REPORT ON SURVEY
FOR
BROADCASTING EXPANSION PROJECT
IN
PHNOM-PENH
KHMER REPUBLIC

February 1972

OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

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PREFACE

Upon the request of the Government of the Khmer Republic, the Government of Japan agreed to undertake a feasibility survey for the Broadcasting Expansion Project in Phnom-Penh and entrusted the Overseas Technical Cooperation Agency with its execution.

For the implementation of the survey, a survey team comprising four experts headed by Mr. Yasuo Otaki, Deputy Head of Technical Division, Broadcasting Department, Radio Regulatory Bureau, Ministry of Posts and Telecommunications, was organized and dispatched to the Khmer Republic.

During its 25-day stay in the Khmer Republic from September 8, 1971, the survey team occupied itself with detailed investigation of radio and TV broadcasting systems in Phnom-Penh inclusive of their facilities, operation and management, and also collected data and information required for planning their improvement and expansion. The team's findings were compiled into an interim report which was submitted to the Ministry of Information of the Khmer Republic to indicate the team's fundamental approach to the project. On its way back to Japan, the team stopped over in Bangkok and carried out a survey on the frequencies and field intensity of the radio waves transmitted from Phnom-Penh Broadcasting Station.

After the team's return to Japan, the survey data were put to a comprehensive study for expanding the service area and improving the programmes and programme production techniques of Phnom-Penh Broadcasting Station as well as for ensuring better maintenance service and rational operation and management of the station. This study provided the basis for formulating a plan presented in this report for implementing the project.

It will give me great pleasure if this report proves useful for early materialization of the expansion project and for socio-economic development and improvement of education of the Khmer Republic, and serves, at once, for enhancing the friendly relations between the Khmer Republic and Japan.

I take this opportunity to express my heartfelt gratitude to the officials of competent authorities of the Khmer Republic who extended unlimited cooperation and assistance to the team throughout the survey period.

February 1972

K. Tatsuke

Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency

LETTER OF TRANSMITTAL

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

I take great pleasure in presenting herewith the Report on the Survey for the Expansion Project of Broadcasting System in Phnom-Penh.

The survey for the said project was conducted, on the one hand, for the purpose of improving and expand the radio broadcasting facilities in Phnom-Penh so as to enlarge the service area of the broadcasting currently carried out and improve its programmes and programme production techniques, and on the other, to effect minor improvements to TV broadcasting facilities to ensure their efficient and systematic utilization and augment TV programme production ability.

The field survey was carried out for a period of 25 days from September 8, 1971, during which a detailed investigation was made on radio and TV broadcasting facilities with respect to their technical aspects, operation, and maintenance and management systems. During the said survey period, the team met the officials of the Government of the Khmer Republic on a number of occasions and discussed with them at length about the project.

In the course of compiling this report, which is an outcome of a prudent study made in Japan on the survey data, each team member fulfilled his task in full recognition of the need for planning the project for advancing the interests of the people of the Khmer Republic. The report therefore fully reflects the intentions of the Ministry of Information of the republic.

It is anticipated that the Expansion Project will require a total capital investment of about 1, 150 million yen and a period of about two years.

I am convinced that the project, when completed, will contribute immensely to the socio-economic development and educational and

cultural improvement of the Khmer Republic, and will also enrich and give diversity to the broadcasting activities of the country to the extent that there will be created a closer tie and familiarity between the people and broadcasting programmes.

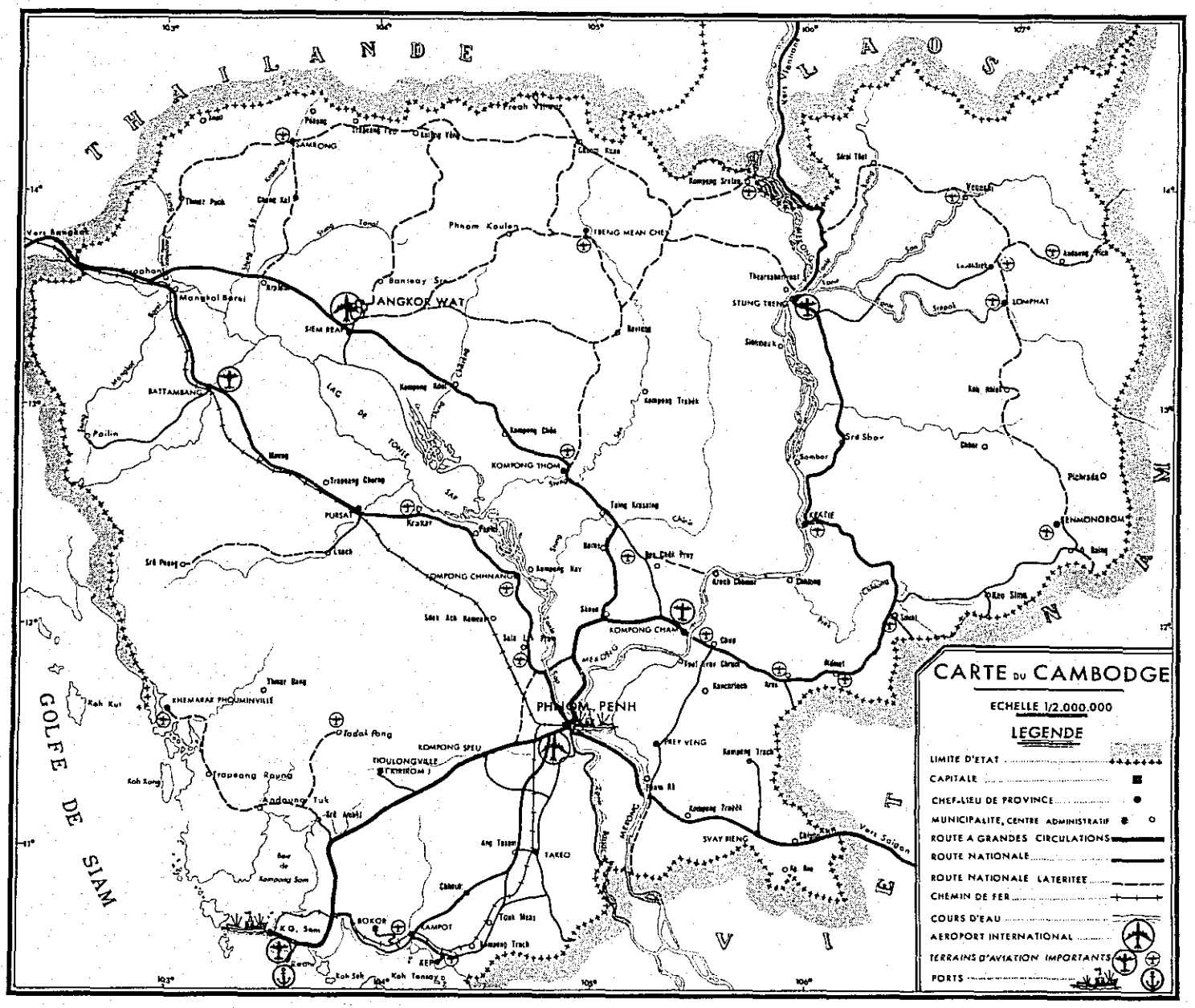
In presenting this report, I wish to express my appreciation to the Ministry of Information of the Khmer Republic and Japanese Embassies in the Khmer Republic and Thailand for valuable cooperation and assistance, and to the Ministry of Foreign Affairs, Ministry of Posts and Telecommunications and Japan Broadcasting Corporation for enabling the team to accomplish its assignment as scheduled.

February 1972

Yasuo Otaki

Yasuo Otaki

Leader of Japanese Survey Team
for the Broadcasting Expansion Project
in Phnom-Penh, Khmer Republic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ROUTE NATIONALE
ROUTE NATIONALE LATERITEE
CHEMIN DE FER
COURS D'EAU
AEROPORT INTERNATIONAL
TERRAINS D'AVIATION IMPORTANTS
PORTS

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PART I SUMMARY

PART I SUMMARY

This report has been prepared on the basis of the results of the survey conducted in September 1971 at the request of the Government of the Khmer Republic for improvement and expansion of the broadcasting facilities in Phnom-Penh.

CHAPTER I RECOMMENDATIONS

1.1 Expansion of Radio Broadcasting Facilities

Radio receivers are well popularized throught the Khmer Republic. Radio broadcasting therefore carries great weight in the development of various aspects of the republic involving politics, economy, culture, education and so forth.

In order to promise better and stabilized livelihood for the people of the Khmer Republic, it is necessary to materialized rapid conveyance of accurate information, spread of education and provision of wholesome entertainment, and this calls for the expansion of radio broadcasting facilities for improving programmes and the enlargement of the nation-wide service area.

1.1.1 Improvement and Expansion of Studio Facilities

(1) In order that the existing six studios may be efficiently utilized for programme production which consists primarily in the recording of dramas and music, it is imperative that tape recorders, disk players, microphones, control equipments which are in deteriorated condition be replaced, acoustic treatment improved, and air-conditioning equipment replaced.

Studio No. 5 which has a large floor space is now in an almost unusable state. It is desirable that improvements and repairs be effected to its subcontrol devices, air-conditioning equipments and acoustic treatment of walls for the production of large-scale music programmes and open programmes in which audience take part.

It is considered to entail substantial difficulties to repair the

acoustic treatment and air-conditioning equipments of Studio Nos. 1, 2, 3, 4 and 6 to bring them to a satisfactory servicing condition. Temporary repairs are planned to be effected to the air-conditioning equipments by the Ministry of Information to provide better environments for programme production to meet the needs in the immediate future.

(2) New Installation of Studios and Other Facilities

The planned improvement and diversification of programmes cannot be achieved by the existing studio facilities. It is therefore recommended that four small announce studios (two each for domestic broadcasting and international broadcasting) and one disk jocky studio be newly installed together with an additional tape editorial studio. Installation of these new studios will serve the purpose of improving and amplifying programmes such as newscasts, news commentaries and interview programmes as well as music programmes including disk jocky programmes.

A master control room should also be newly constructed to assure that both the existing and newly installed studios will fully display their functions in perfect harmony with each other and that programme transmission work be conducted in an integrated and efficient manner.

To facilitate the programme planning and production, it is advisable that one each of disk library, tape library and tape editorial room be newly installed.

Further, for the rational layout of the planning, production and master control departments, a new four-storied building having a floor space of about 1,160 m^2 should be newly constructed adjacent to the studio now existing in the building of the Ministry of Information.

Fig. 2-8 to Fig. 2-13 illustrate the planned layout of the said new building.

Installation of these new facilities will give birth to a new radio broadcasting centre which, though small in scale, can be expected to provide satisfactory broadcasting services.

1.1.2 Expansion of Radio Transmitting Facilities

New installation of high power MF transmitters and replacement of the existing HF transmitters with new ones are prerequisite to the expansion of service area, elimination of interference from foreign countries, prevention of service interruption due to faults in equipments, and maintenance of good sound quality.

One each of 200 kW and 100 kW MF transmitter and two 50 kW HF transmitters should be newly installed. These new transmitters should be employed combinedly with the existing transmitters (Philips), and should be so arranged as shown in Fig. 1-1 to ensure satisfactory operation of two broadcasting systems.

To accommodate these transmitters, it is necessary to build a new transmitting station having a floor space of about 1,000 m^2.

An anti-fading antenna (having a height of about half a wave length) is suited for high power MF transmission. However, since the transmitting station is located near the Phnom-Penh Airport and this sets limit on the antenna height, it is considered advisable to erect a new 105 m high top-loaded guyed antenna.

In order to strengthen one of the two MF broadcasting systems i.e., broadcasting system No. 1 in the Khmer Republic, and to expand the service area, it is advisable to change the frequency of the two MF broadcasting systems and increase the transmitting power as illustrated in Fig. 1-1.

It is an accepted fact that expansion of service area calls for an all-out means including the increase in transmitting power, improvement of antenna efficiency, use of low frequencies, etc. It is therefore desirable that 740 kHz currently used for broadcasting system No. 2 be employed for No. 1 and 918 kHz be assigned No. 2.

The minimum field strength in the planned service area should not be lower than 0.25 mV/m in the dry season. In the rainy season, it should be 0.5 mV/m or higher because of the atmospheric interference incidental to tropical zones (atmospherics resulting from thunders).

Calculations show that the service area of broadcasting system No. 1

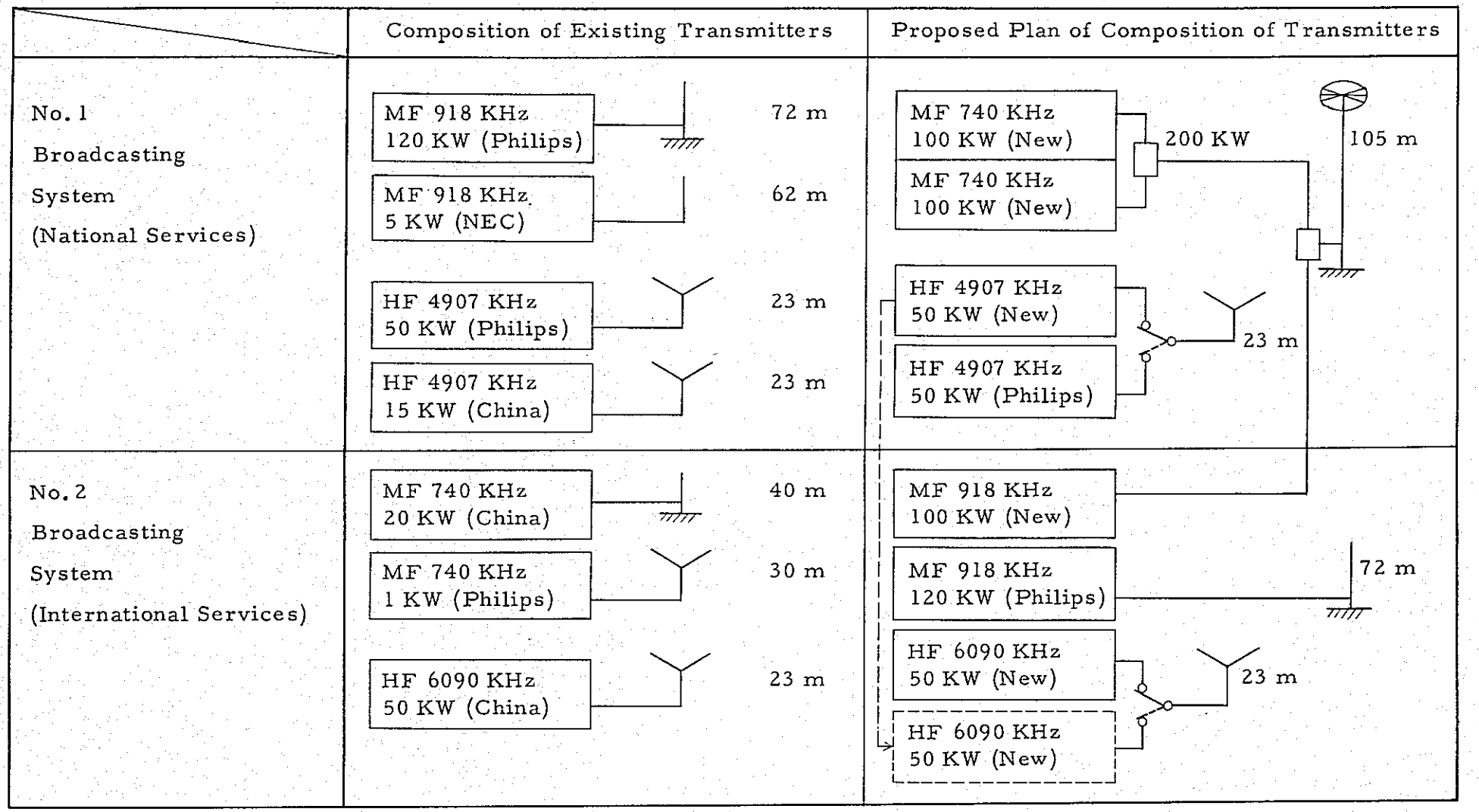
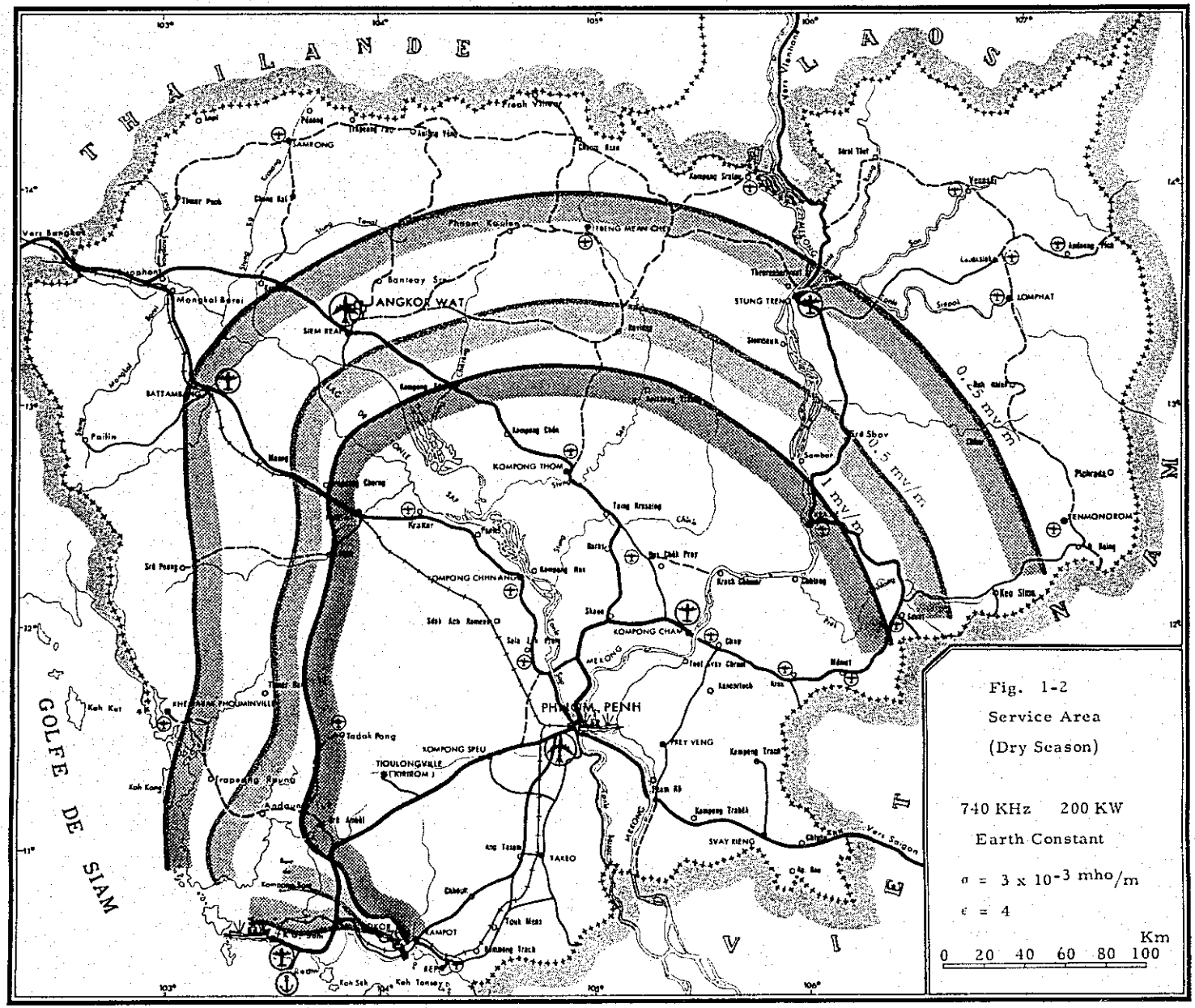


Fig. 1-1 Composition of Existing Transmitters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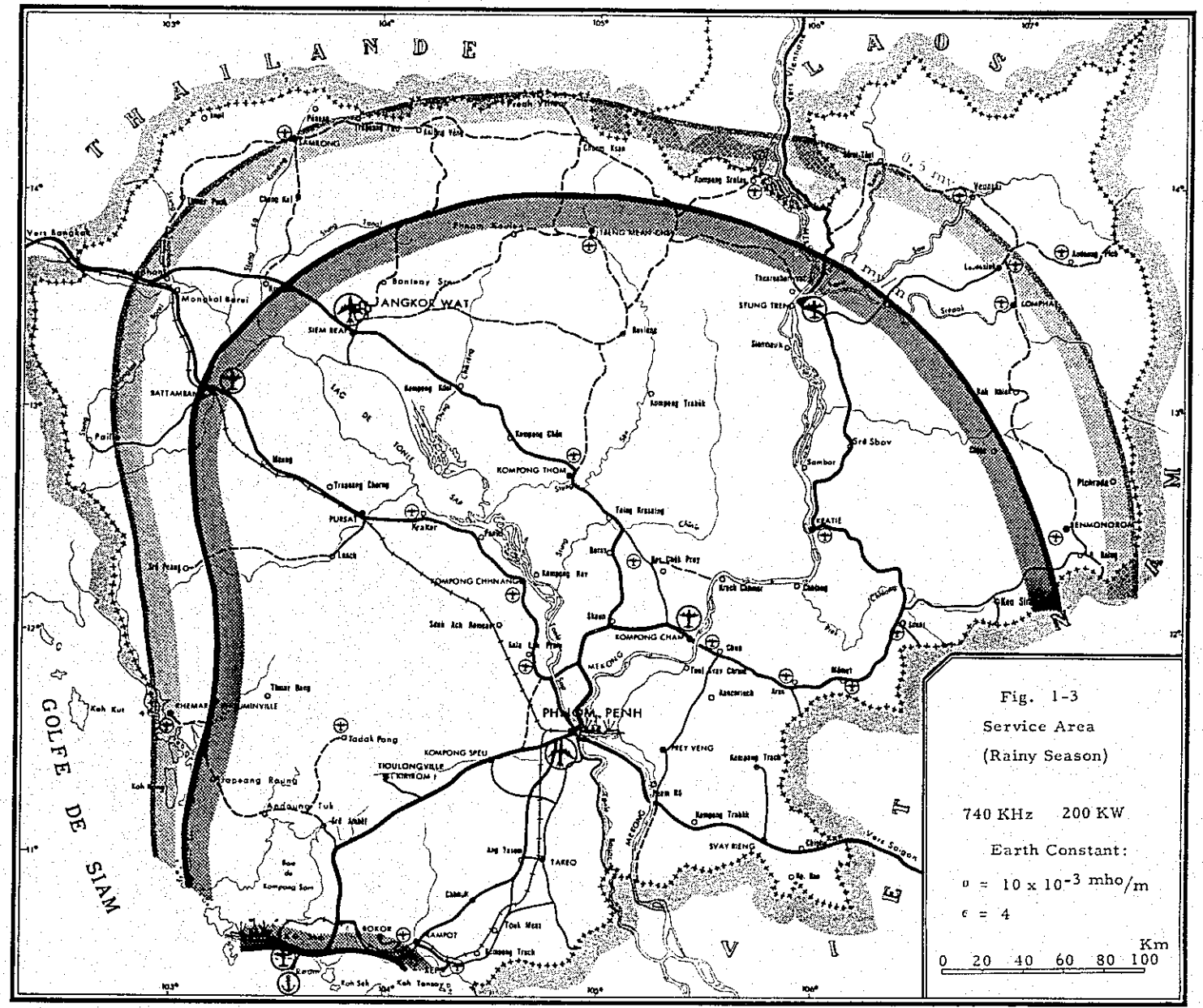
STUNG TRENG
LOMPHAT
TENMONDROM
KOMPONG SPEU
TIOULONGVILLE
SVAY RIENG
TAKEO
KAMPOT
BATTAMBANG
SIEM REAP
0.25 mv/m
0.5 mv/m
1 mv/m
Fig. 1-2
Service Area
(Dry Season)
740 KHz 200 KW
Earth Constant
σ = 3 x 10-3 mho/m
ε = 4
Km
0 20 40 60 80 100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KOMPONG CHAM
PHNOM PENH
KAMPOT
SOKOR
TAKEO
SVAY RIENG
PREY VENG
STUNG TRENG
KRATIE
0.5 mv/m
Fig. 1-3
Service Area
(Rainy Season)
740 KHz 200 KW
Earth Constant:
σ = 10 x 10-3 mho/m
ε = 4
Km
0 20 40 60 80 100

at a transmitting power of 200 kW and a frequency of 740 KHz covers the entire republic as shown in Fig. 1-2 (dry season) and Fig. 1-3 (rainy season).

For HF broadcasting, the existing dipole antenna can be continuously used, and it is preferable that antennas which are not in use be removed as far as possible.

Installation of new transmitters described above demands provision of one unit of 800 KVA stand-by diesel generator in addition to the existing 1,200 KVA generator facilities (600 KVA x 2 units).

1.1.3 STL (Studio - Transmitter Link)

The wire system currently employed for transmitting programmes from the studio to the transmitting station is superannuated and no longer in serviceable condition. It should be replaced by a highly reliable 950 MHz band radio relaying system.

The new STL should comprise two circuits for broadcasting systems Nos. 1 and 2. Moreover, a talking-back circuit allocated with a frequency of 385 MHz should be prepared.

1.1.4 Radio Car and News Car

For field pick-up of various events that take place outside the studio, it is necessary to provide a radio car loaded with a 464 MHz 25 w transmitter for programme relaying and another 469 MHz 25 w radio equipment for making arrangements with the studio.

Further, for rapid remote pick-up and conveyance of news events, there should be furnished one news car which is also equipped with a 469 MHz 25 w radio relaying equipment.

Moreover, to provide the news collecting activity in the vicinity of Phnom-Penh, it will be necessary to provide two 469 MHz 5 w portable transceivers.

As the base station of this mobile radio relaying system, a 469 MHz 25 w radio equipment connected directly with the programme relaying and news collecting department should be installed in the new broadcasting centre.

1.1.5 Others

To assure that broadcasting equipment be given satisfactory inspection and maintenance services, an inspection and maintenance system should be established with the necessary measuring instrument also provided.

Installation of two additional all wave radio receivers for monitoring is also necessary to collect news from foreign broadcasts.

In addition to the above, new supply and consolidation of office appliances and equipment will be required for improving and expanding programme planning and production.

