

#### 4-4-3 Switching Equipment for Training Use

##### (1) Selection of Switching Equipment Location

In consideration with P&T's intention, the new training-use switching equipment will be installed at the existing concrete-made building of the Telecommunications Engineering School of P&T, after careful study of the under-mentioned basic requirements:

- 1) To be the location where switching equipment installed will not easily suffer damage due to windstorm, flood or other natural disaster, as well as fire.
- 2) To be of strong and durable structure where switching equipment can be safely installed.
- 3) To have switching equipment room locked or otherwise protected so that any third party cannot easily enter the room and touch the equipment.

The layout of the school appears in Table IV-19.

##### (2) Switching Equipment

###### 1) Equipment Configuration

Since the objective is to train maintenance and operation staff for now-working digital switching equipment, the switching equipment configuration will be of minimum requirements for achieving such objective. Important equipment components will be double-structured as in the case of digital switching equipment now in operation.

LEGEND	
B	: BUNGALOW
C	: CANTEEN
D	: DORMITORIES
G	: GARAGE
OB	: OLD BLOCK
NB	: NEW BLOCK
Q	: QUARTERS

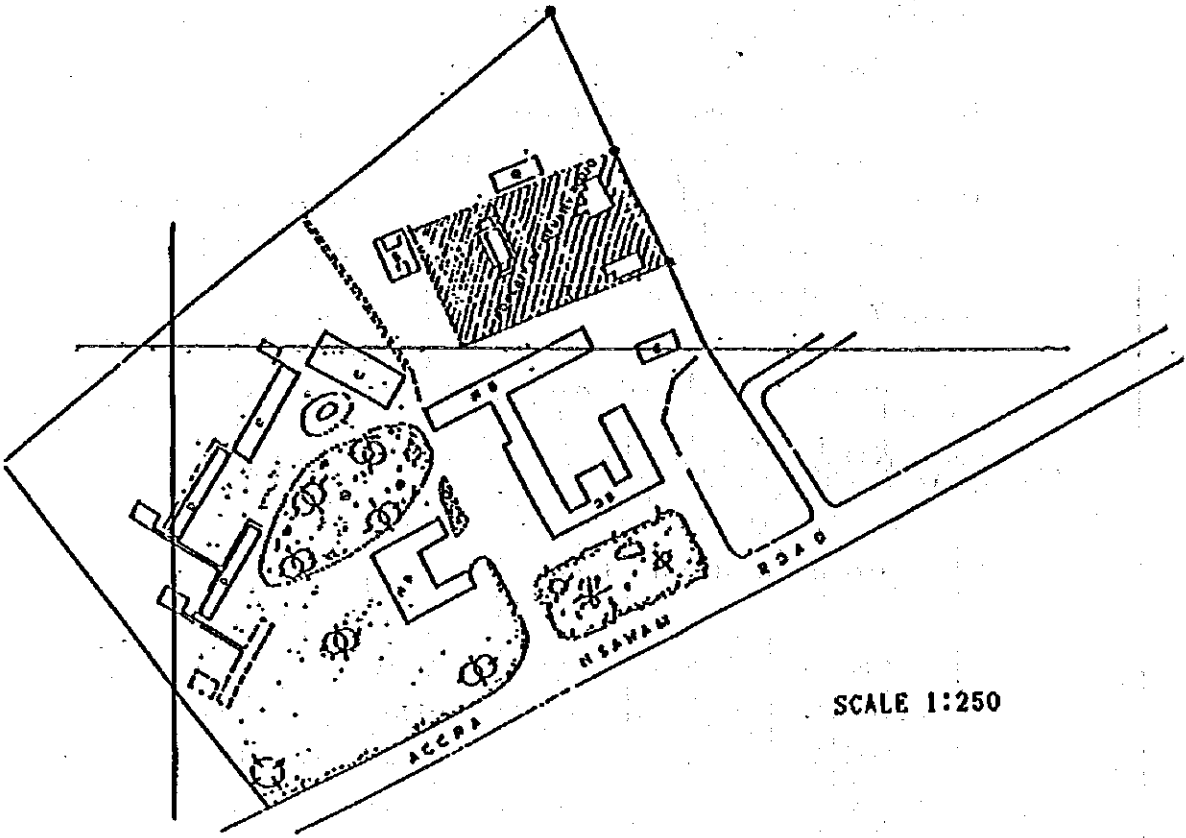


Fig. IV-19 Layout of Telecommunications Engineering School

## 2) Equipment Floor Layout

Equipment floor layout will be decided in consideration of the following requirements:

- Cable length to be as short as possible in view of cable length limits.
- To avoid adverse influence between switching equipment and associated equipment (air-conditioner, lighting, etc.) to be installed in the switching equipment room.
- Equipment location to be such that installation work and training work will not be inconvenienced.

## 3) Wiring System

For office cable wiring, cable rack system will be adopted instead of under-floor system. This is because switching equipment installation is in the existing building.

## 4) MDF

MDF where to connect test-use telephone set and switchboard cable will be installed.

## (3) Associated Equipment

### 1) Rectifier

Silicon dropper (SID) system rectifiers will be adopted. Rectifiers, while floating or charging batteries, will supply D.C. power required by switching equipment.

Rectifier capacity will be equivalent to the sum total of switching equipment consumption current and battery charging current.

2) Battery

Batteries required for satisfying current consumption by switching line units (number of subscriber circuits) will be installed.

3) Air-Conditioner

Design conditions for air-conditioner installation are:

Room temperature:  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Room humidity :  $50\% \pm 10\%$

The switching equipment room should be air-conditioned during training periods, in principle. At all times, air-conditioning must satisfy the requirements described in Paragraph 4-3-2.

4) Earthing

For earthing, copper plate burying and metal bar parallel planting will be adopted. Seasonal variations of earthing resistance will be duly considered.

Earthing of communication equipment can be used together with earthing for lightning arrester on MDF because cable line is not connected with facilities outside the training-use switching equipment room.

(4) Building Use Plan

Building use plan in the school is as follows:

1) Switching Equipment Room  
(7.4 m x 7.6 m x 3.2 m)

A switching equipment, MDF and rectifiers will be installed in the existing exercise room of switching equipment in consideration with the following requirements:

- a) Wiring of communication cable and power cable
- b) To avoid direct sunlight on the switching equipment. Also, covers will be used on all openings, such as windows, keeping open space to necessary minimum, so as to maximize the effect of air-conditioning in the room.

2) Battery Room

For battery room, existing battery room will be used in consideration with the following requirements:

- a) To introduce forced ventilation system.
- b) Wiring of power cable and earthing.

**4-4-4 Maintenance and Training of Outside Plant**

(1) Maintenance Staff and Materials

1) Maintenance and Operation Staff

For the purpose of stable operation of the outside plants for a long period and providing high quality service, the assignment of fully trained maintenance and operation staff is essential. From this viewpoint, P&T is requested to procure the maintenance and operation staff for the facilities and equipment to be introduced by this project, as proposed hereunder.

a) Outside Plant

To organize a maintenance group composed of foreman, supervisory linemen and laborers at each of three telephone exchanges in Accra, i.e., Accra Central, Cantonments and Accra North. This maintenance group is to make a routine for maintenance of the outside plants.

b) Subscriber's Premise Facilities

To assign a maintenance group composed of foreman, supervisory linemen and laborers at each of the three telephone exchanges in Accra. This maintenance group is to make the maintenance tour of subscriber's premise facilities.

c) Measuring Equipment

Measuring equipment to be supplied is for fault finding and for test after trouble-shooting. One unit/set of each type of measuring equipment will be supplied to each of the three exchanges.

d) Vehicles

The following vehicles for maintenance of outside plant and subscriber's premise facilities are to be supplied.

- Light van

For maintenance of subscriber's premise facilities.

- Wagon

For maintenance of cable splicing, drop wire and indoor cable.

- Pickup  
For maintenance of duct cable and direct-buried cable.
- Truck with winch  
For primary cable installation.

One each for the above three items will be supplied to each of the three exchanges. For truck with winch, one will be supplied for common use by the three exchanges.

e) Measuring Equipment and Tool for Maintenance

Item of main measuring equipment and tools for maintenance use are as shown in the following table:

No.	Item
1	Cable Fault Locator
2	Cable Pair Checker
3	Megger, 250V-50M
4	Wheatstone Bridge, No. 3
5	Poisonous Gas Detector
6	Galvanometre for No. 3
7	TR Oscillator
8	TR Amplifier
9	Earth Measuring Set
10	AMP Connector
11	Generator (1.5KW - 2.0KW)
12	Water Pump
13	Electric Hammer Drill
14	Drive Shaft
15	Cable Jack
16	Premises Tool Kit

f) Main Materials for Maintenance Use

Item of main materials for maintenance use are as shown in the following table.

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No.	Item
1	Cables (100 pairs-1200 pairs)
2	Cables (10 pairs-50 pairs)
3	Internal Cables (10 pairs-20 pairs)
4	Wires (Internal, External, Jumper Wires, etc.)
5	Cross Connecting Cabinet, 1400 pairs type
6	Indoor type distribution box (10 pairs-100 pairs)
7	External type distribution box (10 pairs)

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(2) Equipment and Materials for Training-Use

P&T will carry out the training of the maintenance and operation staff personnel for the maintenance of the facilities constructed by this project.

For the training, the below-mentioned equipment, tools and materials are provided by this project:

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No.	Measuring Equipment and Tools
1	Cable Fault Locator
2	Cable Pair Checker
3	Meger (250V-50M)
4	Wheatstone Bridge
5	Poisonous Gas Detector
6	TR Oscillator
7	TR Amplifier
8	Earth Measuring Set
9	AMP Connector

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No.	Main Materials
1	Conduit Cable
2	Armoured Cable
3	Wires (Internal, External, Jumper Wires, etc.)
4	UC Closure and Accessories
5	Cross Connecting Cabinet with Terminals
6	Indoor and External type distribution boxes
7	Steel Pole

#### 4-4-5 Maintenance and Training of Inside Plant

##### (1) Maintenance Staff and Materials

##### 1) Maintenance and Operation Staff

The maintenance and operation staff for the inside plant facilities will be assigned for the whole day maintenance, on shifts basis, as shown below:

##### a) Objective Three Exchanges

	Accra North	Accra Central	Cantonments	Total
Engineer	- (1)	- (1)	- (1)	- (3)
Technician	3 (1)	3 (1)	3 (1)	9 (3)
Total	4 (3)	4 (3)	4 (3)	12 (9)

- Note: 1. Upper column is for daytime and lower column for night time.  
 2. In parentheses is the scheduled number of recruit.

b) PABX in Ministries Area

As the result of rehabilitation work by this project, operators will be increased and will conduct on around-the-clock basis. Maintenance staff and operator requirements are shown below.

Class	In-Office Technician	Attendant Board
Superintendent	1	
Technician	(2)	
Operator		3 (7)
Total	1 (2)	3 (7)

Note: In parentheses is the scheduled number of recruits.

2) Equipment and Materials for Maintenance-Use

As the result of replacement of PABX switching equipment in the Ministries area, 2-3 years stocks will be supplied for parts and components required for the maintenance of new switching equipment.

a) Maintenance materials

One set each for packages of all kinds of spare parts for maintenance is provided.

b) Measuring equipment and tools

One unit or one set each for measuring equipment and tools for fault location, trouble-shooting and testing is provided.

- c) Associated equipment  
Spare parts for associated equipment of air-conditioner and generator are also provided.

(2) Training Equipment and Materials for Training-Use

1) Training

The training of maintenance and operation for the switching equipment to be introduced by this project is mainly twofold.

- a) Training for inside plant technicians to be held at the Telecommunications Engineering School
- b) Training for handling the PABX switching equipment to be newly introduced in Ministries area

2) Equipment and Materials for Training-Use

Along with the training-use switching equipment, items such as measuring equipment, tools and spare parts of all kinds, as well as textbooks for trainees, will be provided by the project.

- a) Measuring equipment and tools for training use will be equivalent to those of small local exchange office. One unit or one set for each kind of equipment and materials is to be provided for maintenance.
- b) One set each for spare parts of switching equipment is to be provided.
- c) Textbooks for basic technology of digital electronic switching equipment and maintenance and operation thereof are to be provided.

#### 4-5 Implementation Plan

##### 4-5-1 Implementation Policy

This project is to rehabilitate the outside plants (cables and civil work) of eight key areas in service areas of the three exchanges in Accra (Accra Central, Cantonments and Accra North). The competent authority for project implementation and for work design and contract is P&T.

Project implementation is considered to require 21.5 months after conclusion of the exchange of notes including detailed design formulation and tender procedures. Considering that the Japanese government principle should be completed for a grant aid project in one fiscal year, it is desirable to divide into two phases for implementation work.

##### 4-5-2 Division of Work

The basic design study team conferred with P&T's personnel concerned including Deputy Director of P&T regarding division of work between Japan and Ghana in case of project implementation by Japanese grant aid. The results of conference are kept on record in the MINUTES OF DISCUSSIONS (See ANNEX-I).

Followings are (1) the scope of work to be borne by Japan's grant aid and (2) the scope of work to be borne by Ghana at its expense and the scope of grant-of-benefits from Ghana to Japan.

##### (1) Scope of Work to be Borne by Japanese Grand Aid

###### 1) Rehabilitation Work in Eight Areas

- a) Rehabilitation work for existing cable facilities
- b) Rehabilitation work for existing civil facilities
- c) Rehabilitation work for PABX switching equipment

2) Training and Maintenance

- a) Supply and installation electronic switching equipment for training use
- b) Supply of vehicles, equipment, tools and materials for maintenance of outside plant constructed by the project
- c) Supply of training-use equipment, tools and materials for outside plant

(2) Scope of Work to be Borne by Ghana

1) Rehabilitation Work in Eight Areas

- a) Provision of temporary office, work place and materials warehouse which are necessary for implementation of the project
- b) Withdrawal of all existing defective facilities after transfer of existing telephone lines
- c) Rehabilitation work for subscriber's premise facilities

2) Training and Maintenance

- a) Provision of the space for accommodating the electronic switching equipment for training-use

3) Others

- a) Acquisition of necessary permits and licenses for project implementation
- b) Payment authorization notice fee and payment commission of Japanese Foreign Currency exchange bank, based on bank agreement
- c) Transaction for equipment and materials landing at port of discharge, customs clearance and duty exemption procedures, and inland transportation

- d) Grant of benefits, such as entry and/or departure to and from Ghana of Japanese national for the purpose of project implementation, as well as their sojourn in Ghana and their exemption from taxes and dues of Ghana
- e) Proper and effective maintenance and operation of facilities and equipment and materials purchased and constructed and installed by Japanese grant aid
- f) Bearing of other expenditure than to be borne by Japan in connection with grant aid
- g) Settlement of disputes with local inhabitants during the period of project implementation

#### 4-5-3 Supervision Plan

For supervision of implementation work, the Consultant employed by the Government of Ghana is to carry out the following items.

(1) Check of Implementation Drawings

To check, on behalf of the Government of Ghana, implementation drawings submitted by the Contractor, establish the Bill of Quantity and report it to P&T.

(2) Witness Inspection in Factory

To carry out witness inspection of major equipment and materials in factory prior to shipment by the Contractor and make sure that requirements of equipment and materials to be shipped conform to contract specifications. Only after Consultant approval, the Contractor can make shipment of equipment and materials.

(3) Work Management

To study work implementation method and schedule submitted by the Contractor and give necessary instructions, if any.

Consultant member must stay in Ghana during work implementation period, so as to verify and check at work site periodically whether work implementation is in accordance with contract specifications or not, and thereby manage work progress.

**(4) System Handover**

To witness final acceptance test when work is completed, make sure that test results conform to contract specifications, and then recommend the Government of Ghana to accept completed system.

**4-5-4 Procurement of Equipment and Materials**

At the time of basic design study in Ghana, it was found that necessary equipment and materials for the project implementation, especially those for cable and switching equipment installation, cannot be locally procured. All must be supplied from Japan.

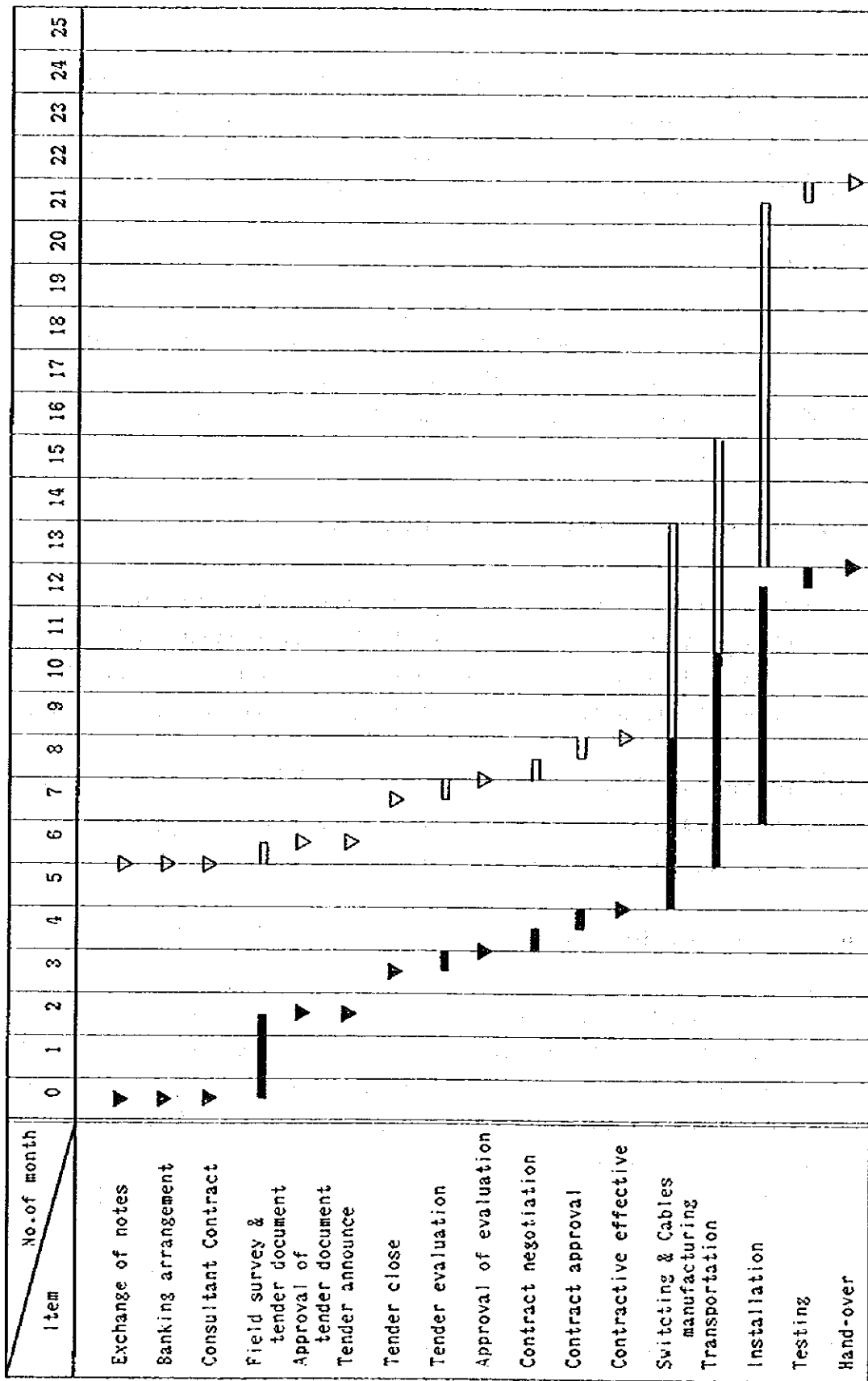
Civil work necessities except for manhole covers and its accessories are locally procurable. These materials include cement, sands, gravels, macadams, woods, reinforcements and PVC pipes.

**4-6 Implementation Schedule**

For this project, work design and tender document formulation will be started immediately after conclusion of exchange of notes and the construction contract is done based on the competitive bidding. The implementation schedule is shown in Table IV-4.

Table IV-4 Project Implementation Schedule

Ph-1  
Ph-2





#### 4-7 Maintenance and Operation Cost

##### 4-7-1 Maintenance and Operation Staff

For maintenance and operation of facilities to be introduced by this project, new technical knowhow is essential, this fact increases importance of training to be held at the Telecommunications Engineering School.

Therefore, it becomes necessary to re-train part of P&T employees now assigned to telephone exchanges and use them as maintenance and operation staff, and, at the same time, to fill vacancies by new employment and invite new trainees at the Telecommunications Engineering School.

Existing vacancies in the objective exchanges are as follows:

##### (1) Inside Plant

- a) Switching equipment maintenance staff
- b) Test board staff

##### (2) Outside plant

- a) Cable maintenance staff
- b) Subscriber's premise facilities maintenance staff

##### (3) PABX Switching Equipment in Ministries Area

- a) Switching equipment maintenance staff
- b) Operators

##### (4) Telecommunications Engineering School

- a) Training-use switching equipment maintenance staff

4-7-2 Maintenance and Operation Cost

Annual maintenance and operation cost is estimated as follows:

(Unit: 1,000 Cedis)

(1) Maintenance staff salaries and operation expenses	5,184
(2) Maintenance equipment and materials expenses	4,050
(3) Maintenance and operation expenses for vehicles	3,240
(4) Electric power and fuel expenses	756
Total	13,230

4-8 Project Cost Borne by Ghana Side

The cost to be borne by Ghana side for implementation of this project is estimated at 9,893,000 Cedis.

The project cost classification by work sectors is as follows:

(Unit: 1,000 Cedis)

(1) Construction cost .....	9,866
- Subscriber's premise facilities improvement	(2,893)
- Outside plant withdrawal	(5,995)
- PABX switches withdrawal	( 103)
- Labor cost	( 875)
(2) Equipment and materials cost .....	27
Total .....	9,893

## **CHAPTER 5 PROJECT EVALUATION**



## CHAPTER 5 PROJECT EVALUATION

As stated in CHAPTER 2 BACKGROUND OF PROJECT, Ghana is now in the second stage of the national economic recovery programme. Of all infrastructures to be improved and upgraded to achieve national economic reconstruction, the transport and communication sector is given a top priority.

Especially serious is the condition of the telephone outside plant in Accra which makes speedy transmission of information practically impossible and fatally impedes the progress of economic recovery programme and the brisking of economic activities in general.

Such being the circumstances, benefits described below can be expected from this project implementation.

### (1) Promotion of Economic Recovery Programme and Brisking of Economic Activities

At present, due to the outage of the telephone outside plants, government offices, international organizations and foreign embassies have their information transmission interrupted. However, once the outage is eliminated and the system improved, information transmission will become smooth and progress of economic recovery programme will pull up momentum.

Exchange of information between government offices and private business offices will also be facilitated, contributing a great deal to the activating of economic activities in general.

### (2) Liaison with Hospital, Police Station and Fire Brigade

At present, even in case of emergency, such as acute illness, complications or fire, liaison with hospital, police station or fire brigade cannot be taken immediately. When 24 hours/day telephone

service is restored, such liaison will become easy. This will improve the life environment and social welfare of the local inhabitants.

(3) Enhancement of Telephone Call Rate

Through this project, significant rehabilitation of outside plants will be realized in the most important areas of Accra, i.e., the area where the telephone call rate is high. As the result, telephone calls not only between subscribers in the area but also to/from rural/remote areas and even overseas will remarkably increase. For P&T, this means the increases of the national and international telephone service revenue which, in turn, will help improvement of its finance.

(4) Improvement of Collection Rate of Telephone Fares

For the reason of frequent telephone line outages, many subscribers in Accra refuse to pay telephone fares. With completion of this project, subscriber details in the project coverage area will become clarified including names, telephone numbers and locations of subscribers, as well as their call and fare records. Since the telephone service and fare collection procedures improve, telephone fare collection will also follow suit, and remarkably.

(5) Alleviation of Traffic Congestion

Telephone communication difficulty presently compels subscribers to visit the other parties by car for transmission or exchange of information. Once normal telephone service is restored, subscribers can use telephones instead of going out by car. This contributes more or less to the alleviation of traffic congestion.

(6) Side Walk Safety

Most of the existing manholes are on side walks, and those manholes are either without covers or with broken covers. Nearby inhabitants and pedestrians are thus greatly inconvenienced. By this project, all

manholes in the objective areas will be fitted with covers. This guarantees safety of pedestrians who use side walks.

(7) Improvement of Outside Plant Maintenance

At the three exchanges in project coverage area, i.e., Accra Central, Cantonments and Accra North, maintenance equipment and materials, such as maintenance work vehicles, tools, and measuring equipment, are in dire shortage. Equipment and materials to be newly supplied by this project can cope with future system faults due to artificial and natural causes. Because the area concerned is the area where important circuits are concentrated, speedy trouble-shooting with appropriate stocks of maintenance materials ensures an effective maintenance and operation system.

(8) Upgrading of Subscriber Service

Present subscriber service is degraded. This is because evening and night-time faults with electronic switching equipment cannot be attended to by the shortage of maintenance and operation staff. Taking advantage of switching equipment provided under this project, the Telecommunications Engineering School will conduct training for a large number of maintenance and operation staff at switching equipment and line test board. By this means, maintenance staff at evening and night-time can be secured, thus improving subscriber services.

As described in the foregoing, this project contributes to the establishment of the infrastructure indispensable for the promotion of economic recovery programme of Ghana. This project covers the most important area of Accra, the capital city and this fact leaves no doubt for significant effects to the Economic Recovery Programme, economic activities and social welfare. For P&T, especially for its financial management, this project holds significant and several effects, particularly in the telephone traffic growth, telephone fare collection improvement and subscriber service upgrading.





## **CHAPTER 6 CONCLUSION AND RECOMMENDATION**



## CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

Foregoing studies regarding the implementation of this project has reached the following conclusion that:

Considerable improvement can be expected in the outside plants of the project coverage areas and in the telephone service which will lead to the increase of social welfare for local inhabitants. Furthermore, a great deal of contribution will be made to the promotion of economic recovery programme of Ghana, as well as the brisking of economic activities in general.

The project coverage area is a limited area of Accra. However, it is hoped that this project be used as a pilot project for the rehabilitation of outside plants in other areas also, making the best of knowledge obtained through the materialization of this project, i.e., that concerning the planning, design, construction, test and commissioning, as well as new technologies employed.

From now on, P&T will gradually introduce digital switching equipment in all parts of Ghana. Therefore, P&T should make its utmost effort to increase maintenance and operation staff by adequate utilization of switching equipment installed at the Telecommunications Engineering School and thereby upgrade subscriber services.

There are certain problem to be solved in P&T's organization, maintenance and operation system, tariff system and training system. Especially, outside plant improvement and modernization, along with its rational operation, will hold a great impact on the successful management of P&T. At the same time, the upgrading of subscriber services is the demand of the times.

Considering the present condition, features and problems involved in the existing outside plants in Accra, the modernization of the maintenance

system of the outside plants is essential, and the following targets are left to P&T:

- (1) Formation of desirable construction and maintenance work system
- (2) Procurement of work vehicles
- (3) Provision of measuring equipment and tools
- (4) Updating of plant records
- (5) Improvement of fault finding and trouble-shooting control system
- (6) Improvement of management of stockpile for maintenance materials
- (7) Improvement of training system

Meanwhile, in connection with this study, Ghana side expressed hope to have the experts of the outside plant maintenance and operation dispatched. Since there is much for P&T to gain from guidance by experts in the improvement and upgrading of outside plant maintenance and operation system from now forward, it is desirable that Japanese side does consider such. Ghana hope positively in the event a request in concrete terms arrives.

## **ANNEX**

- I MINUTES OF DISCUSSIONS**
- II MEMBER LIST OF THE BASIC DESIGN STUDY TEAM**
- III SCHEDULE OF THE STUDY TEAM**
- IV LIST OF CONCERNED PERSONS MET BY THE STUDY TEAM**
- V LIST OF DATA AND INFORMATION COLLECTED BY THE STUDY TEAM**



ANNEX I. MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS  
ON  
THE REHABILITATION PROJECT OF  
TELECOMMUNICATIONS EXTERNAL LINE PLANT  
IN THE REPUBLIC OF GHANA

In response to the request of the Government of the Republic of Ghana, the Government of Japan decided to conduct a basic design study on the Rehabilitation Project of Telecommunications External Line Plant and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Ghana the study team headed by Mr. Noriyuki SHIGETA, Deputy Director, Telecommunications System Division, Ministry of Posts and Telecommunications, from 25th October to 19th November, 1986.

The team had a series of discussions on the Project with the officials concerned of the Government of the Republic of Ghana headed by Mr. T. A. Botchway, Deputy Director General (Engineering) and conducted a field survey in Accra area.

As a result of the study, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Accra, 5th November, 1986.

