5. Transmitting Station Building and Tower

5-1 Transmitting Station Building

In accordance with the network plan, FM station buildings will be built at the proposed 15 transmitting station sites.

According to the results of discussion with the Malaysian Government, TV/microwave standard station buildings are considered to use in common for the FM service, and for the other transmitting station buildings, FM transmitting station building will be newly built.

There are four FM transmitting stations which will use the TV microwave standard station buildings in common, and 11 FM transmitting stations which new FM transmitting buildings will be built.

As there is no room left in the engine generator room of the TV/microwave standard station building to add an engine generator for the FM facilities, an engine generator building will be newly built at four of the FM transmitting stations.

5-1-1 Station Site

The site at Bt. Bintang is on the summit 323m above sea-level (area 750 m^2). The station building and tower will be located on one side of the site and the access road terminating on the other side.

The other 10 transmitting station buildings and four engine generator buildings will use the site of the existing or the planned TV transmitting stations in common. At seven sites, the station buildings and towers cannot be located on flat level in the existing sites, therefore leveling of ground will be necessary by cutting or banking. For the other three FM transmitting station buildings and four engine generator buildings, they will be available to be located on flat level in the existing TV transmitting station sites.

For the layout of buildings and towers, refer to Fig. 5-1 ~ 5-15 (Site Plan).

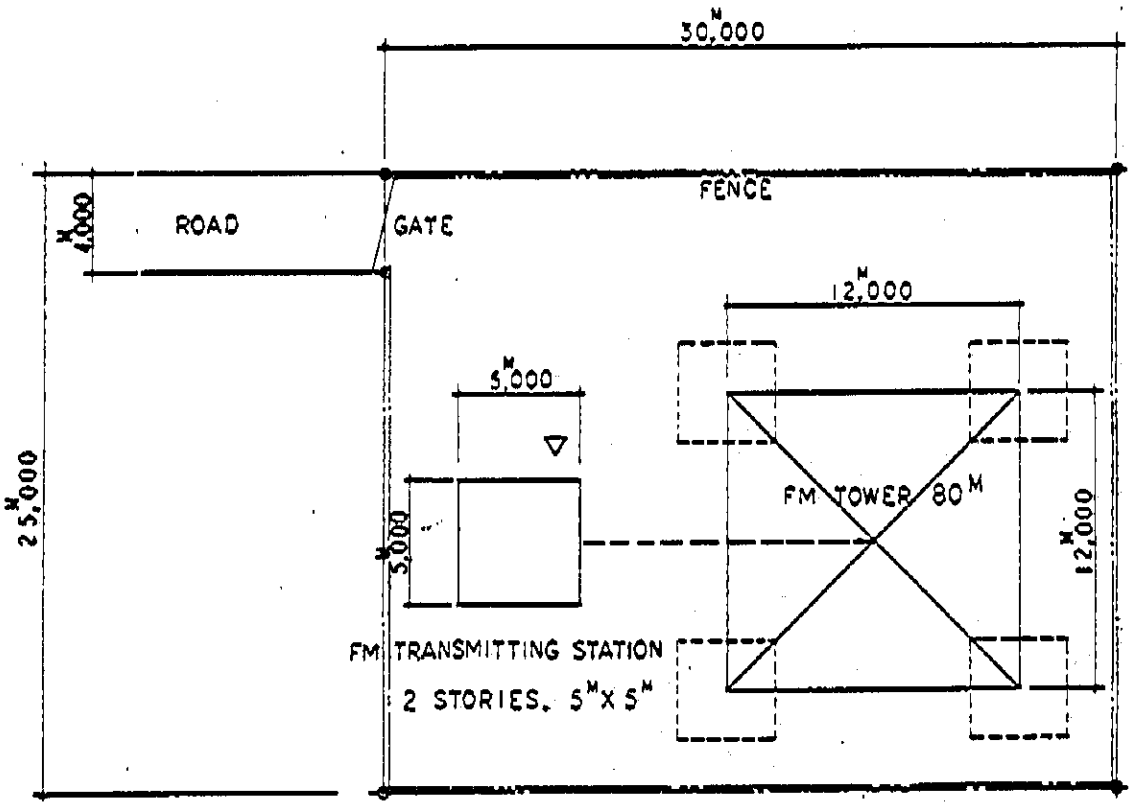
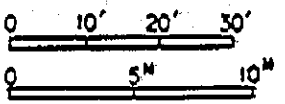


Fig. 5-1 Site Plan – Bt. Bintang. Perlis



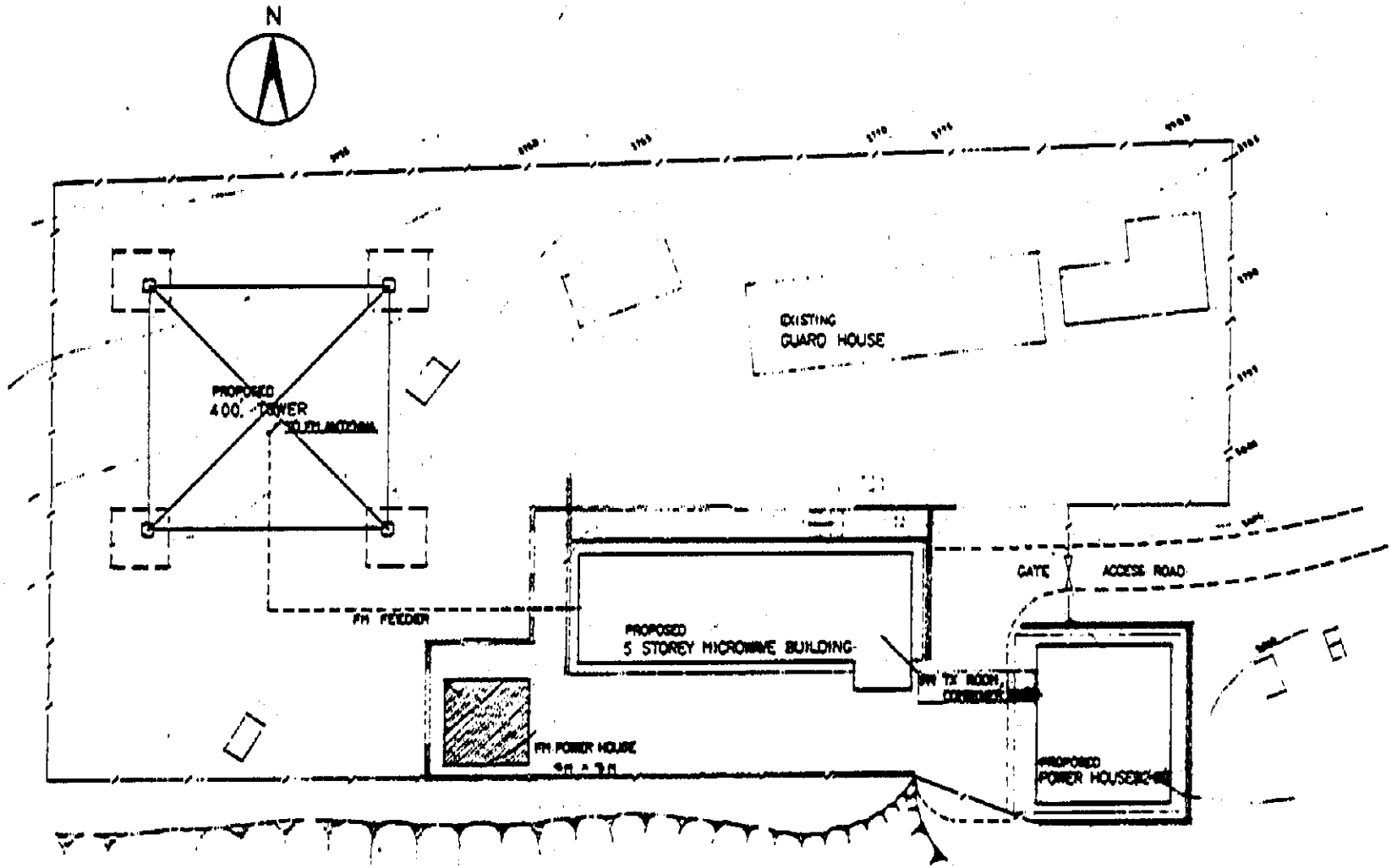


Fig. 5-2 Site Plan – G. Jerai, Kedah

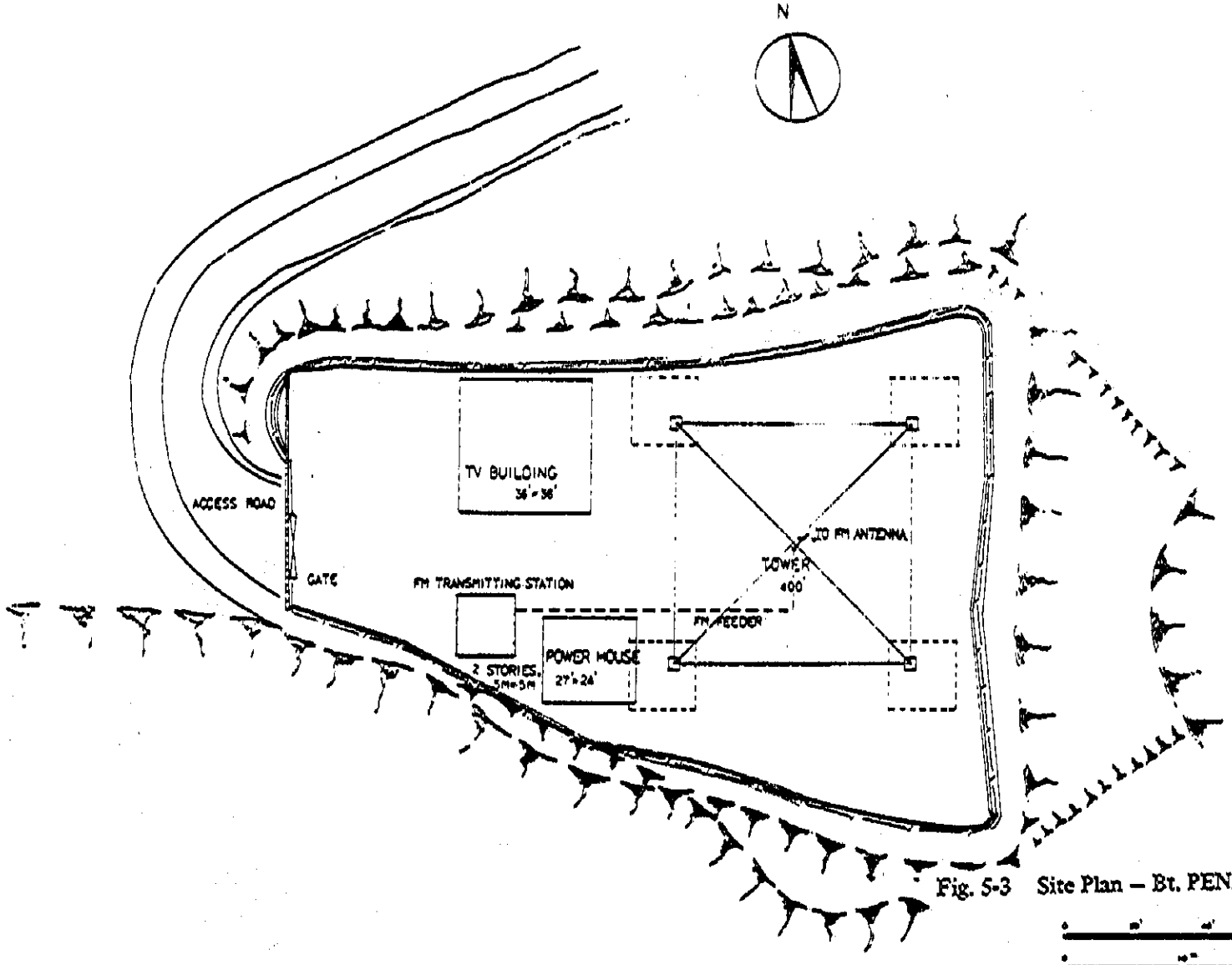


Fig. 5-3 Site Plan – Bt. PENARA Pinang

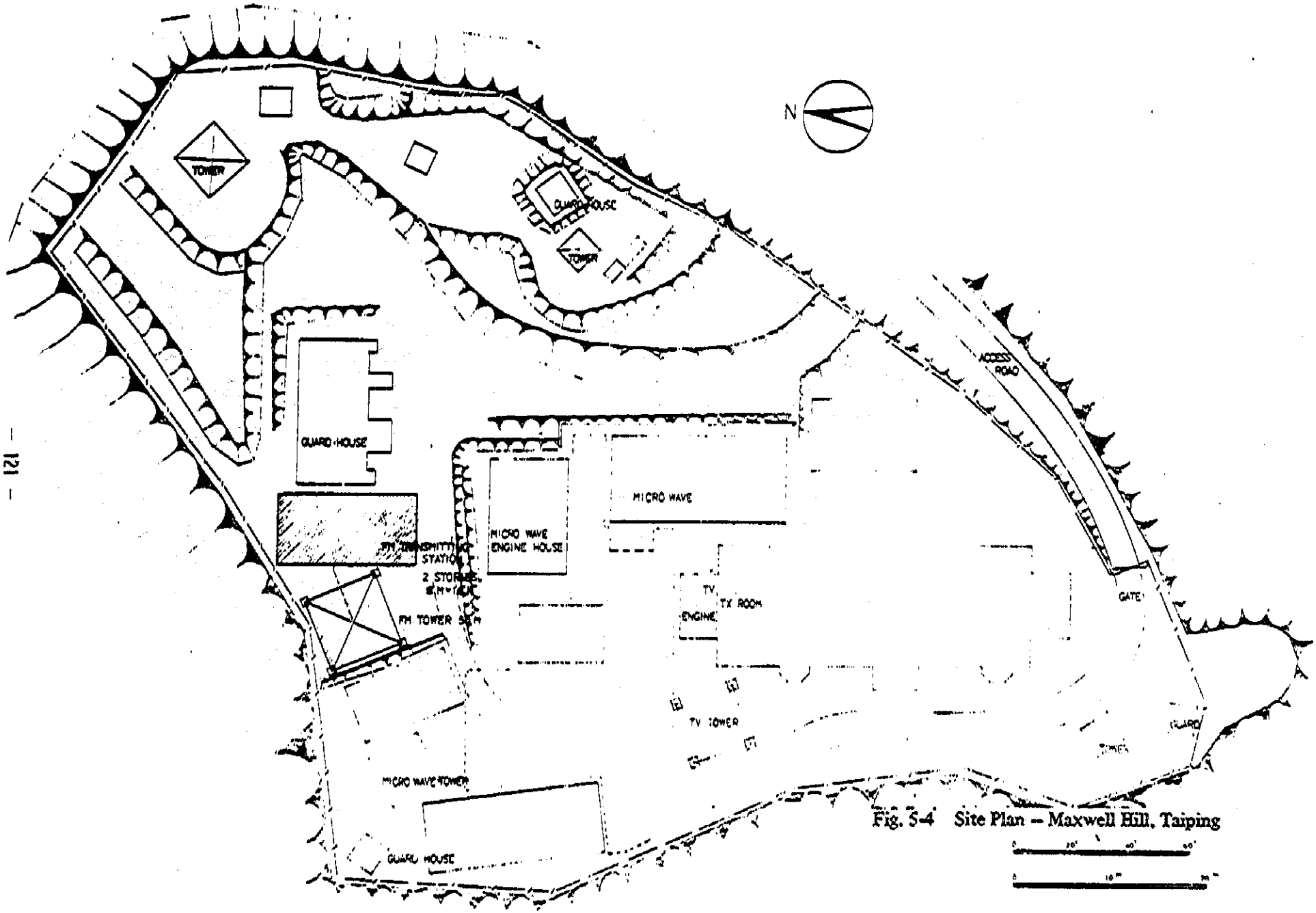


Fig. 5-4 Site Plan – Maxwell Hill, Taiping

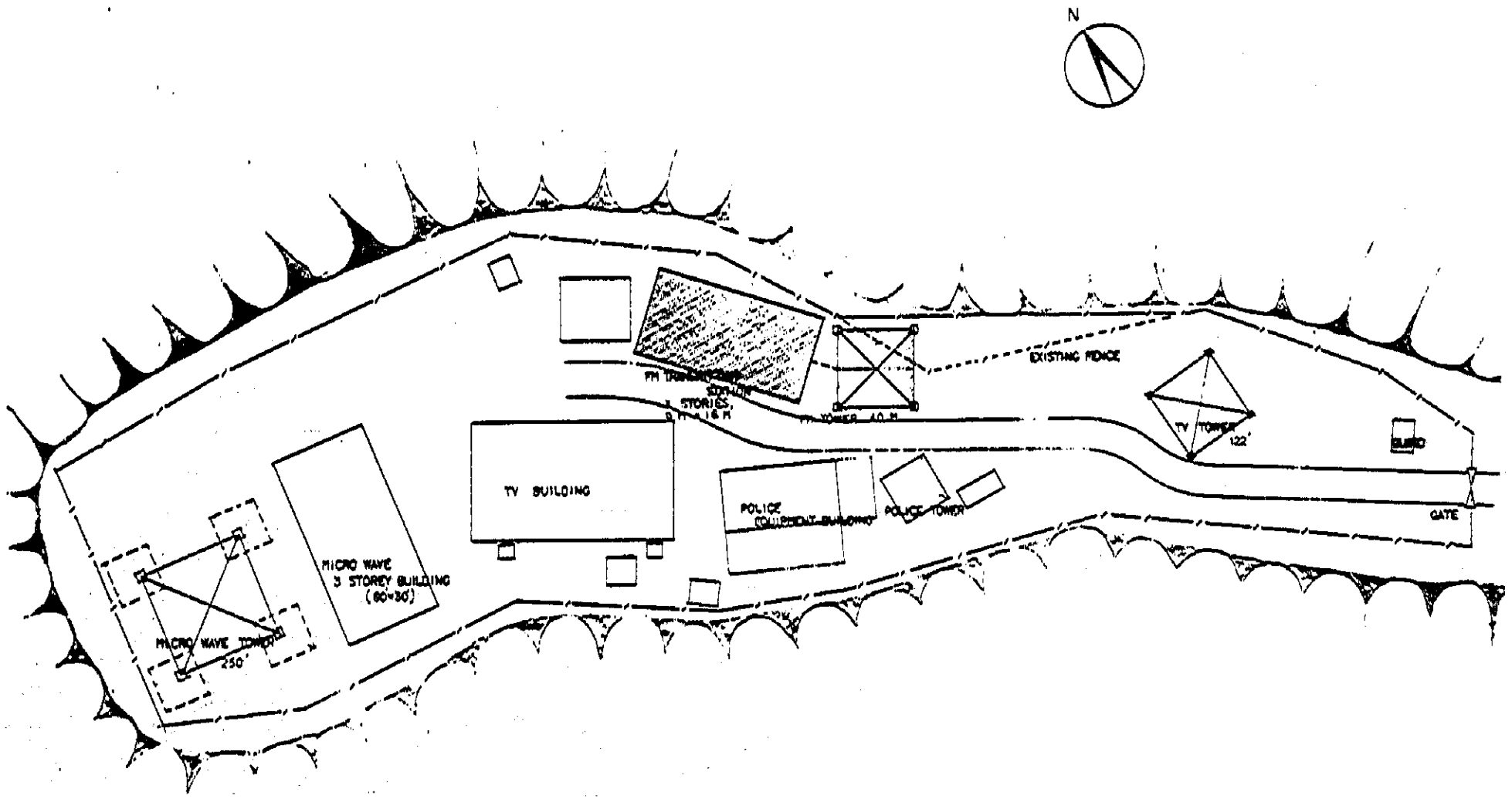


Fig. 5-5 Site Plan – G. Kledang, Ipoh

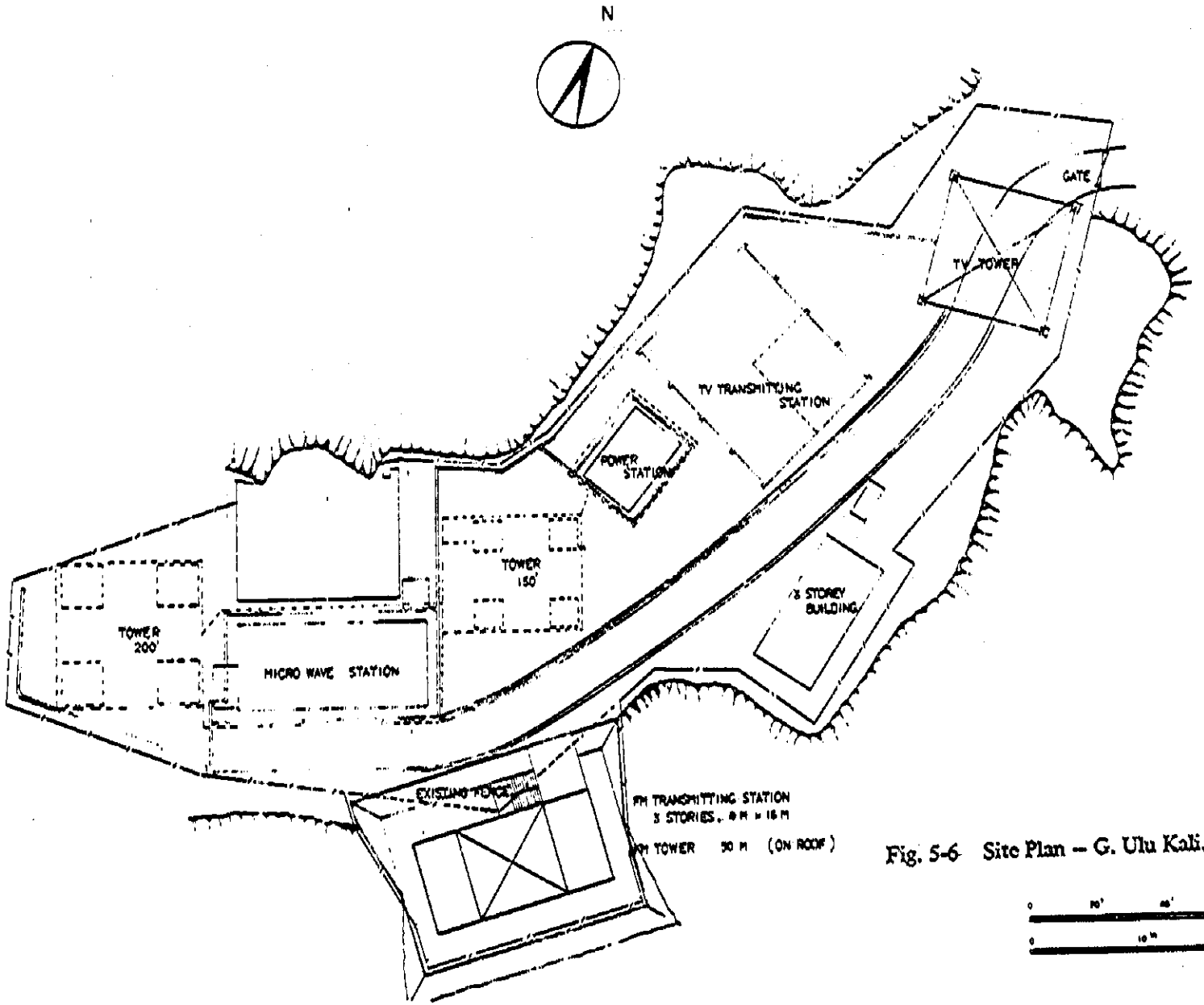


Fig. 5-6 Site Plan – G. Ulu Kali, Selangor

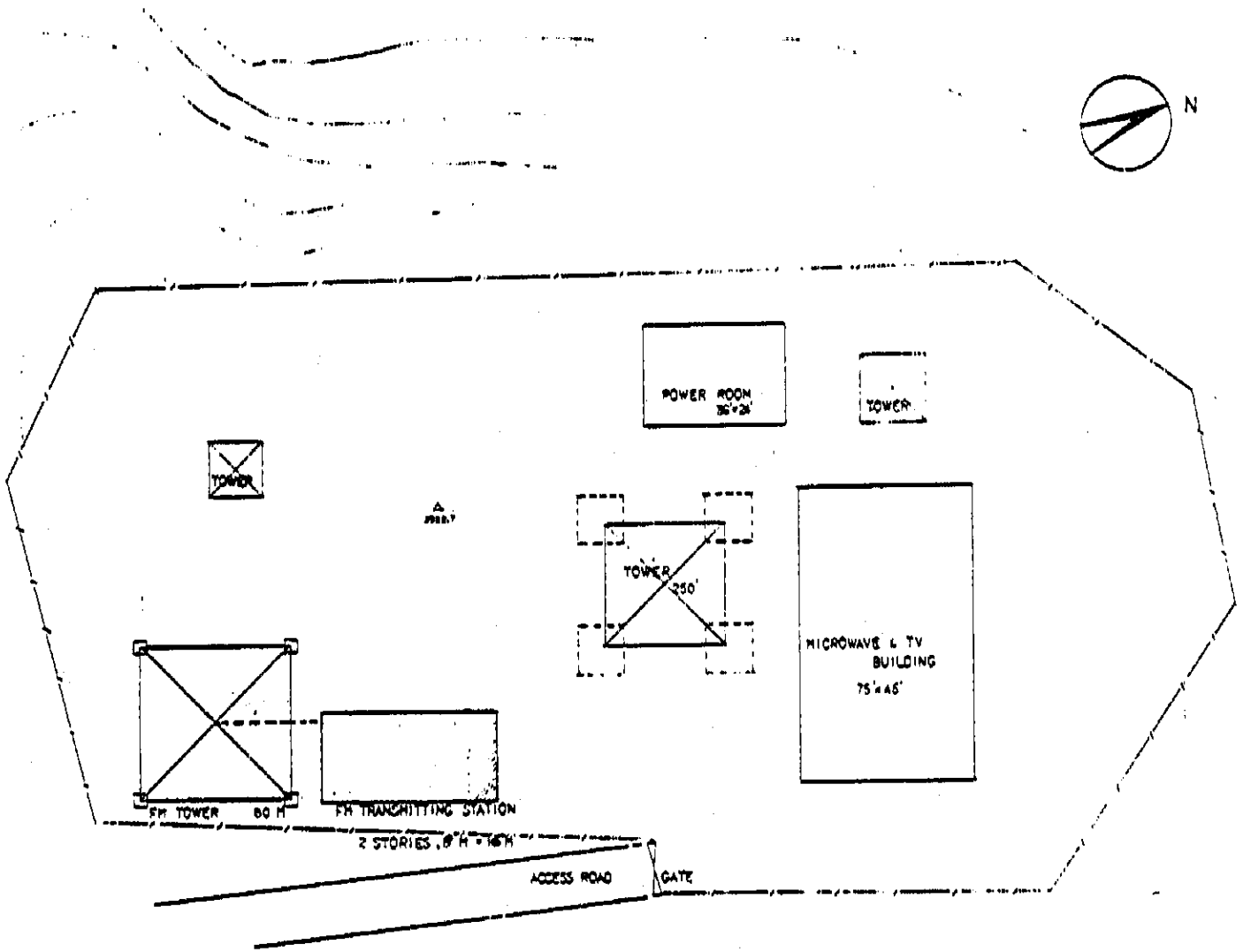


Fig. 5-7 Site Plan – Bt. Telepa Burok, N.S.

