

- Junction Facilities: Transmission Equipment (Cable PCM System) and Junction Cables to Connect the Transmission Equipments in Ridgeway and Lusaka Main Exchanges.
- Power Facilities: Rectifiers and Batteries

Main facilities are:

	<u>Lusaka Main Ex.</u>	<u>Ridgeway</u>
- Digital Switches (L.U.)	-	5,000
- Transmission Equipment (cable PCM system)(set)	1	1
- Junction Cables (Km)	-	2.6
- Power Facilities (set)	-	1

3-3-4 Operation and Maintenance Plan

(1) Operation and Maintenance Organization

Operation and maintenance of the telephone network in Lusaka City after completion of this Project are to be undertaken by the existing organization of the PTC. Figure-5 shows the existing operation and maintenance organization of the PTC. Actual conditions and problems involved are as follows:

- Subscriber Cables

Preventive maintenance is carried out, and a maintenance report is submitted monthly from the manager of a telephone office to the regional manager concerned.

- Switching Equipment

A patrol inspection is made weekly and an inspection report is submitted.

- Power Facilities

A patrol inspection is made weekly and an inspection report is submitted.

- Radio and Transmission Facilities

A patrol inspection is made every three months and an inspection report is submitted.

Repair of defective parts and equipment for Lusaka Main and Ridgeway Exchanges is carried out at the Repair Center established in 1988 with the assistance of Denmark.

Data necessary for facility maintenance, such as plant records, inventories, subscriber cards, etc. have been prepared but not updated. In addition, they are not compiled in such a manner as suitable for maintenance of new equipment, i.e., digital switching equipment, etc.

(2) Recommendation for Maintenance and Operation

1) Operation and Maintenance Staff

The PTC is now managing the operation of 17 digital exchanges, with 45,000 line units and 5 sections of PCM cable junction networks in Lusaka City.

Under this Project the existing telecommunications facilities in Lusaka City are to be rehabilitated and replaced, with no expansion. As adequate maintenance systems are in place, an increase of the staff will not be necessary for operation and maintenance of this Project.

However, with a view to upgrading the level of operation and maintenance for newly completed systems, re-training of the staff, i.e., qualitative reinforcement, should be made, in conjunction with the implementation of this Project.

To ensure stable operation of external plants so as to provide high quality telephone service to subscribers, operation and maintenance staff in charge of external plants must be well trained in utilizing measuring equipment, tools and parts supplied under this Project.

As shown in Figure-5, the operation and maintenance staff concerned with this Project are attached to Area Manager stationed in the Lusaka Main and Ridgeway Exchange offices to take charge of the facilities in Lusaka and surrounding areas.

Exchanges responsible for the operation and maintenance of object facilities of this Project are as follows:

- External plants : Lusaka Main and Ridgeway Exchanges
- Switching equipment : Ridgeway Exchange
- Junction facilities : Lusaka Main Exchange
(except those in Ridgeway Exchange)

Under this Project, a large quantity of new type of cables are to be introduced in the subscriber cable network in Lusaka City, replacing the old ones. To ensure effective and efficient operation of the new system thus introduced, most important is to procure measuring equipment, tools and spare parts suitable for the new system. Equally important is the training of operation and maintenance staff in facility management, as well as new technologies.

Also for digital switching equipment to be introduced by this Project, training and re-training of operation and maintenance staff should be made particularly with respect to the following functions.

- How to set up the automatic and manual control systems and monitor the functional operation of the communication network (including subscriber and junction lines) centering on the switching equipment introduced.
- How to perform a subscriber line test both at the exchange side and the subscriber's side.
- How to use the function to monitor the subscribers' facilities.

2) Operation and Maintenance Plan

Presently, the PTC has an unelaborate operation and maintenance plan. To ensure satisfactory operation and maintenance of the completed system, a proper operation and maintenance plan must be drawn up. For instance, operation and maintenance works usually consist of the following:

a) Network Maintenance

- Preventive maintenance
Tests, measurements, adjustments and replacement of parts, through itinerations, etc. to prevent faults from occurring.
- Trouble shooting
Correction of faults including natural disaster relief works.
- Network management
Inventory, plant records, etc.

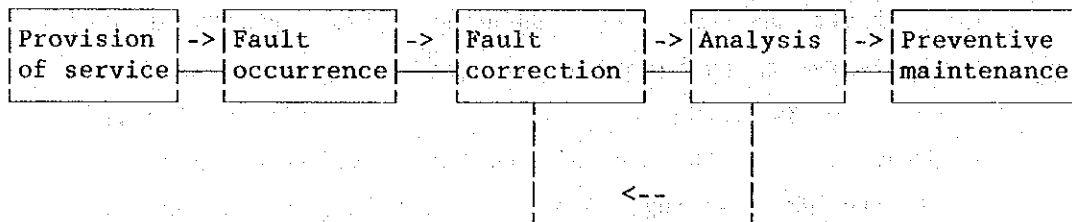
b) Operation

- Facility operation
Operation and control of facilities.

- System management
- c) System Support
- Human resource management
Human resource management plan and service regulations (personnel management, welfare, etc.).
 - Technology management
Training (including preparation of training plans).
 - Equipment management
Management of machines, measuring equipment, tools, vehicles, etc.

In order to execute the above works, the data describing the condition of the network submitted by the Contractor and other plant records must be re-compiled, so that faults in new facilities can be recorded systematically.

The flow of the maintenance work is illustrated below.



Almost all the subscriber cable facilities are installed outdoors and, therefore, exposed to not only the weather elements, such as wind, rain, lightning, temperature and humidity variations, etc., but also social elements such as unfavourable influence from power lines, railways, vehicles, and factories giving out smoke, etc. In order to protect external plants under the above mentioned environmental conditions, the following measures must be taken:

- Introduction of a periodical patrol inspection system to prevent faults from occurring (preventive maintenance).
- When a fault has developed, to locate it as soon as possible and correct it completely, so that the same fault may not develop again.
- To analyze the cause of a fault to prevent it from re-occurring.

It is desirable that new drop wires and protectors be installed by the PTC after completion of this Project, so that subscribers and their premises can be protected properly.

Digital switching equipments have already been introduced and operated in Lusaka City. The PTC's level of maintaining digitalized exchanges is the same with, or rather better than, that of the other African countries. A number of the PTC staff underwent a special training in digital switching equipment in the form of the on-the-job training and the training abroad, when it was introduced. Presently, however, only a small number of them are engaged in the maintenance of these equipments, resulting in hindrance to satisfactory operation and maintenance.

From now on, digital switching equipment and digital transmission facilities will expand quantitatively. To ensure efficient operation of these facilities, including those installed under this Project, attention must be focused on the following:

- To conduct technology transfer through on-the-job training during the implementation period of this Project.

- To establish a technical training course, particularly in the undermentioned items to amplify the knowledge on the digital switching technology.

- (1) Software module functions
- (2) Programme language
- (3) Operating system programme and application programme
- (4) Software patch administration (re-programming)
- (5) Software trouble shooting

- To establish a system to take charge of maintenance equipment and materials, such as panels, etc., to facilitate efficient operation and maintenance works.

- To establish a system under which maintenance works, such as traffic measurements, are carried out periodically and data obtained are distributed to the planning and maintenance departments for future improvement.

- To take measures so that trained operation and maintenance staff will not give up their jobs.

For the existing diesel engine generator in Ridgeway Exchange, the following maintenance works must be made:

- Periodical inspection
- Overhaul maintenance by reasonable operation hours or period

(3) Operation and Maintenance Costs

As described above, the implementation of this Project does not require additional operation and maintenance staff. The recommended manpower required for the systems installed is shown below together with the estimated costs to be covered by the PTC's budget.

1) Operation and Maintenance Staff

(unit: person)

	<u>Engineers</u>	<u>Technicians</u>	<u>Line's Man</u>	<u>Total</u>
- External plant (including junction cable)	4	13	12	29
- Switching equipment	2	8		10
- Transmission facilities	3	5		8
- Power facilities	1	2		3
Total	10	28	12	50

2) Operation and Maintenance Costs

Annual operation and maintenance costs of the objective facilities of this Project are calculated, based on the personnel expenses of the above mentioned staff and the direct expenses, which include the costs of spare equipment/parts, fuel expenses and other miscellaneous expenses (office supplies necessary for plant record keeping, printer paper, magnetic tapes, etc.).

(unit: 1,000 kwacha)

	<u>Personnel</u>	<u>Direct</u>	<u>Total</u>
- Annual maintenance costs	10,830	1,440	12,270
- Annual operation costs	5,790	350	6,140
Total	16,620	1,790	18,410*

(Note*: equivalent to 18,780,000 yen)

3-4 Technical Cooperation

The present operation and maintenance system adopted by the PTC for the subscriber cable network is as described in the previous section. The staff assigned to the operation and maintenance of the subscriber cable network should be re-trained particularly in handling of fault detectors, tools and repair parts to be supplied under this Project.

For operation and maintenance of digital switching equipment, a training must be conducted for the staff concerned in advanced integrated technologies with regard to the switching equipment introduced. In view of the characteristics of the switching technology, this training course must be prepared by the manufacturers of the switching equipment, utilizing the working switching equipment. (Basic switching technologies are common to any types of switching equipment. However, components composing the equipment, software for operation, etc. vary with manufacturers. Hence, the training of operation and maintenance of the equipment should be conducted by its manufacturers.)

The training course covers the following:

- Acquisition of expertise in sub-systems of digital switching equipment.
- Acquisition of expertise in configuration of digital switching equipment.
- Acquisition of expertise in software of digital switching equipment.
- Training in trouble shooting, including countermeasures against emergency cases, through case studies.

Although, the cable PCM system is not new to this country, training of maintenance personal for the cable PCM system should not be under estimated judging from the current programs in maintaining existing system.

In view of the above, the operation and maintenance system for the rehabilitated and replaced facilities by the Project must be reinforced. In order to maximize the benefit arising out of this Japan's grant aid project, as well as to ensure its smooth implementation, it is necessary to support the PTC's network management organization.

Hence, it is considered necessary to provide Japan's technical cooperation (dispatch of experts and acceptance of trainees) with respect to operation and maintenance of external plants and digital switching equipment.

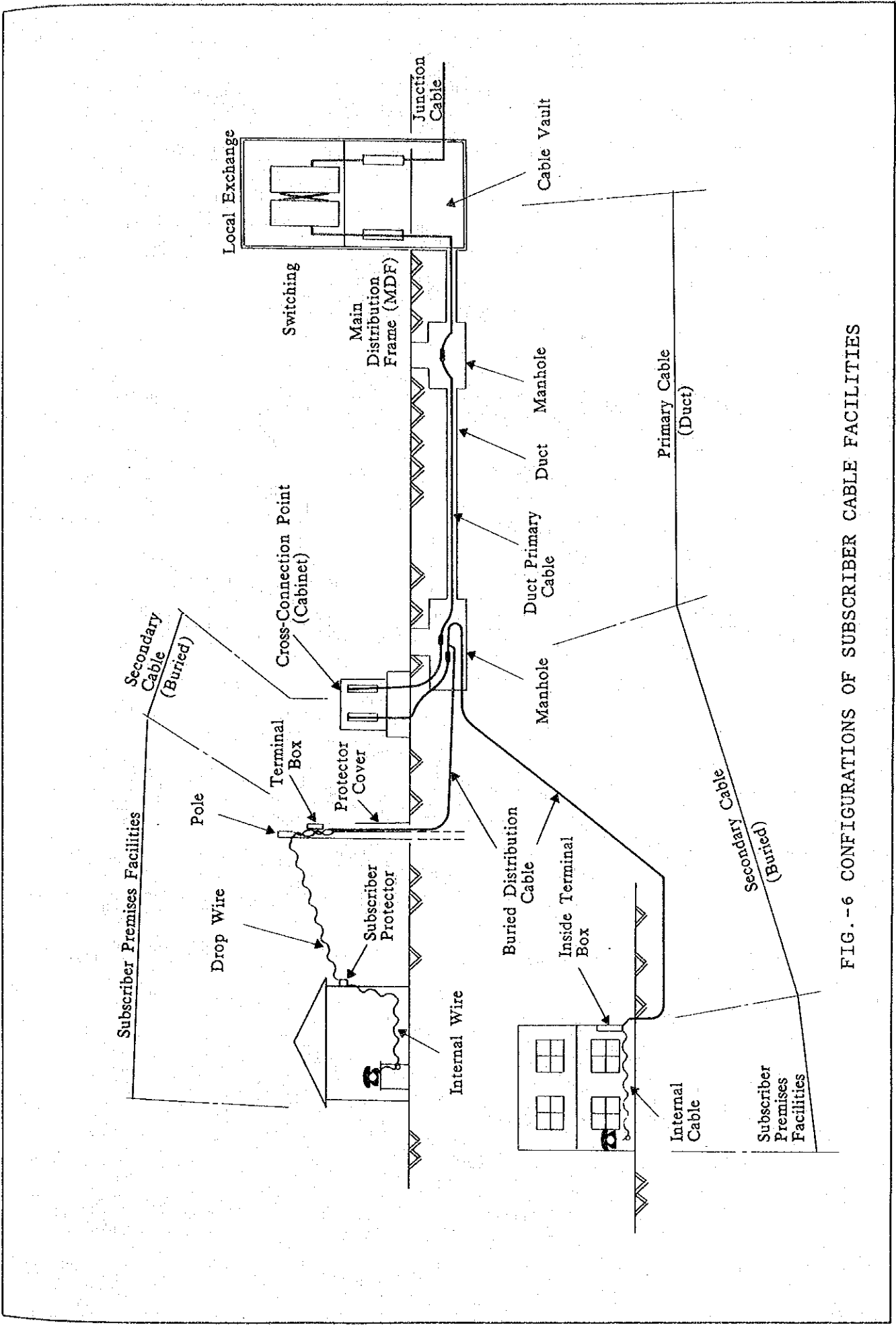


FIG. -6 CONFIGURATIONS OF SUBSCRIBER CABLE FACILITIES

CHAPTER 4 BASIC DESIGN

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4-1 Design Policy

Basic designs for this Project are based on the relevant CCITT recommendations and international standards, as well as the PTC standards, with a view to eliminate probable confusion in operation and maintenance of subscriber cable facilities, digital electronic switching equipment, PCM junction cable facilities and power facilities.

As mentioned in Section 3-2-3 above, the subscriber cable network, junction network and switching equipment in Ridgeway Exchange area to be rehabilitated and replaced by this Project compose one system. In addition, the fault ratio of the Ridgeway Exchange area is 2.14 per subscriber, while that for Lusaka Main Exchange is 1.42, the former being 1.5 times the latter.

Under the above situation, the benefits of this Project can be enhanced if preference in implementation is given to the Ridgeway Exchange area.

Moreover, the existing switching equipment in Ridgeway Exchange has no capacity to accommodate new subscribers, and some 600 subscribers in this exchange area are now accommodated in Lusaka Main Exchange.

To get the maximum benefits from this Project, it is so planned that all the works for the Ridgeway Exchange area, i.e., those for the subscriber cable network, the junction cable network, and the switching equipment, be carried out simultaneously so that the current urgent problems of faulty subscriber cables, relief of waiting applicants and accommodation of 600 subscribers now covered by Lusaka Main Exchange can be solved all at once.

(1) Subscriber Cables

The basic design policy for the subscriber cable facilities consisting of cable facilities and civil works is described below.

1) Subscriber Cable Network and Cable Facilities

- a) To adopt a subscriber cable network employing a cross connection cabinet system which is easy in operation and maintenance, can facilitate effective use of the cable network, and permits easy expansion in the future.
- b) To adopt jelly-filled polyethylene sheathed, polyethylene insulated cables for primary and secondary cables, to protect cables from water penetration and, thus enhance maintenance efficiency.
- c) To adopt a conduit system for primary cables since it is easy to maintain and can protect cables from probable damages due to other construction works (road, power, water, etc.).
- d) To adopt a direct buried system (to bury cables directly under the ground) for secondary cables for cost saving. In the case of a secondary cable, a small number of cable pairs have to be spliced at a plural number of points on the route, and if a conduit system is adopted, a manhole must be installed for each splicing point.
- e) To adopt a suitable splice method for cable jointing to ensure speedy work and uniform quality.
- f) To adopt pole- or wall-mounted type of terminal boxes when they are installed outdoors, since they are usually installed on pole or wall. In the case of a large scale subscribers, indoor type terminal boxes are to be used, since they are installed in the buildings.
- g) To remove, and not to re-use, the existing overage paper insulated cables which have a number of faulty portions and have deteriorated in insulation resistance due to frequent water penetration.

2) Civil Works

A careful study is required in designing the underground conduit facilities since they require a huge amount of investments. The study should cover the selection of underground conduit routes, determination of manhole positions, calculation of the number of conduits, shape and size of manholes, etc. Optimum routes should be selected, through an overall study of the field survey results, city planning, etc., as well as the technical matters involved in system construction and maintenance.

Conduits for entrance cables to Lusaka Main Exchange are now fully occupied. New conduits, therefore, should be installed on the new exchange office side, opposite to the existing ones. For Ridgeway Exchange of which switching equipment is to be replaced, a study must be made with respect to the location of a new entrance and the cable rising method, in consideration of the new switching equipment installation position.

For accommodation and protection of primary cables between an exchange and cross connection boxes, a conduit system is adopted, and necessary conduits and manholes are installed anew. On the other hand, a direct buried cable system is adopted for each section between a cross connection cabinet and a terminal box.

(2) Switching Equipment

The existing crossbar switching equipment is removed after installation of the new digital switching equipment, and re-use of the removed equipment is not considered under this Project.

The exchange equipment to be installed should have the capability to expand easily in future.

(3) Transmission Facilities

The existing old junction cables will not be utilized for the new junction lines, for which PCM cables will be installed for digital transmission. However, the old cables will not be removed and a part of them will be utilized as an alternate route for high usage trunks to be connected to international switching equipment for the purpose of security.

Existing high usage line between Ridgeway and Woodland Exchanges will be converted through the PCM circuit between Ridgeway and Woodland via Lusaka Main Exchanges.

