

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR REHABILITATION
OF
MEDIUM WAVE RADIO BROADCASTING NETWORK
FOR THE ENHANCEMENT OF EDUCATION
IN
THE FEDERAL REPUBLIC OF NIGERIA**

MARCH 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD

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PREFACE

In response to a request from the Government of the Federal Republic of Nigeria, the Government of Japan decided to conduct a basic design study on the Project for Rehabilitation of Medium Wave Radio Broadcasting Network for the Enhancement of Education and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Nigeria a study team from September 7 to October 7, 2006.

The team held discussions with the officials concerned of the Government of Nigeria, 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 Nigeria 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 Federal Republic of Nigeria for their close cooperation extended to the teams.

March 2007

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

March 2007

LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Rehabilitation of Medium Wave Radio Broadcasting Network for the Enhancement of Education in the Federal Republic of Nigeria.

This study was conducted by Yachiyo Engineering Co., Ltd., under a contract to JICA, during the period from September, 2006 to March, 2007. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Nigeria 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,

Kiyofusa Tanaka
Project manager,
Basic design study team on
the Project for Rehabilitation of
Medium Wave Radio Broadcasting Network
for the Enhancement of Education
Yachiyo Engineering Co., Ltd.

SUMMARY

SUMMARY

① Overview of the Country

The Federal Republic of Nigeria (hereinafter referred to as “Nigeria”) borders the Gulf of Guinea in central West Africa and is a leading oil producing nation with a population of approximately 140 million people (2006 National Population Commission in Nigeria). The country is comprised of more than 250 ethnic groups and more than 500 confirmed spoken languages, giving it a very multi-racial quality. Nigeria is two and a half times (2.5) larger than Japan and its territory is divided into two characteristic regions by the Niger and Benue Rivers — a semi-arid zone to the north and a wet (damp) zone to the south. Accordingly, lifestyles, etc. have a major impact on the cultural fabric of the nation, which can be roughly classified into north and south.

② Background, History and Outline of the Requested Japanese Assistance

The Nigerian economy has amassed a huge deficit after the wave of prosperity which occurred during the oil boom of the 1970s. While seventy percentage (70%) of the people continues to live in extreme poverty on a dollar or less a day, the current Obasanjo administration introduced its “Economic Policy for 1999 to 2003” and “National Economic Empowerment and Development Strategy” (hereinafter referred to as “NEEDS”) (2004) with the aim of reforming a failing economy. Since NEEDS supports the six major sectors of (1) agriculture and rural development, (2) roads, (3) education, (4) health, (5) water supply, and (6) electricity, the broadcasting sector has become involved in each sector in a cross-sectional manner. Since a strategy of especially adopting a means to provide distance learning is being applied especially in the educational sector, collaboration with the broadcasting sector it being strongly recommended.

Disparity in education level between urban and rural areas has had a significant effect on the current situation. For example, although the adult literary rate in Nigeria is 67% (2004, UNICEF: United Nations Children’s Fund), the rate for 6.5 million nomadic pastoralists in the north and 2.8 million migrant fishermen in the south is only about 0.2% to 2%. In addition, despite an enrollment rate in primary education of 25.76 million students and a preschool rate of approximately 30 to 40%, the enrollment rate in rural areas is approximately 30% lower than in urban areas. To achieve the goal of “Ensure that all boys and girls complete a full course of primary schooling” as stated in the “Education for All” or “UN Millennium Development Goals”, the current disparity remains a major obstacle for Nigeria.

