REPUBLIC OF ZAMBIA

REPORT ON RADIO AND TELEVISION NETWORK EXPANSION PROJECT

VOLUME I

BASIC PLAN

FEBRUARY 1974

OVERSEAS TECHNICAL COOPERATION AGENCY

IN

JAPAN

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FOREWORD

In compliance with the request made by the Government of the Republic of Zambia for Japan's technical cooperation in The Radio and Television Network Expansion Project in Zambia, the Government of Japan undertook to send a survey mission to the country as a part of Japan's overseas technical cooperation programs in order to carry out a field survey to map out working plans for the project which constitutes the nucleus of mass-media modernization in the Second Five-Year National Development Plan of Zambia.

The survey mission comprising seven technical experts headed by Mr. H. Takeda of the Radio Regulatory Bureau, Ministry of Posts and Telecommunications, conducted various survey works, during its five weeks' stay in Zambia such as the reconnaissance survey of the proposed station sites, measurement of field intensity, study of the existing state of studios and programme production, investigation of buildings and structures, inspection of training programmes and their enforcement, and series of discussions with the Zambia authorities with respect to the development plans and desires of Zambian side.

After its return to Japan, the mission made a careful study and reviewal of the survey data from the technical as well as economic viewpoint, and compiled them into this report which is hereby presented.

It would be more than pleasure if this report proves instrumental in accelerating the implementation of the project which I am convinced is conductive to the elevation of the people's educational level and to Zambia's socio-economic development, and serves at the same time for furtherance of the friendly relations now existing between Zambia and Japan.

I avail myself of this opportunity to express my heartfelt gratitude to all the competent Zambian authorities for the unlimited and very helpful assistance offered to the mission throughout the survey period.

February 1974

K. Tatsuke

Keiichi Tatsuke
Director General

Overseas Technical Cooperation Agency

LETTER OF TRANSMITTAL

To: Mr. Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency

It is a great honor for me to submit this survey report for a Radio and Television Expansion Project in the Republic of Zambia.

The mission was dispatched by the Overseas Technical Cooperation Agency in order to collect data for the detailed design of a Radio and Television Expansion Project in the Republic of Zambia. This expansion project is to be the nucleus of a mass-media modernization scheme as one of the country's Second Five-Year National Development Plan.

For five weeks from February 16, 1973, the mission made on-the-spot surveys on the existing radio and TV broadcasting system, installations, buildings, management, administration and training.

Survey and propagation tests of new sites for expansion of the television net-work were also performed.

During the surveys, mission members exchanged opinions with the Zambian staffs to have full understanding of the actual conditions of the country including conditions in related fields and what Zambian government desires.

The mission has completed this final report after careful studies for several months in Japan refferring to the results which were made in the discussion meetings held in Zambia last October.

The mission has examined the contents of this report taking into deep consideration of Zambian Government opinions and desires as well as other expert's opinions.

We believe that the recommendations, proposals and designs resulting from these efforts are ones best for a Radio and Television Network Expansion Project for the Republic of Zambia.

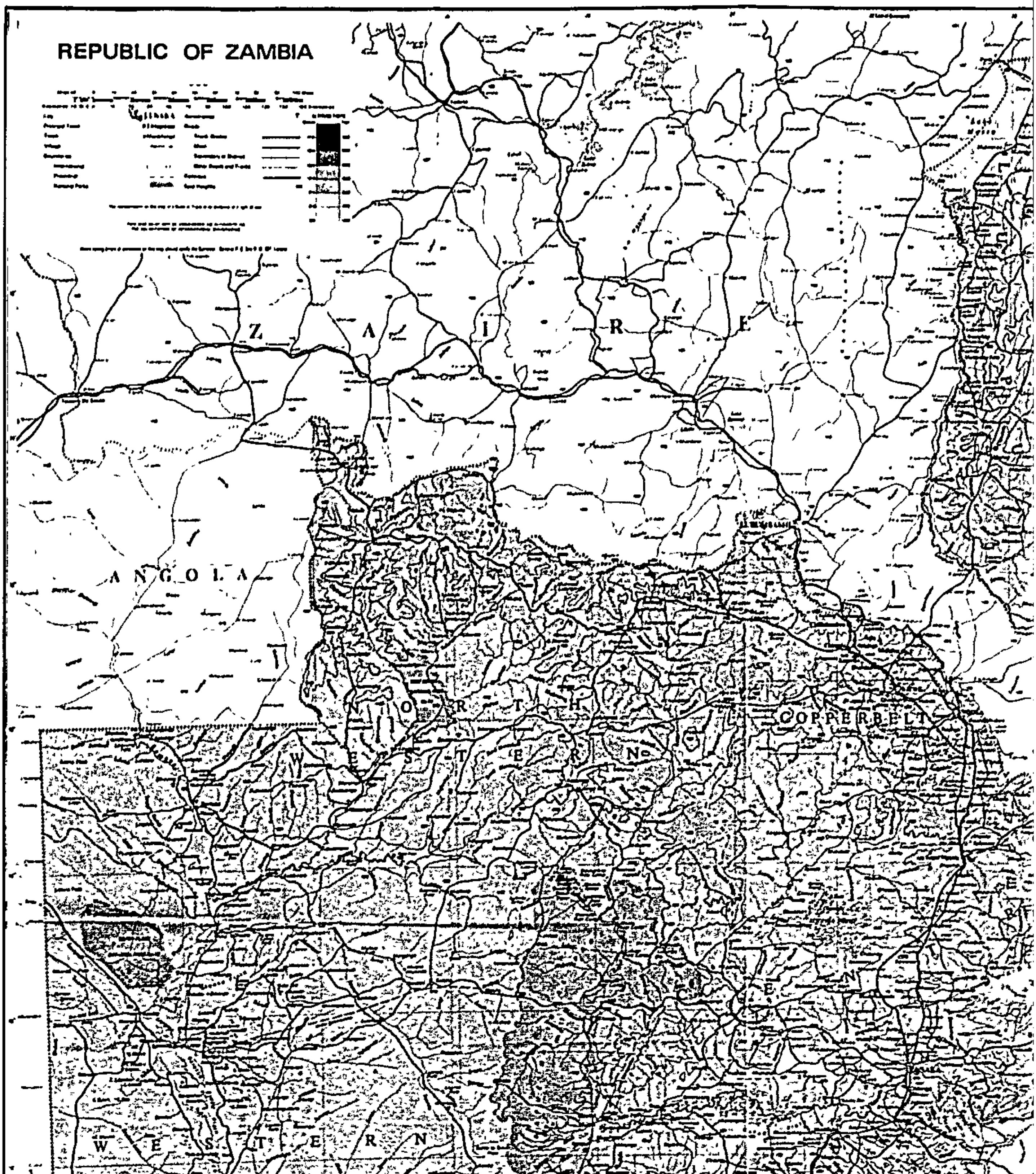
We hope that the proposals made by the mission will contribute to the improvement and development of the broadcasting services in the Republic of

Zambia, and we also hope these modernizations of the mass-media will be a step toward the future big development of the country.

In conclusion, we deeply thank personnel of the Republic of Zambia who provided the mission with great help and cooperation during the period of this survey. Our gratitude also goes to the Japanese Embassy, the Ministry of Foreign Affairs, the Ministry of Posts and Telecommunications, the Japan broadcasting Corporation, the Japan Telecommunications Consulting Association and the Overseas Technical Cooperation Agency who provided the mission with much guidance and assistance.

February, 1974

Hitoshi Takeda
Chief, Survey Mission for the Radio and Television Expansion Project of the Republic of Zambia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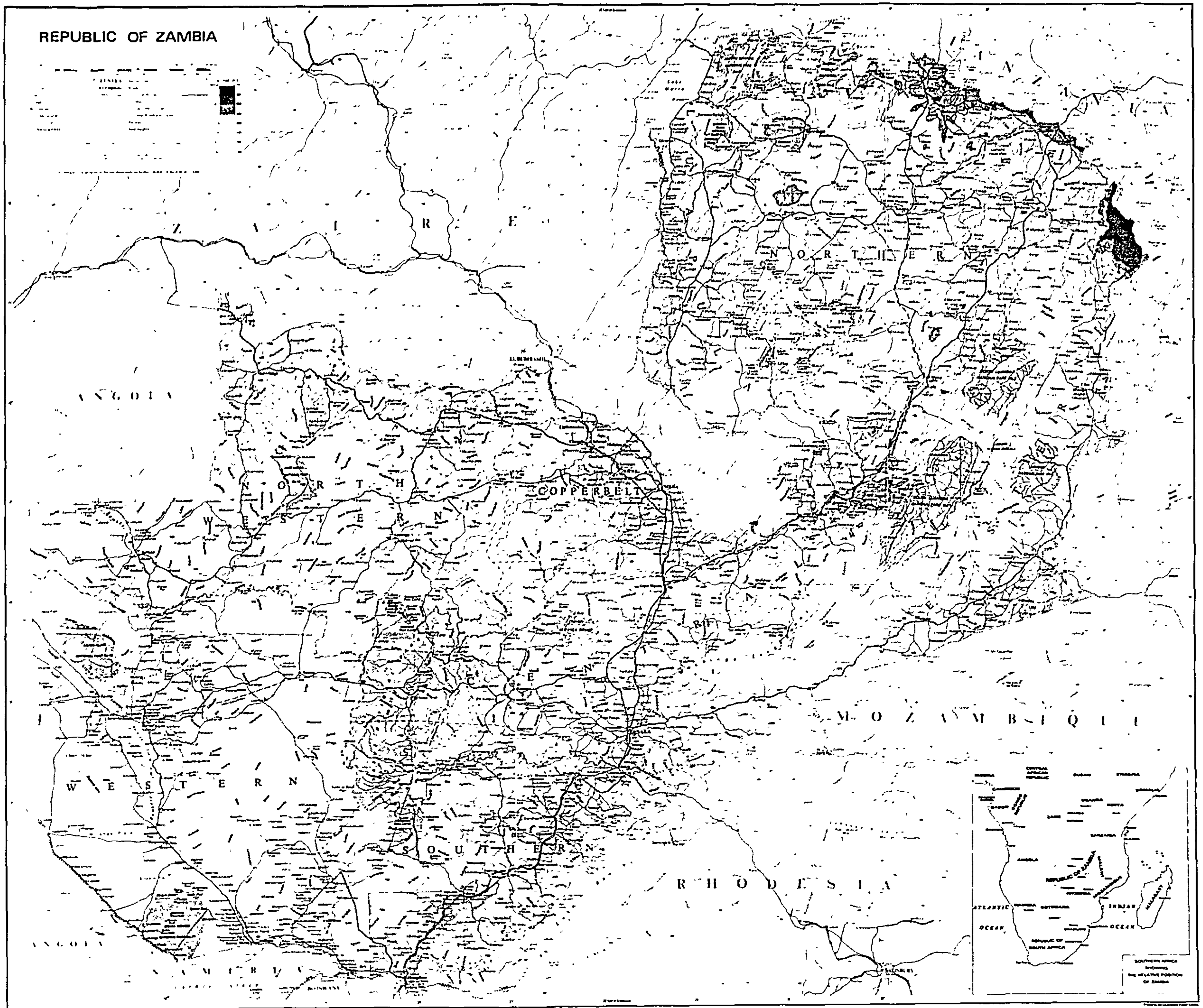
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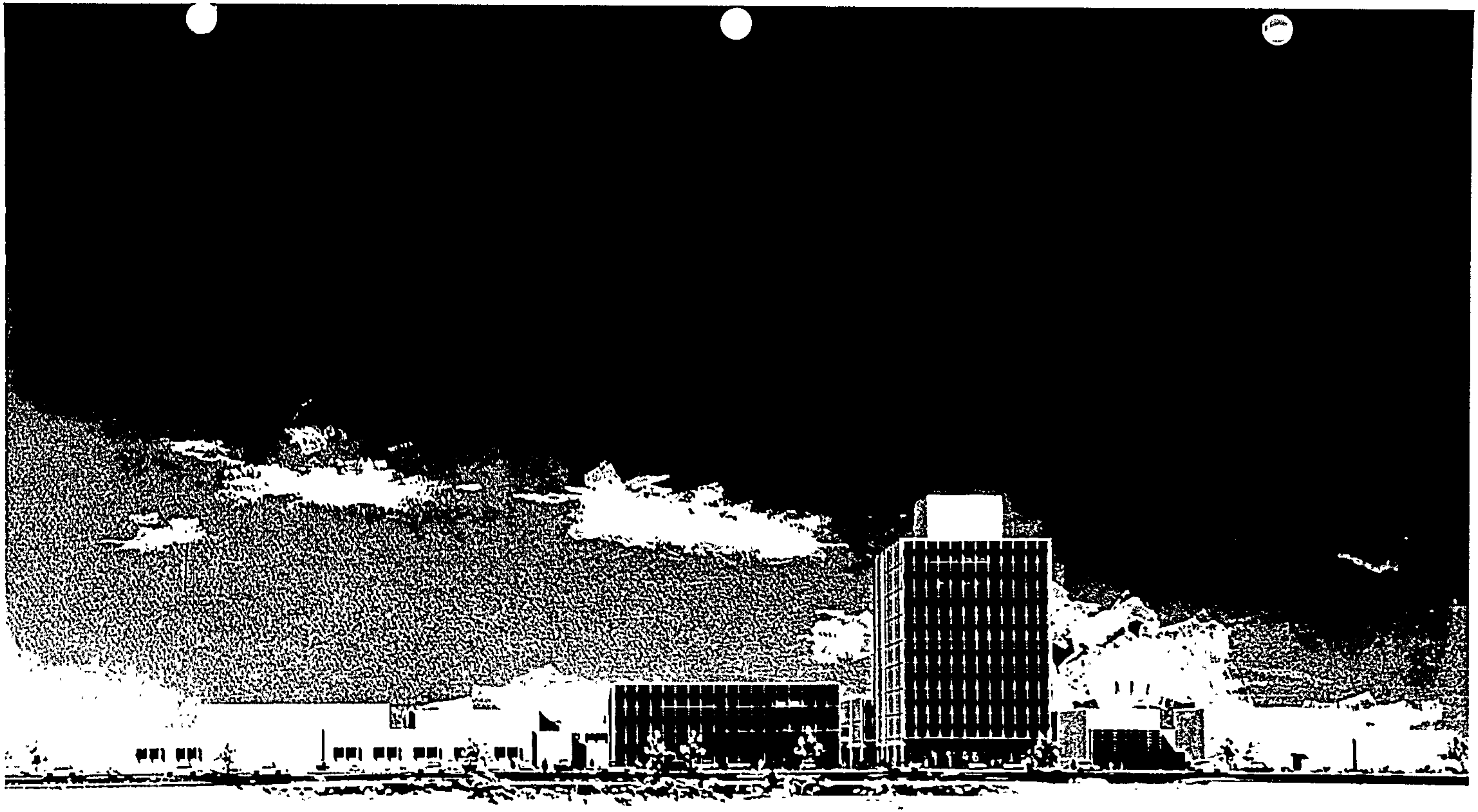

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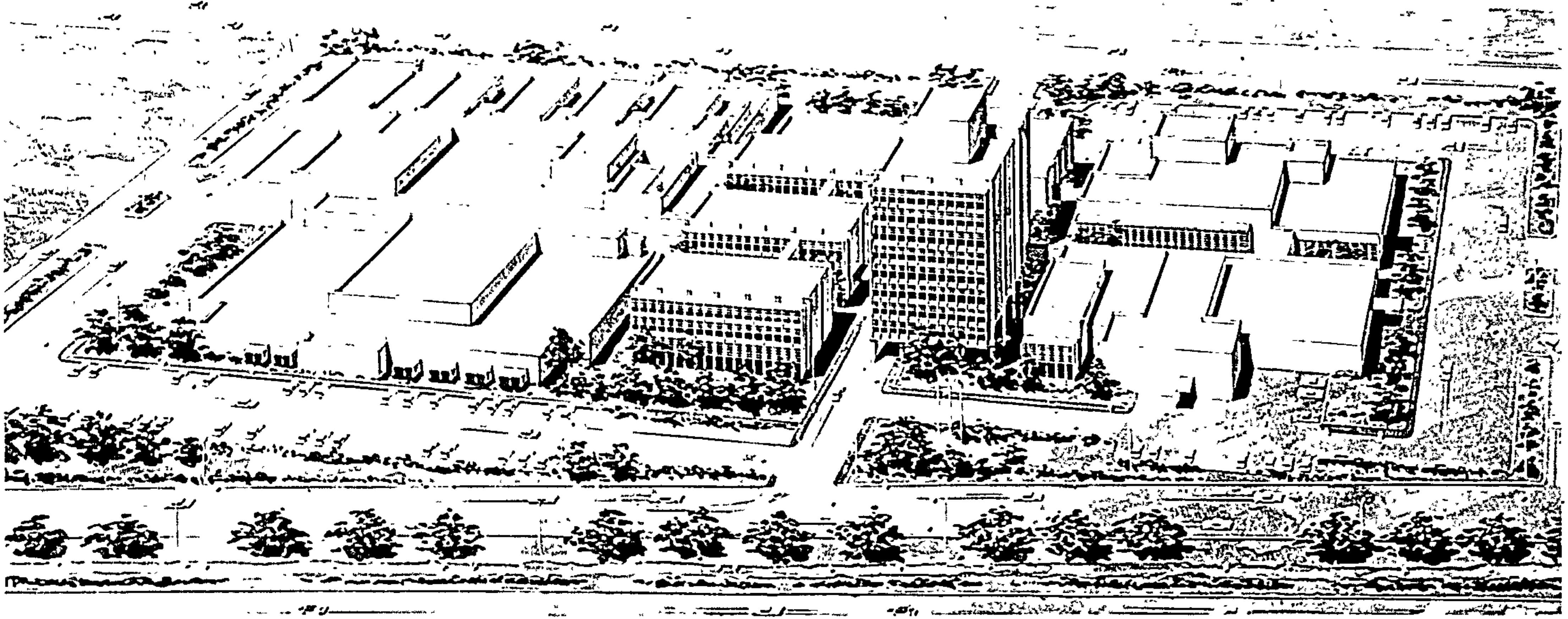

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REPORT ON RADIO & TELEVISION EXPANSION PROJECT OF THE REPUBLIC OF ZAMBIA

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Introduction

This report was compiled on the basis of on-the-spot surveys carried out for 5 weeks by the Survey Mission for the Radio and Television Expansion Project of the Republic of Zambia with the cooperation of many experts. It was completed after careful examination for several months.

Although we fully understand the reasons and necessity of a modernization program for mass-media that the Republic of Zambia wants to develop, at the same time we anticipate many problems in carrying out this project as it requires a large amount of funds, time and personnel.

We came to a conclusion that the project should be carried out in three phases. Completion of the TV broadcasting network and related installations should be given priority in the first phase in consideration of the investment required.

For that reason, the report consists of the basic plan and design specifications (Broadcasting facilities, buildings and steel towers).

In the basic plan the main theme is improvement and expansion of TV broadcasting services but a long-term plan and concrete measures for modernize of the whole mass-media was also touched upon as much as possible. Especially matters of primary concern (1st-phase plan) were described completely and in great detail.

In the design specifications, detailed designs for broadcasting facilities in connection with the 1st-phase plan and the basic plan of buildings and steel towers are provided.

Various plans and their contents described in the report are believed to be the best possible in consideration of economy and rationality and their relationship to future plans. We do not deny the possibility of some changes in the future plan in accordance with future considerations.

Much care was taken to give detailed reasons and information sources in all parts of the study.

PART I SUMMARY

PART I
SUMMARY

Chapter 1 Policy and Scope of the Survey

The mission performed the surveys for the purpose of contributing to modernization of the mass-media of the Republic of Zambia.

The mission clearly indicated the process (plan for execution) to obtain that objective as well as that of obtaining data for designing the buildings and facilities required.

In order to perform an efficient survey and to grasp the true situation, the mission organized four survey teams consisting of mission members and Zambian Government personnel. Full cooperation and understanding of the Zambia government was obtained before surveys were begun. The four survey teams were concerned with stations, studios, buildings and training, respectively.

The mission gave special importance to the following points while performing surveys.

(1) To heed and respect the opinions, desires and ways of thinking of the Zambian project members as much as possible.

(2) To put the emphasis of the survey on matters directly related to the TV expansion project which has the most important function of mass-media and to survey other mass-media items as extensively as possible.

(3) To carry out the surveys with the presence and support of the Zambian members with the results confirmed by all parties.

The policies, scope and objectives of the surveys are described in the following chapters for stations, studios, buildings and training.

Composition of members and the survey itinerary are shown in Tables 1 - 1 and 1 - 2 respectively.

Table 1-1 Composition of Survey Members

	Name	Office belonging to	Duty
Chief	Hitoshi Takeda	Radio Regulatory Bureau, Ministry of Posts and Tele Communications	General management and draft discussion
Member	Hiroshi Akami	" "	Stations
"	Hogara Chiba	Engineering Hqs., Japan Broadcasting Corp.	Construction
"	Shu Takahashi	Central Training Institute, Japan Broadcasting Corporation	Training
"	Tsutomu Himukai	Engineering Hqs., Japan Broadcasting Corp.	Studios
"	Tsuneomi Tsuchiya	Japan Telecommunications Consulting Association	Stations, Transmitting facilities and draft discussion
"	Yasuichi Chikuma	Overseas Technical Cooperation Agency	Business coordination
"	Toshiaki Asano	Engineering Hqs., Japan Broadcasting Corp.	Draft discussion

Table 1-2 Survey Itinerary

Date	Itinerary
Feb. 15 (Thur.)	Leave Tokyo
16 (Fri.)	Arrive Lusaka Press interview
17 (Sat.)	Preliminery conference with Chief Engineer of Zambia Broadcasting Services
18 (Sun)	Conference of the Japanese team members on the survey plans
19 (Mon.)	Conference with the Japanese Embassy
	Courtesy call to Ministry of Information, Broadcasting and Tourism; Zambia Broadcasting Services; Ministry of Power, Transport and Works
	On-the-spot survey of Lusaka transmitting station and studios
20 (Tues.)	Conference with the Zambian govt. personnel concerned with overall matters of the survey
21 (Wed.)	Preparation of survey equipments
	Discussion meeting of the Japanese team members on overall survey matters.

Date	Station Team	Studio Team	Construction Team	Training Team
Feb. 22 (Thur.)	Review of overall plan of survey (Japanese group, MIBT, ZBS)	On-the-spot survey of radio and TV studios at Lusaka	Hearing of explanation of Marconi Report with models Review of survey schedule (at MPTW)	Review of overall plan of survey (at ZIBT).
Feb. 23 (Fri.)	Preparation of survey maps Preparation of test transmitter.	Investigation of requests on TV studio facilities at Lusaka.	Survey of requests for new broadcasting center. Hearing of explanations of Marconi Plan. On-the-spot survey of bldgs.	Survey on ZANA.
Feb. 24 (Sat.)	(")	Arrangement of data	Arrangement of data. Preparation for survey trip.	Arrangement of data on ZANA.
Feb. 25 (Sun.)	Preliminary preparation of propagation test.	(")	(")	Arrangement of data.
Feb. 26 (Mon.)	Review of survey itinerary and route. Testing of measuring equipment	Investigation of requests on TV studio facilities at Lusaka	Survey of existing studio and transmitting station at Kitwe. Survey of transmitting site at Kasompe.	Investigation on ZANA. Investigation of data on ZANA.
Feb. 27 (Tues.)	Loading of survey equipment. Leaving for Livingstone.	Investigation on TV program production.	Survey of sites planned for transmitting stations at Kaloko Hill and Kapiri-Mposhi.	Investigation on ZIS. Hearing of situation on ZIT.

Date	Station Team	Studio Team	Construction Team	Training Team
Feb. 28 (Wed.)	Propagation test at Senkobo area and survey of site planned for transmitting station.	Study of TV studio system of the new broadcasting center.	Survey of existing TV and radio transmitting station at Kabwe. Survey of site planned for transmitting station there.	Investigation on production of TV program at ZBS.
March 1 (Thur.)	Propagation test at Pemba area and survey of site planned for transmitting station.	Investigation requests for radio studio facilities at Lusaka.	Rearrangement of data. Preparation for survey trip.	Investigation of sound production at ZBS.
March 2 (Fri.)	Review of survey schedule. Testing of measuring equipment.	Study of radio program production.,	Survey of site planned for transmitting station at Senkobo.	Investigation of engineering department of ZBS.
March 3 (Sat.)	Review and rearrangement of data by Japanese group.	Rearrangement of Data.	Survey of site planned for transmitting station at Senkobo.	Survey of facilities at ZBS and ZIS.
March 4 (Sun.)	(")	(")	Rearrangement of data.	Rearrangement of data.
March 5 (Mon.)	Collection and arrangement of maps for survey. Testing of measuring equipment.	Conference by Japanese group. Rearrangement of data.	Rearrangement of data on ZANA.	Supplementary survey on ZANA. Rearrangement of data on materials of ZANA.
March 6 (Tues.)	Loading of survey equipment. Leaving for Ndola.	Survey of studio facilities of radio and TV at Kitwe and study of requests.	Investigation at Graphic Art Maintenance Section of ZIS. Survey of buildings of ZANA.	Survey of training schools at Kitwe, Luanshya and Ndola.

Date	Station Team	Studio Team	Construction Team	Training Team
March 7 (Wed.)	Propagation test at Kitwe area and survey of site planned for transmitting station.	Investigation of eration and maintenance of radio and TV systems.	Visit with the University Teaching Hospital. Hearing of explanations on construction from Mr. Sydney Hutt.	Rearrangement of data on ZBS.
March 8 (Thur.)	Propagation test at Ndola area and survey of site planned for transmitting station.	Investigation of requests for engineering specifications on radio.	Visit with the University of Zambia. Survey of existing buildings of ZBS.	Supplementary hearing on school system of ZIBT.
March 9 (Fri.)	Propagation test at Kapiri-Mposhi area and survey of site planned for transmitting station.	Study of requests for engineering specifications on TV.	Hearing of explanations on cost estimation, structure and work of construction from engineers on the spot.	Study on teaching and training at ABS.
March 10 (Sat.)	Propagation test at Kabwe area and survey of site planned for transmitting station.	Rearrangement of data.	Survey on new broadcasting center. Inspection of various buildings of Lusaka.	Rearrangement of data.
March 11 (Sun.)	Rearrangement of survey data. Rearrangement of equipment.	(")	Rearrangement of data.	(")
March 12 (Mon.)	(")	(")	(")	(")

Date	Station Team	Studio Team	Construction Team	Training Team
March 13 (Tues.)	Rearrangement of survey data.	Survey of broadcasting system from standpoint of engineering.	Preparation of draft of interim report.	Hearing of explanations on training at ZBS.
March 14 (Wed.)	Survey of site planned for transmitting station at Lusaka.	(")	Preparation of draft of interim report. Survey of site planned for transmitting station at Lusaka.	Conference on preparation for teaching and training facilities at ZBS.
March 15 (Thur.)	Rearrangement of survey data.	Investigation of requests of ZIS and ZANA.	Preparation of draft of interim report.	Writing of interim report.
March 16 (Fri.)	Study of interim report (Japanese group, MIBT, ZBS)	Overall study of radio and TV studio and preliminery conference on interim report.	Adjustment of interim report draft. Study of interim report draft at MPTW.	Study of interim report draft at ZIBT.
March 17 (Sat.)	Writing of interim report draft			
March 18 (Sun.)	(do)			
March 19 (Mon.)	(do)			
March 20 (Tues.)	Submission of interim report. Explanations and discussions on above.			
March 21 (Wed.)	Preparation for return home of Japanese Mission.			
March 22 (Thur.)	(do)			
March 23 (Fri.)	Thank you visit to the Zambian Government			

Date	Itinerary
March 24 (Sat.)	Leaving Lusaka for Japan

1.1 Siting of Stations

1.1.1 Policy of Survey

Conditions for siting of TV transmitting stations are closely inter-related to such complicated elements as the required service area, geographical conditions, roads, supply of electricity, and the relay of programs. In order to make decisions on sites and transmitting conditions, decisions on the overall service plan and concrete and detailed surveys are a prerequisite.

The mission, in consideration of the urgent policy of the Zambian Government, is that the service area from Kitwe to Lusaka (which is within the coverage of the existing TV net-work) be expanded and a new TV broadcasting net-work for the area from Lusaka to Livingstone be opened. Surveys were made with a policy that not only those areas be covered but also that future expansion also be kept in mind.

1.1.2 Scope of Survey

In carrying out the surveys, emphasis was put on (1) on-the-spot exploration, geographical conditions, supply of electricity, roads, relationship with micro-wave radio stations for relaying programs, existence of radio stations which may cause mutual interference, building conditions of stations and steel towers concerning the sites planned for TV transmitting stations; (2) to transmit test waves from those places in order to measure receiving field intensity at the main points in the planned areas.

Field intensity measurement results will be useful for deciding sites of transmitting stations, heights of transmitting antennas and transmitting power. Testing sites for stations were decided to be Kitwe, Kaloko Hill, Kapiri Mposhi, Kabwe, Lusaka, Pemba and Senkobo in accordance with the Marconi Report, conferences with the Zambian party and the mission's review. The test transmitter was set up at each location and receiving field intensity was measured at about 20 points in 10 areas.

Table 1-3 shows specifications of the transmitter used for the propagation test; Fig. 1-1 is the map of the survey route; Table 1-4 shows the relationship of transmitting test points with receiving test areas.

Table 1-3 Specifications of Transmitter for Propagation Test

Item	Specifications
Transmit Frequency	154 MHz
Transmitter power	8 w
Transmitting Antenna	Yagi-type 3 element using vertical polarization
Antenna pole	Portable extendable triangle steel pole on trailer
Antenna height	about 20 m
Feeder	7C - 2V 30m Loss 2.2 dB
Electric source	DC 12V (Car-loaded battery)

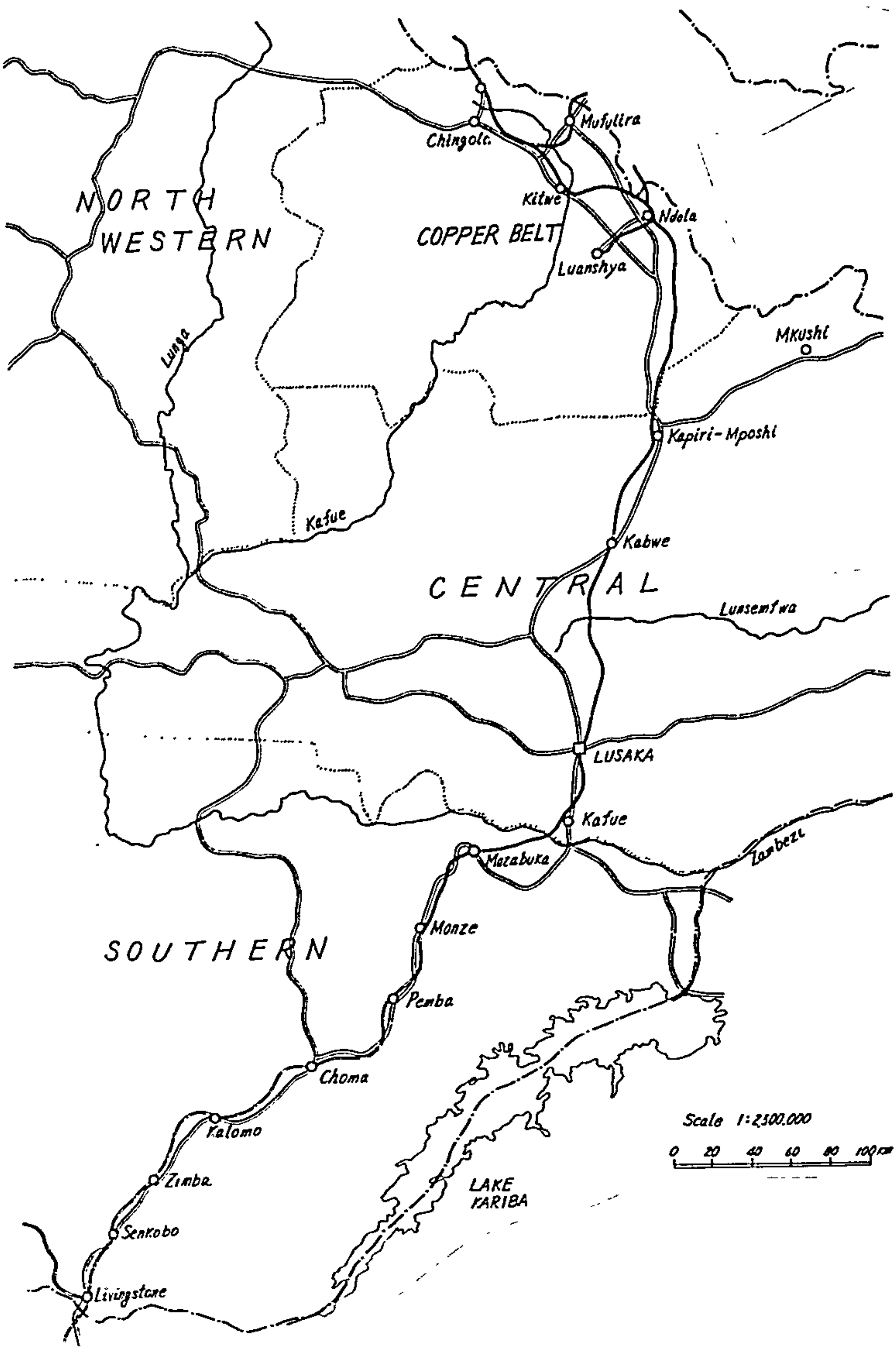


Fig. 1-1 Map of Survey Route

Table 1-4 Test Transmitting Points and Test Receiving Areas

Transmitting points	Receiving Area
Senkobo	Livingstone (Centenary Park, Sports Field) Zimba (Zimba Street, Mulunga Hill)
Pemba	Choma (Choma Main Street, Air Port) Monze (Sports Field, Golf Field)
Kabwe	Chibwe (2 points in Chibwe Village)
Kapili-Mposhi	Mkushi (Mkushi ICA, Chisamba)
Kaloko Hill	Ndola (Ndola Street, Point with unobstructed view 15 km from Kaloko Hill) Luansha (Luansha Street, Roan Township)
Kitwe	Mufulira (mufulira Street, Stadium) Chingora (Chingora Street, Kabndi)

These field test data were very useful for the mission's review of field intensity using profiles produced from 1/5000 maps in Japan.

The mission also made map surveys and calculation of field intensity for several other sites planned for siting stations which were not surveyed on the spot. The conclusions described in Chapter 2 were reached through comprehensive judging of this data.

1.2 Studio Facilities

1.2.1 Policy of Survey

In order to obtain data for planning the size of facilities for studios necessary for operation of TV and radio broadcasts, surveys of the actual special conditions of broadcasting in Zambia were made. Program plans, production of programs, operation of broadcasts and maintenance of facilities were surveyed. Zambian desires for a future broadcasting system were incorporated as much as possible.

1.2.2 Scope of Survey

First, a survey was made to grasp the overall situation under the aforementioned policy at the studio in Lusaka. Then a similar survey was made at the studio in Kitwe. In connection with the above, surveys of ZANA (Zambia News Agency) which was furnishing news and ZIS (Zambia Information Services) which was producing films were also made. During the survey period, a survey was also made on Zambian intentions for future development.

1.3 Buildings and Steel Towers

1.3.1 Policy of Survey

For the purpose of collecting the data and information necessary for the basic design of the studio center, TV transmitting stations and steel towers at Lusaka and several other places, surveys were made on the following items.

(1) Existing status of buildings, building installations and steel towers of related facilities under control of the Ministry of Information, Broadcast and Tourism which are to be the basis of construction plans of studio center, transmitting stations, etc.

(2) Business practices in the above facilities and their implementation.

(3) Ideas and desires of Zambian Government personnel concerning the construction plan.

(4) Opinions of Zambian personnel on the Marconi Report.

(5) Conditions of sites, weather conditions and the environment of the sites planned for construction of the facilities.

(6) Laws and regulations of Zambia in connection with construction.

(7) General conditions of construction in Zambia.

(8) Environment, climate, custom and habits in Zambia.

1.3.2 Scope of Survey

(1) Business practices, present situations and conditions of use of buildings and installations were coordinated with the Headquarters of Ministry of Information, Broadcast and Tourism, ZIS, ZANA, etc. Buildings and installations which are scattered in the city of Lusaka were surveyed and Zambian desires heard on the coming plan.

(2) Conditions of site, weather conditions and environment of the site planned for construction of the Studio Center of Lusaka were surveyed. Kasompe, Kaloki Hill, Kapiri Mposhi, Lusaka, Pemba and Senkobo which are sites planned for TV transmitting stations were also surveyed in turn, on-the-spot.

(3) In the survey of the sites planned for construction of TV transmitting stations, existing studios, transmitting stations, steel towers at Kitwe and Kabwe were surveyed. At the same time, micro-wave relay facilities at Kaloko Hill and Kapiri Mposhi were also surveyed.

(4) While explanations of the Marconi Report were heard from the Chief of the designers' office who had been engaged in the making of the report itself, opinions of the Zambian Government personnel concerned were also sought.

(5) General construction situations in Zambia, i.e. materials, models, methods, installations, types, cost of construction and route of transportation of materials were obtained from designers' offices, intergrating offices, construction calculation offices and contractors. Various data was collected. Buildings designed by the above designers' offices in the construction field were surveyed.

(6) Micro-wave relay installations now under constructions at Kafue, Pemba and Senkobo were surveyed.

(7) The Zambia University and its attached hospital which were recently constructions were inspected.

(8) Laws and regulations applied to construction work in the Republic

of Zambia were investigated.

1.4 Training

1.4.1 Policy of Survey

In planning training, it is necessary to establish a training policy, discover the necessary points of training and establish a training policy, discover the necessary points of training and establish a training system. Therefore, it is a prerequisite to understand the substance of the system of an enterprise, flow of business, and substance of business. At the same time, it is also necessary to investigate requests for training, educational levels, qualifications and business experiences of officers. Surveys were made along those lines.

1.4.2 Scope of Survey

While the system, business practices, business actuality and inter-departmental relations of ZBS (Zambia Broadcasting Services) ZANA and ZIS which were engaged in broadcasting in the Ministry of Information, Broadcast and Tourism were surveyed, requests for training in each department were heard and data was collected. Moreover, in order to be completely informed on the educational system and substance of the training schools, information was collected at the Ministry of Education. Africa Literature Centre at Kitwe, ZIT (Zambia Institute of Technology) at Luanshya and G.P.O. Training School at Ndola were inspected.

Chapter 2 Recommendations

2.1 Modernization of Mass-media

2.1.1 Long-term plan

Since modernization of the mass-media system in the Republic of Zambia requires extensive investment and personnel, it is considered necessary that a long-term plan be made after a complete study and implementation performed step by step in line with the economic development. The mission recommends that the modernization of mass-media of the Republic of Zambia be implemented in the following three phases.

(1) 1st-phase Plan (1974 - 1977)

1) The greatest importance is put on the expansion of service areas of TV broadcasting which have the heaviest weight in the mass-media. Stations shall be sited in the areas from the Cooperbelt to Livingstone in order to provide the information delivery function to more people. At the same time the economic foundation shall be solidified by promoting popularization of receiving sets and increasing receiving charges and advertisement income.

2) With the idea of constructing a mass-media complex in the Capital Lusaka, a studio center shall be constructed in order to provide TV and Radio programs for the time being. Centralization and modernization of broadcasting functions of TV and radio shall be promoted.

(2) 2nd-phase Plan (1978 - 1982)

1) The greatest priority is for.construction of a mass-media complex in Lusaka.

2) Expansion of the TV net-work is continued with main local cities as the objective.

3) A studio is to be constructed at Kitwe in order to improve

broadcasting services for Cooperbelt areas and to provide educational programs.

(3) 3rd-phase Plan (1983 - 1987)

1) A studio is to be constructed at Livingstone in order to expand local programs including newscasts. Improvement of local services and a multiplicity of programs is the goal.
2) Expansion of TV net-work for local cities is successively continued from the and-phase and the broadcasting service on a national scale is to be completed.
3) FM broadcasting net-work on a national scale is to be completed and broadcasting services of high quality and a multiplicity of programs by stereo broadcasting are planned.
4) Radio broadcasting stations are to be established in order that medium-wave radio of good quality is to be received on a national scale.

The above plans are shown in Table 1-5. The plans for the 2nd and 3rd phase are proposals and should be understood as showing only a line of thought.

	1st-phase Plan (1974 - 1977)	2nd-phase Plan (1978 - 1982)	3rd-phase Plan (1983 - 1987)
Expansion plan of radio and TV net-work	Construction of TV trunk stations (Service for 50 % of population is the goal) Dual 10 kw-60m 5 stations Dual 10 kw-100m 1 station Dual 1 kw-60m 1 station	Construction of local and supplementary TV stations (Service for 70 % of population is goal) TV stations ... about 10	Expansion of audio broadcasting net-work and completion of TV net-work. FM stations .... about 10 (Service areas about same size of TV). Big power radio stations* ... 2 - 3 (Completion of national net-work) TV stations .... about 10 (Local and supplementary)
Construction plan of mass-media complex (Lusaka)	Construction of studio center equipped with broadcasting functions Radio ...... 6 studios, etc. TV .... 2 studios, etc. TV O.B. Van (color) ...... 1 Radio O.B. Van 1	Completion of mass-media complex Radio ...... 8 studios, etc. TV .... 4 studios, etc. ZIS .... 2 studios, etc.	
Construction plan of local studios	Temporary reinforcement plan (Kitwe) TV O.B. Van .... 1 VTR .... 1 set	Construction of Kitwe studio station Radio ...... 1 studio, etc. TV .... 1 studio, etc.	Construction of Livingstone studio station

* Allocation of medium- and short-wave frequencies have international implications and construction of radio transmitting stations should be completed earlier than this stage.

Table 1-5 Modernization Plan of Mass-Media

2.1.2 Financial Plan

Since large construction and operation funding is required in order to carry out the modernization plan for mass-media, a long-term financial plan must be established. The construction fund for modernization of mass-media is thought to amount to K12 million in the first phase plan, is temporarily carried out at present time-October, 1973.

The yearly operation cost is thought to fluctuate a great deal according to personnel plans, program editing plans, and progress of construction plans. Therefore, detailed calculation of the operation fund is considered desirable.

2.1.3 Program Plan

(1) TV Program Plan

In order to fulfill the social requirement for TV broadcasting services, it is deemed proper to increase the present broadcasting hours of 62.5 hours per week as follows:

At the end of 1st-phase plan	90 hrs/week
(Mon. - Fri. 9:00 - 23:00	14 hrs/day)
(Sat. - Sun. 13:00 - 23:00	10 hrs/day)
At the end of 2nd-phase plan	100 hrs/week
(Mon. - Fri. 7:00 - 23:00	16 hrs/day)
(Sat. - Sun. 13:00 - 23:00	10 hrs/day)
At the end of 3rd-phase plan	112 hrs/week
(Mon. - Sun. 7:00 - 23:00	16 hrs/day)

In program planning, news and educational and cultural programs must be emphasized and the following distribution of percentages is thought desirable.

News	20 - 25 %
Educational and Cultural	50 - 60 %
Entertainment	15 - 20 %

The following rate of programs produced in the country to the total program hours may be adequate.

1st-phase plan	40 %
2nd-phase plan	70 %
3rd-phase plan	70 %

(2) Radio Program Plan

The present radio broadcasting hours of 18 hours per day (126 hours per week) for three systems should be continued but it is deemed proper to extend FM broadcasting hours to 18 hours per day (126 hours per week) in the 2nd-phase plan.

In program planning, news and educational and cultural programs must be emphasized although there may be some difference in each of the systems. The following rate of percentages may be adequate.

News	25 - 35 %
Educational and cultural	35 - 45 %
Entertainment	25 - 35 %

2.1.4 Personnel Plan

Since a large force of personnel having specialized knowledge and techniques is required in production of programs, news reporting, administration and management in order to carry out a modernization plan for mass-media, it is desirable to establish a long-term plan for recruiting and training of personnel.

2.2 Station Plan

2.2.1 1st-phase plan

It is recommended that 7 TV stations be set up in Kasompe, Nakupata Hill (Ndora), Kabwe, Lusaka, Pemba, Tara and Senkobo as the 1st-phase plan.

In planning expansion of the TV net-work in Zambia; Population distribution, electric supply net-work, micro-wave circuit for relying programs and conditions for placing stations were carefully studied. As a result, it was thought adequate to give priority to serving the densely-populated belt area from Copperbelt to Livingstone. By establishing the above 7 stations, most of the North-South beltline will become receiving areas of TV broadcasts.

2.2.2 2nd-phase and 3rd-phase Plan

The station plan of the 2nd-phase and after all depends upon the future development of the Republic of Zambia, i.e., railways and roads, expansion of electric supply net-work, micro-wave circuits and changes in the population distribution and other variable factors. Therefore, it is difficult to decide details of sites for stations at present. However, it is recommended that a separate station plan be established according to the following policies.

(1) As the 2nd station plan, micro-wave circuits are to be set up along the road connecting Mkushi, Serenje, Mpika, Isoka and Nakonde. Along this micro-wave circuit path small-scale stations are to be set up in good balance with the population distribution. In order to serve the eastern area including Katete, Chipata, Lundazi, 3 or 4 stations of ERP 200 kw class and to serve the northern area including Mansa, Samfya, Kawambwa, Mbala 4 or 5 stations of the same class are to be set up.

    As a program source, new micro-wave circuit lines may have to be set up between Lusaka and Chipata and another line connecting Kasama, Mansa, Kawambwa and Mbala.

(2) As the 3rd station plan, 2 or 3 stations of ERP 200 kw class are to be set up to serve the western area including Mongu, Kalabo and Zambezi. At the same time, small-scale stations are to be set up in important places to supplement the old stations. As a program source, a new micro-wave circuit path may have to be set up between Livingstone and Mongu.

2.3 Studio Facilities

It is recommended that the items shown in the following table (1-6) be set up as studio facilities for use of TV and radio broadcasting services at the time of completion of the modernization plan of mass-media for the Republic of Zambia.

In order to carry out this plan, it is recommended that the construction work be executed in 3 phases as shown in Table 1-6.

Item			1st-phase plan (1974-1977)	2nd-phase plan (1978-1982)	3rd-phase plan (1983-1987)
Lusaka	Conti-nuity System	TV	Master Control Room (1) Central Equipment Room (1) VTR Room (1) Tele-cine Room (1) 100 m^2 studio (1)		
Lusaka	Conti-nuity System	Radio	Master Control Room (1) Continuity Control Room (3) Continuity Studio (3) News Studio (3)	Continuity Control Room (1) Continuity Studio (1) News Studio (1)	
Lusaka	Program produc-ing System	TV	200 m^2 studio (2) (One studio is operated by using an O.B. Van) O.B. Van (with VTR) (Color) (1)	200 m^2 Studio (2) 400 m^2 Studio (2)	
Lusaka	Program produc-ing System	Radio	30 m^2 Studio (4) 70 m^2 Studio (1) 140 m^2 Studio (1) Dubbing Room (1) Echo Room (1) O. B. Van (1) Listening Room (6)	30 m^2 Studio (4) 70 m^2 Studio (1) 140 m^2 Studio (1) Echo Room (1) O. B. Van (1)	
Lusaka	Program produc-ing System	Film	Development-Printing Room (1) (Dubbing studio is in common use with radio studio)	Film Studio (1) Dubbing Studio (1) Preview Theater (1) Animation Room (1)	
Kitwe	Conti-nuity System	TV	VTR (1)	Master Control Room (1) Central Equipment Room (1) VTR Room (1) Tele-cine Room (1) 100 m^2 Studio (1)	
Kitwe	Conti-nuity System	Radio		Master Control Room (1) Continuity Studio (1)	
Kitwe	Program Produc-ing System	TV	O.B. Van (with VTR) (1)	200 m^2 Studio (1)	
Kitwe	Program Produc-ing System	Radio		70 m^2 Studio (1) Dubbing Room (1) O. B. Van (1)	
Kitwe	Program Produc-ing System	Film		Development Room (1)	
Living-stone	Conti-nuity System	TV			Master Control Room (1) Central Equipment Room(1) VTR Room (1) Tele-cine Room (1) 100 m^2 Studio (1)
Living-stone	Conti-nuity System	Radio			Master Control Room (1) Continuity Studio (1)
Living-stone	Program produc-ing System	TV			O. B. Van (with VTR) (1)
Living-stone	Program produc-ing System	Radio			O. B. Van (1)
Living-stone	Program produc-ing System	Film			Development Room (1)

Table 1-6 Modernization Plan of Studio Installations

2.3.1 Lusaka Studio Center

(1) Continuity System

1) Television

Master Control Room	(1)
Central Equipment Room (for common use by TV and radio)	(1)
VTR Room	(1)
Tele-cine Room	(1)
VTR, Tele-cine Control Room	(1)
100 m^2 Studio	(1)

2) Radio

Master Control Room	(1)
Continuity Control Room	(4)
Continuity Studio	(4)
News Studio	(4)

(2) Program Producing System

1) TV Program Producing System

200 m^2 Studio	(4)
400 m^2 Studio	(2)
Outside Broadcasting Vehicle (with VTR)	(1)

2) Radio Program Producing System

30 m^2 Studio	(8)
70 m^2 Studio	(2)
140 m^2 Studio	(2)
Dubbing Room	(1)
Echo Room	(2)
Listening Room	(6)
Outside Broadcasting Vehicle	(2)

3) Film Program Producing System

Film Studio	(1)
Dubbing Studio	(1)
Preview Theatre	(1)
Developing, Printing Facilities	(1 set)

Preview Facilities	(1 set)
Animation Facilities	(1 set)

2.3.2 Kitwe Studio Station

(1) Continuity System

1) Television

Master Control Room	(1)
Central Equipment Room	
(for common use by TV and radio)	(1)
Tele-cine VTR Room	(1)
100 m^2 Studio	(1)

2) Radio

Master Control Room	(1)
Continuity Studio	(1)

(2) Program Producing System

1) TV Program Producing System

200 m^2 Studio	(1)
Outside Broadcasting Vehicle (with VTR)	(1)

2) Radio Program Producing System

70 m^2 Studio	(1)
Dubbing Room	(1)
Echo Room	(1)
Outside Broadcasting Vehicle	(1)

3) Film Program Producing System

Developing Facilities	(1 set)

2.3.3 Livingstone Studio Station

(1) Continuity System

1) Television

Master Control Room	(1)
Central Equipment Room	
(for common use by TV and radio)	(1)

VTR, Tele-cine Room (1)

100 m^2 Studio (1)

2) Radio

Master Control Room (1)

Continuity Studio (1)

(2) Program Producing System

1) TV Program Producing System

Outside Broadcasting Vehicle (with VTR) (1)

2) Radio Program Producing System

Outside Broadcasting Vehicle (1)

3) Film Program Producing System

Developing Facilities (1 set)

2.4 Buildings and Steel Towers

2.4.1 Overall Plan

The overall plan concerning buildings and steel towers is recommended as follows:

(1) For the 1st-phase plan, while a studio center mainly consisting of facilities connected with ZBS is to be constructed in Lusaka, TV transmitting stations and steel towers will be constructed at the following 7 places: Kasompe, Nakupata Hill, Kabwe, Lusaka, Pemba, Tara and Senkobo.

(2) For the 2nd-phase plan, while the studio center above is to be expanded, a mass-media complex is to be completed by combining facilities in other departments of the Ministry of Information, Broadcasting and Tourism. Kitwe studio is to be reconstructed and installed. Corresponding to the 2nd-phase expansion plan of broadcasting net-work, TV transmitting stations will be supplemented.

(3) For the 3rd-phase plan, Livingstone studio will be constructed. In accordance with the 3rd-phase expansion plan of TV, medium-wave and FM broadcast; transmissing stations and steel towers

will be constructed at the required points.

2.4.2 1st-phase Plan

Following installations are recommended concerning studio center, TV transmitting stations and steel towers.

(1) Studio Center (Lusaka)

1) Scale 3 story building (partly one story)

Total floor space 12,500 m^2

2) Construction Reinforced concrete, partly blocks and steel framed

3) Main rooms

TV Studio	200 m^2	2 room
Radio Studio	140 m^2	1
Radio Studio	70 m^2	1
Radio Studio	30 m^2	4
Presentation Studio	100 m^2	1
Continuity Studios		3
News Studios		3
Control Rooms		3
Central Technical Areas	(See the attached Table 4-1, PART 4)	
Artists' Dressing Rooms	"	
Property Stores	"	
Equipment Stores	"	
Building Equipment Rooms	"	
Garage	"	
Library	"	
Film Laboratory	"	
Offices, etc.	"	

4) Installations Electricity, Air-conditioning, Plumbing

5) Steel Tower for STL, self-supporting 1

6) Outdoor facilities, parking spaces, greens and tree plants, etc.

(2) TV Transmitting Station and Steel Tower

1) Station buildings are all same at 7 places

(a) Scale — 1 story
Floor space — about 200 m^2

(b) Construction
Blocks and reinforced concrete

(c) Main rooms

Transmitter Room	1
Power Receiving Room	1
Office, etc.	

(d) Installations
Electricity, ventilation, Oil supply,

(e) Surrounding fence

2) Construction and height of steel towers

Kasompe	Self-supporting	60 m
Nakupata Hill	"	60
Kabwe	"	60
Lusaka	"	100
Pemba	"	60
Tara	Self-supporting or Guyed	60
Senkobo	Guyed	60

2.5 Training Plan

The purpose of training in an enterprise is the development of the capabilities and human growth of its members in order to contribute to the development of the enterprise. Especially in a broadcasting system where production of good programs is based upon creativity of its members, development of its members' capabilities has far more importance than in any other enterprise. Training, therefore, must be carried out with this principle in mind.

2.5.1 On-the-job Training

Training in an enterprise consists of on-the-job training and off-the-job group training. In the training of various jobs in a broadcasting system, especially of producers, announcers, reporters or cameramen, on-the-job individual training by supervisors is most important, because each program has individuality and can not be mass-produced. It is on-the-job training that really improves the knowledge and ability of members.

2.5.2 Off-the-job Group Training

On the other hand, it is also important to train personnel on policies and principles everyone should know. Off-the-job group training is for the purpose of teaching basic matters.

In the production of a program, close cooperation among composing members is required and a good production is possible only with that cooperation. Since each member who is in charge of a different job should have some basic knowledge about the jobs of other members, beginners must be given chances to learn as many jobs as possible.

However, they should be gradually specialized according to their aptitudes for the purpose of improving quality of programs.

Under these considerations, off-the-job group training is preferably given in the following order.

New employee training
Basic training
Specialized training

The purpose of new employee training is to have employees understand the basic ideas of an enterprise or system, enhance self-consciousness and responsibility as a member of the organization, develop human nature as a social being, and learn the basic knowledge and techniques of jobs. 2 to 3 months are necessary because it will cover a very extended range of training.

The basic training is for those employees who have experience of only 2 to 3 years and gives basic knowledge and techniques necessary for carrying out daily work. The training should be as extensive as possible in order to build up desirable cooperation among various jobs.

Specialized training is given to those who have experience of 5 to 10 years and are already performing jobs in a specialized way. It aims at giving specialized knowledge and techniques and a high level of job ability.

Various courses of the basic and specialized trainings can be considered but they should be given in short period (1 - 2 weeks) and intensive. Training courses should be most adequate for the organization in consideration of its system and flow of work.

An example of training courses follows:

	New Employee Training Course	Basic Training Course	Specialized Training Course
Job classification	1) Producer 2) News reporter 3) Announcer 4) Production technician (Cameraman, Mixer, Lightman, etc.)	1) Producer 2) News reporter 3) Announcer 4) Production technician	1) Producer 2) News reporter 3) Announcer 4) Production technician
	5) Engineers in general	5) Engineers in general	5) Studio equipment engineers 6) Tele-cine engineers 7) VTR engineers 8) Transmitting engineers equipment

2.5.3 On-the-job Training and Off-the-job Group Training

Both are closely related and it is necessary that the principles taught at the group training are made use of effectively on the job and that the supervisory people on the job should guide trainees properly in order to attain the full effect of the training.

It is desirable that this trainings be given cyclically such as On-the-job Training - Group Training - On-the-job Training in step with the progress of employees and under pre-determined planning.

2.5.4 Training Facilities

In order that the above training is given effectively with.adequate results, adequate training facilities are required. For that purpose, TV studios, radio studios and other related equipments and facilities are necessary which cost much money. Therefore, in providing the training facilities, much thought should be paid concerning the uses of the facilities. It is wise to make full use of existing facilities for the time being.

2.5.5 Others

It will be 15 to 20 years before the trainings show good results but what can be done must be accomplished right away. It is advised to make use of Evelyn Home College and ZIT.

It is necessary to hire the required personnel in step with the progress of the long-term plan of expansion of mass-media and start training early. However, expansion of installations does not necessarily mean an increase of the number of personnel. The required number of personnel fluctuate a great deal according to such factors as automated systems, studio or film programs and the type of program.

Therefore, high deliberation is necessary for a decision as to the number of personnel. Training of personnel takes time and the expansion plan itself must be made in consideration of that fact.

For teachers the present supervisory staff is most suitable but sending trainees to proper institutes overseas or inviting teachers from abroad may also be desirable.

2.6 Execution Plan

In order to complete the modernization plan of mass-media a great amount of funding and a long period of time for construction is required. Even after completion of construction, its operation requires much money and many people. Therefore, it is necessary to make up a concrete plan for execution including a financial plan a program compilation plan and a personnel plan.

2.6.1 Execution Process

For completion of 1st-phase plan about 4 years may be necessary. Table 1-7 shows an example of construction process plan of 1st-phase plan.

Since the process schedule can vary a great deal due to construction methods and construction conditions, a careful study is required to make the plan.

2.6.2 Financial Plan

The construction funds of 1st-phase plan may amount to K 12 million. The details are described in the Execution Design Plan in a separate volume.