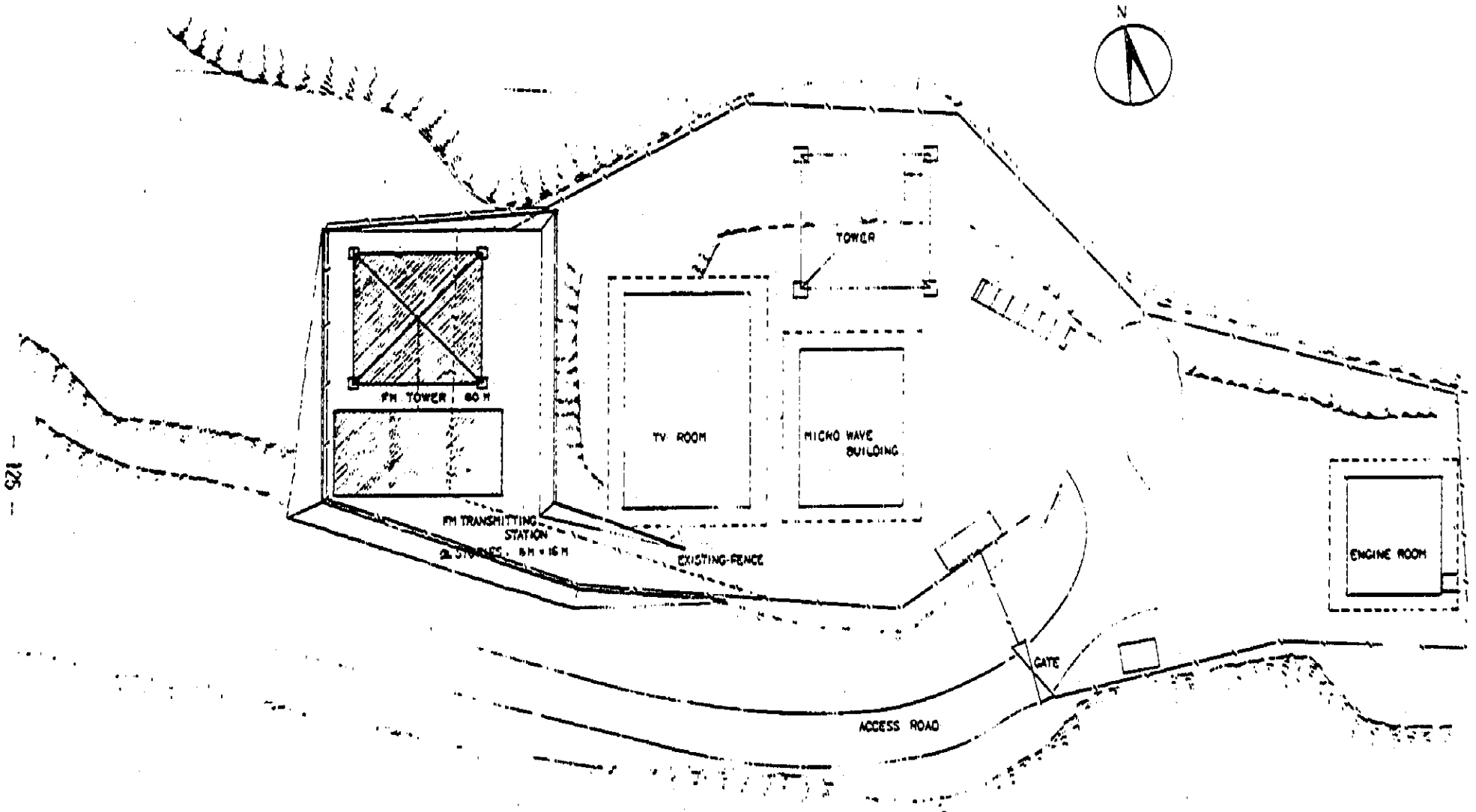


Fig. 5-8 Site Plan – Bt. Tampin, Tampin

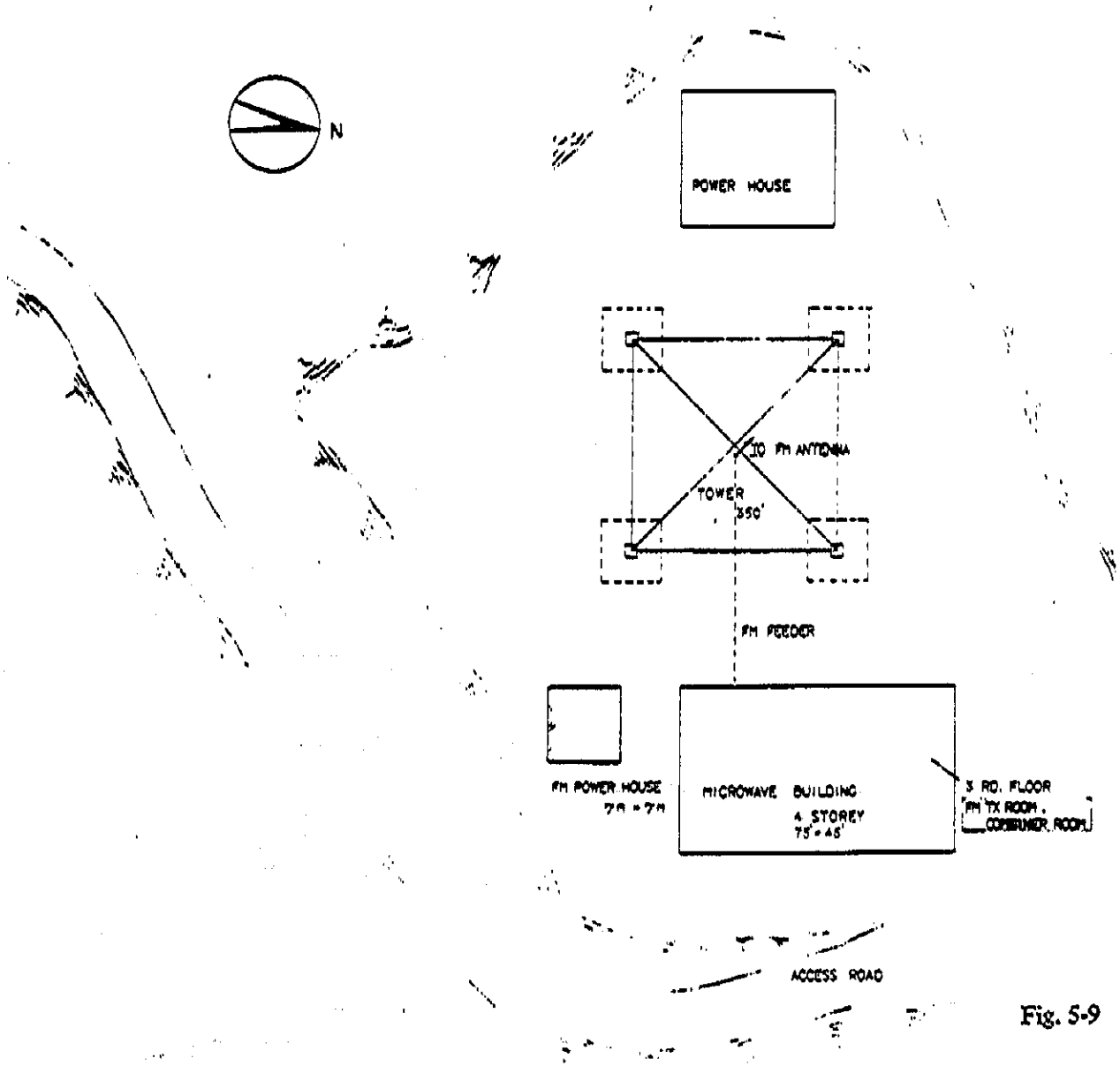


Fig. 5-9 Site Plan – Mt. Ophir, Johor

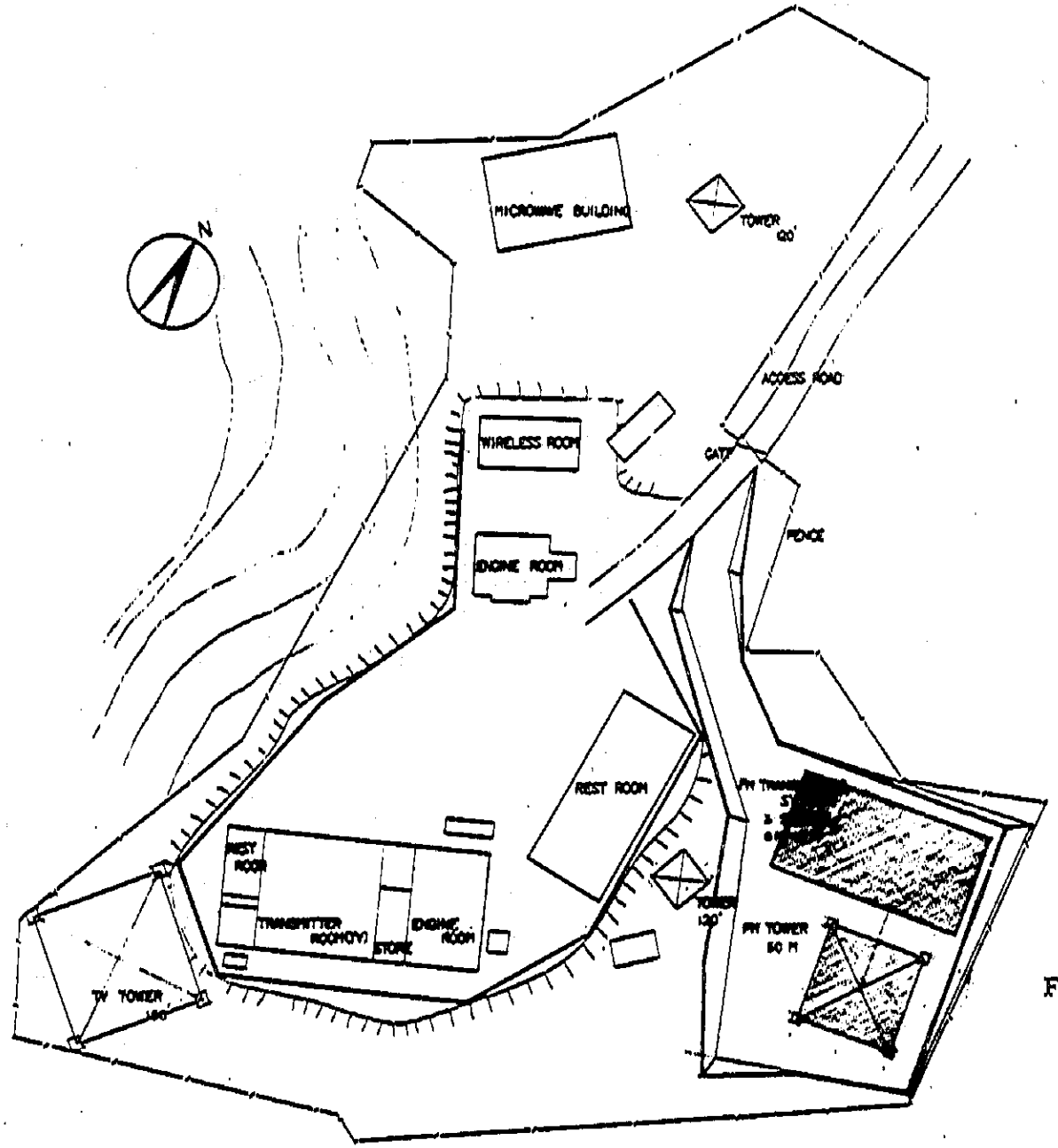


Fig. 5-10 Site Plan – G. Pulai, Johor

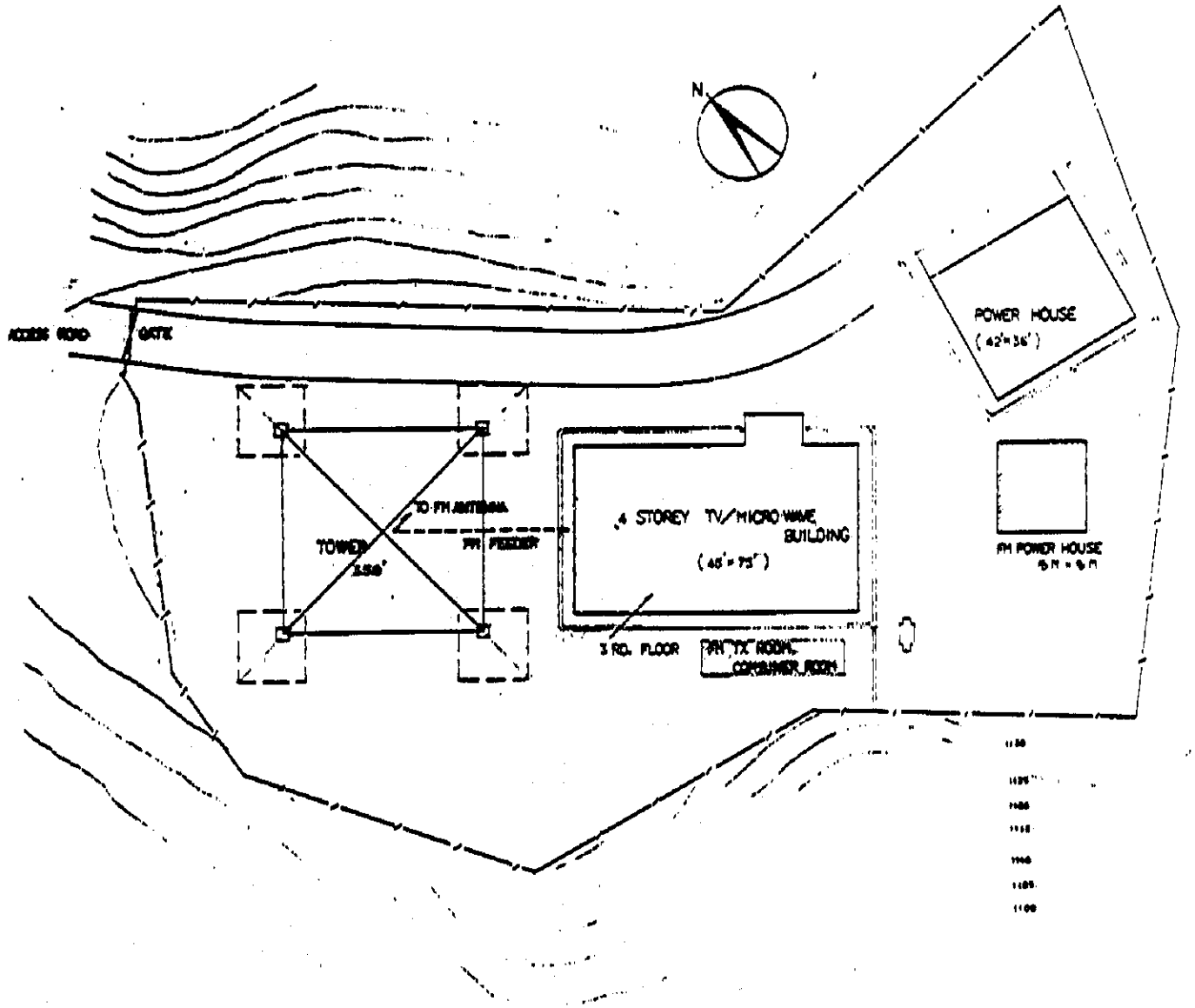


Fig. 5-11 Site Plan – Bt. Tinggi, Johor

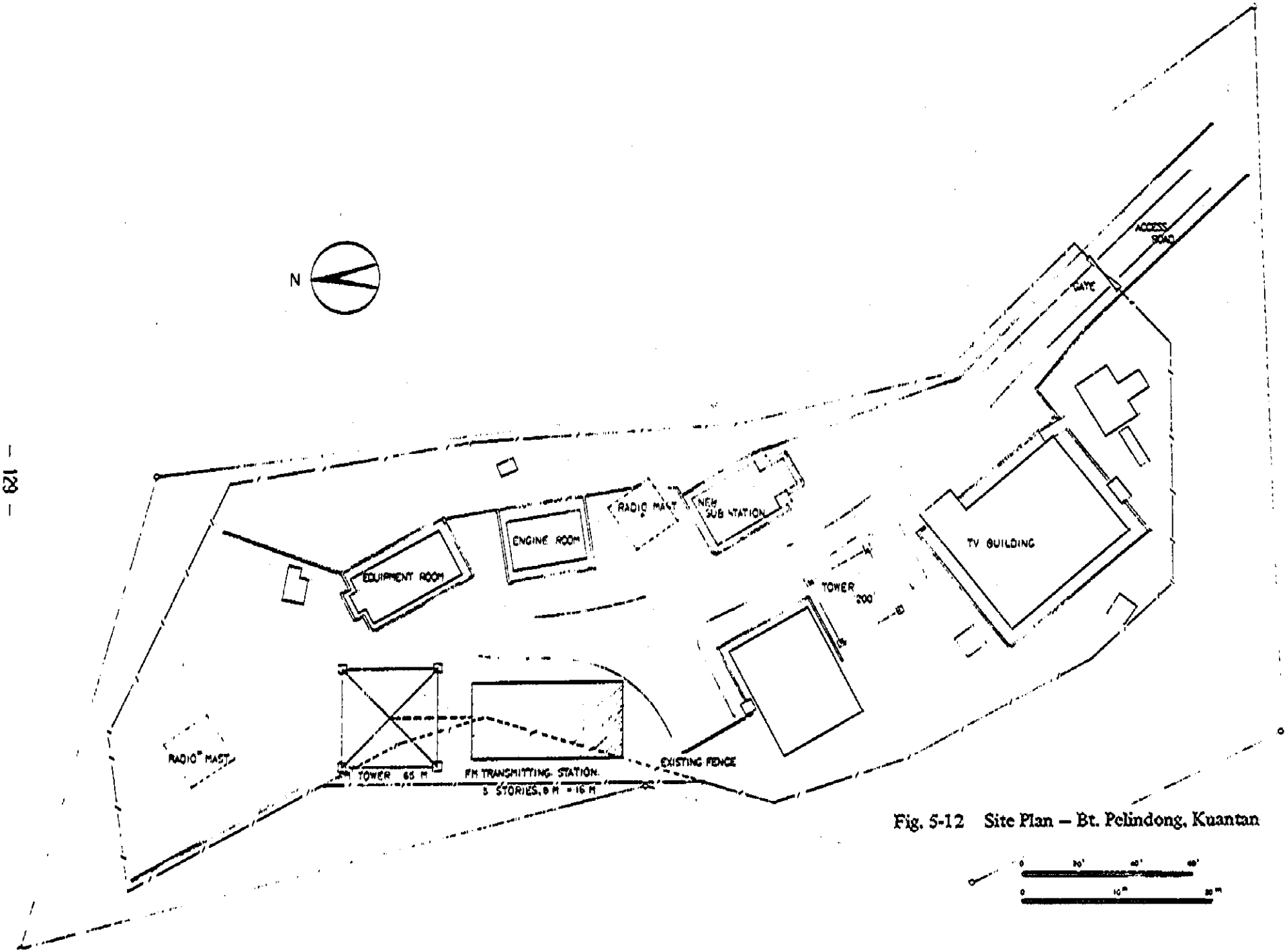


Fig. 5-12 Site Plan – Bt. Pelindong, Kuantan

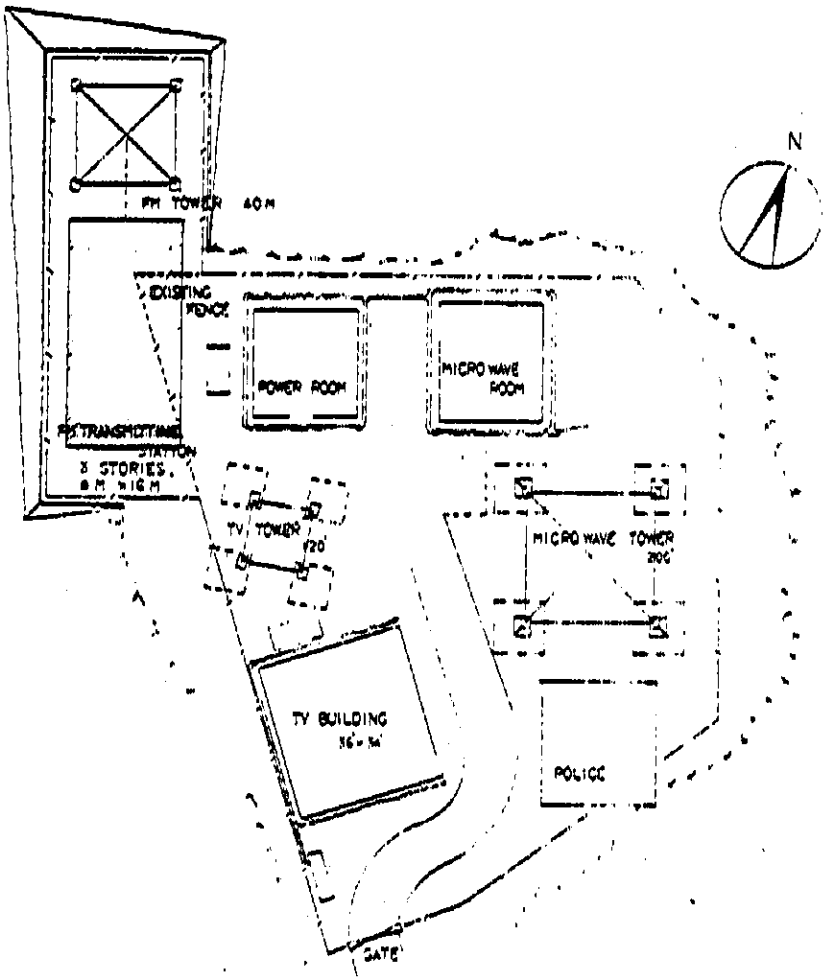


Fig. 5-13 Site Plan -- Bt. Bauk, Dungun

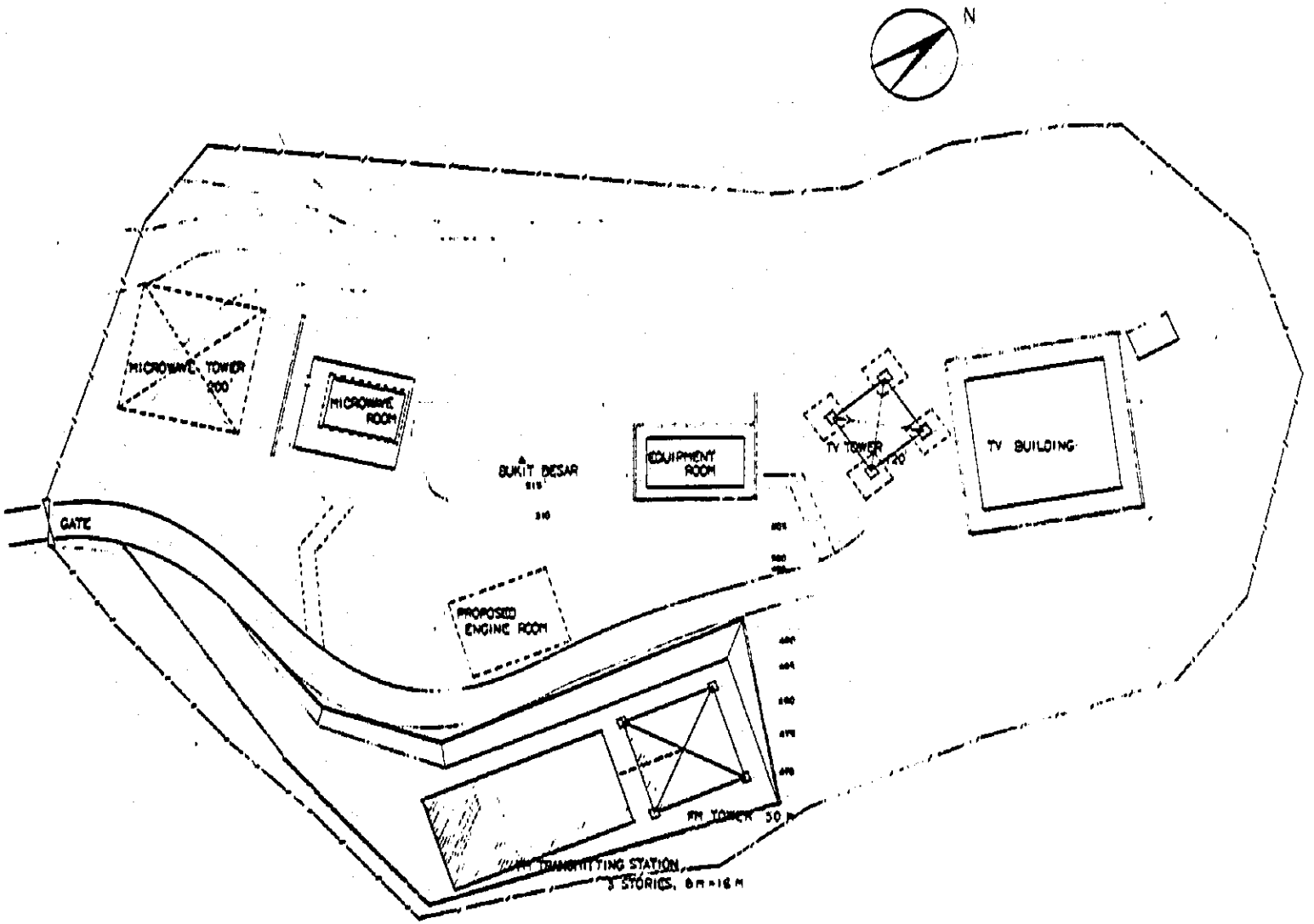


Fig. 5-14 Site Plan – Bt. Besar, K. Trenganu

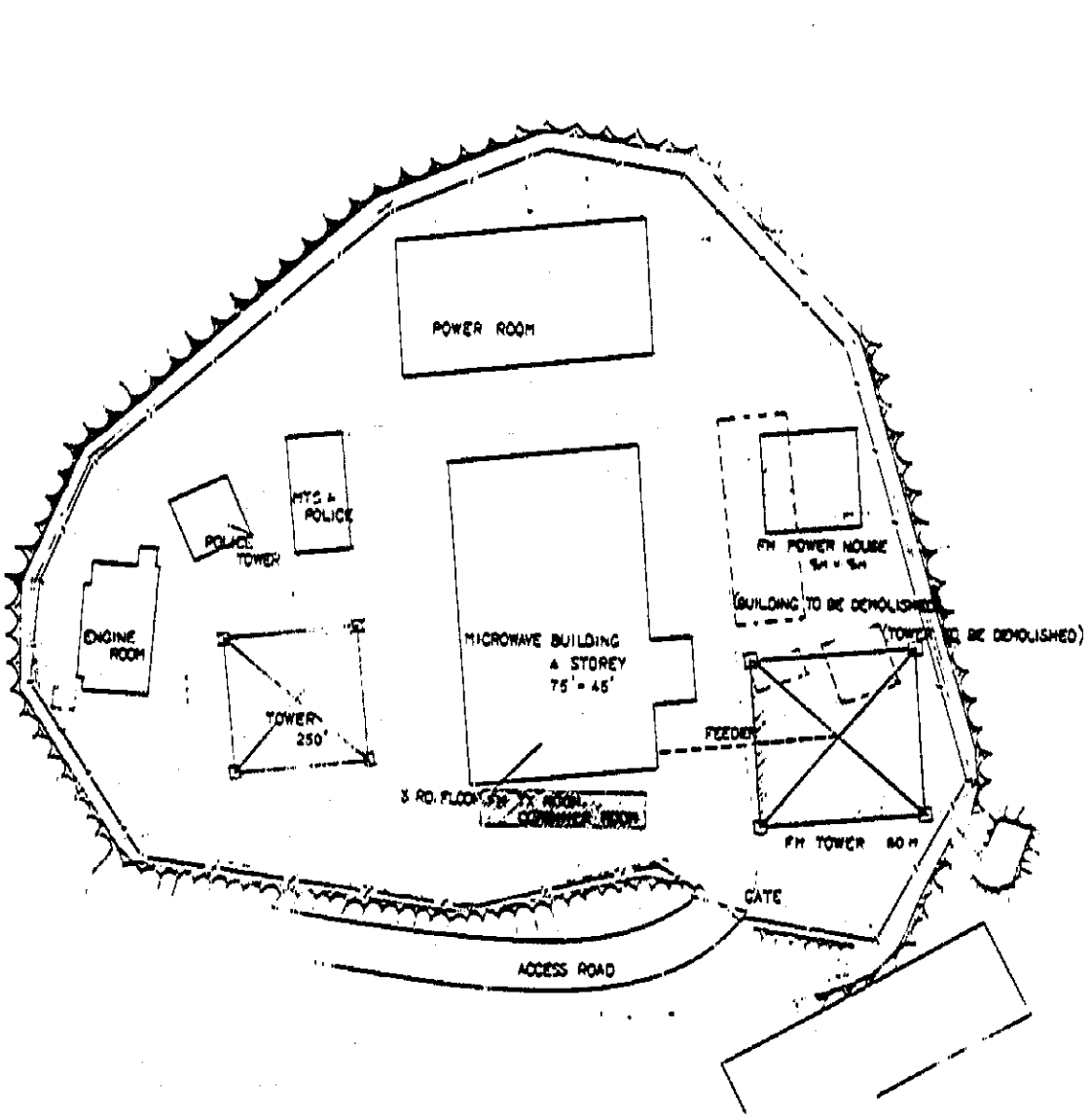


Fig. 5-15 Site Plan – Bt. Bakar, Kota Bahru

5-1-2 New Station Building

(1) Scale of Station Building

The 11 FM transmitting station buildings which are to be newly built will be planned as un-attended stations, and the following four types were assumed in considering the transmitter output power, the number of transmitter equipment and the shape of the site, etc.

Type	Dimension	Number of Stories	Total Floor Area	Remarks
A	16m x 8m	3	384 m²	Tower mounted on roof.
B	16 x 8	3	384	
C	16 x 8	2	256	
D	5 x 5	2	50	

With regard to the engine generator buildings for the FM equipment, the following two types were assumed.

Type	Dimension	Number of Stories	Total Floor Area	Remarks
E_1	8m x 8m	1	64 m²	
E_2	7 x 7	1	49	

For the classification of transmitting station buildings and engine generator buildings, refer to Table 5-1 (FM Station Building List).

The ground floor of the three story FM transmitting station building will be the entrance hall and engine generator room, the first floor will be the transmitter room and rest room and the second floor will be the combiner room. However, for the A-type (Ulu Kali Transmitting Station), the tower will be installed on the roof in considering the shape of the site, and the second floor will be the entrance hall. The other floors will be the same as in the previous case.

With regard to the two story transmitting building, the ground floor will be the entrance hall and engine generator room, the first floor will be the transmitter and combiner room and rest room, etc.

For the floor plan of each transmitting station building and engine generator building, refer to Fig. 5-16 ~ 5-20 (Floor Plan).

(2) Structure

The building will be rigid frame structure of reinforced concrete, and the walls will be built of brick.

For the structural analysis of building and structural design etc., the Building Standards Laws of Japan and structural design standards set out by the Architectural Institute of Japan and the British Technical Standards shall be referred to, as described in item 1-5-1 (Technical Standards for Buildings).

With regard to the loading weight, the Building Standards Laws of Japan and loading weight standards set out by the Architectural Institute of Japan and the British Technical Standards shall be referred to, also.

Considerations on structural strength of building against seismic force was not taken into account.

The allowable bearing capacity of soil at the proposed sites was assumed as a common value of 20 tons/square meter from results of observation at survey time. But for accurate values, geological boring tests are to be performed at each transmitting station site for confirmation, before implementation of design.

(3) Materials, Construction Work, Finishing

The materials which can easily be purchased in Malaysia will be used, and the method of construction work popularized in Malaysia will be adopted.

The finishing of building is to be about the same as to that of existing TV station buildings; the walls are to be mortarpainting finish, the floors are to be mortar finish or vinyl tiling, and the roof is to be water proof mortar finish.

(4) Building Facilities

With regard to building facilities, they are also to be about the same to those of existing TV stations, and the following facilities are assumed.

For rooms equipped with equipment which generate heat, forced ventilation according to exhaust fans will be provided.

Drinking water will be supplied by carrying it up to the station whenever necessary from the mountain foot, and for miscellaneous purposes such as lavatories etc., rain water will be used.

A drainage facility and sewage septic tank etc. will be installed.

The conduits for each room illumination, electric power between rooms, racks for wiring and earth lines etc. will be necessary.

5-1-3 Common Use of TV Station Building

As the four stations at G. Jerai, Mt. Ophir, Bt. Tinggi and Bt. Bakar are of the standard station buildings of TV/microwave, the FM transmitter room and combiner room will be used in common with this building.

For the installation of the FM transmitter and combiner for these four stations, a floor surface of about 150 m^2 will be needed, and it will be necessary to ensure this space in the TV/microwave standard building.

In case an FM transmitter equipment is to be installed in the standard station building, conduits for broadcast facilities, wiring racks and electric power wiring etc. will be necessary.

In addition, a forced ventilation fan is necessary for preventing room temperature rise due to heat generating from broadcasting transmitter.

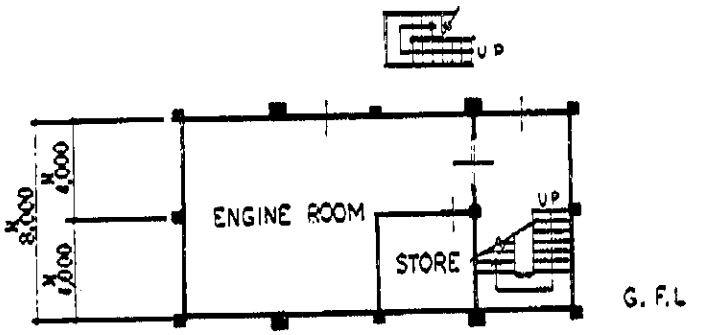
From the results of considering the structural strength, the installation of FM broadcast transmitter in the TV/microwave standard station building will be available with no problems occuring at any of the station buildings.

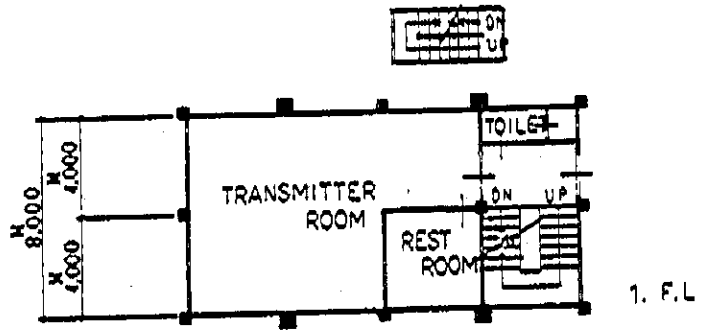
Table 5-1 FM Station Building List

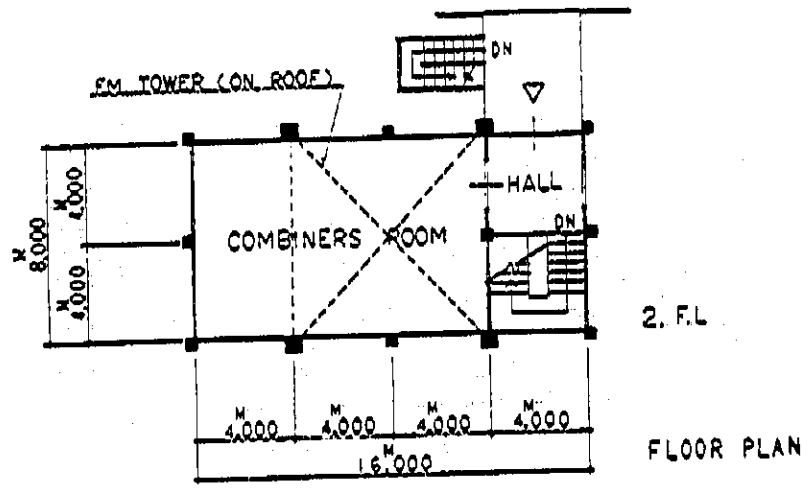
Name of State	Proposed Site	Altitude (m)	Type of FM Station Building	Type of Engine Generator Bldg.
Perlis	Bt. Bintang	323	D	
Kedah	G. Jerai	1216	Common use of TV Building	E_1
Pinang	Bt. Penara	533	D	
Perak	Maxwell Hill	1389	C	
	G. Kledang	808	B	
Selangor	G. Ulu Kali	1772	A	
Negeri Sembilan	Bt. Telepa Burok	1193	C	
Melaka	Bt. Tampin	568	C	
Johor	Mt. Ophir	1276	Common use of TV Building	E_2
	G. Pulai	654	B	
	Bt. Tinggi	348	Common use of TV Building	E_1
Pahang	Bt. Pelindong	268	B	
Trengganu	Bt. Bauk	472	B	
	Bt. Besar	157	B	
Kelantan	Bt. Bakar	615	Common use of TV Building	E_1

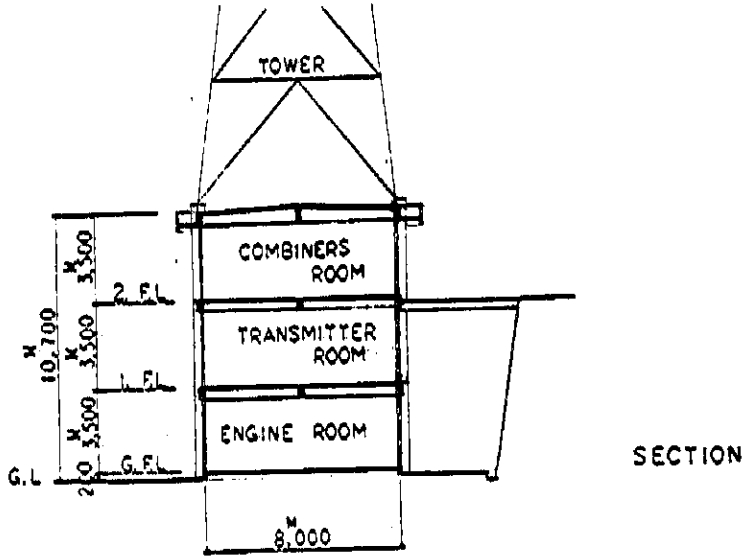
Note 1. For the dimensions of each type of Station, refer to 5-1-2 (New Station Building).

2. In the newly built FM transmitting station building, an FM engine generator room will be included.







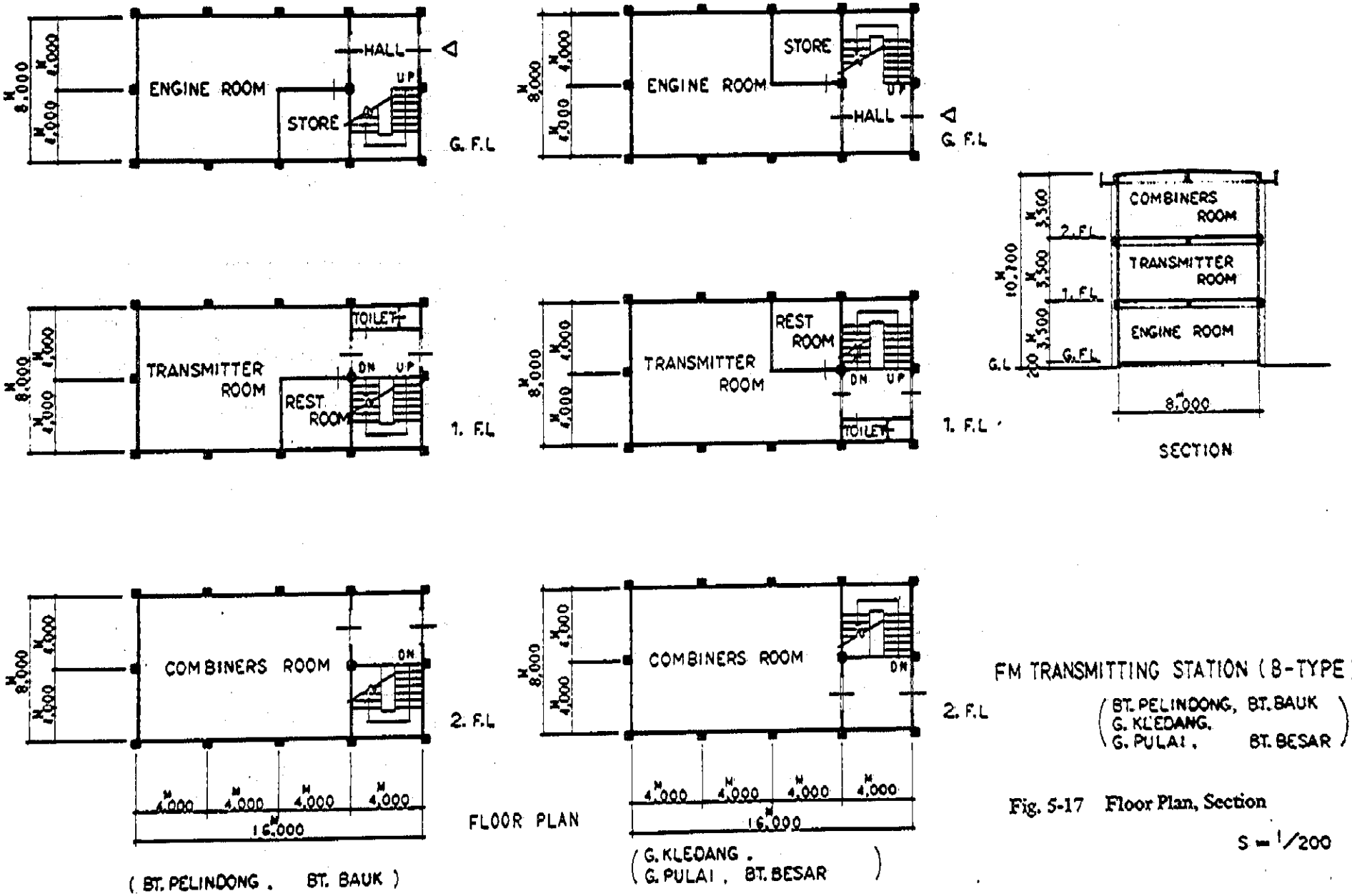


FM TRANSMITTING STATION (A-TYPE)

(G. ULU KALI)

Fig. 5-16 Floor Plan, Section

S = 1/200

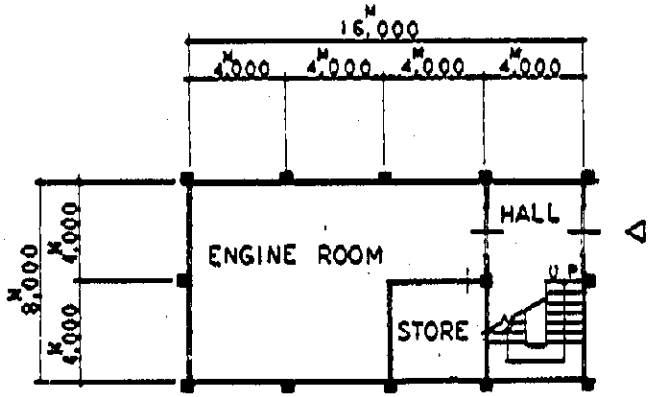


FM TRANSMITTING STATION (B-TYPE)

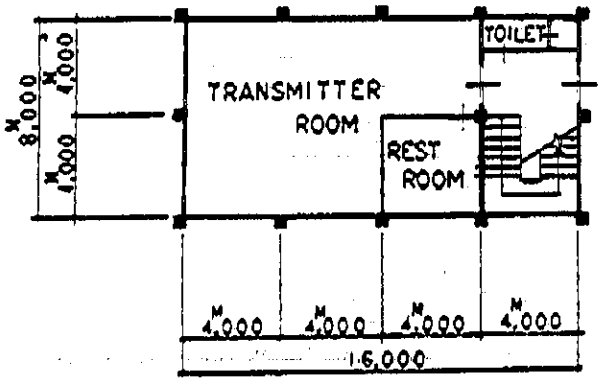
(BT. PELINDONG, BT. BAUK
G. KLEDANG,
G. PULAI . BT. BESAR)

Fig. 5-17 Floor Plan, Section

S = 1/200

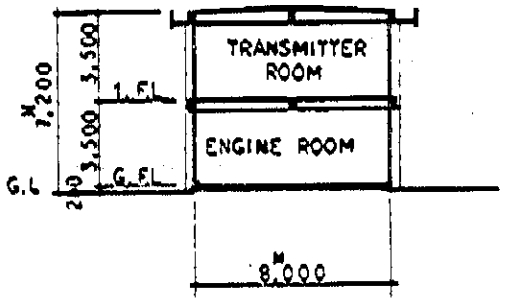


G. F.L



1. F.L

FLOOR PLAN



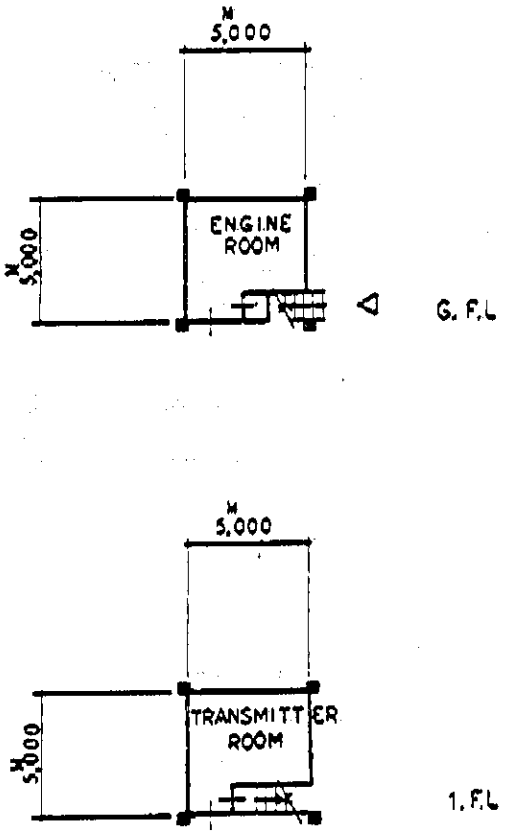
SECTION

FM TRANSMITTING STATION (C-TYPE)

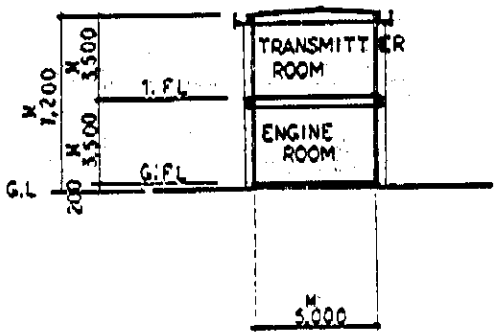
(MAXWELL HILL, BT. TELEPA BUROK
BT. TAMPIN)

Fig. 5-18 Floor Plan, Section

S = 1/200



FLOOR PLAN

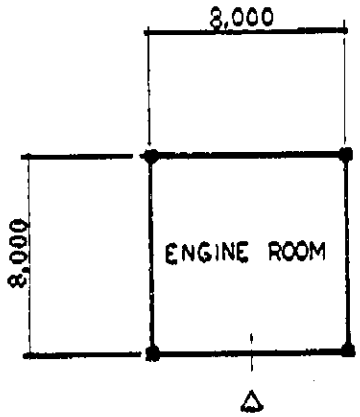


SECTION

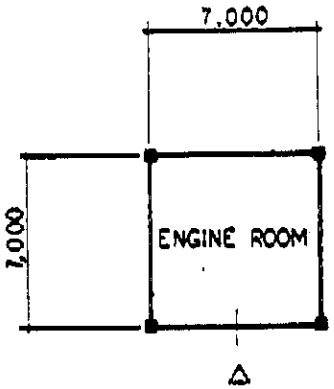
FM TRANSMITTING STATION (D – TYPE)
(BT. PAYA TERUBONG, BT. BINTANG)

Fig. 5-19 Floor Plan, Section

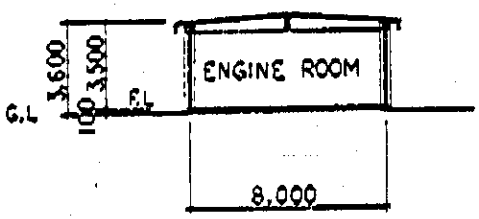
S = 1/200



FLOOR PLAN



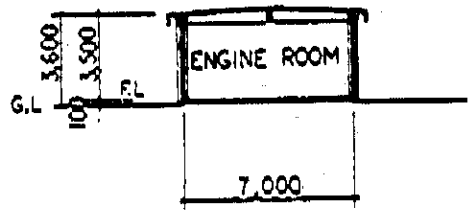
FLOOR PLAN



SECTION

E_1 - TYPE

(G. JERAI, BT. TINGGI, BT. BAKAR)



SECTION

E_2 - TYPE

(MT. OPHIR)

FM POWER HOUSE ($E_{1,2}$ - TYPE)

(G. JERAI, BT. TINGGI
BT. BAKAR, MT. OPHIR)

Fig. 5-20 Floor Plan, Section

S = 1/200

5-2 FM Tower

According to the results of discussion with the Malaysian Government, with regard to the 350 feet and 400 feet towers for FM broadcasting, the existing towers in the country, or the TV towers which are being planned will be used in common, and the others will be newly built.

For the layout of towers of transmitting stations for each site, refer to the attached Fig. 5-1 ~ 5-15 (Site Plan).