Mr. Noriyuki SHIGETA  
Leader, Japanese Study  
Team, JICA

Mr. F. E. Johnson  
Acting Director General  
The Ghana Posts and  
Telecommunications  
Corporation

Dr. William Adote  
Acting Chief Director  
Ministry of Transport  
and Communications

-ATTACHMENT-

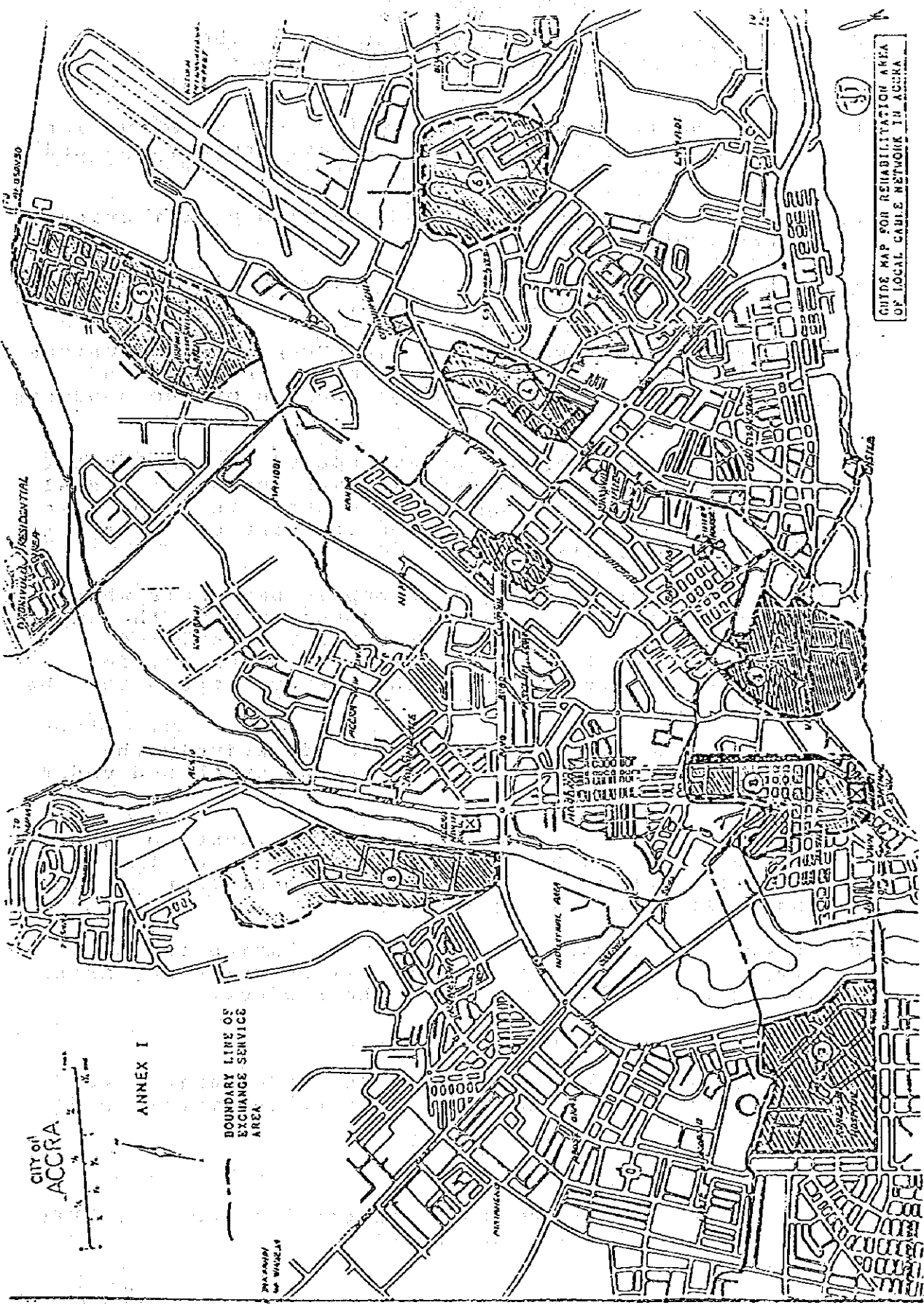
1. The objective of the Project is to execute rehabilitation work of the Telecommunications External Line Plant in the areas where rehabilitation is most urgently required in Accra.
2. The Team will convey the desire of the Government of the Republic of Ghana to the Government of Japan that the latter will take the necessary measures to cooperate in implementing the Project within the scope of the Japanese economic cooperation in grant form.

The proposed areas of the Project are shown in Annex I. The number given to each area shows the order of priority, and the areas of low priority may be deleted or adjusted according to the budget to be allocated by the Government of Japan.

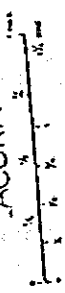
3. The Ghanaian representatives have understood the Japan's grant aid system, explained to them by the Team, which includes a principle of the use of a Japanese consultant and a Japanese general contractor for the execution of the Project.
4. The Government of the Republic of Ghana will take the necessary measures as listed in Annex II on condition that the grant aid provided by the Government of Japan shall be extended to the Project.
5. The Ghana Posts and Telecommunications Corporation shall be the implementing body for the Project and shall be responsible for the implementation of the preparatory work and construction work of the Project.
6. For technical cooperation the Team will convey to the Government of Japan the desire of the Government of the Republic of Ghana to be provided with experts to be dispatched from Japan to assist with the training of the Ghana Posts and Telecommunications's engineers and technicians in the operation and maintenance of the telecommunications external line plant.
7. The Team will convey to the Government of Japan the desire of the Government of the Republic of Ghana for the supply of:
  - (1) measuring equipment, tools, materials and vehicles for the maintenance and operation of the telecommunications external line plant.
  - (2) equipment, tools and materials necessary for training on the maintenance and operation of external line plant and switching facilities.







CITY OF ACCRA



ANNEX I

BOUNDARY LINE OF EXCHANGE SERVICE AREA

GUIDE MAP FOR REHABILITATION AREA OF LOCAL CABLE NETWORK IN ACCRA

ANNEX II

Required Arrangement to be taken by the  
Government of the Republic of Ghana

1. To provide the space necessary for such construction as temporary offices, working areas, stock yards and others.
2. To obtain the appropriate construction permit prior to construction work.
3. To bear commissions to the Japanese foreign exchange bank for the Banking Arrangement.
4. To ensure prompt unloading, tax exemption and customs clearance at ports of disembarkation in Ghana and prompt internal transportation therein of the products purchased under the grant.
5. To exempt Japanese nationals engaged on the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Ghana with respect to the supply of the products and the services under the verified contracts.
6. To accord without delay to Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Ghana and their stay therein for the performance of their work.
7. To maintain and use properly and effectively the facilities constructed and equipment purchased under the grant.
8. 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.
9. To coordinate with the inhabitants living in the Project areas on any related matters which may arise during the implementation of the Project.
10. To execute the following works:
  - (1) Removal works of existing faulty/deteriorated facilities, if necessary, after the transfer of working lines.
  - (2) Subscriber premises rehabilitation works.
  - (3) Rehabilitation works of internal network of PBXs (Private Branch Exchanges).



**ANNEX II. MEMBER LIST OF THE BASIC DESIGN STUDY TEAM**

<u>Name</u>	<u>Duty in Charge</u>	<u>Affiliated</u>
Noriyuki Shigeta	Team Leader	Deputy Director Telecommunications System Division Telecommunications, Bureau Ministry of Posts and Telecommunications
Takafumi Itoh	Project Coordinator	Second Basic Design Study Division, Grant Aid Planning & Survey Department, Japan International Cooperation Agency(JICA)
Hideo Mitsuhashi	Network Engineering	Senior Engineer The Nippon Telecommunications Consulting Co., Ltd. (NTC)
Kenji Eguchi	Civil Engineering	Senior Engineer The Nippon Telecommunications Consulting Co., Ltd. (NTC)
Tetsuo Saitoh	Cable Engineering	Senior Engineer The Nippon Telecommunications Consulting Co., Ltd. (NTC)
Yoshio Iwase	Cable Engineering	Engineer The Nippon Telecommunications Consulting Co., Ltd. (NTC)
Hirotsugu Hamada	Switching Engineering	Engineer The Nippon Telecommunications Consulting Co., Ltd. (NTC)

### ANNEX III. SCHEDULE OF THE STUDY TEAM

<u>Date</u>	<u>Day</u>	<u>Activity</u>
Oct. 25	Sat	- The Study Team leave at Narita
26	Sun	- Arrival at Amsterdam
27	Mon	- Arrival at Accra
28	Tue	- Courtesy call to Japanese Embassy and JICA office in Accra - Briefing of study purposes and tentative schedule
29	Wed	- Courtesy call to Ministry of Finance and Economic Planning, Ministry of Transport and Communications and P&T. - Submission of Inception Report to P&T and request of counterparts for survey
30	Thu	- Discussion with P&T for detailed explanation of Inception Report and survey schedule. - Collection of data and information at Ministries and Authorities concerned. - Courtesy call to IBRD Accra office and collection of data and information.
31	Fri	- Discussion with P&T for objective areas. - Collection of plant records of existing facilities and equipment. - Collection of data and information at Ministries and Authorities concerned. - Survey for training facilities and equipment at P&T's Telecommunications Engineering School.
Nov. 1	Sat	- General survey of objective areas. - Collection of plant records existing facilities and equipment at P&T.
2	Sun	- Discussion of survey progress among study team member and assortment of collected data. - Field survey of existing facilities and equipment in objective areas and telephone exchange offices. - Collection of data and information at Ministries and Authorities concerned.
3	Mon	- Discussion with P&T for contents of Minutes of Discussions. - Field survey of existing facilities and equipment in objective areas and telephone exchange offices. - Collection of data and information at Ministries and Authorities concerned.

- Nov. 4 Tue
- Discussion with P&T for confirmation of contents of Minutes of Discussions.
  - Field survey of existing facilities and equipment in objective areas and telephone exchange offices.
  - Collection of plant records for existing facilities and equipment at P&T.
- 5 Wed
- Signing of Minutes of Discussions at Ministry of Transport and Communications and report to Japanese Embassy.
  - Field survey of existing facilities and equipment in objective areas.
  - Collection of plant records for existing facilities and equipment at P&T.
- 6 Thu
- Team leader and coordinator depart for Japan.
  - Discussion with P&T for technical standard.
  - Field survey of existing facilities and equipment in objective areas and telephone exchange offices.
  - Collection of plant records and data and information at P&T and Ministries and Authorities concerned.
- 7 Fri
- Discussion with P&T for design principle.
  - Field survey of existing facilities and equipment in objective areas and telephone exchange offices.
  - Collection of plant records and data and information at P&T and Ministries and Authorities concerned.
- 8 Sat
- Team leader and coordinator arrive at Narita.
  - Field survey of existing facilities and equipment in objective areas.
- 9 Sun
- Discussion of field survey progress among study team member and assorting of collected data.
- 10 Mon
- Field survey of existing facilities and equipment in objective areas.
  - Collection of data and information from P&T and Ministries and Authorities concerned.
- 11 Tue
- Field survey and discussion for training-use switching equipments in P&T's Telecommunications's Engineering School.
  - Field survey of existing facilities and equipment in objective areas.
- 12 Wed
- Discussion with IBRD and collection of data and information.
  - Survey for PABX maintained by P&T.
  - Field survey of existing facilities and equipment in objective areas.
  - Collection of data and information at Ministries and Authorities concerned.

- Nov. 13 Thu
- Discussion with P&T for maintenance and operation.
  - Field survey of existing manholes and facilities and equipment in objective areas.
  - Collection of data and information at Ministries and Authorities concerned.
- 14 Fri
- Discussion with P&T for design policy of ministries area.
  - Field survey of existing manholes and facilities and equipment in objective areas.
  - Collection of data and information at Ministries and Authorities concerned.
- 15 Sat
- Discussion within the study team member and assorting of collected data.
- 16 sun
- Field survey of existing manholes and facilities and equipment in objective areas.
- 17 Mon
- Collection of data and information at Ministries and Authorities concerned and assorting of collected data.
  - Report to Japanese Embassy and JICA office in Accra.
  - The Study Team depart for Japan.  
(Mr. Mitsuhashi, Mr. Eguchi, Mr. Saitoh, Mr. Iwase and Mr. Hamada.)
- 18 Tue
- Leave Amsterdam for Japan.
- 19 Wed
- The Study Team arrive at Narita.

ANNEX IV. LIST OF CONCERNED PERSONS MET BY THE STUDY TEAM

Ministry of Finance and Economic Planning

Mr. Kofi Sekyiamah                      Acting Chief Director

Ministry of Transport and Communications

Dr. William Adote                      Acting Chief Director

The International Bank for Reconstruction and Development Bank (IBRD)

Mr. Seung H. Choi                      Resident Representative in Ghana

Ghana High - Way Authority

Mr. Yakatey                              Chief Engineer

State Construction Corporation

Mr. A. K. Agyarey                      General Manager

Labour Department

Mr. P. Obegdosu                      Manager

Bank of Ghana

Mr. Stephen Ameyaw                      Manager, Research Dept.

Duraplast Ltd.

Mr. Hitti                                  Chairman

Plant Pool Ltd.

Mr. J. K. Serbeh                      Commercial Officer

Posts and Telecommunications Corporation (P&T)

Mr. Col. Kwasi Opong	Director General
Mr. J. K. Gyimah	Deputy Director General/Engineering
Mr. F. A. Johnson	Deputy Director General/Posts
Mr. Tim A. Botchway	Director of Engineering, Internal Telecommunication Services and Acting Deputy Director
Mr. G. K. Adanusa	Director of Engineering, External Telecommunication Services and Acting Deputy Director
Mr. M. L. K. Appeti	Financial Controller
Mr. Aggrey-Mensah	Deputy Director of Engineering
Mr. E. M. Vondee	Chief Accountant
Mr. Kofi Dua - Adonteng	Legal Officer
Mr. A. A. Afful	School Master, Training School
Mr. G. B. Nquartey	Switching, Training School
Mr. S. S. K. Abotsi	Engineering Technician, Operation Section
Mr. C. K. Mensah	Maintenance Staff, Accra Central Exchange
Mr. S. Amoako - Atta	Maintenance Staff, Cantonments Exchange
Mr. Amartey	Maintenance Staff, Ministries PABX
Mr. Odame Joseph	Maintenance Staff, Ministries PABX
Mr. R. D. Adiei	Maintenance Staff, Volta River Authority PABX
Mr. J. K. Quaye	Maintenance Staff, State House PABX
Mr. S. P. Mensah	Maintenance Staff, Korle - Bu Hospital PABX
Mr. J. K. Quartey	Maintenance Staff, Castle PABX



P&T Counterpart Staff

Mr. N. O. O. Adjebu

Project Manager, IBRD Project

Mr. John Nyodeka

Senior Cable Engineer

Mr. Francis Newlands

Cable Engineer

Mr. M. E. Owusu Ansah

Principal Telecommunications  
Superintendent

Mr. V. K. Adomah

Telecommunications Superintendent

ANNEX V. LIST OF DATA AND INFORMATION COLLECTED BY THE STUDY TEAM

1. Statistical Handbook, 1970  
Central Bureau of Statistics, 1970
2. Industrial Statistic, 1982 - 84, Central Bureau of Statistics, 1986.
3. Industrial Statistics, 1980 - 82, Central Bureau of Statistics, 1984
4. Industrial Statistics, 1981 - 1983
5. Quarterly Digest of Statistics, 1981, Central Bureau of Statistics
6. Quarterly Digest of Statistics, 1983, Central Bureau of Statistics
7. Quarterly Digest of Statistics, 1984, Central Bureau of Statistic
8. Quarterly Digest of Statistics, 1986 Statistical Service
9. Quarterly Digest of Statistics, 1985
10. Civil Aviation Statistics 1970, Central Bureau of Statistics, 1973.
11. Annual Report of P&T, 1978 - 1979 Ghana Posts and Telecommunication Corporation.
12. Annual Report of Electricity, 1982, Electricity Corporation of Ghana.
13. Annual Report of Electricity, 1981, Electricity Corporation of Ghana.
14. Ghana Year Book, 1978  
Graphic Corporation
15. An official Handbook, Ghana 1975, Ghana Information Services Department.
16. Telephone Directory, 1986 Posts and Telecommunications Corporation
17. Accounts at P&T December 1984, Posts and Telecommunications Corporation
18. Telex Tariff Collection Rate Effective
19. The P.N.D.C. Budget Statement and Economic Policy for 1986,  
P.N.D.C. Secretary for Finance and Economic Planning, 1986.

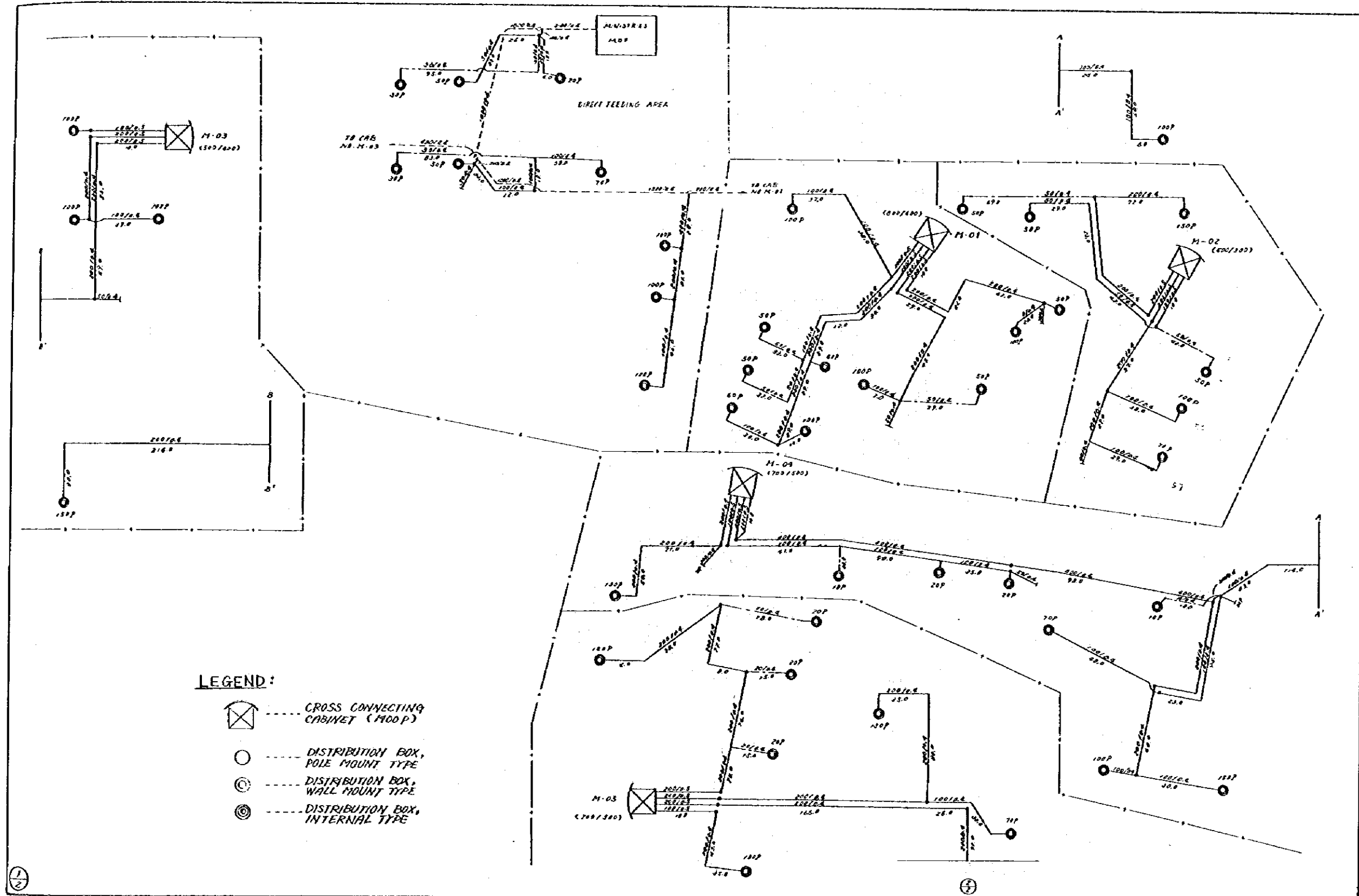
20. Project Performance Audit Report  
Ghana - first Telecommunication Project (Loan 1122-GR)  
International Bank for Reconstruction and Development
21. Golden Handbook, Land of The Rising Star
22. Summary Report on Household, Economic Survey, 1974 - 1975.
23. Towards Structural Adjustment Volume I, The Main Report
24. Towards Structural Adjustment Volume II, Statistical Appendix
25. Progress of Economic Recovery Programme 1984 - 1986  
And Policy Framework 1986 -1988
26. Economic Recovery Programme, 1984 - 86  
Review of Progress in 1984 and Goals For 1985, 1986
27. 1984 Population Census of Ghana  
Preliminary Report
28. Technical Specification
29. Input - Output Table of Ghana, 1968, Central Bureau of Statistics,  
1973.
30. Sources and Method of Estimation of National Income at Current  
prices in Ghana, 1971, Central Bureau of Statistics.
31.
  - 1) Request of Replacement of PABX for Ministries Area
  - 2) Minutes of Discussions on The Rehabilitation Project of  
Telecommunications External Line Plant, In the Republic of Ghana
  - 3) Flouchart Showing Detailed Procedures of  
New Telephone Installation Up to The Time of Issue of First Bill
  - 4) Teaching Equipment ( including Measuring Apparatus)
  - 5) Telecommunications Engineering School,  
Schedule of Courses for Financial Year, 1986
  - 6) - D.P. Record  
- Exchange Time Fault Card

- 7) Organization Chart of Posts & Telecommunications Corporation
- 8) Organisation Chart of Posts & Telecommunications Corporation
- 9) Reconciliation Interim Report
- 10) Description of Types of Activity in Areas
- 11) Particulars of Chambers
- 12) New Switches under IBRD Project
- 13) Indenture
32.
  - 1) Specimen for Cable D.P. Record (2 sheets)
  - 2) Specimen for D.P. Record (2 sheets)
  - 3) Specimen for Weekly Fault Analysis Record
  - 4) Specimen for Cable Card
33.
  - 1) Cost Estimation of PVC Pipe
  - 2) The State of The Economy 1
  - 3) -ditto- 2
  - 4) -ditto 3
  - 5) Economic Recovery Programme, 1984 - 86,  
Review of Progress in 1984 and Goals for 1985, 1986
34.
  - 1) Faulty Cable Pairs for Junction Cable, as of 5/ 4/83
  - 2) Maintenance and Operation Staff
    - ACCRA NORTH LINE DISTRICT
    - ACCRA CENTRAL LINE DISTRICT
    - CANTONMENTS LINE DISTRICT
  - 3) Restoration of Underground Telephone Cable Breakdown
35. Individual Underground Cable Faults,  
ACCRA LINE DISTRICT, 1/Jan. -31/Oct.,1986
36.
  - 1) Memorandum of Revision of Unit Prices for Cable Civil Works  
under the World Bank Project Cable Contract for TAKORADI

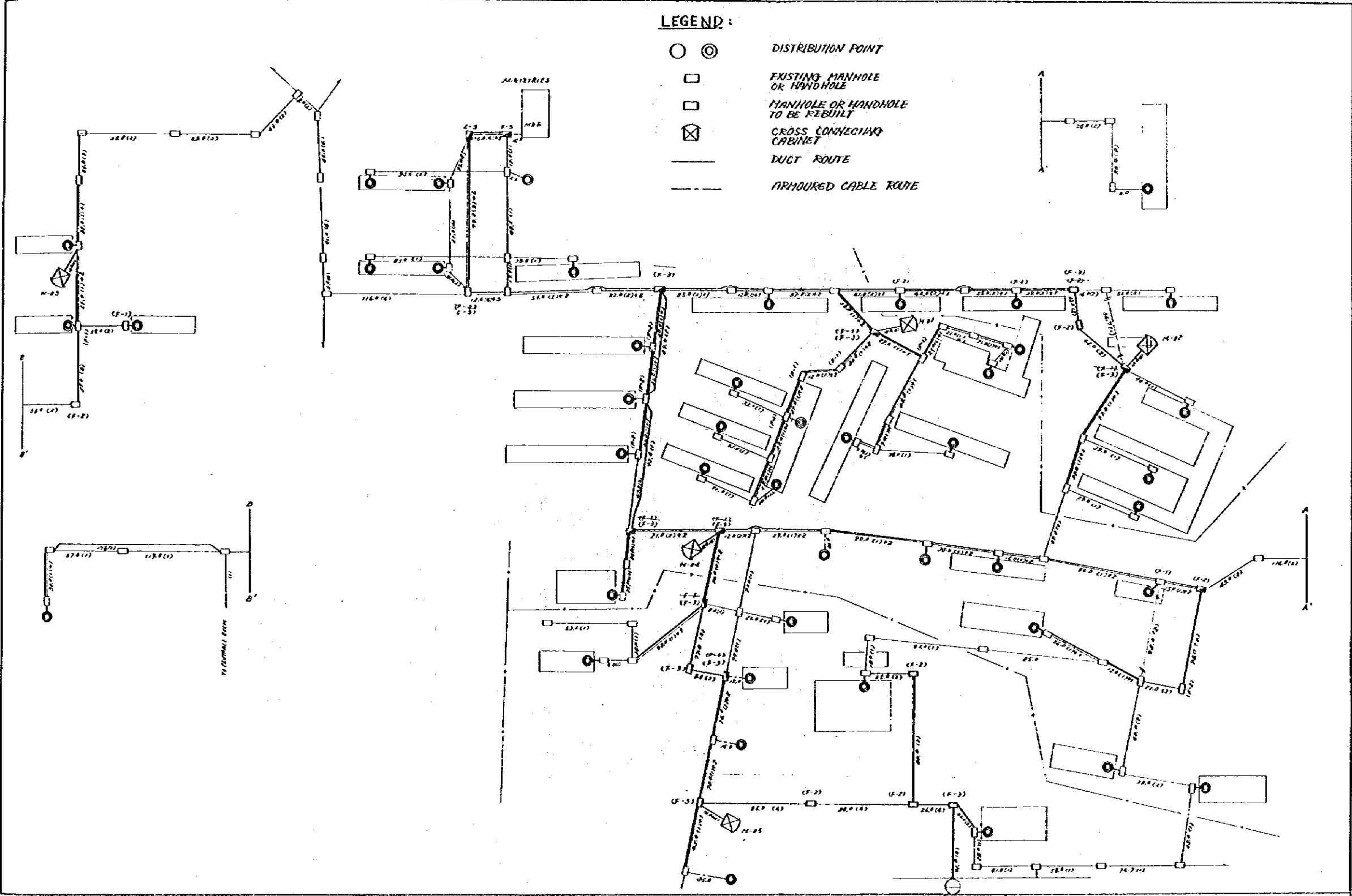
- 2) Population Statistics, Population and Telephone Demand Forecasts
- 3) P&T Corporation, External Plant Staff Strength, As of 10/ 3/86
- 4) Staff Disposition as of 31/ 5/86, Telecommunication Division
- 5) Establishment Schedule
- 6) Accra Central Cable Project, Scope of Work
- 7) Contract for Cable Project Cantonments Area, ACCRA  
Clause 3(a) - Price Adjustment, Jan. 24, 85
- 8) Contract for Cable Project Cantonments Area, ACCRA  
Clause 3(a) - Price Adjustment, Jan. 13, 86
- 9) Rate of Pay in Government Departments in Ghana, 29 Oct. 86
- 10) Cost of Reinstating Asphaltic Concrete Surfaced Roads  
after cutting per Linear Metre, High-Way Authority
- 11) Price of Steel Pipe, Gihoc Steelworks Co.,Ltd.
- 12) Price of Air Conditioner, Ghana Sanyo
- 13) Statistical Service Law, 1985, P.N.D.C.L. 135
- 14) New Charges - Effective from Telecommunication Charges,  
First Schedule, Inland Telephone Charges
- 15) Basic Prices of Materials, March, 1986, Architectural &  
Engineering Service Corporation, Quantity Survey Division
- 16) New Wages Bases on 90.00 A Day Minimum Wage,  
Effective from Jan.1986
- 17) Revision of Hire Rates, State Construction Corporation,  
6th February, 1986
- 18) Water Tariffs, 1986
- 19) Electricity Corporation of Ghana, Tariff Increases  
from April 1986
- 20) Schedule of Rates for Building Works, March, 1986  
Architectural and Engineering Service Corporation