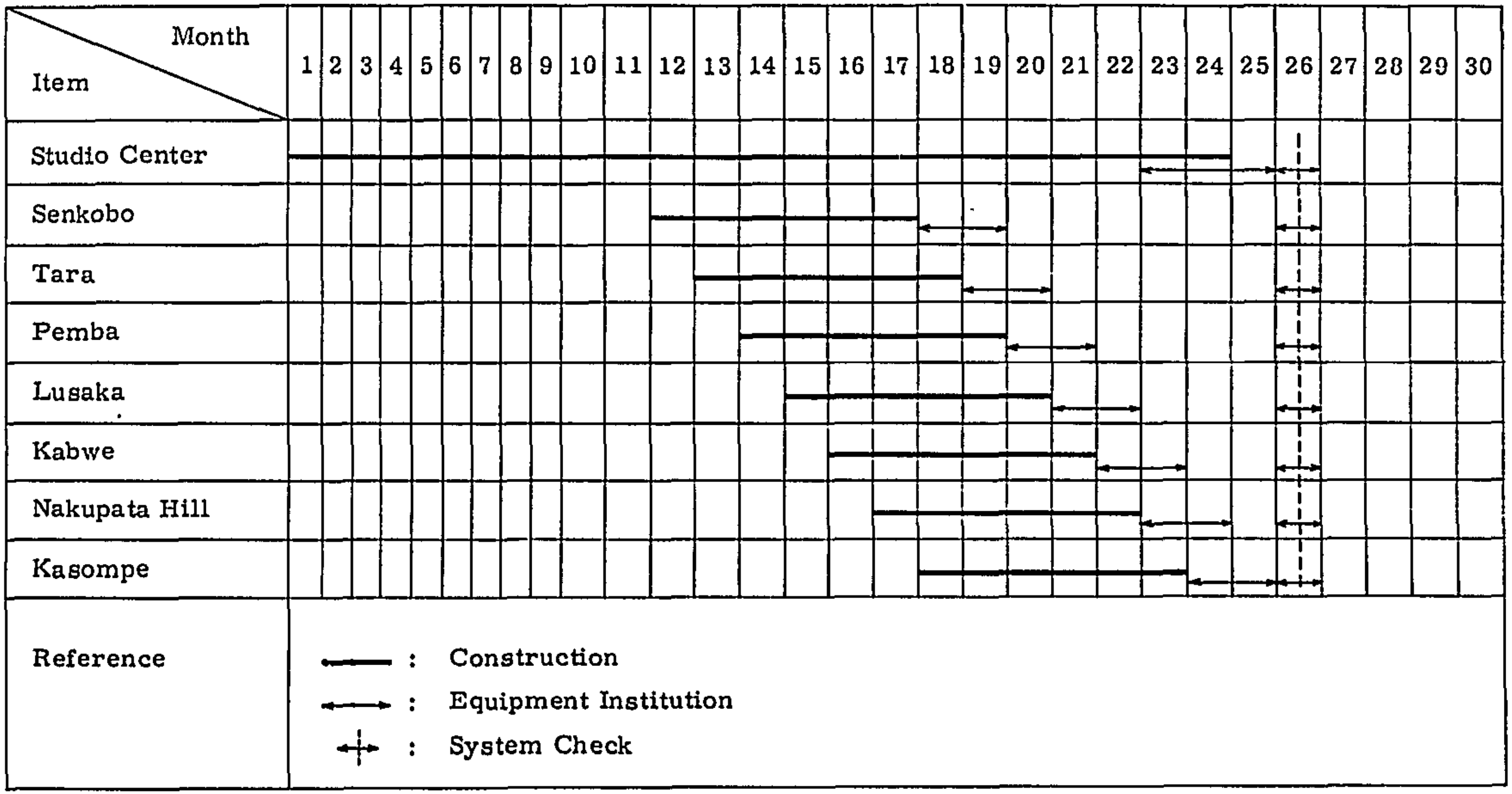
2.6.3 Consultant

It is recommended that competent consultants in the fields of construction and installation be utilized in order to realize the 1st-phase plan successfully and to deal with various procedures properly from bidding, process control to final delivery.

2.7 Improvement Plan for TV Receiving

2.7.1 Popularization Plan for Receivers

Table 1-7 Construction & Equipment Installation Schedule of 1st-phase Plan



The popularization plan of TV receiving sets is a very important subject in the point of view of establishment of a mass-communication system through broadcasting and the increase of receiving charges. It is desirable that the following measures be taken for popularization to attain the target of 100,000 TV sets in step with the progress of the 1st-phase expansion plan.

(1) In order to give chances for watching TV to as many people as possible, receiving sets for common use are sent to schools and community centers. Where there is no commercial electric source, a small-sized generator may be necessary.

(2) By cutting or abolishing import duty, commodity tax or sales tax of receiving sets, prices can be made popular.

(3) By setting up a financing system with low interest toward the sales shops, long-term installment sales or a inexpensive rental system may be realized.

(4) Total funds that people pay for purchase of receiving sets corresponds to the total investment made by the broadcasting system. Therefore, it is better to declare a policy of colorization in the first phase and help people avoid the expenditure of changing from monochrome to a color TV set.

2.7.2 Improvement Plan for Receiving

In order that TV broadcasting waves are received in good condition, not only the transmitting side but the receiving side play important roles. Therefore, it is necessary that active information and proper guidance on how to receive better broadcasts should be directed to the general public and salesmen of the sets.

In addition to a general receiving guide, a measure for common receiving in buildings like hotels and that in the fringe areas are also important.

In order that extensive TV receiving guidance and countermeasure against TV receiving obstruction are given uniformly, a receiving guidance group or receiving consultation room staffed by expert engineers should be set up. Service cars for TV receiving services are preferably arranged at important points to grasp the actual situations of TV receiving and give guidance effectively. Adoption of such a service system is quite desirable.

Chapter 3 Words of Thanks

This survey was completed very efficiently and smoothly thanks to the immeasurable cooperation and consideration extended by the Honorable S. Wina, Minister of Information, Broadcasting and Tourism, the Honorable F. M. Mulikita, Minister of Power, Transport and Works and those concerned in both ministries and the people concerned in the General Post Office, the Zambia Broadcasting Services, the Zambia Information Services and the Zambia News Agency. We express the highest respect and gratitude to those people concerned.

Our heartfelt thanks also go to Ambassador Nishimiya stationed in Zambia and other officials of the embassy who provided us with great assistance and guidance before, during and after the survey and also those concerned in the Ministry of Foreign Affairs, the Ministry of Posts and Telecommunications, the Japan Broadcasting Corporation, the Japan Telecommunications Consulting Association and the Overseas Technical Cooperation Agency.

In conclusion, we hope that the plans based upon this survey are completed as soon as possible and they contribute to the progress of education and culture in the Republic of Zambia and of mutual friendship between our two countries.

PART II TV TRANSMITTING FACILITIES

PART II

TV TRANSMITTING FACILITIES

Chapter 1 Station Plan

1.1 Basic Policy for Site Selection

Television broadcasting's fundamental function is communication of information to the general public. Consequently, it is preferable that TV stations are located where population density is high.

In the Republic of Zambia the narrow central part of the country starting from Copperbelt at the north end to Livingstone at the south end is the most densely populated today. The area along the route to Tanzania via Kapiri Mposhi, Mkushi, Serenjo, Mpika, Chinsali and Isoka is where future TV development is most highly expected.

The rest of ZAMBIA can be divided into the eastern sector with Chipata as its center, the northern sector including Kasama, Mbala, Kawambwa, Mansa and Samfya, and the western sector with Mongu, Kalabo and Zambezi as its center.

The guiding principle for TV transmitter site selection is that construction of stations be limited to the narrow central part of the country, and this is adopted as the primary TV transmitter site selection plan. Because of funding for the new studio center in Lusaka in the current project it is not appropriate at this time to expand the TV transmitter site selection plan to the other sector.

The secondary TV transmitter site selection plan calls for small-scale stations which match the distribution of population along major roads toward Tanzania, and at the same time three or four major stations of ERP 200 kW class in the eastern area with Chipata as the center and four or five major stations of ERP 200 kW class in the northern area including Kasama, Mbala, Kawambwa, Mansa and Samfya. In this secondary plan microwave networks from Kapiri Mposhi to Tanzania, microwave networks between Lusaka and Chipata and also connecting Kasama, Mbala, Kawambwa and Mansa should be newly built as program sources. If it is difficult from a financial standpoint to build both microwave networks and television stations, it is desirable that the microwave network be consolidated first and then stations be built one after another starting from the highly populated areas.

As a third plan it is desirable that stations and microwave networks be built in the western area including Mongu, Kalabo and Zambezi following the guide lines given in the secondary plan. It is assumed that two or three major stations of ERP 200 kW class will become necessary.

1.2 Necessary Service Areas and Station Plan

Based on the Republic of Zambia's current situation, primary TV transmitter site selection plans will be discussed as follows.

1.2.1 Population Distribution in the Republic of Zambia

According to the population distribution chart issued by the government of the Republic of Zambia in 1969 there are three major population areas in the zone which encompass the primary TV transmitter site selection plan. These areas are the northern industrial area with Kitwe and Ndola as its center; the central administrative and commercial area with Lusaka as its center; and the southern commercial and tourist area with Livingstone as its center. Consequently, selection of sites should be made with preference given to these areas.

1.2.2 Service Areas

Major towns to be included in the service areas by the primary site selection plan of TV transmitting stations are as follows.

(1) Northern industrial area
Kitwe, Ndola, Mufulira, Chingola, Luanshia, Chililabombwe Kalulushi, etc.

(2) Central administrative and commercial area
Lusaka, Kabwe, Kapiri Mposhi, Kafue, Mazabuka, etc.

(3) Southern commercial and tourist area
Livingstone, Choma, Monze, Magoye, Pemba, Senkobo, Kalomo,

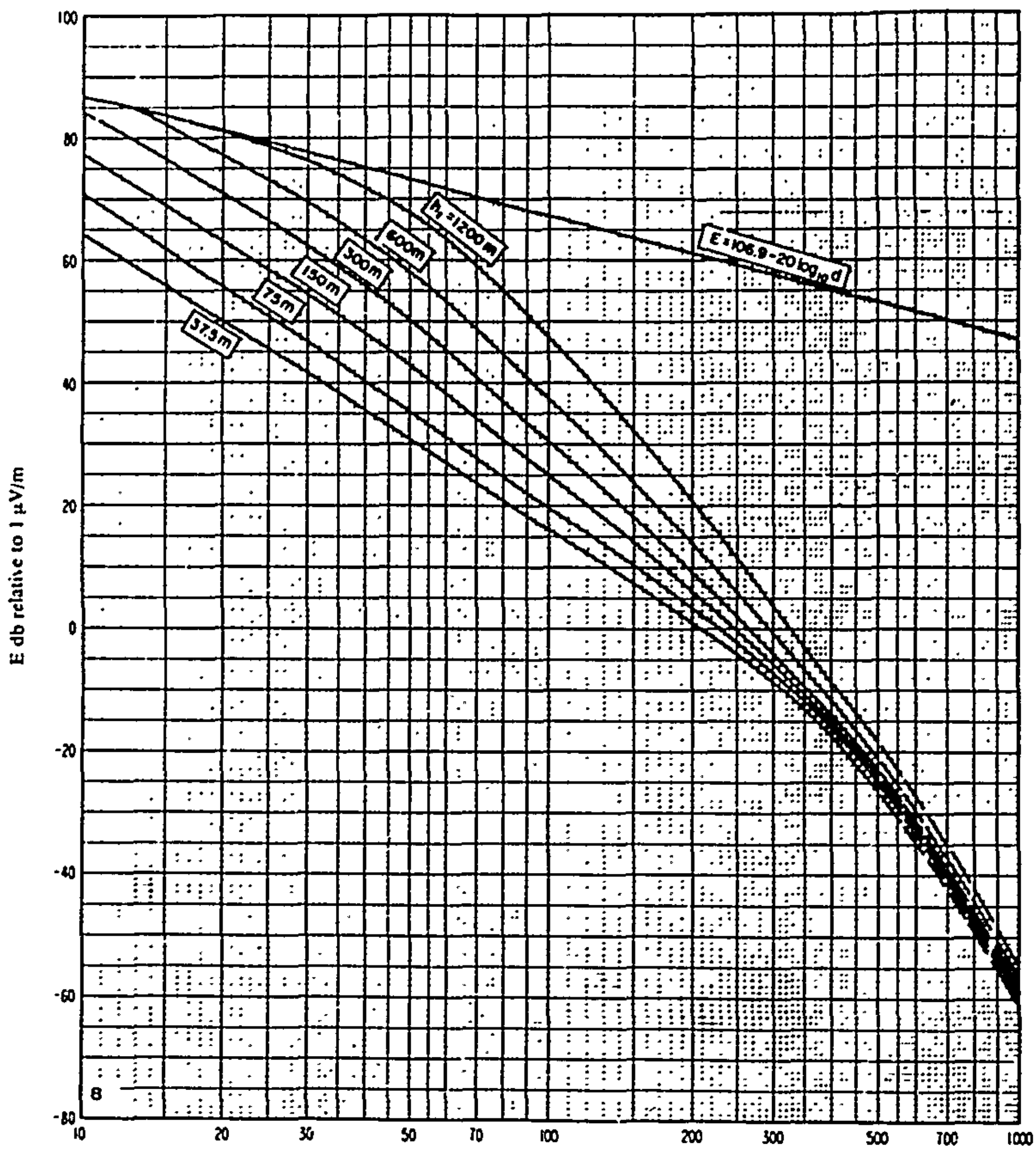
Zimba, etc.

In addition to the above it is expected that the population density along the road running to the north east from Kapiri Mposhi toward Tanzania through Mkushi, Serenje and Mpika will increase in the future. However, with the current population density it is not economical to start TV broadcasting in this area at the present time. Consequently, it is appropriate that commencement of service in this area be considered a part of the secondary site selection plan in accordance with the future development of this area.

1.2.3 Estimation of Service Areas and Picture Quality

(1) Estimation of Service Areas for New TV Transmitting Stations

Measurement of field intensity was made at approximately twenty points by using small-sized transmitters and field intensity meters for the purpose of investigating radio propagation characteristics in the Republic of Zambia. Compared to the results of this measurement with the field intensity curve illustrated in the Final Acts of African VHF/UHF Broadcasting Conference, Geneva, 1963 (Figure 8), it was ascertained that the values actually measured are higher by a few decibles than the values in the field intensity curve. However, due to the fact that the data taken through measurement was not sufficient to correct this field intensity curve, the values read from the curve were used as fundamental values for estimation of field intensity. Fringes of service areas were estimated taking account of geographical elements based on maps of 1/50,000 or 1/25,000 as well as correction values ascertained from experience. Accordingly, it is assumed that there exist margins of field intensity of a few decibels in the fringe areas, in practice. The above mentioned field intensity curve is shown in Fig. 2-1.



E(50, 50): Field Intensity for 50% of Locations and 50% of Time

km

FIGURE 8

Sub-tropical (Continental)

E (50,50) 40-250 Mc/s h_2 - 10 m

Fig. 2-1 Field Intensity for 1 kw Radiated Power in Sub-tropical (Continental) Areas

(2) Field Intensity and Picture Quality

According to C.C.I.R.'s Recommendation 417-2 (1970, New Delhi) the minimum field intensity of TV band III is 55 dBμ and admits that 49 dBμ or higher is sufficient in areas of lean population density. In the case of the Republic of Zambia the population density in the service fringe areas is lean, and consequently, it is practical that the areas where the field intensity at points 10 meters above the ground is 49 dBμ are acceptable service area fringes.

The relationship between the field intensity and practical picture quality obtained with TV receiving units is described below.

The correlation between an evaluation of TV reception and C/N value (carrier power versus noise power) is shown in Table 2-1.

Table 2-1 Corelation Between Picture Evaluation and C/N Value
(Data Obtained from Japan Broadcasting Corporation)

Picture quality	Picture evaluation	C/N value
5	No inteference observed	45 dB or higher
4	Interference observed, but not detrimental	37 dB or higher
3	Interference is detrimental, but not hindering reception	29 dB or higher
2	Interference is excessive and is hindering reception	22 dB or higher
1	Cannot be received due to interference	22 dB or less

The carrier power versus noise power at the input terminal of a TV receiver have the following relationship.

$$C/N = \frac{Vi^2}{4Ri} \; / \; KTBF \qquad (1)$$

where Vi : receiver input voltage (open end)

Ri : receiver input impedance

K : Boltzmann constant 1.38×10^{-23} joule/°K

T : absolute temperature (273 + t) °K

B : receiver equivalent noise band width

F : receiver noise figure

On the other hand, the relation between receiver input voltage (open end) V_i and receiving electric field intensity E is as follows.

$$V_i = E \cdot \frac{\lambda}{\pi} \cdot \sqrt{\frac{R_i}{73.13}} \cdot \sqrt{\frac{Ga}{L_f}} \qquad (2)$$

where λ : wavelength of carrier frequency

R_i : receiver input impedance

Ga : receiving antenna gain

L_f : receiving feeder loss

Assuming that

$R_i = 300\,\Omega$, B = 4 MHz, F = 8 dB, λ = 1.5m (200 MHz), L_f = 1 dB, T = (273 + 35)°K

from equation (1) above,

$$V_i\ (\mathrm{dB}\mu) = C/N\ (\mathrm{dB}) + 21\ (\mathrm{dB}) \qquad (3)$$

and from equation (2) above,

$$Ga\ (\mathrm{dB}) = Vi\ (\mathrm{dB}) - E\ (\mathrm{dB}) + 1\ (\mathrm{dB}) \qquad (4)$$

The correlation among picture quality, C/N value, receiver input voltage, receiving antenna gain and field intensity is summarized as shown in Table 2-2 from equations (3) and (4).

Table 2-2 Relation Among Picture Qualtity, Antenna Gain and Field Intensity

Picture quality	C/N value	Receiver input voltage (open end) Vi	Receiving antenna gain (Ga)	Field intensity (E)
5	45 dB	66 dBμ	12dB/18dB	55dBμ/49dBμ
4	37 dB	58 dBμ	4dB/10dB	55dBμ/49dBμ
3	29 dB	50 dBμ	2dB/11dB	49dBμ/40dBμ

As shown in the above table, pictures quality 5 can be received at places with a field intensity of 55 dB or higher, if an 8 element Yagi antenna (Ga = 10 dB) is used. At places with an intensity of 49 dB or higher, pictures quality 4 can be received with an 8 element Yagi antenna. Even at places with a field intensity of 40 dB normal picture (quality 3) can be received if 8 element Yagi antenna is used.

1.2.4 Locations and Effective Radiation Power of TV Transmitting Stations

The elements that should be taken into account when selecting the site of a TV transmitting station are availability of program source, height above sea level, relationship with major service areas, road conditions, situation of power supply, relation with aviation routes and the presence of small-power radio stations that are likely to be interfered with. If there are two or more proposed sites in a region, the more advantageous site should be selected with the above mentioned elements taken into account. Table 2-3 indicates comparison of proposed sites based on the results of investigation at each site and of an analysis made in Japan after our return.

Area	Location of TX Site	Height	Space	Programme Source	Access Road	Power Supply	Aviation Route	Other Small Power TX	Fringe Area
Kitwe	Map No. 1228C3 (32.85, 85.3)	1210m A.S.L.	OK	Cable from Kitwe	OK	OK	OK	OK	Chilila-bombwe
o Kasompe	Map No. 1227D2 (06.15, 09.85)	1410m A.S.L.	OK	STL from Kitwe	OK	OK	OK	OK	OK
Kaloko Hill	Map No. 1328B1 (80.95, 56.65)	1400m A.S.L.	OK	Cable from Kaloko Hill	OK	OK	OK	NO	OK
o Nakupata Hill	Map No. 1328B1 (75.75, 58.15)	1380m A.S.L.		STL from Kaloko Hill			OK	OK	OK
o Kabwe	Map No. 1428A4 (55.85, 04.20)	1180m A.S.L.	OK	Cable from P.O.	OK	OK	OK	OK	OK
o Lusaka	Map No. 1528A4 First Point (49.25, 92.35)	1320m A.S.L.	OK	STL from St. Center	OK	OK	OK	OK	OK
	Second Point (36.10, 05.25)	1200m A.S.L.	OK	STL from St. Center	OK	OK	NO	OK	OK
	Third Point (37.85, 07.55)	1300m A.S.L.	OK	STL from St. Center	OK	OK	NO	OK	OK
	Studio Center (56.50, 94.80)	1280m A.S.L.	NO Tower Space	Cable from St. Center	OK	OK	OK	OK	OK
Monze	Map No. 1627A4 (51.00, 01.00)	1210m A.S.L.	OK	Cable from Monze		OK			Muzoka Mazabuka
o Pemba	Map No. 1627C2 (34.60, 73.30)	1250m A.S.L.	OK	Cable from Pemba	OK	OK	OK	OK	OK
Choma	Map No. 1626D4 (99.00, 42.00)	1410m A.S.L.		Cable from Chima					Kalomo
o Tara	Map No. 1626D4 (77.15, 25.55)	1350m A.S.L.	OK	Cable from Tara	OK				OK
o Senkobo	Map No. 1627C2 (91.40, 53.70)	1160m A.S.L.	OK	Cable from Senkobo	OK	OK	OK	OK	OK

Note: Those with o marks are where construction of TV transmitting stations is practically proposed.

Table 2-3 Comparison of Proposed Sites of TV Transmitting Stations

Results of analysis of proposed sites are described below.

(1) Kasompe TV Transmitting Station

1) Location Map No. 1227D2 (96.15, 09.85)
Height above sea level: 1,410 m
The location of the station is shown in Fig. 2-2.

The service area of this TV transmitting station should include Kasompe, Chililabombwe, Chingola, Mufulira, Kalulushi and Kitwe. Both Kitwe and Kasompe may be proposed as the site of the TV transmitting station to cover the above mentioned area. When comparison is made based on Table 2-3, however, it appears that Kasompe is immensely superior to Kitwe due to the following reasons.

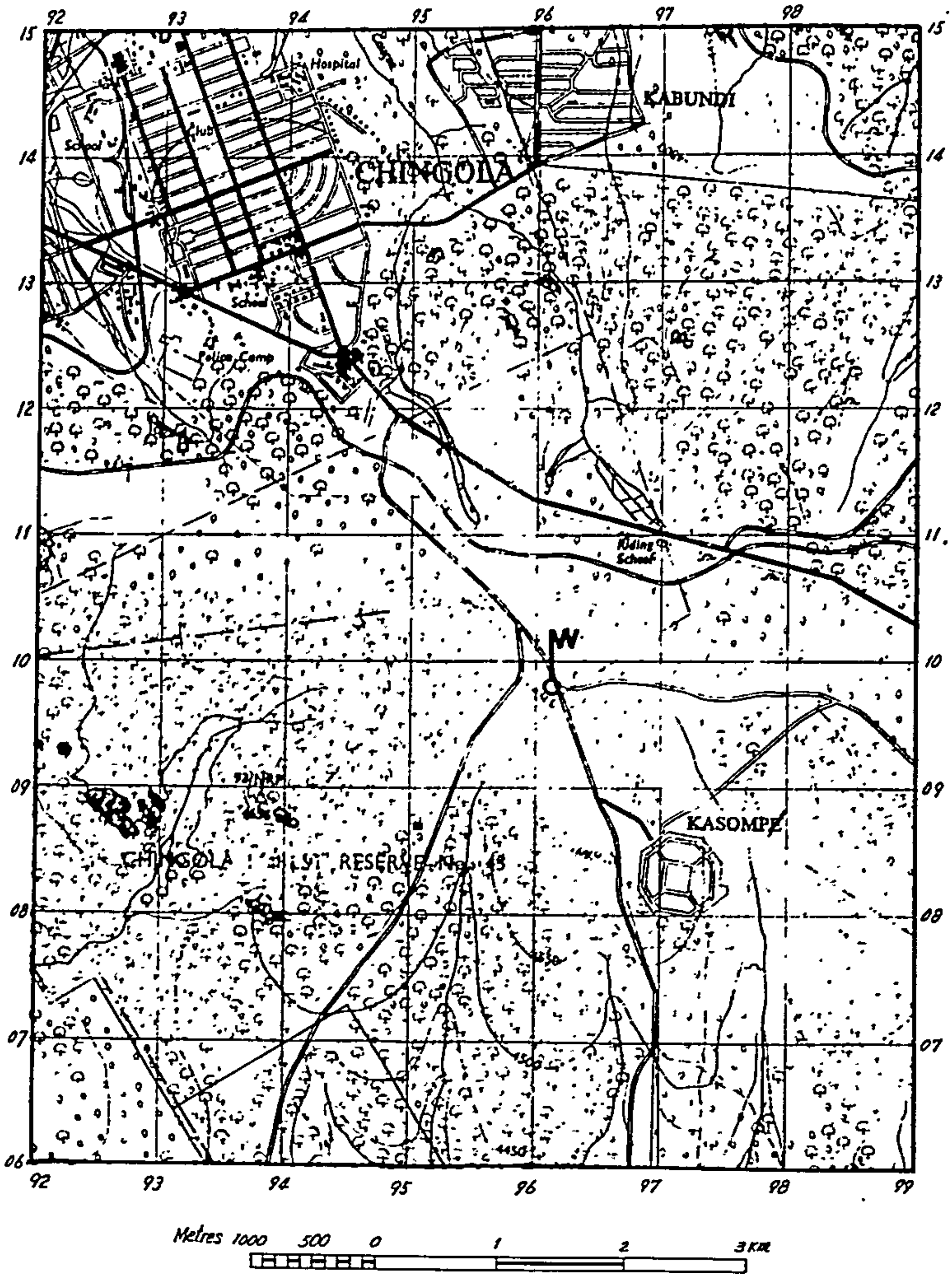
(a) The height of Kasompe above sea level is higher than that of Kitwe by 200 m. Accordingly the height of the transmitting tower can be lowered in Kasompe.

(b) If Kitwe is selected, the distance to Chililabombwe is lengthened, and accordingly there is concern that Chililabombwe is in the fringe of the service area. Kasompe is a better location because it is located in the middle between Chililabombwe and Kitwe.

(c) Kitwe is more advantageous with respect to maintenance because of the existance of TV studios. However, because transmitters are operated unattended and are remote controlled from Lusaka, the demerits of Kasompe are minor.

(d) When the TV transmitting station is built in Kitwe cables will do for the program transmitting circuits. On the other hand, if Kasompe is selected, STL of about 10 W is required. However, the extra cost for STL can be sufficiently offset with the reduction in cost that can be accomplished by lowering the height of the transmitting tower.

(e) With respect to the access road and power supply, Kasompe is not very inferior to Kitwe if the fact that a new residential town will be constructed in Kasompe in the near future is taken into account.



Name of Station	Kasompe
Map No.	1227 D2
Coordinates	96.15, 09.85

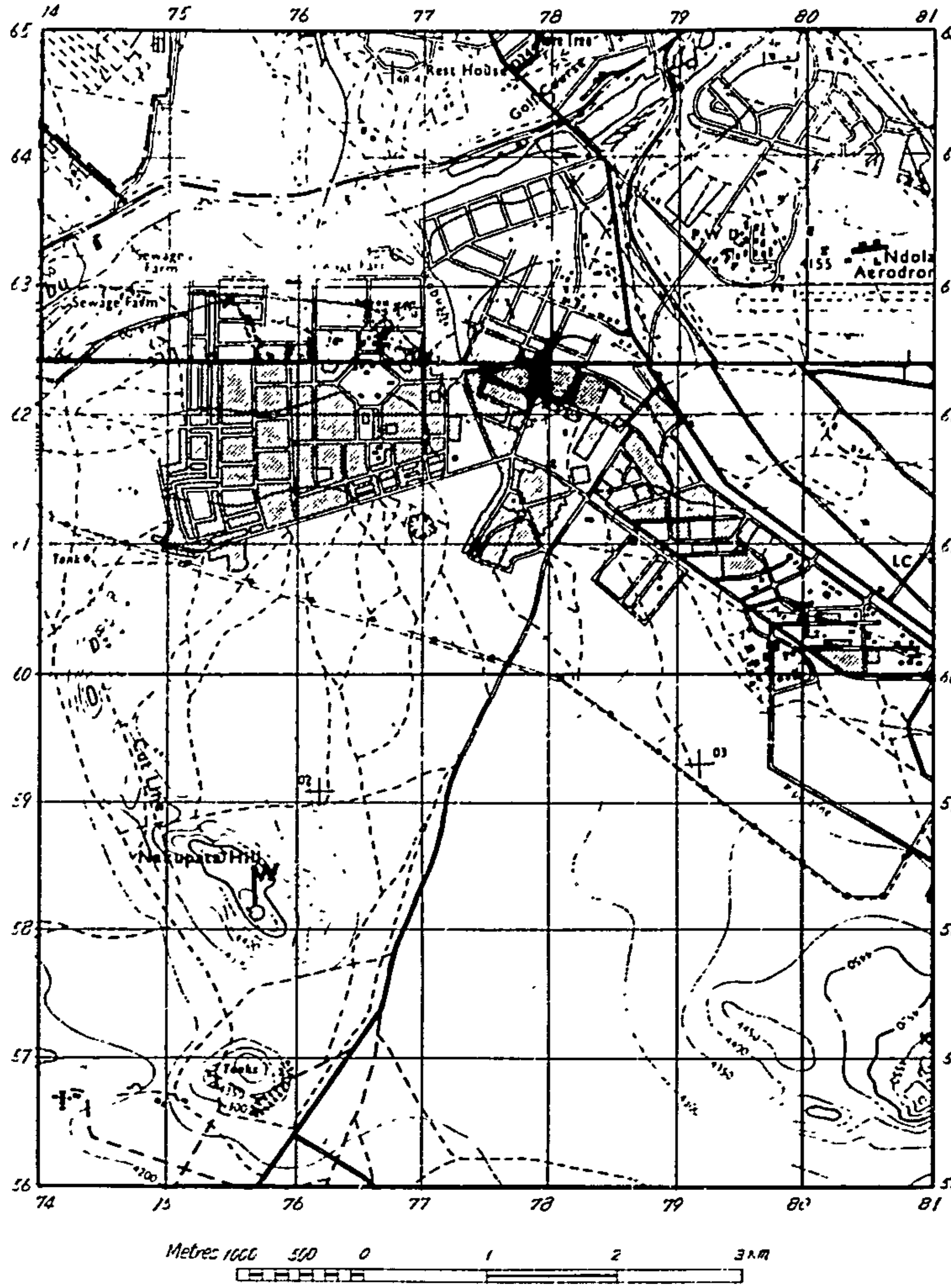
Fig. 2-2 Location of Kasompe Station

2) Antenna and E. R. P.

It is appropriate that the height of antenna tower is determined as 60 m above the ground; an omni-directional antenna is used; and E. R. P. is determined as 200 kW. For your information the above mentioned E. R. P. is appropriate from the standpoint of observing the value specified by the site selection plan of TV transmitting stations adopted at the African VHF/UHF Broadcasting Conference as well as from practical consideration regarding the service area required.

(2) Nakupata Hill TV Transmitting Station

1) Location Map No. 1328B1 (75.75, 58.15)
Height above sea level: 1380 m
The location of the station is shown in Fig. 2-3.



Name of Station	Nakupata Hill
Map No.	1328 B1
Coordinates	75.75, 58.15

Fig. 2-3 Location of Nakupata Hill Station

The service area of this TV transmitting station should include Ndola and Luanshya. Either Kaloko Hill or Nakupata Hill may be proposed as the site of the TV transmitting station to cover the above mentioned area. When comparison is made based on Table 2-3 it appears that Nakupata Hill is more appropriate than Kaloko Hill as the location of TV transmitting station due to the following reasons.

(a) Radio facilities for aviation control are provided in the building of the microwave radio station on Kaloko Hill. If broadcasting waves of large output are radiated nearby, the radio facilities may be adversely affected. On the other hand, Nakupata Hill is apart from Kaloko Hill by about 5 km to the west, and there is no fear of occurrence of obstruction of this kind.

(b) The height of Nakupata Hill above sea level is almost identical to that of Kaloko Hill, and there is not much difference between these two locations will respect to the service area. Taking into consideration that an on-the-spot survey was not made using Nakupata Hill, details regarding access road, power supply and space for construction of the station are not known. If these conditions are disadvantageous using Nakupata Hill as compared with those of Kaloko Hill, the peak on the southwest side out of twin peaks of Kaloko Hill should be considered as the second proposed site. If this peak is selected, the specifications of the radio equipment for aviation control should be carefully considered with major emphasis laid on the frequency and shielding effect, and considerations made so that there is no interference between aviation control and TV broadcasting.

2) Antenna and E.R.P.

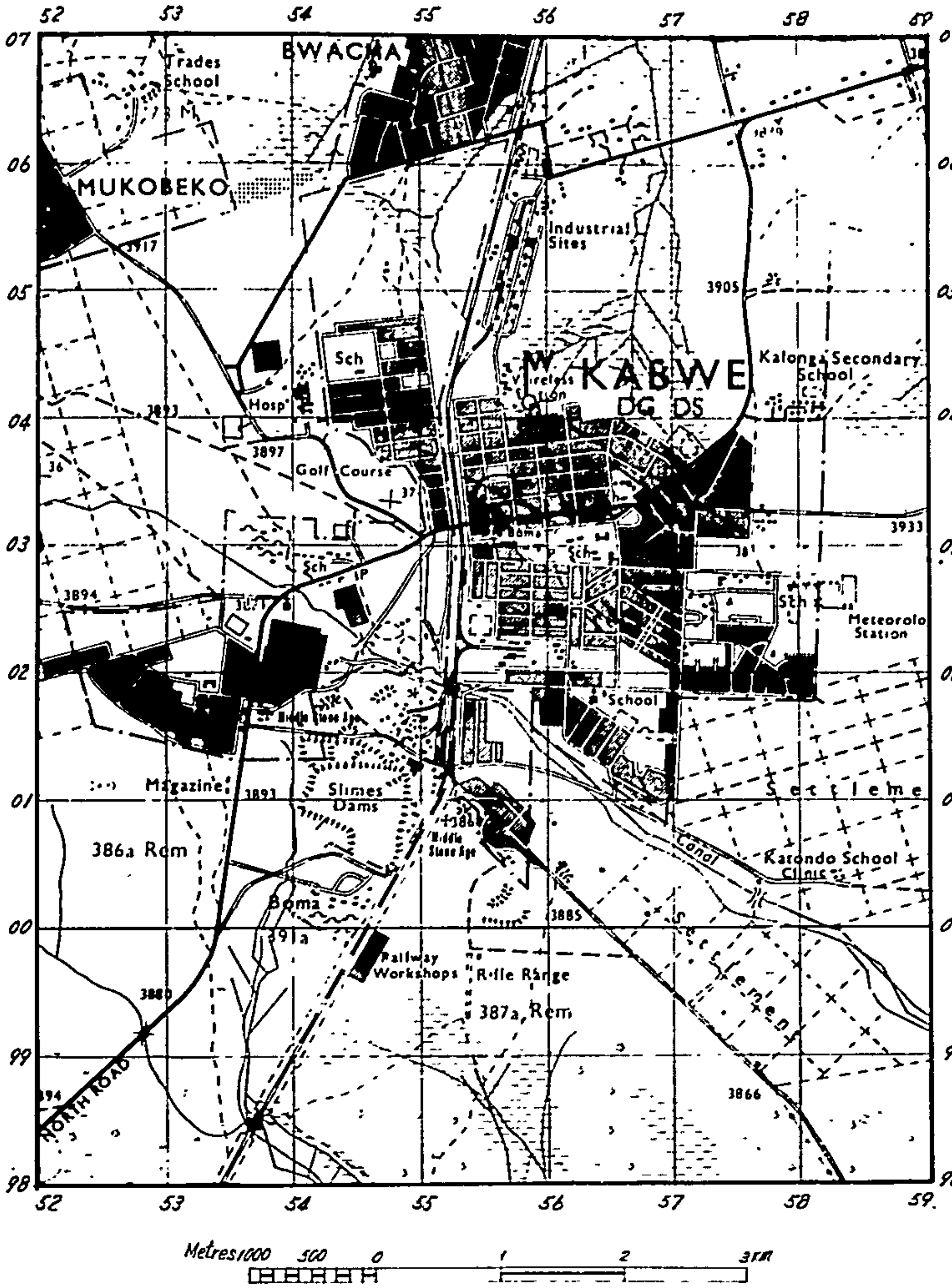
It is reasonable that the height of the antenna tower is determined as 60 m above the ground and E.R.P. is of 200 kW to southwest (toward Luanshya) and of 50 kW to north (toward Ndola) from the geographical conditions of the service area.

(3) Kabwe TV Transmitting Station

1) Location Map No. 1428A4 (55.85, 04.20)

Height above seal level: 1180 m

The location of the station is shown in Fig. 2-4.



Name of Station	Kabwe
Map No.	1428 A4
Coordinates	55.85, 04.20

Fig. 2-4 Location of Kabwe Station

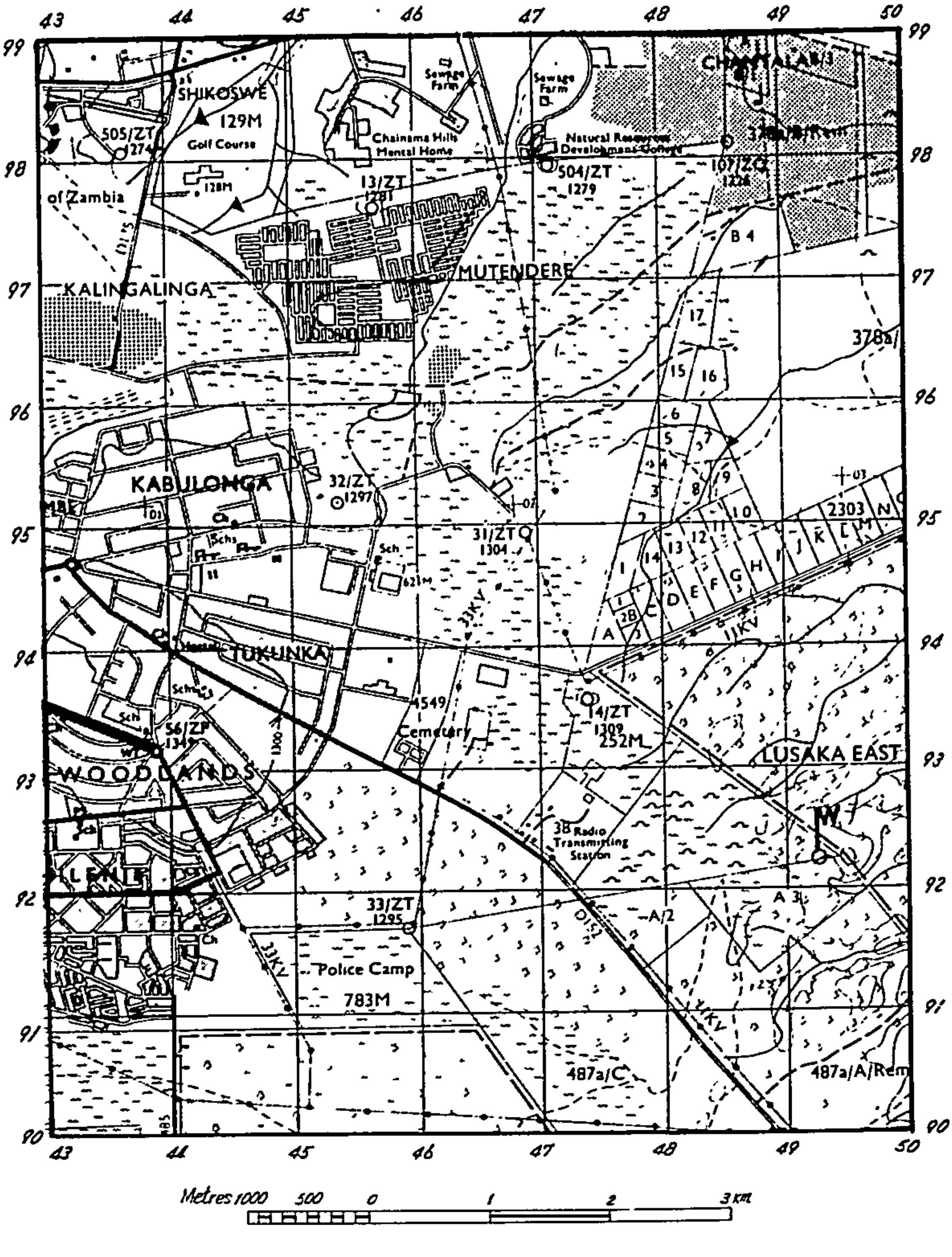
The service area of this station should include Kabwe and Kapiri Mposhi. The area around Kabwe is of generally plain geography without any particular hill suitable for establishment of a TV transmitting station. On the other hand, Kabwe radio transmitting station satisfies various conditions for construction of a TV transmitting station as shown in Table 2-3. Accordingly, it is considered suitable to construct a TV transmitting station near Kabwe radio transmitting station provided that there is sufficient shilding of the TV transmitting station building and filters are provided in the power supply circuit for the purpose of preventing interference of existing radio transmitters to TV transmitters.

2) Antenna and E.R.P.

It is appropriate that the height of the antenna tower is determined as 60 m above the ground; an omni-directional antenna is used; and E.R.P. is determined as 200 kW.

(4) Lusaka TV Transmitting Station

1) Location Map No. 1528A4 (49.25, 92.35)
Height above sea level: 1320 m
The location of the station is shown in Fig. 2-5.



Name of Station	Lusaka
Map No.	1528 A4
Coordinates	49.25, 92.35

Fig. 2-5 Location of Lusaka Station

The service area of this TV transmitting station should include Lusaka, Mazabuka and Kafue, and its northern end should be adjacent to the service area of Kabwe TV transmitting station. First proposed site (eastern suburbs of Lusaka), second proposed site (north-northeast suburbs of Lusaka), third proposed site (north-northeast suburbs of Lusaka) and fourth proposed site (proposed site of construction of studio center in Lusaka) are available in and around Lusaka as shown in Table 2-3. As the result of survey of these four proposed sites it is determined that the first proposed site is most suitable due to the following reasons.

(a) The second and third proposed sites are of good locations that satisfy general conditions as the site for TV transmitting station. However, because aviation routes are nearby, there is a fear that the height of the antenna tower is limited.

(b) The fourth proposed site is most suitable with respect to maintenance and operation because it is within the premises of the studio center to be newly built. However, when the scale and the future plan of the studio center is taken into account it is apparent that this site will not be able to provide sufficient space for construction of an antenna tower.

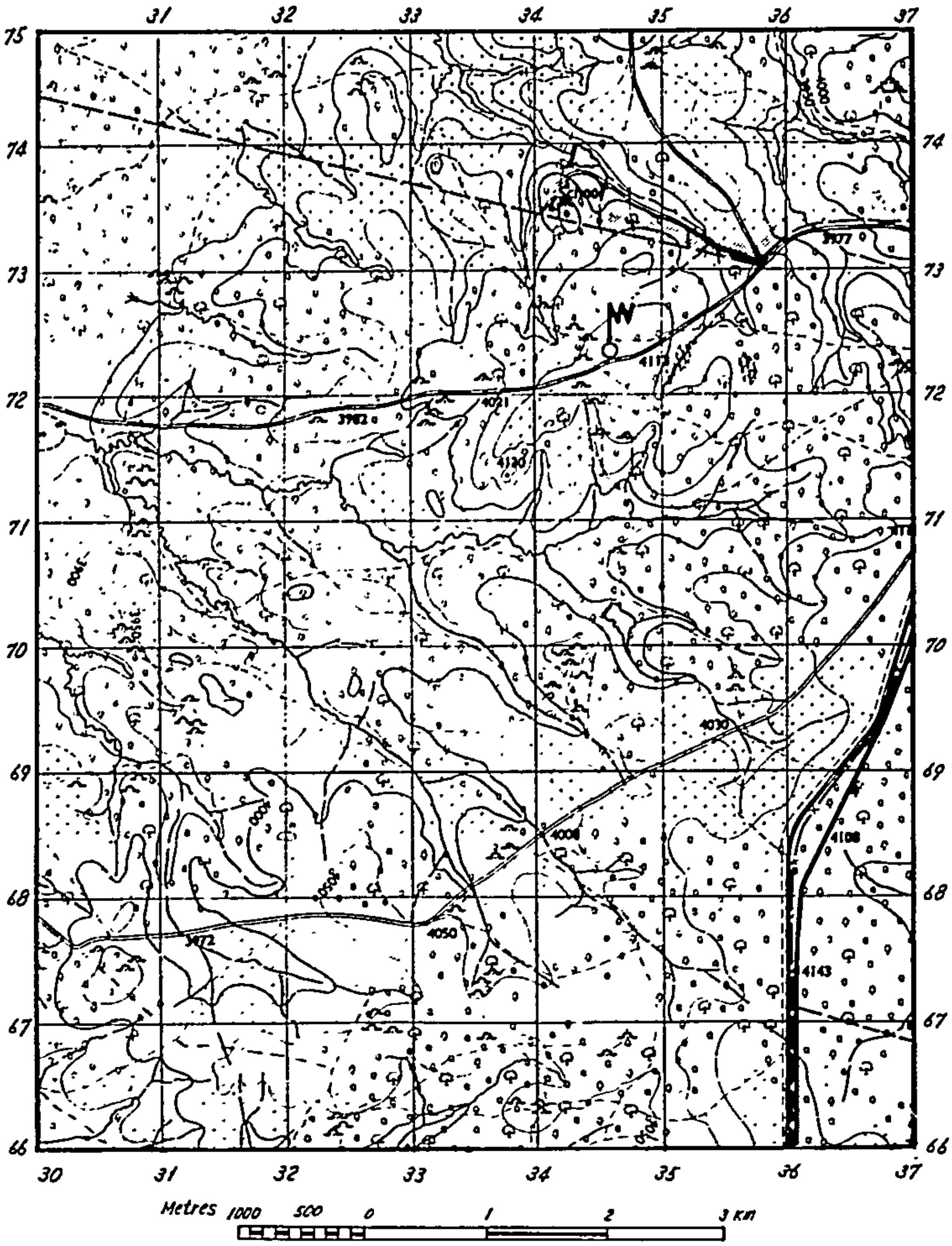
2) Antenna and E.R.P.

It is appropriate that the height of the antenna tower is determined as 100 m above the ground; an omni-directional antenna is used; and E.R.P. of 200 kW is used to cause the service area of this TV transmitting station to be adjacent to the service area of Kabwe TV transmitting station at the north end and to include Mazabuka in the south.

There is a possibility of deterioration of picture quality due to insufficient receiving field intensity or occurrence of ghost phenomena in some areas of Kafue. Such phenomena can be remedied by providing a small-power translator but, it is desirable that whether a new small-power translator is placed or not be made after checking the extent of picture deterioration after commencement of operation of the transmitting station.

(5) Pemba TV Transmitting Station

1) Location Map No. 1627C2 (34.60, 73.30)
Height above sea level: 1250 m
The location of the station is shown in Fig. 2-6.



Name of Station	Pemba
Map No.	1627 C2
Coordinates	34.60, 73.30

Fig. 2-6 Location of Pemba Station

2) Antenna and E.R.P.

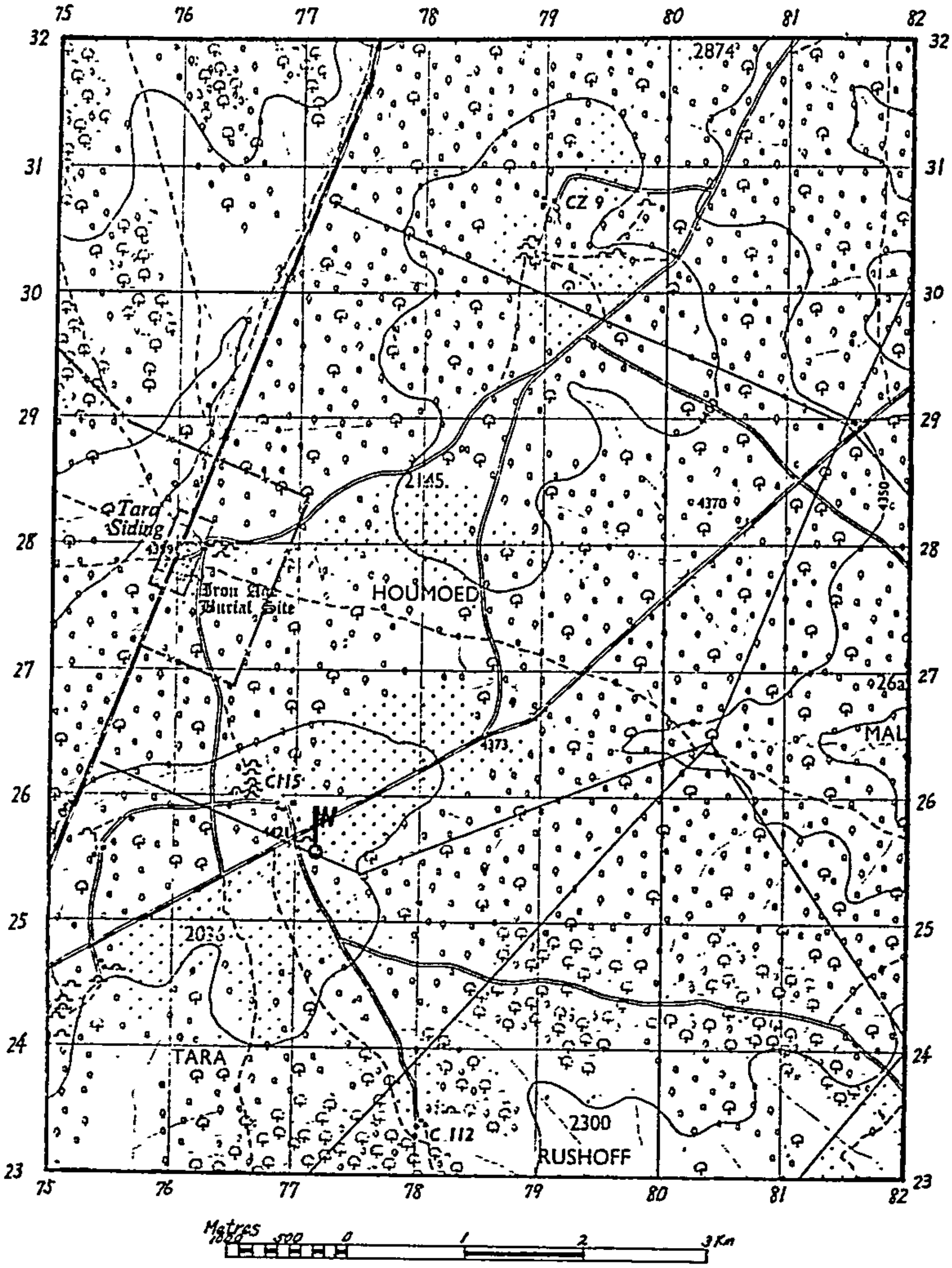
It is appropriate that the height of the antenna tower is determined as 60 m above the ground; an omni-directional antenna is used; and E.R.P. of 200 kW is used.

(6) Tara TV Transmitting Station

1) Location   Map No. 1626D4 (77.15, 25.55)

Height above sea level: 1350 m

The location of the station is shown in Fig. 2-7.



Name of Station	Tara
Map No.	1626 D4
Coordinates	77.15,25.55

Fig. 2-7 Location of Tara Station

2) Antenna and E.R.P.

It is appropriate that the height of the antenna tower is determined as 60 m above the ground; an omni-directional antenna is used; and E.R.P. of 10 kW is used.

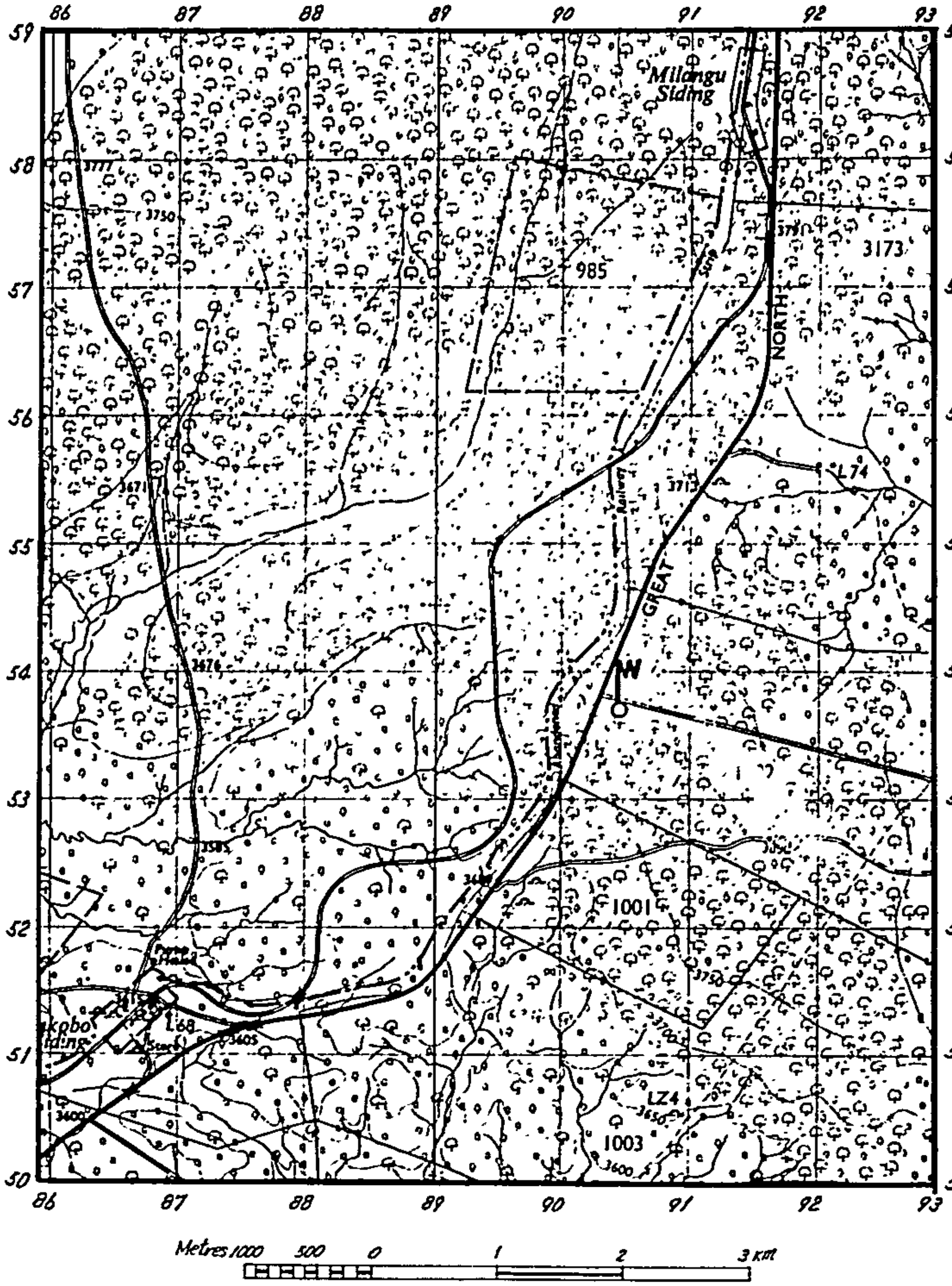
Against the plan of selecting Pemba and Tara as the sites of TV transmitting stations, there is a concept to select Monze and Choma. As a result of the comparison made among these four sites in accordance with the data shown in Table 2-3 it is considered that it is more appropriate to select Pemba and Tara than Monze and Choma. The reasons are as described below.

(a) When Monze is selected there is a possibility that Muzoka is on the fringe even if E.R.P. of 200 kW is used, and not much improvement of Kafue can be expected.

(b) When Choma is selected there is a possibility that Kalomo is on the fringe even if E.R.P. of 200 kW is used. With the above facts taken into account it is logical to provide a TV transmitting station in Pemba with E.R.P. of 200 kW and to provide an auxiliary transmitting station of E.R.P. of 10 kW in Tara.

(7) Senkobo TV Transmitting Station

1) Location Map No. 1627C2 (91.40, 53.70)
Height above sea level: 1160 m
The location of the station is shown in Fig. 2-8.



Name of Station	Senkobo
Map No.	1627 C2
Coordinates	91.40, 53.70

Fig. 2-8 Location of Senkobo Station

The service area of this TV transmitting station should include Zimba, Senkobo and Livingstone. It is assumed that Senkobo which is located at the center between Zimba and Livingstone is most suitable as the site of the TV transmitting station from the viewpoints of geographical conditions and linkage with a microwave terminal station.

2) Antenna and E.R.P.

It is appropriate that the height of the antenna tower is 60 m above the ground; an omni-directional antenna is used; and E.R.P. of 200 kW is used. The relation between the sites of TV transmitting stations described above and their service areas is shown in Fig. 2-9.