5-2-1 Erection of New Tower

Eleven steel towers will be newly erected. As stated in the Previous item 1-5-2 (Technical Standards for Steel Towers), the structural analysis and structural design of steel towers shall be carried out as referring to the Building Standards Laws and related Regulations of Japan, the structural design standards set up by the Architectural Institute of Japan and the British Technical Standards (BTS).

The height of towers is divided into four classes of 40, 50, 65 and 80 meters, and the proper height of tower will be respectively selected for each transmitting station as referring to the height of the existing TV towers, etc.

With regard to the layout of tower in the site, it will be erected at a distance more than 30m apart from the existing TV towers, close to the FM building in order to avoid interference between the two radiating waves.

The structure of steel tower will be the self-supporting type with a square cross-section, mounted on four reinforced concrete foundations.

However, in the case of Ulu Kali transmitting station, the tower will be mounted on the roof because there is no more space for it in the site.

The structural design for wind load will be made to withstand a maximum instantaneous wind velocity of 40 meters/sec. or 90 miles/hour as a standard.

With regard to the structural strength, seismic force were not taken into account.

With regard to the allowable bearing capacity of soil at the sites, a common value of 20 tons/square meter was assumed from the results of the survey, but, for the accurate values, boring tests etc. are to be performed at each transmitting station site for reconfirmation in advance of implementation of design.

The steel tower is to be furnished with horizontal and vertical feeder racks, ladders and aviation lights, etc.

All materials of steel tower should be galvanized and finished with paint.

It is to be noted that in erecting the towers at transmitting station sites, the erection work will have to be directed by certain experts from the tower manufacturer.

Refer to Table 5-2 (FM Tower List) and Fig. 5-21 (Outline of FM Tower).

Table 5-2 FM Steel Tower List

Name of State	Proposed Site	Altitude (m)	Tower Height (m)	Antenna Mounted (dipole)	(stage)	(array)	Remarks
Perlis	Bt. Bintang	323	80	2	2	2	
Kedah	G. Jerai	1216	122 (400')	2	2	3	Common use of TV tower
Pinang	Bt. Penara	533	122 (400')	2	2	3	ditto
Perak	Maxwell hill	1389	50	2	2	4	
	G. Kledang	808	40	2	2	3	
Selangor	G. Ulu Kali	1772	50	2	2	3 *1	Tower on roof
				2	2	2 *2	*1National Prog.
				2	2	1 *3	*2Reg. & Loc. Prog. for Selangor
							*3Reg. & Loc. Prog. for Pahang
Negeri Sembilan	Bt. Telepa Burok	1193	80	2	2	2	
Melaka	Bt. Tampin	568	80				National
				2	2	1 *1	*1Reg. & Loc. Prog. for Negeri Sembilan
				2	2	1 *2	*2Loc. Prog. for Melaka
Johor	Mt. Ophir	1276	107 (350')	4	2	1	Common Use of TV tower
				2	2		
	G. Pulai	654	50	4	2	2	
				2	2	2	
	Bt. Tinggi	348	107 (350')	4	2	3	Common Use of TV tower
				2	2	1	
Pahang	Bt. Pelindong	268	65	2	2	3	
Trengganu	Bt. Bauk	472	40	2	2	2	
	Bt. Besar	157	50	2	2	2	
Kelantan	Bt. Bakar	615	80	2	2	3	

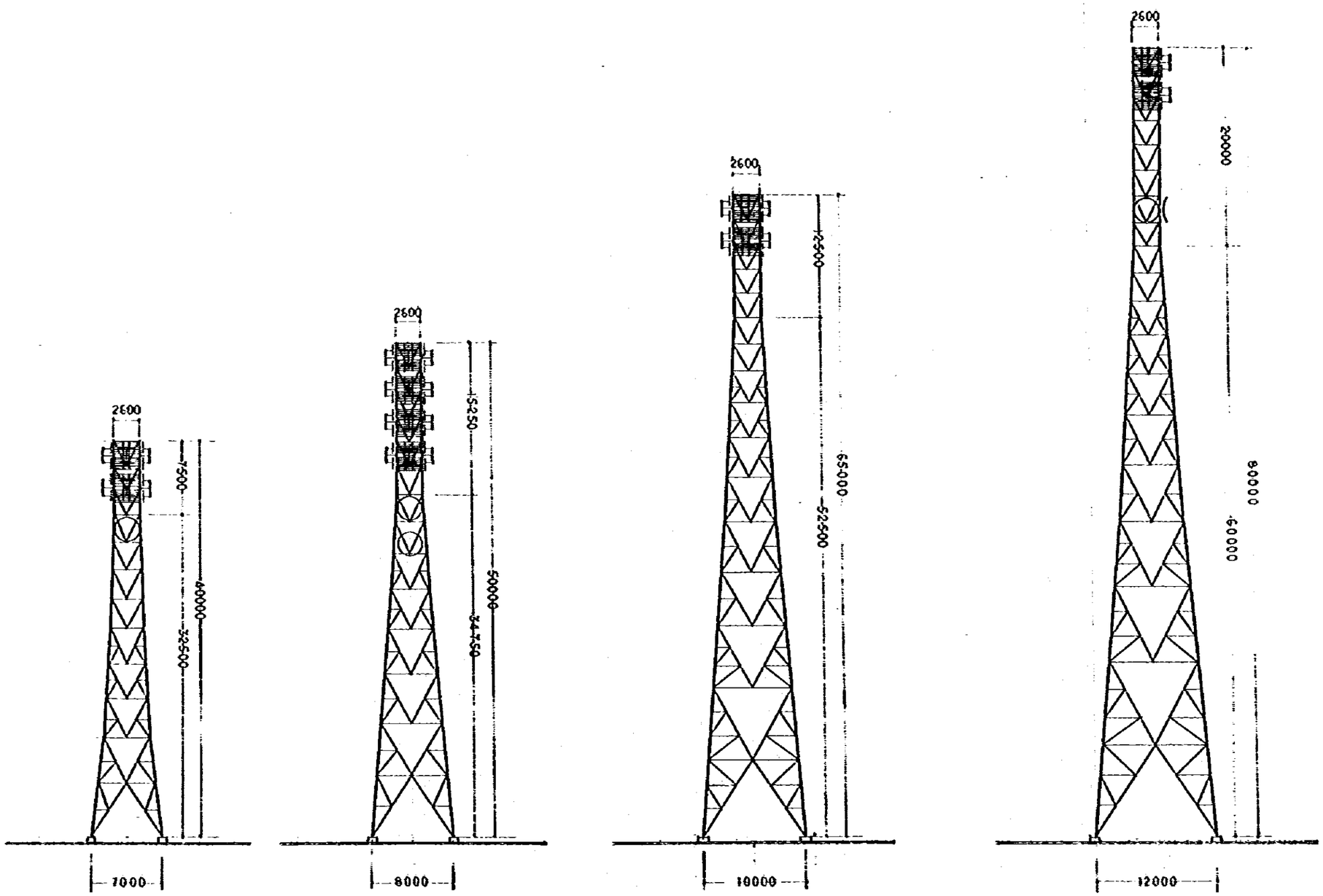


Fig. 5-21 Outline of FM Tower

UNIT :

5-2-2 Common Use of Tower

The TV towers which will be used in common with the FM transmitters are the following four.

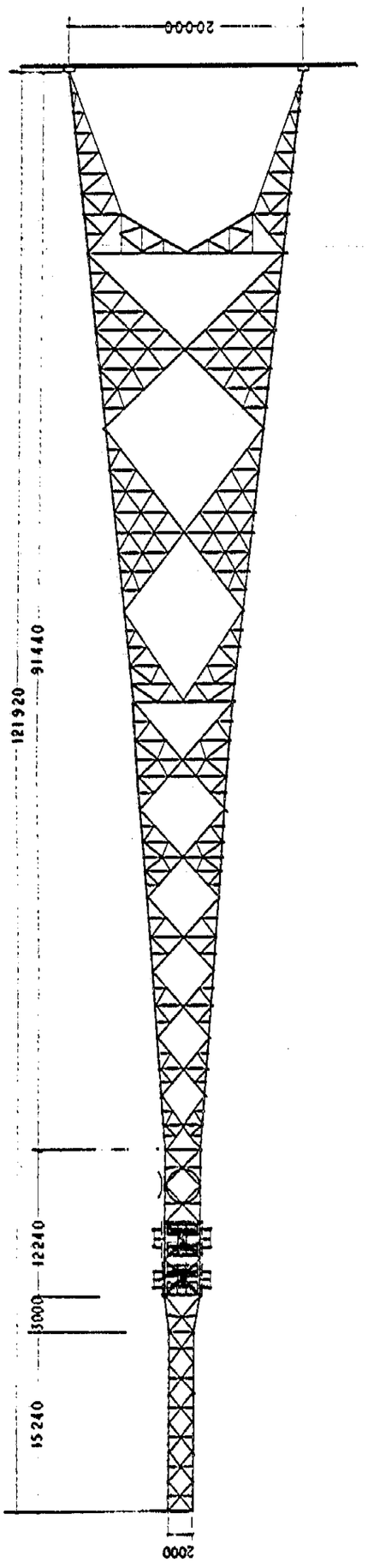
Name of Transmitting Station	Height of Tower (Feet)
G. Jerai	400
Bt. Penara	400
Mt. Ophir	350
Bt. Tinggi	350

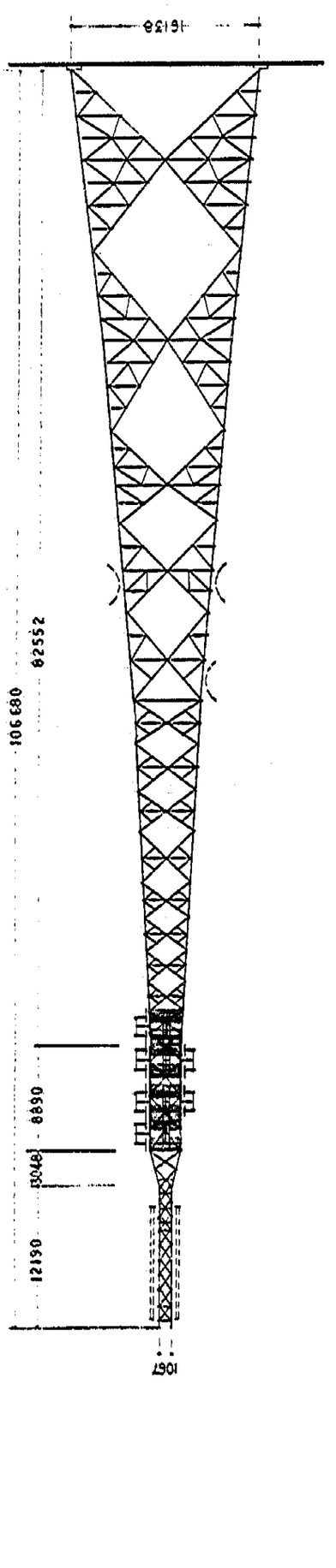
For the towers to be used in common, consideration of structural strength of TV tower was examined by the following tentative values.

Maximum instantaneous wind velocity : 40 meters/sec. (90 miles/hour)
Allowable bearing capacity of soil : 20 tons/square meters
Number of antennas to mount : FM, As listed in Table 5-2
TV, 4-arrays of 4-element dipoles in 3-stacks
Parabolic, 3 of 2.5 meter diameter

From the results of examination of design drawings of these towers made in Australia, there seems to be no problem existing in structural strength. However, it would be necessary to re-examine the soil by boring tests etc., and confirm whether there is any plan of mounting TV antennas etc. and also re-examine the structural strength before implementing this project design.

Refer to Fig. 5-22 (Outline of TV Towers).





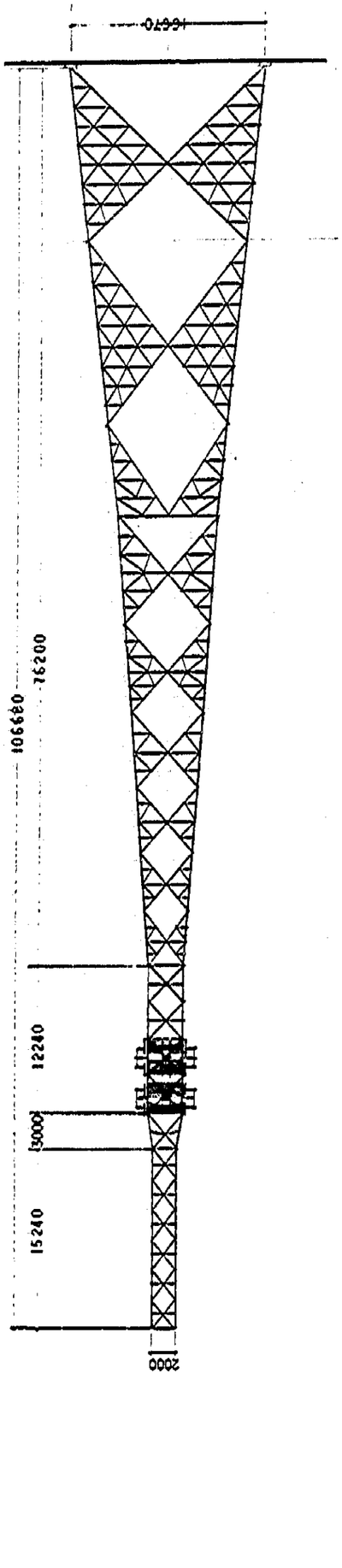


Fig. 5.22 Outline of TV Tower

5-3 Access Road

As the existing access roads for all of the transmitting stations, excluding transmitting stations of Bt. Bintang, can be used, it will be unnecessary to widen nor build new roads.

But for Bt. Bintang transmitting station, an access road is to be built from the existing road at mountain foot up to the mountain top. The width of this access road is four meters and the average gradient will be 7%. The total length of the road will be about 6 km.

In addition, as the roads will be used for conveying the construction materials and equipments for the building, it will be necessary to complete the road before starting the building construction work.

6. Program Plan

6-1 FM Broadcast Channels of This Project

As discussed in Chapter 3 and 4, six channels can be assigned, then, six programs can be broadcast. Tentatively they are named as FM 1, FM 2, . . . FM 6. The programs of these six channels will be as the following, according to the intension of RTM.

FM 1	RTM National Program (1)
FM 2	RTM National Program (2)
FM 3	RTM National Program (3)
FM 4	RTM Regional Program
FM 5	RTM Local Program
FM 6	PSP Educational Program

The national programs will be produced "mainly" at the RTM Headquarters at Kuala Lumpur and be sent to all transmitting stations in the country to transmit simultaneously. The meaning of "mainly" is that a few programs produced at local stations will be sent to Headquarters to broadcast as national programs, or a few programs produced at local stations will be relayed throughout the country. In accordance with the intention of RTM, all national program transmission lines are planned to go through the regional stations. Therefore, insertion of program at regional stations to national program would be available. This will be used for inserting programs in case of emergency or for transmission of station call-sign.

The regional programs will be produced mainly at four stations of Kuala Lumpur, Kuala Trengganu, Pinang and Johor Bahru, and transmitted from the transmitting stations in the respective areas.

The local programs will be produced at each local station in the 11 states and transmitted to their respective areas. For local stations where studio facilities are not yet provided, programs will be produced at regional stations or other local stations nearby until completion of studio facility construction.

The educational programs of PSP will be produced by PSP of Education Ministry, and transmitted simultaneously through all of the educational channel transmitters in the country. As the transmission lines for FM 6 will go through RTM regional stations, in the same way as national programs, insertion of programs will be available at RTM regional stations.

6-2 Expectation of the Malaysian Government and Problems Involved in Implementation of the Project

The roles of the FM broadcast which the Malaysian Government expects could be such as; stereophonic broadcasting, improvement of pocket areas, better regional service and independence of educational broadcast service. It is easy to realize these roles by using 12 Channels. At least eight channels are necessary; one for stereophonic national service, three for improving pocket areas of present medium wave services, two for regional and local services and two for educational service. Therefore, careful consideration is required in order to implement this by using six channels, as so far discussed.

6-3 Relation Between AM and FM Programs

In order to improve the pocket areas of the medium wave services, the AM programs will be transmitted by three of the FM channels. In other words, the three FM national programs will be broadcast on AM channels. However, from the view point of program production, meaning of these two expressions are different.

The difference in producing FM programs from that of AM programs, is utilizing feature of high technical quality. Therefore, transmission of AM programs on FM channels and transmission of FM programs on AM channels are different in considering program production. Namely, the transmission of AM programs on FM channels will result in not utilizing the high quality of FM broadcasting. In order to improve the pocket areas of medium wave services with a limited number of FM channels, the transmission of FM programs on medium wave channels could be more effective than the transmission of AM programs on FM channels. By transmission of FM programs on medium wave channels, audience can satisfy in listening stereophonic programs, which is not possible by contrary way.

In accordance with the intention of the Malaysian Government, for the time being, the three FM channels will transmit the programs of three AM channels, and in the future, the language shared broadcast channels will be reorganized into program contents channels. According to the tentative proposal of RTM, the three medium wave channels will respectively transmit FM 1, FM 4 and FM 5 programs in the future. As the medium wave channels other than national are not transmitted throughout Malaysia, this proposal is appropriate.

In considering the fact that only six channels are available, the period "for the time being" is to be shortened as short as possible, and the period "future" is to be a concrete target in the near future. Then, the features of FM broadcasting can be utilized and improvement of pocket areas can be successful.

In this report, the period "for the time being" was set for three years after the commencement of operation of this project. As is explained in the "Construction Schedule" in Chapter 9, this will be the period when the FM nation wide network will be completed in accordance with the completion of the second phase stations.

6-4 Program Compilation Schedule for FM and AM Broadcasting

The following points were taken into consideration in making the program compilation schedule.

i) From the commencement of operation to three years

1) To demonstrate the features of FM broadcasting effectively, and to promote audience, at least one channel is to be broadcast in stereophonic from the beginning.

2) The programs of a channel which will be broadcast in stereophonic from beginning will be of the newly compiled form. There will be no remarkable influence on program compilation of other channels, because only few stations out of whole project will start operation. The distance of stereophonic transmission line to be leased will be as short as possible in order to achieve high efficiency of rentals. In considering these conditions, the FM local service (FM 5) will be transmitted in stereophonic from the beginning.

3) Since regional channels at local stations will not be constructed yet, programs for FM regional service (FM 4) will not be compiled during this period.

4) The FM national (FM 1 – FM 3) will transmit programs of the three AM channels in monophonic.

5) The AM channels will continue their usual programs as they are doing.

6) The educational broadcasting service will remain as it is.

7) During the AM local program hours, the programs of FM 5 will be transmitted at Headquarters and regional stations.

ii) After three years

1) A nation wide program of the AM of National, Blue, Green and Red will be reorganized and by adding the features of FM broadcasting, new national programs of FM 1, FM 2 and FM 3 will be compiled. The programs which could utilize the features of stereophonic broadcast will be produced in stereophonic.

2) At present, local and regional programs are broadcast with time-shared form on AM nation-wide network. They will be made independent as FM 4 and FM 5. Both channels will broadcast mostly in stereophonic because there are more programs dealing with culture and music, than education and news.

3) The educational programs will be broadcasted in FM. The educational broadcast programs which are on AM channels will be transferred to FM channels. The details will be explained in 6-6. The educational broadcast facilities will be converted to stereophonic in seven years. Some educational programs will be broadcast in stereophonic, and social and adult education programs besides the school broadcast will be produced.

4) The three medium wave channels will respectively transmit the program of FM 1, FM 4 and FM 5.

The above plans are shown in Fig. 6-1, Fig. 6-2 and Fig. 6-3.

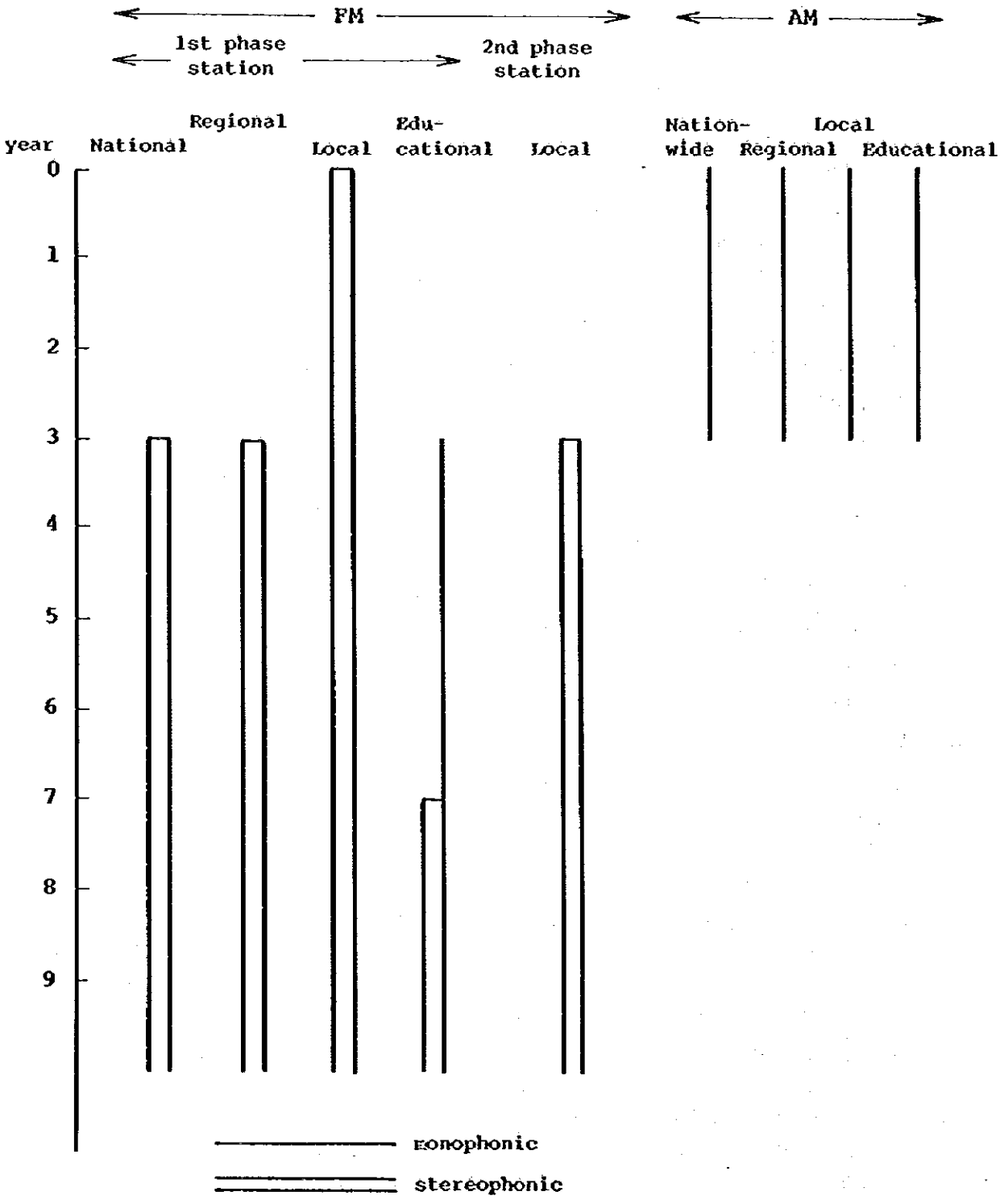


Fig. 6-1 Program Production Schedule

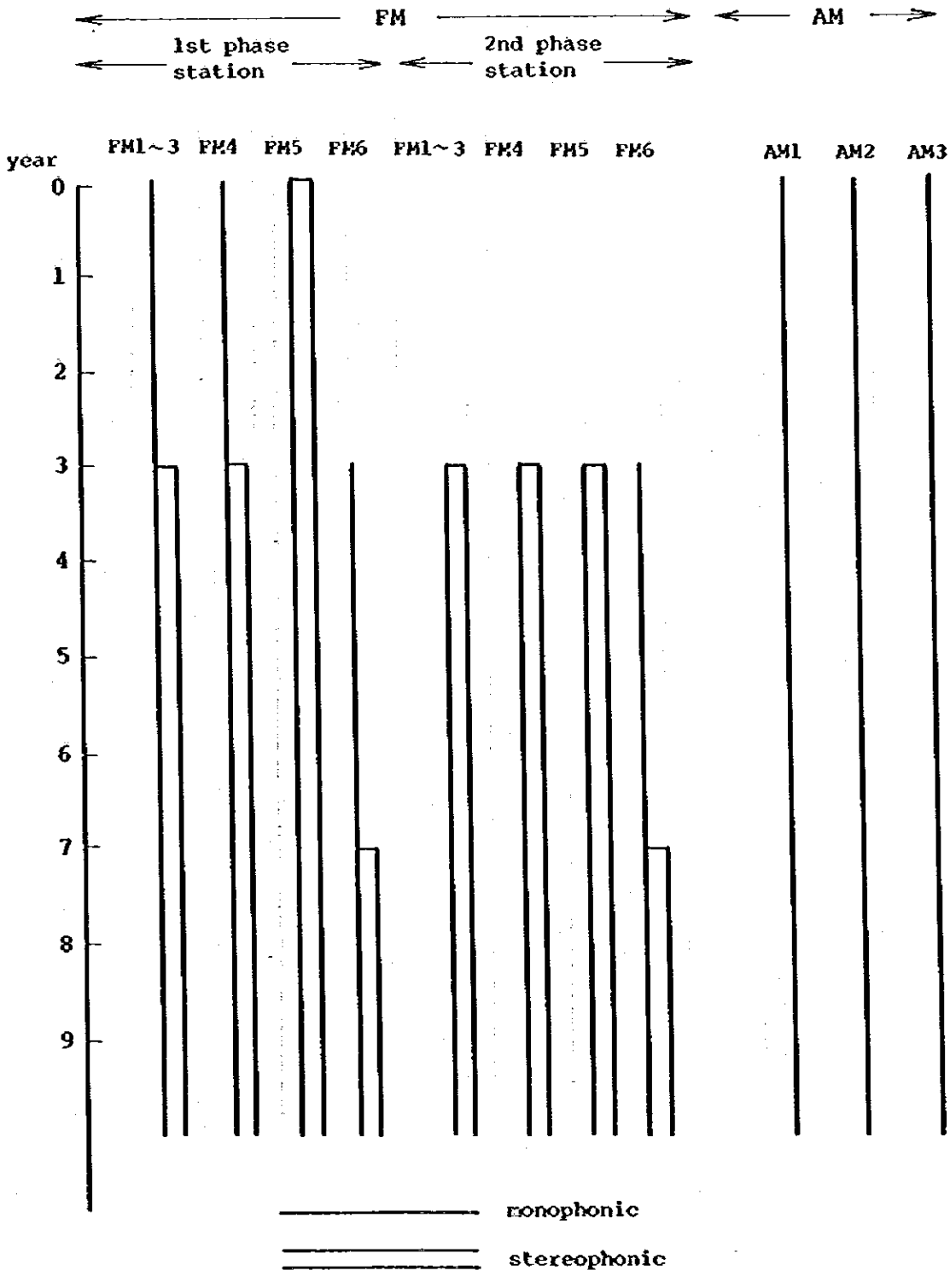


Fig. 6-2 Transmission Schedule

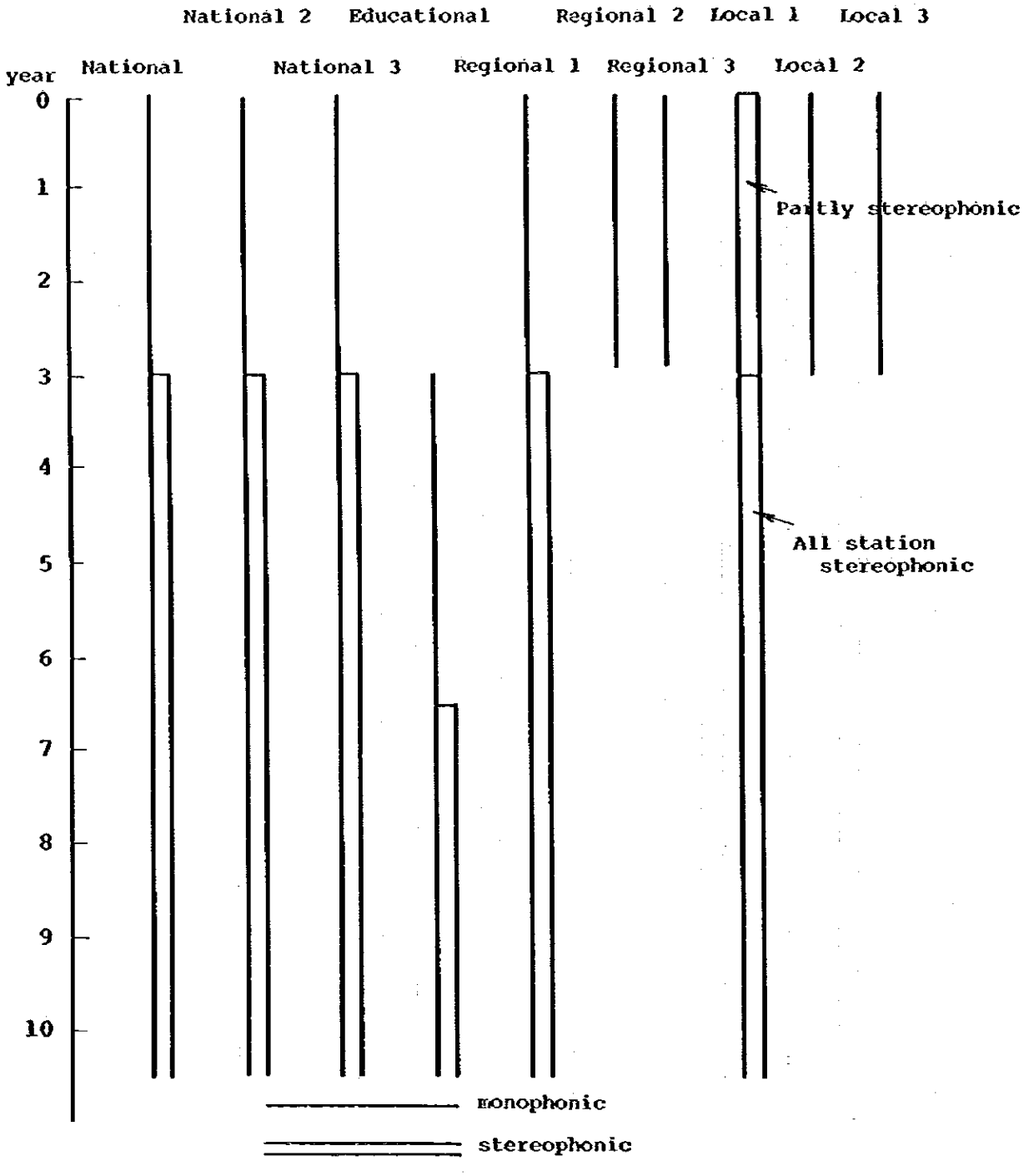


Fig. 6-3 Rental Line Operation Schedule

6-5 Metropolitan Broadcasting Services

In this report, study is carried out on the assumption that the metropolitan broadcasting service at Sungai Besi and the FM stereo station at Ulu Kali will remain as it is. Even if these services were absorbed in the FM 1 – FM 6, the number of available frequencies will not increase. Therefore, whether to continue or abolish the existing two FM services is simply decided by their needs. In considering the nature of the capital city, they would continue their services.

6-6 Educational Broadcasting

In accordance with the tentative plan of RTM, the AM channels will transmit the same programs as for FM 1, FM 4 and FM 5, the educational broadcast will be on one channel of FM 6.

As shown in Table 6-1, the average broadcasting hours of present educational service per day is four hours. By making FM 6 and an independent educational channel, it is assumed to extend the broadcast hours to 10 hours. Accordingly, the contents of programs will be very much improved.

In the case of educational broadcasting, time restriction will be important. In present Malaysia, schools system is double-shift. The first shift begins at 7:45 and ends at 12:45 hours, whereas the second shift begins at 13:00 and ends at 18:00 hours. Holidays differ from area to another, either on Friday or Sunday. Accordingly, it would be necessary to concentrate school broadcasting on the above hours between Monday and Thursday. As shown in Table 6-1, it would be possible to present more broadcasting hours than present by using two channels. But it would be impossible to cover it by using one channel of FM 6 because of the restriction in the school hours. As a consequence, FM 2 is to be leased for transmission. Original programs of the leased FM 2 will be transmitted on FM 6 during hours of no school education, and the total hours of FM 2 and FM 6 will be as discussed in 6-7.

6-7 Broadcasting Hours

Facilities of all channels will be capable to perform twenty four hour operation a day. However, in considering the social needs, operation cost and capability of production, it would be better to set the daily broadcasting hours as follows for the time being.

FM 1	24 hours
FM 2	18 hours
FM 3	18 hours
FM 4	10 hours
FM 5	10 hours
FM 6	10 hours

On FM 2 channel, educational programs will be transmitted yearly average four hours. Along with this, the programs of FM 2 will be transmitted on FM 6 channels for equivalent hours.

Table 6-1 Educational Broadcasting Hours (Current)

DAY	TIME	AM 1 (Blue)	AM 2 (Green)	AM 3 (Red)	
Mon.	9:00 - 10:00 10:00 - 11:00 11:00 - 12:30	}Primary Middle	Primary	Primary	
Tue.	9:00 - 10:00 10:00 - 11:00 11:00 - 12:30	}Primary Middle	Primary	Primary	
Wed.	9:00 - 10:00 10:00 - 11:00 11:00 - 12:30	}Primary Middle	Primary	Primary	
Thur.	9:00 - 10:00 10:00 - 10:35 10:35 - 11:00 11:00 - 12:30	}Primary }Middle	Middle	} Middle	
TOTAL		14 hours	4 hours	4 hours	GRAND TOTAL 22 hours

1. The same programs are rebroadcasted in the afternoon due to the double-shift system.
2. For 34 weeks yearly the above programs are broadcast.
   22 hours ÷ 7 x 34/52 = 2.0 hours
   Average Production hours are two hours a day with four transmission hours.

7. Program Transmission Line

7-1 Fundamental Concept in Designing Program Transmission Line

The design of program transmission lines will be based on the following fundamental concept, and the technical feasibilities and concrete plans will be described in 7-2.

1) The nation-wide transmission line will originate from Kuala Lumpur Head Quarters and then send to each transmitting station via regional stations. This is the proposal of RTM. It will be available to insert programs into the nation wide network programs at the regional stations. For this, the Telecom transmission lines will be leased from Kuala Lumpur to the regional stations.

2) Between stations where the off-air relay is technically possible, except routes of item 1), the off-air relay will be adopted. At where off-air relay is technically unavailable, the Telecom lines will be leased.

3) The most of the Regional program transmission will depend on the off-air relay, program will not pass through the local stations. It would be technically possible to amend the plan, whenever necessary, so that it would pass through the local stations. But, it is considered that the amount of investment will be too high in comparison with the necessities of it.

4) As described in Chapter 6, three programs of this FM project will be the same as that of the medium wave channels, therefore, it will be unnecessary to change the routes of the transmission lines leased for the medium wave broadcasting. However, it will be necessary to improve them for 15 kHz stereophonic transmission.

5) For transmission lines between studio and transmitting stations, a 900 MHz band STL will be planned for distance over 10 km, in considering the technical quality and economical aspects. This STL will connect the RTM studio directly to the transmitting station. For transmission distance less than 10 km, the Telecom lines will be leased.

7-2 Composition and Quality of Program Transmission Line

On the basis of the previous fundamental concept, the program transmission lines to connect each station will be composed as shown in Table 7-2-1 and Fig. 7-2-1. The quality of each transmission line, inclusive of studio equipment to audience receiver and outgoing distribution lines, are to comply with the prescribed overall characteristics (CCIR Report 293-4).