# **DRAWINGS OF BASIC DESIGN**



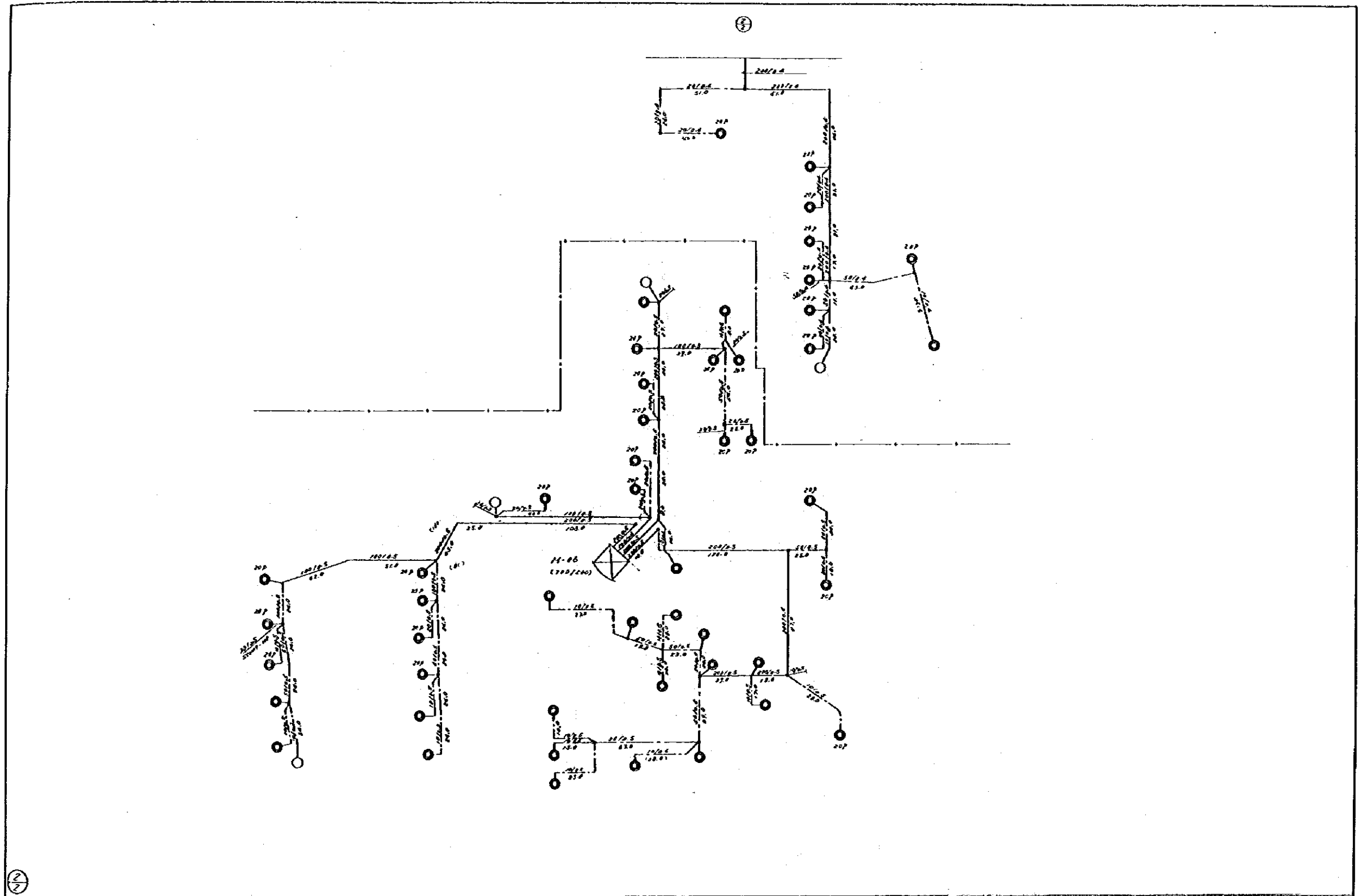




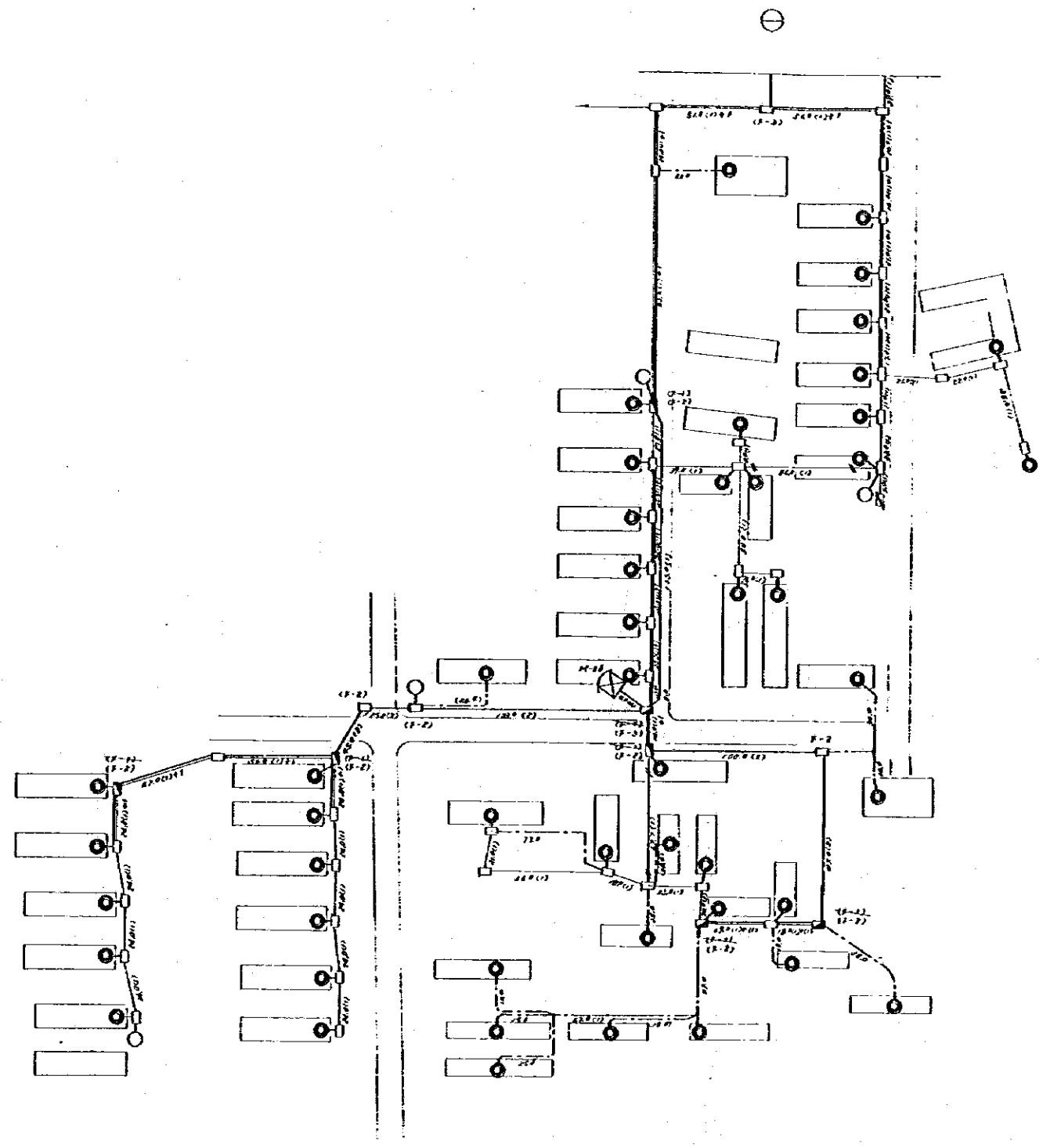
**LEGEND :**

- ⊙ DISTRIBUTION POINT
- EXISTING MANHOLE OR HANDHOLE
- MANHOLE OR HANDHOLE TO BE REBUILT
- ⊗ CROSS CONNECTING CABINET
- DUCT ROUTE
- - - ARMURED CABLE ROUTE

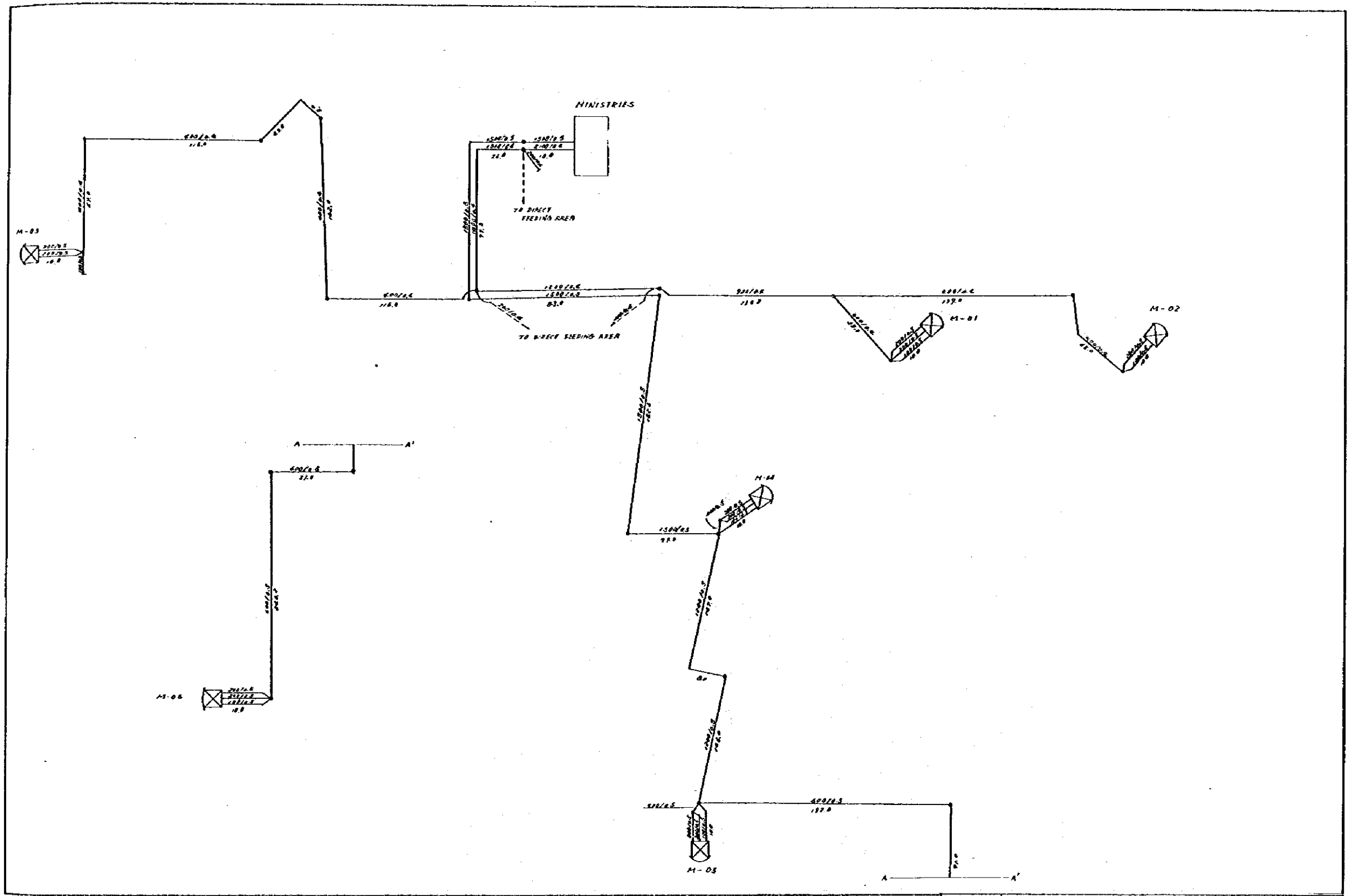
NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (MINISTRIES AREA)			
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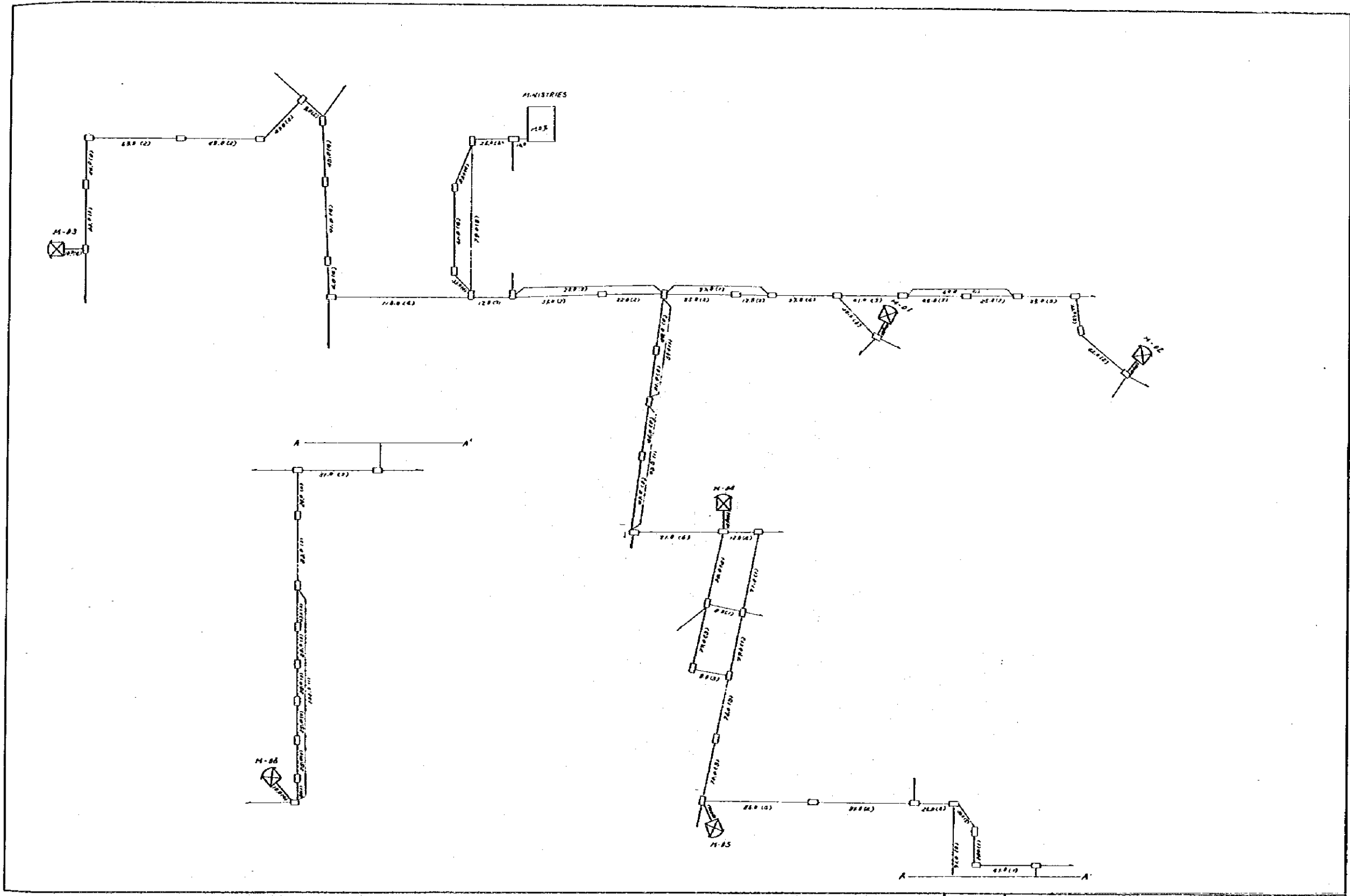
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DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL
			DRAWING NO. . 3



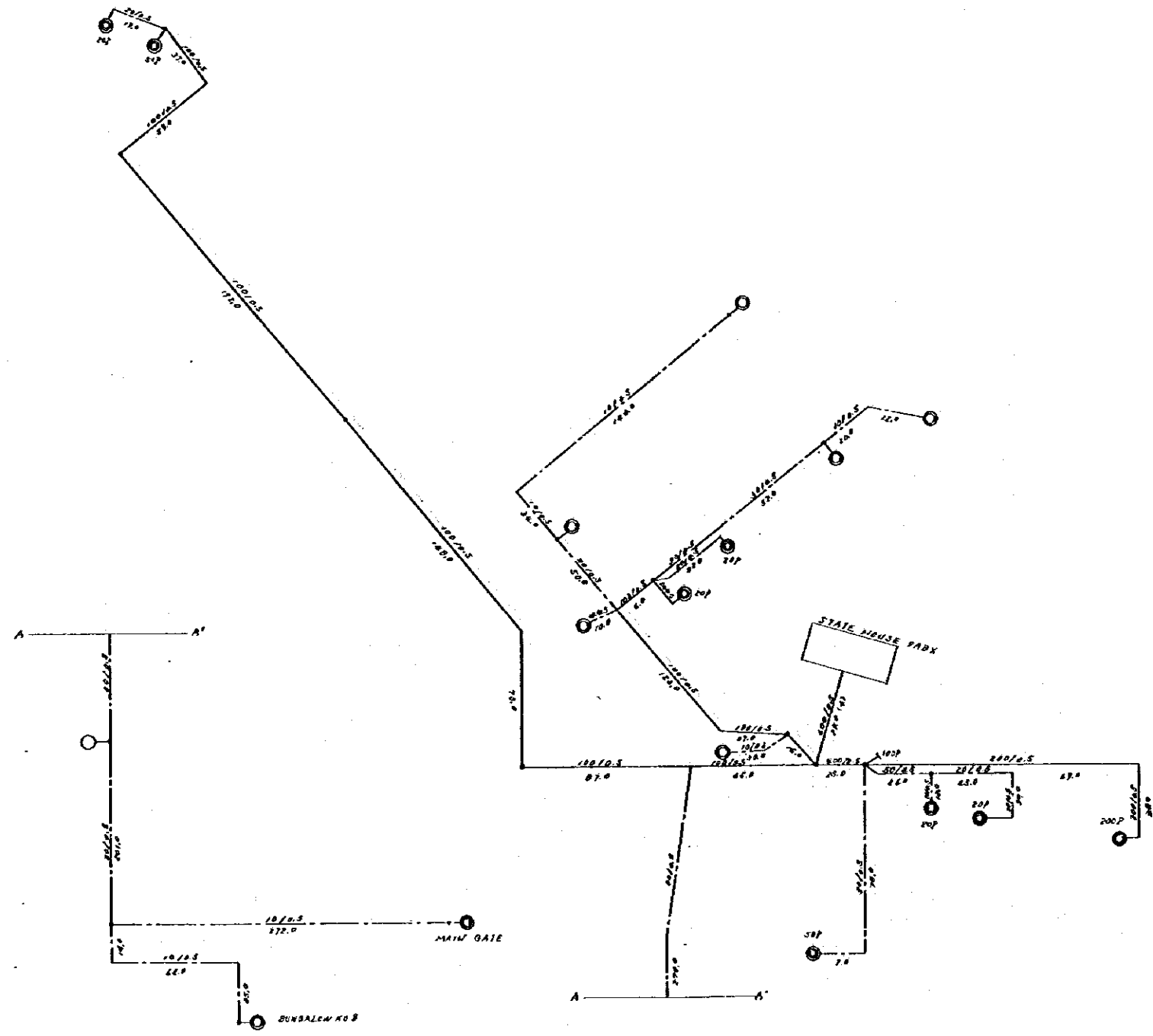
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DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL DRAWING NO. 4



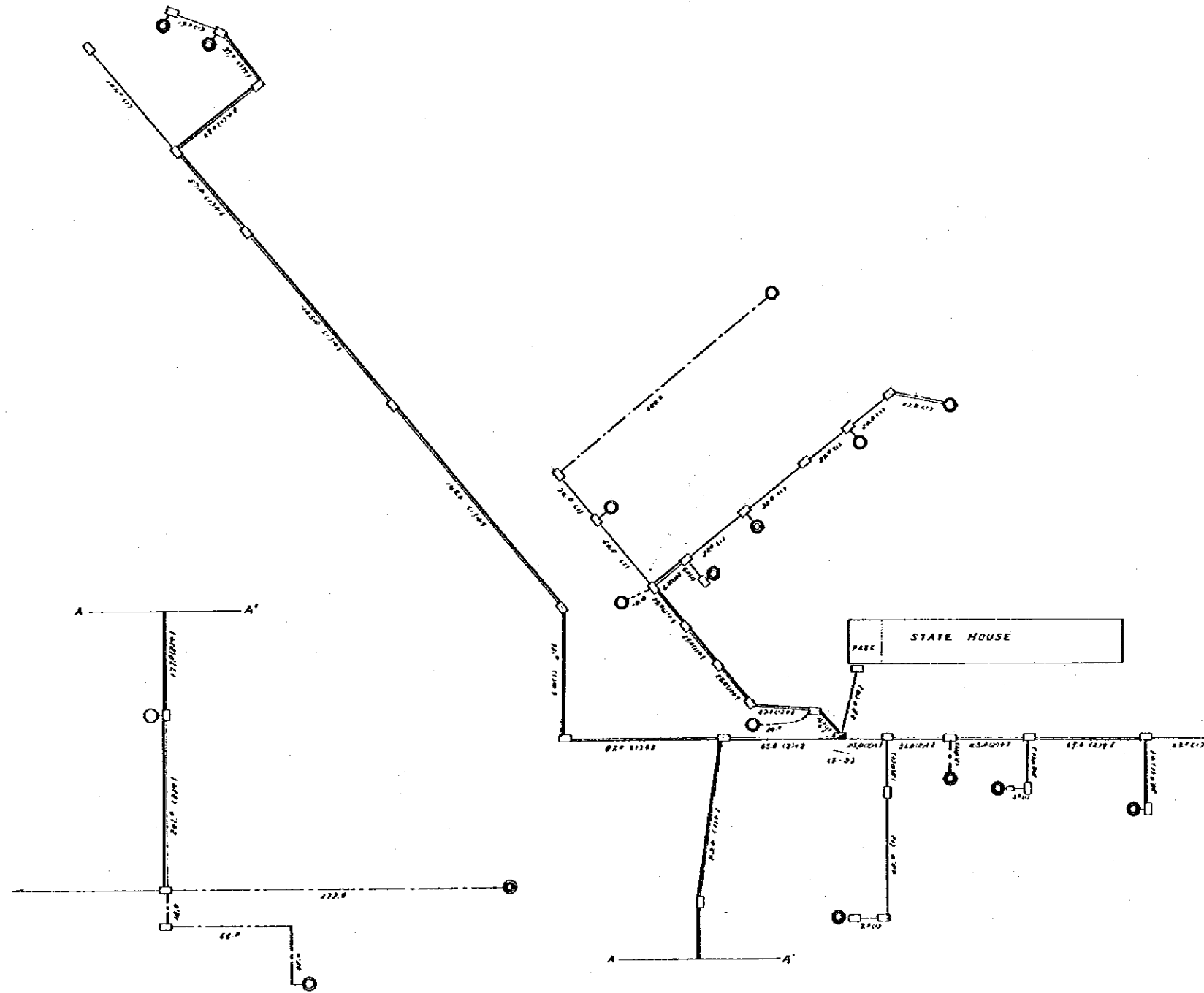
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DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 5



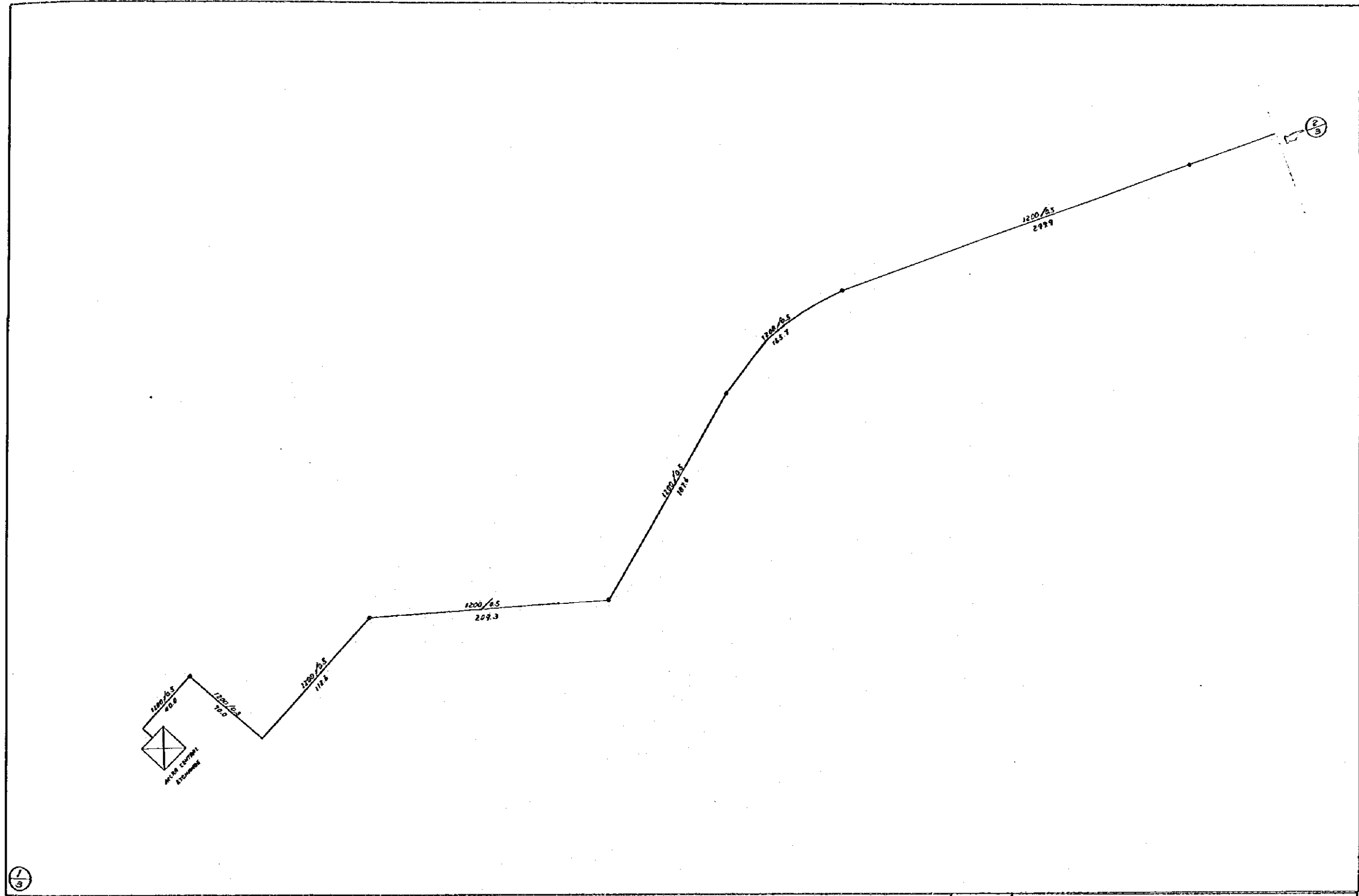
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DATE	FEB. 1987	NAME OF EXCHANGE	ACRA CENTRAL	DRAWING NO. 6



NAME OF DRAWING		BASIC PLAN FOR DISTRIBUTION CABLE (STATE HOUSE AREA)		
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 7

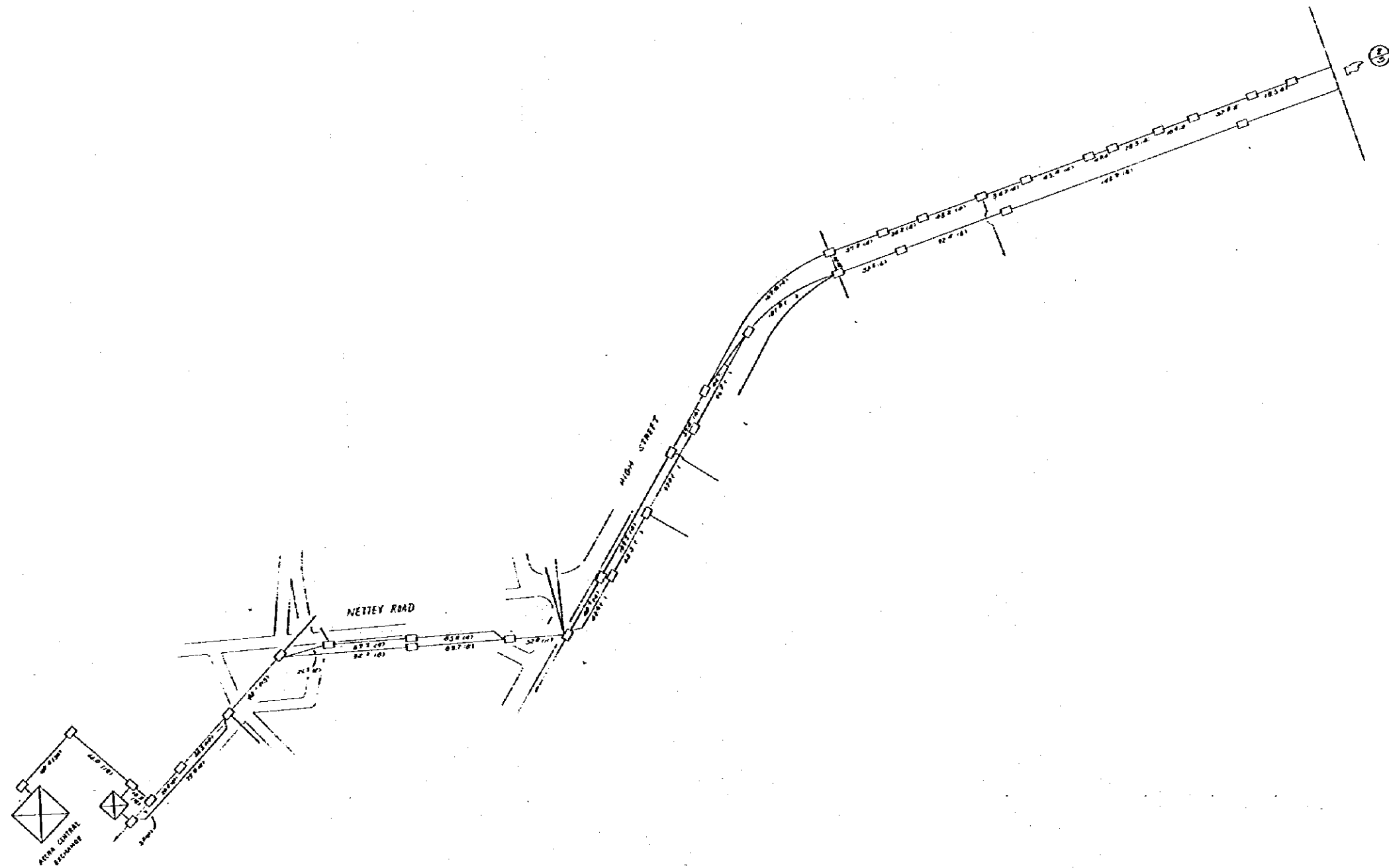


NAME OF DRAWING	BASIC PLAN FOR DIRECT-BURIED AND DUCT ROUTE (STATE HOUSE AREA)			
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 8