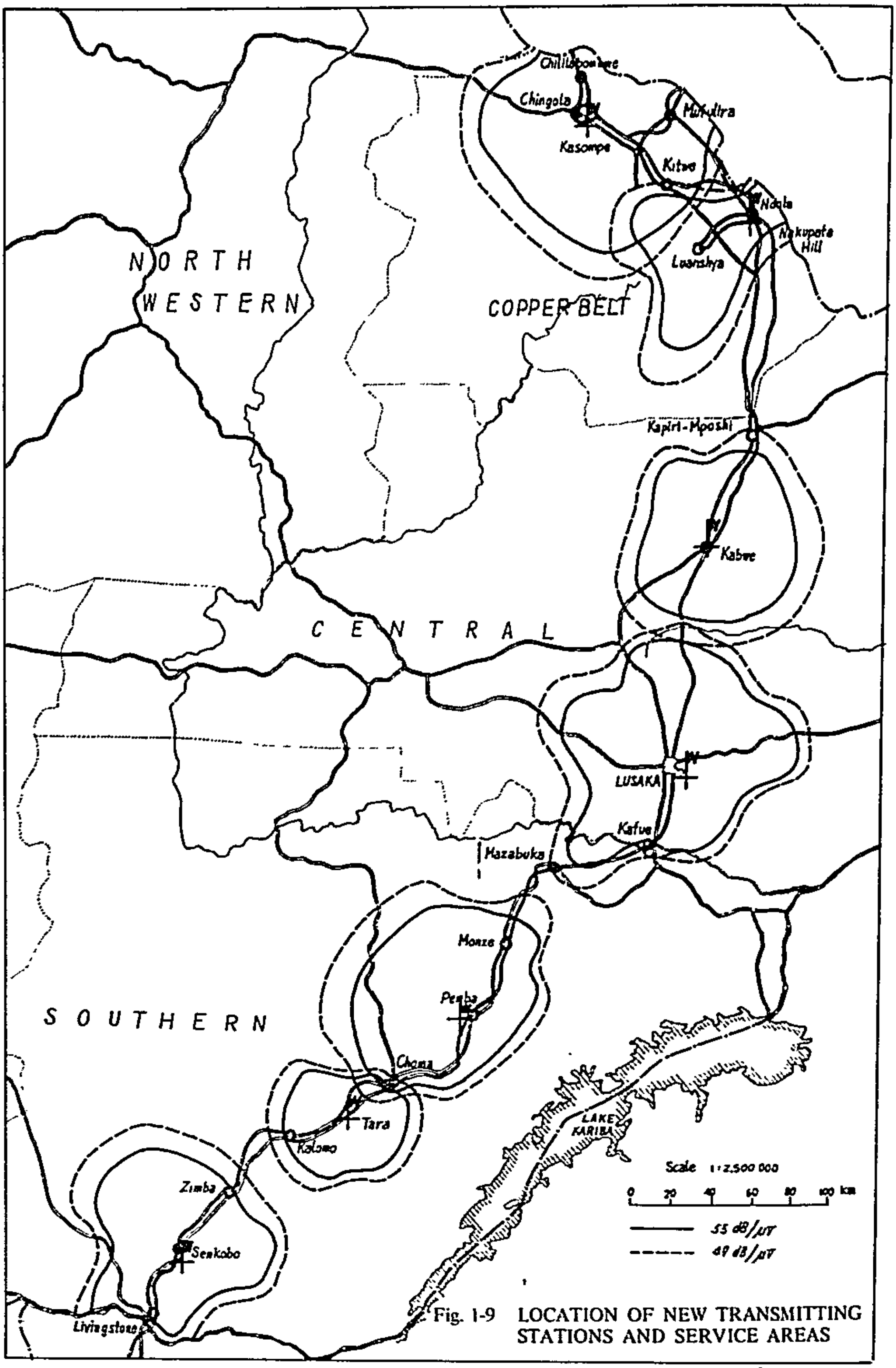


Fig. 1-9 LOCATION OF NEW TRANSMITTING STATIONS AND SERVICE AREAS

Fig. 2-9 Location of New Transmitting Stations and Service Areas

1.2.5 Channel Plan

The frequency allotted to each TV transmitting station should be determined based on the Final Acts of African VHF/UHF Broadcasting Conference, Geneva, 1963.

If the sites of TV transmitting stations are different from the specified locations due to geographical and/or other conditions, it is advisable to use the frequency allotted to the closest locations. It is also advisable that adjacent stations use channels alternately. Table 2-4 indicates a typical allottment of frequency to different TV transmitting stations.

Table 2-4 An Example of Channel Plan

Name of Station	Channel	Pol. of Ant.	Visual Carrier	Aural Carrier
Kasompe	9 Ch	H	203.25 MHz	208.75 MHz
Nakupata Hill	7 Ch	H	189.25 MHz	194.75 MHz
Kabwe	8 Ch	H	196.25 MHz	201.75 MHz
Lusaka	10 Ch	H	210.25 MHz	215.75 MHz
Pemba	8 Ch	V	196.25 MHz	201.75 MHz
Tara	6 Ch	H	182.25 MHz	187.75 MHz
Senkobo	10 Ch	V	210.25 MHz	215.75 MHz

1.3 Transmitting System

1.3.1 Basic Ideas

The transmitting system should be logically determined with economy, reliability and ease of maintenance taken into account.

If restrictions are made from the standpoint of badget, the following remedies should be taken into account.

(1) Limit the redundancy of the system to a minimum at the beginning. In place of it, increase the number of transmitting sta-

tions and cover a broad service area with a predetermined budget.

(2) Improve reliability by providing the system with redundancy from the beginning. In place of it, reduce the number of transmitting stations and thus reduce the service area.

However, with the characteristics of TV broadcasting and local situations taken into account it is assumed that provision of TV waves to the public of as broad range as possible should be given top priority, and it is considered that strengthening of a redundancy should be carried out after completion of the first stage of construction of transmitting stations.

1.3.2 TV Transmitters

TV transmitters are central equipment of the system. Because transmitting tubes are used it is desirable that they be provided with a redundant system. Either a parallel system or an in-use/stand-by change-over system may be used. Due to the relation between E.R.P. and transmitting antenna gain, transmitter output required is about 20 kW. Consequently, a parallel system of 10 kW transmitters is more economical than in-use/stand-by change-over system of 20 kW transmitters. In addition, a parallel system provides such advantages that broadcasting with reduced power is possible even when trouble develops and off air time for change-over to the stand-by transmitter can be avoided. Accordingly, a parallel system is desirable for transmitters.

1.3.3 Power Supply Equipment

Commercial power supply can be readily obtainable at the proposed sites of TV transmitting stations. Accordingly, if commercial power supply is stabilized, it is assumed that the necessity of emergency power generators is not very high. If the budget is sufficient to provide emergency power generators, it is appropriate to provide them in such major TV transmitting stations as Lusaka Station and

Kasompe Station will top priority. Because generators require periodic overhaul it is desirable to select such makers and models that dealers who are capable of maintaining generators on behalf of the users can be readily located within the Republic of Zambia.

1.3.4 Link

Link in this paragraph means microwave link and cable link. Solid state equipment providing a high degree of reliability should be used except in the case of large outputs (around 10 W). When use of such equipment is a premise it is considered that there is no need to consider in-use/stand-by systems for all the links. However, it is desirable that stand-by STL be provided in Lusaka transmitting station and Kasompe transmitting station due to the following reasons.

(a) These two transmitting stations are key stations which include major areas of administration and commerce in their service areas.

(b) Even if a microwave circuit for program transit is out of order, it is possible to transmit a different program from the studio. Consequently, it is desirable to have a spare STL for a case where the STL in use is out of order.

With respect to cable links, because the cost of burying cable is high, it is considered appropriate to bury two pairs each of visual system and aural system; and to provide equalizers at the terminals only for the current use and then provide spares when the time to strengthen the system comes after the first stage of the site selection plan of TV transmitting stations is completed.

With respect to order links it is advisable to provide ones for current use for the time being and then provide spares in the stages of consolidating the system.

1.3.5 Monitor and Control Equipment

If it is taken into account that it is necessary to save maintenance staff and that there are some transmitting stations at which monitoring with attendance can be hardly effected because proposed sites of transmitting stations are located away from towns, it is advisable to centrally monitor and control each transmitting station from the studio center in Lusaka. For the purpose of simplifying the equipment to the greatest extent possible it is necessary to limit monitor items and control items to the minimum required for daily operation while at the same time it is necessary to reserve some spare monitor items and control items as provisions for the time when emergency power generators are introduced in the future.

For the transmission of monitor and control signals it is deemed satisfactory to use radio circuits of the VHF band where the distance between transmitting station and microwave terminal station is long and to use cables where the distance is short.

1.3.6 Broadcasting Relay System

The possibilities of television relay systems is discussed below.

The receiver termination voltage is represented by the following equation.

$$V_t = \frac{1}{2} E \cdot \frac{\lambda}{\pi} \cdot \sqrt{\frac{G_a}{L_f}} \cdot \sqrt{\frac{R_i}{73.13}} \qquad (5)$$

where V_t : receiver termination voltage
E : electric field intensity
λ : wavelength
G_a : receiving antenna gain
L_f : feeder loss
R_i : receiver input impedance

To obtain good image the input voltage of 62 dBμ (0 dB = 1 μV) is required at minimum for the repeating receiver. Consequently, it is determined that V_t = 62. Assuming the frequency as 200 MHz and also λ = 1.5 m, R_i = 50 ohm and L_f = 3 dB, the relation between receiving electric field intensity, E and receiving antenna gain, G_a is obtained by the equation below.

$$E\ (dB\mu) + G_a\ (dB) = 79\ dB \qquad (6)$$

The distances among proposed sites of TV transmitting stations are as shown below.

Kasompe - Nakupata Hill	approx. 95 km
Kabwe - Lusaka	approx. 110 km
Lusaka - Pemba	approx. 160 km
Pemba - Tara	approx. 80 km
Tara - Senkobo	approx. 110 km

If the distance is over 100 km, received electric field intensity is 58 dB at maximum even if the height of the transmitting antenna is 100 m above the ground, E.R.P. is of 200 kW and the height of receiving antenna is 50 m above the ground. If equation (6) is used, the receiving antenna gain required is 21 dB or higher which is practically hard to accomplish. Where a good possibility lies is between Kasompe and Nakupata Hill and between Pemba and Tara. When the electric field intensity of both routes is calculated and the receiving antenna gain required is obtained, the values shown in Table 2-5 are obtained.

Table 2-5 Calculated Data for Air Relay Route

Route	Field Intensity	Rec. Ant. Gain
Kasompe —— Nakupata Hill	61 dB	18 dB
Pemba —— Tara	58 dB	21 dB
Note Height of Transmitting Antenna: 55 m A.G.L. Height of Receiving Antenna : 10 m A.G.L. E.R.P. 200 kW		

As shown in the above table the receiving antenna gain of the repeater receiver required is 18 dB to 21 dB. On the other hand, the antenna gain of a 12 element Yagi antenna is 11.5 dB. Accordingly, composition of antennas is as shown below.

Kasompe —— Nakupata Hill	12 element Yagi antenna, 4 section 2 panel
Pemba —— Tara	12 element Yagi antenna, 6 section 2 panel

The above composition of antennas requires considerable space, and is not practical from the standpoint of mast structure. Since the E.R.P. of Tara TV transmitting station is 10 kW, if a repeating receiver is to installed in Pemba, the antenna gain required is 35 dB which is difficult to accomplish. Consequently, it is considered unpractical to utilize TV relay systems between the locations mentioned.

Fig. 2-10 covers the system utilized by TV transmitting stations.

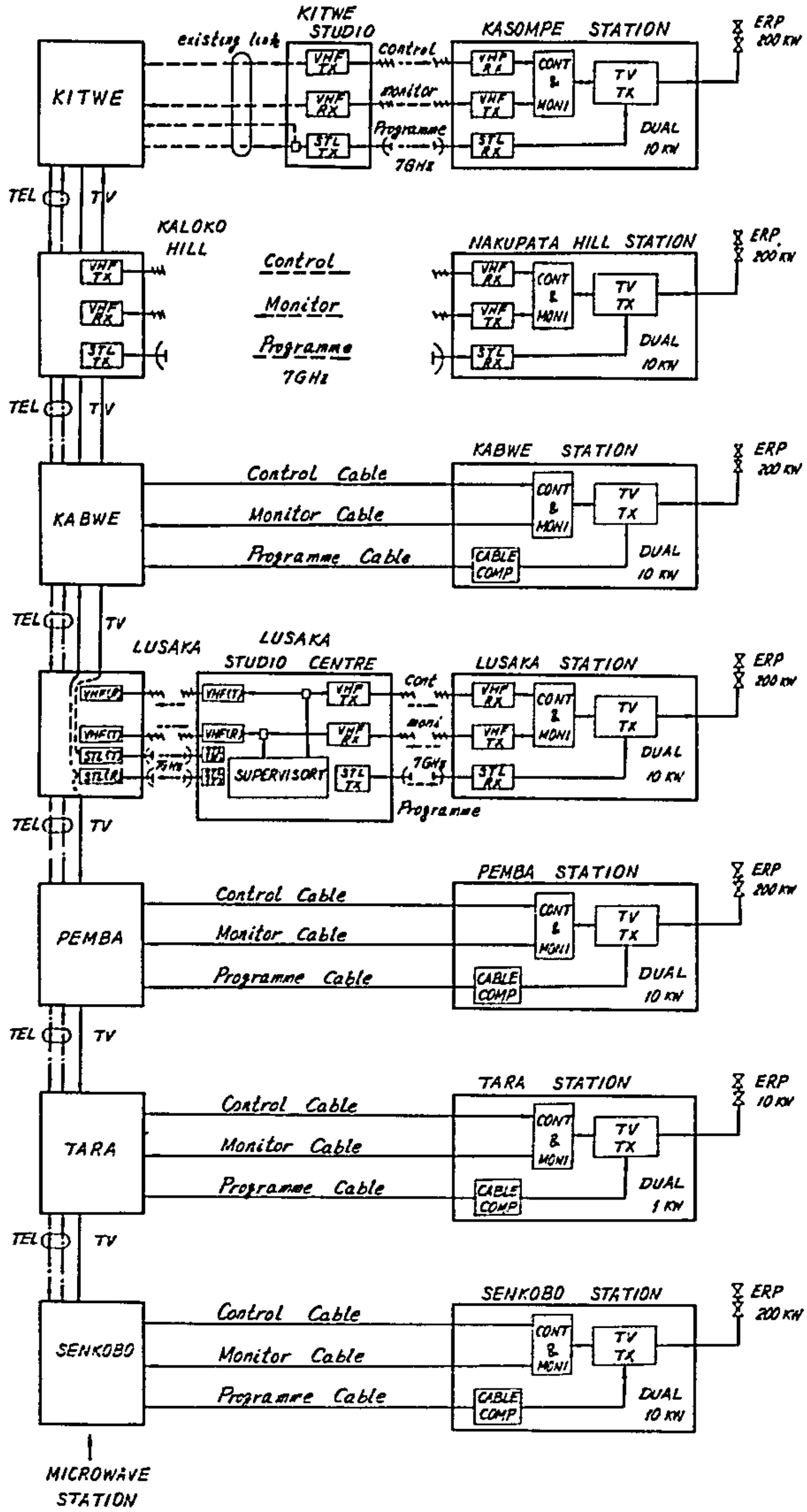


Fig. 2-10 System Diagram of TV Station

Chapter 2. Transmitting Equipment

2.1 Transmitters

TV transmitters recently designed utilize low power stage IF modulation systems, while before they utilized a high power stage modulation system. Following are the reasons for this change.

(1) With the IF modulation system, modulation stage and modulated stage utilize semi-conductors. Accordingly, good and stabilized modulation characteristics can be readily realized.

(2) With IF modulation system VSBF can be used in the IF stage. Consequently, it is possible to effectively accomplish phase compensation of VSBF in the IF band. Most importantly, the cost of VSBF is lowered thanks to the utilization of low power and low frequency.

As a consequence, when introduction of new transmitters is considered it is advisable to adopt the IF modulation system and to introduce new models which utilize solid state techniques and use a minimum number of transmitting tubes.

2.1.1 10 kW Parallel VHF TV Transmitter

General specifications of 10 kW parallel VHF TV transmitters to be used in Kasompe, Nakupata Hill, Kabwe, Lusaka, Pemba and Senkobo TV Transmitting Stations are described below.

(1) General Specifications

1) Electrical specifications

Color broadcasting of CCIR system B, PAL system shall be possible.

2) Transmitting output

Vision output: 20 kW (peak value, 10 kW parallel operation)

Sound output : 4 kW (2 kW parallel operation)

3) Monitor and control

Remove control, automatic control and manual control in transmitting station building shall be possible.

4) Output change-over system

a) When one of the vision transmitters is out of order, broadcasting should be continued with video output which is 1/4 of normal output.

b) When one of sound transmitters is out of order, broadcasting should be continued with aural output which is 1/4 of normal output.

c) Reduction of the output of either vision or sound transmitter which is out of order to 1/2 of normal output by reconnection of U link in the transmitting station building shall be possible.

d) One dummy load shall be provided, vision transmitter simplex output, sound transmitter simplex output, vision transmitter complex output and sound transmitter complex output shall be possible to interconnect through manual change-over of U links to the dummy load.

5) Power supply

The power supply shall be of 3 phase, 380 V, 50 Hz and of a capacity of 65 kVA or less.

6) Environmental temperature and humidity

Environmental temperature:	Normal operation should be effected in the temperature range between 0°C and 40°C.
Environmental humidity:	Normal operation should be effected in the himidity of 90% max.

7) Operation

Operation shall be continuous.

8) Miscellaneous

a) The number of transmitting tubes to be used shall be two or less for vision transmitter, and be one or less for the sound transmitter. With this exception, solid state techniques will be utilized throughout.

b) Blowers shall be incorporated in the cabinets to reduce the floor space required for installation. Transmitter systems are shown in Figs. 2-11 and 2-12.

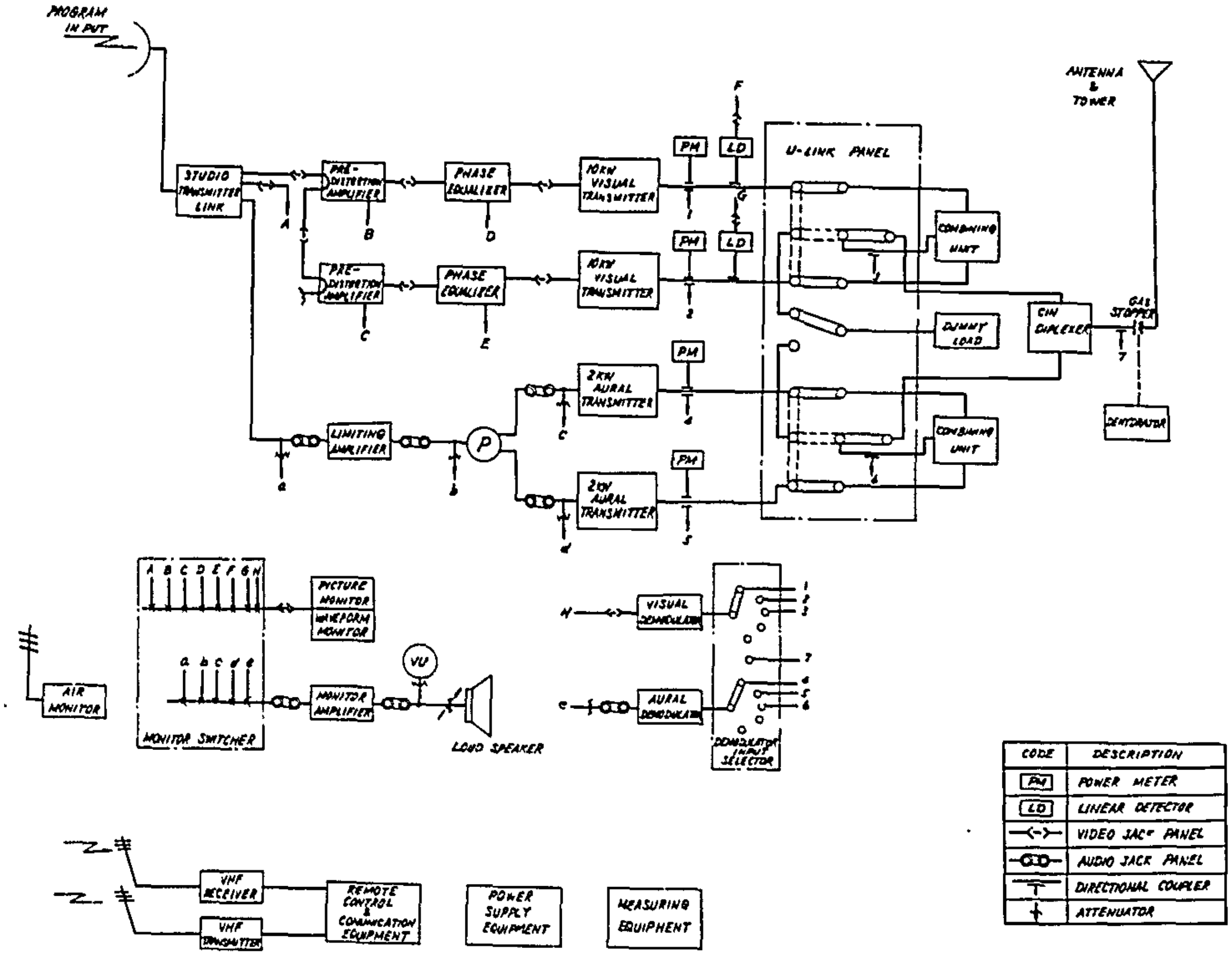


Fig. 2-11 Block Diagram of Dual 10 kW VHF TV Transmitter (Kasompe, Nakupata Hill, Lusaka)

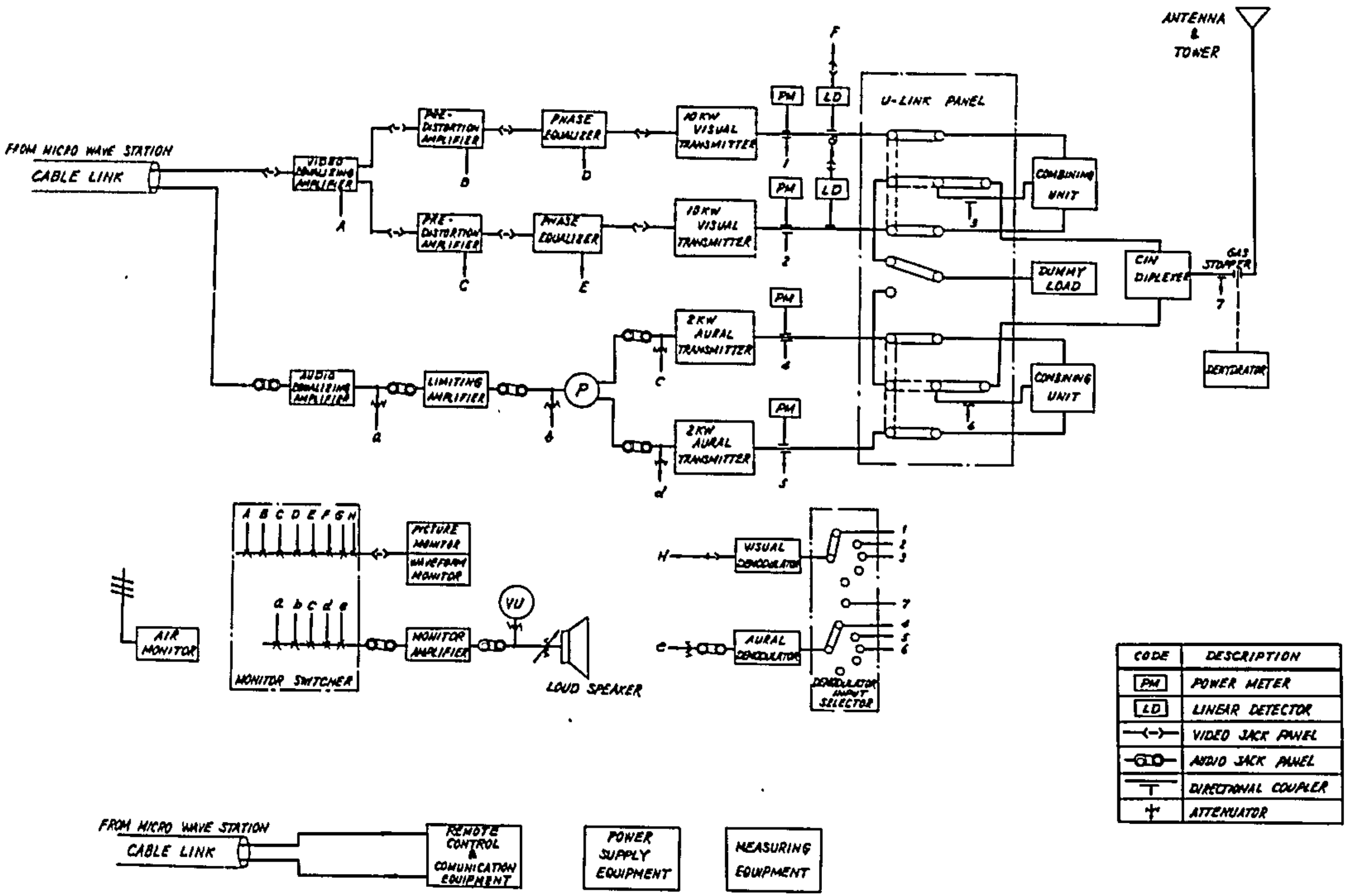


Fig. 2-12 Block Diagram of Dual 10 kW VHF TV Transmitter (Kabwe, Pemba, Senkobo)

(2) Composition

The composition of transmitters shall be as shown below.

1) 1 set of parallel 10 kW VHF TV transmitters
2) 1 set of output circuits
3) 1 set of input equipment
4) 1 set of monitor equipment
5) 1 set of spare parts
6) 1 set of accessories

2.1.2 1 kW Parallel VHF TV Transmitter

General specifications of 1 kW parallel VHF TV transmitter to be used in the Tara TV Transmitting Station are as described below.

(1) General specifications

1) Electrical characteristic

Electrical characteristic shall be identical to that specified in paragraph (1) - 1) of 2.1.1.

2) Transmitting output

Vision output: 2 kW (peak value, 1 kW parallel operation)
Sound output : 400 W (200 W parallel operation)

3) Monitor and control

Monitor and control shall be identical to that specified in paragraph (1) - 3) of 2.1.1.

4) Output change-over system

Output change-over system shall be identical to that specified in paragraph (1) - 4) of 2.1.1.

5) Power supply

Power supply shall be of 3 phase, 380V, 50 Hz and of a capacity of 20 kVA or less.

6) Environmental temperature and humidity

Environmental temperature and himidity shall be identical to that specified in paragraph (1) - 6) of 2.1.1.

7) Operation

The operation of transmitters shall be identical to that specified in paragraph (1) - 7) of 2.1.1. Transmitter system is shown in Fig. 2-13.

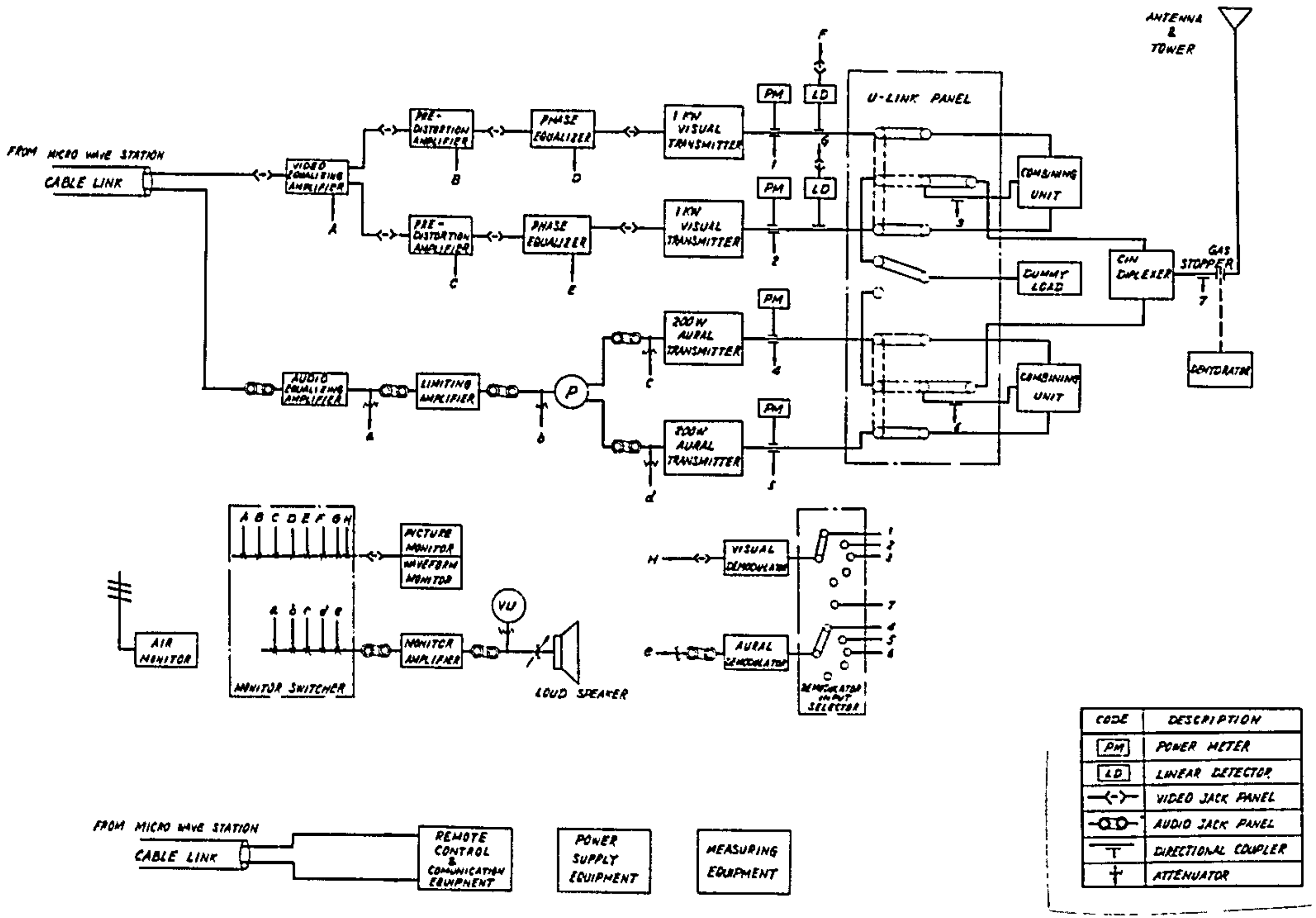


Fig. 2-13 Block Diagram of Dual 1 kW VHF TV Transmitter (Tara)

(2) Composition

The composition of transmitters shall be identical to that specified in paragraph (2) of 2.1.1.

2.2 Microwave Link

2.2.1 System

The microwave link routes are as follows, as shown in Fig. 2-9.

(1) Kitwe studio → Kasompe TV station

(2) Kaloko Hill micro station → Nakupata Hill TV station

(3) Lusaka studio center → Lusaka TV station

(4) Lusaka studio center → Lusaka micro station

(5) Lusaka micro station → Lusaka studio center

The result of circuit design based on the condition that S/N value at the bottom of fading becomes 50 dB or higher with each route are shown in Table 2-6. Design was made with the carrier in the 7 GHz band. However, this may be changed due to consideration of the situation in the Republic of Zambia. Microwave link system is shown in Figs. 2-14 and 2-15.

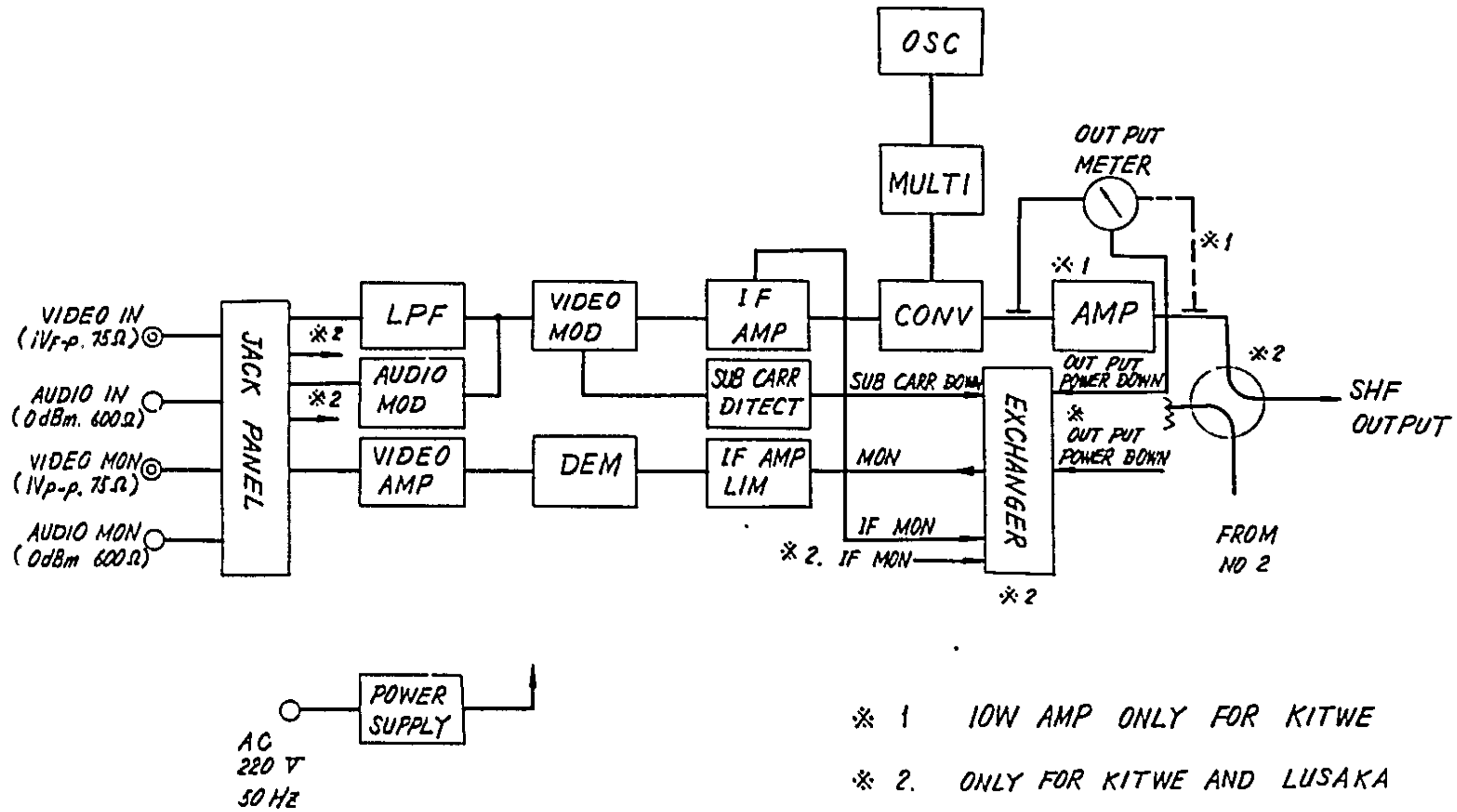
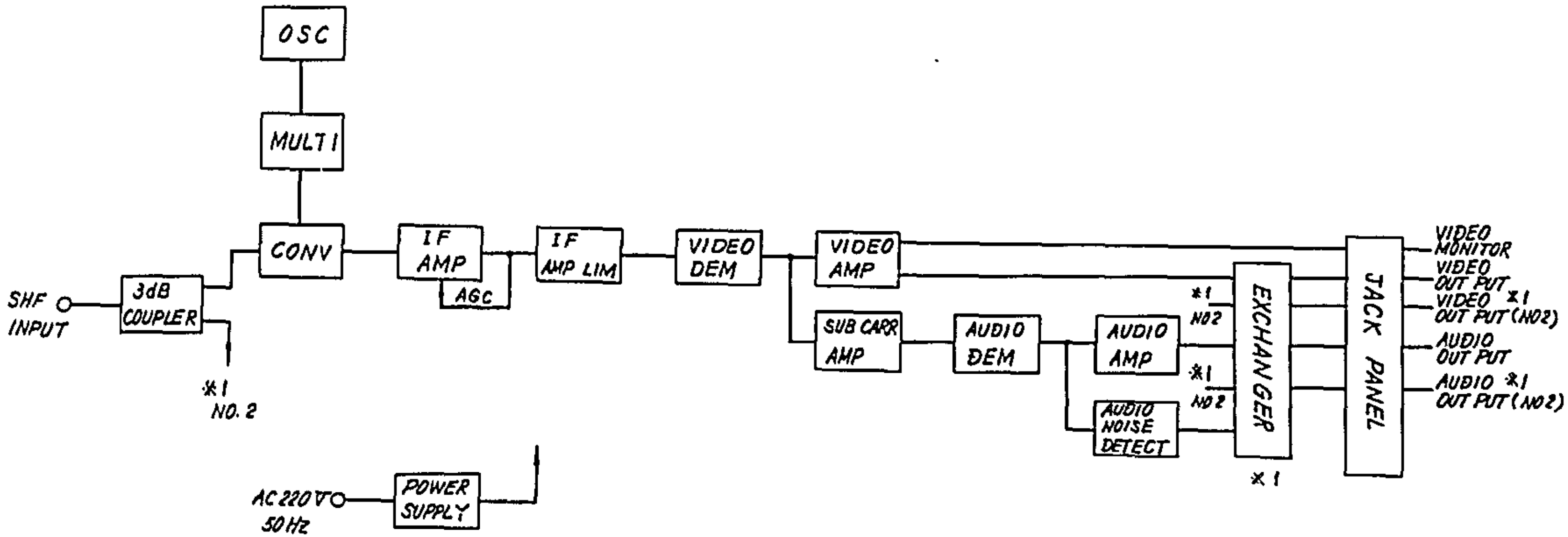


Fig. 2-14 Block Diagram of Micro Wave Link
Transmitter



※1. ONLY FOR KASOMPE AND LUSAKA

Fig. 2-15 Block Diagram of Micro Wave Link Receiver

2.2.2 General Specifications

(1) Transmitting equipment

1)	Transmitting frequency	Shall be one specified channel in the 7 GHz band.
2)	Transmitting output	Shall be as specified in Table 2-6.
3)	Modulation system	FM modulation
4)	Max. frequency deviation	8 MHz (P-P)
5)	Voice auxiliary carrier wave	FM wave of 7.5 MHz ± 140 KHz
6)	Visual input	1.0 V (P-P), 75 Ω , normal polarity
7)	Aural input	0 dBm, 600 Ω , balanced
8)	Power supply	Single phase, 220V, 50 Hz
9)	Operation	Continuous
10)	Environmental temperature	Normal operation should be effected in the temperature range between 0°C and 40°C.
11)	Environmental humidity	Normal operation should be effected in the humidity of 95% max.

(2) Receiving equipment

1)	Receiving input	-50 dBm ~ -25 dBm
2)	Receiving system	Super heterodyne system
3)	Visual output	1.0 V (P-P), normal polarity
4)	Aural output	+10 dBm, 600 Ω , balanced
5)	Power supply	Identical to paragraph (1) - 8)
6)	Operation	Identical to paragraph (1) - 9)
7)	Environmental temperature	Identical to paragraph (1) - 10)
8)	Environmental humidity	Identical to paragraph (1) - 11)

(3) System

The system is as shown in Table 2-6.

Table 2-6 Specification of Microwave Link

Route	Power output	System	Diameter of Dish	Antenna Height
1 Kitwe Studio → Kasompe TV Station	10 W	1 Set in Use 1 Set for Spare	Tx. Side, 3mφ Rx. Side, 3mφ	Tx. Side, 30m A.G.L. Rx. Side 30m A.G.L.
2 Kaloko Hill Micro Station → Nakupata Hill TV Station	0.1W	1 Set in Use	Tx. Side, 1.8mφ Rx. Side, 1.8mφ	Tx. Side 30m A.G.L. Rx. Side 30m A.G.L.
3 Lusaka TV Station → Lusaka TV Studio	0.5W	1 Set in Use 1 Set for Spare	Tx. Side, 1.8mφ Rx. Side, 1.8mφ	Tx. Side 30m A.G.L. Rx. Side 30m A.G.L.
4 Lusaka TV Studio → Lusaka Micro Station	0.1W	1 Set in Use	Tx. Side, 1.8mφ Rx. Side, 1.8mφ	Tx. Side 30m A.G.L. Rx. Side 30m A.G.L.
Lusaka Micro Station → Lusaka TV Studio	0.1W	1 set in Use	Tx. Side, 1.8mφ Rx. Side, 1.8mφ	Tx. Side 30m A.G.L. Rx. Side 30m A.G.L.

Note: (1) Tx. : Transmitting (3) S/N 50dB at the worst time

(2) Rx. : Receiving (4) Band : 7GHz Band

2.2.3 Composition

The composition of microwave link is as follows.

(1) 1 set of transmitting equipment *1

(2) 1 set of receiving equipment *1

(3) 1 set of antenna

(4) 1 set of spare parts

(5) 1 set of accessories

(6) 1 set of 10 W travelling-wave tube amplifier *2

NOTE: *1 The equipment between Kitwe - Ksompe and between Lusaka studio - Lusaka TV station shall be of in-use/stand-by system.

*2 To be used only between Kitwe and Kasompe.

2.3 Cable Link

2.3.1 System

The routes to use cables are, as shown in Fig. 2-10.

(1) Kabwe micro station - Kabwe TV station

(2) Pemba micro station - Pemba TV station

(3) Tara micro station - Tara TV station

(4) Senkobo micro station - Senkobo TV station

Buried cables shall provide both in-use and spare cables with all the systems. Equalizers at cable ends shall be of current use only. System diagram is shown in Fig. 2-16.

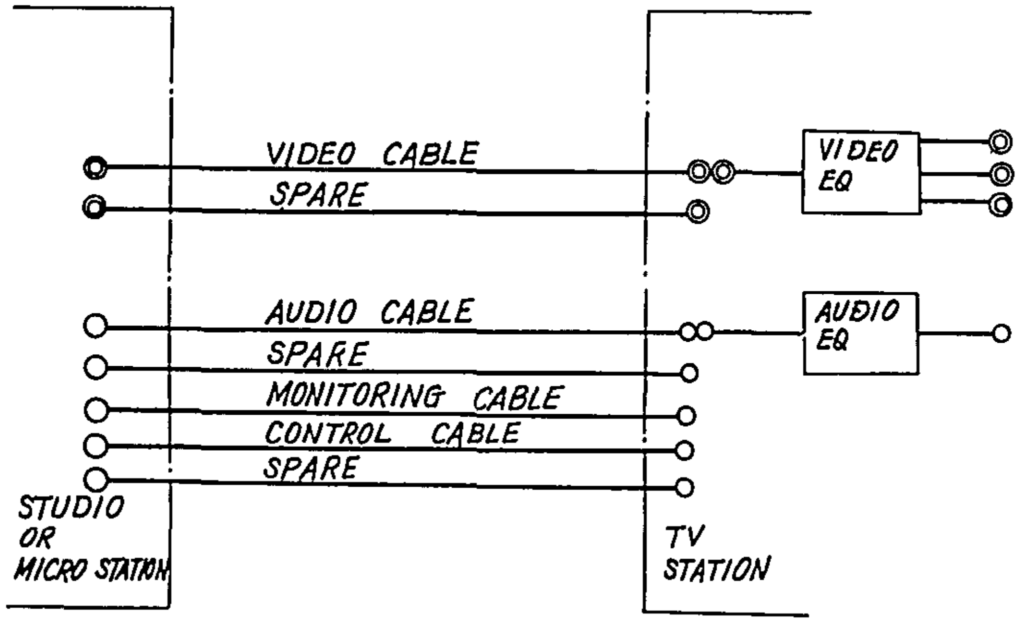


Fig. 2-16 Block Diagram of Cable and Cable Equalizer

2.3.2 Composition

The composition of cable is as follows.

(1) 2 sets of visual signal transmission cables.

(2) 2 sets of aural signal transmission cables (shall be compound cables that are capable of providing monitor, control and communication circuits)

(3) 1 set of visual signal equalizers.

(4) 1 set of aural signal equalizers.

2.4 Power Supply Equipment

The power supply for transmitting station shall be of 3 phase, 50 Hz and incoming line voltage of 380 V. Emergency power generator shall be provided at Lusaka and Kasompe TV transmitting station.

2.4.1 I.V.R.

I.V.R. shall be provided at each transmitting station. It is advisable that the capacity of I.V.R. provides allowance for FM transmitters of 1 kW which may be installed in the future as well as current transmitters, STL, remote control system, power supply for miscellaneous use (room light, ventilator fan, measuring equipment, aviation light).

General specifications of IVR are as follows.

(1)	Input voltage	3 phase, 50 Hz, line voltage 380 V ± 10%
(2)	Output voltage	3 phase, 50 Hz, 380 V ± 1.5%
(3)	Capacity	Parallel 10 kW station: 75 kVA
		Parallel 1 kW station : 20 kVA

2.4.2 Distribution Panel

System diagram of distribution panel is shown in Fig. 2-17.

2.4.3 Composition

The composition of power supply shall be as follows.

(1) 1 set of IVR

(2) 1 set of distribution panel

(3) 1 set of spare parts

(4) 1 set of accessories

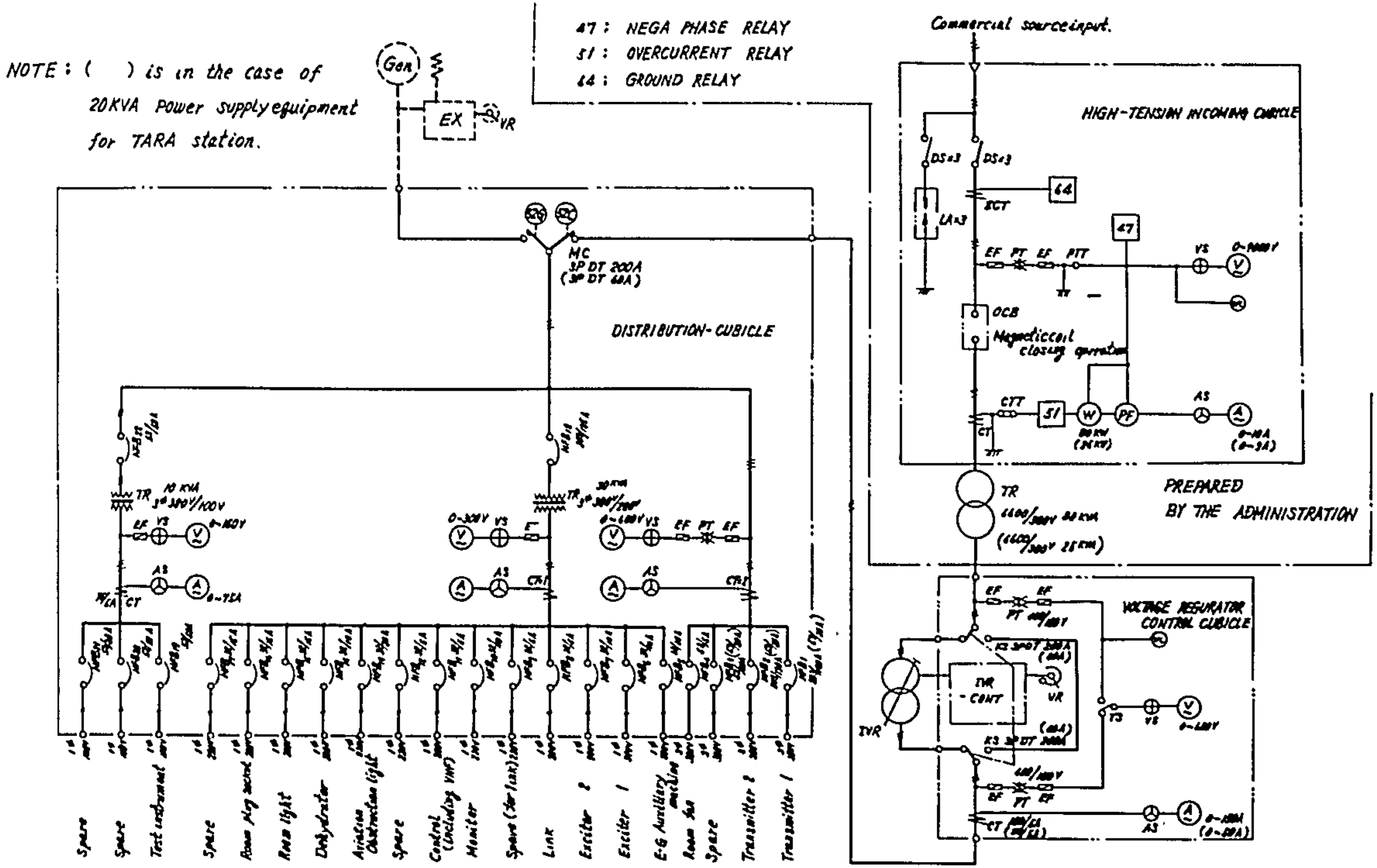


Fig. 2-17 Connection Diagram of Power Supply Equipment
(3ϕ 75 kVA (20 kVA))

2.5 Monitor and Control Equipment

2.5.1 System

The system diagram of monitor and control equipment is shown in Fig. 2-18. This figure indicates the diagram of Lusaka control center and Kasompe TV station. The system of transmitting stations other than Kasompe is omitted as it is identical to that of Kasompe.

The control signal given by the control panel in Lusaka passes through the encoder and is then stored in the register as a binary code. The parallel to series converter converts binary code into serial code and feeds it to the modulator. Because identification bit output which is different for each station is provided in the encoder output, sending logic circuit can be commonly used. Consequently, single control circuit will do between the control center and the transmitting station. The control signal which reaches the transmitting station passes through the demodulator and is then reconverted into binary code by the series to parallel converter. It then passes through the relay driver and drives the control relay. The contacts of this relay control relays of the transmitters. The operation panel provided in the transmitting station is used when manually controlling transmitters in the transmitting station.

In the case of the monitor signal, the signal of each monitor item is impressed on the scanning unit in constant frequency, passes through encoder, modulator and is then fed through the monitor circuit that connects the transmitting station and the control center. The number of monitor circuits is one only, but it carries monitor signals of seven transmitting stations. Consequently, it should be arranged that the frequencies of the monitor carrier waves to be sent from the respective transmitting stations are such that they can be readily separated at the studio center. At the studio center signals which are demodulated by demodulators which correspond to monitor signals of respective transmitting stations are rearranged into parallel from by series to parallel converter and are then stored in the register.

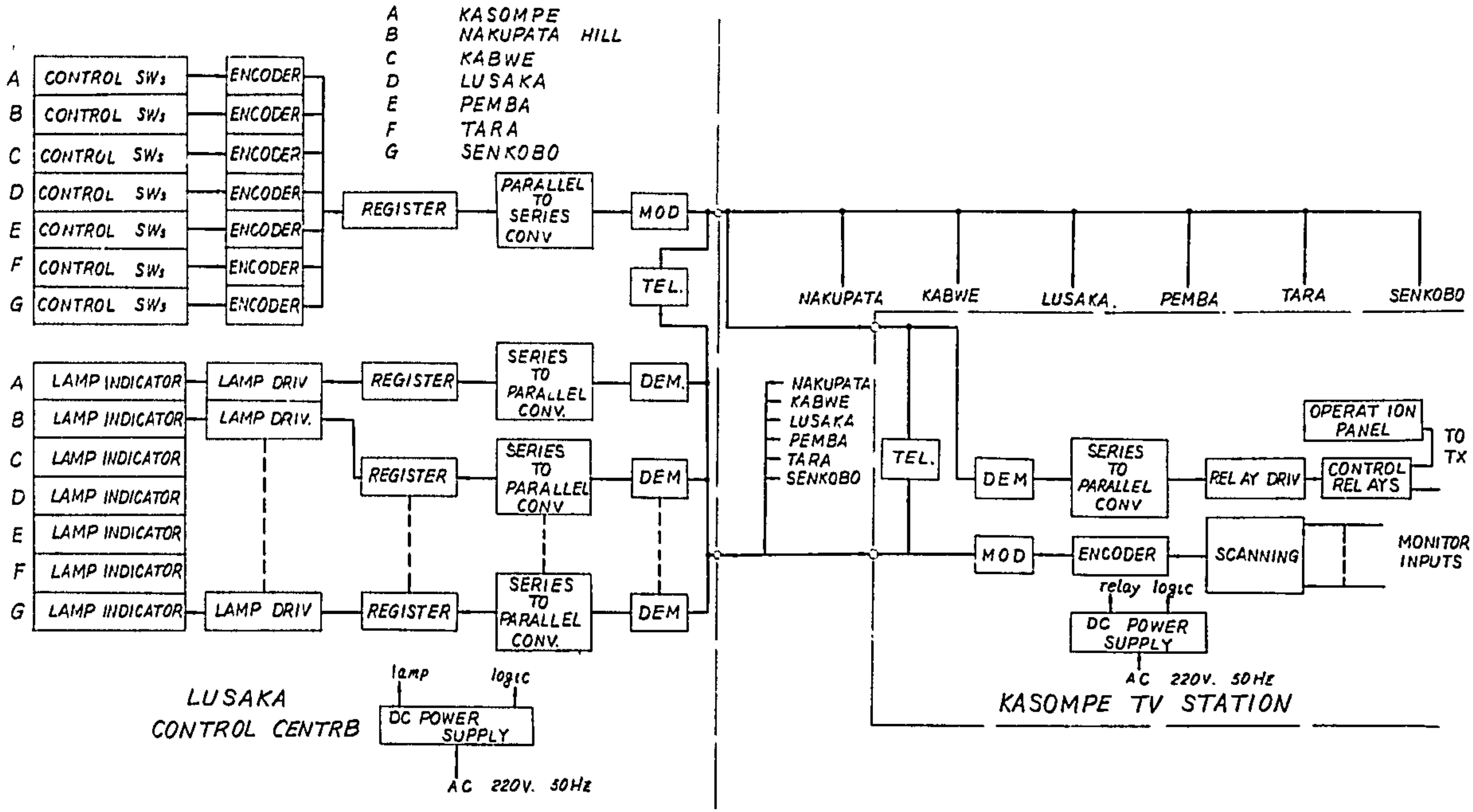


Fig. 2-18 Block Diagram of Supervisory & Control System

The register output drives the lamp driver and causes corresponding lamps and indicators of respective transmitting stations to glow.

When talking from studio center to any transmitting station through communication telephone, the words spoken at the studio center can be heard simultaneously at all the transmitting stations. However, reply from the subject transmitting station can be heard only at the studio center, and not at other transmitting stations.

2.5.2 Monitor and Control Items

The monitor and control items shall be as shown in Table 2-7.

Table 2-7 Monitoring and Control Items of Transmitting Station

No.	Monitoring Item		Control Item
1	Transmitter	No. 1 ON-OFF	TRANSMITTER ON
2		No. 2 ON-OFF	TRANSMITTER OFF
3		No. 1 HT ON	TRANSMITTER FAULT
4		No. 2 HT ON	HOLD RESET
5		No. 1 FAULT	AUTOMATIC OPERATION
6		No. 2 FAULT	REMOTE CONTROL
7	COMMERCIAL SOURCE ON-OFF		SPARE
8	PROGRAMME ON-OFF		SPARE
9	FIRE		
10	DOOR OPEN		
11	CONTROL LINE OFF		
12	AUTOMATIC-REMOTE		
13	MANUAL OPERATION		
14	SPARE		
15	SPARE		
16	SPARE		

2.5.3 Composition

The composition shall be as follows.

(1) Lusaka central monitor and control equipment

1 set of operation indicator panel

1 set of transmission/receiving logic units

1 set of interphone type telephone set

1 set of 2 channel power unit

1 set of cabinet rack

(2) Controlled terminal station equipment

7 sets of transmission/receiving logic units

7 sets of interphone type telephone set

7 sets of control relay board

7 sets of 2 channel power unit

7 sets of transmitting station control display board

7 sets of cabinet rack

(3) 1 set of spare parts

(4) 1 set of accessories

2.6 Communication Equipment

2.6.1 System

The communication equipment to be described below is the equipment required for communication between respective transmitting stations and Lusaka studio center. The aural signal for communication superposes on the transmission circuit of the monitor and control equipment. As shown in Fig. 2-10, voice communication from Lusaka studio center to each respective transmitting station is superposed on the control line through radio equipment of the VHF band or through cable, while voice communication from each respective transmitting station to the studio center is superposed on the monitor line. A telephone set is incorporated in the monitor and control rack at each transmitting station.

2.6.2 General Specifications for VHF Transceivers

The transmission output, number of sets required and the outline of transmitting/receiving antennas are shown in Table 2-8.

Table 2-8 Table of VHF Band Communication Equipment

Name of Station	Output Power of TX	Quantity of TX	Frequency	Number of RX	Transmitting Antenna	Receiving Antenna
Kasompe TV Station	10W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set
Kitwe Studio	10W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set
Nakupata Hill TV Station	1W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set
Kaloko Hill Micro Station	1W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set
Lusaka TV Station	1W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set
Lusaka Studio Center	1W	2 Sets	160 MHz Band	2 Sets	5Y-1, 2 Sets	5Y-1, 2 Sets
Lusaka Micro Station	1W	1 Set	160 MHz Band	1 Set	5Y-1, 1 Set	5Y-1, 1 Set

Note (1) Tx. : Transmitter
(2) Rx. : Receiver
(3) 5Y-1 : Yagi-Antenna of Five Elements, 1 Section

2.7 Antennas

2.7.1 Transmitting Antenna

2-dipole antennas shall be used at each transmitting stations. The specifications for transmitting antennas used by each transmitting station are as shown in Table 2-9. Fig. 2-19 indicates horizontal valiation pattern for 2-dipole antenna, and Fig. 2-20 indicates horizontal valiation pattern for same antenna. Fig. 2-21 indicates vertical valiation pattern for 2-dipole antenna (7 section), and Fig. 2-22 A, B indicates vertical valiation pattern for 2-dipole antenna (6 section and 3 section). Fig. 2-23 indicates vertical valiation pattern of 2-dipole antenna (4 section), and Fig. 2-24 indicates panel layout of 2-dipole antenna.

The composition of transmitting antenna shall be as follows.

(1) 1 set of 2-dipole panel antenna

(2) 1 set of branch feeder

(3) 1 set of junction box

(4) 1 set of Tee transformer

(5) 1 set of transmission line

(6) Gas stopper

(7) Dehydrator

Table 2-9 Specification of Transmitting Antenna

Name of Station	ERP Max.	TX Power	Configuration of Antenna	Polarity	Directivity	Horizontal pattern	Vertical Pattern	Height of Tower
Kasompe	200kW	2x10kW	2-Dipole 4x7 Panels	H	OD	Fig. 2-19	Fig. 2-21	60m A.G.L.
Nakupata Hill	200kW	2x10kW	2-Dipole 2x6 Panels 2x3 Panels	H	D	Fig. 2-20	Fig. 2-22A 2-22B	60m A.G.L.
Kabwe	200kW	2x10kW	2-Dipole 4x7 Panels	H	OD	Fig. 2-19	Fig. 2-21	60m A.G.L.
Lusaka	200kW	2x10kW	2-Dipole 4x7 Panels	H	OD	Fig. 2-19	Fig. 2-21	100m A.G.L.
Pemba	200kW	2x10kW	2-Dipole 4x7 Panels	V	OD			60m A.G.L.
Tara	10 kW	2x 1kW	2-Dipole 4x4 Panels	H	OD	Fig. 2-19	Fig. 2-23	60m A.G.L.
Senkobo	200kW	2x10kW	2-Dipole 4x7 Panels	V	OD			60m A.G.L.