Table 7-2-1 Composition of Program Transmission Network

Classification	Section	Program	Transmission Line
KL - Regional Headquarters	KL → K.Trengganu	N	Telecom Line
	KL → Johor Bahru	N	" "
	KL → Pinang	N	" "
Between each Transmitting Station	K.Trengganu → Kota Bharu	N, R	Telecom Line
	K.Trengganu → Kuantan	R	" "
	Bt.Besar → Bt.Bauk	N, R, L	Off-air Relay
	Bt.Bauk → Bt.Pelindong	N, R	" "
	G.Ulukali → Bt.Telepa Burok	N, R	" "
	Mt.Ophir → Bt.Tampin	N, R	" "
	G.Jerai → Maxwell Hill	N, R	" "
	Maxwell Hill → G.Kledang	N, R	" "
	G.Kledang → Maxwell Hill	L	" "
Between Studio and Transmitting Station	K.Trengganu → Bt.Besar	N, R, L	Telecom Line
	Kota Bharu → Bt.Bakar	N, R, L	STL
	Kuantan → Bt.Pelindong	L	"
	Kuantan → G.Ulukali	R, L	Telecom Line
	KL → G.Ulukali	N, R, L	STL
	Seremban → Bt.Telepa Burok	L	"
	Bt.Telepa Burok → Seremban	R	"
	Seremban → Bt.Tampin	R, L	"
	Melaka → Bt.Tampin	L	"
	Johor Bahru → G.Pulai	N, R, L	"
	Johor Bahru → Mt.Ophir	N, R, L	Telecom Line
	Johor Bahru → Bt.Tinggi	N, R, L	" "
	Pinang → Bt. Penara	L	STL
	Pinang → G.Jerai	N, R	"
	Alorsetar → G.Jerai	L	"
	Ipoh → G.Kledang	L	"
	Kangar → Bt.Bintang	L	"

N: National Network

R: Regional Network

L: Local Network

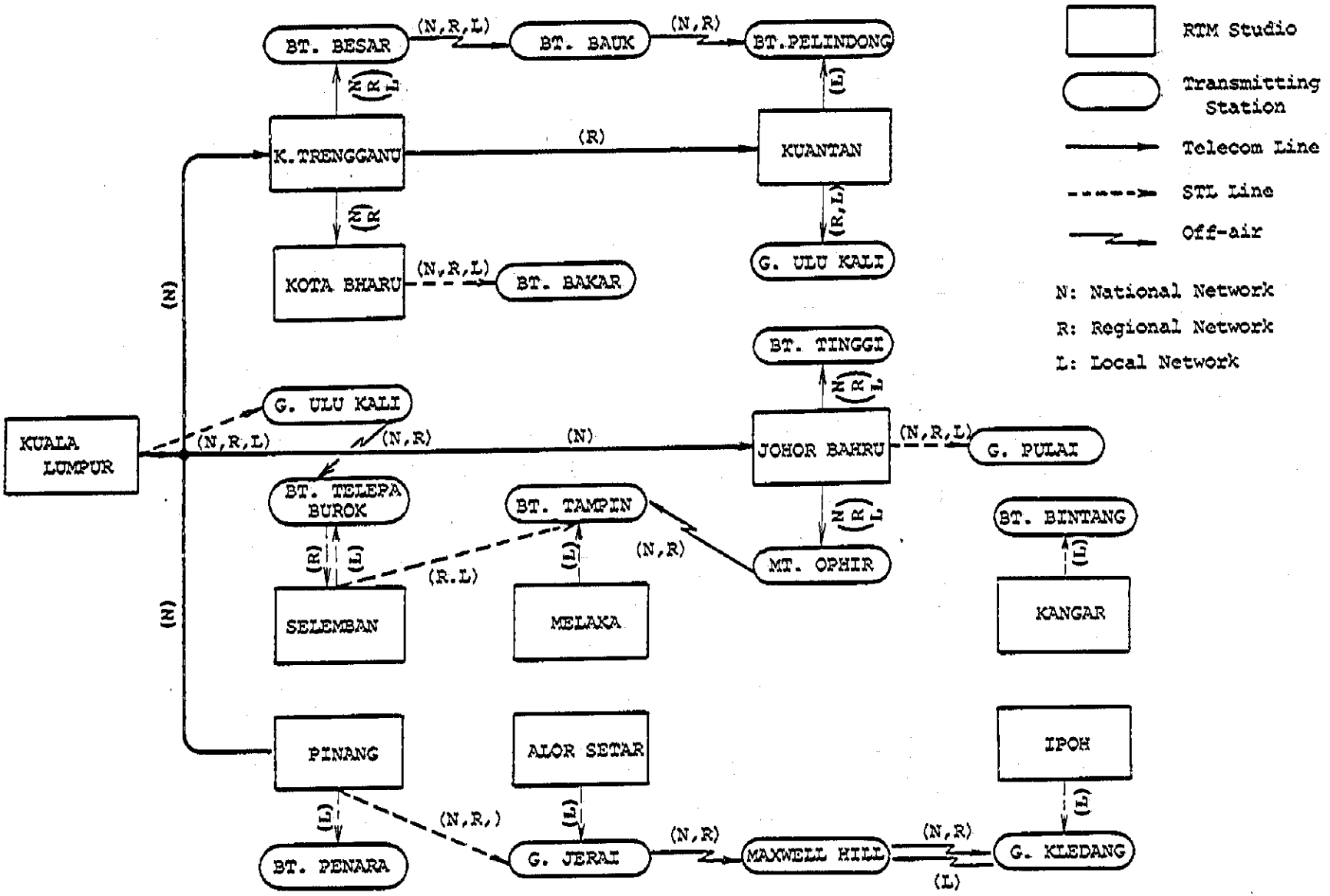


Fig. 7-2-1 Program Transmission Route

The technical specifications for transmission line is as following.

(1) Telecom Line

The existing 10 kHz transmission line is adequate during the monophonic broadcasting period, but, when stereophonic broadcasting comes into operation, a transmission line which will satisfy CCITT Recommendation J-21 is necessary. In Table 7-2-2, the outline of J-21 is shown.

(2) Off-air Relay

The quality of off-air relay should be a subjective evaluation of rank 5 at transmitter output. Off-air relay are planned only for routes between stations which satisfy the following items.

1) S/N

S/N better than 60 dB is to be obtained at transmitter ouput, namely, the receiver input is to be higher than 42 dB (terminal voltage).

2) Fading Margin

As the reliability of transmission line is to be higher than 99% in time, a fading margin of 0.2 dB per 1 km transmission distance is to be applied.

3) D/U (Including own station)

$$\frac{\text{Field strength of desired signal}}{\text{Field strength of interferring signal}} \geq D'/U' + F - A_1 - A_2$$

where;

D'/U': D/U Required at receiver input

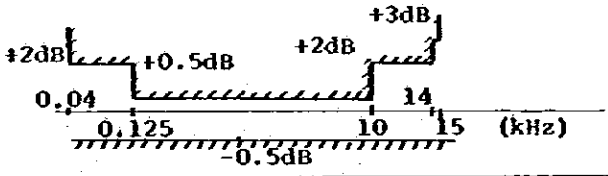
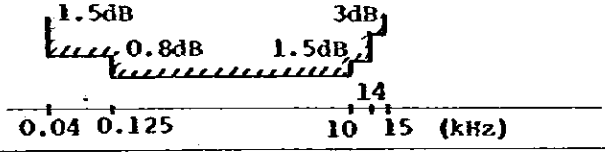
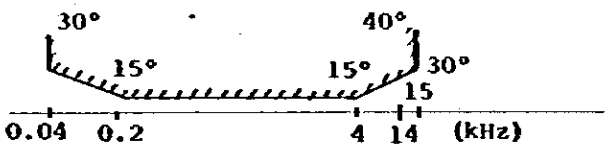
Δf	D'/U'
0 kHz	60 dB
200	40
300	10
400	−20
600	−40
over 800	−60

F: Fading Margin

A_1 : Effect of receiving antenna directivity

A_2 : Effect of receiving antenna diversity . . . 15 dB

Table 7-2-2 Quality for Stereophonic Transmission Line

Item	Standard
Nomina Bandwidth	40 Hz ~ 15 kHz
Attenuation Distortion	
Group Delay	0.04 kHz : less than 55 ms 0.075 kHz : less than 24 ms 4 kHz : less than 8 ms 15 kHz : less than 12 ms
Overall Weighted Noise	less than -47 dBmop
Harmonic Distortion	Both second and third harmonics at +9 dBm 0.04 ~ 0.125 kHz less than 0.7% 0.125 ~ 15 kHz less than 0.35%
Level Difference between L, R	
Phase Difference between L, R	
Amount of Cross-talk Attenuation between L, R	better than 50 dB

(from CCITT Rec. J-21, Characteristics of 2,500 km Hypothetical reference circuits)

4) Distortion caused by Multipath propagation

Multipath propagation distortion should not be percepted. For judgment, the profile diagram between transmission sections and evaluation of received picture quality at each TV transmitting station were referred to.

In considering the possibility of off-air relay from the above considerations, as a result, it would be available to perform off-air relay at the seven sections, as shown in Table 7-2-3.

(3) STL

In considering the economic aspects, STL was planned for transmission distance over 10 km and for the routes where transmission is available with STL transmitter output power less than 10W. S/N = 60 dB at receiver output was employed for technical design standard as well as off-air relay. (receiver input power −62 dBm)

Fading margin of 0.2 dB per 1 km is applied as well as off-air relay, and the reliability of STL is to be higher than 99% in time.

The results of specific study are shown in Table 7-2-4.

Table 7-2-3 Design of Off-air Relay

	Bt.Besar → Bt.Bauk	Bt.Bauk → Bt.Pelindong	G.Ulukali → Bt.Telepa Burok	Mt.Ophir → Bt.Tampin	G.Jerai → Maxwell Hill	Maxwell Hill → G.Kledang	G.Kledang → Maxwell Hill
Transmission Distance	74 km	96	73	46	111	37	37
ERP of Master Station	4.4 kw	2.9	3.5	2.6	3.5	0.45	2.6
Field Strength of Master Station	75 dB*1	73	71	68	71	62	70
Fading Margin	-15 dB	-19	-14	-9	-22	-7	-7
Receiving Antenna Gain	11 dB	11	11	11	11	11	11
Antenna Effective Length	0 dB	0	0	0	0	0	0
Feeder Loss	-1 dB	-1	-1	-1	-1	-1	-1
Distribution Loss *2	-16 dB	-16	-16	-16	-16	-16	-16
Minimum Receiver Input *3	54 dB	48	51	53	43	49	57

*1 dB: μV/m

*2 BPF loss: -5.0 dB, Distribution loss -3.5 dB, Matching loss -1.5 dB, Termination loss -6.0 dB

*3 Terminal Voltage

Table 7-2-4 (1) Design of STL Line (1)

	Kota Bharu → Bt.Bakar	KL → G.Ulukali	Seremban → Bt.Tampin	Seremban → Bt.Telepa Burok	Bt.Telepa Burok → Seremban	Melaka → Bt.Tampin	Johor Bahru → G.Pulai
Transmission Distance	46 km	33	39	19	19	33	28
Transmit Output	40 dBm (10w)	40 (10)	40 (10)	30 (1)	30 (1)	40 (10)	37 (5)
Transmit Antenna Gain	23 dB (3mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)
Free Space Loss	-125 dB	-122	-124	-118	-118	-122	-121
Receive Antenna Gain	23 dB (3mφ)	21 (2.4mφ)	23 (3mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)	21 (2.4mφ)
Feeder Loss	-4 dB	-4	-4	-4	-4	-4	-4
Distribution Loss etc.	-6.5 dB	-6.5	-6.5	-5.5	-5.5	-5.5	-6.5
Fading Margin	-9 dB	-7	-8	-4	-4	-7	-6
Minimum Receiver Input Power	-59 dBm	-58	-59	-60	-60	-57	-59

Table 7-2-4 (2) Design of STL Line (2)

	Pinang → G.Jerai	Pinang → Bt. Penara	Alor Setar → G.Jerai	Kangar → Bt.Bintang	Ipoh → G.Kledang
Transmission Distance	43 km	8	37	11	8
Transmit Output	40 dBm (10w)	27 (0.5)	40 (10)	30 (1)	27 (0.5)
Transmit Antenna Gain	23 dB (3mφ)	19 (1.8mφ)	21 (2.4mφ)	19 (1.8mφ)	21 (2.4mφ)
Free Space Loss	-125 dB	-110	-123	-113	-110
Receive Antanna Gain	23 dB (3mφ)	19 (1.8mφ)	21 (2.4mφ)	19 (1.8mφ)	21 (2.4mφ)
Feeder Loss	-4 dB	-4	-4	-4	-4
Distribution Loss etc.	-6.5 dB	-5.5	-5.5	-5.5	-5.5
Fading Margin	-9 dB	-2	-7	-2	-2
Minimum Receiver Input Power	-59 dBm	-57	-58	-57	-53

8. Staff Planning

8-1 Introduction

Present broadcasting organizations in Peninsular Malaysia are shown in Table 8-1.

Table 8-1 Present Broadcasting Organization in Peninsular Malaysia

Network	Program Production	Continuity Operation	Transmission
Medium Wave Sound Broadcasting	RTM	RTM	RTM
Overseas Broadcasting	RTM	RTM	RTM
VHF/FM Broadcasting	RTM	RTM	JT
TV Broadcasting	RTM	RTM	JT
Educational Sound Broadcasting	PSP	RTM	RTM
Educational TV Broadcasting	PSP	RTM	JT

Note: RTM ..... Radio Television Malaysia
JT ..... Telecom
PSP ..... Educational Massmedia Service of Education Ministry

In studying Staff Planning, it is necessary to assume the organization. In this project, organizations as shown in Table 8-2 will be assumed for the study.

Table 8-2 Organizations for FM Broadcasting

Network	Program Production	Continuity Operation	Transmission
RTM. FM	RTM	RTM	JT
PSP. FM	PSP	PSP	JT

Also, the number of program channels and transmitting hours are important elements for the study. In this chapter, the study is carried out on the following assumption.

FM 1 ..... National Program (1) 24 hours
FM 2 ..... National Program (2) 18 hours
FM 3 ..... National Program (3) 18 hours
FM 4 ..... Regional Program 10 hours
FM 5 ..... Local Program 10 hours
FM 6 ..... Educational Program 10 hours

AM 1 ..... Common with FM 1 24 hours
AM 2 ..... Common with FM 4 18 hours
AM 3 ..... Common with FM 5 10 hours

8-2 Personnel Required for Transmission

At present, at each Telecom transmitting stations, there are about 20 technicians engaged in TV broadcasting.

1) The FM transmitters are similar to TV transmitters and its line-up is even simpler.
2) The FM transmitter is located in the same site of TV broadcasting transitter.
3) Also in Japan, all FM transmitting stations are unattended.
4) The stability of the FM transmitter is being improved.

By taking these four points into consideration, unattended operation would be suggested and increasing personnel will not be needed. The present TV personnel will be sufficient in number. However, since FM broadcast technics is a little different from TV, one person per one shift or 4 persons per 4 shifts in each station would be added.

The stations which are not co-sited with Telecom facilities will be unattended. Four persons will be stationed at the nearest Telecom office to look after the station.

Accordingly, the increase in personnel will be about 60 for the entire Telecom.

8-3 Personnel Required for Continuity Operation

The number of personnel required for the continuity operation will depend on the operational system.

Since RTM does not intend to employ automatic operation system so far, manual operation system is assumed.

The programs will not be in the form of complete package. They will be sent from the continuity studio under the direction of producer in charge. In other words, the present operational system of RTM will be employed. Of the six FM channels, five of them excluding the educational service, will be presented by one announcer, one operator and one producer.

Based on the above assumption, the required number of personnel for the continuity operation is estimated as follows.

Headquarters

FM 1 – FM 4 .... To be operated by the present number of personnel for the four AM channels (National, Blue, Green and Red)
FM 5 ..... 3 shifts x 3 persons = 9 persons

PSP

FM 6 ..... 3 shifts x 2 persons = 6 persons

Regional Stations (three stations)

FM 4	1 additional shift x 3 persons = 3 additional persons	
FM 5	1 additional shift x 3 persons = 3 additional persons	
	TOTAL	18 persons

Local Stations (seven stations)

FM 5	1 additional shift x 3 persons = 3 additional persons	
	TOTAL	21 persons

In grand total, the increase in personnel for RTM will be 48 while PSP will be 6. The breakdown of category of work will be as follows.

RTM	BA IV	16 persons
	Announcer	16 persons
	Operator	16 persons
PSP	Producer	3 persons
	Operator	3 persons

8-4 Personnel Required for Program Production

8-4-1 Producer

The present number of personnel at RTM Headquarters, which are engaged in producing sound programs are 554 in Program Section and 81 in News Section. Since about 20 of them are on daily continuity duty, the remaining 615 could be engaged in program production. The total sound broadcasting hours of RTM including overseas service is 100 hours and 25 minutes per day, so the time per one person in producing programs is 9.8 minutes. Even if the four hours of educational broadcasting are to be subtracted, this figure will be 9.4 minutes and there is no great difference.

The similar result can be obtained by another examination. A typical producer in RTM (BA III) produces an average of four programs a week in terms of 15-minute program. By converting it to a day basis, it corresponds to 10 minutes. As regional and local stations have their own specific condition, the figures of the Headquarters will be applied for estimation of the number.

Now, the personnel required in producing all programs of FM 1 ~ FM 5 is as follows.

Headquarters:	The total broadcasting hours of the present four channels are 69 hours and 50 minutes, while the broadcasting hours of FM 1 ~ FM 5 in this project are 80 hours. The personnel required for this increase of 10 hours and 10 minutes is 61.
Regional Stations:	As the present Regional and Local Programs will be extended to 10 hours respectively, an increase is 11 hours. 66 persons will be required per station. For three stations together, it will account to 198 persons.
Local Stations:	As the present three hours of Local Program will be extended to 10 hours, an increase of 42 persons per station is needed. It will be an increase of 294 persons in total.

The next study is on the educational program of FM 6. As the present educational programs of PSP are produced for two hours a day on average, and because they are rebroadcasted due to double shift system of school education in Malaysia, the total transmission hours are four hours. As these programs are produced by 49 persons, one person produces 2.4 minute program a day. As the programs for FM 6 will be an increase of 8 hours, the increase in producing personnel will be 200. In considering the importance of educational programs, more persons for producing unit program will be needed than for the unit programs of RTM. However, on the other hand, the educational programs can be used repeatedly. Therefore, it would be more reasonable to apply the figure of 10 minutes of RTM for estimating the required personnel than the figure of 2.4 minutes. Namely, for an increase of 8 hours of programs, an increase of 48 persons will be required.

8-4-2 Studio Operator

At present, the number of personnel engaged in sound program studio operation is 138 for RTM Headquarters and three for PSP. Of the 138 persons of RTM, since 20 persons are on continuity duty every day, then, 118 persons could be engaged in program production. Of the total 100 hours and 25 minutes of sound broadcasting hours of RTM, 70% of them are in the form of packaged programs, which corresponds to 70 hours. The remaining 30 hours are live programs and if OB programs are not many, these 30 hours could be transmitted from the continuity studio. As 118 persons operate the 70 hours of programs, it could be said that one person operates 35 minutes of program per day. Even if the five hours of educational broadcasting are to be sustracted, it will become 33 minutes and there will be no great difference. The required number of studio operator for this project by this creterion, is as follows. In calculating, the rate of packaged program was estimated as 70% which is same as the present rate.

Headquarters: When the educational broadcasting hours are substracted, the broadcasting hours of the present four channels are 64 hours and 50 minutes. The increase in broadcasting hours of FM 1 ~ FM 5 will be 15 hours and 10 minutes.
15 hours 10 min. x 70% ÷ 35 min. = 18.2 persons

Regional Stations: 14 hours additional x 70% ÷ 35 min. = 16.8 persons
16.8 persons x 3 stations = 50.4 persons

Local Stations: 7 hours additional x 70% ÷ 35 min. = 8.4 persons
8.4 persons x 7 stations = 58.8 persons

PSP: The all educational programs will be in form of package programs according to their nature. At present, as three operators are on duty for two hours of programs at PSP studios, the hours per person will be 40 minutes.
There will be an increase of 8 hours for educational broadcasting.
8 hours ÷ 40 min. = 12 persons additional

8-5 Conclusion

Sammary of studies in the foregoing descriptions is as following.

Transmission	Telecom	60
Continuity Operation	RTM	48
	PSP	6
Program Production	RTM	552
	PSP	48
Studio Operator	RTM	127
	PSP	12

Sub Total:	RTM	727 persons
	PSP	66 persons
	Telecom	60 persons
Grand Total		853 persons

They are personnel which are directly engaged in broadcasting operation, besides, the personnel engaged in administration, maintenance and development work must be added. At RTM, the total personnel for the Program Division and Technical Division are 2710, and besides these personnels for Administration Division, Training Division and Monitoring Division are 897, and this will correspond to 33% of the 2710 persons. In addition to this, about an amount of 10% of person will be required for maintenance and development in Technical division and Program division.

At PSP, the number of persons engaged in general affairs are 23% of the remaining divisions. In addition to this, there are three maintenance persons engaged in maintenance work, but, eight persons are to be increased to cope with the extension of broadcasting hours (4 shifts x 2 persons). Furthermore, in the Radio Production Division, there are 17 persons other than the 32 producers.

In considering this condition, the required personnel is given in Table 11-2. Generally speaking, about 50% of indirect-personnel will be necessary, Grand total of required number of personnels to operate this project will be about 1,300.

8-6 Personnel Required for the Transition Period

So far we have estimated the number of required operational personnel when construction of this project are completed. However, as discussed in the chapters 6 and 9, the construction will be implementated in two phases and the staff involved in operation and broadcasting programs will be gradually reinforced. As discribed in the chapter 6 and 9, the period between the completion of the first-phase construction and that of the 2nd-phase is a transition period of three years. The necessary increase of personnels during this period would be as follows:

Continuity operation

Headquarters	3 persons x 3 shifts = 9 persons
Regional stations	3 persons x 1 shift x 3 stations = 9 persons

Program production

7 hours ÷ 10 minutes x 4 stations = 168 persons

Studio operator

7 hours x 70% ÷ 35 minutes x 4 stations = 34 persons

Total 220 persons

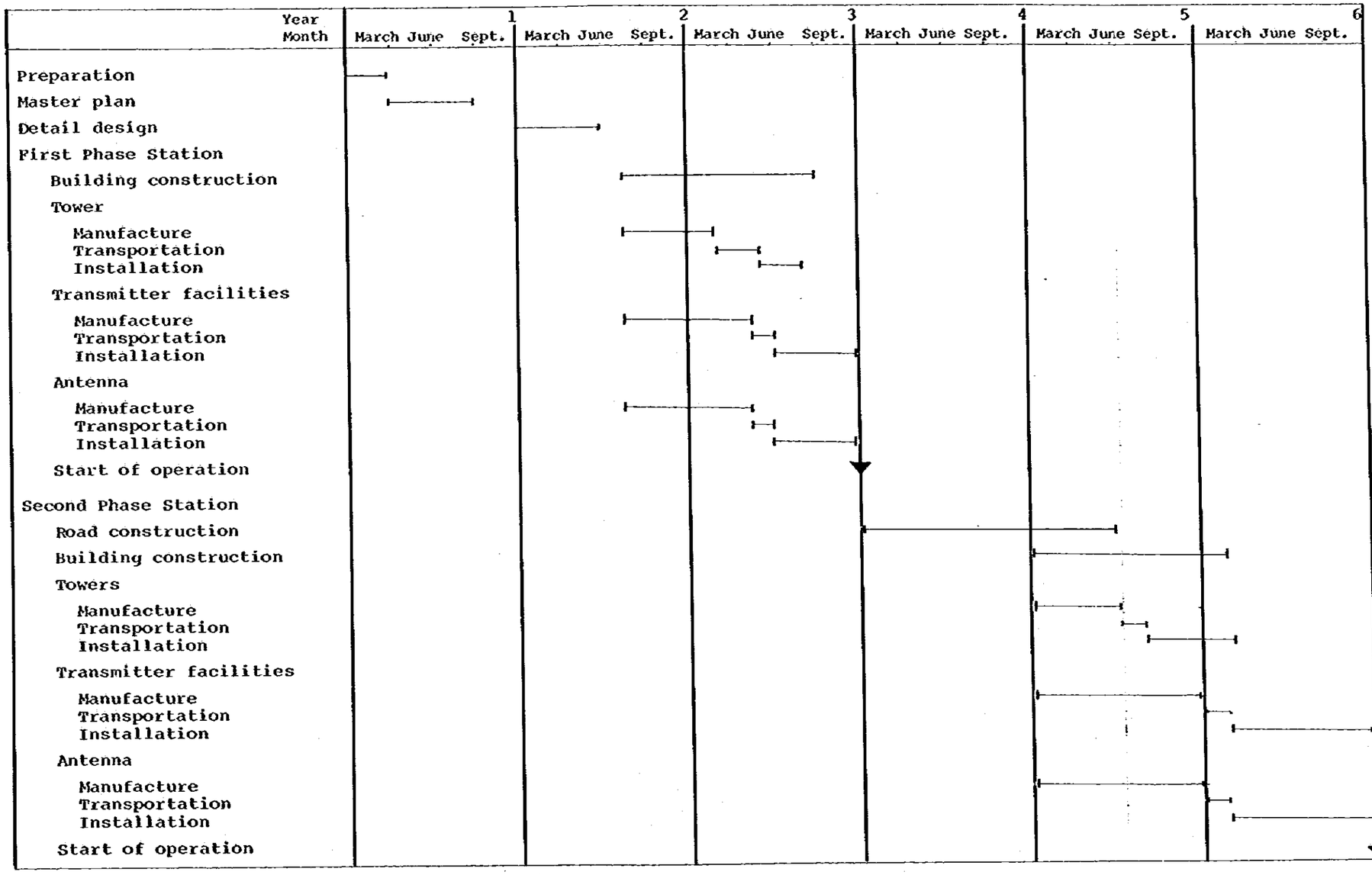
By adding 50% indirect staff, total number would be 330. Increase in personnel expenses would be about 2.25 million Malaysian dollars.

9. Construction Schedule

In compliance with the intent of RTM, the construction of the stations will be implemented in two phases. First phase, stations will be Kuala Lumpur (Ulu Kali); Pinang (G. Jerai, Bt. Penara); Johor Bahru (G. Pulai) and Kuala Trengganu (Bt. Besar), while ten other sites will be completed during the second phase.

The first phase stations will cover 48% of the population and a total of 98% will be covered when the second phase is completed. The period between the beginning of the operation of the first phase stations and that of the second phase stations is three years. It is so planned to avoid simultaneous construction work, to give sufficient time for staff training and preparation of transmission lines. Table 9-1 shows the construction schedule.

Table 9-1 Construction Schedule



10. Construction Cost

The total amount of construction cost required for transmitter facilities shall be M$51,231,000, excluding road construction cost.

The cost estimation is made on following conditions;

(1) Estimation is made as of October, 1980. All equipments and materials for the construction are estimated on the condition of CIF Malaysia Port by sea.

(2) Economic fluctuation if caused during the period of construction will be compensated by contingency.

The beakdown is given below.

(a) Cost for transmitting facilities: M$25,847,000.
Installation fee: M$3,329,000.

(b) Cost for station buildings and towers: M$16,428,000.

(c) Cost for STL: M$5,113,000.
Installation fee: M$514,000.

(d) Contingency: 10% of the total amount of construction cost.

Additionally, under mentioned inland transportation fee and road construction cost shall be required:

(a) Inland transportation fee:
Since the expense for the equipments and materials is estimated on the CIF Malaysia port by sea, it is necessary to estimate M$239,000 for inland transportation and warehouse storage in Malaysia.

(b) Road construction cost:
The road construction for Bt. Bintang transmitting station; M$3,391,000.

The total construction cost including studio facilities which is mentioned in Appendix A of M$26,200,000 (with 10% contingency) is M$86,384,000.

11. Operation Cost

11-1 Transmitter Operation Cost

Telecom claims operation fee to RTM, under contract of ODM basis. As the ODM formula requires actual expense figures it is difficult estimate the budget in advance. Actual figures for the year 1979 and given in the Table 11-1 below:

Table 11-1 ODM for 1979 (Malaysian dollars)

State	Labor	Materials	Incidentals	Power in kW ( ): unattended station
Kedah and Perlis	74,020.10	94,166.95	26,437.50	10
Kelantan	59,058.16	80,804.73	49,613.58	10 (0.3)
Johor	80,844.61	111,612.70	27,383.91	10 (0.1) (0.1)
Pahang	106,538.88	41,263.76	63,778.16	10
Perak	146,441.40	131,041.15	43,018.29	10 1 (1) (0.1)
Trengganu	103,640.67	120,590.43	36,066.79	1 1
Melaka	36,581.22	42,366.37	1,246.45	10

In Kedah and Perlis there is an old equipments which need replacement. In Kelantan there are one attended station and one unattended station; Johor has two attended and two unattended stations; and Pahang has one attended and one unattended stations. Since each station has its own specific situation and problems, no common figures could be drawn out of the Table 11-1.

The following situations are presumed for budgetting.

A. As mentioned in the chapter 8 the project requires 20% increase in personnels. The broadcasting hours will be 24 hours which is longer than TV broadcasting. So we would estimate 30% increase in fee compared to TV.

B. The average expenses for equipments per station could be similar to TV, because there are eight transmitter units in TV stations, which consist of two video, two reserve, two sound and two reserve and seven transmitter units in projecting stations, which consist of six main and one shared reserve.

C. Half amount of incidentals are estimated for FM compared to TV in considering respective number of personnels and of equipments.

By considering above mentioned concepts and Table 11-1, ODM budget per station is estimated as below.

Labor	30,000 Malaysian dollars
Materials	70,000 Malaysian dollars
Incidentals	20,000 Malaysian dollars
Total	120,000 Malaysian dollars

11-2 Transmission Line Rentals

The following conditions were presumed for estimating the transmission line rentals.

A. All the circuits are to be 15 kHz stereophonic transmission circuits. Unit price for rentals are to be 3 times as much as the rentals for 10 kHz monophonic in both cable fee and terminal fee. It is due to the need of expanding base band frequency by 1.5 times and for transmitting L, R 2 signals.

B. The sections where lines will be leased are shown in the Fig. 11-1.

C. Yearly Rental fee unit for 10 kHz monophonic will be as follows:

Long line	M$420/mile
Terminal fee	M$3000
Local circuit (on the assumption of 5 miles)	M$550

D. Except the circuit to G. Ulu Kali from Kuantan telecom and Trengganu telecom, and also all PSP circuits, all the sections duplicate with the present 10 kHz monophonic where rentals for midium-wave are paid. So the amount will be reduced to avoid double charges.

Following yearly rentals were calculated under above conditions. (in Malaysian dollars)

National circuits	2,467,020
Regional circuits	543,900
Local circuits	264,100
Total	3,275,020
Educational circuits	1,113,690
Grand total	4,387,060

11-3 Program Production Cost

In RTM's budget for the year 1981, 4,884,000 Malaysian dollars are allocated to the production of sound broadcasting programs. The total sound transmission hours of all channels are 100 hours and 25 minutes currently including educational broadcasting. Regional and local broadcasting hours must be added to it to get the total production hours. In 1981, three Regional stations will produce 6 hours of programs respectively a day. These regional and 5 local stations will have 3 hours local programs a day respectively. As the educational broadcasting has 2 hours of rebroadcasted programs, we deduct the 2 hours from the total figure. Total producing hours for RTM and PSP are;

100 hrs 25 min + 42 hrs – 2 hrs = 140 hrs 25 min.

The breakdown of the 140 hours and 25 minutes is as follows:

(1)	Domestic broadcast program hours at RTM Headquarters	79 hrs 55 min
(2)	PSP program hours	2 hrs
(3)	Program hours at regional and local stations	42 hrs
(4)	Overseas broadcast program hours	16 hrs 30 min
	Total	140 hrs 25 min.

In estimating program production cost in this project, broadcasting hours as given in the chapter 8 were employed.

The breakdown is as follows:

(1)	FM 1 – 5		80 hrs
	Metropolitan broadcasting		14 hrs
		Sub total	94 hrs
(2)	PSP		10 hrs
(3)	Three regional stations x 20 hrs Seven local stations x 10 hrs		130 hrs
(4)	Overseas broadcast		16.5 hrs
		Grand total	250.5 hrs

At first increase of RTM budget is calculated.

$$4{,}884 \times 10^3 \div (140 \text{ hrs } 25 \text{ min} - 2 \text{ hrs}) \fallingdotseq \text{M\$35,264.}$$

The figure thus obtained is the per hour budget for the year.

The production cost when the project is completed:

$$\text{M\$35,264} \times 250.5 \fallingdotseq 8{,}816 \times 10^3.$$

Increase is $3{,}932 \times 10^3$ dollars.

Under the assumption of the same unit cost for PSP educational programs, program production cost of PSP, including this project, would be 355,400 dollars, namely the increase by this project is 266,550 dollars.

11-4 Personnel Expenses

The number of required personnels and related personnel expenses are shown in the Table 11-2. These results were derivend from descriptions in chapter 8 and 1980 budget of RTM and of PSP.

Table 11-2 (a) The number of required personnels by this project

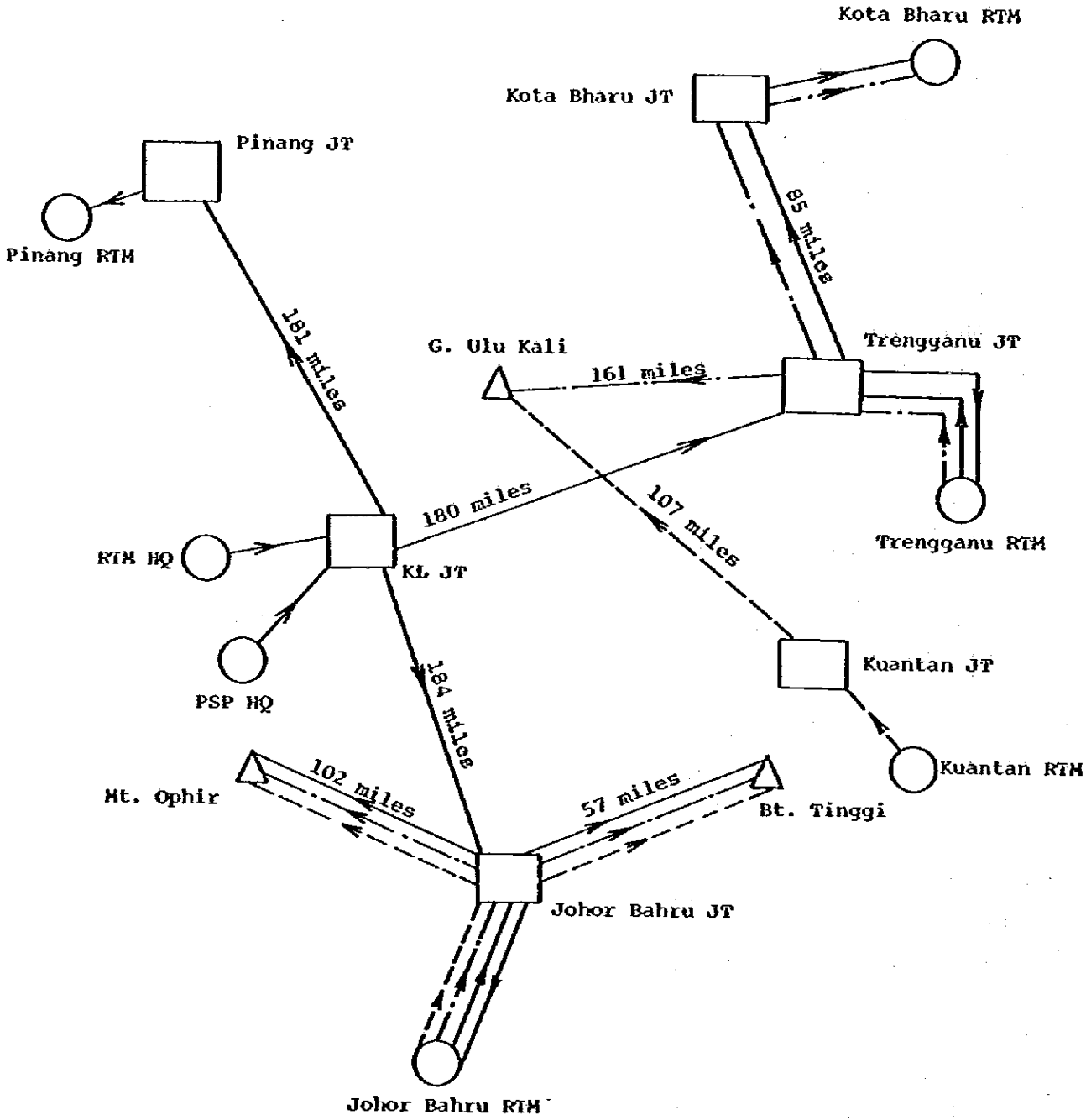
Category	Number of personnels in 1980	Increase by this project	Total
RTM			
Management	675	199	874
Programming	1,496	642	2,138
Engineering	1,214	157	1,371
Training	164	48	212
Monitoring	58	17	75
Total	3,607	1,063	4,670
PSP	270	124	394
Grand total	3,877	1,187	5,064

Table 11-2 (b) Required personnel expenses by this project

Category	1980 Budget	Increase by this project	Total expense
RTM			
Management	1,700	501	2,201
Programming	12,965	5,565	18,530
Engineering	8,500	1,099	9,599
Training	1,220	357	1,577
Monitoring	250	73	323
Total	24,635	7,595	32,230
PSP	3,028	1,391	4,419
Grand total	27,663	8,986	36,649

Note:

1) The unit amount of figures in Table 11-2 (b) is 1,000 Malaysian dollars.
2) In addition to the above figures, another 90 persons will be added for transmitter operation. Since this expense is included in the operation cost, it is not given here to avoid duplication.
3) The number of personnels and the budget of RTM are only for Peninsular Malaysia.



———————— National and Educational Program (total 4 channels)

———.———.——— Regional Program

— — — — — — — — — Local Program

Fig. 11-1 Program Transmission Line Rentals

12. Financial Assessment and Economic Appraisal

12-1 Introduction

12-2 Financial Assessment

12-2-1 Flow Chart for Calculation of data required for a broadcasting project

12-2-2 Analysis of revenue structure of the RTM in the 1970s

12-2-3 Estimation of gross revenue, gross expenditure, ordinary expenses and development expenses based on the estimation, using the logistics curve, of the growth of revenue from licence fee for the project assessment period (1981–1995)

12-2-4 Project Funds Operation Table

12-2-5 Estimation on plant & equipment investments and on the growth of increase in expenditure and the calculation of depreciation and residual value following the investments in the new FM project

12-2-6 Funds Operation Table "R" (earnings)

12-2-7 Examination of the methods to increase revenue from the new FM project

I Step No. 1 – the case where no FM investment is made but the business scale is gradually extended

II Step No. 2 – the case where the FM investment project is implemented and a revenue-expenditure balance is achieved

III Step No. 3 – the case where the FM investment project is implemented and an appropriate internal rate of return is envisaged

– Case A
– Case B
– Case C

Conclusion, Risk analysis, and Analysis of present values

12-2-8 Analysis of rate of return of net worth

12-3 Economic Appraisal

12-1 Introduction

When we make a financial assessment and economic appraisal of projects related to the infrastructure, it is essential for us to consider the fact that the effects of the project will extend over a long period and that the resultant social benefits will cover extensive areas. In the case of a broadcasting project, such a trend is even more acute than other types of projects. Especially when the project calls for a massive development investment at the start as in a broadcast network project, it is necessary for us to make the expense-effects estimation for a considerably long period. In this chapter, we would like to make a financial analysis of the RTM's revenue and expenditure and appraisals on social and economic benefits, mainly in relation to the expense-effects estimation, on the assumption that the development investments are made to the FM project on the basis mainly of the technical planning and analyses as explained in the preceding chapters.

12-2 Financial Assessment

First, we would like to present management analysis of a broadcasting project from general and financial points of view. The analysis of this FM broadcast network project of the RTM will also be made along the same lines of explanation.