(4) Power Facilities

The existing power facilities are inadequate in capacity. New power facilities will be provided for newly installed switching equipment and transmission equipment. The existing power facilities will be utilized for intra-office (including repair center) power supply.

(5) Environmental Conditions

Facilities installed by the Project will be able to operate satisfactorily under the following environments:

- Temperature (in the sun) : 65°C (maximum)
- Temperature (in the shade): 3°C - 45°C
- Humidity : 10% - 95%
- Altitude : 1,500 m above sea level

4-2 Study of Design Criteria

Items	Existing Materials & Construction Method	Proposed Materials & Construction Method	Remarks
Subscriber Cable	Paper Insulated & PVC cable	Non Gas Pressurized Jelly Filled Polyethylene Sheathed, Polyethylene Insulated	easy maintenance, reliable
Subscriber Cable Network System	Cabinet System, Direct Feed System	Cabinet System, Direct Feed System (Vicinity of Exchange)	easy maintenance, reliable & easy expansion
Primary Cable	Conduit System	Conduit System	protect from damage, easy maintenance
Secondary Cable	Direct Buried System	Direct Buried System	cost saving
Joint	Lead Sleeve, Closure type	Closure type (Suitable method)	to ensure speedy work and uniform quality
Underground Conduit facilities			
Manhole Cover	Concrete	Iron Cover	Safety easy Installation of Cable
Pipe	Concrete, PVC	PVC, Steel pipe	
Switching Equipment	Crossbar Analog switch No Repair parts	Digital Switch	Reliable Diversified telecomm services
Transmission Facilities	Paper Insulated Cable Analog Transmission	PCM Cable Digital Transmission	Digital Transmission Big Transmission Capacity
Power Facilities	Batteries, Rectifier	Batteries, Rectifier	Shortage of Capacity

4-3 Design Standard

This section deals with the basic plan which has been drawn up based on the basic design study findings. Installation positions of underground pipes and cross connection cabinets and the location of a container or shelter are to be determined at the time of a detail design study, the next stage of this Project, through reconfirmation.

(1) Object Areas

Object areas of this Project are:

- a) In the Lusaka Main Exchange Area
- b) In the Ridgeway Exchange Area

(2) Targeted Rehabilitation

This Project aims to (1) rehabilitate the subscriber cable networks and associated civil works in the above object areas, (2) supply maintenance equipment and materials for them (fault detectors and other tools and materials), (3) replace the switching equipment in Ridgeway Exchange, and (4) rehabilitate the junction network between Lusaka Main and Ridgeway Exchanges, including associated power facilities.

Details of the rehabilitation plan are given in the Basic Design attached hereto.

(3) Design Standard

1) External Plant

a) Cable Termination

A primary cable to be led in an exchange is jointed with a termination cable and then terminated on an MDF. Compound is injected into the splicing portion of the primary and

termination cables to make moisture dams.

b) MDF

Termination cable pairs (on the primary cable side) and office cable pairs (from switching equipment) are terminated on MDF, and then connected by jumper wires. For termination, the central layer of the primary cable is terminated on the upper part of MDF, and the outer layer on the lower part.

c) Primary and Secondary Cables

Cables to be used for this Project are jelly-filled cables which do not require gas-pressurization maintenance and can meet the PTC's technical standards and the international criteria.

d) Cross Connection Cabinet

- A cable distribution boundary for each cross connection cabinet is the same as that established for management of the existing subscribers and waiting applicants, in view of the efficient use of the external plant, proper future expansion, fixation of the same boundary over a long period, etc.
- A cross connection cabinet should be located in a position that is not far away from the exchange, permits economical distribution of secondary cables, and has the least possibility of relocation in the future.

e) Terminal Box

- The position of a pole on which a pole-mounted type terminal box is installed should be determined in consideration of advantages in installation and

maintenance, that is, easy installation of a drop wire to an object house, no obstruction to road traffic, least possibility of relocation in the future.

- The position of a wall-mounted type terminal box should be determined in consideration of easy installation of drop wires to a solid building and its neighboring houses, least possibility of relocation in the future and of suffering damage from a third party.
- Vertical portion of a riser cable up to a pole type terminal box should be protected by a steel pipe, 50 mm in diameter.
- Riser cables for wall-mounted type terminal boxes and indoor type terminal boxes are protected by cable covers.

2) Civil Works

- a) For the underground conduits, PVC pipes are used in principle. In the places where high strength is required, such as railway, culvert or river crossing, steel pipes are used. Inner diameter of a pipe should be 100 mm, in view of the ease in cable installation and the maximum outer diameter of a cable to be introduced in the future (85 mm - 90 mm).

b) Manhole Location and Span

Manholes should be so positioned that they will not disturb the traffic on the road, avoiding an entrance to a house or a crossing. The position which may require relocation of a manhole in the future should also be avoided. Manhole spans should be determined through an overall consideration of the locations of cable branchings and cross connection cabinets, allowable tensile stress at the time of cable installation, road configuration, etc.

- Straight road section : Max. 250 m
- Curved road section : Max. 150 m

c) Positions Occupied by Conduit Routes

In selecting a conduit route, preference is given to the pedestrian walkways when they are clearly demarcated from the roadway, and if not, on the shoulder of the roadway.

d) Manhole Types

Manholes are installed at cable jointing points, branching points and any other necessary locations for cable installation and maintenance after installation. Manhole capacities (dimensions) are determined in consideration of the following:

- (1) Number of pipes required
- (2) Necessary work space
- (3) Presence of cable joints
- (4) Necessary radius of curvature of a cable

Manhole types and their respective dimensions are given below.

Types	Length (m)	Width (m)	Depth (m)	Number of Pipes
Handhole HH -1	1.2	0.6	0.9	4
Manhole S -1	2.3	1.3	1.5	6
Manhole S -2	3.0	1.4	1.7	12
Manhole S -3	3.2	1.4	2.1	24
Manhole L -1	2.5	1.3	1.5	6
Manhole L -2	3.4	1.4	1.7	12
Manhole L -3	3.6	1.4	2.1	24
Manhole T -1	2.5	1.3	1.8	6
Manhole T -2	3.4	1.4	1.8	12
Manhole T -3	3.6	1.4	2.3	24

e) Depth of Underground Conduits

An underground conduit should be buried to a depth of 100 cm or more, as measured from the surface of the ground to the top of the conduit.

f) Warning tape

A warning tape is buried between the underground conduit/direct cable and the ground surface to draw attention to the presence of communication cables, so that probable damages to the cables due to other construction works (for power lines, water mains, etc.) can be prevented.

3) Switching Equipment

a) Type and Capacity of Switching System

- (1) A full stored programme controlled time-division digital electronic switching system is adopted.
- (2) Its capacity is such that it can cope with the quantity of subscriber lines to be accommodated (5,000) and the average subscriber line traffic (0.16 Erl. at the busiest time). Subscriber lines include those for ordinary telephones, PBX/PABX and coin boxes.
- (3) Mutual connections between domestic and international networks is made via a toll switch (NEAX-61 digital ESS) in Lusaka Main Exchange. The existing junction line between Ridgeway and the International Exchange (AXE10) will not be removed but used as an alternate route to provide a high usage line for this section for security.

b) Numbering Plan

The undermentioned numbering plan is adopted.

- Subscriber number
7-digit number (uniform) e.g. ABCxxxx
A : trunk code
BC: exchange area code

- Access code
For toll calls 0
For international calls 00

- Special service code
For domestic service 10x and 999
For international service 09x

c) Signalling System

The following signalling system is adopted:

- Subscriber line signalling
DP/MF register signalling system with loop resistance
being 1,800 Ω , and insulation resistance, 20,000 Ω .

- Inter-exchange signalling
CCITT R2 signalling system
2W loop signalling system

d) Charging System

(1) When a called party has answered, a unit rate is charged, and then a periodic pulse metering depending upon both the length of the call and distance to the called party works out until the end of the call, i.e., until the calling party has hung up the receiver. The length of a call for a unit rate depends upon the combinations of trunk codes of the calling and called parties (proportional to the distance between the exchanges concerned). The following 6 classes are considered.

<u>Class</u>	<u>Length (second)</u>
U	180
B	30
C	20
E	10
F	7.5
G	6

For local calls, class U applies.

(2) Charging for local calls are dealt with by the exchanges of the calling parties, that for toll calls, by Lusaka Main Exchange, and for international calls, by International Exchange automatically. For this purpose, charging equipment is provided with the calling party detection function.

(3) For coin boxes, 16 KHz charging signals are used.

(4) One set of magnetic tape unit necessary for charging data dumping is installed in Ridgeway Exchange. Accounting and billing works are undertaken by the Accounting Center.

e) Main Services

Provision of the following services is feasible:

- Direct dialling in
- Malicious call identification
- Operator-assisted call service
- Warning by howler signals
- Public Recorded Information service
- Time announcement service
- Subscriber service supervision
- Other services in compliance with international standards

4) Junction Facilities

- a) A cable PCM (2M b/s) system is adopted for transmission of junction calls between Ridgeway and Lusaka Main Exchanges.
- b) The PCM transmission capacity is designed to correspond to 600 junction circuits.
- c) The number of junction cable pairs is designed to be 300 pairs, in consideration of future accommodation of circuits for telex, facsimile and data transmission services.

5) Power Facilities

- a) The power source to operate the newly installed switching facilities and junction facilities consists of commercial mains (3 phase, 4-wire, 380V/220V±10%, nominal 50Hz±10%), as the primary power source, and rectifier equipment and batteries.
- b) Silicon or thyristor is adopted for the rectifier cell.
- c) A rectifier consists of a plural number of rectifying units having the same capacity, one of which works as the standby unit.
- d) Batteries to be adopted are the enclosed type and of maintenance-free.
- e) Batteries are composed of 2 banks of cells connected in parallel, having the capacity of 4-hour discharge for telecommunication load at the busiest hours.
- f) An earthing conductor (earthing resistance: less than 10 ohms) is provided to protect telecommunications facilities.

g) The commercial a.c. mains will be supplied via a power receiving switch in the existing diesel engine room.

6) Exchange Office Building

The switching facilities, junction equipment and power facilities provided by this Project are to be installed in a mobile container or a prefabricated shelter, with a view to curtailing the construction period. The container or shelter is to be located in the premises of the existing exchange and is provided with air-conditioning facilities, interior lighting apparatus, outlets and ventilators.

4-4 Implementation Plan

4-4-1 Construction and Installation Condition

To realize the rehabilitation of subscriber cable facilities and junction cable facilities and the replacement of switching facilities in an efficient and money saving manner, it is desirable that the portion of the Project which is under the responsibility of the Japan side be carried out by a single contractor, covering all the works involved, i.e., survey, design, procurement of equipment/materials, and construction/installation.

Local construction companies in Zambia will be employed for civil works (road excavation, etc.) and cable and pole installation works, depending on their past experience and in consultation with PTC. For the works which require specific expertise, such as cable splicing, cable cutover, installation of switching, transmission and power facilities, tests of various kinds of facilities, etc., technology transfer will be made for both the PTC staff and construction companies' employees in the form of on-the-job training, by assigning them as assistants to Contractor's engineers dispatched from Japan. Since the existing facilities are to be replaced under this project, training in operation and maintenance of new systems including facility management is indispensable. Hence the dispatch of engineers from Japan is necessitated.

4-4-2 Implementation Method

This Project is to be implemented by the Posts and Telecommunications Corporation Limited (PTC), with the assistance of a Japanese consultant.

Construction works for this Project are to be carried out on a complete turn-key basis by a Japanese contractor awarded through a competitive bidding. The PTC will be responsible for all the matters related to the project implementation, including the contract signing and supervision of construction works. To ensure smooth materialization of the Project, the PTC will nominate a Project Manager who will work in concert with the consultant for the Project. After completion of the Project, the PTC will undertake the operation and maintenance of the completed facilities.

4-4-3 Construction and Supervision Plan

Construction works for this Project will be carried out as follows:

(1) Examination of installation drawings.

The consultant will examine, on behalf of the PTC, the installation drawings submitted by the contractor, and report the examination results to the PTC.

(2) Witness to Factory Inspection

The consultant will make a witness to factory inspection in manufacturers' factories prior to the shipment of equipment and materials by the contractor to verify that the shipping equipment and materials conform to the contract specifications. The contractor will ship the equipment and materials after obtaining the consultant's approval.

(3) Construction Work Supervision

The consultant will check the construction work time schedule and issue necessary instructions. During the construction work period, the consultant will visit work sites periodically and supervise the progress of the work.

(4) Handing-Over of the System

The consultant will witness to the acceptance test at the completion of the works, and examine the drawings of the completed facilities. When the acceptance test results prove that the completed works conform to the contract specifications, the consultant will advise the PTC to accept the system.

4-4-4 Procurement Plan

According to the field work findings made by the Basic Design Study Team, materials obtainable in Zambia, among those necessary for implementation of this Project, are cables (primary and secondary), cement, sand, gravel, crushed rock, brick, lumber, concrete plate and asphalt necessary for temporary recovery of pavement. All the other equipment and materials will be procured in Japan.

Inland transport by truck from Durban in South Africa Via Zimbabwe and Botswana will be used for safety and security.

Zambia is a copper production country, and telecommunications cables are manufactured by a private Zambian company, ZAMEFA. Therefore, required quantity of primary and secondary cables for the subscriber cable network can be obtained from this company.

4-4-5 Demarcation of the Works to be Undertaken by the Japanese and Zambian Governments

The respective works to be undertaken by the Japanese and Zambian Governments are as follows:

(1) Works to be Done by the Japanese Government

The Japanese Government is responsible for the construction/installation of the targeted facilities including the supply of equipment and materials necessary for the installation.

Main equipment and materials to be supplied are:

a) External Plant

Jelly-filled cables, cross connection cabinets, terminal boxes, poles, manholes, conduit pipes, etc.

b) Switching Facilities

Digital electronic switching equipment.

c) Junction Facilities

Digital transmission equipment, PCM cables, and regenerative repeaters for the PCM system.

d) Power Facilities

Rectifiers and batteries.

(2) Works to be Undertaken by the Government of Zambia

The PTC acting on behalf of the Government of Zambia will be responsible for the undermentioned works in connection with the construction/installation of the targeted facilities, as well as the provision of data and information necessary for the realization of this Project (plant records, subscribers' cards, etc.)

a) Repavement of roads after completion of the

construction/installation works under the Project.

b) Removal of existing cables and poles.

c) Installation and removal of drop wires.

- d) Procurement and levelling of the land for the exchange (container) site (before the commencement of the work).
- e) Cutover of lines accommodated in the existing switching equipment to the newly installed equipment.
- f) Removal of the existing switching equipment and associated facilities which will no longer be used after the cutover.
- g) Commercial mains distribution works (before the commencement of the work).
- h) Provision of a warehouse where equipment and materials for the Project are to be stored (before the commencement of the work).

4-4-6 Implementation Schedule

The implementation schedule of this Project is as described below. The time required for the completion of this Project including the contract signing is estimated to be 29 months after the signing of an Exchange of Notes between both Governments. The implementation time schedule is summarized in Table-6.

This Project is to be executed in two phases:

Phase 1 : Rehabilitation of the subscriber cable network in Ridgeway Exchange area, replacement of the switching equipment in Ridgeway Exchange, rehabilitation of the junction lines between Lusaka Main and Ridgeway Exchanges and associated Works.

Phase 2 : Rehabilitation of the subscriber cable network in Lusaka Main Exchange area.

(1) Signing of an Exchange of Notes

An Exchange of Notes on the grant aid for this Project is to be signed by and between the Government of Japan and the Government of Zambia.

(2) Consultant Service Contract

The PTC acting on behalf of the Government of Zambia will select a consultant (only Japanese consulting firms are eligible) for detailed design and installation work supervision, and conclude a consultant service contract with the consultant thus selected. The contract will become effective subject to the approval of the Government of Japan.

(3) Field Survey and Preparation of Tender Documents

The consultant selected will survey the subscriber cable networks, switching facilities, junction facilities and associated facilities in the object areas and the sites of this Project. On the basis of the survey findings, the consultant will make detailed designs and prepare the tender documents, which will be finalized after obtaining the approval of the PTC.

(4) Evaluation of Tender Proposals and Conclusion of Installation work Contract

The consultant, in concert with the PTC, will evaluate the proposals submitted. The contract negotiation with the Successful Tenderer will be started after obtaining the approval of JICA. The consultant will draft the Installation Work Contract in accordance with the Guidelines for Preparation of Contracts issued by JICA, and assist the PTC in contract conclusion. The installation works contract will become effective subject to the approval of the Government of Japan.

4-4-7 Project Cost to be borne by Zambia side

The costs to be borne by Zambia amount to 40.4 million kwacha (41.2 million yen), as follows:

	(unit: million Kwacha)		
	Phase 1	Phase 2	Total
a) Repavement of roads	15.8	14.7	30.5
b) Removal of existing cables and poles	0.3	0.4	0.7
c) Removal and installation of Drop wires	0.4	1.1	1.5
d) Removal and installation of jumper wires	1.7	5.3	7.0
e) Others	0.7	-	0.7
Total	18.9	21.5	40.4

Note; Exchange rate 1 US\$ = 128.10 kwacha

1 kwacha = 1.02 yen

Table - 6 Project Implementation Schedule

Phase	Items	0	1	2	3	4	5	6	7	8	9	10	11	12	
Phase I	Detailed Design Field Survey Preparation of Tender Document				(in Zambia)										
						(in Japan)									
															(Total 2.0 Months)
Phase I	Manufacturing Transportation Construction /Installation Testing														
															(Total 11.0 months)
Phase II	Detailed Design Field Survey Preparation of Tender Document				(in Zambia)										
						(in Japan)									
															(Total 2.0 Months)
Phase II	Manufacturing Transportation Construction /Installation Testing														
															(Total 11.5 months)

CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

The Republic of Zambia has formulated the Fourth National Development Plan (1989-1992) aiming at the reconstruction of her national economy, i.e., the revitalization of economic activities and the adjustment of the disparity in wealth now widening between the rich and the poor. The emphasis in the plan is placed on the improvement of infrastructures.