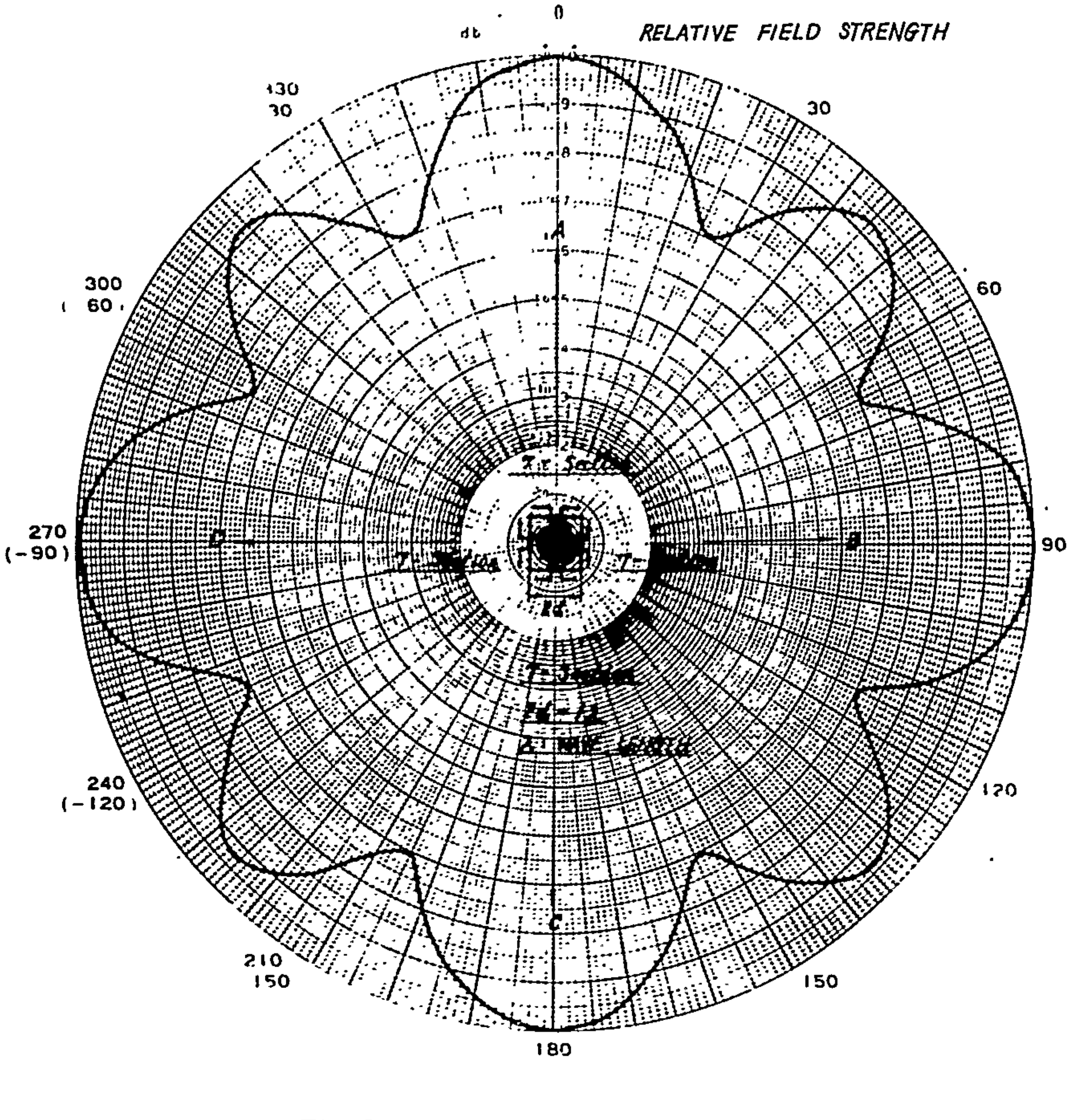


Fig. 2-19 2-Dipole Panel Antenna Calculated Horizontal Radiation Pattern

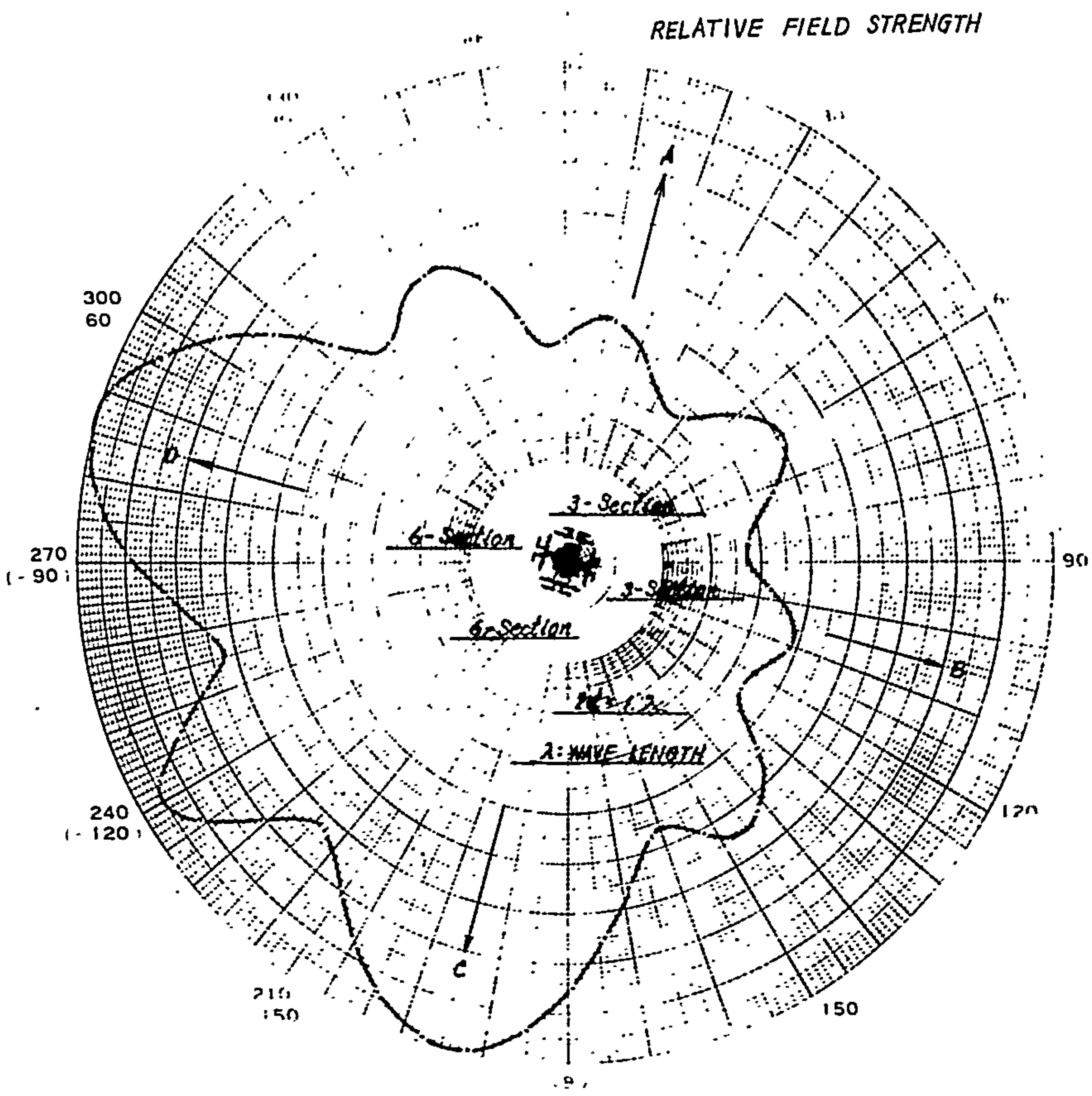


Fig. 2-20 2-Dipole Panel Antenna Calculated
Horizontal Radiation Pattern

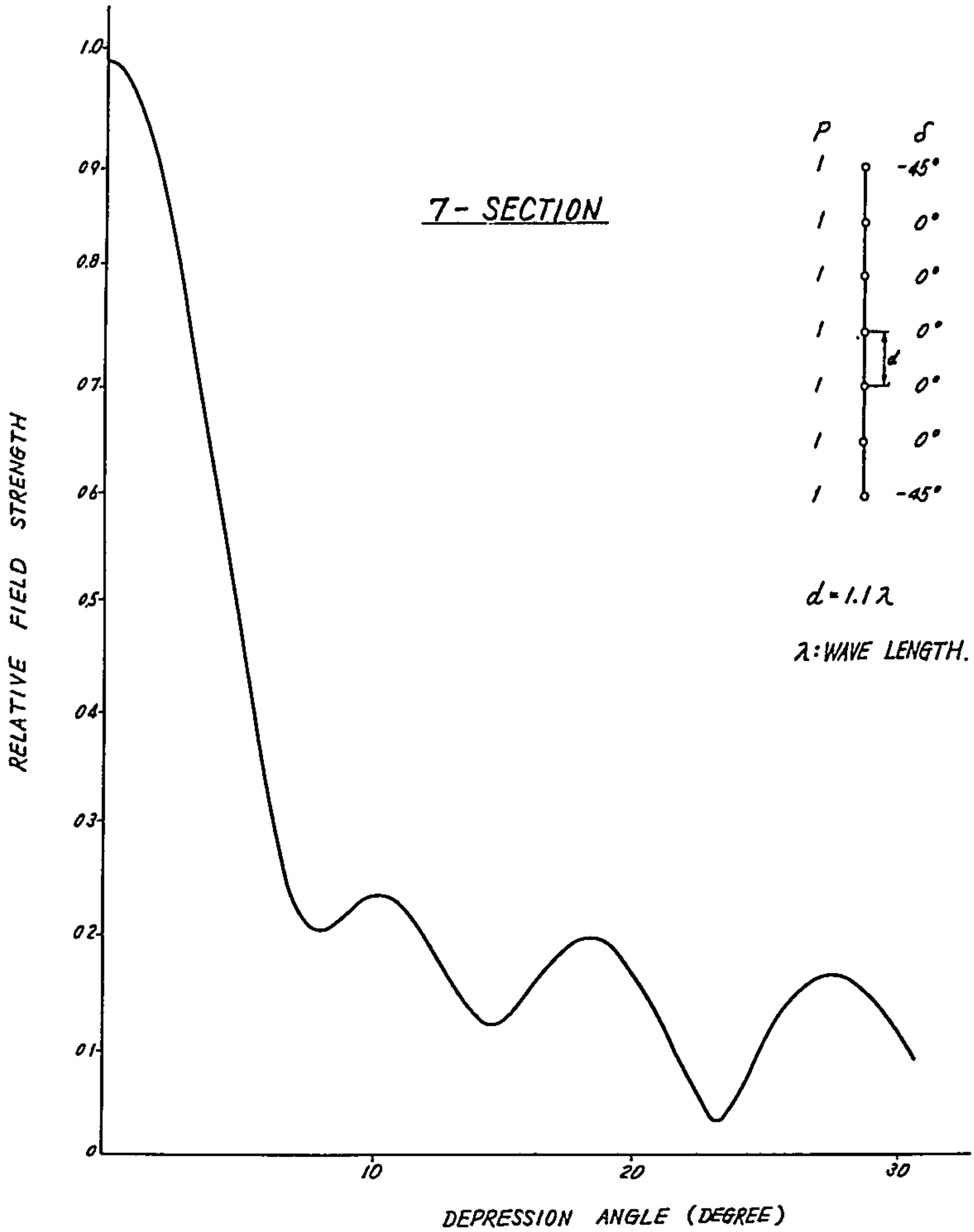


Fig. 2-21 2-Dipole Panel Antenna Calculated
Vertical Radiation Pattern

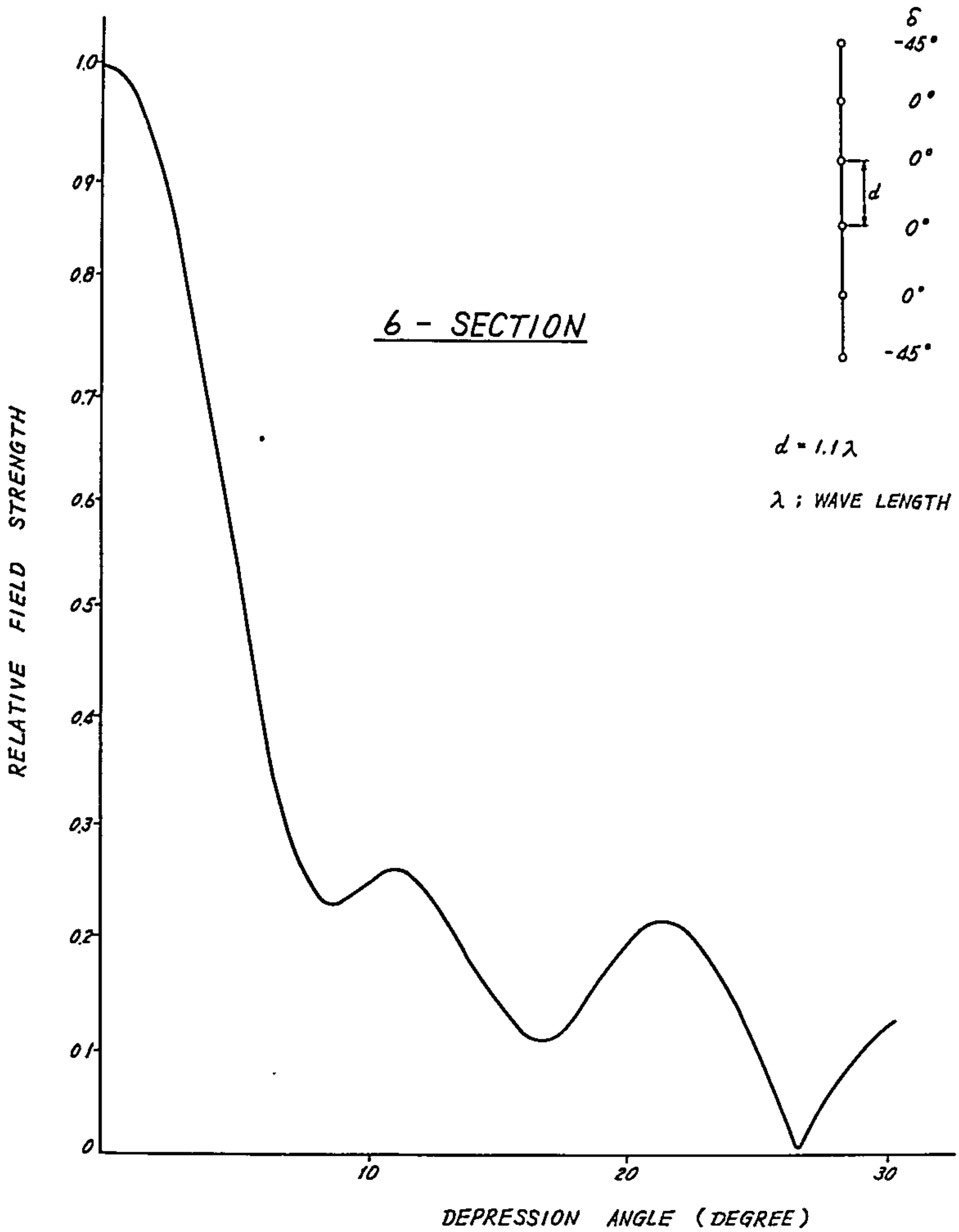


Fig. 2-22A 2-Dipole Panel Antenna Calculated Vertical Radiation Pattern

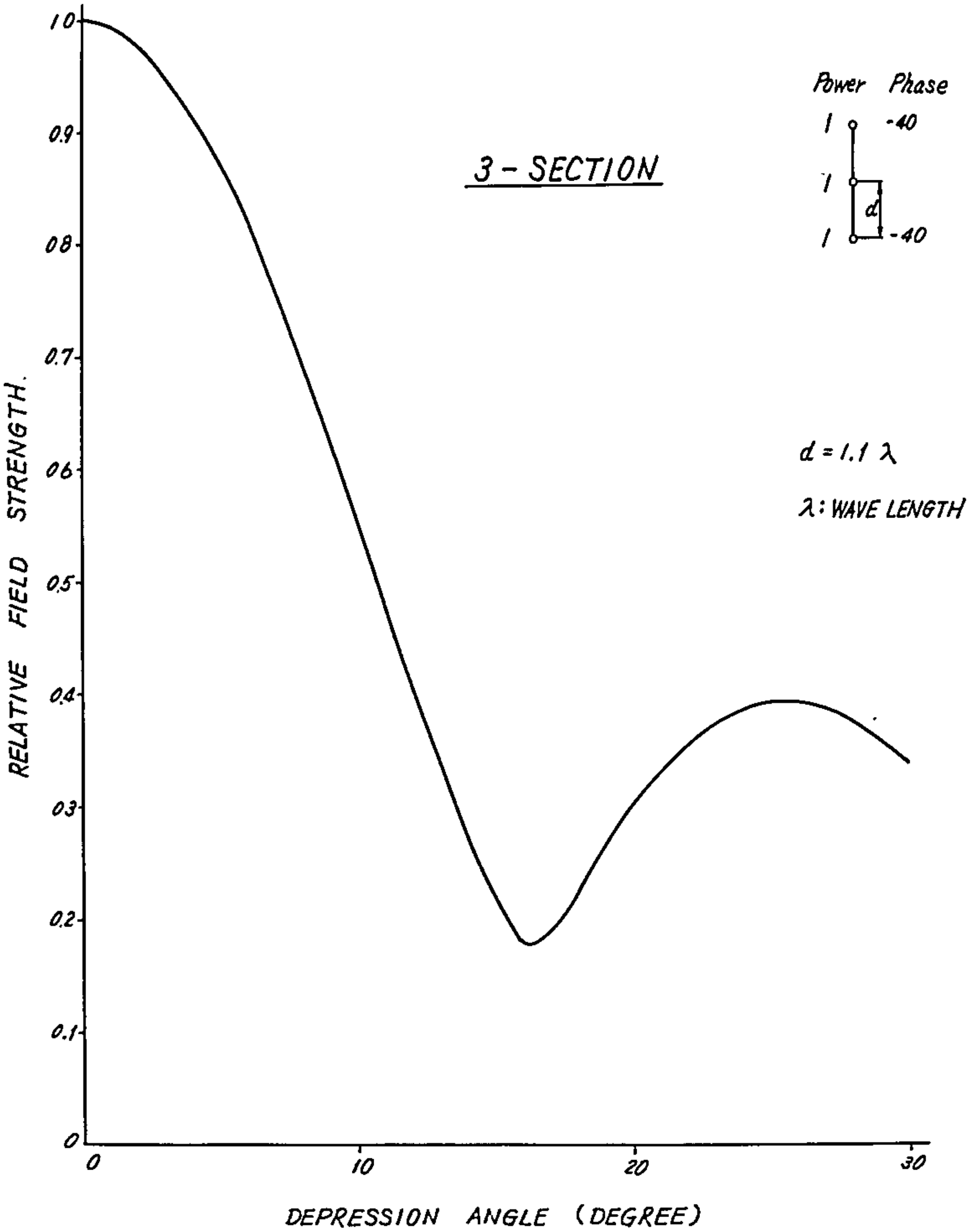


Fig. 2-22B 2-Dipole Panel Antenna Calculated
Vertical Radiation Pattern

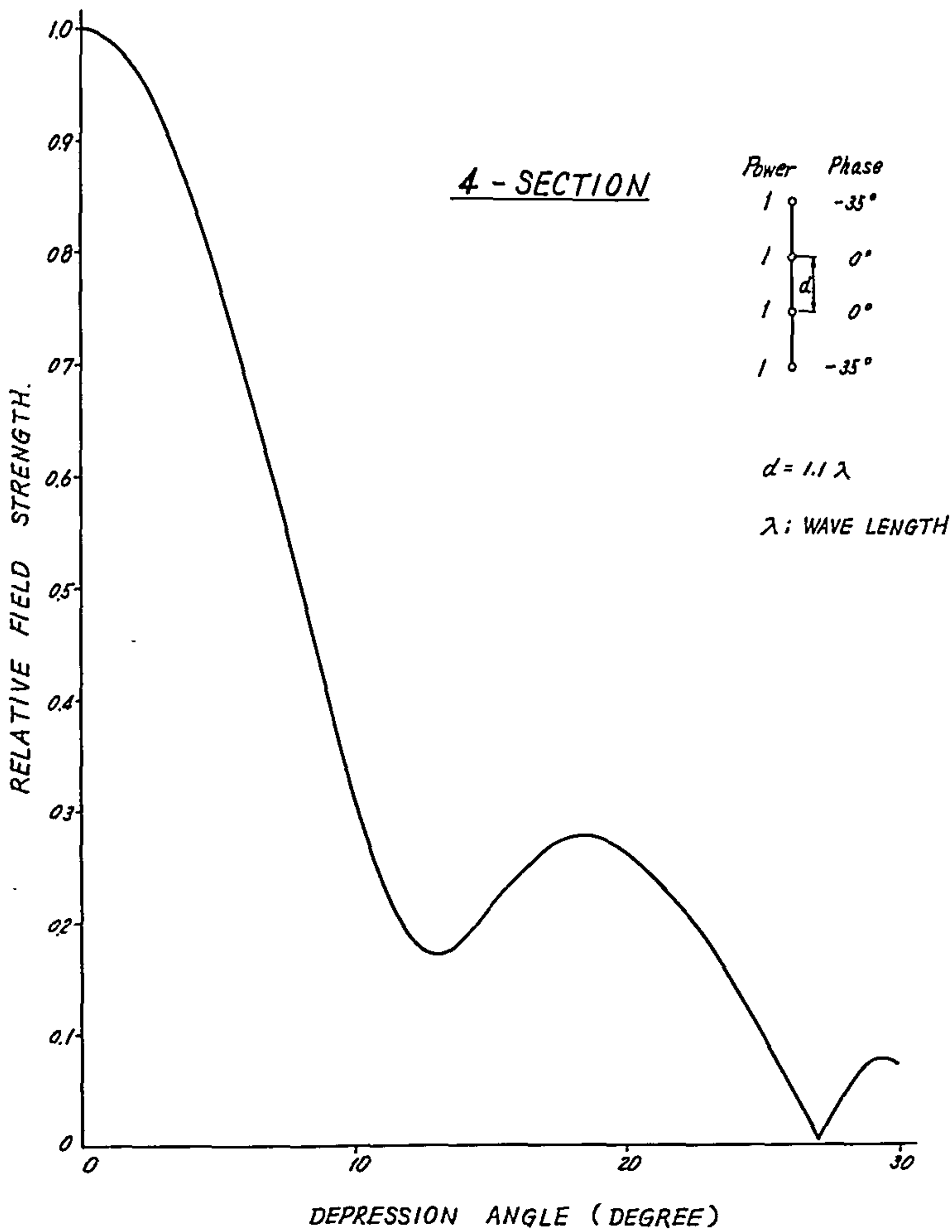


Fig. 2-23 2-Dipole Panel Antenna Calculated
Vertical Radiation Pattern

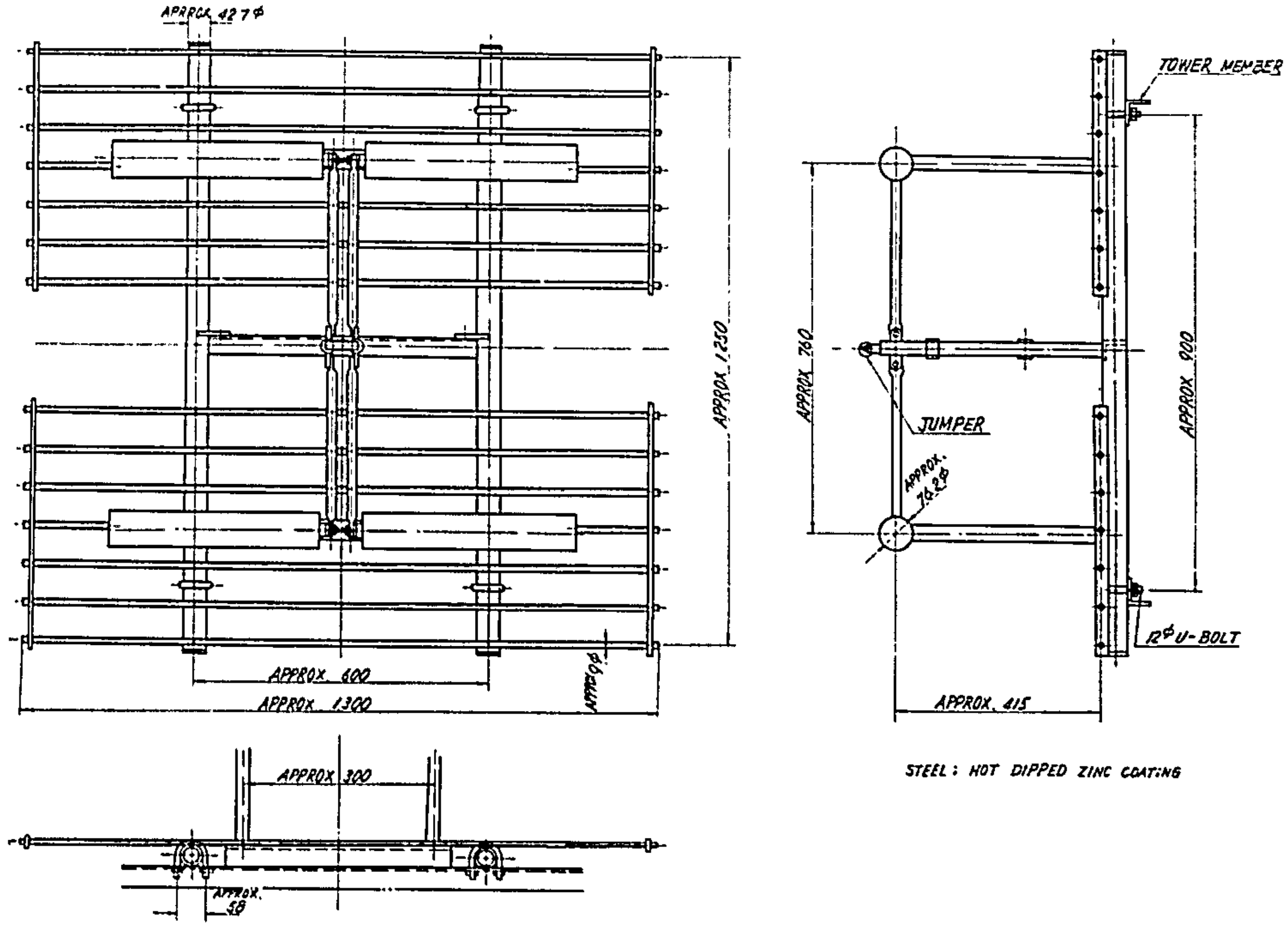


Fig. 2-24 2-Dipole Antenna Panel Layout

2.7.2 Parabolic Antenna for Microwave Link

The dimensions of parabolic antenna for microwave link are as shown in Table 2-6. Figs. 2-25 through 2-27 indicate data of parabolic antenna of 1.8 m DIA.

2.7.3 VHF Yagi Antenna

The kind of Yagi antenna to be used with the VHF band radio transmitter/receiver used for monitor, control and communication is the 5 element Yagi antenna as shown in Table 2-8. Figs. 2-28 through 2-30 give data on the 5 element Yagi antenna.

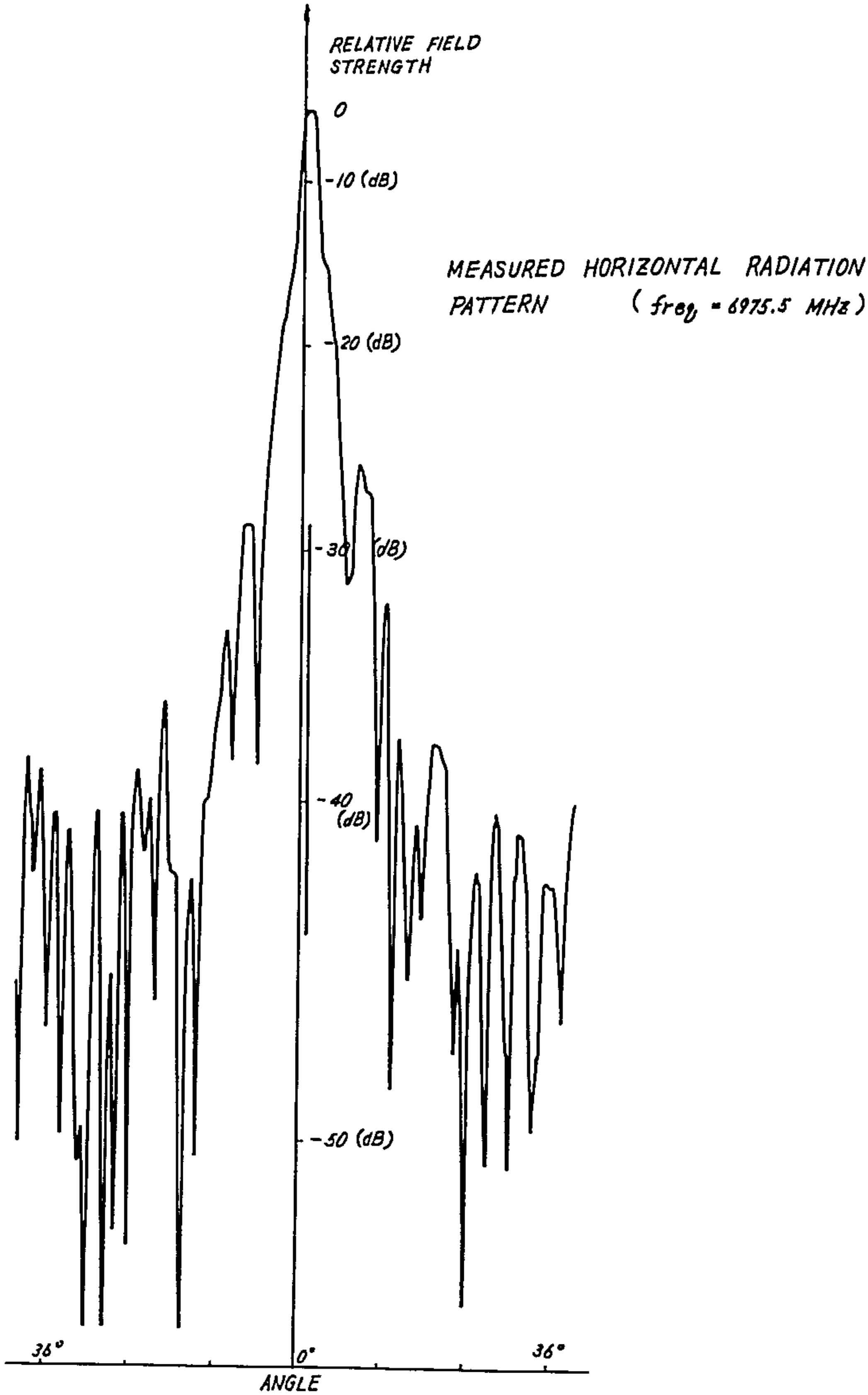


Fig. 2-25 1.8mϕ SHF-Plate Parabolic
Antenna

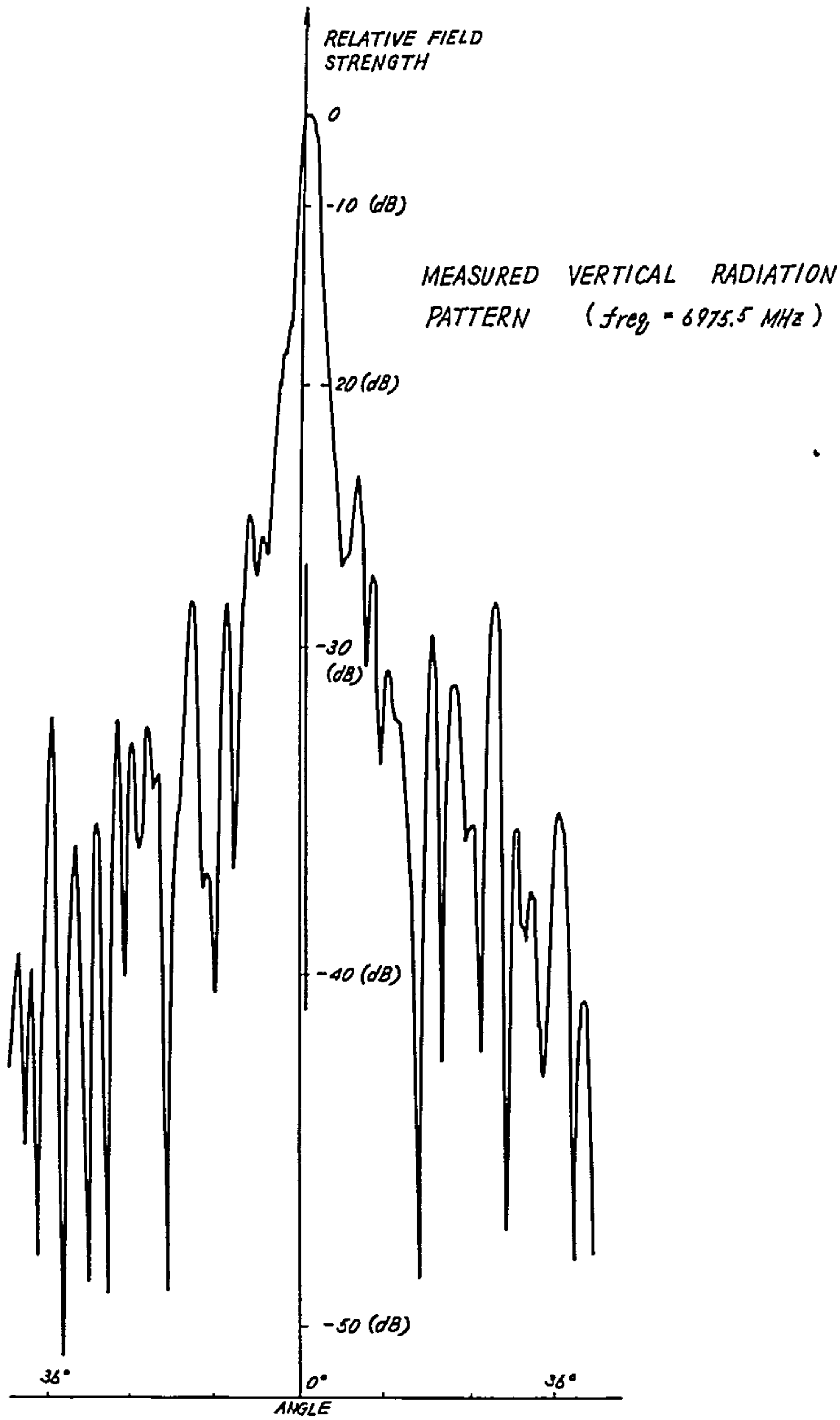
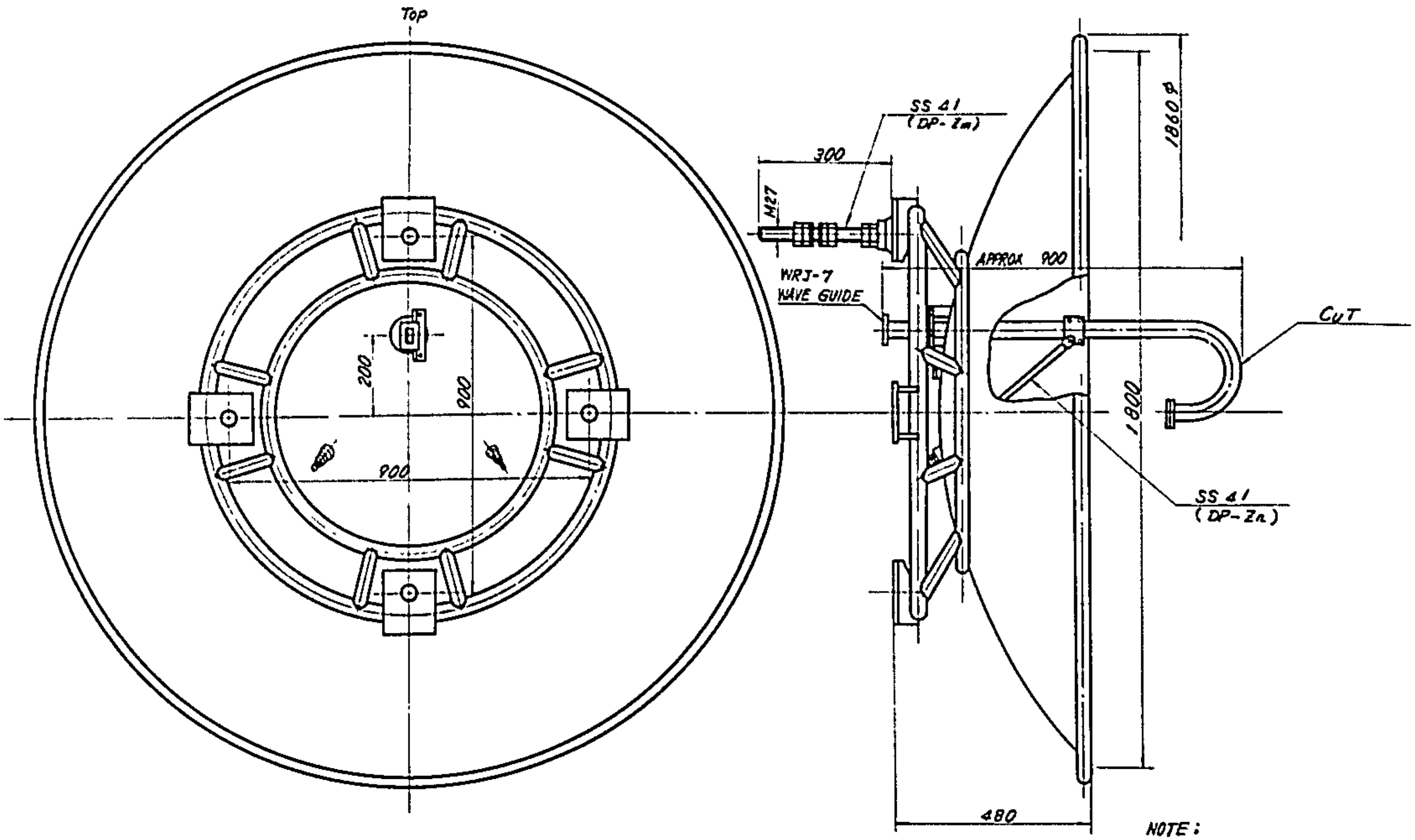


Fig. 2-26 1.8 mϕ SHF Plate Parabolic Antenna



NOTE:
1 MATERIAL: ALUMINUM
2 SS41: STEEL
3 DP-Zn: HOT DIP GALVANIZED
4 CuT: COPPER TUBE

Fig. 2-27 1.8 mφ Parabolic Antenna
(SHF), 7 GHz Band

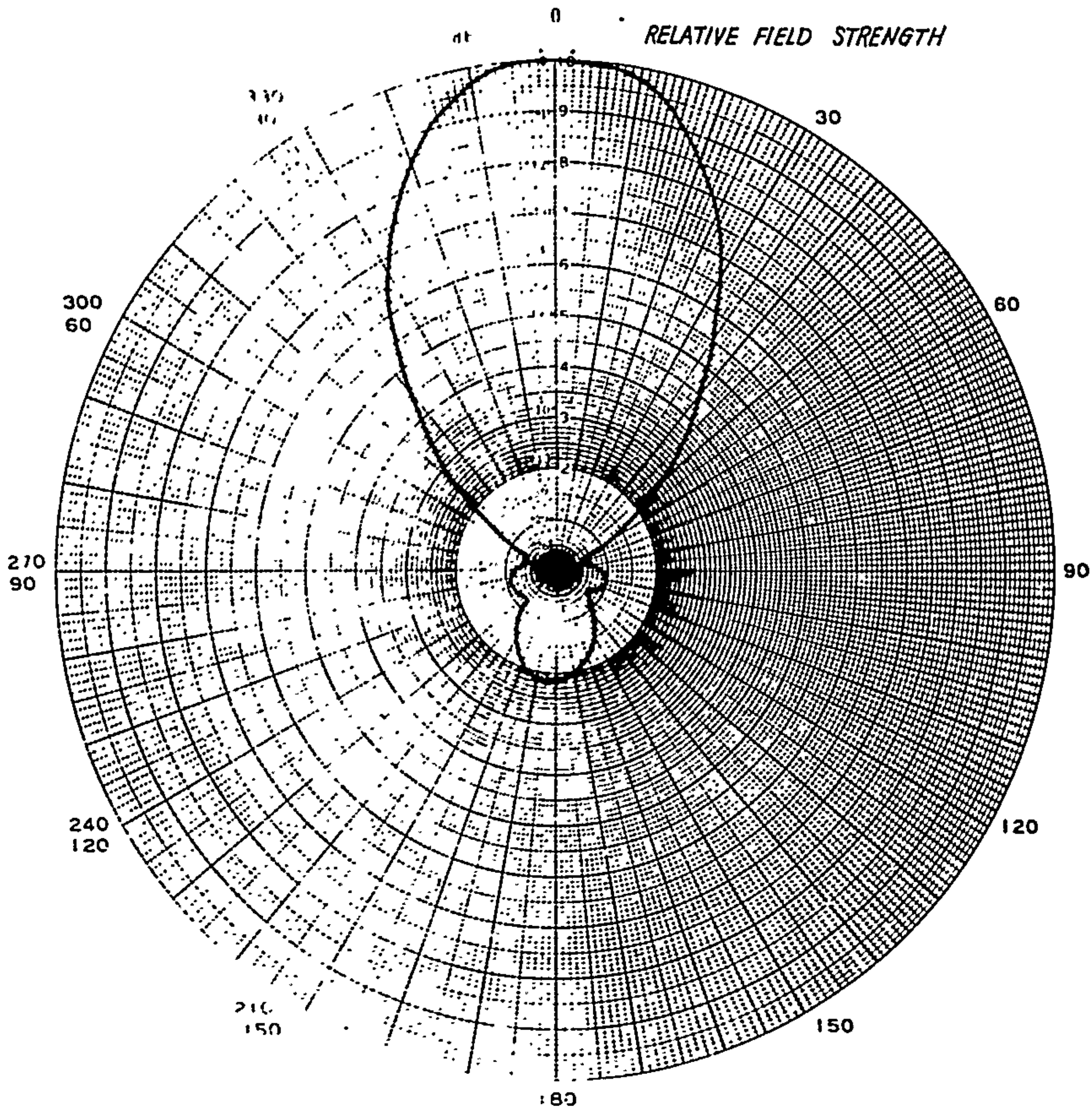


Fig. 2-28 5-Element VHF Yagi Antenna Measured Horizontal Radiation Pattern

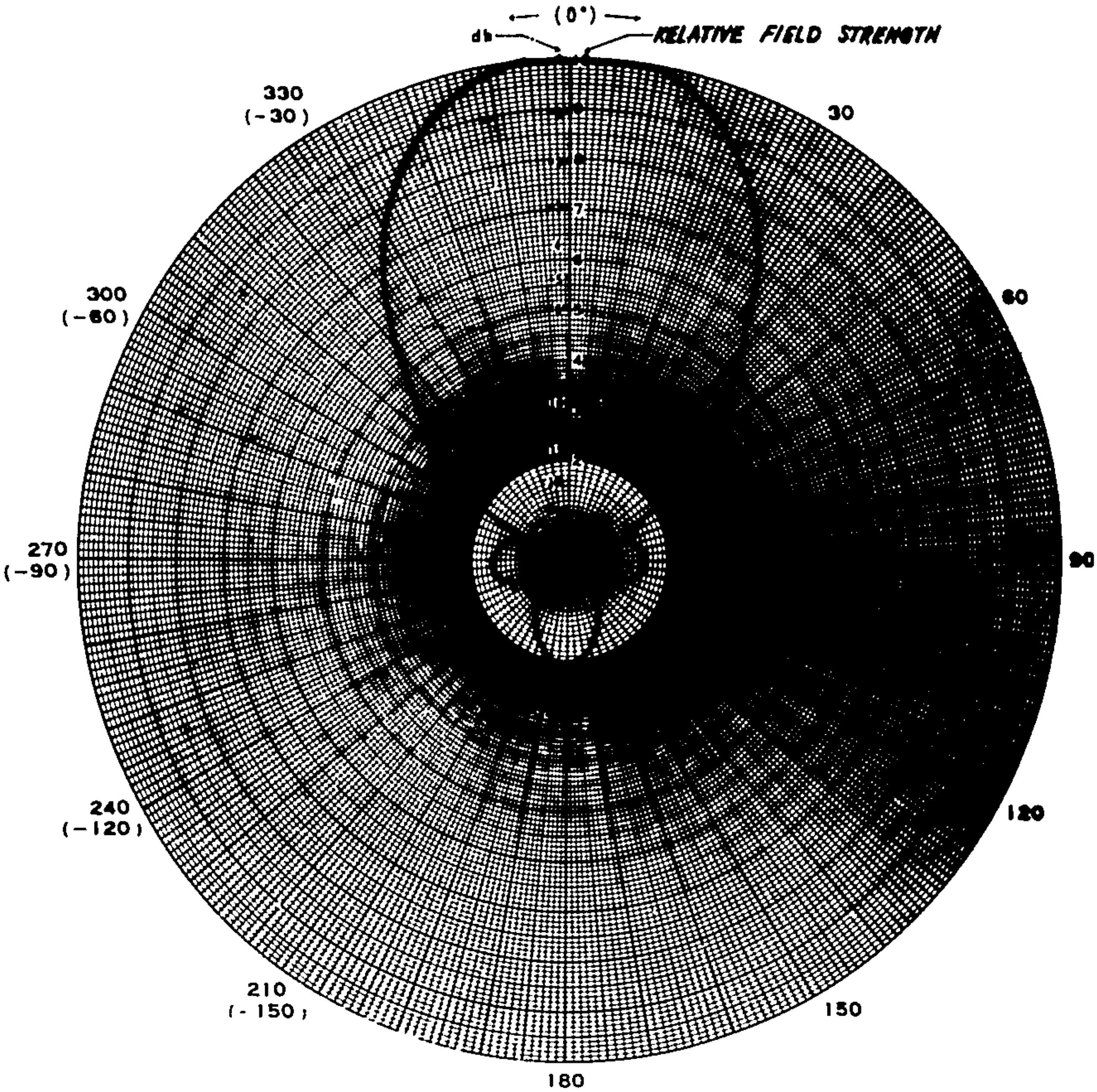
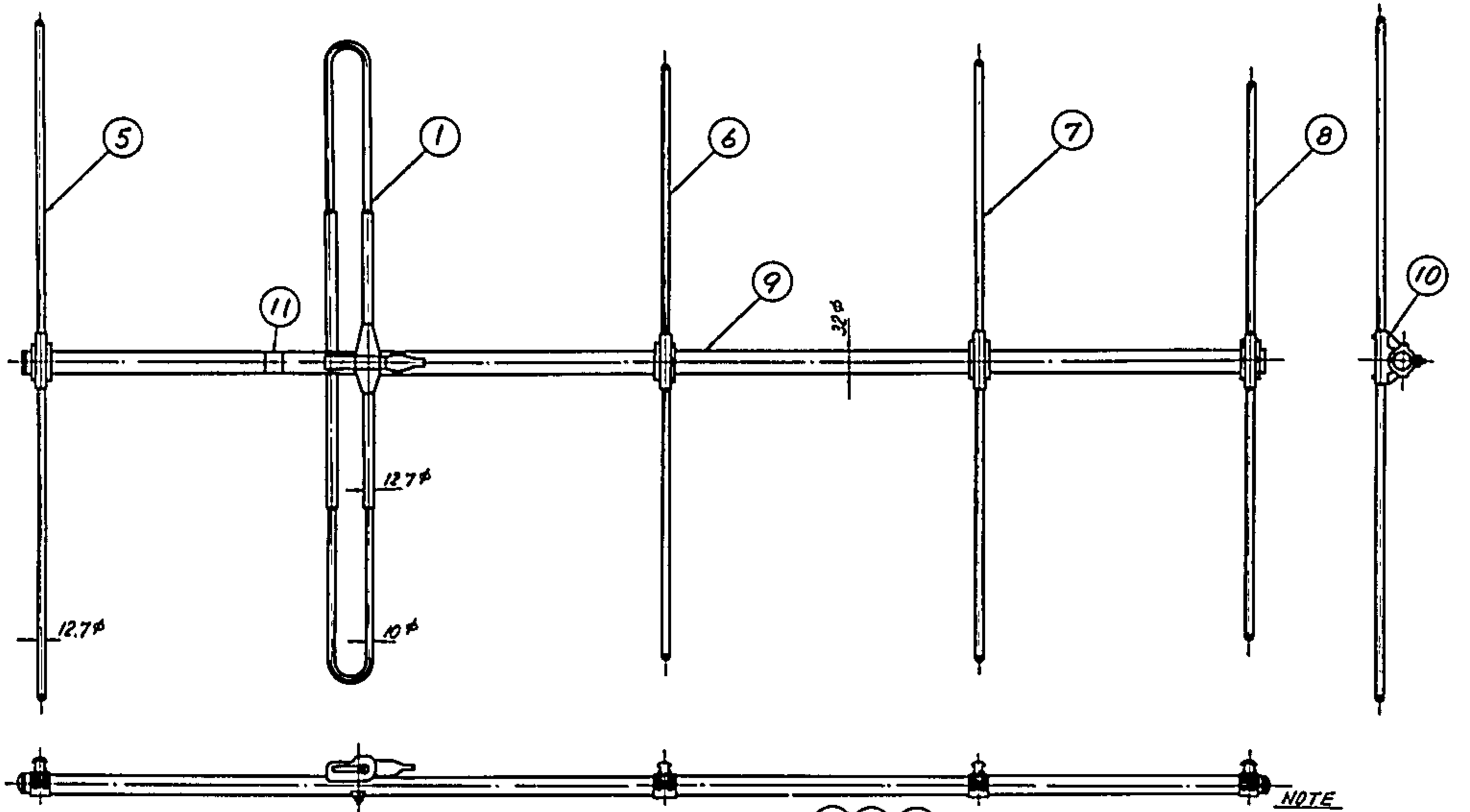


Fig. 2-29 5-Element VHF Yagi Antenna Measured Vertical Radiation Pattern



NO.	DESCPIPTION			SPECIFICATION
11	NAME	PLATE	1	BRASS PLATE
10	5 TH	DIRECTOR	1	ALUMINIUM ALLOY
9	4 TH	DIRECTOR	1	DO
8	3 RD	DIRECTOR	1	DO
7	2 ND	DIRECTOR	1	DO
6	1 ST	DIRECTOR	1	ALUMINIUM ALLOY TUBE
5	REFLECTOR			ALUMINIUM ALLOY TUBE
4	RUBBER	CAP		NEOPRENE
3	BAND			
2	INSULATOR		1	POLYESTER
1	PROJECTOR		1	BRASS TUBE

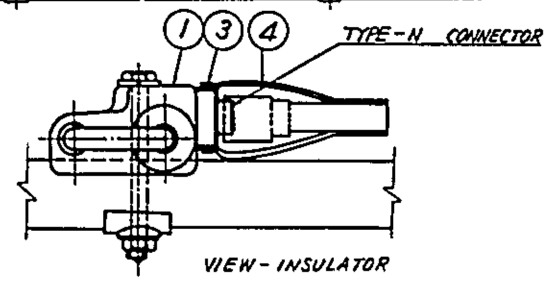


Fig. 2-30 5-Element Yagi Antenna

PART III STUDIO FACILITIES

PART III

STUDIO FACILITIES

Chapter 1 Studio System

1.1 Program Plan

It can be said that TV and radio broadcasts are capable of playing an important part for promotion of the national welfare and improvement in economy, society and culture. To comply with the mission and secure a better effect of broadcasting as well, it is desirable to plan out programs so that characteristics of each medium are put to a practical application to the fullest extent.

Also the manner of planning programs is also essential in deciding the size of studio center.

1.1.1 Broadcasting Hours

Broadcasting hours are contingent on management and broadcast policy at the same time. Broadcasting hours also vary according to the situation of each country. In the case of the Republic of Zambia, the present condition stands as follows.

Radio	General service	About 18 hours a day
	Home service	About 18 hours a day
	External service	About hours a day
TV	Tuesday through Friday	About 12 hours a day
	Monday, Saturday, Sunday	About 6 hours a day

An educational broadcast for schools covers about 29 weeks a year, which is carried out as follows.

Radio	(General service)	Monday through Friday	About 3 hours a day
TV		Tuesday through Friday	About 6 hours a day

As a concept for modernization is worked out, it is deemed proper that the broadcasting hours be expanded as follows.

Radio : Remains unchanged. 18 hours a day for both systems.

FM : 18 hours a day from the second phase plan and after.

TV : 90 hours per week from the first phase plan and after.
100 hours per week from the second phase plan and after.
112 hours per week from the third phase plan and after.

As for TV broadcasting, it is deemed proper that the broadcasting hours be increased as much as 27 hours and 30 minutes a week and carried out separately in two steps in correlation with the personnel plan. The correlation is given in Table 3-1.

Regarding the educational broadcasts for schools and children, it is deemed proper that both TV and radio broadcasts be carried out covering 52 weeks a year including the schoolchildren's long vacation to help them to the maximum extent possible.

Plan	Year	Per Day		Per Week		Per Year		Remarks
		Hour Increased	Broadcasting Hour	Hour Increased	Broadcasting Hour	Hour Increased	Broadcasting Hour	
Present condition		hr. min. -	hr. min. Tues.-Fri. 11.30 Sat., Sun., Mon 5.30	hr. min. -	hr. min. 62.30	hr. min.	hr. min. 2698.00	E 24°x29 = 696° G 38.5°x52 = 2002°
First phase plan	1978	Mon. 7.00 Tues.-Fri. 1.00 Sat., Sun. 4.00	Mon.-Fri. 12.30 Sat., Sun. 9.30	19.00	81.30	850.00	3548.00	News 7°30'/Wx52W Education 6°00'/Wx29W Culture 2°30'/Wx52W Amusement 3°00/Wx52W
	1980	Mon.-Fri. 1.30 Sat., Sun. 0.30	Mon.-Fri. 14.00 Sat., Sun. 10.00	8.30	90.00	729.30	4277.5	News 3°30'/Wx52W Education (12°30'/Wx23W) Culture 2°30'/Wx52W Amusement 2°30'/Wx52W
Second phase plan	1983	Mon.-Fri. 2.00	Mon.-Fri. 16.00 Sat., Sun. 10.00	10.00	100.00	922.30	5200.00	News 5°00'/Wx52W Education (17°30'/Wx23W) Culture 5°00'/Wx52W
Third phase plan	1988	Sat., Sun. 6.00	16.00	12.00	112.00	624.00	5824.00	News 1°00'/Wx52W Culture 11°00'/Wx52W

* 52 weeks per year.

Table 3-1 Plan for Increasing TV Broadcasting Hours

1.1.2 Policy for Program Plan

The broadcast is sorted in social function as shown in Table 3-2.

Table 3-2 Broadcast in Social Function

Function	Broadcast
Information	Newscast, news comment, documentary, sports, public information, etc.
Education; culture	Educational programs for schools, infants, adults; culture program for the general public.
Amusements	Amusement program
Commercial	Commercial program

The ratio of programs classified by function should be decided fundamentally according to the organization policy of the broadcasting organ, the state of affairs in the country and the opinions of the people who receive the broadcasting service. In the case of the Republic of Zambia, it is deemed that programs of news, education and culture should be given the most emphasis. Therefore, it is proper that the ratio classified by function will become as shown in Table 3-3 for the total broadcasting hours.

Table 3-3 Broadcasts Classified by Function

Sorting	TV	Radio
News	20 - 25 %	25 - 35 %
Education; culture	55 - 60 %	35 - 45 %
Amusements	15 - 20 %	25 - 35 %

In preparing programs, it is desirable that the wishes of every class including schoolchildren, infants and adults be satisfied as much as possible. Simultaneously the programs should be popular to cope with the desires of the multitude. Also the program time should be accommodated to the life and activities of the people as classified by occupation, age, school career and social classes.

The basic policy for program preparation should be decided after clarification of desired program goals. Some program aims or goals are, for example, guidance policy and dissemination of government measures, promotion of mutual understanding and cooperation between tribes and areas, unification of languages, equality of opportunity of education, development of economy, society and culture; promotion of the national welfare and promotion of international understanding.

1.1.3 Standards for Programs

Broadcasts are categorized as shown in Table 3-4 according to their contents. It is desirable that broadcasting program standards purpose and the basic idea for broadcasting programs, and programs will be prepared accordingly.

Table 3-4 Categorizing of Program Contents

Program	Contents
News	News, local News, overseas News comment News, special (special program at emergency and calamity) Government public information Others
Education; culture	Program for school Infants' Program for infants Program for children Program for ladies Correspondence course for education Program for social welfare Program to give latest information on society, economy, politics, industry and culture, etc. Program on health and sanitation Program for promoting scientific knowledge and technology Program on managing factories and stores Program on agricultural management and technique Program on professional education (including technical guidance) Program for educating adults (including spread of the standard language) Program for introduction of manners, customs, history and culture of foreign countries Program on religion Others
Amusements	Drama Music, dance Quiz Variety show Movie Others
Sports and others	On-the-spot broadcasting Others

1.1.4 Program Council

For reasonable operation of broadcasting programs, it is desirable that a Program Council comprising men of learning and experience in the fields of politics, economy, science, education, arts and religion be set up. The Program Council in compliance with inquiries from the department concerned will provide guidance concerning broadcasting hours, broadcasting hours classified by function and program contents including establishment or changes of the broadcast standards and fundamental program preparation. Broadcasting organs will carry out broadcasting in accordance with what has been reported by the Council.

1.1.5 Investigation of People's Desires

To be acquainted well with the desires of the people for broadcasting programs, surveys should be made regularly. The survey results should be considered in all areas of broadcasting including program preparation.