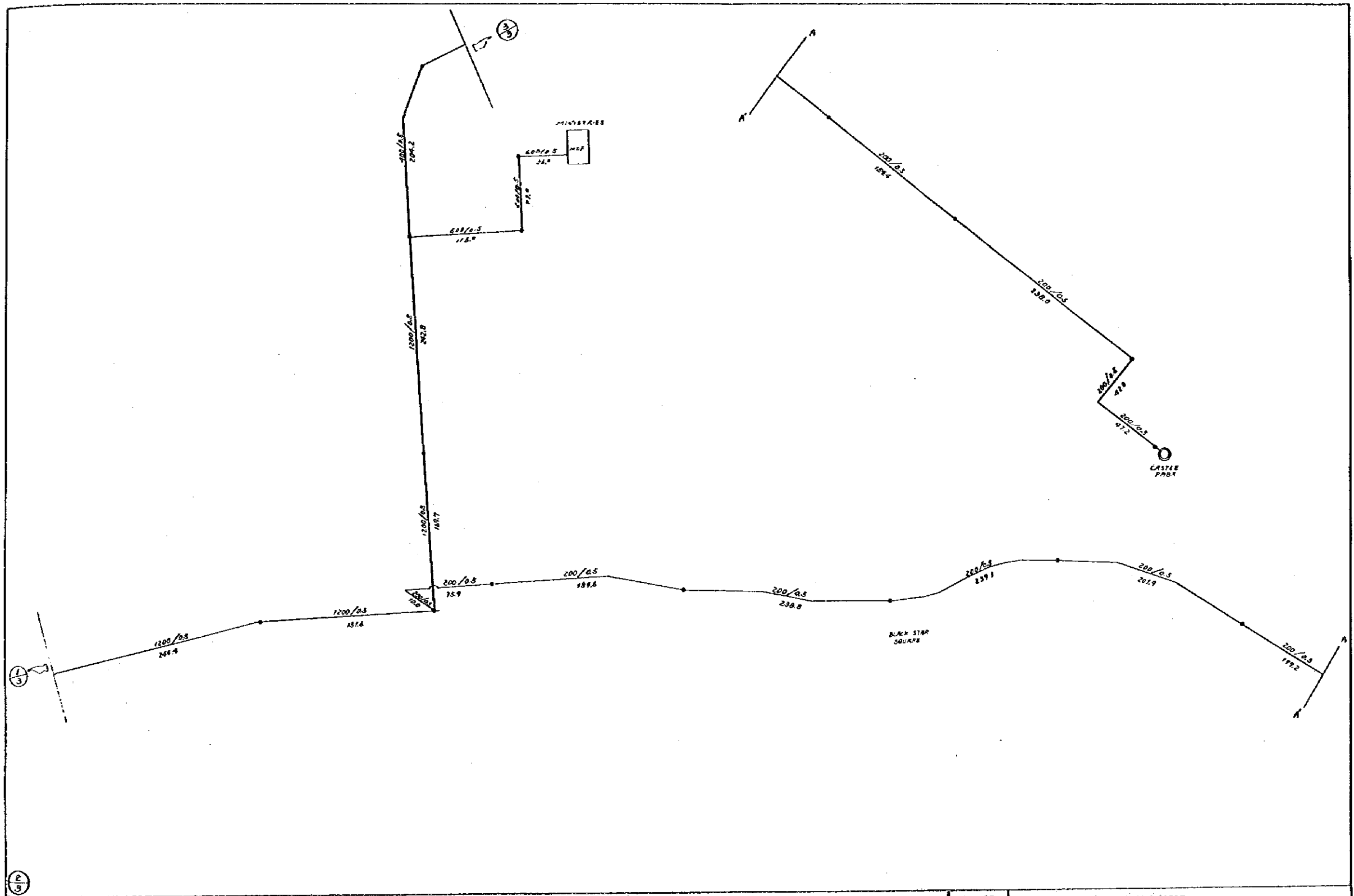


NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE (ACCRA CENTRAL - MINISTRY, STATE HOUSE, CASTLE)		1/3
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL
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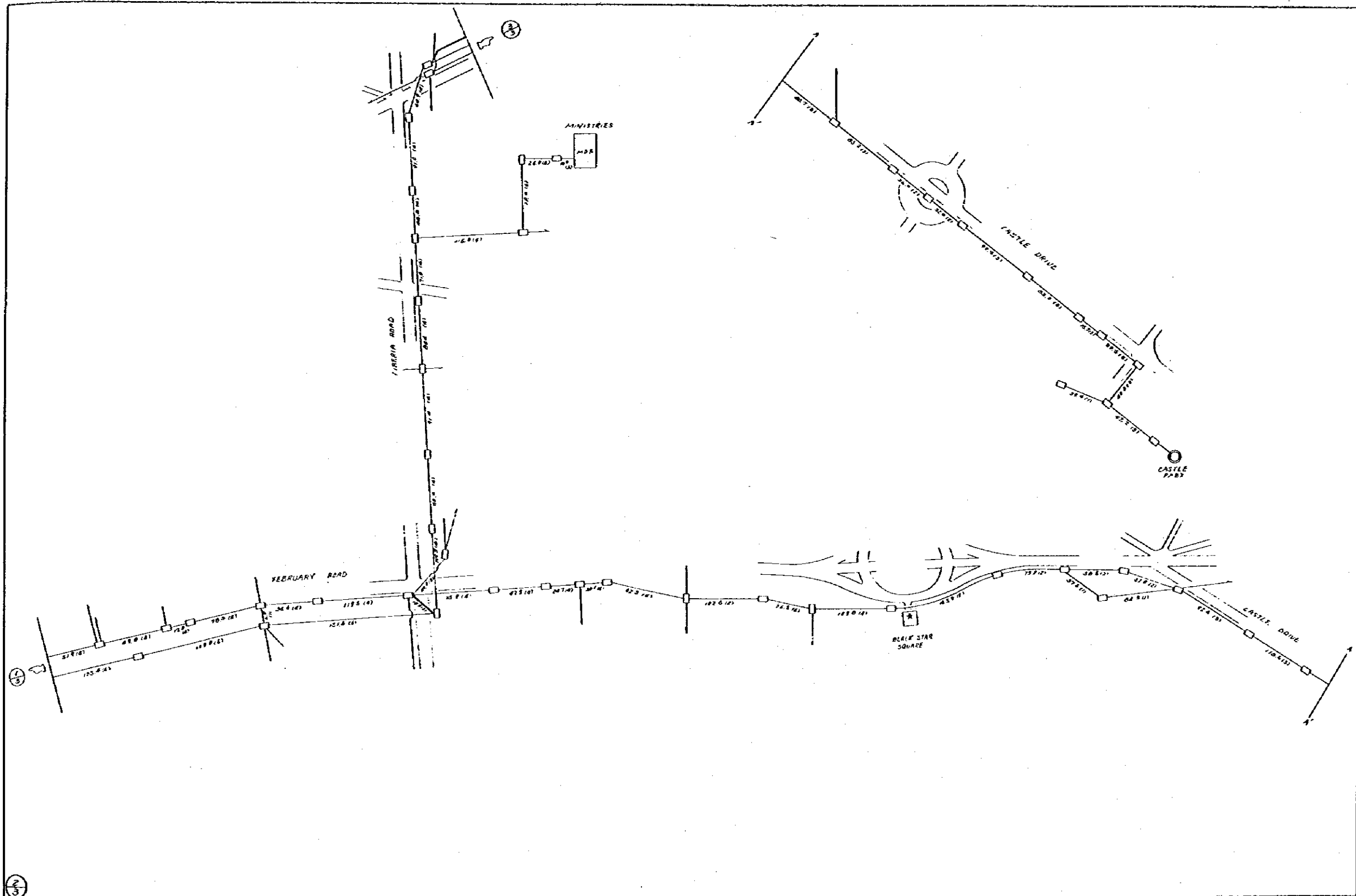




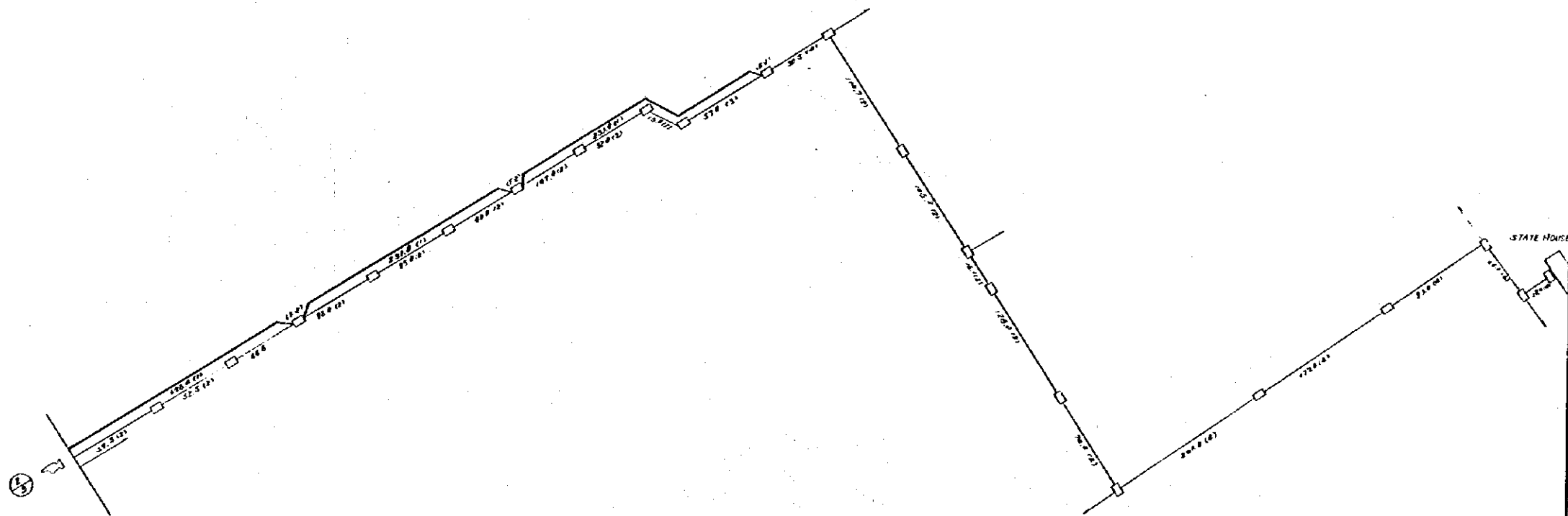
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DATE	FEB. 1967	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 10



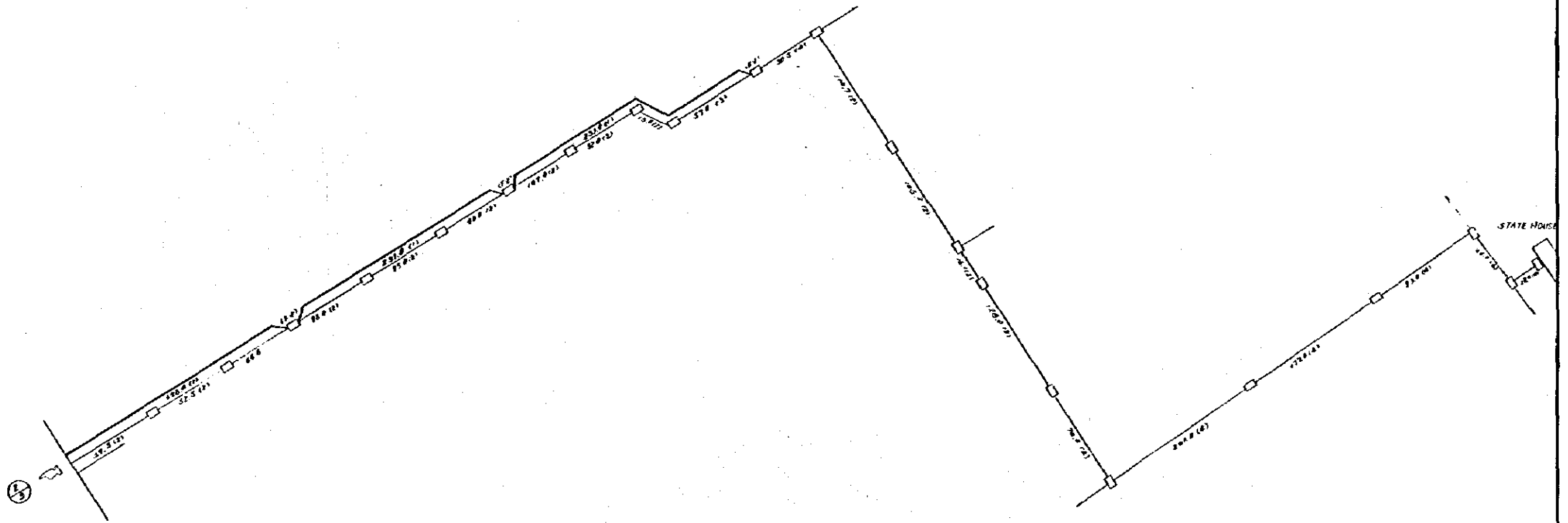
NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE (ACCRA CENTRAL - MINISTRY, STATE HOUSE, CASTLE)				2/3
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO.	11



NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (ACCRA CENTRAL-MINISTRY, STATE HOUSE, CASTLE)			2/3
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 12

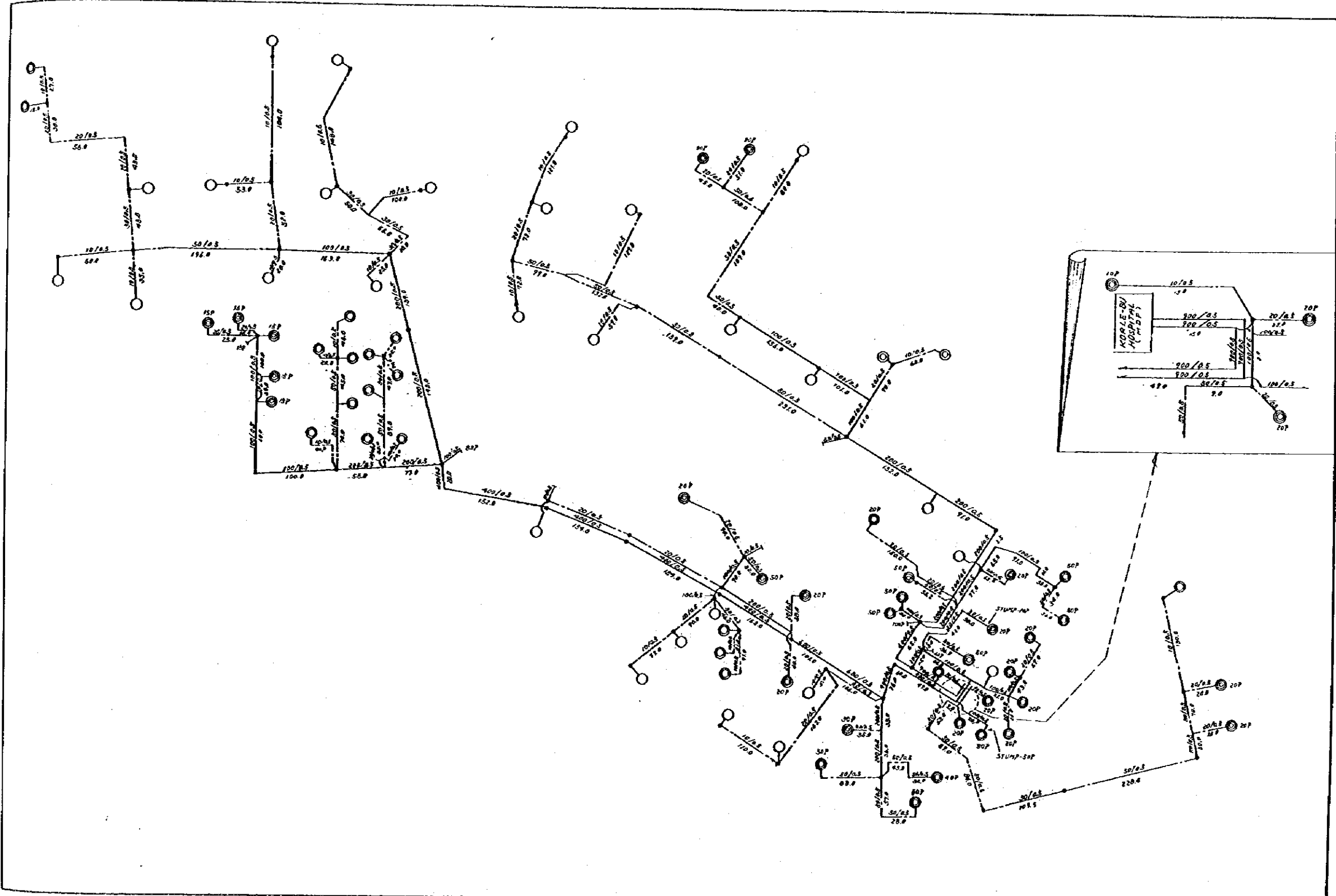


NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (ACCRA CENTRAL- MINISTRY, STATE HOUSE, CASTLE)			3/3
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 14

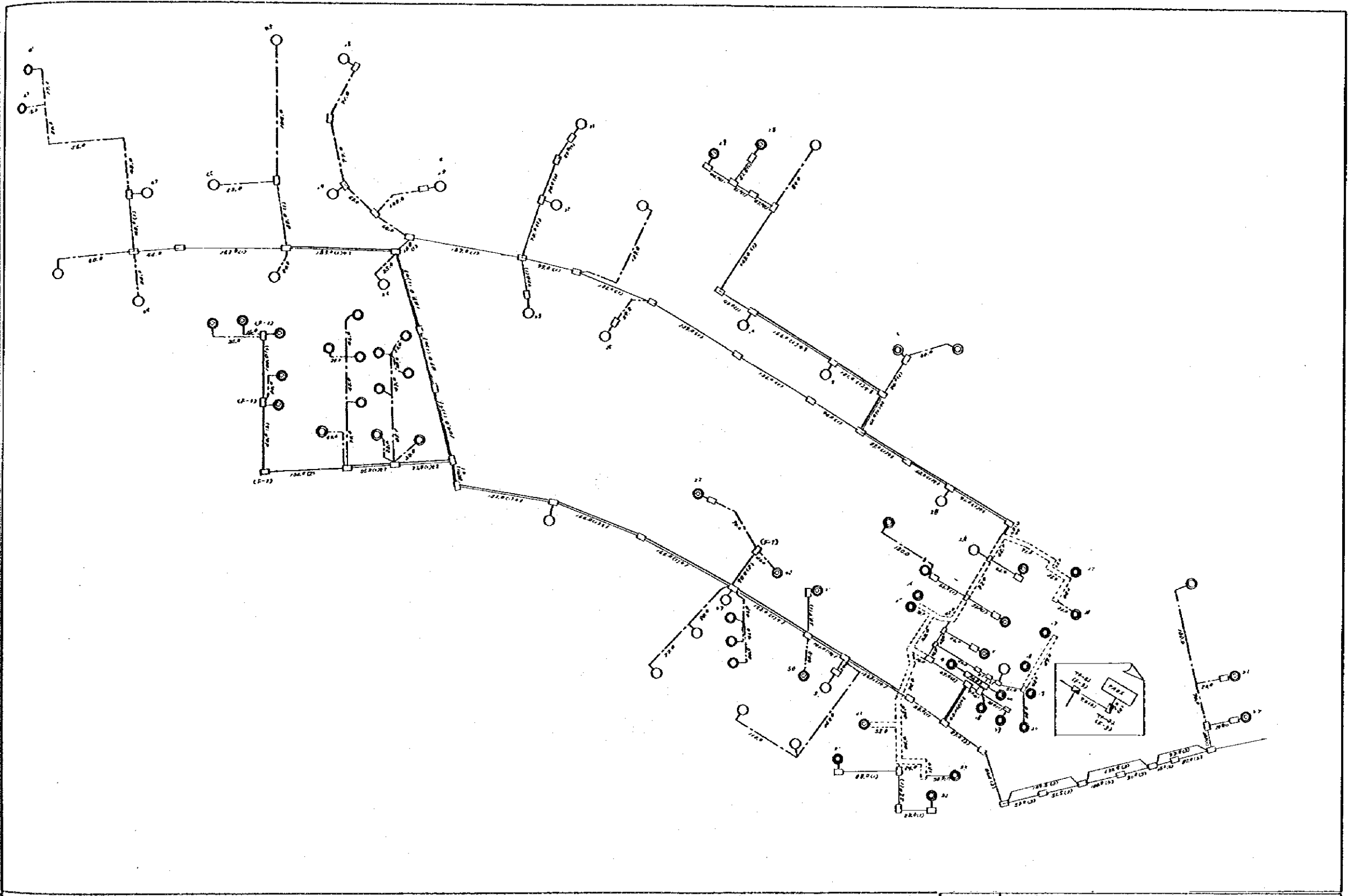


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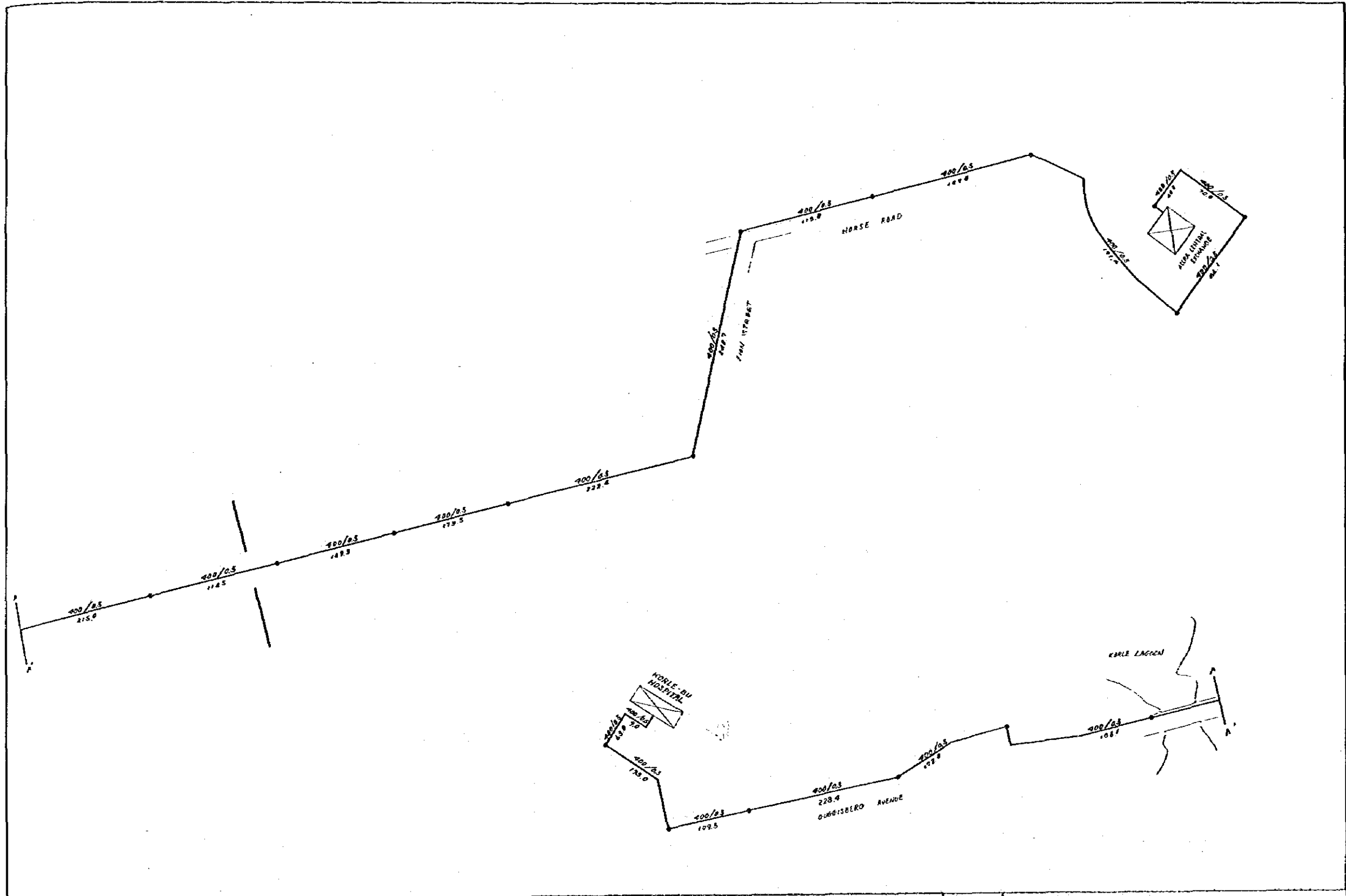
NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (ACCRA CENTRAL- MINISTRY, STATE HOUSE, CASTLE)		3/3
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL
		DRAWING NO.	14



NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (KORLE-BU HOSPITAL AREA)		
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL
			DRAWING NO. 15

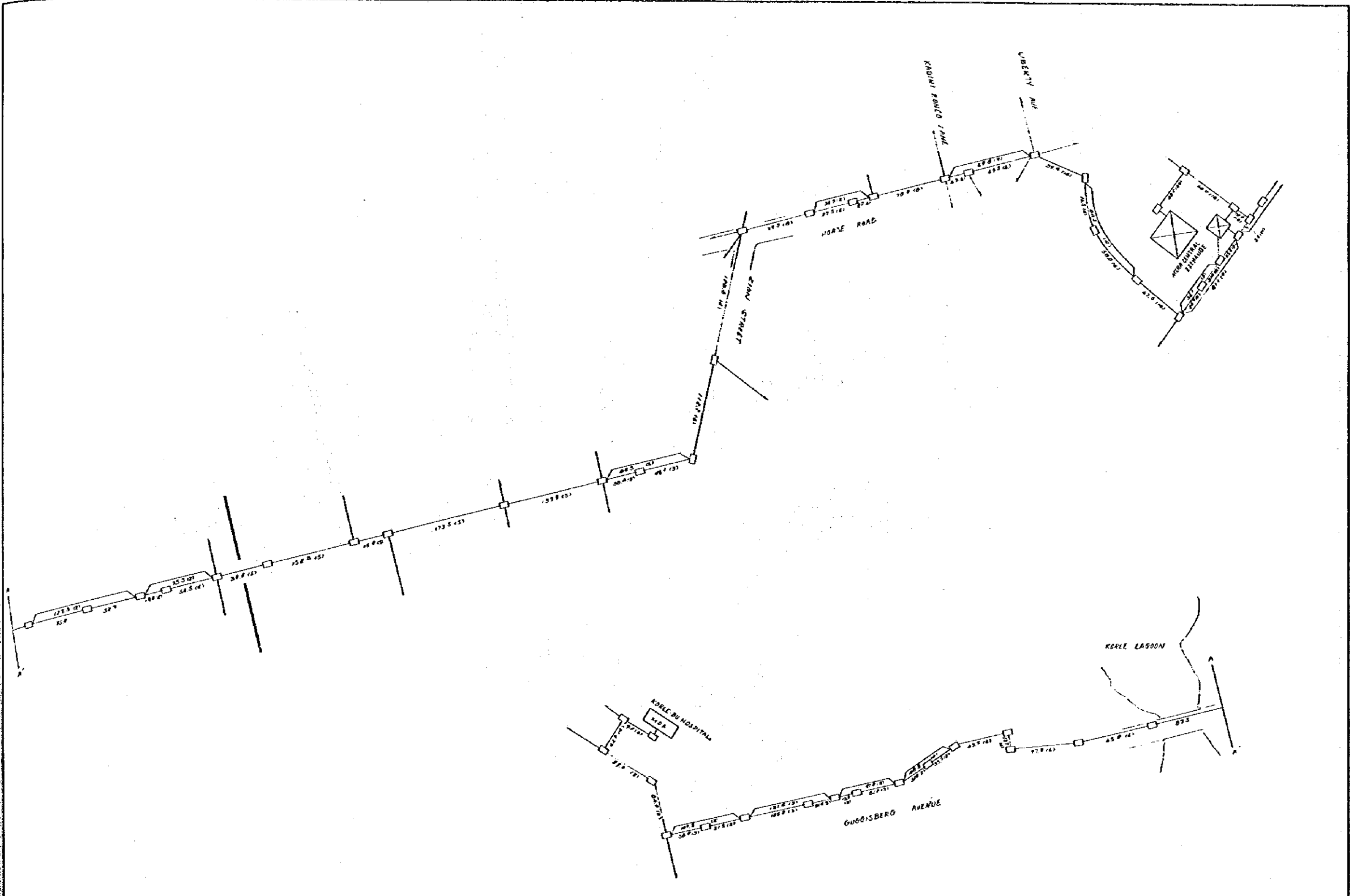


NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (KORLE-BU HOSPITAL AREA)		
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		DRAWING NO.	16