1.2 Expansion of TV Broadcasting Facilities

Because of the limited broadcasting hours (10 hours a week) and the insufficient popularization of TV receivers, TV broadcasting cannot be considered to be fully playing its role of information conveyance at present. However, since the information it conveys appeals to both acoustic and visual senses of viewers, TV broadcasting manifests a marked promotional effect on politics, economy, culture and education.

Accordingly, improvements described in the following pages should be effected to the existing facilities as the minimum requirement for elevating the level of TV broadcasting in the republic, extending broadcasting hours, and enriching programmes.

1.2.1 Improvement and Expansion of Studio Facilities

Improvement of programme production ability calls for the fulfilment of such minimum requirements as the additional installation of one each of small sized studio, VTR and telecine system as well as new installation of one set of master control facilities. It is to be added that this additional and new installation work should be accompanied by the interior remodelling of the existing building and improvement or repaire of the existing related facilities.

The new small sized studio should be used for broadcasting news, news commentaries and round-table talk programmes participated by a small number of persons, whereas the existing studio should be employed for the production of larger programmes. Efforts should be made for efficient studio utilization through effective use of VTR.

The existing VTR should be brought to a perfect servicing condition through the establishment of a satisfactory maintenance and inspection system so that it may be put in use concurrently with the new one for smooth and systematic transmission of VTR programmes.

Further, projectors for 35 mm, 16 mm and 8 mm films should be installed to enrich film programmes. These projectors will serve to give variety to film programmes since 35 mm film projector can be used for direct broadcasting of motion picture film and 8 mm film projector makes it possible to take full advantage of amateurs' films and a film library.

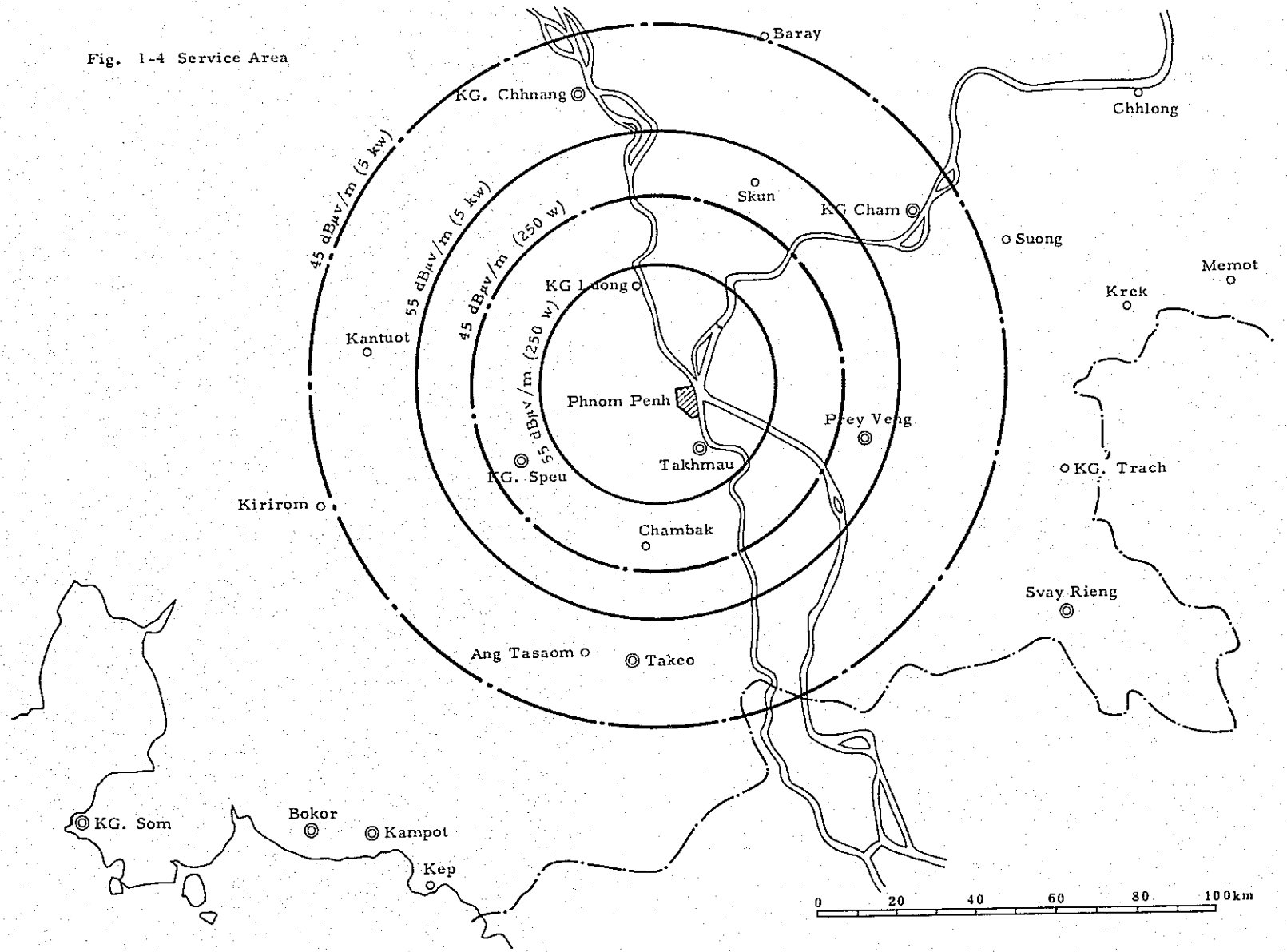
1.2.2 Improvement of Transmitting Facilities

The currently used TV transmitter (video transmitting power - 5 kW, sound transmitting power - 2.5 kW) was installed in February 1966 when the TV station started service, and there has been no additional transmitter put in use since that time. Considering the lapse of five years since its installation and the possible interruption of broadcasting service that might result from a fault in its component equipment, installation of a stand-by transmitter is a necessity beyond doubt.

For economic reasons, however, it is recommended that the stand-by transmitter have the minimum transmitting power that meets the immediate need, i.e., transmitting power of 250 w for video and 50 w for sound. The service area covered by the stand-by transmitter, as calculated in accordance with CCIR's Recommendation No. 370-1 and technical data available in Japan, is shown in Fig. 1-4. In this figure, the service area where the field intensity is 55 dB/μV/m is shown as Grade A and the area where the intensity is 45 dB/μV/m as Grade B.

As is clear in the said Fig. 1-4, part of Grade A service area covered by the existing 5 kW transmitter will be reduced to Grade B

Fig. 1-4 Service Area



area if the stand-by transmitter is put in operation. However, since Phnom-Penh and its neighbourhood will maintain Grade A intensity even in this case, that the stand-by purpose can be fully fulfilled by the recommended installation of a small power transmitter.

1.2.3 Extension of Broadcasting Hours

Average TV broadcasting hours is no longer than 10 hours a week at present (2 hours a day x 5 days). To assure that TV broadcasting performs its role, broadcasting service should be offered daily for at least about 5 hours (2 hours in the morning and 3 hours in the evening).

In the initial stage, however, efforts will have to be directed to the improvement of facilities and training of staffs for increasing the broadcasting hours to an average of 21 hours a week (3 hours a day; one hour in the morning and 2 hours in the evening) with particular emphasis placed on the repletion of news and educational programmes.

1.2.4 Installation of TV Receivers for Community Viewing

While radio receivers are quite well popularized in the republic, TV receivers are hardly found in the people's houses due to their high cost.

The situation demands that TV receivers be installed at community centers and schools so that the public at large will be given the chance to watch TV programmes. 50 TV sets should be distributed for this purpose and the effect of such community viewing should be studied.

1.2.5 Others

To assure that TV broadcasting equipment be given proper inspection and maintenance services, an inspection and maintenance system should be established with the necessary measuring instrument also installed.

In addition, provision and consolidation of office appliance and equipment will be required for improved programme planning and production.

1.3 Construction Schedule and Cost of Broadcasting Facilities Expansion Project

As shown in Table 1-1 (Construction Schedule), a period of about a year and ten months is required for the completion of the expansion project.

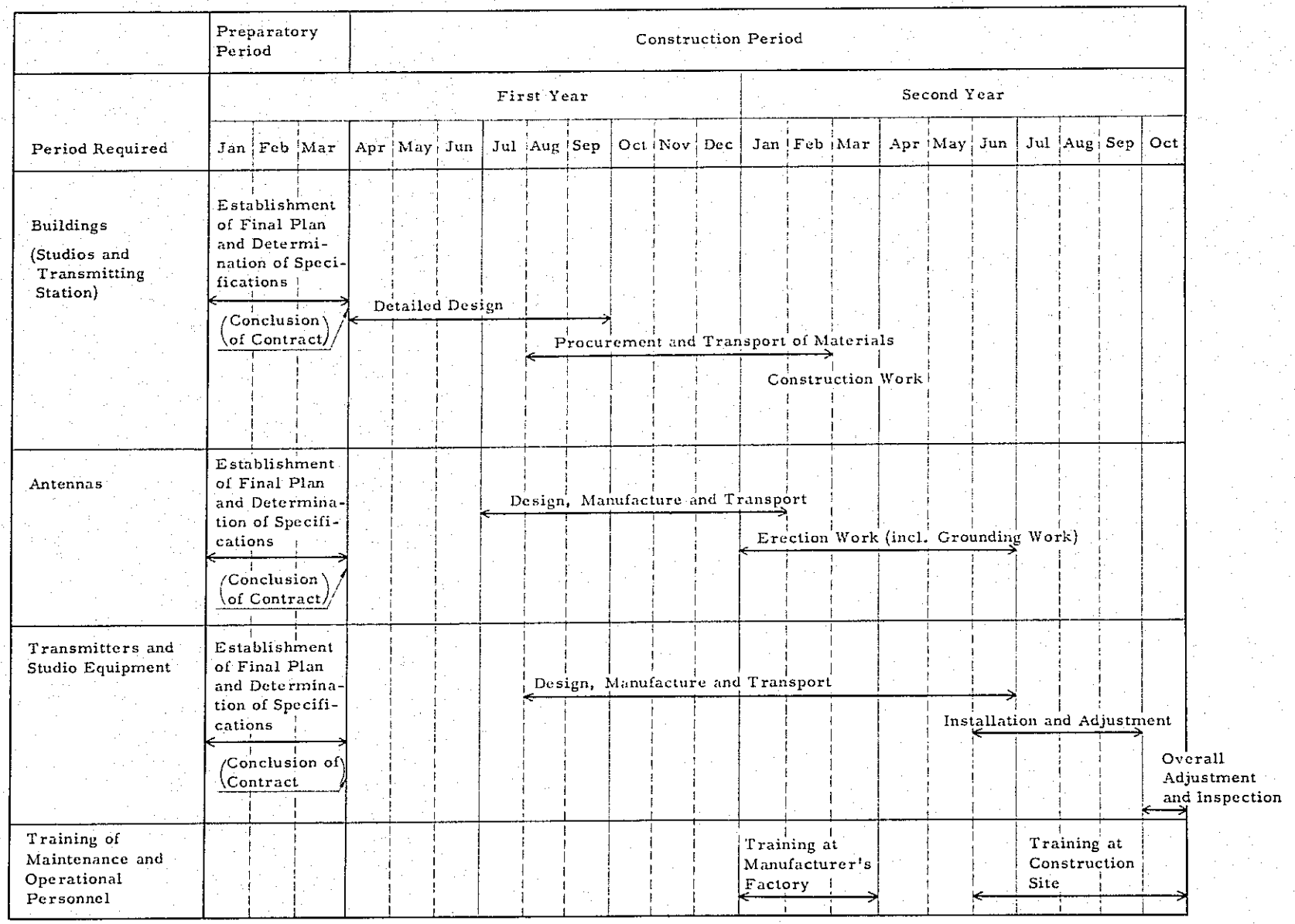
It is to be noted, however, that Table 1-1 was prepared to show a criterion of the time required, and it is likely that the entire construction period becomes longer or shorter than shown in the table depending, among others, on the completion of the new building.

Fig. 1-5 (Construction Administration Chart) shows the interrelationship between respective types of work and the flow of the construction work.

To ensure smooth execution of the project, it is desirable that a project adviser experienced in construction administration and personnel training be invited from abroad. Further, construction administration of buildings of studios and transmitting station should be left to a consultants company having special skill and expert knowledges and experienced in design and work control, and the actual construction work should preferably be undertaken by a local construction company with the greater part of construction materials imported from abroad.

As shown in Table 1-2, (Construction Cost), the project requires a construction cost of approximately 1, 150 million yen.

Table 1-1 Construction Schedule of Broadcasting Facilities Expansion Project



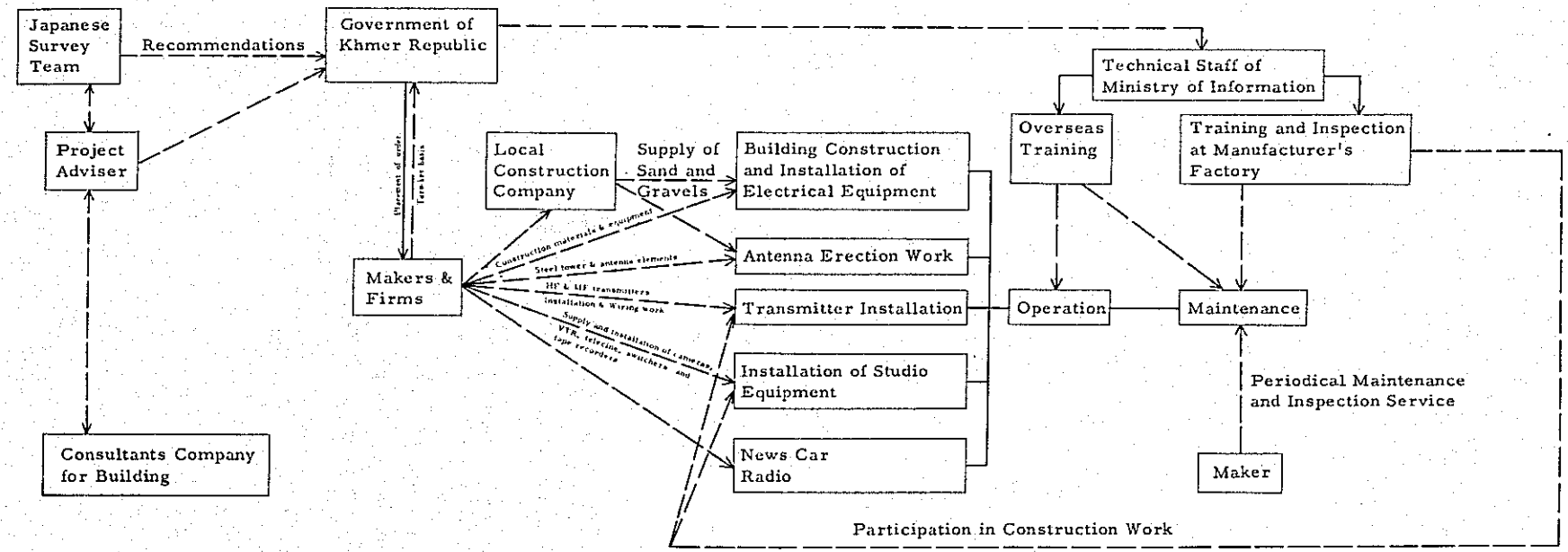


Fig. 1-5 Construction Administration Chart

Table 1-2 Construction Cost of Broadcasting Facilities Expansion Project

(Unit: 1,000¥)

		Broadcasting Equipment	Construction Materials & Electrical Facilities		Total
			Construction Materials & Control of Construction Work	Construction Work at Site	
Radio	Studios	222,800	118,200	35,000	376,000
	Transmitting Station	450,000	81,500	23,000	554,500
TV	Studios	174,000	4,500	2,500	181,000
	Transmitting Station	15,000	200	100	15,300
Consultant		-	15,000	-	15,000
Total		861,800 (2,798)	219,400 (712)	60,600 (197)	1,141,800 (3,707)

Notes: ( ) indicates units of 1,000 US$.
Official exchange rate: 308¥ = 1 US$.

1.4 Training of Personnel

Assignment of increased numbers of highly capable staffs in various fields such as techniques, programme production and management and administration is prerequisite to the expansion of broadcasting facilities and improvement of programmes. This calls for the establishment of a long-term plan for training of newly recruited and existing staffs. The following three means can be conceived of as a step forward to the implementation of the training.

(1) Installation of a training facility within the Ministry of Information.

(2) Dispatching of staffs for overseas training.

(3) Employment of training experts from advanced nations.

Maximum advantage should be taken of the project implementation for effective training of the personnel assigned to the maintenance of broadcasting facilities. As a first step, training at the manufacturing factory and then at the construction site should be carried out as shown in Table 1-1 (Construction Schedule) and Fig. 1-5 (Construction Administration Chart). This first step should be ensued by the training of many technicians, particularly those specialized in high power MF broadcasting transmitter and VTR.

Makers are to be requested to make a periodical inspection and maintenance of equipment once a year or so after the project completion so as to maintain all the equipment in good servicing condition and provide continued training chances for the technicians.

CHAPTER 2 SCOPE OF SURVEY

2.1 Scope of Survey Activity

(1) Survey for the improvement and expansion of radio broadcasting facilities in Phnom-Penh, improvement of programmes, and assurance of satisfactory broadcasting service over the entire nation.

(2) Survey for the improvement of TV broadcasting facilities in Phnom-Penh.

(3) Estimation of rough construction cost.

2.2 Formation of Survey Team

The Japanese Survey Team for Improvement and Expansion of Broadcasting Facilities in Phnom-Penh, organized by the Overseas Technical Cooperation Agency in September 1971, was composed of the following members.

Leader	Yasuo OTAKI	Engineer. Deputy Head of Technical Division, Broadcasting Department, Radio Regulatory Bureau, Ministry of Posts and Telecommunications.
Member	Yukio MIYAZU	Engineer. Chief of Frequency Assignment Section, Frequency Division, Radio Regulatory Bureau, Ministry of Posts and Telecommunications.
Member	Minoru TAKAGI	Engineer. Deputy Manager, Construction Control Division, Headquarters of Technical Administration and Construction, NHK (Japan Broadcasting Corporation)
Member	Shozo HAYAMI	Engineer. Engineering Advisor, Development Surveys Department, Overseas Technical Cooperation Agency.

2.3 Itinerary of Survey Team

During its 25-day stay in the Khmer Republic from September 8, 1971, the survey team held a number of meetings with the Ministry of Information and other competent authorities of the republic and conducted investigations of radio and TV broadcasting facilities.

The findings of the survey were compiled into an interim report and submitted to the Ministry of Information on September 28.

The itinerary of the survey team is as shown in Table 1-3 below.

Table 1-3 Itinerary of Survey Team

Date and Day	Description
Sept. 8 (Wed)	Departure from Tokyo and arrival at Bangkok (direct flight to Phnom-Penh prevented by heavy rain).
9 (Thu)	Departure from Bangkok and arrival at Phnom-Penh. Arrangement of survey equipment.
10 (Fri)	Courtesy call on the ministry of Information. Consultation with Mr. Im Saroeun, Commissariat General of Broadcasting, and with the Japanese Embassy in Phnom-Penh.
11 (Sat)	Survey of the radio and TV broadcasting station.
12 (Sun)	Holiday
13 (Mon)	Courtesy call on H.E. Mr. Long Boret, the Minister for Information. Discussion with the Commissariat General of Broadcasting. Measurement of field intensity of MF and HF broadcasting.
14 (Tue)	Courtesy call on the Ministry of Posts and Telecommunications. Discussion with Mr. Khy Taing Ly, Director of Posts and Telecommunications on frequency assignment. Survey of radio studios.
15 (Wed)	Survey of radio studios. Arrangements and consultation with the representatives of Enterprise Khaou Chuly & Cie, a leading construction enterprise in the Khmer Republic.
16 (Thu)	Survey of radio transmitting station.

17 (Fri)	Measurement of field intensity at the HF radio transmitting station for international telecommunication of the Ministry of Posts and Telecommunications (located at Kamboul 13 km to the west of Phnom-Penh).
18 (Sat)	Discussion with the Commissariat General of Broadcasting concerning radio broadcasting facilities.
19 (Sun)	Holiday Inspection of Hotel Cambodia (240 rooms) under construction.
20 (Mon)	Survey of the TV studio and STL.
21 (Tue)	Survey of the TV studio and TV transmitting station. Consultation with the officials of the Ministry of Posts and Telecommunications concerning frequency allocation.
22 (Wed)	Inspection of the power plant of the Electric Power Authority (Electricité du Cambodge).
23 (Thu)	Consultation with Civil Aviation Bureau, Ministry of Public Works, about the antenna height. Survey of the TV studio.
24 (Fri)	Preparation of the draft of the interim report.
25 (Sat)	Consultation with the Ministry of Information. Preparations of the interim report.
26 (Sun)	Preparation of the interim report.
27 (Mon)	Consultation with the Japanese Embassy. Preparation of the interim report.
28 (Tue)	Submission of the interim report to the Commissariat General of Broadcasting at a report meeting. Packing of survey equipment. Attendance at a party held by the Minister for Information.

	29 (Wed)	Submission of the interim report to the Minister for Information. Departure from Phnom-Penh and arrival at Bangkok.
	30 (Thu)	Consultation with the Japanese Embassy and OTCA office in Bangkok. Measurement of field intensity of radio waves from Phnom-Penh Broadcasting Station.
Oct.	1 (Fri)	Measurement of field intensity of radio waves from Phnom-Penh Broadcasting Station.
	2 (Sat)	Return to Japan.

CHAPTER 3 ACKNOWLEDGEMENT

The survey was conducted with a wholehearted and effectual cooperation of the Ministry of Information.

The team is much indebted to H.E. Mr. Long Boret, the Minister for Information, Mr. Im Saroeun, the Commissariat General of Broadcasting, and other government officials of the Khmer Republic whose unlimited assistance made it possible for the team to accomplish its assignment.

Acknowledgement is also due to the staffs of the Ministry of Posts and Telecommunications, Ministry of Public Works and Electricité du Cambodge for furnishing the team with data and materials required for the survey.

The team further wishes to express its appreciation to H.E. Mr. Noboru Sugiura, Japanese Ambassador to the Khmer Republic, Mr. Yoichi Kajitani, Second Secretary, and other staffs of the Japanese Embassy in Phnom-Penh, as well as to Japanese government offices and organizations for assisting the team in executing its task.

While reiterating its gratitude to all the above-mentioned organizations and individuals, the team wishes to take this opportunity to thank the many other Khmer and Japanese individuals whose valuable assistance contributed largely to the smooth execution of the survey, and hopes that the improvement and expansion plans worked out on the basis of the survey will be materialized at an early data for cultural and educational improvement of the Khmer Republic as well as for the enhancement of the amicable relations between the Khmer Republic and Japan.

PART II DETAILED DESCRIPTION

PART II DETAILED DESCRIPTION

CHAPTER 1 IMPROVEMENT AND EXPANSION OF RADIO BROADCASTING FACILITIES

1.1 Studio Facilities

1.1.1 Objectives of improvement and Expansion

(1) Improvement of programmes.

(2) Assurance of good sound quality for broadcasting.

(3) Improvement of environments of programme production.

(4) Smooth implementation of programme production and editing, and smooth flow of programme transmission work.

(5) Replacement or repairs of superannuated or deteriorated equipment.

1.1.2 Plan and effect of improvement and Expansion

(1) Improvement of Existing Studios

The existing state of the radio studios and survey results and shown in Table 2-1. The survey revealed that it would entail substantial difficulty to improve the acoustic treatment and air-conditioning equipment of Studio Nos. 1, 2, 3, 4 and 6 and sub-control room. As regards the air-conditioning equipments, the Ministry of Information is planning to a partial effect improvement and repair work which, though not expected to bring about a drastic remedy, will serve to fulfill the needs in the immediate future. As the big studio No. 5 which has the floor area of 200 m^2 is hardly being used at present, it is necessary to restore the studio to the usable state in order to give variety to the broadcasting programmes.

Therefore, large repairs of air-conditioner and sub-control room, and some repairs of acoustic treatment are required.

To assure that these existing studios will be efficiently utilized for recording, it is recommended that the following improvements be undertaken.

a) Studio No. 1

Replacement of two tape recorders.
Removal of existing transmission line.

b) Studio No. 2

Replacement of two tape recorders.
Removal of existing transmission line.

c) Studio No. 3

Replacement of two tape recorders.

d) Studio No. 4

Replacement of two tape recorders.
Replacement of two single disk players.

e) Studio No. 5

Replacement of two tape recorders.
Replacement of two single disk players.
New installation of a subcontrol room (See Fig. 2-6).
New installation of a subcontrol desk and its accessories.
Installation of air-conditioning equipment and improvement of acoustic treatment of the studio and subcontrol room.

f) Studio No. 6

Replacement of two tape recorders.

(2) Construction of a New Radio Broadcasting Center

Since no smooth flow of production staffs nor satisfactory working environments can be promised by the existing studios, it is proposed

that a new four-storied radio broadcasting building, whose general lay-out is shown in Figs. 2-8 to 2-13, be constructed adjacent to the existing studios. The new broadcasting building, to be designed to accommodate six studios (four announce studios, one disk jocky studio and one tape editorial room, one editorial studio and one master control room, should have a total floor space of about 1,160 m^2, with a 25 m high antenna tower set up on its roof for ST-link and remote pick-up. The new facilities installed in this building should be intended primarily for programme editing and transmission, but they should also be used for recording. These facilities, if employed combinedly with the auditorium of Studio No. 5, will largely contribute to the improvement of radio programmes. In preparing the said layout of the Center, the team game special consideration to ensure improved working environments and smooth flow of staffs between the new and existing studios.

Major facilities of the new building will be as follows.

a) 1st Floor (340 m^2)

Reception desk, telephone exchange room, assembly hall, office rooms, air-conditioning room, store room, etc.

b) 2nd Floor (340 m^2)

Tape editorial rooms, tape editorial studio, tape control rooms, tape and disk libraries, office rooms, etc.

c) 3rd Floor (340 m^2)

Master control room, small studios and disk jocky studio with sub-control desk.

d) 4th Floor (140 m^2)

Wireless relay room, maintenance shop, office rooms, etc.

e) Roof

One antenna tower (25 m high) with antennas as follows, and also shown in Fig. 2-9.

i) Two parabolic antennas for STL.