On the other hand, radios are commonly used throughout Nigeria with the diffusion (ownership) rate for households at 76% (according to the Statistics Bureau of the Federal Ministry of Finance in

Nigeria). One major reason for this is the low electrification rate; information resources in rural areas are limited so it is important to provide information while taking cultural and living conditions into account. Many people who reside not only in urban areas but also rural areas listen to radio broadcasts and so radio has become deeply rooted in everyday life. In Nigeria, where access to education is poor and the literacy rate remains low, there has been much discussion on the effective utilization of radio to which people naturally access as an educational tool. In particular, the scope of information provided for modern living is proportional to the coverage characteristics of medium wave radio broadcasting, and it has secured a footing in medium wave radio broadcasting. Since medium wave broadcasting is the only source of real-time media available to nomadic pastoralists and migrant fishermen, the Federal Radio Corporation of Nigeria (hereinafter referred to as “FRCN”), the sole public nationwide broadcaster in Nigeria, has provided information to these listeners through medium wave radio broadcasting since broadcasting began.

However, since medium wave radio transmitting facilities, which were improved in the 1970s in prosperities, are incapable of formulating a renewal plan due to the subsequent business recession, only 10% of the coverage provided when broadcasting first began can be secured at the present time due to deteriorated facilities and other factors. As a result, this has created a new information gap and, as a public broadcaster, facilities are no longer able to provide the adequate amount of information needed for daily life. Consequently, some apprehension exists toward collaboration with the educational sector as requested by NEEDS. Nigeria made a request for Japan’s Grant Aid for the renewal of medium wave radio broadcasting facilities at the FRCN for the purpose of improving the current situation.

③ Outline of the Study Results and Contents of the Project

In response to this request, the Government of Japan decided to carry out a Basic Design Study and the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team to Nigeria from September 7 to October 7, 2006 in order to confirm the components being requested and to carry out a site survey, etc. After returning to Japan, a draft final report was compiled based on the necessity and the social and economic effects, and the relevance of the Project was examined based on materials collected during the field survey and an analysis conducted in Japan. The Basic Design Study Team was again dispatched to the said country from February 18 to 24, 2007 in order to explain the draft final report. The Basic Design Study Report was then prepared based on the draft final report.

The requested Japanese assistance formulated from the results of the study includes the renewal of medium wave radio transmitters at the Jaji Transmitting Station at Kaduna National Station and Milliken Hill transmitting Station at Enugu National Station which are national stations of the FRCN and where it has become more and more difficult to procure repair parts and to provide public

broadcasting on a continuing basis. The overall goal of the Project is to improve the accessibility to education by establishing various educational systems and by providing educational opportunities for more people scattered throughout Nigeria's vast territory. To accomplish this goal, the coverage of medium wave radio broadcasting will be expanded and improved. After the Basic Design Study Team returned to Japan, the basic design compiled its finding from a field survey and discussions with the Nigerian side as outlined in the following table.

Outline of the Basic Plan

No.	Description	Quantity	
1.	Jaji Transmitting Station (Kaduna)		
(1)	200 kW Medium Wave (MW) Transmitter	1	lot
(2)	200 kW Dummy Load	1	lot
(3)	Program Input Equipment (PIE) Rack	1	lot
(4)	Automatic Voltage Regulator (AVR) & Primary Distribution Board (PDB)	1	lot
(5)	Test Equipment	1	lot
(6)	MW Antenna System	1	lot
(7)	Air Conditioning System	1	lot
(8)	Spare Parts	1	lot
(9)	Consumable Parts	1	lot
(10)	Installation Materials	1	lot
2.	Milliken Hill Transmitting Station (Enugu)		
(1)	100 kW Medium Wave (MW) Transmitter	1	lot
(2)	100 kW Dummy Load	1	lot
(3)	Program Input Equipment (PIE) Rack	1	lot
(4)	Automatic Voltage Regulator (AVR) & Primary Distribution Board (PDB)	1	lot
(5)	Test Equipment	1	lot
(6)	MW Antenna System	1	lot
(7)	Air Conditioning System	1	lot
(8)	Spare Parts	1	lot
(9)	Consumable Parts	1	lot
(10)	Installation Materials	1	lot

Under this plan, a system should be created that will help to expand coverage to the necessary area while taking continuous public broadcasting into consideration primarily through the renewal of equipment. To achieve this goal, the necessary requirements for rehabilitating public broadcasting in the southern and northern regions and the implementation of sustainable educational broadcasting will be promoted. In addition, the minimum and effective amount of equipment necessary is scheduled based on a survey of all facilities and equipment conditions of the broadcast stations. The FRCN has implemented various projects through their own self-supporting efforts mainly to improve studio-related equipment. Consequently, special emphasis should be given to equipment that will

provide efficient operational cost and personnel who can utilize the latest equipment in order to ensure sustainability following the renovation of facilities and equipment and maintenance after the completion of the Project.

