No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
EXPANSION
OF
RADIO BROADCASTING COVERAGE
IN THE REMOTE AREA
IN
THE REPUBLIC OF INDONESIA

MARCH, 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

GM
JR
06-027

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for Expansion of Radio Broadcasting Coverage in the Remote Area and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team from November 27 to December 23, 2005.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Indonesia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the teams.

March 2006

Seiji Kojima
Vice President
Japan International Cooperation Agency

March, 2006

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Expansion of Radio Broadcasting Coverage in the Remote Area in the Republic of Indonesia.

This study was conducted by NHK Integrated Technology Inc., under a contract to JICA, during the period from November, 2005 to March, 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

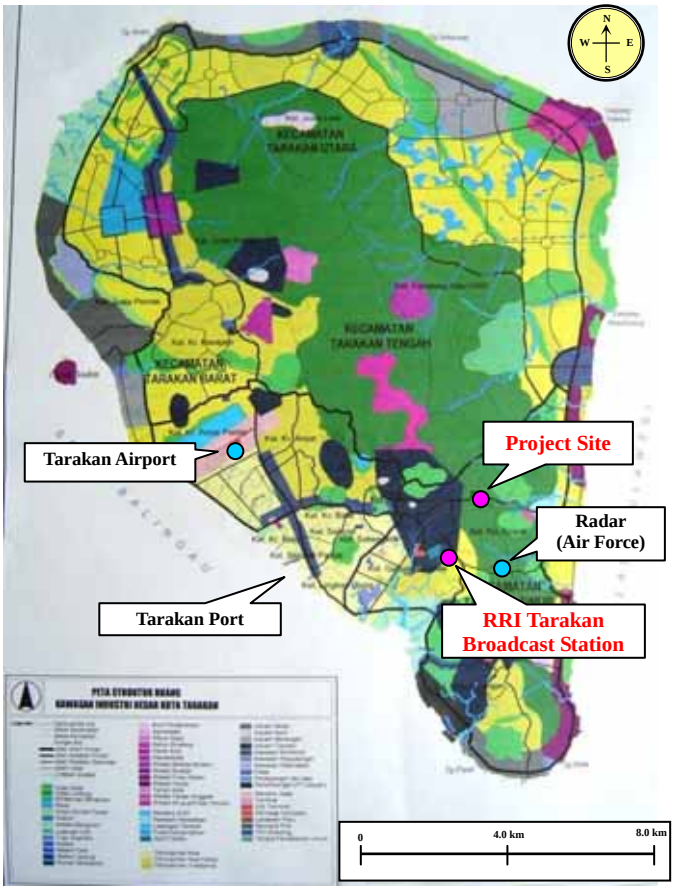
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

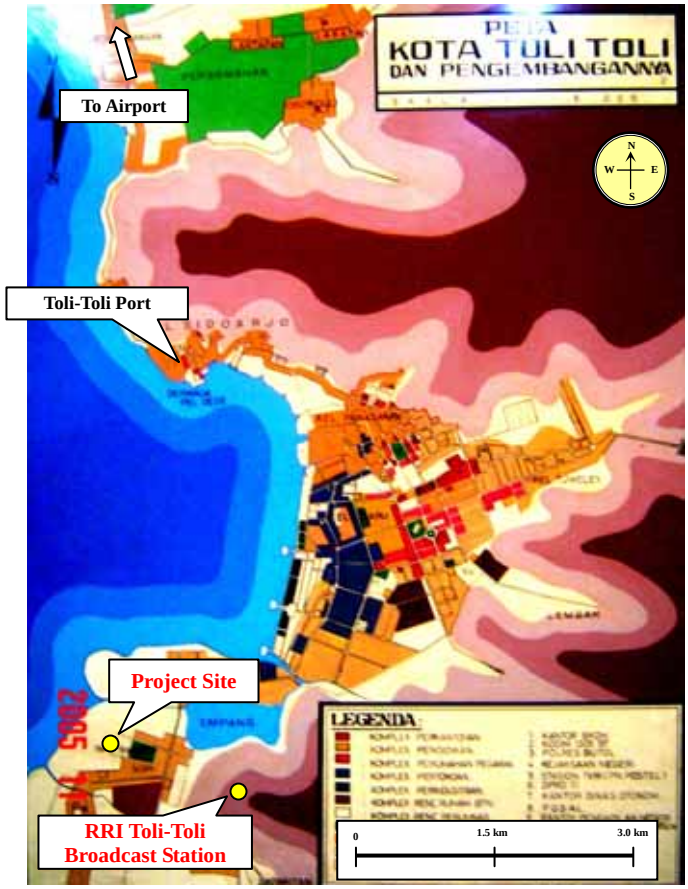
Akira Nagase
Chief Consultant,
Basic design study team on
the Project for Expansion of
Radio Broadcasting Coverage
in the Remote Area
NHK Integrated Technology Inc.

Project Sites

RRI Tarakan MW Transmitting Station



RRI Toli-Toli MW Transmitting Station



Radio Republic Indonesia (RRI)　Braoadcast Station

List of Figures & Tables

Abbreviations

AC	:	Alternating Current
A/C	:	Air Conditioner
A/D	:	Analog/Digital
ADA	:	Audio Distribution Amplifier
AES	:	Audio Engineering Society
AM	:	Amplitude Modulation
ANT	:	Antenna
ATT	:	Attenuator
ATU	:	Antenna Tuning Unit
AVC	:	Automatic Voltage Control
AVR	:	Automatic Voltage Regulator
BAPPENAS	:	National Development Planning Agency
BPF	:	Band Pass Filter
CH	:	Channel
COAX	:	Coaxial
CoS	:	Changeover Switch
CTR	:	Cassette Tape Recorder
DAW	:	Digital Audio Workstation
DC	:	Direct Current
DHY	:	Dehydrator
D/L	:	Dummy Load
E/G	:	Engine Generator
EIAJ	:	Standards of Electric Industries Association of Japan
EX	:	Exciter
F	:	Fuse
FL	:	Fluorescent Light
FM	:	Frequency Modulation
GBHN	:	Garis-Garis Baser Haluan Negara
HPF	:	High Pass Filter
HY	:	Telephone Hybrid
Hz	:	Hertz
IEC	:	International Electrotechnical Commission
ISO	:	Industrial Organization for Standardization
ITU-R	:	International Telecommunication Union-Radio Communication Sector
IVR	:	Induction Voltage Regulator
JIS	:	Japan Industrial Standards
KfW	:	Kreditanstalt fur Wiederaubau
KOMINFO	:	Ministry of Communication & Information Technology
LIM	:	Limiting Amplifier
LPF	:	Low Pass Filter
MC	:	Magnet Contactor
MDF	:	Main Distribution Board
MF	:	Medium Wave Frequency
MIC	:	Microphone
MIX	:	Mixer
MOD	:	Modulation
MONI	:	Monitor
N	:	Neutral
NFB	:	No Fuse Breaker
OB Light	:	Obstruction Light
OECD	:	Organization for Economic Cooperation and Development
OMI	:	Omni-directional
OP	:	Open Phase
OS	:	Oscillator
OSC	:	Oscilloscope
OV	:	Over Voltage
P	:	Phase
PA	:	Power Amplifier
PDB	:	Power Distribution Board

PIE	:	Program Input & Monitoring Equipment
PROPENAS	:	Program Pembagunan Nasional (2000 ~ 2004)
PS	:	Power Supply
REPELITA	:	Rencana Pembanguan Lima Tahun
REPENAS	:	Rencana Pembangunan Nasional (2004 ~ 2009)
RF	:	Radio Frequency
RRI	:	Radio Republic Indonesia
RX	:	Receiver
SP	:	Speaker
STL	:	Studio Transmitter Link
SW	:	Switcher
TH	:	Thermal Relay
TRPA	:	Transistor Power Amplifier
TVRI	:	Television Republic of Indonesia
TX	:	Transmitter
UPS	:	Uninterruptible Power Supply
UV	:	Under Voltage
V	:	Volt
VSWR	:	Voltage Standing Ratio
W	:	Wire

SUMMARY

The Republic of Indonesia (hereinafter refereed to as “Indonesia”) is the world’s largest archipelago country, with some 18,000 islands, large and small, stretching east-west over a distance of approximately 5,000 km and north-south over a distance of around 2,000 km. It has a population of about 215 million (as of 2003) and a total national territory of about 1.89 million km^2 (five times bigger than Japan). In view of the fact that Indonesia is a multiethnic, multilingual nation with a vast territory, the government of Indonesia sees radio broadcasting as a means of striving for peaceful national unity (promotion of wide use of the Indonesian language as the national language, rapid conveyance of information, etc.) and as a tool for purposes such as promotion of healthy life, dissemination of education and enhancing communication among its different ethnic groups and regions. In this situation, the government of Indonesia has been putting effort on dissemination of its policy and national principle, expansion of public relations regarding such as the National Development Plan. As printed media towards the multiethnic population of more than 200 million people and towards the vast land faced an extreme difficulty, the government puts utilization of broadcasting media as one of its basic policies.

Broadcasting in Indonesia had been managed and supervised by the Department of Radio Television Film (RTF) under the former Ministry of Information (DEPPEN). At the time of inauguration of the Wahid government in October 1999, the former Ministry of Information was abolished together with the RTF as considered that “the information shall be managed not by the government but by the people”. Consequently, the broadcasting administration service that had been conducted by the former Ministry of Information became ineffective, resulted in significant decline in the quality of broadcasting services such as by frequent false reports by broadcasters as well as by the wave interference due to upsurge of private broadcasting stations. Later in 2002, the Law on Broadcast (Law No.32/2002 on Broadcast) was enacted , containing the rules such as on ① freedom of press/expression, ② the role of broadcasting, ③ responsibility of public business, ④ protection from human right violation by the press, and ⑤ establishment of press regulation agency. Now under this Law on Broadcast, only the public broadcasting institutions of Radio Republic Indonesia (radio broadcast service) and Television Republic Indonesia (TV broadcast service) are permitted to do services on the national network, while commercial broadcasters’ services are limited only in the specific regions.

Radio Republic Indonesia (RRI) was established in 1945 as the state owned radio broadcasting station and became a corporation (PERJAN) in August of 2000. Later in October of 2005, RRI has stipulated as the public broadcast institution (LPP) under the Government Regulation No.11 and No.12.

At the time of establishment, RRI was limited to the island of Java, with a central broadcasting station in Jakarta and branch stations at Bandung, Purwokerto, Yogyakarta, Surakarta, Sumarang, Malang and Surabaya. Subsequently, efforts have been put into expanding the area of reception of medium-wave (MW) radio broadcasts so as to be able to provide stable broadcasting service to all corners of Indonesia as a public broadcasting operator. Since 1990, RRI has continued to make efforts to expand its broadcasting service areas through procurement of some 100 new MW broadcast transmitters with its own funds or with loans (including yen loans). Presently 53 of the 58 radio stations organized nationwide (not including international radio stations) carry out MW radio broadcasting service, and about 90% of the country's population (i.e. about 193 million people) and 80% of the national territory have reception thereof.

In Indonesia's national development plan formulated in November 2000 (PROPENAS 2000-2004), five cross-cutting issues are identified which are; ① establishment of democratic political system and maintenance of national unity, ② establishment of rule of law and good governance, ③ economic reconstruction and strengthening of the base for sustainable and fair development (reduction of poverty), ④ enhancement of the welfare of the people and creation of vigorous culture (development of education and science and technology) and ⑤ promotion of regional development (narrowing of interregional gap). Regarding information and communications and the mass media, the plan places emphasis on improvement of the quality of information services and establishes the following activity guiding principles:

i) Making efforts for equal furnishing of information to all classes of Indonesian society
ii) Reporting in such a way as to abide by reporting ethics and to observe the law and human rights, while recognizing freedom of reporting
iii) Improving the quality of information and communications in the different fields through research on and application of information and communications technology
iv) Working for improvement of the content of broadcasting and expansion of broadcasting service in remote areas

The purpose of those guiding principles is to increase the quantity of information available to the public, to avoid occurrence of distrust of the government by the people, and to eliminate the gap in opportunity to obtain information between urban and rural areas which jeopardizes national unity. Besides being conducive to narrowing of the interregional gap, equal access of all of the people of the country to information is also recognized as a means of promoting the country's development and eliminating poverty. In remote area of the country, broadcasting, particularly MW radio broadcasting which has reception anywhere with inexpensive radio receivers, plays a significant role. As a public broadcasting institution RRI is expected to carry out the task of "improving and expanding its MW

radio broadcasting network so as to make it possible for all of the people of the country to enjoy the benefit of radio broadcasting." Succeeding to PROPENAS, these active guiding principles are placed in the mid-term national development plan (REPENAS 2004-2009) issued on January 2005.

For the sake of achieving "provision of radio broadcasting service to the whole national population", as called for in the national development plan, RRI recognizes the urgent need to build a nationwide broadcasting network based primarily on improvement and strengthening of MW radio broadcasting facilities and is therefore in the process of providing 3 of its 5 radio stations that do not have them with MW radio broadcasting facilities. FM broadcasting services are provided in the Toli-Toli and Tarakan areas, both located in remote, poverty-stricken regions but their covering areas are limited because of low power output. Accordingly as things stand, the residents of those regions are able to obtain hardly any Indonesian information since they can receive only broadcasts from neighboring Malaysia and the Philippines, which has given rise to the problem of information gap within the regions. However, in view of budget limitations, it has been difficult to make progress in that regard concerning the other two broadcasting stations that have been left behind. In order to remedy that situation the Government of Indonesia has requested the Government of Japan to implement grant aid project for improving those two MW radio broadcasting stations, one in Toli-Toli Regency in Central Sulawesi Province and the other at Tarakan Regency in East Kalimantan Province, with MW radio broadcasting equipment.

In September 2005, the Government of Japan sent the Preliminary Study Team. The study team surveyed and confirmed the current status of frequency allocation and the project sites. Based on the results of this preliminary study, the Basic Design Study Team on "The Project for Expansion of Radio Broadcasting Coverage in the Remote Area in the Republic of Indonesia (hereinafter referred to as "the Project") was sent to Indonesia over the period of 28 days from November 27, 2005 to December 24, 2005, to examine the relevance of the Project and to draw up the necessary and most appropriate basic design for the Project. The study team reviewed and discussed the content of the request with the relevant parties from the Indonesian side, and conducted the field survey at the project sites.

Since in the discussions with RRI, additional request was made by RRI for the equipment needed for a fully digitalized studio, the study team reviewed and made priorities in the equipment the Indonesian side requested from the viewpoint of whether or not and to what extent it was necessary after having closely examined the whole content of the request, including those additions, and having identified problems in the situation as it now stands.

After returning to Japan, while taking the contents of the request into consideration, the study team examined the optimum range, scale and quantity of equipment from the view points of operation and management capability of RRI, the relevance, the need and socio economical effect of the Project, and formulated the most appropriate content and the optimal equipment layout. The study team

summed up the content in the Draft Basic Design Report, and revisited Indonesia for 7 days from March 12 to March 18, 2006 to explain to the relevant parties from the Indonesian side and to make the final confirmation of the project content through discussion.

The aim of this Project is to furnish the Toli-Toli broadcasting station and the Tarakan broadcasting station, the only two remaining RRI broadcast stations without MW radio broadcasting facilities, with MW radio broadcasting system so as to be able to start MW radio broadcasting service in the Toli-Toli Regency area of Central Sulawesi Province and the Tarakan Regency area of East Kalimantan Province and thereby attain the goal set forth in the national development plan "to make it possible for all of the people of the county to enjoy the benefit of radio broadcasting through expansion of MW radio broadcasting network."

Based on the premise of using the existing equipment, the study on what would be required as minimum for the MW radio broadcasting systems results in procuring the following equipment in the Project.

Equipment for Toli-Toli and Tarakan Broadcasting Station

Equipment	Quantity	Purpose of use	Place to be installed
10kW MW Broadcast Transmitter	2 sets	Transmission of MW signal	MW Transmitting Station
10kW Dummy Load	2 sets	Apparatus for adjustment of the 10kW MW broadcast transmitter	MW Transmitting Station
10kW Lightning Protector	2 sets	Included in the 10kW MW broadcast transmitter	MW Transmitting Station
3-port U-Link Panel	2 sets	Switching of MW broadcast transmitter output between antenna and dummy load	MW Transmitting Station
MW Transmitting Antenna	2 sets	Radiation of MW radio wave	MW Transmitting Station
Program Input and Monitoring Equipment (PIE)	2 sets	Monitoring of program signal and adjustment of signal level	MW Transmitting Station
45kVA Isolation Transformer	2 sets	Protection of the equipment from lightning surge	MW Transmitting Station
40kVA Automatic Voltage Regulator (AVR)	2 sets	Stable supply of electric power	MW Transmitting Station
Studio-Transmitter Link (STL)	2 sets	Sending the program signal to the MW transmitting station	Transmitter Part: Existing Broadcast Station Receiver Part: MW Transmitting Station
16CH Audio Mixer for Program Transmission	2 sets	Switching between local programs and programs from Jakarta and sending the program signal to the STL transmitter	Existing Broadcast Station
VHF Communication Link	2 sets	Liaison between transmitting station and existing broadcasting station	Fixed Station: Existing Broadcast Station Mobile Station: MW Transmitting Station
Cooling Equipment	2 sets	Cooling of the procured equipment	MW Transmitting Station

Equipment	Quantity	Purpose of use	Place to be installed
Measuring Equipment	2 sets	Equipment maintenance	MW Transmitting Station
Spare Parts	2 sets	Parts/modules for trouble shooting of the equipment	
Installation Materials	2 sets	Power cables, signal cables for the installation of the equipment	

Scope of works for which the Indonesian side is responsible in the Project are as below.

① Obtaining of the MW broadcasting frequencies for Toli-Toli and Tarakan MW Transmitting Stations

② Preparation of the land of the sites for the Toli-Toli and Tarakan MW Transmitting Stations

③ Construction of a transmitter building, a power supply building (including generator), an STL tower, etc. at the Toli-Toli and Tarakan MW transmitting stations

④ Obtaining of the construction permits for the above buildings and MW transmitting antenna

In case this Project is implemented under Japan's grant aid cooperation, the implementation schedule would totally be 17 months long including 4 months for detailed design and 13 months of procurement and installation of the equipment. The total project cost is estimated 520 million Japanese yen (Approx. 354 million Japanese yen to be borne by Japanese side and approx. 13.8 billion Rp equivalent to about 166 million Japanese yen to be borne by Indonesian side.).

The implementation of this Project will be supervised by the Ministry of Communication of Information Technology (KOMINFO) and the project implementing agency will be RRI. RRI's Toli-Toli and the Tarakan broadcasting stations will be responsible for the operation and maintenance after the Project implemented. As the scope of works for which the Indonesian side is responsible in this Project, Toli-Toli and Tarakan regional governments have already obtained and been preparing the land of the project sites respectively. Construction cost of MW transmitting station buildings has already applied to the National Development Planning Agency (BAPPENAS) in June 2005, and would be earmarked from the budget of the government project (DIPA) in the fiscal year 2006. Frequencies for MW broadcasting have also been applied to International Telecommunication Union (ITU) and notified to all countries through ITU circular on February 7, 2006. In addition, the project implementation system has already been established, and there is no problem either in operation or maintenance cost after the completion of this Project.

The effect that can be expected of implementation of this Project is as follows:

(1) Direct Effect

1) Expansion of MW Radio Broadcasting Service

MW radio broadcasting service will be started in the Toli-Toli Regency area of Central

Sulawesi Province and in the Tarakan Regency area of East Kalimantan Province, by which residents of 670,000 (250,000 and 420,000 in respective areas) will be able to receive MW radio broadcasting service. With that, all 58 RRI broadcasting stations will be equipped with MW radio broadcasting facilities, and all of them will be providing MW radio broadcasting service.

2) Increase in Broadcasting Programs

Thanks to combination of the MW radio broadcasting facilities that will be procured in this Project and the FM transmitting equipment that will be provided on the basis of aid provided by the German state-owned development bank (KfW), the residents of the areas in question will have more diversified obtaining of information as a result of increase of broadcasted programs (18 hours/day) following two systems.

- 10kW MW transmitter: broadcast of local programs and nationwide news programs form Jakarta (Toli-Toli and Tarakan)
- FM transmitter: broadcast of programs from Palu broadcasting station (Toli-Toli)
  broadcast of program form Samarinda broadcasting station (Tarakan)

(2) Indirect Effect

1) With MW radio broadcasting service, the residents of the Toli-Toli and Tarakan areas will have more opportunity to obtain Indonesian information, and that will reduce the information gap in Indonesia between different regions. In addition, the living environment will be improved through easier access to various useful information as to health, sanitation, education, agriculture, social and public welfare as well as cultural and international information. Accordingly, it can be expected to favor industrial and other economic activity and to help reduce poverty.

2) With provision of emergency systemized MW radio broadcasting equipment, it will increase the stability of broadcasting. Immediate conveyance of emergency information on natural disasters, accidents and incidents, riots, etc. can be expected to reduce casualties.

CONTENTS

Appendices

Chapter 1 Background of the Project

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1-1 Background of the Project

The Republic of Indonesia (hereinafter referred to as “Indonesia”) is the world's largest archipelago country, with some 18,000 islands, large and small, stretching east-west over a distance of approximately 5,000km and north-south over a distance of around 2,000km. It has a population of about 215 million (as of 2003) and a total national territory of about 1.89 million km^2. In view of the fact that Indonesia is a multiethnic, multilingual nation with a vast territory, radio broadcasting plays a very big role as a means of striving for peaceful national unity (promotion of wide use of the Indonesian language as the national language, rapid conveyance of information, etc.) and as a tool for purposes such as promotion of healthy life, dissemination of education and enhancing communication among its different ethnic groups and regions.

Radio Republic Indonesia (RRI) was established in 1945 as the state-owned radio broadcasting station and became a corporation (PERJAN) in August of 2000. At the time of establishment, RRI was limited to the island of Java, with a central broadcasting station in Jakarta and branch stations at Bandung, Purwokerto, Yogyakarta, Surakarta, Sumarang, Malang and Surabaya. Subsequently, efforts have been put into expanding the area of reception of medium-wave (MW) radio broadcasts so as to be able to provide stable broadcasting service to all corners of Indonesia as a public broadcasting operator. Since 1990, RRI has continued to make efforts to expand its service areas through procurement of approximately 100 new MW transmitters with its own funds or with loans (including yen loans). Presently 53 of the 58 radio stations organized nationwide (not including international radio stations) carry out MW broadcasting, and about 90% of the country's population (i.e. about 193 million people) and 80% of the national territory have reception thereof.

In remote area of the country, broadcasting, particularly MW radio broadcasting which has reception anywhere with inexpensive radio receivers, plays a significant role. In Indonesia’s national development plan formulated in November 2000 (PROPENAS 2000-2004), five cross-cutting issues are identified which are; ① establishment of democratic political system and maintenance of national unity, ② establishment of rule of law and good governance, ③ economic reconstruction and strengthening of the base for sustainable and fair development, ④ enhancement of the welfare of the people and creation of vigorous culture and ⑤ promotion of regional development, and improvement and expansion of MW radio broadcasting is also mentioned as one way of reducing interregional gaps. For the sake of achieving “provision of radio broadcasting service to the whole national population”, as called for in PROPENAS, RRI recognizes the urgent need to build a nationwide broadcasting network based primarily on improvement and strengthening of MW radio

broadcasting facilities and is therefore in the process of providing 3 of its 5 radio stations that do not have them with MW broadcasting facilities. FM broadcasting services are provided in the Toli-Toli and Tarakan areas, both located in remote, poverty-stricken regions but their covering areas are limited because of low power output. Accordingly as things stand, the residents of those regions are able to obtain hardly any Indonesian information since they can receive only broadcasts from neighboring Malaysia and the Philippines, which has given rise to the problem of information gap within the regions. However, in view of budget limitations no progress has been made in that regard concerning the other two broadcasting stations that have been left behind.

In order to remedy that situation the Government of Indonesia has requested the Government of Japan to implement the Project for Expansion of Radio Broadcasting Coverage in the Remote Area (hereinafter referred to as "the Project") for providing those two RRI broadcasting stations, one in Toli-Toli Regency in Central Sulawesi Province and the other at Tarakan Regency in East Kalimantan Province, with MW radio broadcasting system by Japan's grant aid assistance.

1-2 Contents of the Project

In view of the fact that after confirmation of the request for this Project in the minutes at the time of the preliminary study there was an additional request concerning mainly studio equipment, it was necessary to confirm the final content of the request. Since in the discussions with RRI additional request was made by RRI for the equipment needed for a fully digitalized studio, the study team reviewed each equipment item from the viewpoint of whether or not and to what extent it was necessary after having closely examined the whole content of the request, including those additions, and having identified problems in the situation as it now stands. As a result of such review, agreement was reached that the additions concerning studio equipment should be eliminated from the content of the request in view of the fact that the existing studio equipment could continue to be used and the fact that studio full digitalization was not necessary for attainment of the purpose of this Project – provision for MW radio broadcasting service to the residents of the Toli-Toli and Tarakan Regency areas.

The following table presents the final content of the request from Indonesian side as the minimally required equipment for attainment of the purpose of the Project, the priorities thereof and change from the original request.

Items	Equipment	Quantity	Priority	Comparison with Original Request
1.	10kW MW Broadcast Transmitter	2 sets	A	Not Changed
2.	10kW Dummy Load	2 sets	A	Not Changed

Items	Equipment	Quantity	Priority	Comparison with Original Request
3.	10kW Lightning Protector	2 sets	A	Not Changed
4.	10kW Coaxial Switch	2 sets	A	Not Changed
5.	Isolation and Lightning Protection Transformer	2 sets	A	Not Changed
6.	Automatic Voltage Regulator	2 sets	A	Not Changed
7.	Program Input and Monitoring Equipment (PIE)	2 sets	A	Not Changed
8.	MW transmitting Antenna System	2 sets	A	Not Changed
9.	Studio-Transmitter Link (STL)	2 sets	A	Not Changed
10.	Essential Spare Parts	2 sets	A	Not Changed
11.	Consumable Spare Parts	2 sets	A	Not Changed
12.	Installation Materials	2 sets	A	Not Changed
13.	Instruction Manual and Documentation (prepared in English)	2 sets	A	Not Changed
14.	Measuring Equipment	2 sets	A	Not Changed
15.	Standard Accessories	2 sets	A	Not Changed
16.	Digital Audio Mixer for Program Transmission	2 sets	B	Added Newly
17.	VHF Communication Link (154.5MHz)	2 sets	B	Added Newly

A: First Priority to include in the Project

B: Second Priority to include in the Project

As a result of surveying of the equipment at existing 10kW MW Transmitting Station (Palu broadcasting stations, etc.) and the conclusions reached in discussions with RRI in the site survey, confirmation was made of the fact that the requested MW transmitting equipment (items 1-15) constitutes the minimally necessary equipment to carry out MW radio broadcasting service and that therefore the content of the request was appropriate.

In the survey of the existing equipment at the Toli-Toli and Tarakan broadcasting stations the study team confirmed that their present studio equipment, consisting of both professional and consumer equipment, is adequate for their program production needs, particularly insomuch as it is still relatively new, having been acquired only two years ago. However, as those stations have only one program transmission audio mixer to switch between programs from Jakarta and locally produced programs and it has only one output, making it impossible to use it for both MW broadcasting and FM broadcasting, a digital audio mixer (item 16) for program transmission of MW broadcasting has been added to the content of the request.

It has also been confirmed that a VHF communication link (item 17), which was overlooked at the time of drawing up of the list in spite of the fact that RRI considers it indispensable as dedicated equipment for smooth liaison between the existing broadcasting stations and the MW transmitting stations, is to be added to the content of the request.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 National Development Objectives and Project Goals

The national development plan (PROPENAS 2000-2004) formulated in November 2000 and the mid-term national development plan (REPENAS 2004-2009) issued on January 2005 are the higher-order plans under which this Project lies. PROPENAS sets forth five cross-cutting issues: ① establishment of a democratic political system and maintenance of national unity, ② establishment of rule of law and good governance, ③ strengthening of economic reconstruction and a sustained and equitable development foundation (reduction of poverty), ④ welfare of the people and creation of cultural vitality (development of education and science and technology) and ⑤ promotion of regional development (narrowing of interregional gap). Regarding information and communications and the mass media, the plan places emphasis on improvement of the quality of information services and establishes the following activity guiding principles:

i) Making efforts for equal furnishing of information to all classes of Indonesian society
ii) Reporting in such a way as to abide by reporting ethics and to observe the law and human rights while recognizing freedom of reporting
iii) Improving the quality of information and communications in the different fields through research on and application of information and communications technology
iv) Working for improvement of the content of broadcasting and expansion of broadcasting service in remote areas

The purpose of those guiding principles is to increase the quantity of information available to the public, to avoid occurrence of distrust of the government by the people, and to eliminate the gap in opportunity to obtain information between urban and rural areas which jeopardizes national unity. Besides being conducive to narrowing of the interregional gap, equal access of all of the people of the country to information is also recognized as a means of promoting the country's development and eliminating poverty. As a public broadcasting institution RRI is expected to carry out the task of "improving and expanding its MW radio broadcasting facilities so as to make it possible for all of the people of the country to enjoy the benefit of radio broadcasting." Succeeding to PROPENAS, above activity guiding principles are placed in REPENAS.