Frequency: 950 and 951 MHz for broadcasting system Nos. 1 and 2.

ii) One Yagi antenna for talking-back.

Frequency: 385 MHz

iii) One rotary type Yagi antenna for remote field pick-up.

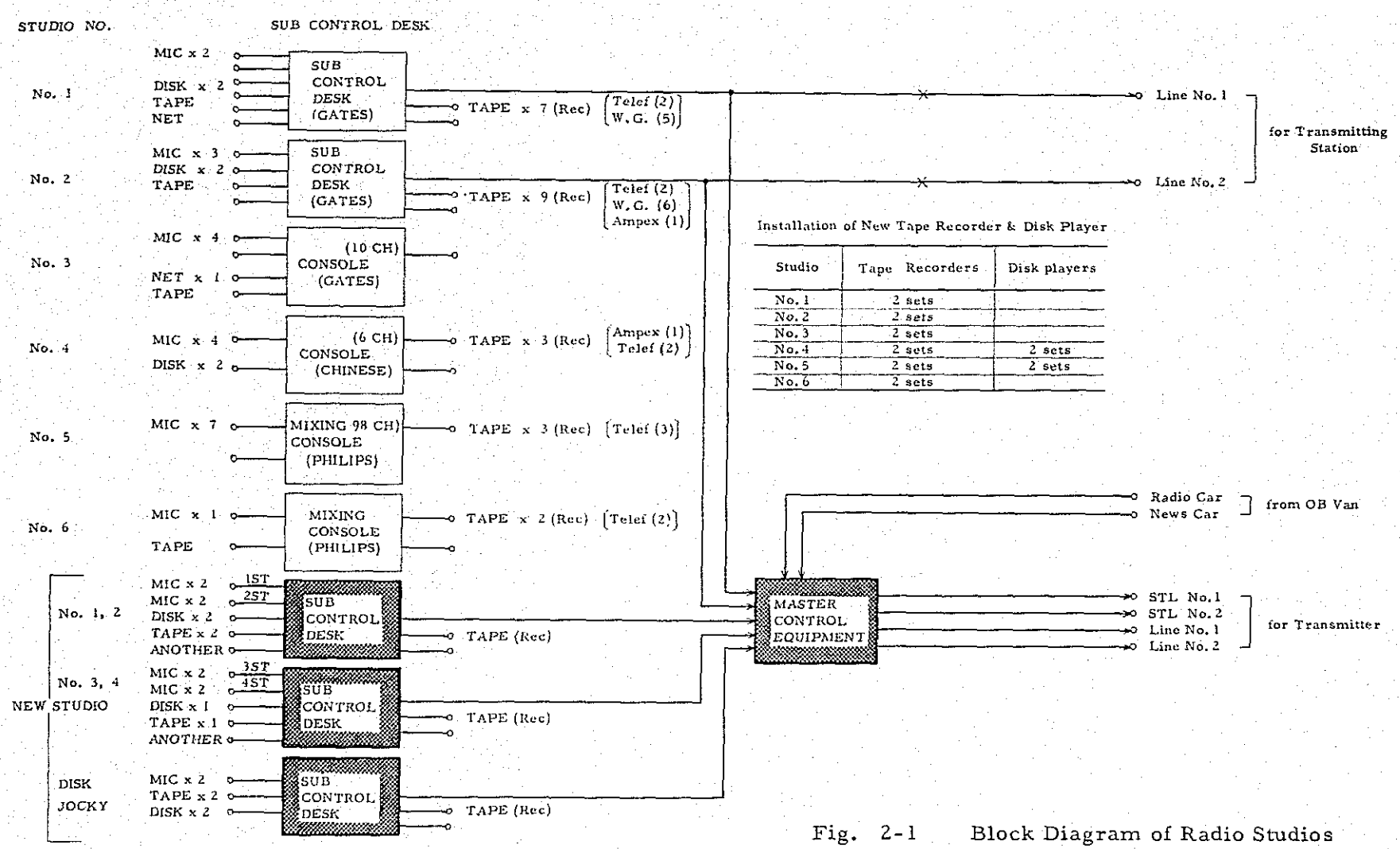
Frequency: 464 and 469 MHz

iv) One collinear antenna for radio communication with radio and news cars.

Frequency: 469 MHz

Table 2-1 Radio Studio Facilities

					Existing Radio Studio									Result of Survey		Improvement Plan				
		Room Name	Floor	Floor Area (m^2)	Air Condition	Power Supply 50 c/s (v)	Sub-Control Desk Maker	Sub-Control Desk Quantity	Tape Recorder Maker	Tape Recorder Quantity	Disk Player Maker	Disk Player Quantity	Sound Noise A (phone)	Sound Noise C (phone)	Sound Noise Analysis	Room Condition	Acoustic Condition	Air Conditioning	Improvement of building	Installation of new Tape Recorder	Installation of new Disk Player	Plan of New building
Existing Radio Studio	1st Studio	Studio	1F	74	Out of order	200	-	-	-	-	-	-	33	47	Medium High-Freg Noise	Hot 31°C 62%	Sound insulation is not in good condition. Acoustic characteristic should be improved.			2 sets		It stands in need to construct new building for producing editing and playing back radio programs. Fig. 2-8 ~ Fig. 2-13
		Announce Booth	1F	12	Out of order	200	-	-	-	-	-	-	37	61	High Low-Freg Noise	Hot 29°C 75%						
		Sub-Control Room	1F	16	Window type	200 / 105	Gates	1	Telefunken W.G.	7	Gates	2	50	65	High L, H Freg Noise	Coal 25°C 58%						
	2nd Studio	Studio	2F	74	Duct type	200	-	-	-	-	-	-	31	56	High Low-Freg Noise	Cool						
		Announce Booth	2F	12	Not installed	200	-	-	-	-	-	-	35	58	High L, H Freg Noise	Hot				2 sets		
		Sub-Control Room	2F	16	Window type	200	Gates	1	Telefunken W.G.	7	Gates	2	49	63	High L, H Freg Noise	Cool						
	3rd Studio	Studio	1F	50	Not installed	200	-	-	-	-	-	-	34	52	High H-Freg Noise	Hot						
		Sub-Control Room	1F	13	Window type	200	China	1	China Telefunken	3	-	-	52	65	High H-Freg Noise	Cool				2 sets		
	4th Studio	Studio	1F	14	Not installed	215	-	-	-	-	China	2	29	46	Good	Hot						
		Sub-Control Room	1F	13	Window type	215	Gates	1	Telefunken Ampex	3	Gates	2	42	51	High L, H Freg Noise	Cool				2 sets	2 sets	
	5th Studio	Studio	1F	200	Not installed	215	-	-	-	-	-	-	41	48	Medium H-Freg Noise	Hot		Install New air conditioner	(1) Install new subcontrol room on the studio floor. (2) Acoustic condition is improved	2 sets	2 sets	
		Sub-Control Room	1F	15	Not installed	205	Philips	2	Telefunken	3	-	-	34	51	High L, H Freg Noise	Hot						
	6th Studio	Studio	2F	20	Not installed	205	-	-	-	-	-	-	35	52	Medium L, H Freg Noise	Hot				2 sets		
		Sub-Control Room	2F	16	Not installed	205	Philips	1	Telefunken	2	Gates	2	49	60	High L, H Freg Noise	Hot						



Installation of New Tape Recorder & Disk Player

Studio	Tape Recorders	Disk players
No. 1	2 sets	
No. 2	2 sets	
No. 3	2 sets	
No. 4	2 sets	2 sets
No. 5	2 sets	2 sets
No. 6	2 sets	