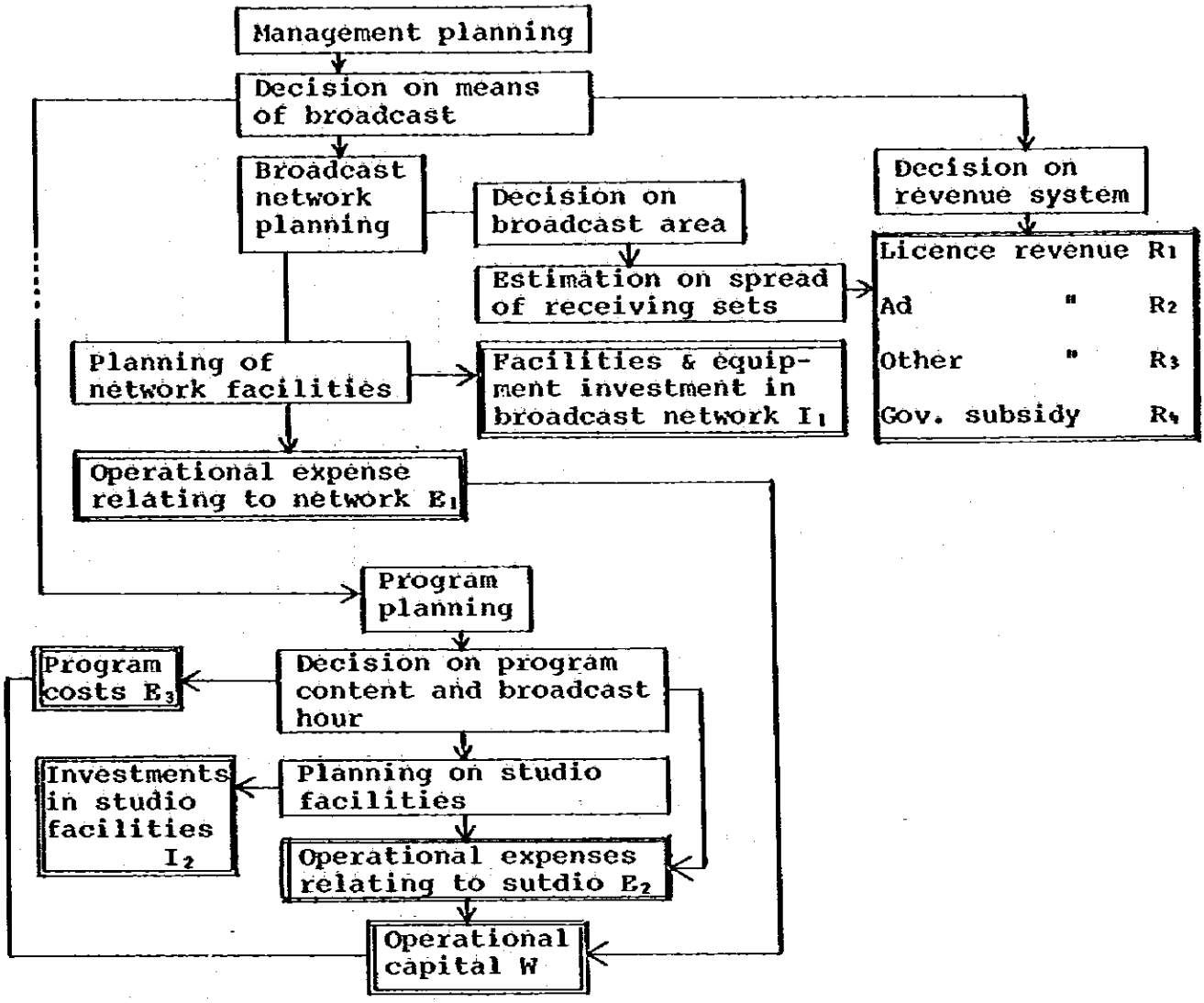
12-2-1 Flow chart for calculation of data required for a broadcasting project

As shown in Fig. 12-1, the first thing that must be done is to establish a management plan and to determine the means of broadcasting. In the present case, our management plan calls for completion of a national network of FM broadcast and we have, as a result of technical analyses made as explained in the preceding Chapters, concluded that it would be technologically appropriate to establish six FM networks in Malaysia. And in accordance with these analyses, a broadcast network plan has been developed. Also, along the same basic lines, studies have been made on facilities and equipment investments in the broadcast networks and in studios. Similarly, calculations have been made on the operational expenses for the network and for the studios.

While such calculation of expenses include that for educational broadcasts, we would like to base our analyses on the financial constitution of the RTM as the organization that represents the main pillar of Malaysian broadcasting and to conduct a financial feasibility study on the investments aimed at the completion of the FM networks and also on the operational expenses required after their completion, for a period of 15 years.

12-2-2 Analysis of revenue structure of the RTM in the 1970s

One of the main characteristics of RTM's basic financial constitution is, as can be perceived from the Table 12-1, that, during the last ten years, the revenue from the licence fee covered only about 20% of the gross expenditure. Thus, even including its revenue from advertisement, RTM has managed to cover only a half of its expenditure and hence it has had to depend for the remaining half of its revenue on other government resources. Moreover, the rates of licence fees have been kept unchanged for many years; at the rates of 12M$ for radio since 1947 and 24M$ for TV since telecasting began in Malaysia in 1964. And after the start of television, a household owning both radio and TV has been exempted from paying the radio fee. (Ref. Table 12-2)



----- Financial data required

----- Factors that determine the financial data required

Gross earnings $R = R_1 + R_2 + R_3 + R_4$

Total plan & equipment investment $I = I_1 + I_2$

Total operational expense $E = E_1 + E_2 + E_3$

Fig. 12-1 Flow chart for calculation of financial data required for the broadcast project

Table 12-1 RTM Budget – Revenue – in the 1970s

[Revenue]

Year	Licence fee (M$)	(i) %	(ii) %	Advertising fee (iii) (Million M$)	(iv) %	(v) %	Gov. resources (vi) %
1970	8,636,819	–	31	13.0	46	77	23
1971	9,026,361	4.51	27	14.2	42	69	31
1972	11,219,884	24.30	23	16.8	35	58	42
1973	12,604,179	12.34	23	16.3	29	52	48
1974	13,973,776	10.87	21	17.9	26	47	53
1975	14,874,924	7.20	21	19.5	28	49	51
1976	17,173,733	15.30	21	21	26	47	53
1977	19,609,532	14.18	18	23.8	21	39	61
1978	21,969,260	12.03	18	27.1	23	41	59
1979	25,099,918	14.25	21	29.6	25	46	54
1980	27,197,204*	8.36	22	–	–	–	–
1971 – 80 average		12.3	21.5	–	30	52	48

(i) Growth rate of licence fee against preceding year
(ii) Percentage of licence fee against gross expenditure
(iii) Amount of advertising fee in Million M$
(iv) Percentage of advertising fee against gross expenditure
(v) Percentage of (licence fee + advertising fee) against gross expenditure
(vi) Percentage of Government resources against gross expenditure

* The amount 27,197,204 is the result of the following calculation:
Multiply the rates of licence fees for radio and TV by the numbers of radio and TV sets as at April 1980 and add the average annual revenue, during the past five years, of the Rediffusion (cable TV).

Table 12-2 Revenue from Radio and TV Licences in Malaysia

	LESEN			HASIL			
	RADIO	TV.	JUMLAH	RADIO M$	REDIF-FUSION M$	TV. M$	JUMLAH M$
1947	10,227	-	10,227	122,724	-	-	122,724
1948	22,443	-	22,443	269,316	-	-	269,316
1949	35,064	-	35,064	420,768	-	-	420,768
1950	46,620	-	46,620	559,440	59,208	-	618,648
1951	62,279	-	62,279	747,348	86,568	-	833,916
1952	73,488	-	73,488	881,856	108,876	-	990,732
1953	110,835	-	110,835	1,330,020	132,300	-	1,462,320
1954	115,286	-	115,286	1,383,432	156,696	-	1,540,128
1955	135,347	-	135,347	1,624,164	164,580	-	1,788,744
1956	157,540	-	157,540	1,890,480	176,652	-	2,067,132
1957	175,711	-	175,711	2,108,532	145,344	-	2,253,876
1958	172,403	-	172,403	2,068,836	150,672	-	2,219,503
1959	211,135	-	211,135	2,533,620	157,356	-	2,690,976
1960	226,828	-	226,828	2,721,936	169,716	-	2,891,652
1961	264,797	-	264,797	3,177,564	183,876	-	3,361,440
1962	309,791	-	309,791	3,717,492	181,248	-	3,898,740
1963	325,734	-	325,734	3,908,808	173,911	-	4,082,719
1964	324,342	28,125	352,467	3,892,104	158,042	675,000	4,725,140
1965	304,167	49,216	353,383	3,650,004	144,163	1,181,184	4,975,351
1966	285,352	75,322	360,674	3,424,224	130,981	1,807,728	5,362,933
1967	319,030	104,512	423,542	3,828,360	92,706	2,508,288	6,429,354
1968	291,304	122,682	413,986	3,495,648	95,352	2,944,368	6,535,368
1969	302,985	151,017	454,002	3,635,820	89,115	3,624,408	7,349,343
1970	333,943	189,376	523,319	4,007,316	84,479	4,545,024	8,636,819
1971	311,009	216,797	527,806	3,732,108	91,125	5,203,128	9,026,361
1972	425,026	274,432	699,458	4,543,902	100,614	6,586,368	11,219,884
1973	430,130	327,609	757,739	4,627,006	114,557	7,862,616	12,604,179
1974	420,723	390,899	811,622	4,461,341	130,859	9,381,576	13,973,776
1975	378,008	446,444	824,452	4,040,027	140,241	10,714,656	14,894,924
1976	368,445	548,568	917,013	3,863,020	145,081	13,165,632	17,173,733
1977	353,940	657,609	1,011,549	3,682,541	144,375	15,782,616	19,609,532
1978	333,336	766,831	1,100,167	3,428,986	136,330	18,403,944	21,969,260
1979	303,164	911,748	1,214,912	3,093,590	124,377	21,881,952	25,099,919

12-2-3 Estimation of gross revenue, gross expenditure, ordinary expenses and development expenses based on the estimation, using the logistics curve, of the growth of the licence revenue for the project assessment period (1981–1995)

When we consider the aspect of gross earnings as represented by "R" in the 12-1 Financial Data Flow Chart, we would first like to make an estimate by using the increase in number of licences and its logistics curve for the coming 15 years by feeding the results into a computer, on the assumption that the rates of licence fees are kept unchanged. This calculation would produce the Table 12-3 (Growth rate of number of combined radio-TV licences), Fig. 12-2 (Growth in the number of Combined R-TV licences in logistics curve) and Fig. 12-3 (Estimation of Growth in number of Combined R/T licences and ratios as against populations). From the growth of the combined radio-TV licences, the growth of radio licences and TV licences can be calculated in the following way. That is, we first make an estimation of changes in ratio between the numbers of radio and TV licences for the period between the year 1964 when television began and the year 1995 (Fig. 12-4). Then, on the basis of the relationship obtained from the Fig. 12-4, we divide the number of licences into radio and TV, and calculate the total revenue from radio and TV licenses up to the year 1995. The result will be something like the Table 12-4. As is clear from Table 12-1, the average ratio of the licence revenue against the total expenditure during the ten years of the 1970s was 21.5%. Therefore, supposing that the business management of the RTM continued to develop with a growth rate in development investment similar in case to that of the present, then, the growth in scale of the gross expenditure up to 1995 would be as shown in the Table 12-5.

Unlike the ordinary private enterprises in Malaysia, the RTM operates on a budget of a balanced revenue and expenditure account. Hence, if the scale of gross expenditure is clarified, that of the gross revenue would automatically be clarified.

Next, what about the ratio between the ordinary budget and the development budget within the gross expenditure?

As is clear from the Table 12-6, the ratio of the RTM's development budget as against the ordinary budget during the 1970s was 29.4%.

From the studies as outlined above, it is clear that we can make an estimate of the growth of licence revenue, or gross revenue, gross expenditure, ordinary expenses and development expenses. We can make a Project Fund Operation Table based upon these figures.

Table 12-3 Growth Rates of Combined Radio-TV Licences

Year	Population (1,000) (a)	R/T Licence ratio against population (b)	R/T Licence No. of (c)
1947	5,779	0.18	10,227
1948	5,864	0.38	22,443
1949	5,961	0.59	35,064
1950	6,100	0.76	46,620
1951	6,193	1.01	62,279
1952	6,367	1.15	73,488
1953	6,560	1.69	110,835
1954	6,741	1.71	115,286
1955	6,909	1.96	135,347
1956	7,102	2.22	157,540
1957	7,316	2.40	175,711
1958	7,629	2.26	172,403
1959	7,868	2.68	211,135
1960	8,113	2.80	226,828
1961	8,368	3.16	264,797
1962	8,644	3.58	309,791
1963	8,915	3.65	325,734
1964	9,155	3.85	352,467
1965	9,421	3.75	353,383
1966	9,598	3.76	360,674
1967	9,779	4.33	423,542
1968	9,963	4.16	413,986
1969	10,150	4.47	454,002
1970	10,390	5.04	523,319
1971	10,700	5.23	559,122
1972	11,000	5.68	625,349
1973	11,310	6.08	687,333
1974	11,650	6.52	759,652
1975	11,900	6.93	824,452
1976	12,300	7.46	917,013
1977	12,600	8.03	1,011,549
1978	12,910	8.52	1,100,167
1979	13.250	9.17	1.214.912
Estimated values ↓ 1980	13,538	9.36	1,267,000
1981	13,832	9.86	1,364,000
1982	14,132	10.36	1,464,000
1983	14,439	10.88	1,571,000
1984	14,753	11.40	1,682,000
1985	15,074	11.93	1,798,000
1986	15,401	12.46	1,919,000
1987	15,736	12.99	2,044,000
1988	16,078	13.52	2,174,000
1989	16,427	14.05	2,308,000
1990	16,784	14.58	2,447,000
1991	17,148	15.10	2,589,000
1992	17,521	15.62	2,737,000
1993	17,901	16.13	2,887,000
1994	18,290	16.62	3,040,000
1995	18,688	17.11	3,198,000

Notes:

- Up to 1979, the figures show the actual statistical values
- For the period between 1980 and 1995:

Population (a) ..... based on an assumption that the population as of 1979 will increase at the annual rate of 2.17%*
(*) Average increase rate for 1947–1979

Ratio of the number of combined R-TV licences as against population (b) ..... obtained by extrapolative estimation on the basis of the actually-measured values during 1947–1979 and applying them to a logistics curve

Number of combined Radio-TV licences (c) ..... a × b

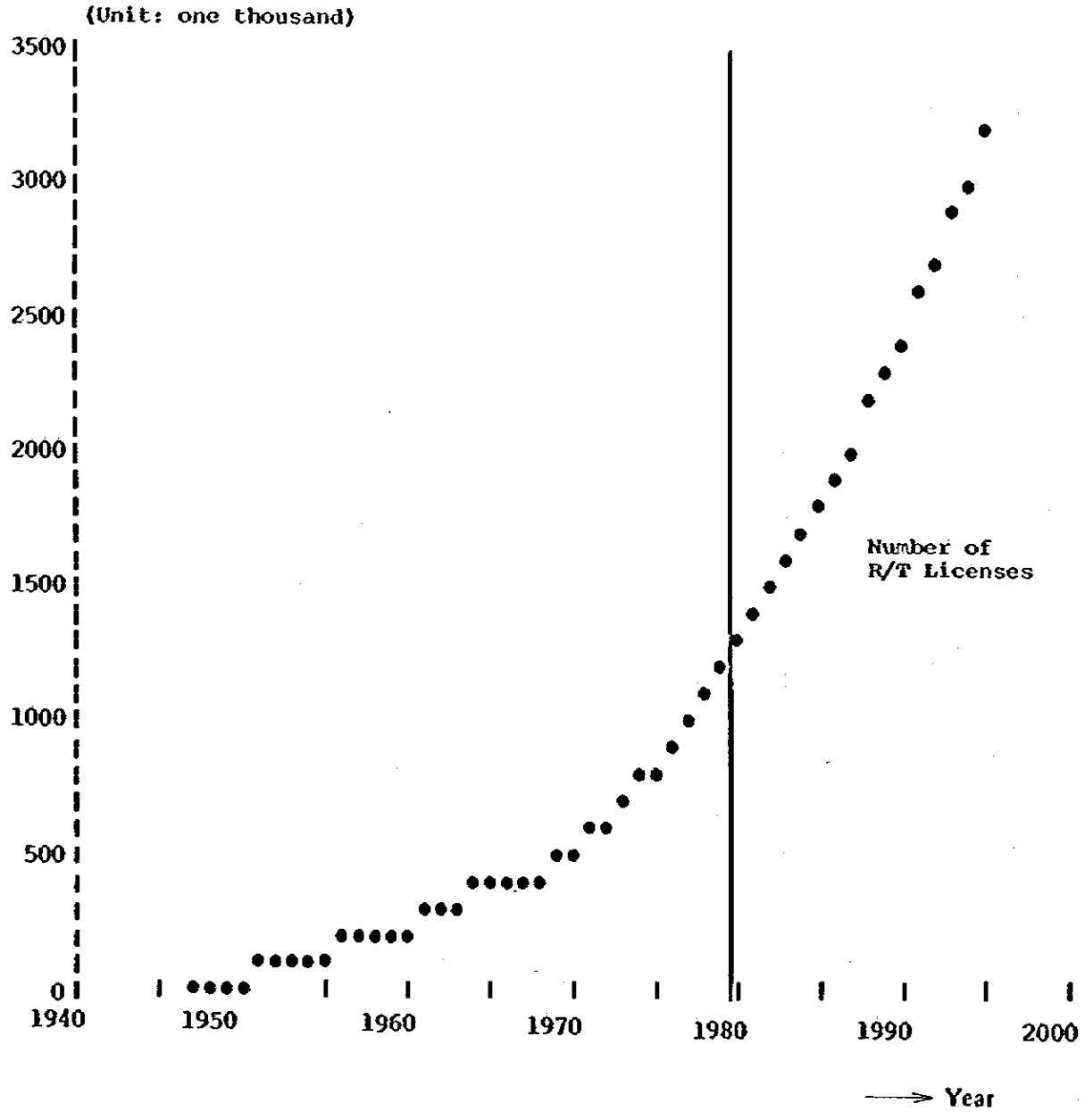


Fig. 12-2 Growth in the number of Combined R-TV licenses in logistics curve

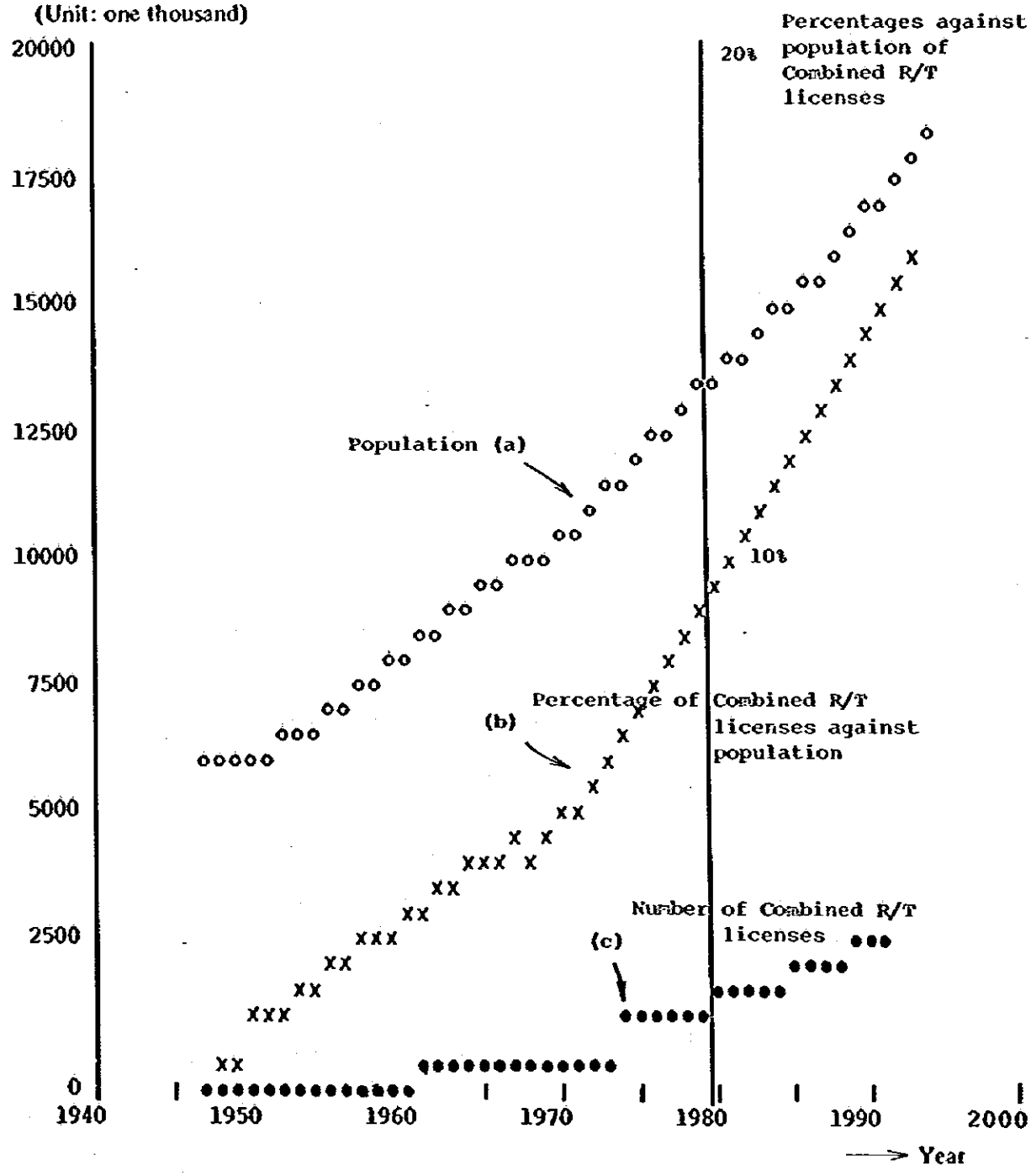


Fig. 12-3 Estimation of Growth in number of Combined R/T licences and ratios as against populations

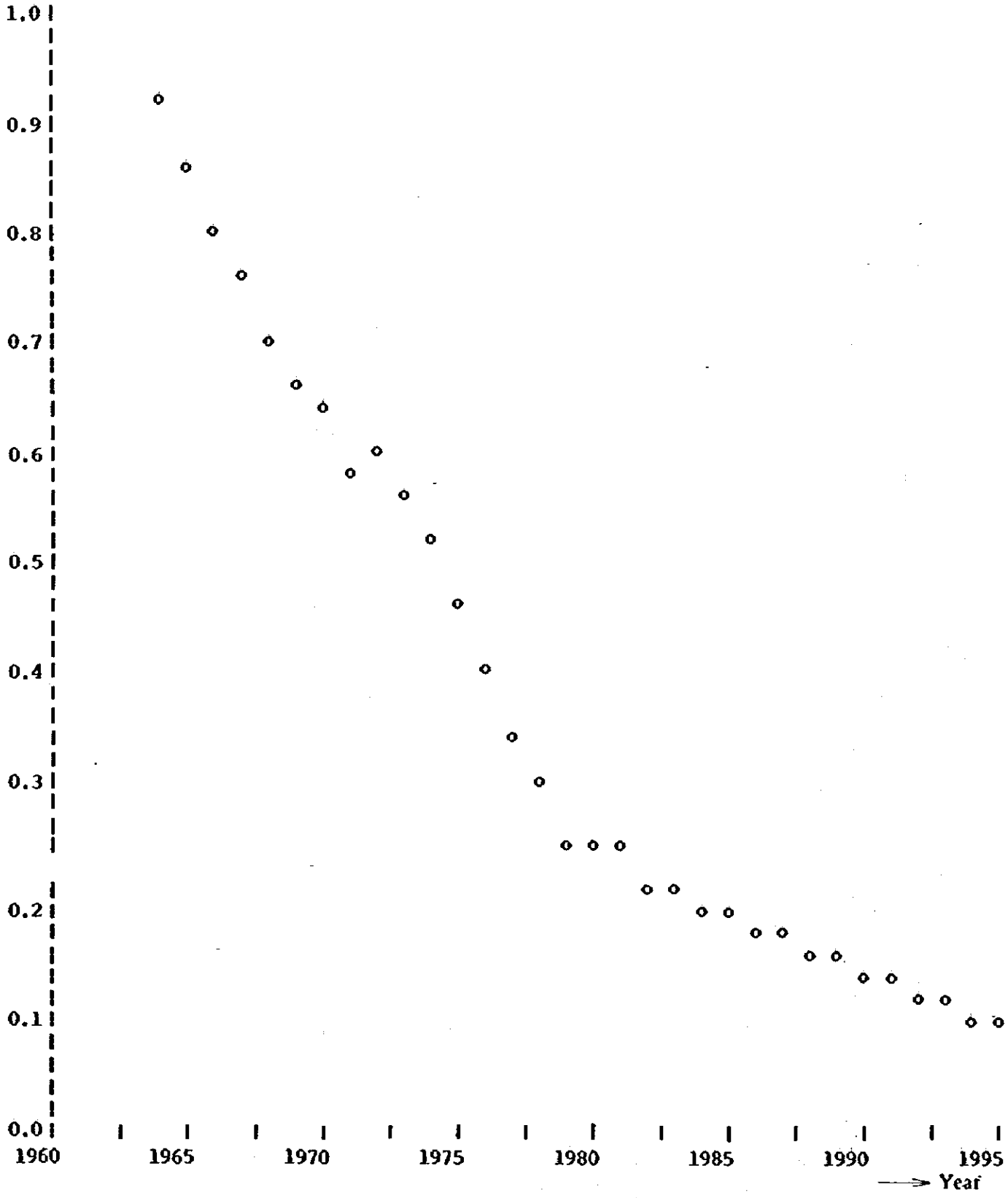


Fig. 12-4 Ratio of radio licenses against Total licenses in number

Table 12-4 Estimation on the Growth of Revenue from Radio and TV Licences (1980–1995)

(M$)

Year	R + T (a) Estimation	R% (b) Linear ratio	No. of R licences (c) c = a x b	No. of T licences (d) a - c	Radio Revenue (e) c x 12M$	TV Revenue (f) d x 24M$	R + TV Revenues (g) e + f
1980	1,267,000	24	304,080	962,920	3,648,960	23,110,080	26,759,040
1981	1,364,000	23	313,720	1,050,280	3,764,640	25,206,720	28,971,360
1982	1,464,000	22	322,080	1,141,920	3,864,960	27,406,080	31,271,040
1983	1,571,000	21	329,910	1,241,090	3,958,920	29,786,160	33,745,080
1984	1,682,000	20	336,400	1,345,600	4,036,800	32,294,400	36,331,200
1985	1,798,000	19	341,620	1,456,380	4,099,440	34,953,120	39,052,560
1986	1,919,000	18	345,420	1,573,580	4,145,040	37,765,920	41,910,960
1987	2,044,000	17	347,480	1,696,520	4,169,760	40,716,480	44,886,240
1988	2,174,000	16	347,840	1,826,160	4,174,080	43,827,840	48,001,920
1989	2,308,000	15	346,200	1,961,800	4,154,400	47,083,200	51,237,600
1990	2,447,000	14	342,580	2,104,420	4,110,960	50,506,080	54,617,040
1991	2,589,000	13	336,570	2,252,430	4,038,840	54,058,320	58,097,160
1992	2,737,000	12	328,440	2,408,560	3,941,280	57,805,440	61,746,720
1993	2,887,000	11	317,570	2,569,430	3,810,840	61,666,320	65,477,160
1994	3,040,000	10	304,000	2,736,000	3,648,000	65,664,000	69,312,000
1995	3,198,000	9	287,820	2,910,180	3,453,840	69,844,320	73,298,160

12-2-4 Project funds Operation Table
(Project statement of sources and uses of funds)

The figures under columns (2), (4) and (5) in Table 12-7 are the results of the estimation as mentioned above. As for radio, however, the development investments hereafter are expected to be made mainly in connection with the FM network project. On the other hand, as can be seen from Table 12-6, the ratio of development budget tends to decrease and therefore in our estimation of the growth of development budget, we have estimated the ratio of development budget at 20% as against 80% for the ordinary budget. These figures are based on the estimate of gradual increase in expenditure of the organization running the business on much the same scale as at present. In other words, in (4) or (5), none of the entirely new projects such as the FM national network is included. It was against such background that we gave the figures under the columns (6), (7) and (8) of the Table 12-7 (Project Funds Operation Table) which were the results of our calculation of the amounts of new investment in facilities and equipment and the resulting increase in the operational expenses and operational capital under the FM project. When we use this Table in making analysis of the future trend, we will find that the estimated amount (2) of the gross revenue, which was calculated by using the logistics curve and with the assumption that the present unit rates of licence fees will be kept unchanged, would, as they are, represent the total of the amount of funds to be secured each fiscal year, provided that we exclud the possibility of drawing capitals from outside sources. On the other hand, in the aspect of operation, the total expenditure would be as the amounts shown under the column (10) which is a total of those under (4), (5), (6), (7) and (8), since no borrowed capital is used and so there would be no payment in interest under column (9). Consequently, the difference in the totals of Funds procurement I and OperationII, i.e., (3) minus (10), will represent the earnings "R" from this project.

12-2-5 Estimation of the amount of facilities & equipment investments and of the growth of increase in expenditure, and calculation of depreciation and residual value, following the investments in the new FM project

Here, we would like to add some explanation about the factors causing the increase in expenses in relation to the implementation of the FM project, i.e., the figures appearing under the columns (6), (7) and (8). In the preceding Chapters, calculations have been made of the amounts required for the facilities and equipment investments. Those amounts have been divided according to uses, such as, network, studios, land procurement, road construction, etc. and rearranged in such a way as to facilitate calculation of depreciation and residual values. The result is the Table 12-8 (Detail of the Facilities and Equipment Investment). The figure under column (6) of the Table 12-7 are those alloted to six years starting in 1981 in accordance with the objectives of the facilities & equipment investments under the 1st and the 2nd phases.

The Table 12-9 (Residual values and depreciation) was prepared by calculating depreciation according to the categories of the facilities & equipment investments so as to prepare for the analyses, as mentioned later on in this report, of the internal rate of return and the present values. As to the operational capitals under column (8) of the Table 12-7, the calculation was made on the increase assuming that the annual operational capital would be 30% of the gross expenditure.

Table 12-5 Estimation on the growth of RTM's gross expenditure (= gross revenue) up to 1995 (assuming that its business scale will develop continuously)

M$

Year	Revenue from cable TV added (h) (g)= 99/100	Total revenue (calculated back from licence revenue) (i) (h)= 21.5/100
1981	29264000	136111628
1982	31586909	146915856
1983	34085939	158539251
1984	36698182	170689219
1985	39447030	183474558
1986	42334303	196903735
1987	45339636	210882028
1988	48486788	225519944
1989	51755152	240721637
1990	55168727	256598730
1991	58684000	272948837
1992	62370424	290094995
1993	66138545	307621140
1994	70012121	325637772
1995	74038545	344365326

Table 12-6 RTM Budget – Expenditure (1970s)

Year	Expenditure						
	Ordinary budget	Development budget	Total	Growth rate against proceding yr. (total)	Growth rate of ordinary budget	Growth rate of development budget	development budget / ordinary budget
1970	24,246,073	4,066,600	28,312,673				
1971	28,800,000	5,071,694	33,871,694	19.63%	18.78%	24.72%	18.00%
1972	33,997,602	14,477,176	48,274,778	42.52	18.05	185.45	43.00
1973	40,550,000	15,466,200	56,016,200	16,04	19.27	6.83	38.00
1974	48,672,097	19,240,343	67,912,440	21.24	20.03	24.40	40.00
1975	56,744,500	12,547,476	69,291,976	2.03	16.59	-34.79	22.00
1976	69,361,900	11,062,465	80,424,365	16.07	22.24	-11.84	16.00
1977	83,936,700	26,850,540	110,787,240	37.75	21.01	142.72	32.00
1978	87,077,800	32,285,180	119,362,980	7.74	3.74	20.24	37.00
1979	96,563,700	22,418,930	118,982,630	-0.32	10.89	-30.56	23.00
1980	99,795,000	25,064,801	124,859,801	4.94	3.35	11.80	25.00
Average				16.76	16.94	33.90	29.40

Table 12-7 Project Statement of Sources and Uses of Funds

Unit 1000 M$

Fiscal year	Item No.	Procurement I (1) Loan	(2) Revenue	(3) Total	Operation II (4) Ordinary expense	(5) Development in FM	(6) New F/E investment in FM		(7) Expense increase due to (6)	(8) Operational capital	(9) Principal & interest payment	(10) Total	R (11) I minus II ((3) minus (10))
1980			124,860		99,795	25,065							
1981	- 3		136,112		108,890	27,222	7,689	1st phase		43,140		186,941	-50,829
1982	- 2		146,916		117,533	29,383	7,689	1st phase		46,382 + 3,242		157,849	-10,931
1983	- 1		158,539		126,831	31,708	10,252	1st phase	2,254	51,314 + 4,932		175,977	-17,438
1984	0		170,690		136,552	34,138	13,887	2nd phase	3,714	56,487 + 5,173		193,464	-22,774
1985	1		183,475		146,780	36,695	13,887	2nd phase	3,937	60,390 + 3,903		205,202	-21,727
1986	2		196,903		157,522	39,381	18,516	2nd phase	4,173	65,873 + 5,488		225,080	-28,177
1987	3		210,882		168,706	42,176			19,372	69,076 + 3,198		233,452	-22,570
1988	4		225,520		180,416	45,104			20,534	73,816 + 4,740		250,791	-25,274
1989	5		240,722		192,578	48,144			21,766	78,746 + 4,930		267,418	-26,696
1990	6		256,599		205,279	51,320			23,072	83,901 + 5,155		284,826	-28,227
1991	7		272,949		218,359	54,590			24,456	89,222 + 5,321		302,726	-29,777
1992	8		290,095		232,076	58,019			25,923	94,805 + 5,583		321,601	-31,506
1993	9		307,621		246,097	61,524			27,478	100,530 + 5,725		340,824	-33,203
1994	10		325,638		260,510	65,128			29,127	106,430 + 5,900		360,665	-35,027
1995	11		344,365		275,492	68,873			30,875	112,572 + 6,142		381,382	-37,017
Total (excl. 1980)			3,467,026	Same as figures on left	2,773,621	693,405	71,920		236,681			3,888,199	-421,173

- Figures, in principle, are rounded to the nearest whole number.
- Development expense was divided proportionally at the rate of 20% of gross expenditure.
- Rate of increase in operational expense was set at 6%.
- For both the 1st and 2nd phases, Facilities & equipment investments were distributed 30% each for the initial, the 2nd and 40% for the 3rd years.

12-2-6 Funds Operation Table "R" (earnings)

Since, as outlined above, the amount of expenses required in relation to the new investments in FM has now been distributed properly in the Funds Operation Table (Table 12-7), let us explain in more detail the earnings "R" mentioned above.

Since we cannot properly measure the effects of development investments made for a project unless the R becomes a positive figure, what we must do will be to devise the means of increasing the revenue in such a way as to make $0 \leqq R$.

For that purpose, we have to make sure that either one of the following three factors of earnings will increase, even though such an effort on the part of RTM will eventually take the form of the national budget allocation for the RTM. The three factors are, (a) Amount equivalent to revenue from licence fees (hereinafter called "Licence fees"), (b) Amount equivalent to revenue from advertisement hereinafter called "Advertising fee") and (c) Amount from government resources other than the amounts equivalent to revenue from licence and from advertisements (hereinafter called "Government resources").

12-2-7 Examination of the Methods to Increase Revenue from the New FM Project

We would like to examine this question by means of the following three steps:

I – Step No. 1

In this Step, we will examine the amounts of increase in the revenues from the licence fee, advertising fee and the government resources with regard to the revenue that is to support the gradual increase in the business scale, in the case where the FM broadcast project is not introduced (revenue under the column (2) of Table 12-7).

II – Step No. 2

In this Step, we will examine as to which of the three earnings factors the largest weight should be placed on in order to balance the revenue with expenditure when the FM network project is implemented.

III – Step No. 3

In this Step, we will examine the increases in the amounts of the three factors of earnings in order to calculate the internal rate of return that justifies the development investments.

Let us explain the above-mentioned three Steps by using the Fig. 12-5 (Revenue Structure of the RTM). As regards the Step No. 1, it is an examination made on the portion (a), that is, the case where the FM project is not introduced. The Steps Nos. 2 and 3 are the examinations of the portion (b), that is, the case where the FM broadcast is introduced into Malaysia.