The aim of this Project is to furnish the Toli-Toli broadcasting station and the Tarakan broadcasting station, the only two remaining RRI stations without MW radio broadcasting facilities, with MW radio broadcasting systems so as to be able to start MW radio broadcasting service in the

Toli-Toli Regency area of Central Sulawesi Province and the Tarakan Regency area of East Kalimantan Province and thereby attain the goal set forth in the national development plan "to make it possible for all of the people of the country to enjoy the benefit of radio broadcasting through expansion of MW radio broadcasting network." Furthermore, in the Project there is to be implementation of technical guidance for appropriate operation of the procured equipment as well as assigning of the necessary technical personnel for appropriate operation and maintenance and securing of the needed operating budget. With implementation of all of that, it can be expected to become possible for MW radio broadcasting service to be accomplished by all 58 RRI broadcasting stations.

Coordination with the project now being implemented for provision of FM transmitter equipment on the basis of soft loan provided by the German state-owned development bank (KfW) will make it possible to broadcast the following 2 kinds of programs from the Toli-Toli and Tarakan broadcasting stations, which will mean a wider choice of programs for the residents of those areas and diversification of information obtained.

[Toli-Toli broadcasting station]

① Local programs and nationwide news programs from Jakarta (MW)

② Programs of RRI Palu broadcasting station (FM)

[Tarakan broadcasting station]

① Local programs and nationwide news programs from Jakarta (MW)

② Programs of RRI Samarinda broadcasting station (FM)

Besides boosting the national development plan goals of reduction of poverty, closing of the interregional gap, development of education, etc. that Indonesia is promoting, those outcome can be expected to lead to the indirect effect of enhancing RRI's operating and maintenance capabilities.

2-1-2 Outline of the Project

This Project is for procurement and installation of the minimally required equipment for MW radio broadcasting systems at RRI's Toli-Toli and Tarakan transmitting stations in order to attain the above-mentioned goals.

◆ Input

The Japanese side:

[Equipment]

Procurement and installation of the equipment for MW radio broadcasting system for the Tarakan and Toli-Toli broadcasting stations:

- 10kW MW Broadcast Transmitter : 2 sets
- MW Transmitting Antenna : 2 sets

- Program Input and Monitoring Equipment (PIE) : 2 sets
- Studio-Transmitter Link (STL) : 2 sets
- Isolation Transformer : 2 sets
- Automatic Voltage Regulator（AVR） : 2 sets
- Uninterruptible Power Supply（UPS） : 2 sets
- VHF Communication Link : 2 sets
- Audio Mixer for Program Transmission : 2 sets
- Measuring Equipment : 2 sets
- Spare Parts : 2 sets
- Installation Material : 2 sets

[Human resources]

Technical personnel to provide initial operation guidance for the procured equipment

The Indonesian side:

Obtaining MW broadcasting frequencies for the Toli-Toli and Tarakan MW transmitting stations

[Facilities]

- Preparation of the sites for the Toli-Toli and Tarakan MW transmitting stations
- Construction of a MW transmitter building (including incidental facilities), a power supply building (including an emergency generator), an STL tower, etc. at the Toli-Toli and Tarakan MW transmitting stations

[Human resources]

- Providing the operating and maintenance personnel for the Toli-Toli and Tarakan MW transmitting stations

◆ Activities

- Training of the operating and maintenance personnel of the Toli-Toli and Tarakan MW transmitting stations
- Securing of the operating and maintenance budgets of the Toli-Toli and Tarakan MW transmitting stations

That can be expected to bear the following outputs:

◆ Output

- Conduct the MW radio broadcasting service at all 58 RRI broadcasting stations
- Increasing the population covered by RRI MW radio broadcasting service
- Reduction of broadcasting interruption time (realization of stable broadcasting)
- Increase in broadcasting programs

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy of Equipment Design

1) This Project is for the purpose of providing support in the technical field to the RRI's radio broadcasting activities in remote areas in order to help it fulfill its mission of "making it possible for all Indonesians to have access to information through radio broadcasting," the project scale of such assistance being as follows:

- Procurement of the minimum equipment necessary for MW radio broadcasting system at Toli-Toli broadcasting station
- Procurement of the minimum equipment necessary for MW radio broadcasting system at Tarakan broadcasting station

2) Equipment design that makes for efficient MW radio broadcasting systems for the sake of stable and continuous furnishing of broadcasting service (126 hours a week of broadcasting) at the Toli-Toli and Tarakan broadcasting stations from program production to radio wave transmission.

3) Adopting systems based on those of the existing RRI broadcasting stations operating 10kW MW broadcast transmitters (the Palu broadcasting station and others).

4) According to function and performance, the equipment used in broadcasting stations is generally classified into three grades: equipment designed specifically for broadcasting stations, professional equipment and consumer equipment. In the past most of the equipment procured for broadcasting stations was equipment designed specifically for broadcasting stations, but along with the progress in digital technology that has been seen in recent years professional equipment that is entirely adequate for use at broadcasting stations has come into wider use. In this Project, too, the grade of the equipment will be set according to purpose of use. However, the equipment relating to the MW broadcast transmitters will be mainly broadcasting specifications, including backup function, so as to be able to ensure stable broadcasting with minimization of interruptions. Furthermore, as far as possible use of the existing equipment that can still be used will be continued, with new procurement of only the items and quantities of equipment minimally necessary for formulating the MW radio broadcasting systems.

5) Selection of equipment for which it will be possible for RRI to procure spare parts on its own and selection of the same types of equipment for both broadcasting stations so that the spare parts for it can be used by either of them.

(2) MW Frequencies to Be Used

The signal interference situation (as based on field intensity measurement surveys) regarding the MW frequencies that have been applied for with the International Telecommunication Union (ITU) for use by the Toli-Toli and Tarakan MW transmitting stations is as follows:

Area	Frequencies applied for	Potential electric field intensity	Interference from	Usability
Toli-Toli	1287kHz	60dB	Philippines	No
	1377kHz	30dB	Noise	Yes
Tarakan	1350kHz	33dB	Philippines	Yes

Interfering signals have been confirmed for all of those frequencies, but the recommendation of the radio division of the International Telecommunication Union (ITU-R) stipulates that the frequency can be used if the interference protection ratio (the difference between the intensity of the signal transmitted by the Toli-Toli or Tarakan MW transmitting station (the desired signal) and the intensity of the other, interfering signal (the undesired signal)) is at least 26dB. The interference protection ratio of each frequency is calculated as follows:

- 1287kHz:
  Field intensity within the broadcasting service area of 60dB for the desired signal and 60dB for the undesired signal, for a difference of 0dB (unusable)
- 1377kHz:
  Field intensity within the broadcasting service area of 60dB for the desired signal and 30dB for the undesired signal, for a difference of 30dB (usable)
- 1350kHz:
  Field intensity within the broadcasting service area of 60dB for the desired signal and 33dB for the undesired signal, for a difference of 27dB (usable)

Therefore the frequencies to be used at the two MW transmitting stations are as follows:

Toli-Toli MW transmitting station: 1377kHz
Tarakan MW transmitting station: 1350kHz

(3) Setting of Broadcasting Area (Service Area)

In accordance with the ITU-R recommendation (ITU-R BS. 703) the broadcasting service area, i.e. the area within which the broadcasts can be received with good hearing quality, will be set as that defined by the scope of the required field strength of 60dB μ V/m (1mV/m). However, in view of the fact that for ordinary radio receivers satisfactory reception is possible with a field intensity of about 40dB to 50dB μ V/m, the actual extent of satisfactory reception will be wider than the broadcasting service area as thus defined.

(4) Policy Regarding Natural Conditions

1) Coping With Rain

Both the Toli-Toli area and the Tarakan area have maximum rainfall in November and December. That being the case, that period should be avoided for inland transportation of the equipment and for the installation work. For the MW transmitting antenna foundation work and the radial earth work, both of which require a long period, particular consideration should be given in planning the work schedules to measures to cope with rainfall.

2) Temperature and Humidity

The high and low air temperature trends are similar for both the Toli-Toli area and the Tarakan area. They are both high-temperature areas the year round, the highest monthly mean high of about 35 °C coming in September and the lowest monthly mean low of about 23 °C coming in May. As for annual mean humidity, it is high the year round, above 80%, since both areas are located in coastal areas. That is particularly true of the Toli-Toli area, which has a record high humidity of 97%. That being the case, air conditioner to maintain constant indoor humidity and temperature will be provided so as to ensure a suitable operating environment for the MW broadcast transmitter, which is adversely affected by moisture and dust.

3) Lightning

The maximum number of days a month with thunderstorms in the Toli-Toli area in the past 5 years is 23. For the Tarakan area it is 22. The Indonesian Meteorological Agency classifies those two areas as areas with medium lightning risk level, the Toli-Toli area having an IKL (isokeraunic level: annual rate of occurrence of thunderstorms) of 44.7% and the Tarakan area an IKL of 34.5%. The procured equipment must therefore be designed to cope with lightning, which means that it must include equipment such as isolation

transformers.

4) Wind Speed

The maximum wind speeds experienced in the past 30 years are 26m/s in the Toli-Toli area and 29m/s in the Tarakan area. On the basis of that data the existing towers (65m) at both those broadcasting stations were designed for a maximum wind speed of 45m/s, and therefore that value will be used in the design of the MW transmitting antennas as well.

(5) Policy Concerning Use of Local Contractors

The Indonesian broadcasting equipment manufacturer LEN would be able to do the work of installation and adjustment of special apparatus such as the broadcasting equipment. However, it does not do installation work of products of other companies, only its own products. Up to now the different manufacturers have sent their own specialists to do the installation work for the broadcasting equipment that RRI has procured. That being the case, in this Project will have the equipment suppliers dispatched their own engineers for the work of installation of the broadcasting equipment that requires special work instead of using local subcontractors. However, for such work as the MW transmitting antenna foundation work and the radial earth laying work, local electricians will be employed as auxiliary personnel working under the supervision of specialists dispatched for that purpose.

(6) Policy Concerning RRI's Operation and Maintenance Capabilities

The technical personnel of the Toli-Toli and Tarakan broadcasting stations have high-level technical capacity acquired in training at the Radio Education and Training Centre (RETC) in operation and maintenance techniques for broadcasting equipment of the analog type. The fact that the existing equipment at those two broadcasting stations has been operated well speaks for that high technical level. But since most of the existing equipment is analog, they are not familiar with operation and maintenance of the equipment using digital technology to be procured in this Project. That being the case, specialists sent by the contractor will provide them with about 15 days of guidance in operation and maintenance of the procured equipment after the installation work.

(7) Policy Regarding Construction Work and Procurement Methods and the Period of the Construction Work

1) Policy Concerning Equipment Procurement Method

Existing MW broadcast transmitters of RRI have been supplied by Japanese (NEC, TOSHIBA), Indonesia (LEN), U.S. (HARRIS), British (BE) and Dutch (PHILIPS) manufacturers. Of them, only the Japanese manufacturers have supplied MW broadcast transmitters with a power output of above 10kW. Considering the fact that most of the solid type MW broadcast transmitters used by RRI are Japanese made and that it has absolute confidence in Japanese products as regards equipment stability and reliability, sureness of equipment supply and quality of after-sales service, the equipment to be procured in this Project will be Japanese made, in principle. However, Indonesian domestic regulations require the UHF frequency band for the Studio-Transmitter Link (STL) for sending broadcast programs from the existing broadcasting stations to the MW transmitting stations. In the aid up to now (yen loans) the UHF band STL has been Japanese products manufactured by HITACHI, NEC and others. But in the meantime in Japan the frequency band for STL has changed to SHF, which means that UHF band STL can no longer be used in Japan. That being the case, consideration will be given to procurement of the STL from third countries such as the U.S., Canada and European countries.

2) Policy Regarding Setting of the Period of Installation Work

The following points will be borne in mind in planning for setting the period of installation work:

① The time that it will take to manufacture and transport the equipment to be procured

The equipment for the MW radio broadcasting systems to be set up in this Project consists of MW transmitting antenna that takes about 4 months to manufacture and MW broadcast transmitter equipment that takes about 6 months to manufacture. Since the installation work, including the foundation work, for the MW transmitting antennas takes rather long time (3 months), it is necessary to have it done in advance of the installation work of the MW transmitter equipment. Two ships will therefore have to be used for separate transportation of the equipment, the first one for the MW transmitting antenna and the second one for the MW transmitter equipment.

② Installation Work Schedule

Considering the above, in the installation work of MW transmitting antenna, requiring foundation work, etc., which will take 3 months at each site, will be done first, followed by the installation work for the MW transmitter equipment, which will take 2

months at each site. The installation work will be done by two different teams, a MW transmitting antenna installation work team and a MW transmitter equipment installation work team. Furthermore, since the two project sites are located long distance from one another and since it would be uneconomical in terms of personnel planning and transportation planning of heavy machines necessary for the installation work at both sites at the same time, the installation work schedule will be such as to avoid simultaneous work at the two sites, and it will be made as efficient as possible by minimizing waiting time.

It has also been proved from the results of the soil surveys at the sites that the ground foundation is weak at both sites, which means that piling will be necessary before carrying out the foundation work for the MW transmitting antennas. The work schedule will therefore have to be such as to finish the piling work (which will take about one month) before commencement of the foundation work for the MW transmitting antennas.

③ Inspection and Acceptance

Before shipment of the equipment to Indonesia, the equipment will be inspected by a third-party organization. Since the equipment procured in this Project will be transported to Indonesia in two separate shipments, there will be two such inspections before loading on board. About two weeks will be considered for the time needed for such inspection from preliminary preparations to actual inspection and approval of the results.

④ Circumstances in Indonesia Concerning Time Off Work

There are 18 days a year of public holidays in Indonesia (as of 2006). In addition to that, labor legislation there gives workers who have worked for 12 months in a row at least 12 days of vacation a year, and workers who have been on the job for at least 6 years are entitled to at least 2 months of vacation a year. The work day is up to 8 hours, and the work week up to 40 hours, the days off generally being Saturday and Sunday. It will therefore be necessary to consider such circumstances in formulating the schedule for work involving local labor, such as the foundation work for the MW transmitting antennas and the work of laying of the radial earth, in which local electricians are to be employed.

3) Permits and Authorizations That Have to Be Applied For

According to building standards legislation in Indonesia it will be necessary to apply for

building authorization for construction of the MW transmitting station buildings (at the expense of the Indonesian side) and the MW transmitting antenna. That is to be applied by the client in the areas where the construction is to take place.

In this Project the procedure for application of these permits will be as follows:

- Applicant:
  RRI（the project implementing agency）
- Organization to be applied to:
  Toli-Toli broadcasting station: Toli-Toli Regency Development Department
  Tarakan broadcasting station: Tarakan Regency Urban Planning Department

In the case of both sites, according to the planning of the local governments that issue the building permits, besides furnishing the land, the local government also does the land preparation, which means that there should not be any problem concerning obtaining of building permits after application for them.

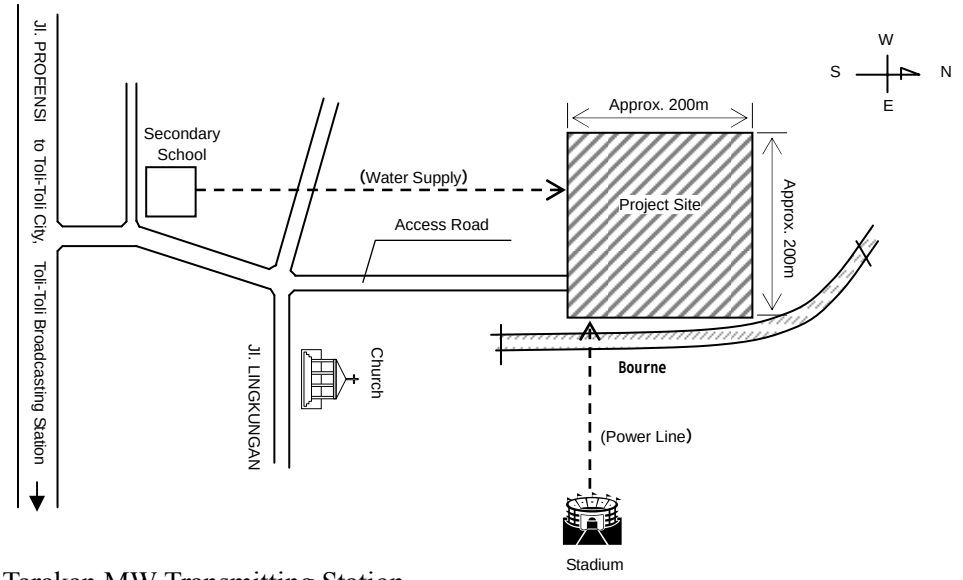
2-2-2 Basic Plan

2-2-2-1 Present Conditions of the Project Sites

(1) Site of the Toli-Toli MW Transmitting Station

1) Location of the site:
Nopi, Toli-Toli Regency, Central Sulawesi Province, Sulawesi Island.
N 01° 17’ 03”, E 120° 47’ 26”. Elevation above sea level: 2m.

2) Situation of the site
A 4-hectare strip of marshland (2m elevation above sea level) about 2km west of the existing Toli-Toli broadcasting station, 5km southwest of the town of Toli-Toli and 2km from the coast is to undergo leveling of the ground and banking for use as the site of the MW transmitting station. The Toli-Toli regional government began the ground leveling work in November 2005 and completed in February 2006. Electric power will be brought in from the stadium about 450m from it, and a water supply line will be laid from the school about 500m from it. A paved access road to the site with a length of about 350m was also improved by the regional government.



(2) Site of the Tarakan MW Transmitting Station

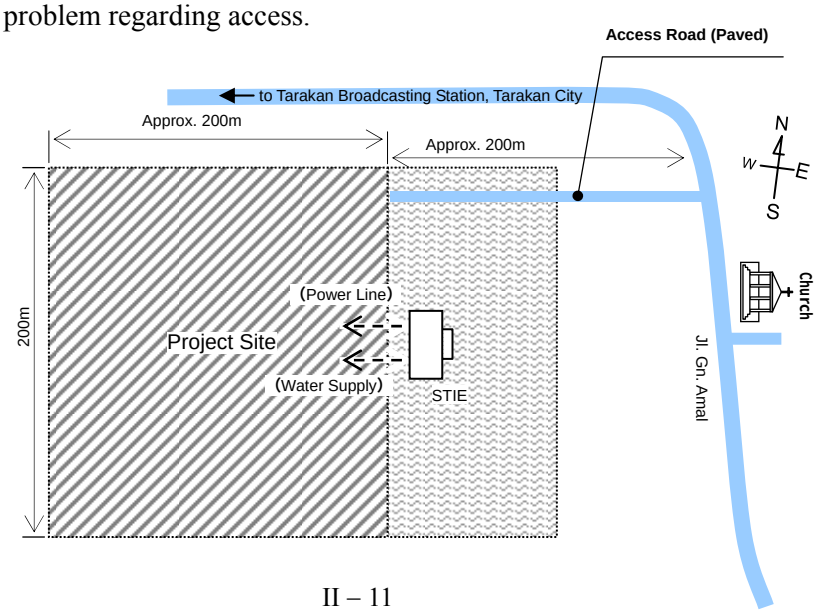
1) Location of the site:

Kampung Enam, Tarakan Administrative City, East Kalimantan Province, Kalimantan Island

N 03° 18' 34", E 117° 37' 41". Elevation above sea level: 81m.

2) Situation of the site

The site is situated about 1.5km northeast of the existing Tarakan broadcasting station in southeast part of the Tarakan Island. A 4-hectare plot of thicket behind the economics college (STIE) is undergoing land preparation for use as the site of the MW transmitting station. The land preparation (tree felling, excavation and banking) entails a considerable amount of work since the trees cover the whole plot which even has a great deal of undulation with a 10m difference between the highest point and the lowest point. The Tarakan regional government began the preparation work of the land in March 2006 and will complete it by the end of June 2006. Electric power and water supply lines will be laid from the STIE to the site, and since there is already a paved road between the two, there will be no problem regarding access.



(3) Geological Conditions at the Toli-Toli and Tarakan Sites

At the Tarakan and Toli-Toli sites two boreholes each were sunk for the purpose of investigating the bearing capacity of the soil. The method used is as summarily indicated below:

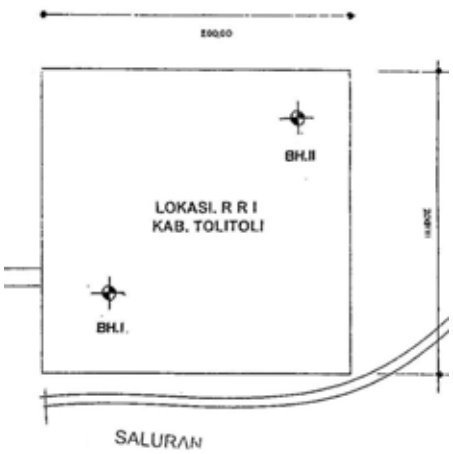
Outline of Soil Survey Method

	Tarakan	Toli-Toli
Date of geological survey	January 6 to 11, 2006	December 29, 2005 to January 4, 2006
Borings	2, both to a depth of 15.5m	1 to a depth of 30.0m 1 to a depth of 28.0m
Standard penetration test (SPT)	Every 1m	same as left
Taking of soil samples for laboratory test	3 specimens from BHI 6 specimens from BHII	same as left
Laboratory test	Density test, moisture content test, grain size analysis, etc., using 9 test specimens for each Unconfined compressive strength test and atterberg limit, using 3 test specimens for each	same as left
Others	Measurement of groundwater level at each borehole	same as left

The following is a summary discussion of the soils and necessary foundations of structures at the two sites as based on the in situ and laboratory tests.

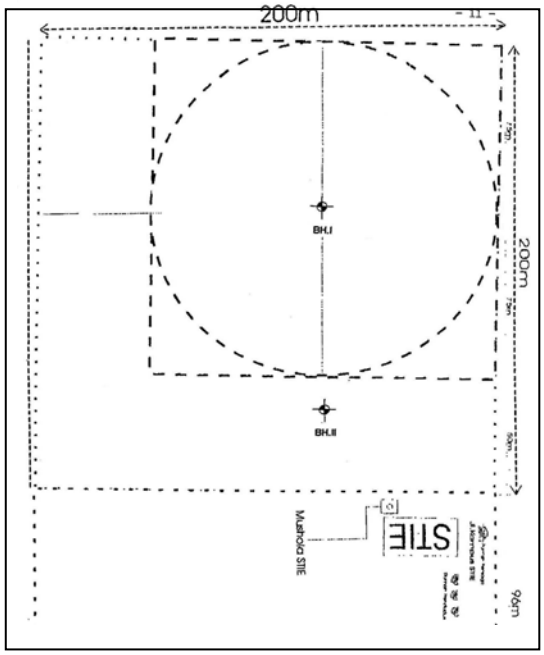
[Toli-Toli Site]

The 2 borings at the site revealed considerable difference between them in soil strata. Borehole 1 (BH I) showed a comparatively good soil stratum with an N value of 41 at a depth of about 10 m below the surface of the ground and continuation again of weak strata with an N value of under 10 as the borehole got deeper. On the contrary, in the case of Borehole 2 (BH II) after continuation of strata with an N value of under 10 from the surface of the ground to a depth of 14 m a sandy stratum with N values of 15 to 22 were encountered, and deeper than that the same kinds of soil strata were found as in BH I.



Since both borings show weak soils near the surface of the ground and a high groundwater level, for the installation of the MW transmitting antenna, pile driving work will be necessary for reinforcement of the ground. As for the type of piles, they will be prefabricated pre-stressed concrete piles. Since there is no clear support stratum (hard layer), the support structure will be that of the friction pile type, not the end-bearing pile type. The piles will have to be driven to a depth of about 20m below the ground surface.

[Tarakan Site]

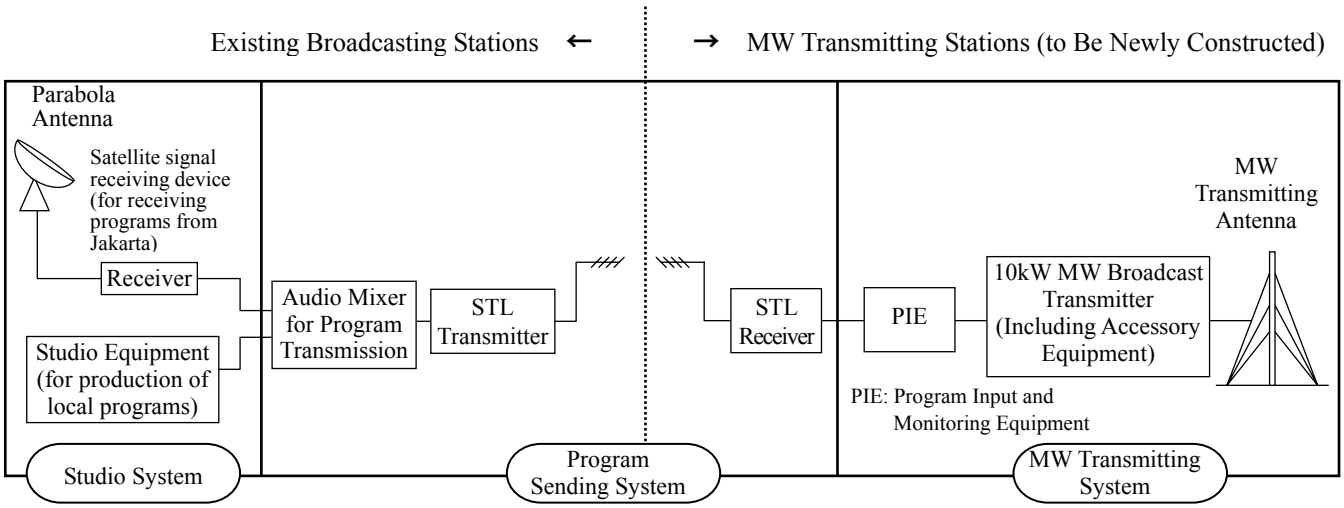


The soils of the site consist of cohesive soils with an N value of 1 to 8 from the surface of the ground to a depth of 4 m. The results of the soil tests show a bearing capacity of the soil of about 60kN/m^2 at a depth of 2m and about 155kN/m^2 at a depth of 4m. Since at least 100kN/m^2 is needed for the foundation of the MW transmitting antenna, it will be necessary that the foundation depth be at least 4m from the surface of the ground. On the other hand, since it is expected that the groundwater level will be no lower than 0.6m from the surface of the ground, excavation to a depth of 4m in the foundation work would require large-scale temporary installations and drainage, which is not practical. That being the case, just as in the case of the Toli-Toli site, for the installation of the MW transmitting antenna it will be necessary to do pile driving work to 12m below the surface of the ground for reinforcement of the ground.

2-2-2-2 The Necessary Equipment for MW Radio Broadcasting Service

The purpose of this Project is to improve MW radio broadcasting systems so as to be able to start MW radio broadcasting service at the Toli-Toli and Tarakan broadcasting stations. The MW radio broadcasting system at each of those two broadcasting stations will, as indicated in Fig. 2-1, consist of a studio system for production of broadcast programs, a system for sending out the programs and a MW transmitting system for broadcasting of the programs.

Fig. 2-1: The MW Radio Broadcasting System of Toli-Toli and Tarakan Broadcasting Stations



At both the Toli-Toli and the Tarakan broadcasting stations the studio equipment for production of local programs consists of both professional equipment and consumer equipment. Although the quantity thereof is not sufficient, it is relatively new, having been procured only 2 years ago, and is operating satisfactorily. At both broadcasting stations it is possible to continue making use of the existing studio equipment for production of local programs consisting mainly of music programs that is presently being implemented (126 hours a week). It will also be possible to continue use of the satellite receiving equipment for receiving news and other programs from Jakarta since it, too, is operating satisfactorily. That being the case, it will not be necessary to procure any new studio equipment or satellite receiving equipment. However, there is presently only one 16-input audio mixer with one output for switching between local programs and programs (news, etc.) from Jakarta, which means that it is not possible to use the existing audio mixer for both new MW broadcasting service and existing FM broadcasting service. Furthermore, the specifications of the existing audio mixer are not such as to make for stable continuity of programs without a backup power source and an audio amplifier for amplifying the output to a particular audio level. It is therefore necessary to procure a new audio mixer for sending out programs that can smoothly switch between local programs and programs from Jakarta and that has a function of stably sending out program signals to the STL transmitter equipment.

Moreover, since neither of the two broadcasting stations is equipped with the STL, program input and monitoring equipment, 10kW MW transmitting system (including accessory equipment), MW transmitting antenna, VHF communication equipment, etc. that constitute a MW radio broadcasting system, that equipment will have to be newly procured in this Project as well to start MW radio broadcasting service.