④ Project Schedule and Estimated Project Cost

In the case of implementing the Project through the Government of Japan's Grant Aid scheme, the total project cost is estimated to be approximately ¥1,200 million (approximately ¥1,170 million to be taken by Japan and approximately ¥30 million to be taken by Nigeria). Since major work items to be taken by Nigeria include removal of existing equipment such as antennas, building renovation and repair work, and installation of fences along the periphery of transmitting stations, the work period will be approximately 19 months for Phase 1 at the Kaduna site, and approximately 18.5 months for Phase 2 at the Enugu site which includes a detailed design and installation work.

⑤ Verification of the Relevance of Japan's Grant Aid Scheme

The responsible agency in the recipient country is the Federal Ministry of Information and Communications and the implementing agency is the FRCN. In addition, large-capacity medium wave transmitters to be procured under the Project will be maintainable during continuous broadcasting since it will be possible to replace parts on a per unit basis or need more skills or know-how as ever before, such as safety measures to prevent electrostatic induction at the transmitting stations. On the other hand, Nigeria has more than 50-year experience in operating and maintaining Japanese-made medium wave transmitters, so no technical problems in operation and maintenance of the said equipment are expected.

The following direct effects can be expected through the implementation of the Project.

- The continuous usage of transmitters required for public broadcasting will be possible, thus providing stable broadcasting.
- Coverage as broadcasting service areas (appropriate audible range) will be expanded so that real-time information on education, agriculture, health services and news, etc. can be provided to a larger number of people.
- Sound quality will be improved, so the scope of listening content can be expanded.

In addition, the following indirect effects can be expected.

- Distance learning will be improved under the cooperation with educational agencies, and will contribute to an improvement in educational levels.

- The number of listeners will increase seven times due to the expansion in coverage; advertising revenues will be increased and lower broadcasting charges will be encouraged, enabling more broadcasts of educational programs.
- Broadcasting of various content such as educational programs and news to a larger number of people is expected to lessen the information gap.

The major effects mentioned above can be expected under the Project and therefore implementation of Japan's Grant Aid is judged to be appropriate. As mentioned above, since Nigeria has maintained medium wave transmitters for more than 50 years and is judged to have an adequate system and technical ability in maintaining the equipment under the requested Japanese assistance, there are no particular problems with the implementation of this Project. However, in order to effectively utilize the effects of this Project and maximize its benefits, measures toward implementing educational broadcasting that is consistent with the formal educational curriculum by developing current types of educational broadcasting in collaboration with educational institutions, etc. should also be developed.