Table 12-8 Facilities & Equipment Investments in FM Project

Unit - 1,000 M$

	Network					Studios		
	Construction		Facilities		I Network total			II Studios total
	Building	Towers	Transmitters	Program circuits		Building	Studio facilities	
1st phase	2,267	2,091	11,368	2,725	18,451	1,800	1,800	3,600
2nd phase	3,506	6,274	17,808	2,902	30,490	4,600	11,200	15,800
Total	5,773	8,365	29,176	5,627	48,941	6,400	13,000	19,400

	III Land procurement	IV Road construction	Total (I + II + III + IV)
1st phase	188	3,391	25,630
2nd phase	—	—	46,290
Total			71,920

Table 12-9 Residual Values and Depreciation

Unit: 1,000M$

[Basic figures]

	(Building)	(Tower)	(Broadcast equipment and machines)
1st phase			
1st year	(1) (4067x0.3)1220	(2) (2091x0.3)627	(3) (15893x0.3)4768
2nd year	(4) (4067x0.3)1220	(5) (2091x0.3)627	(6) (15893x0.3)4768
3rd year	(7) (4067x0.4)1627	(8) (2091x0.4)837	(9) (15893x0.4)6357
2nd phase			
1st year	(1) (8106x0.3)2432	(2) (6274x0.3)1882	(3) (31910x0.3)9573
2nd year	(4) (8106x0.3)2432	(5) (6274x0.3)1882	(6) (31910x0.3)9573
3rd year	(7) (8106x0.4)3242	(8) (6274x0.4)2510	(9) (31910x0.4)12764
Total investment	12173	8365	47803

Depreciation by fixed installment method

	Building	Tower	Broadcast equipment and machines
Depreciation period	65yrs	40yrs	15yrs
Depreciation ratio	1.6%	2.5%	6.7%

[For the 1st phase]

Investment for the 1st year -- to be depreciated in 14 years

Investment for the 2nd year -- to be depreciated in 13 years

Investment for the 3rd year -- to be depreciated in 12 years

[For the 2nd phase]

Investment for the 1st year -- to be depreciated in 11 years

Investment for the 2nd year -- to be depreciated in 10 years

Investment for the 3rd year -- to be depreciated in 9 years

Depreciation

	Building	Tower	Broadcast equipment and machines
[1st phase]			
	(1)--19.52 per annum	(2)--15.675 per annum	(3)--319.456 per annum
	273.28 for whole phase	219.45 for whole phase	4,472.38 for whole phase
	(4)--19.52 per annum	(5)--15.675 per annum	(6)--319.456 per annum
	253.76 for whole phase	203.78 for whole phase	4,152.93 for whole phase
	(7)--26.032per annum	(8)--20.925 per annum	(9)--425.919 per annum
	312.38 for whole phase	251.1 for whole phase	5,111.03 for whole phase
[2nd phase]			
	(1)--38.91 per annum	(2)--47.05 per annum	(3)--641.39 per annum
	428.03 for whole phase	517.55 for whole phase	7,055.30 for whole phase
	(4)--38.91 per annum	(5)--47.05 per annum	(6)--641.39 per annum
	389.10 for whole phase	470.50 for whole phase	6,413.91 for whole phase
	(7)--51.87 per annum	(8)--62.75 per annum	(9)--855.19 per annum
	466.85 for whole phase	564.75 for whole phase	7,696.69 for whole phase
Total amount of depreciation	2,123.43	2,127.13	34,902.24
Residual values	110,049.57	6,147.87	12,900.76

Total residual values : 29,099 x 10^3 M$

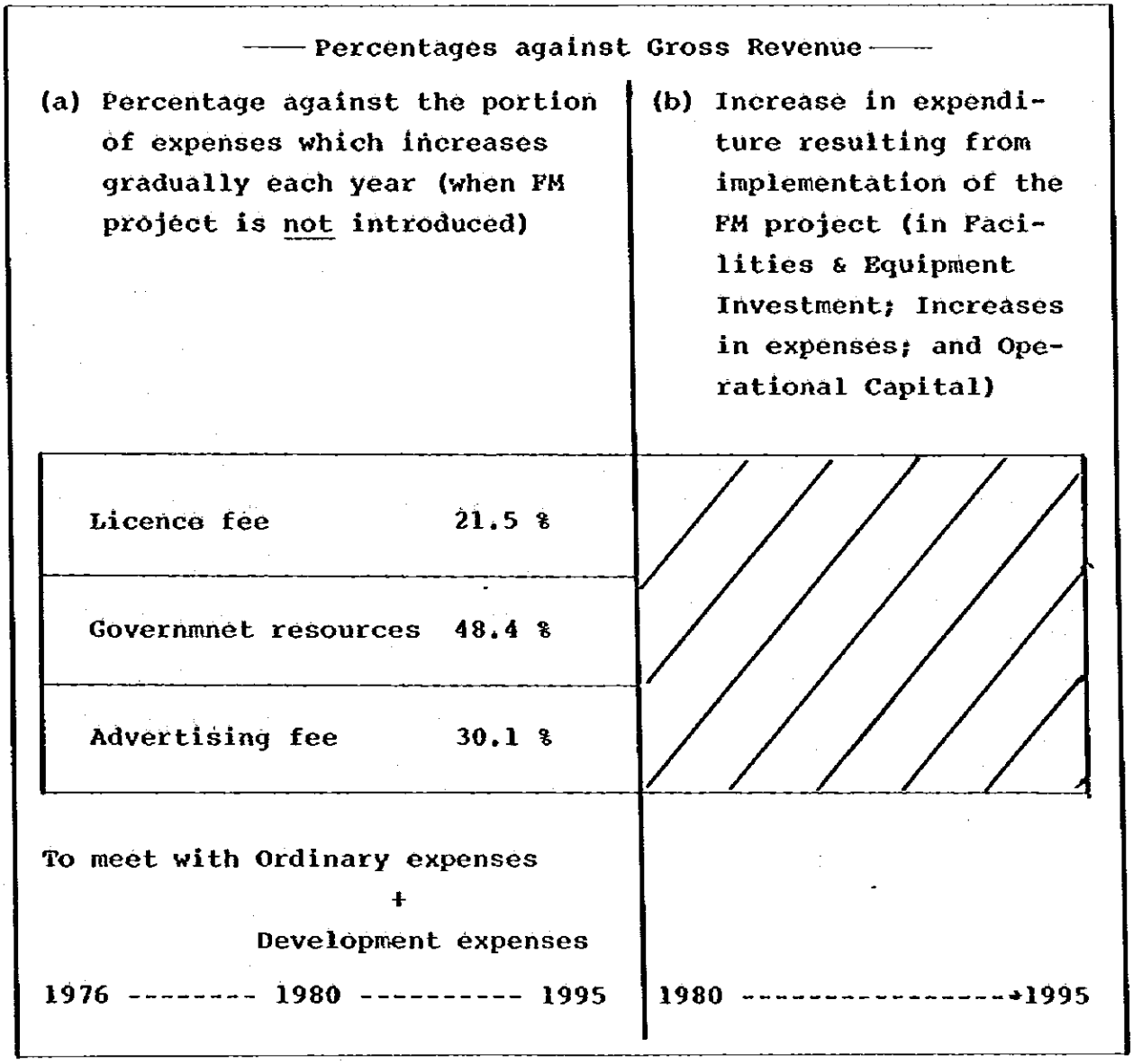


Fig. 12-5 Revenue Structure of the RTM

Analysis of I (Step No. 1)

First, this analysis is to examine with the purpose of knowing what the growths of revenues from the licence fee, advertising fee and the government resources would be. Such data are necessary if we are to cover the additional amounts required of the ordinary expenses and development expenses in the case where the RTM's scope of business activities is to be extended in the present form as the foundation on which to implement the FM broadcast project.

Of the three earnings factors, the estimation on the growth of licence revenue is not such an excessive one, since what we did was that we estimated its growth during the project assessment period up to 1995 by multiplying the increase in the number of licences which had been based on the Table 12-3 and the logistics curve predicted in the Fig. 12-2 by the current unit amounts of licence fees.

On the other hand, throughout the 1970s, the licence fee accounted for 21.5% of the whole revenue, the advertising fee accounted for 30.1% and the government resources, 48.4%. (Refer to Fig. 12-5 and Table 12-1).

In the case of Fig. 12-5 (a), if we are to assume that all the three earnings factors continue to increase while maintaining the ratio as mentioned above, it will be necessary for us to examine whether we are not overestimating the growth of the two other earnings factors, i.e., advertising fee and government resources, as compared with their growth in the 1970s. The Table 12-10 shows a calculation of the growth of the gross revenue, advertising fee and government resources in the case where the revenue from licence fee kept on increasing as indicated by the logistics curve. The gross revenue shown in this Table coincides with (2) in the Table 12-7. The Figure 12-6 gives the same information as that contained in the Table 12-7 but in a graph form.

Now, under the premises as mentioned above, let us examine the growth of revenues from the advertisement and from government resources in the case as shown in the Fig. 12-5.

Table 12-10 Growth of RTM's Revenue from Advertising Fee and from Government Resources, in the Case where the FM Project is not Introduced

(Unit: 1000 M$)

Year	(a) Gross revenue	(b) Advertising fee(a x 0.3)	(c) Government resources (a x 0.48)
1981	136112	40970	65334
1982	146916	44222	70520
1983	158539	47720	76099
1984	170689	51377	81931
1985	183475	55226	88068
1986	196904	59268	94514
1987	210882	63475	101223
1988	225520	67882	108250
1989	240722	72457	115547
1990	256599	77236	123168
1991	272949	82158	131016
1992	290095	87319	139246
1993	307621	92594	147658
1994	325638	98017	156306
1995	344365	103654	165295

The above Table shows how the revenue from advertisement and from government resources will need to be increased in order to cope with the increase in RTM's expenses, if the FM project is not introduced.

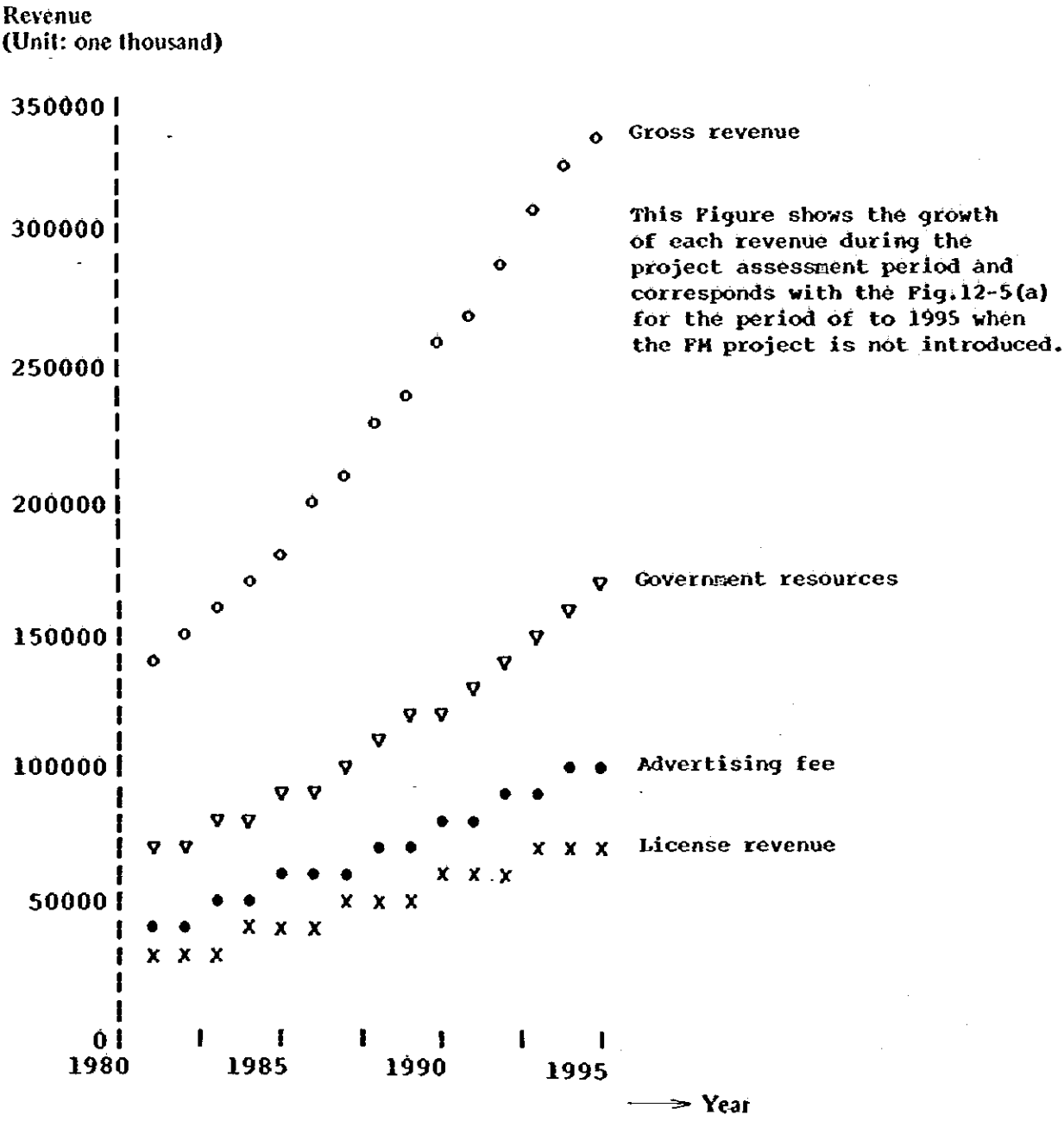


Fig. 12-6 Growth of RTM's Revenues in the Case where The FM is not Introduced (the case (a) in Fig. 12-5)

Advertising fee

The Table 12-11 shows the estimated increase in the advertising revenue when the estimation for the period up to 1995 is made from the ratio of advertisement revenue against the total revenue during the ten years in the 1970s. If shown in a graph form, this would be something like the Fig. 12-7.

Table 12-11

(Unit: 1000 M$)

	Advertising Fee	Increase	Growth Rate against Preceding Year
1981	40970	—	— %
82	44222	3252	7.35
83	47720	3498	7.33
84	51377	3657	7.12
85	55226	3849	6.97
86	59268	4042	6.82
87	63475	4207	6.63
88	67882	4407	6.49
89	72457	4575	6.31
90	77236	4779	6.19
91	82158	4922	5.99
92	87319	5161	5.91
93	92594	5275	5.70
94	98017	5423	5.53
1995	103654	5637	5.44

If we are to calculate on the basis of this Table 12-11, we would obtain the following figures:

* For the period between 1981 and 1990,
  - i) Exponential growth rate (compound interest rate) 6.5%
  - ii) Average growth rate 41.5%
* For the period between 1991 and 1995,
  - i) Exponential growth rate 4.76%
  - ii) Average growth rate 12%

The Malaysian Department of Information has never raised the rates of licence fee for either radio or TV. The rate of advertising fee has been raised by nearly 20% at the rate of once every ten years. In the above-mentioned calculation, an average of 41.5% a year during the 1980s would be a little excessive and would be impractical.

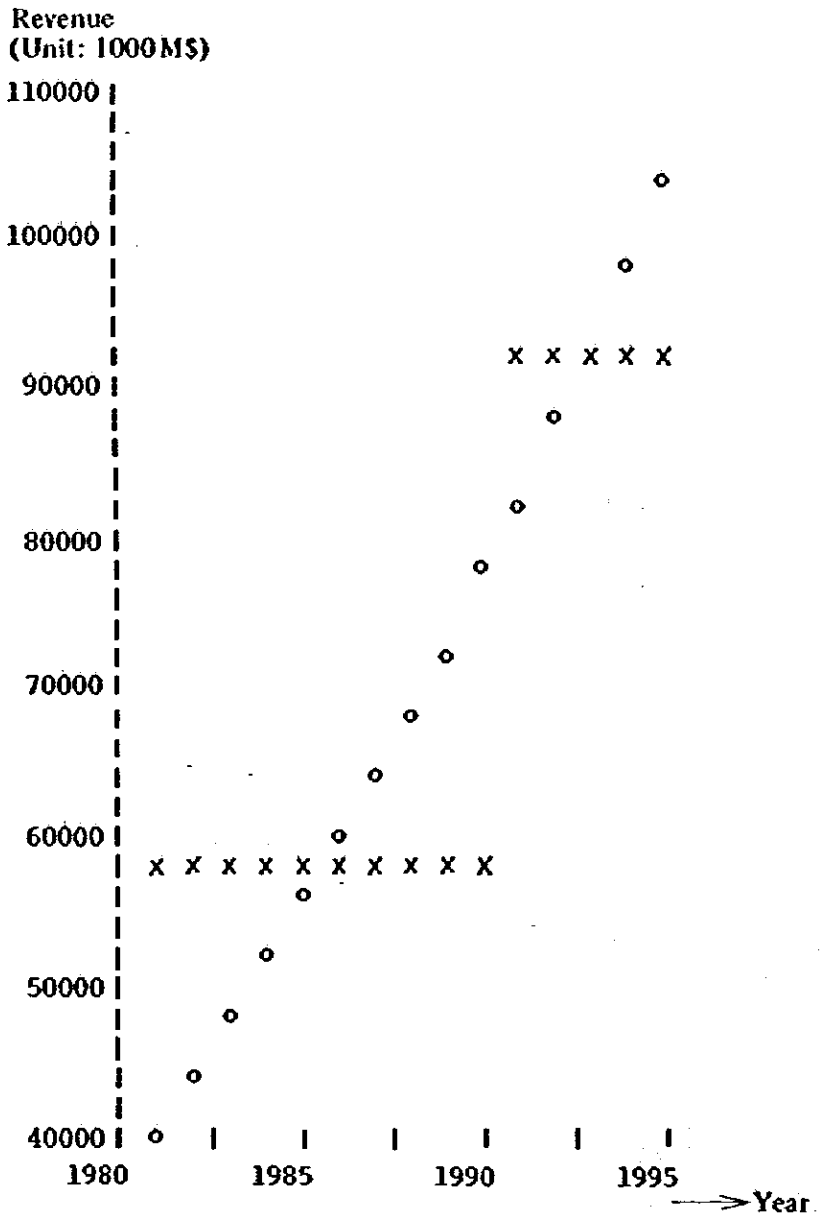


Fig. 12-7 Growth of revenue from advertisement

Government resources

Then, what about the growth of government resources? The Table 12-12 shows the changes during the 1970s in the ratio of the revenue from the government resources as against the RTM's total budget and also the growth rates of such revenues for each year. The average growth rate was as high as 19.6%, the fact from which it was clear that the revenue from government resources was contributing considerably to the growth of RTM's budget during the 1970s.

So, if we take into consideration the fact that the 1970s had been a decade of worldwide high economic growth and even if we discounted the possibility of slight fall in the growth rate of both the revenue and the expenditure, it would not be unreasonable for us to expect a considerably high growth rate in revenue from government resources even for the project assessment period ending in 1995.

Table 12-12 Growth Rate of Revenue from Government Resources as Shown in the RTM's Annual Budgets during the 1970s

(Unit: M$)

Year	Gross Annual Expenditure	% of Rev. from Gov. Res.	Amount of Rev. from Gov. Res.	Difference from preceding year	Growth Rate %
1970	28312673	26	7361295	–	–
1971	33871694	31	10500225	3138930	29.89
1972	48274778	42	20275407	9775182	48.21
1973	56016200	48	26887776	6612369	24.59
1974	67912440	53	35993593	9105817	25.30
1975	69291976	51	35338908	-654685	-1.85
1976	80424365	53	42624913	7286005	17.09
1977	110787240	61	67580216	24955303	36.93
1978	119362980	59	70424158	2843942	4.04
1979	118982630	54	64250620	-6173538	-9.61
				Average	
				19.6% up	

As regards the advertising fee, if it were to be raised by 20% at the rate of once every 10 years as was the case in the past in this country, the RTM's revenue from advertisement would be considerably less than what are shown in the Table 12-11. The Table 12-13 shows the results of our examination on whether or not any difficulty will arise in increasing revenue from government resources if we were to supplement the reduced amount in revenue from advertisement with the revenue from the government resources.

Table 12-13 Growth rates of the RTM's revenue from Government Resources – in the case where no investment is made to the FM project and where the advertising fee is raised once every 10 years by 20%

(Unit: 1000 M$)

Year	Ads.	Gov. Resources	Ads + Gov. Resources
1981	37440	68864	106304
1982	37440	77302	114742
1983	37440	86379	123819
1984	37440	95868	133308
1985	37440	105854	143294
1986	37440	116342	153782
1987	37440	127258	164698
1988	37440	138692	176132
1989	37440	150564	188004
1990	37440	162964	200404
1991	44928	168246	213174
1992	44928	181637	226565
1993	44928	195324	240252
1994	44928	209395	254323
1995	44928	224021	268949

Year	Gov. Resources	Increase in Gov. Resources	Growth Rate Against Preceding Year (%)
1981	68864	–	–
1982	77302	8438	11
1983	86379	9077	11
1984	95868	9489	10
1985	105854	9986	9
1986	116342	10488	9
1987	127258	10916	9
1988	138692	11434	8
1989	150564	11872	8
1990	162964	12400	8
1991	168246	5282	3
1992	181637	13391	7
1993	195324	13687	7
1994	209395	14071	7
1995	224021	14626	7
			Average 8.14

From this Table, it is clear that there still is some room for further growth in revenue from government resources in view of the fact that the amount has been increasing at an average rate of 8.14% over the preceding year.

This concludes our basic analysis of the RTM's revenue structure and we would now like to go into an analysis of the case where the FM project is newly introduced.

Analysis of II (Step No. 2)

In the analysis of I, we studied the advertising fee as one of the three earnings factors, the other two being licence fee and government resources. We first measured the increase in revenue from the advertisement on the basis of the past customs in which the rate was raised once every 10 years by 20%. As for the licence fee, we estimated the increase resulting from the increase in number of licences even though their unit amounts were to be left unchanged. Thus, in order to cover the increase in the ordinary expenses and development expenses during the 15 years, we studied the possibility of achieving a balance in revenue and expenditure by a further increase in revenue from the government resources in case the FM broadcast project is not implemented.

If, however, the FM broadcast project is implemented, it will become necessary for us to consider increasing the rates of licence fee or, more urgently, the revenue from government resources, since the implementation of the FM project will naturally necessitate increase in facilities and equipment investments, in relevant operational expenses, and also in the operating capital. Here in this section, we would like to study a number of cases where the overall increase in the operational expenses is to be covered by an increase in the rates of licence fees and the case in which such an increase in expenditure is covered by the government resources.

In this case, we would like to study on the premises that there shall be no further increase in the rates of advertising fees, because, as mentioned in the analysis of I above, we already have in mind the additional revenue from the expected increase of 20% in the advertising fee. Besides, as is clear from the Table 12-14, in the case of radio, the revenue from advertisement has been gradually falling since 1972 when the advertising fee was raised. Even if a new advertisement tariff system is applied to FM broadcasts, three of the six FM channels will be allocated to Educational, Regional and Local broadcasts, with the result that 3 FM stations will be operating in addition to the existing national networks that are capable of carrying advertisements. As for the broadcast hours, that of the new FM stations in the 1st phase would be 10 hours as compared with the existing radio networks' 24 hours. Moreover, even after the FM went into full operation, the stations will mostly be carrying the same programs as those of the medium wave stations. Furthermore, if we consider the fact that it would take a total of six years to complete the whole of the proposed FM networks including the 2nd phase, it seems that it would be extremely difficult for us to secure an aggregate total of more than 50 million M$ in advertisement revenue during the project period, unless the advertising fee is set at a considerably high level. Even if we were to be very conservative in making an estimate, the increase in the operational expenses as a whole would be over 400 million M$ (during the assessment period). Therefore, when we consider the increase in revenue from advertisement, we would like to think of the rate of the advertising fee simply as a factor contributing to a reduction in the amount of increase in the share of government resources as the source of RTM's revenue, or a reduction in the amount of increase in the rates of licence fees.

Table 12-14 Chronological Records of Revenue from Advertisement

HASIL DARI IKLAN
RADIO DAN TV
(Semananjung Malaysia, Sabah dan Sarawak)
1962 – 1979

Tahun	Radio	TV	Jumlah
1962	$2.8 Juta	-	$ 2.8 Juta
1963	$3.1 "	-	$ 3.1 "
1964	$3.4 "	-	$ 3.4 "
1965	$3.4 "	$ 0.2 Juta	$ 3.6 "
1966	$3.5 "	$ 2.3 "	$ 5.8 "
1967	$3.4 "	$ 3.6 "	$ 7.0 "
1968	$3.3 "	$ 4.9 "	$ 8.2 "
1969	$3.8 "	$ 6.1 "	$ 9.9 "
1970	$4.1 "	$ 8.9 "	$13.0 "
1971	$4.8 "	$ 9.4 "	$14.2 "
1972	$6.4 "	$10.4 "	$16.8 "
1973	$6.4 "	$ 9.9 "	$16.3 "
1974	$5.8 "	$12.1 "	$17.9 "
1975	$6.00 "	$13.5 "	$19.5 "
1976	$5.00 "	$16.00 "	$21.00 "
1977	$4.7 "	$19.1 "	$23.8 "
1978	$5.7 "	$21.4 "	$27.1 "
1979	$5.4 "	$24.2 "	$29.6 "
JUMLAH	$81.00 "	$162.00 "	$243.00 "

* Juta = million.

(1) The case where the increase in expenses resulting from the implementation of the new project is covered by raising of the licence fees.

(1)-1 The amount of increase in the licence fee in the case where the licence fee accounts for 21.5% of the whole revenue.

We will calculate the amount of increase required for the radio and TV licence fees by calculating what percentage of the necessary increase in the total revenue to cover the aggregate amount of deficits resulting from investment in the FM project (Table 12-7: Project funds operation table – asee the total in column (11)) would have to be contributed by revenue from licence fees.

* Aggregate total of the number of radio licences during 1981–95 ..... 4947650 ..... (1)
* Aggregate total of number of TV licences during 1981–95 ..... 28274350 ..... (2)
* Aggregate total of deficits in revenue earnings (Table 12-7: (11)) during 1981–95 when the FM project is carried out ..... 421173×10^3 ..... (3)
* The portion of (3) to be covered by revenue from licence fee ..... (3) x 0.215 = 90552×10^3 ..... (4)
* (1) x 12M$ ..... 59371.8×10^3 M$ ..... (5)
* (2) x 24M$ ..... 678584.4×10^3 M$ ..... (6)
* Ratio of (6) in the total of (5) and (6) ..... 0.919545 ..... (7)
* (7) x (4) ..... Of the (4), the amount that should be covered by a raise in TV licence fee ..... 83308×10^3 ..... (8)
* $\{1 - (7)\} \times (4)$ ..... Of the (4), the amount that should be covered by a raised in radio licence fee ..... 7244×10^3 ..... (9)
* $\frac{(8)}{(2)} = 2.946$ Amount of increase in TV fee ..... (10)
* $\frac{(9)}{(1)} = 1.464$ Amount of increase in radio fee ..... (11)

From the above, we may conclude that a balance in revenue and expenditure can be achieved by raising the radio and TV licence fees per annum by:

1.46 M$/1 radio licence
2.95 M$/1 TV licence

The above, of course, is based on the premises that an appropriate amount of revenue in proportion to the revenue from licences is secured from government resources. Assuming that the advertising revenue does not cover any part of the increase in expenditure, the increase in revenue from government resources will have to cover 78% of the increase caused by FM project in expenditure. In this case, the growth rate in the increase in revenue from government resources as compared with the preceding year will be as shown in the Table 12-15.

Table 12-15 Growth Rate of the Amount to be Shared by the Revenue from National Financial Resources

Year	(1)	(2)	(1)+(2)	Growth Rate Against Preceding Year
				(Unit - 1,000 M$)
1981	68864	39901	108765	58,38%(*)
1982	77302	8581	85883	-26.64
1983	86379	13689	100068	14.18
1984	95868	17878	113746	12.03
1985	105854	17056	122910	7.46
1986	116342	22119	138461	11.23
1987	127258	17717	144975	4.49
1988	138692	19840	158532	8.55
1989	150564	20956	171520	7.57
1990	162964	22158	185122	7.35
1991	168246	23375	191621	3.39
1992	181637	24732	206369	7.15
1993	195324	26064	221388	6.78
1994	209395	27496	236891	6.54
1995	224021	29058	253079	6.4

(1) .....When the FM project is not implemented
(2) ..... Amount to be covered by revenue from government resources in implementing the FM project
(1)+(2) .. Total amount to be covered by revenue from government resources when FM project is implemented

(*) 58.38% ..... This figure was obtained by the following calculation:
First, multiply 124,860 (total revenue for 1980) by 55% (average share, in the total revenue, of the revenue from government resources during the last 5 years) and we will get 68,673. From this figure, estimate the growth rate for 1981 and we will get this percentage, 58.38%. This high percentage is mainly due to the fact that increase in the expenditure is normally large at the start of a project.

(1)-2 The case where the increase in expenses resulting from the implementation of the whole FM project is covered by raising of the licence fee

This is the case in which the aggregate total of deficits in the gross earnings in R as shown in the column (11) of the Table 12-7 (Project funds operation table) is covered 100% by the raising of the licence fees. In our analysis (1)-1 above, we made an estimation of the total revenue from radio and TV licences during the assessment period by multiplying the aggregate totals of the number of licences by the respective amounts of licence fees. So, in terms of ratio, we may conclude that the above-mentioned deficit can be covered 100% if we let the revenue from TV and radio licences take care of the deficit at the ratio of TV-0.92/Radio-0.08.

In this case, the amounts to be shared by TV and radio will be:

TV 387479×10^3 ..... (12)

Radio 33694×10^3 ..... (13)

(12) ÷ (Aggregate total of number of TV licences, i.e., (2)) = 13.7 M$ ..... (14)

(13) ÷ (Aggregate total of number of Radio licences, i.e., (1)) = 6.8 M$ ..... (15)

From the foregoing, we may conclude that more than 55% raise in licence fees – by 13.7M$ for TV and 6.8M$ for radio, a year – would be required if we are to cover the increase in expenses resulting from the investments in FM project with the licence fee alone.

(2) The case where the increase in expenses for the new project is to be taken care of with the revenue from government resources alone

This is a case in which the additional income required in order to pay for the facilities and equipment investments in the FM project and the resultant increase in expenses is to be derived 100% from the revenue from government resources alone. The following Table 12-16 shows what the figures would be like in this particular case.

Table 12-16 Estimated Amounts and Growth Rates in the Case where the Costs of the FM Project were to be Covered Solely by the Revenue from Government Resources

(Unit: 1000M$)

Year	(1)	(2)	(1)+(2)	Growth Rate against Preceding Year
1980			68673	
1981	68864	50829	119693	74.29
1982	77302	10931	88233	-35.66
1983	86379	17438	103817	15.01
1984	95868	22774	118642	12.5
1985	105854	21727	127581	7.01
1986	116342	28177	144519	11.72
1987	127258	22570	149828	3.54
1988	138692	25274	163966	8.62
1989	150564	26696	177260	7.5
1990	162964	28227	191191	7.29
1991	168246	29777	198023	3.45
1992	181637	31506	213143	7.09
1993	195324	33203	228527	6.73
1994	209395	35027	244422	6.5
1995	224021	37017	261038	6.37

(1) Amount of revenue from government resources to be used to cover the gradual increase in expenditure.

(2) Amount of revenue from government resources to be used to cover the increase due to FM project.

Analysis of III (Step No. 3)

In the analysis of II, we made a more strict assumption, as compared with our analysis for the 70s, regarding the estimated increase in expenses. Thus, on the assumption that the amount of new investments to the FM project would be as given as a result of calculations made in the preceding Chapters, we made the analysis with the objective of achieving a balance in revenue and expenditure for the RTM during the project assessment period up to 1995. The growths of the figures used in the analysis, however, are rather closer to actual than nominal, even though they may not be called accurate in the strict sense of the word. Therefore, the analysis is not such in which the balance in revenue and expenditure is aimed at, taking into consideration the possibility of fluctuation in costs as a result of continuous high economic growth in Malaysia or the prospect of the country being hit hard by the effects of world-wide inflation. If we want to incorporate these circumstances, it would be safe to make another analysis in which an organisation can attain 7–8% internal rate of return – a rate that could

be considered as being normal even for public works. For this purpose, firstly the re-examination of the growth rate of licence revenue and the revenue from government resources will be made using computers.

At present, in Malaysia, the people who are paying the radio licence fee are those who own a radio but do not own a television set. So, conversely, while the TV set owners may be surmised as also owning a radio in most cases, those paying TV licence fee are not required to pay for their radios even if they had one in addition to a TV set. Moreover, the rates of licence fees – for radio and for TV – have not been raised ever since the radio and TV were inaugurated in Malaysia; 1947 for radio and 1965 for TV.

In covering the additional expenditure required by the new FM project, it would be inappropriate from the viewpoint of the national social policy to place any portion of the burden on the radio-only owners who are supposed to belong to the lower income bracket. So, we believe that our analysis should begin with a study of the question as to how much increase in the rate of licence fee, payable by TV set owners for whom the fee has not been raised for a long time, should be enough to cover the additional expenses resulting from investments in the project. And if the amounts of fee raise and profit ratio were calculated in advance through such an analysis as outlined above, it would then be feasible for us to cover a certain ratio of the additional expenses with revenue from government and other resources. Furthermore, a part of the increase in the rate of licence fee may be considered in the form of a special tariff for reception of FM broadcasts. In view of the fact that the average personal income in Malaysia has increased seven times as much since the start of television broadcasting, we would think that the rate of TV fee may be raised to some extent in order to cover a part of the expenses for the new broadcasting project.

Next, we would like to use a computer to find out as to what would be the total annual amount in revenue from TV licence fees which would be enough to cover the additional expenses resulting from the FM project and which, also, would bring the internal rate of return to somewhere around 8% as against the developmental investments.

By the way, the internal rate of return i may be obtained from the following formula:

$$I = \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \ldots + \frac{R_N}{(1+i)^N} + \frac{S}{(1+i)^N}$$

I : Amount of investment into the project

S : Pure residual value of I

R, R . . . R : Earnings minus expenses for each term

N : Number of project-assessment years

Case A – in which the development investments are covered by the revenue from licence fees

If we are to increase the amount of TV licence fee from the current 24M$ to 40M$, this would cover the increase in development investments and the operational expenses, and the resultant internal rate of return would be 8.8%. In this case, we would achieve a surplus in the revenue-expenditure account without any further revenue from government resources in addition to the increase in revenue from government resources to cover the ordinary increase in the annual expenditure (Ref. Fig. 12-5(a)). The funds operation table in this case would be as shown in the Table 12-17. The slight differences in the amounts shared by revenue from government resources between those in the Tables 12-17 and 12-13 are due to the fact that, in preparing the Table 12-17, we calculated beyond the decimals.

Table 12-17 "Statement of Sources and used Fund" applicable when the licence fee for TV set owners is set at 40M$ per annum

Unit 1000 M$

Fiscal year	Gradual increase in budget will be covered by revenues from :				(2) Implementation of project will be covered by increase in licence fee, as follows :		Gross revenue I (1) + (2)	Gross operational expense II	R Earnings I - II
	Licence	Gov. resources	Ads.	(1) Total					
1981	29264	69408	37440	136112	18928		155040	186941	-31901
1982	31587	77889	37440	146916	21392		168308	157847	10461
1983	34086	87013	37440	158539	23952		182491	175977	6514
1984	36698	96551	37440	170689	26576		197265	193463	3802
1985	39447	106588	37440	183475	29200		212675	205202	7473
1986	42334	117130	37440	196904	31840		228744	225081	3663
1987	45340	128102	37440	210882	34416		245298	233452	11846
1988	48487	139593	37440	225520	36944		262464	250794	11670
1989	51755	151527	37440	240722	39376		280098	267418	12680
1990	55169	163990	37440	256599	41728		298327	284826	13501
1991	58684	169337	44928	272949	43952		316901	302726	14175
1992	62370	182797	44928	290095	46112		336207	321601	14606
1993	66139	196554	44928	307621	48176		355797	340824	14973
1994	77012	210698	44928	325638	50160		375798	360665	15133
1995	74039	225398	44928	344365	52064		396429	381382	15047

Growth rate of increase in amount to be borne by revenue from government resources, against preceding year

Fiscal year	Amount	Growth rate
1981	69408	—
1982	77889	10.89
1983	87013	10.49
1984	96551	9.88
1985	106588	9.42
1986	117130	9.00
1987	128102	8.57
1988	139593	8.23
1989	151527	7.88
1990	163990	7.60
1991	169337	3.16
1992	182797	7.36
1993	196554	7.00
1994	210698	6.71
1995	225398	6.52

Note: The growth curve of the TV licences which is the basis for calculating the revenue increase is an independent one in this table and is slightly different from the joint R/TV growth curve used in the Table 12-4.

Case B – in which the increase in expenses resulting from development investments is covered solely with revenue from government resources

This is a case where an attempt is made to depend solely on the revenue from government resources in achieving an increase in the total revenue amounting to what may be secured by raising the licence fee for television by 16M$. As is clear from the Table 12-18, the increase in the amount to be shared by the revenue from government resources in this case would reach an average percentage of 65.4 which would be too large a share. In the past in Malaysia, however, the rates of radio and TV licences have been left unchanged for many years, the rates of advertising fee having been the only factor among the items of major revenue for the RTM that have been raised. This would seem to be much too little in comparison with the per-capita growth in GNP of this country. The Table 12-18 indicates that, if this policy is to be maintained hereafter, an increase in revenue from government resources as mentioned above would become necessary.

Case C

In the Case B, the revenue from government resources was somewhat too heavily depended upon. So, in this case, we would like to assume that the TV licence fee is raised to 30M$ instead of 40M$, and examine what the annual increase in revenue from government resources and its growth rate would be within the RTM budget if the increase in revenue to fill in the gap corresponding to 10M$ difference is to be contributed by an increase in revenue from government resources. The Table 12-19 and 12-20 show the points mentioned above; the annual growth rate against each preceding year of the revenue from government resources is not so high as compared with those of the 70s, but as against the whole revenue, the average annual growth rate during the 15 years will be somewhat higher at 60.4% as compared with 48.4% in the 70s. And the exponential growth rate in the 15-year project assessment period would be 8.01%.

The Fig. 12-8 also shows the revenues in the above-mentioned case but in a graph. In this case, the revenue from advertising fee shows a decrease in ratio against the total revenue, in spite of the 20% raise made on two occasions. We would like to supplement our explanation of this subject when we do a risk analysis and other studies in the next section of this Chapter.