Table 2-1 below indicates the equipment to be procured in the Project for the MW radio broadcasting systems as based on the findings of the site survey.

Table 2-1: Equipment Needed for the MW Broadcasting Systems

Equipment	Purpose of Use	Request or not	New Procurement or Use of the Existing Equipment	Place to Be Installed
Satellite Receiver	Receiving programs from Jakarta	_	Use of the Existing Equipment	Existing Broadcasting Station
Studio Equipment	Production of local programs	_	Use of the Existing Equipment	Existing Broadcasting Station
Audio Mixer for Program Transmission	Switching between local programs and programs from Jakarta and sending the program signal to the STL transmitter	○	New Procurement	Existing Broadcasting Station
STL Transmitter	Sending the program signal to the MW transmitting station	○	New Procurement	Existing Broadcasting Station
STL Receiver	Receiving the program signal at the MW transmitting station	○	New Procurement	New MW Transmitting Station

Equipment	Purpose of Use	Request or not	New Procurement or Use of the Existing Equipment	Place to Be Installed
Program Input and Monitoring Equipment	Monitoring of program signal and adjustment of signal level	○	New Procurement	New MW Transmitting Station
10kW MW Broadcast Transmitter (including Cooling Equipment)	Transmission of MW signal	○	New Procurement	New MW Transmitting Station
10kW Dummy Load	Apparatus for adjustment of the 10kW MW broadcast transmitter	○	New Procurement	New MW Transmitting Station
10kW Lightning Equipment	Included in the 10kW MW broadcast transmitter	○	New Procurement	New MW Transmitting Station
3-port U-Link Panel	Switching of MW broadcast transmitter output between antenna and dummy load	○	New Procurement	New MW Transmitting Station
45kVA Isolation Transformer	Protection of the equipment from lightning surge	○	New Procurement	New MW Transmitting Station
40kVA Automatic Voltage Regulator (AVR)	Stable supply of electric power	○	New Procurement	New MW Transmitting Station
65kVA Engine Generator	Supply of electric power at times of city power failure	–	To Be Newly Procured by the Indonesian Side	New MW Transmitting Station
MW Transmitting Antenna System	Radiation of MW radio wave	○	New Procurement	New MW Transmitting Station
Measuring Equipment	Equipment maintenance	○	New Procurement	New MW Transmitting Station
VHF Communication Link	Liaison between transmitting station and existing broadcasting station	○	New Procurement	New MW Transmitting Station

2-2-2-3 Basic Design of the Equipment

(1) Basic Conditions for Selection of the Equipment

The equipment for MW radio broadcasting system to be procured in this Project should be selected to meet the following conditions.

1) Applicable Recommendations and Standards

The recommendations and rules of the following organizations will be applied in view of their wide international use as norms in the electrical and telecommunications field:

① International Telecommunication Union: Radio Communication Sector (ITU-R)
② International Electrotechnical Commission (IEC)
③ Japan Industrial Standard (JIS)
④ Japan Electronics and Information Technology Industries Association (JEITA)
⑤ International Organization for Standardization (ISO)
⑥ Audio Engineering Society (AES)

2) Equipment Operating Environmental Conditions

Ambient air temperature	:	15 to 45°C
Indoor temperature	:	15 to 45°C
Relative humidity	:	97%
Elevation above sea level	:	Up to 500m
Maximum wind speed	:	45m/s

3) Power Supply Voltage and Frequency

Power supply for operation of the equipment: 3-phase, 380V/220V, 50Hz, 4-wire

Commercial power supply voltage fluctuation tolerance: 3-phase, 380V +10/-15%

4) Transmitting Frequency and Transmitter Output

They are to be as follows in accordance with the application made to the ITU:

	Transmission Frequency	Transmitter Output
Toli-Toli MW Transmitting Station	1377kHz	10kW
Tarakan MW Transmitting Station	1350kHz	10kW

5) Procurement Criteria

① Since ease of operation and maintenance are essential elements in enhancement of equipment reliability, selection will be made, as far as possible, of equipment that is manufactured with the same parts and finishing.

② The availability of procurement of spare parts and spare modules should be guaranteed at least for 10 years. When spare parts and spare modules go out of production, alternatives with equivalent or better performance should be available.

③ The 10kW MW broadcast transmitters are to be of the solid-state type that does not use vacuum tubes and adopted the air conditioner cooling system so as to avoid influence of dust and moisture.

④ Considering the stability of the solid-state type MW broadcast transmitters, standby MW broadcast transmitters will not be procured. It shall be of a type for which it is possible to procure spare units such as the power amplifier, Radio Frequency (RF) exciter, etc. needed in case of trouble.

(2) Equipment for MW Radio Broadcasting System

Considering that the Toli-Toli and Tarakan MW transmitting stations will be manned facilities attended continuously by engineers needed for operation and maintenance as in the case of the other RRI transmitting stations, all of the basic operations procedures such as starting and stopping the transmitters, selection and switching of program input and switching back to the commercial power supply from the emergency power supply when commercial power supply is failed are in principle to be manual operations. MW radio broadcasting system equipment to be procured in the Project shall consist of the following: ① 10kW MW Broadcast Transmitter, ② 10kW Dummy Load, ③ 3-port U-link Panel, ④ Program Input and Monitoring Equipment, ⑤ MW Transmitting Antenna System, ⑥ Studio-Transmitter Link (STL), ⑦ Isolation Transformer, ⑧ Automatic Voltage Regulator, ⑨ Measuring Equipment, ⑩ VHF Communication Link, ⑪ Audio Mixer for Program Transmission, ⑫ Uninterruptible Power Supply (UPS), ⑬ Spare Parts, etc. An outline description of each equipment follows.

1) 10kW MW Broadcast Transmitter

In order for it to operate stably over a long time the 10kW MW broadcast transmitter is to be of full broadcasting specifications using parts with high reliability, and operation of it is to be manual, with easy operating steps. Furthermore, it is to be of the solid-state type, which does not need any vacuum tubes, and of the digital modulation method with high modulation efficiency. Since the solid-state type has high stability and since even if 10% of the total number of amplifiers of the power amplifier unit malfunction, it is possible to continue operation without any stoppage, no standby transmitter will be procured. However, the RF exciter unit consisting of the crystal oscillator, which generates the transmission carrier wave, and amplifiers that amplify the carrier wave signal to a particular level is to have a standby with automatic switching in order to avoid, as far as possible, interruption of broadcasting due to trouble with the RF exciter unit. Furthermore, the output circuit is to be a band pass filter (BPF) circuit with a lightning resistance function that consists of combination of a low pass filter (LPF) with the function of eliminating unwanted high frequencies and a high pass filter (HPF) with the function of attenuating the lightning surge component.

The advantages of the solid-state type MW broadcast transmitter with the digital modulation method are as follows:

- Operating cost is reduced by the fact that it does not need vacuum tubes or a modulation transformer, and also thanks to high overall efficiency.

- A operation hindrance doesn't arise even if about 10% of the total number of the power amplifier breaks down in power amplification part because it is compensated by other power amplifiers.
- A protection circuit of the solid-state power amplifier is set up against any unusual impendence change in the transmitting antenna.
- Maintenance work is made safer by absence of any parts under high voltage.

The following is an outline of the 10kW MW broadcast transmitter to be procured under the Project.

Station	Type of Transmitter	Method of Modulation	Transmitter Output	Frequency
Toli-Toli Transmitting Station	Solid-state Type	Digital modulation	10kW	1377kHz
Tarakan Transmitting Station	Solid-state Type	Digital modulation	10kW	1350kHz

Adoption of cooling system of the 10kW MW broadcast transmitter by air conditioner will avoid the influence of moisture and other adverse conditions, thereby making stable operation for a long time possible. To accomplish cooling system in case the air conditioner goes out of order the ventilating fan will be provided for control system of operation by thermostat.

The scope of the air conditioning shall cover the transmitter room, the necessary capacity of the air conditioner being calculated on the following basis:

① Design conditions

・Design outdoor air temperature conditions

Dry-bulb temperature: 35 °C

Relative humidity : 60%

・Temperature and humidity conditions inside the transmitter room with air conditioning

Dry-bulb temperature : 27 °C

Relative humidity : 50%

・Area of transmitter room : $35m^2$ (5m × 7m)

・Volume of transmitter room : $140m^3$ (5m × 7m × 4m)

② Calculation of the heat generated by the different equipment

・ 10kW MW broadcast transmitter :2.5kW

(average degree of modulation of 50%)

・ Program input and monitoring equipment	: 0.5kW	
・ STL and measuring equipment	: 1.0kW	
・ Automatic voltage regulator	: 0.7kW	
・ 3-port U-link panel	: 0.3kW	
Total	: 5.0kW	
Total volume of equipment heat	: 4,300kcal/H (5kW × 860kcal/H)	Ⓐ

③ Amount of heat intrusion from the building (area × heat reduction rate × actual temperature difference)

・ Quantity of heat from outer wall (3 surfaces)	: 2,000kcal/H	
・ Quantity of heat from interior walls	: 200kcal/H	
・ Quantity of heat from roof	: 2300kcal/H	
・ Quantity of heat from floor:	: 300kcal/H	
Total quantity of intrusion of heat:	: 4,800kcal/H	Ⓑ

④ Quantity of heat from lighting and an operator: 600kcal/H Ⓒ

⑤ Degree of leeway in tropical region (10%): 970kcal/H Ⓓ

The total quantity of heat is 10,670kcal/h (Ⓐ + Ⓑ + Ⓒ + Ⓓ), and the required capacity of the air conditioner is about 11,000kcal/H. Taking into account the operating efficiency of the air conditioner, coping with the situation when it goes out of order, maintenance work and other factors, the cooling system should be accomplished by operation of two air conditioners with a capacity of 5,500kcal/H each.

2) 10kW Dummy Load

A 10kW dummy load is to be installed for maintenance of the 10kW MW broadcast transmitter. Such a dummy load is for the purpose of checking the MW broadcast transmitter's state of operation and electrical characteristics, etc. after switching its output from the MW transmitting antenna. The load capacity shall be such that the 10kW MW broadcast transmitter can continuously accomplish 100% modulation. The type of cooling to be adopted is forced cooling by fan.

3) 3-port U-Link Panel

A coaxial switching equipment (one input and two outputs) will be installed for selecting

the output of the 10kW MW broadcast transmitter to the MW transmitting antenna or the 10kW dummy load according to the purpose, i.e. broadcasting, maintenance, etc. It will be in the form of a 3-port U-link Panel, which for the sake of ease of switching is to be installed on the wall at the back of the 10kW MW broadcast transmitter.

4) Program Input and Monitoring Equipment (PIE)

There will be installation of a program input and monitoring equipment for automatically controlling the broadcasted program signal sent from the existing broadcasting station and for supplying a signal with a stable level to the 10kW MW broadcast transmitter. It will have such functions as switching inputs, monitoring and adjustment of the input level of the audio signal, audio monitor, display of transmitter output and degree of modulation, etc. and will be constituted by the following equipment, which is to be accommodated in a 19" rack.

① Audio Processor

The audio processor is to have the functions of input in the 10kW MW broadcast transmitter of the program signal sent from the existing broadcasting station after adjusting it to a certain level and reproducing the same audio quality as FM broadcasts by compressing and expanding the signal for greater average degree of modulation. In order to prevent interruption of broadcasting because of trouble, there will be two of them, one in operation and the other on standby, with manual switching between them.

② FM Receiver

The FM receiver will be used as a backup in case the STL for sending of the program signal from the existing broadcasting station to the MW transmitting station goes out of order. Switching between the STL and the FM receiver will be manual.

③ Audio Monitor Switcher and Audio Monitor Speaker

The audio monitor switcher and audio monitor speaker are for making sure that the broadcasted program signal level and quality is being properly input in the 10kW MW broadcast transmitter, the audio processor, etc., and the speaker will be equipped with an amplifier.

④ RF Exciter for 10kW MW Broadcast Transmitter

Since the RF exciter units of the 10kW MW broadcast transmitter, which are to be redundant, with one in operation and the other on standby, cannot be mounted in the transmitter itself, it is to be mounted in the PIE rack.

5) 10kW MW Transmitting Antenna System

This is a system for radiation of MW broadcast radio waves with an output of 10kW which consists of an antenna mast, a radial earth system, an antenna tuning unit (ATU), coaxial cable, dehydrator, obstruction lighting system, etc.

As at the other broadcasting stations the antenna mast with a steel structure is to be of the type with stays in three directions and an insulated base.

Generally the height of antenna with a transmitter output of 10kW is taken as 0.25 times the wavelength of the frequency (0.25λ; in the case of 1,000kHz, $0.25\lambda = 3 \times 10^8/1000000 /4=$ 75m). But since the frequencies for Tarakan (1350kHz) and Toli-Toli (1377kHz) are both high frequencies in the MW band, the antenna height would be rather low if designed on the basis of 0.25λ, which would make for poor radiation effect (a smaller service area than usual). That being the case, it will be necessary to maximize service area by ① adopting 65m as the antenna height on the basis of the design criterion 0.3λ, which gives optimum cost-effect ratio considering radiation efficiency and construction cost, ② raising apparent antenna height by making the upper part of the stays in three directions into an umbrella-like antenna (top loading) and ③ laying in radial fashion around the antenna at a depth of 30cm in the ground 120 copper lines (radial earth) with the same length as the antenna height at intervals of 3° in order to enhance radiation efficiency. The air navigation obstacle lights are to be installed at the top of the antenna mast besides painting daytime obstacle signs. The ATU, which is for matching the impedance (50Ω) of the output of the 10kW MW broadcast transmitter with the impedance of the antenna mast, which varies with frequency and antenna height, will be installed between the 10kW MW broadcast transmitter and the antenna mast. The 10kW MW broadcast transmitter and the ATU will be connected by a 1" 5/8 (39D) coaxial cable (with a length of about 150m) for the sake of minimizing attenuation of the 10kW MW transmitter output in sending it. There will also be provision of dehydrator for keeping the coaxial cable filled with dried air so as to prevent deterioration of transmission efficiency due to the influence of moisture.

Since the findings of the soil surveys at the two sites have shown that both of them have weak ground, it will be necessary to do pile driving work at both sites for reinforcement of the ground before the MW transmitting antenna foundation work. Among the possible types of piles are ① piles made in situ by digging holes in the ground and placing concrete reinforcement baskets and pouring concrete directly in them, ② square (30cm × 30cm) concrete piles precast in situ by placing reinforcement baskets in formwork and pouring concrete in them at the site and ③ round, factory-made prefabricated pre-stressed concrete

piles.

The study team compares those methods of pile driving work regarding suitability to the two sites. Method ① can hardly be said to be suitable from the viewpoints of cost and quality control considering that large-scale equipment would be needed for prevention of collapse of the hole walls and for making the concrete. As for method ②, it would entail lower transportation expense since the piles would be made at the sites, but special care would have to be taken regarding the work schedule to ensure that proper strength of the concrete is obtained as well as regarding quality control. On the other hand, although method ③ would entail higher transportation expense than the others due to fabrication at the factory, it is outstanding regarding quality assurance, and with it would be possible for the construction time to be less than half of that for the other methods. That being the case, the type of piles for ground reinforcement in construction of the MW transmitting antennas in this Project shall be prefabricated pre-stressed concrete piles. As for the depth to which the piles are to be driven, it shall be 20m below the surface of the ground in the case of Toli-Toli and 12m in the case of Tarakan.

Only the foundation under the antenna mast will require piles, direct foundations that do not make use of piles being sufficient for anchoring the three stays of each mast. However, it will be necessary to secure an adequate safety margin regarding foundation movement considering the weakness of the ground.

6) Studio-Transmitter Link (STL)

STL has to be provided for sending the broadcast program signal from the existing broadcasting station to the MW transmitting station by UHF band. That equipment consists of the STL transmitter to be installed on the existing broadcasting station side and the STL receiver to be installed on the MW transmitting station side.

① STL Transmitter Equipment

To be accommodated in a 19" rack in the FM transmitter room of the existing broadcasting station.

Transmission frequency	:	300.75MHz (RRI's designated frequency)
Transmitting power	:	5W (set on the basis of the distance of about 2km between the existing broadcasting station and the MW transmitting station)
Transmitting antenna	:	Yagi antenna (to be installed at the upper section (50m) of the broadcasting station's existing 65m self-supporting tower)

② STL Receiver Equipment

To be accommodated in a 19" rack in the transmitter room of the MW transmitting station.

Receiving frequency	:	300.75MHz
Signal-to-noise ratio	:	at least 60dBm
Receiving antenna	:	Yagi antenna (to be installed at the upper section of the 50m tower to be newly built by RRI)

7) 40kVA Automatic Voltage Regulator (AVR)

As a result of records over a period of 24 hours of voltage and frequency fluctuation of the commercial electric power sources of the Toli-Toli and Tarakan broadcasting stations, it has been confirmed that the voltage fluctuation is +10/-15% of the nominal voltage of 380/220V at both stations. An automatic voltage regulator (AVR) will therefore have to be installed to protect the equipment from voltage fluctuation in excess of the stipulated tolerance. It will be given an input voltage fluctuation range of 380/220V +10/-15%, and its capacity will be 40kVA considering the total of the capacities of the equipment mentioned below that is scheduled to be procured under the Project at the MW transmitting station.

Equipment	Power source capacity	3-phase / signal phase
10kW MW Broadcast Transmitter	20kVA	3-phase
Program Input and Monitoring Equipment	1kVA	Single phase
STL	1kVA	Single phase
10kW Dummy Load	1kVA	3-phase
Air Conditioner (1)	5kVA	3-phase
Air Conditioner (2)	5kVA	3-phase
Dehydrator	2kVA	Single phase
Obstruction Light	2kVA	Single phase
Ventilation Fan	2kVA	3-phase
Measuring Equipment	1kVA	Single phase
Total	40kVA	

8) 45kVA Isolation Transformer

45kVA isolation transformer has to be provided for protection against lightning surge by attenuation of the lightning surge that penetrates to the equipmentr from the power supply line. Considering the total capacity of the equipment (40kVA) and a leeway of 10%, its capacity is set at 45kVA.

9) Measuring Equipment

As the necessary minimum for operation and maintenance of the equipment, an audio signal generator and distortion meter (for measurement of frequency characteristic, distortion ratio, S/N ratio, etc.), an oscilloscope (for measurement of degree of modulation, RF output waveform, etc.) and a resistance attenuator (for adjustment of the transmitter input signal level) are to be provided. Instead of providing a dedicated rack for them, however, they will be accommodated in the STL receiver rack.

10) VHF Communication Link

For the sake of smooth accomplishment of daily broadcasting work, a dedicated liaison line will be installed between the existing broadcasting station and the MW transmitting station. It will be liaison radio equipment operating on the VHF band allocated to RRI for exclusive use and will consist of a fixed-station transceiver to be installed at the existing broadcasting station and a mobile-station transceiver to be installed at the MW transmitting station.

The mobile-station transceiver can be used not only for liaison with the existing broadcasting station but also for radiated signal confirmation work and for maintenance work on the MW transmitting antenna. Three mobile-station transceivers will have to be provided since MW transmitting antenna maintenance work will entail liaison between three points (the transmitter room, the ATU and the antenna mast).

The main composition of the VHF transceiver and the places where it is to be installed are as follows:

① Fixed-Station Transceiver (to be accommodated in the STL transmitter rack of the existing broadcasting station)

- Frequency : 154.5MHz (RRI's designated frequency)
- Transmitting power : 25W

② Mobile-Station Transceivers (to be placed in the STL receiver rack of the MW transmitting station)

- Frequency : 154.5MHz (RRI's designated frequency)

- Transmitting power : 5W

11) Audio Mixer for Program Transmission

Audio mixer for program transmission and an audio distribution amplifier have to be provided for switching between locally produced programs and programs from Jakarta and for sending the program signal to the STL transmitter. The audio mixer is to be of the digital type and of professional grade, and it is to have the same number of inputs as the existing audio mixer, 16 channels. The audio distribution amplifier is to be capable of 4-way distribution of the level-adjusted signal.

12) Uninterruptible Power Supply (UPS)

A backup power source is to be provided so that the equipment to be installed at the existing broadcasting station can operate even during mains power outages. The UPS, to be accommodated in the STL transmitter rack, is to have a capacity of 500W to be able to backup the STL transmitter, the digital audio mixer, the audio distribution amplifier and the satellite receiving equipment (existing) and a backup time of about 30 minutes.

13) Spare parts

① Consideration to Spare Parts

Selection of spare parts is to be based on the following considerations.

- Spare parts that it will be easy for the RRI personnel to use for replacement
- Mainly the printed circuit boards and units of the main equipment in quantities such as to ensure operation for at least one year after delivery of the equipment
- Consumables consisting on a priority basis of contactors, relays, parts of revolving mechanisms, fuses and other things that have to be replaced periodically.

② Spare Parts to be procured

Since there will be no standby MW broadcast transmitter, to cope with transmitter failure, essential spare parts to be procured will consist of power amplification (PA) units, RF driver printed circuit boards, transmitter control printed circuit boards, analog/digital converter printed circuit boards, AVR control printed circuit boards, etc.

In addition, consumable parts such as fuses, fans, air filters, obstruction lights, magnet contactors, surge absorbers, choke coils, etc. are also to be procured.

14) Installation Materials

There is to be procurement of the different types of power cables and signal lines and the connectors, special tools and other materials and equipment needed for the equipment installation work.

- Installation materials : Coaxial cables, Audio cables, Power Cables, Coaxial Feeder, Sundry installation materials

(3) List of Equipment

Table 2-2 shows the planned equipment to be procured under the Project for the Toli-Toli and Tarakan broadcasting stations.

Table 2-2: List of Equipment

(Tarakan and Toli-Toli MW Broadcasting Stations: Each 1 set)

	Equipment	Q'ty	Main Specifications and Uses
1.	10kW MW Broadcast Transmitter	1 set	Frequency: Tarakan 1350kHz Toli-Toli 1377kHz RF Exciter: Main/Standby (Automatic Changeover System)
2	10kW Dummy Load	1 set	Load Capacity: 10kW+100% modulation
3	10kW Lightning Protector	1 set	Included in the 10kW MW Broadcast Transmitter
4	3-port U-Link Panel	1 set	Number of Input :1 Number of Output :2
5	Program Input and Monitoring Equipment	1set	
(1)	Audio Processor	2 sets	Main / Standby (Manual Changeover System)
(2)	FM Receiver	1 set	Back up for STL Receiving Frequency: 90 to 108MHz
(3)	Audio Monitor Switcher	1 set	
(4)	Audio Jack Panel	1 set	
(5)	Monitor Speaker	1 set	Including Audio Amplifier
(6)	NFB Panel	1 set	
(7)	19" Rack	1 set	
6	MW Transmitting Antenna	1 set	
(1)	Antenna Mast	1 lot	Guy-Wire Type, 65m height
(2)	Radial Earth	1 lot	120 Wires, 65m length
(3)	Antenna Tuning Unit (ATU)	1 set	Including Lightning Protector
(4)	Coaxial Cable	1 lot	1-5/8 inch 50Ω, 150m length
(5)	Obstruction Light	1 set	
(6)	Dehydrator	1 set	

	Equipment	Q'ty	Main Specifications and Uses
7	Studio-Transmitter Link (STL)		
7.1	STL Transmitter Equipment	1 set	
(1)	STL Transmitter	1 set	Output Power : 5W Frequency :300.75MHz
(2)	UPS (500W)	1 set	30 min Backup for STL Transmitter, Audio Mixer, etc.
(3)	NFB panel	1 set	
(4)	19" Rack	1 set	
(5)	Antenna with Coaxial Cable	1 lot	Yagi Antenna, Cable: 100m length
7.2	STL Receiver Equipment	1 set	
(1)	STL Receiver	1 set	Frequency: 300.75MHz
(2)	NFB Panel	1 set	
(3)	19" Rack	1 set	
(4)	Antenna with Coaxial Cable	1 lot	Yagi Antenna, Cable: 100m length
8	40kVA Automatic Voltage Regulation (AVR)	1 set	3-Phase, 380/220V 50Hz Including AC Power Failure Detector such as Under/Over Voltage, Open Phase and Reverse Phase Detector
9	45kVA Isolation Transformer	1 set	3-Phase, 380/220V 50Hz
10	VHF Communication Link	1 set	Frequency:154.5MHz
10.1	Fixed Station		
(1)	VHF Transceiver	1 set	Installed in the STL TX Rack
(2)	Omni-directional Antenna	1 set	High Gain Antenna
(3)	Coaxial Cable	1 set	100m length
10.2	Mobile Station		
(1)	Portable Type VHF Transceiver	3 sets	Placed in the STL / Measuring Rack
11	Audio Mixer for Program Transmission	1 set	
(1)	16-CH Digital Audio Mixer	1 set	Professional Type
(2)	Audio Distribution Amplifier	1 set	Number of Output: 4
12	Measuring Equipment	1 set	
(1)	Oscillator with Distortion Meter	1 set	Frequency Range : 20Hz to 200kHz, Output +20dBm
(2)	Oscilloscope	1 set	200MHz, 2CH
(3)	Variable Audio Attenuator	1 set	600Ω, Balanced
(4)	Handy Tool set	2 sets	Including Soldering sets
13	Cooling Equipment	1 set	
(1)	Air Conditioner	2 sets	Capability: 5500kcal/h
(2)	Ventilation Fan	1 set	450mm × 450mm, Thermostat Control Air Quantity: more than $70m^3$/min. 3-phase 380V, 50Hz

	Equipment	Q'ty	Main Specifications and Uses
(3)	Louver	1 set	1000mm × 1000mm
(4)	Dumper	1 set	1000mm × 1000mm, Motor Drive Single phase 220V, 50Hz
(5)	Shutter for Ventilation Fan	1 set	450mm × 450mm
(6)	Air Filter	1 set	1000mm × 1000mm, including Frame
14	Standard Accessories	1 lot	Attached to the Equipment
15	Spare Parts	1 set	
(1)	Power Amplifier (PA)	5 sets	For 10kW MW Broadcast Transmitter
(2)	Printed Board of RF Exciter	1 set	For 10kW MW Broadcast Transmitter
(3)	Printed Board of TX Control	1 set	For 10kW MW Broadcast Transmitter
(4)	Printed Board of A/D Converter	1 set	For 10kW MW Broadcast Transmitter
(5)	Printed Board of AVR Control	1 set	For 40kVA AVR
(6)	Choke Coil for ATU	1 lot	For 10kW MW Broadcast Transmitting Antenna
(7)	Fuse	1 lot	For 10kW MW Broadcast Transmitter, PIE, STL, 40kVA AVR and Dehydrator
(8)	Fan	1 pc	For 10kW MW Broadcast Transmitter
(9)	Surge Absorber	1 lot	For 10kW MW Broadcast Transmitter, 45kVA Isolation Transformer and 40kVA AVR
(10)	FET for Transistor Power Amplifier	30 pcs	For 10kW MW Broadcast Transmitter
(11)	Magnet Contactor	1 lot	For 10kW MW Broadcast Transmitter and 40kVA AVR
(12)	Obstruction Light	3 pcs	For MW Transmitting Antenna
(13)	Silica Gel	1 set	For Dehydrator
16	Installation Materials	1 set	
	1-5/8" Coaxial Feeder/Cables, Power Cables, Audio Cables Fixing Materials, Installation Tools, etc.	1 lot	

2-2-2-4 Basic Design of the Facility

Construction of the transmitter building, the power supply building, the STL tower, etc. for installation of the equipment to be procured in this Project is to be implemented at the expense of the Indonesian side. It is necessary that that construction work be done bearing the following matters in mind and taking into account the data obtained in the soil survey of the two sites. It should also be noted that some of the incidental facilities work of the transmitter building will be done at the expense of the Japanese side.

(1) Consistency of the Work to be done by the Indonesian Side and the Japanese Side

For construction of the transmitting station building, the power supply building, etc. the places

are to be selected so as not to pose any obstacles to the MW transmitting antenna installation work, including foundation and laying of the radial earth, that is to be done by the Japanese side (refer to Fig. 2-4: Toli-Toli Broadcasting Station / Site Layout of MW Radio Transmitting Station, and Fig. 2-5: Tarakan Broadcasting Station / Site Layout of MW Radio Transmitting Station). Furthermore, the service entrances are to be wide enough not to give rise to any problems in bringing in the procured equipment.

(2) Construction of the Transmitter Building and Incidental Facility Work

1) Construction of the Transmitter Building

It is necessary that the transmitter building have a structure with a high degree of air tightness so as to prevent intrusion of dust from the outside as well as being limited to the minimal space required for installation and operation of the equipment so as to enhance air conditioning efficiency. It has to be built in such a way as to meet those conditions and in accordance with Fig. 2-6: Toli-Toli and Tarakan Broadcasting Stations / Equipment Layout of MW Radio Transmitting station.