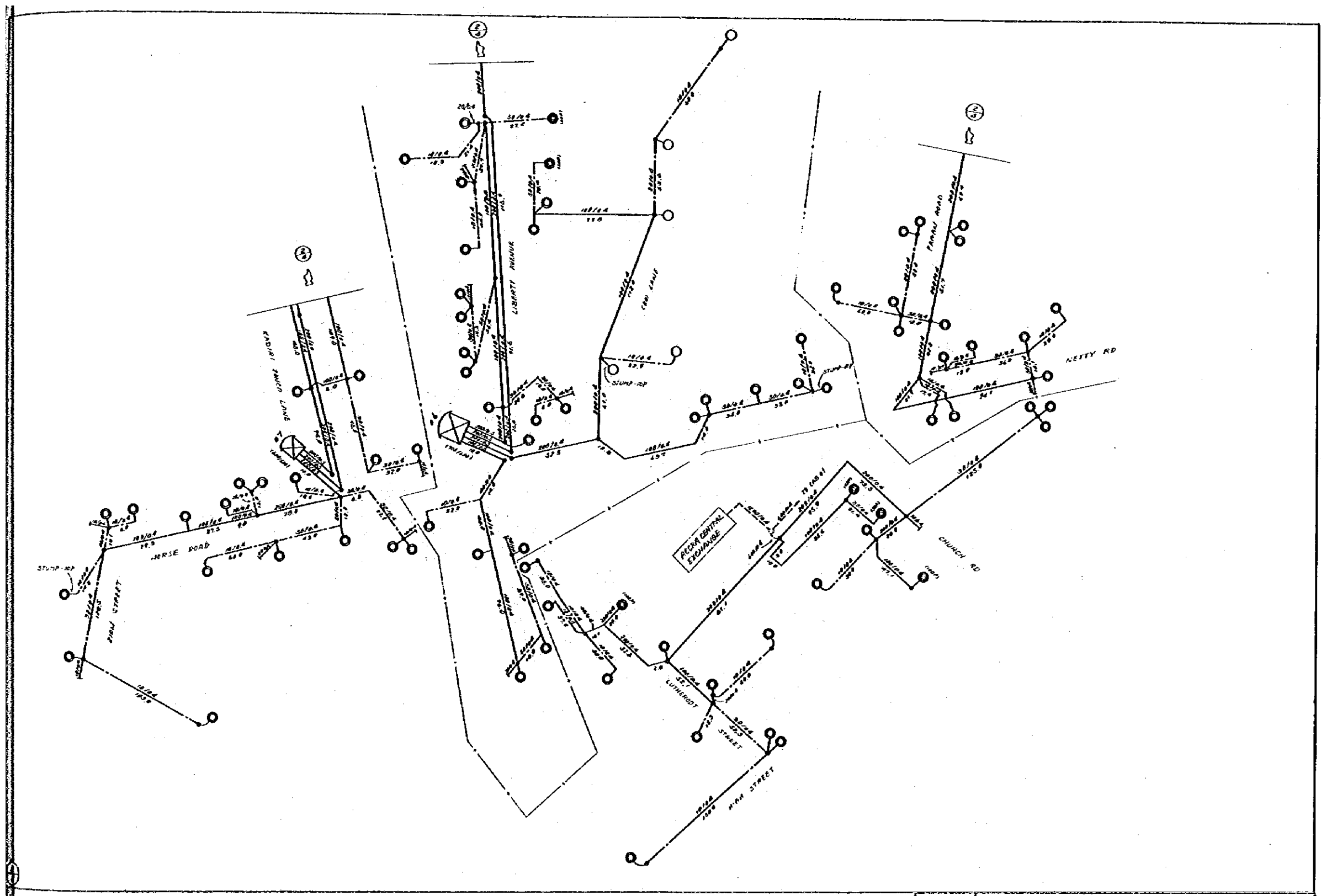


NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE (ACCRA CENTRAL - KORLE-BU HOSPITAL)		
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL
			DRAWING NO. 17

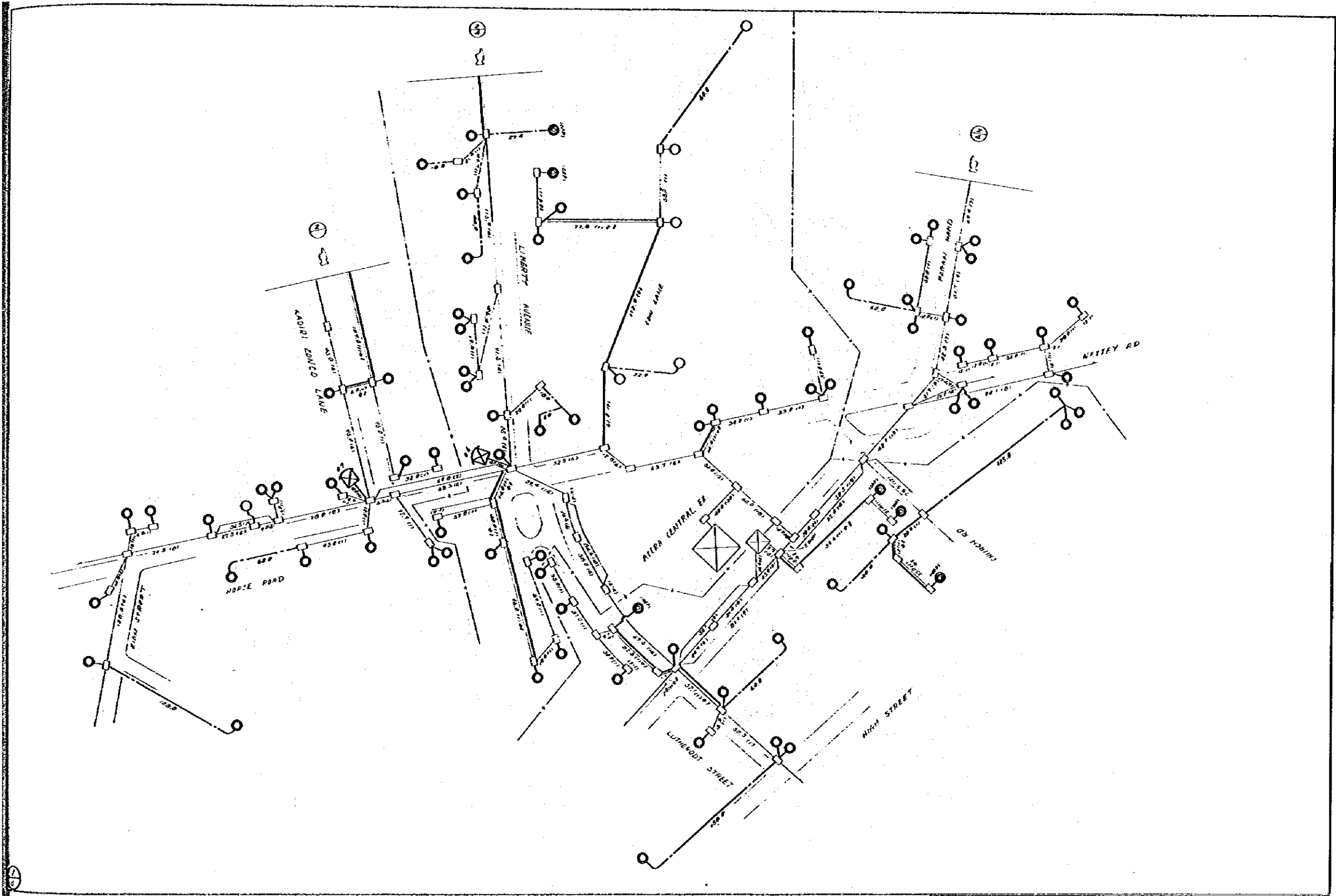




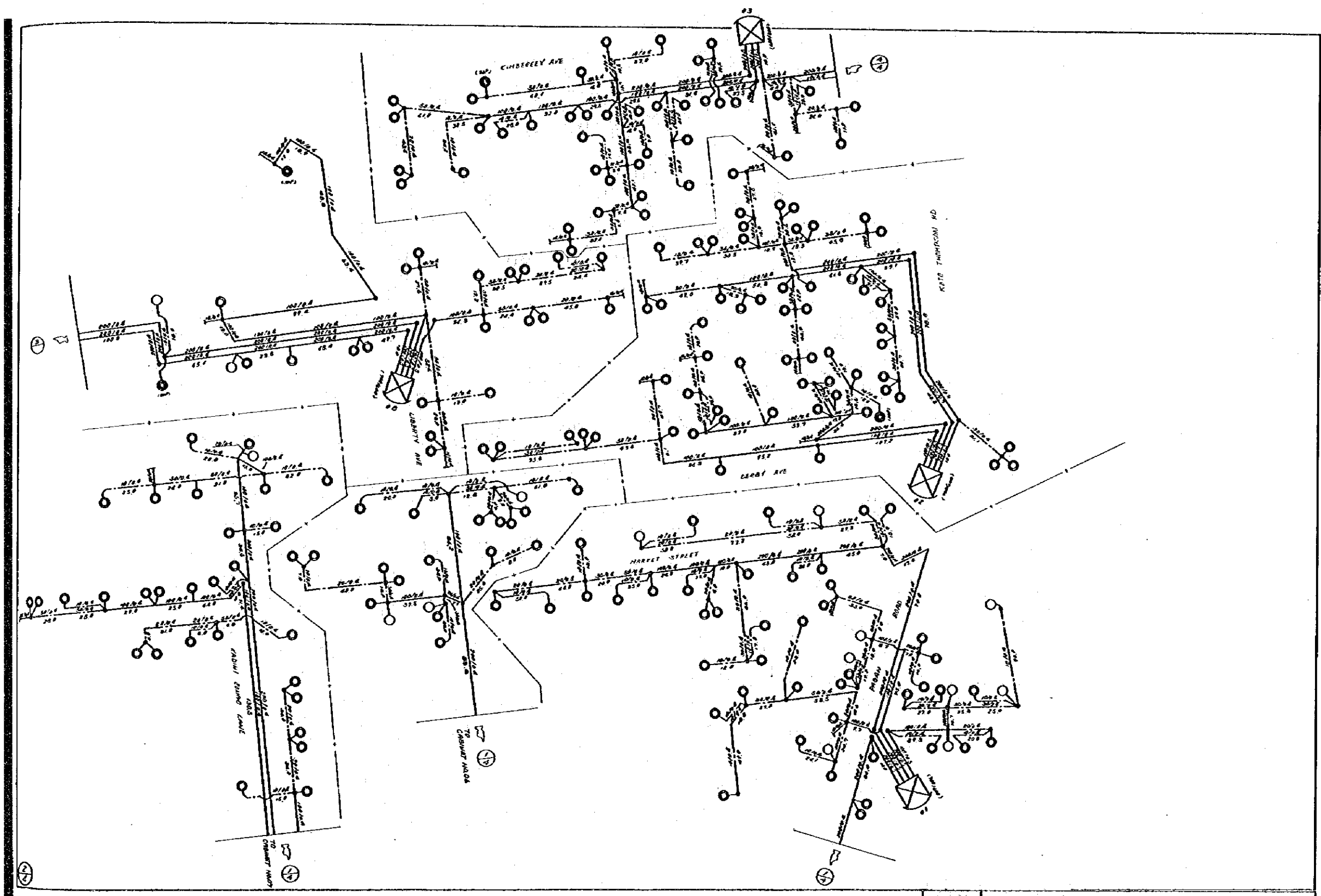
NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (ACCRA CENTRAL - KORLE-BU HOSPITAL)		
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL
			DRAWING NO. 18



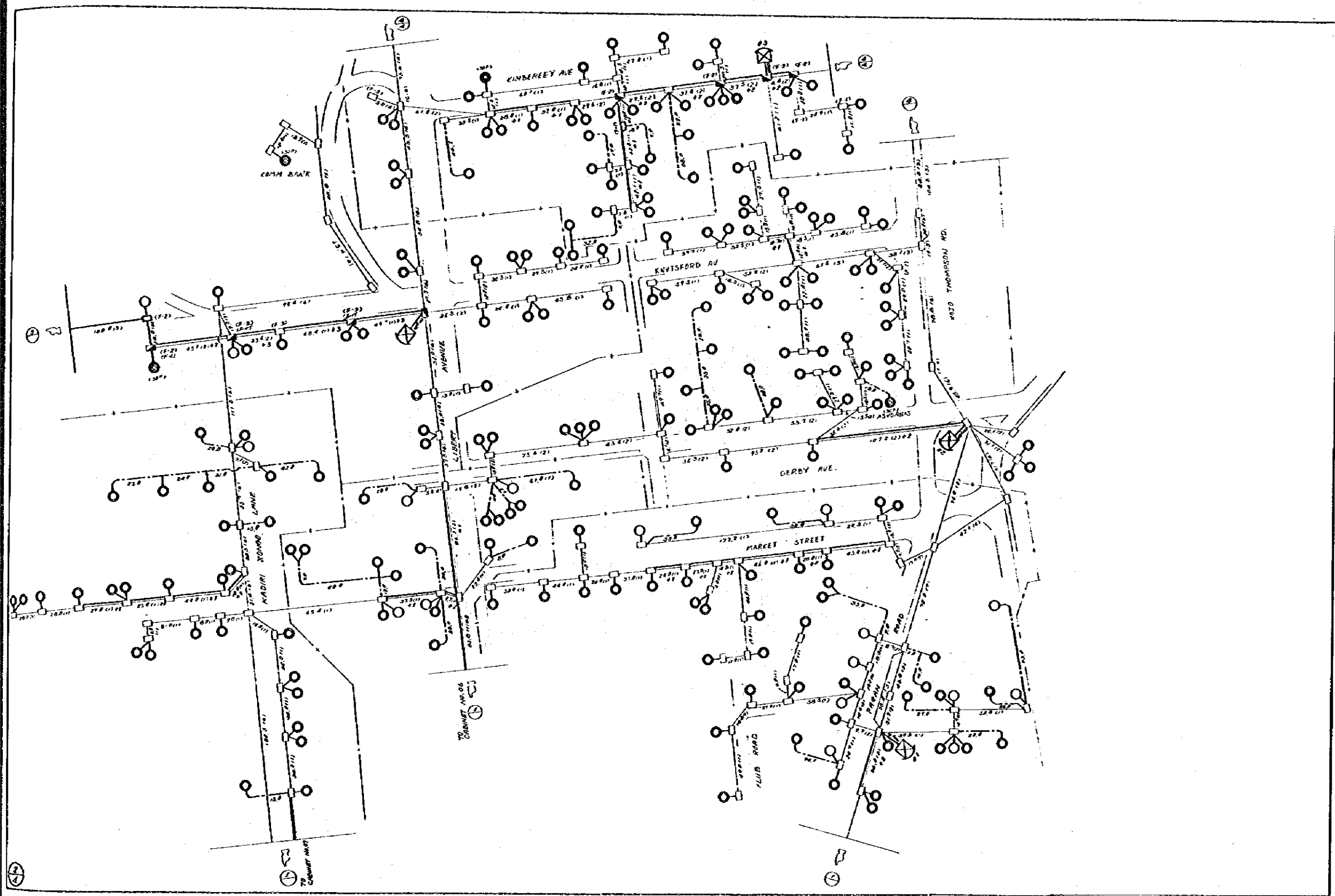
NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (BUSINESS AND COMMERCIAL AREA)			1/4
DATE	FEB. 1937	NAME OF EXCHANGE	ACCPA CENTRAL	DRAWING NO. 19



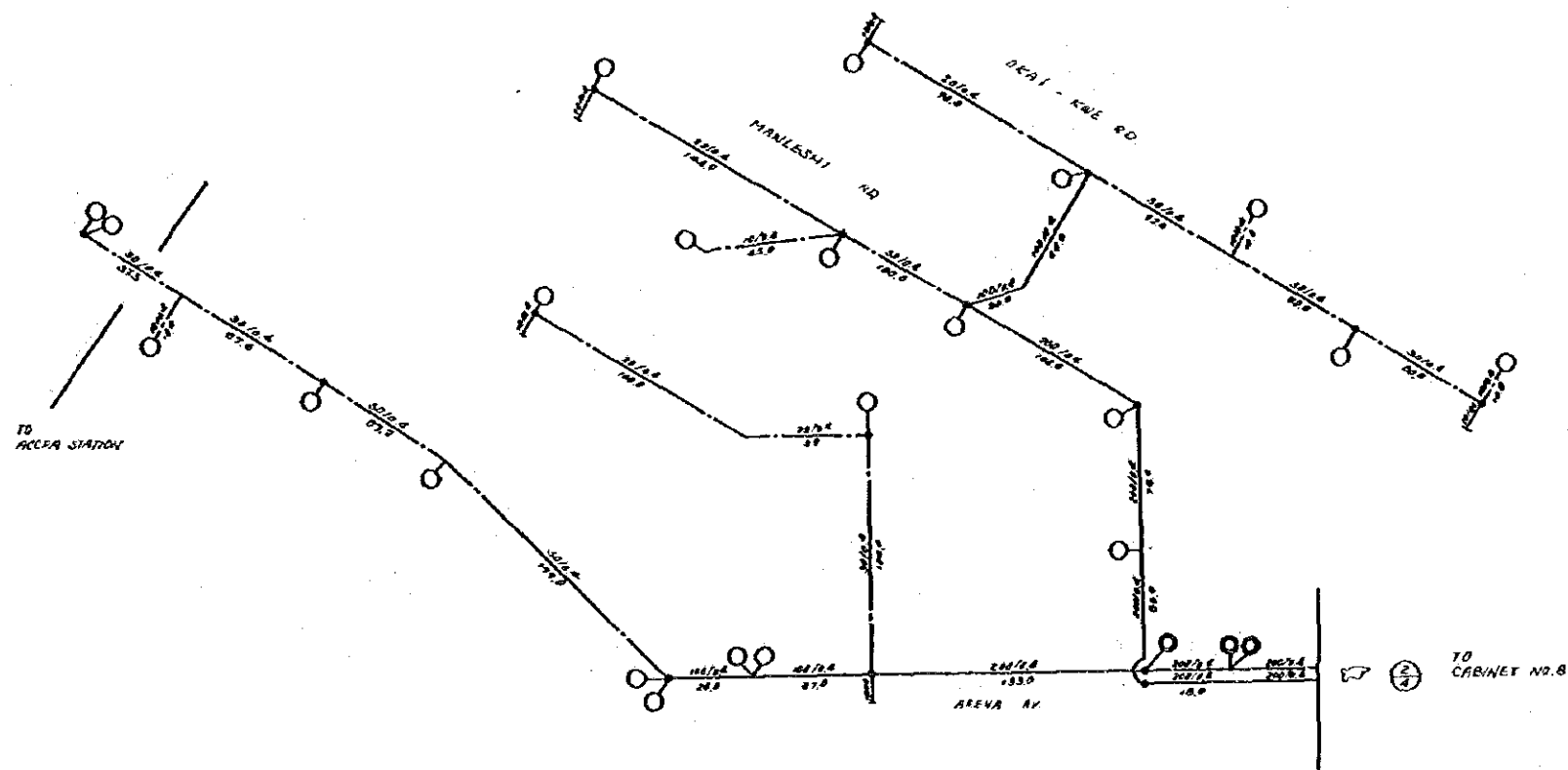
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DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL
		DRAWING NO.	20



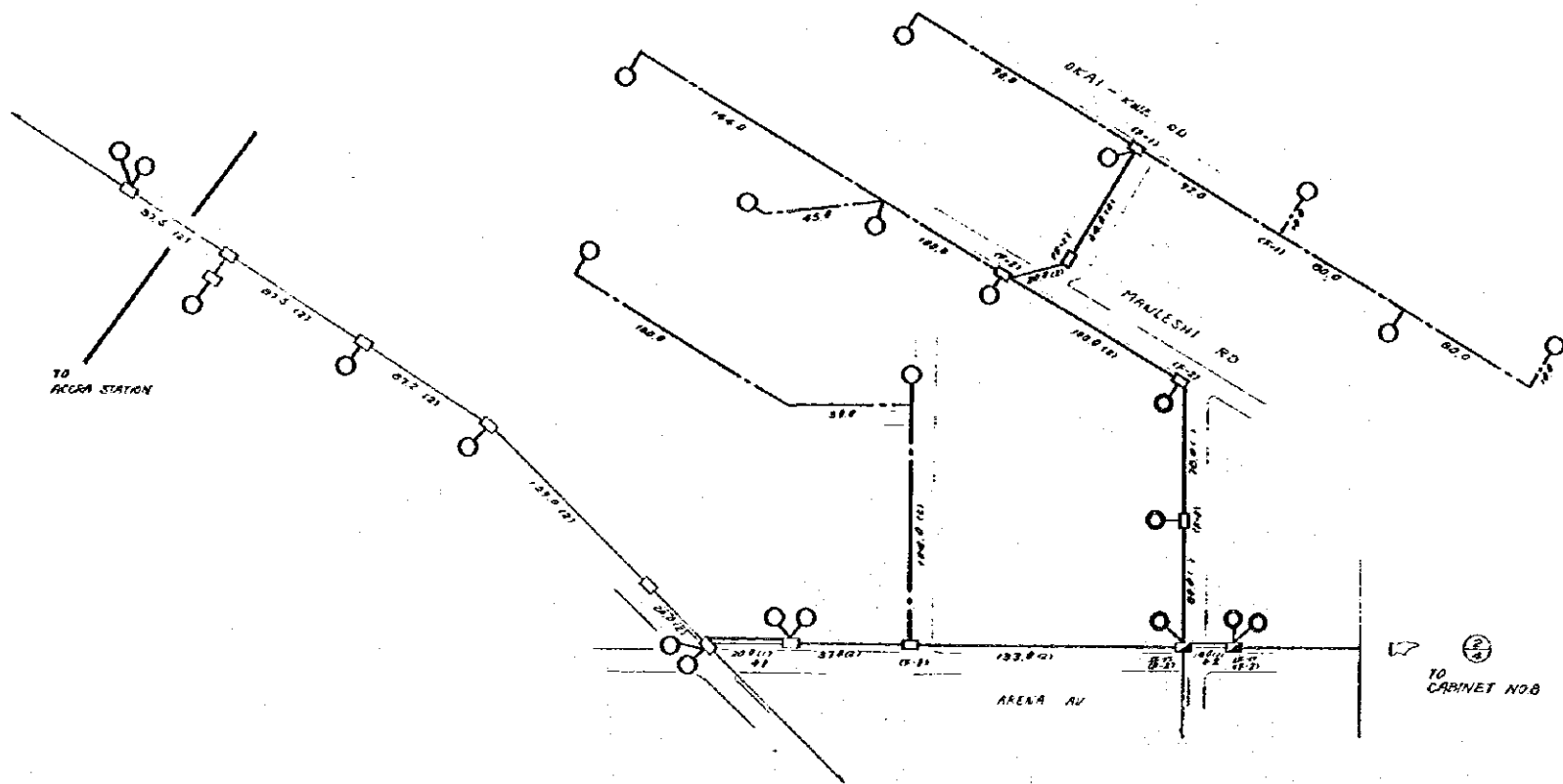
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DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL DRAWING NO. 21



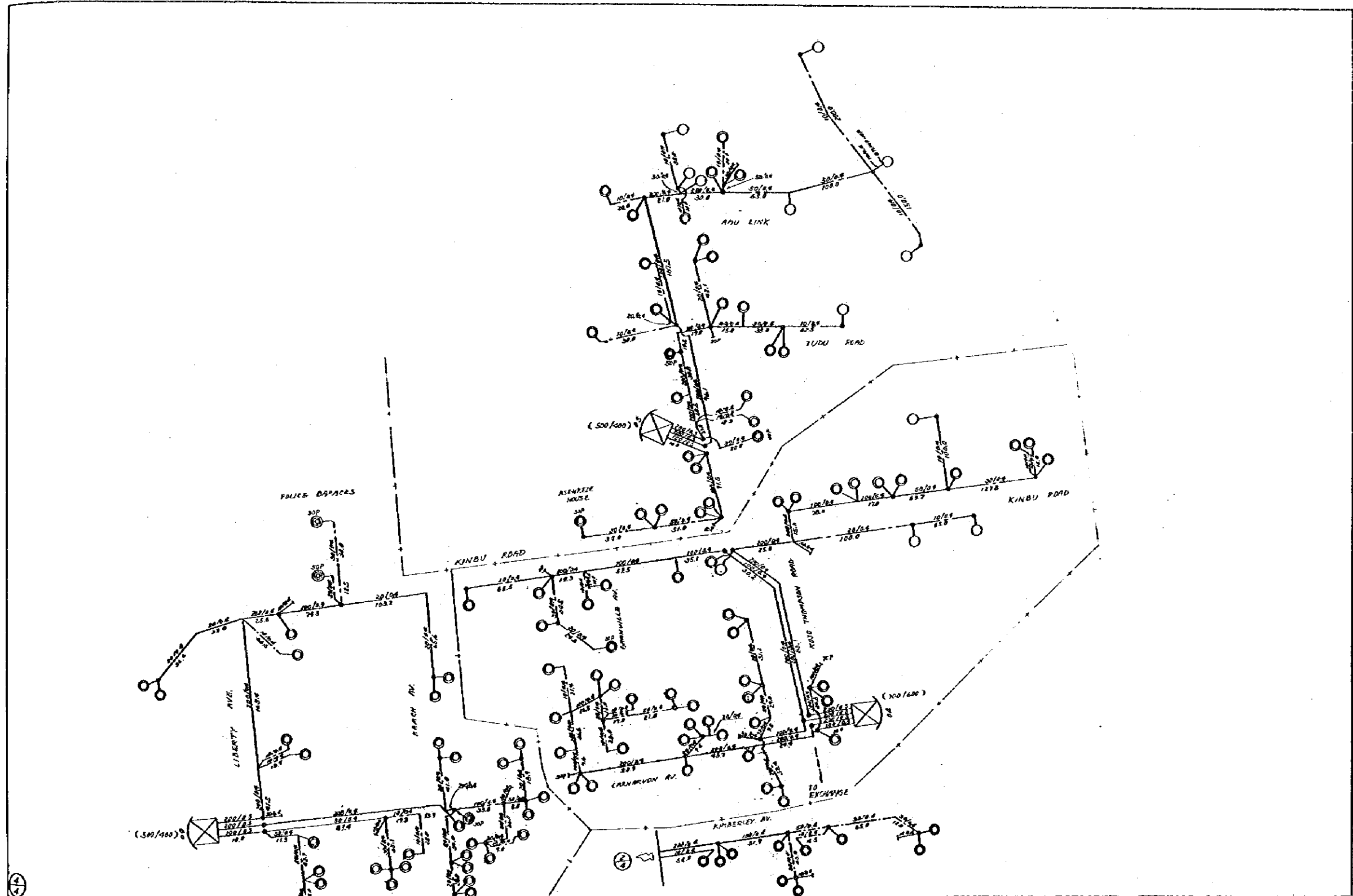
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DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 22



NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (BUSINESS AND COMMERCIAL AREA)			3/4
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 23