1.1.6 Program Plan

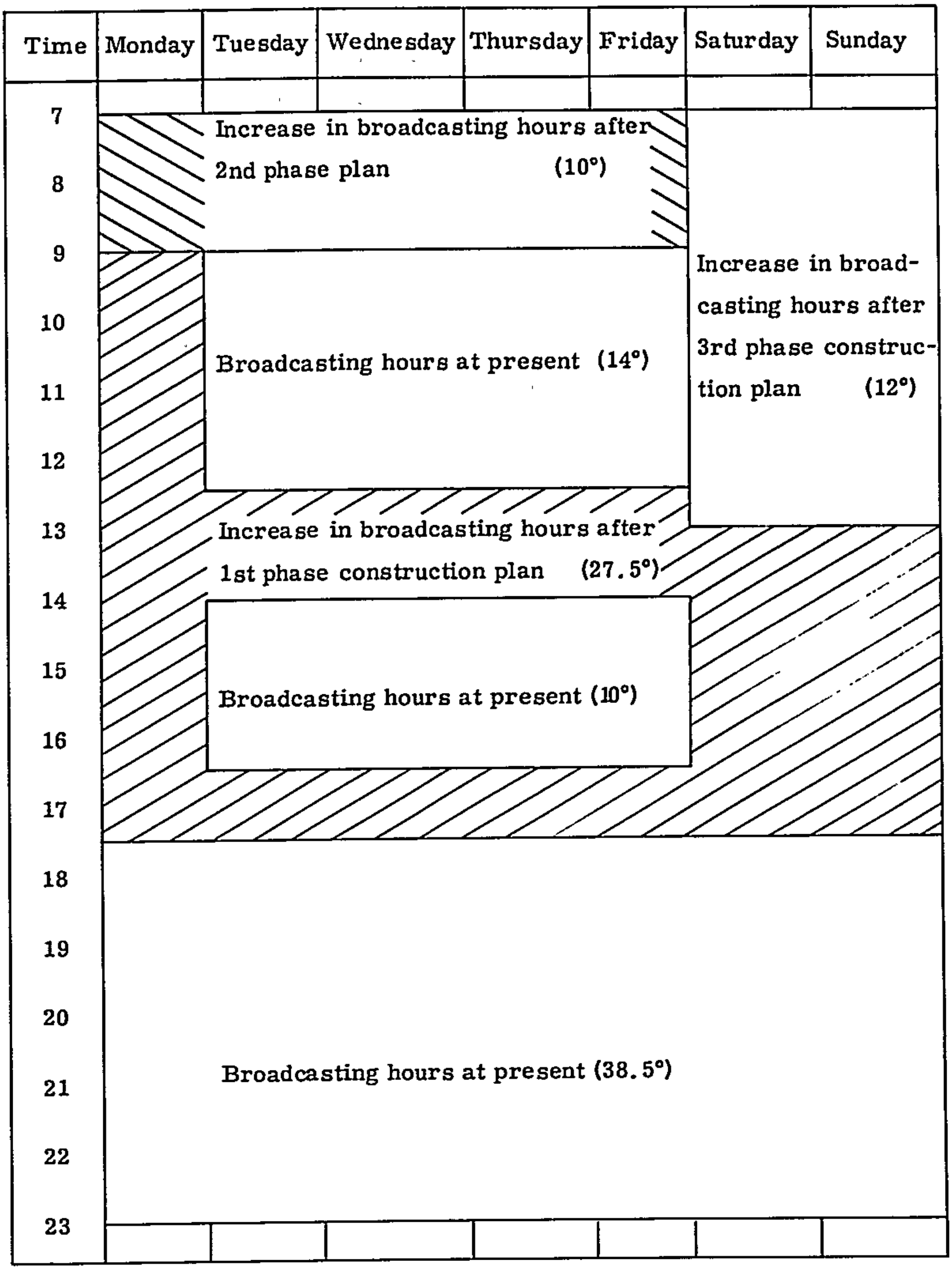
(1) Program Schedule

It is deemed proper that a program schedule for television broadcasting service be like that given in Table 3-5 as an example. A program schedule is given for one week. It is also desirable to increase broadcasting hours as shown in Table 3-6. As for the radio program schedule the one now in use is proper.

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7							
8	News program 5°00'					News program 1°00'	
9	Caltural program 5°00'						
10	Educational program (for schools) 17°30'					Cultural program 11°00'	
11							
12	Cultural program 2°30'						
13	News program 3°30'						
30	Amusement program 2°30'					News program 4°00' (including sports)	
14							
15	Educational program (for schools) 12°30'						
16						Amusement program 3°00'	
30	Cultural program 2°30'						
17	News program 3°30'						
18	Cultural program 8°45'						
45							
19	News program 7°45'						
20	Amusement program 8 00'						
21	News program 1°45'						
15	Amusement program 5°15'						
22	Cultural program 7°00'						
23							

Table 3-5 TV Broadcast Program Schedule in a Modern Concept (Example)

Table 3-6 Relation Between a Modernizing Concept and Increase in Broadcasting Hours on TV Broadcast Program Schedule (Example)



For the FM broadcast program schedule, it should be equivalent to the general service of the radio program schedule.

(2) Program Preparation Plan

Tables 3-7, 8 and 9 represent preferred examples of program plans for TV, radio and FM broadcasts.

(3) Programming Plan

It is desirable that an example of TV programming as given in Table 3-10 be available for formulating programming plan of TV and radio broadcasts.

(4) Plan for Program Producing

It is desirable that the TV and radio program producing plan be made in accordance with Table 3-11 "Plan for arranging TV program (Example)". This plan will aid in deciding the size of studios and the schedule for using them.

Item	1st phase plan					2nd phase plan					3rd phase plan				
	Broadcasting		Program			Broadcasting		Program			Broadcasting		Program		
	Hour	%	Pro-duction	Repro-duction	Others	Hour	%	Pro-duction	Repro-duction	Others	Hour	%	Pro-duction	Repro-duction	Others
News programs	20°30'	23	14°40'	3°30'	2°20'	25°30'	25	20°15'	2°30'	2°45'	26°30'	34	23°35'	0	2°55'
News	8°45'		6°25'	0	2°20'	10°00'		7°15'	0	2°45'	10°30'		7°35'	0	2°55'
Information	7°45'		4°15'	3°30'	0	11°30'		9°00'	2°30'	0	12°00'		12°00'	0	0
Sports	4°00'		4°00'	0	0	4°00'		4°00'	0	0	4°00'		4°00'	0	0
Educational program	30°00'	33	2°30'	2°30'	25°00'	30°00'	30	11°00'	11°00'	8°00'	30°00'	27	12°00'	12°00'	6°00'
Cultural program	20°45'	23	2°30'	2°30'	15°45'	25°45'	26	9°00'	5°00'	11°45'	36°45'	33	14°00'	5°00'	17°45'
Amusement program	18°45'	21	7°00'	2°30'	9°15'	18°45'	19	13°30'	0	5°15'	18°45'	16	13°30'	0	5°15'
Music, show	9°00'		3°00'	2°30'	3°30'	9°00'		6°45'	0	3°00'	9°00'		6°45'	0	2°15'
Drama	9°45'		4°00'	0	5°45'	9°45'		6°45'	0	3°45'	9°45'		6°45'	0	3°00'
Total	90°00'	100	26°40'	11°00'	52°20'	100°00'	100	53°45'	18°30'	27°45'	112°00'	100	63°05'	17°00'	31°55'

Table 3-7 Plan for Organizing TV Broadcasting Programs (Example)

Item	1st phase plan						2nd phase plan						3rd phase plan					
	General		Home		FM		General		Home		FM		General		Home		FM	
	Hour	%	Hour	%	Hour	%	Hour	%	Hour	%	Hour	%	Hour	%	Hour	%	Hour	%
News program	40°	32	45°	36	Under experimental broadcasting		40°	32	45°	36	30°	24	40°	32	45°	36	30°	24
News	15°		20°				15°		20°		15°		15°		20°		15°	
Information	15°		20°				15°		20°		15°		15°		20°		15°	
Sports	10°		5°				10°		5°		-		10°		5°		-	
Educational program	20°	16	-	-			20°	16	-	-	-	-	20°	16	-	-	-	-
Cultural program	35°	28	45°	36			35°	28	45°	36	50°	40	35°	28	45°	36	50°	40
Amusement program	31°	24	36°	28			31°	24	36°	28	46°	36	31°	24	36°	28	46°	36
Music, show	10°		10°				10°		10°		14°		10°		10°		14°	
Drama	9°		9°				9°		9°		13°		9°		9°		13°	
Disk jockey	12°		17°				12°		17°		19°		12°		17°		19°	
Total	126°	100	126°	100	0		126°	100	126°	100	126°	100	126°	100	126°	100	126°	100

Table 3-8 Broadcasting Hours at Each Program in Radio and FM Broadcasts (Example)

Item	1st phase plan					2nd phase plan					3rd phase plan				
	Broadcasting		Program			Broadcasting		Program			Broadcasting		Program		
	Hour	%	Pro-duction	Repro-duction	Others	Hour	%	Pro-duction	Repro-duction	Others	Hour	%	Pro duction	Repro-duction	Others
News program	85*	34	65*	15*	5*	115*	30	95*	15*	5*	115*	30	100*	10*	5*
News	35*		35	0	-	50*		50*	-	-	50*		50*	-	-
Information	35*		15*	15*	5*	50*		30*	15*	5*	50*		35*	10*	5*
Sports	15*		15*	-	-	15*		15*	-	-	15*		15*	-	-
Educational program	20*	8	12*	8*	-	20*	5	14*	6*	-	20*	5	14*	6*	-
Cultural program	80*	32	60*	20*	-	130*	35	95*	35*	-	130*	35	100*	30*	-
Amusement program	67*	26	45*	15*	7*	113*	30	100*	10*	3*	113*	30	100*	10*	3*
Music, show	20*		8*	8*	4*	24*		17*	5*	2*	24*		17*	5*	2*
Drama	18*		8*	7*	3*	23*		17*	5*	1*	23*		17*	5*	1*
Disk jockey	29*		29*	-	-	66*		66*	-	-	66*		66*	-	-
Total	252*	100	182*	58*	12*	378*	100	304*	66*	8*	378*	100	314*	56*	8*

Table 3-9 Plan for Organizing Radio and FM Broadcasting Programs (Example)

Program	Contents	Hour	Day of the week	Broadcasting hours	Number of programs	Remarks
News program		(26°30')				
	(1) News, information	10°30'	Mon. - Sun.	7.00 - 7.15	15' x 7 = 1°45'	
			"	13.00 - 13.15	15' x 7 = 1°45'	News studio
			"	17.00 - 17.15	15' x 7 = 1°45'	(Live broadcast)
			"	18.45 - 19.15	30' x 7 = 3°30'	
			"	21.00 - 21.15	15' x 7 = 1°45'	
	(2) Documentary	7°00'	"	7.15 - 7.30	15' x 7 = 1°45'	
			"	13.15 - 13.30	15' x 7 = 1°45'	Produced
			"	17.15 - 17.30	15' x 7 = 1°45	
			"	19.15 - 19.30	15' x 7 = 1°45'	
	(3) News comment	5°00'	Mon. - Fri.	7.30 - 8.00	30' x 5 = 2°30'	
			"	19.30 - 20.00	30' x 5 = 2°30'	News studio
	(4) Sports	4°00'	Sat., Sun.	13.30 - 15.30	2°00' x 2 = 4°00'	Produced
Educational program		(30°00')				
			Mon. - Fri.	9.00 - 12.30	30' x 35 = 17°30'	Produced
			"	14.00 - 16.30	30' x 25 = 12°30'	30'x24=12°00'
Cultural program		(36°45')				
	(1) For infants	8°45'	Mon. - Sun.	17.30 - 18.15	45' x 7 = 5°15'	
			"	18.15 - 18.45	30' x 7 = 3°30'	
	(2) For ladies	5°00'	Mon. - Fri.	8.00 - 8.30	30' x 5 = 2°30'	Produced
			"	12.30 - 13.00	30' x 5 = 2°30'	
	(3) For adults	23°00'	"	8.30 - 9.00	30' x 5 = 2°30'	Produced
			"	16.30 - 17.00	30' x 5 = 2°30'	
			Mon. - Sun.	22.00 - 23.00	1°00' x 7 = 7°00'	
			Sat., Sun.	7.30 - 10.00	30' x 10 = 5°00'	Produced
			"	10.00 - 11.00	1°00' x 2 = 2°00'	
			"	11.00 - 13.00	2°00' x 2 = 4°00'	Produced
Amusement program		(18°45')				
			Mon. - Fri.	13.30 - 14.00	30' x 5 = 2°30'	
			Sat., Sun.	19.30 - 20.00	30' x 2 = 1°00'	Produced
			Mon. - Sun.	20.00 - 21.00	1°00' x 7 = 7°00'	
			"	21.15 - 22.00	45' x 7 = 5°15'	Produced
			Sat., Sun.	15.30 - 17.00	1°30' x 2 = 3°00'	45'x4=1°30'

Table 3-10 TV Broadcasting Programming Plan (Example)

Program	1st phase plan					2nd phase plan					3rd phase plan				
	Total	Studio				Total	Studio				Total	Studio			
		$100m^2$	$200m^2$	$400m^2$	O.B.Van		$100m^2$	$200m^2$	$400m^2$	O.B.Van		$100m^2$	$200m^2$	$400m^2$	O.B.Van
News	(42) 17°00'	(40) 13°00'			(2) 4°00'	(66) 23°00'	(44) 14°00'	(15) 3°45'		(7) 5°15'	(75) 26°30'	(40) 13°00'	(28) 7°00'		(7) 6°30'
15'	(28) 7°00'	(28) 7°00'				(52) 13°00'	(32) 8°00'	(15) 3°45'		(5) 1°15'	(56) 14°00'	(28) 7°00'	(28) 7°00'		
30'	(12) 6°00'	(12) 6°00'				(12) 6°00'	(12) 6°00'				(17) 8°30'	(12) 6°00'			(5) 2°30'
2°00'	(2) 4°00'				(2) 4°00'	(2) 4°00'				(2) 4°00'	(2) 4°00'				(2) 4°00'
Educational	(5) 2°30'				(5) 2°30'	(22) 11°00'		(12) 6°00'	(2) 1°00'	(8) 4°00'	(24) 12°00'		(20) 10°00'	(2) 1°00'	(2) 1°00'
30'	(5) 2°30'				(5) 2°30'	(22) 11°00'		(12) 6°00'	(2) 1°00'	(8) 4°00'	(24) 12°00'		(20) 10°00'	(2) 1°00'	(2) 1°00'
Cultural	(5) 2°30'				(5) 2°30'	(14) 9°00'		(12) 7°00'	(2) 2°00'		(22) 14°00'		(20) 10°00'	(1) 2°00'	(1) 2°00'
30'	(5) 2°30'				(5) 2°30'	(10) 5°00'		(10) 5°00'			(20) 10°00'		(20) 10°00'		
1°00'						(4) 4°00'		(2) 2°00'	(2) 2°00'						
2°00'											(2) 4°00'			(1) 2°00'	(1) 2°00'
Amusements	(13) 7°00'		(13) 7°00'			(18) 13°30'		(14) 9°30'	(4) 4°00'		(18) 13°30'		(13) 8°30'	(4) 4°00'	(1) 1°00'
30'	(12) 6°00'		(12) 6°00'			(7) 3°00'		(7) 3°30'			(7) 3°30'		(7) 3°30'		
45'						(4) 3°00'		(4) 3°00'			(4) 3°00'		(4) 3°00'		
1°00'	(1) 1°00'		(1) 1°00'			(7) 7°00'		(3) 3°00'	(4) 4°00'		(7) 7°00'		(2) 2°00'	(4) 4°00'	(1) 1°00'
Total	(65) 29°00'	(40) 13°00'	(13) 7°00'		(12) 9°00'	(120) 56°30'	(44) 14°00'	(53) 26°15'	(8) 7°00'	(15) 9°15'	(139) 66°00'	(40) 13°00'	(81) 35°30'	(7) 7°00'	(11) 10°30'

Note: Figures given in parentheses represent the number of programs produced per week.

Table 3-11 Plan for Arranging TV Programs (Example)

1.2 Continuity System

The broadcasting center is composed of a program production and a continuity system. For best positioning, it is advantageous in function to keep the continuity system at the çenter and arrange a group of the program production systems peripherally. Integration and effectiveness of the operational arrangement can be realized by arranging the TV and radio continuity systems at one location.

The continuity system is designed for future use upon commencement of FM broadcasting and also for high degree of freedom of operation in the equipment expansion plan and the personnel plan. It is based on a modernizing concept.

It is desirable that the equipment for which a high standard of technique is necessary in operation be integrated into the continuity system for better efficiency of maintenance and operation. Also a continuity system will be efficiently integrated therein, thus keeping an independency and cooperation of each department in engineering technique, program arrangement and information reporting.

Space for increasing the equipment in the future will particularly be taken into consideration for the VTR and telecine rooms, and at the same time a better efficiency of operation will have to be realized by arranging it near the program and information departments allowing a reasonable flow of business.

It is desirable that the TV presentation studio will will be about $100m^2$ so as to cope with the work for news programs, government public information, weather forecast and information reporting and also for arranging programs like simple interviews and further to secure an emergent broadcasting arrangement.

As for radio broadcasting, it is desirable that simplification and effectiveness of the operation be realized and at the same time, a delicate continuity of program be provided by giving each system a continuity control room, continuity studio and news studio.

System block diagrams are detailed in the following figures.

Fig. 3-1 (a)	Lusaka Broadcasting Center (TV) (Full plan)
Fig. 3-1 (b)	Lusaka Broadcasting Center (TV) (1st phase plan)
Fig. 3-2 (a)	Lusaka Broadcasting Center (Radio) (Full plan)
Fig. 3-2 (b)	Lusaka Broadcasting Center (Radio) (1st phase plan)
Fig. 3-3	Kitwe Broadcasting Station (TV)
Fig. 3-4	Kitwe Broadcasting Station (Radio)
Fig. 3-5	Livingstone Broadcasting Station (TV)
Fig. 3-6	Livingstone Broadcasting Station (Radio)

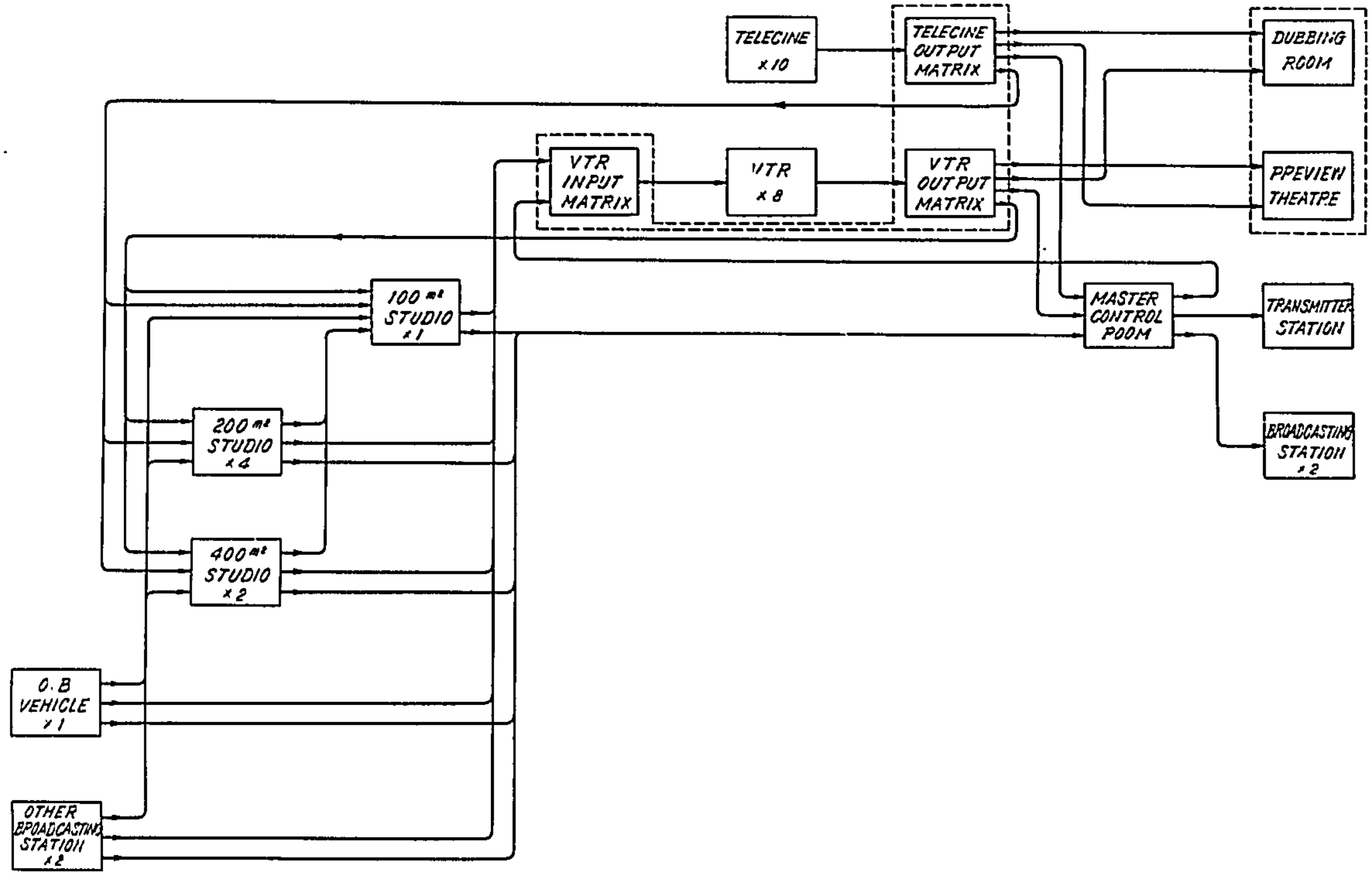


Fig. 3-1(a) System Block Diagram of Television Broadcasting Center in Lusaka

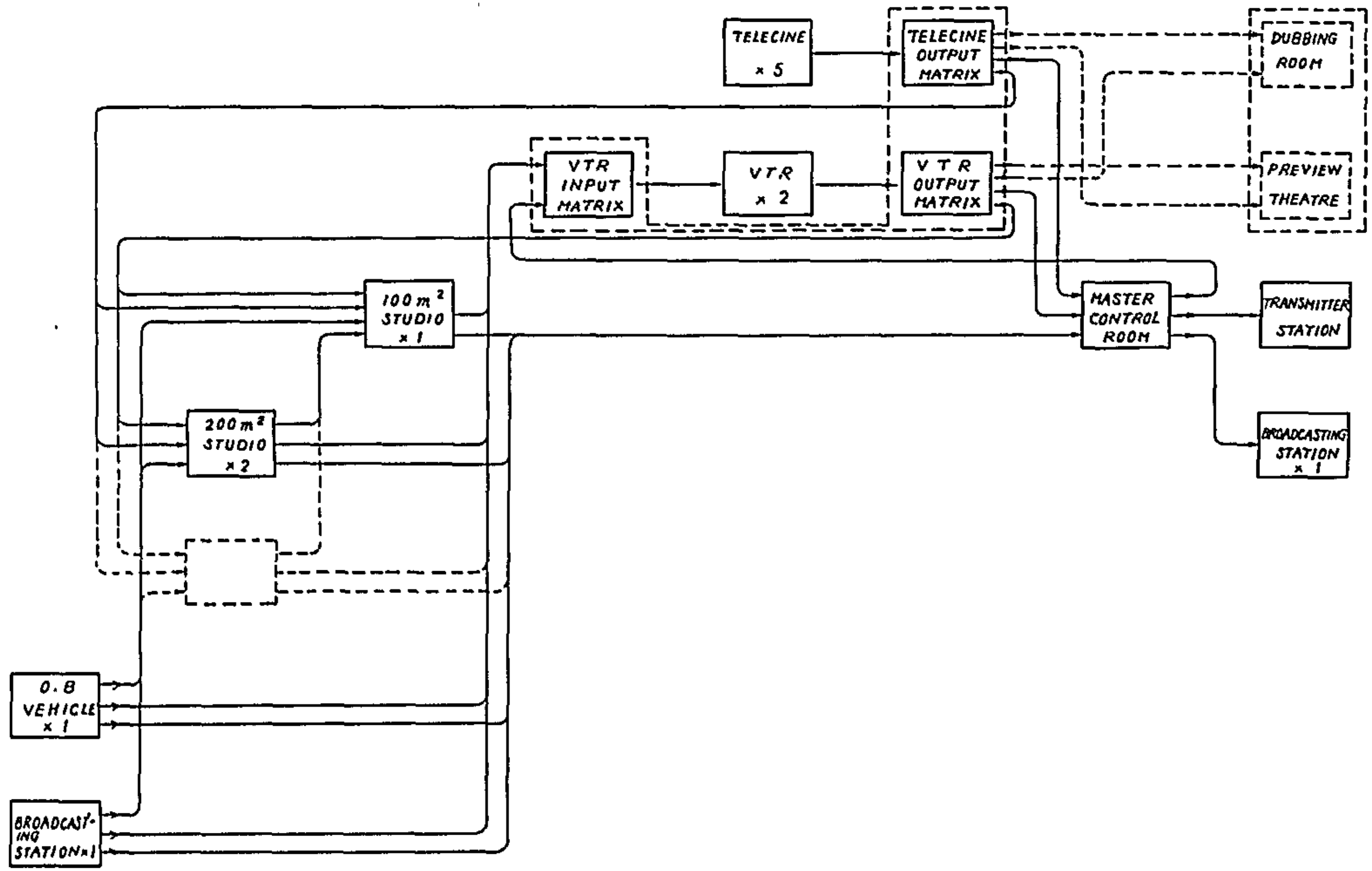


Fig. 3-1-(b) System Block Diagram
of Lusaka Television Broadcasting Center
in First Phase

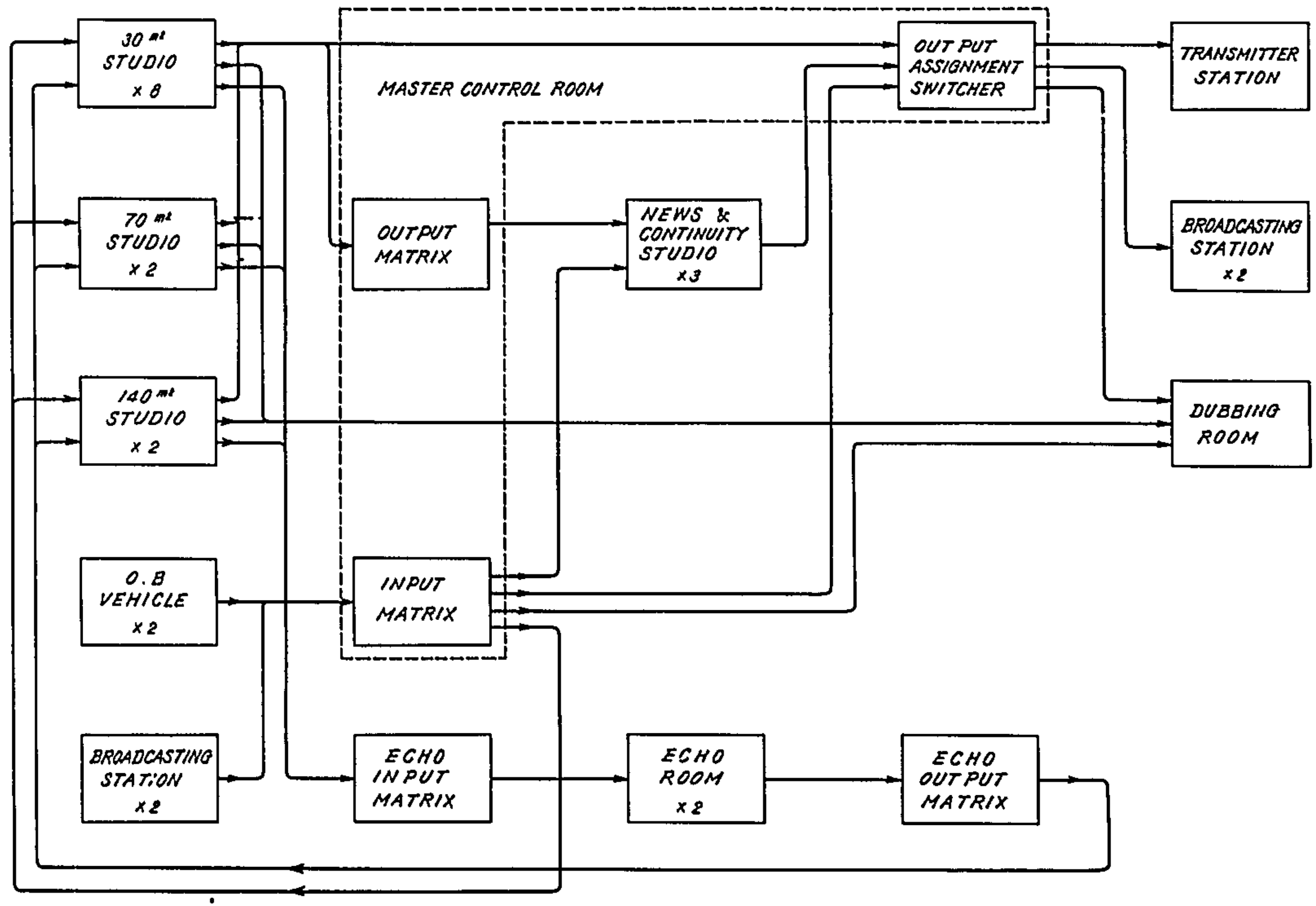


Fig. 3-2 (a) System Block Diagram of Radio Broadcasting Center in Lusaka

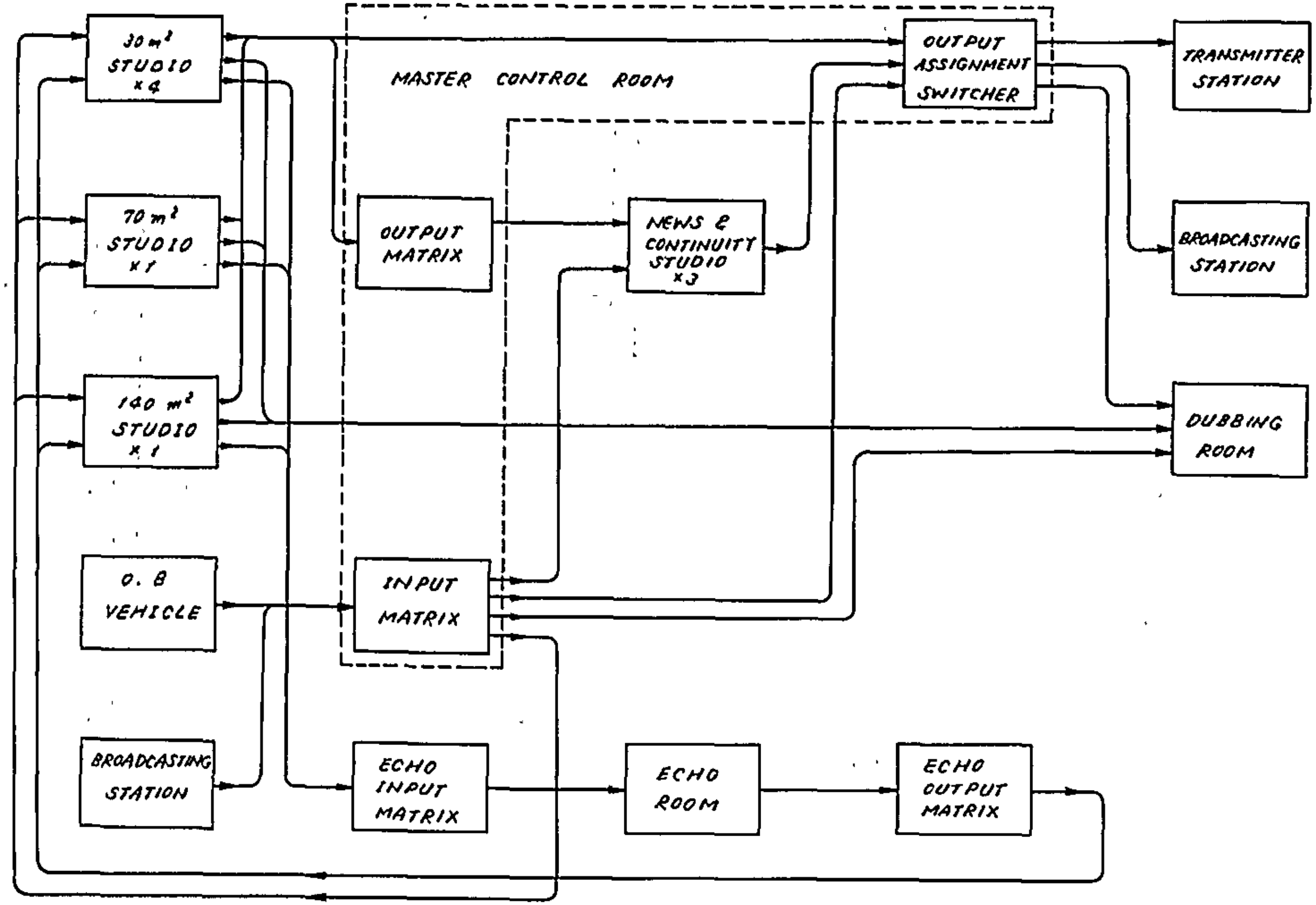


Fig. 3-2 (b) System Block Diagram of Lusaka Broadcasting Center in First Phase

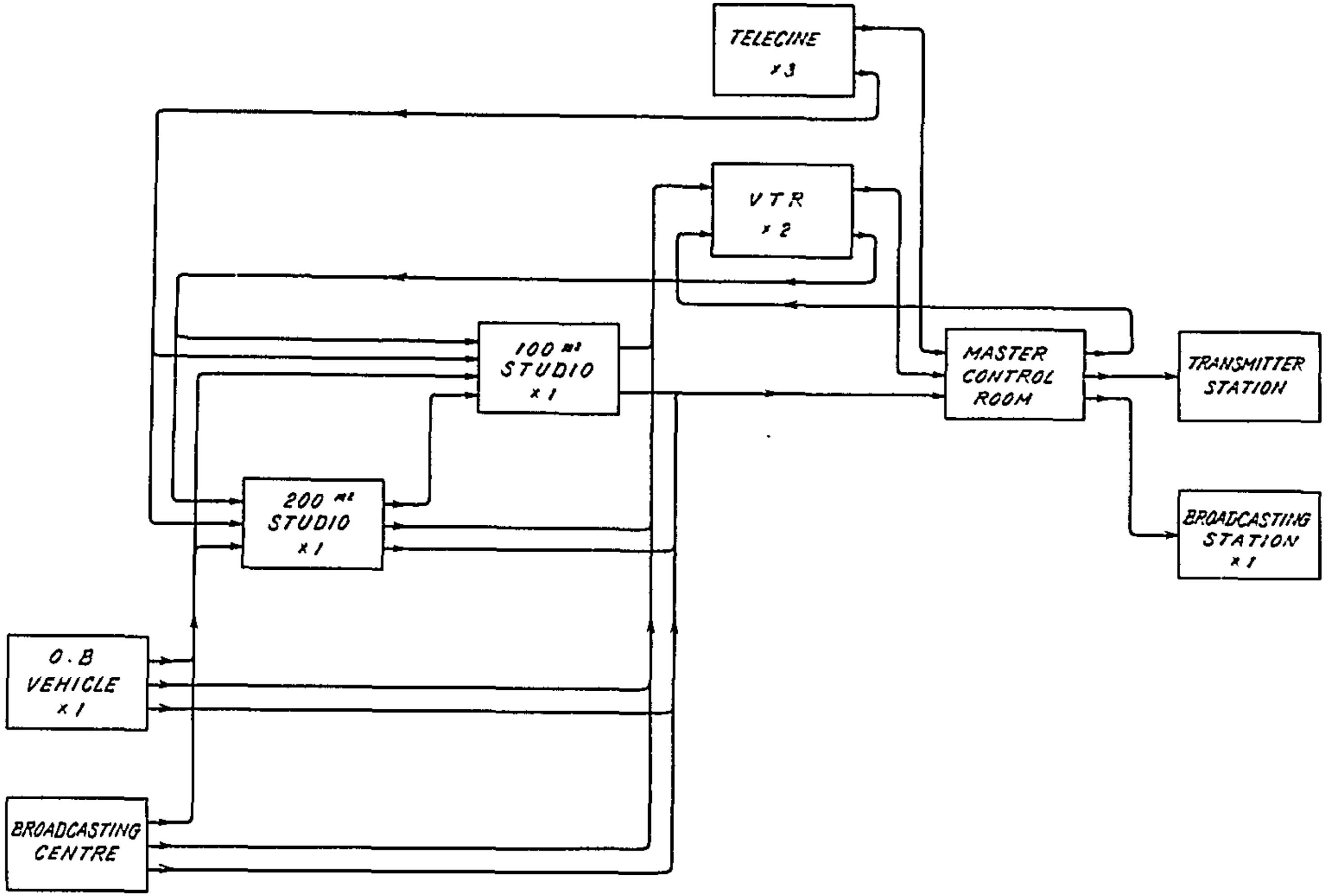


Fig. 3-3 System Block Diagram of Television Broadcasting Station in Kitwe

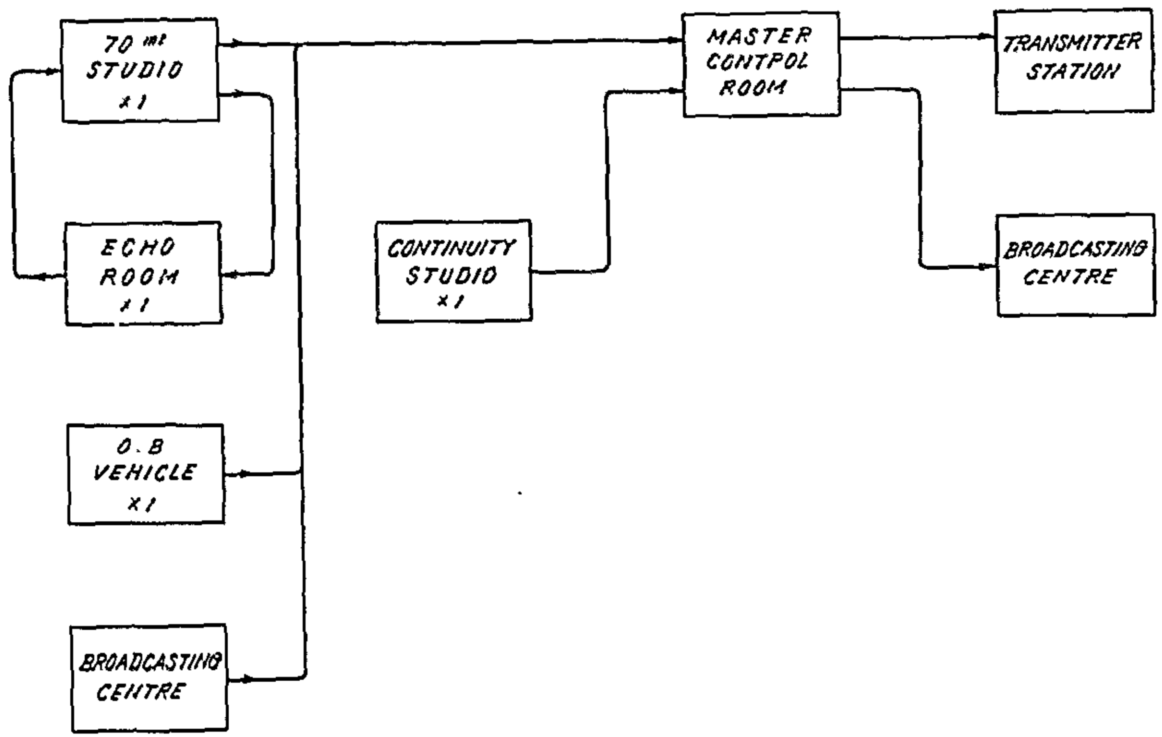


Fig. 3-4 System Block Diagram of Radio Broadcasting Station in Kitwe

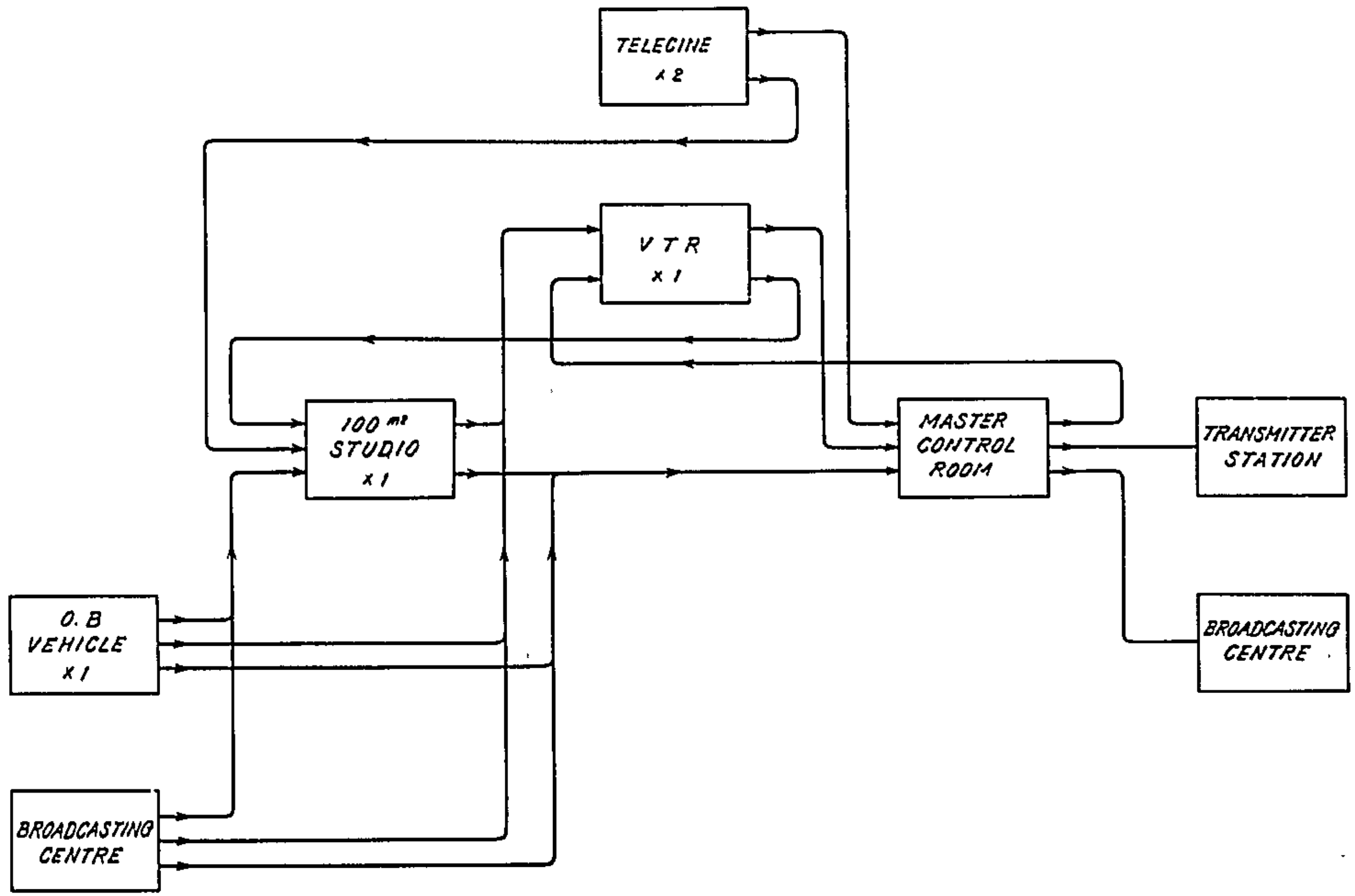


Fig. 3-5 System Block Diagram of Television Broadcasting Station in Livingstone

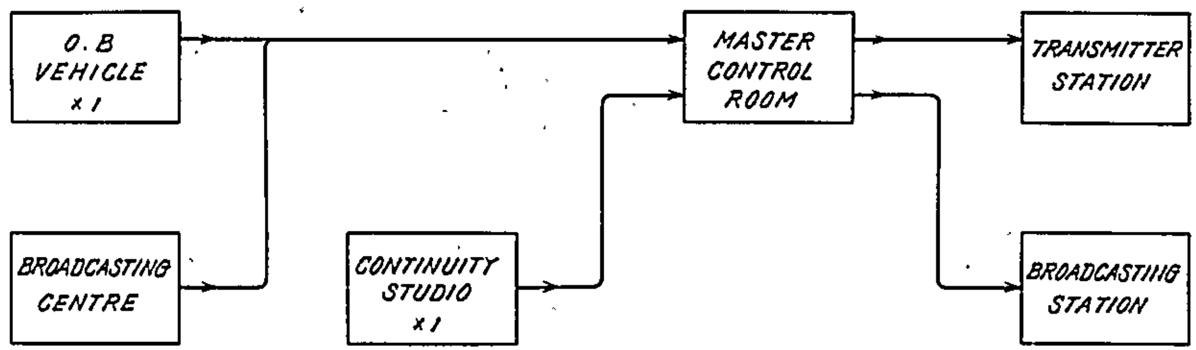


Fig. 3-6 System Block Diagram of Radio Broadcasting Station in Livingstone

1.3 Program Producing System

1.3.1 Studio Program Producing System

The scale of program producing system should be decided essentially in accordance with program planning which is worked out after the policy for basic organization of broadcasting, however, it is very difficult to set up a long-range planning program at present in the Republic of Zambia. Therefore it is deemed reasonable to decide the scale of a program producing system using a modernizing concept according to the program planning made out as a model for future prospects.

For designing this system, it is deemed proper to get a better efficiency of operating and maintaining the facilities in consideration particularly of simplification, standardization and specifialization. In other words, dimentions of the studio will have to be standardized, and at the same time, the size of facilities will be decided according to the sort of studios, the type of equipment, and the type of the units and parts will be decreased accordingly. Also it is desirable to have a specialized studio only for program producing. Simplify the arrangement of facilities by carrying out centralized operation of the studio camera CCU, thereby securing an operational availability and an advance in quality of the programs.

For utilizing the limited studio effectively, it is deemed proper to design the studio to generalized application and at the same time, cope with the use of patterned programs including interview or original programs including drama.

In materializing the program producing system in a modern concept, furthermore, it is proper to carry out the construction work in separate phases so as to obtain the desired results of investment for the construction fund.

1.3.2 Film Program Producing System

In the field of vision, film has superior characteristic never realized using other materials from the viewpoint of operational, mobile and cutting availability. To use these superior characteristic thoroughly in television broadcasting, it is deemed proper to establish a film program producing system firmly using a modern concept.

On the other hand, inasmuch as a coverage of television broadcasting service will not be substantial enough to include all areas in the country even after completion of the modernizing concept, the circuit information service activity by on-the-car projecting arrangements which is now carried out by ZIS (Zambia Information Services) is taken as an important mission in the future, too. In designing the film program producing system, the point described above should fully be taken into consideration.

From a general principle, it is not proper to use the film program for the television broadcasting service jointly with that for the movie service. However, it will be necessary for the time being to have such a function as is available by arranging one film program with film material so that it can be used both for broadcasting and circuit information service, rearranging a television program to a film program for the circuit information service or substituting the foreign film for the mother tongue.

In designing this system, it is desirable to get the system ready for efficient operation in close relation with telecine and VTR rooms.

Further, if possible, it is deemed desirable that the film be standardized to 16 m/m wide for simplification of the system, lowering of the construction cost and for efficient operation.

1.4 Outside Broadcasting System

The remote pickup system comprises an outside broadcasting vehicle for producing programs and an on the air relay system connecting the studio and the outside broadcasting vehicle.

1.4.1 Outside Broadcasting Vehicle

The outside broadcasting vehicle performs the whole function of a studio even though it is small insize. The rate of operation of the outside broadcasting vehicle is low generally, and it is usual that the cost for producing programs becomes remarkably high as compared with normal studio programs. However, the instantaneousness of broadcast by the outside broadcasting vehicle is the biggest feature, never realized on other mass-media, which will be vital for the mission of broadcasting.

In designing the outside broadcasting system, it is therefore necessary to insure that the system work economically but is also provided with a full function for operation and will bring about a high rate of operation with efficiency.

As for the outside broadcasting vehicle, the arrangements are varied to cover a large scale wherein 3 or 4 cars are set in one to the minimum requisite of mounting necessary equipment on a minicar. In the case of the Republic of Zambia, it is deemed optimal to arrange a car whereon a complete set of necessary equipment will be mounted in view of economical need, mobility and operational availability.

System block diagram shown in Fig. 3-7 and 8 are taken as practical examples.

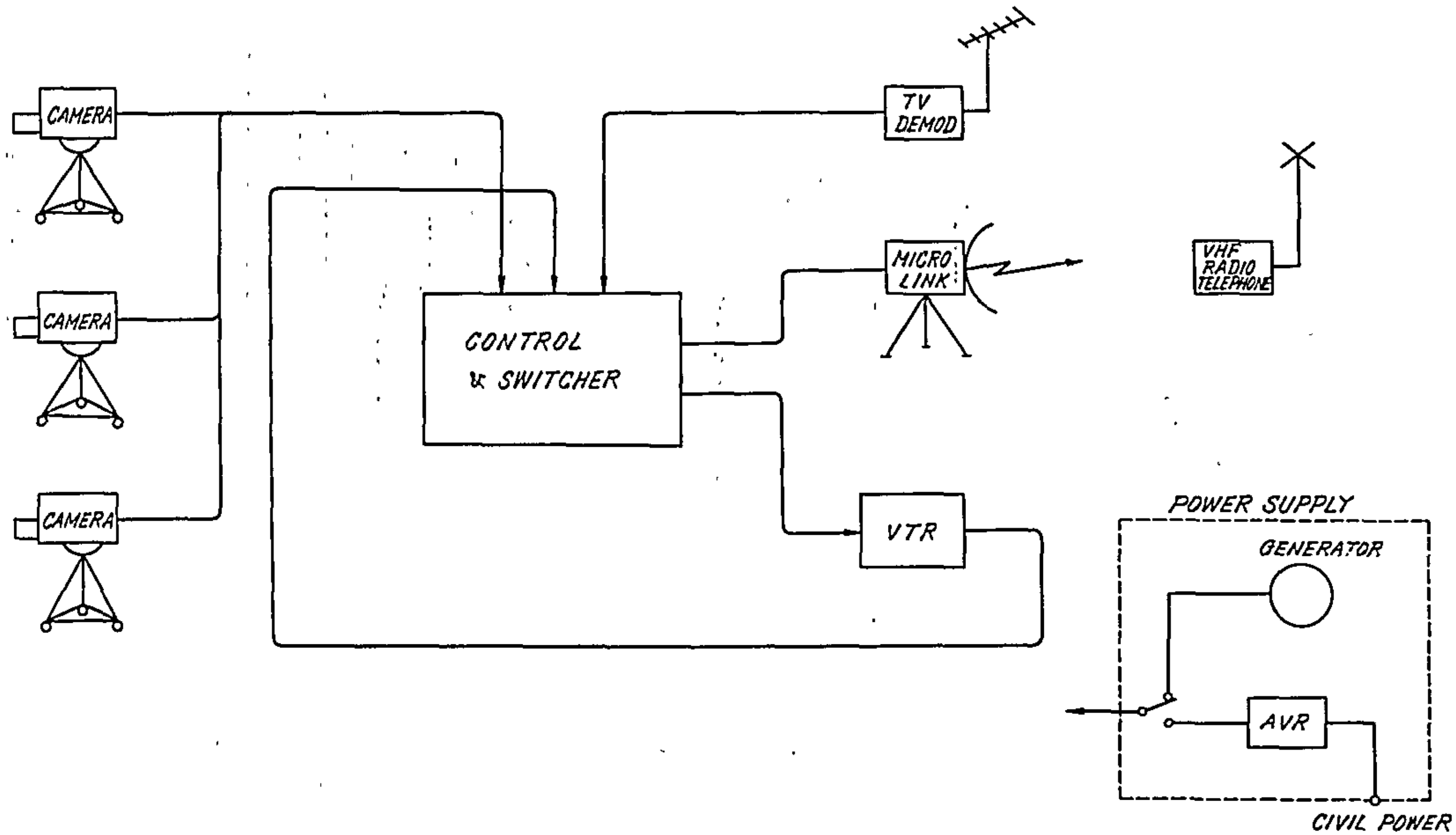


Fig. 3-7 Television Outside Broadcast Vehicle

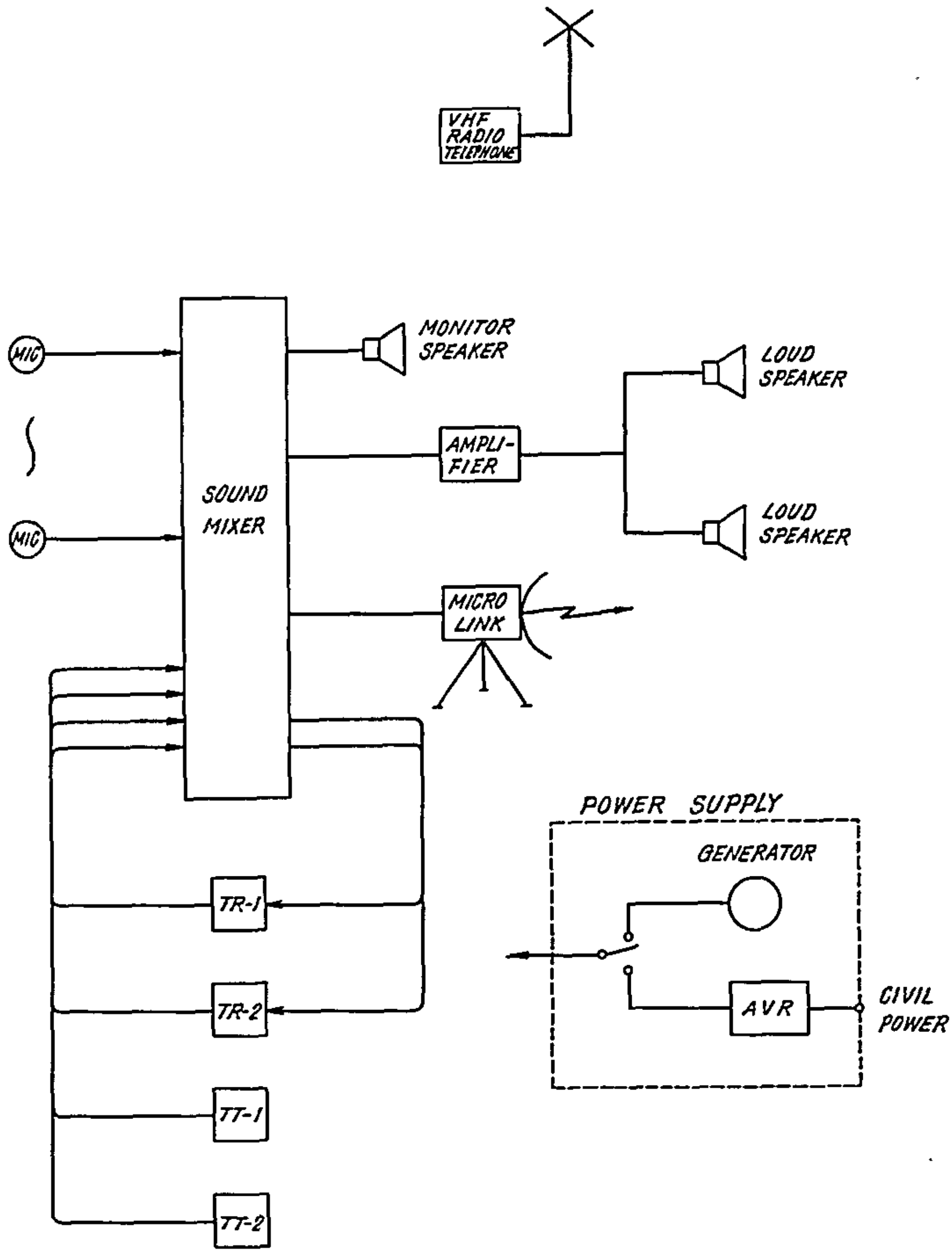


Fig. 3-8 Radio Outside Broadcast Vehicle

1.4.2 Relay System

As the on the air relay system for remote pickup, a final and ideal state will come in availability for connection with any area in the country through microwave circuits of the GPO (General Post Office), however in the modernizing concept for the time being, it is desirable to set up a on the air relay system with studio centers of Kitwe, Livingstone and Lusaka selected as base stations and also to set up an interrupt system to the microwave circuit.

1.5 System of Studios in Local Stations

As centralization of broadcasting functions in Lusaka is desirable for efficient operation of broadcasting, however, the social demand will increase as the broadcasting system develops and there may be intensified requirements for local news and local programs. In addition a feature of simultaneousness of broadcasting will have to be embodied to the fullest extent. In view of the above, it is deemed necessary to construct broadcasting stations at main local cities.

In consideration of the city of Kitwe being historically a center of economy and culture in the Republic of Zambia and thus occupying an important position for educational programming, it will be necessary to renew functional requirements completely in the future. However, it is proper for the time being to strengthen the broadcasting function by arranging an outside broadcasting vehicle and stationary VTR in accordance with the first phase.

Further, Livingstone is an important city for population and locality, and a new broadcasting station will therefore be necessary there.

Also, it is deemed proper that other local studio stations will be planned, in cast it becomes necessary from social requirements in the future.

It is deemed proper that system design of each broadcasting station will be carried out with the same idea in principle as the broadcasting center in Lusaka, and on a smaller scale the same concept will be applicable to the studio.

System block diagrams are shown in Fig. 3-3, 4, 5 and 6.

Chapter 2 Continuity System

It is desirable that the equipment necessary for operating TV, radio and FM broadcasting be centralized by arranging the continuity system at the center of the broadcasting center plus a simple function for programming.

The system comprises the following subsystems.

(1) TV Continuity System

1)	TV master control room	1 room
2)	100 m^2 presentation studio	1 room
3)	Central Equipment Room (for common use on TV, radio and FM)	1 room
4)	Telecine room	1 room
5)	VTR room	1 room
6)	VTR/ telecine control room	1 room

(2) Radio Continuity System

1)	Radio master control room	1 room
2)	Continuity control room	4 rooms
3)	Continuity studio	4 rooms
4)	News studio	4 rooms

2.1 TV Continuity System

2.1.1 TV Master Control Room

The room should be provided with various functions to operate, control and supervise the broadcast including delivery to other studios and transmitting stations.