Table 12-18 Revenue from government resources and its growth rate against that of preceding year and ratio against gross revenue, in Case B (where development investment is covered solely by revenue from government resources)

Unit 1000 M$

Year	Licence	Gov. resources	Ads.	Total	Additional expense due to PM investments to be covered by :				Earnings R (Revenue-Expenses)
					TV Licence increase	Gov. resources increase	Total rev.	Operational expense	
1981	29264	69408	37440	136112	0	18928	155040	186941	-31901
1982	31587	77889	37440	146916	0	21392	168308	157847	10461
1983	34086	87013	37440	158539	0	23952	182491	175977	6514
1984	36698	96551	37440	170689	0	26576	197265	193463	3802
1985	39447	106588	37440	183475	0	29200	212675	205202	7473
1986	42334	117130	37440	196904	0	31840	228744	225081	3663
1987	45340	128102	37440	210882	0	34416	245298	233452	11846
1988	48487	139593	37440	225520	0	36944	262464	250794	11670
1989	51755	151527	37440	240722	0	39376	280098	267418	12680
1990	55169	163990	37440	256599	0	41728	298327	284826	13501
1991	58684	169337	44928	272949	0	43952	316901	302726	14175
1992	62370	182797	44928	290095	0	46112	336207	321601	14606
1993	66139	196554	44928	307621	0	48176	355797	340824	14973
1994	70012	210698	44928	325638	0	50160	375798	360665	15133
1995	74039	225398	44928	344365	0	52064	396429	381382	15047

Year	Gov. resources	New gov. resources	Gov. res. total	Growth rate against preceding year	Ratio to Total Revenue
1981	69408	18928	88336	—	57 %
1982	77889	21392	99281	11.02	59 %
1983	87013	23952	110965	10.53	61 %
1984	96551	26576	123127	9.88	62 %
1985	106588	29200	135788	9.32	64 %
1986	117130	31840	148970	8.85	65 %
1987	128102	34416	162518	8.34	66 %
1988	139593	36944	176537	7.94	67 %
1989	151527	39376	190903	7.53	68 %
1990	163990	41728	205718	7.20	69 %
1991	169337	43952	213289	3.55	67 %
1992	182797	46112	228909	6.82	68 %
1993	196554	48176	244730	6.46	69 %
1994	210698	50160	260858	6.18	69 %
1995	225398	52064	277462	5.98	70 %

65.4 % (Average)

Table 12-19 "Statement of Sources and used Funds" appliable to a case where a part of expenditure corresponding to an amount of revenue from TV licence fee at 10M$ is covered by revenue from government resources (Case C)

* TV fee is 30 M$
* Government is supposed to cover expenditure corresponding to television fee 10 M$

(Unit: 1000 M$)

Year	Licence	Gov. resources	Ads	Total	Additional expenses due to FM investments to be covered by:				
					TV licence increase	Gov. resources increase	Total revenue	Operational expense	Earnings R (Revenue -Expenses)
1981	29264	69408	37440	136112	7098	11830	155040	186941	-31901
1982	31587	77889	37440	146916	8022	13370	168308	157847	10461
1983	34086	87013	37440	158539	8982	14970	182491	175977	6514
1984	36698	96551	37440	170689	9966	16610	197265	193463	3802
1985	39447	106588	37440	183475	10950	18250	212675	205202	7473
1986	42334	117130	37440	196904	11940	19900	228744	225081	3663
1987	45340	128102	37440	210882	12906	21510	245298	233452	11846
1988	48487	139593	37440	225520	13854	23090	262464	250794	11670
1989	51755	151527	37440	240722	14766	24610	280098	267418	12680
1990	55169	163990	37440	256599	15648	26080	298327	284826	13501
1991	58684	169337	44928	272949	16482	27470	316901	302726	14175
1992	62370	182797	44928	290095	17292	28820	336207	321601	14606
1993	66139	196554	44928	307621	18066	30110	355797	340824	14973
1994	70012	210698	44928	325638	18810	31350	375798	360665	15133
1995	74039	225398	44928	344365	19524	32540	396429	381382	15047

Year	Rev. from gov. resources to cover gradual increase	Rev. from gov. resources to cover project expenses	Total revenue from gov. resources	Growth rate against preceding year (%)
1981	69408	11830	81238	-
1982	77889	13370	91259	10.98
1983	87013	14970	101983	10.52
1984	96551	16610	113161	9.88
1985	106588	18250	124838	9.35
1986	117130	19900	137030	8.90
1987	128102	21510	149612	8.41
1988	139593	23090	162683	8.03
1989	151527	24610	176137	7.64
1990	163990	26080	190070	7.33
1991	169337	27470	196807	3.42
1992	182797	28820	211617	7.00
1993	196554	30110	226664	6.64
1994	210698	31350	242048	6.36
1995	225398	32540	257938	6.16

Table 12-20 Percentages of revenue from government resources against gross revenue, in Table 12-19 (Case C)

(Unit: 1000 M$)

Year	Total new revenue	Revenue from Licence	% of Licence revenue against gross revenue	Revenue from gov. resources	% of revenue from gov. resources against gross revenue
1981	155040	36362	23.45	81238	52.40
1982	168308	39609	23.53	91259	54.22
1983	182491	43068	23.60	101983	55.88
1984	197265	46664	23.66	113161	57.36
1985	212675	50397	23.70	124838	58.70
1986	228744	54274	23.73	137030	59.91
1987	245298	58246	23.74	149612	60.99
1988	262464	62341	23.75	162683	61.98
1989	280098	66521	23.75	176137	62.88
1990	298327	70817	23.74	190070	63.71
1991	316901	75166	23.72	196807	62.10
1992	336207	79662	23.69	211617	62.94
1993	355797	84205	23.67	226664	63.71
1994	375798	88822	23.64	242048	64.41
1995	396429	93563	23.60	257938	65.07
					60.42%

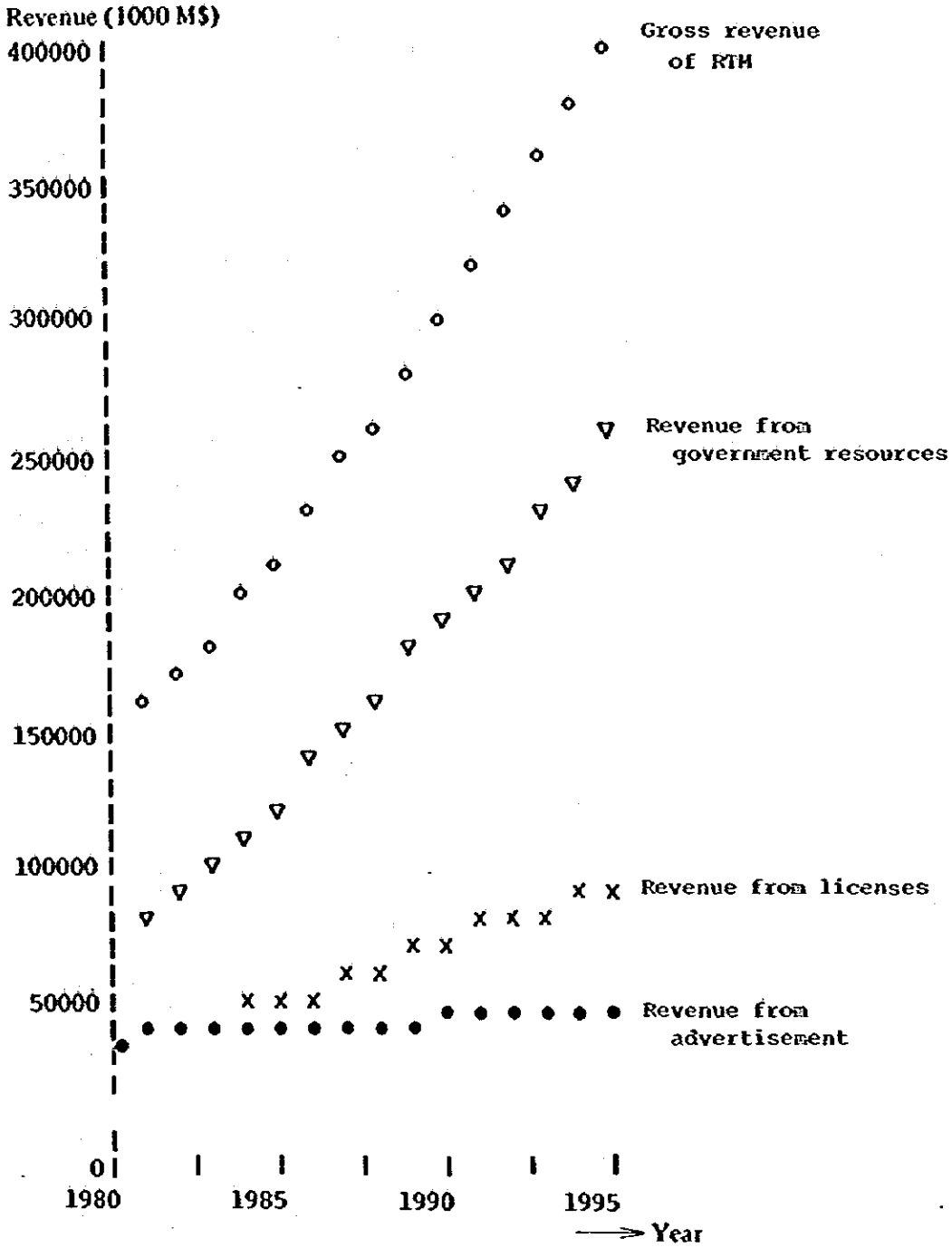


Fig. 12-8 Growth Showing Revenues in Case C

Conclusion, Risk analysis and Present-value analysis

In the preceding section of this Chapter, we have analysed three different cases; Case A, Case B and Case C. All of three Cases are the same in that an attempt was made to achieve an increase in revenue by an amount corresponding to what may be gained by raising the TV licence fee from M$24 to M$40.

If the increase in revenue thus achieved were to an amount corresponding to what may be achieved by raising the TV licence fee from M$24 to M$36, the internal rate of return of the project would be −7% and therefore, as a management plan, it would be necessary to increase the revenue by an amount that would be secured by raising the TV licence fee from M$24 to M$40. And of the three Cases A, B and C, we believe the Case C would be most appropriate and hence we would like to propose an alternative plan under which the Case C is used as the basic plan and a comparative reduction is aimed at in the amount to be borne by the revenue from government resources, resulting from a reconsideration of the current advertisement tariff system.

Whichever of the three Cases may be adopted, we would like to do a risk analysis in which the changes in the earning rate are examined in two different cases, on the premises that we are to achieve an increase in revenue by an amount corresponding to what may be secured by raising the TV license fee from M$24 to M$40. The first case is one in which there is either an increase in revenue or a decrease in expenditure (a) and the second case is where the reverse takes place (b).

What underlies this plan is the "R" in the FM project funds operation table, that is, the column (11) of the Table 12-7.

What is given here is the deficit resulting from investments in the FM project when there is no positive scheme to increase revenue. Supposing this deficit is reduced to half in the Case (a), the internal rate of return would increase as much as 53.3%. The following is a summary of a several of such cases:

Table 12-21 Risk Analysis of Internal Profit Rate

Deficit	Case	Internal rate of return
−20%	(a)	19.7%
+10%	(b)	1.9%
+20%	(b)	−0.4%
+40%	(b)	−10.1%
+45%	(b)	−12.7%

What can be perceived from this Table are that, in either of the Case A, B or C, any amount of policy effort or an effort to reduce costs is reflected delicately in the rise of internal profit rate. Of the three Cases, the Case C seems to be the one that can be adopted without too much strains, from a commonsense point of view. The situation, however, would be different if a major change in policy is made on the grounds that the revenue from advertisement should be depended on in larger proportion than the revenue from licence fees.

The foregoing is the conclusion of our financial analysis but, finally, we would like to make a present-value analysis on the assumption that a business plan is established which aims at achieving increase in revenue as examined in the Step No. 3 analysis. Generally speaking, a present-value analysis is useful in comparing the present values of the gross profits to be derived from a several different draft plans for a project. In this report, we have already concluded from an engineering point of view that FM networks using six different frequencies would be most appropriate in the case of Malaysia. And since the costs have been calculated on those premises, we would like to show there that the calculated values would change according to the variation in market interest rate.

The present value can be calculated by the following formula:

$$V = \frac{R_1}{(1+r)} + \frac{R_2}{(1+r)^2} + \cdots\cdots + \frac{R_N}{(1+r)^N} - (I - \frac{S}{(1+r)^N})$$

V: Gross profit during the project assessment period

I : Amount of investment

S : Pure residual value

R_1 :..... R_2 ..... R_N : Earnings in each term

N: Project assessment period

r : Market interest rate

[Present Value at different Market interest rate] (Unit M$ 1000)

68472 at 5%	47885 at 8%
60842 at 6%	42410 at 9%
53995 at 7%	37495 at 10%

As regards the present value, the higher the value, the better the project. But, in any case, it would be most appropriate to base the calculations on the basic market interest rate of that country. So, if we are to use the recent data from the National Bank of Malaysia, it would be appropriate to compare our plans with other plans at the present value calculated when the market interest rate was 7%.

Before concluding our analysis of the Case C, we would like to give here for your reference the following Table 12-22 to show that, assuming that we could adjust the rates of advertising fee in such a way that the revenue from advertisement would account for 30.1% of the total revenue of the RTM as was the case during the 1970s instead of adhering to the pattern of raising the advertising fees once every 10 years by 20%, the amount of expenditure to be covered by revenue from government resources would be reduced to an annual level of 46%.

Table 12-22 A variation of the Case C
-- when the advertising revenue is enhanced

(Unit: 1000 M$)

Year	Licence	Gov. res.	Adv.	Ratio 1	Ratio 2	Ratio 3	Revenue Total
1981	36362	72011	46667	23.5	46.4	30.1	155040
1982	39609	78038	50661	23.5	46.4	30.1	168308
1983	43068	84493	54930	23.6	46.3	30.1	182491
1984	46664	91224	59377	23.7	46.2	30.1	197265
1985	50397	98263	64015	23.7	46.2	30.1	212675
1986	54274	105618	68852	23.7	46.2	30.1	228744
1987	58246	113217	73835	23.7	46.2	30.1	245298
1988	62341	121121	79002	23.8	46.1	30.1	262464
1989	66521	129268	84309	23.7	46.2	30.1	280098
1990	70817	137714	89796	23.7	46.2	30.1	298327
1991	75166	146348	95387	23.7	46.2	30.1	316901
1992	79662	155347	101198	23.7	46.2	30.1	336207
1993	84205	164497	107095	23.7	46.2	30.1	355797
1994	88822	173861	113115	23.6	46.3	30.1	375798
1995	93563	183541	119325	23.6	46.3	30.1	396429

The increase in revenue in this case, however, would be equal to that which is to be obtained as a result of raising the advertising fee by 95.64% once every 10 years. In exponential calculation, this would be equal to a case in which the revenue is increased by 9.35% every year. Therefore, it would be very difficult to adopt this advertisment increase rate as a policy, as already touched upon in the foregoing analysis.

In addition, when the draft explantion team visited Malaysia, they were asked that some cases of lower increased advertising fee should be annexed to the Table 12-22.

Therefore, two cases are shown here furthermore, as follows:

Table 12-22 A variation of the Case C

-- when the advertising revenue is enhanced (2)

(Unit: 1000 M$)

YEAR	LICENSE	GOV.RES.	ADV. RATIO1		RATIO2	RATIO3	REV.TOTAL
1981	36362	81238	37440	23.5	52.4	24.1	155040
1982	39609	91259	37440	23.5	54.2	22.2	168308
1983	43068	101983	37440	23.6	55.9	20.5	182491
1984	46664	113161	37440	23.7	57.4	19.0	197265
1985	50397	124838	37440	23.7	58.7	17.6	212675
1986	54274	137030	37440	23.7	59.9	16.4	228744
1987	58246	149612	37440	23.7	61.0	15.3	245298
1988	62341	162683	37440	23.8	62.0	14.3	262464
1989	66521	176137	37440	23.7	62.9	13.4	280098
1990	70817	190070	37440	23.7	63.7	12.5	298327
1991	75166	196807	44928	23.7	62.1	14.2	316901
1992	79662	211617	44928	23.7	62.9	13.4	336207
1993	84205	226664	44928	23.7	63.7	12.6	355797
1994	88822	242048	44928	23.6	64.4	12.0	375798
1995	93563	257938	44928	23.6	65.1	11.3	396429

The above table shows the percentage ratio among license revenue, government resources revenue and advertising fee, when the raising of the advertising fee takes place once every 10 years by 20%. In this case, the exponential growth rate of advertisement revenue increase in the 15 year project assessment period would be 2.46%.

Table 12-22 A variation of the Case C

– when the advertising revenue is enhanced (3)

– the 7% increase of advertising fee's exponential growth rate

(Unit: 1000 M$)

NEN	LICENSE	GOV.RES.	ADV.	RATIO1	RATIO2	RATIO3	REV.TOTAL			
1981	36362	85294	33384	23.5	55.0	21.5	155040	1981	33384	47592
1982	39609	92978	35721	23.5	55.2	21.2	168308	1982	35721	47592
1983	43068	101202	38221	23.6	55.5	20.9	182491	1983	38221	47592
1984	46664	109704	40897	23.7	55.6	20.7	197265	1984	40897	47592
1985	50397	118518	43760	23.7	55.7	20.6	212675	1985	43760	47592
1986	54274	127647	46823	23.7	55.8	20.5	228744	1986	46823	47592
1987	58296	136952	50100	23.7	55.8	20.4	245298	1987	50100	47592
1988	62341	146516	53607	23.8	55.8	20.4	262464	1988	53607	47592
1989	66521	156217	57360	23.7	55.8	20.5	280098	1989	57360	47592
1990	70187	166135	61375	23.7	55.7	20.6	298327	1990	61375	47592
1991	75166	176064	65671	23.7	55.6	20.7	316901	1991	65671	72597
1992	79662	186277	70268	23.7	55.4	20.9	336207	1992	70268	72597
1993	84205	196405	75187	23.7	55.2	21.1	355797	1993	75187	72597
1994	88822	206526	80450	23.6	55.0	21.4	375798	1994	80450	72597
1995	93563	216784	86082	23.6	54.7	21.7	396429	1995	86082	72597
								0	838906	838905

In this case, it is required to raise advertising fee once 10 years by 52.54%.

12-2-8 Analysis of rate of return of net worth

In 12-2-7, we examined the methods to increase the revenue to cover the expenses required for the new FM project and found that, in any case, increase in revenue of a certain scale would be necessary. Then, what would the approximate rate of return of net worth be if we were to cover a certain portion of the expenses with loans? While our analysis of the RTM's revenue structure has indicated the difficulty as to which portion corresponded to the RTM's own capital, the following analysis has led us to a conclusion as a result of our calculation of net worth rate of return.

In this analysis, an assumption was made that 80% of the facilities & equipment investment required for the new project would be covered by loans (repayable in ten years) and the remainder by own resources. We also assumed that the scale of revenue and expenditure during the project assessment period to be somewhere near the level of the case mentioned in the preceding section (12-2-7).

Table 12-23 Funds Operation Table Based on Profit Ratio of Net Worth

(in the case where the amount of loan covers 80% of the expendigure the loan being repayable in 10 years Interest rate – 10%)

(Unit: 1000 M$)

Year	Licence	Revenue from Gov. res.	Adv.	Loan	Incr. in TV licence	Incr. in Gov. res.	Total revenue
1981	29264	69408	37440	6151	7098	11830	161191
1982	31587	77889	37440	6151	8022	13370	174459
1983	34086	87013	37440	8202	8982	14970	190693
1984	36698	96551	37440	11110	9966	16610	208375
1985	39447	106588	37440	11110	10950	18250	223785
1986	42334	117130	37440	14813	11940	19900	243557
1987	45340	128102	37440	0	12906	21510	245298
1988	48487	139593	37440	0	13854	23090	262464
1989	51755	151527	37440	0	14766	24610	280098
1990	55169	163990	37440	0	15648	26080	298327
1991	58684	169337	44928	0	16482	27470	316901
1992	62370	182797	44928	0	17292	28820	336207
1993	66139	196554	44928	0	18066	30110	355797
1994	70012	210698	44928	0	18810	31350	375798
1995	74039	225398	44928	0	19524	32540	396429

Table Showing Earnings and Funds Outflow

(Unit: 1000 M$)

Year	Ordinary	Devel.	New FM inv.	Incr. in expense	Amount plus interest	Oper. expense	Funds oper. Total	Earnings
1981	108890	27222	7689	0	615	43325	187741	-26550
1982	117533	29383	7689	0	1784	3592	159981	14478
1983	126831	31708	10252	2254	3096	5325	179466	11227
1984	136551	34138	13887	3714	4822	5692	198804	9571
1985	146780	36695	13887	3937	6728	4474	212501	11284
1986	157523	39381	18516	4173	8893	6138	234624	8933
1987	168706	42176	0	19372	9799	3470	243523	1775
1988	180416	45104	0	20534	9224	4567	259845	2619
1989	192578	48144	0	21766	8649	4758	275895	4203
1990	205279	51320	0	23072	8073	4982	292726	5601
1991	218359	54590	0	24456	7498	5148	310051	6850
1992	232076	58019	0	25923	6369	5245	327632	8575
1993	246097	61524	0	27478	5303	5405	345807	9990
1994	260510	65128	0	29127	4111	5542	364418	11380
1995	275492	68873	0	30875	4224	6176	385640	10798

In accordance with the Funds Inflow-Outflow Table shown above, we calculated on the assumption that 20% of the new FM project investments is to be covered with own resources. The following table is the result of our calculation:

Debt (D)	6151 6151 8202 11110 11110 14813
Year	15
Interest rate (P)	10.000
Return (R)	-26550 14478 11227 9571 11284 8933 1775
	2619 4203 5601 6850 8575 9990 11380 10789
Sum of return nondefl.	90725
Initial invest-debt (left)	14383
Initial cash flow (right)	30636

After calculation based from Table 12-23, owned capital return rate computed falls between 4.15 and 4.16.

As is clear from this calculation, this project would be quite practicable even if we were to draw a substantial amount of funds from outside, so long as we made sure that an increase in revenue as mentioned in the preceding section (12-2-7) was secured.

12-3 Economic Appraisal

The financial analysis made in the preceding paragraph 12-2 was a long-term estimation of financial revenue and expenditure in the case where a government-run enterprise makes a new investment to a FM project. However, the influence to be brought about by the broadcast project to various fields of society would be much more than what are expressed in terms of figures. Such influences can be assessed from a variety of viewpoints: how the social benefits of that country would be enhanced; the effects on that country's income distribution, employment creation and overall demand increase; the various types of effects on the enterprisers, government, consumers, domestic suppliers concerned (including manufacturers and distributors), skilled and unskilled workers, domestic financiers, and others in the various economic sectors; what kind of benefits would be brought about as a result of the expansion of people's network of communication including the communication system by broadcast in case in disasters; and so forth. In order to make such assessments, however, further survey of a larger scale will be required.

Therefore, in this report, we would like to confine ourselves mainly to a cost-benefit analysis and re-calculate the benefits and the costs of the Malaysian FM project, in an effort to quantify as far as possible the social and economic benefits.

Basically, what we will do is to use the present values and calculate the internal rate of return of social and economic benefits, and show, through a comparison with the results of our financial analysis, how large the social benefits will be. In order to recalculate the costs and benefits, we must first obtain the conversion factors as follows:

Item	Conversion factor
Import goods (those paid for in foreign exchange)	CIF prices
Other trade goods	FOB prices
Non-trade goods	Standard Conversion Factor (SCF)
Skilled labor	Propensity to consume x CCF (Consumption Conversion Factor)
Unskilled labor	SWR (Shadow Wage Rate) x CCF
Benefits	SCF

Although we would have to use a complex series of formulas in doing the above-mentioned calculations, we have omitted the process of such calculations and have attempted to show only the results. Due to lack of data, a part of the calculation has had to be made on the basis of estimates.

SCF 1.01*

* Because, in Malaysia, the export duty is comparatively large in amount among the SCF calculation elements, we have thus obtained a figure larger than 1.

CCF 0.96

Factor by which the skilled-labor cost is to be multiplied 0.68

Factor by which the unskilled-labor cost is to be multiplied 0.87

In our calculation we have used the following figures:

Propensity to Consume 71% (calculated on the basis of the 1976 statistics), the consumption growth rate-for use in calculating the savings premiem 14% (average of the rates in 1973–77). We have also used the estimated figures of 7% for the standard interest rate, 1.2 for the Marginal Utility Elasticity of consumption, M$319 for the market wage as a factor from which to calculate a potential wage rate, and M$91 for the Labor Opportunity Cost.

On the basis of the data mentioned above, we have recategorized and recalculated the costs (refer to Table 12-24).

Regarding the benefits, we have calculated them by dividing the broadcast programs into the following three categories according to contents: Educational programs; News and Information programs; and Entertainment, Music and Sports programs.

i) Educational programs

In this report, it is envisaged that, as at the end of the 2nd phase of construction of the FM network – six years after the start of the project – a frequency will have been allocated to educational and cultural programs to be broadcast 10 hours a day. But here in our economic analysis, in order to make a more conservation assessment of the benefits, we would like to base our calculation on the assumption that a broadcasting hour of about the same length as that of the present medium wave radio's educational broadcasts is alloted to the new FM network's broadcast to schools.

(Primary schools)

According to the data published by the Ministry of Education of Malaysia, the educational cost per pupil at primary school is M$354.81. If we divide this amount by the effective annual education hour (assuming this to be 1,428 hours per pupil), we will obtain a figure of M$0.25 per hour. And by taking into consideration the annual broadcasting hour of programs directed to schools and the total number of pupils, we can calculate as follows:

0.25 x 462 hours x 1,669,888 pupils = M$ 192,878,720

This calculation has been done to make a rough estimate of the benefits which the Malaysian primary school children are currently receiving, from the point of view of costs. In the case of school broadcasts, we may regard them as playing a role to supplement the work

done by teachers. So, we have discounted the above calculational by multiplying the total by 0.2, as follows:

192,872,064 x 0.2 = M$38,574,413

(Junior High Schools)

Similarly, in the case of junior high schools, our calculation would be:

$$\frac{\text{M\$519.42}}{\text{1,666 hours}} = 0.31 \ldots\ldots\ldots \text{Educational cost per hour}$$

M$0.31 x 286 hours x 887,174 x 0.2 = 15,731,369

Note: "1,666 hours" is the effective annual education hour (assumed), "286 hours" is the annual broadcasting hour of programs directed to junior high schools, and "M$519.42" is the annual per-student education cost according to statistics.

The figures shown in the "benefits" column of the Table 12-24 are the results of estimations made of the benefits which the primary and junior high school children would recieve. In making the estimation, we have assumed that such benefits will increase each year at a certain rate.

Table 12-24 Social Costs and Social Benefits for Economic Appraisal

Unit 1000 M$

Fiscal year	Social Benefits: Educational Programs	Social Benefits: Current Affairs, News, and Information Programs	Social Benefits: Music, Entertainment, and Sports Programs	Social Benefits: Total (1)	Social Benefits: Total (1)' (1) x SCF	Social Costs: New Facilities & Investments in FM: Trade Goods: Paid in foreign currency CIF price	Social Costs: New Facilities & Investments in FM: Trade Goods: Paid in domestic currency FOB price	Social Costs: New Facilities & Investments in FM: Non-trade goods	Social Costs: New Facilities & Investments in FM: Personnel Costs: Skilled labor	Social Costs: New Facilities & Investments in FM: Personnel Costs: Unskilled labor	Social Costs: New Facilities & Investments in FM: Total(2) of Investments in FM	Social Costs: Operational Costs: Trade goods paid in domestic currency FOB price	Social Costs: Operational Costs: Nontrade goods converted by SCF	Social Costs: Operational Costs: Personal Costs: Skilled labor converted by CP x CCF	Social Costs: Operational Costs: Personal Costs: Unskilled labor converted by SWR x CCF	Social Costs: Operational Costs: (3) Total operational costs	Social Costs: (4) Operational capital (2)+(3) x 0.3	Social Costs: (5) Indirect costs mainly costs of receivers and electricity	Social Costs: (6) Cost Total	(7) Net Benefits (1)' - (6)
1981						5448	476	2918	619	428	9889						2967	56380	69236	-69236
82						5448	476	2918	619	428	9889						+ 0 2967	59280	69169	-69169
83						7265	633	3890	825	572	13185	1307	386	306	98	2097	+1618 4585	63520	80420	-80899
84		7226	95117	102343	103366	10337	1025		1409	445	13216	2154	637	505	162	3458	+ 417 5002	66940	84031	18391
85		8178	107664	115842	117000	10337	1025		1409	445	13216	2283	626	537	171	3667	+ 63 5065	70760	87706	29148
86		9283	129494	138777	140165	13782	1365		1879	595	17621	2420	716	568	182	3886	+1387 6452	74680	97574	43759
87	77032	16544	217666	311242	314354							11236	3293	3874	969	19372	- 640 5812	78380	97122	201116
88	81654	18836	247793	348283	351766							11910	3491	4106	1027	20534	+ 348 6160	82480	103362	247590
89	86553	21049	276914	384516	388361							12624	3701	4353	1088	21766	+ 370 6530	86360	108496	279003
90	91747	23572	310108	425427	429681							13382	3922	4614	1154	23072	+ 392 6922	90640	114104	314663
91	97250	26416	347521	471187	475899							14184	4158	4891	1223	24456	+ 415 7337	94380	119251	355679
92	103086	29642	389968	522696	527923							15035	4407	5185	1296	25923	+ 440 7777	99140	125503	401393
93	109271	33099	435459	577829	583607							15937	4671	5496	1374	27478	+ 466 8243	102740	130684	451834
94	115827	37131	488501	641459	647874							16894	4952	5825	1456	29127	+ 495 8738	106700	136322	510398
95	122777	41197	541997	705971	713031							17907	5429	6175	1544	30875	+ 525 9263	111360	142760	569048

ii) Entertainment, Music and Sports Programs

We would like to calculate the benefits from these programs on the basis of the admission fees that people would be required to pay when they actually go to music concerts or other types of public performances, or to watch the sporting events at a stadium. As can be seen from the Table 12-25 below, the amounts of admission fees for shows vary case by case, but if we are to use the simple average amount of M$14 for a show of, say, 2 hours, the cost would be M$7 per hour. But, in order to avoid overestimation of the admission fees, we would like to further reduce this amount and use the figure M$3.5 per admission. The figures given in the "benefit" column of the Table 12-14 are the results of our calculation which was done by using 0.4 as the discount rate applicable to listening on FM in comparison with actual presence and on the assumption that 3% of the estimated number of the radio-set owners would listen to broadcasts on FM at one time.

Table 12-25 Admission Fees for Shows

1.	Concert	(a)	Local Artist	$3,	$5,	$10.	
		(b)	Foreign Artist	$3,	$5,	$10,	$15, $20.
2.	Show	(a)	Local Artist	$2,	$4,	$6,	$8.
		(b)	Foreign Artist Film Stars or TV Stars with orchestra	$5,	$10,	$15,	$25, $50.
		(c)	Night Club International Artist	$15,	$25,	$50,	$100.
3.	Drama			$3,	$5,	$10,	$15.
4.	Cantonese Opera			$5,	$10,	$15,	$20.
5.	Music Halls Local Singers			$2,	$4,	$6,	$8.
6.	Hong Kong and Taiwan Singers			$4,	$6,	$8,	$10.

iii) Information, Current Affairs and News Programs

In a country like Malaysia where the broadcasts are regarded as one of the important factors of national and social developments, the value of news and information programs should be assessed highly from the point of view of the broadcasters as well. In this analysis, however, we would like to take into account the costs of advertisement in newspapers in calculating the benefits of broadcasts.

If we are to base our calculations on the costs of advertisement in the Malaysian papers, we would find that one hour of news and current affairs programs will roughly be equivalent to 2.63 pages of newspaper. And by multiplying this number of pages by the advertising fee for a 1st-class paper and divided the total by the circulation of that paper, we would get an amount of M$0.11 as a roughly calculated cost per one broadcast hour. Multiply this figure by the ratio of the news, current affairs and information program hours as against the total broadcasting time and we will get the figures as shown in the Table 12-24 in its "benefits" column.

Therefore, if we add together the benefits thus calculated for each of the three categories of programs as mentioned above, we would get the total benefits that may be derived from the proposed FM net work.

As for the expenses, we have categorized the various kinds of costs required for the project in the Table 12-24 and calculated the expenses by multiplying the amounts by the respective conversion factors as listed at the beginning of this paragraph. We have multiplied the amounts by these conversion factors because some of the costs by their nature affect the social costs, and the social benefits in some cases, and therefore it was necessary for us to recalculate the amounts as a kind of opportunity costs.

On the basis of the benefits and costs thus calculated, we have obtained the internal rates of return and the present values as shown in the Tables 12-26.

Table 12-26 Economic Appraisal

– Internal Rate of Returns and Analysis of Present Values –

a) Analysis of Internal Rate of Returns

	Evaluation Period	Internal Rate of Returns	Risk Analysis
Case 1	15 years	35%	30%
Case 2	10 years	27%	20%

The risk analysis here has been made on a case where expenses have increased by 20% as a result of high inflation rate or any other unexpected change in circumstances.

b) Analysis of Present Values

Case 1 . . . . . 1,395,536 x 10^3

Case 2 . . . . . 456,647 x 10^3

if the calculations were based on a market interest rate of 7%.

c) Rate of returns to net worth, if 80% is to be borrowed from outside, will be:

35.96% if the interest rate is 10% *Period for payment:

36.04% if the interest rate is 7% 10 years

for an evaluation period of 15 years.

From this evaluation, we may draw a conclusion that the social benefits to be brought about by the proposed FM project would be by far the larger as compared with the results obtained from the financial analysis and that the project will be extremely effective in consolidating the infrastructure that supports the social developments in Malaysia.

Note: All the calculated figures in tables of the 12th Chapter are in accordance with our recommended plan of this report, except a few adjustments and amendments which is necessary for the financial and economic evaluation at the decision of analyst.

As we analyzed in the preceding paragraphs, it is clear that FM project would bring ample effects even from the point of investment-effect analysis only.

However, the benefit which might be brought from the FM project is not restricted to only this economic analysis. It would bring further benefit. By the completion of FM project nationwide, the good-quality sound broadcast would be expanded to cover nationwide area and be improved the reception of area where medium-wave broadcast hardly coveres.

Furthermore, the expansion of FM local broadcast which is one of the target of this project will enhance local community development and accerelate regional development and all in all lead to bring multilateral benefits to the society.

Simultaneously, the improvement of communication density-degree over the nationwide network will result in disseminating not only the infomation relating to the protection against calamities such as typhoon or cyclon, but also political, economic, commercial and social information, much quickly and much accurately, leading towards enrichment of Malaysia as a cultural society.

On the whole, it would be verified that the total broadcast system including FM nationwide network would be very useful for pursuing nastional development policy and very effective as a basic infrastructure for social progress. From the Japanese experience also, it might be appropriate to say that the completion of network of good quality sound network would contribute very much the enhancement and elevation of cultural benefit to the society.

Considering these versatile effects, nationwide FM network project in Malaysia would be of the very much significant and valuable one from the financial, economic, social and cultural point of view.

13. General Assessment

(1) In Peninsular Malaysia, the present medium wave broadcasting service does not cover entire country. Construction of more medium wave transmitting stations or power increase of the existing stations, to overcome this situation, are very difficult in considering the international frequency allocation.

(2) Successful district services which are intended by the Government of Malaysia will not be realized by medium wave due to its nature.

(3) Radio receiver sets, tape recorders and disc record players, as home appliances, were distributed widely in the country. And their quality has been very much improved. Along with this, audience expect better technical quality of broadcasting.

(4) Utilization of educational broadcasting are being activated in the world.

In above circumstances, VHF/FM broadcasting plays important role.

As the result of this study, it was proved that six VHF/FM programs will be possible. These six channels avail high technical quality broadcasting service, improvement of pocket areas of present medium wave services, better district services and better educational service.

Construction cost and operation cost of this project is not small amount, but, Financial Assessment in the Report suggested successful finance and Economic Appraisel stressed the social benefit by this project.

Advanced electronics technology will help efficient realization of the project.

Since a scale of the project is rather big in broadcasting field, this Report recommends construction period of six years. For earlier realization, earlier start will be required.

APPENDIX

APPENDIX A

Studio Facilities

A-1 Introduction

A study on studio facilities was not included in the range of this Feasibility Study, in acordance with the proposal by the Government of Malaysia. However, basic study became necessary to achieve an outline of the amount of investment in order to make economic and financial assessment.

A-2 Existing Facilities

Existing studio facilities at the headquarters, regional and local stations are as given in the Table A-1.

A-3 Fixed Expansion Plan

Expansion plan which was fixed by RTM are also given in the Table A-1.

A-4 Necessary Studio Facilities to Provide Programs to The Networks Which Will be Constructed by This Project

A-4-1 Facilities of Headquarters

(1) Continuity Facilities

Since one channel will be added to the current ones, and there will be transmission to PSP also, two more continuity studios will be necessary. Four of the present monophonic continuity studios should be remodelled for stereophonic.

(2) Production Studio

As stated in 8 – 4 the production hours of present 64 hours and 50 minutes will be increased to 80 hours. As packaged programs occupy 70% of all, the packaged program hours are 45.4 hours and 56 hours respectively.

Since, 45.4 hour programs are produced at 16 studios at present, an average of 2.84 hours' programs are produced at each studio. If the production time is from 10 o'clock in the morning to 20 o'clock in the evening, that is ten hours, the studios are occupied 3.5 times as much as the broadcasting hours.

This coincides with the explanation given by RTM that the studio occupancy hours amount to 3 to 4 times as much of the program hours. This suggests that studios are being used to their full capacity – 100%, and this also underlines RTM program staff's explanation. Now, in order to produce programs for 10.4 more hours planned under the project (56 – 45.4 = 10.4 hours), four more studios have to be constructed as $10.4 \times 3.5 \div 10 = 3.6$. In addition to new studios the present 12 monophonic studios must be remodelled to enable stereophonic broadcast.

A-4-2 Facility of Regional Stations

Production hours will be increased to 20 hours from the present 6 hours.

(1) Continuity Facilities

Three continuity studios will be necessary for Local and Regional channels and 1 extra for emergency transmission to national and/or educational channel. As Pinang, Johor Bahru stations have 4 and 3 studios respectively, they need not more studios. It is necessary, however, to remodell two studios to enable stereophonic programs. Kuala Trengganu will require additional two studios in stereophonic.

(2) Production Studio

If 70% of the 20 hours, namely 14 hours, are for packaged programs, it would require 49 hours of studio occupancy. 5 studios will be necessary in assuming production of 10 hours in a day. This means that Pinang will need one more studio, Johor Bahru 3 more, and Kuala Trengganu 2 more. Also all the present studios should be so remodelled as to enable stereophonic broadcast.

A-4-3 Facilities of Local Stations

At Local stations, production hours will be increased from the present 3 hours to 10 hours, which are 7 more hours.

(1) Continuity Facilities

Local stations will produce only 1 channel programs. Therefore only one continuity studio will be sufficient. All the stations will need stereophonic facilities and installation of a new studio at Kangar and at Seremban is necessary.

(2) Production Studio

Production of programs for 10 hours means that studios will be in use for 35 hours. Suppose production hours per day is 10 hours it would require 4 studios. In addition to remodelling all the existing studios for stereophonic production, the following new installation is recommended:

Kota Bahru	2 studios
Kuantan	1 studio
Kangar	4 studios
Alor Setar	1 studio
Ipoh	2 studios
Melaka	3 studios
Seremban	4 studios

A-4-4 PSP

PSP educational broadcast at present is, on the yearly average, of 2 hour production and 4 hour transmission a day. By this project the time will be increased to 10 hours.

(1) Continuity Facilities

Since there is no continuity facility now, 2 continuity studios should be constructed.

(2) Production Studio

All the educational programs will be in packages. Production of 10 hour programs will require 4 studios as is stated in A-4-3. The three existing studios should be remodelled for stereophonic production and one new studio should be constructed.

A-4-5 Construction Cost

Rough estimates of construction costs are given in this chapter as the figures will be required for the study of economic and financial assessment in the Chapter 12. This is only for reference purposes and the calculation is based on the following assumptions:

a. Floor space of the continuity stuido is 30m² and that for production is 50m² which is a median of drama and talk programs.

b. Office space is designed for the increased numbers of personnels which are 120 at the Headquarters, 120 at Regional stations, 80 at Local stations and 100 at PSP. Unit space per person is to be 3m².

c. Transmission will be manual operation.