Currently, however, the inadequacy of the telecommunication services throughout the country represents major constraints to not only the promotion of the social, economic and political activities of the nation but also the implementation of the Development Plan. In particular, the delay in rehabilitation of telecommunications facilities in the capital city, Lusaka, is crucial.

The implementation of this Project under the above mentioned circumstances will derive the following benefits:

5-1 Evaluation

(1) Advancement of National Development Plan

The object areas of this Telephone Cable Network Rehabilitation Plan for Lusaka City are the center of political activities in Zambia, where a number of important subscribers, such as Presidential Office, governmental agencies and offices including the Statistic Bureau, foreign embassies, the Lusaka Municipal Office, are concentrated. These areas are also the center of economic activities, where a number of important business offices including bankers are located. In other words, they are the high telephone demand areas.

The modernization of telecommunication services in these areas will facilitate speedy and smooth transmission of information, leading to efficient administration by the Government, and effective realization of assistance from foreign countries and international organizations.

This will further support the promotion of the Fourth National Development Plan and the Public Investment Plan reviewed by the new government. In particular, the Fourth National Development Plan envisions the regional development and the promotion of the diversification of industries, and significant contribution as a supportive means for advancing the Plan can be expected from this Project.

(2) Promotion of Economic Activities

Telecommunications is a means to support the economic activities, such as commodity production, distribution, etc. Since financial institutions, enterprises, hotels, stores, etc., in addition to those mentioned above, are concentrated in the object areas, the improvement of telecommunications by this Project is expected to have a fundamental impact on economic activities. The Government of Zambia intends to achieve the annual growing rate of 3.0% in terms of domestic national product, of which target for fiscal 1993 is set at 21.42 billion kwacha. Emphasis in these activities is placed on the development of the agricultural industry and the rehabilitation of infrastructures.

Provision of stable communication services can realize the speedy transmission of information, serving for activation of national economy.

(3) Enhancement of Social Welfare

Telecommunications plays an important role in social activities, including transmission of information indispensable in daily activities, and urgent information on emergency cases, such as sudden illness, disasters, etc. In particular, emergency information in case of a disaster will serve for prevention of damage to, and outflow of, the social capital, and elimination of social life stagnation so as to keep the economic loss to the minimum, in addition to upgrading the standard of safety and quality of a daily life.

All the more benefits can be expected from this Project if its contribution to the public welfare in the objective area (the number of inhabitants accounts for only 15% of the whole Lusaka population, but in the day time, population increases up to 3-5 times) and the fact that administrative institutions responsible for emergency cases are concentrated in these areas are taken into account.

(4) Improvement of Telecommunications Services

Implementation of this Project will not only improve approx. 10,000 telephone lines of Lusaka Main Exchange and 3,000 lines of Ridgeway Exchange, but also make it possible for Ridgeway Exchange to accommodate new subscribers on the new digital switching equipment. Hence the telephone service can be remarkably improved. With the improved telephone service which can realize good telephone connections, the PTC can expect the increased income from the subscribers who are now kept away from the telephone service due to line failures, in addition to that from new subscribers. Thus the PTC's financial position can be significantly improved.

The number of faults in the object areas amounting to approx. 18,400 per year, i.e., 1.42 per subscriber (Lusaka Main Exchange: 1,200 with 1.42 per subscriber; Ridgeway Exchange: 5,200 with 2.14 per subscriber), will be decreased to almost zero after the completion of this Project.

At present, about 600 subscribers of Ridgeway Exchange have been accommodated in Lusaka Main Exchange due to insufficient equipment capacity. After completion of this Project, they will be cut over to Ridgeway Exchange, permitting Lusaka Main Exchange to accommodate long-waiting applicants in its own area.

(5) Establishment of Operation and Maintenance System

Due to shortage in maintenance equipment and materials, PTC is now unable to take satisfactory measures against telephone faults. After the implementation of this Project, the PTC's financial conditions will be improved and, in addition, necessary equipment and materials will be supplied to the PTC. Hence, an operation and maintenance system will be established and proper actions can be taken promptly against failures.

In the following are summarized current problems to be solved, countermeasures considered by this Project, and the expected effects and improvement.

Problems to be Solved	Countermeasure by this Project	Expected Effects
<p>Telecommunications services are poor throughout the country, with bad telephone connections. Particularly in Lusaka Main and Ridgeway Exchange areas, the number of faults amounts to 15.7 per 100 subscribers per month during 6 months including the rainy season.</p> <p>-----</p> <p>The shortage of measuring equipment and maintenance materials for maintenance use has resulted in prolonged failures. The fault clearing ratio in the 6 months is 44%.</p>	<p>To rehabilitate subscribers cable networks in both exchange areas, employing high-quality and long-life materials:</p> <ul style="list-style-type: none"> -jelly filled polyethylene cables -suitable jointing -PVC pipes <p>To replace the switching equipment of Ridgeway Exchange with the digital one, and digitalize the junction lines between the two exchanges, using PCM circuits.</p> <p>To procure maintenance equipment and materials.</p>	<p>The number of faults will decrease remarkably, leading to good telephone connections. The maintenance target may be set at 0.9 per month/100 subs, in terms of the number faults. Reliability of not only telephone lines but also facsimile, data transmission and leased lines will be enhanced. Not only waiting applicants but also new subscribers can be connected.</p> <p>-----</p> <p>The fault clearing time can be curtailed. Fault clearing rate of 100% can be expected.</p>
<p>The digital switching equipment in Lusaka Exchange is not working efficiently due to shortage of subscriber cable capacity.</p>	<p>To rehabilitate and install subscriber cable lines suitable in capacity to the available capacity of the switching equipment.</p>	<p>Efficient and effective use of switching equipment can be achieved, with probable maintenance cost saving.</p>
<p>The utilization ratio of the crossbar switch in Ridgeway Exchange is limited due to difficulty in procurement of spare parts.</p>	<p>To replace the crossbar switching equipment with the digital one.</p>	<p>Approx. 600 subscribers now accommodated in Lusaka Main Exchange can be transferred to Ridgeway Exchange. Further, decrease in faults and relief of waiting applicants can be realized.</p>

<p>The successful call ratio is extremely low.</p>	<p>To rehabilitate and improve the existing facilities.</p> <p>To increase the number of new connections and junction circuits .</p>	<p>The successful call ratio can be improved by a few percent to approx. 10%.</p>
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5-2 Conclusion

The implementation of this Project can significantly contribute to the promotion of the Fourth National Development Plan of the Republic of Zambia, the revitalization of economic activities, and enhancement of social welfare. Since the object areas are located in the nucleus of the capital city, Lusaka, i.e., the center of the political and economic activities of the nation, the effects of the rehabilitation of telecommunications in these areas will extend not only in the object areas but also to the whole Lusaka city and further to the rest of the country.

The implementing agency of this Project, PTC, is fully capable of operating and maintaining a telecommunications system, in terms of its expertise and manpower, and it is judged that the operation and maintenance of the completed system can be carried out satisfactorily.

In view of the above, this Project is considered suitable for a grant aid by the Japanese Government.

5-3 Recommendations

(1) In order to implement the Project smoothly and without delay, the PTC should be made budgetary arrangements to cover its financial responsibilities for this Project, after signing the Exchange of Notes by the Government of Japan and the Government of Zambia.

(2) The following measures should be taken by the PTC, with a view to efficient operation and maintenance of the system, as well as its maximum utilization in the future:

- 1) Training and procurement of staff equipped with satisfactory expertise in operation and maintenance of the system. In particular, attention should be so paid that trained staff may not give up their jobs.
- 2) A suitable tariff system should be established so that the fund to purchase the spare parts and equipment necessary for maintenance of the system can be raised by itself. In this connection, it is desirable to take actions in budgeting so that the PTC can obtain the foreign currency as necessary for purchasing spare parts and equipment from foreign companies.
- 3) A number of underground cables and civil facilities are to be installed. Therefore, a careful management is necessary for their maintenance so that they can be free from damages due to other construction works.
- 4) The software development and necessary training should be made, for effective filing of customer records.
- 5) To improve the successful call ratio, expansion of the junction lines connecting exchanges in Lusaka City (particularly Woodland and Roma Exchanges) and the transfer of the existing subscribers should be executed, prior to the new subscriber connections.
- 6) Expertise obtained through the implementation of this Project should be applied to the operation and maintenance of the entire facilities, with a view to improving the facilities yet to be rehabilitated and reinforcing the capability of operation/maintenance staff. By so doing the effect of this Project will be further enhanced.

ANNEX

ANNEXES

**ANNEX - 1 MEMBER LIST OF TEAM FOR SURVEY/CONSULTATION ON
DRAFT REPORT**

**ANNEX - 2 TIME SCHEDULE FOR SURVEY/CONSULTATION ON DRAFT
REPORT**

ANNEX - 3 MINUTES OF DISCUSSIONS

**ANNEX - 4 MEMBER LIST OF CONCERNING PARTY IN THE RECIPIENT
COUNTRY**

ANNEX - 5 COUNTRY DATA

ANNEX - 1 (1/2) MEMBER LIST OF SURVEY TEAM

<u>DUTY-IN-CHARGE</u>	<u>NAME</u>	<u>AFFILIATED TO</u>
1) Official Members		
Leader/Project Coordinator	Takao YAMAZAKI	Telecommunications Development Specialist. Japan International Cooperation Agency
Telecommunications Policy	Hiroshi MATSUMURA	Officer, Communications Policy Bureau, International Cooperation Division, Ministry of Posts and Telecommunications
2) Consultant Members		
Telephone Network Planner	Sumio SHIMIZU	Nippon Telecommunications Consulting Co., LTD.
Outside Plant Planner	Mitsuo MAKINO	- ditto-
Network Planner	Kunio YUKINO	- ditto-
Civil Engineering /Cost Estimator	Teruhiro TAHARA	- ditto-

ANNEX - 1 (2/2) MEMBER LIST OF TEAM FOR CONSULTATION ON DRAFT
REPORT

<u>DUTY-IN-CHARGE</u>	<u>NAME</u>	<u>AFFILIATED TO</u>
1) Official Members		
Leader/Project Coordinator	Takao YAMAZAKI	Telecommunications Development Specialist. Japan International Cooperation Agency
Telecommunications	Masanori NAGATOSHI	Official, International Cooperation Division, Ministry of Posts and Telecommunications
2) Consultant Members		
Telephone Network Planner	Sumio SHIMIZU	Nippon Telecommunications Consulting Co., LTD.
Network Planner	Kunio YUKINO	- ditto-

ANNEX - 2 (1/2) SURVEY SCHEDULE

<u>No. of</u>	<u>Days</u>	<u>Date</u>	<u>Work Contents</u>
1		March 29 '92 (Sun)	Movement (Tokyo to London)
2		30 (Mon)	Departure from London
3		31 (Tue)	Arrival in Lusaka, Meeting with JICA, Courtesy Visit to Embassy of Japan
4		April 1 (Wed)	Courtesy Visit to Ministry of Communications & Transport (MCT), Meeting with Posts & Telecommunications Corporation (PTC), Field Survey
5		2 (Thu)	Field Survey, Inner Meeting
6		3 (Fri)	Movement (Lusaka - Ndola), Courtesy Visit to PTC Ndola
7		4 (Sat)	Explanation/Discussion on Inception Report to PTC (Ndola)
8		5 (Sun)	Site Survey and Data/Information Collection by 3 (three) groups
9		6 (Mon)	1st group : Discussion on Draft Minutes (Ndola), 2nd/3rd group: Field Survey at Lusaka
10		7 (Tue)	1st group : Signing of Minutes (Ndola), 2nd/3rd group: Field Survey at Lusaka
11		8 (Wed)	1st group: Movement (Ndola - Lusaka), Report to MCT and JICA, 2nd & 3rd group: Field Survey (Lusaka)
12		9 (Thu)	1st group: Report to Embassy of Japan, 2nd & 3rd group: Field Survey and Data Collection (Lusaka), Official Member: Departure from Lusaka
13		10 (Fri)	Field Survey and Data Collection (Lusaka)
14		11 (Sat)	same as above
15		12 (Sun)	same as above
16		13 (Mon)	same as above
17		14 (Tue)	same as above
18		15 (Wed)	same as above

<u>No. of</u> <u>Days</u>	<u>Date</u>	<u>Work Contents</u>
19	16 (Thu)	Field Survey and Data Collection (Lusaka)
20	17 (Fri)	same as above
21	18 (Sat)	same as above
22	19 (Sun)	same as above
23	20 (Mon)	Summarization of Field Survey, Meeting with PTC
24	21 (Tue)	Finalization of Design Concept and Technical Standard, Arrangement of Collected Data and Information
25	22 (Wed)	Report to PTC and JICA
26	23 (Thu)	Report to Embassy of Japan, Departure from Lusaka (Consultant group)
27	24 (Fri)	Arrival in London
28	25 (Sat)	Departure from London
29	26 (Sun)	Arrival in Tokyo

ANNEX - 2 (2/2) TIME SCHEDULE FOR CONSULTATION ON DRAFT REPORT

<u>No. of</u>	<u>Days</u>	<u>Date</u>	<u>Work Contents</u>
1		July 19 '92(Sun)	Movement (Tokyo to London)
2		20 (Mon)	Departure from London
3		21 (Tue)	Arrival in Lusaka, Meeting with JICA, Courtesy Visit to Embassy of Japan
4		22 (Wed)	Courtesy Visit to Office of the President, Explanation/Discussion on Draft Report to Posts & Telecommunications Corporation (PTC)
5		23 (Thu)	Inner Meeting, Explanation/Discussion on Draft Report to PTC, Meeting with JICA
6		24 (Fri)	Discussion on Draft Minutes, Signing of Minutes
7		25 (Sat)	Inner Meeting
8		26 (Sun)	Inner Meeting, Arrangement/Study of Collected Data
9		27 (Mon)	Courtesy Visit to Ministry of Communications and Transport (MCT), Field Survey, Report to JICA and Embassy of Japan
10		28 (Tue)	Departure from Lusaka
11		29 (Wed)	Arrival in London
12		30 (Thu)	Departure from London
13		31 (Fri)	Arrival in Tokyo

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT
FOR REHABILITATION OF TELEPHONE CABLE NETWORK
IN LUSAKA CITY
IN THE REPUBLIC OF ZAMBIA

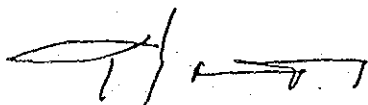
In response to a request from the Government of the Republic of Zambia, the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Telephone Cable Network in Lusaka City in the Republic of Zambia (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Zambia a study team, which is headed by Mr. Takao Yamazaki, Telecommunications Development Specialist, JICA, and is scheduled to stay in the country from March 31 to April 23, 1992.

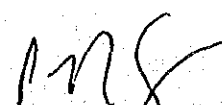
The team held discussions with the officials concerned of the Government of the Republic of Zambia and conducted a field survey at the study area.

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

Ndola, April 7, 1992



Takao Yamazaki
Leader
Basic Design Study Team
JICA



Philemon Ngoma
Managing Director,
Posts and Telecommunications
Corporation Limited

ATTACHMENT

1. Objective

The objective of the Project is to develop the national telecommunication network in Zambia by execution of rehabilitation of telephone cable network in Lusaka city, and thus, to contribute greatly to socio-economic development in the Republic of Zambia, especially in Lusaka area.

2. Project Sites

The Project sites are parts of Lusaka Main exchange and Ridgeway exchange areas which are located in the center of Lusaka city (refer to Annex-1 Object Area).

3. Executing Agency

Posts and Telecommunications Corporation Limited (PTC) is responsible for the administration and execution of the Project (refer to Annex-2 Organization of PTC).

4. Items requested by the Government of Zambia

After discussions with the Basic Design Study Team, the items, which are shown in the priority order below, were finally requested by the Zambian side.

(1) Improvement of subscriber cable network

	<u>Lusaka Main</u>	<u>Ridgeway</u>	<u>Total</u>
- Primary Cable (pair-km)	20,000	15,000	35,000
- Secondary Cable (pair-km)	5,500	8,200	13,700
- Conduit (pipe-km)	55	55	110

(2) Procurement of necessary maintenance equipment, tools, and materials for subscriber cable network such as jointing closures, distribution boxes, drop wires, etc.

(3) Replacement of switching system in Ridgeway exchange office (5,000 LU), construction of necessary transmission link between Lusaka Main and Ridgeway exchanges, and construction of their related facilities.

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

5. Technical Cooperation

The Zambian side pointed out the need for dispatch of Japanese experts as well as technical training of counterpart personnel in Japan. They also understood that technical cooperation cannot be requested in the Grant Aid system and that another official request should be submitted through diplomatic channels.

6. Share of Main Work

(1) Work to be carried out by Japanese side

- a) Construction work of subscriber cable network from MDF in an exchange office to distribution points.
- b) Construction work of exchange equipment and cut-over work from the existing to new exchange equipment.
- c) Construction work of necessary transmission systems between Lusaka Main and Ridgeway exchange offices.
- d) Construction work for related facilities.

(2) Work to be carried out by Zambian side

- a) Transfer work for existing subscribers.
- b) Restoration work of damaged part of roads related to the construction of conduits.