(1) Continuity

The following input/output signals are necessary for TV broadcasting program operations.

Input signals:	From studio	7 inputs
	From telecine	3 inputs
	From VTR	2 inputs
	From other station	2 inputs
	From O.B. Vehicle	1 input

	From spare	1 input
Output signals:	To other studio	1 output
	To transmitting station	1 output

(2) Control and Supervision

A function is necessary for supervising broadcasting programs of local delivery and controlling and supervising each transmitting station.

It is desirable that the above continuity, control and supervision be carried out according to program operating procedures and engineering facilities operating procedures described hereinafter.

2.1.2 100m^2 Studio

The studio will have to be provided with such functions as are required for making up program's on news, public information and weather forecasts. This is necessary for continuity of the studio and also for making up simple interview programs, thus coping with an emergent broadcasting set up.

It is desirable that the studio work together with the TV master control room to provide a higher degree of freedom for operation.

The main equipment required in the studio is as follows.

Studio camera	2 units
Video control console	1 unit
Audio control console	1 unit
Disk Reproducer	2 units
Audio Tape Recorder/Reproducer	1 unit
Lighting equipment (40 kW; fixed grid)	1 complete set

2.1.3 Central Equipment Room

It is deemed proper that main equipment of the broadcasting center including CCU for the studio cameras is centralized in the Central Equipment Room, thus securing an efficient operation of the arrangements. And it is proper to control the equipment for radio and FM broadcasting which is also centralized in the room in addition to the TV equipment.

Main equipment arranged in the Central Equipment Room is as follows.

Video equipment	1 complete set
Audio equipment	1 "
Synchronizing pulse generator	1 "
Camera control unit	1 "
Master clock	1 "
Radio telephone equipment	1 "
Field pick up unit	1 "
STL (Studio to transmit Link)	1 "
Terminal equipment	1 "
Control supervising equipment	1 "
Inter-area loud speaking telephone	1 "

Here, the following two points should be taken into consideration.

(1) Not only improvement and unification of the picture quality of programs will be secured but also the system will be simplified, by centralized operation of the camera CCU.

(2) A structure for color broadcasting will be established by arranging a synchronizing pulse generator of PAL 625 Lines.

2.1.4 Telecine Room

The telecine room is operated in conjunction with the telecine/ VTR control room. It is deemed proper to design the system in consideration of the telecine room being closely related not only with the operation of news and commercial programs other than general film programs but also with programming like film inserts.

Main equipment necessary for the telecine room is as follows.

(1) Film reproducer (5 systems)

16 m/m film projector x 2 35 m/m slide projector x 1	(monochrome)	2 systems
16 m/m film projector x 1	(color)	1 system
35 m/m film projector x 1 8 m/m " x 1 35 m/m slide projector x 1	(color)	2 systems

(2) Opaque reproducer (2 systems)

Caption scanner (monochrome) 1 system

" (color) 1 system

(3) Film Recorder Reproducer (3 systems)

16 m/m film recorder reproducer 2 systems

35 m/m " 1 system

The following equipment from them is set for the first phase plan.

(1) Film reproducer (3 systems)

16 m/m film projector x 2 35 m/m slide projector x 1	(monochrome)	2 systems
16 m/m film projector x 1	(color)	1 system

(2) Opaque reproducer (monochrome) 1 system

(3) Clock reproducer (monochrome) 1 system

(4) Film recorder reproducer (16 m/m) 2 systems

In the first phase plan, it is deemed proper to use one film reproducer system on color broadcasting for the following reasons.

(1) Inasmuch as the film program covering broadcasting programs comes to about 50%, a contribution ratio of TV broadcast to color broadcasting is large.

(2) An increase in expense necessary for one system of the film reproducer (color) comes less than 1% of the fund necessary for the first term plan.

(3) An expenditure of the people made for changing monochrome TV receivers to color TV receivers in the future can be minimized by establishment of color broadcasting in the first phase.

Since 16 m/m film provides optimal performance, 16 m/m film is prevailing for use on TV broadcasting, and 35 m/m and 8 m/m film are scarcely used normally excluding special cases. Namely, 35 m/m and 8 m/m film offer nothing optimal to the broadcasting function in type but also they are not advantageous from the viewpoints of construction funding, operation, and maintenance of the equipment. Such being the case, it is desirable to standardize on 16 m/m film. However, the situation is such that in the Republic of Zambia, the film cannot be reprinted from 35 m/m to 16 m/m, as a matter of fact, as in the case of other countries, therefore an arrangement of 35 m/m and 8 m/m projectors has been planned for the second phase plan.

2.1.5 VTR Room

The VTR room is integrated with the telecine/VTR control room for operation. Where an efficient operation of the studio is taken into consideration, it is profitable that the studio program is recorded and reproduced with VTR. Therefore, the number of VTR will be decided by the size of the program producing system.

It is reasonable that main equipment will be arranged as follows.

VTR (VR1200C type)	6 units
Cassette VTR	2 units

One monochrome and one colour VTR are arranged for the first phase plan. The cassette VTR will be unified, where possible in funding to the same type for standardization.

2.1.6 Telecine/VTR Control Room

Room work requirements for operation and supervision of the telecine and VTR. The major part of TV broadcasting programs will have been recorded on film and magnetic video tape, therefore it is necessary to provide the room with such a function as is available for operating in conjunction with the TV master control room for operation of broadcasting programs.

The program producing system will have to be provided also with a function to carry out reproduction and delivery of the film and VTR inserts and recording of programs newly made up.

Further it is desirable that the room is capable of working as an audition room or carrying out reproduction and delivery to the magnetic video tape/film converter.

A matrix for distributing the outputs of each equipment (telecine and VTR) to necessary places, another matrix for distributing inputs incoming for recording to a selected recording VTR, and a controller of these matrix will be necessary for main equipment of the room.

2.2 Radio Continuity System

2.2.1 Radio Master Control Room

It is necessary that the room is capable of operating synthetically the broadcasting programs including delivery to the transmitting station and other stations in conjunction with continuity control rooms used exclusively for general service, home service, external service FM broadcasting.

The following equipments will be necessary.

(1)	Continuity control room preselect matrix	1	complete set
(2)	Output distributing matrix	1	"
(3)	Input distributing matrix	1	"

2.2.2 Continuity Control Room

Four rooms will have to be arranged for operation of general service, home service, external service, and FM service. It is desirable that the continuity control room is integrated with the master control room for operation of each system.

The following input signals are necessary for the continuity control room.

Input signals: From continuity studio 4 inputs

From new studio	2 inputs
From external	2 inputs
From disk reproducer	1 input
From audio recorder and reproducer	2 inputs
From cartridge tape player	2 inputs

Output signals:

To master control room	1 output
To audio recorder and reproducer	2 outputs

Two external inputs given above will have been sent to the continuity control room. The master control room properly selected them out of inputs of each studio, each continuity control room, other studio station, remote and radio pickup.

2.2.3 Continuity Studio

The studio is intended for operating broadcasting programs in conjunction with the continuity control room and it is desirable to have disk reproducers and the audio control console arranged therein for carrying out wide program or disk jockey programs.

The following input/output signals will be necessary.

Input signals:	From Microphone input	2 inputs
	From disk reproducer	2 inputs
Output signal:	To continuity control room	1 output

2.2.4 News Studio

It is deemed proper that the studio will be designed suitably and serviceably for giving news in several native languages or giving spot news and programs in a wide program and is also capable of operating in conjunction with the continuity control rooms and continuity studio.

It is also deemed proper that the system will be standardized by unifying the tape speed of the audio tape recorder and reproducer at 19 cm/sec. and 9.5 cm/sec. The tape speed at 9.5 cm/sec. has not been specified in CCIR Standard, however, it does not offer a problem on practice, and standardization of these tape speeds is available for lowering the construction cost, saving expenses for operation and securing better efficiency of operation. Therefore, tapes of other speeds must be re-recorded and the tape speed standardized at 19 cm/sec. or 9.5 cm/sec. at the dubbing room. In case a program is presented to countrys which standardize the tape speed at 38 cm/sec. and 19 cm/sec., the program will have to be recorded at speeds 38 cm/sec. and 19 cm/sec. respectively.

Further it is also desirable that the rotational speed of the disk reproducer be specified as 33 rpm and 45 rpm, and that 78 rpm recordings of poor tone quality will not be being used, where possible.

Chapter 3 Program Producing System

It is deemed proper that the program producing system have TV and radio program producing systems arranged on both sides of the operational system to insure better efficiency.

In designing the system, it is necessary to decide the size of the studio and the number and contents of the equipment in consideration of the general purpose of utilizing effectively studios which are limited in number and having an exclusiveness of use classified by producing type for easy use according to the sort of programs.

It is deemed proper that the system comprises the following group of subsystems.

(1)	TV Program Producing System	
	200 m^2 studio	4 rooms
	400 m^2 studio	2 rooms
(2)	Radio Program Producing System	
	30 m^2 studio	8 rooms
	70 m^2 studio	2 rooms
	140 m^2 studio	2 rooms
	Dubbing room	1 room
	Echo room	2 rooms
	Listening room	6 rooms
(3)	Film Program Producing System	
	Film studio	1 room
	Dubbing studio	1 room
	Developing/printing equipment	1 complete set
	Preview equipment	1 complete set
	Tape to film converting equipment	1 complete set
	Animation equipment	1 complete set

Then in the first phase plan, it is deemed proper to construct the following system in consideration of the program plan, personnel plan and financial plan.

(1)	TV Program Producing System	
	$200m^2$ studio	1 room
	$200m^2$ studio (O.B. vehicle drive)	1 room
(2)	Radio Program Producing System	
	$30m^2$ studio	3 rooms
	$30m^2$ studio (added with film recorder function)	1 room
	$70m^2$ studio	1 room
	$140m^2$ studio	1 room
	Dubbing room	1 room
	Echo room	1 room
	Listening room	6 rooms
(3)	Film Programming System	
	Developing/printing equipment (monochrome 16 m/m)	1 complete set
	Preview equipment (16 m/m)	1 complete set

3.1 TV Program Producing System

It is deemed proper to design the system for economical and easy operation in consideration of the state of affairs in the Republic of Zambia and the way of thinking for producing programs.

3.1.1 $200m^2$ Studio

It is deemed proper to construct the studio working in the main stream for lowering construction cost and operation expenses and securing better efficiency of operation. The studio should be used for producing the major part of broadcasting programs including educational and cultural programs.

Necessary main equipment is as follows.

Studio camera (monochrome)	3 units
Video control console	1 unit
Audio control console	1 unit
Switching console	1 unit
Disk reproducer	2 units

Audio tape recorder and reproducer	2 units
Lighting equipment (80 kVA)	1 complete set
Suspension device (manual batten type)	1 complete set
Illuminating fixture	1 complete set
Horizontal screen	1 complete set
Caption roller	1 unit

In the first phase plan it is deemed proper to construct one studio room equipped with all of the arrangements and another studio room equipped with lighting equipment only, whereby programs are produced the O.B. vehicle thus lowering the construction cost without deteriorating the program producing capacity.

It is desirable that the studio subcontrol room is arranged as a mezzanine type for easy view of the studio floor and easy vertical movement. The bulkheads in the studio subcontrol room will be removed with the director and other staff personnel coming to a mutual understanding, thus providing an efficient operation by the staff including players in full cooperation.

A simple lowering of the cost for equipment is capable not only of deteriorating product quality but also of spoiling the stability, which makes it easy to incur disadvantages in operation. Therefore, it is deemed proper to curtail expenses at the following points.

(1) The wider the studio is made, the larger all-purpose availability and convenience are obtainable, however, it may incur an increase in construction cost and operation expenses for the power supply and air-conditioner in addition to that for the building and studio facilities, therefore the space of $200m^2$ will be proper. The area is available for using 3 studio cameras thereon and also good for general purpose and operational need.

(2) The lighting equipment will be arranged to have the trunk part designed at a capacity of 80kVA to cope with color broadcasting; units for the light controlling device will be increased when it is ready for color broadcasting.

(3) For a suspension device, that of batten type in a manual system for which the construction cost is low and expenses for operation including maintenance are not required will be employed. The studio is applied to producing patterned programs which will give no serious problems on operation.

(4) A horizontal screen will be used instead of a cyclorama or fixed horizontal. Its use is effective in decreasing the construction cost and increasing in effective area of the studio.

(5) Bulkheads at each department of the studio subcontrol room will be removed, and monitors, change-over mechanism and communication equipment required will be simplified, thus lowering the construction cost.

It is deemed proper that the construction cost will be curtailed in coping with the personnel plan without deteriorating the programming ability by arranging the studio to a reasonable area, employing O.B. vehicle drive systems and adjusting the arrangements reasonably. Thus an improvement of the overall function of mass media will be expected as a result.

In the meantime, it is deemed proper that the following points will be taken into consideration and also a necessary fund for construction will be invested for securing the availability of operation which is vital for the studio function apart from the matter of saving expenses.

(1) To operate CCU of the studio camera in the central equipment room and limit the studio subcontrol room to working only for program producing, thus simplifying the system and securing a better efficiency of operation.

(2) To install a telecine/VTR control room, thereby improving the availability of operation by keeping the system from being complicated for program recorder and film or VTR insert.

(3) To arrange the horizontal screen high enough to prevent abandonment because of TV camera picture taking requirements.

3.1.2 $400m^2$ Studio

It is deemed proper that two $400m^2$ studios will be constructed in the second phase plan for producing drama on a grand scale, in addition to musical and public broadcasting.

It is proper to arrange the following equipment for one studio.

Studio camera	4 units
Video control console	1 unit
Audio control console	1 unit
Switching console	1 unit
Disk reproducer	3 units
Audio tape recorder and reproducer	2 units
Lighting equipment (100kVA)	1 complete set
Suspension device (motor-driven battem type)	1 complete set
Illuminating fixture	1 complete set
Fixed horizontal	1 complete set
Caption roller	1 unit

Inasmuch as drama and musical require delicate illumination, it is that the suspension device be arranged as a batten type of motor-driven system, and the light controlling device be provided with a full function, thereby improving the program producing function.

It will be preferable to employ fixed type for the horizontal despite the space factor becoming deteriorated more or less so as to bring about an effect on free and delicate program production.

3.2 Radio ProgramProducing System

3.2.1 $30m^2$ Studio

It is deemed proper that the studio be designed to cope with producing patternized information, educational and cultural programs.

Main equipment necessary for one studio will be as follows.

Audio control console	1 unit
Disk reproducer	2 units

Audio tape recorder and reproducer	2 units

It is deemed proper that the studio will be constructed in 4 rooms in the first phase plan and also 4 at the second.

It will be preferable that one room out of the four in the first phase be provided with a 16 m/m magnetic film recording function as a provisional measure until a film dubbing room is constructed in the second phase plan.

3.2.2 70m^2 Studio

The studio comes intermediate between 30m^2 and 140m^2 and will have to be designed to have a wide all-purpose application.

Main equipment for one studio are as follows.

Audio control console	1 unit
Disk reproducer	2 units
Audio tape recorder and reproducer	2 units
Cassette tape reproducer	1 units
Announce booth (19m^2)	1 room

It is proper that the studio will be constructed in one room in the first phase plan and also one in the second.

3.2.3 140m^2 Studio

It is deemed proper that the studio be designed for producing programs on a grand scale like drama, music and musicals.

Main equipment necessary for one studio are as follows:

Audio control console	1 unit
Disk reproducer	2 units
Audio tape recorder and reproducer	3 units
Cassette tape reproducer	1 units
Announce booth (23m^2)	1 room

It will be proper that the studio will be constructed in one room in the first phase plan and also one in the second and provided with a announce booth for use on narration as in the case of the 70m^2 studio and also with a warehouse for musical instruments, thus coping with a wide all purpose application.

3.2.4 Dubbing Room

The magnetic tape recording system in the studio has been standardized as a full track system with a tape speed at 19 cm/sec. and 9.5 cm/sec., therefore it is deemed proper that the dubbing room be provided with a function whereby the tape recorded on non-standard recording system will be re-recorded to that of the standard system. Recordings can also be made for a non-standard system.

Main equipment which will be necessary in the first phase plan is as follows.

(1)	Audio tape recorder and reproducer	
	Full track (38/19)	1 unit
	Full track (19/9.5)	2 units
	Half track (19/9.5/4.75)	1 unit
	Disk player	2 units
	Cassette tape recorder and reproducer	2 units
(2)	Eraser	2 units
(3)	Editing device	2 units

Where much dubbing is necessary, a high-speed dubbing machine will be provided for the second phase plan.

3.2.5 Echo Room

The echo room provides an echo of good tone quality in conjunction with the echo machine in the audio control console in each studio subcontrol room. The echo room will be finalized in two rooms, however, it is deemed proper to be in one room in the first phase plan for the time being.

3.2.6 Listening Room

It is proper that the listening room be provided with one disk reproducer and are tape reproducer for selecting or editing materials necessary for the program producing period.

3.3 Film Program Producing System

3.3.1 Film Studio

It is deemed proper that one film studio be arranged for producing film programs in the second phase plan.

The following equipment will be proper for the film studio.

Lighting equipment	1 complete set
Suspension device	1 complete set
Illumination fixture	1 complete set
Pickup equipment	1 complete set
Audio control console	1 unit
Film recorder (magnetic and optical)	1 complete set
Film projector	1 complete set

Where a studio is necessary for producing film programs before the second phase plan, it is desirable to utilize the studio for O.B. vehicle drive which is out of production thus coping with operational requirements.

3.3.2 Dubbing Studio

It is deemed proper to arrange as a provisional measure in the first phase plan that the $30m^2$ studio be set up to function for magnetic film recording in a joint use with the radio studio.

A full-scale arrangement of the dubbing studio will be carried out in the second phase plan, and it is desirable to utilize main equipment as follows.

Film recorder (magnetic and optical)	1 complete set
Film projector	1 complete set
Audio control console	1 unit
Disk reproducer	2 units
Audio tape recorder and reproducer	2 units

3.3.3 Development/Printing Equipment

It is that arrangement available for color broadcasting in the future form the main stream prospects, however, monochrome (16 m/m) will be preferable for the time being in consideration of economical operation.

The following equipment will be utilized for the system.

(1) First phase plan (monochrome 16 m/m)

Negative/positive developing machine	1 unit
Printing device	1 unit
Ancillary equipment	1 complete set

(2) Second phase plan (color)

Color reversal developing machine	1 unit
Color negative developing machine	1 unit
Color positive developing machine	1 unit
Printing device (automatic)	1 unit
Ancillary equipment	1 complete set

3.3.4 Preview Equipment

As a previewing system for TV programs, it will be optimal to preview through the TV video monitor, however, it is deemed proper that a preview theater be provided with a film preview function for the general public information service. It will be constructed in the first phase plan. Video signals to the TV video monitor will be given from the telecine/VTR control room, thereby lowering the cost of the system and securing better efficiency of operation.

3.3.5 Tape to Film Conversion Equipment

For dubbing TV program on film for general public information. It is deemed proper that high quality converting equipment be provided in the second phase plan and it is desirable that the TV video signal be sent from the telecine/VTR control room, there by lowering the cost of the system and securing better efficiency of operation.

3.3.6 Animation Equipment

It is desirable that animation equipment be provided in the second phase plan for the function of producing film programs.

Chapter 4 Outside Broadcasting System

4.1 Outside TV Broadcasting Vehicle

The TV O.B. Vehicle car needs to have such functions as are available for producing programs remotely, as well as broadcasting from a studio and at the same time, recording programs at these sites.

The following will be proper as main equipment for the TV outside broadcasting vehicle.

TV camera	3 units
Video control console	1 unit
Audio control console	1 unit
Switching console	1 unit
Video equipment	1 complete set
Audio equipment	1 complete set
Synchronizing pulse generator	1 complete set
Monitor equipment	1 complete set
VTR	1 unit
Audio tape recorder and reproducer	1 unit
Field pick up unit	2 pair
Radio telephone equipment	1 complete set
Generator	1 complete set

A preferable system block diagram is as given in Fig. 3-7.

It is deemed proper that one pair of FPU shall be arranged on the vehicle and one pair shall be provided for a multi-air-relay system in the first phase plan.

In the first phase plan, it is deemed proper to arrange the TV outside broadcasting vehicle for color to Lusaka and monochrome to to Kitwe will be used exclusively for monochrome because of the short practical life due to severe producing conditions and will be equipped with one pair of microwave link equipment.

As a link on the air relay system, it is deemed proper that an iron tower be built at the broadcasting center to a base station working for the FPU, radio telephone and radio relay between the transmitting station and GPO.

4.2 Outside Radio Broadcasting Vehicle

An outside radio broadcasting vehicle workable like a satellite studio will be preferable. However, the two outside radio broadcasting vehicles working at present will be used for the time being, and will be expanded in the second phase plan.

The following will be proper as main equipment for the outside radio broadcasting vehicle.

Audio control console	1 unit
Audio equipment	1 complete set
Monitor equipment	1 complete set
Disk reproducer	1 unit
Audio tape recorder and reproducer	2 units
Radio telephone equipment	1 unit
Loudspeaker	1 complete set

A preferable system block diagram is as given in Fig. 3-8.

Chapter 5 Studio System in Local Station

It is deemed proper that studio systems in Kitwe and Livingstone under a modernizing concept will be planned with the same idea in principle as the Lusaka Broadcasting Center. Preferable system diagrams are as shown in Fig. 3-3, 4, 5 and 6.

Also, it is deemed proper that other local station shall be pleasured, in case it becomes necessary from social requirements in the future.

5.1 Kitwe Studio

The following are desirable as main equipment for each system.

5.1.1 Continuity System

(1) TV Continuity System

TV master control room	1 room
Central Apparatus room (used jointly with radio)	1 room
Telecine/VTR room	
Film reproducer	2 systems
{ 16m/m film projector x 2; 35m/m slide projector x 1 }	
Opaque reproducer	1 system
VTR	2 units
$100m^2$ studio (camera 2 units)	1 room

(2) Radio Continuity System

Radio master control room	1 room
News studio	1 room

It is deemed proper that the VTR will be arranged in one unit for improvement of function to produce and provide continuity of the broadcasting program in the first phase plan, and an overall arrangement will be carried out in the second phase plan.

5.1.2 Program Producing System

(1) TV Program Producing System

$200m^2$ studio (color camera 2 units)	1 room
Outside broadcasting vehicle	1 car

(2) Radio Program Producing System

$70m^2$ studio	1 room
Listening room	2 rooms
Outside broadcasting vehicle	1 cars

(3) Film Program Producing System

Color reversal developing machine	1 unit
Ancillary equipment	1 complete set

It is deemed proper that one monochrome outside TV broadcasting vehicle will be prepared for providing educational and cultural programs in the first phase plan, and an overall arrangement will be carried out in the second phase plan.

5.2 Livingstone Studio

The studio will be arranged in the third phase plan in accordance with the modernizing concept, and preferable main equipment will be as follows.

5.2.1 Continuity System

(1) TV Continuity System

TV master control room	1 room
Central Apparatus room (used jointly with radio)	1 room
Telecine/VTR room	1 room
Film reproducer (color)	1 system
16m/m film projector x 2	
35 m/m slide projector x 1	
Opaque reproducer (color)	1 system
VTR (color)	1 unit

$100m^2$ studio (color camera 2 units)	1 room
(2) Radio Continuity System	
Radio master control room	1 room
News studio	1 room

5.2.2 Program Producing System

(1) TV Program Producing System	
Outside broadcasting vehicle	1 car
(2) Radio Program Producing System	
Outside broadcasting vehicle	1 car
(3) Film Program Producing System	
Color reversal developing machine	1 unit
Ancillary equipment	1 complete set

A production studio is not taken into consideration for both TV and radio under the present stage, however, in case it becomes necessary from social requirements in the future, an arrangement of $200m^2$ TV studio and $70m^2$ radio studio will be preferable.

PART IV BUILDINGS AND STEEL TOWERS

PART IV
BUILDINGS AND STEEL TOWERS

Chapter 1 Overall Plan

The following construction plan is significantly suggested through the examination of buildings and towers based on the long-term (for between 15 and 20 years) massmedia modernization plan which has been discussed in PART I.

1.1 Massmedia Complex

In the 1st and the 2nd phase plan, a massmedia complex will be constructed in Lusaka in order to unite and consolidate the allied departments of the Ministry of Information, Broadcasting and Tourism which have been dispersed here and there in the metropolis.

1.2 Consolidation of Local Stations

In the 2nd phase plan, Kitwe broadcasting station will be reconstructed and improved, and in the 3rd phase plan a new broadcasting station will be established at Livingstone.

1.3 Nation-wide Broadcasting Network

In the 1st phase plan, large-power television transmitting stations will be constructed at seven places - Kasompe, Nakupata Hill, Kabwe, Lusaka, Pemba, Tara and Senkobo. In the 2nd phase plan, their complementary stations and several large-power local television transmitting stations will be constructed.

In the 3rd phase plan, moreover, the requisite allied facilities will be set up to meet the reorganization and amplification plan of the nation-wide broadcasting network system (television, radio and F.M.) in the Republic of Zambia.

Chapter 2 1st Phase Plan

2.1 Studio Center

Of the massmedia complex construction plan, those coming under the category of the 1st phase plan, mainly comprising Zambia Broadcasting Service Facilities, are called "Studio Center."

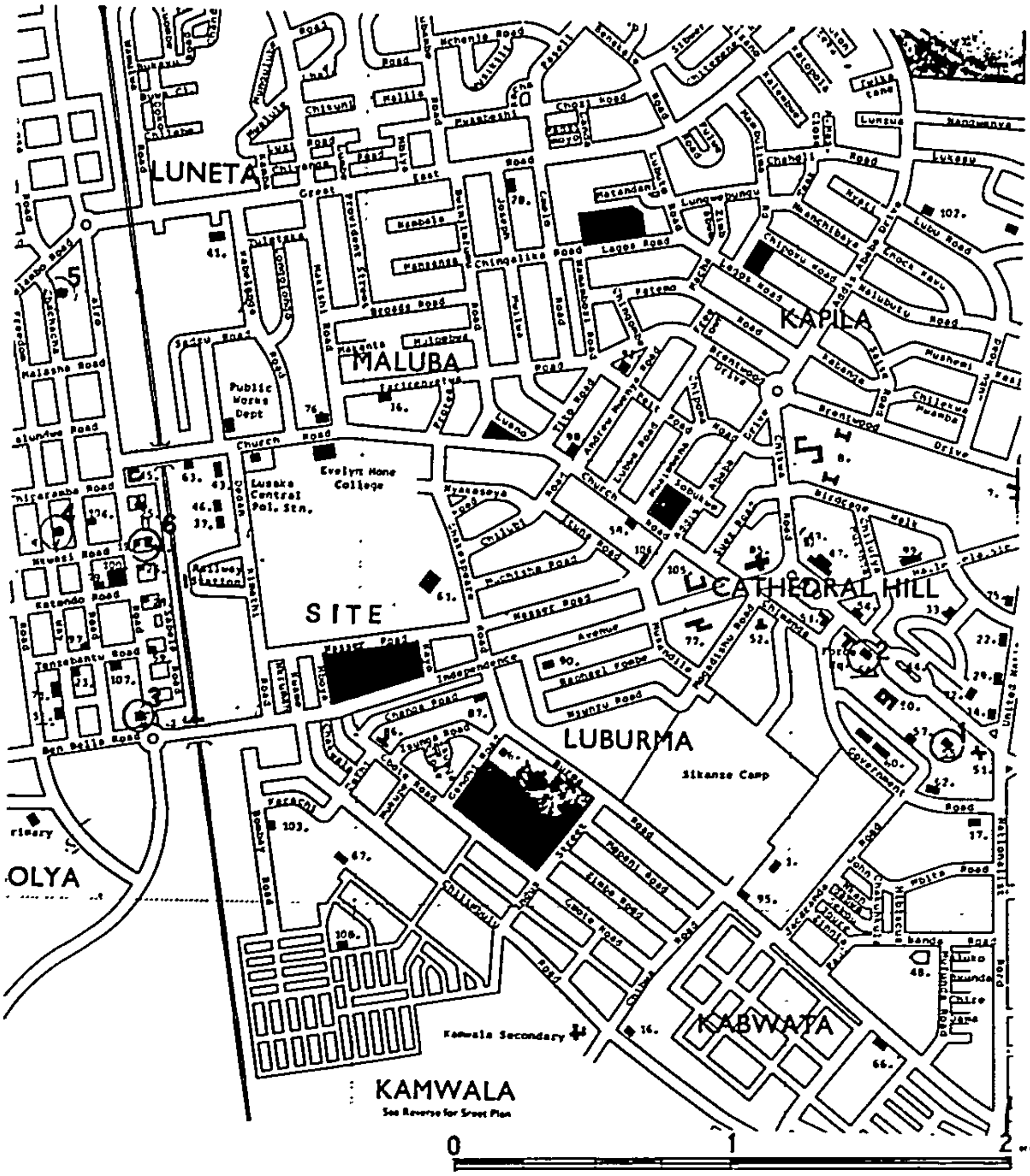
2.1.1 Site

The site selected for the construction of the massmedia complex is near the center of Lusaka. It provides a good place for both commuters and visitors as well as for the associated external organs because it is near a railway station and a bus stop on the south. The location is favourable as a construction site of the Ministry of Information, Broadcasting and Tourism and also for the business operations of the departments to be accommodated in it. The site is surrounded by roads, of which the southern one runs parallel to the Independence Avenue with a green zone in between and so the site has no direct access to the Avenue. Although the Lusaka city authorities have not yet commented on the future plan for the Avenue, it is recommended that a shortcut be provided to the Avenue across the green zone or at least to extend the southern road westward up to a road which intersects the Avenue. Meanwhile the eastern part of the site should be reserved as a residential zone for the Ministry's officials and workers with a road laid off in between the residential zone and the complex site.

(See the attached Drawing Fig. 4-1, "Studio Center-Site Location Plan")

2.1.2 Layout of Buildings

The layout of the studio center should not impair the overall building layout of the massmedia complex. It is roughly concluded that the building blocks constituting the massmedia complex should be installed on the center line running east to west from the viewpoint of the shape of the site.



NOTE: EXISTING LOCATION

1 M.I.B.T.
2 Z.B.S.
3 Z.I.S. GRAPHIC ARTS
4 Z.I.S. MAINTENANCE SECTION
5 Z.A.N.A.
6 Z.N.T.B.

Fig. 4-1 Studio Center
Site Location Plan

To be more precise, a multi-storied office building will be installed at the center of the site in order to accommodate the Ministry's headquarters, Zambia National Tourist Board and administration and public relations departments of Zambia Information Services, and the facilities for Zambia Broadcasting Services will be located on the west, with the studio block outer side and ZBS office block inside, for increased efficiency of operations.

On the east of the multi-storied office building will be the facilities associated with ZIS production services. On the occasion of studies of the buildings layout plan as above, the following were duly taken into account.

(1) to minimize the lines of traffic motion inside each block and between blocks,

(2) to centralize at the center of the site libraries, conference rooms and functionally analogous facilities which are considered to be centralized for common use,

(3) to provide allowance for the future expansion of buildings westward or eastward,

(4) to install an intra-site passage running south to north for everyone to get easy access to his desired blocks at the center of the massmedia complex,

(5) to make it possible to gain easy access to each block from outside for carrying in materials and supplies,

(6) to reserve as large a parking space as possible and channel the site with passages,

(7) to arrange plants around the buildings and along the boundaries of the site in sympathy with the complex buildings.

(See the attached Drawing Fig. 4-2 "Massmedia Complex - Block Plan.")

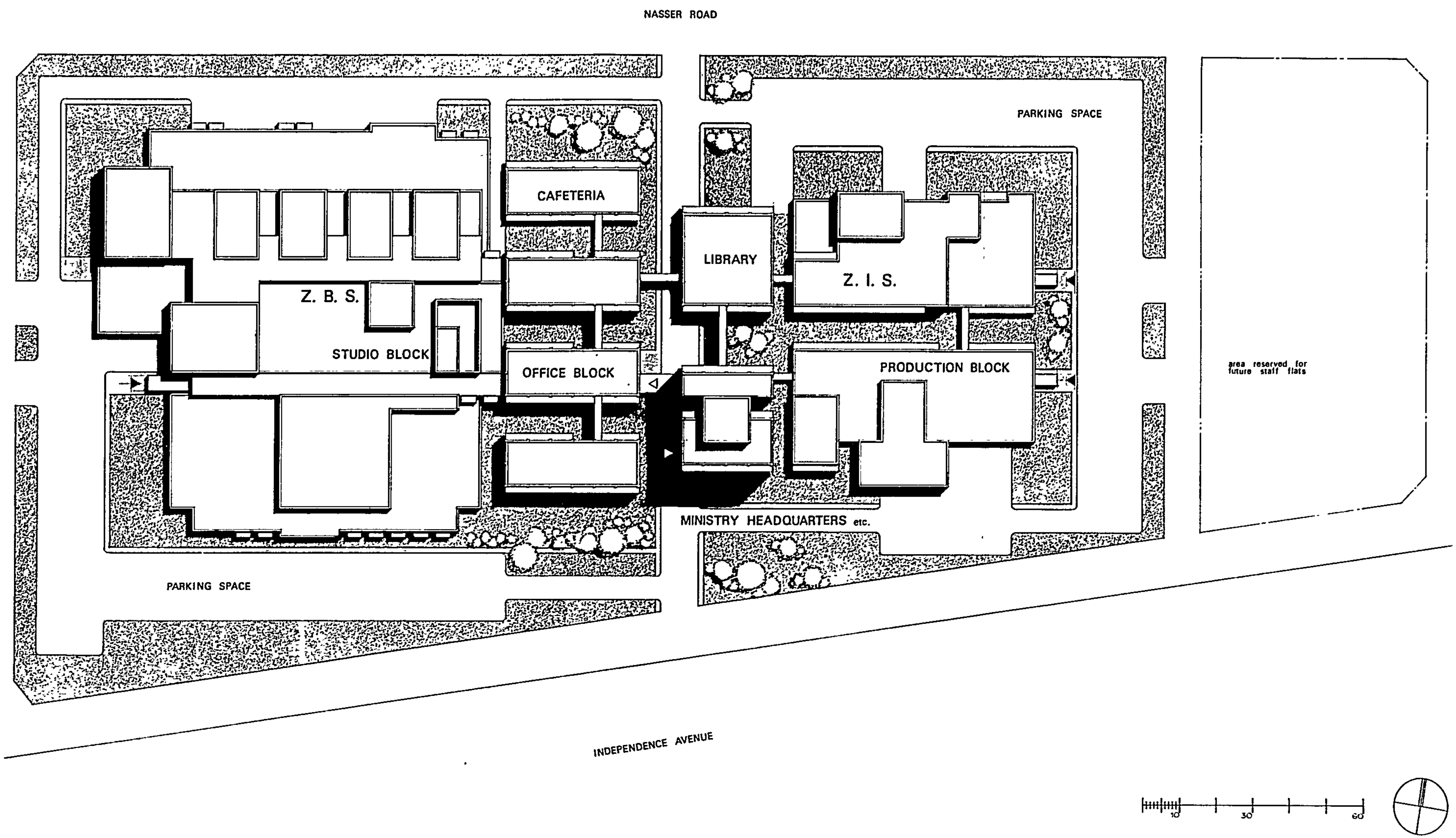


Fig. 4-2 Massmedia Complex
Block Plan

2.1.3 Planning

In the studio center which is intended for the 1st phase plan, ZBS facilities will mostly be installed. Besides, it is recommended that installation of the facilities for producing broadcasting programs be made, especially those for ZANA having close concern with news programmes and also those for a film processing laboratory for film programmes.

Namely, roughly speaking, the studio center will be composed of a studio block, an office block, a library and a film processing laboratory.
(See the attached Drawings Fig. 4-3 - Fig. 4-5, "Studio Center - Ground Floor Plan, 1ST Floor Plan and 2ND Floor Plan.")

(1) Studio Block

The basic idea will be to place continuity and presentation functions at the center and programme production facilities around them, in order to set up an organic linkage between them.

The central part will be a two-story building in which the ground floor will be allocated for make-up rooms for performers, rehearsal rooms, production offices, and building equipment room, etc., with television presentation studio, radio continuity and news studios, master control rooms, VTR room, telecine room and rack room, etc. on the 1st floor. In this way, the continuity and presentation functions for television and radio broadcasting are integrated on the 1st floor for the purpose of promoting efficient operation with minimum personnel. Here simple programme production functions will be maintained, in order to make it possible to undertake the minimum necessary broadcasting tasks. Since this section of the 1st floor is linkened to man's heart, some defence measures against possible emergency are considered necessary. As regards the VTR room, telecine room, etc., the space for their future expansion should be procured. On the north of the central part, television studios and related rooms will be arranged ahead of a lobby.

Two studios, each with 200 m^2 or so, and attached stores will be centered, with scenery and property stores, carpenters' shop and paint shop around. Also there will be installed a garage for outside broadcast vehicles and a maintenance room, etc.

The subcontrol room, viewing room and others for the television studios will be installed on the 1st floor. The subcontrol room will not be partitioned in order that the directors and other staff members may engage in production work as a closely tied team. The television studios will have the ceiling height of three stories as it requires an extraordinarily high ceiling. The studios will be used for the production of television programme including music performance, shows and dramas. On the south of the central part, a group of radio studios will be located ahead of a lobby; namely, six studios - one 140 m^2, one 70 m^2 and four 30 m^2 - and their attached rooms, echo room, rehearsal rooms, etc. will be located. The 140 m^2 studio will be used for music performance, and dramas, etc., the 70 m^2 studio for chamber music, dramas, discussions and talks, etc. and the 30 m^2 studios for conversations, news commentaries, etc. Both the 140 m^2 one and the 70 m^2 one will have the ceiling height of two stories, and others will be of the one-story type. On top of the roof of the two-story building, a ST link tower will be erected. Its location is determined in consideration of the influence of the multi-stories office building to be constructed in the 2nd phase plan. For the present studio block, investigations and studies have been made on the expansion of the number of studios and related facilities in the 2nd phase plan.

(2) Office block

Three three-story buildings will be constructed east to west adjacent to the studio block with courtyards in between. Of them, the central and northern ones will be connected to the studio block with corridors, and the interconnection among three buildings will be made with connecting corridors running south to north.

The layout of this office block presupposes natural ventilation instead of providing airconditioners, thus determined in consideration of the natural conditions including sunshine and prevailing wind direction. In order to prevent direct incidence of sunlight into the rooms, fixed louvers will be installed.

Structurally the office block will be in the form of large room. Aside from the rooms with specific uses, it is recommended to use movable partitions for actual compartmenting. This will provide a high flexibility and high degree of freedom in the office arrangement to meet the changes in the mode or system of broadcasting services.

For compartmenting of the various buildings and various floors, priority will be given to the idea that the office rooms concerning the programme production be located nearest to the studio block. Also, the locations of other offices are determined in consideration of the convenience of liaison with library and communications with the talents and performers.

The offices, in fact, are to be located where it will be most convenient for the various departments concerned. The arrangement of compartments in each department will be satisfactorily made in the stage of the implementation design after discussions with the persons concerned.

The visitors will enter the hall of the central building, and the performers going to the studios will pass through a 5.7 m lobby stretching from it.

The office block will be linked up with the library by a connecting corridor on the north.

(3) Library

This will be a three-story building, which upon completion of the 2nd phase plan will be situated at the center of the mass-media complex to be conveniently available to multi-storied office building, ZBS and ZIS production services, etc. in common.

Although the libraries have been assigned to respective departments of the Ministry, their centralization will make it easy to carry out unified and intensified control of materials and data and concentration of personnel.

It is also important to lay out on a priority principle the equipments which are indispensable for making up the environment required for the safe keeping of the materials and data.

(4) Film Processing Laboratory

It is decided to incorporate the film processing laboratory into the ZIS film section to be constructed in the 2nd phase plan. The building for it will be a single-story one, and will be located at the nearest part to ZBS.

(5) Rooms required

For the rooms and their spaces for each block of the studio center, see the attached Table 4-1. "Schedule of Accommodation for Studio Center."

(6) External and Internal Finishes

For the external and internal finishes of each block, refer to the attached Table 4-2, "Rough Schedule of Finishes for Studio Center."

(7) Outdoor Facilities

For the premises including the blocks of the studio center, parking spaces, passages, greens and tree plants are planned.

Around the premises the fence will be erected with two gateways and near by them two guard-boxes will be placed separately.

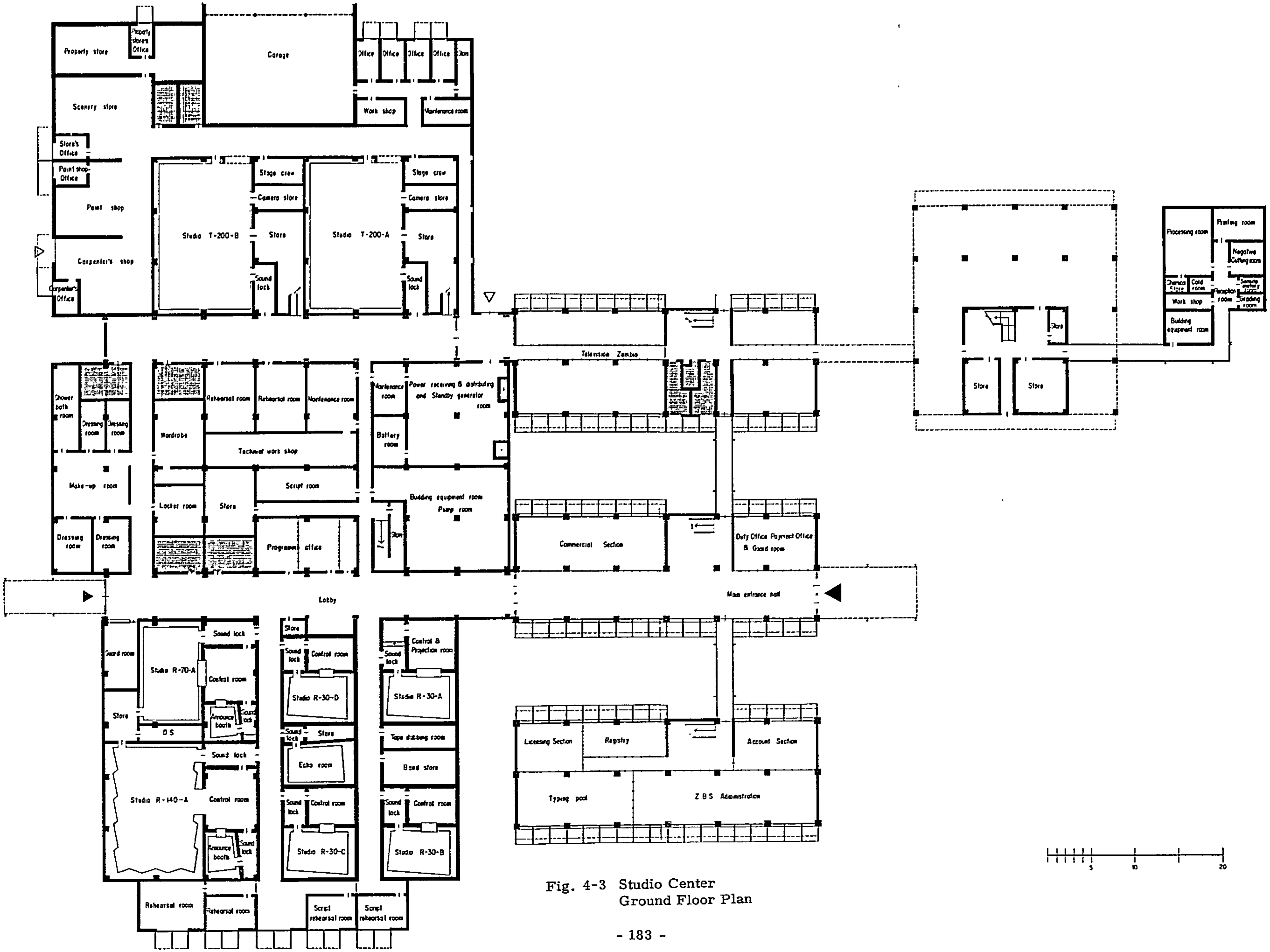


Fig. 4-3 Studio Center
Ground Floor Plan

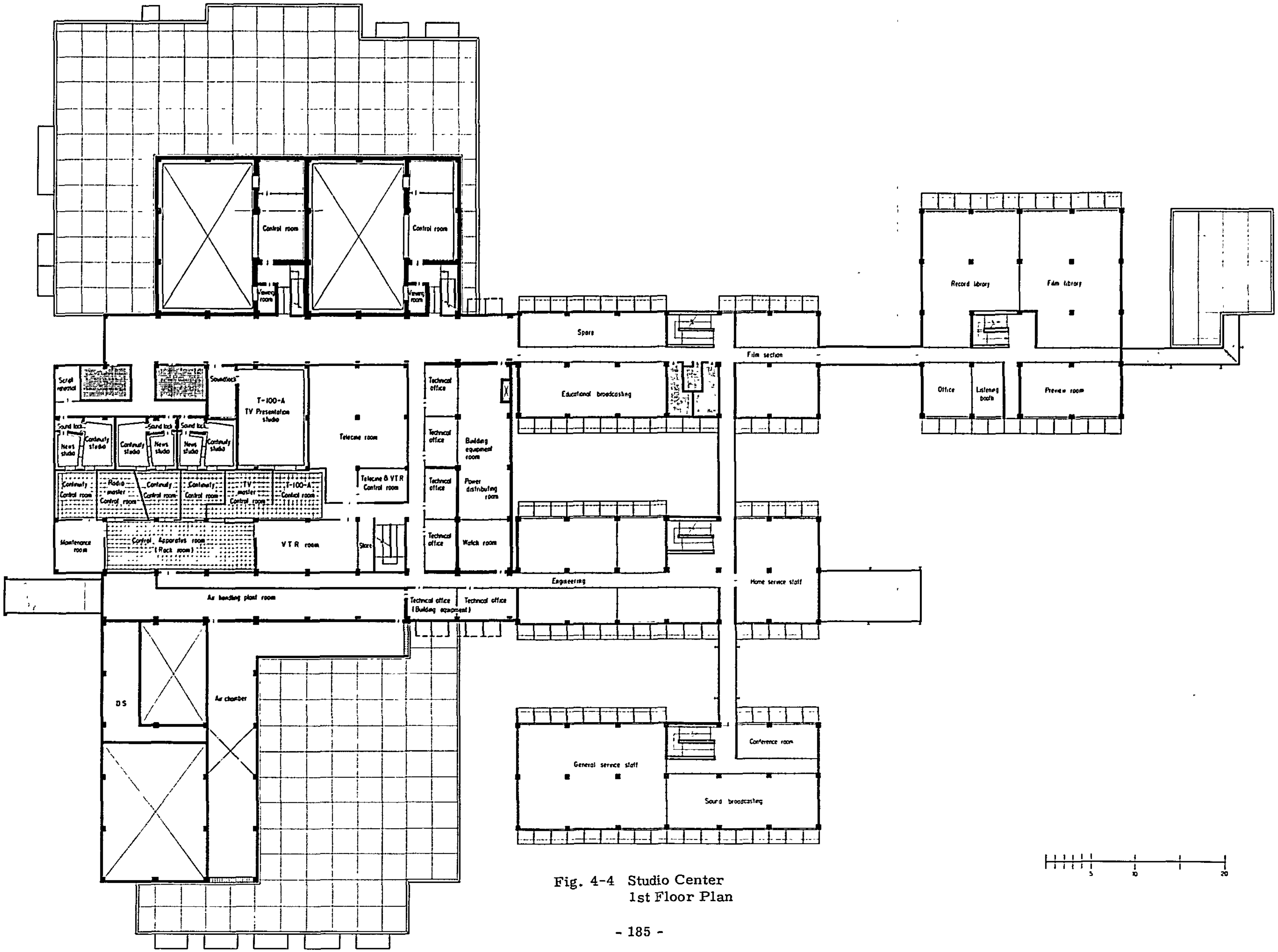


Fig. 4-4 Studio Center
1st Floor Plan

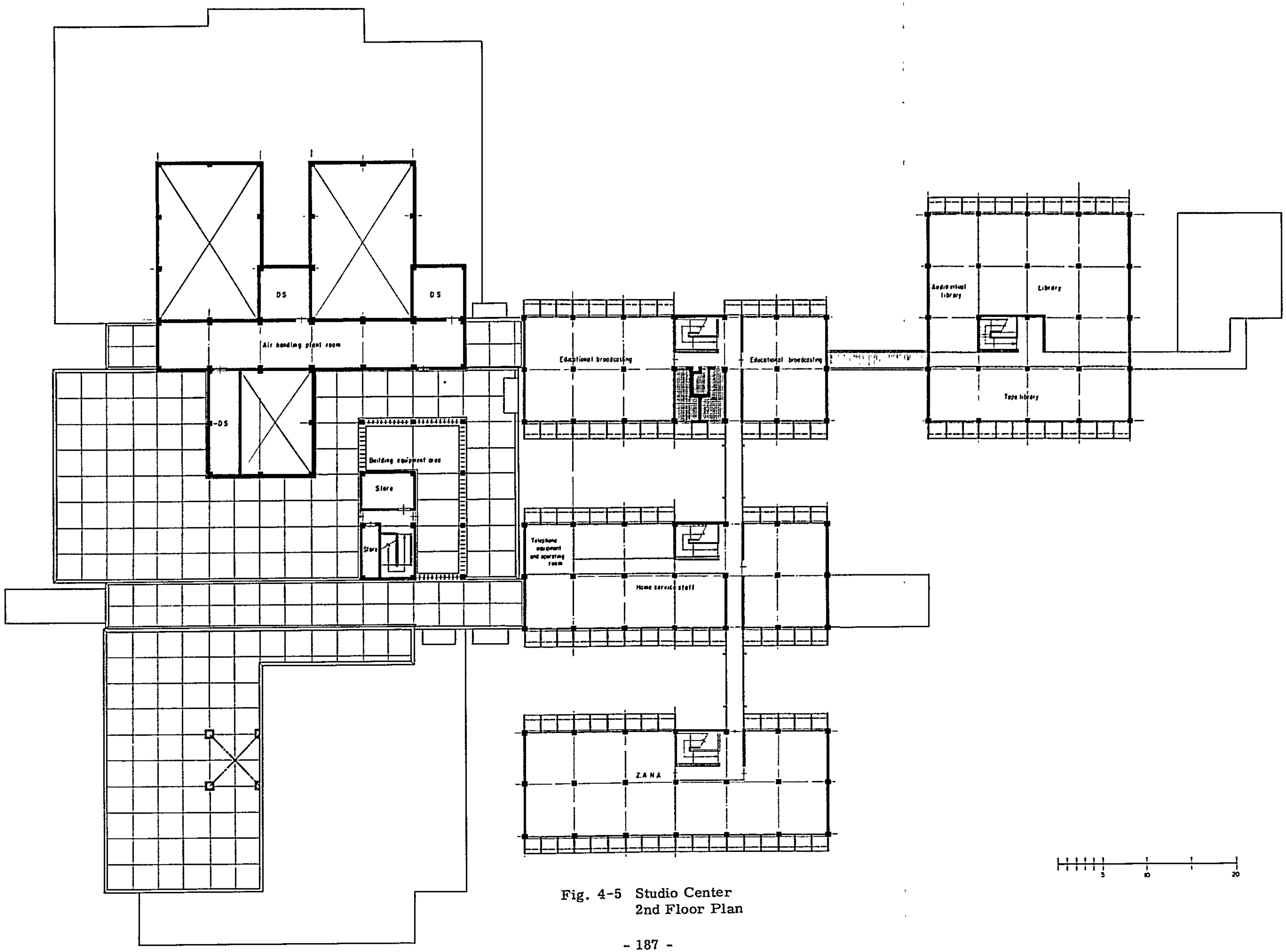


Fig. 4-5 Studio Center
2nd Floor Plan

Table 4-1-(1) Schedule of Accommodation for Studio Center

Studio Block	m^2
T. V. Studios	
Studio T-200-A	195
Control room	65
Sound lock	13
Store	42
Camera store	16
Stage crew	16
Viewing room	8
Studio T-200-B	195
Control room	65
Sound lock	13
Store	42
Camera store	16
Stage crew	16
Viewing room	8
Radio Studios	
Studio R-140-A	173
Announce booth	23
Control room	38
Sound lock	26
Store	11
Studio R-70-A	87
Announce booth	19
Control room	37
Sound lock	20
Store	11
Studio R-30-A	49
Control & projection room	32
Sound lock	18

Table 4-1-(2) Schedule of Accommodation for Studio Center

	m^2
Studio R-30-B	49
Control room	25
Sound lock	13
Studio R-30-C	49
Control room	25
Sound lock	13
Studio R-30-D	49
Control room	25
Sound lock	13
Rooms Relative to Studios	
Dressing room	16
Dressing room	16
Dressing room	24
Dressing room	24
Make up rooms	65
Shower bath room	27
Locker room	32
Wardrobe	54
Rehearsal room	43
Rehearsal room	43
Rehearsal room	43
Rehearsal room	22
Script rehearsal room	22
Script rehearsal room	22
Band store	32
Carpenter's shop	86
Carpenter's office	11
Paint shop	54
Paint shop office	11
Scenery store	83
Store's office	11

Table 4-1(3) Schedule of Accommodation for Study Center

	m^2
Property store	90
Property store's office	11
Broadcasting Equipment Rooms	
T.V. master control room	35
Presentation stuido T-100-A	91
T-100-A control room	34
Sound lock & store	19
Radio master control room	27
Continuity studio (A)	20
News studio	12
Continuity control room	26
Sound lock	6
Continuity studio (B)	20
News studio	12
Continuity control room	26
Sound lock	6
Continuity studio (C)	20
News studio	12
Continuity control room	26
Sound lock	6
Telecine room (incl. T.C. & V.T.R. control room)	165
V.T.R. room	65
Rack room	97
Tape dubbing room	24
Echo room	42
Sound lock	6
Script rehearsal room	11
Maintenance room - central technical area	32
Maintenance room -studio area	43

Table 4-1-(4) Schedule of Accommodation for Studio Center

	Maintenance room - Outside broadcast area	13 m^2
	Workshop-Outside broadcast area	17
	Workshop-Studio area	65
	Store-Central technical area	11
	Store-Outside broadcast area	13
	Store-Studio area	43
	Store-Studio area	13
Office		
	Technical office	86
	Outside broadcast office	54
	Building equipment office	43
	Programme office	65
Store		
	Script room	43
	Store-common use	5
	Store-common use	22
	Store-common use	11
	Store-common use	15
Building equipment rooms		
	Electric power receiving & distributing and standby generator room	130
	Electric power distributing room (incl. Watch room)	130
	Battery room	22
	Maintenance room	22
	Pump room	144
	Air handling plant room	335
	Garage	211
Office Block		
	Administration	119

Table 4-1-(5) Schedule of Accommodation for Studio Center

	m^2
Licensing section	43
Commercial Section	97
Accounts Section	54
Typing pool & Registry	112
Duty & payment	43
Guard room (incl. Guard room in Studio block)	40
Engineering	108
Sound Broadcasting	151
Home Service staff	432
General Service staff	195
Television Zambia	252
Film Section	90
Educational Broadcasting	378
Z.A.N.A.	347
Telephone equipment & operating room	32
Conference room	36
Spare room	65
Library	
Office	32
Listening room	22
Preview room	65
Record library	151
Film library	166
Tape library	130
Library	230
Audio visual library	86
Store	32
Store	22
Store	7

Table 4-1-(6) Schedule of Accommodation for Studio Center

	m^2
Processing Laboratory	
Processing room	43
Printing room	22
Negative cutting room	14
Chemical store	5.5
Cold room	5.5
Sensitometry room	5.5
Grading room	5.5
Workshop	11
Reception room	18
Building equipment room	22

Table 4-2-(1) Rough Schedule of Finishes for Studio Center

External Finish

Roof	Light weight concrete covering on asphalt roofing
Wall	On concrete block, special paint spraying
Pilaster	Architectural concrete finishing
Louvre	Architectural concrete finishing
Door, Window	Steel, painting

Internal Finish

T.V. Studio	Floor	Linoleum flooring
	Wall	Glass fiber cloth hanging, wire mesh fastening
	Ceiling	" " " "
R-140, R-70 Studio	F	Linoleum flooring
	W	Asbestos cement flat sheet boarding, painting, cloth hanging & sound reflecting & absorbing box installing
	C	Asbestos cement flat sheet boarding, painting & cloth hanging
R-30 Studio Announce booth	F	Linoleum flooring
	W	Asbestos cement flat sheet boarding, painting & cloth hanging
	C	Asbestos cement flat sheet boarding, painting, & cloth hanging
Control room Sound lock	F	P.V.C. floor tiling
	W	Asbestos cement flat sheet boarding, painting
	C	" " "
Store, Camera store	F	Cement mortal float finishing
	W	Cement mortal plastering
	C	" " "

Table 4-2-(2) Rough Schedule of Finishes for Studio Center

Stage crew	Floor	P.V.C. floor tiling
	Wall	Cement mortal plastering, painting
	Ceiling	Gypsum boarding
Echo room	F	Cement mortal float finishing
	W	Cement mortal plastering, painting
	C	" " "
Master control room, Rack room	F	Double floor (built-up type)
	W	Cement mortal plastering, painting & built up type partition
	C	Textured sound absorbent tiling
Telecine room V.T.R. room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting & built up type partition
	C	Textured sound absorbent tiling
Dressing room	F	Flooring block finishing
	W	Cement mortal plastering, painting
	C	Gypsum boarding
Make up room Wardrobe Locker room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting
	C	Gypsum boarding
Carpenter's shop etc.	F	Cement mortal float ginishing
	W	Cement mortal plastering
	C	Asbestos spraying
Tape dubbing room Rehearsal room Work shop Maintenance room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting
	C	Textured sound absorbent tiling
Entrance hall	F	Terrazzo finish with brass strip joint
	W	
	C	Asbestos spraying, Aluminium louvre fitting

Table 4-2-(3) Rough Schedule of Finishes for Studio Center

Lobby	Floor	P.V.C. floor tiling
	Wall	Facing bricklaying & Cement mortal plastering, painting
	Ceiling	Textured sound absorbent tiling
Office Telephone equipment & operating room Library Spare room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting & Built up type partition
	C	Textured sound absorbent tiling
Processing room Printing room Chemical store	F	Acid proof floor tiling
	W	Cement mortal plastering, painting
	C	Asbestos cement flat sheet boarding, painting
Negative cutting room, Cold room Grading room Sensitometry room Workshop Reception room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting
	C	Asbestos cement flat sheet boarding, painting
Building equipment room (Processing laboratory)	F	Cement mortal float finishing
	W	Concrete block
	C	Asbestos spraying
Building equipment room, Standby generator room	F	Cement mortal float finishing
	W	Cement excelsior boarding
	C	Asbestos spraying
Battery room	F	P.V.C. floor tiling
	W	Cement mortal plastering, painting
	C	Asbestos cement flat sheet boarding
Garage	F	Cement mortal float finishing
	W	Cement mortal plastering, painting
	C	Asbestos spraying
Shower bath room Hotwater service room, Lavatory	F	Clay tiling
	W	Clay tiling
	C	Asbestos cement flat sheet boarding, painting

2.1.4 Structure Plan

The selected site for the studio center is covered for the most part with limestone. Whether or not this natural ground condition is exploited effectively in planning will largely affect the construction cost of the structure. Accordingly, a geological survey should be conducted throughgoingly.