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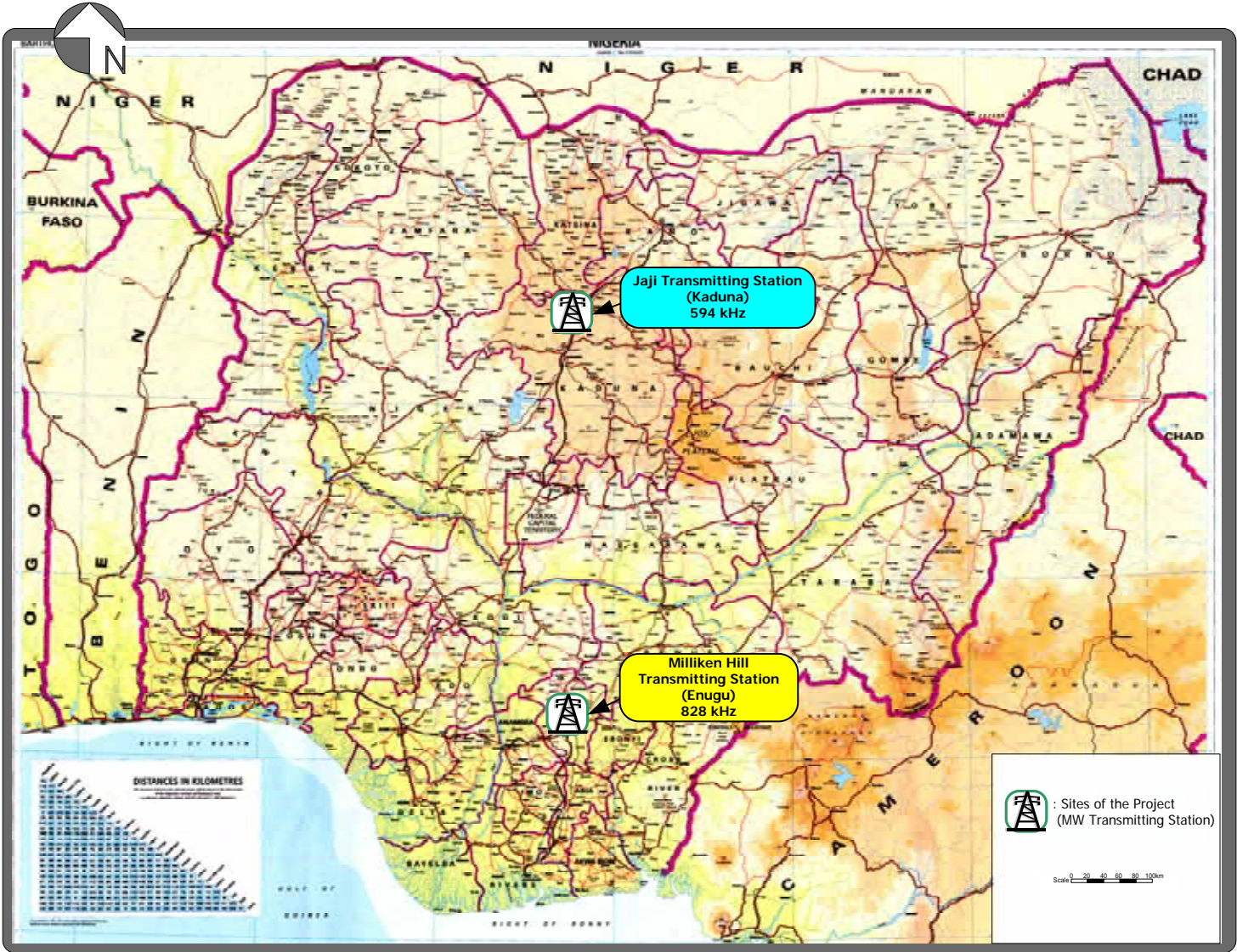
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Appendix 7 Letter about Procurment Country from FRCN

