03Nov.'00 |
| Technical Spec. | J 49-2001 | Angola Telecom | CONDUTAS E CÂMARAS TELEFÓNICAS PADRONIZADAS | Portuguese | 03Nov.'00 |
| Development Plan | | Angola Telecom | O DESAFIO DAS TELECOM | Portuguese | 14Nov'00 |
| Development Plan | ANO 2000 | Angola Telecom | PLANO EMPRESARIAL ANO 2000 | Portuguese | 14Nov'00 |
| National Budget | ANO 2000 | Republic of Angola | ORCAMENTO GERAL DO ESTADO | Portuguese | 14Nov'00 |
| Revista | Setembro'00 | Angola Telecom | TEL informa Revista No.11 Ano 1 2000 | Portuguese | 14Nov'00 |
| Telecom. Policy | May-98 | M.P.T(郵電省) | New Telecom Policy for 2004 | Portuguese | 17 Jan.'01 |
| Specification | SABS457 | SABOS | SOUTH AFRICAN STANDARD for Wooden Pole | English | Feb. '01 |
| Specification | SABS753 | SABOS | SOUTH AFRICAN STANDARD for Wooden Pole | English | Feb. '01 |