For the posts for reinforced concrete construction parts, it is recommended to set posts at a center-to-center interval of 5.7 m, and heights at 5 m for the ground floor and 4 m for the first floor and the second floor. For the floor load distribution in the studio block, studies should be made at length to account for details including even rare, specific cases.

The design philosophy of the blocks should take the following considerations.

(1) Studio Block

The studio block will be divided structurally into three: part covering television studios; central part; and part covering radio studios. These will be separated from each other by lobbies and corridors.

T-200-A, T-200-B, R-140-A and R-70-A are two or three-story, and will be reinforced concrete construction except walls. Single-story buildings lying around will have walls of concrete blocks and foundations and slabs of reinforced concrete construction.

The roof slabs for the television studios and presentation studio will be doubled for isolating plane booms. The water storing tanks will be provided in the ground under the studio block. For the future expansion of studio facilities, design considerations will be given beforehand.

(2) Office Block and Library

Each will be three-story reinforced concrete structure.

(3) Film Processing Laboratory

The walls will be made of concrete blocks, and the foundation and slabs will be of reinforced concrete construction.

The louvers in each office will be of reinforced concrete, and the corridors interconnecting buildings will be of steel-framed construction.

2.1.5 Air Conditioning and Plumbing Installation Plan

(1) Air Conditioning Installation Plan

In this plan, the cooling and ventilating facilities for the studio center are discussed.

Heat ing will be unnecessary as the following suggests.

The meteorological data shows that even in the most coldeest season in Lusaka the mean hourly temperatures are above 10 degrees Centigrade on the dry bulb thermometer.

Zambia is really a temperature district; during the broadcasting hours (5:00 to 23:00), the temperature is about 10°C from 5:00 to 7:00, the lowest temperature in a day, then rises after around 7:00, and reaches 22°C on the dry bulb from 14:00 to 16:00. For this reason, the heating is omitted.

In the scheme of the studio center, however, the air conditioning should satisfy the following requirements as the special characteristics of the studio center.

1) ability to air-condition satisfactorily for full a 24 hours.
2) to reduce operating and monitoring personnel through automation.
3) to simplify the installations for simple and easy maintenance.
4) The air conditioning system should be such that even if part of the air conditioners get out of order the remainder can back up it without hampering the use of the building.

It is further recommended to employ the following air conditioning systems as classified by blocks.

1) Studio Block

For the heat source equipment, an air-to-water system chiller unit will be used. Two such units will be installed in order to provide for meeting load fluctuation, maintenance and trouble development during a year. In order to curtail the operational cost, a chilled water storing system will be adopted.

As rooms different in duration of use and nature of cooling load are found in mixture, classification of the airconditioning system has been made in order to promote simplification of equipment and economy of operation. Since there is such a case where the heat load situation differs even in the same air conditioning system, small-sized fan coil units will be used jointly wherever required.

Each system will also be provided with such automatic controls as start-stop device, temperature and humidity adjustment by thermostat and humidistat, and motorized flow control damper, etc. separately in accordance with the respective conditions of use. In the studio block as for those rooms which are not cooled, in which must heat is generated, such as power receiving and distributing room, standby generator room, etc., which is dusty, such as scenery and property stores, etc., and in which any smell or vapor is generated, such as lavatories, hot water service rooms, etc., forced mechanical ventilation will be employed.

2) Library

Of the libraries, those for tapes, records and films will be cooled by packaged air conditioners. For the film library, an automatic control system will be provided to keep constant temperature and humidity.

3) Film Processing Laboratory

This will be cooled by means of a packaged air conditioner. Since the laboratory emits much heat from developing and printing machines and uses chemicals, ventilating with fresh air is an important subject.

The air conditioning equipment room will be transferred to the building equipment room to be installed in the 2nd phase plan.

4) Office Block

The office will not adopt air conditioning but natural ventilation.

(2) Plumbing Installation Plan

Water will be supplied to a water receiving tank underground from the city service pipe and will be pumped up therefrom to an elevated tank in order to gravitationally distribute water in the building.

Hot water service will be classified into two systems; centrally served general-purpose hot water system for lavatories, showers and bathrooms in the studio block, etc. and independently served drinking hot water system. Each system will use an automatic electric water heater. Fire-fighting equipments will be installed in accordance with the ordinances and regulations enforced by the authorities; each floor will be equipped with fire hydrant boxes as required, and the fire pumps will be started by working a button switch in the box. Sanitary equipments will be installed as needed in the lavatories, showers and bathrooms and other places.

Drainage system will be divided into general drainage, sewer drainage and rain water drainage, and they will be connected to the public sewerage and surface water drainage systems separately outside the site. For the standby generator, fuel main tank and pipings for fuel supply, engine cooling water and exhaust be provided.

2.1.6 Electric Installation Plan

It is recommended to map out the electric installations according to the various equipments as follows.

(1) Power Receiving (from Utility System)

In order to keep stabilized sources of power supply, for the studio center, the following two should be taken into account regarding power receiving.

i) Power receiving should be from two different systems in order to minimize chances of electricity failure due to trouble with the power supply lines.

ii) Power supply lines free from the effect of any other loads so far as possible will be selected.

(2) Power Supply Equipment

The power supply eequipment to be installed at the studio center should be given an enough capacity to serve all the electrical loads planned in the 1st phase, and the studios and attached facilities to be added in the 2nd phase plan. It is particularly desirable to lay the incoming cables with a capacity sufficient for supplying power for the electrical loads of the entire massmedia complex from the outset.

It is right that in the 2nd phase plan, a secondary substation will be installed in ZIS block and served from the hightension power supply in the studio center. The standby generator should be capable of serving the installations in the 1st phase plan and additional studios and attached facilities planned in the 2nd phase.

For loads in the 2nd phase plan other than above, another standby generator should be installed.

The battery power supply will also be installed to serve emergency lights and telephone system.

(3) Earth Equipment

The earth will be used in the following two types.

Type A: less than 10 ohms

Type B: less than 100 ohms

(4) Lighting Equipment

The recommended illumination is more than 300 lux for offices, radio studios and broadcasting equipment rooms, etc. and more than 200 lux for corridors, stairs, stores, and building equipment rooms, etc.

It is also recommended that provision be made to provide emergency lights all over the buildings in order to keep the minimum necessary illumination at the time of utility blackout.

(5) Motive Power Equipment

The air conditioning equipment will permit automatic control using a time switch and manual control as well. Automatic control system using thermostat and humidistat is desirable for reliable control of temperature and humidity.

(6) Clock Equipment

The master clock to be installed as broadcasting equipment will also be used in common.

The slave clocks will be in two types; 30-sec. type for general use and 1-sec. type for the broadcasting equipment rooms.

(7) Telephone, Television and Radio Monitor and Other Equipment

The telephone exchange will be of the automatic PBX type, and will have a capacity to cover the traffic volume expected in the studio center.

In the 2nd phase plan, it will be merged into an integrated telephone exchange system which is able to accommodate the traffic requirements of the entire massmedia complex.

Television and radio monitors will be installed everywhere in the studio center, and the loud speakers for the radio monitors will also serve as simultaneous announcement speakers.

Automatic fire alarms will also be installed pursuant to the regulations stipulated by the authorities.

(8) Main Line for Broadcasting Use

The routes for the connecting cables linking the broadcasting equipments are of paramount importance functionally in the studio center. The routes should be fully secured and have an ample allowance for the future expansion of the installations.

(9) Central Monitoring Equipment

Monitoring equipment will be provided in the watch room to centrally monitor the operating state of the building equipments such as power supply equipment, motors, and fire alarms, etc.

2.1.7 Acoustic Plan

In the studio center, most of the rooms of which the acoustical character is an important subject are accommodated, and the absorption and insulation of sounds, vibration isolation, and other acoustical measures are of grave concern.

Fortunately, the site is favoured with quiet environs relatively for the time being, and it is judged that external noises will not matter to the overall building layout plan.

It is recommended by way of precautions for effects on the studios to provide measures against the flight noise created from the planes utilizing the airport near the complex.

In the meantime, the evil effects of the noise from the standby generator and air conditioning equipment on the studios within the building should not be dismissed, and the following provisions will be necessitated.

(1) Room Acoustics

1) Shapes and Dimensions of Rooms

The following are determinants of the room shapes and dimensions.

a) The shapes and dimensions of a room should be so determined as to prevent such phenomena detrimental to sound recording and hearing as booming due to the lack of uniformity in the distribution of normal modes in the room, flutter echo to be caused by multiple reflections of sounds between two parallel walls and concentration of sounds by concave surfaces.

b) Television studios, radio studios and echo room are various in shapes and dimensions depending on purposes and sizes of rooms.

c) As regards the television studios, the ceiling height should be determined to meet the television camera operation, scale of lighting equipment, height of horizontals and grids, etc.

d) Where a large observation window is required between the studio and its subcontrol room, the pane on the studio side should be inclined to prevent multiple reflection with the opposed wall.

2) Reverberation Time

Each room should be designed to have a suitable reverberation time to meet its purposes.

For general-purpose studios, an adjustable reverberation system using, for example, a curtain, should be considered. Also the internal finishing materials should be pliable to meet the various applications. It is necessary to avoid concentric use of the same kind of materials and disperse them properly for the purpose of diffusing sounds.

(2) Noise Control

1) Acceptable Noise Level

The acceptable noise levels should be set for standing meaningless noises emanating from air conditioners, ventilators, etc. as well as for meaning noises from speeches in the corridors and lobbies, music in the other studios, and external traffic, etc.

2) Sound Insulation

a) Sound Insulation Required

The sound insulation required between rooms should be designed based on the acceptable noise level in each room, power level of noise source, area and sound absorption characteristics of the room under consideration.

b) Sound Insulating Construction

The radio studios, continuity studios, echo room and the like will be of the floating construction by resilient rubber mounting.

As regards the television studios, the external shells, and walls bounding the air conditioner room, scenery and property stores, etc. where a large capacity of sound insulation is required, will be of the double-wall structure using blocks and bricks.

The ceiling will also be of the double structure using double layers of concrete slabs in order to muffle external noises.

Other rooms will also be sound proofed adequately.

c) Sound Insulating Doors and Observation Windows

A sound lock should at any rate be prepared btween each studio and corridor, and two doors be used for maintaining a required level of sound insulation.

It should be noted that there are two types of door mounting according to the place where door is installed - mounting on the building structure and mounting on floating structure.

3) Air Conditioning and Ventilating Noise Control

In order that the acceptable noise level for each room is satisfied, required sound insulation regarding noise from the air conditioners and ventilators that may affect the studios will have to be calculated, and the number of needed sound absorbing elbows will have to be determined at the implementation design stage of airconditioning system.

Consideration, also, will have to be given for preventing generation of noise by the shapes of the supply and return. openings and the air velocity.

Where the studio walls are adjacent to the air conditioner room, it must absolutely be avoided that the air duct to each studio from the airconditioner room should penetrate directly through them.

4) Vibration Proofing of Building Equipment, Air Duct and Water Piping

The standby generator, transformers, motors, pumps and blowers should all be installed with adequate vibration proof device.

For the pipings and ducts, the use of vibration-proof suspension fixtures is recommended.

2.2 Television Transmitting Stations

According to the television station establishment plan, the following seven television transmitting stations will be constructed.

Name of Station	Transmitter Output
Kasompe	10 kW x 2
Nakupata Hill	ditto
Kabwe	ditto
Lusaka	ditto
Pemba	ditto
Tara	1 kW x 2
Senkobo	10 kW x 2

For the construction of these transmitting stations, it is recommended to carry out a plan as follows.

2.2.1 Sites

Kabwe: Within the existing radio transmitting station premise.

Pemba: An approximately level site adjacent to a microwave relaying station.

Senkobo: ditto

Kasompe: There is a public water supply facilities near the proposed site, and construction of a housing complex near the site seems to be under consideration.

The exact locations of the sites at the place under consideration for the stations excluding Kabwe, Pemba and Senkobo are yet to be determined.

For the altitudes, access roads and power supply routes, etc. of the seven places, see the pertinent data to Chapter 1. Station Plan included in PART II TV TRANSMITTING FACILITIES.

2.2.2 Layout of Building and Steel Tower

As regards Kabwe, the location of building and tower will be determined in consideration of the location of the existing radio transmitting tower and of the anchors for the guys. Considering the possibilities of interference between television and radio waves, it is recommended to construct the television transmitting station building and tower as far away from the existing facilities as possible.

As regards Senkobo, the location of the guyed steel tower will be determined on the basis of the location of the guy wire anchors within the site. The location of the station building will be determined with reference to the tower position.

As regards Pemba, the area of the site is spacious enough to erect the guyed tower. If the guyed tower system is imployed, however, it will be too near to the microwave route. Accordingly, the self-supporting tower is recommended instead. The station building and tower will be arranged so as to minimize the site area.

While concrete arrangements within the sites at four other places will have to wait for selection of the sites themselves, concrete arrangements will have to be made in consideration of the conditions of locations and the most suitable tower system between the guyed and self-supporting types. Anyway it is desirable to surround each station premise with a fence of some 2 m high with one gateway.

2.2.3 Planning

For all seven stations, the building design will be common. But as regards the Kabwe station, the external wall should be shielded against radio wave interference.

The station building will comprise a transmitter room, power receiving room and an office room, etc.

For the transmitter room, an allowance should be made for the future installation of FM transmitter. Within the power receiving room will be a standby generator bed be installed. Both rooms will be equipped with floor ducts for accommodating wires for connecting equipment. An oil tank will be installed outdoor. Since the station will be unmanned, full measures should be provided for the protection of station facilities.

For the required rooms, spaces and finishes, refer to the attached Table 4-4, "Schedule of Accommodation for Television Transmitting Station", 4-5 "Rough Schedule of Finishes for Television Transmitting Station" and the attached Drawing, Fig. 4-6 "T.V. Transmitting Station."

2.2.4 Structure Plan

The walls will be of concrete blocks, and the foundations, floor and slab will be of reinforced concrete construction.

2.2.5 Ventilation and Fueling Installation Plan

The transmitter room and power receiving room generate much heat, and will be cooled by forced exhaust fan allowing to flow naturally outside air into the rooms to prevent excess temperature rise in the rooms.

The start and stop operations of the exhaust fans will be automatically carried out by means of thermostats. An oil tank will be installed outside for the standby generator and also oil supply pipes and the like will be provided.

In the site conditions permit the use of public water, a water service line will be installed. If not available, water may have to be carried to the station everytime when maintenance of the transmitter and so forth is carried out.

2.2.6 Electric Installation Plan

A lighting distribution board and a power board will be installed. These boards will be supplied with power from the power supply panel to be installed as part of the transmitter equipment, and will serve lights, plus sockets and exhaust fans.

The illumination will be 250 lux for transmitter room, workshop and office room, 200 lux for the power receiving room and 150 lux for other rooms. The exhaust fans in the transmitter room and power receiving room will be designed to permit both automatic thermostat control and manual control. In the power receiving room, however, the exhaust fan operation will be checked automatically when the generator starts.

The aviation obstruction lights on the tower will be of the automatic blinking type. For the transmitter and lightening conductor, separate earth systems will be prepared.

The station will also be equipped with automatic fire alarms, which will signal, the studio center in Lusaka in charge of the transmitting station in question.

2.3 Steel Towers

Towers are classified into two; one for the television towers to be erected beside the aforesaid seven transmitting stations, and the other for the ST link use to be erected on top of the studio center.

Table 4-3 Schedule of Accommodation for Television Transmitting Station

	m^2
Transmitter room	85
Power receiving and standby generator room	55
Office	12
Rest room	12
Workshop	16
Others	28

Table 4-4 Rough Schedule of Finishes for Television Transmitting Station

External Finish

Roof	Standed asphalt waterproofing, reflective painting
Eaves	Waterproof cement mortal plastering
Wall	Waterproof cement mortal spray coating
Door, Window	Steel, painting

Internal Finish

Transmitter room Power receiving and standby generator room Office, Rest room Workshop	Floor	P.V.C. floor tiling
	Wall	Cement mortal plastering, painting
	Ceiling	Cemented excelsior boarding, painting
W.C.	F	Clay tiling
	W	Clay tiling
	C	Cemented excelsior boarding, painting
Air chamber	F	Cement mortal plastering
	W	Concrete block
	C	Cemented excelsior boarding

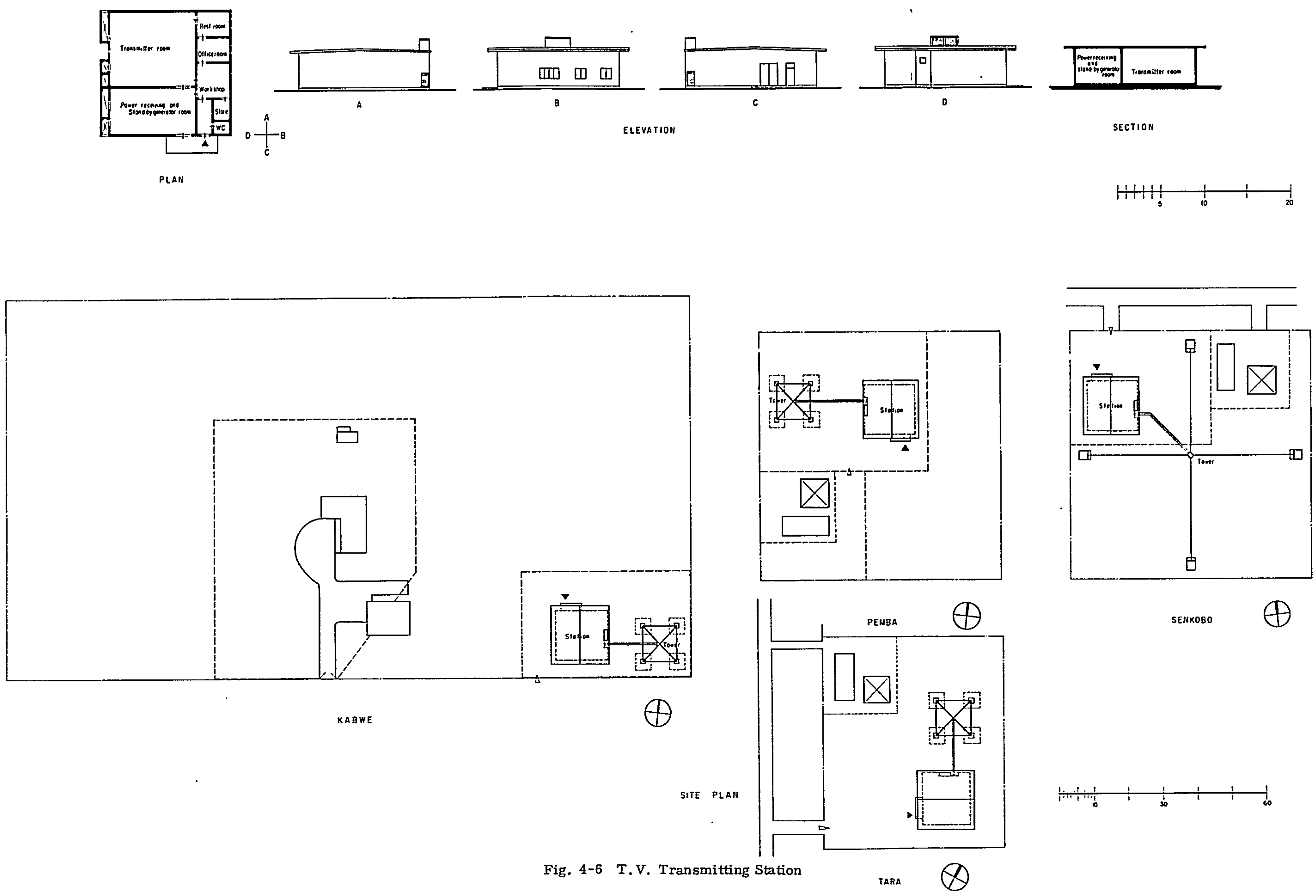


Fig. 4-6 T.V. Transmitting Station

2.3.1 Comparison of Self-Supporting Tower with Guyed Tower

Both of the self-supporting tower and guyed tower have merits and demerits respectively.

The self-supporting tower is a tapered cantilever beam supported in the ground, and usually has a rectangular or triangular section, forming a truss using steel angles or steel pipes as structural members. Steel sheet joints are used to bolt up members at site. As compared to the guyed tower, construction necessitates more materials and is more costly, but space requirement for construction is smaller. Its other merit is little vulnerability to distortion and inclination.

It is universal structurally and it has been adopted for many constructions. On the other hand, the guyed tower is one which a slender pillar is supported with guys. The end of each guy is mounted on the tower at suitable interval. The other end of each guy is fixed to an anchor block. The tower is usually a built-up one of rectangular or triangular section or a cylindrical one, using either steel angles or steel pipes. The diameter of the tower is to be sized depending on the supporting span by guys, antenna load, ladder, etc.

Generally, the guyed type costs less than the self-supporting type, but requires larger space and is prone to be distorted and inclined. By adjustment of the initial tension of guys, it is possible to reduce the inclination of tower to a certain degree. Naturally, the guyed tower calls for serious attention to the tower erecting work and the analysis of guying methods. For this reason, the self-supporting type is usually recommended for those towers carrying microwave antennas.

For the present plan, all these considerations are given to select the types best fitted to specific site conditions. (See the attached Drawing, "T.V. Tower & Studio Center Tower")

2.3.2 Television tower

From the relationships between the existing facilities and proposed sites, specifications of antennas according to the station installation plan and requirements of ST link antennas, the types and heights of television towers ard determined as listed below.

Name of Station	TowerHeight, m	Type of Construction
Kasompe	60	Self-supporting
Nakupata Hill	60	Self-supporting
Kabwe	60	Self-supporting
Lusaka	100	Self-supporting
Pemba	60	Self-supporting
Tara	60	Self-supporting (or guyed)
Senkobo	60	Guyed

Notes:

1) Kasompe, Nakupata Hill and Lusaka require ST link antennas, and the self-supporting type is selected.
2) For Tara, the self-supporting type is selected for the time being, but the guyed type may be permitted depending on the final site plan.
3) Kabwe is to be installed on the same premise with the existing radio transmitting station, and its antenna should be separated far from the radio one to prevent interference to radio one. The self-supporting type is preferred in order to avoid absorption of radio wave by the guy wires.
4) Senkobo has a large site and holds a terminal station for a microwave circuit in the same premise. It dispenses with ST link antenna, and the guyed type tower is picked.
5) Pemba is almost the same in conditions as Senkobo, but will use the self-supporting type as interference to the nearby microwave circuit is likely during tower construction.

2.3.3 Studio Center Tower

The studio center will install a 25 m high self-supporting tower for microwave and ST link antenna on the roof.

2.3.4 Arrangement of Steel Tower in the Site

Refer to relevant items concerning the layout of television transmitting stations and studio center.

For Kasompe, Nakupata Hill, Lusaka and Tara, the selection of sites should precede the layout planning of the tower facilities.

2.3.5 Structure

(1) Self-supporting tower

1) The foundation for the self-supporting tower will be of reinforced concrete structure in which anchor bolts are to be buried to fasten the tower main body.
2) Tower body will be of the truss structure using steel angles or steel pipes as members. Assembly will be by bolting.
3) The tower will be harnessed with such auxiliaries as worker's ladder, landings and feeder rack (incl. horizontal part) etc.

(2) Guyed tower

1) Both the foundation and anchor blocks will be of reinforced concrete structure. The foundation will have anchor bolts built in, and will be connected to the tower main body in a state nearly approaching the pin joint. The anchor blocks will have a steel frame inset to fasten one end of the guy.
2) The tower mast will be of the built-up type using steel angles or steel pipes, and its assembling will be by bolting.
3) The guy will be galvanized steel cable.
4) The tower will be harnessed with auxiliaries including worker's ladder, landings, feeder rack (incl. horizontal part) etc.

In any type, the tower will be designed to be strong enough to carry additional antennas to be installed in future.

2.3.6 Miscellaneous

Painting: Steel members will be galvanized, and the tower main body will be painted to give an aviation daymark. Light equipment (aid to aviation): This will be installed according to the regulations enforced by the authorities.

Earth: Grid earth system and earth rods will be used in combination.

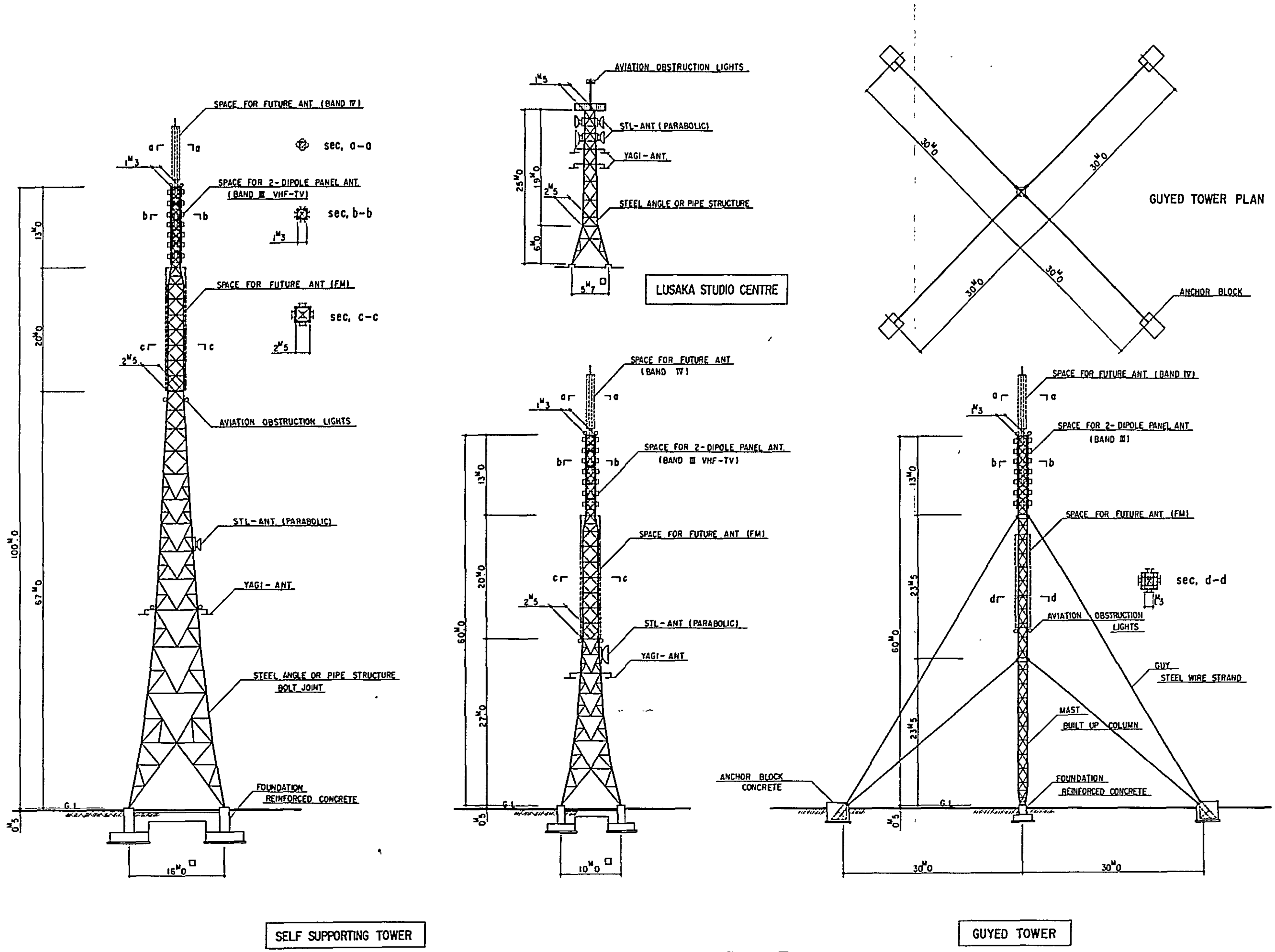


Fig. 4-7 T.V. Tower & Studio Center Tower

2.4 Others

Implementation Design: -

The studio center, transmitting station and tower are special structures. The implementation design for the 1st phase plan should therefore be undertaken by an expert architect who has experiences and achievements for many years in this field. For the present project, it has been determined to use studio equipment and transmitter equipment made in Japan, along with various construction materials of Japanese make. Negotiations will be held often with the manufacturers of these equipments and materials even in the design stage. The knowledge and experience about the materials and supplies are also an important asset for the design work.

In this context, it is believed that the best architect should be picked among eligible architectural offices in Japan.

Note: For details of each item in this chapter, refer to relevant items in Volume III, "BASIC DESIGN FOR BUILDINGS & TOWERS."

Chapter 3. 2nd and 3rd Phase Plan

The following construction plan is recommended for the 2nd and 3rd phase plan.

3.1 Massmedia Complex

In the 2nd phase plan, additional television and radio studios will be installed west of the studio block to be constructed in the 1st phase plan. Along with this, the scenery and property stores and make up room, etc. will be expanded to complete the studio center. On the other hand, a multi-storied office building to accommodate the Ministry's headquarters and administrative departments of ZNTB and ZIS etc., and a singlestory and a two-story cum one-story buildings to accommodate production services departments of ZIS will be constructed east of the office block. On the north of the Z B S office block, a cafeteria and kitchen will be prepared. All these buildings including those constructed in the 1st phase plan will be closely tied by connecting corridors with the multi-storied building at center. Thus, the long-waited-for dream, "All under a single roof", will materialize, as a giant massmedia complex integrating into unity all the systems and functions of the Ministry of Information, Broadcasting and Tourism. (See the attached Drawings, Fig. 4-8 Explanatory Diagram and Fig. 4-9 Massmedia Complex-Elevation).

3.1.1 Planning

(1) Studio Block

Additional studios will be built on the west of the studio block to be constructed in the 1st phase plan. At the center of the ground floor, dressing rooms, rehearsal rooms and script rehearsal rooms, etc. will be added to the 1st phase's. On the north, 400 m^2 and 200 m^2 television studios will be annexed two each to the 1st phase's. As a consequence, additional scenery and property stores will be installed surrounding these studios. As in the case of the 1st phase control rooms will be installed on the 1st floor. On the south, radio studios (1 room x 140 m^2, 1 room x 70 m^2, 4 rooms x 30 m^2) and echo room, etc. will be disposed.

On the central part of the first floor, FM control room, continuity studio and news studio will be arranged. By these additions, television and radio studios will form an inner ring surrounded concentrically by scenery and property stores with the core having rooms for performers on the lower floor and broadcasting equipment rooms for television, radio and FM on the upper floor.

And then, an arrangement of concentric circle type will be completed through the 1st and 2nd phase. Of two 400 m2 class television studios, one will preferably be open to the public as studio for producing audience participating programme. This will enlighten the public in general to have deep interest and appreciation in the broadcasting services and let them feel a sense of intimacy with Z.B.S. Thus this will be a help to promote the spread of broadcasting in Zambia.

(2) Cafeteria and Kitchen

These will be located north of ZBS office block, and a connecting corridor will be used to interconnect them.

The cafeteria will desirably be one that can serve not only the ZBS staffs and performers, but personnel working in all departments of the massmedia complex with meals and drinks.

(3) Multi-storied Office Building

This will hold nearly the center of the massmedia complex and keep close connection with ZBS office block and ZIS production services departments. Here will be centralized the pivotal functions of the Ministry, including the Ministry's headquarters, ZNTB's headquarters and ZIS's administrative and public relations departments offices. Also, this building will accommodate PBX center for the telephone service of the entire complex (exchange system in the studio center in the 1st phase plan will be merged in the center in the 2nd phase) and common conference rooms.

Just as with the office block for ZBS, the office room compartmenting will be settled by the use of movable partitions for enhanced pliability to the future rearrangement of rooms. It is also important to reserve some two floors of office space for future expansion. For the floor-to-floor connection, two lifts will be installed in addition to stairs. The connection with the library will be made with a connecting corridor. Special rooms will be air conditioned by packaged units. Ordinary office rooms will be designed to produce a comfortable working environment by means of fixed louvers.

(4) ZIS production block

This block will be divided into two buildings - north and south. The south one will accommodate west to east a cinema, graphic art section, maintenance section and stores in the said order. Since the cinema will be used less frequently, it will be designed to serve also as a large conference room for space economics. Its location is determined to be the western end so as to provides a shortcut to the multi-storied building and easy access for visitors. The maintenance section is planned to hold a parking space for PR task force vehicles nearby.

The north building will accommodate functionally analogous sections such as photograph, film, recording, etc. The film processing laboratory to be set up in the 1st phase plan will be included to this building in the 2nd phase plan. With the recording studio and dubbing theater at the center, the associated rooms will be arranged around. The power receiving room and air conditioning equipment room for buildings other than the studio block and cafeteria of the scope to be covered by the 2nd phase plan, will also be accommodated in this building.

These two buildings will be interconnected with a connecting corridor, and the south building will have a connection to the multi-storied office building while the north building will be given an approach to the library. Each of these buildings will have its office room section separated from others by the inside corridor.

For the compartmenting of the office room space, movable partitions will be adopted. Also sunlight control will be accomplished by means of louvers. The rooms and spaces requirements of each section accommodated in these buildings are as per Malcony's Report, and the posterior additional requirements are also incorporated in the plan.

3.1.2 Structural Plan

The multi-storied building will be of reinforced concrete construction, and the two-story part of ZIS production block will also be of reinforced concrete construction. The single-story part of ZIS production block and cafeteria will be constructed of concrete block walls and reinforced concrete slabs. The connecting corridors will be of steel-framed construction.

3.1.3 Air Conditioning and Plumbing Installation Plan

For the air conditioning of the studio block to be constructed in the 2nd phase plan, necessary equipments will be installed to add to the 1st phase air conditioners. For other parts, chiller units of required capacity and the like will be installed at new air conditioning equipment spaces. For the facilities to be constructed in the 2nd phase plan, a chilled water storing tank and a water receiving tank will be prepared. The air conditioning and ventilating facilities the cinema, recording studio, dubbing theater and their associated rooms, etc. will be engineered in compliance with the design principles observed in the 1st phase plan. The air conditioning and ventilating facilities for the film processing laboratory will be merged into the new air conditioning equipment room. While packaged air conditioners are considered for special rooms in the multi-storied office building, the ordinary office rooms will be of the natural ventilation type.

The cafeteria will be equipped with cooking and dining utensils to meet the user requirements.

The air conditioning and plumbing equipment for others will be designed in compliance with the 1st phase plan.

3.1.4 Electric Installation Plan

As already explained as to the 1st phase plan, the incoming cable will have a capacity to cover all the loads within the massmedia complex.

Of the facilities to be constructed in the 2nd phase plan, the studio block will be served from the power supply equipment or standby generator to be installed in the 1st phase. Others will be served from the secondary substation to be installed in the ZIS production block and supplied with high-tension voltage from the said power supply equipment or from an additional standby generator. There will be installed a PBX center in the multi-storied office building in order to dispose of telephone traffic within the massmedia complex. It will absorb PBX facilities to be installed in ZBS office block in the 1st phase.

The multi-storied building will install two passenger lifts. A lift for cargo-passenger will be provided in the library which was built in the 1st phase plan, at this stage. Other electric installations will be designed in the same way as in the 1st phase.

3.1.5 Acoustic Plan

Cinema, recording studio, dubbing theater and related rooms requiring special considerations for acoustic treatment will be designed just in the same way as in the 1st phase.

The test room in the maintenance section will be provided with noise preventive measures.

3.1.6 Others

ST link antenna and its auxiliaries on the tower on the roof of the studio block in the 1st phase plan will be relocated to the top of the multi-storied office building in the 2nd phase plan, and the tower on the studio block will be removed accordingly.

Parking spaces and passages will be arranged within the premises, and planting and turfing will be carried out around the buildings and along the boundary of the premises.

Around the premises a fence will be erected in the 1st phase by Zambian requirement. However, it should be borne in mind that the massmedia complex should not be provided with a stern, inaccessibly concealed or barricaded wall, but should be designed to give open and familiar amenity to the surroundings in the future.

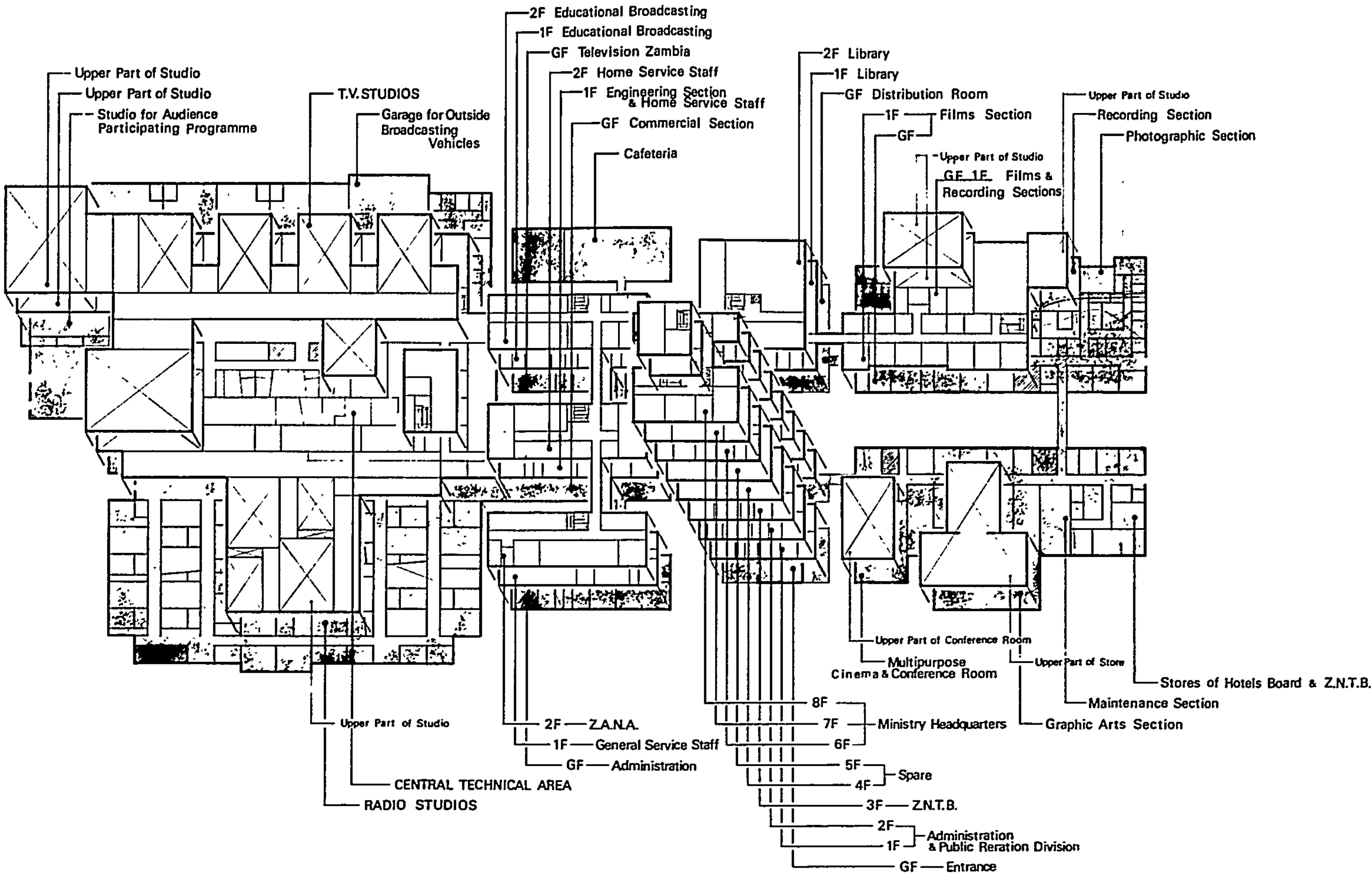
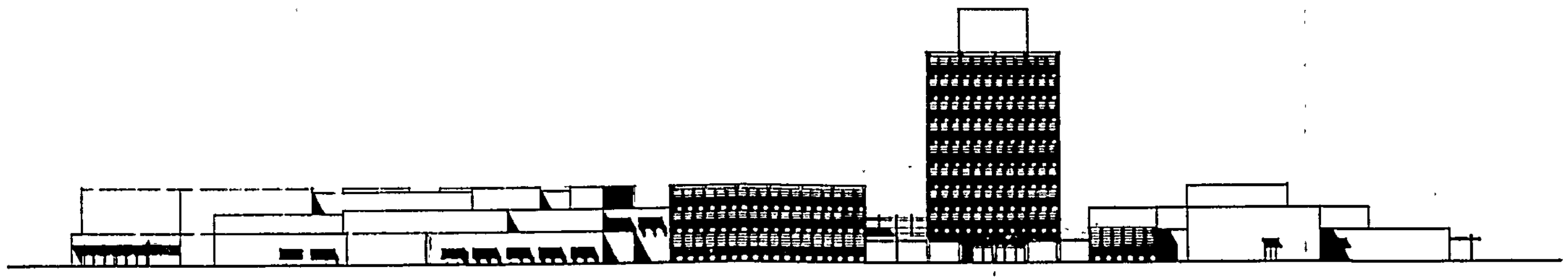
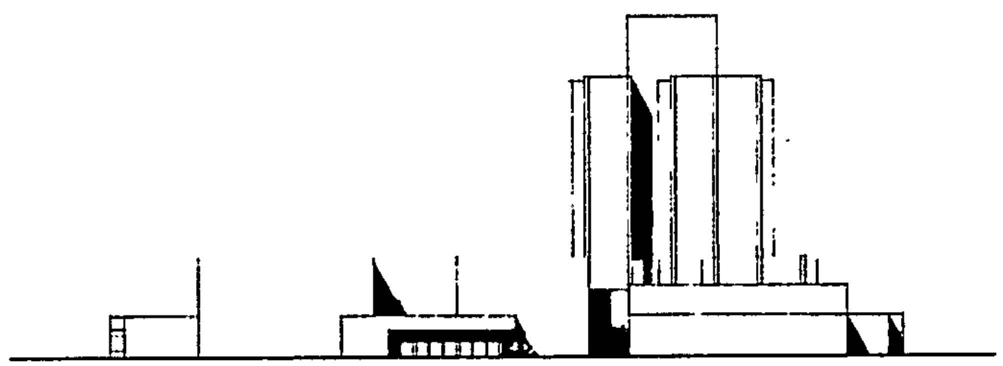


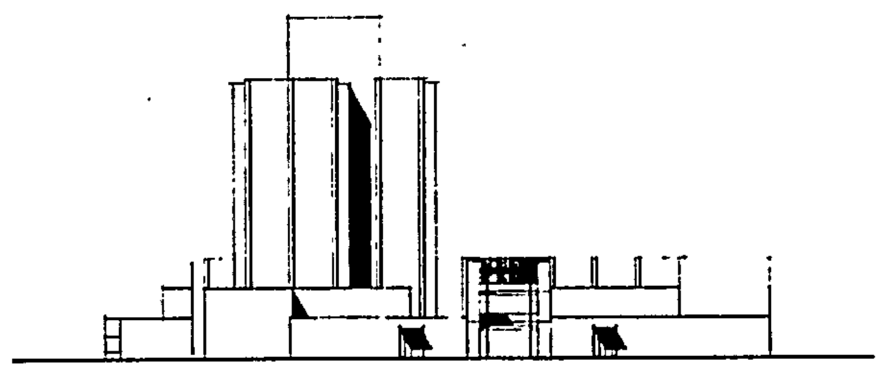
Fig. 4-8 Masmedia Complex
Explanatory Diagram



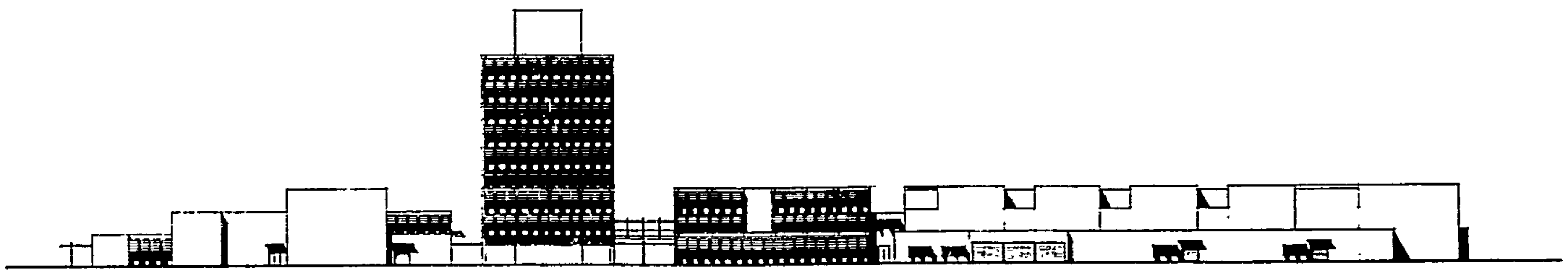
ELEVATION south



ELEVATION west



ELEVATION east



ELEVATION north

Fig. 4-9 Massmedia Complex
Elevation

3.2 Consolidation of Local Stations

As local stations, studio centers will be constructed at Kitwe and Livingstone in order to fortify regional broadcasting activities through the amplification of local news services and local programmes, diversify and improve in quality the broadcasting programmes in the Republic of Zambia as a whole by fully exploiting the recency and real-time service functions inherent in the broadcasting.

(1) Studio Center in Kitwe

Considering the history of the broadcasting services in the Republic of Zambia, Kitwe has been the hub of the economic, cultural and educational activities, and will hold the most important place for the production of educational broadcasting programmes.

In the 2nd phase plan, a studio center with the following facilities will be constructed to replace the existing facilities.

Programme Producing Facilities: -	
Television studio (200 m^2)	1 room
Radio studio (70 m^2)	1 room
Dubbing room	1 room
Echo room	1 room
Continuity facilities: -	
Television master control room	1 room
Presentation studio (100 m^2)	1 room
VTR room	1 room
Telecine room	1 room
Central equipment room	1 room
Radio master control room	1 room
Radio continuity studio	1 room
Film program producing facilities: -	
Developing and printing room	1 room
Editing and preview room	1 room
Office rooms and others	1 set

(2) Studio Center in Livingstone

Livingstone is located near the borders of Rhodesia, and its world-famous Victoria Falls attracts many visitors from all over the world.

A studio center having the following facilities will be constructed in the 3rd phase plan by taking into account the special circumstances of Livingstone for the production of local news and local programmes.

Continuity facilities; -

Television master control room	1 room
Presentation studio (100 m^2)	1 room
VTR room	1 room
Telecine room	1 room
Central equipment room	1 room
Radio master control room	1 room
Radio continuity studio	1 room

Film program producing facilities: -

Developing and printing room	1 room
Editing and preview room	1 room
Office rooms and others	1 set

3.3 Nation-wide Broadcasting Network

In addition to the seven trunk transmitting stations to be constructed in the 1st phase plan, local television stations and towers will be constructed at some 10 additional places in the 2nd phase plan in order to extend the coverage to principal local cities as well as to improve the service area fringes of the stations to be constructed in the 1st phase plan.

In the 3rd phase plan, the service area will also be expanded larger. To prepare for start of the nation-wide FM broadcasting services and to satisfy the broadcasting network reorganization and amplification plan including improvement in the quality of MW radio broadcasting, television, radio and FM transmitting stations and towers will be constructed.

PART V TRAINING

PART V
TRAINING

Chapter 1 General

1.1 Object and System of Training

Training is carried out with the following objects.

(1) To provide the knowledge and technology required for accomplishment of the duties of the staff.

(2) To formulate the attitude and habits of the staff required by the organization (enterprise).

(3) To cultivate a strong staff responsibility which is organization (enterprise) oriented.

For organization and enterprise development, growth of capabilities as well as growth of staff personnel is essential. Particularly impotent for a broadcasting organization is that if should not create rich broadcasting programs based on the creativity of its staff. Therefore development of the staff has far reaching significance compared with other enterprises, with the necessity that every one of the staff members exhibit his ability to the fullest.

It is quite natural that the duties of a manager can be generally divided into control of jobs and control of personnel. A major part of a manager's responsibility for the control of personnel is keeping his personnel as well as responsibility for growth and development of their capabilities. Especially there is no one but the manager who directly controls the performance and ability of each of his personnel. Therefore, the greatest duty of each manager is development of the ability of each of his personnel so that they grow while also making a contribution to the growth of the organization.

As described above the concept is that training activities in an enterprise be conducted in conjunction with routine business activities. Therefore, training can be divided into the following categories.

(1) On-the-job training effected by the supervisor through routine

business activities.

(2) Off-the-job training with curriculum based on a training theme common among the different work sites.

(3) Participation in training courses conducted outside of the organization; including studies either abroad or in country.

These training categories are systematically summarized as follows.

- Training
  - On-the-job training
  - Off-the-job training
    - Freshman training
    - Function training
      - Basic training
      - Expert training
    - Management training
  - Participation in training outside of organization

1.2 Staff Plan

A long-term concept of broadcasting network expansion is described in PART I, Chapter 2, Sub-Section 2.1, Mass Media Modernization Conception Enforcement Plan. A Staff plan is required to carry out the fundamentals of the broadcasting network expansion plan. Because it is not feasible to expect improvement in the quality of a staff within a short period of time, it is desirable that training of the essential staff be commenced two or three years before the respective expansion plan is implemented.

The number of staff members required cannot be computed in such a simple way that the number of staff members should be doubled when the number of studios is doubled. With the equipment required for studios centrally arranged, readily adjustable and providing a high degree of stability and utilizing automatic control and/or remote control, it is not necessary to make a large increase in the number of operators and engineers required to adjust and operate this equipment. The number of program producing personnel such as producers, announcers, cameramen, mixers and light men vary by the number of programs to be produced and also by the contents of programs. Therefore, it is not possible to provide a general measure for the production staff. Even if the number of programs to be produced is large, it is possible to produce them with a minor staff if the programs are of such content as dialogue with little movement. A larger production staff is required for music programs and dramas. Further, the number of programs to be produced is related to the length of broadcasting hours per day, and to the number of film programs and rebroadcasting programs. That is, the number of programs to be produced depends upon the program compilation principle.

With this expansion plan the increase of staff related to television is particularly important, with emphasis laid on the improvement in the quality of the staff.

When the first phase plan is completed it will become possible to use three studios and one out side pick-up vehicle in Lusaka, thereby making it possible to produce up to three general TV programs per day besides news and weather forecast.

An example of the concepts used in calculation of the size of the staff required for accomplishment of the expansion program is described below.

(1) Production Staff

Consideration is first given to switchers, cameramen, mixers and lightmen for the production staff. For television broadcasting these functions compose a team and effect production of a program. Two different systems are available for consideration: i.e., one is to use the same team members on certain regularely scheduled programs, and another is to compose a team for each different program from the pooled staff members. The number of staff members required is discussed below using each of the above mentioned systems for production of three programs per day. The result is as follows. Provided that each staff member is assumed to take two continuous days off every week.

With the former system, because the number of hours required for production of a television program is five to six hours at minimum, if it is assumed that one team produces one program per day, three teams are requested to work every day.

	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
Team No. 1	O	O	O	O	O	X	X
Team No. 2	O	O	O	X	X	O	O
Team No. 3	O	X	X	O	O	O	O
Team No. 4	X	O	O	O	O	O	X
Team No. 5	O	O	O	O	X	X	O

Such a weekly diagram is provided for each team when two off days are taken into account. X marks in the diagram indicate off days. Thus five teams of staff are required, but on Monday through Thursday one team is excessive per day. Assuming that each team consists of one switcher, three cameramen, two aural men and two light men, forty persons are required in total.

With the latter system it is necessary to make weekly diagram for each person for the purpose of calculating the number of persons required. However, approximate value can be obtained based on the volume of jobs required to produce programs for a week. If it is assumed that the average number of hours required to produce a program is seven hours and that the composition of each team is of eight persons like in the former system, the volume of jobs required for production of a program is 56 man-hours. The total volume of jobs per day for production of three programs is 168 man-hours, and the same per week is 1, 176 man-hours. If it is assumed that actual working hours per day per person is 7.5 hours, each person is able to process the jobs of 37.5 hours per week (7.5 x 5). It means that to process the weekly volume of jobs approximately 32 persons will do (1, 176 manhour ÷ 37.5 hours). Because this number of staff members is the absolutely minimum required value for production of programs and does not take holidays or training of staff into account, it is necessary to allow a margin of some

10 to 20 percent.

The above are only examples based on a number of assumptions, while in actual practice it is necessary to analyze the volume of jobs in detail for each one of the programs.

News and weather forecast programs are produced in continuity studios. It is preferable that such a structure be provided particularly for news so that transmission can be made at any time during the broadcasting hour, from 9:00 am through 12:00 midnight for instance. If two teams are necessary to cover a day, three teams are required with off days taken into account. If a team consists of one switcher, two cameramen and one aural man, twelve persons are required in total.

The number of producers who take charge of planning and production of programs is naturally related to the number of programs produced, however, it is largely affected by the contents of programs. There are some complicated programs which require as long as two months from the stage of planning while there also are some simple routine programs that can be completed within a few days. If it is assumed that one producer is in charge of one program per week, at least twenty one producers are required to produce twenty one programs per week.

The above is only an example of thoughts regarding the staff for production of programs. To correctly compute the number of staff required it is essential to clearly determine the annual program composition and to carefully examine the contents of programs based on the principles discussed.

(2) Engineers

Using this expansion plan will not be so different composed to radio. With television, however, because now transmitting stations and studios will be constructed careful examination becomes necessary with respect to the staff. First of all, the staff required in Lusaka for control, operation and maintenance of various studio equipment, telecine equipment and VTR is examined. This equipment is centrally arranged and is operatable with a small staff. It is assumed that a team is comprised of two engineers and four operators. If it is assumed that the daily broadcasting hours are between 9:00 am and 12:00 midnight and that these broadcasting hours are covered by two teams, enough coverage is made by three teams with holidays taken into account. This means the numbers of persons required is six engineers and twelve operators.

Transmitting stations can be remote controlled and are of parallel operation system with two transmitters, and consequently, operation without attendance can be normally accomplished. Thus the staff minimum required for transmitting stations are those for periodic maintenance once every month and for emergency service. At least two persons should form a team for periodic and emergency service to prevent occurrence of personal injury. If such a service team is comprised of one engineer and one operator, a total staff of seven engineers and seven operators becomes necessary for seven transmitting stations. These persons are to be dispersed to Lusaka and Kitwe for performance of the above mentioned jobs. When they are not kept busy the time may be spent for processing of various technical jobs and for training. If periodic maintenance to be carried out once every month is taken into account, one team, i.e., two persons are sufficient even if three days are spent at each transmitting station.

Improvement in quality of the staff is essential to improve the quality of programs. At the same time, it is important that the staff take good care of the equipment provided as well as being experienced in the handling of the equipment. For this purpose it is advisable to have a technical supervisor, i.e., so-called technical director, who is capable of making various technical suggestions in cooperation with the producer of each program. It is also advisable that one engineer in each team for control, operation and maintenance of studio equipment, master control equipment, telecine equipment and VTR mentioned before is selected as the technical director to cooperate with the producer and also to command the technical team.

The quality of staff should also be taken into consideration. Particularly producers, reporters and announcers are required to have professional knowledge in the fields of politics, economy, diplomacy, medical science and culture etc. in general. Consequently, it is advisable to employ those who majored in these subjects in professional schools or colleges. Same thing can be said for engineers who are in charge of planning and maintenance of various equipment.

1.3 Basic Training Plan

The object and system of training were described in this PART V, sub-section 1.1. Basic matters which are necessary to create such a training plan are described below.

1.3.1 Basic Idea of On-the-Job Training

(1) What is on-the-job Training

On-the-job training is to systematically lead the men with respect to knowledge, skill, ability to solve problems and attitude which are necessary to perform routine work. It may be divided into the following kinds.

1) To individually lead the men.
2) To collectively lead a number of men who require the same kind of training through study meeting and/or practice at job site.
3) To lead men through such methods whereby the manager shows through examples and lets his men to substitute for the manager.

The person who carries out on-the-job training is the manager who thoroughly knows every one of his staff and is fully aware of each man's job responsibilities.

Generally staff members have very little chance to participate in off-the-job training described in sub-section 1.1. Almost all the year round they are engaged in the job in their individual job sites with close contact with their managers. The importance of on-the-job training lies in this fact.

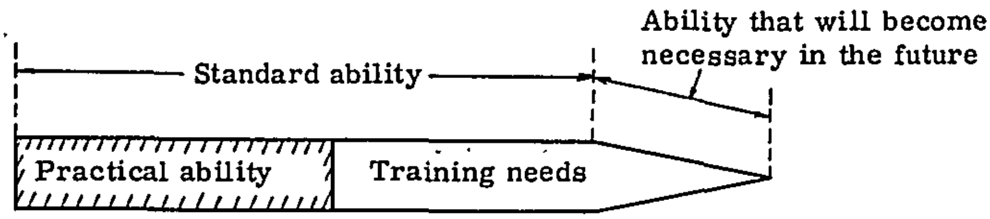
The advantages of on-the-job training are:

1) Guidance which is tailored to each person can be accomplished.
2) Practical training which matches the situation of the job site can be made.
3) The subject of training can be soon utilized in the practical job, and consequently, it is soon practically acquired.
4) Continuity of the job is not interfered with by the training.
5) Training can be made at any time as needed. It is inexpensive because no expenses are particularly needed.
6) Because the effect of training is soon observed on the practical job, the quality of training can be evaluated within a short period of time, enabling improvement of the method of training.
7) It is possible to change the assignment of jobs and instruction methods by observing the effect of training.
8) Understanding and reliance among managers and staff is improved, and formation of good human relations can be expected.