7. Japan's Grant Aid System

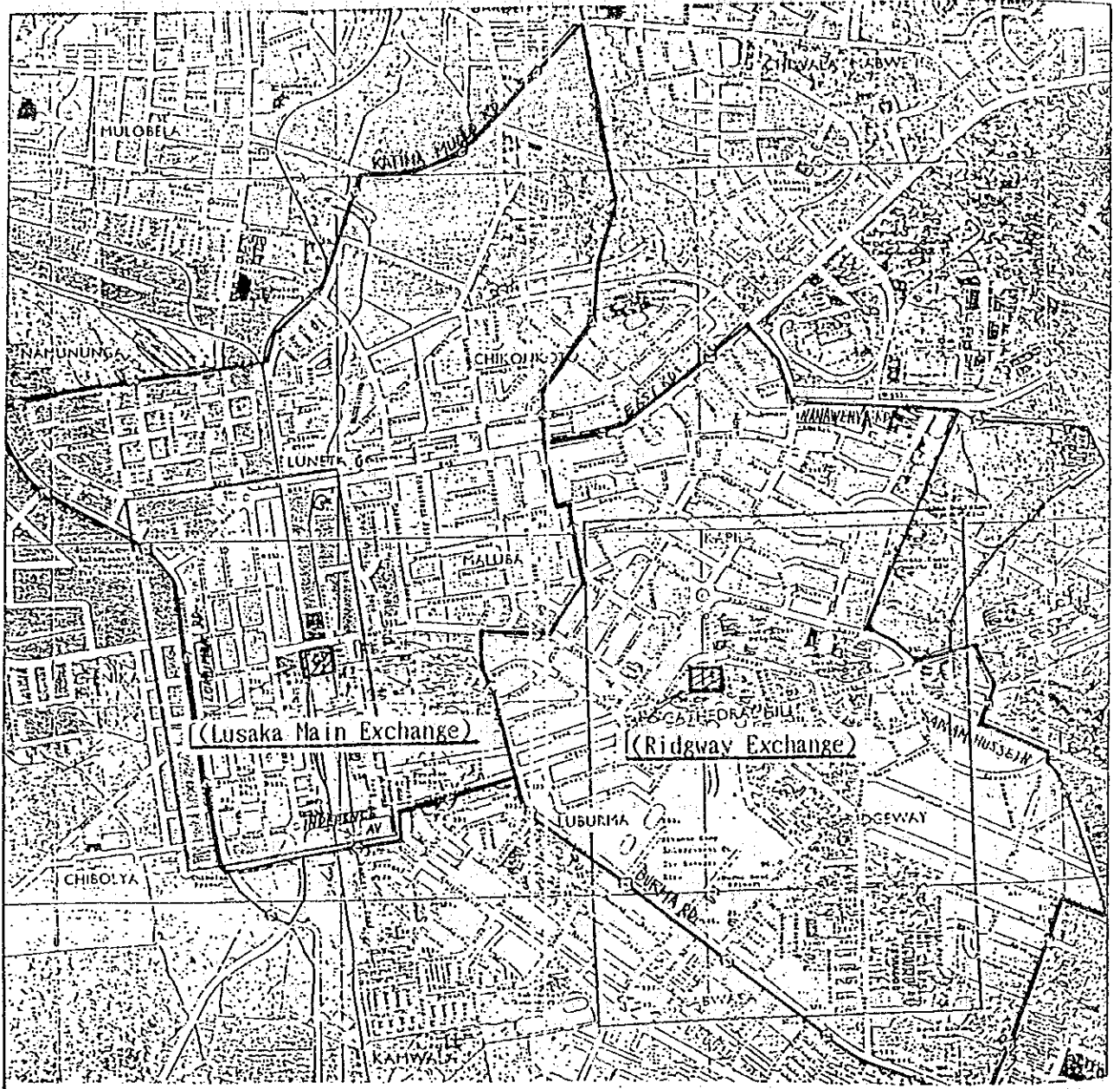
- (1) The Government of Zambia has understood the system of Japanese Grant Aid explained by the team.
- (2) The Government of Zambia will take necessary measures, described in Annex-3 for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

R

8. Schedule of the Study

- (1) The consultants will proceed to further studies in Zambia until April 23.
- (2) Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the draft final report and will explain it to the Government of Zambia in July, 1992.
- (3) After agreement with the Government of Zambia, JICA will complete the final report and send it to the Government of Zambia by the end of September, 1992.

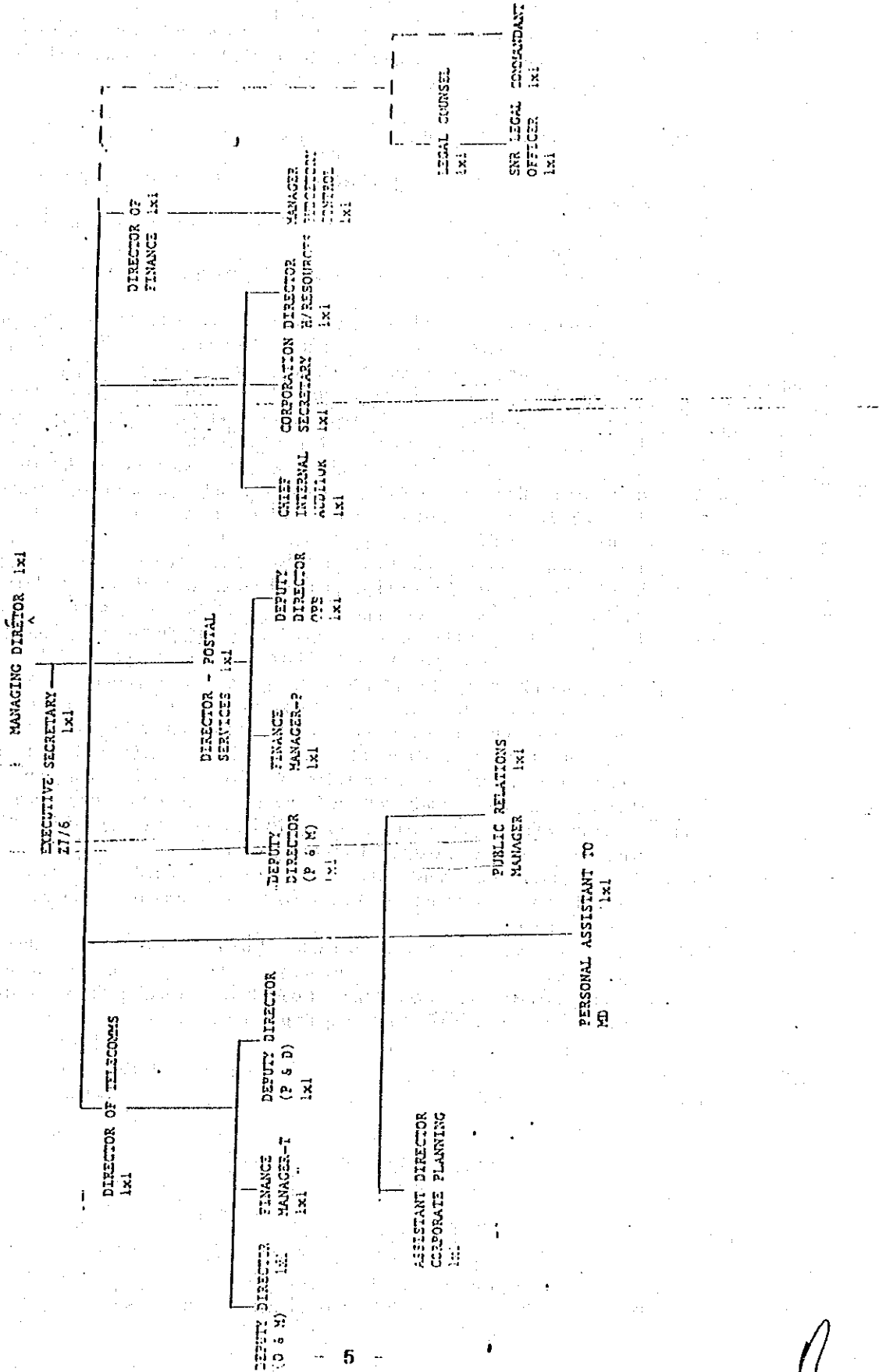
ANNEX 1 Object Area



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ANNEX 2 Organization of PTC



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ANNEX 3

Necessary measures to be taken by the Government of Zambia in case Japan's Grant Aid is executed.

1. To provide data and information necessary for detailed design.
2. To prepare the Project office area with storage and parking spaces.
3. To arrange the above office area before commencement of work.
4. To undertake incidental out door works such as garden- ing, fencing, gates and exterior lighting in and around the office area.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project office.
6. To obtain the right-of-way for construction of cable network facilities from the authorities concerned.
7. To provide commercial electric power to Ridgeway exchange office.
8. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
9. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
10. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Zambia and stay therein for the performance of their work. In addition, to afford them every protection through their stay.
11. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
12. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

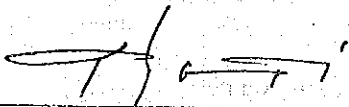
MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON THE PROJECT
FOR REHABILITATION OF TELEPHONE CABLE NETWORK
IN LUSAKA CITY
IN THE REPUBLIC OF ZAMBIA
(CONSULTATION ON DRAFT REPORT)

In April 1992, the Japan International Cooperation Agency (JICA) dispatched the Basic Design Study team on the Project for Rehabilitation of Telephone Cable Network in Lusaka City (hereinafter referred to as "the Project") to the Republic of Zambia, and has prepared the draft report of the basic design study through examining the results of the study in Japan.

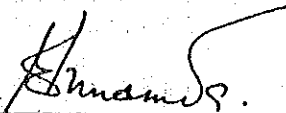
In order to explain and to consult with the Government of the Republic of Zambia about the components of the draft report, JICA sent to Zambia a study team, which is headed by Mr. Takao Yamazaki, Telecommunications Development Specialist, JICA, and is scheduled to stay in the country from July 21 to 28, 1992.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

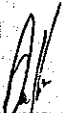
Lusaka, July 24, 1992



Takao Yamazaki
Leader
Basic Design Study Team
JICA



E.M. Musonda
Director of Telecommunications
Posts and Telecommunications
Corporation Limited



M.C. Soko
Director of Economic and
Technical Cooperation
Planning and Development Cooperation
Office of the President

ATTACHMENT

1. Executing Agency

Posts and Telecommunications Corporation Limited (PTC) is responsible for the administration and execution of the Project.

2. Component of draft report

The Government of Zambia agreed and accepted in principle the components of the draft report proposed by the Team.

In the course of discussions, following items are confirmed by both parties.

- (1) The Government of Zambia accepted the recommendations for the Project implementation, Operation and Maintenance, and Technical cooperation, stated in the report.
- (2) Should the Japan's Grant Aid materialize, the Government of Zambia agreed :
 - (a) to prepare necessary budgets for the Project.
 - (b) to take necessary actions on time in accordance with the implementation schedule in the report and construction schedule to be submitted by Contractor.
 - (c) to repave roads after backfilling work as soon as possible.
- (3) The Government of Zambia requested the Team to add the following matters to the scope of Project.
 - (a) Installation of PCM junction circuits between Ridgeway and Woodland exchanges, as the replacement of the existing 2-W circuits.
 - (b) Exchange equipment to be installed in Ridgeway exchange should have the capability to expand easily in future.

The Team stated to convey the above requests to the related authorities in Japan for their considerations.

3. Japan's Grant Aid system

- (1) The Government of Zambia has understood the system of Japan's Grant Aid including further schedule of the study explained by the Team.
- (2) The Government of Zambia will take the necessary measures, described in Annex-1, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

4. Further schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of Zambia around October 1992.

ANNEX-1 Necessary measures to be taken by the Government of Zambia in case Japan's grant Aid is executed.

1. To provide data and information necessary for detailed design.
2. To prepare the Project office area with storage and parking spaces.
3. To arrange the above office area before commencement of work.
4. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the office area.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project office.
6. To obtain the right-of-way for construction of cable network facilities from the authorities concerned.
7. To provide commercial electric power to Ridgeway exchange office.
8. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
9. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
10. To exempt Japanese Nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Zambia with respect to the supply of the products and services under the Verified Contracts.
11. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Zambia and stay therein for the performance of their work.
12. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
13. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

ANNEX - 4 MEMBER LIST OF CONCERNING PARTY IN THE RECIPIENT
COUNTRY

1. Office of the President
 - Mugongbo (Deputy Minister)
 - Suwasony (Permanent Secretary)
 - Soko (Director of Economic & Technical Cooperation)
2. Ministry of Communications & Transport (MCT)
 - E.A. Kashita (Minister of Communications & Transport)
 - Mululu (Deputy Minister of MCT)
 - G.D. Mwanza (Assistant Secretary to Minister of MCT)
 - I. Mpishi (Deputy Permanent Secretary of MCT)
3. Posts and Telecommunications Corporation Ltd. (PTC)
 - P. Ngoma (Managing Director)
 - E.M. Musonda (Director of Telecommunications)
 - A. Kumar (Deputy Director of Telecommunications, P&D)
 - C. Ketani (Chief Engineer, External Planning)
 - J. Katapa (Chief Engineer, Switching Planning)
 - B. Oriaku (Deputy Director of Telecommunications, O&M)
 - B. Sichali (Finance Manager, Telecommunications)
 - G. Cosh (Manager, Budgetory Control)
 - B.A. Sakala (Assistant Director - Customer Services)
 - B.J. Sakala (Principal Engineer of External Planning)
 - J. Chizyuka (Senior Engineer of External Planning, Lusaka)
 - E.M. Chisompola (Principle Engineer of Technical Services)
 - B.T. Mutale (Engineer of External)
 - Mukombo (Senior engineer of Construction, Lusaka)
 - T. Kalumba (Engineer of External Planning, Lusaka)
 - E.S. Mabuda (Principal Telecomms Officer -Dev. & Marketing)
 - D.M. Kwalombota (Assistant Director Planning, Corporate Division)
4. Government Printing Department
 - T.K. Mwanza (Government Printer)

5. Labour Office
E.J. Nyirenda (Assistant Labour Commissioner)
6. Lusaka City Council
S.S. Davis (Chief Town Planner)
7. Bank of Zambia
Martin Kakoma (Manager Foreign Payments)
Martin Sakala (Director of Research)
8. Zambia Electricity Supply Corporation Limited
R.A. Liempe (Customer Service Manager)
9. Lusaka Water and Sewerage Company
Harry Shaba (Director of Finance)
10. Embassy of Japan
Kiyokazu Ota (Counsellor)
Kaoru Tsurita (Second Secretary)
Kohei Obara (Second Secretary)
Kazuyuki Eda (Second Secretary)
11. JICA Office
Kouji Kamiya (President Representative)
Seiichi Miyoshi
Shiro Nabeya
Masami Komiya

ANNEX - 5 COUNTRY DATA

1. FOURTH NATIONAL DEVELOPMENT PLAN (1989 - 1993)
2. PUBLIC INVESTMENT PROGRAMME 1992 - 1995, MARCH, 1992
3. 1990 CENSUS OF POPULATION, HOUSING AND AGRICULTURE
4. MAIN ECONOMIC INDICATORS, ZAMBIA
5. MONTHLY DIGEST OF STATISTICS
6. NATIONAL ACCOUNTS STATISTICS BULLETIN
7. CONSUMER PRICE NEWS
8. ZAMBIA IN FIGURES, 1991
9. STATISTICS REPORT (1991. 9), PTC
10. TEN YEAR DEVELOPMENT PLAN FOR TELECOMMUNICATIONS (1992-2002), PTC
11. CAPITAL BUDGET 1991/92 AND INVESTMENT PLAN 1991/92 TO 1993/94, PTC
12. FINANCIAL STATEMENTS, 1986 - 1990, PTC
13. NATIONAL TRANSMISSION PLAN, PTC
14. NATIONAL NUMBERING PLAN, PTC
15. NATIONAL CHARGING PLAN, PTC
16. ORGANIZATION OF PTC
17. MAINTENANCE STAFF, PTC
18. ENGINEERING STAFF, LUSAKA MAIN & RIDGEWAY EXCHANGE OFFICE, PTC
19. PLANT RECORDS, EXTERNAL PLANT, PTC
20. DATA OF TRAFFIC, DEMAND, INTERNAL EXCHANGE, TELEX, ETC. PTC
21. ANNUAL REPORT (1986/87, 1987/88), PTC
22. PROSPECTUS, STAFF TRAINING COLLEGE & TRAINING PROGRAMME, PTC
23. TELEPHONE DIRECTORY (1992) & YELLOW PAGES (1991), PTC
24. MAPS OF ZAMBIA & LUSAKA CITY
25. OTHERS (COST ESTIMATION DATA)

BASIC DESIGN

BASIC DESIGN

1. Rehabilitation of Subscriber Cable Network

Object Area

- (1) Ridgeway Exchange Area
- (2) Lusaka Main Exchange Area

Basic Design

- (1) Key map (Ridgeway & Lusaka Main Exchanges)
- (2) Plan of Cable Chamber and MDF room, Site Plan (Ridgeway & Lusaka Main Exchanges)
- (3) Primary Cable Diagram (Ridgeway & Lusaka Main Exchanges)
- (4) Duct System Diagram (Ridgeway & Lusaka Main Exchanges)
- (5) Secondary Cable Diagram (Ridgeway & Lusaka Main Exchanges)