Fig. 2-1 Block Diagram of Radio Studios

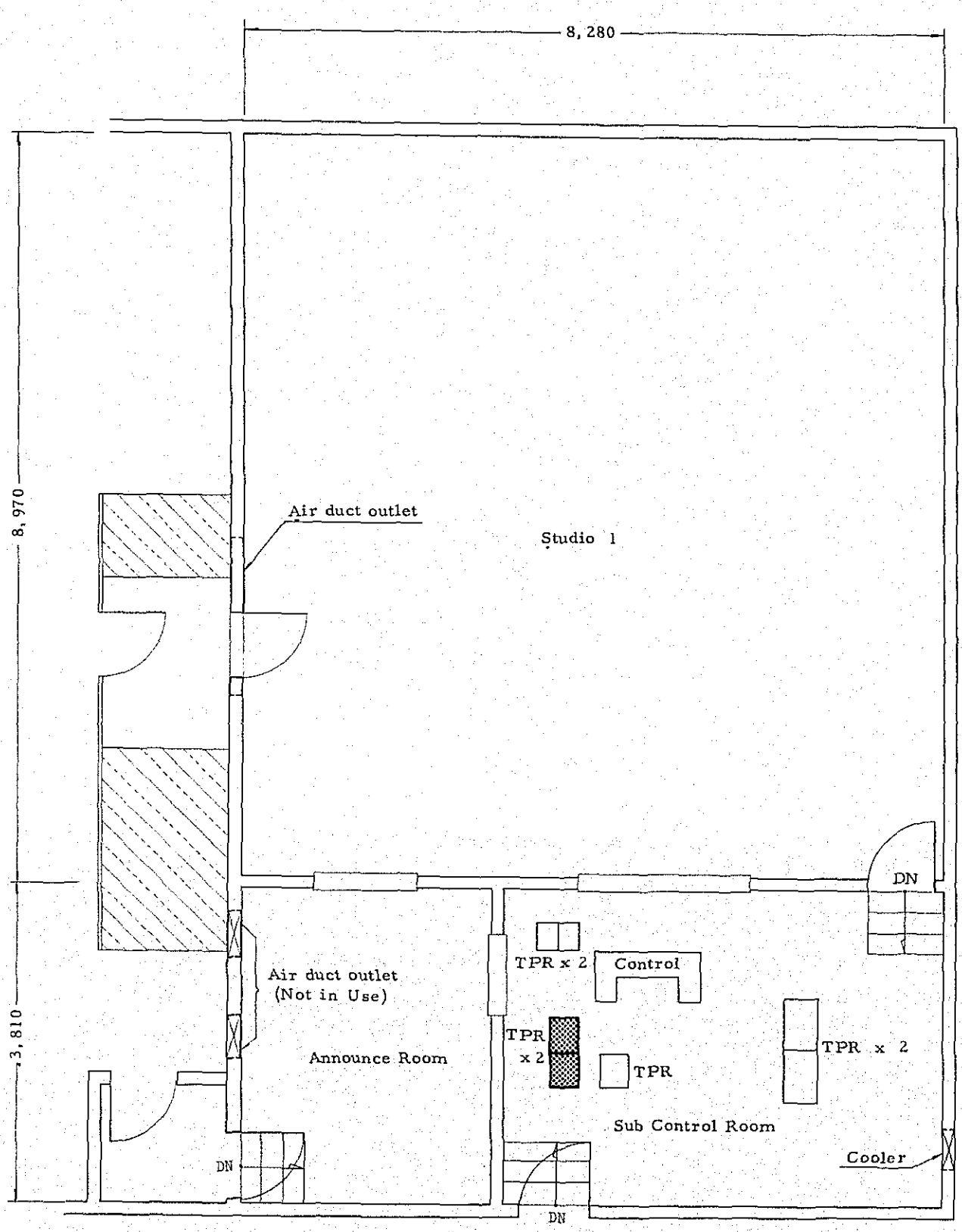


Fig. 2-2 Existing Radio Studio No. 1

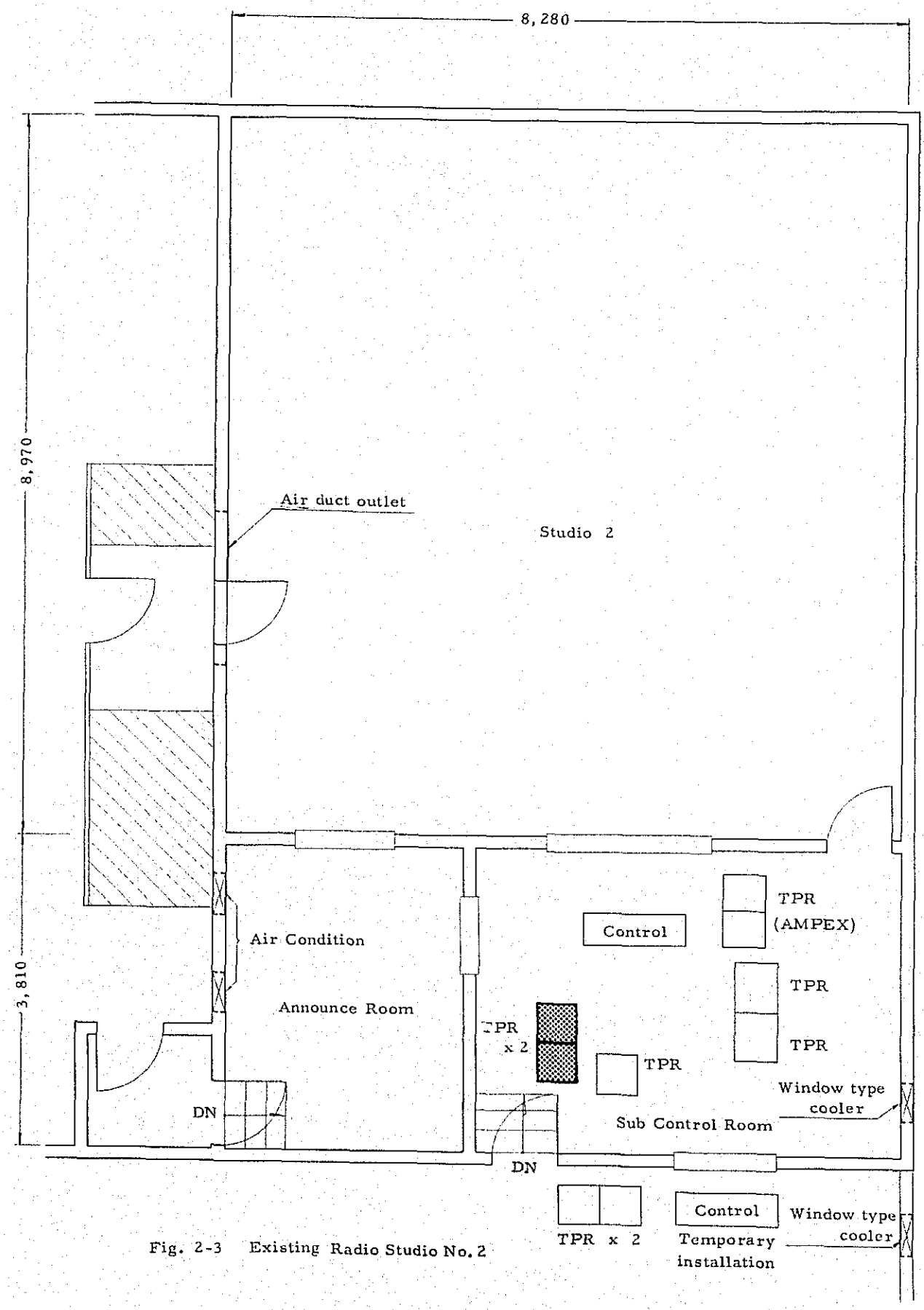


Fig. 2-3 Existing Radio Studio No. 2

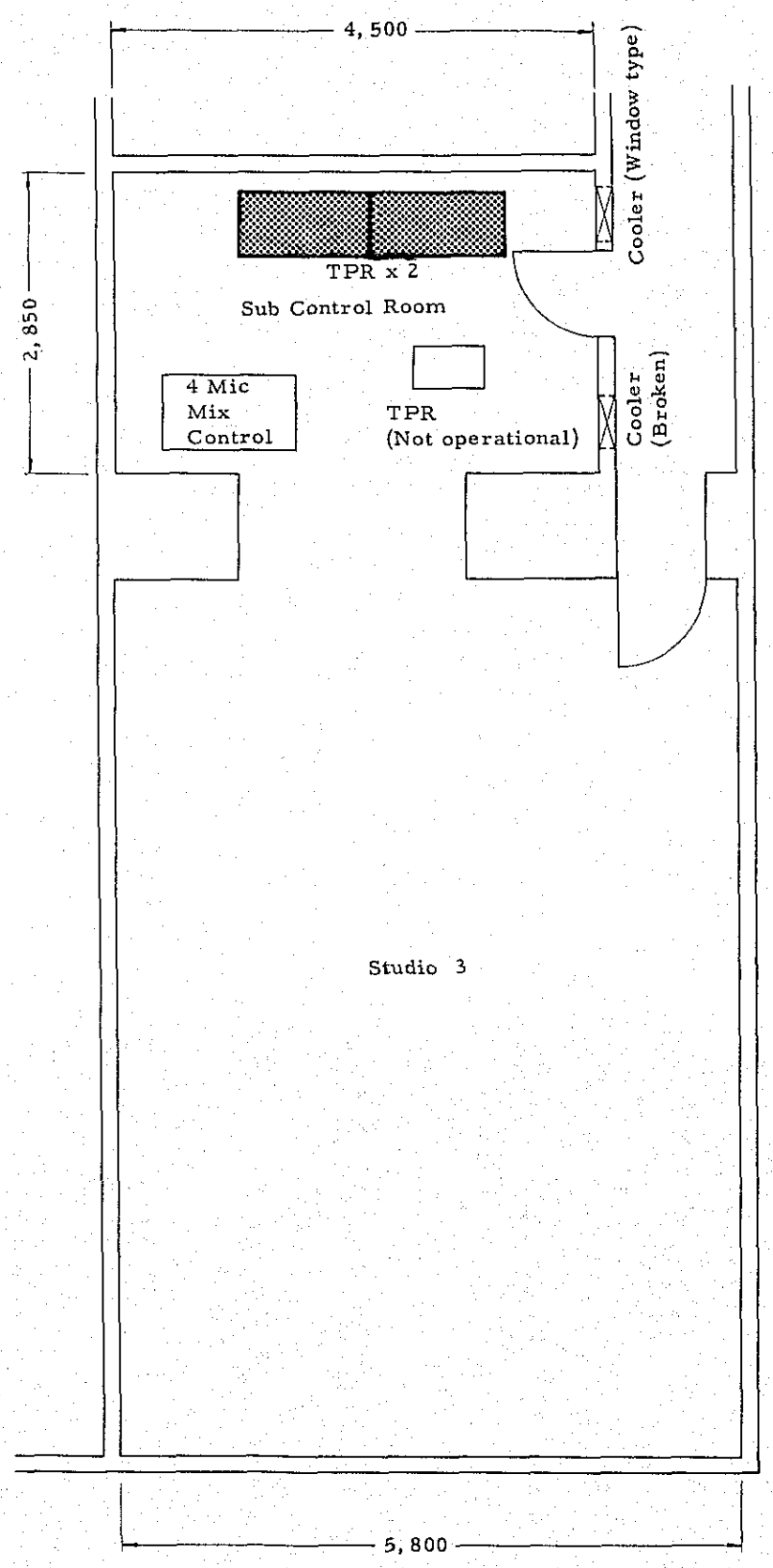


Fig. 2-4 Existing Radio Studio No. 3

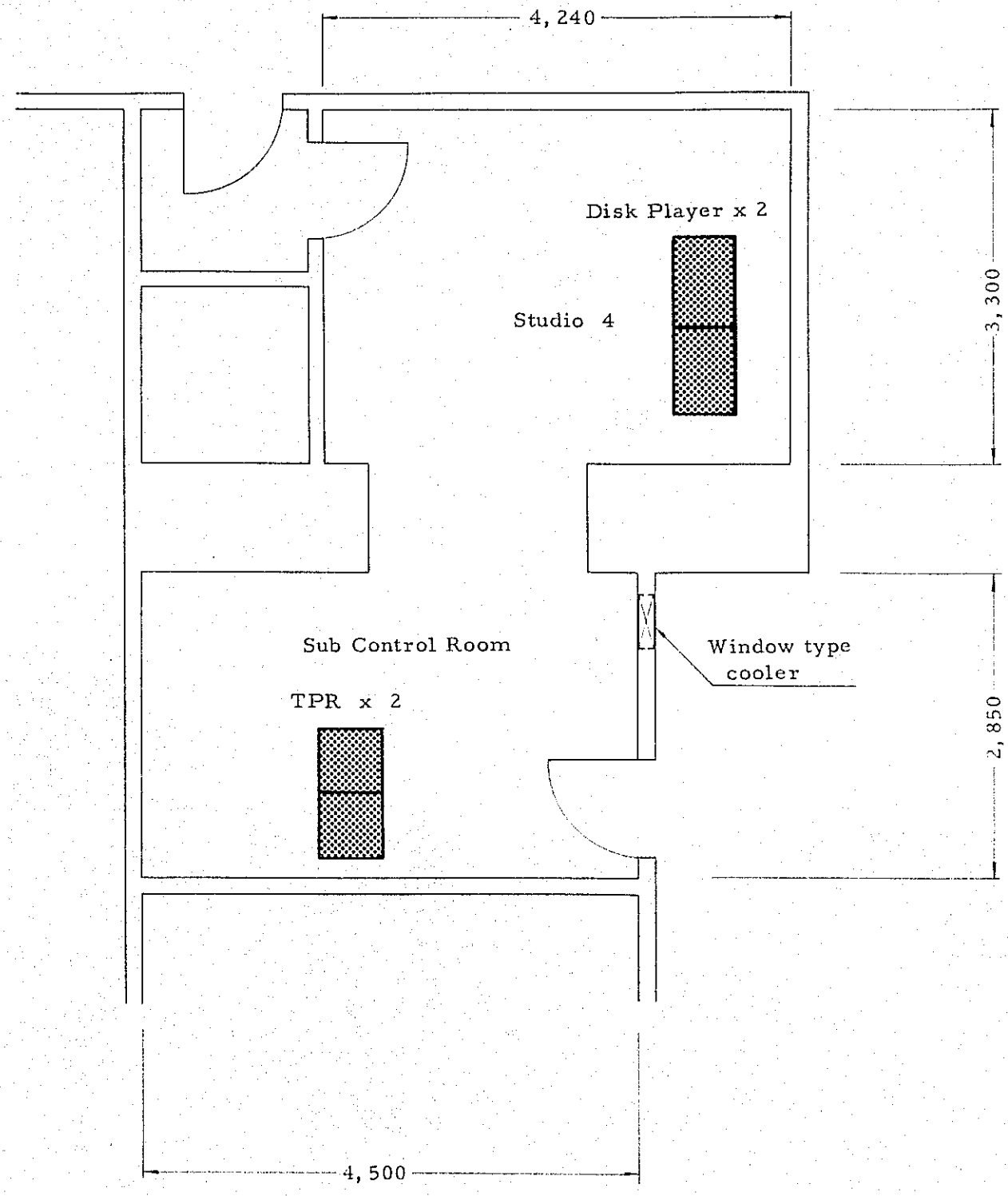


Fig. 2-5 Existing Radio Studio No. 4

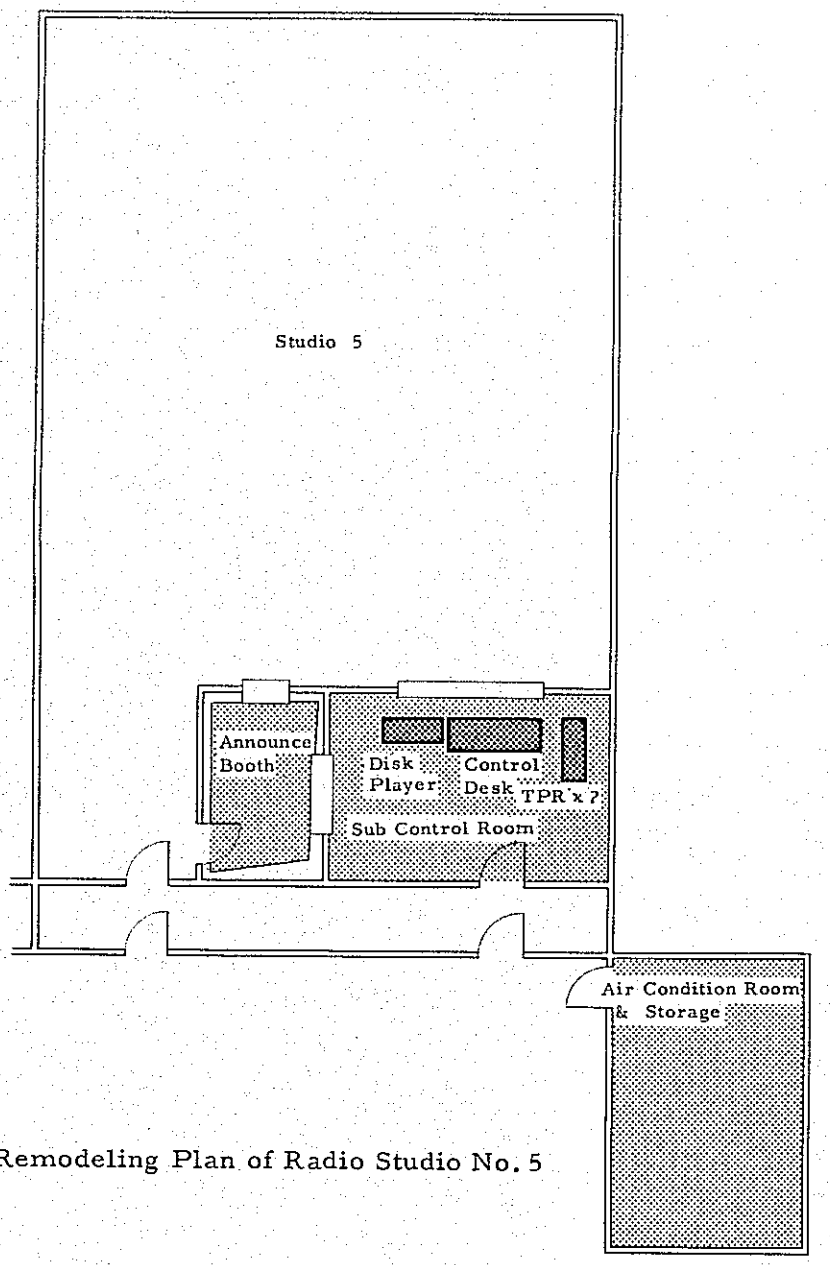


Fig. 2-6 Remodeling Plan of Radio Studio No. 5

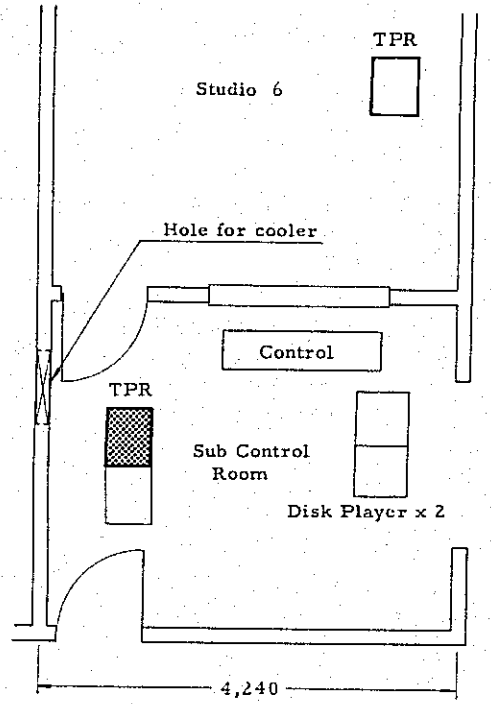


Fig. 2-7 Existing Radio Studio No. 6

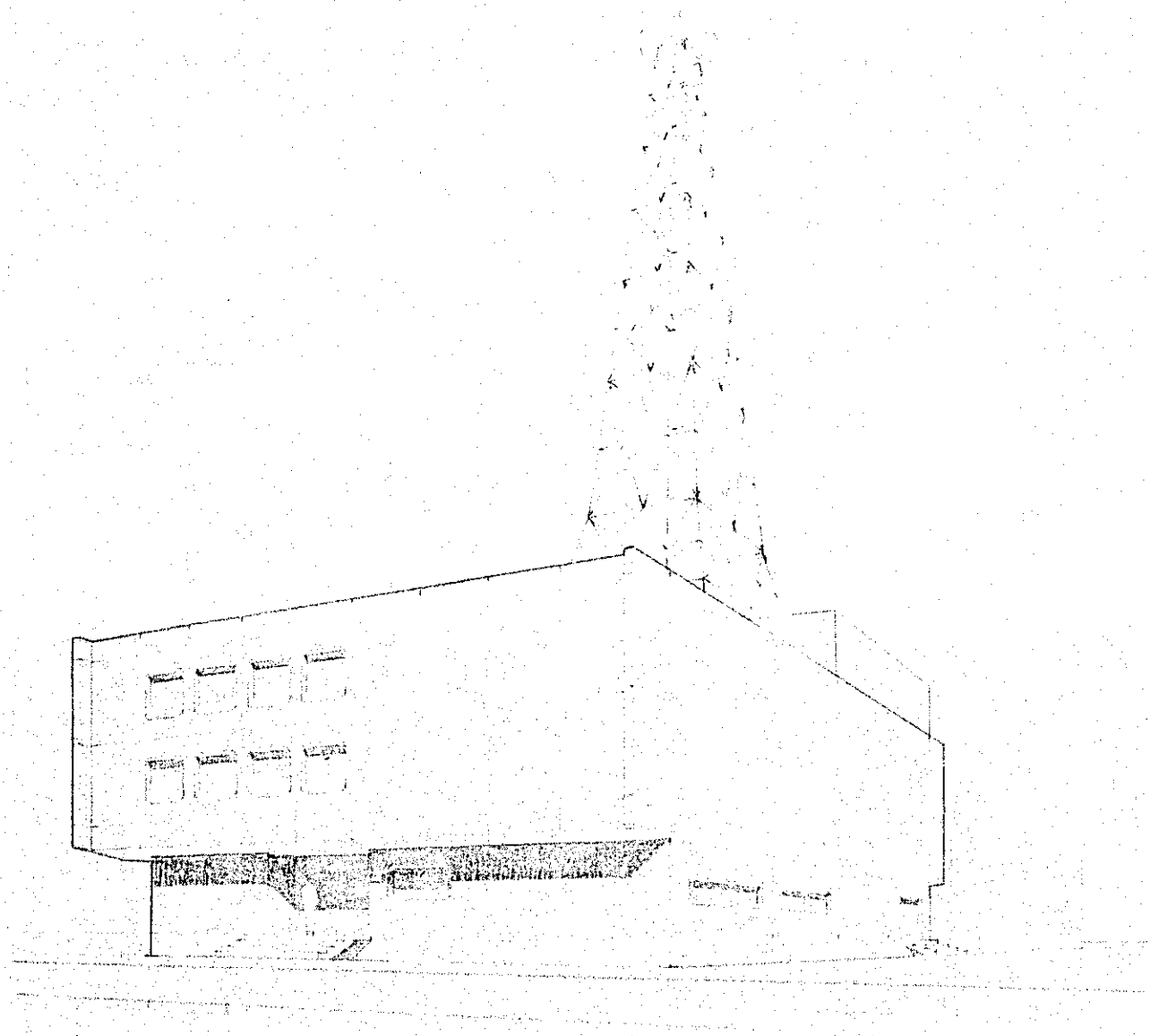


Fig. 2-8 Pictorial View of New Radio Studio Building

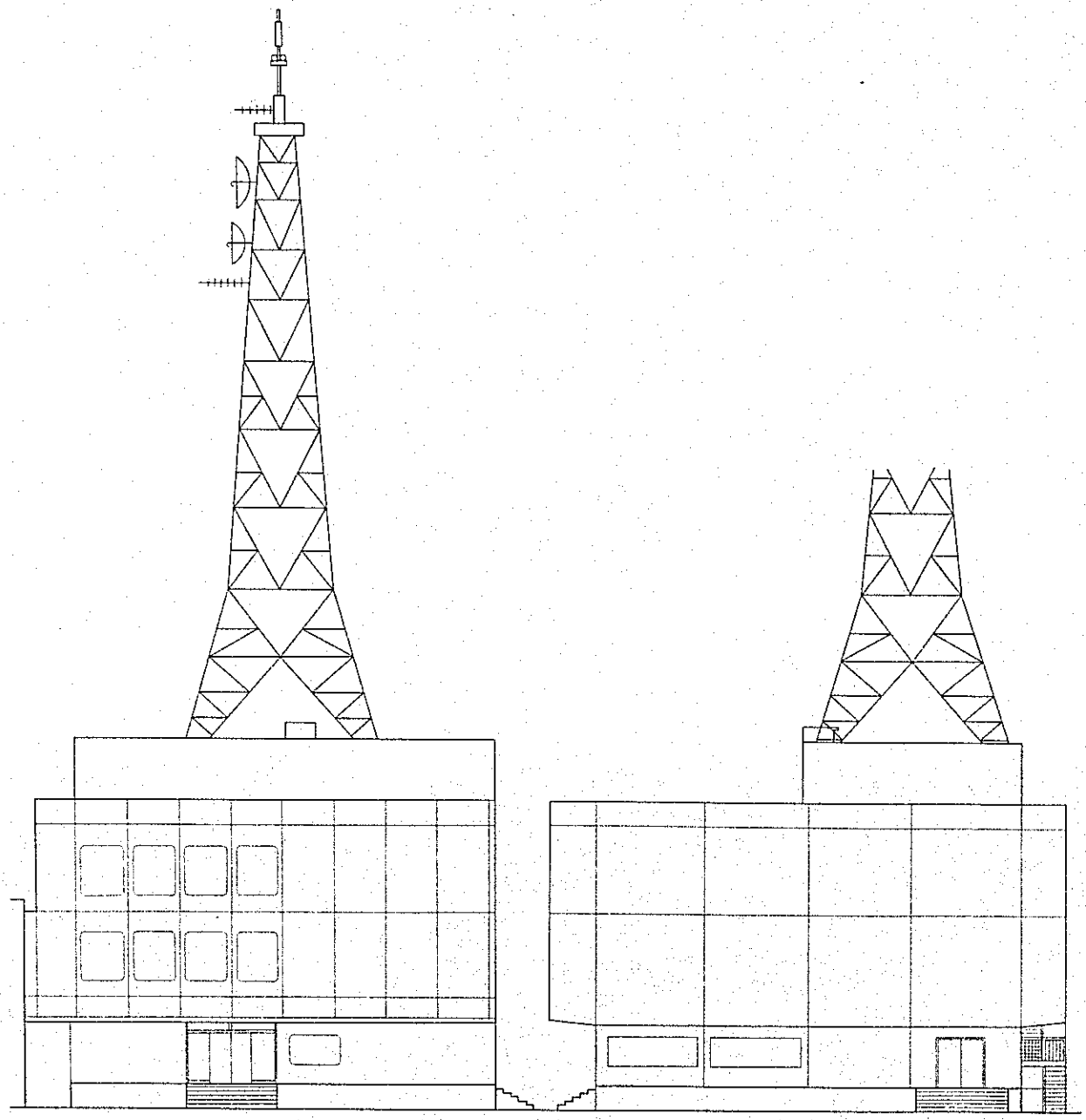


Fig. 2-9 Elevation of New Radio Studio Building

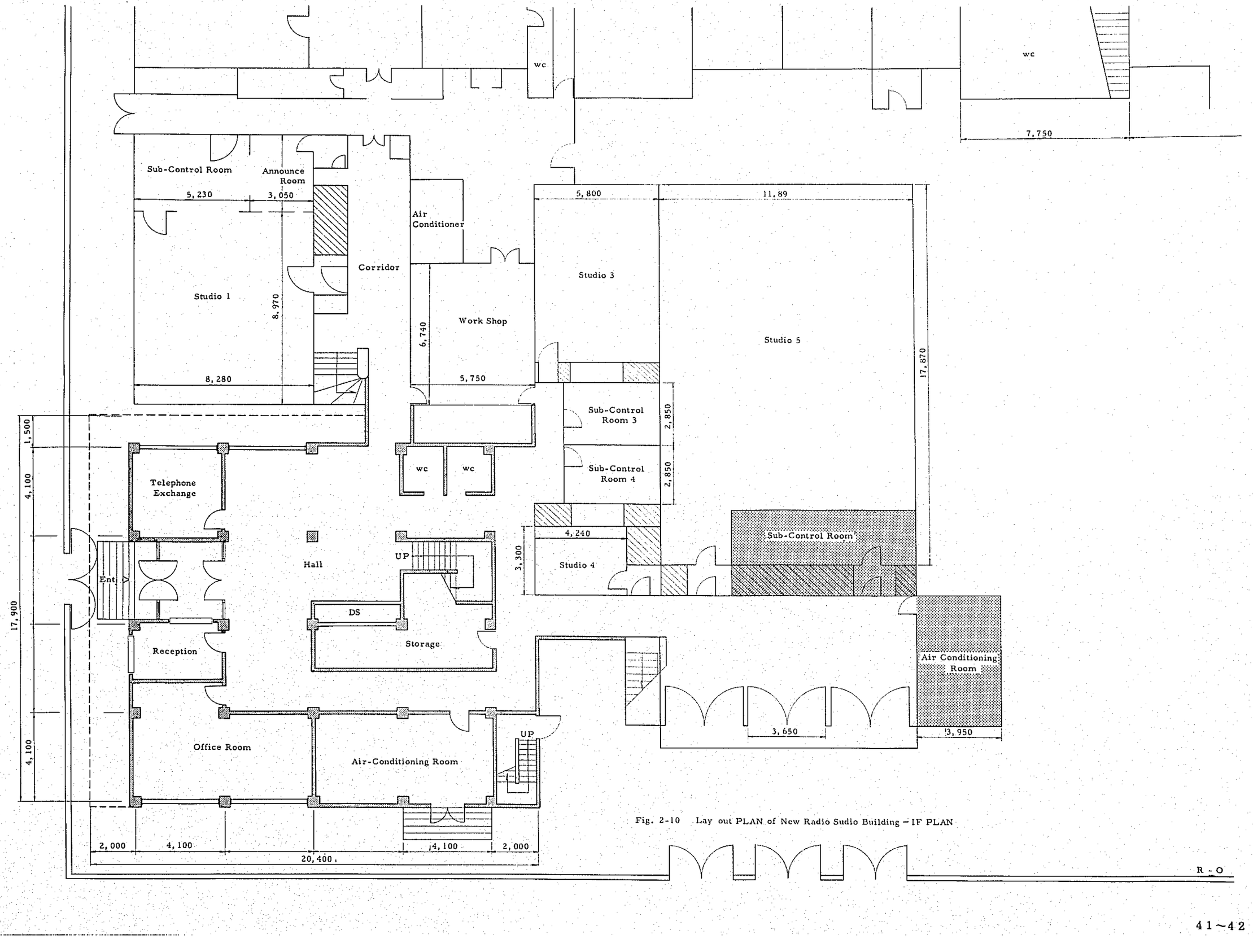


Fig. 2-10 Lay out PLAN of New Radio Sudio Building – IF PLAN

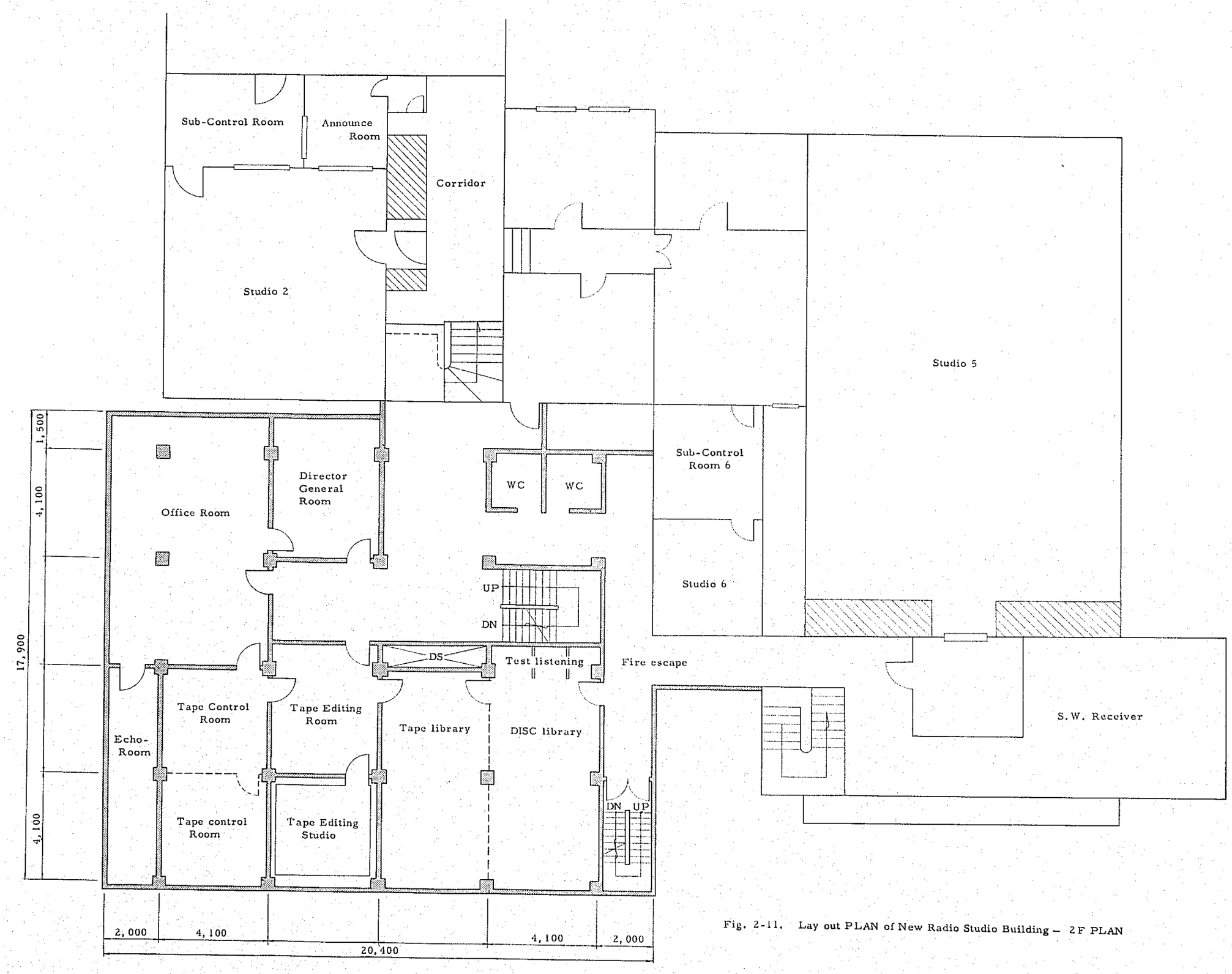


Fig. 2-11. Lay out PLAN of New Radio Studio Building – 2F PLAN

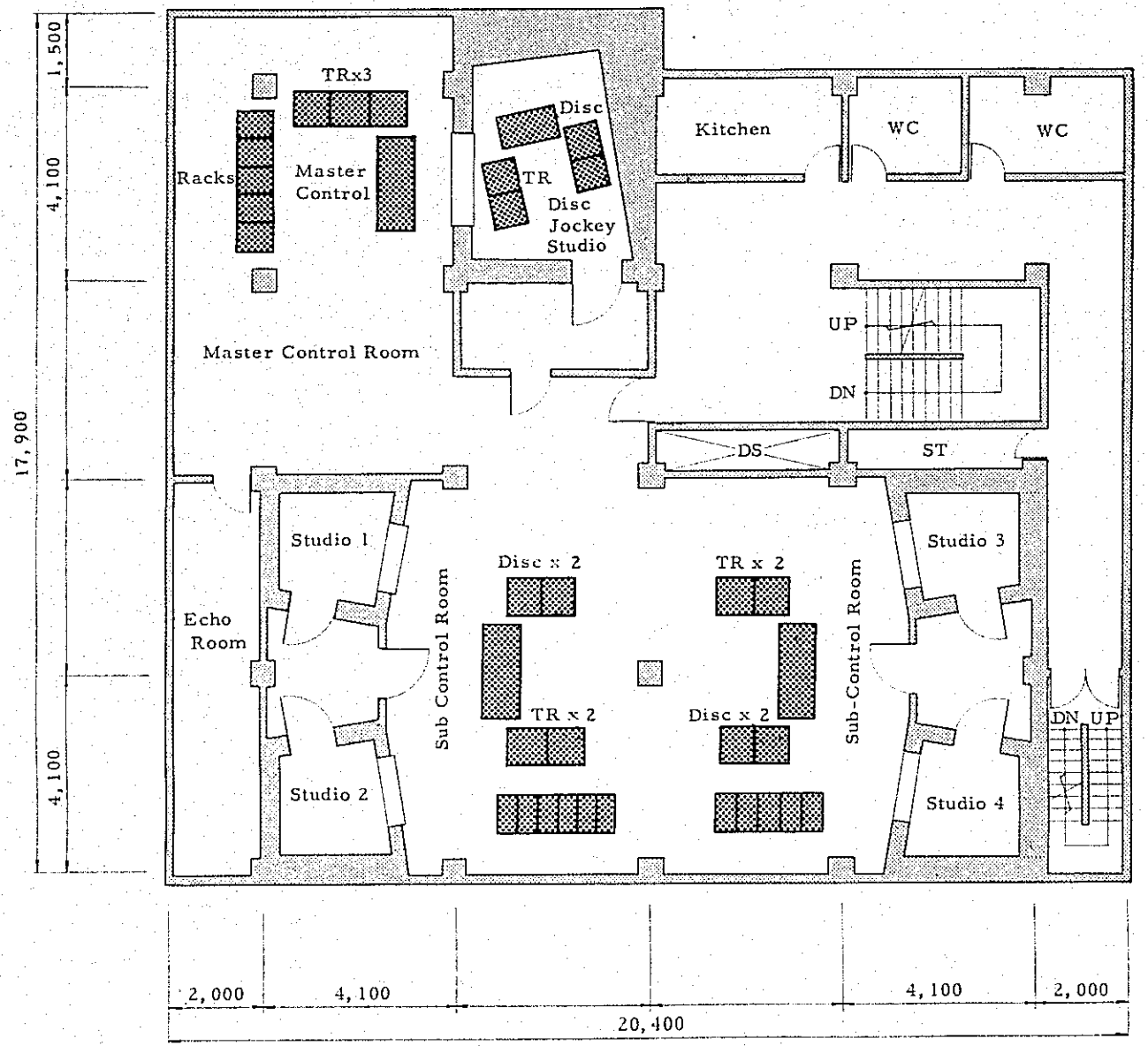
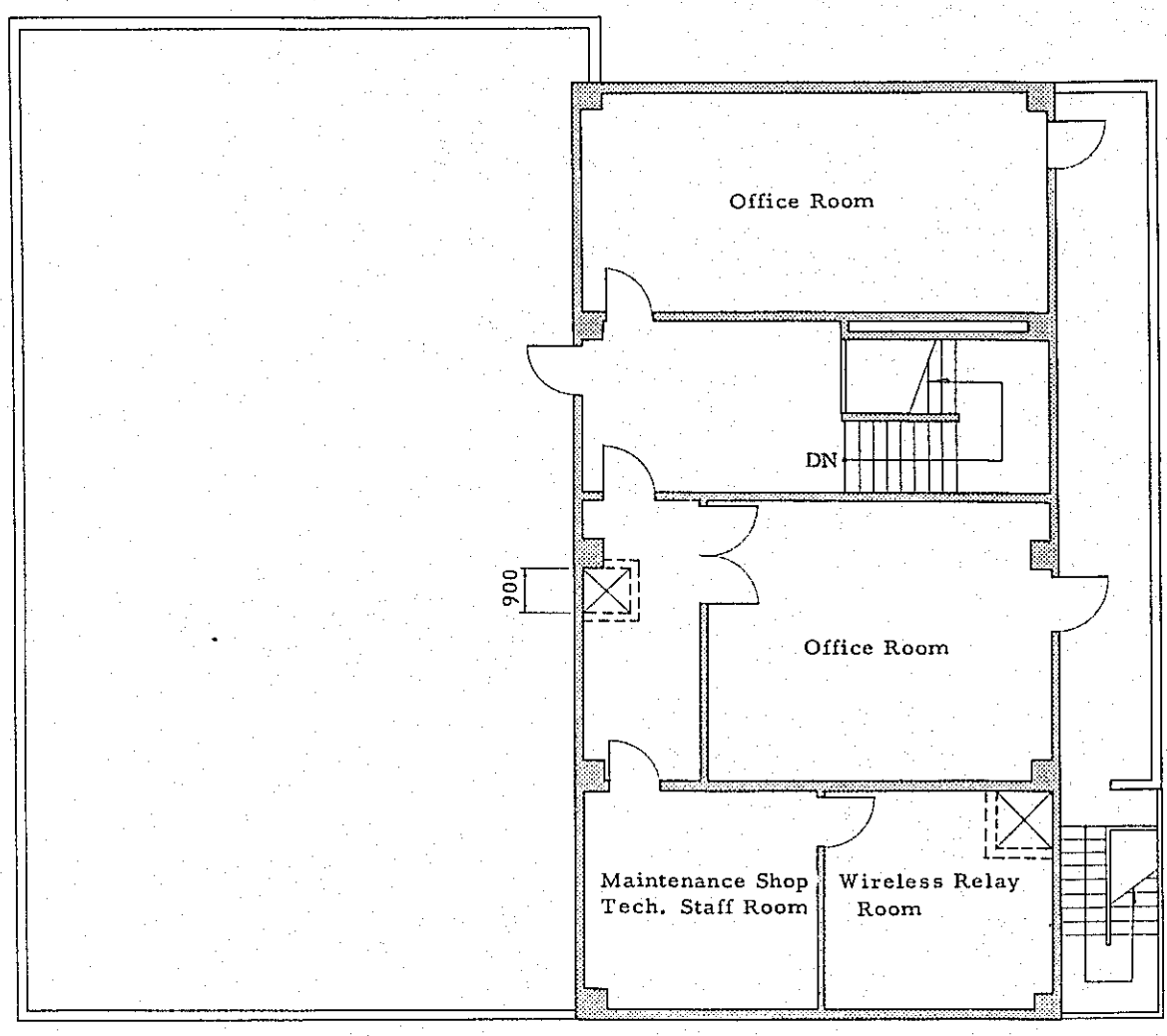


Fig. 2-12. Lay out PLAN of New Radio Studio Building – 3F PLAN



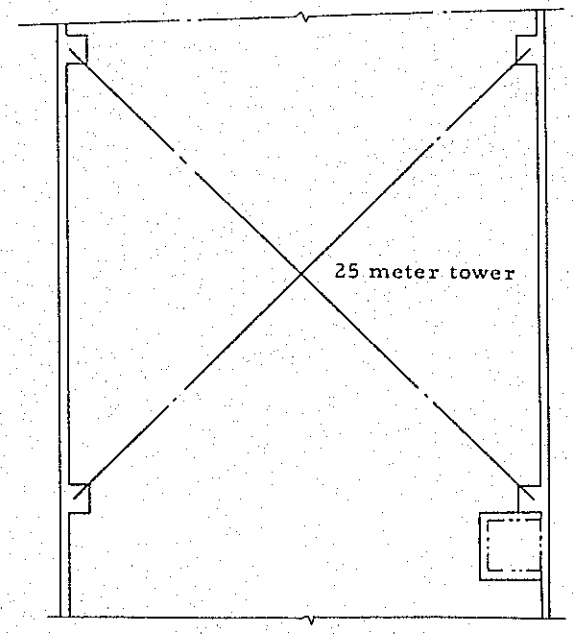


Fig. 2-13 Lay out PLAN of New Radio Studio Building – 4F & Roof PLAN

1.2 Transmitting Station

1.2.1 Objectives of Improvement and Expansion

(1) Expansion of the service area of broadcasting systems Nos. 1 and 2 over the entire nation.

(2) Replacement, improvement or repairs of superannuated equipments.

(3) Minimizing of the total operating cost.

(4) Establishment of back-up system in case of any fault in the equipment.