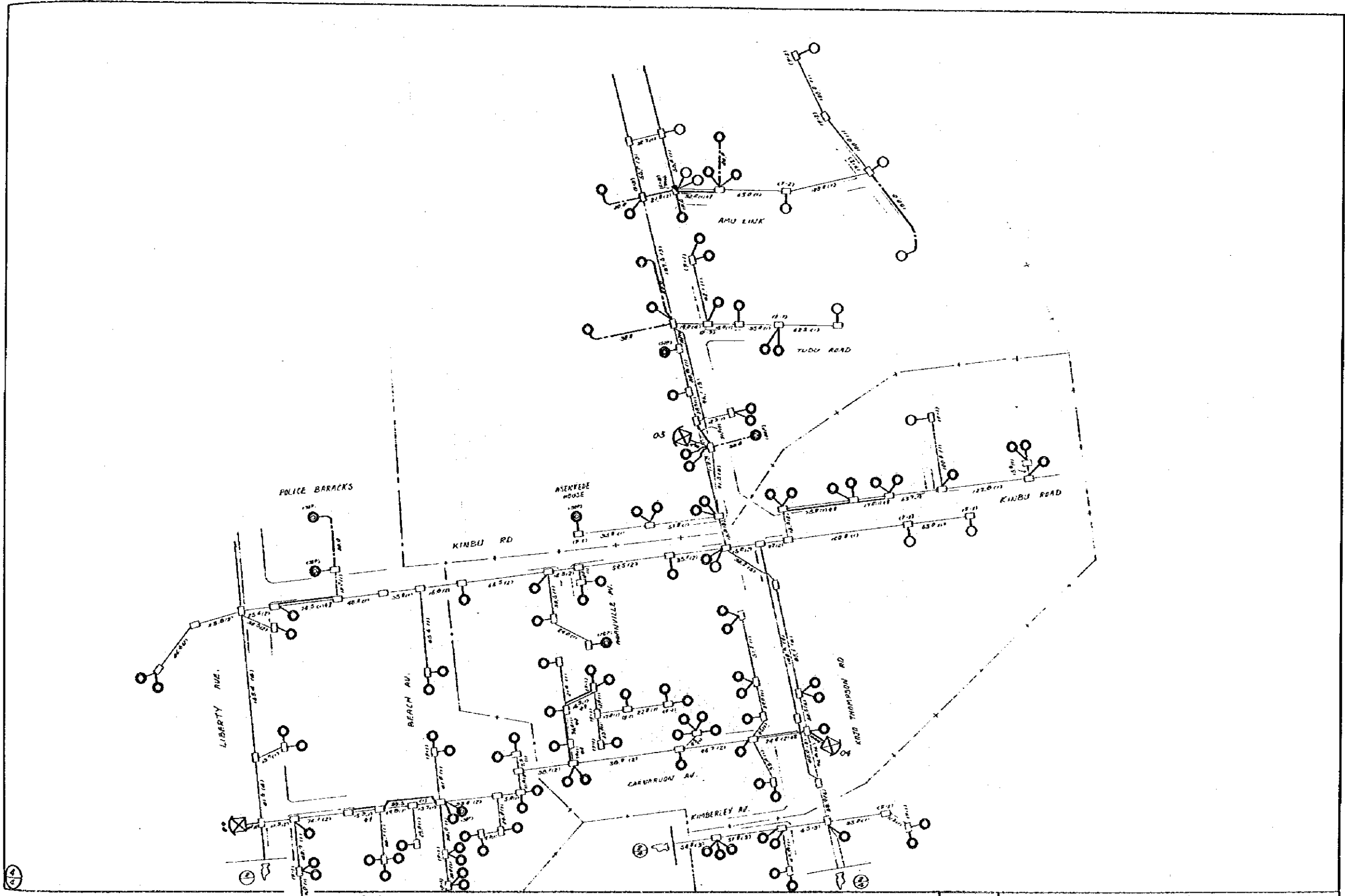


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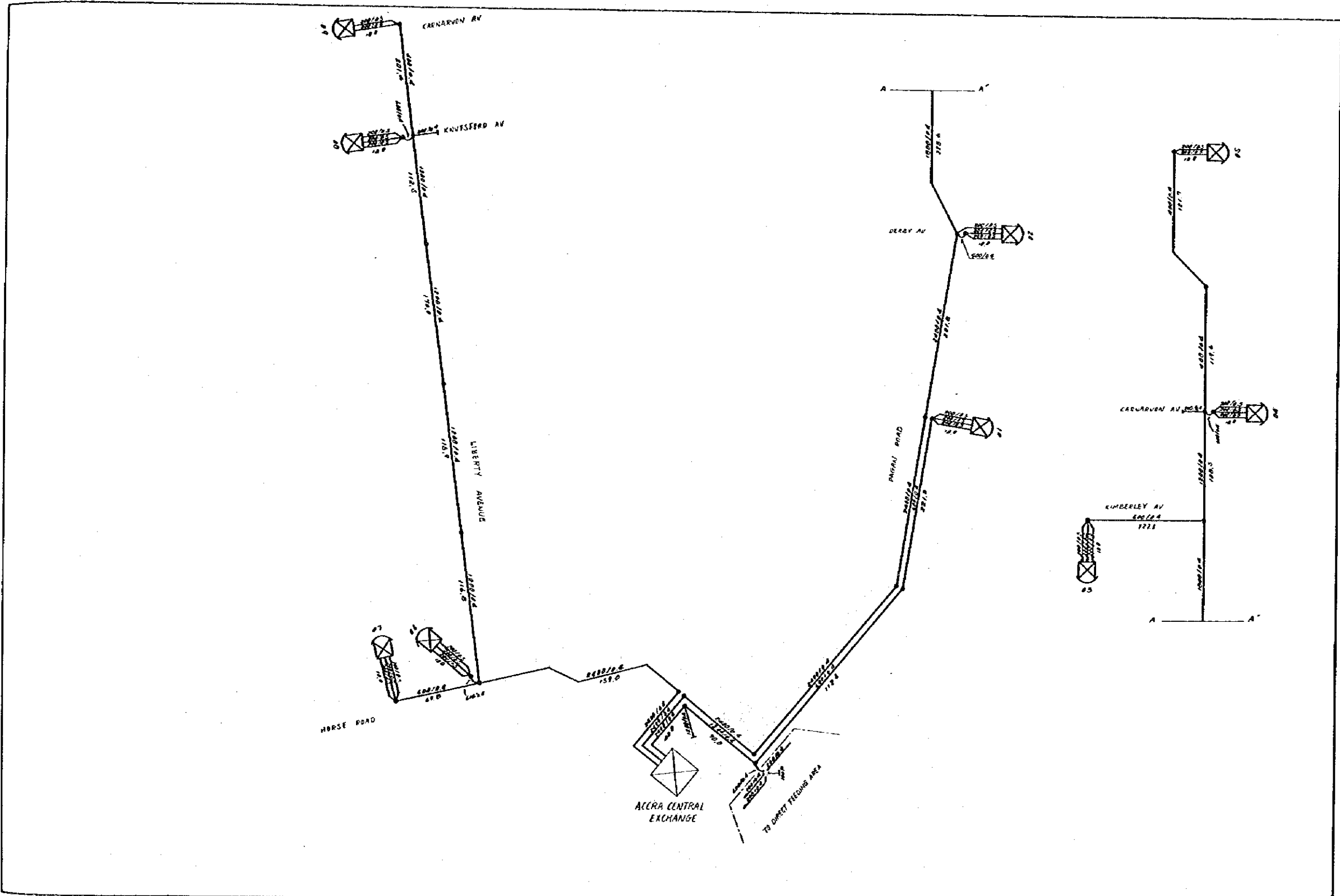


NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (BUSINESS AND COMMERCIAL AREA)		4/4
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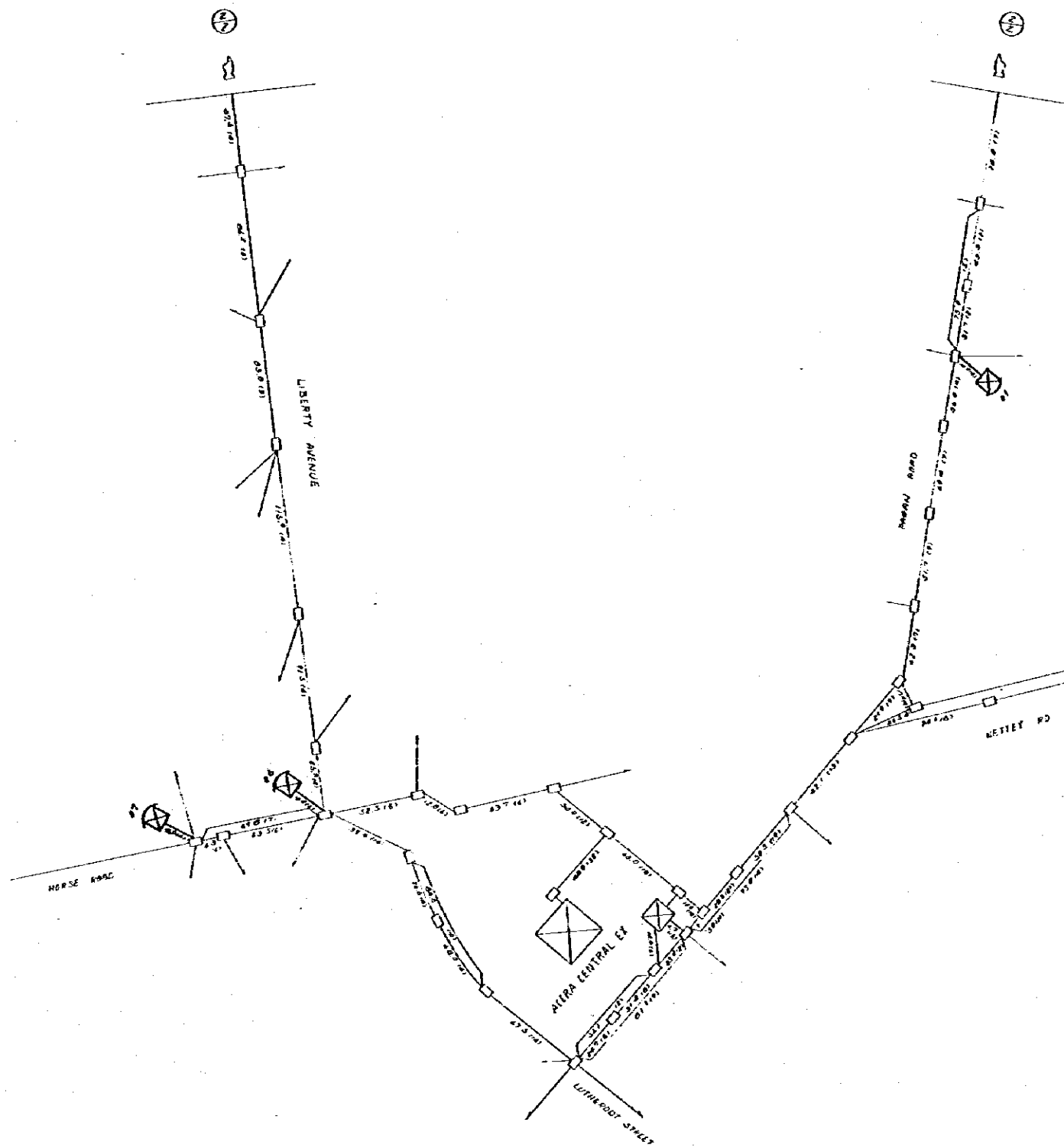




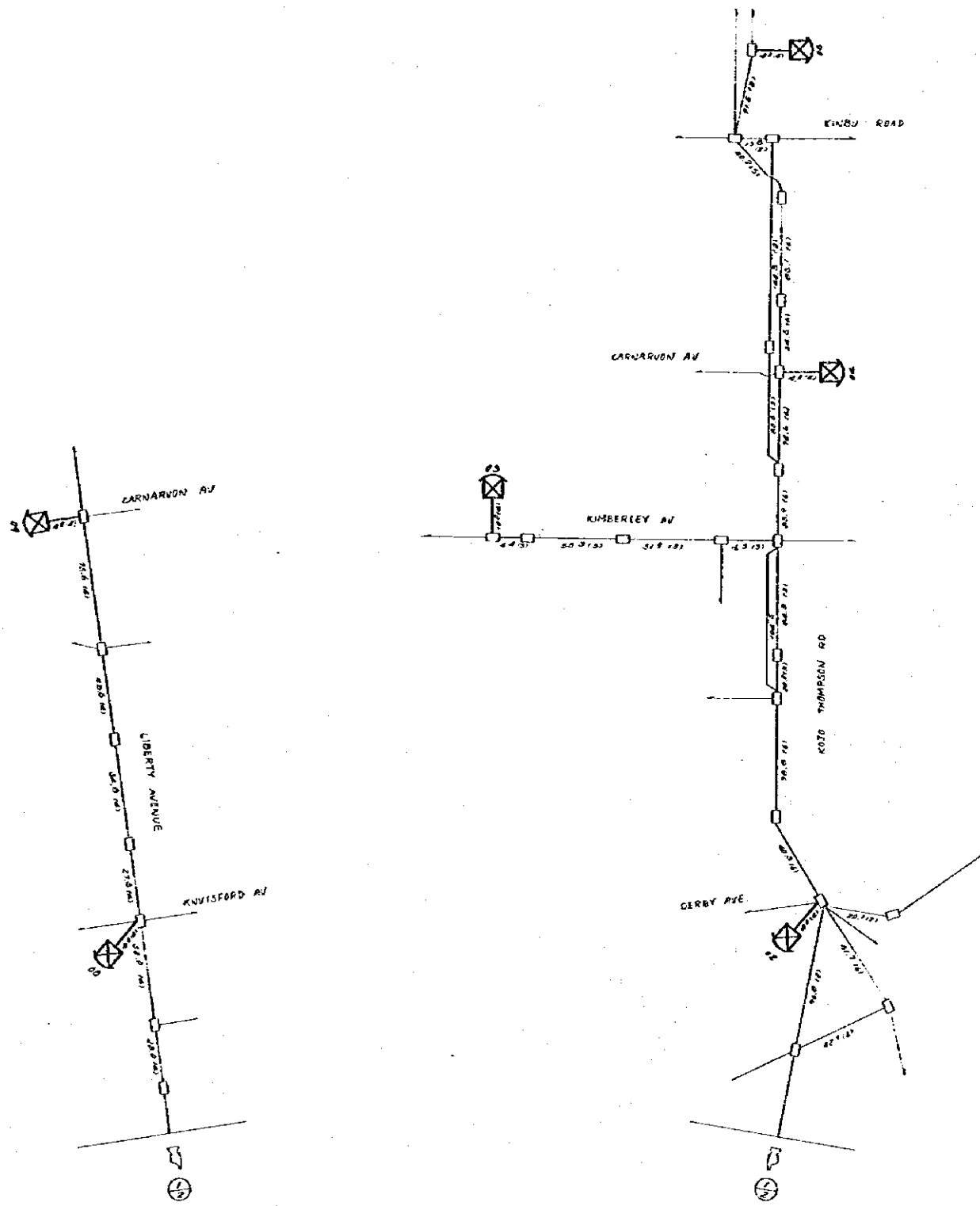
NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (BUSINESS AND COMMERCIAL AREA)			4/4
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 26



NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE (BUSINESS AND COMMERCIAL AREA)			
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 27

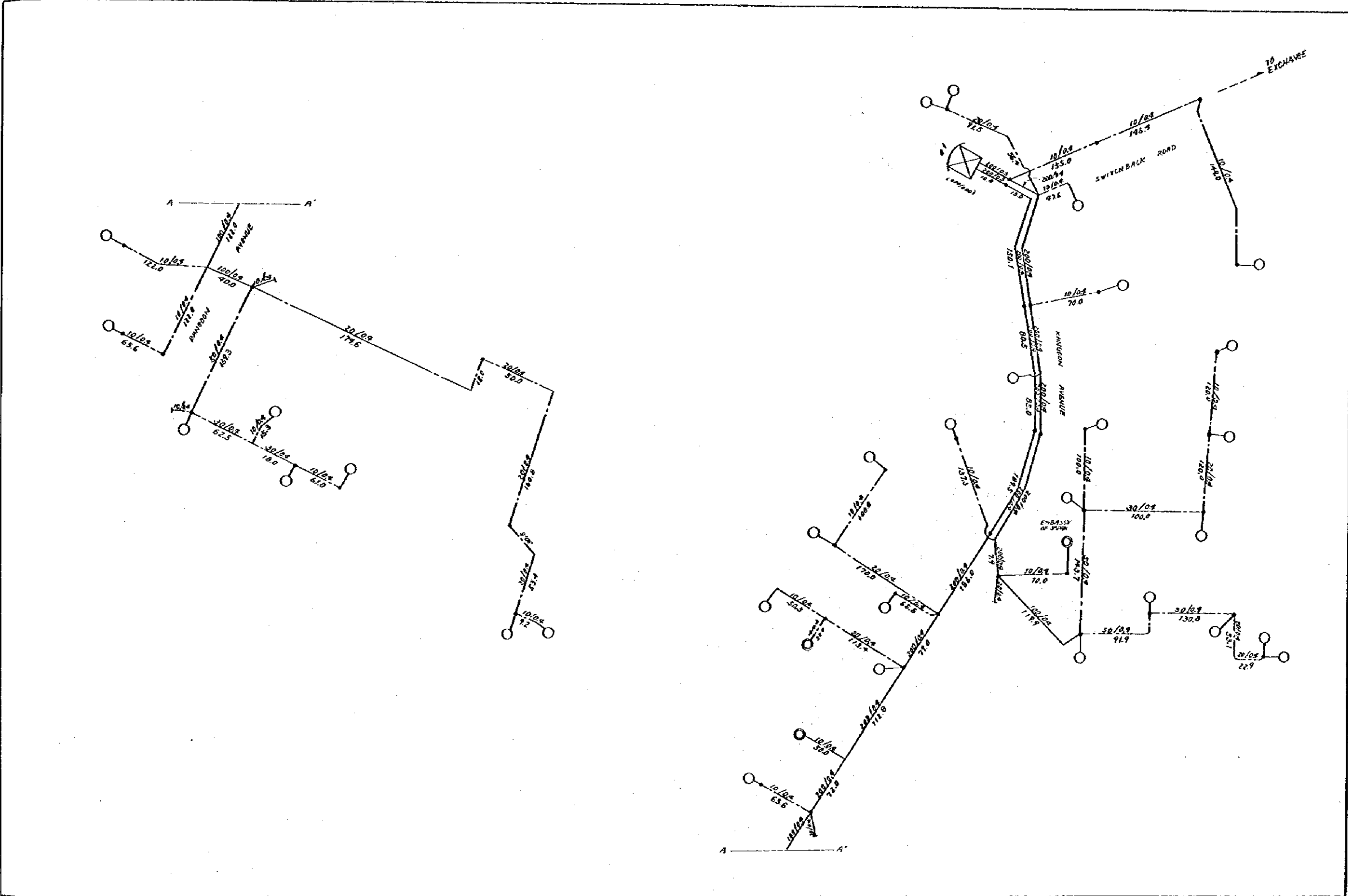


NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (BUSINESS AND COMMERCIAL AREA)			1/2
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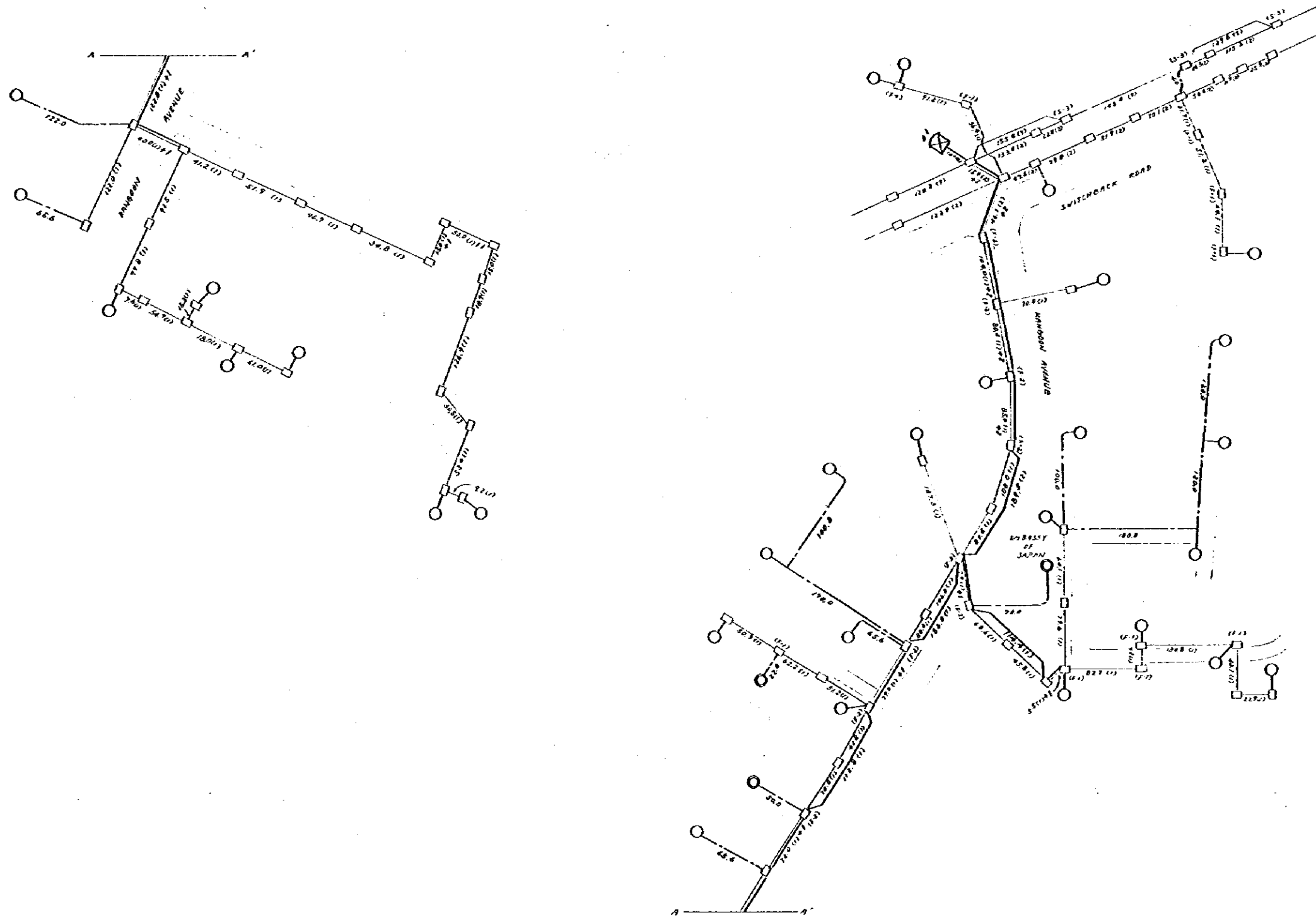


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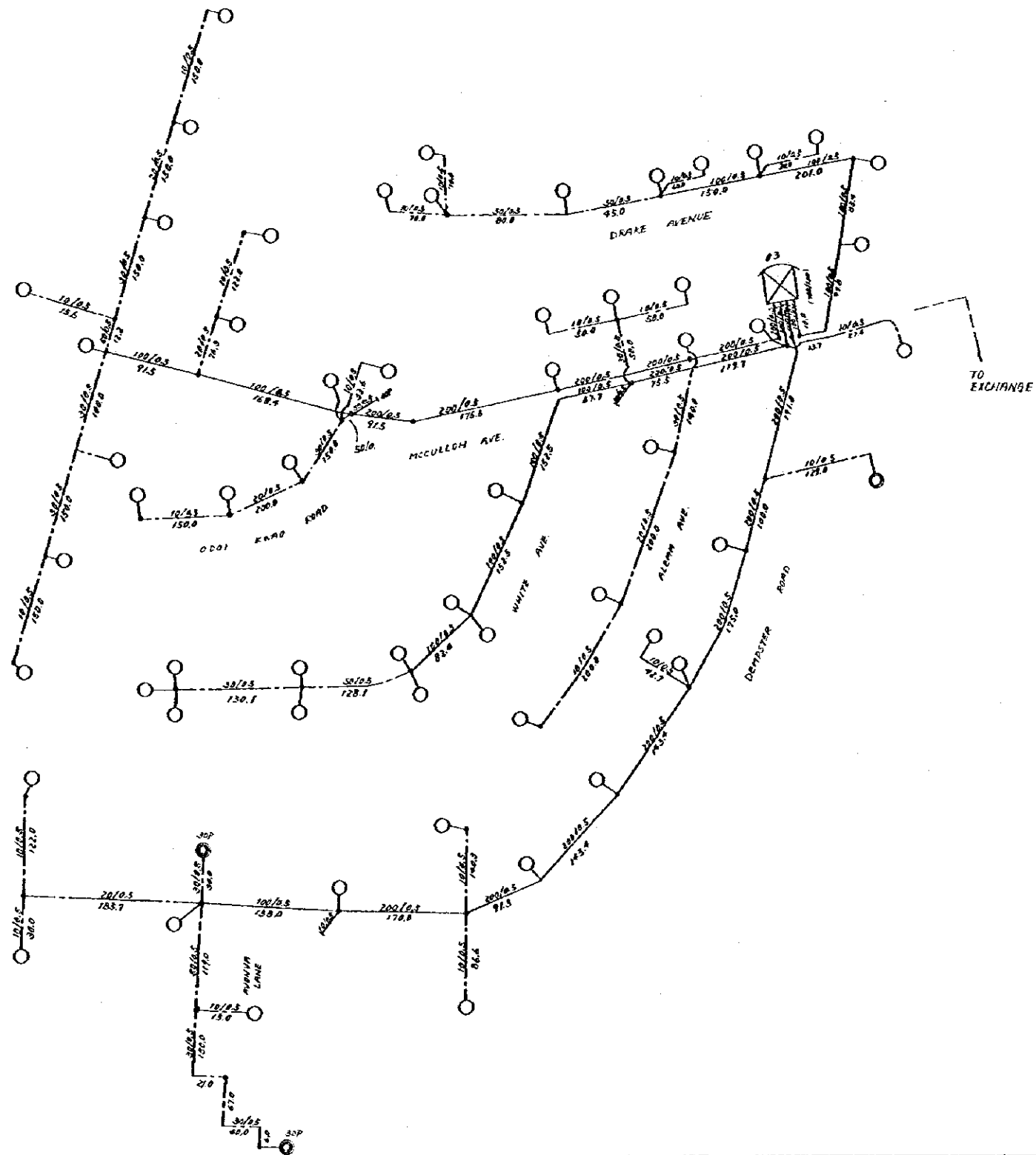
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DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 29



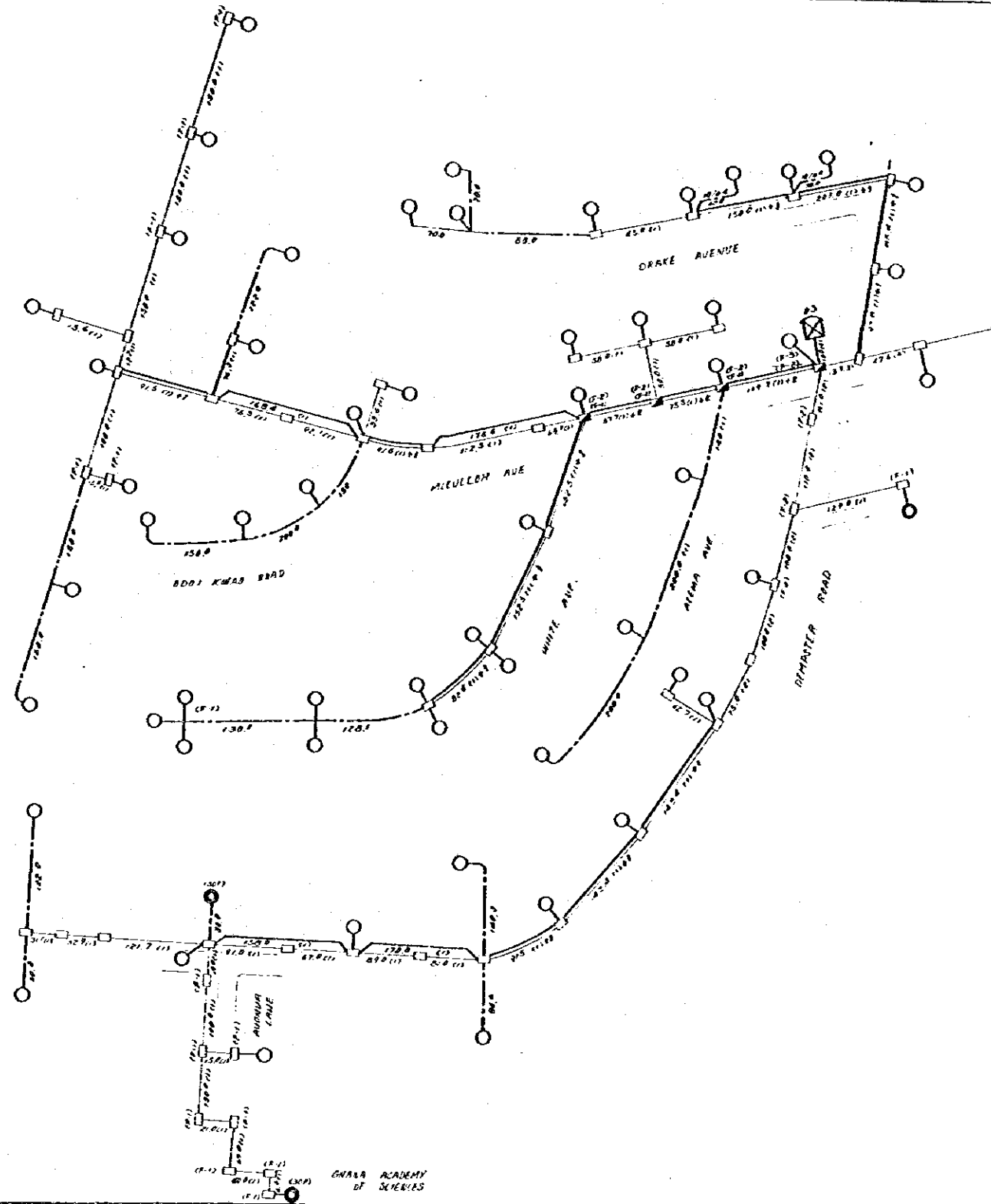
NAME OF DRAWING		BASIC PLAN FOR DISTRIBUTION CABLE (EMBASSIES AREA)		
DATE	FEB. 1987	NAME OF EXCHANGE	CAMPMENTS	DRAWING NO. 30



NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (ENGASSIES AREA)			
DATE	FEB. 1987	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 31

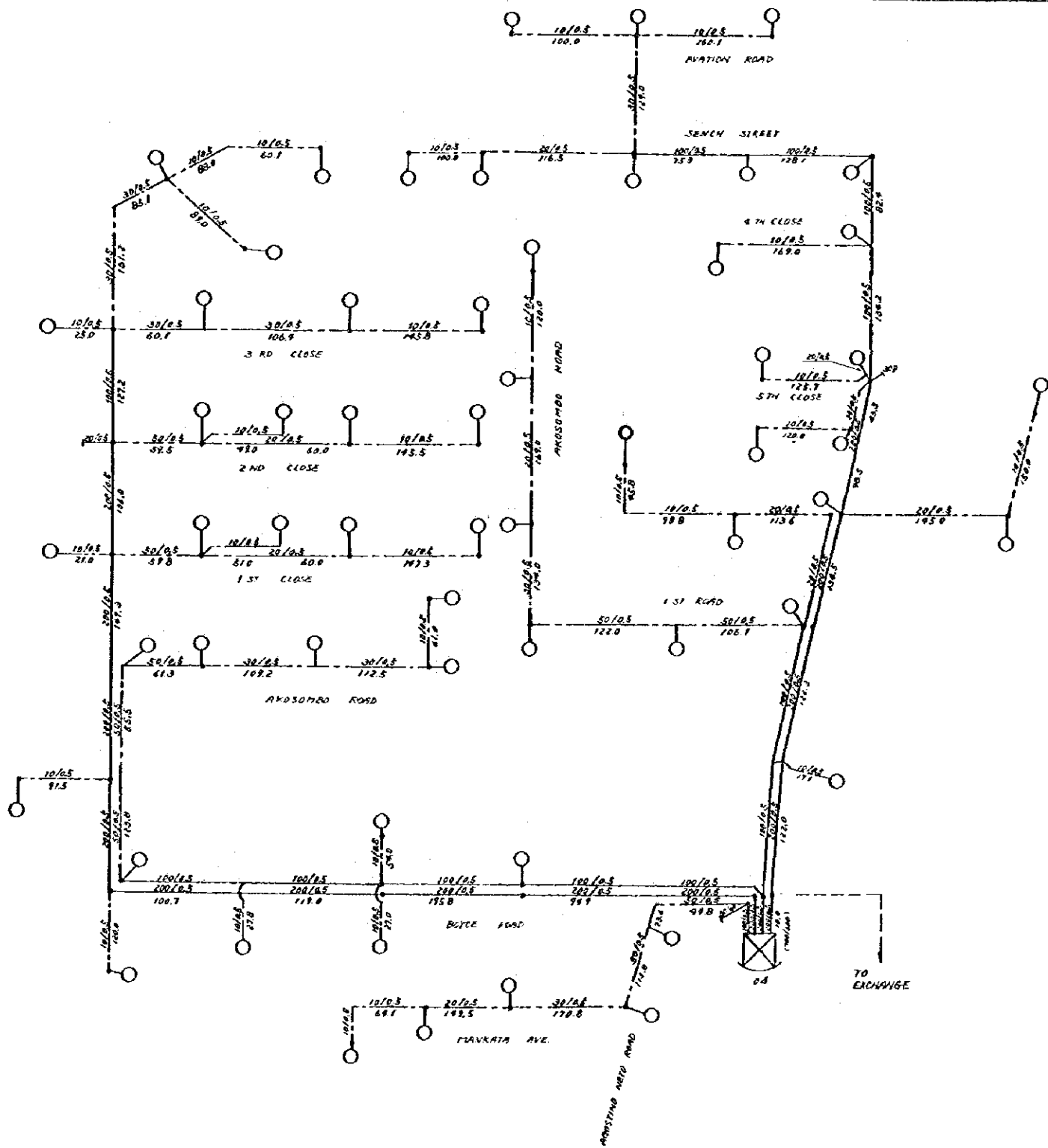


NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (AIRPORT RESIDENTIAL AREA)			1/2
DATE	FEB. 1987	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 32

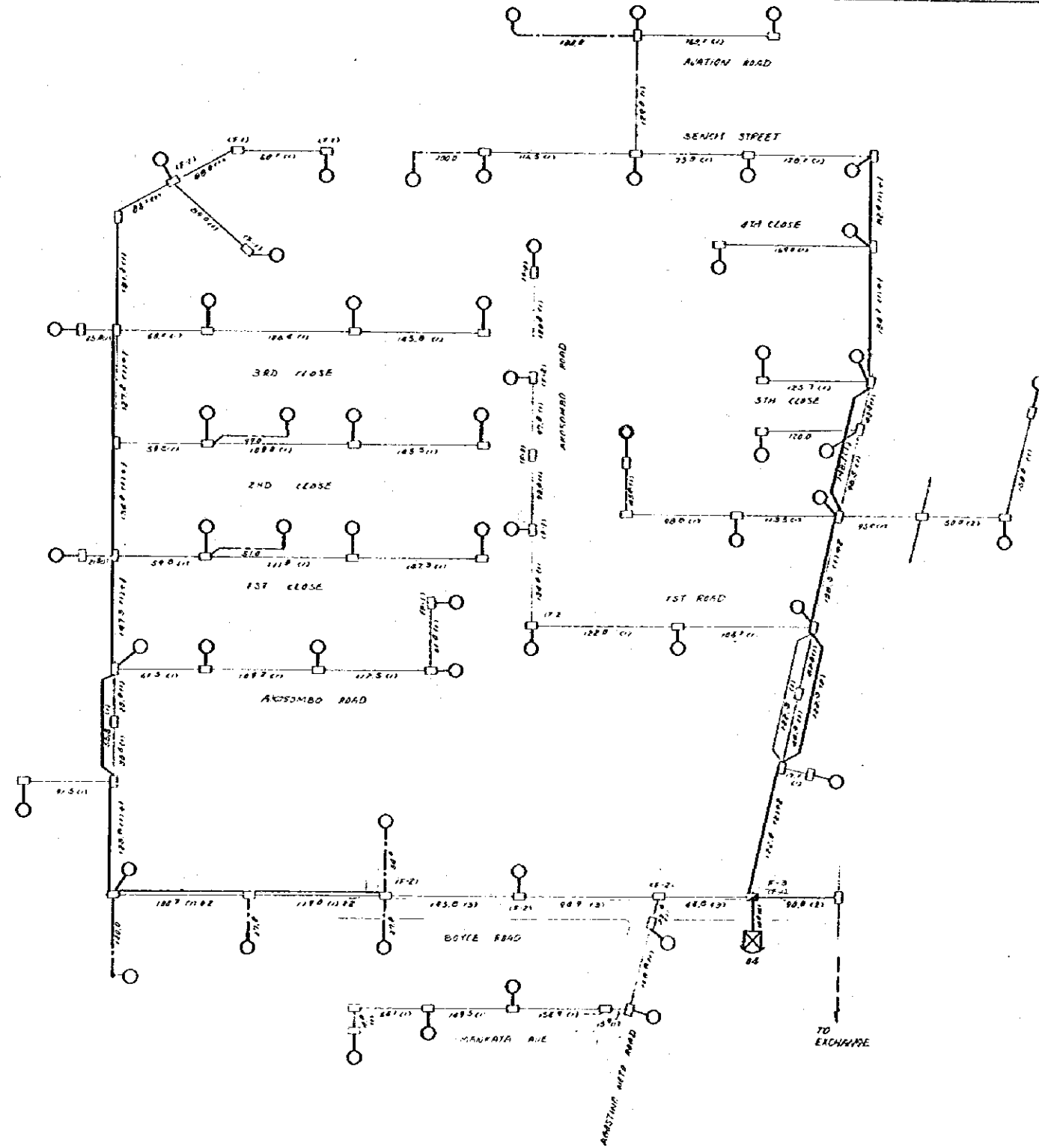


NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (AIRPORT RESIDENTIAL AREA)			1/2
DATE	FEB, 1987	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 33

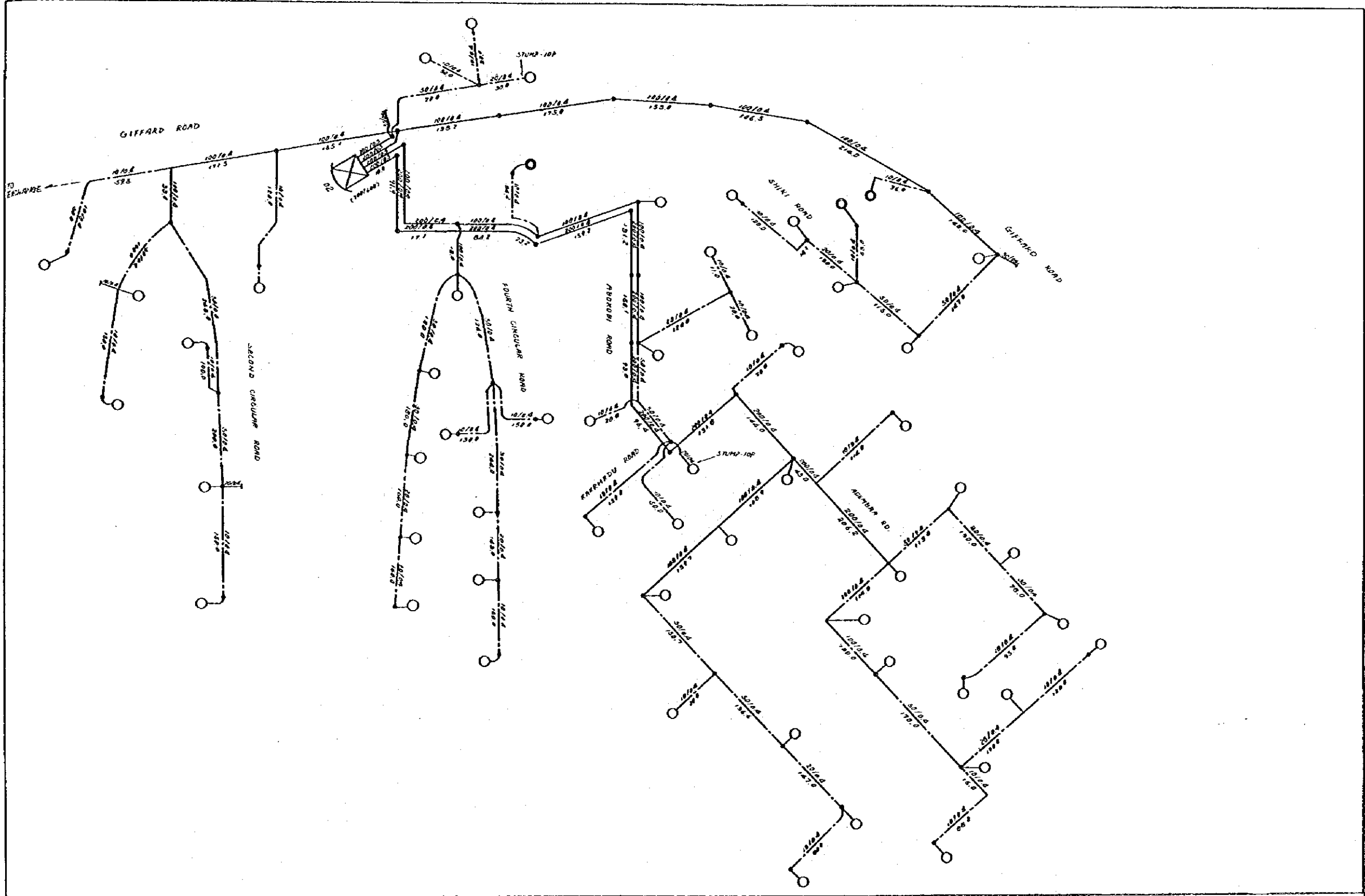




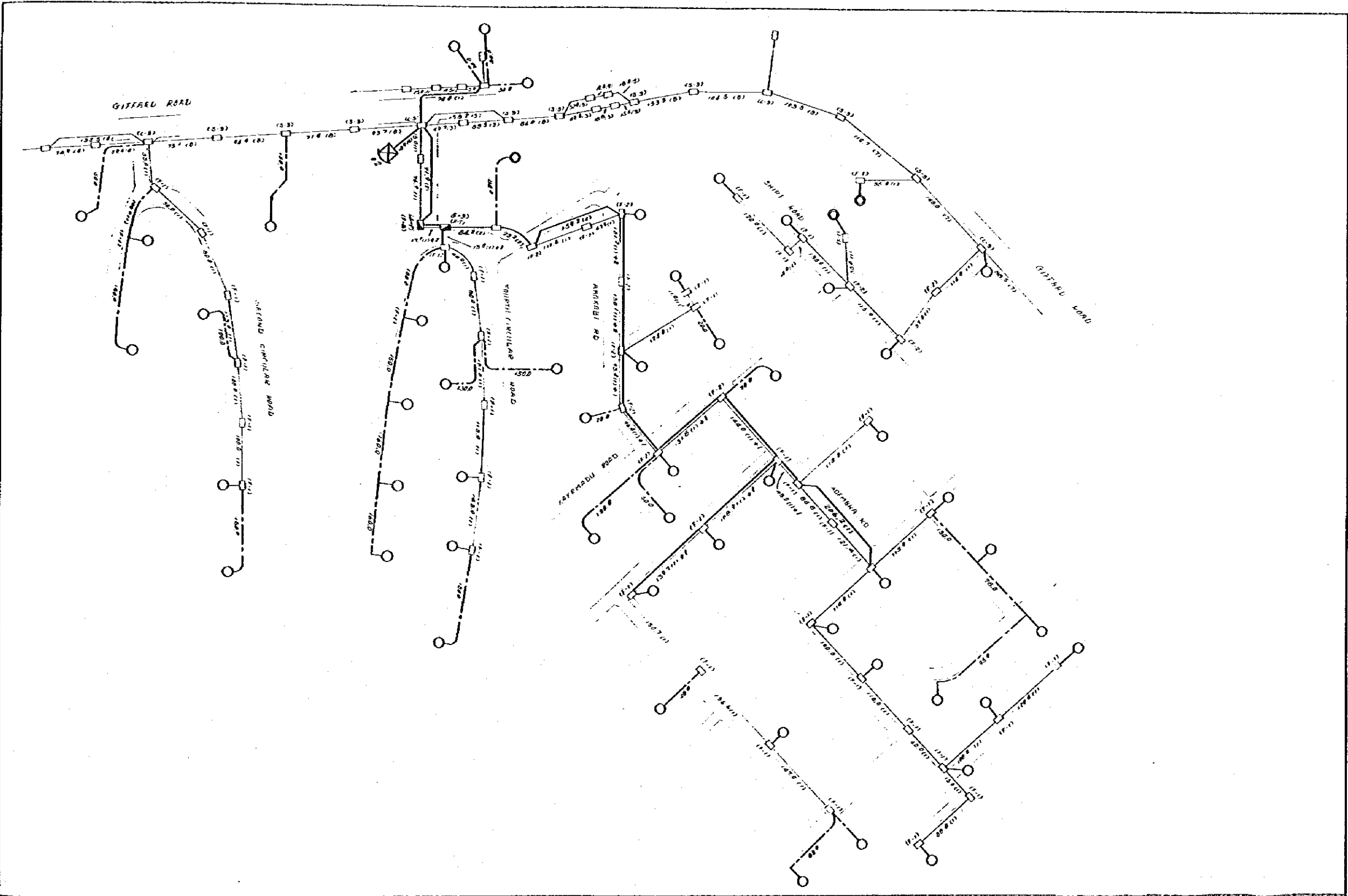
NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (AIRPORT RESIDENTIAL AREA)			2/2
DATE	FEB. 1937	NAME OF EXCHANGE	CARTONMENTS	DRAWING NO. 34



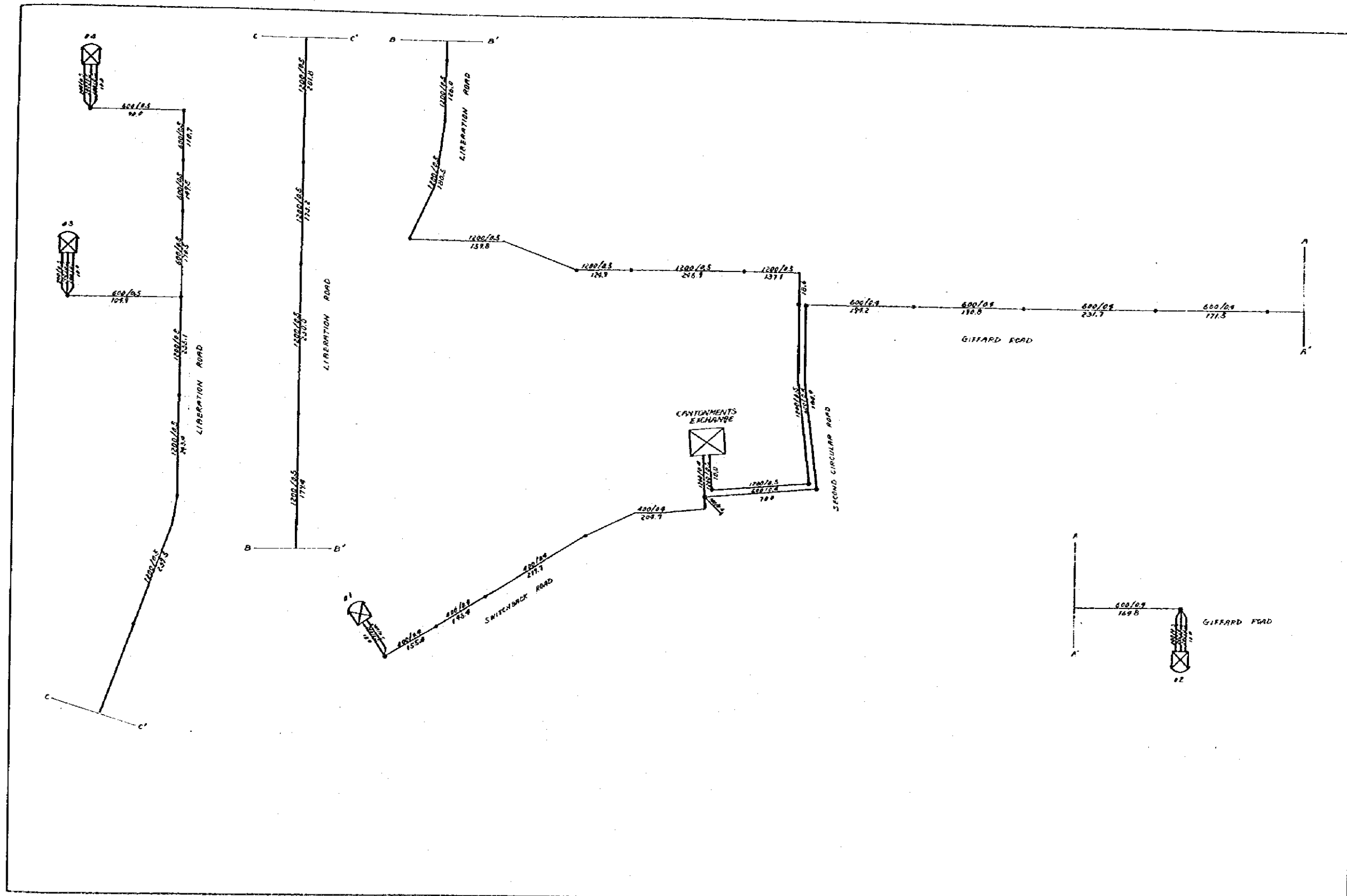
NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (AIRPORT RESIDENTIAL AREA)			2/2
DATE	FEB. 1937	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 35



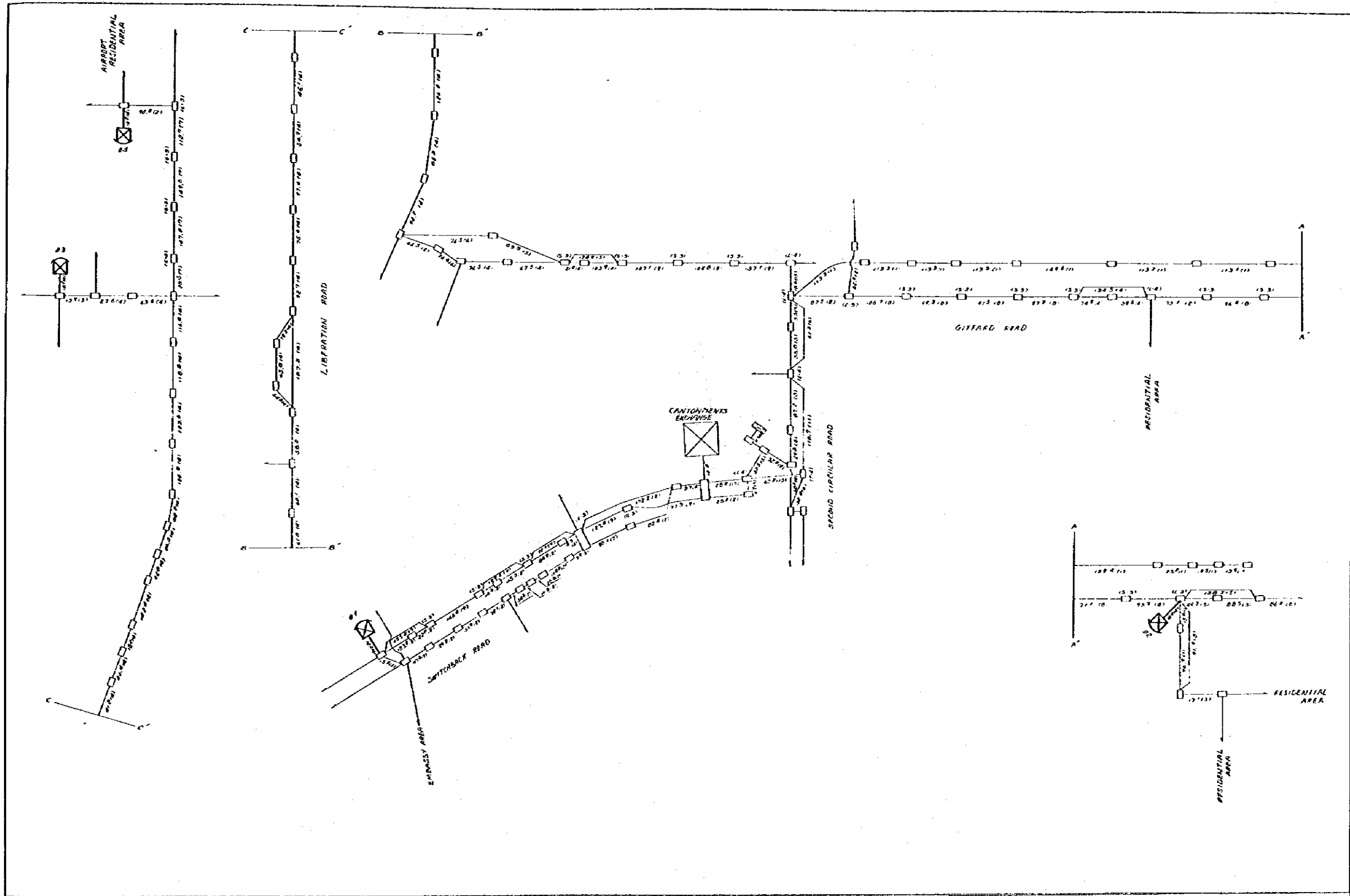
NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (EAST CANTONMENTS AREA)		
DATE	FEB. 1987	NAME OF EXCHANGE	CANTONMENTS
			DRAWING NO. 36



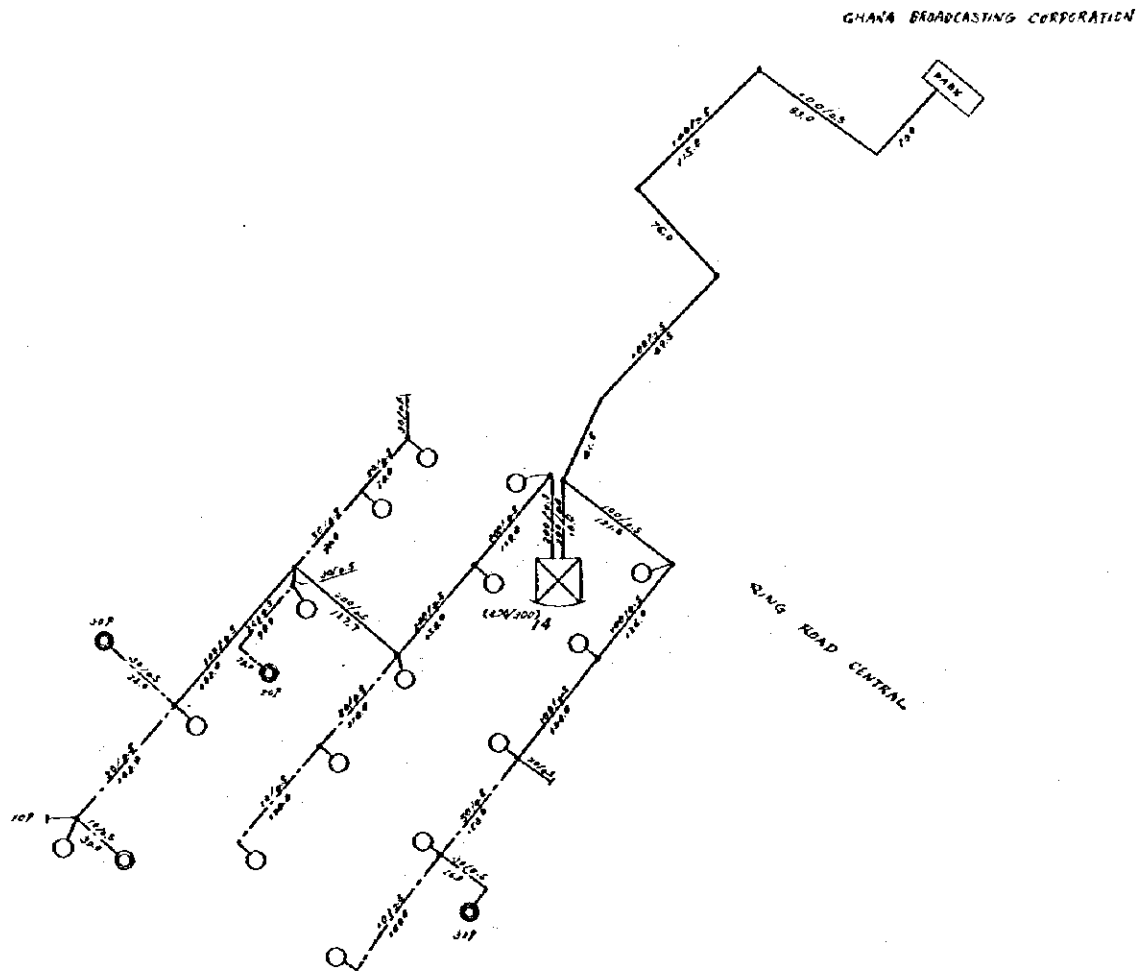
NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (EAST CANTONMENTS AREA)			
DATE	FEB. 1937	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 37