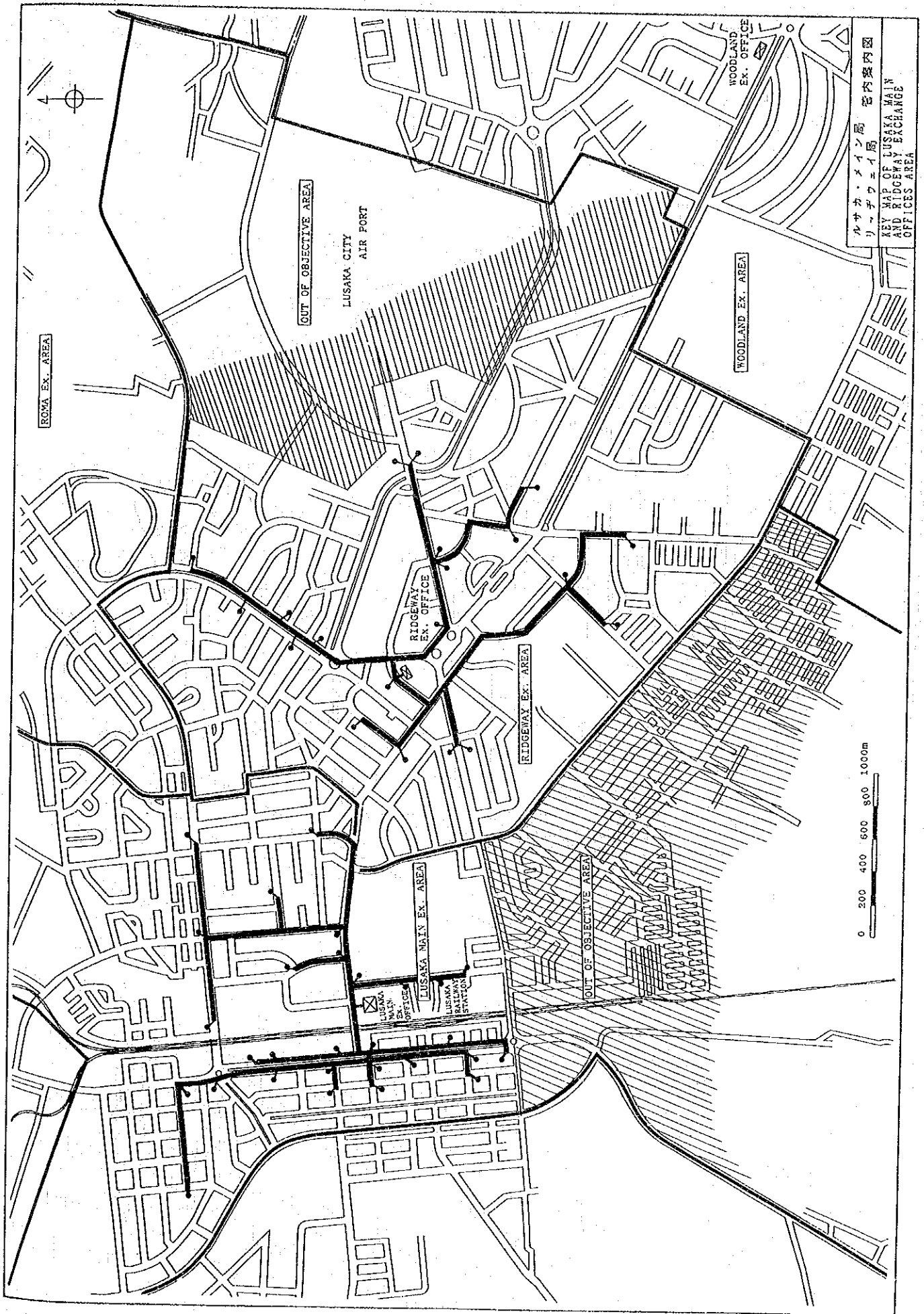
2. Replacement of Telephone Switching Equipment and Rehabilitation of Junction Network

Object Areas

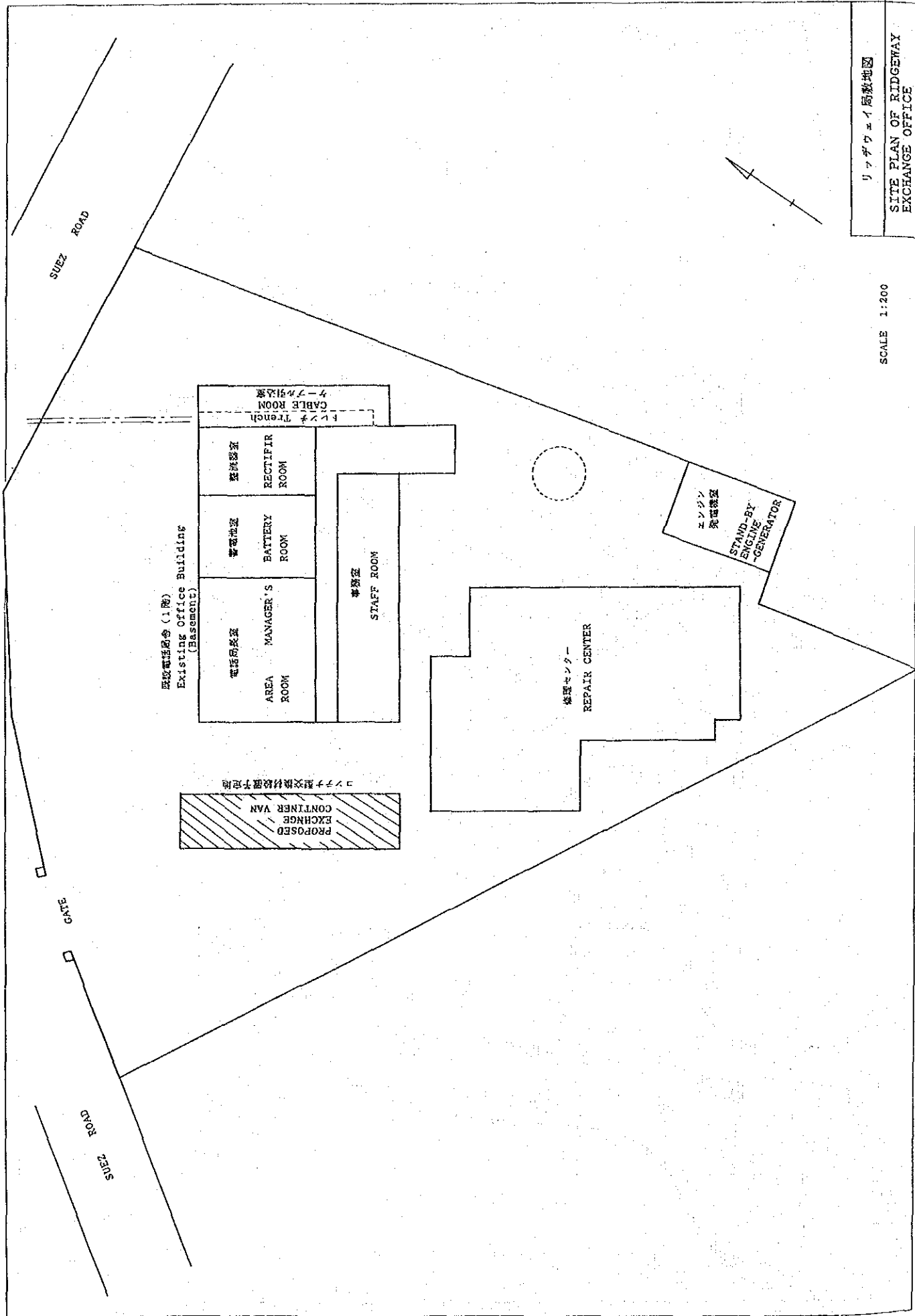
- (1) Ridgeway Exchange
- (2) Lusaka Main Exchange

Basic Design

- (1) Telephone Switching Network (Lusaka Multiexchange Area)
- (2) Traffic Flow Schematic (Ridgeway Exchange)
- (3) Switching Equipment Block Schematic (Lusaka Main Exchange)
- (4) Power Equipment Block Schematic (Ridgeway Exchange)
- (5) Switching Equipment Block Schematic (Ridgeway Exchange)
- (6) Site Layout (Ridgeway Exchange)



ルサカ・メイン局 管内案内図
 リッジウェイ局
 KEY MAP OF LUSAKA MAIN
 AND RIDGEWAY EXCHANGE
 OFFICES AREA



リッジウェイ局敷地図

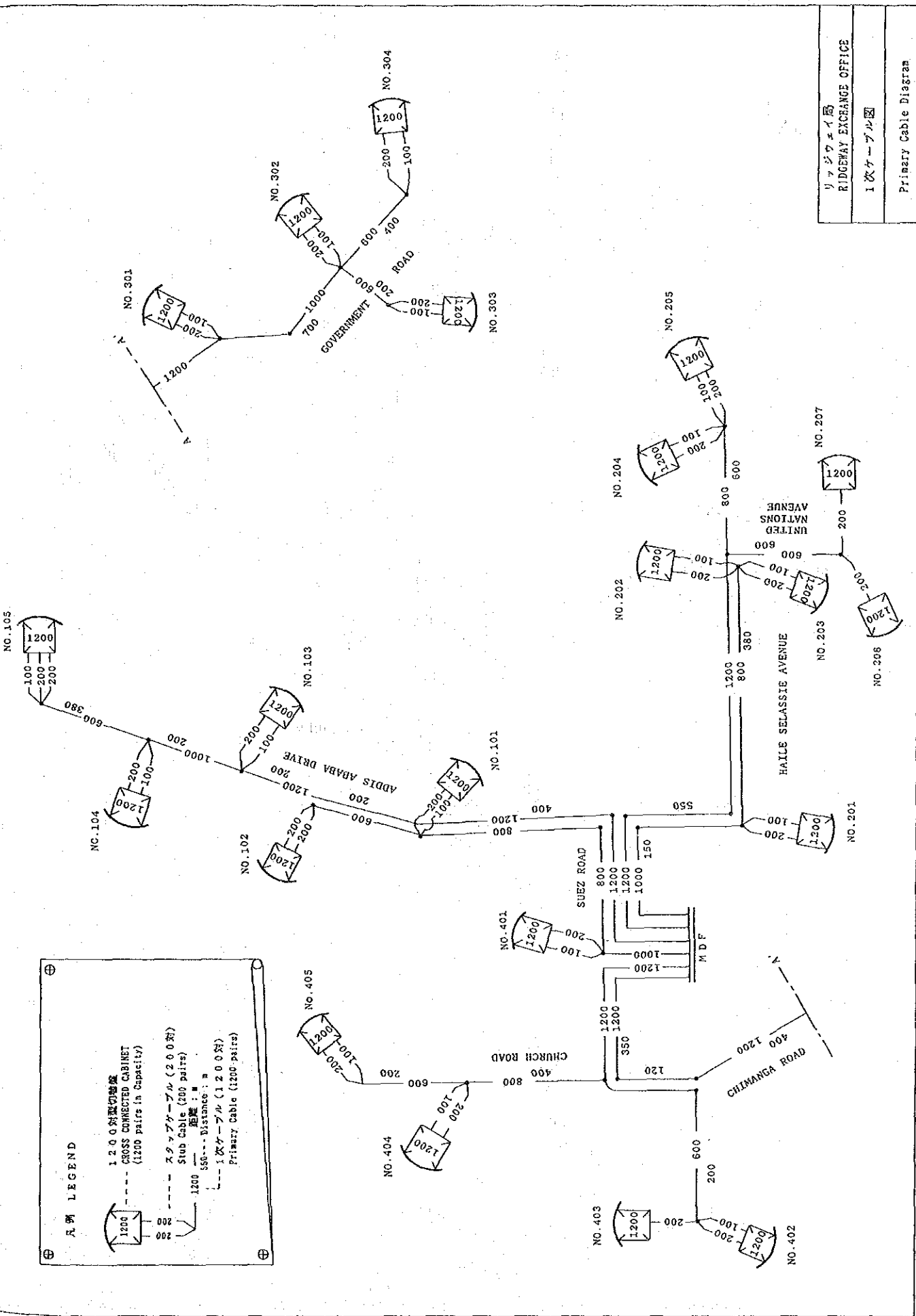
SITE PLAN OF RIDGEWAY EXCHANGE OFFICE

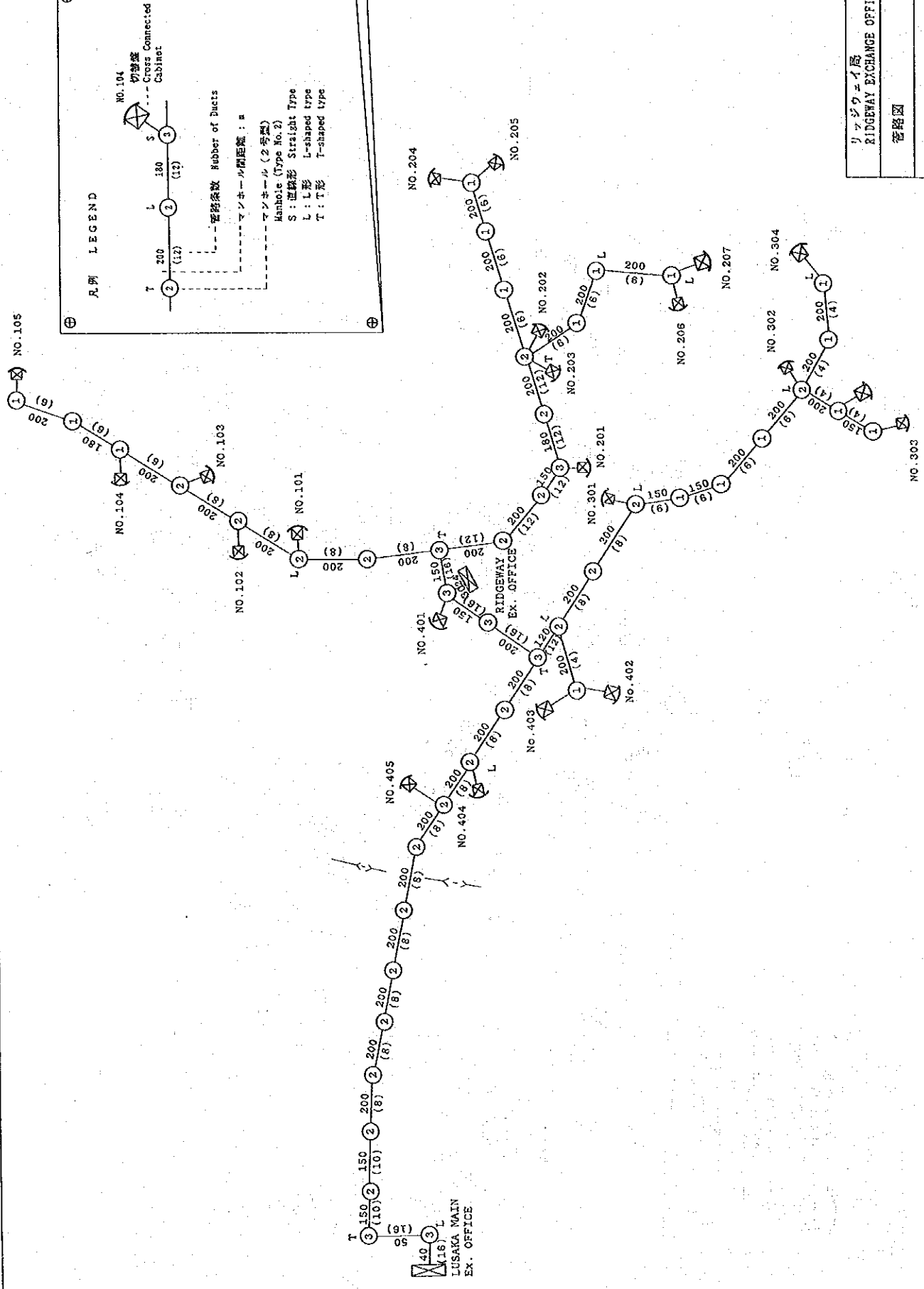
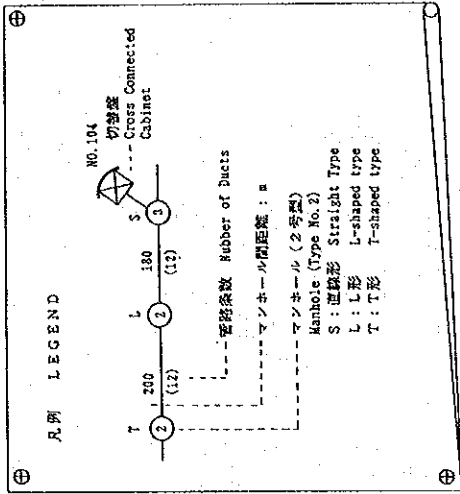
SCALE 1:200