2) Incidental Facility Work

The incidental facility work in the transmitter building necessary for installation of the procured equipment is divided as indicated below between items for which the Indonesian side is responsible and items for which the Japanese side is responsible. It is essential that it be carried out in such a way as not to cause any discrepancies or conflicts between the work items for which the two sides are respectively responsible (refer to Fig. 2-7: Toli-Toli and Tarakan Broadcasting Stations / Scope of Works on Incidental Facilities in the Transmitter Room). It should also be noted that it is necessary that the items for which the Indonesian side is responsible be completed before commencement of the equipment installation work that is to be done by the Japanese side.

[Scope of Work to be carried out by Indonesian Side]

① Installation of cable ladder

A horizontal cable ladder with a width of 200mm needed for the laying of power supply lines, audio signal lines, control lines, etc. between the equipment will be procured and installed in the transmitter room at a height of about 2.5m.

② Installation of Class A grounding

A Class A earth plate (resistance of under 10Ω) needed for the equipment will be

installed underground outdoors.

③ Installation of earth terminal box

An earth terminal box needed for connection of the procured equipment earth line will be installed in the transmitter room. That includes procurement and connection of the earth line (copper line) from the Class A earth plate installed outdoors to the earth terminal box.

④ Main power board

A main power board needed for supply of electricity to the equipment will be procured and installed in the transmitter building. That includes the work of laying the electric power line from the power supply building. The power capacity should be 65kVA (380V, 3-phase, 4-wire). (Provision of the wiring from the main power board to the AVR will be done by the Japanese side.)

⑤ Foundation for Installation of Air Conditioner Outdoor Units

A concrete foundation with a thickness of 100mm (area: 2,200mm × 500mm) needed for installation of the air conditioner outdoor units for cooling of the equipment is to be provided. (The Japanese side will procure and install the air conditioner itself.)

⑥ Installation of ventilation fan hood

A hood with an anti-insect screen at the opening of ventilation fan in the transmitter room shall be procured and installed.

⑦ Installation of canopy

A canopy with a thickness of 50mm (area: 1,600mm × 600mm) is to be procured and installed above the air intake opening.

⑧ Louver opening work

An opening (1,000m × 1,000m) is to be made for installation of a louver for air intake (the louver itself will be procured and installed by the Japanese side).

⑨ Air chamber work

An air chamber (area: 900mm × 1,500mm; height: 4,000mm) for removal of dust is to be set up in the transmitter room.

⑩ Air filter opening work

An opening (1,000mm × 1,000m) needed for installation of the air filter is to be made. (The air filter itself will be procured and installed by the Japanese side.)

⑪ Ventilation fan opening work

An opening (400mm × 400mm) for installation of the ventilation fan is to be made. (The ventilation fan itself will be procured and installed by the Japanese side.)

⑫ Installation of fluorescent lamps

Lighting fixtures for adequate lighting of each room are to be procured and installed.

[Scope of Work to be carried out by the Japanese Side]

① Installation of louver

A louver (1,000mm × 1,000m) is to be installed at the air intake opening made in advance by the Indonesian side.

② Installation of air filter

A filter frame (1,000mm × 1,000mm) is to be installed in the air chamber.

③ Installation of damper

There is to be installation of a motor-driven damper (1,000mm × 1,000mm) on the external side of the air filter. Normally the air filter is closed by the damper, shutting off air from the outside.

④ Installation of ventilation fan with shutter

A ventilation fan with shutter is to be installed as a means of cooling in case the air conditioner goes out of order. It is to operate automatically, with air intake from the outside when the motor-driven damper is opened by thermostat.

⑤ Air conditioner

The cooling system is to be by air conditioner for protection of the procured equipment from dust, moisture, etc. from the outside.

The above work items for which the Japanese side is responsible are to be done at the time of the equipment installation work.

(3) Construction of Power Supply Building and Procurement of Power Supply Equipment

There is to be procurement of the power supply facilities, including the incoming power receiving facilities (60kVA) and the emergency generator (65kVA) for use at the time of power outages, and construction of the building for accommodation thereof. In order to avoid the noise of the emergency generator it is desirable that the power supply building and the transmitter building be built at a distance of at least 10m from one another. Switching between the commercial power source and the emergency generator is to be manually operated by means of a switching board.

Connection from the incoming power receiving facilities to the main power board of the transmitter room is to be by trench (underground).

(4) Construction of STL Self-Supporting Tower

A 50m self-supporting tower for installation of the antenna for the STL receiver for receiving the broadcast program signal sent from the existing broadcasting station and the antenna for FM receiver is to be constructed next to the transmitter building. It is appropriate that the height of installation of the antenna for the STL receiver be at least 40m considering the height of the coconut trees in the vicinity of the transmitting station. Furthermore, there is to be a horizontal ladder (about 10m) between the tower and the transmitter building for bringing in the coaxial cable from the receiving antenna. The receiving antenna, the coaxial cable, etc. are to be procured and installed by the Japanese side.

2-2-2-5 Coverage Area of MW Radio Broadcasting Service

Although the Toli-Toli and Tarakan broadcasting stations are presently engaged in FM broadcasting, they have not been able to secure a service area commensurate with transmitting facility scale because of the fairly mountainous terrain of their respective geographical areas, which is a type of terrain that does not lend itself to FM broadcasting.

On the other hand, MW broadcasting is propagated as surface waves, which are not influenced all that much by the terrain, making for good reception even in mountainous area. That means that a wider service area can be expected with MW broadcasting than with FM broadcasting.

The present FM broadcasting service areas of the two broadcasting stations are compared with the MW broadcasting service areas that they will have after implementation of this Project in Fig. 2- 2 and Fig. 2- 3, respectively.

Service area is defined in accordance with the ITU-R recommendation as the area within which the reception field intensity has the values indicated below:

- Reception field intensity within the service area of FM broadcasting:
  54dB μ V/m (0.5mV/m)
- Reception field intensity within the service area of MW broadcasting:
  60dB μ V/m (1mV/m)

(1) Broadcasting service areas of the Toli-Toli area

1) FM broadcasting service area

Since the southeast, east and northeast parts of Toli-Toli Regency consist of mountainous

areas, the present broadcasting service area of the existing 3kW FM transmitter is limited to the plains of the Ogodide district and the coastal areas of the Baolang, Galang, Bandondo and North Toli-Toli districts. The population within that broadcasting service area is estimated at about 110,000, or about 58% of the population of Toli-Toli Regency.

Population of Toli-Toli Regency: 190,579

District	Number of Residents	District	Number of Residents
South Denpai	19,611	Baolang	54,961
North Denpai	12,122	Lanbasio	12,167
Dondo	19,893	Galang	28,860
Ogodide	10,770	North Toli-Toli	22,768
Bandondo	9,427	■: Districts covered by FM service	

(Source: survey data of the Central Statistics Bureau for 2003)

2) MW broadcasting service area

The broadcasting service area of the Toli-Toli MW transmitting station, which will be improved by this Project with a 10kW MW broadcast transmitter (1377kHz), will extend over the entire area of Toli-Toli Regency in Central Sulawesi Province and even the northern part of Dongara Regency, for an estimated population coverage of about 250,000 people.

Population of Central Sulawesi Province: 2,242,914

Area	Surface Area (km^2)	Number of Residents	Area	Surface Area (km^2)	Number of Residents
Bangai Island	3,160	150,880	Bagiri Montan Regency	6,231	347,842
Bangai Regency	9,673	284,275	Toli-Toli Regency	4,079	190,579
Morowari Regency	15,490	165,542	Buor Regency	4,043	108,635
Poso Regency	14,433	275,974	Pal Autonomous District	509	281,646
Dongara Regency	10,471	437,541	■: Area covered by MW Service		

(Source: survey data of the Central Statistics Bureau for 2003)

(2) Broadcasting service areas of Tarakan Region

1) FM broadcasting service area

The present broadcasting service area with the existing 5kW FM transmitter covers all of Tarakan Regency. But some areas in the eastern and northern parts do not have adequate

FM broadcasting reception because of blocking of the radio signal by the mountainous terrain. It is therefore estimated that in the service area the population with reception is only about 100,000 (about 77% of the population of Tarakan Regency), centering on the Central and West Tarakan Districts of Tarakan Regency, instead of all of Tarakan Regency's residents.

Population of Tarakan Regency: 124,579

District	Number of Residents	District	Number of Residents
East Tarakan	25,229	West Tarakan	44,885
Central Tarakan	42,885	North Tarakan	11,580

: Districts covered by FM service

(Source: survey data of the Central Statistics Bureau for 2003)

2) MW broadcasting service area

The Tarakan MW transmitting station, which will improved by this Project with10kW MW transmitter (1350kHz) will extend over Tarakan Regency and the Nunukan, Burungan and Bilau regencies of East Kalimantan Province and an estimated population coverage of 420,000 people.

Population of East Kalimantan Province: 2,609,707

Area	Surface Area (km^2)	Number of Residents	Area	Surface Area (km^2)	Number of Residents
Nunuka Regency	14,585	82,469	Karutanegara Regency	27,263	424,452
Burungan Regency	18,010	84,438	Samarinda Autonomous District	783	531,912
Tarakan Regency	507	124,579	Bontan Regency	406	106,813
Malinau Regency	42,620	37,237	Balik Papan Regency	749	412,045
Bilau Regency	24,201	123,974	Pasil Regency	14,937	273,495
East Kutai Regency	35,747	151,823	North Pasil Regency	3,333	117,063
West Kutai Regency	31,628	139,407			

: Area covered by MW Service

(Source: survey data of the Central Statistics Bureau for 2003)

The Toli-Toli and Tarakan broadcasting stations chiefly broadcast programs the content of which is closely related to the local community or region, with programming that meets the desires and needs of local residents. As mentioned above, the FM broadcasting now being done by those

two broadcasting stations is not able to secure a sufficiently wide service area, which means that the benefit of such FM broadcasting can be enjoyed only by those living not too far from the stations. Residents who do not have reception of that FM broadcasting are able to receive only broadcasts from Malaysia and the Philippines. Although they are Indonesian, they do not have access to Indonesian information, and that has given rise to an information gap within the region. But as a result of provision of those broadcasting stations with MW transmission facilities, the broadcasting service areas of those stations will be enlarged, increasing the number of residents that can receive RRI's radio broadcasts from about 110,000 to about 250,000 people in the Toli-Toli region and from about 100,000 to about 420,000 in the Tarakan region.

Fig 2-2: The MW and FM Broadcasting Service Areas of the Toli-Toli Broadcasting Station

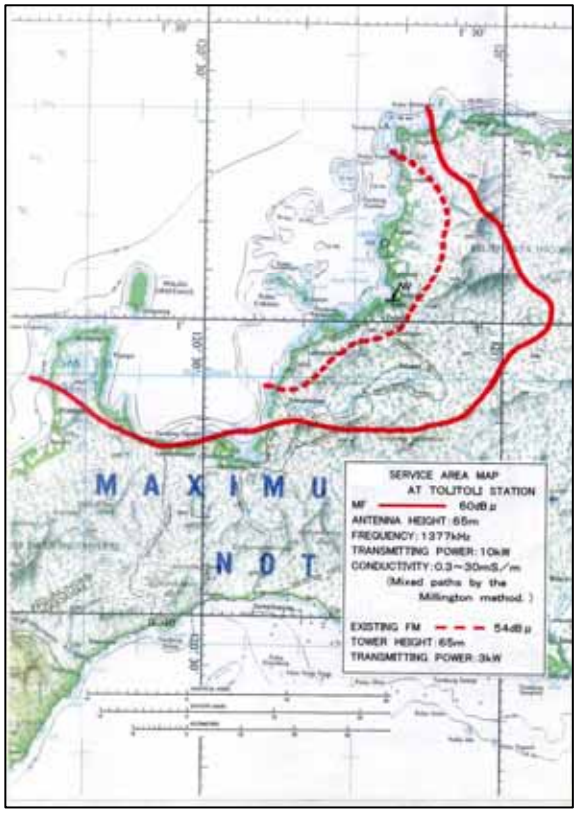


Fig. 2-3: The MW and FM Broadcasting Service Areas of the Tarakan Broadcasting Station

2-2-3 Basic Design Diagrams

Fig. 2-4 : Toli-Toli Broadcasting Station / Site Layout of MW Radio Transmitting Station

Fig. 2-5 : Tarakan Broadcasting Station / Site Layout of MW Radio Transmitting Station

Fig. 2-6 : Toli-Toli & Tarakan Broadcasting Station / Equipment Layout of MW Radio Transmitting Station

Fig. 2-7 : Toli-Toli & Tarakan Broadcasting Station / Scope of Works on Incidental Facilities in the Transmitter Room

Fig. 2-8 : Toli-Toli Broadcasting Station / Floor Layout of FM Transmitter Room

Fig. 2-9 : Toli-Toli Broadcasting Station / Floor Layout of Continuity Studio

Fig. 2-10 : Tarakan Broadcasting Station / Floor Layout of FM Transmitter Room

Fig. 2-11 : Tarakan Broadcasting Station / Floor Layout of Continuity Studio

Fig. 2-12 : Toli-Toli & Tarakan Broadcasting Station / Overall Block Diagram of MW Broadcasting System

Fig. 2-13 : Toli-Toli & Tarakan Broadcasting Station / Block Diagram of MW Transmitting System

Fig. 2-14 : Toli-Toli & Tarakan Broadcasting Station / Block Diagram of 10kW MW Transmitter

Fig. 2-15 : Toli-Toli & Tarakan Broadcasting Station / Block Diagram of 40kVA AVR

Fig. 2-16 : Toli-Toli & Tarakan Broadcasting Station / External View of Program Input & Monitoring Rack and STL/Measuring Rack

Fig. 2-17 : Toli-Toli & Tarakan Broadcasting Station / Elevation of 65m MW Transmitting Antenna

Fig. 2-18 : Toli-Toli Broadcasting Station / Block Diagram of MW Broadcast Program Transmission

Fig. 2-19 : Tarakan Broadcasting Station / Block Diagram of MW Broadcast Program Transmission

Fig. 2-20 : Toli-Toli Broadcasting Station / Block Diagram of Power Supply (Broadcasting Station Side)

Fig. 2-21 : Tarakan Broadcasting Station / Block Diagram of Power Supply (Broadcasting Station Side)

Fig. 2-22 : Toli-Toli Broadcasting Station / Elevation of 65 m Self-Supporting Tower

Fig. 2-23 : Tarakan Broadcasting Station / Elevation of 65 m Self-Supporting Tower

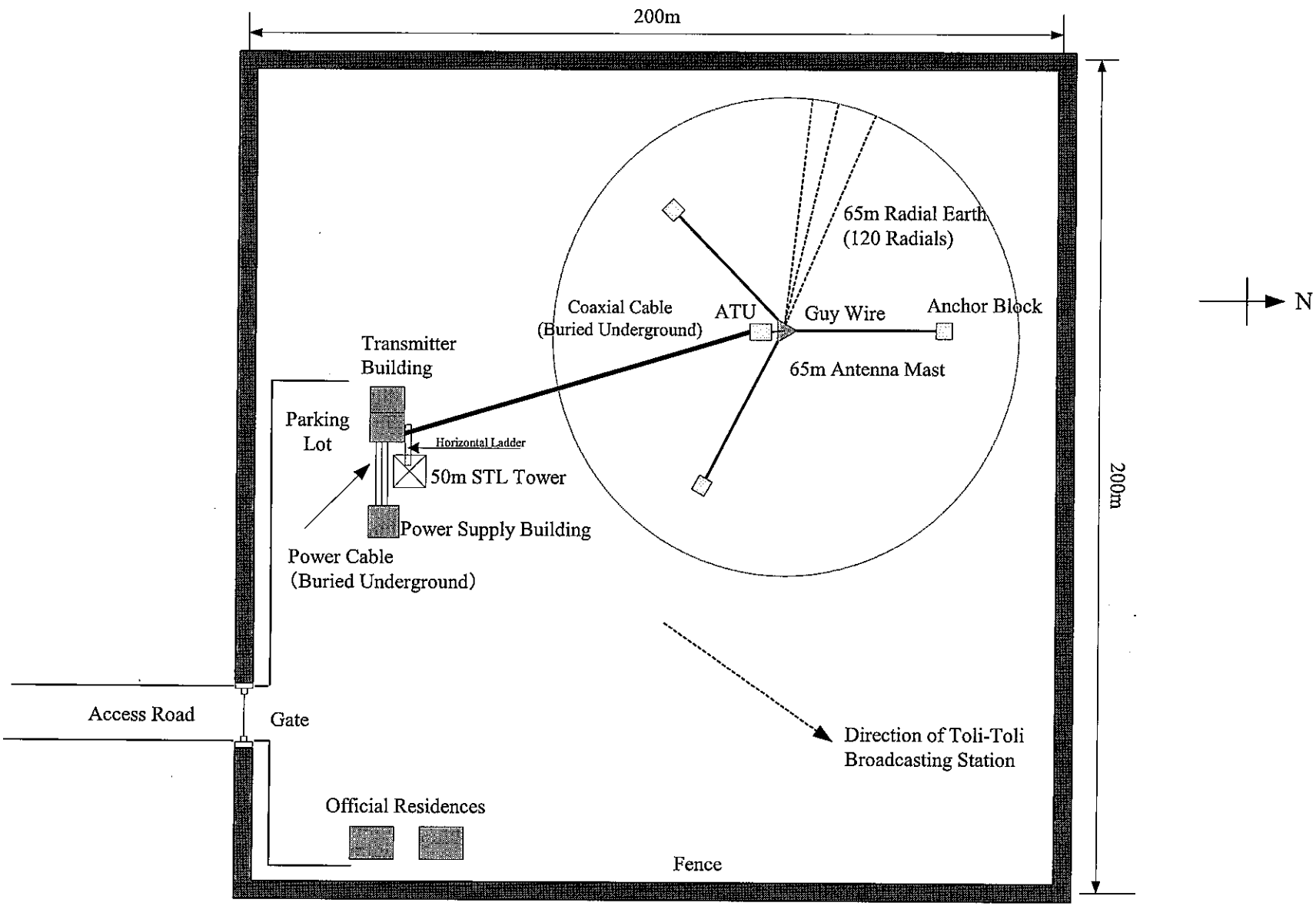


Fig.2-4	TOLI-TOLI BROADCASTING STATION	SITE LAYOUT OF MW RADIO TRANSMITTING STATION

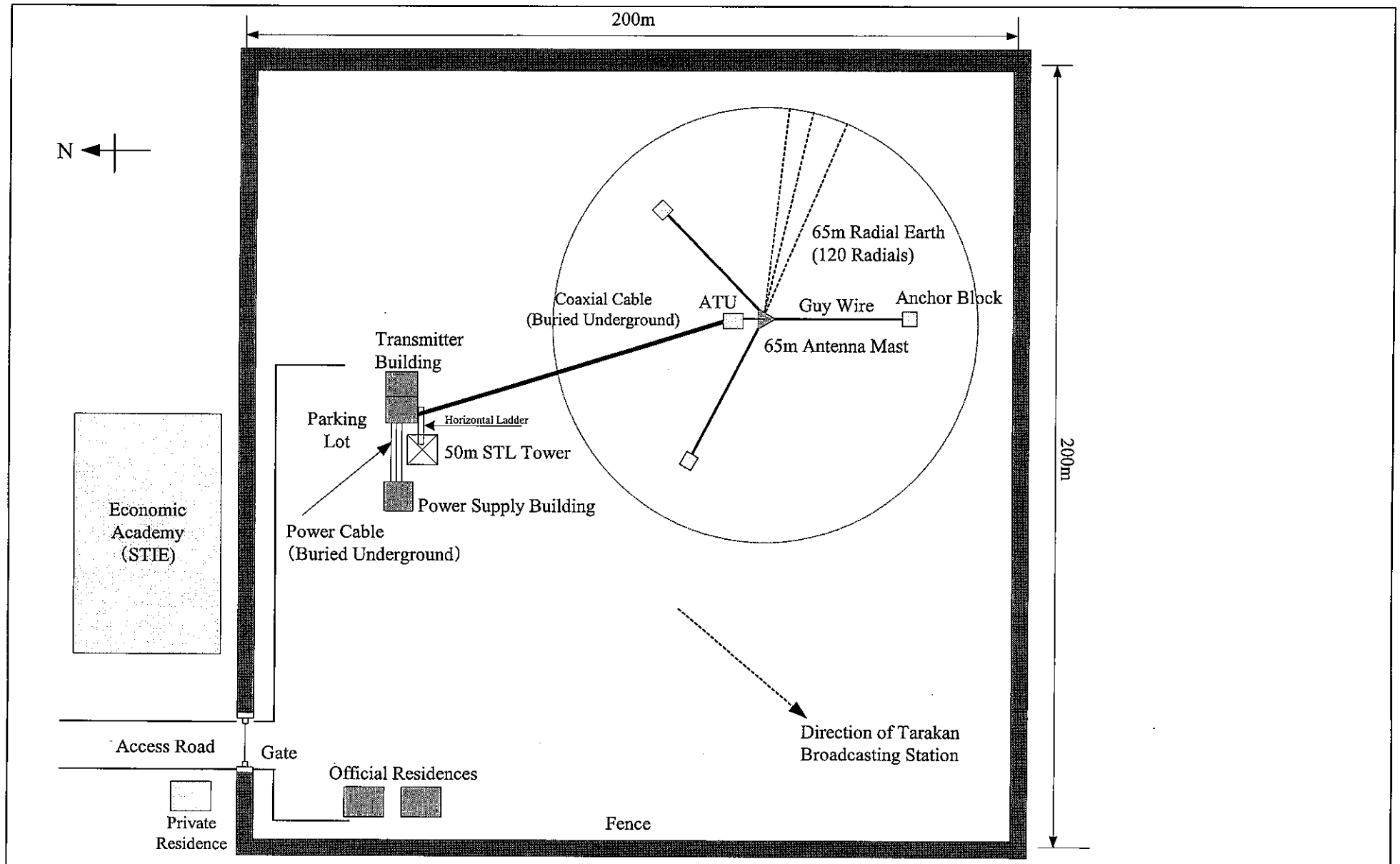
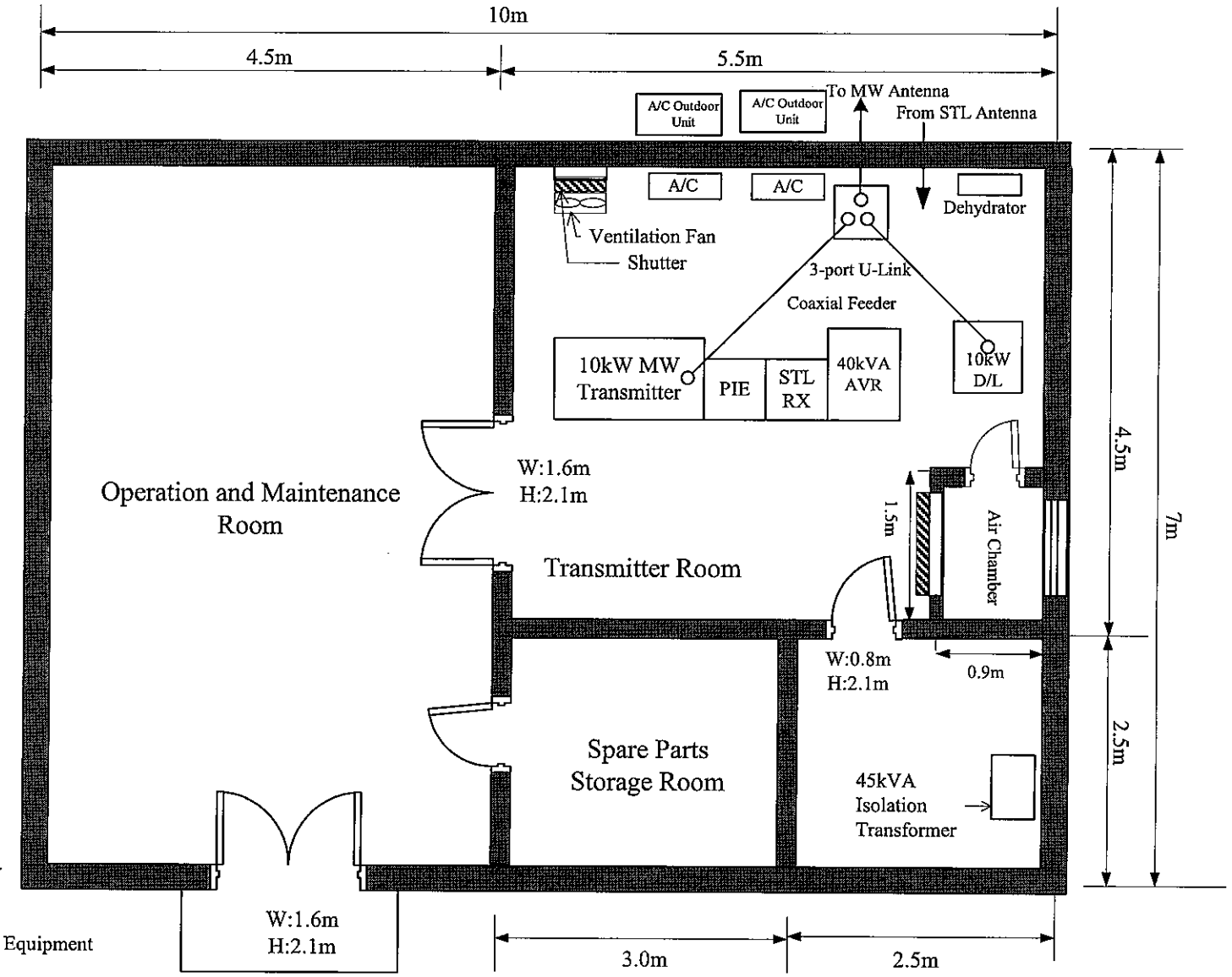


Fig.2-5	TARAKAN BROADCASTING STATION	SITE LAYOUT OF MW RADIO TRANSMITTING STATION



Legend

A/C :Air Conditioner
AVR :Automatic Voltage Regulator
D/L :Dummy Load
MW :Medium Wave
PIE :Program Input & Monitoring Equipment
RX :Receiver
STL :Studio-Transmitter Link

Fig.2-6	TOLI-TOLI & TARAKAN BROADCASTING STATION	EQUIPMENT LAYOUT OF MW RADIO TRANSMITTING STATION

	Item	Indonesian Side	Japanese Side
①	Cable Ladder (W:200mm)	●	
②	Earth Terminal Box	●	
③	PDB	●	
④	Foundation (2200 x 500 x 100mm)	●	
⑤	Air Hood for Ventilation Fan	●	
⑥	Sunshade (1600 x 1000 x 50mm)	●	
⑦	Opening for Louver (1000 x 1000mm)	●	
⑧	Opening for Air Filter (1000 x 1000mm)	●	
⑨	Opening for Ventilation Fan (400 x 400mm)	●	
⑩	Through Hole for STL Cable (100 x 100mm)	●	
⑪	Fluorescent Light	●	
⑫	Louver (1000 x 1000mm)		●
⑬	Air Filter (1000 x 1000mm)		●
⑭	Damper (1000 x 1000mm)		●
⑮	Ventilation Fan (450 x 450mm)		●
⑯	Shutter (450 x 450mm)		●

Legend

A/C :Air Conditioner
AVR :Automatic Voltage Regulator
D/L :Dummy Load
MW :Medium Wave
PDB :Power Distribution Board
PIE :Program Input and Monitoring Equipment
RX :Receiver
STL :Studio-Transmitter Link