1.2.2 Plan of Improvement and Expansion

(1) The existing 120 kW transmitter (918 Khz) of Philips for MF broadcasting system No. 1, should be used as a stand-by transmitter of broadcasting system No. 2, and the NEC's 5 kW transmitter (918 Khz) should be employed at a local broadcasting station in future. In place of these transmitters, a 200 kW transmission system (comprising two 100 kW transmitters operated in parallel) should be newly installed, with the frequency altered to 740 KHz to extend the ground wave propagation. A top-loaded antenna has been adopted to attain a higher antenna efficiency and minimize the fading effect at the limited height of 105 m.

(2) For HF broadcasting system No. 1, the existing 50 kW transmitter of Philips should be used for stand-by purpose and the Chinese made 15 kW transmitter should be displaced from the transmision service. A 50 kW (4907 Khz) transmitter should be newly installed for HF broadcasting, with a frequency converter provided to shift its frequency from 4907 KHz to 6090 KHz and vice versa so that it may serve the stand-by purpose for broadcasting system No. 2.

The existing doublet antenna should be continuously used to avert long distance propagation.

(3) For MF broadcasting system No. 2, the existing Chinese made 20 kW transmitter should be displaced from service and the Philips' 1 kW transmitter should be used for training. In place of these transmitters, a 100 kW transmitter (918 KHz) should be newly installed, with the existing 120 kW transmitter of Philips (918 KHz) reserved for stand-by purpose. The 105 m high antenna to be newly erected for broadcasting system No. 1 should also be used for No. 2.

(4) For HF broadcasting system No. 2, the existing Chinese made 50 kW transmitter should be replaced by a new 50 kW transmitter (6090 KHz), with the existing doublet antenna continuously used. As a stand-by transmitter, the 50 kW transmitter to be newly installed for broadcasting system No. 1 should be used by frequency conversion.

(5) A new transmitting station having a floor space of 1,000 m^2 should be newly constructed at the site No. 23 shown in Fig. 2-14 to accommodate one system of 200 kW broadcasting equipment, one set of 100 kW MF broadcasting equipment, and two sets of 50 kW HF broadcasting equipment.

(6) An 800 KVA generator equipment should be newly installed on the empty mount in the existing generator room to augment the power generation capacity, with the power distribution system arranged as shown in Fig. 2-19.

(7) Those existing antennas which are not in use and detrimental to radio wave propagation should be removed.

1.2.3 Effect of Improvement and Expansion Plan

(1) With the implementation of the above-mentioned improvement and expansion plan, the service area can be enlarged as shown in Figs. 2-23 and 2-24.

What counts for a great deal in improving the propagation of MF radio waves is to materialize an effective combination of various design factors (such as the frequency, transmitting power, antenna height,

ground conductivity, city and atmospheric noise, etc.). The service area can be markedly expanded as illustrated in the figure if such means as the increase of transmitting power, erection of a top-loaded antenna and alteration of frequency (from 918 KHz to 740 KHz) are carried out to the maximum extent allowable under the existing restrictive conditions. The ground conductivity improves in the rainy season, but it is offset by the counterbalancing increase of atmospheric noise incidental zones. Hence, the service area does not vary much throughout the year.

(2) With a back-up system planned to be established by the installation of a stand-by transmitter for each transmitter which is to be put in constant operation, quick repair work can be made without suspending broadcasting service.

(3) Transmitting power was set at 200 kW since power consumption incurs a larger portion in the operational cost. If the cost of operation is desired to be further reduced, it may as well be proposed to broadcast No. 1 programmes at a transmitting power of 200 kW during the daytime and at 100 kW at night and to keep the stand-by transmitters disconnected from power source equipment under ordinary operating condition.

Table 2-2 Radio Transmitting Facilities

		Existing Radio Transmitting Facilities										Results of Survey	Proposed Plan		
		Frequency (KHz)	Output Power (KW)	Maker	Installed in	Mod System	Cooling System	Antenna feeding System	Feeder / Feeder length (m)	Tower height (m)	Tower		Treatment of existing equipment	Transmitter	Tower & Antenna
No.1 Broadcasting System (National Service)	MF	918	120	Philips	1969	Plate Mod.	Forced Air	Single feed to antenna base	Concentric open wire / 280	72	Base insulated Vertical guyed truss tower. (△)	(1) It can be used. (2) Mismatching should be adjusted.	Divert to back up system for International service	New set 200KW TX: (740 KHZ)	New 105m guyed tower antenna with toploading
			5 (back up)	NEC	1969			Shunt feed to FM Tower	Open parallel wire / 50	62	Base earthed Vertical guyed truss tower. (△)	(1) Output power is too small to keep same service.	Divert to local Station	-	-
	HF	4907	50	Philips	1965	Plate Mod.	Forced Air	Single feed	Open four wire / 50	23	Horizontal L shape doublet antenna.	(1) It can be used.	Use continuously as back-up	Existing set 50KW TX. (4907 KHZ)	Existing antenna
			15 (back up)	China	1959			Single feed	Open four wire / 80	23	Same as the above	(1) Out of Date. (2) No spare parts.	Dismount	New set 50KW TX. (4907 KHZ)	Existing antenna
	FM	MHz 94.25	5 (not in used)	Philips	1965		Forced Air	Single feed	Coaxial cable / 50	62	V type antenna 8 stacks	(1) It can be used if necessary.	Dismount	-	-
			-	-	-	-	-	-	-		-	-	-	-	-
No.2 Broadcasting System (International Service)	MF	740	20	China	1959	Plate Mod.	Water	Single feed to antenna base	Open parallel wire / 100	40	Base insulated Vertical guyed antenna	(1) Out of Date. (2) No spare parts.	Dismount	New set 100KW TX: (918 KHZ)	Dual feed to a new 105m base insulated tower antenna
			1 (back up)	Philips	1965		Forced Air	Single feed	Open parallel wire / 50	30	T type antenna	(1) Output power is too small to keep same service.	Dismount	Existing set 120KW TX. (918 KHZ)	Existing 72m Tower antenna
	HF	6090	50	China	1959	Plate Mod.	Water	Single feed	Open four wire / 80	23	Horizontal L shape doublet antenna.	(1) Out of Date. (2) No spare parts.	Dismount	New set 50KW TX: (6090 KHZ)	Existing antenna
				-	-	-	-	-	-	-	-	-	-	Common use of back up system for national service	-
Buildings		Building of Fig. 2-14 in numerical order. No. 1. (250m^2) ..... FM Transmitter (TX) made by Philips is installed. No. 2. (240m^2) ..... 20 KW MF TX and 15KW HF TX made in China are installed. No. 7. (240m^2) ..... 50 KW HF TX made in China is installed. No. 10. (320m^2) ..... 120 KW MF TX and 50 KW HF TX made by Philips are installed.											New Radio Transmitter Building (1000^2) in No.23 Building in Fig. 2-14.		
Power Supply		Power Generater. 600 kVA x 2. 130 kVA x 2. (made in China) not in use. City Power Supply.											New power Generator (800 KVA) is installed in No. 8 Building in Fig. 2-14. Generator mount is shown in Fig. 2-20.		

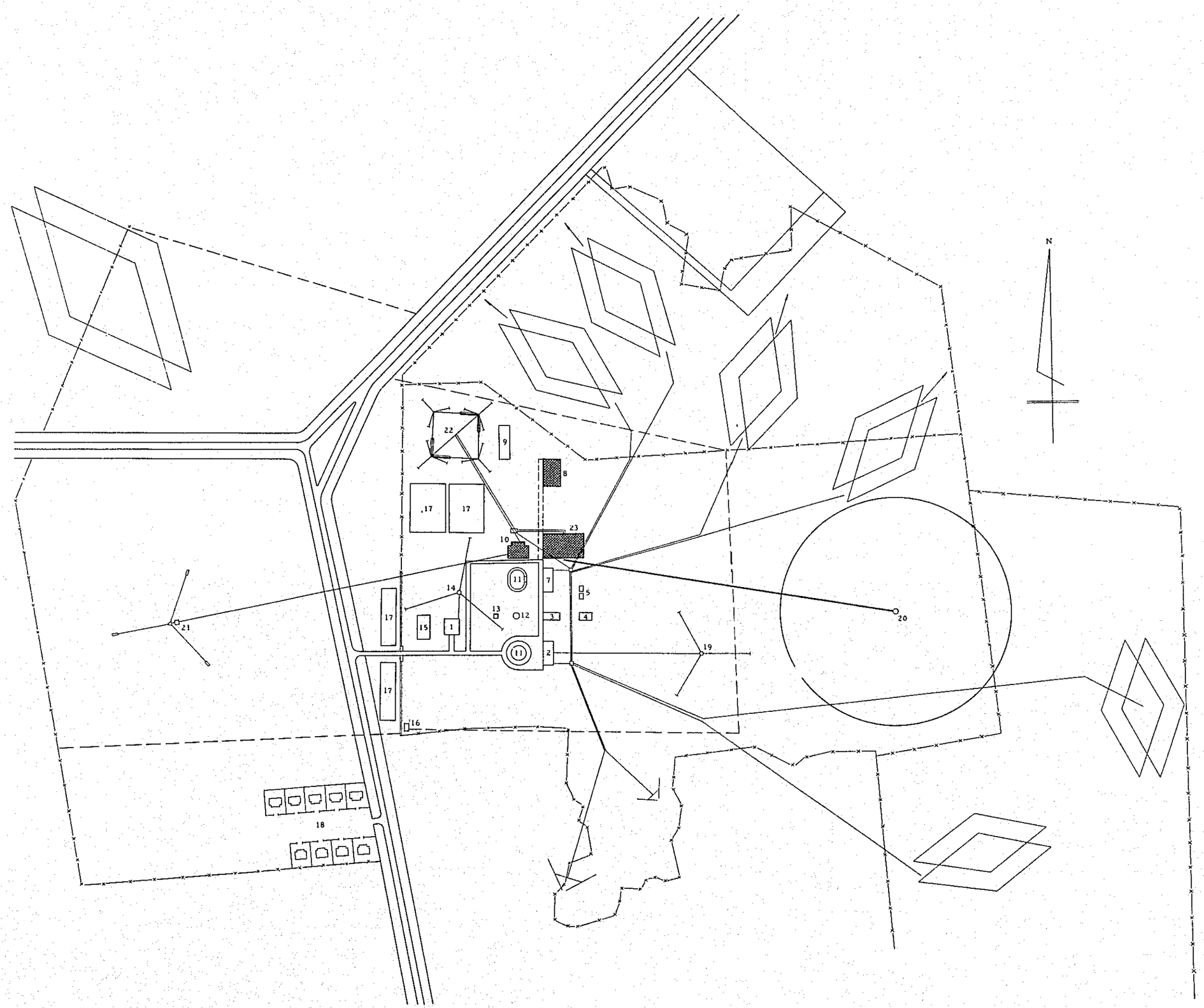


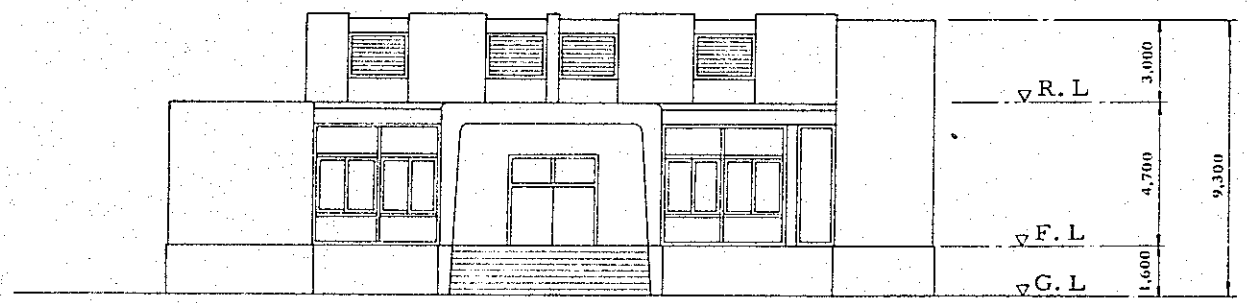
Fig. 2-14

PLAN DE MASSE DE LA STATION
DE RADIODIFFUSION NATIONALE

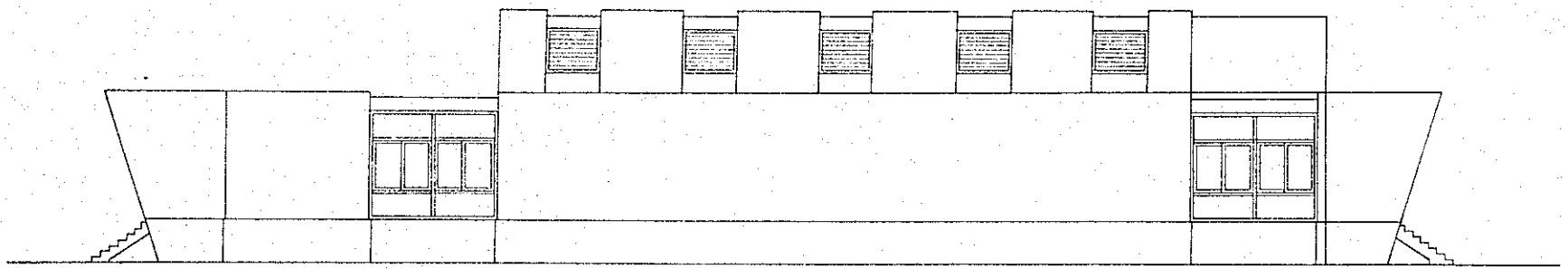
KHMERE

Echelle : 1/3000

1. Bâtiment Direction
2. Bâtiment Emetteur 15 kw & 20 KW
3. Groupe Electrogene de 130 KVA
4. Groupe Electrogene de 130 KVA
5. Cabine de Transformation D'energie
6. Cabine de Commutation D'antennes
7. Bâtiment Emetteur 50 KW
8. Groupe Electrogene de 2x600 KVA
9. Garage
10. Bâtiment Emetteur 50 KW & 120 KW
11. Bassin de Refroidissement
12. Chateau d'eau
13. Puits
14. Antenne Emetteur F.M. Hauteur 62 m
15. Terrain Basket Ball
16. Logement du Sevice de garde
17. Mares
18. Logement du Personnel de la Station
19. Antenne Emetteur 20 KW : Hauteur 40 m
20. Antenne Emetteur 200 KW : Hauteur 105 m
21. Antenne Emetteur 120 KW : Hauteur 72 m
22. Antenne Emetteur 50 KW : Hauteur 24 m
23. Bâtiment Emetteur 50 KW x 2, 100 KW & 200 KW

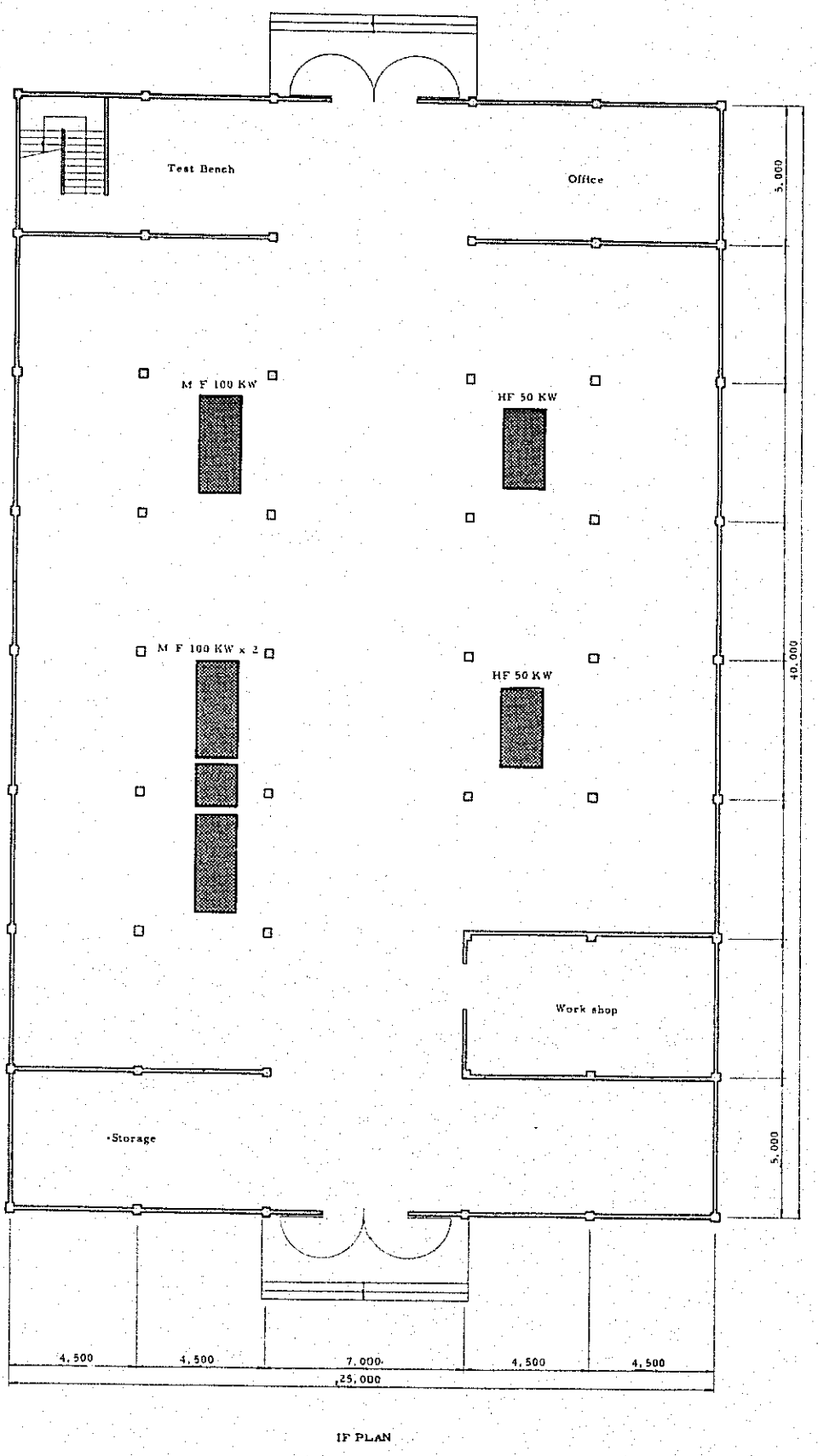


Front View



Side View

Fig 2-15 New Radio Transmitter Building Elevation



IF PLAN

Fig. 2-16 Floor PLAN of NEW RADIO TRANSMITTER Building NO. 1

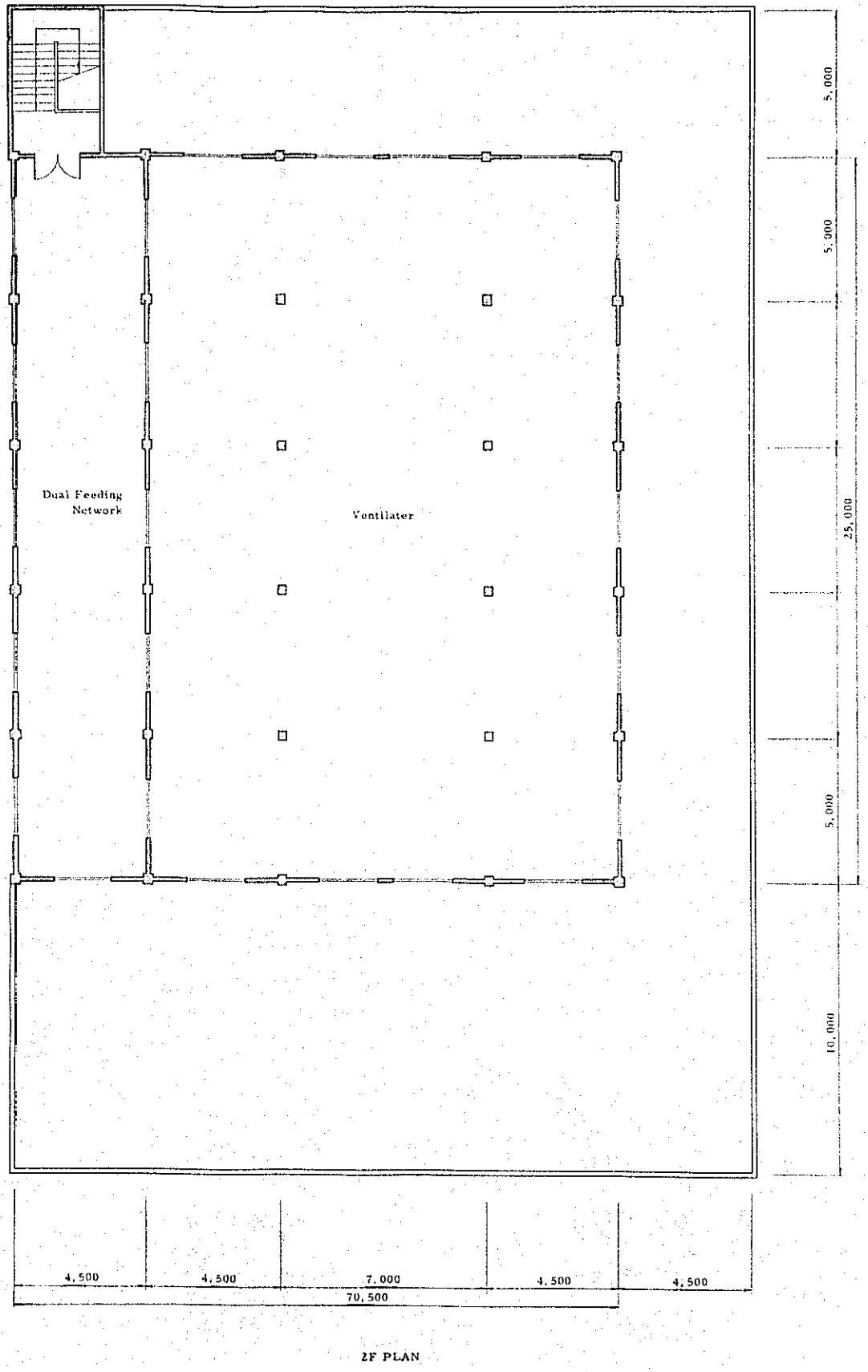


Fig 2-17 Floor PLAN of New Radio Transmitter Building No. 2

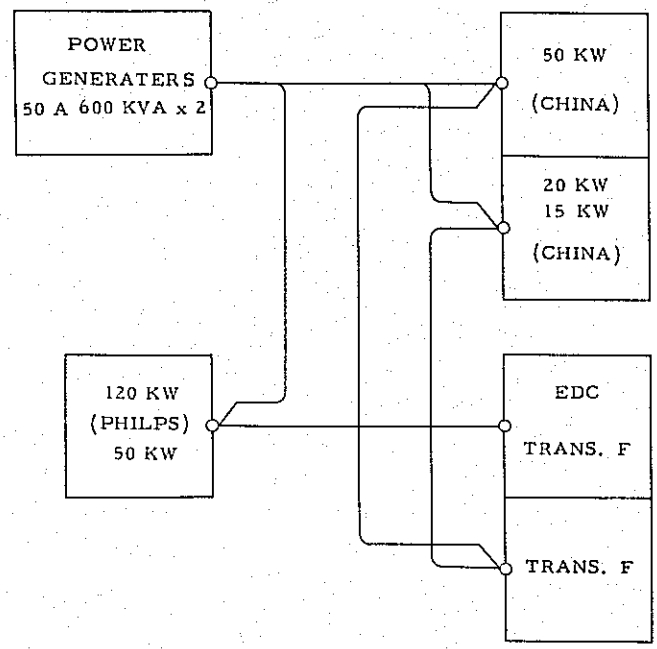


Fig. 2-18 EXISTING POWER SUPPLY SYSTEM AT Radio TX. STATION

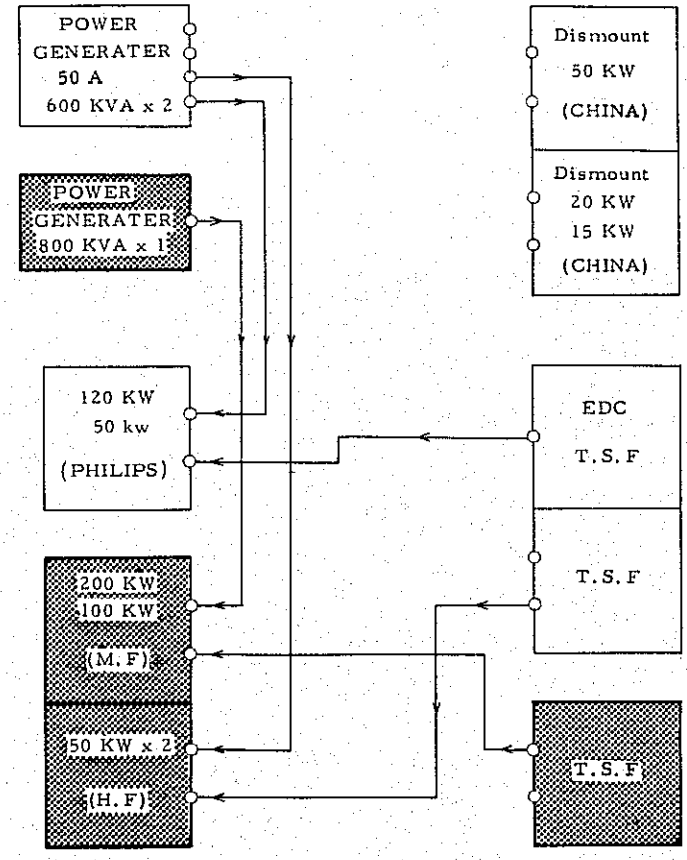


Fig. 2-19 EXPANSION PLAN OF POWER SUPPLY SYSTEM AT Radio TX STATION

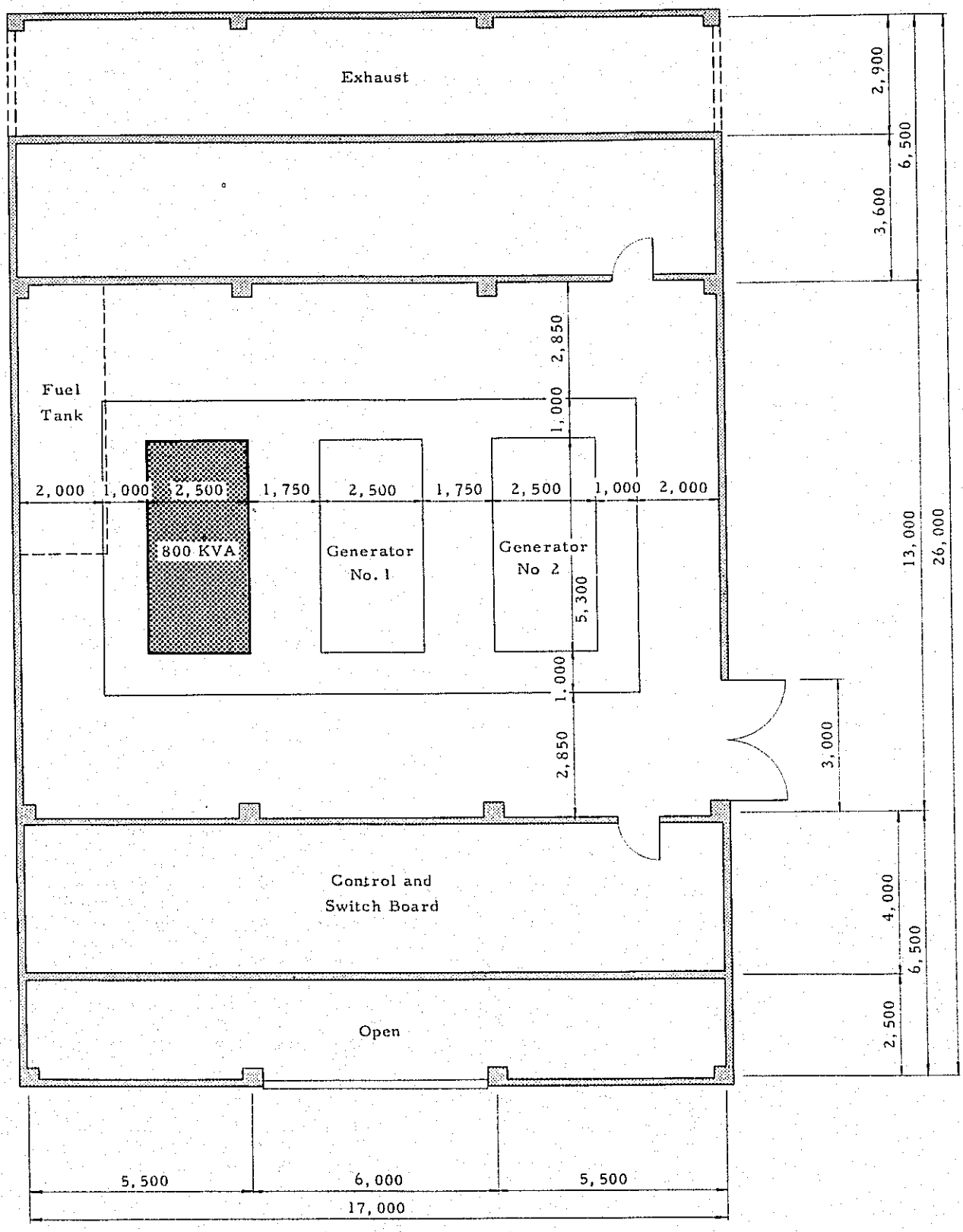


Fig. 2-20 Floor plan of Power Generator Building

1.3 Service Area

The existing state of radio broadcasting activity in the Khmer Republic is as shown in Table 2-3, and the service area of broadcasting system No. 1 of Phnom-Penh Broadcasting Station is shown in Fig. 2-21 for the dry season and Fig. 2-22 for the rainy season. Field intensity within this service area was obtained by the calculations made in accordance with the Recommendation No. 368-1 adopted at the 12th Plenary Assembly of CCIR (New Delhi, 1970) and with the technical data available in Japan.