リッジウェイ局
RIDGEWAY EXCHANGE OFFICE

1次ケーブル図

Primary Cable Diagram

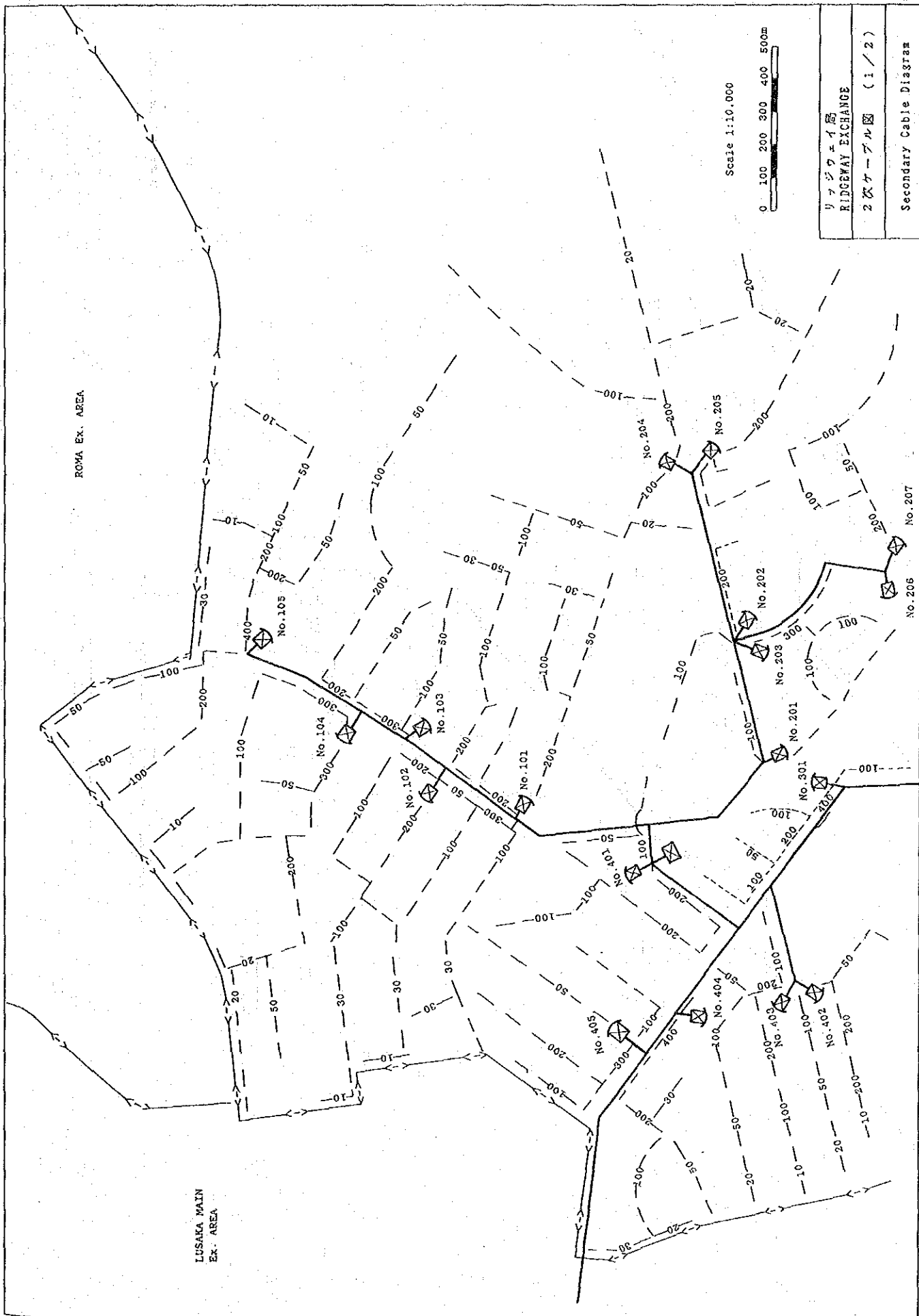


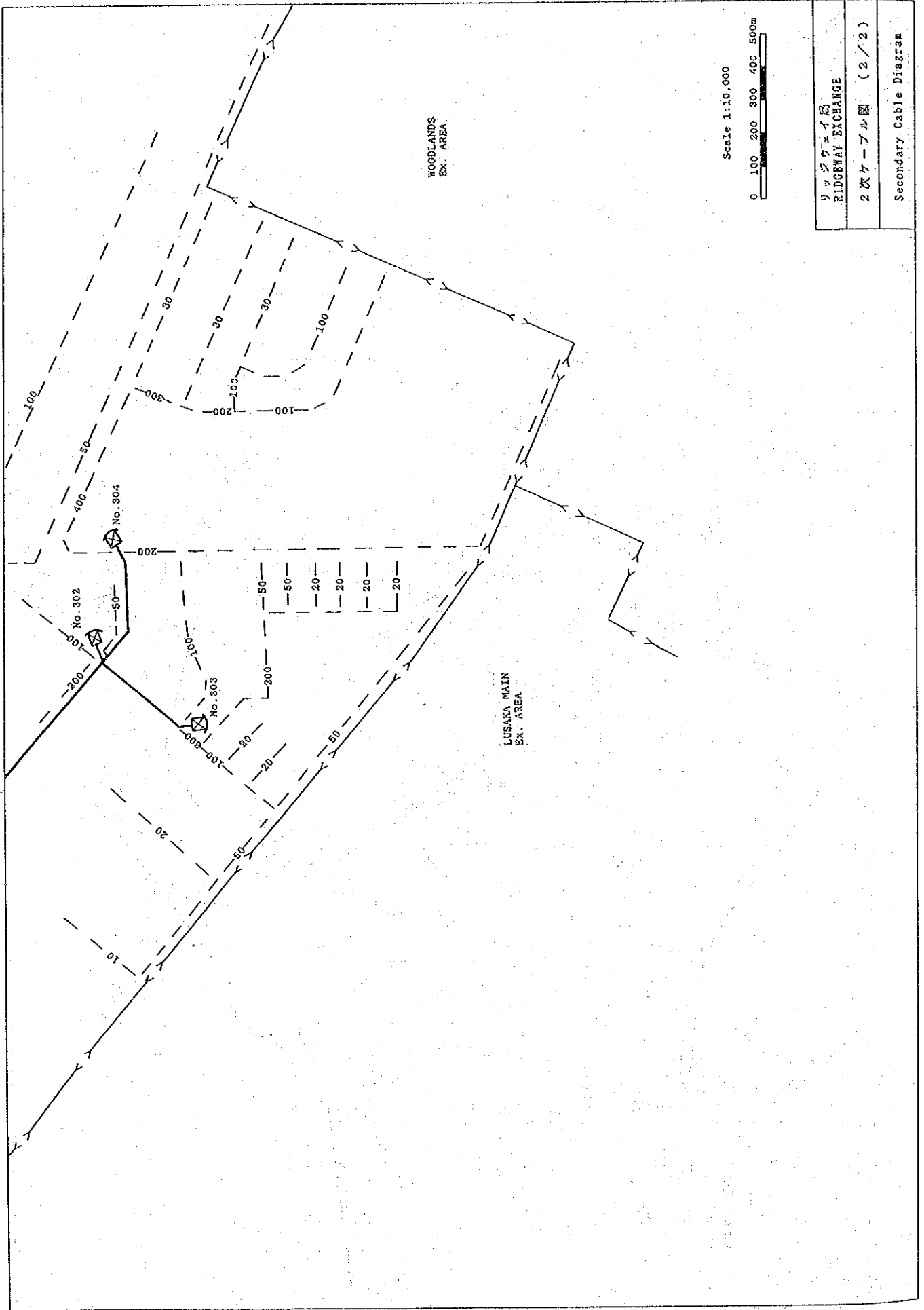


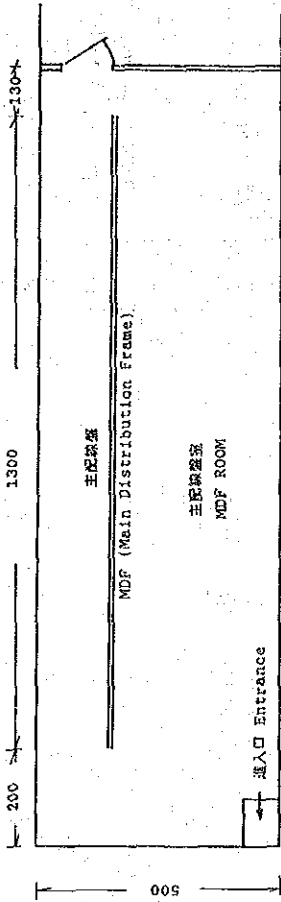
リッジウェイ局
RIDGEWAY EXCHANGE OFFICE

管路図

Duct System Diagram

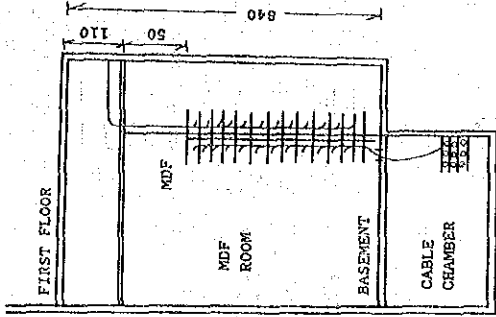




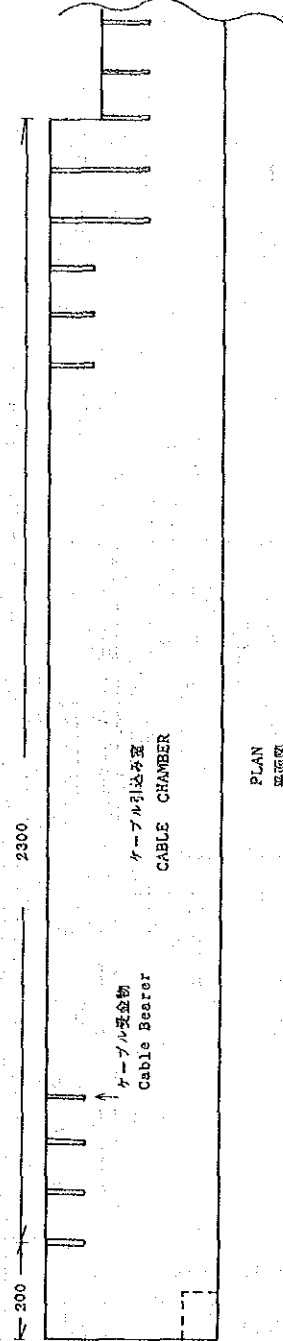


PLAN
平面図

MDF SIZE : 65 column (39 USED) .10 RAW/COLUMN
1 COLUMN : 20 X 29.5cm

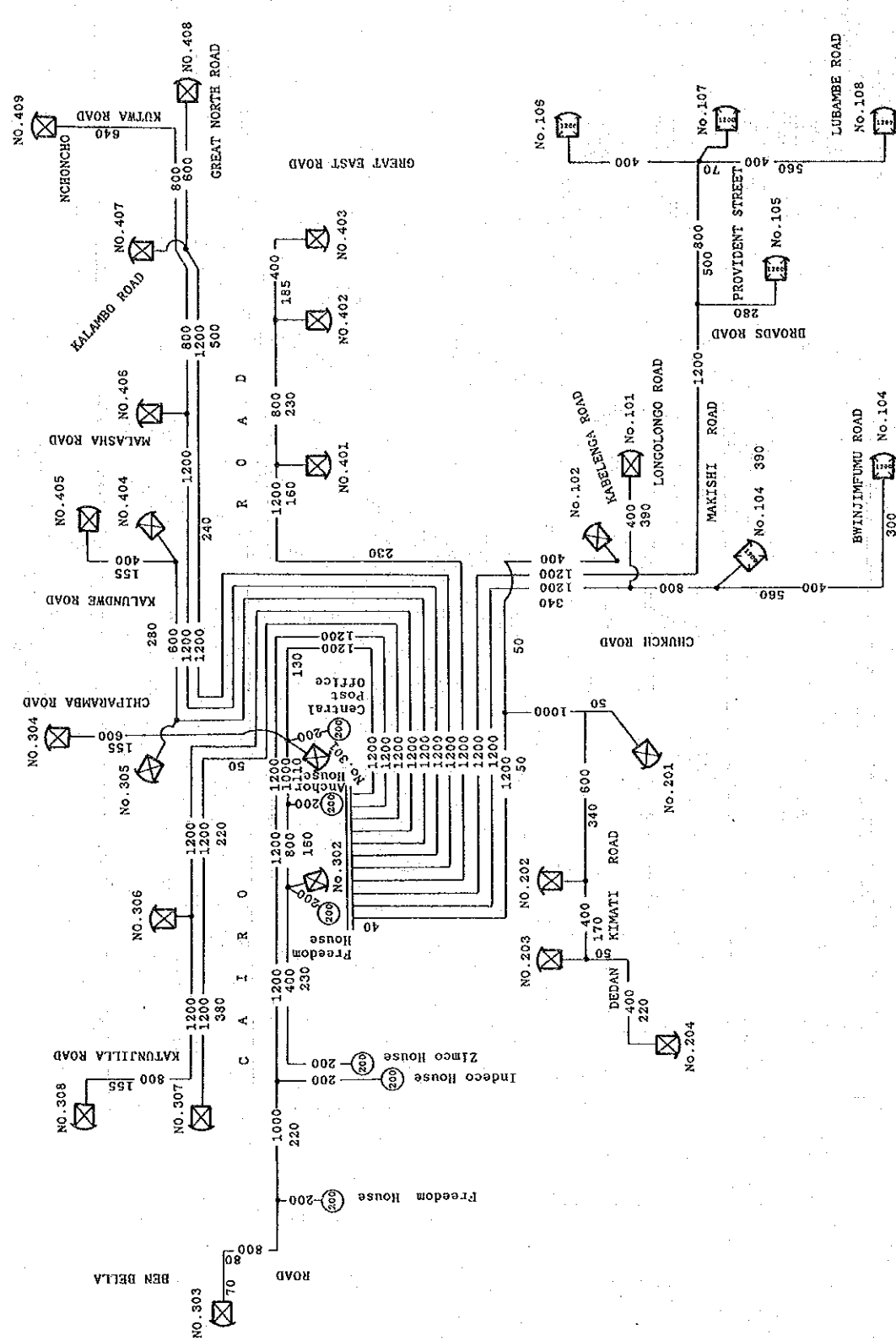


SECTION
断面図

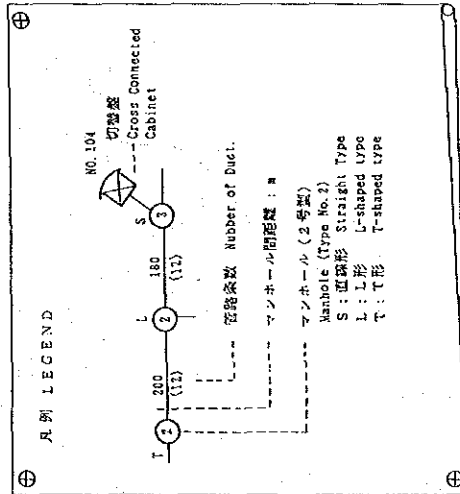
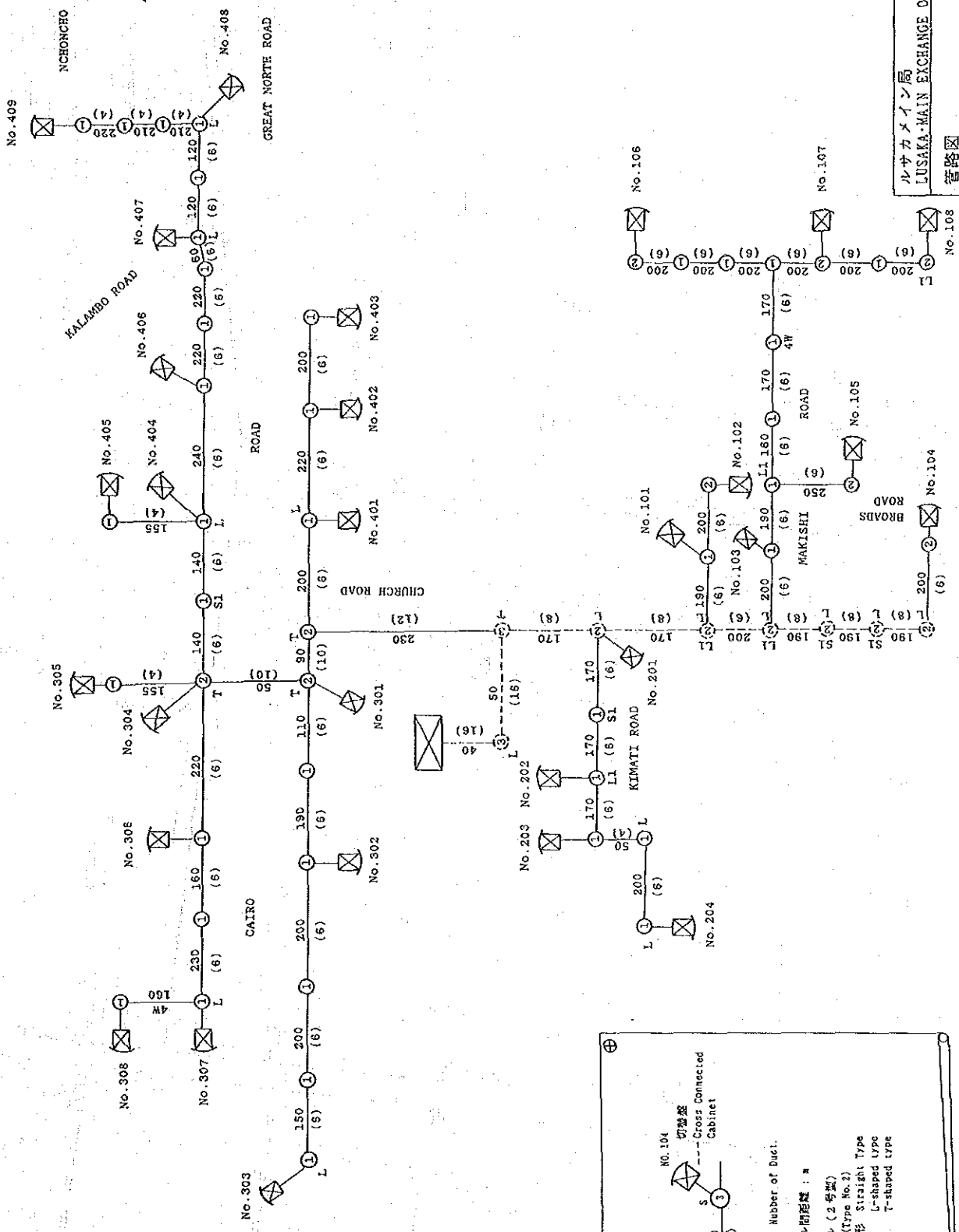