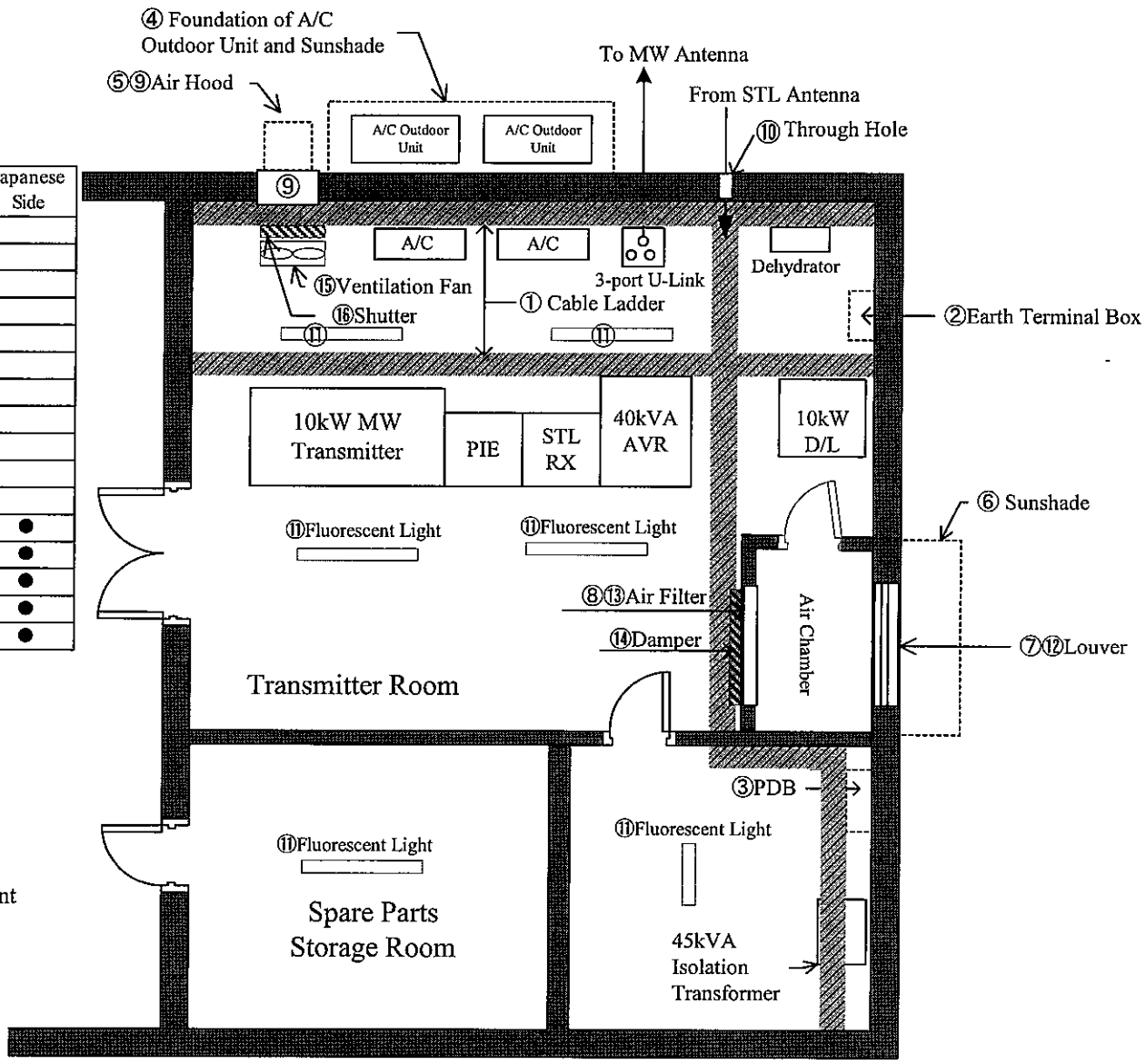


Fig.2-7	TOLI-TOLI & TARAKAN BROADCASTING STATION	SCOPE OF WORKS ON INCIDENTAL FACILITIES IN THE TRANSMITTER ROOM

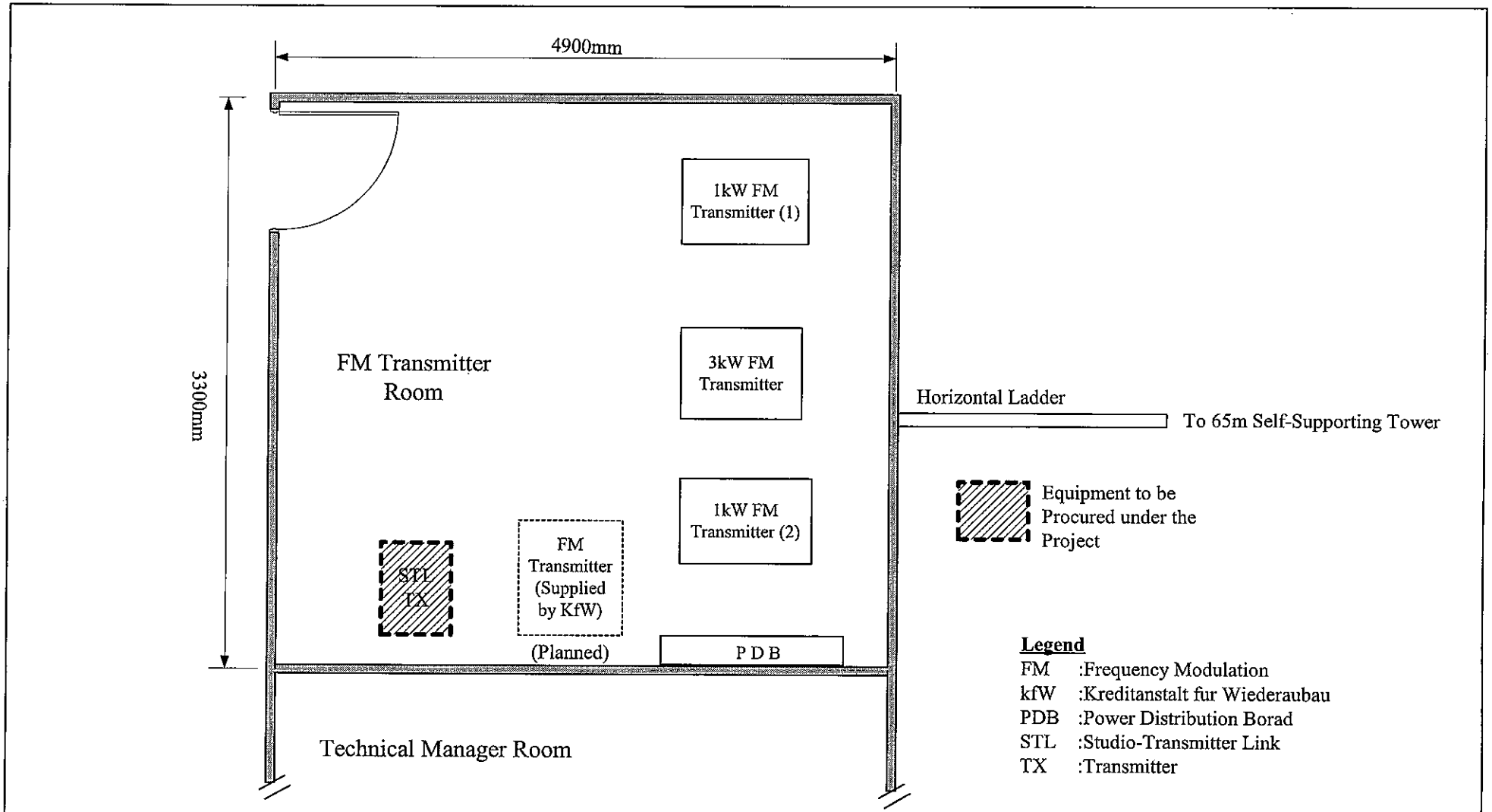


Fig.2-8	TOLI-TOLI BROADCASTING STATION	FLOOR LAYOUT OF FM TRANSMITTER ROOM

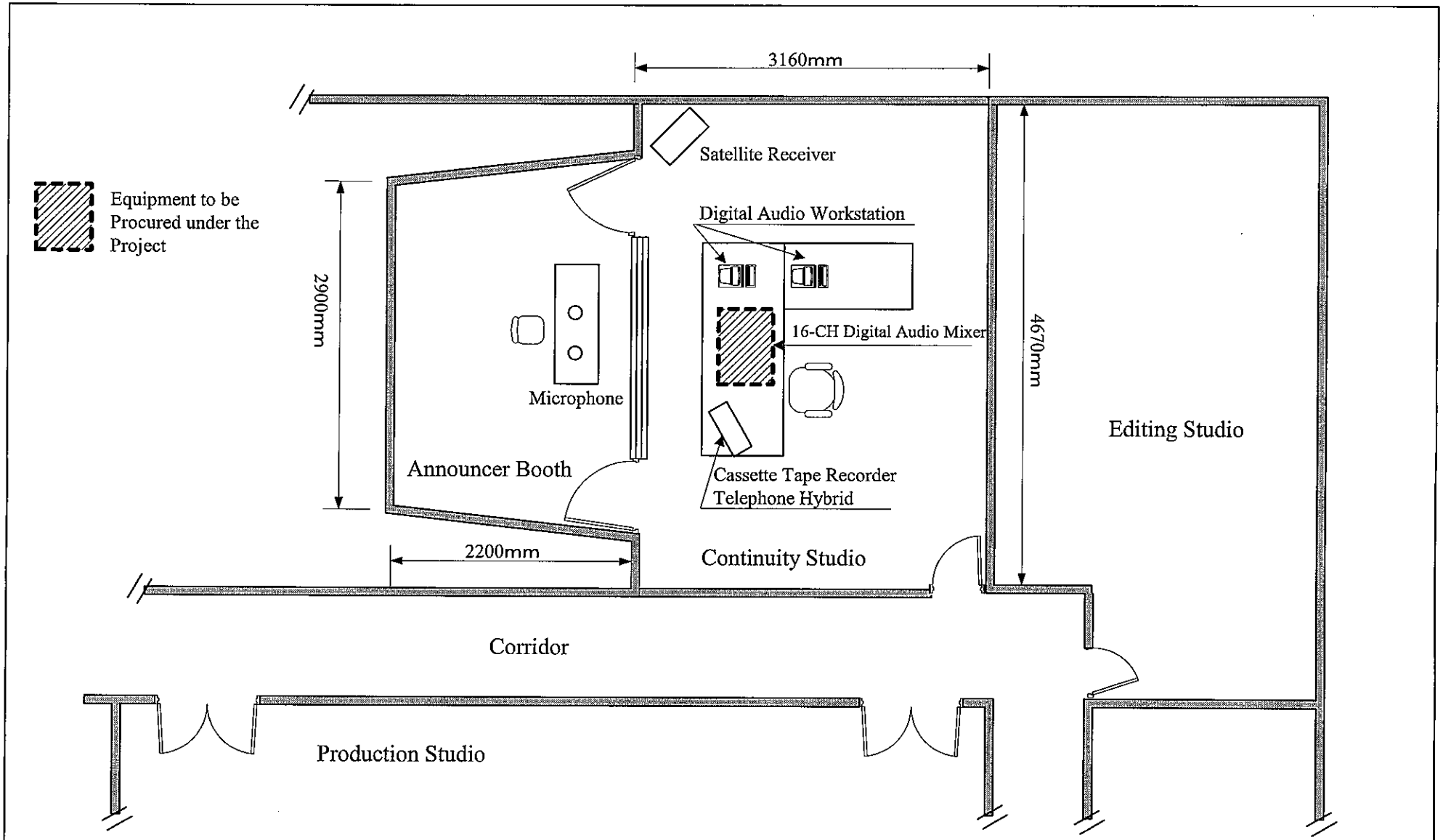


Fig.2-9	TOLI-TOLI BROADCASTING STATION	FLOOR LAYOUT OF CONTINUITY STUDIO

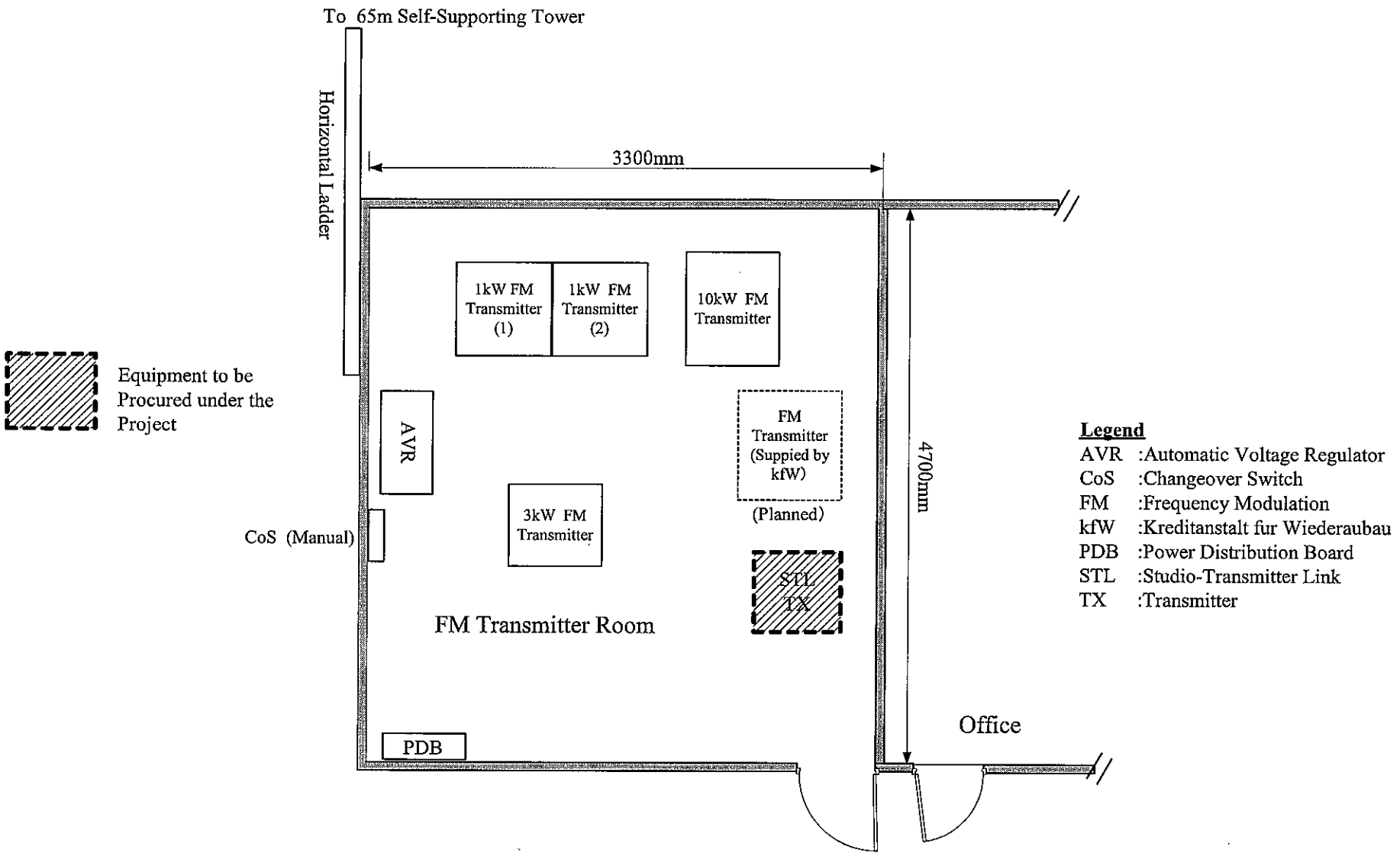


Fig.2-10	TARAKAN BROADCASTING STATION	FLOOR LAYOUT OF FM TRANSMITTER ROOM

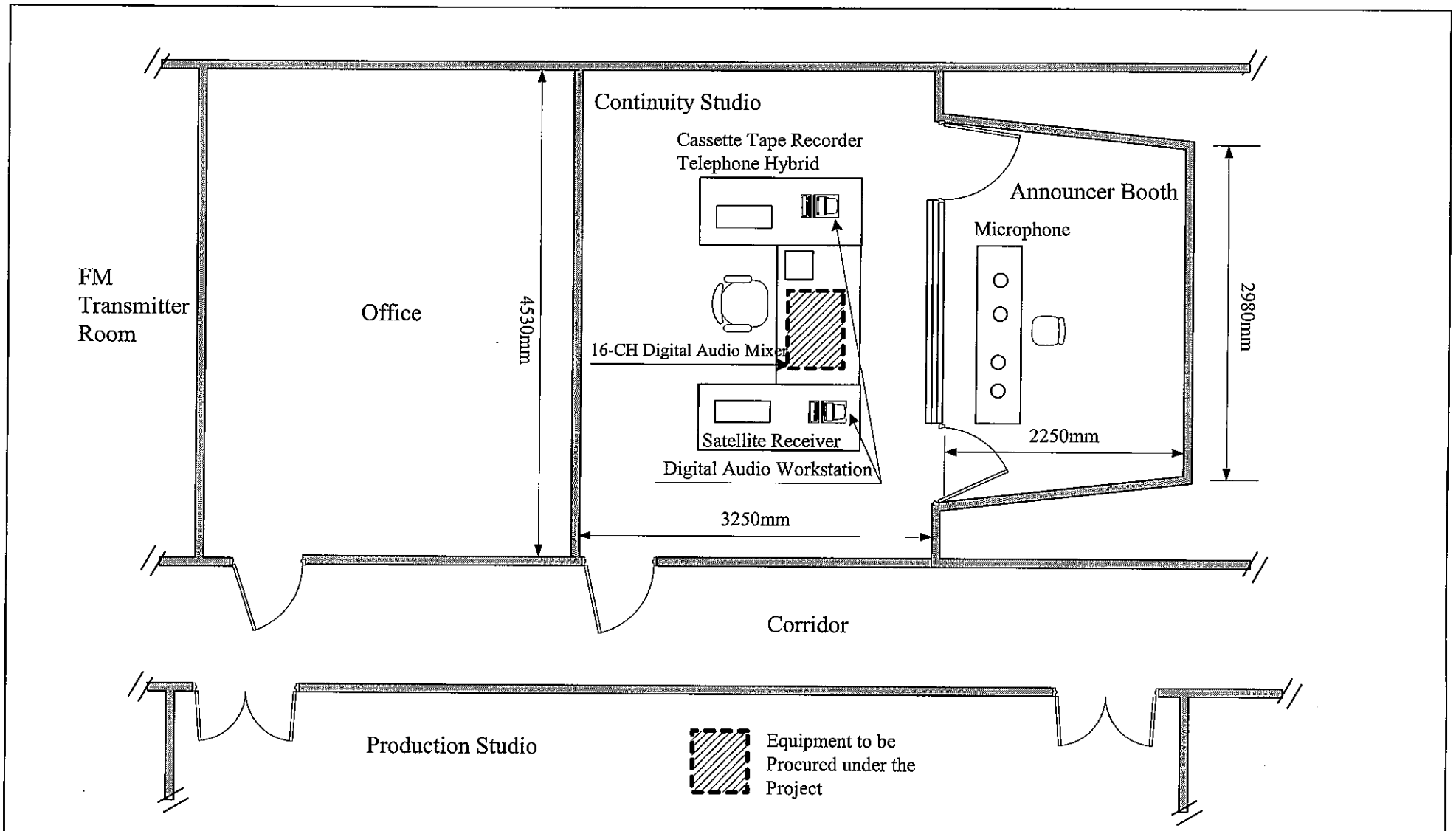


Fig.2-11	TARAKAN BROADCASTING STATION	FLOOR LAYOUT OF CONTINUITY STUDIO

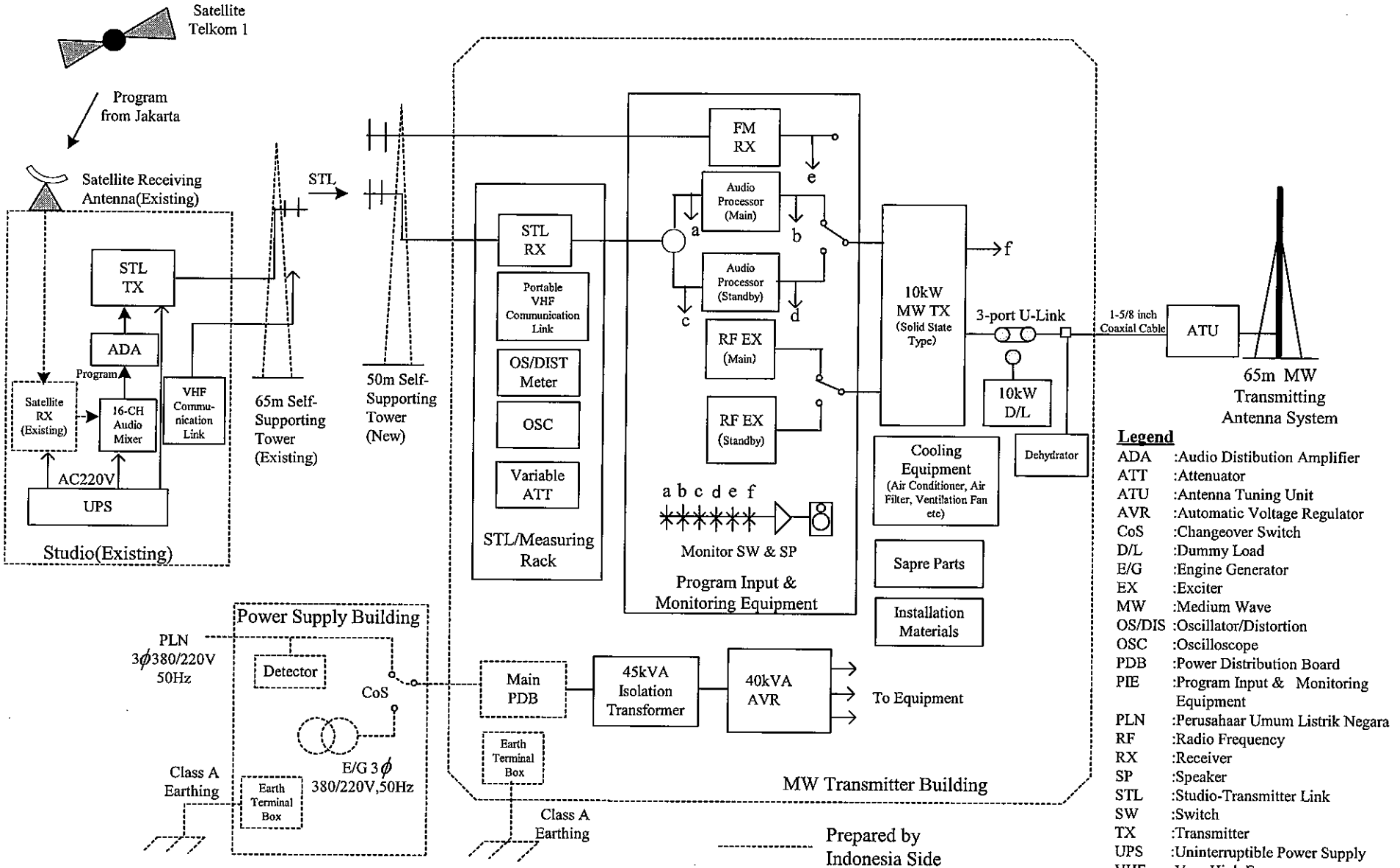


Fig.2-12	TOLI-TOLI & TARAKAN BROADCASTING STATION	OVERALL BLOCK DIAGRAM OF MW BROADCASTING SYSTEM

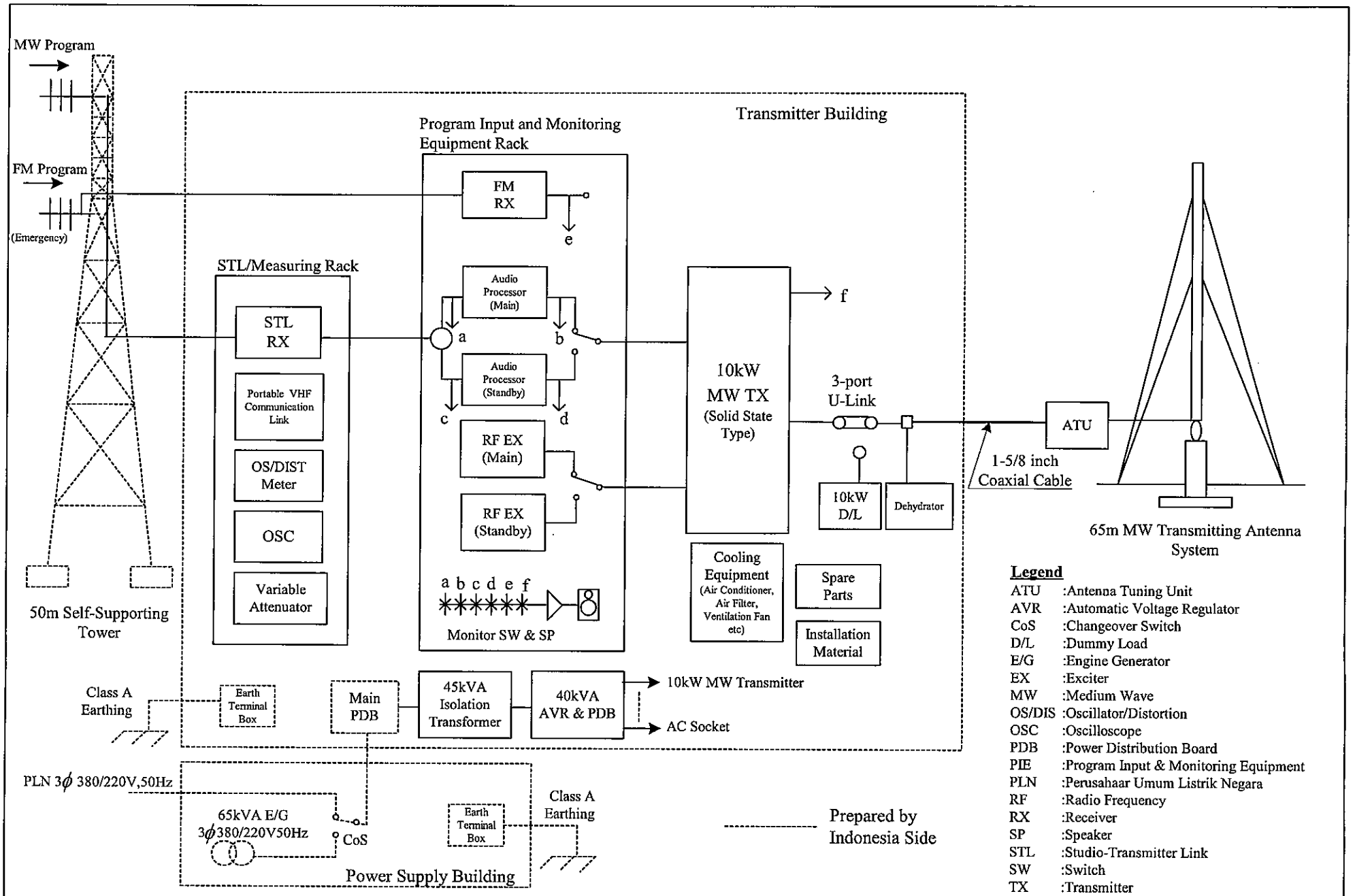
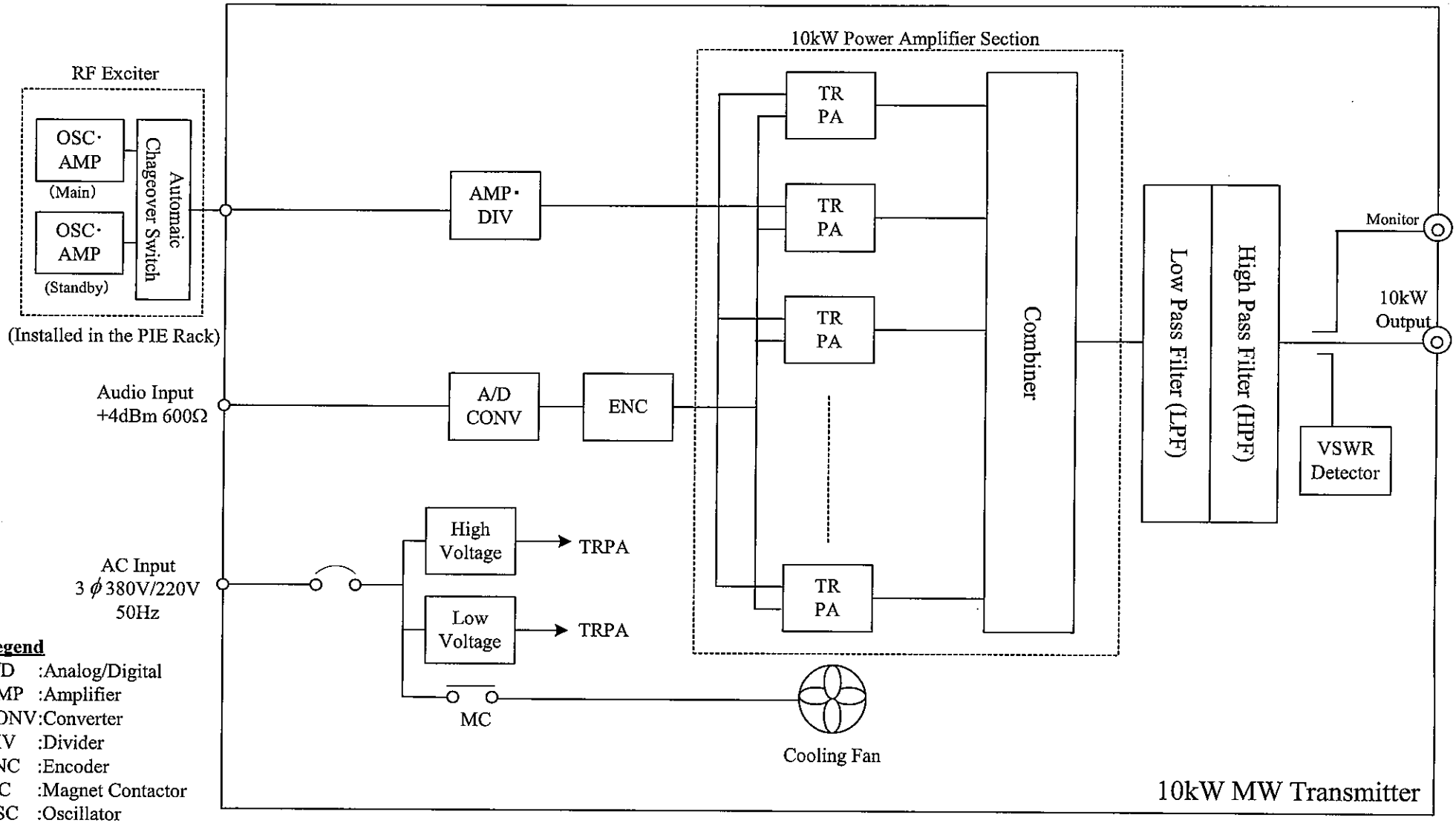