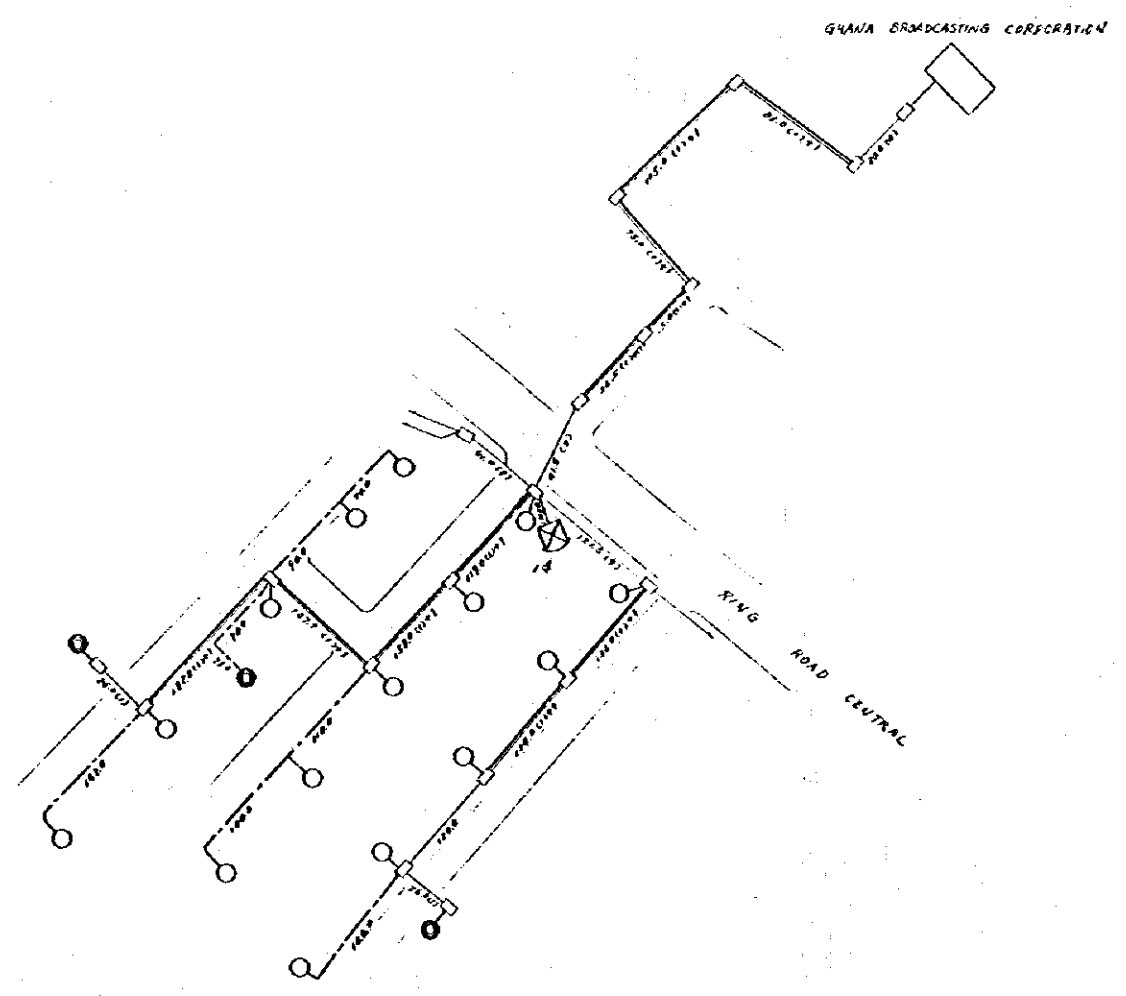
NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE (AIRPORT RE., EAST CANTONMENTS RE. AND EMBASSIES AREA)			
DATE	FEB. 1987	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 38



NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (AIRPORT RE., EAST CANTONMENTS RE. AND EMBASSIES AREA)			
DATE	FEB. 1937	NAME OF EXCHANGE	CANTONMENTS	DRAWING NO. 39

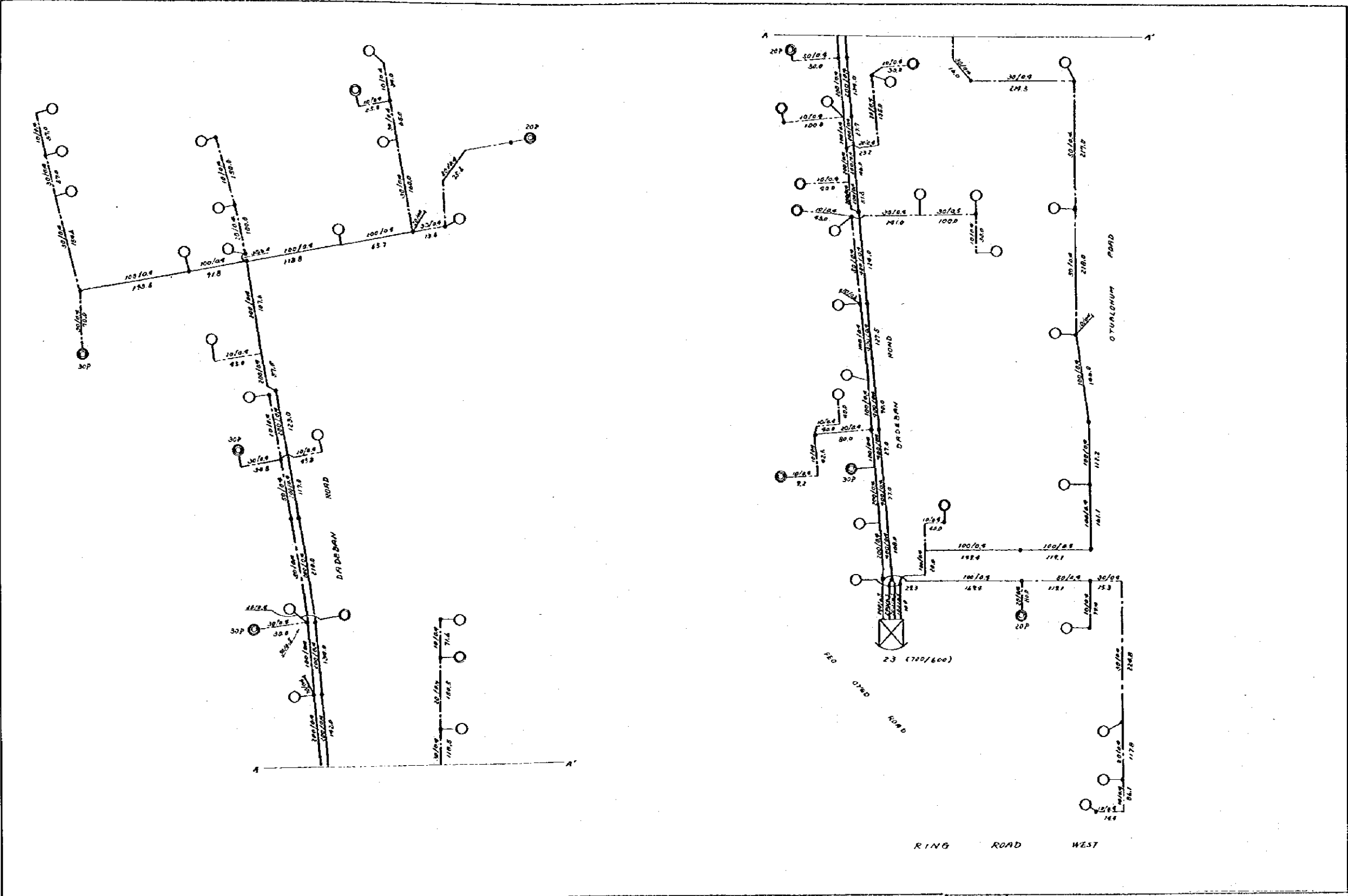


NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (GHANA BROADCASTING CORPORATION AREA)		
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA NORTH
			DRAWING NO. 40

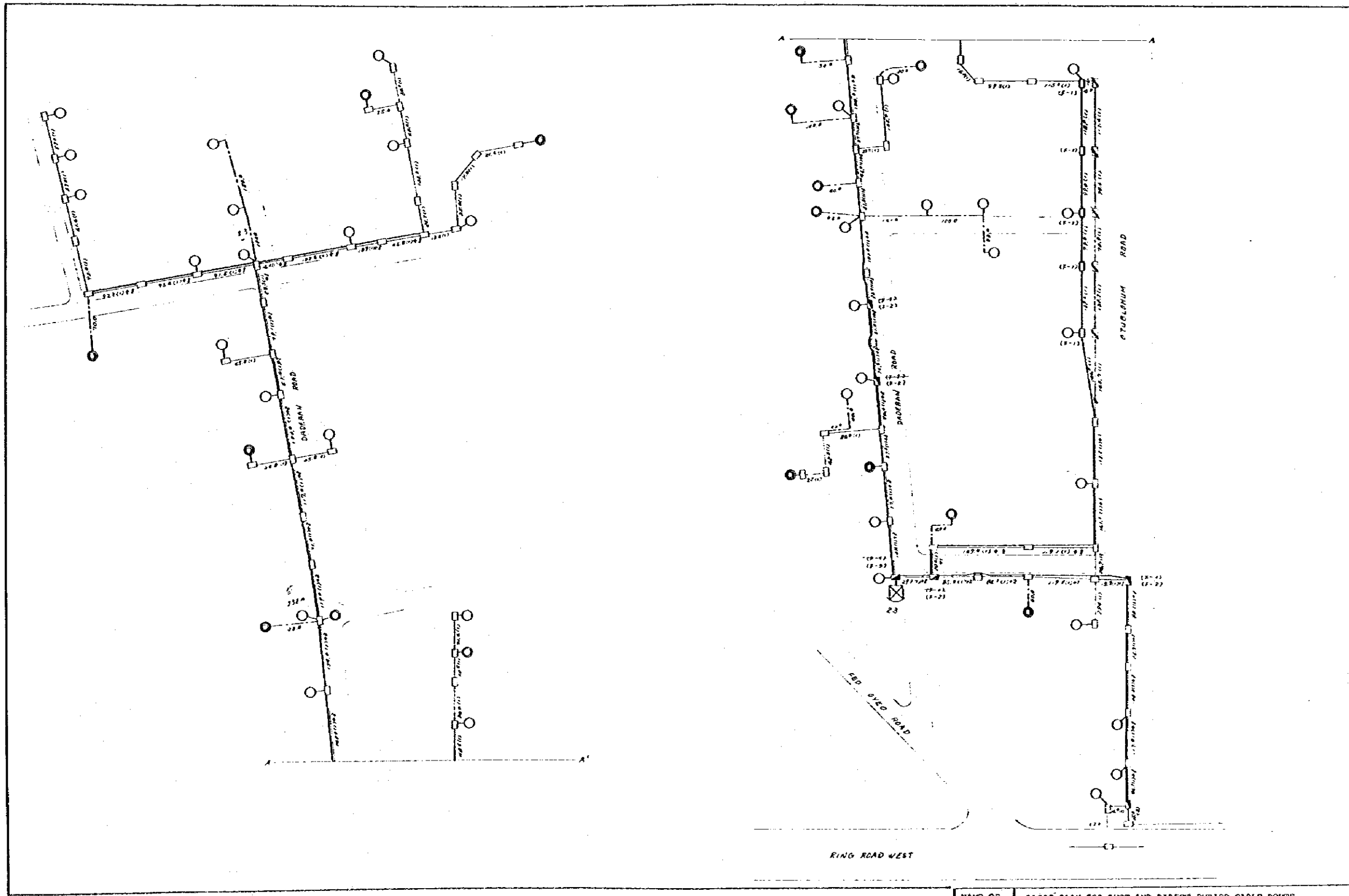


NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (GHANA BROADCASTING CORPORATION AREA)			
DATE	FEB. 1987	NAME OF EXCHANGE	ACCRA NORTH	DRAWING NO. 41

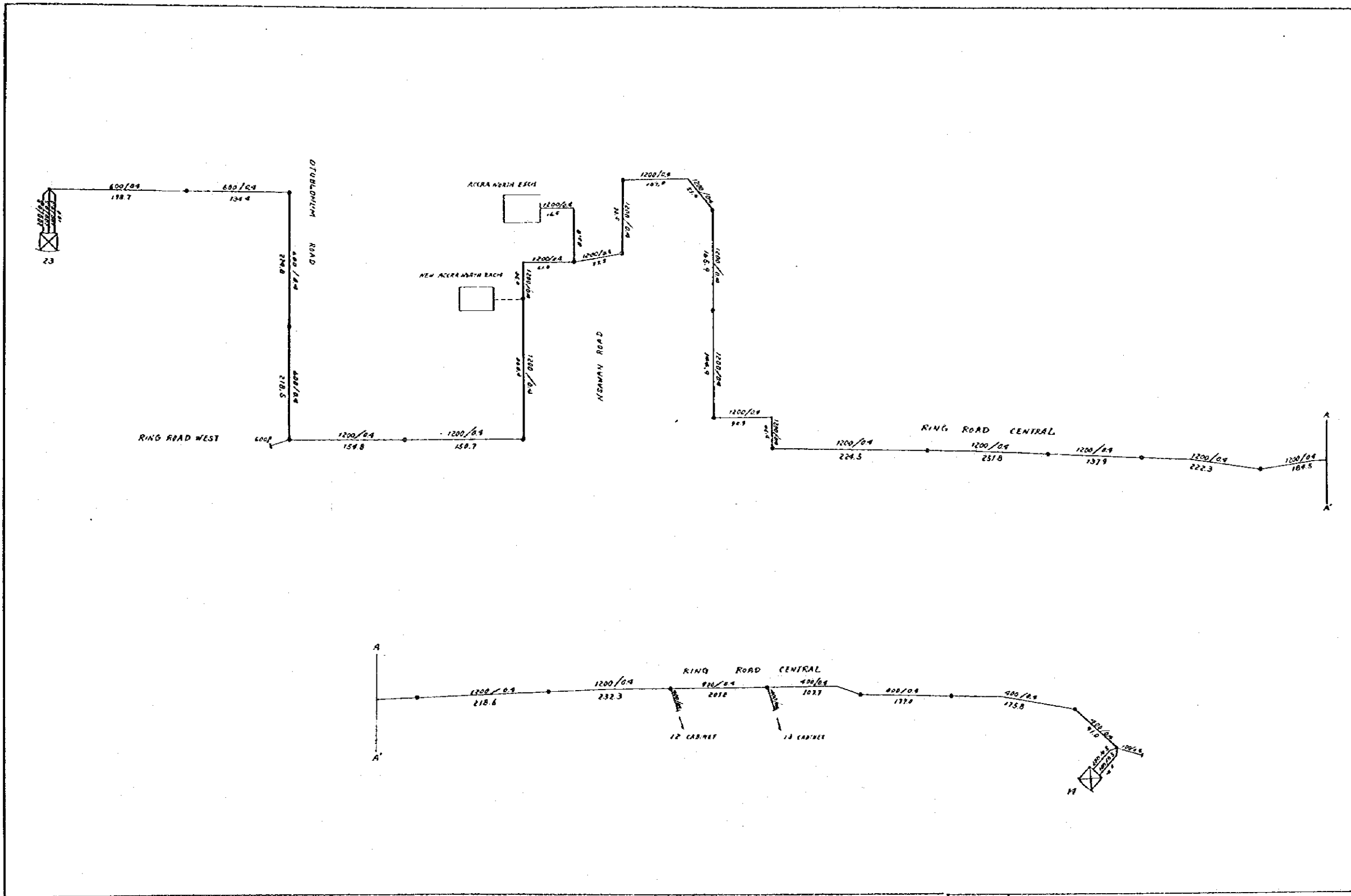




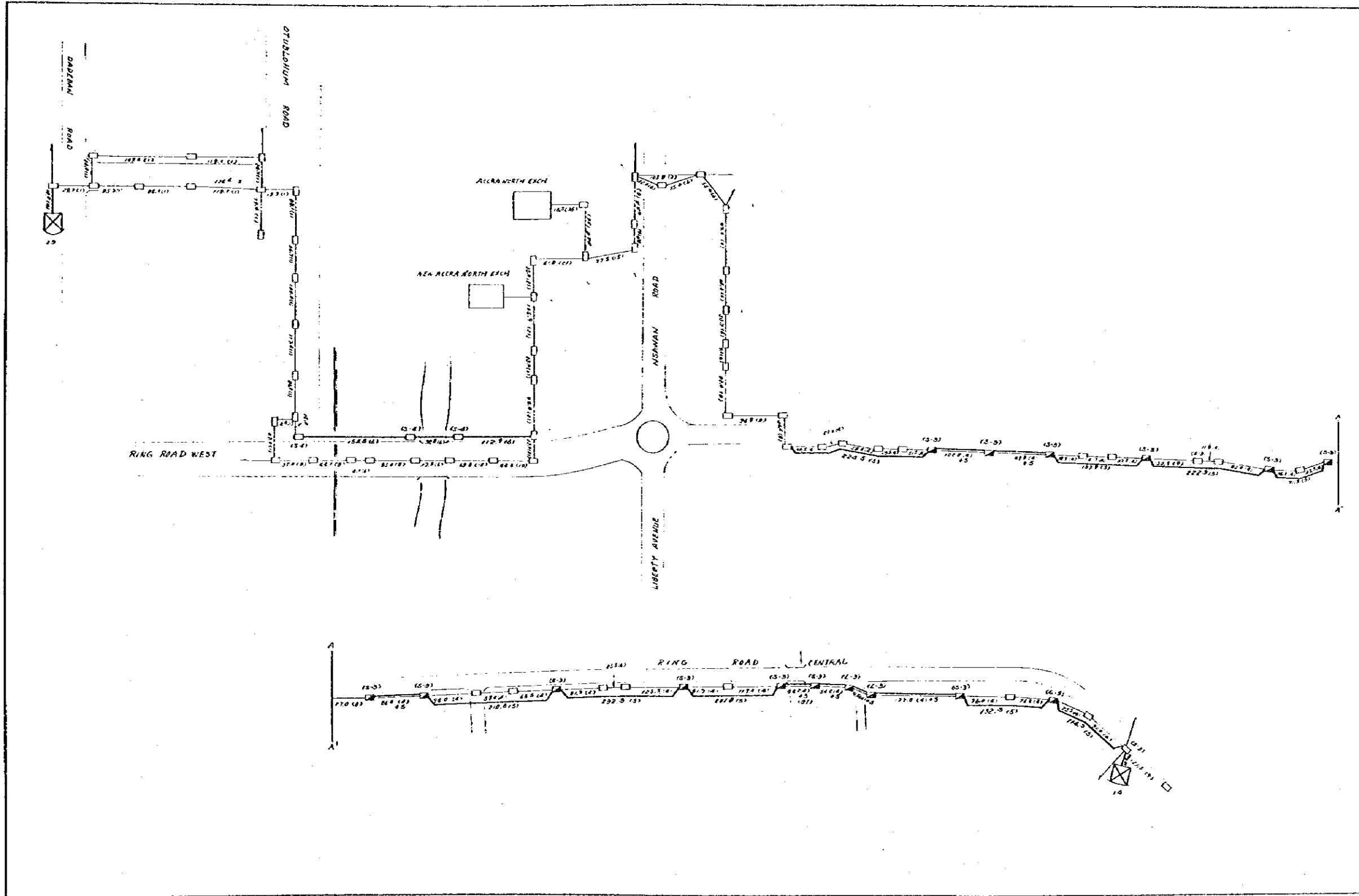
NAME OF DRAWING	BASIC PLAN FOR DISTRIBUTION CABLE (INDUSTRY AREA)		
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA NORTH
		DRAWING NO.	42



NAME OF DRAWING	BASIC PLAN FOR DUCT AND DIRECT-BURIED CABLE ROUTE (INDUSTRY AREA)			
DATE	FEB. 1997	NAME OF EXCHANGE	ACCPA NORTH	DRAWING NO. 43

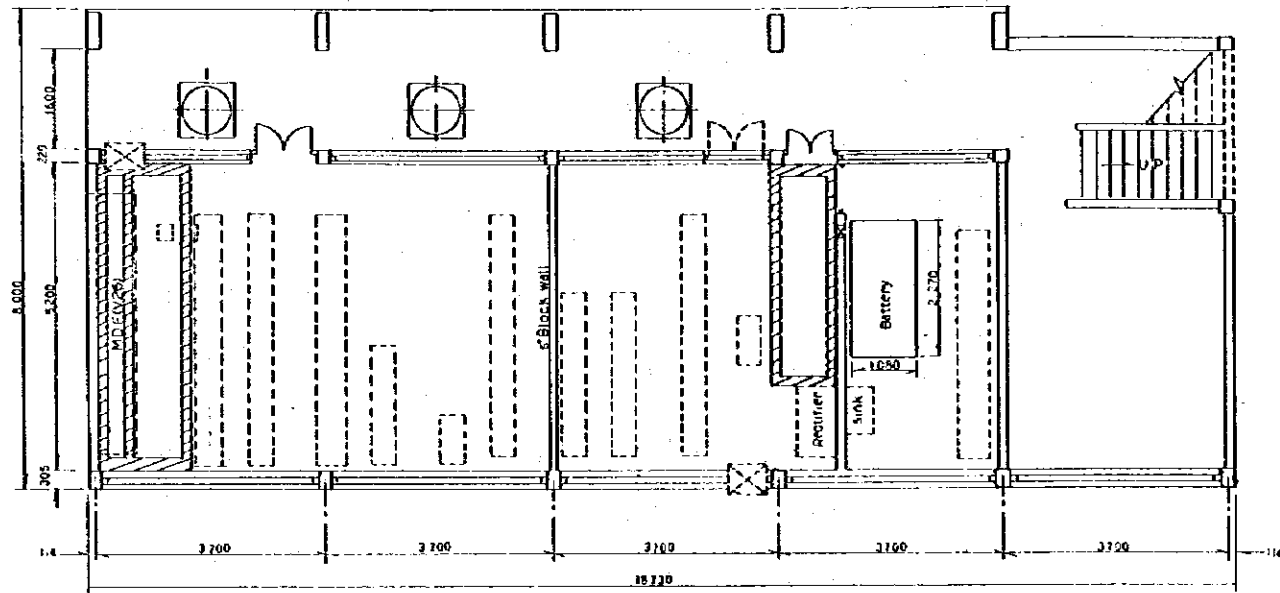


NAME OF DRAWING		BASIC PLAN FOR PRIMARY CABLE (GHANA BROADCASTING CORPORATION AND INDUSTRY AREA)			
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA NORTH	DRAWING NO.	44

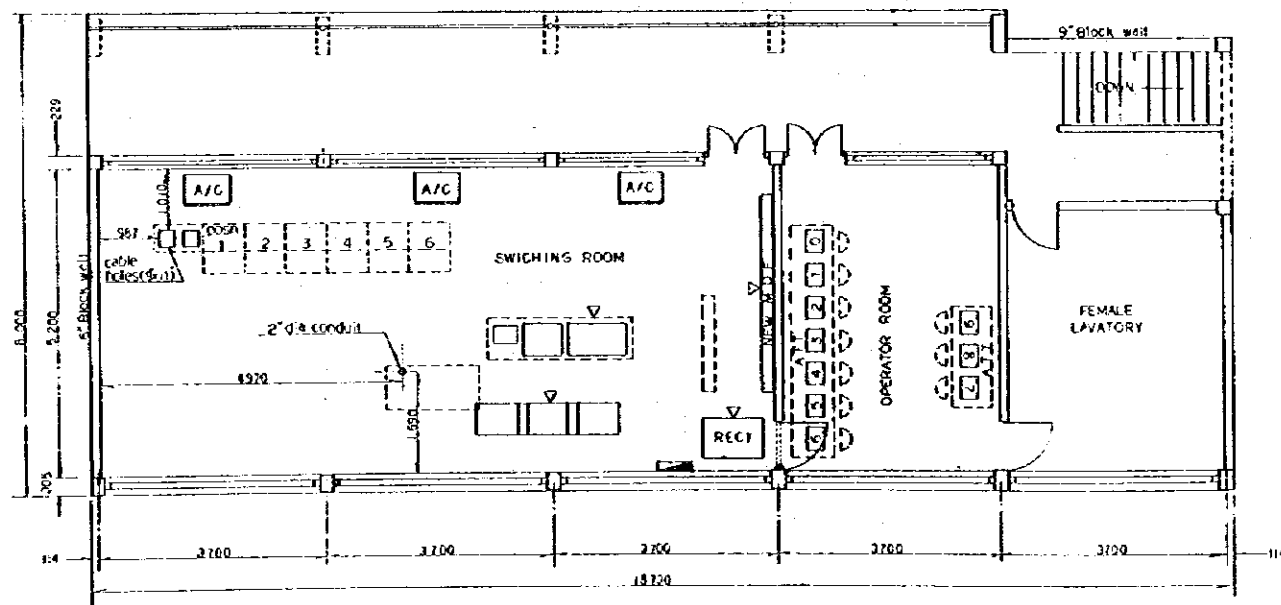


NAME OF DRAWING	BASIC PLAN FOR PRIMARY CABLE DUCT ROUTE (GHANA BROADCASTING CORPORATION AND INDUSTRY AREA)			
DATE	FEB, 1987	NAME OF EXCHANGE	ACCRA NORTH	DRAWING NO. 45

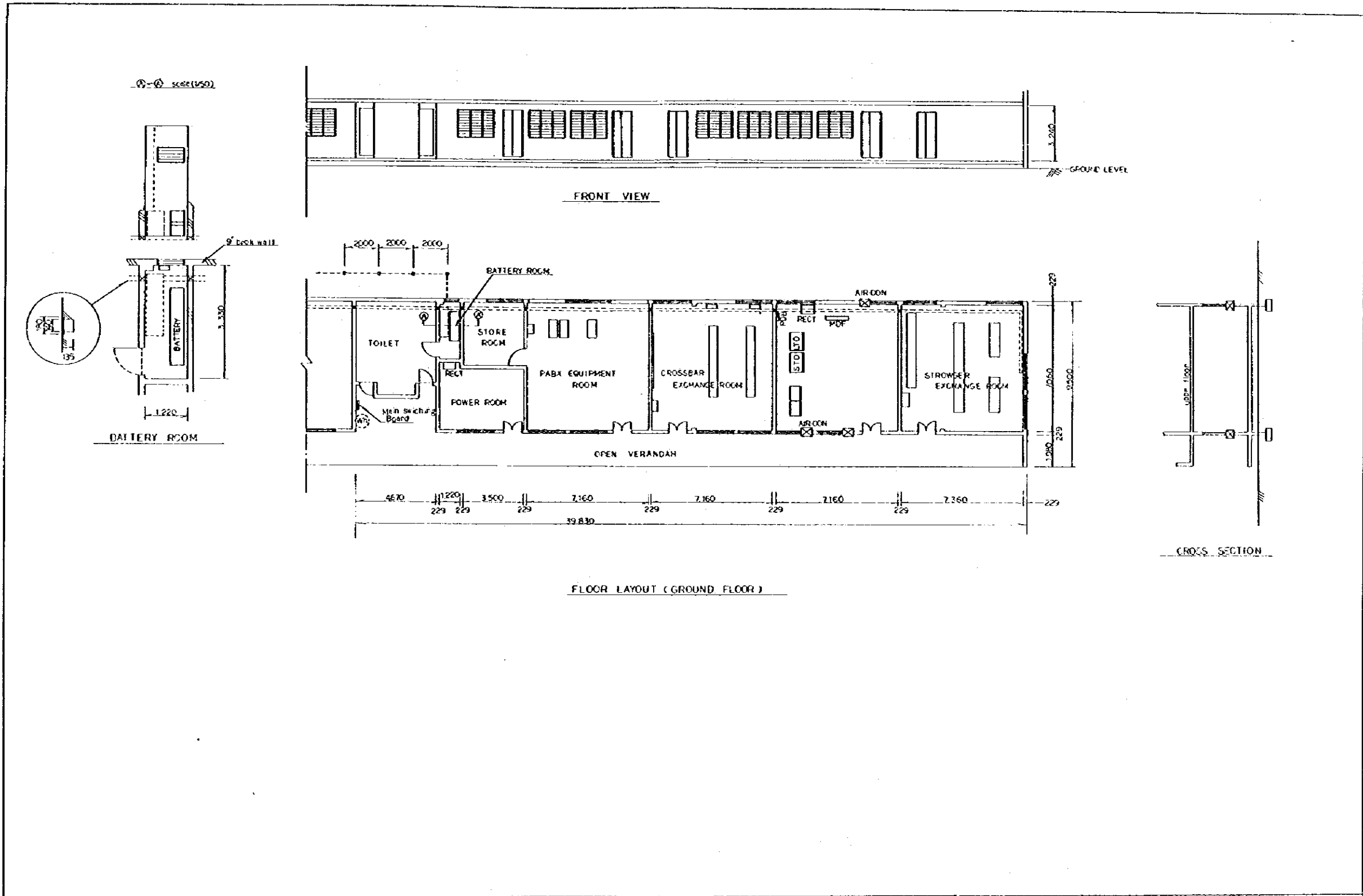
GROUND FLOOR



FIRST FLOOR



NAME OF DRAWING	BASIC PLAN FOR FLOOR LAYOUT (1/2)			
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 46



NAME OF DRAWING	BASIC PLAN FOR FLOOR LAYOUT (2/2)			
DATE	FEB. 1937	NAME OF EXCHANGE	ACCRA CENTRAL	DRAWING NO. 47







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