Artificial noise is rather limited in the Khmer Republic, but atmospheric noise incidental to tropical zones (atmospherics resulting from thunders) is heavy. Consequently, if account is taken of the sensitivity characteristics of portable radio receivers which are popularized among the general public, the rating of received sound quality corresponding to respective field intensities would be as shown in Table 2-4.

Table 2-5 shows some of the field intensities obtained or measured by the team during the survey period.

When the new 200 KW transmitter is put in operation at a frequency of 740 Hz from the new transmitting antenna, its service area will cover the entire republic as shown in Fig. 2-23 for the dry season and Fig. 2-24 for the rainy season. As will be clear from Fig. 2-24, Phnom-Penh Broadcasting Station alone can cover the whole nation and provide news and entertainment programmes to the listeners in all corners of the country during the rainy season.

Table 2-6 was prepared to show the rough population within the service area. The population given in this table is based on the 1970's population of about 6,824,800 which was obtained on the assumption that a population of 5,728,771 disclosed by the 1962 census has increased at an annual natural growth rate of 2.2% without any change in its area-wise distribution.

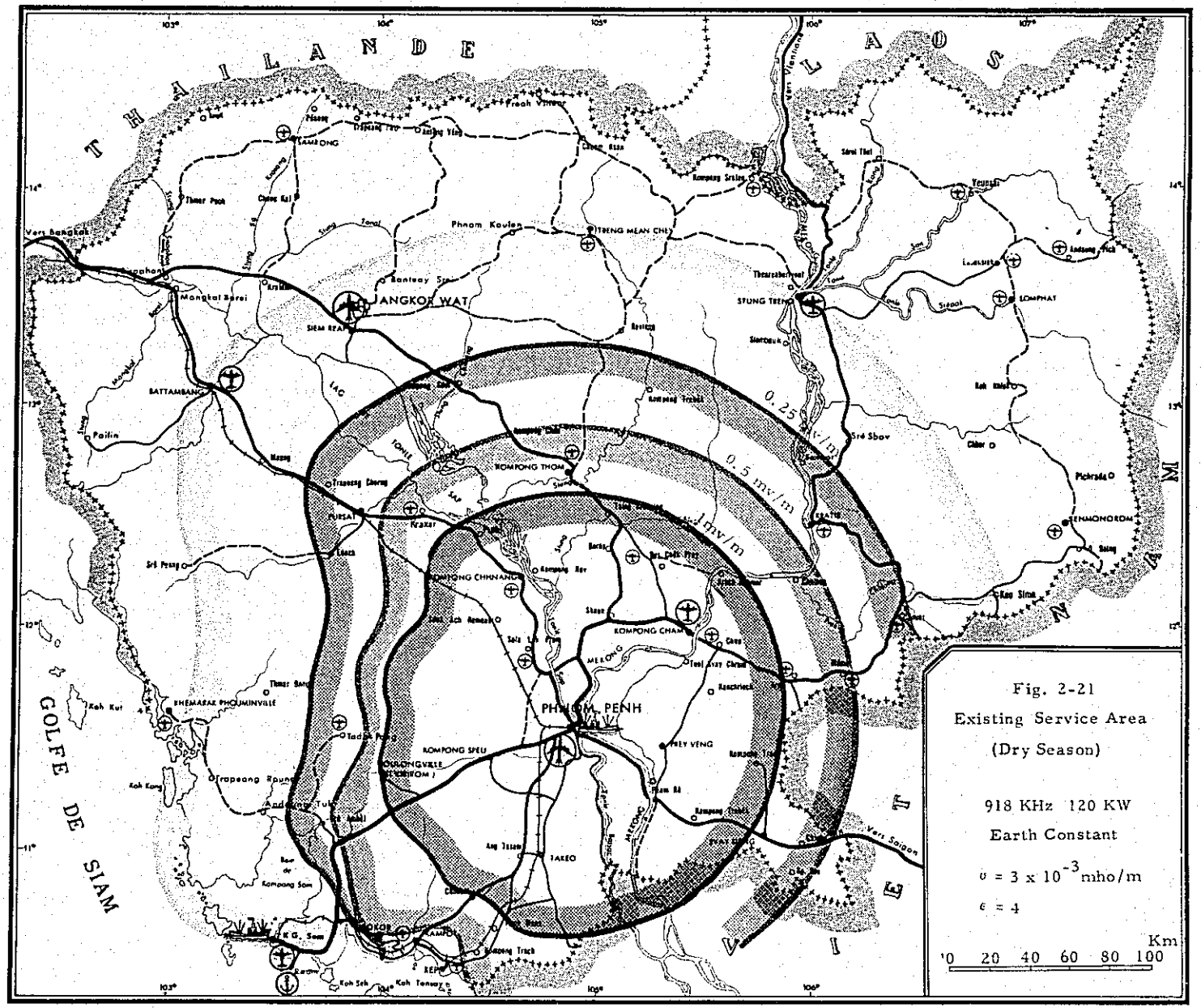


Fig. 2-21
Existing Service Area
(Dry Season)

918 KHz 120 KW
Earth Constant
$\sigma = 3 \times 10^{-3}$ mho/m
$\epsilon = 4$

0 20 40 60 80 100 Km

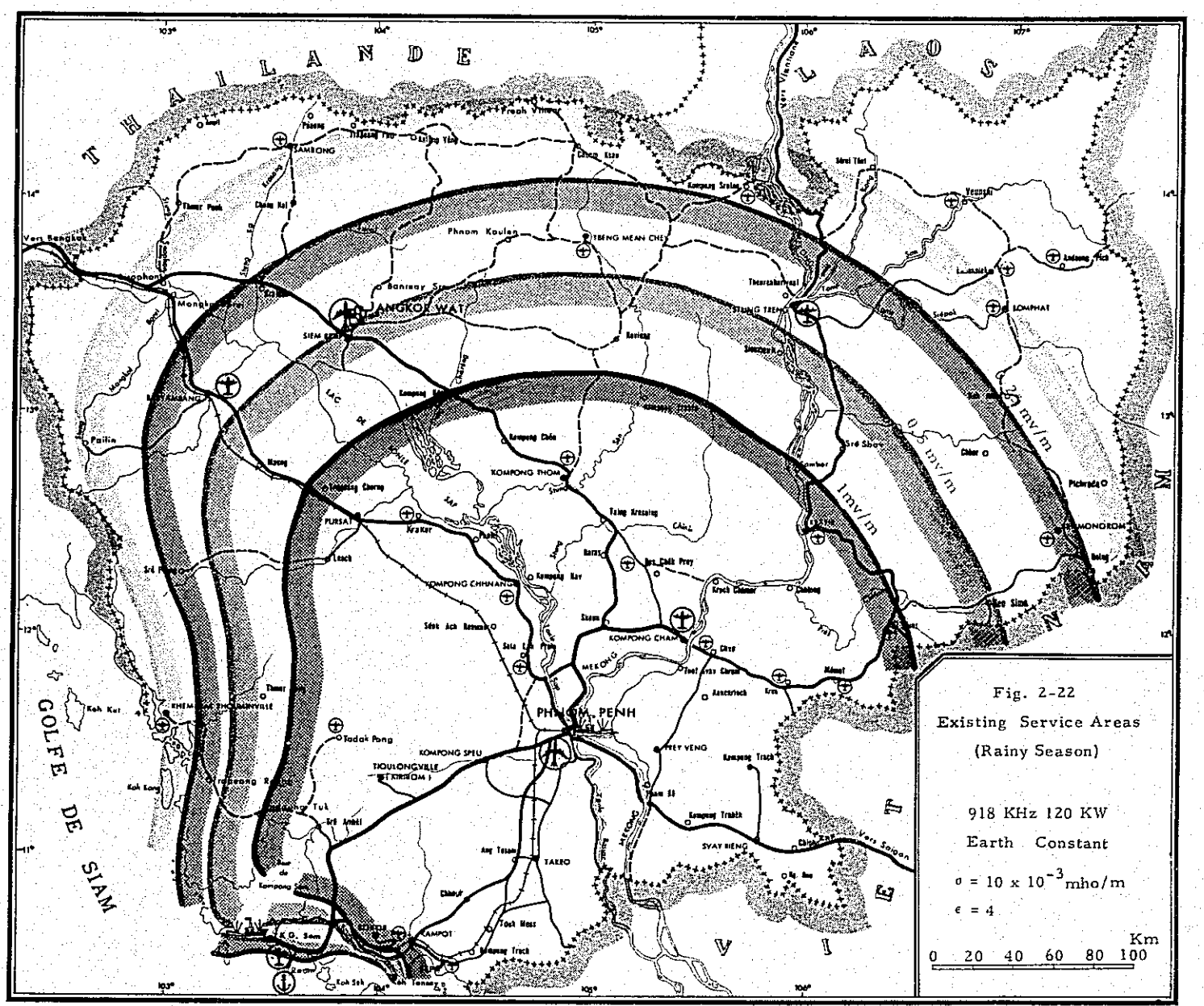


Fig. 2-22

Existing Service Areas

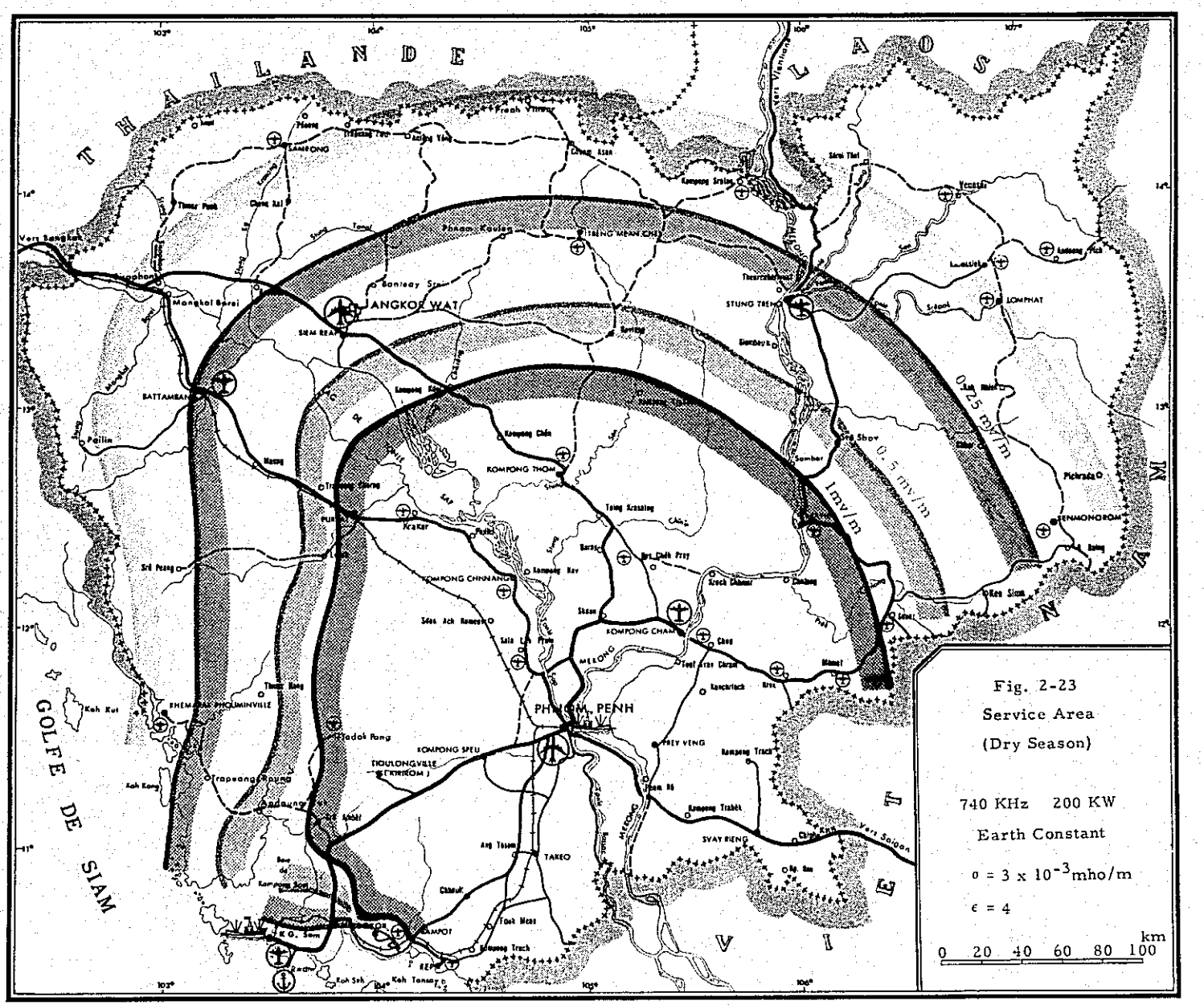
(Rainy Season)

918 KHz 120 KW

Earth Constant

$\sigma = 10 \times 10^{-3}$ mho/m

$\epsilon = 4$


THAILANDE
LAOS
VIET NAM
GOLFE DE SIAM
ANGKOR WAT
PHNOM PENH
KOMPONG THOM
KOMPONG CHHNANG
KOMPONG CHAM
TAKEO
SVAY RIENG
STUNG TRENG
LOMPHAT
BATTAMBANG
KRAKOR
0.75 mv/m
0.5 mv/m
1mv/m
Fig. 2-23
Service Area
(Dry Season)
740 KHz 200 KW
Earth Constant
σ = 3 x 10⁻³ mho/m
ε = 4
km
0 20 40 60 80 100

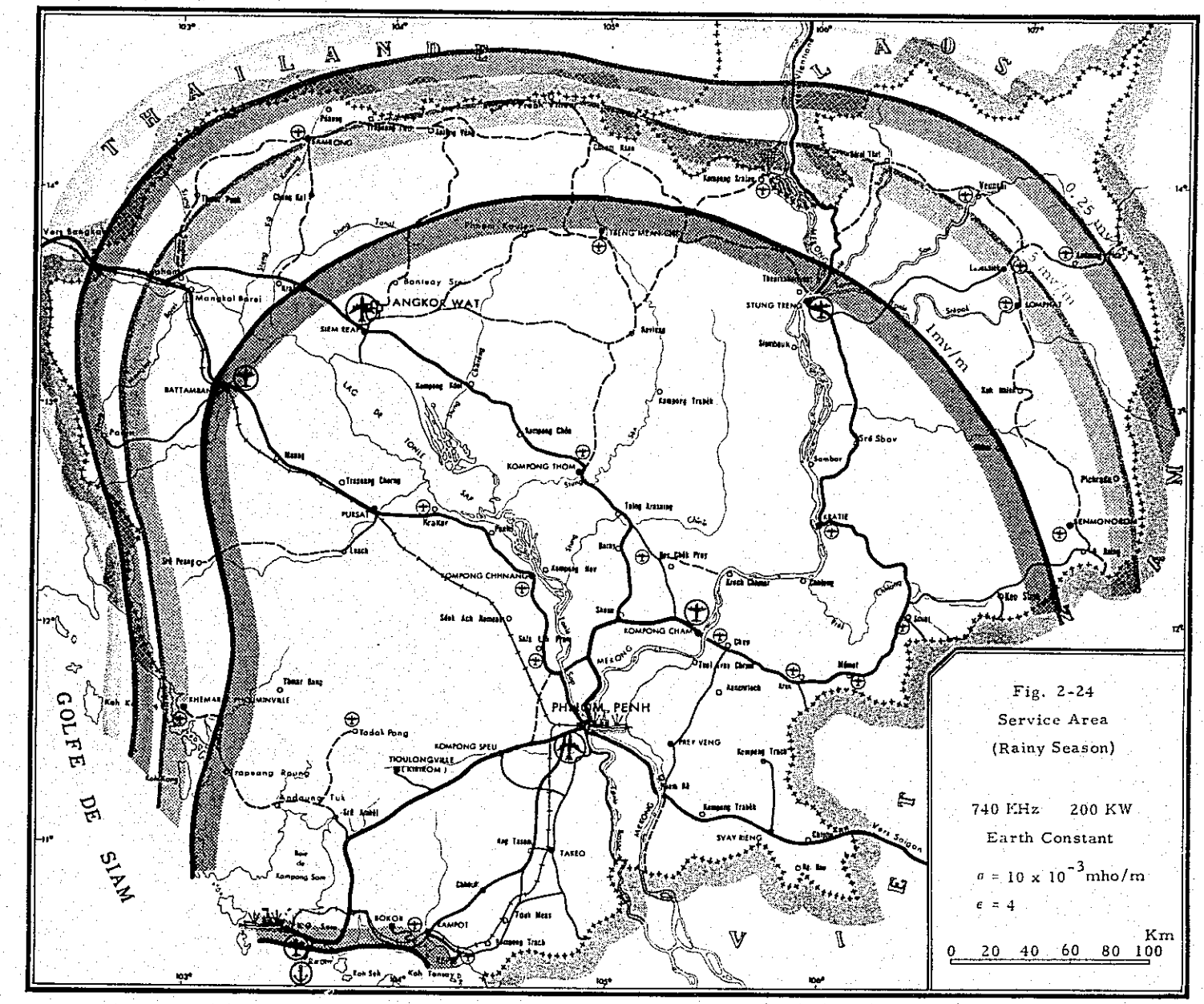

THAILANDE
LAOS
VIET NAM
GOLFE DE SIAM
0.25 mv/m
1mv/m
5 mv/m
ANGKOR WAT
SIEM REAP
BATTAMBANG
KOMPONG THOM
PURSAT
KOMPONG CHHNANG
KOMPONG CHAM
PHNOM PENH
KOMPONG SPEU
TAKEO
KAMPOT
BOKOR
KRATIE
STUNG TRENG
SVAY RIENG
PREY VENG
KEP
KOH TONSAY
MEKONG
TONLE SAP
Fig. 2-24
Service Area
(Rainy Season)
740 KHz 200 KW
Earth Constant
σ = 10 x 10⁻³ mho/m
ε = 4
Km
0 20 40 60 80 100

Table 2-3 Brodcasting Station

Station name	Frequency (KHz)	Power (KW)	Makev	Antenna type and height(m)	Broadcasting System
Phnom Penh	740	20	China	Vertical 40	No. 2
	918	120	Philips	Vertical 72	No. 1
	4,907	50	Philips	Corner-doublet 23	No. 1
	6,090	50	China	ditto	No. 2
Battambang	1,315	1	Brazil	Y 36.5	
KG. Som	720	10	Collins	Vertical 25	

Table 2-4 Field Strength vs. Quality of Reception

(mv/m)

Quality	Phnom Penh	Provincial city	The others
Excellent	above 10	above 5	above 1
Good	above 5	above 1	above 0.5
Fair	above 1	above 0.5	above 0.25
Poor	above 0.5	above 0.25	above 0.1
Un usable	—	—	—

Notice 1. Regarding the service area, it should be considered as within the limits of "Fair" in the quality of reception.

2. In case the reception is inferior in quality due to tropical noise (atmospherics caused by thunder) prevailed in rainy season, it seems to be appropriate to consider that the lowest field intensity should be 0.5 mv/m.

Table 2-5 Data of Measurement Test of Broadcasting Stations

Location	Distance (KM)	740 KHz		918 KHz		4907 KHz		6090 KHz		Remarks
		dB	mv/m	dB	mv/m	dB	mv/m	dB	mv/m	
Phnom Penh										
Japanese Embassy	6.7	99.8	97.8	115	562	69~75	2.8~5.6	58~68	0.8~2.5	Evening
Chbar Ampou	5.5	102.0	103	112.4	410					Daytime
Hotel Khemara (on the roof)	5.4	104.0	158	about120	1000					Ditto
Kamboul	11.3	94.3	52	110.5	318.5	60.0	1.0	60.9	1.1	Daytime
Kompong Som										
Airport	172	33.2	0.05	50.7	0.34					Daytime
AirCambodgeTerminal	172			46.0	0.2					ditto
Radio TX Station	180			43~44	0.15~0.16					ditto
in the city	180	42~47	0.13~0.22	60~66	1.0 ~2.0					Night time
Battambang										
Radio TX Station	250	43	0.14	52.0	0.4			38~46	0.08~0.2	Daytime
Radio Studio	250			46.0	0.2	41~49	0.11~0.28			ditto
Airport	250			51.0	0.35					ditto
in the city	250			54~60*	0.5 ~1.0	41~53	0.11~0.45	40~50	0.1 ~0.3	Nighttime
Thailand										
Bangkok	540	**		23 *	0.014					Nighttime
Bansan Coast	470	**		**		6~20	0.002~0.01	16~32	0.006~0.04	Daytime

* Interference accompanied with carrier - beat was experienced.

** Measurements were impossible due to interferences caused by adjacent frequencies from Broadcasting stations in Bangkok.

Table 2-6 New Coverage of Phnom Penh Brodcasting Station

(mv/m)

Dry season	above 1	above 0.5	above 0.25	above 0.1		
Rainy season			above 1	above 0.5	above 0.25	above 0.1
Population in the Sevice area (thousand)	5,371	5,631	6,163	6,456	6,743	6,824
Coverage of total Population (%)	78	83	90	95	99	100

1.4 Determination of Transmitting Antenna Height

In order to assure that radio waves are efficiently transmitted at a transmitting power of 200 KW and a frequency of 740 KHz, the transmitting antenna should have a height of at least 150 m even if it is top-loaded. However, Stung Mean Chey transmitting station is only about 5 km apart from Phnom-Penh International Airport which is in the western suburbs of Phnom-Penh (See Fig. 2-27), and this sets limit on its antenna height for the safety of aeroplanes landing at and taking off from the said airport.

In its recommendation regarding structures in the neighborhood of an airport, ICAO (International Civil Aviation Organization) stipulates a number of restrictive provisions which are illustrated in Fig. 2-28. In accordance with this recommendation, Civil Aviation Bureau, Ministry of Public Works of the Khmer Republic has established regulations pertaining to structures built on the inner horizontal surface and the conical surface around the airport (See Fig. 2-26), whereby the height above the ground of the new antenna was set at 105 m (See Fig. 2-25).