On-the-job training is carried out in the following sequence like all the other kinds of training.

1) To establish the goals of guidance and to establish a training plan.
2) To perform training.
3) To examine the result.

First of all it is necessary to find the items for which training is required. It is generally called training needs. It can be said that each one of the staff members including executives and freshman have training needs of some kind. Training needs means the difference between the standard ability required for accomplishment of work and the practical ability each person possesses. It is advisable to take the ability which will become necessary in the future into account.



Training needs are located in the following sequence.

1) Examine the duty standards.
2) Investigate practical ability and the attitude of each staff member. For this purpose, observe daily working methods; check job results; and ask questions to check abilities.
3) If the result of investigation reveal a below standard staff members, find the causes for it.
4) Examine the best method to remove the causes.

Establish the goal after determining the training needs. When establishing the goal the manager should avoid using force on his men. Satisfactory effect can be obtained if the goal is established after confirming the ability and will of the men through thorough discussion. Motivation of the men to positively move toward achievement of the goal is very important. It is the manager's duty to educate his men with future possibility, ability and aptitude thoroughly taken into consideration. For this purpose each manager should to the following.

1) To cultivate his own ability
2) To highly grasp the jobs at the job site
3) To provide his men with jobs which require an ability which is slightly higher than that possessed by the individual.
4) To correctly evaluate the ability and result of each staff
5) To thoroughly know each staff
6) To pay attention to the opinion of his men

7) To entrust performance of jobs to a certain extent under his own responsibility.

(2) Concrete methods of on-the-job training

1) In combination with the goal of self enlightenment

For the purpose of obtaining good results of training, it is important that each individual sets the goal of self enlightenment to

a) have desire for growth;

b) be conscious of the goal of growth; and

c) make the method and steps of growth concrete. Satisfactory results cannot be obtained without self enlightenment.

A discussion with each individual regarding the goals of self enlightenment should take the above into account.

2) Assignment of job and guidance

Jobs are upbringing, and the process of upbringing brings jobs to completion. If the job result only is what matters, better results may be obtained if jobs are assigned to the experienced staff or those who are not kept busy. However, it is very difficult to cause the ability of a certain indivisual to grow. Consequently, it is necessary to consider assignment of jobs while considering the following.

a) To assign jobs which are of a level slightly higher than the ability of the subject staff.

b) Combine the experienced staff and young staff and assign jobs which are of a relatively high level.

c) Determine the way to upbring the staff and assign jobs based on this determination.

3) Entrusting jobs with heavier responsibility

When one wrestles with a problem which is of a level higher than his ability with sincerity of attitude and judgement, recognition of self responsibility and the will to solve the problem are developed. The following points are important in this case.

a) To correctly hold the ability of each staff, entrust them to do jobs which are of a level which is slightly higher than their ability or of a volume which is more than can be normally delivered by them. (heavy loading). However, excessively heavy loading obstructs performance of jobs and is inappropriate from the standpoint of upbringing development.

b) Concretely provide a principle for performance of jobs. It is nothing but non-intervention to entrust jobs lacking any principle.

c) It is important to give complete instructions regarding the entrusted jobs.

d) Do not forget to assume an educational attitude regarding the result. Even though the result of the entrusted job is a failure or is insufficient, avoid adversely evaluating and unfavorably criticizing as long as the result was obtained by following the principle and by making a sincere effort. It is one of the superior methods of upbringing men to let them substitute for the manager while he is away.

4) Personal coaching

Individual guidance of the men through the job is called personal coaching. It is of the following sequence.

a) To discuss the establishment of job goals.

b) To encourage the men to reach the goals

c) To give assistance on the points which requiring assistance

d) To evaluate the result of the job performance.

e) To praise and esteem the men when they reach the level to accomplish jobs with good results

The method of coaching naturally varies by difference in ability level. When giving instructions and commands, when listening to reports and when troubles occur are good chances for personal coaching. The way to have men make reports and accept reports are important attitudes for guidance of the men.

5) Guidance through study and investigation

Upbringing of staff should be upbringing of the ability not only for the current jobs but for becoming capable of accomplishing future jobs. Study and investigation with the theme and project specially provided from an educational standpoint is an effective method of on-the-job training. It is accomplished as followings.

a) To let men do study and investigation which are normally the jobs of managers
b) To have men to take charge of special projects (usually charged plural men)
c) To let the men give business guidance to freshmen and men of lower levels.
d) To name men responsible for study and investigation

6) Presentation at a study meeting

It is said that teaching is the best method of learning. The study meeting method is an effective method of education for both speaker and audience. To let men report the contents of training after completion of off-the-job training is another effective means of education.

7) Guidance through group discussion

Group discussion at meetings can also be used as a stage of on-the-job training. Discussion of the problems of program production and of the method of correction while reproducing a program recorded by VTR is one method. It is also possible to effect guidance in combination with the method described in the preceding paragraph 6). Off-the-job training report meetings and technical matter report meetings are also held. See PART V, paragraph 2.2.1 (2).

8) Collective training at job site on professional themes concerning duties. Examples of such training are given below.

   a) Lecture by and discussion with lecturers inside or outside of the organization on professional themes
   b) Lecture on related jobs so that knowledge is deepened
   c) Lecture and practice about new technology

9) Preparation of reports

   Let the men write reports on a subject such as improvement of their duties. For example, let men monitor the program which is on the air, to point out things for improvement and to examine the method of improvement.

10) Job rotation

   Change job supervision from an educational standpoint. Job rotation is particularly important for freshmen and newcomer for the purpose of letting them obtain knowledge of the jobs and using it as an aid to judge future learning ability and aptitude. It is highly advisable to find excellent staff members and carry out person-to-person training for them.

(3) Conditions for Effective Performance of On-the-Job Training

1) Making on-the-job training a routine matter

   Good results of on-the-job training can be obtained when on-the-job training becomes daily routine.

2) Upbringing of an on-the-job training leader

   Managers are not the only leaders for on-the-job training. Good results are obtained at job sites where senior staff lead the junior staff.

3) Good communication

   At such job site where the manager and his men have good morale, good communication and rich human relations the controller can be humanly concerned about his men and can carry out active listening as a good listener.

4) Self enlightenment of manager

   The most essential element for obtaining a superior effect in on-the-job training is the manager himself who is in charge of training. The manager who desires to develop the ability of his men should be self enlightening. Development of the ability of his men is directly connected to the development of his own ability.

5) Belief and Patience of Manager

Upbringing of a staff cannot be accomplished in a day. The faith of the manager motivates his men and persistent patience causes his men to shine.

The "atmosphere of the job site" is another major condition that affects on-the-job training. Even if every one of the staff members who compose the group is self enlightened, good results cannot be obtained, if the atmosphere of the job site is such that it does not allow development of the staff. Consequently, it is a significant job of the manager to create an atmosphere for the job site which encourages advancement.

(4) Examination of The Result of Study and Supplementary Guidance

It is said that the result of on-the-job training is determined in this stage. No matter how guidance is undertaken the significance of the training is reduced if the correct grasp for the results are not obtained.

1) Routine follow-up

It is not true that examination of the result of training is not required until a certain period of time elapse to reach the goal. Follow-up during the process of training through careful observation and make-up of deficiencies is naturally required.

The period of on-the-job training may vary from one month or two through one year or longer depending upon the goal. The controller is required to record the process of on-the-job training, to observe the ability of each of his men and to establish the goal of guidance for each person.

2) Method of examination of the results of training

When the training period has elapsed carefully examine the result of the training. Major points to pay attention to are:

a) What kind of result was obtained

b) If the method of guidance was appropriate

The former point signifies if training needs which were set at the beginning were satisfied or how much they were fulfilled, and the latter point signifies if the method of training was appropriate.

There are a number of methods for making comparison is practice. Usually, such a method is to compare data obtained before and after the training (data includes such quantitative ones as the volume and speed of the duties accomplished and number of proposals as well as the opinion of those concerned) and to compare those who were trained with those who were not trained. Having a talk with the trained staff to observe how they recognize their growth is said to be very effective.

3) Supplementary guidance

Supplementary guidance means continuation of guidance toward the same goal when the original goal was not achieved in the scheduled period of time.

If it is considered that the original goal was completely reached, on-the-job training will be programmed for different training needs. That is, even if one goal of on-the-job training is reached, it does not mean completion. It only means the beginning of an advancement toward new training needs.

1.3.2 Basic Idea of Off-the-Job Group Training

(1) What is off-the-job training?

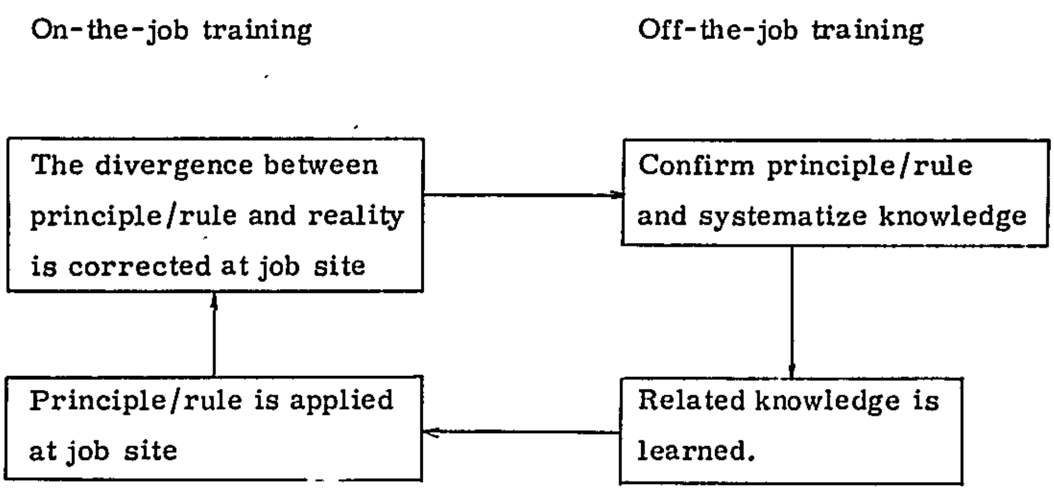
Off-the-job training is a training method whereby training is carried out exclusively for a common theme (VTR training and announcer training, for example) based on a curriculum with the staff released from daily duties. It mainly refers to the training carried out at training centers.

The features and advantages of off-the-job training are as follows.

1) It is possible to systematically carry out uniform training to a large number of staff members.
2) Systematic knowledge and principles can be taught within a short period of time.
3) The trainees can concentrate in the training as the training is carried out away from daily duties.
4) Professional lecturers can be readily obtained.
5) Special equipment and tools can be used.
6) The staff of different sections and divisions can have chances to exchange their knowledge and experience.
7) Collective efforts are made for the goal of training.

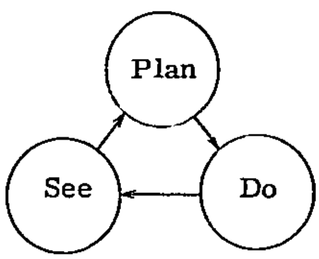
Both on-the-job training and off-the-job training have advantages, and it is possible to obtain good results when both are suitably utilized. Consequently, the managers should have close contact with the staff of the training center to obtain the necessary assistance and advice. Positively cooperate with the staff of the training centers with various surveys and plans so that desirable training programs can be made.

The following relation exists between on-the-job training and off-the-job training.



The sequence of off-the-job training is in the cycle of planning, enforcement and examination, which is identical to that of on-the-job training described in PART V, Paragraph 1.3.1 (1). In this case,

1) Planning means establishment of a training principle, discovery of training needs, establishment of a training structure, composition of a curriculum and preparation of a schedule;
2) Enforcement means to carry out training; and
3) Examination means development of a feedback function with measurement and evaluation of effect of training to check effectiveness.



The system of off-the-job collective training may be divided into a number of categories, and the following is normal systematization.

1) System classified by class

a) Systematization by class (rank)

Can be divided into freshman training, general staff training and management training

b) Systematization by degree of experience:

Can be divided into apprentice training, experienced staff training and highly experienced staff training.

2) System classified by function

This system aims at the specialization of the job and specialization of training curriculum. It is divided into program production training and technical training. It can be further divided into program production training and technical training. It can be further divided into producer training, announcer training, reporter training, transmitter training and VTR training, etc.

Besides the above, such training as a culture seminar and training for development of creativity with the staff members in general as the subject can also be made.

(2) Giving Shape to Off-the-Job Collective Training Plans

Basic systems of off-the-job training were described above. Freshman training ⟶ basic training ⟶ professional training ⟶ manager training

can be considered as a routine flow of the system which summarizes and gives shape to training. Odd off-the-job collective training may also be carried out when new systems (color system and automatic and remote control system, for example) and/or new equipment is introduced.

When planning such training it is essential to thoroughly take the long-term concept and management principle of the enterprise or organization into account and to compose a curriculum incorporating training needs at each job site in order that superior training results are obtained. It is also necessary to compose a curriculum which give the practical knowledge and skill required for routine work through on-the-job training and to give opportunities through off-the-job training for acquiring rules and theoretical backing necessary for understanding practical knowledge so that it helps future growth of the ability. Particularly with respect to such software technology as production of program the improvement in technique can be made only through on-the-job training. For improvement of such technique as the method of reporting, camera work, mixing and judgement of picture quality, it is important to become experienced with practical work by observing and grasping the method the senior staff uses to accomplish their job listening to and seeing excellent TV and radio programs, music and movies. The long-term accumulation of experience is also required. In other words, long-term experience based on rules and principles is an important factor for improvement of knowledge and skill regarding the above mentioned software technology. Poor program production technique will directly result in a drop in quality of programs. In order to avoid such occurrence it is desirable that new knowledge and skill are always learned and new techniques are developed. Such improvement can be made based only on long-term experience.

Broadcasting programs are the results when all the functions are summed up. In order that they are of high level, the knowledge and skill level of each function should naturally be high. In addition, good teamwork among functions is important so that excellent works are accomplished. Having basic knowledge on the related functions is an important factor to create good teamwork. With freshman training it is desirable to let freshmen learn knowledge and skill on broadcasting in general with the above factors taken into account. It is also desirable to let freshmen to take charge of jobs in a number of related functions for a few years instead of fixing them to specific functions. The managers should judge the hidden ability and aptitude of freshmen during these years to determine the path the freshmen should take. On the other hand, it is difficult for each person to professionally master the knowledge and skill related to all functions. Consequently, for the purpose of providing broadcasting of high quality, developing of the professional ability of staff members should be in accordance with the aptitude of each individual. From these reasons it is necessary that basic training and professional training carried out following freshman training be segmented and professionalized to the greatest extent possible. This training is also called function training.

It is desirable that the period of function training be short from the standpoint of efficiency and results are not obtained in proportion to the time spent in off-the-job training. Training is carried out with the men away from the routine jobs resulting in an increased burden on each job site especially if the length of time the trainees are away from job sites is long. Training aims at solving problems the staff members have questions about and also improvement in knowledge and technique through leaning of new technology and technique. What is more important is to motivate each individual toward self enlightenment.

If trainings are classified by function, the form should naturally follow the flow of jobs in the enterprise or organization, and it is essential to compose a curriculum which fully takes the management principle into account for the purpose of obtaining superior training results.

(3) Conditions to make off-the-job training effective

Function training is mainly discussed here.

1) Make the knowledge and technology level of the trainees uniform to the most possible extent. It is important to select participants with full attention paid to the object, aim, contents and level. This is because difference in these elements among trainees results in a great reduction

in the training effect.

2) Training should be made by lecturers who correctly consider the training needs of the trainees. From this reason it is desirable that training is effected by the lecturers from within the enterprise or organization rather than from outside.

3) The term of the training period shall be one week or two, and training shall be carried out intensively within a short period of time. If the training period is excessive, the efficiency will drop due to the fatigue of the trainees. Instead, establishment of such a training cycle as on-the-job training ⟶ off-the-job training ⟶ on-the-job training will provide better results for upbringing of the staff.

4) Appropriate number of trainees per group is 10 to 20. The number of trainees is also restricted from the scale of training equipment (class room, drilling equipment, etc.). If the number is too small, good efficiency cannot be obtained. However, an excessive number of trainees will result in poor control of the trainees.

5) Teaching tools which are capable of improving the training effect shall be used. Such teaching tools as slides and films which appeal to the trainees will provide excellent results. As stated by the proverb "Seeing is believing", seeing in addition to listening is an excellent means to obtain good results.

Above mentioned elements are the conditions to effectively carry out collective training. Further, listening to trainees' opinion and impressions can be used as a help to check the degree of understanding of the trainees and also to make subsequent training programs more effective.

Chapter 2 Training Plan

2.1 Training of Program Production Staffs

Program production staffs generally mean those who are in charge of the planning, production, reporting, editing, announcing, camera handling, lighting, stage handling and make-up.

2.1.1 On-the-Job Training for Program Production Staffs

Every one of the broadcasting programs has its own individuality, and it is not possible to produce them uniformly. From this reason with off-the-job training the principles and rules only should be taught, with an improvement of the ability level of the staff made through on-the-job training. Production of broadcasting programs is a kind of knowledge production activity, and the basis of the activities is accomplished by the brains of the individual staff. The fact that knowledge is demanded by the subscribers is that unique knowledge cannot be obtained through other sources. In other words, for the purpose of producing excellent programs it is most important to develop the creativity of each individual staff. For this reason study of rich practical knowledge on related works is highly required.

The method of carrying on-the-job training was described in PART V, sub-section 1.3.1. It is advisable to start with the items which are currently possible and to then advance to other items. For example,

(1) Have the trainees monitor a certain program, and let them point out good points and those points which require improvement. Have switchers point out matters related to cutting; have cameramen do the same related to camera work, for example. Then let them consider why these matters have occurred. It is necessary to thus train eyes and ears through observing and listening to programs. Such training will result in self improvement of knowledge and technique. The points at which subscribers feel shocks and/or abnormalities will always be

problems. Of course such an effect is intended in some cases. However, it is most important in general not to cause subscribers to be conscious of the presence of cameras and microphones as well as switchers for cutting. Further, for the purpose of providing programs with variation it is basically important with respect to camera work that cameras take pictures while moving if the object is stationary; and cameras are stationary when the object is moving. Many of these matters are left up to the judgement of the staff who are directly in charge. Excellent work requires that the points which subscribers want to see and hear are suitable expressed correct timing along with the flow of the programs. The ability to such expression can be obtained only through contact with many good works. Consequently, it is a good method to have the trainees monitor programs and point out excellent points which require improvement. It is also important during such training that the manager who gives instruction also monitors the same programs.

It is desirable that an atmosphere be created that the staff voluntarily observes programs during their off-duty hours to brush up their knowledge and technique. For the above purpose it is recommended to provide a simple monitor room and a listening room so that the staff members can spend time for such purposes at any time.

(2) Let the staff positively produce trial programs by making use of free time, and have such programs recorded on tapes. Then open study meetings, show the tapes and discuss methods of improvement. Start with such subjects, for example, that if the intention of the program was correctly expressed, if the flow of the programs is smooth and then proceed to the subjects related to the quality of picture, sound and teamwork. For elevation of the ability to judge

the quality of programs, it is first important to train the eyes and ears of the staff members. If such ability is acquired, the staff will naturally be able to find the methods for improvement. Paragraphs (1) and (2) above as well as paragraph (3) below cover these points.

(3) Provide chances to admire excellent music, dramas and movies for staff members and have them to submit reports on them.

(4) With production of programs, as already described, close relation of various functions is essential to accomplish high quality work, and consequently, it is desirable to learn fundamental knowledge and the technique of related functions. For this purpose train junior class trainees without fixing specific functions. Understanding of the duties of third persons will result in the production of good programs as a cooperative relationship is created. For example, when broadcasting a film program excellent TV pictures cannot be obtained unless the film cameramen determine picture taking conditions based on a thorough knowledge of various characteristics of the telecine system. The range of the brightness that can be reproduced by TV monitors is reduced to 1/3 to 1/4 of the reproduceable range of film itself. Consequently, it becomes necessary that the films used for TV broadcasting avoids scenes in which contrast range is too broad. Even if the picture is good when seen on a screen, it may be poor when broadcasted through a telecine system due to the above reason. Improvement in this point cannot be made unless producers and cameramen produce the program with the above mentioned characteristics taken into account.

(5) It is helpful for personnel and also for their work sites to let staff members who participated in off-the-job training and overseas training report their experiences upon return. Also they should coach junior staff members so that the knowledge and technique they have learned is widely propagated.

2.1.2 Off-the-Job Group Training for Program Production Staffs

(1) Freshmen Training

The object is to have freshmen recognize and understand basic doctrines of enterprise and/or organization, to deepen self consciousness and a sense of responsibility as staff members, to have humanism as members of society and to learn basic knowledge and techniques of their jobs as well as related jobs. A period of two to three months is required as this covers a broad field.

It is desirable that the courses be classified in the manner most suited to the organization and also to the flow of the jobs. Curriculum that corresponds to the current job situation should be prepared. Producer course for planning staff and producers, reporter course and production technician course for cameramen, mixers and lightmen are examples. The outlines of curriculums of this trainings are described below.

1) Freshman training for producers

1st week	Laws and regulations related to broadcasting, information on society, nature of mass communication, broadcasting technology, staff systems, etc.
2nd week	Process with which programs reach subscribers, nature and functions of broadcasting, process with which programs are produced, how broadcasting journalism should be, responsibilities of broadcasting, etc.
3rd week	Broadcasting sentences and script, practice of portable tape recorders and tape editing, practice of comment on production, practice on scripts, how to play records, etc.

4th week	Composition of programs, criteria of broadcasting programs, culture programs, reporting programs, entertainment programs, etc.
5th week	Reporting of news, basic knowledge of radio studio and practice, listening to excellent radio programs, etc.
6th week	Basic knowledge of TV studio and practice, knowledge of color TV, etc.
7th week	Practice at TV studio, basic knowledge of out side pick-up programs and practice.
8th week	Practice of out side pick-up programs.

2) Freshman training for reporters

1st week	Identical to those for producers
2nd week	" " .
3rd week	Basis of picture taking and practice, communication network and equipment, phototelegraphy, examination of rush film, practice of preparation of manuscript.
4th week	Report from police office, report from local government administration, report on economic matters, report on judical matters, basis of interviews, fundamentals of reporting programs, etc.
5th week	Practice of recording for report program and tape editing, practice of preparation of manuscripts, etc.
6th week	Basis of color picture taking, practice of picture taking, basis and practice of disaster reporting, etc.
7th week	Film editing and tellop writing, practice of reporting, etc.

8th week	Description, reporting with 16 mm camera, practice of talk interview

3) Freshman training for announcers

1st week	Identical to those for producers
2nd week	" "
3rd week	Basis of vocalization, handling of tape recorders, introduction to announcement, introduction to news program, etc.
4th week	Handling of portable tape recorders, what is interview, etiquette of conversation, sentences for broadcasting, announcing practice, etc.
5th week	Various programs vs. footing of announcers, how to score, announcing practice, practice of preparation of manuscript.
6th week	How to read and write scenarios, construction of words and expression, announcing practice, etc.
7th week	Announcing practice, planning and representation of programs.

4) Freshman training for production technicians

1st week	Identical to those for producers
2nd week	" "
3rd week	Introduction to radio program production technique, introduction of TV program production technique, varieties and usage of microphones, basic arrangement of microphones, basis of mixing technique, stereo production, etc.

4th week	Varieties and usage of lighting equipment, basis of lighting, tone of pictures with lighting, dimming equipment, special effect with lighting, etc.
5th week	Picture taking equipment, basis of camera work, basic knowledge of film, exposure, introduction to development and telecine equipment, special phototaking, edition of films, etc.
6th week	Introduction to out side pick-up program production technique, basic knowledge and operation of microwave transmitter/receiver.
7th week	Practice and examination of program production
8th week	" "

The above are examples of freshman training for program production staffs. Until such training plans as described above are on the right track it is advisable to carry out training at the Africa Literature Center and Evelyn Hone College and to start with what can be accomplished in accordance with the situation.

(2) Function training for program production staffs

Let staff members of the respective job functions learn at the job sites the knowledge and technique necessary for performance of duties as a motivation for self enlightenment. The term of training period shall be one week or two and training shall be carried out intensively.

1) Basic training

Let staff members who do not yet have enough experience (between 2 and 3 years after being employed) learn the basic knowledge and functions required for the accomplishment of duties. Examples of training for the respective functions are described below.

a) Basic training for producers

Part I	Planning and composition of radio programs, planning and composition of TV programs, study of recorded programs emergency disaster broad-casting.
Part II	Essence of broadcasting and social responsibility, study of recorded program, aims of program production, discussion and reporting on planning and composition of programs.

b) Basic training for reporters

Part I	Aims of data collection, ethics of reporting, study on cases of reporting, report of reporting experience and discussion, report on international affairs.
Part II	Mission of reporting, report of reporting experience and discussion, ethics of reporting, study of reporting of emergency disaster, essence and functions of broadcasting, handling of handy-talky radios, etc.

c) Basic training for announcers

Study of report programs, study of interview programs, study of information programs, broadcasting of emergency disaster, etc.

d) Basic training for production technicians

Part I	Aural equipment and gist of operation, aural level and level control, frequency spectrum and equalizing, treatment of echo time, dubbing of sound, etc.
Part II	Basic rules of picture composition, picture composition patterns and psychological effect, picture composition through golden section, camera work in practice, etc.
Part III	Photoelectric conversion characteristics of camera tubes and contrast range by lighting, ratio between base light and key light, lighting of day-light scene, lighting of night scene, etc.

The above are only examples of basic training for respective job functions. Where training is divided into a number of parts it is desirable that training of each subsequent part be carried out with an interval of 6 months to 12 months, rather than continuously. For the purpose of obtaining higher training results it is necessary to provide time for supplementary lectures. Lectures which cover the principles and rules learned and acquired through practical application at job sites and provide job direction for solving newly found problems and questions.

2) Professional training

Professional training is accomplished with staff members who are professionally processing jobs (5 - 10 years after being employed). The object is for them to learn professional knowledge and techniques and to acquire a high degree of duty accomplishing ability.

a) Professional training for producers

Part I	Study of recorded programs and discussion, principle of representation, how disaster broadcasting should be, etc.
Part II	Reporting and discussion regarding possibilities of TV documentary (by using media other than film, that is, VTR and out side pick-up broadcasting, for example), documentary from a methodological viewpoint, study of documentary programs, etc.
Part III	Representation of drama programs, study of excellent drama programs, presentation of self made scenerio and examination, etc.
Part IV	To have trainees to participate in Part II of the training for reporters to be described below.
Part V	Color design, problems encountered when producing color programs in studio, problems of color telecine broadcasting. color effect by lighting, study of color out side pick-up broadcasting at night time, physiology of visual sensation, etc.

b) Professional training for reporters

Part I	Mission of information, basis of disaster report, broadcasting terms for news programs, ethics of data collection, etc.
Part II	Economy of 70's agriculture in the future, study of economy report programs, problems of local development, problems of distribution, study of public nuisance report programs, etc.

Part III	News report and its problems, study of report programs, study of emergency disaster programs, study of overseas report programs, discussion on social mission of information, etc.

c) Professional training for announcers

Part I	Interviewing, broadcasting terms and broadcasting sentences, study of recorded programs, broadcasting of disaster broadcasting, etc.
Part II	Consideration of words used in broadcasting, selection and limits of words used in broadcasting, spoken words in school education, language functions, etc.

d) Professional training for production technicians

Expression of pictures and thoughts from the standpoint of representation, study of dramas, plans of out side pick-up broadcasting, gist of production technique, study of programs, etc.

Only examples of professional training for respective functions were given above. It is desirable that the contents of training be selected from what is most needed at the time. Because the contents are of a considerable high level it will naturally become necessary to invite outside authorities as lecturers.

2.2 Training of Engineers

Training to be made with the engineering staff who are in charge of such duties as control, operation, maintenance and improvement of equipment as well as planning of equipment as the object is described below. Equipment of a broadcasting station is such that the various equipment necessary for studio, out side pick-up broadcasting and transmission etc. are arranged differently for each medium (Radio, FM and television). Consequently, knowledge and technique covering a very wide range is required to completely understand and operate them. Broadcasting of good quality can be accomplished only when all of the above mentioned equipment is operated under satisfactory conditions. This equipment is not independently operated, but perform their functions when they are connected to each other. For the above reasons engineers who operate broadcasting station equipment are requested to have a systematic knowledge on the equipment in general as well as basic knowledge and technique regarding each equipment. Because staff members who have such duties as maintenance and improvement and make planning for equipment are required to have highly professional knowledge and functions, it is not possible that a single person develops professional knowledge and functions regarding all the equipment. Professionalization that corresponds to aptitude is therefore necessary, and thus it is desired that a development plan for staff members be established along this line. That is, have begineers absorb knowledge and technique of a wide range instead of fixing each individual to a specific function, and give professional training on specific functions as the staff members become experienced.

2.2.1 On-the-Job Training for Engineers

Various training plans can be established with reference made to concrete methods for on-the-job training described in PART V, paragraph (2) of sub-section 1.3.1. Some examples are given below.

(1) Have trainees make reports on elimination of weak points of the equipment and on the problems of control. If the ideas are

of a materializable nature, have them make plans for practical solution and let them carry out the plans. Training of this nature is helpful for judgement of the ability of the staff and is necessary for development. When carrying out this training it is desirable to let less experienced staff members participate with proper guidance given.

(2) When the jobs mentioned in the preceding paragraph are carried out the manager should let the staff in charge trace the results and let them prepare plans for necessary control methods, operation criteria and method of maintenance. The result shall be summarized in the form of a report to be used as technical data.

It is also a good means of training to let the staff in charge present technical reports at meetings of the same group for the purpose of fully propagating the results to those concerned. Accumulated data can be used as valuable teaching tools for training or junior men. Have the most fruitful reports presented at the engineers' conference to be held once a year. This is required for the advancement of knowledge and technique of engineers in general. Such training also provides a favorable effect for creating an atomosphere which maker possible self enlightenment at job sites. As previously stated, self enlightenment is most important for the advancement of ability.

(3) Open study meetings periodically. Schedule in advance those who make the presentation plus the subject and date and provide time necessary for preparation. Do not expect contents of high grade from the beginning. But select such items as methods of control of studio cameras and method of control of VTRs which are common but need to be understood by every one of the staff members. Let senior staff speak of their experience and thus elevate the level of the entire group. If discussion regarding the reasons why such controls are required

could be made on such occasions, better results can be obtained but doubtful points will also become apparent. Managers requested to let reporters or other suitable staff members study doubtful points and present the result of this study at the following meetings. Accumilation of such effect will surely elevate the knowledge and technical level of the group members.

(4) When staff members who have participated in off-the-job training and/or overseas training come back to the job site open a meeting to let them present the results of training and let them coach junior staff members.

2.2.2 Off-the-Job Group Training for Engineers

(1) Freshman training for engineers

The object and method of enforcement of this training is described in PART V, paragraph (1) of sub-section 2.1.2. With engineers, however, it is desirable to separate courses and prepare different curriculums in accordance with their school çareer.

1) Freshman training for university graduates

1st week	Identical to freshman training for producers.
2nd week	" "
3rd week 4th week	Theory and practice of synchronizing signal, Video amplifier, studio equipments.
5th week 6th week	Theory and practice of telecine equipment, developing equipment, VTR, automatic control system.
7th week 8th week	Theory and practice of radio transmitter, TV transmitter, FM transmitter and satellite equipment.
9th week	Theory of program production technique and practice of mixing, lighting and camera work.

2) Freshman training for high school graduates

The contents of freshman training for high school graduates shall be limited to the knowledge and technique required for the time being. Lay emphasis on the training carried out on-the-job site. Let them positively participate in function training and thus develop their ability.

1st week	Identical to freshman training for producers.
2nd week	〃 〃
3rd week	Theory and practice of transmission circuit, waveforms, on the various circuit, basis of transistors, low frequency amplifying circuit, method of measurement, and video amplifying circuit.
4th week	Theory and practice of pulse circuit, propagation of various waves and antennas, modulation, demodulation and synchronization.
5th week	Theory and practice of deflection circuit and introduction to program production technique.

(2) Functional Training for Engineers

See 2.1.2 (2) for the object and method of enforcement.

1) Basic training

Part I	Theory and practice of camera tubes, studio camera equipments, and introduction to microwave transmitting/receiving equipment.
Part II	Theory and practice of digital circuit, master control equipment, magnetic recording, VTR equipment, telecine equipment, automation system.

Part III	Introduction to radio, television and FM transmitters, and theory and practice of electron tubes and their circuit, high frequency circuit.

The object of this basic training is to let all the broadcasting engineers learn fundamental knowledge and techniques that form the basis of their techniligical ability. Let them systematically understand each technical field and thus cultivate the grounds for development of a comprehensive ability for technical duties. This is to promote consolidation and systematization of exprimentally learned knowledge with the relatively less experienced staff members. Thus creation of foundations for growth of ability and motivation for future development are assured. However, as in the case of basic training for program production staffs, subsequent training should be carried out with appropriate intervals.

2) Professional training

a) For studio equipment (including out side pick-up broadcasting) engineers.

On color analysis and synthesis, new camera tubes, microwave transmitter/receiver and their operation, reliability of equipments, scientific management for equipments.

b) For telecine equipment engineers

Systematic analysis of film technique in general for TV, film processing technique, telecine equipments and practice.

c) For VTR engineers

FM transmission system at VTR, servo system, problem on maintenance and operation of VTR (discussion), and control and operation of VTR head and tape.

d) For transmitter engineers

Part I	Theory and application of distributed constant circuit, electron tubes (klystron, TWT), wave propagation and antenna, modulation and transmission distortion.
Part II	Basis of satellite transmission system, introduction to satellite equipment, transmitting/receiving antenna, emergency power supply, anti-thunder measure, and reliability and maintenance of satellite equipment.
Part III	Automating equipment by pulse circuit at transmitting station, basis of logic circuit, transmitting station automating equipment and remote monitor and control equipment, and trouble shooting (practice)

Examples of off-the-job training to be periodically carried out with engineers as the object were described above. At the time when these training systems are established in the future, it is expected that training courses for statistical technique, scientific management technique and creative engineering of higher level will be provided. Until such training plans are realized carry out training at ZIT and Everyn Hone College (as before) and start net training plans which possible.

In addition to the above, temporary collective training should be carried out by equipment makers when new equipment is installed. This training is made to the staff on the occasion of the inspection at the maker's plant and to the staff when the equipment is installed in the station. This is for the purpose of providing the staff with the knowledge and technique necessary for operation, handling and maintenance so that performance of a new plan can be smoothly accomplished. It is suggested that staff members of a high technical level witness the inspection at the maker's plant.

Training courses related to production equipment (studio, out side pick-up broadcasting vehicle, EPU equipment), video transmission equipment (master control equipment, telecine equipment, VTR, FSS) and transmitting equipment can be considered. The contents of training shall include introduction to respective systems, operating principle of equipment, method of control, method of handling and operation, and method of maintenance using both lecture and practice. Recommended term of training period is about one month. This training should be included in the contract to be made when placing an order for equipment with the maker.

The staff members who are responsible for improvement of equipment as well as the planning for equipment are requested to have highly professional knowledge and technique. Consequently, it is recommended to employ those who majored in these subjects in professional schools and/or universities in this capacity.

Chapter 3 Training Facilities

For the purpose of effectively carrying out the various training described in the preceding section with satisfactory results it is desirable to have satisfactory facilities for training.

However, the facilities necessary for training in a broadcasting enterprise includes major TV studio facilities and such minor equipment as teaching tools and materials, requiring extensive funding for training equipment. Consequently, administrative judgement to determine the training facilities required is needed to keep within the scale of training to be carried out in the future. That is, training courses, number of trainees and frequency of training should be taken into account. If the frequency of use is not very high, use of other training facility such as Evelyn Hone College and ZIT is preferable from the standpoint of efficiency and economy.

3.1 Training Facility for the Time Being

It is desirable to consolidate the facility with emphasis laid on the facility for effectively enforcing on-the-job training.

(1) Consolidation of Meeting Rooms

Install blackboards, slide projectors, 16 mm film projectors, simple tape recorders, simple VTR and TV receivers so that job site study meetings, program monitor and examination meetings with programs projected can be made. Meeting rooms shall be provided with inlets for aural and visual signals for transmission to the transmitting stations so that recording of sound and picture can be made from time to time with the above mentioned simple tape recorders and simple VTR's. It is further desirable that the output of sound and pictures being currently recorded can be used in these rooms.

(2) Consolidation of library that staff members can use from time to time

Let the staff members make use of necessary textbooks, reference books, literature, and magazines to promote the self enlightenment of staff members.

(3) Carry out training by making use of the currently available equipment during the hours this equipment is not use.

3.2 Future Plan

Outline of the equipment necessary for training may be as follows.

(1) Classrooms

It is desirable that two or three rooms having a capacity of 20 persons each be provided with the equipment described in PART V, Paragraph 3.1 (1).

(2) Practice facility

1) One radio studio room (having floor space of some 30 m^2); with a set of necessary equipment including a mixing table, tape recorder player and disc player

2) One TV studio room (having floor space of 70 m^2); with a set of necessary equipment including video switching table, audio mixing tablė, 2 studio cameras, tape recorder/player, disc player, FSS equipment and lighting equipment.

3) Operation room; with VTR equipment, telecine equipment, developing equipment, synchronizing pulse generator, etc.

4) Transmitter room; with radio transmitter (1 kW), FM transmitter (1 kW), TV transmitter (1 kW), one set each.

5) Fundamentals study room; with various transistor circuits, TV receiver, and various measuring instruments.

6) Miscellaneous; with a set of reporting (covering) equipment including still camera, 16 mm film camera and portable tape recorder, etc.

(3) Ancillary Equipment

Teachers' room, library, teaching tool room and residence. Preparation and operation of this equipment will require a considerable amount of expenses and it is assumed that full time teachers are necessary for 15 to 20 persons. Consequently, management judgement of a high degree is required as already mentioned. It may be a practical method to use the studio equipment and transmission equipment in Lusaka (which will become excessive when the broadcasting network expansion plan is completed) in the future as training equipment.

Chapter 4 Others

Various training with staff members of broadcasting stations as the object and the facility required for such training were described above. Because it is considered that a period of at least ten years is necessary before the training is fairly under way and satisfactory results of training are recognized, it is appropriate that planning is made so that replenishment of the equipment and of the contents of training is made gradually.

It is most adviseable that appropriate first-line controllers work as teachers. It is natural that those who hold the jobs should be in charge of education, which is different from regular school education. It is probably necessary for the time being to dispatch those controllers who seem to be appropriate as teachers to overseas training organizations and to invite lecturers from appropriate overseas organizations for the purpose of replenishing the training plan. In this it is desirable that plans are materialized starting with what can be done at the appropriate time.

The followings are major training courses the Japanese Government is carrying out with those who are related to broadcasting in overseas countries at the present time.

(1) Seminar in broadcasting management

(2) Group training course in television broadcasting management

This is the carried out with training controllers of TV broadcasting stations as the object. The term is approximately 8 weeks.

(3) Group training course in educational television program

This is the training carried out with producers having experience of about 3 years as the object. The term is about 11 weeks.

(4) Group training course in television engineering

This is the training carried out with those who have knowledge of electronic technology equivalent to professional school graduates and also have a few years of experience as TV engineers. The term is about 13 weeks.

For details of these training courses please refer to the Japanese Embassy in your country.

PART VI MAINTENANCE AND OPERATION OF ENGINEERING FACILITIES

PART VI

MAINTENANCE AND OPERATION OF ENGINEERING FACILITIES

Chapter 1 Engineering Plan

It is desirable that the following engineering plan is for planning, construction and operation of a high quality, well stablized and efficient broadcasting system to carry out the mission of mass communication.

It consists of the following sections.

(1) Construction plan

(2) Maintenance plan

(3) Supply plan

(4) Engineering, operation and maintenance standard

It is desirable that this engineering plan shall be sent to the executing department together with the budget plan and executed in accordance with more detailed executing plans formulated.

1.1 Construction Plan

The mass media modernization plan made by the Japanese Government for the Republic of Zambia is long-term plan that requires a large construction fund and a long term. It is necessary that this plan will require adjustment from time to time in accordance with the changing situation.

It is desirable that the construction plan shall be executed in close cooperation with the constructing department in the first phase together with that a budget plan for the first phase shall be made and its construction fund shall be insured.

1.2 Maintenance Plan

Various plans required for operation and maintenance of existing and future equipment are within the scope of this maintenance plan. A long-term maintenance plan and budget plan necessary for operation and maintenance of engineering facilities seem most important for executing management smoothly.

1.2.1 Long-term Maintenance Plan

The serviceable life of technical equipment can be divided into two categories, i.e., physical life due to aging and deteriorating of electric parts, which cannot obtain satisfactory function and stability through repair or replacement of a part of components and practical life due to being changed with requirements in the elevation of functions of mass media which change in accordance with the social environment developments in disregard of physical life remaining. Large funds identical to construction funds are required to renew equipment with either physical life or practical life. Therefore it is desirable that maintenance and operation of engineering facilities shall be executed in accordance with a long-term maintenance plan which considers the renewal plan.

In reality, however, it is not very easy to secure funds for renewing. Accordingly, it is considered essential to form a maintenance plan of equipment for the purpose of extending the renewal period. The maintenance plan should be divided into the following two categories.

(1) Periodic Maintenance Plan

A periodic maintenance plan is made for the purpose of reduction of aging and deteriorating of engineering facilities. The best effect can be obtained if repair is confined to the mechanical sections of the equipment.

(2) Improvement Maintenance Plan

An improvement maintenance plan is made for the purpose of upgrading the functions of the engineering facilities through repair partially. It is required when operation and maintenance standards can not satisfied through regular repair or adjustment due to aging and deteriorate, or when it becomes necessary to upgrade the functions to the level of expanded social needs. The best effect can be obtained if repair is confined to the electrical system.

1.2.2 Budget Plan

The budget plan is necessary for the maintenance of the engineering facilities and also for operation of these facilities. Compilation of the budget may be made in a number of forms depending upon the situation of the country. Budget items deemed important are described below.

(1) Repair Expenses

Estimating repair expenses is as difficult as determining whether equipment should be renewed or have extended life through repair, because the principle and thoughts of the government are reflected in this estimation. Consequently, the budget plan for renewal and repair should be based on a long-term maintenance plan thoroughly investigated.

(2) Transmission Line Rental Charges

It is estimated that rental charges for TV micro links and audio lines as well as other long-term and temporary line rental charges become very expensive as the television and radio expansion plan is materialized. It is necessary, therefore, to formulate a budget plan and to reduce expenses through logical operation of lines.

(3) Power Supply Fee

Formulating budget plans for power supply charges should be made using a good estimate as a great increase in power consumption is expected due to the increase in the number of large-power TV transmitting stations and expanded operation of TV studios.

(4) Vacuum Tube Expenses

Expenses for renewal of vacuum tubes such as transmitting tubes and pick up tubes are the largest in expenses of supplies for engineering facilities. Because vacuum tubes are essential for broadcasting operation, it is necessary to form a budget plan which exactly fits the demand.

(5) General Operation Expenses

This expenses include general operation expenses for maintenance and operation such as the purchase of spare parts and repair of simple troubles, and so on in engineering facilities. An appropriate budget plan shall be also required for these expenses depending upon increases in the equipment used.

1.3 Supply Plan

The role of supply is immeasurable in support of operation and maintenance of engineering facilities.

The supply plan covers not only transmitting tubes and pick up tubes but also the purchase of spare parts, VTR heads and so on. Quite a long period may be required for procurement of them.

Therefore it is desirable that the supply plan be formulated making use of reliability methods and operation research method in the number of spare parts, spare units and spare tubes, and the establishment of an economical and efficient supply route.

1.4 Standards for Engineering, Operation and Maintenance

For the purpose of providing uniform quality broadcasting service and the exchange of programs will other countries, it is desirable that engineering, operation and maintenance standard shall be established and the performance of duties shall be based on these standard in engineering facilities.

1.4.1 Engineering Standards

It is desirable that engineering standards should be established for the purposes of good management. Good management will be capable with three points, the first point is modernization of broadcasting equipment in accordance with engineering innovations.
The second is the uniformity of these systems, the third is standardization of facilities and these in broadcasting services.

Engineering standards can be divided into equipment standards and engineering standards.

(1) Equipment Standards

Broadcasting equipment standards from the basis for construction, maintenance and operation of numerous equipment, such as the way of thinking, form of equipment, numbers of facilities and etc. These standards should fully take into consideration the duties and expenses required and should aim at rationalization of planning, operation and administration of equipment. These standards provide excellent guidance in the standardization of equipment and in the rationalization of duties. On the other hand, there standards may interfere in adaptability and advancement of technology if every detail is specified. Consequently, it is desirable that equipment standards be limited to basic matters which form an important basis for other specification of detail matters.

(2) Engineering Standards

Engineering standards should also aim at the standardization and rationalization of broadcasting equipment and also the provision of guidance for design, manufacture, supply maintenance and operation.

Because equipment is made uniform and consolidated through standardization, mass production of equipment becomes possible; the principle of design and manufacture becomes apparent; and further, prices can be reduced.

From the standpoint of supply it is possible to prepare standard goods of limited variety and always fulfill the needs of the field. In addition, large advantages are provided in the field, e.g., as the equipment is standardized, the method of operation is standardized, interchangeability is made possible among parts and equipment, the number of kinds and quantity of spares can be reduced.

However, specification of every detail may result in interference in engineering advancement. Consequently, it is desirable that minimum specifications be made on paints which are apparently useful for rationalization of equipment and that provide large advantages. These standards are of a nature essentially different from specifications that completely cover entire conditions for each piece of equipment. But these standards should provide an important basis for preparation of such specifications.

It is desirable that broadcasting engineering standards in the Republic of Zambia be based on CCIR Standards.

1.4.2 Operation Standards

These operation standards are provided for the purpose of maintaining and insuring the functioning broadcasting equipment together operating procedure. It is desirable that these standards specify basic details regarding values of signal waveforms, standard values for operating conditions and standard operation forms of engineering facilities, routine operation, and monitoring and remeding troubles.

1.4.3 Maintenance Standards

For the functions of engineering facilities to be fully indicated, it is desirable that basic matters such as frequency of inspection, inspection items, instructions for enforcement, standard values and remarks shall be summerized at each equipment and provided a basis for preparation of concrete detail and of maintenance procedures in field or operation. Maintenance standards based on engineering standard should be made with economy and efficiency taken into account to such an extent that the quality of broadcasting is not spoiled.

Chapter 2 Operation of Engineering Facilities

2.1 Broadcasting Program Operating Procedure

For smooth continuity of radio, TV and FM broadcasting it is necessary to specify basic details related to such duties as preparation, operation, measuring and monitoring which the operating staff shall be required. It is appropriate that necessary details be specified by each department in accordance with their needs.

It is desirable that the continuity of broadcasting programs shall be on-time operation as rule and programs shall be run on schedule and the provision of appropriate instructions and action shall be taken to ensure smooth continuity of program as described below.

2.1.1 Basic Matters

(1) Start of Broadcasting Service

1) Preparation

To check starting time by referring to the broadcasting program schedule table.

Also to check such materials as tape and film which are required at the same time.

To check time and synchronize watch.

2) Test before starting

To check for unusual conditions of video and audio level, video and audio quality between the studio station and the transmitting station and also along transmission lines by using test signals of video and audio.

3) Operation of starting broadcasting service

It is desirable that a test signals shall be sent in accordance with schedule table determined. Signals sent by video are call sign, test pattern, color bars, starting film, national flag and etc. signals sent by audio are call sign, music, time signal national anthem and etc.

(2) Sending of Programs

1) Sending of Programs

a) In Lusaka, to send programs through the downline (from Lusaka) and also to send programs directly to the transmitting station in Lusaka.

b) At local stations, to send programs through the upline (to Lusaka) and to send input signal of the downline to the local transmitting stations as a rule.

c) Using the line test. It is desirable that sending stations and receiving stations shall mutually check for unusual conditions of line before programs start as soon as connections are made.

2) Starting and ending time of program

a) To start and end on time.

b) With change-over of programs taken into account, that sound shall be started 2 seconds after scheduled starting time, and shall end 5 seconds before scheduled ending time.

3) Correct time broadcasting

a) Correct time broadcasting on the hour
To send specified correct time at specified hours. That the sending hours shall be these specified in the program table.

b) Digital correct time broadcasting
When digital correct time is superposed at left bottom corner of the TV picture, that sending is to be made from Lusaka at the time programs are started, and at specified hours, and in addition, sent continuously during specific hour bands.

(3) Change-over of programs

1) Inter-program change-over
That change-over is made at specified hours as a rule. However, this principle does not apply to particularly

important programs. Such exceptions shall be thoroughly advertised by use of broadcasting program tables or by other means of communication. The time, cue and method of change-over shall be decided in advance and change-over shall be made based on such information.

2) In-program change-over

That change-over shall be made by means of a change-over pattern, chime and other appropriate change-over cue.

(4) End of broadcasting

At end of broadcasting, to send ending film, ending music, national anthem or call sign in accordance with specified sending time table.

(5) Broadcasting outside of normal hours

When broadcasting may be commended before normal hours or may be extended after normal hours, that operation shall be made, as a rule, in accordance with a routine schedule for the start and end of broadcasting.

(6) Administration of broadcasting material

In administrating tapes and films of completed programs (program which contents are entirely recorded on either tape or film, and the sending of relays may be made without the presence of the program producer in charge there being no intermediate operation need between start and termination), and semi-completed programs (again the sending of relays may be made without the attendance of the program producer in charge, and no intermediate operation is needed except for the addition of program announcements and inscriptions etc. at the beginning and at the end), that care should be taken in the following points.

Also if any doubts or abnormalities arise, that the departments concerned should be immediately notified so that necessary action can be taken.

1) Acceptance of broadcasting material

To accept material from the program producing staff or material storage staff up until a pre-arranged time, together with the program reproduction sheet which is a material description sheet listing the name of broadcasting program, broadcasting hour and broadcasting time. When the material is delivered, to check the contents of the program reproduction sheet and note the date of delivery and the names of the persons concerned.

2) Pre-broadcasting operation

To check the material and to make preparation for sending.

3) After-broadcasting operation

To take necessary action such as checking reuse of the material.

2.1.2 Program Monitoring

Program monitoring is necessary to maintain good broadcasting quality, to prevent occurrence of troubles with braodcasting, and to take appropriate action immediately in case of emergency.

When trouble occurs, that necessary action shall be taken immediately in accordance with paragraph 2.1.3 "Troubles with broadcasting." If any doubt arises, that promptly notify the departments concerned so that appropriate action can be taken.

It is desirable that the following procedures and methods of monitoring be followed.

(1) Supervising Procedure

To supervise the over all operation of the respective systems by utilizing such automatic systems as off-air and no modulation alarms, and to check major points at appropriate times.

To check major items with respect to the following for programs broadcast from the station.

1) To check and compare with the broadcasting program table

2) To check lines.

3) To check the times of program change-over.

4) To check quality, level of video and audio.

(2) Method of Supervising

1) Supervising Broadcasting

Besides direct viewing on a TV receiver, which is done as a matter of principle, it is necessary use a supervising system. To use the picture monitor and speaker to supervise picture quality and sound quality.

2) Supervising when using line for material

That the receiving station, as well as the sending station, shall supervise in accordance with the program sending.

2.1.3 Troubles in Broadcasting

(1) Action to be taken upon the occurrence of troubles

It is desirable that operation staff shall take emergency action described below when any trouble occurs, so inconvenience the viewers as little as possible, and also "Execuse" and "Apology" be broadcasted. For troubles which make normal operation difficult among long hours, it is desirable that independent procedures be made, and action be taken in accordance with them.

1) Action against trouble of equipment

If any trouble occurs with broadcasting equipment, to make special efforts to continue sending of the program, and at the same time, to take action to restore the equipment trouble. In advance, to make a preferential order of use for substitutive lines in case trouble of audio lines occur simultaneously with two or more systems.

2) Action against trouble of program

If occurrence of trouble can be predicted in advance and there is sufficient time, that the operation staff shall get in touch with the compilation department and take necessary action.

If the trouble occurs immediately before broadcasting or during broadcasting, that the operation staff shall take such emergency action as sending of filler or stand-by programs, and shall immediately get in touch with the compilation department upon completion of the action.

That the compilation department shall fix in advance emergency program action *in case of such troubles* by the preparation of fillers and stand-by programs.

When trouble occurs from starting of program or intermittently in the program, that the principle of whether to rebroadcast the program from the beginning or to continue the program shall be determined in advance in accordance with the situation when recovery is made.

3) Sending of "Execuse" and "Apology"

To send "Execuse" or "Apology" immediately after the occurrence of trouble, during continuation of trouble, at the time of recovery, and when the program ends or during the following station break.

If breakdown or no-modulation trouble lasts for an extended period of time, to send "Execuse" and "Apology" through different systems.

(2) Standard on troubles with broadcasting

It is necessary to formulate a standard on broadcasting troubles for the purpose of providing uniform broadcasting service. It is desirable that establishment of a standard and *judgements made, should* be based on the influence on service to the viewing people.

(3) Report on troubles with broadcasting

The broadcasting supervisor has an important duty to grasp whether broadcastings continue with troubles or not. Consequently, upon occurrence of troubles which largely effect the viewing people it is desirable that prompt report shall be made to the predetermined broadcasting program continuity supervisor through telephone or other means of communication based on the standard on troubles with broadcasting. It is also desirable that a periodical report of troubles including prompt troubles and also other troubles, be made to the broadcasting program continuity supervisor.

1) Prompt report

   a) Scope and standard on troubles of broadcasting requiring prompt report:

      It is desirable that the scope and standard on the troubles of broadcasting requiring prompt report be formulated as a reference trouble standard for broadcasting.

   b) Contents of prompt report:

      That the following should be promptly reported each time the trouble requiring prompt report occurs. If there are any unclear points such as the cause of the trouble, that prompt report shall be made without the unclear points, and these points shall be promptly reported later as soon as they become clear.

      a. Name of station
      b. System
      c. Name of program
      d. Date and hour of occurrence and recovery; duration of trouble
      e. Phenomenon
      f. Action taken (both technical and program)
      g. Cause and remark

2) Periodic report

   It is desirable that a periodic report be made regarding predetermined items on troubles with broadcasting in general according to a prompt report.

2.2 Engineering Facilities Operating Procedure

Engineering facilities cover a broad field, are complicated, and provides high grade functions. For the purpose of exact operation of equipment in their function, it is desirable that basic items such as preparation, operation, control and action to be taken by each department as described below as reference. It is desiable that each department formulate detailed and concrete operation procedures for engineering facilities on the basis of this .

2.2.1 Routine Works

It is clear that basic items of routine duties shall be limited to items which are repeated every day, and for production of programs and for operation of such equipment as air conditioning equipment that have specific functions, their basic items shall be made as occasion demands.

(1) Standard on Adjustment

To provide standard on setting of levels and modulation.

(2) Operation and Control

To clarify whether the operation of each equipment regarding control of the power supply is manual or auto, and the method of control and others. As an operating procedure when trouble occurs with equipment, to make clear procedures for the change-over to independent operation from parallel operation of broadcasting equipment, start and stop of the emergency power supply system when troubles occur with the commercial power supply and others.

(3) Work to be done before starting and after ending broadcasting

To clarify the method of checking for unusual conditions of starting equipment necessary for broadcasting and power supply and of acting against such troubles before starting broadcasting.

After end of broadcasting, to clarify the method of confirmation in stoppage of equipment and action in trouble.

To clarify operation testing where adjustment, measurement and work are made after end of broadcasting; confirmation of normal condition; and confirmation of safety from fire and theft.

(4) Supervising Work

It is desirable that the standard on method, scope and frequency of checking the condition of equipment, and action to taken in unusual conditions should be specified.

2.2.2 Action for Broadcast Accidents

It is desirable that action shall be taken so that accidents in broadcasting are prevented. If any trouble occurs, it is important to continue broadcasting by one way or an other. It is desirable that the following action shall be provided for this purpose.

(1) Everyday Properation

1) To make an everyday effort to eliminate the weak point of the equipment. To fix a method for emergency action to provide against the occurrence of troubles. That training should be carried out from time to time so that action can be quickly and smoothly carried out if trouble occurs.

2) To make thorough previous arrangements with the organization concerned for action against troubles with transmission line and power supply.

(2) Action to be taken when trouble occurs

1) Immediately to take necessary action and attempt to continue broadcasting.

2) If the cause of the trouble of equipment lies within the station, to determine the cause, and to endeavour to prevent occurrence of troubles of unknown cause, and to take necessary action so that the same kind of trouble does not occur again.

3) If the cause of the trouble in power supply etc. lies outside the station, immediately to get in touch with the organization concerned, to check the cause and to estimate time of recovery and to urge the organization for urgent recovery. If required, to take any necessary action to continue broadcasting, depending upon the situation.

2.2.3 Safety Plan

(1) Securing of Safety

For hazardous work such as handling of high tension power supplies, and work at high elevations, to make thorough provisions for equipment required to prevent personal harm and also to establish safety precautions.

(2) Action to be taken when trouble occurs

1) If any personal harm occurs, to apply first-aid treatment, to report to the manager of the department and then take necessary action.

2) Thoroughly to investigate the cause of the trouble and to recheck the action to prevent troubles. Then immedia-ately to carry out the action required to prevent of troubles. of troubles.

2.2.4 Emergency Plan

When emergencies such as fire occur, to try to keep damage to engineering facilities and to broadcasting material at a minimum. If any damage occurs, to make efforts to maintain the functions of the equipment through quick and appropriate emergency action so that broadcasting can be continued.

2.2.5 Report

It is desirable that necessary reports shall be required as occasion demand or periodically to provide and correct the basis and concrete items with regard to operation of engineering facilities and to grasp and improve problems.