PLAN
平面図

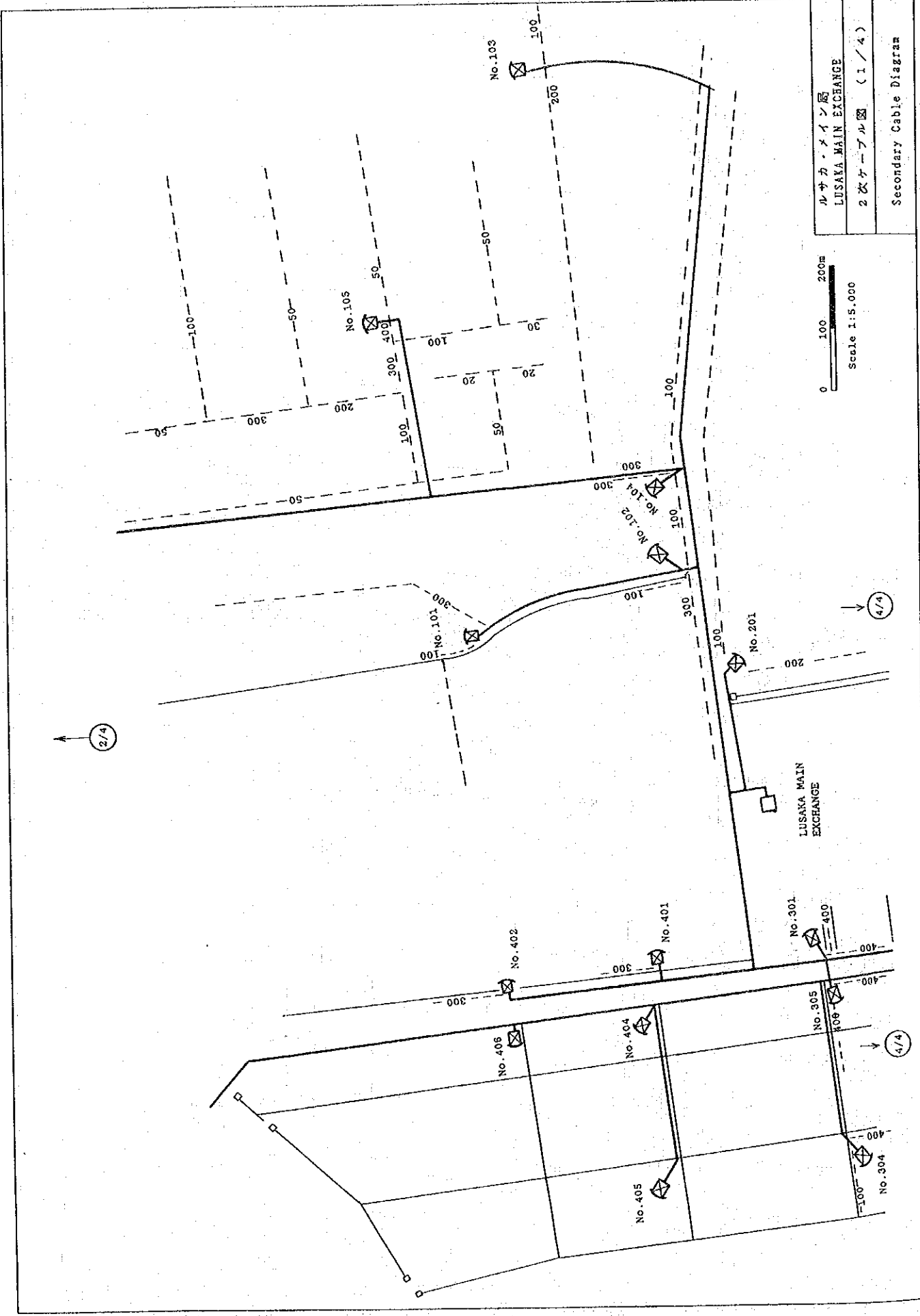
ルサカメイン局
ケーブル室及CMD F 室
PLAN OF CABLE CHAMBER AND
MDF ROOM IN LUSAKA MAIN
EXCHANGE OFFICE



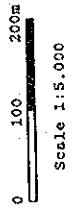
ルサカメイン局
 LUSAKA-MAIN EXCHANGE OFFICE
 I 次ケーブル図
 PRIMARY CABLE DIAGRAM



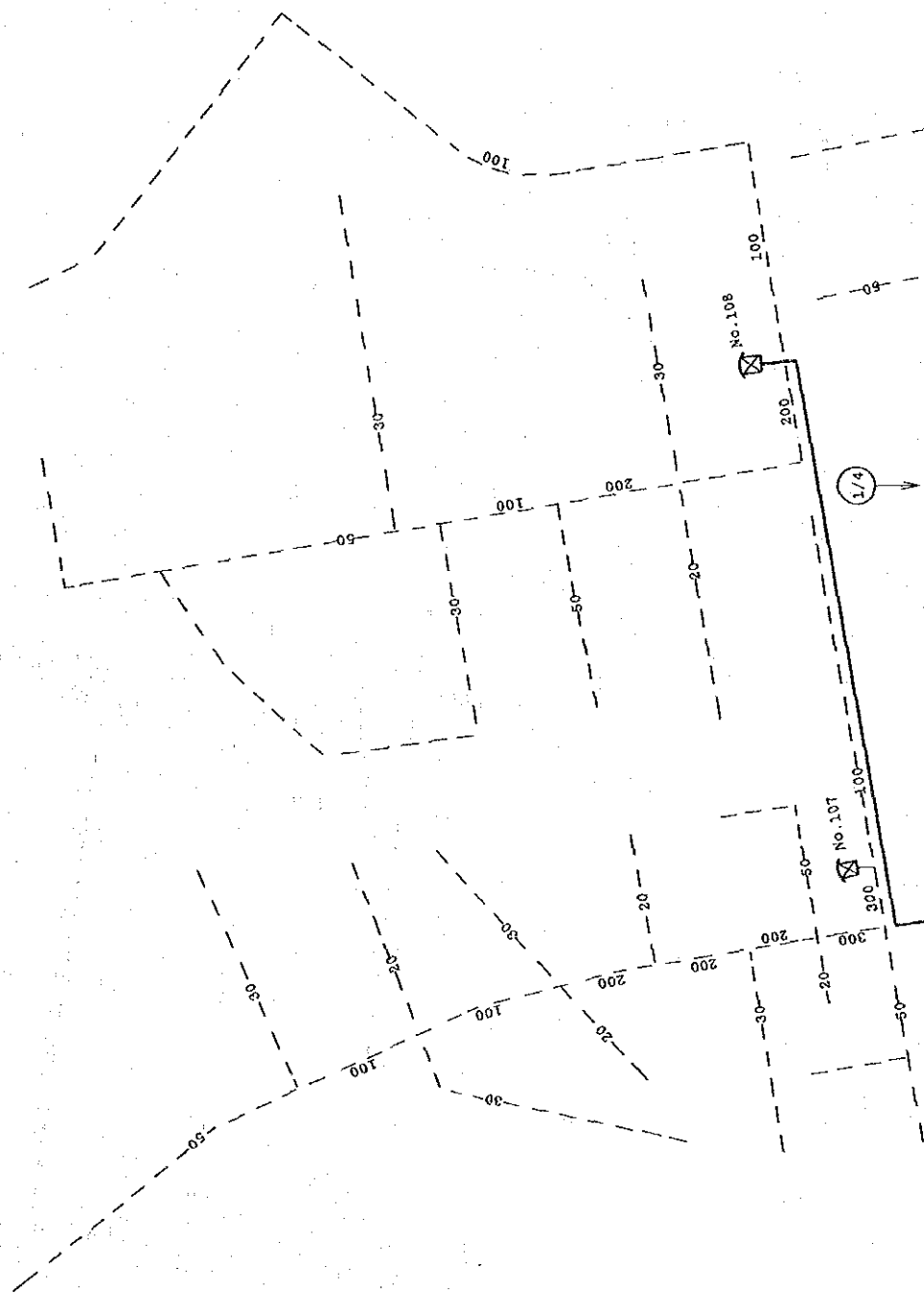
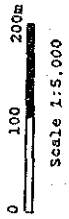
ルサカメイン局
 LUSAKA-MAIN EXCHANGE OFFICE
 管路図
 Duct System Diagram



ルサカ・メイン局
LUSAKA MAIN EXCHANGE
2次ケーブル図 (1/4)
Secondary Cable Diagram

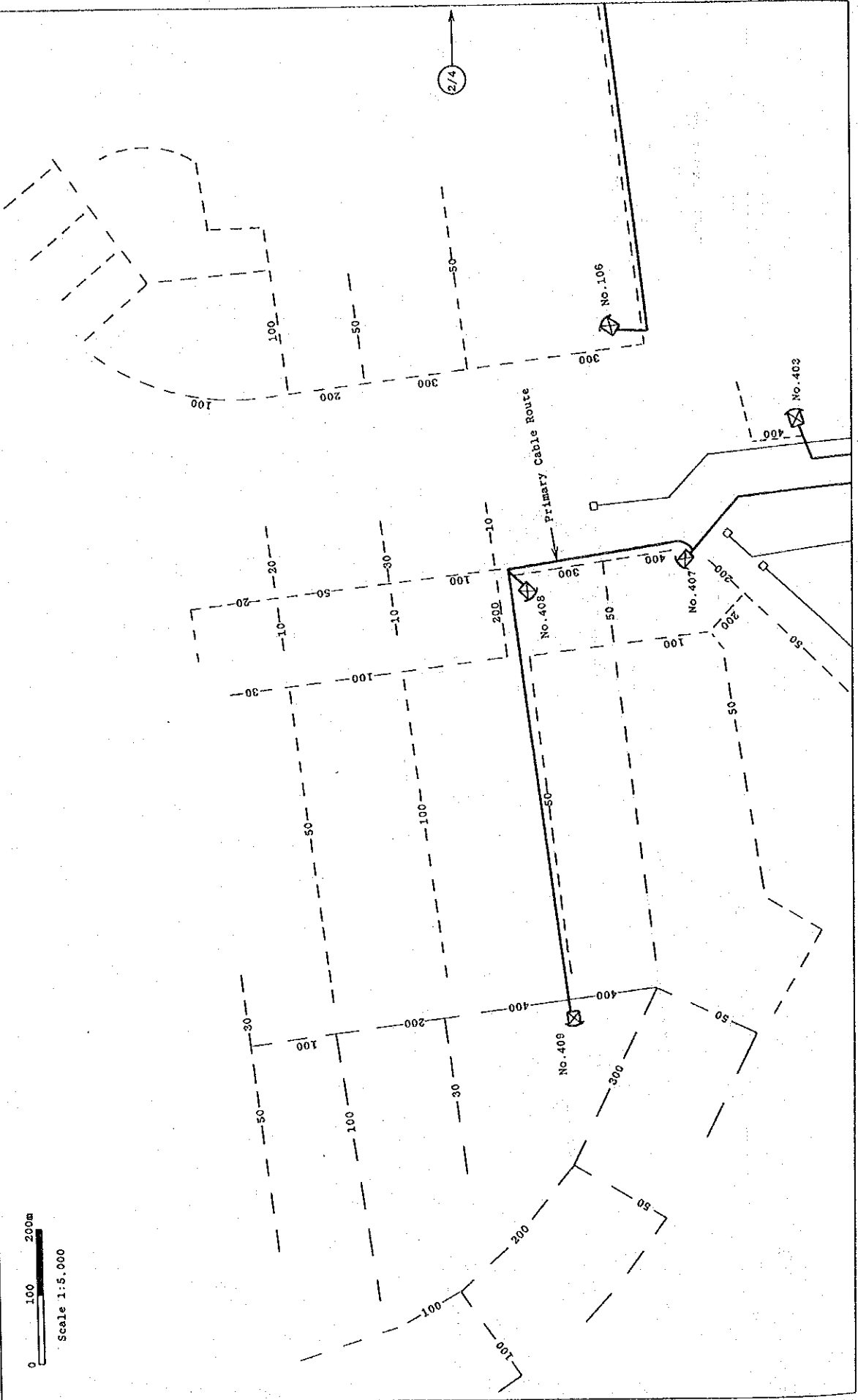


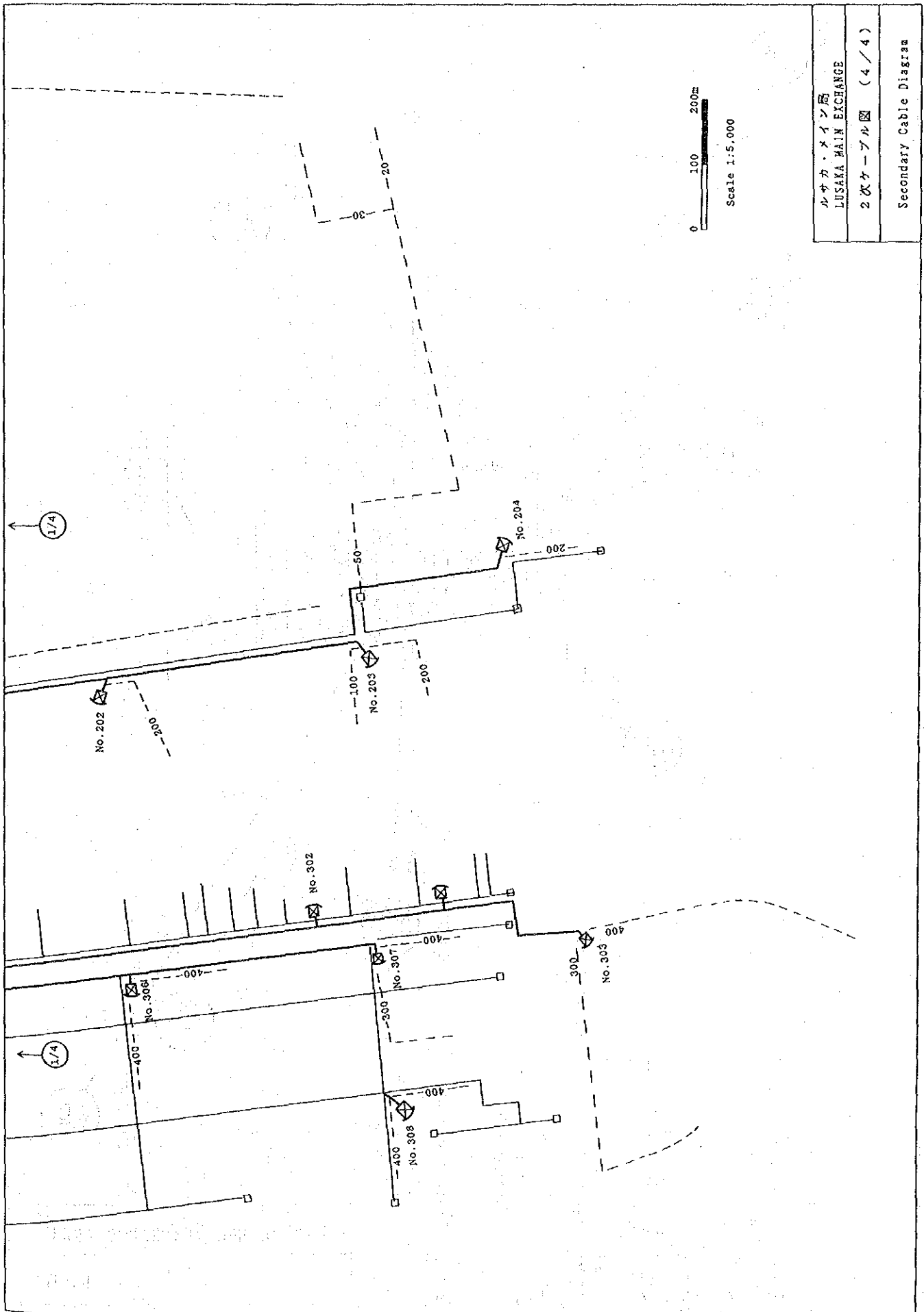
ルサカ・メイン局
 LUSAKA MAIN EXCHANGE
 2次ケーブル図 (2/4)
 Secondary Cable Diagram