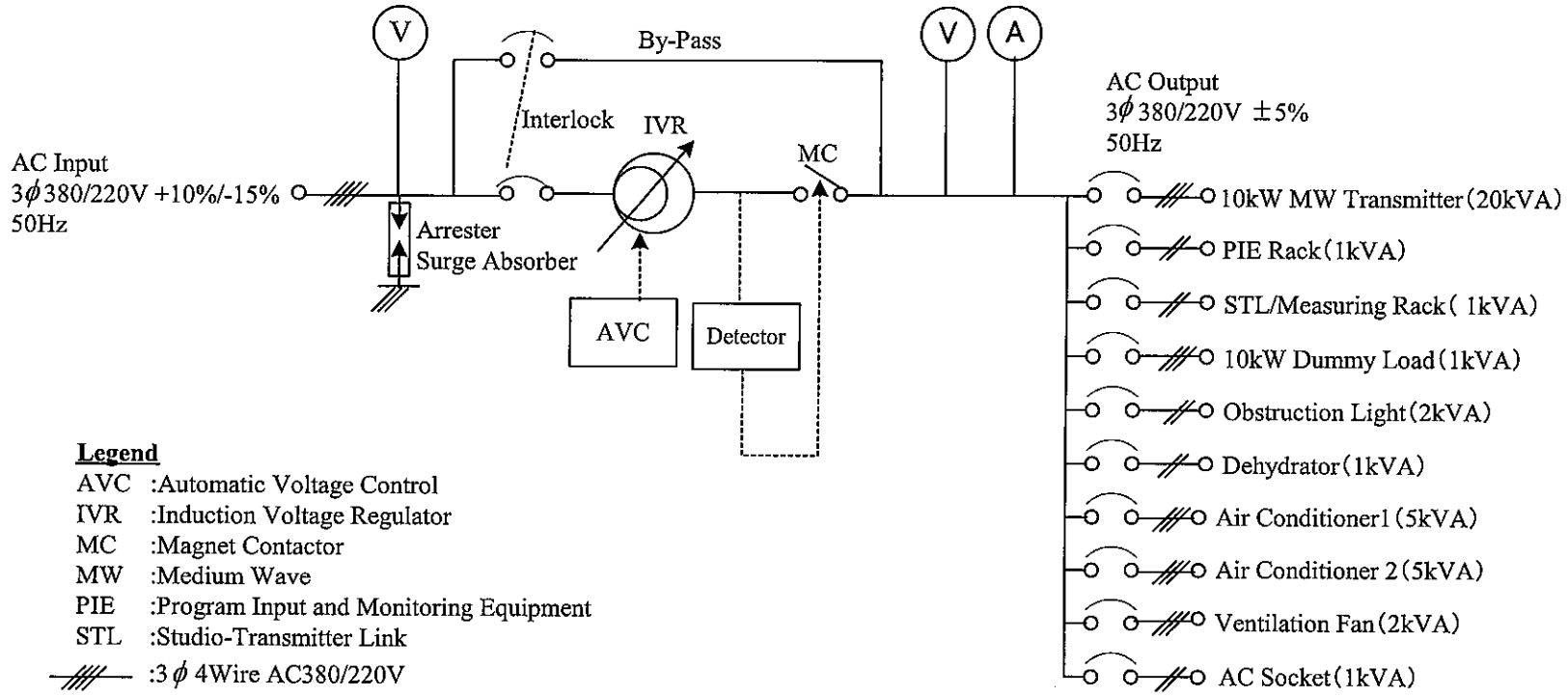
Fig.2-13	TOLI-TOLI & TARAKAN BROADCASTING STATION	BLOCK DIAGRAM OF MW TRANSMITTING SYSTEM



Legend

A/D :Analog/Digital
AMP :Amplifier
CONV:Converter
DIV :Divider
ENC :Encoder
MC :Magnet Contactor
OSC :Oscillator
PIE :Program Input and Monitoring Equipment
RF :Radio Frequency
TRPA :Transistor Power Amplifier
VSWR:Voltage Standing Wave Ratio

Fig.2-14	TOLI-TOLI & TARAKAN BROADCASTING STATION	BLOCK DIAGRAM OF 10kW MW TRANSMITTER



Legend

AVC :Automatic Voltage Control
IVR :Induction Voltage Regulator
MC :Magnet Contactor
MW :Medium Wave
PIE :Program Input and Monitoring Equipment
STL :Studio-Transmitter Link
:3φ 4Wire AC380/220V
:3φ 3Wire AC380V
:Single φ Wire AC220V

AVC :Automatic Voltage Control

Detector :Over/Under Voltage, Open Phase, Reverse Phase

V :AC Voltage Meter

A :AC Current Meter

Fig.2-15	TOLI-TOLI & TARAKAN BROADCASTING STATION	BLOCK DIAGRAM OF 40kVA AVR

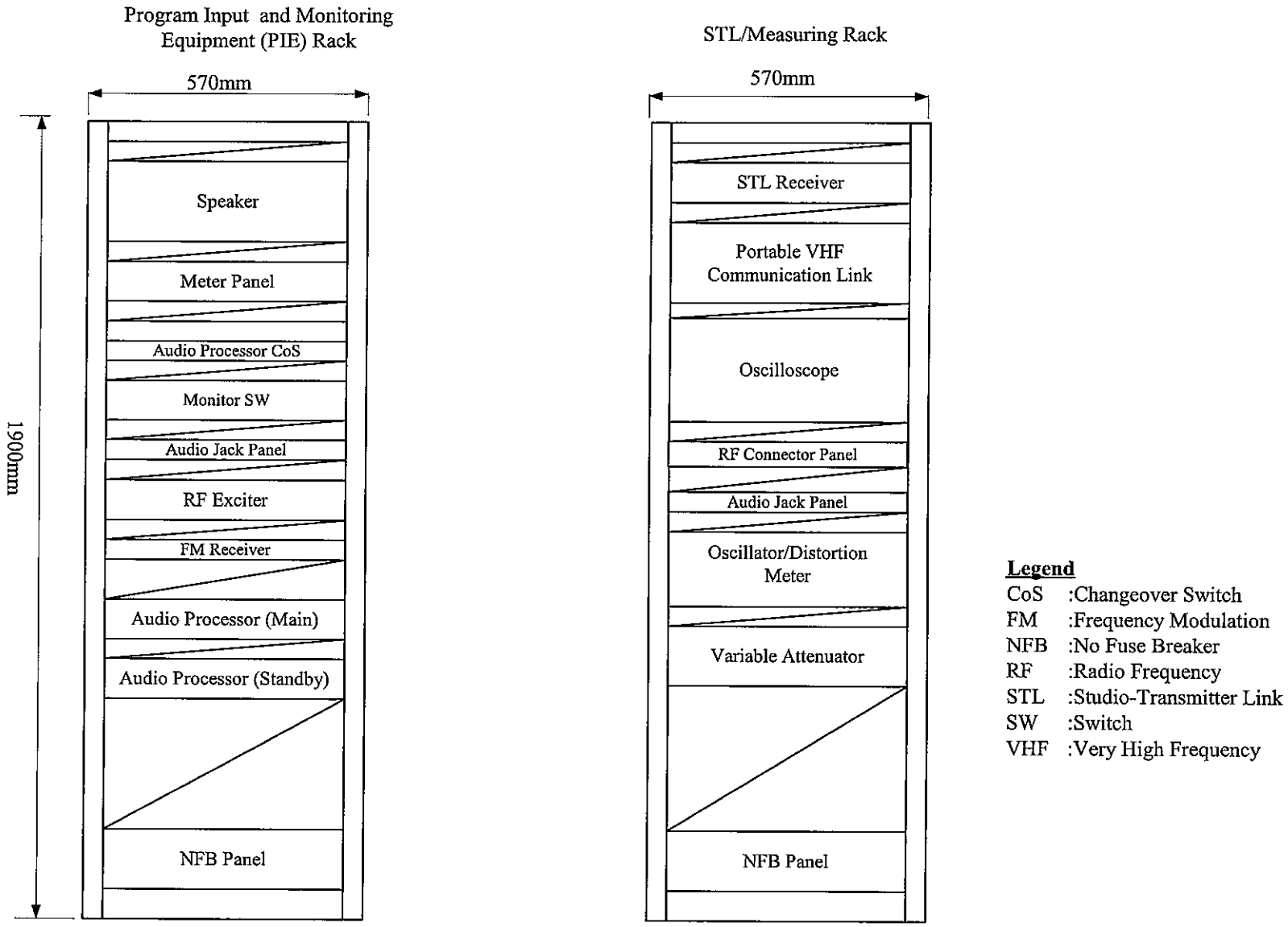


Fig.2-16	TOLI-TOLI & TARAKAN BROADCASTING STATION	EXTERNAL VIEW OF PROGRAM INPUT & MONITORING RACK AND STL/MEASURING RACK

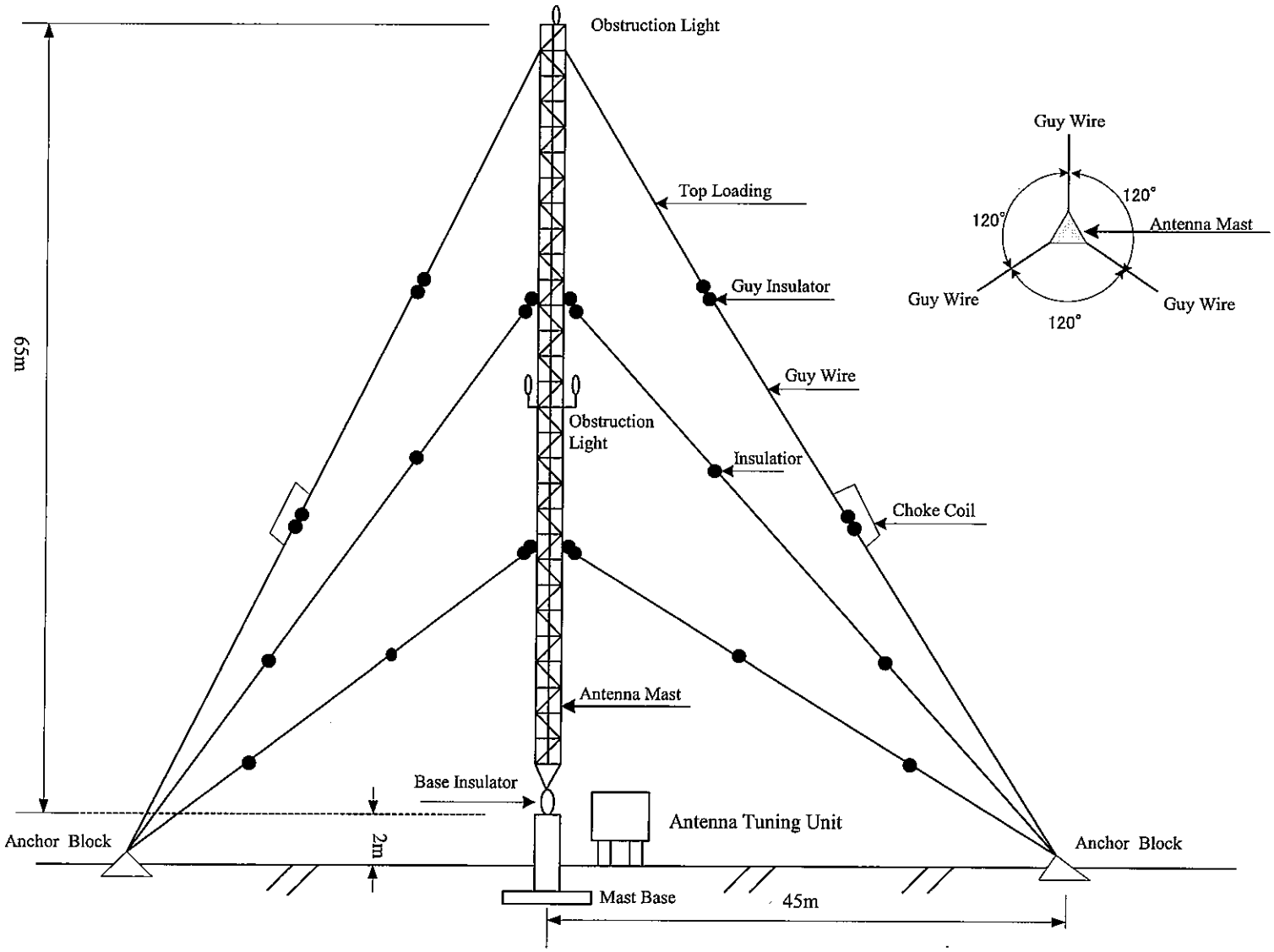


Fig.2-17	TOLI-TOLI & TARAKAN BROADCASTING STATION	ELEVATION OF 65m MW TRANSMITTING ANTENNA

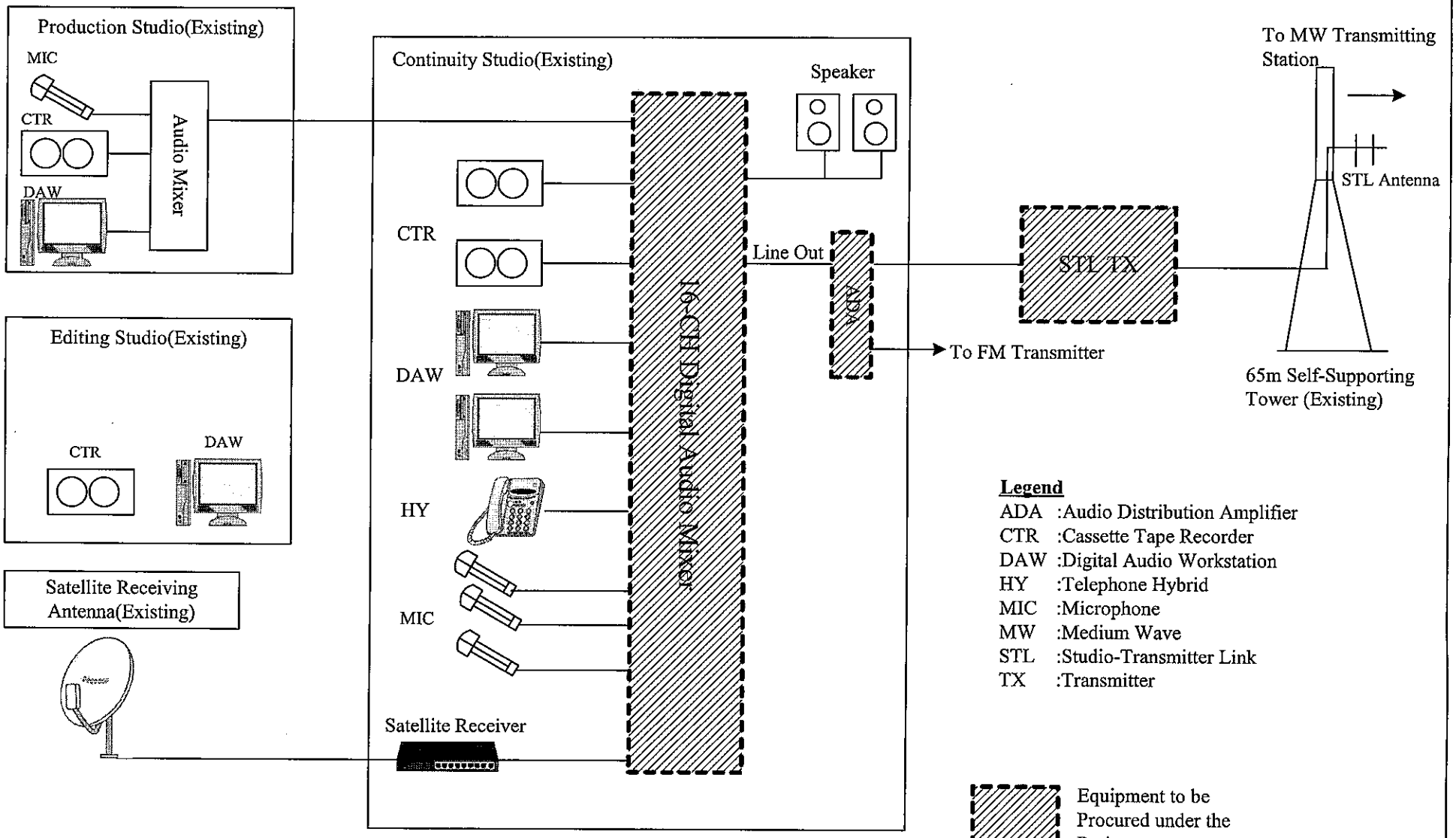


Fig.2-18	TOLI-TOLI BROADCASTING STATION	BLOCK DIAGRAM OF MW BROADCAST PROGRAM TRANSMISSION

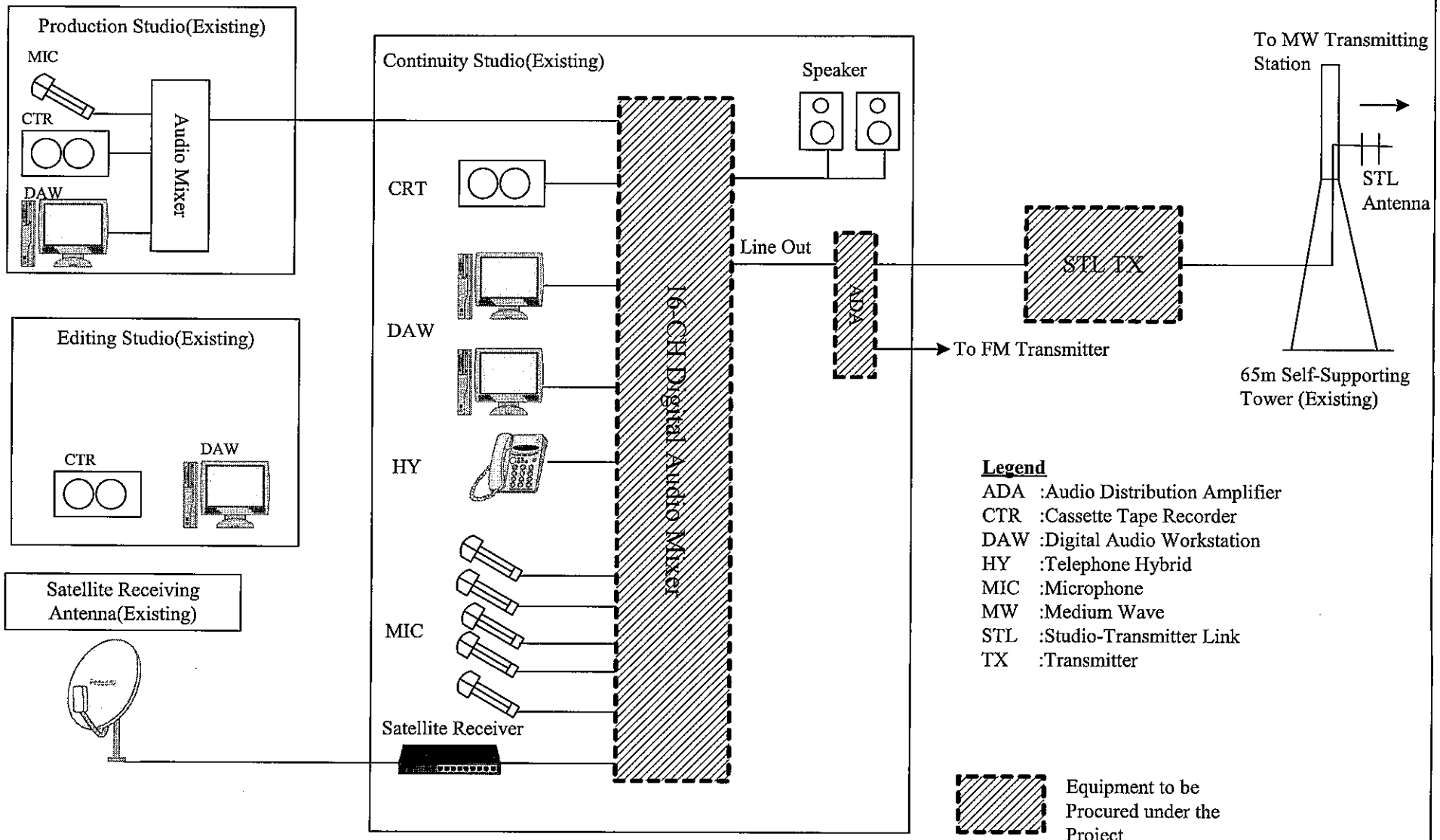
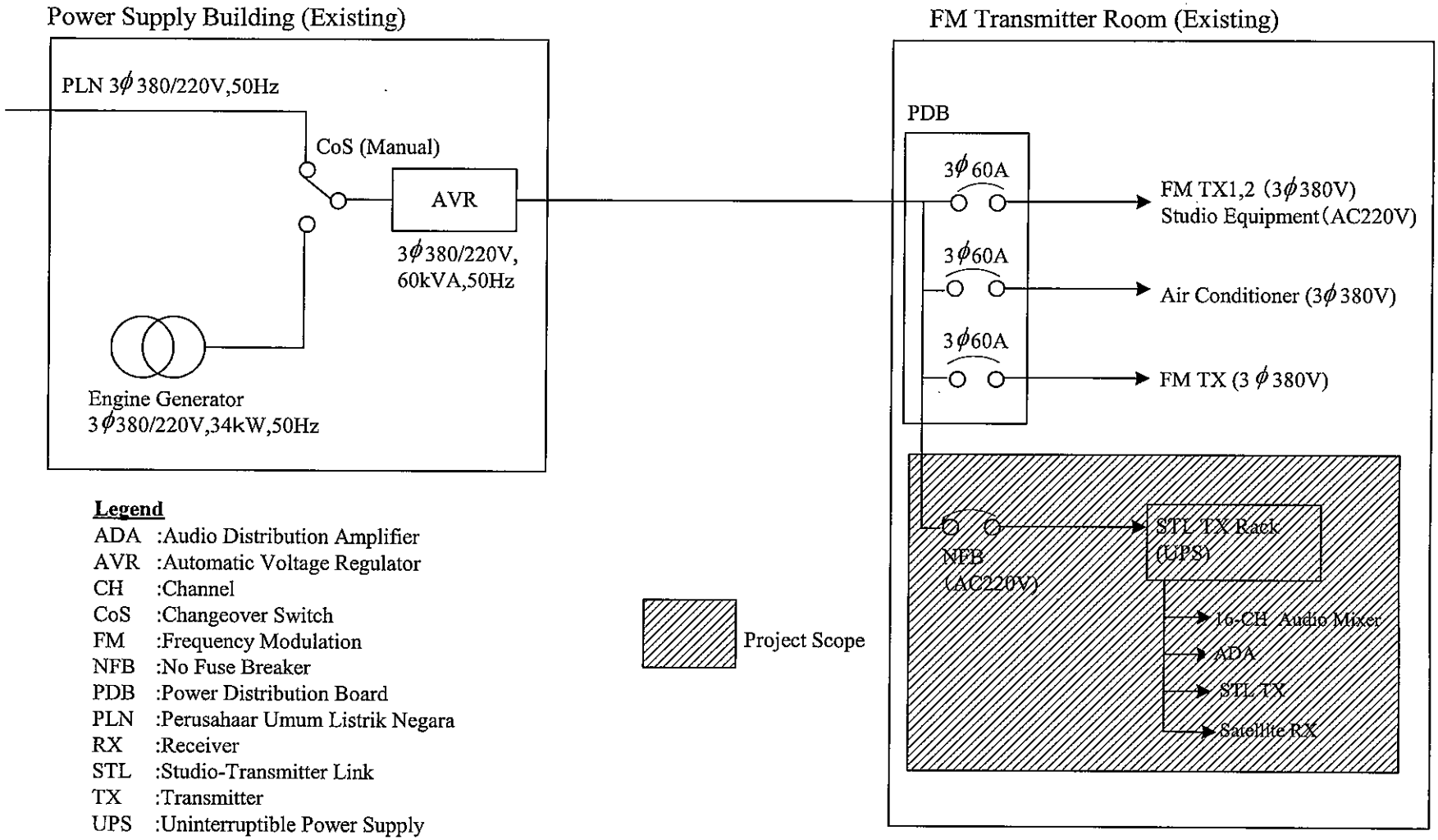


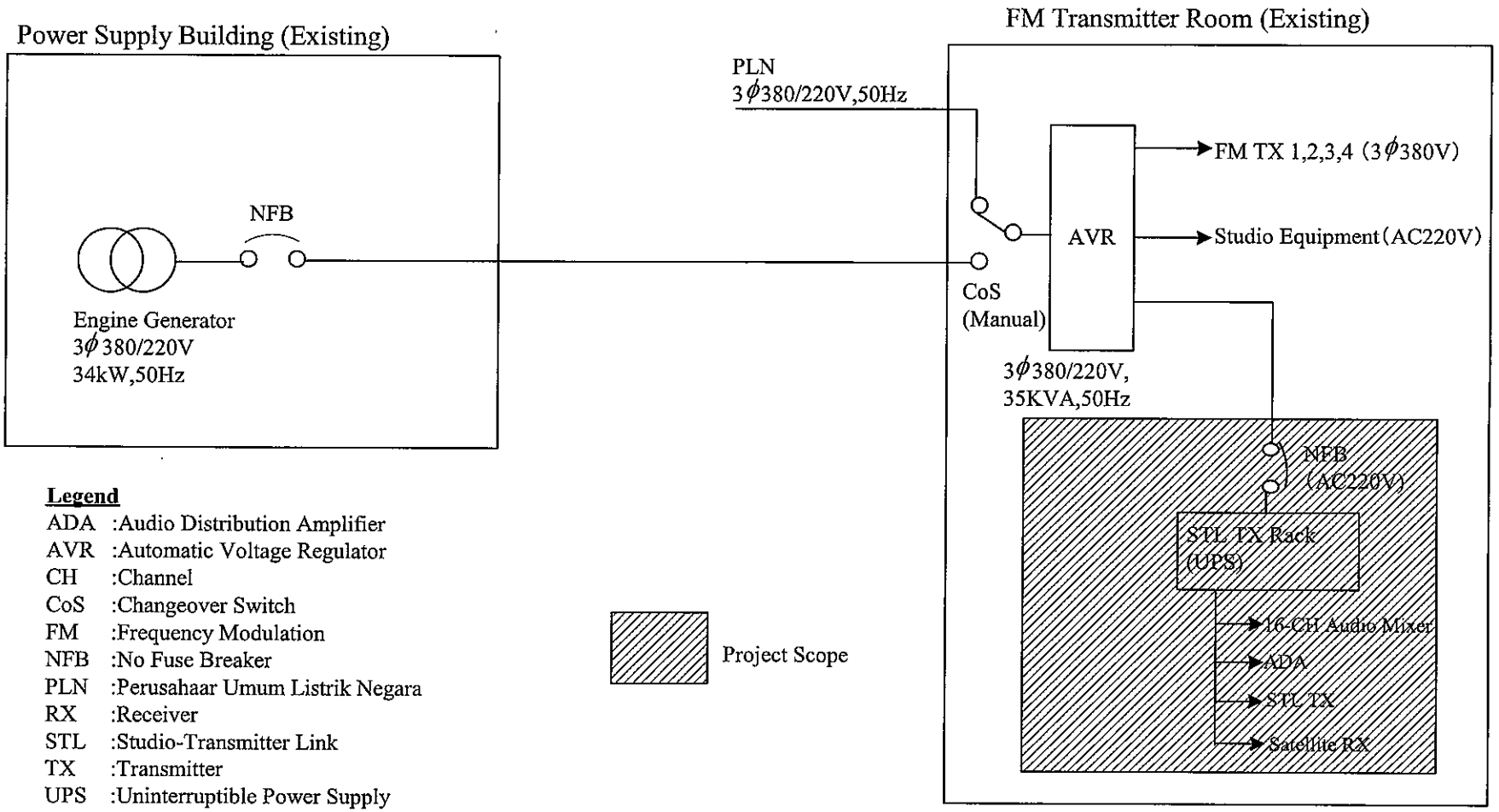
Fig.2-19	TARAKAN BROADCASTING STATION	BLOCK DIAGRAM OF MW BROADCAST PROGRAM TRANSMISSION



Legend

ADA	:Audio Distribution Amplifier
AVR	:Automatic Voltage Regulator
CH	:Channel
CoS	:Changeover Switch
FM	:Frequency Modulation
NFB	:No Fuse Breaker
PDB	:Power Distribution Board
PLN	:Perusahaar Umum Listrik Negara
RX	:Receiver
STL	:Studio-Transmitter Link
TX	:Transmitter
UPS	:Uninterruptible Power Supply