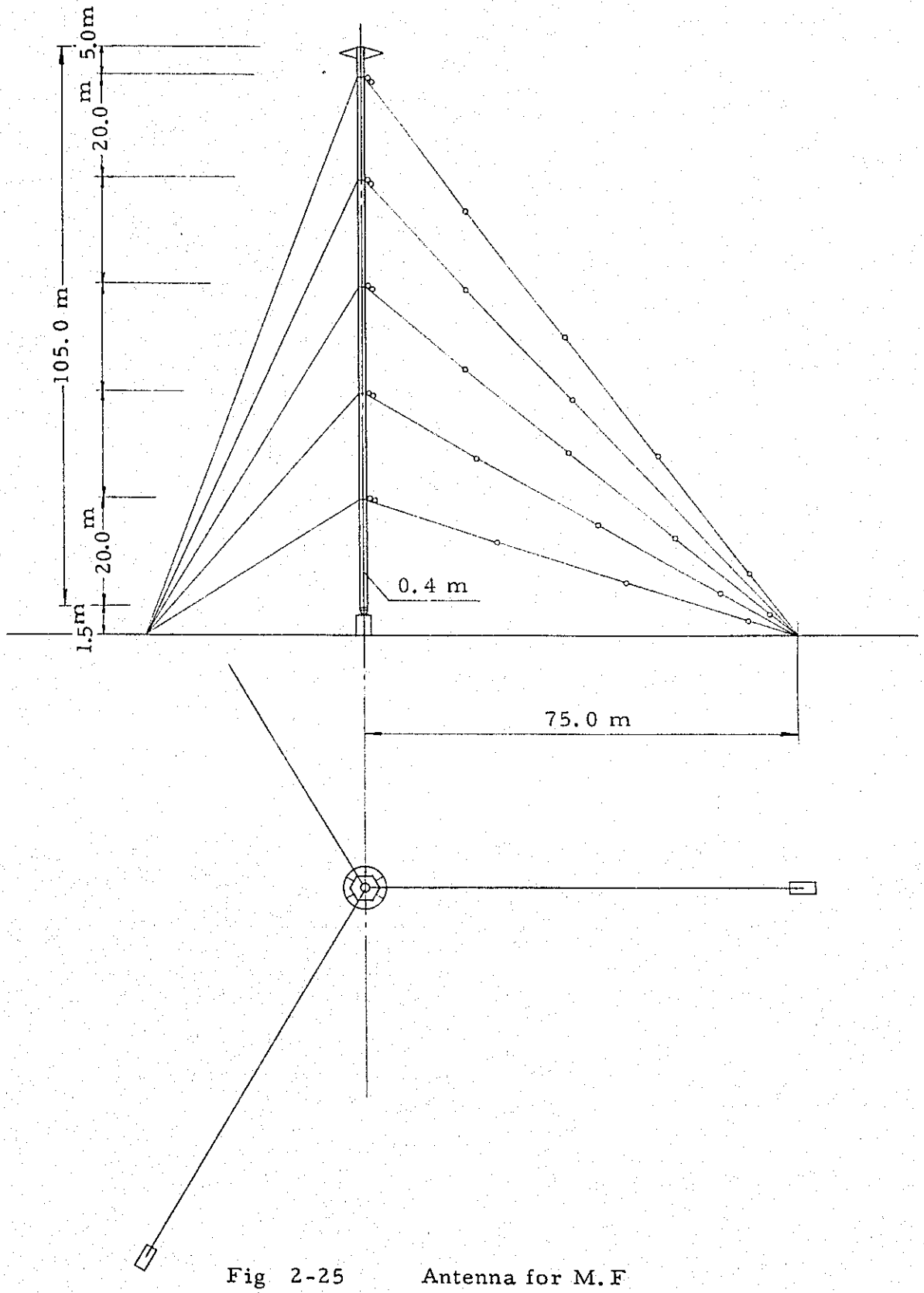


Fig 2-25 Antenna for M.F

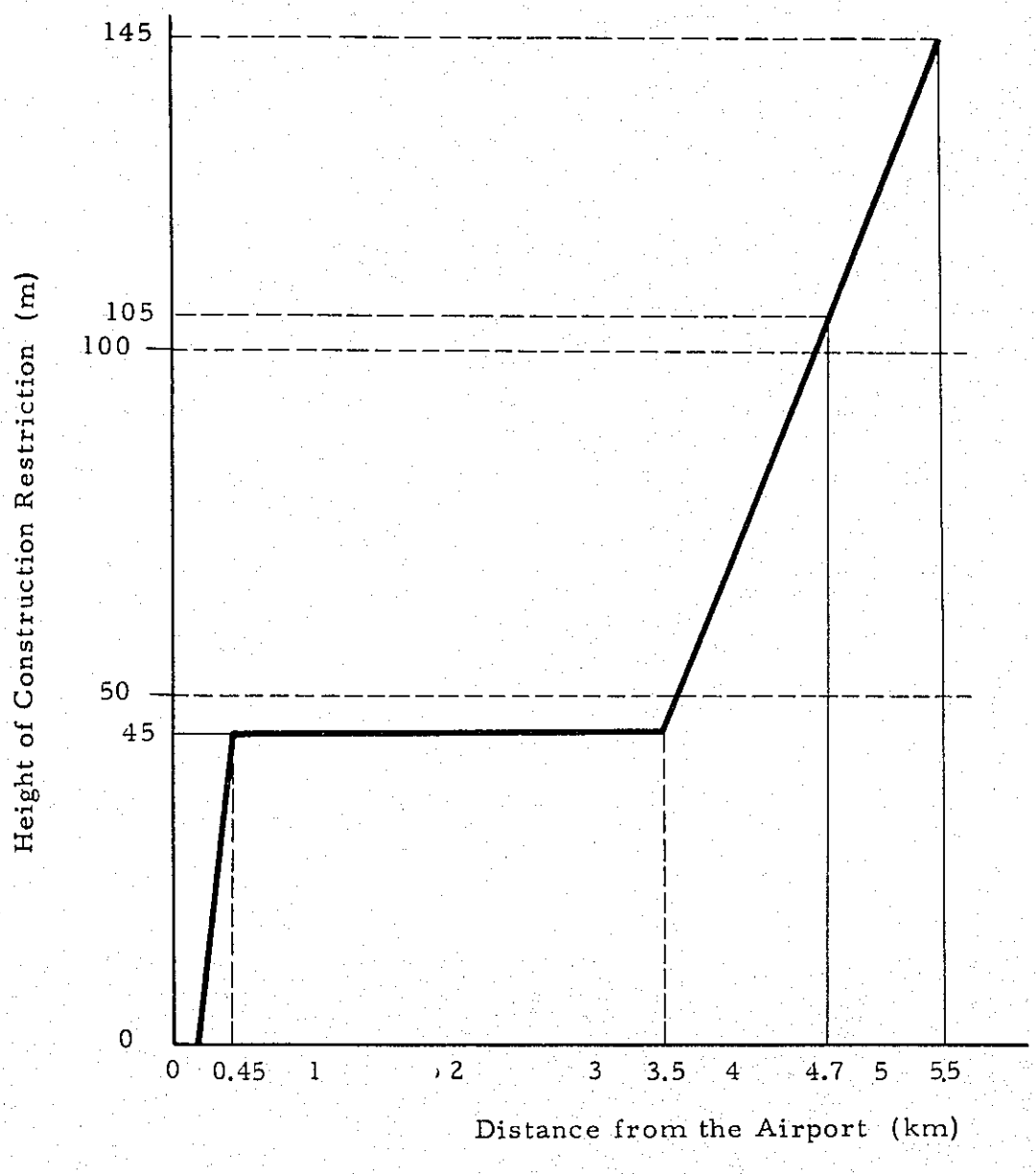


Fig. 2-26 Height of Construction Restriction around the airport

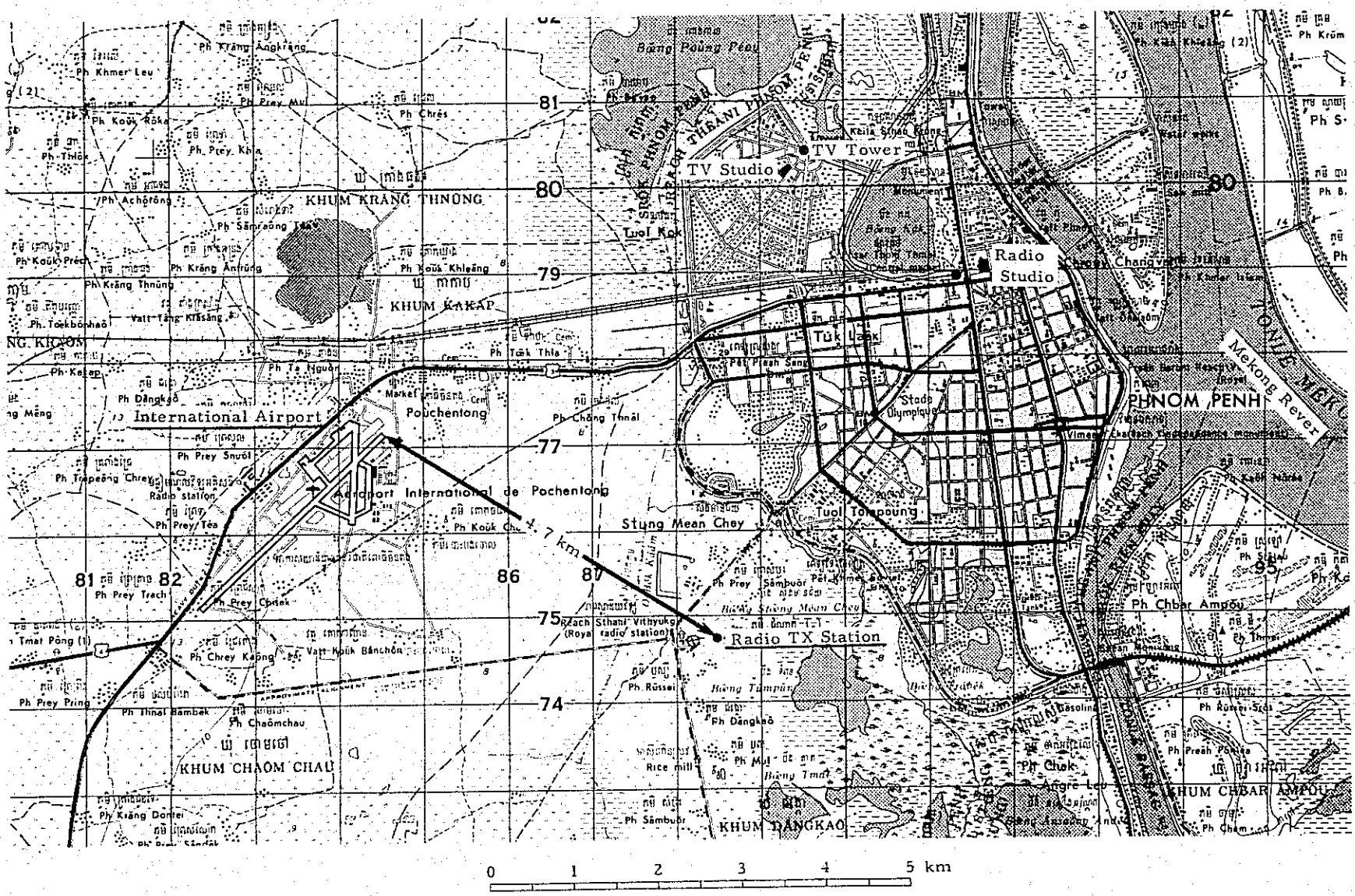


Fig. 2-27 Phnom Penk and vicinity

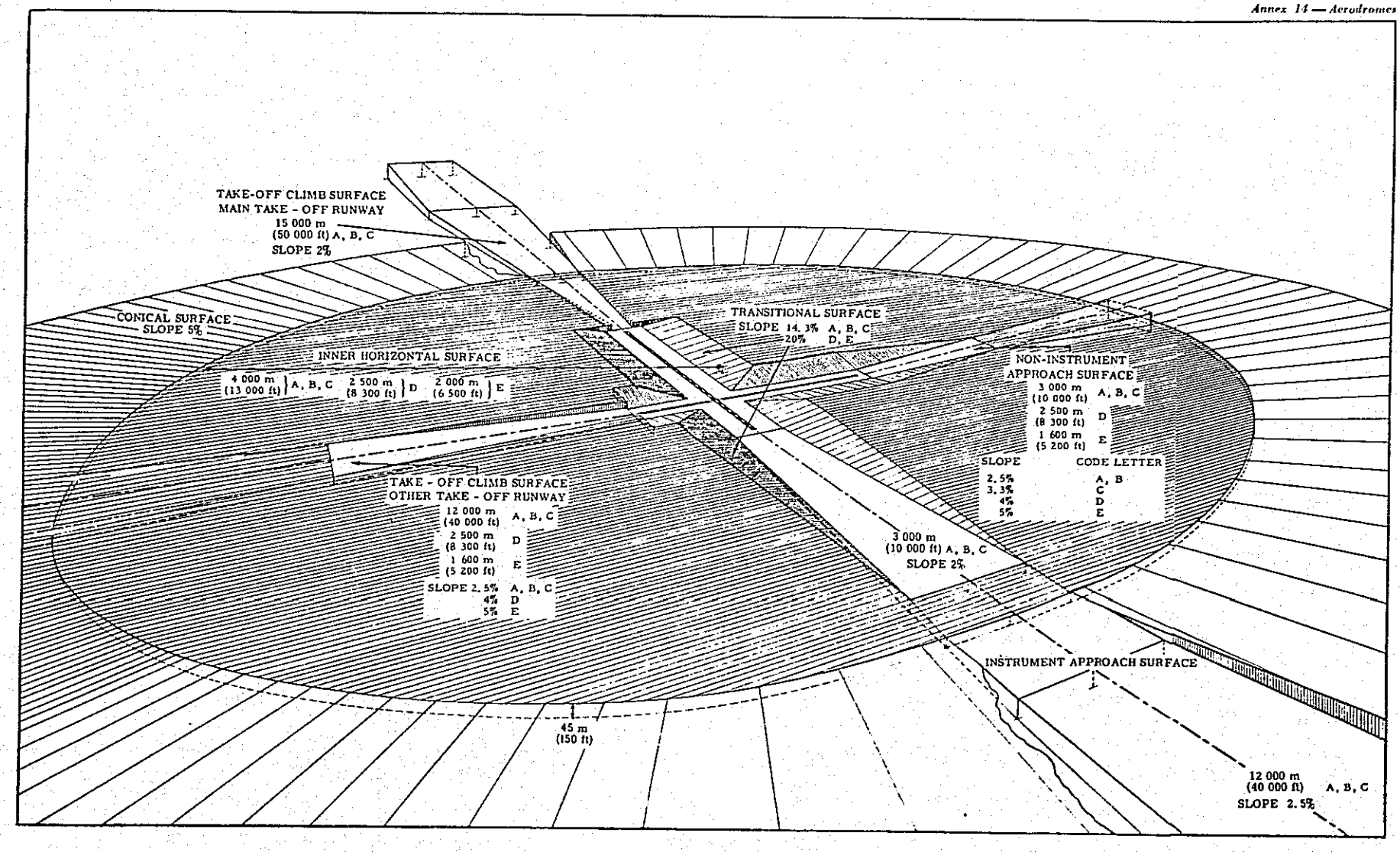


Fig. 2-28 OBSTRUCTION RESTRICTION

1.5 STL (Studio-Transmitter Link)

The building of the Ministry of Information which is accommodates radio sutudios and the transmitting station at Stung Mean Chey are connected by eight pairs of city cables. Six out of these eight pairs of cables are rather superannuated, and the remaining two are used for linking the studio and transmitting station for broadcasting system Nos. 1 and 2. The proposed expansion of broadcasting facilities should therefore include the improvement of this STL.

The programme line between a studio site and a transmitting station resorts either to a radio relaying system or a wire system. For the improvement of the said STL, employment of a radio relaying system is recommended in view of its low construction cost, circuit stability and easy maintenance.

If the said STL is constructed to connect the studio in the Ministry of Information and the radio transmitting station at Stung Mean Chey, its route will pass on the road extending in the southwest direction from the central market in Phnom-Penh. Programmes transmitted by this circuit will therefore be subjected to ignition noise of automobiles and other artificial noise. To avoid such noise, a frequency band of 950 MHz is to be used for the STL. It is hoped that this STL will be fully capable of transmitting programmes and also provided with a stand-by circuit and an order line.

To meet the abovementioned conditions, equipments shown in Table 2-7 should be installed for STL facilities.

Fig. 2-29 is a schematic drawing of the STL. The antenna of the studio side should be fitted on top of a 25 m high tower (height above the ground: 40 m) which is to be set up on the roof of the new building having a height of 15 m above the ground. The antenna of the transmitting station side, on the other hand, should be set on the truss tower for FM broadcasting erected behind the office building. If the antenna height above ground is 38 m at the studio-side and 35 m at the transmitting station, a good line-of-sight can be obtained between the two places as shown in Fig. 2-30, and this clearance is sufficient to disregard the disturbance due to buildings in the city area.

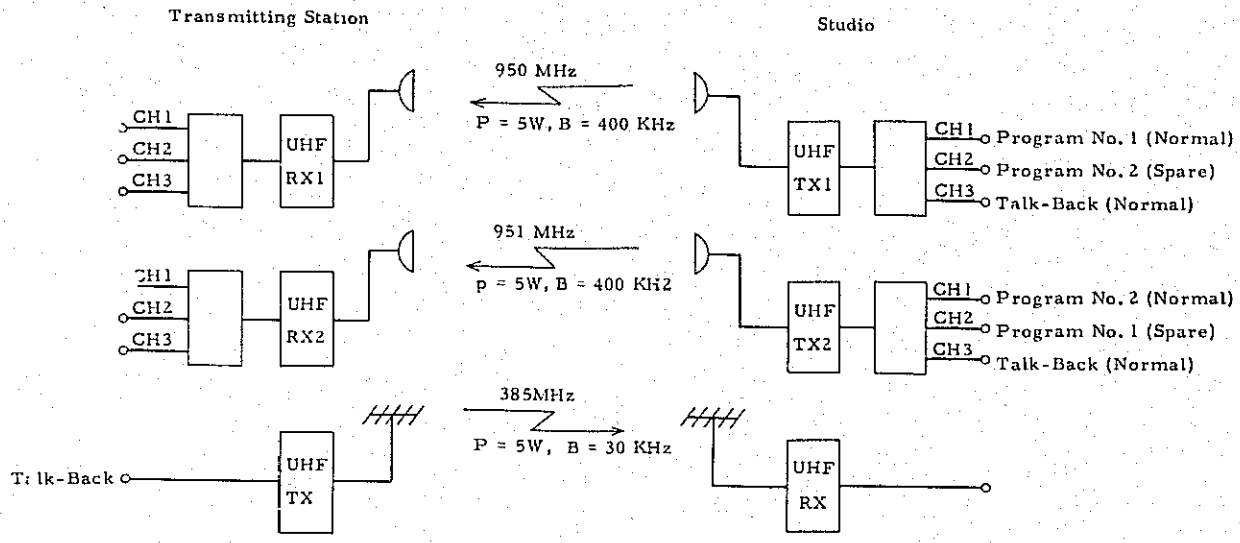


Fig 2-29 Studio Transmitting Station Link

Table 2-7 S T L Facilities

	Frequency (MH_z)	Bandwidth (KH_z)	Class of Emission	Power (W)	Number of set	Direction of Transmission	Antenna			
							Transmitting Side		Receiving Side	
							Type	Location of Antenna	Type	Location of Antenna
No. 1 S T L	950	400	F9	5	1	Studio - TX Station	Parabolic	25m Tower on the New Studio Building	Parabolic	62m Tower for FM TX
No. 2 S T L	951	400	F9	5	1	ditto	ditto	ditto	ditto	ditto
Talk Back	385	30	F3	5	1	TX Station Studio	Yagi	62m Tower for FM TX	Yagi	25m Tower on the New Studio Building

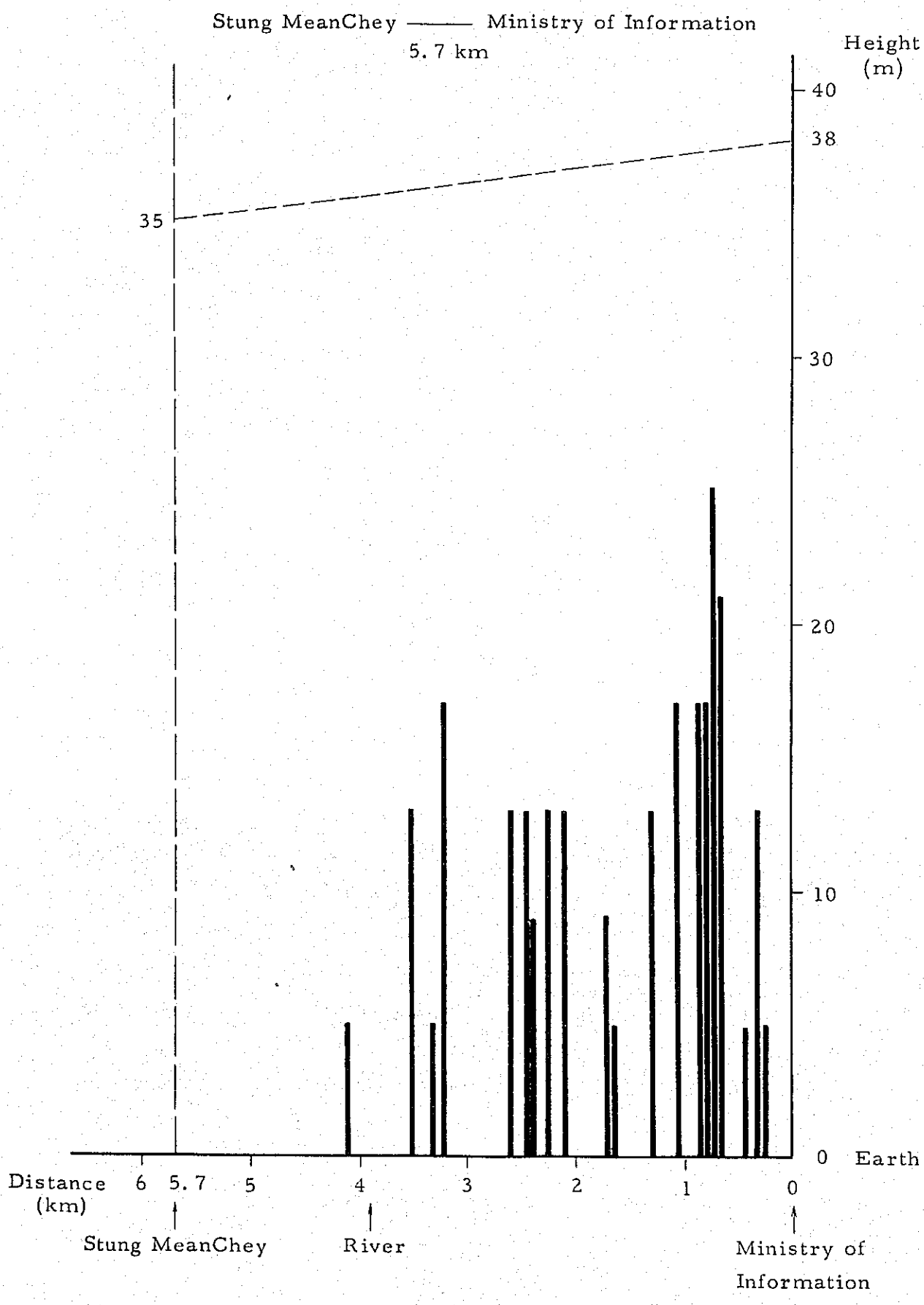


Fig 2-30 Profile

1.6 Radio Car and News Car

The planned enrichment and diversification of broadcasting programmes calls for remote pick-up of events and accidents that take place outside the studio in addition to the improved production of studio programmes. To link the spot of remote pick-up and the studio for this purpose, a mobile radio relaying system should be employed for its speed, mobility and excellent transmission characteristics. Considering the radio wave propagation characteristics, a VHF band is more suitable for this mobile radio relaying, but since the allocation of this band entails difficulty in the republic, use of 460 MHz in UHF band is recommended.

For programme relaying from the outside of the studios, a radio car loaded with one programme relaying transmitter and another transmitter for arrangements with the studio should be provided. The system of programme relay to studio side by the radio car is the so-called one-way transmission system, and if its transmitter has an output power of 25 w, it can perform its relaying function at a maximum distance of about 40 km away from the studio.

The news collecting capacity of the Phnom-Penh Station will be greatly smplified if a news car equipped with a transmitter for news event collection is connected with base station installed at the studio-side. The news car would be able to collect and relay news events within a distance of approximately 60 km from the studio and would serve the purpose of relaying programmes as well.

Besides the news car and radio car mentioned above, two sets of small portable radio equipment should be used for pick-up of news events within a distance not far from the studio.

Table 2-8 shows the outline of these radio stations and their operation system is given in Fig. 2-31.

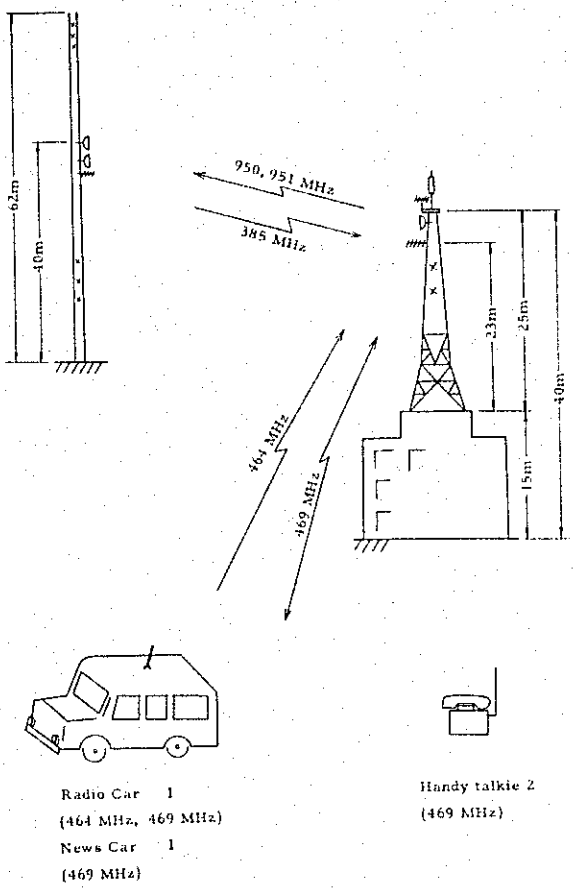


Fig. 2-31 STL and Land Mobile Service

Table 2-8 Land Mobile Facilities

Kind of Facility	Frequency (MHz)	Bandwidth (KHz)	Power (W)	Number of set	Service
Radio Car	464	100	25	1	Broadcasting Relay
	469	30	25	1	News and Data Collection
Base Station	469	30	25	1	ditto
News Car	469	30	25	1	ditto
Handy-talkie	469	30	5	2	ditto

CHAPTER 2 IMPROVEMENT AND EXPANSION OF TV BROADCASTING FACILITIES

2.1 Studio Facilities

2.1.1 Objectives of Improvement and Expansion

(1) Improvement for easier video recording operation.