The results are as follows:

RTM Headquarters	
(1) Office room	360m²
(2) Continuity studio	2
(3) Production studio	4
(4) Remodelling studio for stereophonic	6
Kuala Trengganu Station	
(1) Office room	360m²
(2) Continuity studio	2
(3) Production studio	2
(4) Remodelling studio for stereophonic	3
Johor Bahru Station	
(1) Office room	360m²
(2) Continuity studio	unnecessary
(3) Production studio	3
(4) Remodelling studio for stereophonic	4

Pinang Station	
(1) Office room	360m²
(2) Continuity studio	unnecessary
(3) Production studio	1
(4) Remodelling studio for stereophonic	7
Kuantan Station	
(1) Office room	240m²
(2) Continuity studio	unnecessary
(3) Production studio	1
(4) Remodelling studio for stereophonic	4
Kangar Station	
(1) Office room	360m²
(2) Continuity studio	4
(3) Production studio	1
(4) Remodelling studio for stereophonic	unnecessary
Alor Setar Station	
(1) Office room	240m²
(2) Continuity studio	unnecessary
(3) Production studio	1
(4) Remodelling studio for stereophonic	4
Ipoh Station	
(1) Office room	240m²
(2) Continuity studio	unnecessary
(3) Production studio	2
(4) Remodelling studio for stereophonic	3
Melaka Station	
(1) Office room	240m²
(2) Continuity studio	unnecessary
(3) Production studio	3
(4) Remodelling studio for stereophonic	2
Seremban Station	
(1) Office room	360m²
(2) Continuity studio	1
(3) Production studio	4
(4) Remodelling studio for stereophonic	unnecessary
PSP	
(1) Office room	300m²
(2) Continuity studio	2
(3) Production studio	1
(4) Remodelling studio for stereophonic	3

Total construction cost for studio facilities are;

RTM	M$19,400,000
PSP	M$1,800,000
Grand total	M$21,200,000

In addition, it is necessary to remodel the master control facilities to enable stereophonic operation in the entire stations, and the cost for this improvement is estimated to be 2,200,000 Malaysian dollars for RTM, and 200,000 Malaysian dollars for PSP, approximately.

A-4-6 Construction Schedule

The construction of the studio facilities will coincide with the schedule given in the Capters 6 and 9. According to the program production schedule given in the Fig. 6-1, during three years after the start of operation of the first phase stations, new programs are produced only for Local channel of the Regional stations. The minimum requirement for the first phase construction is as follows:

Headquarters	
Production studio	2
Remodelling continuity studio for stereophonic	1
Pinang Station	
Remodelling production studio for stereophonic	3
Remodelling continuity studio for stereophonic	1
Johor Bahru Station	
Production studio	2
Remodelling production studio for stereophonic	1
Remodelling continuity studio for stereophonic	1
Kuala Trengganu Station	
Production studio	1
Remodelling production studio for stereophonic	2
Remodelling continuity studio for stereophonic	1

Approximate construction cost for the first phase is 3,600,000 Malaysian dollars.

According to the program production schedule given in Fig. 6-1, it will be seven years after the start of the operation of the first phase stations that educational broadcast channel will start stereophonic broadcasting.

Facilities of PSP should be remodelled for stereophonic by that time.

Identical construction schedule given in the Table 9-1 are also applied to construction of studio facilities.

Table A-1 Present Status of RTM Sound Studio Facilities

( ) indicates fixed expansion plan

Station	Production Studio Including Auditorium	Continuity Studio
Headquarters	stereo x 4 mono x 12	stereo x 1 mono x 7
Pinang	3 (1)	4
Johor Bahru	1 (1)	3
Kuala Trengganu	3	1
Kota Bahru	2	2
Kuantan	none (3)	temporary 1 (1)
Kangar	none	none
Alorsetar	temporary 1 (3)	none (1)
Ipoh	2	3
Melaka	1	3
Seremban	none	none

Note: All facilities are monophonic unless noted.

APPENDIX B

LIST OF
MEASURED FIELD STRENGTH
OF EXSISTING STATIONS
IN PROJECTING FREQUENCY BAND

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Slim River	95.5		60.0	Ulu Kali
Tanjong Malim	97		22.3	S. Besi
Kangar	97.1	10	33.9	Thailand
Pdg. Besar	97.1	10	36.1	ditto
PTM New Site at Alor Setar	97.1	0	21.0	ditto
Alor Setar	97.1	0	13.0	ditto
K. Nerang	97.0	0	8.0	ditto
Nami	97.0	0	very weak	Thailand
Keroh	93.5	190	1.0	
	97.0	180	9.5	S. Besi
Began Serai	95.0	180	11.0	Ulu Kali
Parit Buntar	95.5		17.0	ditto
Gerik	93.8	0	5.0	Thailand
Kuala Kangsar	95.0	120	4.0	
Ipoh	95.0	90	4.0	
Teronoh	95.0	110	31.5	Ulu Kali
Lumut	95.0	170	31.0	ditto
	91.0	0	5.0	
	91.5		very weak	
Beruas	95.0	270	33.0	Ulu Kali
Kampar	95.0	180	24.0	ditto
	96.5		very weak	
	97.2		very weak	S. Besi
Tapah	95.0	150	25.0	Ulu Kali

Field strength; $dB(\mu V/m) = dBo - 20\log\frac{\lambda}{\pi} + 3$

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Tapah	97.2		very weak	S. Besi
Ringlet	95.0	100	very weak	Ulu Kali
Tanal Rata	95.0		very weak	ditto
	97.2		very weak	S. Besi
Kota Bharu	92.7	300	18.0	Thailand
	92.8	310	22.0	
Tumpat	93.0	320	26.0	
	100.0	320	3.0	
Selising	93.0	310	22.5	
Morib	95.0		49.1	Ulu Kali
	97.2		39.0	S. Besi
Sepang	95.0		53.0	Ulu Kali
	97.2		53.0	S. Besi
Sinpang	95.0		38.0	Ulu Kali
	97.2	238	56.5	S. Besi
Subang Jaya	95.0		81.5	Ulu Kali
Batu Caves	95.0		76.0	ditto
	97.2		66.0	S. Besi
Ampang Jaya	97,2		80.0	ditto
KL Station	95.0		82.0	Ulu Kali
Tampin Station	97.5		30.0	S. Besi
Rembau	97.2	145	16.0	ditto
Seremban	97.2		22.0	ditto

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Telepa burok Station	95.0		66.0	Ulu Kali
Kuala Pilah	95.0		63.0	ditto
Port Dickson	95.0		62.0	ditto
Masjid Tanah	97.5		5.0	S. Besi
Mt. Ophir Station	95.0		55.0	Ulu Kali
	97.2		25.0	S. Besi
	92.4		27.0	Singapore
	94.2		36.5	ditto
	96.0		33.0	ditto
	97.4		26.0	ditto
Segamat	95.0		37.0	Ulu Kali
Jementah	95.0		29.0	ditto
Tangkak	95.0		27.0	ditto
Jasin	95.0		41.0	ditto
Muar	95.0		25.0	ditto
Parit Sulong	95.0		12.0	ditto
	92.6		12.0	Singapore
	94.2		15.0	ditto
	96.0		4.0	ditto
	97.0		12.0	ditto
Yong Peng	95.0		19.0	Ulu Kali
	92.6		11.0	Singapore

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Yong Peng	94.2		8.0	Singapore
	96.0		4.0	ditto
	97.0		very weak	ditto
Labis	92.5		8.0	ditto
	94.5		4.0	ditto
	96.0		11.0	ditto
	97.0		16.0	ditto
Melaka	92.6		12.5	ditto
	94.4		12.0	ditto
	96.0		10.0	ditto
	97.0		13.0	ditto
Semerah	95.0		8.0	Ulu Kali
	92.5		18.0	Singapore
	94.2		20.0	ditto
	96.0		18.0	ditto
	97.0		23.0	ditto
Batu Pahat Station	92.5		65.5	ditto
	94.2		68.0	ditto
	96.0		66.0	ditto
	97.0		68.0	ditto
Batu Pahat	95.0		9.0	Ulu Kali
	92.4		25.0	Singapore
	94.2		27.0	ditto

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Batu Pahat	95.0		24.0	Singapore
	97.0		27.0	ditto
Benut	92.4		35.0	ditto
	94.2		35.0	ditto
	95.0		35.0	ditto
	97.0		35.0	ditto
Pontian Kechil	92.5		45.0	ditto
	94.2		45.0	ditto
	96.0		45.0	ditto
	97.0		45.0	ditto
Bandar Permas	92.5		51.0	ditto
	94.3		51.0	ditto
	96.0		51.0	ditto
	97.0		51.0	ditto
Ayer Hitam	95.0		29.0	Ulu Kali
	92.5		24.0	Singapore
	94.4		17.0	ditto
	96.0		22.0	ditto
	97.0		12.0	ditto
Simpang Renggam	95.0		15.0	Ulu Kali
	92.5		28.0	Singapore
	94.4		20.0	ditto
	96.0		29.0	ditto
	97.0		28.0	ditto

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Renggam	95.0		10.0	Ulu Kali
	92.5		36.0	Singapore
	94.4		35.0	ditto
	96.0		36.0	ditto
	97.0		36.0	ditto
Kulai	92.5		46.0	ditto
	94.4		46.0	ditto
	96.0		46.0	ditto
	97.0		46.0	ditto
Johore City	95.0		20.0	Ulu Kali
	92.4		76.0	Singapore
	94.2		74.0	ditto
	96.0		74.0	ditto
	97.0		53.0	ditto
G. Pulai Station	85.0		53.0	ditto
	94.0		71.0	ditto
	96.0		68.0	ditto
	97.5		71.0	ditto
	99.0		71.0	ditto
Men kibol	92.5		50.0	ditto
	94.4		50.0	ditto
	96.0		50.0	ditto
	97.0		50.0	ditto
Pdg. Endau	95.0		24.0	Ulu Kali

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Pdg. Endau	92.5		15.0	Singapore
	94.0		15.0	ditto
	96.0		15.0	ditto
	97.0		15.0	ditto
Mersing	95.0		7.0	Ulu Kali
	92.5		22.0	Singapore
	94.4		22.0	ditto
	96.0		22.0	ditto
	97.0		22.0	ditto
Keluang	95.0		34.0	Ulu Kali
	92.4		38.0	Singapore
	94.2		38.0	ditto
	96.0		38.0	ditto
	97.0		10.0	ditto
Sedili Besar	95.0		5.0	Ulu Kali
	92.5		35.0	Singapore
	94.0		35.0	ditto
	96.0		35.0	ditto
	97.0		12.0	ditto
Kota Tinggi	92.5		49.0	ditto
	94.0		49.0	ditto
	96.0		49.0	ditto
	97.0		26.0	ditto

Location	Frequency MHz	Azimuth degree	Measured Value dBo	Remarks
Bt. Tinggi Station	93.0		57.0	Singapore
	95.0		57.0	ditto
	96.0		57.0	ditto
	97.0		57.0	ditto

At under mentioned spots, no signals were detected.

K. Kubu Bahru
Sabak
Telok Anson
Bidor
Kg. Pdg Masirat
Kuah
Pasir Hitam
Changlum
Sik
Beling
Mukmh
S. Burong
Batu Maung
George Town
Ayer Itam
Batu Feringgi
Serama
Kg. Baharu
Sauk
Lintang
Tg. Rambotang
Kuantan
K. Dungun
K. Trengganu
Bachok
Bahav
Kg. Raja
Gemas

C. Supplementary Plan to cover areas which are not covered by Basic 15 stations

C-1 Introduction

In the Main Report, 15 Basic Stations were recommended to cover 98% population which is almost entire population in Peninsular Malaysia.

However, there are certain areas which are not covered by 15 Basic Stations. The Plan to cover those areas will be required in due course. Usually service area contour lines on the map are drawn in the form of smooth lines, however, their actual lines are to be comb-shaped which are notched lines. Besides, there are holes inside of the contour lines and islands outside of them.

It is expected that there will be population explosion by national development plan in some sparsely populated areas which were not included in service areas of 15 Basic Stations due to present less population. And also increase of mobile listeners is expected in connection with national highway scheme, in the said areas.

10 Supplementary Stations were planned for the typical areas among said areas and the Plan was added to the Report as Appendix C.

Since such a supplementary plan is usually made after completion of basic plan stations mainly due to such a technical reason as prediction of mutual interference, minor modification of the Plan, which does not affect principal part of the Plan, will be probable in implementing.

C-2 Site and ERP, of the 10 Stations

The sites and ERP are given by Table C-1. The Service Area are given by attached map to this Appendix. 46 dB (μV/m) contour lines, which is lower by 8 dB than minimum field strength required, were added to original 54 dB (μV/m) lines, because listeners can still enjoy programmes practically in the areas of 46 dB (μV/m). This is due to the fact that 50% of listners evaluate 46 dB (μV/m) signal as Grade 4 and 40% of them do as Grade 3, referring to Fig. 2-6-2 in the Main Report.

Land coverage by 46 dB (μV/m) contour lines is 80% for 15 Basic and 10 Supplementary Stations altogether.

C-3 Frequency Assignment

Frequency assignment to 10 Supplementary Stations was examined by applying the same technical standards as those for 15 Basic Stations, while results are given by Table C-2.

C-4 Transmitting Facilities and Antennas

The same technical standards and the same systems as those for 15 Basic Stations were employed to design transmitting facilities and antennas of the 10 Supplementary Stations.

Equipments for remote control and supervisory, and engine generator, were not included in the design for the 10 Stations in considering economical station-design for less populated area. And LLN power supply to all the stations was assumed in designing.

At all the sites C type transmitter system is suggested, while at Bt. Sembilan A type is employed due to such a reason that off-air relay will be impossible.

Table C-3 shows the outline of design and Fig. C-1 and Fig. C-2 show the schematic diagram, for the transmitter facilities.

C-5 Building and tower

The same technical standards, structure and finishing as those for Basic 15 Stations were applied to 10 Stations.

The existing TV building can accomodate FM facilities at Bt. Istana. A single-story building of 25 m^2 floor area is suggested at Bt. Sembilan. Buildings which will be designed for the rest of sites are of single-story 15 m^2 floor area.

The existing TV tower can be also used for FM antenna at Bt. Istana while new 30 m towers of self support type will be erected at the rest of sites. The TV tower of 75 m height at Bt. Istana can be used for FM because of suffecient space to install FM antenna, though Telecom explained that the existing tower of lower than 100 m can not accomodate FM antenna.

Table C-4, Fig. C-3, and Fig. C-4 show outline of the design.

C-6 Construction Cost

Total construction cost, not including road construction and land acquisition, will be M$11,354,000 of the following breakdown.

(1)	Transmitting facilities	M$ 4,858,000
	Installation fee	M$ 1,364,000
(2)	Building and tower	M$ 4,100,000
	Sub total	M$10,322,000
(3)	Contingency (10%)	M$ 1,032,000

In Addition, inland transportation fee will be M$80,000.

Table C-1 Outline of the Design for 10 Stations

	Location (Longitude E) (Latitude N)	Altitude (ft)	Transmitter Output Power (W)	Antenna		ERP (W)
				Array · Stage	Direction	
1. Bt. Sembilan	(102° 57′ 30″) (3° 10′ 00″)	1,642	50	2D 2 · 2	110° 350°	220
2. Bt. Istana	(102° 21′ 00″) (3° 56′ 25″)	656	10	2D 2 · 2	110° 350°	44
3. Bt. Ulu Beruit	(102° 36′ 00″) (4° 29′ 10″)	1,332	10	2D 3 · 2	0° 90° 270°	29
4. Bt. Batu Papan	(101° 54′ 40″) (4° 50′ 35″)	3,820	5	2D 3 · 2	30° 120° 300°	14
5. Bt. X	(102° 39′ 50″) (5° 7′ 50″)	2,523	10	2D 2 · 2	0° 180°	44
6. Bt. Tali Angin	(101° 58′ 10″) (5° 43′ 45″)	2,583	5	2D 1 · 2	260°	43
7. Bt. Y	(101° 30′ 25″) (5° 36′ 45″)	4,120	10	2D 2 · 2	140° 320°	44
8. G. Pilong	(101° 19′ 50″) (5° 30′ 10″)	2,344	5	2D 3 · 2	0° 90° 180°	14
9. Bt. Seluang	(101° 10′ 45″) (5° 32′ 35″)	2,443	3	2D 2 · 2	200° 320°	13
10. Bt. Genting Kundor	(100° 55′ 20″) (5° 59′ 10″)	2,934	5	2D 2 · 2	0° 180°	22

Table C-2 Frequency Assignment Plan

N; National/Educational Net. R; Regional Net. L; Local Net.

	f_1 (N)	f_2 (N)	f_3 (N)	f_4 (N)	f_5 (R)	f_6 (L)
	MHz ch	MHz ch	MHz ch	MHz ch	MHz ch	MHz ch
1. Bt. Sembilan	93.2 (28⁻)	94.4 (34⁻)	98.0 (52⁻)	101.8 (71⁻)	102.6 (75⁻)	104.8 (86⁻)
2. Bt. Istana	89.9 (11)	90.7 (15)	91.9 (21)	92.7 (25)	88.9 (6)	88.1 (2)
3. Bt. Ulu Beruit	90.1 (12)	90.9 (16)	92.1 (22)	92.9 (26)	89.1 (7)	88.3 (3)
4. Bt. Batu Papan	8.7 (10)	90.5 (14)	91.7 (20)	92.5 (24)	88.7 (5)	87.9 (1)
5. Bt. X	103.3 (78)	104.1 (82)	105.3 (88)	106.1 (92)	107.1 (97)	107.9 (101)
6. Bt. Tali Angin	89.9 (11)	90.7 (15)	91.9 (21)	92.7 (25)	88.9 (6)	88.1 (2)
7. Bt. Y	102.1 (72)	102.9 (76)	104.9 (86)	105.7 (90)	106.7 (95)	107.5 (99)
8. G. Pilong	94.5 (34)	96.3 (43)	98.3 (53)	99.1 (57)	100.1 (62)	100.9 (66)
9. Bt. Seluang	89.7 (10)	90.5 (14)	91.7 (20)	92.5 (24)	88.7 (5)	87.9 (1)
10. Bt. Genting Kundor	103.1 (77)	103.9 (81)	105.1 (87)	105.9 (91)	106.9 (96)	107.7 (100)

Table C-3 (1) The Composition of Transmission Facilities

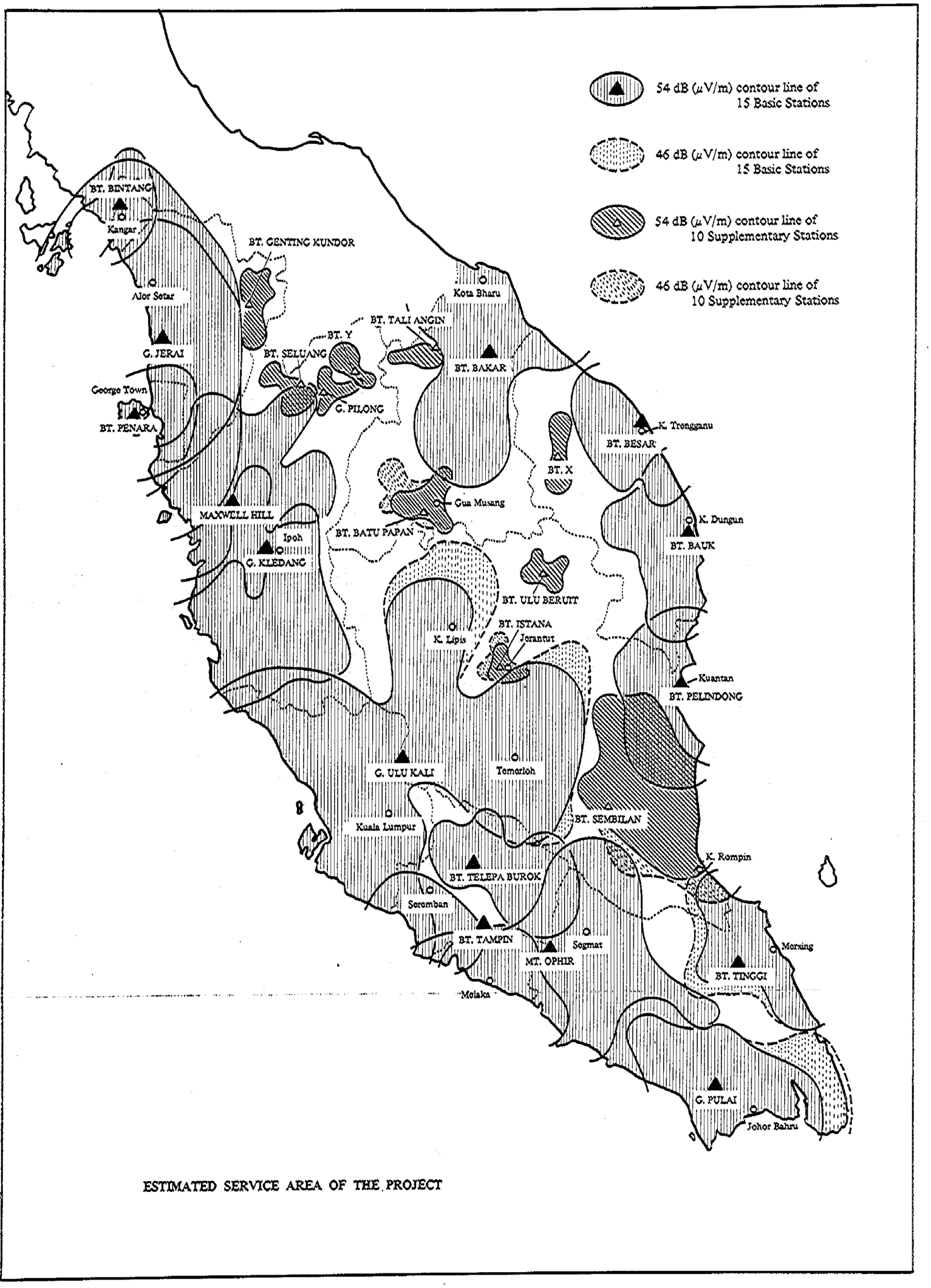
	BT. GENTING KUNDOR	BT. SELUANG	G. PILONG	BT. Y	BT. TALI ANGIN
Net work	N, R, L	N, R, L	N, R, L	N, R, L	N, R, L
Transmitter Composition	5W x 6 (1)	3W x 6 (1)	5W x 6 (1)	10W x 6 (1)	5W x 6 (1)
Type	C	C	C	C	C
Antenna Receiving Antenna	5Y x 2	5Y x 2	5Y x 2	5Y x 2	5Y x 2
Transmitting Main Feeder	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2
Transmitting Antenna	2.2D x 2	2.2D x 2	2.2D x 3	2.2D x 2	2.2D x 1
Power Source Transformer	5 kvA	5 kvA	5 kvA	5 kvA	5 kvA
Schematic Diagram	Fig. C-1	Fig. C-1	Fig. C-1	Fig. C-1	Fig. C-1

Table C-3 (2) The Composition of Transmission Facilities

	BT. BATU PAPAN	BT. X	BT. ULU BERUIT	BT. ISTANA	BT. SEMBILAN
Network	N, R, L	N, R, L	N, R, L	N, R, L	N, R, L
Transmitter Composition	5W x 6 (1)	10W x 6 (1)	10W x 6 (1)	10W x 6 (1)	50W x 6 (1)
Type	C	C	C	C	A
Antenna Receiving Antenna	5Y x 2	5Y x 2	5Y x 2	5Y x 2	(line)
Transmitting Main Feeder	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2	20D, 40m x 2
Transmitting Antenna	2.2D x 3	2.2D x 2	2.2D x 3	2.2D x 2	2.2D x 2
Power Source Transformer	5 kvA	5 kvA	5 kvA	5 kvA	(AVR) 10 kvA
Schematic Diagram	Fig. C-1	Fig. C-1	Fig. C-1	Same as Fig. C-1	Fig. C-2

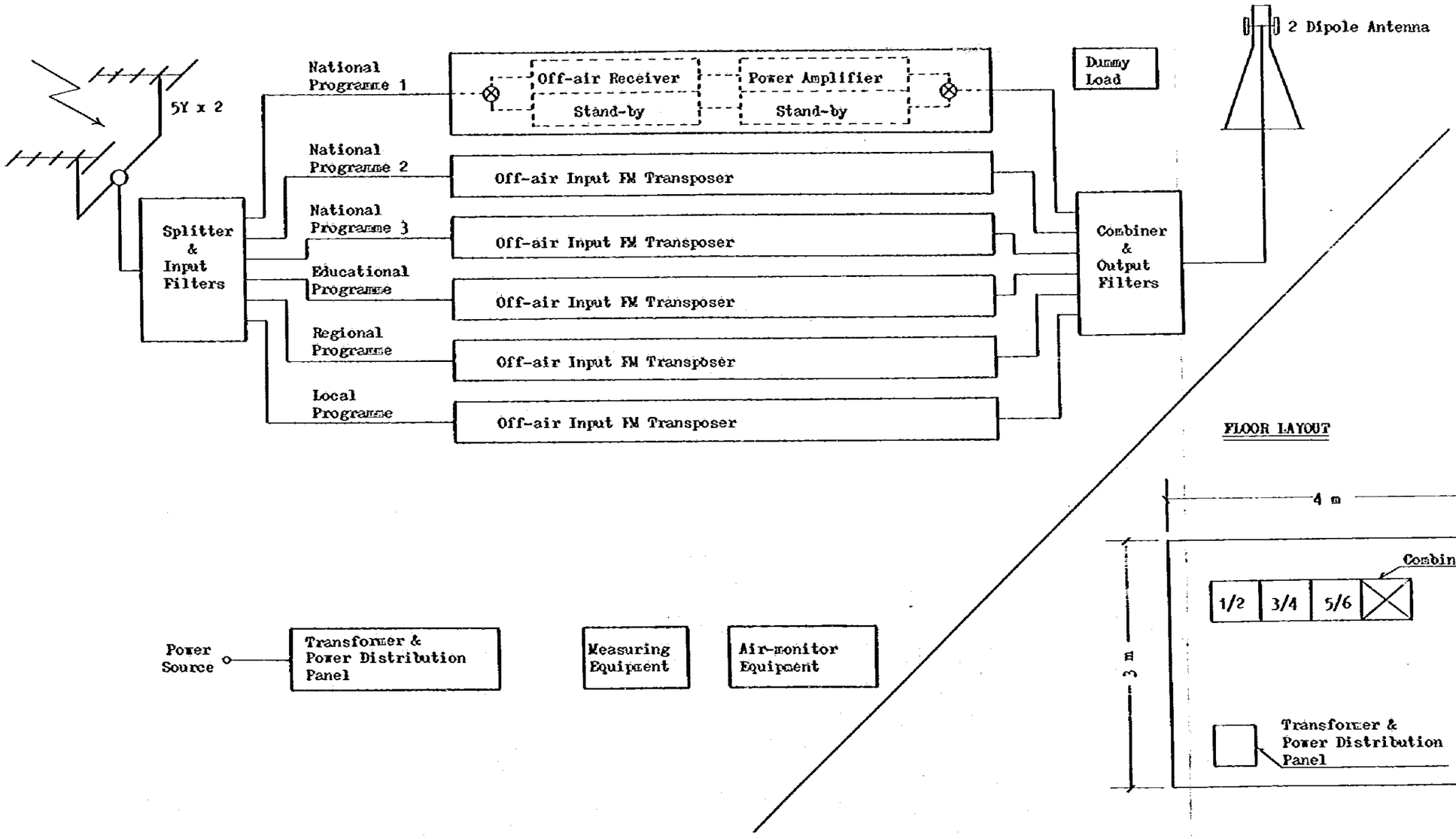
Table C-4 Station Building and Tower

Proposed Site	Altitude (ft)	Building		Tower			
		Number of Stories	Total Floor Area (m^2)	Tower Height (m)	Antenna Mounted (stage) (dipole)	(array)	
Bt. Genting Kundor	2,934	1	15.96	30	2D	2	2
Bt. Seluang	2,443	1	15.96	30	2D	2	2
Bt. Pilong	2,344	1	15.96	30	2D	2	3
Bt. Y	4,120	1	15.96	30	2D	2	2
Bt. Tali Angin	2,583	1	15.96	30	2D	2	1
Bt. Batu Papan	3,820	1	15.96	30	2D	2	3
Bt. X	2,523	1	15.96	30	2D	2	2
Bt. Ulu Beruit	1,322	1	15.96	30	2D	2	3
Bt. Istana	656	Common use of TV Building and Tower			2D	2	2
Bt. Sembilan	1,642	1	25.00	30	2D	2	2



ESTIMATED SERVICE AREA OF THE PROJECT

SCHEMATIC DIAGRAM



FLOOR LAYOUT

Fig. C-1 SCHEMATIC DIAGRAM AND FLOOR LAYOUT OF 3W, 5W & 10W TRANSPOSER STATION

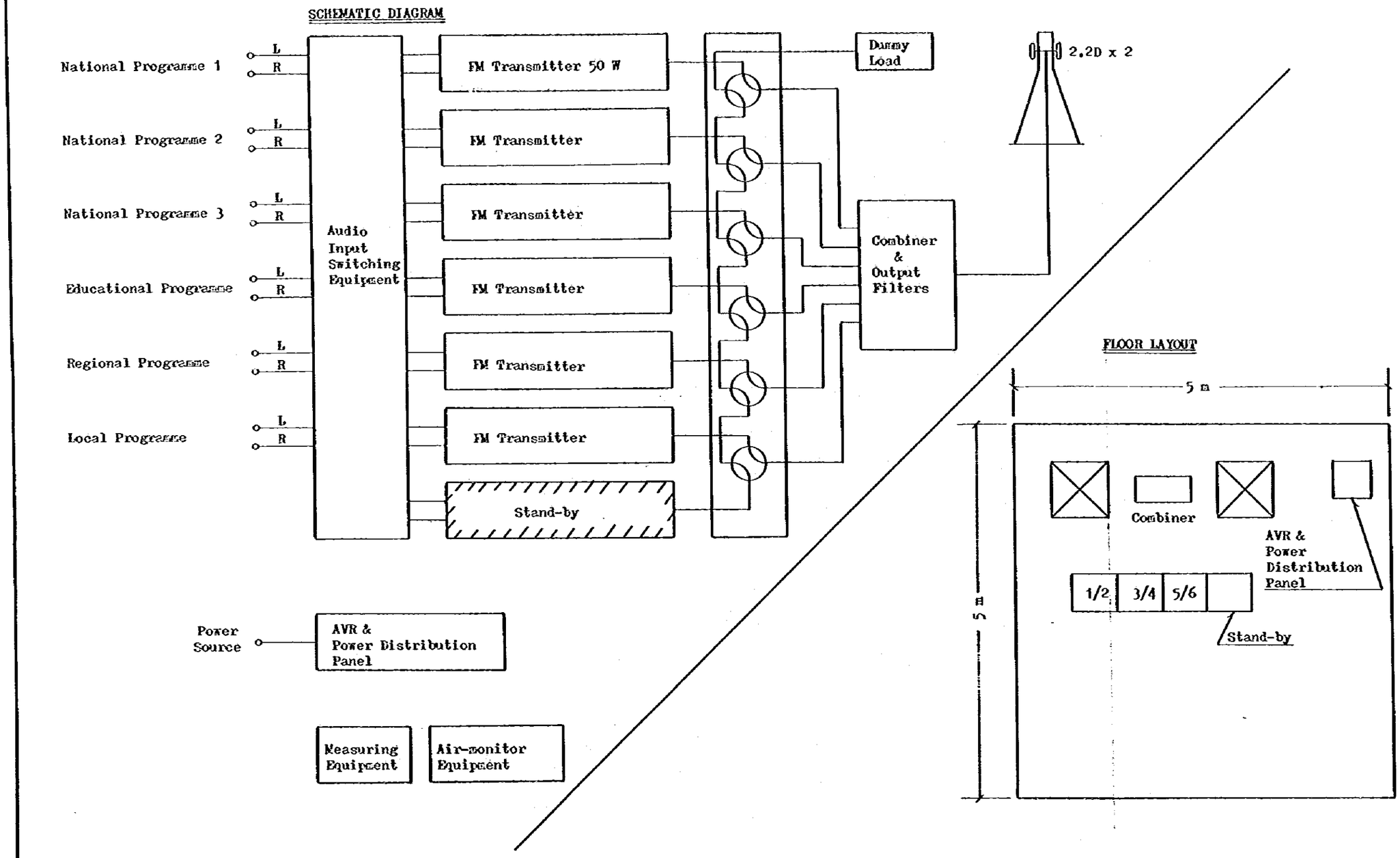
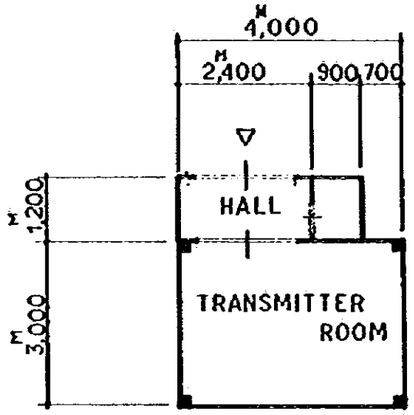
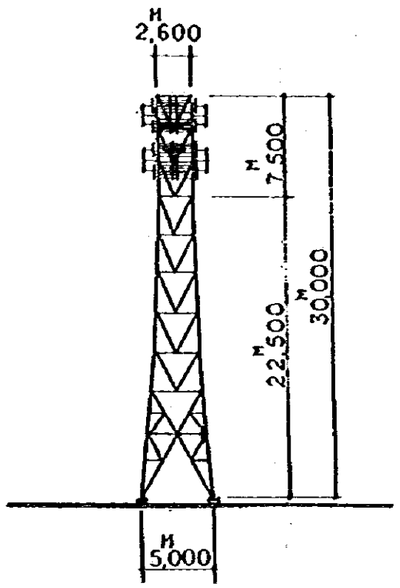


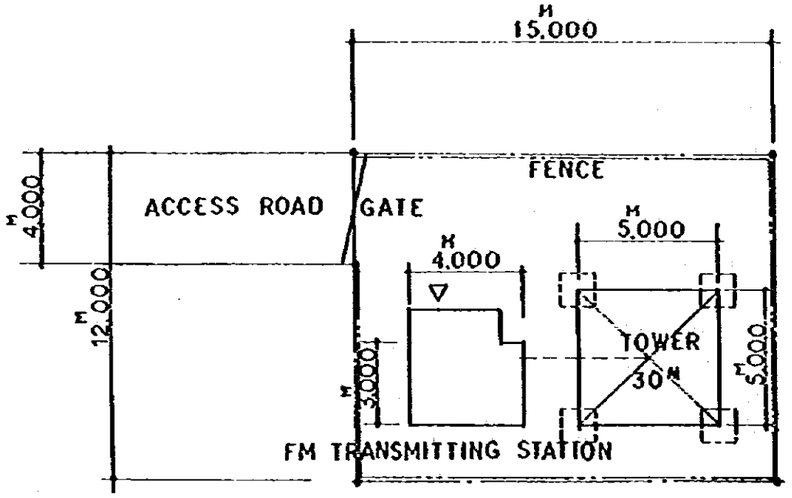
Fig. C-2 SCHEMATIC DIAGRAM AND FLOOR LAYOUT OF BT. SEMBILAN STATION



FLOOR PLAN S : 1/100



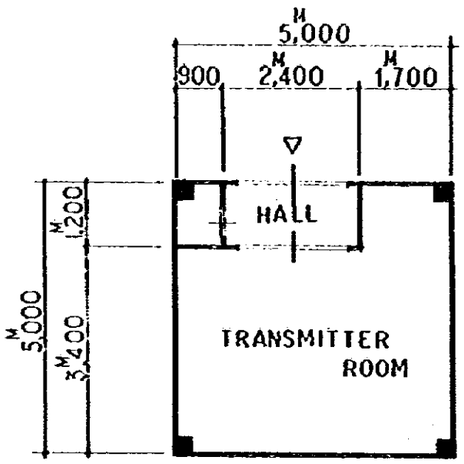
30M TOWER S : 1/400



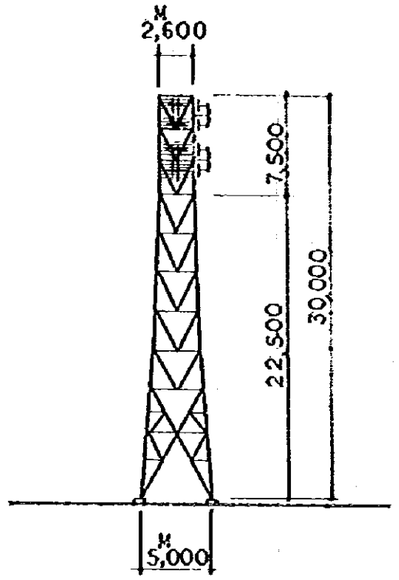
SITE PLAN S : 1/200

Fig. C-3 FLOOR PLAN, SITE PLAN & OUTLINE OF TOWER

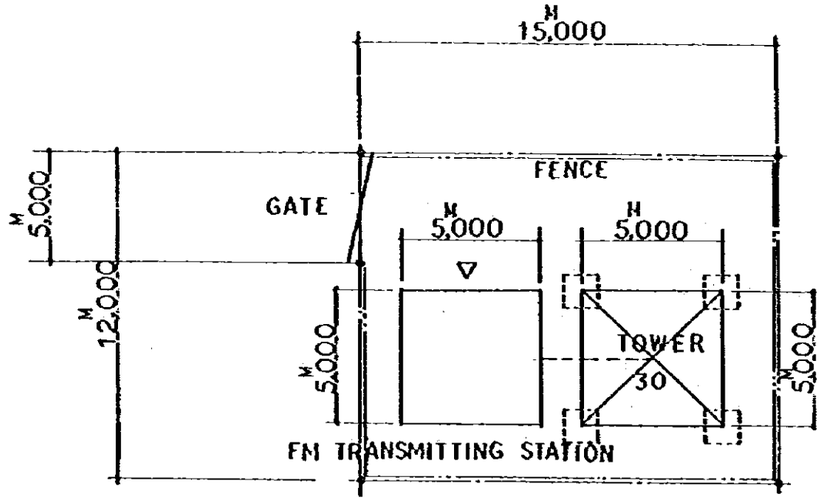
(BT. GENTING KUNDOR, BT. SELUANG, G. PILONG, BT. Y,
BT. TALI ANGIN, BT. BATU PAPAN, BT. X, BT. ULU BERUIT)



FLOOR PLAN S : 1/100



30M TOWER S : 1/400



SITE PLAN S : 1/200

Fig. C-4 FLOOR PLAN, SITE PLAN & OUTLINE OF TOWER
(BT. SEMBILAN)