Fig.2-20	TOLI-TOLI BROADCASTING STATION	BLOCK DIAGRAM OF POWER SUPPLY (BROADCASTING STATION SIDE)



Legend

ADA :Audio Distribution Amplifier
AVR :Automatic Voltage Regulator
CH :Channel
CoS :Changeover Switch
FM :Frequency Modulation
NFB :No Fuse Breaker
PLN :Perusahaar Umum Listrik Negara
RX :Receiver
STL :Studio-Transmitter Link
TX :Transmitter
UPS :Uninterruptible Power Supply

Fig.2-21	TARAKAN BROADCASTING STATION	BLOCK DIAGRAM OF POWER SUPPLY (BROADCASTING STATION SIDE)

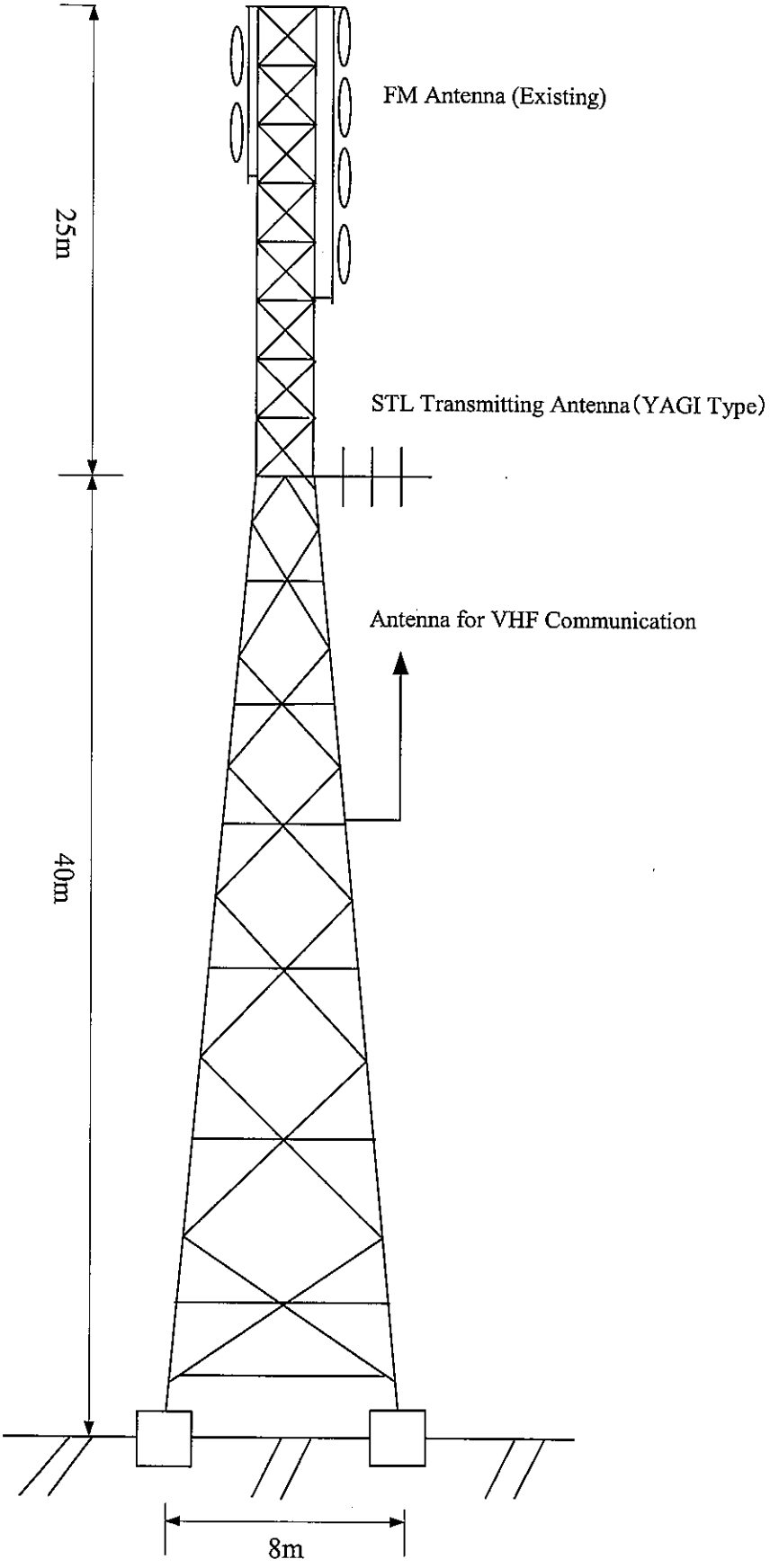


Fig.2-22	TOLI-TOLI BROADCASTING STATION	ELEVATION OF 65m SELF-SUPPORTING TOWER

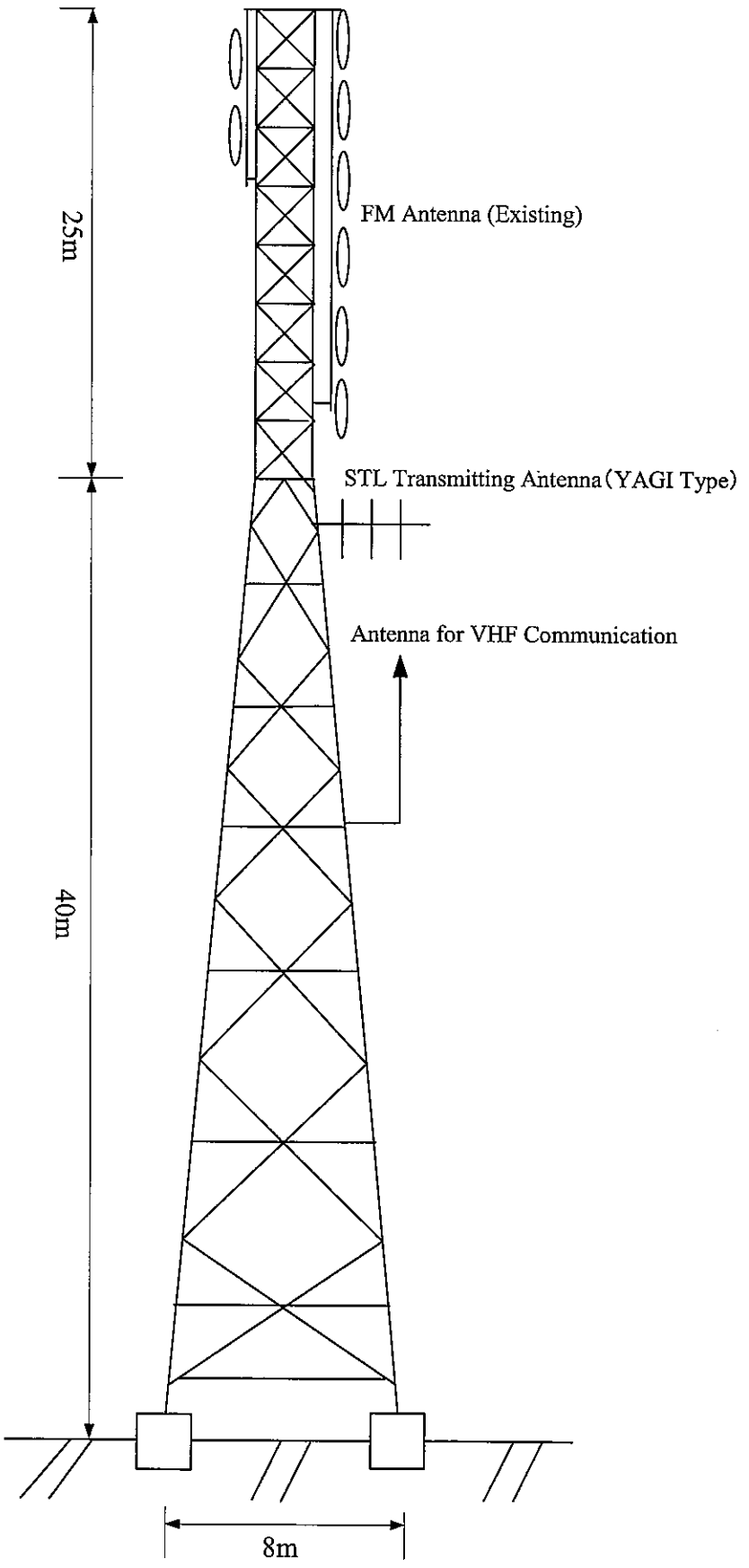


Fig.2-23	TARAKAN BROADCASTING STATION	ELEVATION OF 65m SELF-SUPPORTING TOWER

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Implementation Setup

1) Implementation Procedure

This Project will be implemented according to the framework of the grant aid scheme of the Government of Japan. Therefore, it shall be implemented, following cabinet decision by the Government of Japan and the Exchange of Notes (E/N) between the governments of both countries. Following the E/N, the project implementing agency shall conclude an agreement with the consultant, which shall then enter into the detailed design for the project components.

Tender documents prepared by the consultant shall be distributed to prospective tenderers after approval has been obtained from the project implementing agency and the Government of Japan and the announcement of tender. The tender works for the Project up to the signing of the contract shall be implemented in Japan. Meanwhile, concerning the consultant agreement, it is normal to be concluded in Indonesia.

The contractor decided by the tender shall start manufacturing of the equipment and carry out the installation work of the equipment to the buildings constructed by Indonesia side. Until the total completion of these works, RRI must consolidate the operation and maintenance setup and secure the necessary operating budget and manpower.

2) Role of Each Organization in Project Implementation

The roles and important duties of each organization concerned with the project implementation are summarized in the following paragraphs.

① Project Implementing Agency

The project implementing agency is Radio Republic Indonesia (RRI) under the supervision of the Ministry of Communications and Information Technology (KOMINFO). In order to ensure full understanding of the grant aid system and the smooth implementation of the Project, RRI must maintain close communications with all related agencies on the Indonesian and Japanese sides and appropriately coordinate work in all stages of the Project. Moreover, the KOMINFO (the responsible Ministry) should make the utmost effort in order to secure sufficient budget for carrying out the scope of works of Indonesia side and enabling RRI to conduct appropriate operation and maintenance.

RRI and KOMINFO should place emphasis on implementing the following items:

- Securing of budget for the scope of works done by Indonesia side and formulation of the schedule and implementation of the scope of works that complies with the overall project schedule;
- Identification and handling of all the procedures that need to be followed on the Indonesian side during the project period; and
- Understanding and arrangement of permits and authorizations connected with the Project, and provision and coordination of relevant information with the consultant

② Consultant

Following the Exchange of Notes (E/N) between the governments, RRI shall conclude a consultant service agreement for detailed design and supervision works with the Japanese consultant, and the Government of Japan shall verify this agreement. Following the verification, the consultant shall implement survey and discussions concerning the contents of the detailed design with RRI, and then shall commence the detailed design according to this basic design study report. The consultant shall compile the findings of the detailed design into the design drawings and specifications, and shall also prepare the instructions to tenderer, draft contracts, general contract conditions and other tender related documents and obtain approval thereof from RRI.

In the tender stage, the consultant shall act on behalf of RRI in carrying out all tender affairs up to the signing of contracts between RRI and the contractor including announcement of tender, distribution of tender documents, answer to questionnaire, opening of tenders, contract negotiations, and so on. Moreover, in the supervision stage of the Project, the consultant shall implement all supervisory service from the procurement of the equipment through to installation, adjustment of the equipment and handing over. In this Project, one of the most important tasks of the consultant is to act as a coordinator on the interface and work schedule between the works done by Indonesian side and the equipment installation work done by Japanese side.

③ Contractor

The contractor shall be selected from among Japanese general trading companies that possess ample experiences in this field. These conditions of tenderers' qualifications shall be stipulated in the tender announcement. The contractor shall be decided by the open tender. The contractor shall complete procurement and installation of the equipment that comply with the specifications prepared by the consultant within the

contract periods. When handing over the equipment, the contractor shall submit completion drawings and adequate maintenance manuals, and furthermore shall be responsible for after-sales service such as supply of spare parts, appropriate response in case of equipment failure, etc.

(2) Need for Sending Technical Personnel From the Manufacturers

Most of the broadcasting equipment to be introduced in this Project will be dismantled, if necessary, after manufacturing in Japan or a third country and then transported to the site. After it arrives at the site, it will be necessary to restore it to its original condition through assembly work and then undertake mounting and adjustment work. In view of the fact that such dismantling and reassembly work is based on the equipment manufacturer's special know-how, that a high technical level is required for adjustment and testing after mounting and that there is a whole series of steps that have to be taken after the installation/mounting work before the equipment can be accepted, including explaining of the operation method of the different equipment, training and quantity inspection, sending of technical personnel for that from the manufacturers is indispensable. Furthermore, since MW transmitting antenna installation work requires special technology, sending of technical specialists is necessary for it as well. The technical personnel that have to be sent, their number and the time for which they are sent are to be set as the minimum that is necessary, and in the installation/mounting work they are also to strive for accomplishment of technology transfer to the RRI's technical staff and other local technical personnel.

Since the technical personnel of the Toli-Toli and Tarakan broadcasting stations are already basically versed in broadcasting equipment operation and maintenance techniques, there are no technical problems regarding maintenance and upkeep. However, in view of the fact that they are not familiar with operation and maintenance of the latest equipment based on digital technology, after completion of the installation/mounting work about 15 days of guidance in operating and maintenance methods mainly concerning the MW broadcast transmitters procured in this Project will be provided to the technical personnel of the Toli-Toli and Tarakan broadcasting stations by specialists who are sent for that purpose.

2-2-4-2 Implementation Conditions

(1) Matters Regarding Natural Conditions That Require Attention

As a result of study of the rainfall, air temperature, humidity and wind speed conditions and frequency of seismic activity in the vicinity of the sites, it has been determined that there are no

natural conditions that require particular attention in the equipment installation work. However, it is desirable that the months of November and December, which have the maximum mean rainfall records, be avoided for the sake of efficient accomplishment of the MW transmitting antenna installation work and the radial earth work.

(2) Preparations for Procurement of Equipment and Materials

The following equipment and materials for this Project can be procured in Indonesia:

Equipment and materials	Place can be procured
Cement for the MW transmitting antenna foundation work	Toli-Toli and Tarakan
Concrete aggregate for the MW transmitting antenna foundation work	Toli-Toli and Tarakan
Reinforcement bars for the MW transmitting antenna foundation work	Jakarta and Tarakan
Prefabricated pre-stressed piles for the MW transmitting antenna foundation work	Jakarta
Pile drivers for the MW transmitting antenna foundation work	Jakarta
Ginpoles for the MW transmitting antenna construction work	Jakarta

Since the prefabricated pre-stressed piles and heavy machinery for the work (pile drivers and ginpoles) will have to be procured in Jakarta and transported to the sites, it will be necessary to collect information beforehand on how to procure and transport such equipment and materials.

(3) Matters Concerning Operation of the Existing Facilities

It is vital that the equipment installation work be accomplished without interruption of the 18 hours a day, in principle, of FM broadcasting and the program production that are presently being done at both broadcasting stations. The work at the MW transmitting stations to be newly installed will not interfere with anything, but it will be necessary to consult with the RRI side beforehand concerning the installation work of the STL transmitter, 16CH audio mixer for program transmission, etc. at the existing broadcasting stations so as to be able to decide on work methods and work schedules that can be efficiently followed without interference with the daily work there.

(4) Ensuring Safety During the Work

During the period of the installation work, the contractor and the consultant are to obtain the latest information on the security situation in the regions in question and strive to ensure safety at the project sites and in movement between them. In cases in which it is judged that safety cannot be ensured, the two sides—the Embassy of Japan and the JICA office in Indonesia and the Japanese Ministry of Foreign Affairs and JICA Headquarters in Japan on the Japanese side and the Ministry of Communications and Information Technology and the RRI on the Indonesian side—are to discuss the situation and decide measures to be taken.

Also this Project includes the installation work of the MW transmitting antennas with a height of 65m and the work of mounting the STL antennas and VHF communication antennas on the 50m self-supporting towers to be constructed by the Indonesian side. At the time of such work it will be necessary to be extremely careful to ensure safety in work at heights, including obligatory use of helmets and safety belts, placement of signs at the bottom of the towers during the work that indicate that work at heights is taking place above, assigning of safety monitoring personnel on the ground and suspension of the work during rain or strong winds.

2-2-4-3 Scope of Works

Table 2-3 below lists the items for which the Government of Japan and the Government of Indonesia will be responsible, respectively, in case of implementation of this Project on the basis of Japanese grant aid assistance.

Table 2-3: Table of Items for Which the Governments of the Two Countries Will Be Respectively Responsible

Items of responsibility	Japan	Indonesia
Obtaining of the MW transmitting frequencies for Toli-Toli and Tarakan		●
Preparation of the land of the sites for the Toli-Toli and Tarakan MW Transmitting Stations		●
Procurement, transport and installation of the MW broadcasting system equipment and guidance of operation after the installation work	●	
(in connection with construction of the Toli-Toli and Tarakan MW transmitting station buildings)		
Construction of the MW transmitter buildings		●
Procurement and installation of the cable ladders		●
Provision of Class A earth facilities		●
Procurement and installation of the earth terminal boxes		●
Procurement and installation of the main power boards		●
Concrete foundations for installation of the air conditioner outdoor units		●
Procurement and installation of the ventilation fan hoods		●

Items of responsibility	Japan	Indonesia
Openings for louvers		●
Installation of air chambers		●
Openings for air filter		●
Openings for ventilation fans		●
Procurement and mounting of fluorescent lamps		●
Procurement and mounting of louvers	●	
Procurement and mounting of air filters	●	
Procurement and installation of ventilation fan dampers	●	
Procurement and mounting of ventilation fans with shatter	●	
Construction of power supply building		●
Procurement of 65kVA emergency generators		●
Preparation of access roads		●
Preparation of parking space		●
Construction of official residences		●
Construction of the 50m self-supporting towers		●
Procurement and installation of horizontal ladders		●
Work for bringing in commercial power supply		●
Work for laying water supply lines		●
Obtaining of all permits and authorizations required by law in Indonesia		●
Ensuring safety during the period of the work		●
Arrangement of tax exemption for the imported equipment		●
Issue of authorizations to pay (A/P) and payment of bank commissions for issue therefore and changes in them		●
Appropriate and efficient maintenance and operation of the procured equipment in this Project		●
Meeting of any other obligations on the part of the recipient country the assistance that are specified in the Exchange of Notes		●

2-2-4-4 Consultants Supervision

(1) Basic Concept of Supervision

To ensure the smooth execution of the Project, the consultant shall organize a project team to manage the implementation of detailed design and supervision works based on the purport of the basic design. The basic concept of the supervision work shall be as follows.

1) Carry out fine-tuned adjustments to ensure that no discrepancies arise on the equipment installation work, and make the utmost effort to ensure completion of the works on schedule.

2) Appropriately report on work progress to related organizations in both countries to ensure there are no discrepancies in their understanding of work status. Moreover, give prompt

responses and advice to inquiries from the contractor.

3) Be prepared to offer technical transfer to officials on Indonesia side in order to realize greater effects of the grant aid. Moreover, always be ready to offer adequate and appropriate explanations concerning not only the design concept of the equipment but also execution methods and technology, etc.

(2) Contents of Consultant's Supervision

The contents of the supervision work to be implemented by the consultant are as follows:

1) Contract-related Service

The consultant shall implement such contract-related services as: preparation of detailed design and tender documents, handling of tenderers from announcement of tender through to opening of tenders, evaluation of tenders and selection of the contractor, holding of contract negotiations, and witnessing of the contract, etc., and report on the progress and results of such events to RRI at appropriate points.

2) Examination of Items Submitted by the Contractor

The consultant shall review execution plans, work schedules, working drawings, shop drawings, technical materials and samples, etc. submitted by the contractor and approve them upon confirming their compliance with design drawings and specifications, etc.

3) Supervision of Work

The consultant shall dispatch supervisors to the project sites at appropriate points during the execution period to supervise whether the works are being implemented according to the specifications and drawings and to give the necessary instructions. Moreover, the consultant shall constantly supervise in detail the work progress and offer appropriate advice and guidance to the contractors. The consultant shall prepare monthly reports of work progress and inform the parties related thereto.

4) Cooperation Regarding Payment Approval Procedures

Concerning contract fees to be paid to the contractor during and after the works, the consultant shall examine all requests for payment, etc. that are submitted by the contractor, and issue the necessary certificates.

5) Inspections and Witnessing

The consultant shall implement inspections of the equipment at the plant before shipment, and witness various tests implemented at sites such as acceptance inspection on completion of the work. The consultant shall give approval when the inspection results comply with specifications and design documents, or issue proper instructions to the contractor if nonconformities are found. Test results shall be compiled into the monthly reports and fed back to the related organizations.

6) Assistance of Handing Over Procedures

In addition to compiling the acceptance inspection reports, the consultant shall review and approve spare parts and equipment manuals and maintenance manuals, etc. that are handed over by the contractor and provide pertinent advice to RRI concerning the operation and maintenance of the equipment.

(3) Supervisory Personnel Assignment Plan

Although this Project is one for provision of equipment, it includes the foundation work for the MW transmitting antennas and the pile driving work for reinforcement of the ground. Furthermore, the transmitter building is technical structures that require close overseeing of the installation work. The supervision of the work by the consultant must be accomplished with constant awareness of the overall situation of the work and close liaison with the Indonesian governmental organizations concerned and the contractor so as to be able to ensure observance of the work schedule. For that, sending of a supervisor who is assigned to stay for the whole period of the foundation work for the MW transmitting antennas is indispensable. Furthermore, one supervisor at a time is to be sent for the MW transmitting antenna installation work and the MW transmitter equipment installation work in spot fashion when needed. The criteria for selection of such supervisory personnel are plentiful experience and appropriate technical judgment as well as broad vision and good adjustment capability.

2-2-4-5 Quality Control Plan

The consultant shall carry out quality control during the project execution stage based on the purport of the basic design. The JIS definition of quality control, i.e. 'the structure of means for economically producing goods or services of quality that complies with customer requirements', shall be adopted as the basic line of the project execution. The consultant will provide the contractors with appropriate guidance to entirely assure the quality of the equipment procured in this Project, by

carrying out detailed surveillance on all the stages of the Project from the tender, installation, adjustment and inspection, and completion and handover. Among the all processes, the following is five important points in terms of quality control:

- Tendering
- Manufacturing of equipment
- Shipping and transportation
- Installation work in Indonesia
- Adjustment, acceptance test and handover of the equipment

The priority issues at each of the above five stages are summarized below.

1) Tendering

At the tendering stage, the consultant will examine in detail if the systems proposed by tenderers comply with the specifications provided for under the tender documents.

2) Equipment manufacturing stage

Reviewing of the technical information materials, manufacturing drawings, samples, etc. submitted by the contractor and confirming in detail conformity with the written specifications. Confirmation of the functions and electrical characteristics of the 10kW MW transmitting equipment, which consists of products manufactured by special order, in the presence of the consultant at the time of inspection at the plant before shipment and close review of the degree of completion of the system.

3) Shipping and Transportation

The consultant entrust the following verifications to a reliable, third-party inspection organization, in prior to shipment of the equipment.

- Comparison of the contract equipment list with the shipping documents
- Comparison of the shipping documents with the equipment
- Issuance of inspection certificates

Furthermore, in the aspect of transportation, the consultant will confirm if the transportation route is appropriate, and if necessary measures are in place for minimizing a possibility of accident during transportation, and provide adequate recommendation on rerouting, etc. as necessary.

4) Installation Work in Indonesia

During the installation work stage, it is no exaggeration to say that execution of safe, accident-free works is the ultimate key to successful installation work of the equipment. The consultant will provide guidance from this standpoint after prior confirmation of the details of work plan proposed by the contractor, such as planning an unforced schedule, allocating appropriate staff, work procedures, etc., so that the works will be smoothly carried out without any accident.

5) Adjustment, Acceptance Test and Handover of the Equipment

After the installation, adjustment and inspection of the equipment are completed, the consultant will confirm if the original functions and electric characteristics of the equipment are reproduced, by comparing the test data taken at the sites and at the factory before shipment. Further, the consultant will provide the contractor with sufficient guidance on the handover of the equipment, suggesting, for example, that the contractor confirm the numbers on the contract equipment list and prepare a detailed spare parts list, so as to transfer adequate technical information to the Indonesian side.

2-2-4-6 Procurement Plan

(1) Equipment Procurement Plan

In the grant aid projects, qualification as the source of procurement is in principle limited to Japan and the country receiving the aid, but the MW broadcasting equipment to be procured in this Project consists of the latest types of electronic parts, which are not produced in Indonesia. Furthermore, RRI has full confidence in Japanese products because of their stability and reliability of performance and sureness of supply as well as excellent follow-up system (particularly the fact that for Japanese made equipment it is guaranteed that spare parts will be supplied for at least 10 years). Besides that, the main part of the existing equipment consists of Japanese products. That being the case, the equipment introduced in this Project will, in principle, be Japanese products.

However, among the equipment in this Project there is some that is no longer produced in Japan and some for which Japanese products might not be the most appropriate in comparison of functions, performance and price. For instance, Indonesian regulations require that the STL for sending broadcast programs from the existing broadcasting station to the MW transmitting station to be newly built use the UHF frequency band. In aid up to now (yen loan aid) Japanese products have been procured for the STL in UHF frequency band, but in the meantime in Japan

the frequency band for STL has changed to SHF, which would make it extremely difficult now to procure STL in UHF band from Japan. That being the case, it is necessary to consider products of OECD countries such as the U.S., Canada or European countries for the STL. Table 2-4 gives a list indicating the likely countries of production of the main equipment in this Project.

Table 2-4: List of Main Equipment and Countries of Production Thereof

Equipment	Country of Manufacture			Reasons for Choice and Remarks
	Indonesia	Japan	Other Country	
10kW MW broadcast transmitters and accessory equipment		○		Assured quality and performance, sureness of supply and use by RRI in the past
MW transmitting antenna		○		Assured quality and performance, sureness of supply and use by RRI in the past
Program input and monitoring equipment		○		Assured quality and performance, sureness of supply and use by RRI in the past
STL		△	○	Assured quality and performance and use by broadcasting stations in Indonesia and elsewhere in the world in the past
Measuring equipment		○		Assured quality and performance, sureness of supply and use by RRI in the past
VHF communication link		○		Assured quality and performance
Digital audio mixer		○		Assured quality and performance, sureness of supply and use by RRI in the past
Audio distribution amplifier		○		Assured quality and performance, sureness of supply and use by RRI in the past

Legend ○：Main country of manufacture △：Possible country of manufacture

Before shipmen of the equipment, the Contractor shall make up the broadcasting system with the procured equipment and confirmed function of the system in Japan.

(2) Equipment Transportation Plan

The transportation route for the procured equipment in this Project will be as follows: From Japan to Jakarta or Surabaya by ocean vessel (container ship); accomplishment of customs clearance at the port of arrival and transshipment to home-waters vessel for transportation to Toli-Toli and Tarakan; and after unloading at the port of Toli-Toli or Tarakan transportation to the site by truck. The necessary transportation time will be about 45 days as per the breakdown by means of transportation given below.

- For the Toli-Toli site
  - Japan to port of Jakarta or Surabaya … About 20 days, by 40 feet container ship

- Unloading and customs clearance at port of Jakarta or Surabaya …About 10 days
- Port of Jakarta or Surabaya to port of Toli-Toli … About 14 days, by 20 feet container ship (40 feet container ship cannot get to Toli-Toli port.)
- Port of Toli-Toli to the Toli-Toli site … About 1 day, by truck

- For the Tarakan site
  - Japan to port of Jakarta or Surabaya … About 20 days, by 40feet container ship
  - Unloading and customs clearance at the port of Jakarta or Surabaya … About 10 days
  - Port of Jakarta or Surabaya to port of Tarakan … About 14 days, by 40 feet container ship
  - Port of Tarakan to the Tarakan site … About 1 day, by truck

The documents that will be needed for the import formalities are as follows:

① Commercial invoice ② Packing list
③ Insurance policy ④ Certificate of origin
⑤ Original bill of lading ⑥ Letter of approval of consignee
⑦ Duty exemption authorization (document to be arranged by RRI)

A matter to which attention must be paid as regards transportation is the need for the implementing agency to accomplish "State Project Registration" (DIPA formalities) after conclusion of the E/N of the Project. If those formalities have not been taken care of, it will not be possible to get the duty exemption confirmation needed for customs clearance, and customs clearance will be delayed, which could result in major delay in implementation of the Project. It is therefore necessary for the Ministry of Communications and Information Technology to accomplish the DIPA formalities by the time of arrival of the equipment at the port of import.