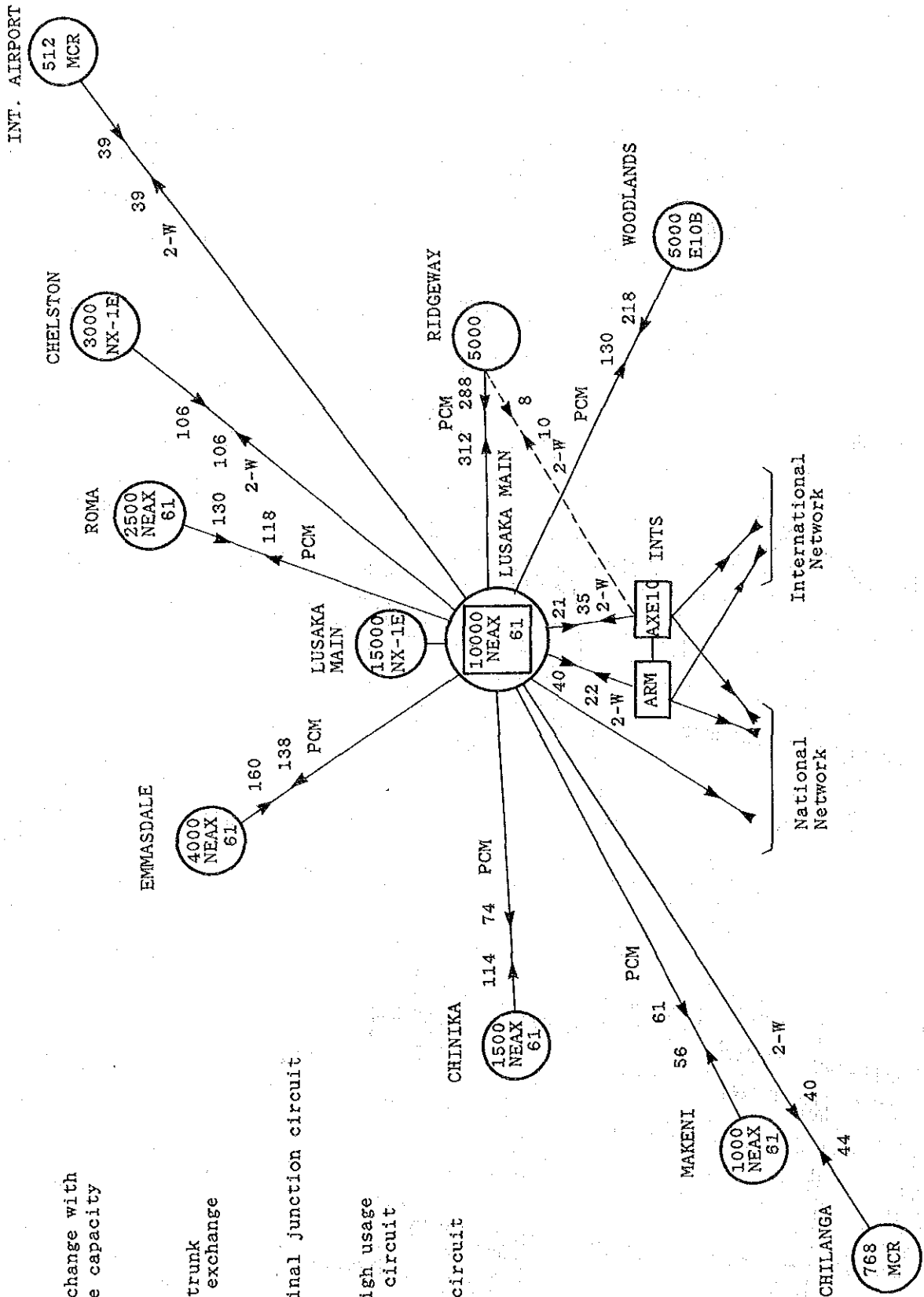
3/4

ルサカ・メイン局
 LUSAKA MAIN EXCHANGE
 2次ケーブル図 (3/4)
 Secondary Cable Diagram





ルサカ・メイン局
LUSAKA MAIN EXCHANGE
2次ケーブル図 (4/4)
Secondary Cable Diagram



Local exchange with 5000-line capacity by ART

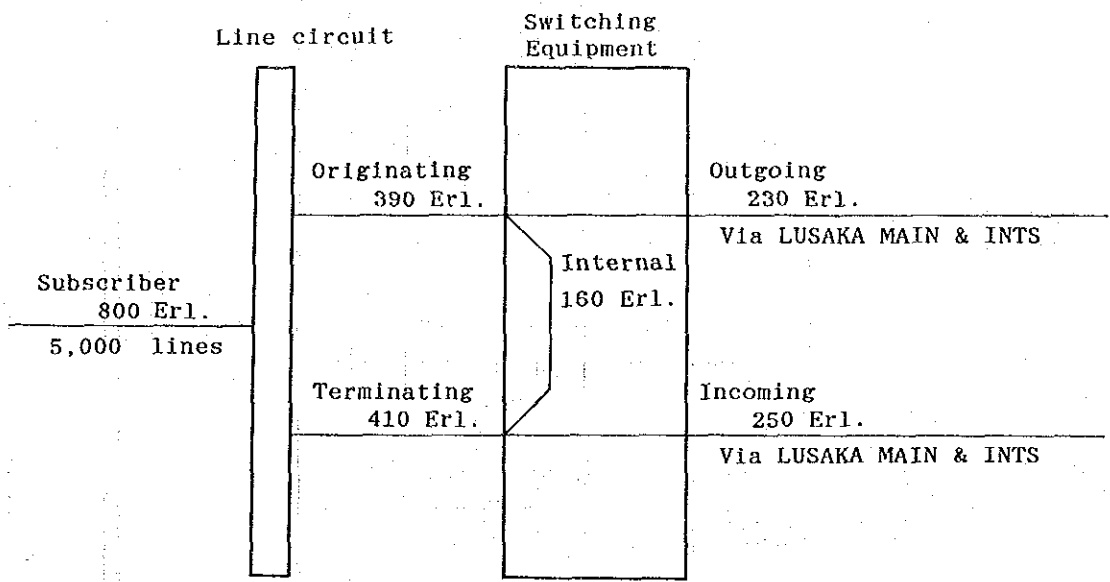
Local & trunk combined exchange

No. of final junction circuit

No. of high usage junction circuit

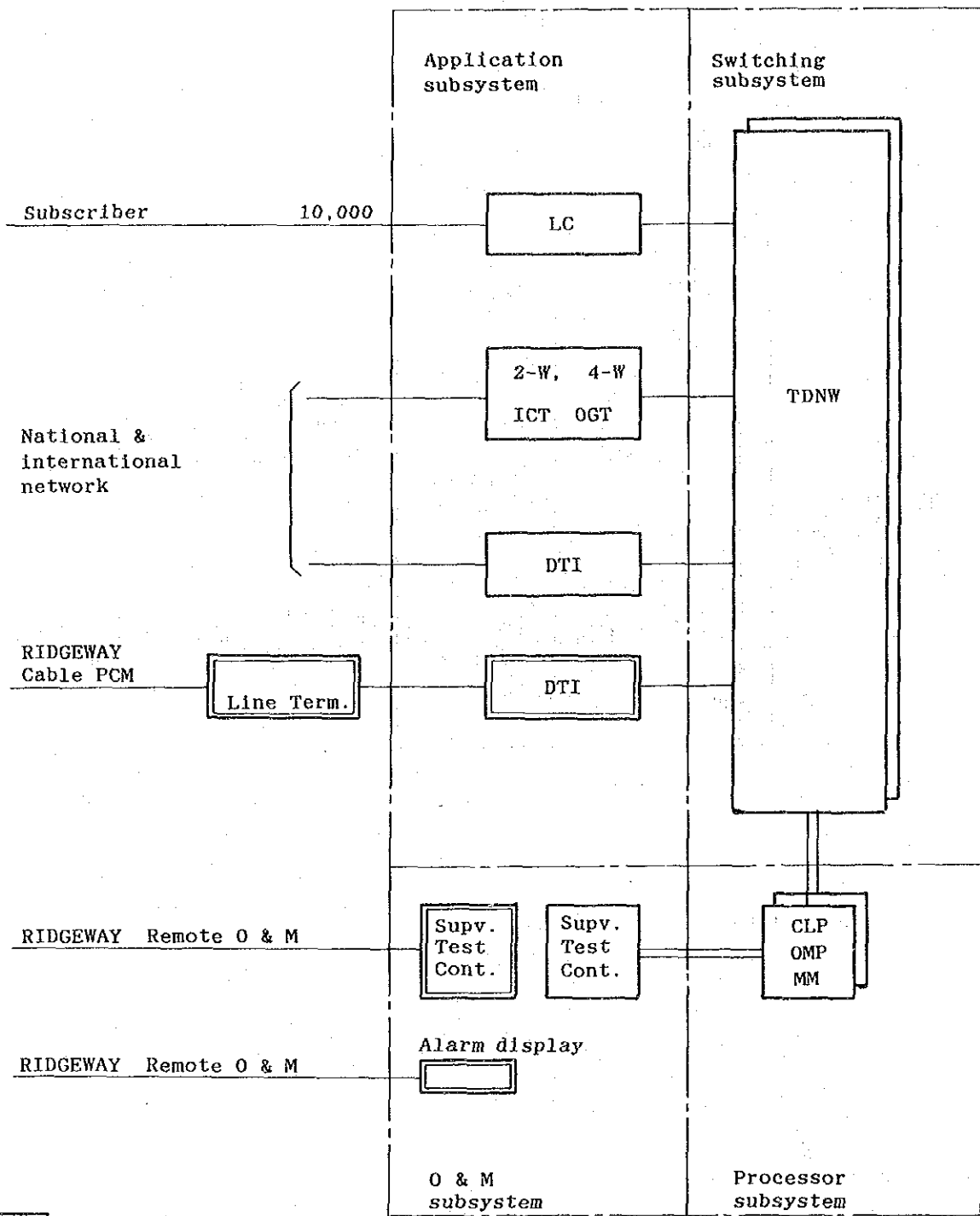
2-wire circuit

LUSAKA MULTIEXCHANGE AREA
(1/6)
Telephone Switching Network



Erl. Erlang

RIDGEWAY EXCHANGE
(2/6)
Traffic Flow Schematic



Additional equipment

- LC Line Circuit
- ICT Incoming Trunk
- OGT Outgoing Trunk
- DTI Digital Trunk Interface
- TDNW Time Division Network

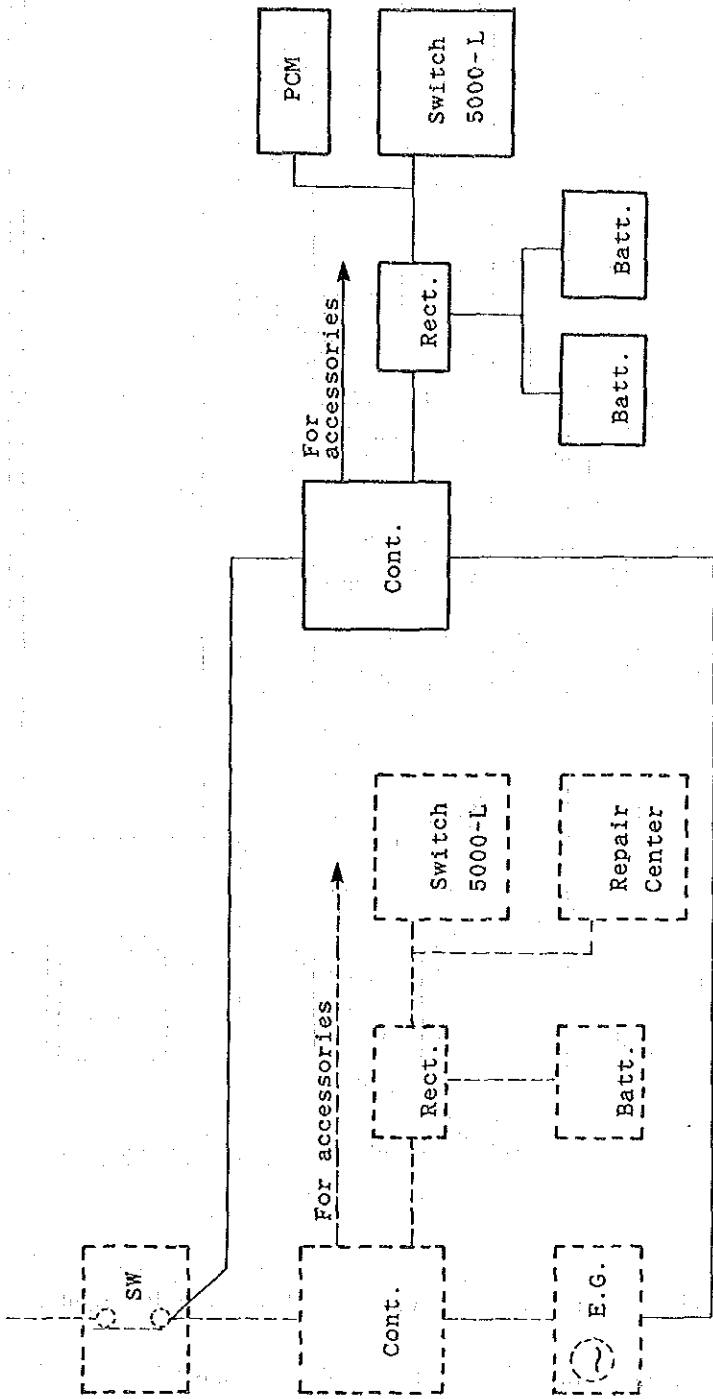
- CLP Control Processor
- OMP Operation Maintenance Processor

LUSAKA MAIN EXCHANGE

(3 / 6)

Switching Equipment
Block Schematic

A.C Mains 3-P 4-W 380V 50-Hz



--- Existing facilities

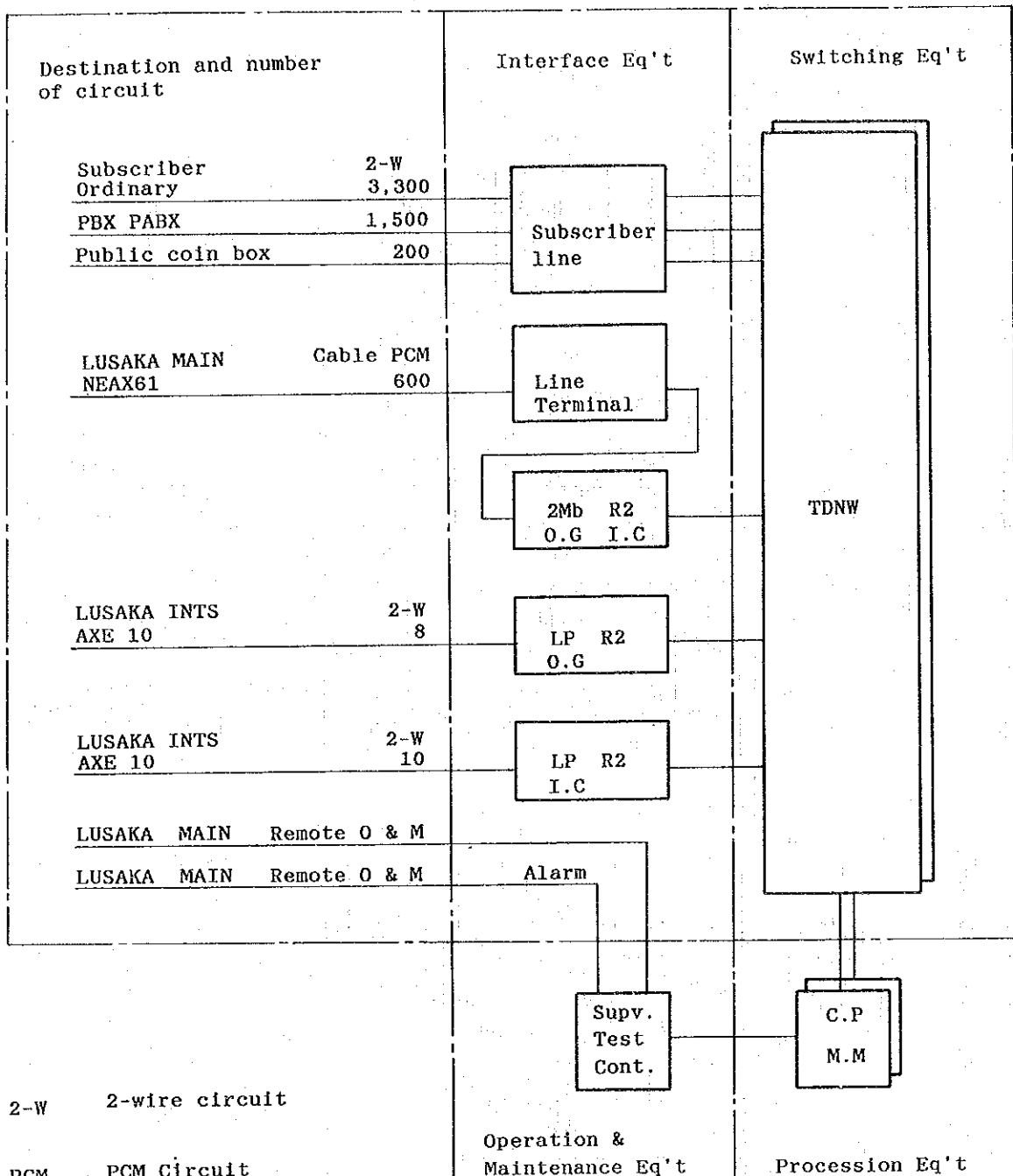
Cont. Controller

E.G. Engine Generator

Rect. Rectifier

Batt. Battery

RIDGEWAY EXCHANGE	
(4/6)	
Power Equipment Block Schematic	



2-W 2-wire circuit

PCM PCM Circuit

2Mb 2 Mega bits per second

LP Loop supervisory signalling

R2 CCITT R2 register signalling

O.G Outgoing

I.C Incoming

TDNW Time Division Network

Operation & Maintenance Eq't

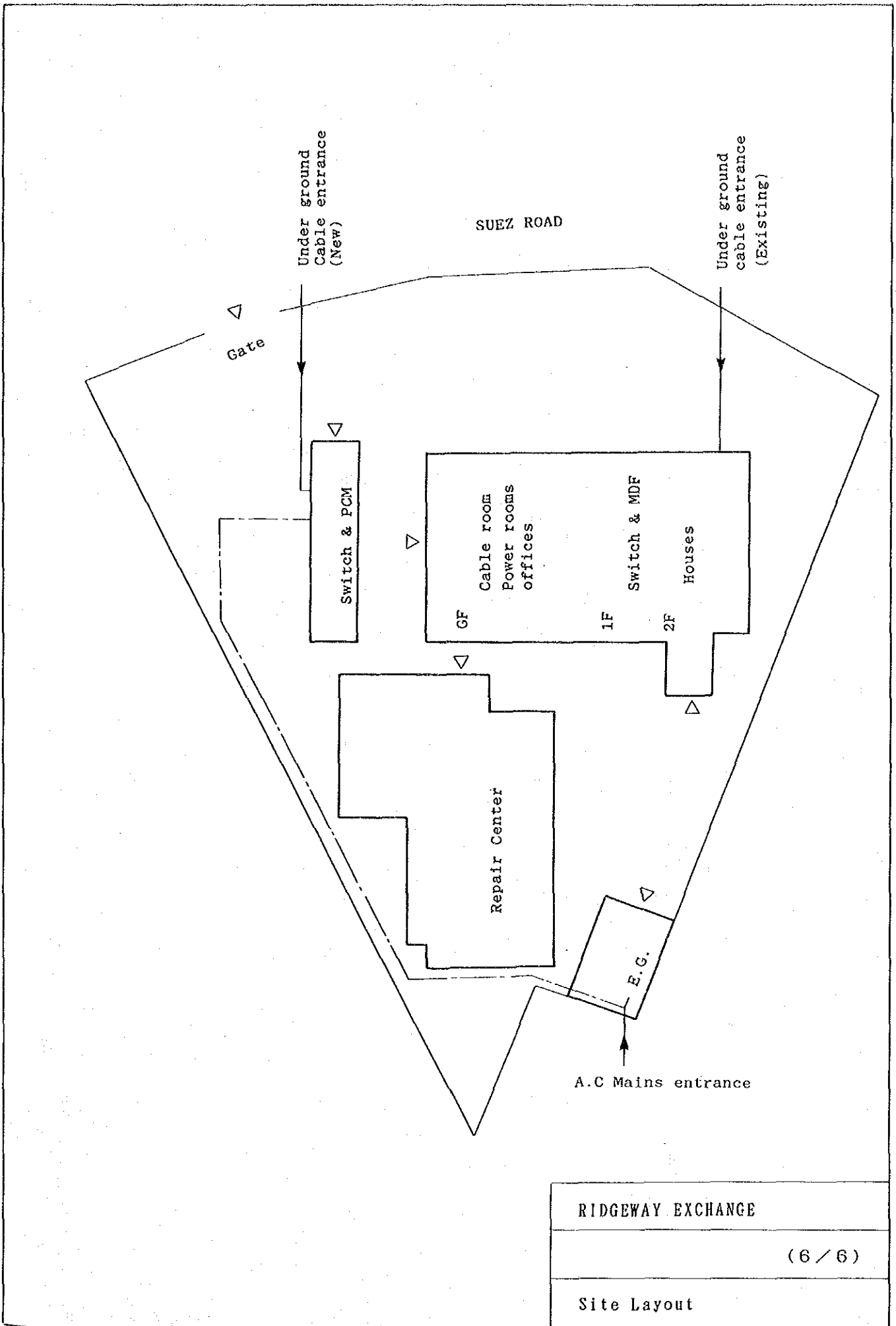
Procession Eq't

C.P Control and Processing

M.M Main Memory

O & M Operation & Maintenance

RIDGEWAY EXCHANGE
(5/6)
Switching Equipment Block Schematic



JICA