(2) Installation of a conveniently designed small studio to be used combinedly with the existing large studio for improvement of programmes.

(3) Installation of facilities fully capable of handling various programme sources such as films and video tapes.

2.1.2 Plan of Improvement and Expansion

(1) The VTR should be improved as shown in Fig. 2-33 by effecting complete repair to the existing VTR and installing an additional VTR set.

(2) Additional installation of one each of small studio and subcontrol room as shown in Fig. 2-34. Equipment to be installed in the studio and subcontrol room are as follows.

a) Studio

4-1/2" I.O. studio camera	2 units
Lighting equipment	1 set

b) Subcontrol room

4-1/2" I.O.C.C.U.	2 units
Subcontrol desk (monitor inclusive)	1 set
Tape recorder	1 unit
Single disk player	2 units

(3) The telecine room should be expanded as shown in Fig. 2-33, with the following equipment newly installed in it.

16 mm film projector	1 unit

35 mm film projector	1 unit
8 mm film projector	1 unit
Multiplexer	2 units
Vidicon camera	2 units
Constant frequency power supply	3 units

(4) A set of master control desk should be newly installed.

2.1.3 Effect of Improvement and Expansion Plan

(1) With two VTR units, recording, reproducing and editing work can be facilitated.

(2) Film programmes will be given variety by the use of motion picture films and other films available on the market, so that the TV programme as a whole can be enriched and improved.

Table 2-9 TV Studio Facilities

	Existing TV Studio						Results of Survey	Improvement Plan		
	Floor area (m^2)	Equipments	Quantity	Maker	Type	Installed in		Facilities	Construction Improvement	others
Studio	1st F 172 m^2	Lighting Equipments	1 set	Domestic	bank light	1964	(1) It is necessary to add one more small studio because existing studio is only one and it is not enough for production of 2 hours program.	—		Lighting Max. Capacity 300A usually use 120A 1000 Lx.
		Camera	2 sets	CF. Thomson	4½' I.O.	1969				
		Microphones	1 set	—	Moving coil	1961				
Sub-control Room	2nd F 65 m^2	sub-control desk	1 set	CF. Thomson NEC	2 Mix. VR type	1969 1969	(1) It is necessary to install new master control desk for increased, studios, VTR and Telecine chain. (2) Existing tape recorder and disk player should be replaced by new models.	Install (1) Master control desk x 1 (2) Tape Recorder x 2 (3) Disk player x 2		
		C C U (camera control units)	1 set	NEC	Tube type	1961				
			2 sets	CF. Thomson	Transister type	1969				
Announce Booth	2nd F m^2	announce desk	1 set	Domestic		1961	—	—		
		Microphones	1 set	—	Moving coil	1961	—			
Decoration Room	1st F 81.5 m^2	—	—	—	—	—	(1) This room can be used for new additional small TV studio and its sub-control Room.	Install (1) I.O camera x 2 (2) Sub-control desk x 1 (3) Lighting set x 1	(1) News studio 1 Room (35 m^2) (2) Sub-control room 1 Room (25m^2)	
VTR Room	2nd F 32.5 m^2	V T R	1 set	NEC	Transister SVTR-OB. 4 Head Low Band-Mod.	1968	(1) It is necessary to add a set of VTR. (2) Present three bays should be reduced to one bay by transisterizing each unit.	Install (1) VTR x 1	(1) VTR layout should be changed in case of installing new VTR. Fig. 2-33	
		Racks	1 set	Philips	Transister					
			3 sets	NEC	Tube type	1961				
Telechine Room	2nd F 43.5 m^2	16 m/m Film projector	2 sets	CF Thomson / Hokusin	THT 1617-2 / TFP-1	1969 / 1960	(1) Floor space is enough for further installation of Telecine equipments, if it uses next existing rack room. (2) More VTR, Telecine equipments should be installed.	Install (1) 16m/m Film Proj x 1 (2) 35m/m Film Proj x 1 (3) 8m/m Film Proj x 1 (4) Multiplexer x2 (5) CF Power Supply x 3 (6) Film Vidicon Camera x 2	(1) Increase floor space by 11 m^2 utilising unused present rack room.	
		Slide projectors	1 set	Kodak		1969				
		Multiplexer	1 set	CF Thomson	THT654A	1969				
		opaque card projector	1 set	NEC	Seiki ST - 3E	1961				
		Vidicon Camera	3 sets	CF / Shiba-Den / NEC	THT 601 / 1.5' / 1'	1969 / 1967 / 1959				
		8 m/m Film projector	—	—	—	—				
		35 m/m Film projector	—	—	—	—				
Rack Room	2nd F 11 m^2	Disuse Racks	2 sets	—	BSS No.2		(1) This floor space can be used for increased equipment.			
OB Van	OB Van L x W x H 9m x 2.6m x 3m BX752 130 HP.	CCU mounting desk	2 sets	—	—	1968	—	—	—	
		7GHz FPU	1 set	NEC	TF - 4					
		Car cooler	1 set	YANASE	TVG-300					

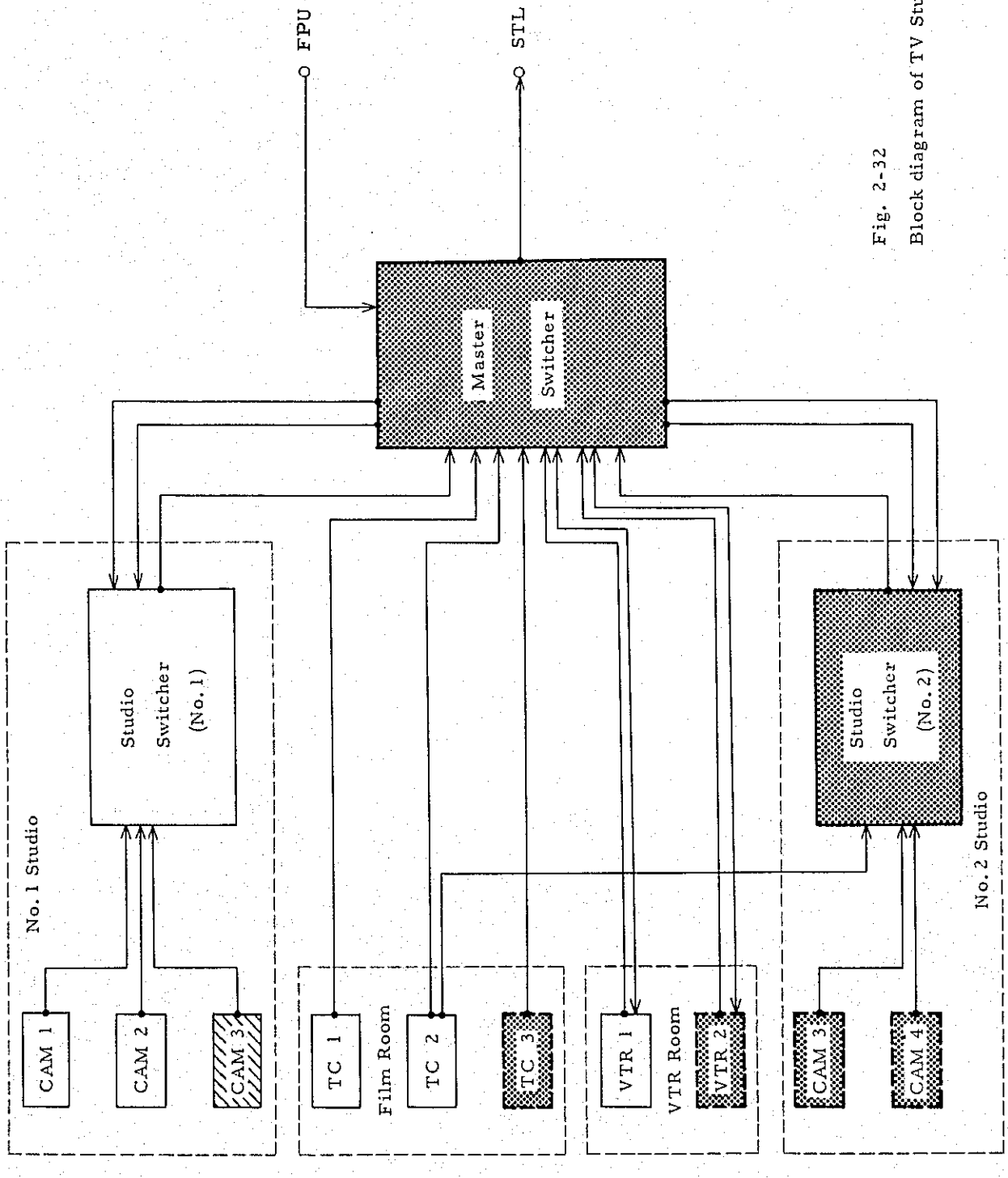


Fig. 2-32
Block diagram of TV Studio

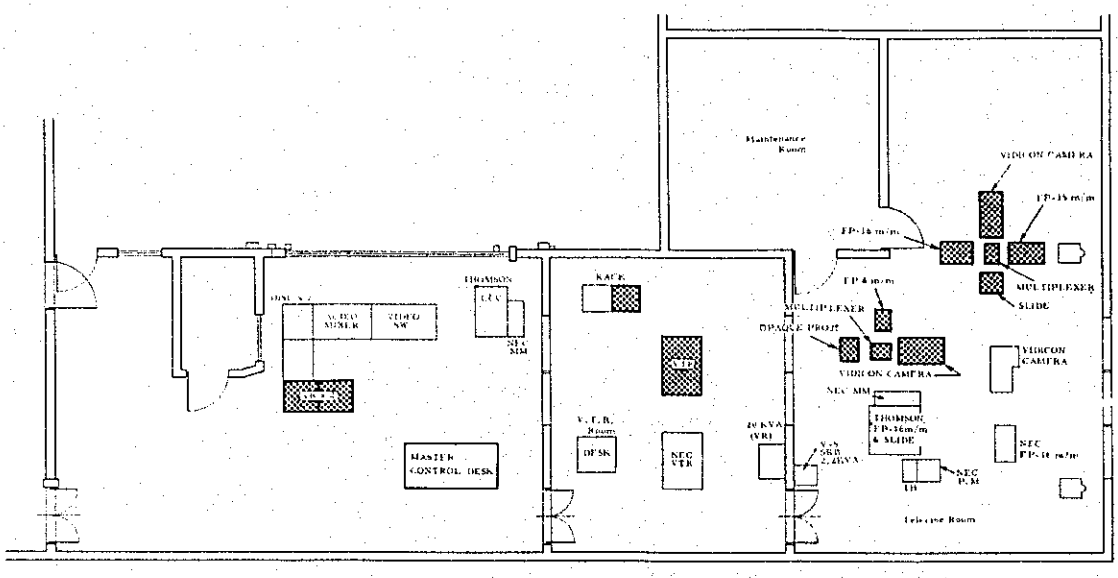


Fig. 2-33 Improvement of New T.V Studio Building 2nd F

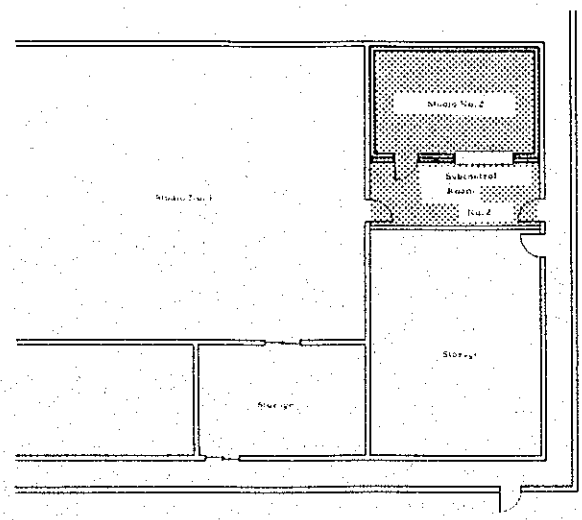


Fig. 2-34 Improvement of New T.V Studio 1F

2.2 Transmitting Station

2.2.1 Objectives of Improvement and Expansion

2.2.1 Objectives of Improvement and Expansion

Establishment of a back-up system.

2.2.2 Plan and Effect of Improvement and Expansion

A 250 w TV transmitter is to be newly installed at the position shown in Fig. 2-35 for stand-by purpose. In case of a fault of the existing transmitter, this stand-by transmitter can cover Phnom-Penh and surrounding area. See Fig. 1-4 for its service area.

Table 2-10 TV Transmitting Facilities

Existing TV transmitting station	Place	Phnom-Penh W-N N. 11°35' W. 104°54'
	Floor area	155 m^2
	Frequency	180 ~ 186 MHz 8 ch (USA)
	Power	Video 5 KW Audio 2.5 KW
	Cooling	Forced air
	Installed in	1963 (NEC)
	Tower	Height 100 m. Selfsupport Truss tower
	Antenna	Super-turn- stile antenna 12 elements (Gain 11 dB)
	Antenna feeding	Single feeding , Feeder WX-39D,Length 110 m
Result of survey		(1) In good maintenance (2) In need of back up transmitter
Improvement plan		Installment of a new 250 W TV transmitter (Audio 50 W) Fig. 2-35

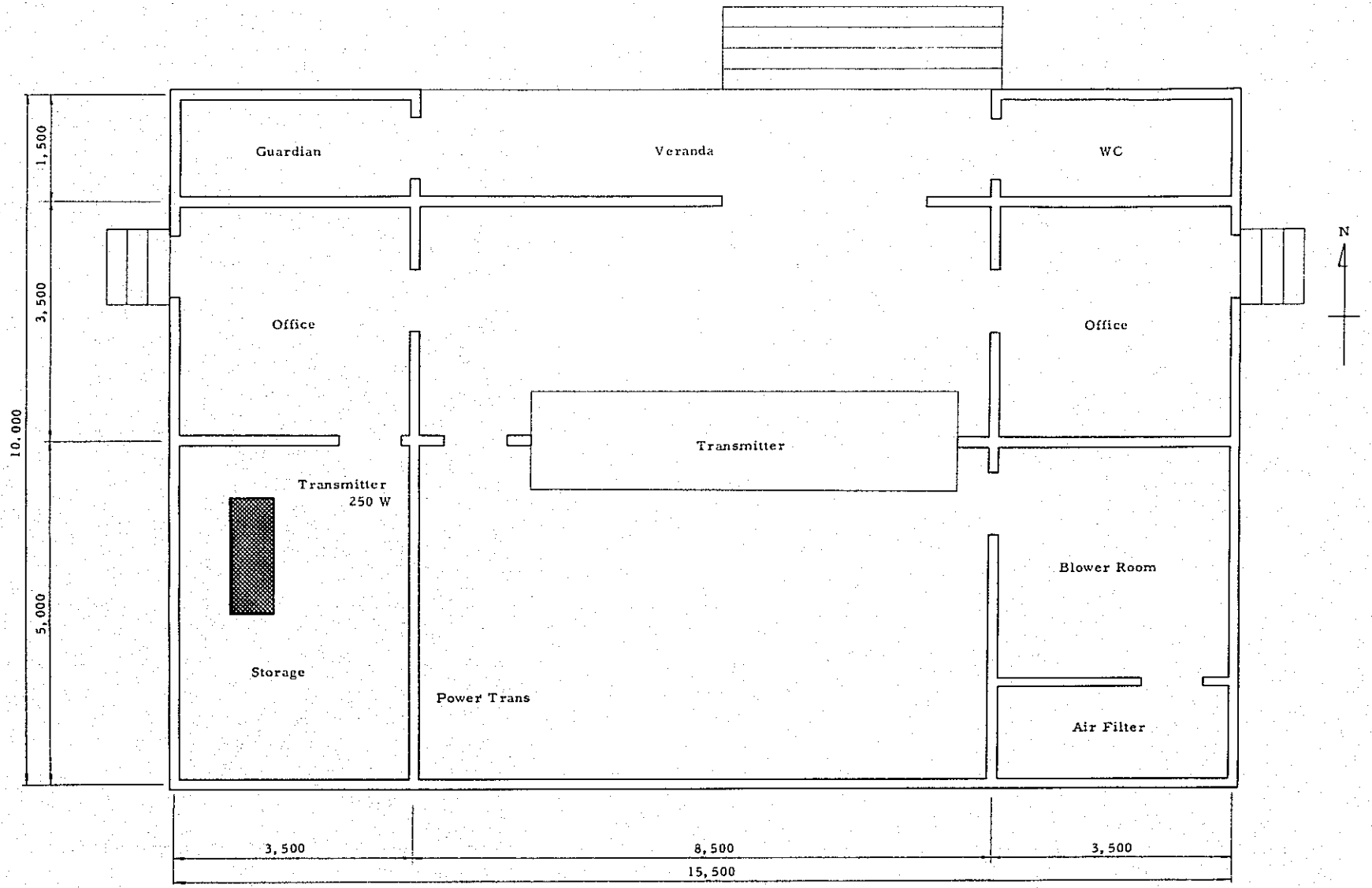


Fig. 2-35 Plan of T V Transmitting Station

Table 2-11 Electric Power Facilities

				Old Type Station (Diesel Engine)	New Type Power Station (Gas Turbine)
Power Stations	Plan			Phsar Tauch	Chak Angrê (Basak River)
	Construction year			1962	1968
	Maker			Switzer-land, USA, Germany, France	Czechoslovakia
	Quantity of Generators			11 sets	3 sets
	Power Capacity			17,000 KW	18,000 KW
	Max. Power Supply			15,600 KW	10,000 KW
	Voltage			4,400V 1φ, 15KV 3φ, 50 c/s	15 KV 3φ, 50 c/s
	Load			Radio Studios, TV Studio, TV Transmitting Station	Radio Transmitting Station
Broadcasting Stations	Radio	Studios	Power Capacity	340KVA (15KV, 2φ) 2φ, 3φ; 300KVA (15KV, 3φ) 3φ → 340KVA+300KVA	
			Max. Use	165 KVA	
		Transmitting Station	Power Capacity		3,000 KVA (15 KV, 3φ)
			Max. Use		1,200 KVA
	TV Studio & Transmitting Station		Power Capacity	315 KVA (15 KV, 3φ)	
			Max. Use	150 KVA	
	Cable Capacity		Radio	340 KVA, 300 KVA	4,000 KVA
			TV	315 KVA	
	Extended Plan for Power Supply	Radio	Studios	250 KVA	
			Transmitting Station		800 KVA
		TV	Studios	50 KVA	
			Transmitting Station	10 KVA	
	Survey Conclusion			Capacity of Power & Cable is enough for the extended plan. Stability of frequency & voltage is good.	

Table 2-12

A List of New Broadcasting Facilities

	Improvement and Expansion of Radio Broadcasting Facilities					Improvement and Expansion of TV Broadcasting Facilities		Total
	Existing Studios	New Broadcasting Center	Transmitting Station	Mobile Service		Existing Studio	Transmitting Station	
				Facilities	Car			
Building (m^2)	40 (Repair of No.5 Studio)	1,160	1,000			60 (Establishment of No.2 Studio)		2,260 m^2
Tower (m)		25	105					
Antennas		Parabola (2) Yagi (1) Rotary Yagi (1) Collinear (1)	105m Vertical antenna with top-loading (1) Parabola (2) Yagi (1)					8
Feeder (m)			300					
Broadcasting Transmitters			MF 200 KW (1) 100 KW (1) HF 50 KW (2)				VHF 250W (1)	5
Power Generator (KVA)			800 (1)					800 KVA
Power-board		1	1			1		3
STL Program		2						2
STL Order-line		1						1
Mobile Service: Radio Car Program				1	1			1
Mobile Service: Radio Car Order-line				1				
Mobile Service: News Car				1	1			1
Mobile Service: Base station		1						1
Mobile Service: Portable Tranceiver				2				2
Tape Recorder	12	18				2		32
Disk Player	4	4				2		10
Master Control Desk		1				1		2
Sub-Control Desk	1 (No.5 Studio)	3				1		5
Cameras: Image-Orthicon						2		2
Cameras: Vidicon						2		2
V T R						1		1
Film Projectors: 16 mm						1		1
Film Projectors: 35 mm						1		1
Film Projectors: 8 mm						1		1
Multiplexer						2		2
Constant Frequency Power Supplies						3		3
TV Monitor						15	1	16
Monitor Speaker	2	12				3		17
Lighting Equipments	1 (No.5 Studio)	1	1			1 (No.2 Studio)		4
Air-conditioning apparatus	1 (No.5 Studio)	1				1 (No.2 Studio)		3
Acoustic treatment	1 (No.5 Studio)	1				1 (No.2 Studio)		3
Receivers: All-wave Radio receiver		2						2
Receivers: TV Receiver							50	50
Equipments for office work		1				1		2

CHAPTER 3 OTHERS

3.1 Power Equipment

As shown in Table 2-11, the Electric Power Authority (Electricité du Cambodge) promises sufficient power supply. Power reception facilities should be additionally installed at the studio side and transmitting station.

3.2 List of New Broadcasting Facilities

All the new equipments and facilities required for the planned improvement of broadcasting are shown in Table 2-12.

3.3 Modified Plans for Improvement and Expansion of Broadcasting Facilities

Table 2-13 shows, for the sake of reference, two modified plans in which the project is envisaged to be implemented on a smaller scale than is proposed in this report.

The two plans were mapped out for the possible case of fund shortage that may either make the installation of stand-by MF and HF transmitters a total impossibility or allow their installation on a scale considerably reduced as compared to the proposed plan. Consequently, they both are liable to invite interruption of broadcasting serve and decrease in service area due to faults in the existing transmitters, and also leave problems of maintenance.

Details of the two plans are shown in Table 2-14, and construction cost required for their implementation in Table 2-15 and Table 2-16.

Table 2-13 Plans of Composition of Radio - transmitters

	Proposed plan	Modified plan No. 1	Modified plan No. 2
No. 1 Broadcasting System	740 KHz 200 KW (100KW x 2) (New)	740 KHz 200 KW (100KW x 2) (New)	740 KHz 200 KW (100KW x 2) (New)
National (Service)	4907 KHz { 50KW (New) ----, 50KW (Philips)	4907 KHz { 50KW (New), 10KW (New) ----,	4907 KHz 50KW (New)
No. 2 Broadcasting System	918 KHz { 100KW (New), 120KW (Philips)	918 KHz { 50KW (New), 120KW (Philips)	918 KHZ { 120KW (Philips), 5KW (NEC)
International (Service)	6090 KHz { 50KW (New, Stand-by <----'	6090 KHz { 50KW (Philips), stand-by <----'	6090 KHz 50KW (Philips)
Note (New Radio-transmitters)	MF 200KW (100KW x 2)··(740KHz) 100KW ····· (918KHz) HF 50KW ····· (4907KHz / 6090KHz) 50KW ····· (6090KHz)	MF 200KW (100KW x 2)··(740KHz) 50KW ····· (918KHz) HF 50KW ····· (4907KHz) 10KW ····· (4907KHz / 6090KHz)	MF 200KW (100KW x 2)··(740KHz) HF 50KW ····· (4907KHz)

Table 2-14 Details of Modified Plans

	Existing Equipments			Modified plan No. 1			Modified plan No. 2		
	Frequency	Power	Maker	Treatment of Existing Equipments	Transmitters	Tower & Antenna	Treatment of Existing Equipments	Transmitter	Tower & Aatenna
No. 1 Broadcaxting System (National Service)	918 KHz	KW 120	Philips	Divect to back up system for National Service	New set 200KW (740KHz)	New 105m guyed tower antenna with toploading	Divert to International Service	New set 200KW (740KHz)	New 105m guyed Tower antenna with top loading
		KW 5	NEC	Divert to local station	-	-	Divert to back up system for International Service	-	-
	KHz 4907	KW 50	Philips	Divert to International Service	New set 50KW (4907KHz)	Existing antenna	Divert to International Service	New set 50KW (4907KHz)	Existing antenna
		15KW (back up)	China	Dismount	New set 10KW KHz (4907 6090)	Existing antenna	Dismount	-	-
No. 2 Broadcasting System (International Service)	KHz 740	20KW	China	Dismount	New set 50KW (918KHz)	Dual feed to 105m base insulated tower antenna	Dismount	Existing set 120KW (918KHz)	Existing 72m tower antenna
		1KW (back up)	Philips	Dismount	Existing set 120KW (918KHz)	Existing 72m tower antenna	Dismount	Eisting set 5KW (918KHz)	The same as above
	KHz 6090	50KW	China	Dismount	Existing set 50KW (6090KHz)	Existing antenna	Dismount	New set 50KW (6090KHz)	Existing antenna

Table 2-15 Construction Costs of Modified Plan No.-1

(Unit: 1,000 ¥)

		Broadcasting Equipment	Construction Materials & Electrical Facilities		Total
			Construction Materials & Control of Construction Work	Construction Work at Site	
Radio	Studios	222,800	118,200	35,000	376,000
	Transmitting Station	419,500	81,500	22,500	523,500
TV	Studios	174,000	4,500	2,500	181,000
	Transmitting Station	15,000	200	100	15,300
Consultant		-	15,000	-	15,000
Total		831,300 (2,699)	219,400 (712)	60,100 (195)	1,110,800 (3,606)

Notes: ( ) indicates units of 1,000 US$.
Official exchange rate: 308 ¥ = 1 US$.

Table 2-16 Construction Costs of Modified Plan No.-2

(Unit: 1000¥)

		Broadcasting Equipment	Construction Materials & Electrical Facilities		Total
			Construction Materials & Control of Construction Work	Construction Work at Site	
Radio	Studios	222,800	118,200	35,000	376,000
	Transmitting Station	347,000	81,000	22,000	450,000
TV	Studios	174,000	4,500	2,500	181,000
	Transmitting Station	15,000	200	100	15,300
Consultant		-	15,000	-	15,000
Total		758,800 (2,404)	218,900 (711)	59,600 (193)	1,037,300 (3,368)

Notes: ( ) indicates units of 1,000 US$.
Official exchange rate: 308 ¥ = 1 US$.