2-2-4-7 Soft Component

The best way to ensure that proper operation and maintenance methods are acquired for the MW broadcast transmitters to be provided in this Project is to provide guidance in use of the equipment that is actually installed. Since operating and maintenance methods have been simplified in the solid-state type MW broadcast transmitters developed on the basis of technological progress, large-scale training is not necessary. That being the case, there is no need to accomplish operation and maintenance guidance for the equipment to be procured under the Project on the basis of a soft component and technical assistance, and it is considered that it will suffice to provide 15 days of initial operating and maintenance guidance by a specialist sent by the contractor after completion of the installation work.

2-2-4-8 Implementation Schedule

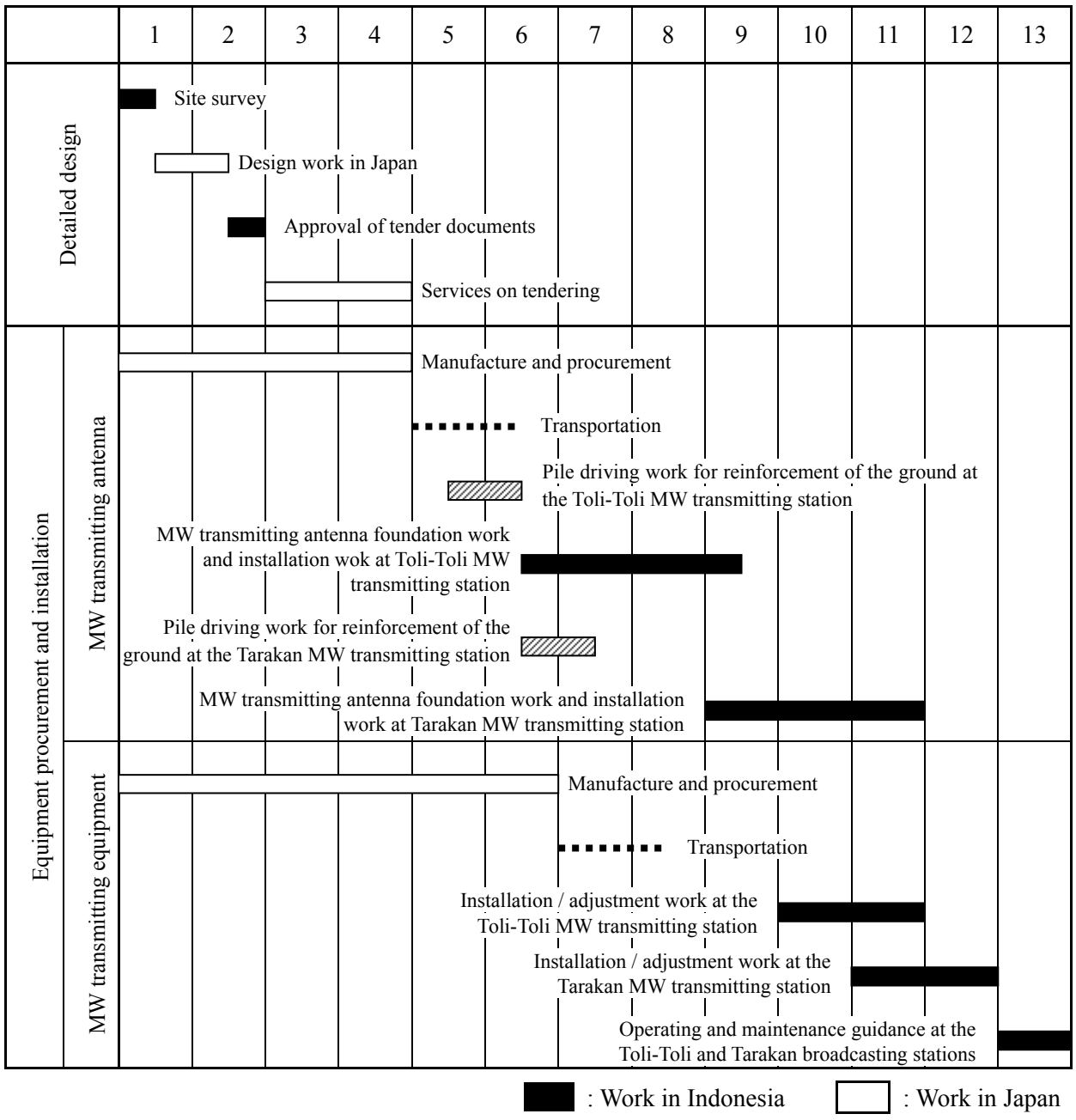
The following is the implementation schedule of this Project. (Refer to Table 2-5.)

(1) Detailed design and tendering : 4 months

(2) Equipment procurement / installation works : 13 months

The total period needed for completion of the Project is 17 months.

Table 2-5: Work Implementation Schedule



2-3 Obligations of Recipient Country

The matters for which the Indonesian side will be responsible if this Project is implemented on the basis of Japanese government grant aid are the following:

(1) Obtaining of the MW transmitting frequencies for the Toli-Toli and Tarakan broadcasting stations

For establishment of a new MW radio station (application for new allocation of frequency), moving of the location of a radio station, changing the frequency, increasing radiation power, etc. the ITU requires that the formalities stipulated by the Final Acts of the Regional Administrative LF/MF conference (Regions 1 and 3) held at Geneva in 1975 be carried out.

Since the Toli-Toli and Tarakan broadcasting stations have not been allocated MW broadcasting frequencies, in connection with new establishment of MW radio transmitting stations at those two broadcasting stations, they have to obtain new frequencies from the ITU.

The situation regarding the progress that has been made by the Indonesian side in obtaining those frequencies is as described below.

First they made a list of candidate frequencies—the 4 frequencies 1350kHz, 1260kHz, 1305kHz and 1395kHz for Tarakan and the 4 frequencies 1287kHz, 1332 kHz, 1377kHz and 1422kHz for Toli-Toli. Then on September 12 2005, the Ministry of Communications and Information Technology (its department that manages frequencies) applied to the ITU for the frequencies indicated below as frequencies among those candidate frequencies with little interference with broadcasting from other countries.

Site	Frequencies	Transmitting Power
Toli-Toli	1287kHz	10kW
	1377kHz	10kW
Tarakan	1350kHz	10kW

These frequencies have officially notified to the all countries by the ITU Circular (BRIFIC 2562, GE 75/113) on February 7 2006. After due date of lodging the objection to the circular on May 30 2006, these frequencies would be officially allocated.

(2) Preparation of the land of the transmitting station sites

1) Toli-Toli transmitting station

The plans called for leveling and banking on 4 hectares of marshland (elevation above sea level of 2m) located about 5km southwest of the town of Toli-Toli and about 2km from the coast to use as the transmitting station site. Because of such low elevation of 2m above

sea level, above 1 m of filling was necessary. The Toli-Toli regional government began preparation work of the land in November 2005 and already finished such work in February 2006. A paved access road to the transmitting station (about 350 m long) was also improved by the regional government. It spent Rp 4,000,000,000 for the work.

2) Tarakan transmitting station

The plans call for preparation of 4 hectares of woodland behind the economics college (STIE) to use as the site of the transmitting station. Considerably large-scale work (felling of trees and filling) will be needed to obtain a level ground since the whole site consists of undulating ground with a difference in elevation of about 10m. The Tarakan regional government began the land preparation work in March 2006 and will complete such work by the end of June 2006. The regional government's budget allocation for the work is Rp 6,224,000,000.

(3) Construction of transmitting station buildings

Construction of a transmitter building, a power supply building, an STL tower, etc. is necessary at the Toli-Toli and Tarakan MW transmitting stations, the budget for that being as follows:

1) Toli-Toli transmitting station

Construction of 70m^2 Transmitter Building	Rp	140,000,000
Construction of 36m^2 Power Supply Building	Rp	72,000,000
Construction of Access Road (300m × 3m^2)	Rp	270,000,000
Construction of Parking Lot (200m^2)	Rp	60,000,000
Construction of 2 Officinal Residences (35m^2 × 2)	Rp	105,000,000
50m Self-Supporting Tower for STL	Rp	700,000,000
Procurement of 65kVA Emergency Engine Generator (1 set)	Rp	285,000,000
65kVA Power Supply Construction	Rp	70,000,000
Water Supply Works	Rp	100,000,000
TOTAL	Rp	1,802,000,000

(The Toli-Toli regional government is presently constructing the access road.)

2) Tarakan transmitting station

Construction of 70m^2 Transmitter Building	Rp	140,000,000
Construction of 36m^2 Power Supply Building	Rp	72,000,000
Construction of Access Road (300m × 3m^2)	Rp	270,000,000
Construction of Parking Lot (200m^2)	Rp	60,000,000
Construction of 2 Official Residences (35m^2 × 2)	Rp	105,000,000
50m Self-Supporting Tower for STL	Rp	700,000,000
Procurement of 65kVA Emergency Engine Generator (1 set)	Rp	285,000,000
65kVA Power Supply Construction	Rp	70,000,000
Water Supply Works	Rp	100,000,000
TOTAL	Rp	1,802,000,000

RRI estimated those construction costs (total of Rp 3,604,000,000 (about 43.2 million yen) for the two transmitting stations) on the basis of its past experience and applied to the National Development Planning Agency (BAPPENAS) for approval in June 2005. The necessary construction cost will allocate to RRI as a part of the budget for national projects (DIPA) in April 2006. The construction schedule for the transmitting stations is given below.

	2006											
	1	2	3	4	5	6	7	8	9	10	11	12
Tender for selection of the consultant for design of the station buildings and tower				━	━							
Design of the station buildings and tower					━	━						
Tender for selection of the contractor for construction of the station buildings and tower						━	━					
The construction work								━	━	━	━	━

(4) Securing of space for the equipment and material storage areas

It is necessary to secure the space for temporary storage of the imported equipment and installation materials.

(5) Obtaining of the construction permits for the transmitting station buildings and MW transmitting antenna

Indonesia has restrictions and an authorization system concerning building construction that is

prescribed by law. It will therefore be necessary in this Project for the Indonesian side to apply for and obtain in time authorizations for the construction of transmitting station buildings and MW transmitting antenna. As the implementing agency, RRI is to apply to the local governments with jurisdiction over the project sites for such construction authorization. Furthermore, if new legal provisions are enacted, they could affect the content and work schedule of this Project. In view of that RRI must stay constantly alert to such developments and furnish the Japanese side with information on them as well as expeditiously making any necessary additional applications for authorizations.

(6) Measures for exemption of Tariff/Taxes on the imported equipment and materials

For the formalities for exemption of the equipment to be imported in this Project from customs duties, RRI must accomplish adequate prior collection of information from BAPPENAS and other government agencies concerned regarding the details of such formalities, particularly information on things like the documents that RRI must prepare and the amounts of time that will be needed for accomplishment of the different steps of authorization. In the past there have been cases of holding up of Japanese grant aid projects for Indonesia because of failure to carry out the DIPA formalities and resulting impossibility of applying exemption from customs duties to the imported equipment. It is therefore necessary for RRI to thoroughly familiarize itself with the system through sufficient discussions beforehand with the government agencies concerned.

(7) Issue of Authorization to Pay (A/P) and payment of bank commissions thereof

The Authorization to Pay is normally issued on the basis of agreements between the bank representing the recipient country side and the bank representing the Japanese side. It is necessary that about 1/30 % (past records) of the total amount of the aid be made ready for such bank commissions as expenses to be borne by the Indonesian side. It is necessary that adequate attention be given to it in budget preparations.

(8) Appropriate and efficient maintenance and operation of the equipment procured in the Project

The details of appropriate and efficient operation and maintenance of the procured equipment will be discussed in the next chapter.

(9) Execution of other obligations stated in the Exchange of Notes (E/N)

RRI must obtain a copy of the exchange of notes as soon as possible after it takes place, in order to be able to fully understand the work that is to be accomplished by the recipient country side, and if it has any doubts concerning the content thereof, it must address them to BAPPENAS and KOMINFO as the places to be contacted on the Indonesian side regarding the Project.

The necessary expenses of the matters for which the Indonesian side will be responsible in this Project are as follows:

• Toli-Toli transmitting station site preparation work (including land acquiring and pavement of access road cost)	:	Rp	4,000,000,000
• Tarakan transmitting station site preparation work (including land acquiring cost)	:	Rp	6,224,000,000
• Construction of the Toli-Toli transmitting station buildings	:	Rp	1,802,000,000
• Construction of the Tarakan transmitting station buildings	:	Rp	1,802,000,000
Total	:	Rp	13,828,000,000

(approximately 166 million yen on the basis of the exchange rate of 1 Rp = 0.012 yen)

2-4 Project Operation Plan

2-4-1 Operation and Maintenance System

As shown in the table below, equipment operation and maintenance at Toli-Toli and Tarakan broadcasting stations is presently being accomplished by a technical staff of 4 persons working 4 shifts.

	Toli-Toli broadcasting station	Tarakan broadcasting station
1st shift (1 person): 5 hours	04：00～09：00	05：00～10：00
2nd shift (1 person): 5 hours	09：00～14：00	10：00～15：00
3rd shift (1 person): 5 hours	14：00～19：00	15：00～20：00
4th shift (1 person): 5 hours	19：00～24：00	20：00～01：00

Training at RRI for enhancement of technical capacity and equipment operating and maintenance skills is accomplished mainly at its Radio Education and Training Center (RETC) but also at the Multimedia Training Center (MMTC) and abroad (in Germany and elsewhere). The RETC has had 6,203 trainees from its establishment in 1977 to 2004. The training record there of the technical staffs of the Toli-Toli and Tarakan broadcasting stations is as indicated below, making for a high technical level at both of them.

- Toli-Toli broadcasting station:
  7 persons of its technical staff of 10 have received training at the RETC.
- Tarakan broadcasting station:
  6 persons of its technical staff of 9 have received training at the RETC.

Both MW transmitting stations to be improved in this Project will be manned stations with a technical staff of 4 working in 4 shifts. Considering the technical staff of 4 at each of the existing broadcasting stations, that means that a total technical staff of 8 will be needed at each location, 4 for the existing station and 4 for the new transmitting station. Of the present staff of 40 at the Toli-Toli broadcasting station and 37 at the Tarakan broadcasting station, there are 10 technical personnel and 9 technical personnel, respectively. That present number of technical personnel is enough to cover the operation of the new transmitting station as well, which means that there is no need to boost the personnel strength of either broadcasting station.

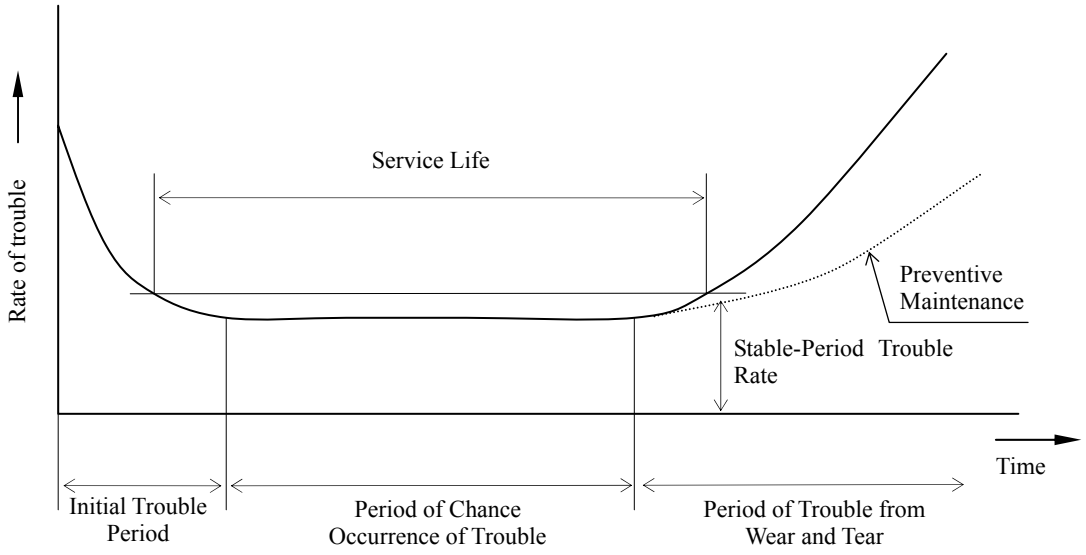
2-4-2 Project Maintenance Plan

(1) Maintenance of the MW Transmitting Equipment

As a result of technological innovation, equipment trouble has markedly decreased thanks to

improvement of the reliability and durability of the broadcasting equipment and to reduction of the number of parts constituting it. However, for effective operation of the broadcast equipment over a long period of time not only routine operating management and periodical checks but also repairing of trouble, changing of parts and other maintenance work are still necessary. Through correct operation and strict carrying out of routine checks as well as oiling, adjustment, cleaning, repairing and other preventive maintenance, it is possible to prevent occurrence of trouble and accidents and enhance equipment safety and functionality as well as lengthening service life, which does not depend only on the number of hours that the equipment has been operated. In periodical checks it is necessary to do dismantling and repairs and changing of consumable parts in accordance with the maintenance manual.

It is necessary that RRI become thoroughly familiar with the systems of the MW radio broadcasting system to be newly brought in and establish and operate and manage a system for obviating accidents before they happen. For that it is essential that maintenance personnel be designated and that they receive on-the-job training at the sites from the stage of installation and adjustment of the equipment so as to be thoroughly familiar with the systems by the time that they are handed over. It is generally considered that the rate of trouble with broadcasting equipment changes over time as indicated in the diagram below.



Ⅰ Initial trouble period

The trouble in this period is caused by initial defects due to bad lots, etc., and it is considered important to identify the reasons for the trouble as quickly as possible and take steps to eliminate it.

Ⅱ Period of chance occurrence of trouble

After eliminating the problems of the initial trouble period, the trouble rate stays just about

constant at a low level. The time, up to the beginning of the following period, that of trouble from wear and tear, during which the trouble rate is below a certain level is called the service life.

Ⅲ Period of trouble from wear and tear

After the service life of parts, units of equipment or system, i.e. the period of chance occurrence of trouble, the trouble rate rises again. Since trouble in this period occurs because of deterioration from wear and tear of pieces of equipment or parts constituting the system, it is considered that appropriate preventive maintenance can reduce trouble and extend the service life of the equipment or system.

The periodical check and maintenance items for the 10kW MW broadcast transmitter and MW transmitting antenna that will be necessary after completion of this Project are indicated in Table 2-6 and Table 2-7.

Table 2-6: Periodical Check and Maintenance Items for the 10kW Transmitters

Classification	Equipment Designation or Part	Checking And Maintenance Item	Checking Cycle				
			Daily	Weekly	Monthly	Semi -annually	Annually
10kW MW Broadcast Transmitter	Power Supply Circuit	Voltage	○				
		State of connection of the cable of the main power source terminal and state of connection of the electromagnetic switches				○	
		Ground terminal					○
	Cooling Circuit	Abnormal noise, vibration and direction of rotation of blower			○		
	Control Circuits	Transmitter switching control (U-link)		○			
		Checking of interlock					○
	Power Amplifier	Surface temperature, checking with bare hands			○		
		Cleaning of heat radiation fins				○	
		Internal visual inspection for discoloring, etc.					○
	Output Circuit	Looseness of large-scale magnetic condenser, coil, terminal board and other connection part				○	
	RF Exciter	Internal visual inspection of each module for discoloring, etc.				○	
	Frame	Cleaning of inside			○		
		Visual checking of inside parts			○		
	Electrical Characteristics	Checking of state of operation and metering (voltage and current of the different parts)	○				
		Signal-to-noise ratio			○		
		Distortion ratio				○	
		Frequency characteristics				○	

Table 2-7: MW Transmitting Antenna Periodical Check and Maintenance Items

Part	Check and Maintenance Items	Checking Cycle
Mast	Checking, by telescope, etc. from at least 2 directions, and repairing, if necessary, of verticality of the steel column from 2 directions perpendicular to one another, damage to bolts, rivets, the body of the tower, platform insulators, top hat, foundation, etc., displacement, state of fitting, etc.	7 to 8 years
Guys	Checking for, and repairing if necessary, deterioration, dirtiness, rusting corrosion, looseness, damage, etc. of the guy anchor blocks, wires, fittings (sockets, clips, turnbuckles, shackles, etc.), guy insulators, insulator fittings, guy choke coils, etc.	7 to 8 years
Accessory equipment	Checking for and repairing deterioration, dirtiness, rust corrosion, looseness, damage, etc. of air navigation obstruction lights, lightning rod, tuning house, tuning box, lead-in bowl-shaped insulators, power feed tubes, power feed lines, protective railing, etc.	7 to 8 years
Others	The antenna masts will have to be periodically painted and repaired considering their location in coastal areas.	7 to 8 years

Furthermore, besides such checking and maintenance, it will be necessary to set up a budget for planned procurement and renewal of the equipment for the sake of maintaining the functionality of the broadcasting stations. The service lives of the main equipment to be procured in this Project are set below on the basis of the actual experience to date of RRI and The Independent State of Papua New Guinea (PNG), etc. of neighboring countries.

10kW MW broadcast transmitter	:	15 years
Program input and monitoring equipment	:	12 years
STL	:	15 years
Air conditioner	:	12 years
Emergency engine generator	:	15 years
Digital audio mixer	:	10 years
MW transmitting antenna	:	50 years (It is necessary, however, to carry out painting and checking and repair work about every 7 to 8 years.)

(2) Facility Maintenance Management

Maintenance of the transmitting station buildings to be built by the Indonesian side will consist mainly of routine cleaning and repairs and parts replacement for wear and tear, damage and deterioration due to age of interior and exterior facings and finishes. For ongoing effective maintenance it is desirable that RRI itself prepare a building maintenance manual that adequately takes into account its operation and maintenance management system and the economic and construction conditions in Indonesia.

2-5 Outline of the Project Cost

2-5-1 The Project Cost

In case this Project is implemented under the grand aid scheme of the government of Japan, the total project cost is estimated at 520 million Japanese Yen. Details of project cost to be born by Japanese side and Indonesia side are estimated in accordance with the below conditions are as follows;

(1) The project cost to be born by Japanese side

Approximately 354 million

<table>
<tr><th colspan="2">Items</th><th colspan="2">Cost (million Yen)</th></tr>
<tr><td rowspan="2">Equipment procurement & Installation</td><td>Equipment for MW Radio Broadcasting System for Tolitoli Broadcasting Station</td><td>156</td><td rowspan="2">313.5</td></tr>
<tr><td>Equipment for MW Radio Broadcasting System for Tarakan Broadcasting Station</td><td>157.5</td></tr>
<tr><td colspan="2">Consultant fee</td><td></td><td>40.5</td></tr>
</table>

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the grant.

(2) The project cost to be born by the Indonesia side

Approximately 13.8 billion Rp (166 million Japanese Yen)

- Land preparation of the site for Tolitoli MW transmitting station
- Land preparation of the site for Tarakan MW transmitting station
- Construction of transmitter building, power supply building, STL tower, parking lot, etc. for Toli-Toli MW transmitting Station
- Construction of transmitter building, power supply building, STL tower, parking lot, etc. for Tarakan MW transmitting station

(3) Estimation conditions

1) Date of cost estimation: December, 2005

2) Exchange rate: 1US$ = 113.53 Japanese Yen
1Rp = 0.012 Japanese Yen

3) Implementation period: Refer to Implementation Schedule.

2-5-2 Management Cost after Completion of the Project

(1) The Toli-Toli and Tarakan Broadcasting Stations

The necessary operation expense of RRI broadcasting stations consists of salary, program production cost, the cost of electric power, water and communications, office expenses, travel expenses for temporary assignment of personnel elsewhere, facility maintenance and repair expenses, etc.

After implementation of the Project there will be neither increase in the number of personnel at the Toli-Toli and Tarakan broadcasting stations nor increase in the quantity of program production, which means that there will be no need for additional budget allocations for salary and program production costs. Nor will there be installation of telephone service at the transmitting stations, and the present budget allocations for office expenses can be shared between the new transmitting stations and the existing broadcasting stations without requiring any increase.

That being the case, about the only necessary new items of expense for operation and maintenance of the Toli-Toli and Tarakan MW transmitting stations after implementation of the Project will be ① electricity, ② water, ③ facility maintenance and repair and ④ miscellaneous.

The estimated additional annual operation and maintenance costs of the Toli-Toli broadcasting station and the Tarakan broadcasting station after implementation of the Project are, respectively, Rp 223,290,000 (about 2.7 million yen) and Rp 255,005,000 (about 3 million yen).

The budgets for running the two broadcasting stations have been allocated by RRI's head office, and the necessary additions to those budgets after project implementation will be coming from there, too. RRI's ordinary budget for 2005 was Rp 378,644,388,000 (about 4.54 billion yen), and the total annual operation and maintenance costs of the two broadcasting stations after implementation of the Project, estimated at Rp 478,345,000 (about 5.7 million yen), is only about 0.12% of that. Since the budgeting mechanism is one whereby the Government of Indonesia increases the budget allocation to RRI for running its stations if RRI applies for such increase, there will be no problem covering the necessary operation and maintenance costs after project implementation. Details on those costs are given below:

Additional Annual Operation and Maintenance Cost After Project Implementation

	Toli-Toli Broadcasting Station	Tarakan Broadcasting Station
Electricity	Rp 120,176,000	Rp 152,678,000
Water	Rp 3,114,000	Rp 2,327,000
Facility Maintenance and Repairs	Rp 90,000,000	Rp 90,000,000
Other Costs	Rp 10,000,000	Rp 10,000,000
Total	Rp 223,290,000	Rp 255,005,000

1) Electricity

① Annual electricity consumption

Item	Capacity	Power Factor	Operating Time	Hours of Operation a Year	Annual Consumption Capacity	Annual Power Consumption
10kW MW Broadcast Transmitter	20kVA	0.95	18 h/day	6,570H	131,400kVA	124,830kW
Program Input and Monitoring Equipment	1kVA	0.95	18 h/day	6,570H	6,570kVA	6,241kW
STL	1kVA	0.95	18 h/day	6,570H	6,570kVA	6,241kW
Air Conditioner	5kVA	0.95	18 h/day	6,570H	32,850kVA	31,207kW
Obstruction Lighting System	1kVA	0.90	12 h/day	4,380H	4,380kVA	3,942kW
Fluorescent Lamps, etc.	1kVA	0.70	20 h/day	7,300H	7,300kVA	5,110kW
Total						177,571kW

② Table of electricity rates

	Power Receiving Capacity	Basic Rate	Meter Rate
Toli-Toli	65kVA	30000Rp/kVA	545Rp/kWH
Tarakan	65kVA	25000Rp/kVA	750Rp/kWH

③ Annual charge for power consumption

Toli-Toli MW Transmitting Station	Basic rate（65kVA×30,000Rp×12 months）	Rp 23,400,000
	Meter rate（545Rp×177,571kWH）	Rp 96,776,000
	Total	Rp 120,176,000
Tarakan MW Transmitting Station	Basic rate（65kVA×25,000Rp×12 months）	Rp 19,500,000
	Meter rate（750Rp×177,571kWH）	Rp 133,178,000
	Total	Rp 152,678,000

2) Water

From the actual past experience of the existing broadcasting stations the monthly water consumption is assumed to be 200m^3.

① Water rates

	Monthly basic rate (0 to 10m^3)	Meter rates
Toli-Toli	5,760Rp/month	1,043Rp/m^3 （11 to 20 m^3） 1,352Rp/m^3 （over 21 m^3）
Tarakan	35,000Rp/ month	5,250Rp/m^3 （11 to 20 m^3） 7,000Rp/m^3 （21 to 30 m^3） 10,500Rp/m^3 （over 31 m^3）

② Annual charge for consumption of water

Toli-Toli MW Transmitting Station	Basic rate (5,760 Rp/month × 12 months)	Rp	69,000
	Meter rate（1,043Rp×10m^3＋1,352Rp ×180m^3） ×12 months）	Rp	3,045,000
	Total	Rp	3,114,600
Tarakan MW Transmitting Station	Basic rate（35,000 Rp/month × 12 months）	Rp	420,000
	Meter rate（5,250Rp×10m^3＋7,000Rp×10m^3 ＋10,500Rp×170 m^3） ×12 months	Rp	1,907,000
	Total	Rp	2,327,000

3) Facility maintenance and repairs

This is the necessary cost of maintenance and repairs of the MW transmitting station facilities. On the basis of the past experience of the broadcasting stations the annual cost of that at each of the two transmitting stations is estimated at Rp 90,000,000. That does not include the cost of procurement of spare parts, etc., for the transmitting equipment since they will be supplied by the RRI head office.

4) Other expenses

For contingency costs an amount of Rp 10,000,000/year is assumed.

(2) RRI Head Office

Procurement of spare parts for maintenance of the broadcasting equipment is all being done by the RRI head office. That being the case, the RRI head office needs to consider in its budget the maintenance cost for trouble with the equipment to be procured in this project. In the past the broadcasting stations estimated annual maintenance costs at about 1% of the cost of the equipment, but now about 0.5% is considered enough in view of the lower frequency of trouble brought about by technological progress.

On that basis it is estimated that the cost of maintenance of the MW broadcasting equipment to be provided in this project will be about 85 million rupiah (about 1 million yen) a year, and thereof that amount will have to be provided for in the budget.

Chapter 3 Project Evaluation and Recommendations