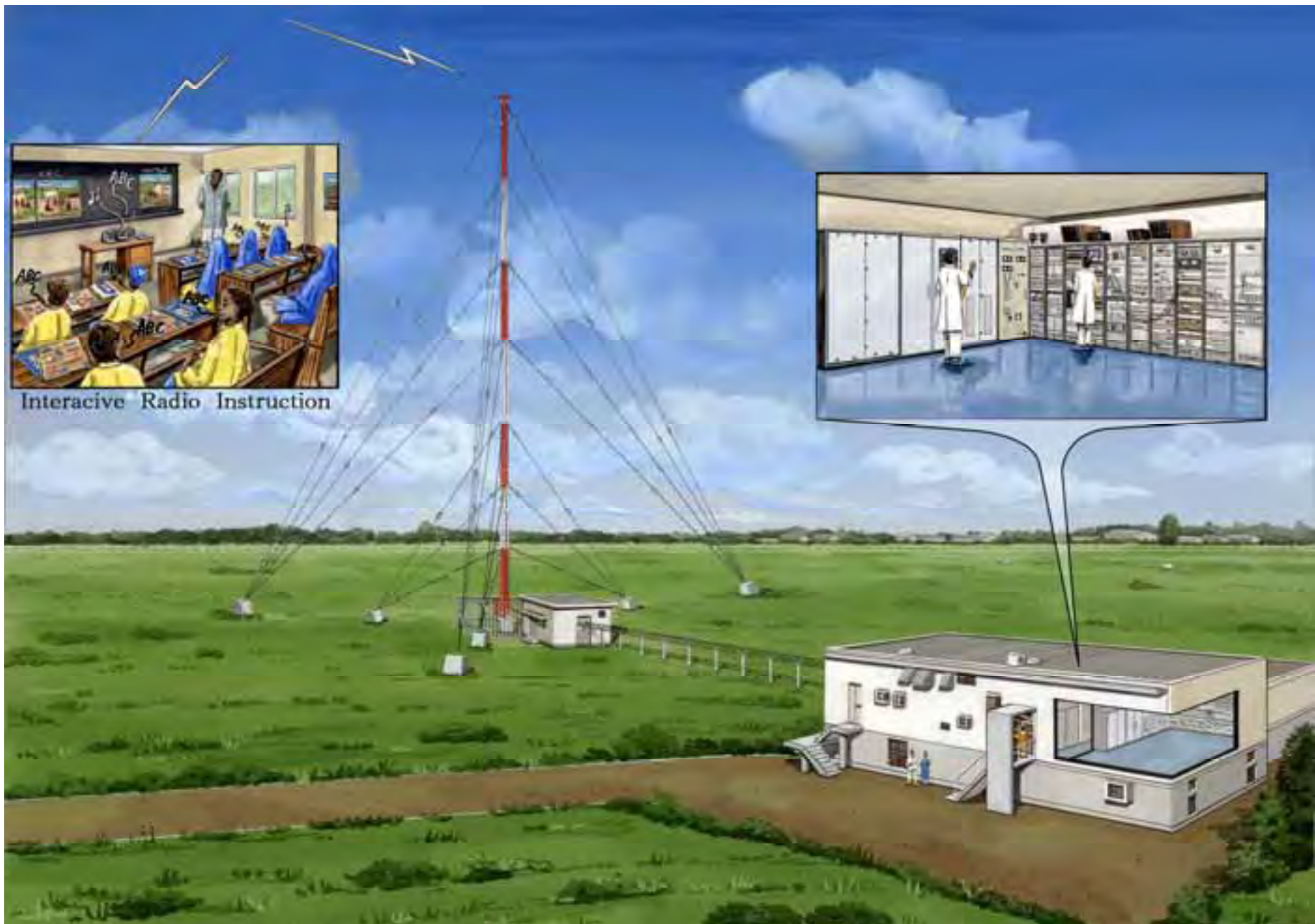
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ABBREVIATIONS

ADEA	Association for the Development of Education in Africa
AM	Amplitude Modulation
ATU	Antenna Tuning Unit
AVR	Automatic Voltage Regulator
COMPASS	Community Participation for Action in the Social Sectors
CUBE	Capacity for Universal Basic Education
DFID	Department for International Development
EFA	Education for All
E/N	Exchange of Notes
FCT	Federal Capital Territory
FET	Field Effect Transistor
FIFA	Fédération Internationale de Football Association
FM	Frequency Modulation
FMPS	Federal Ministry of Power and Steel
FRCN	Federal Radio Corporation of Nigeria
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union – Radio Communication Sector
JICA	Japan International Cooperation Agency
KSMC	Kaduna State Media Corporation
MDGs	Millennium Development Goals
MW	Medium Wave
NBC	Nigeria Broadcasting Commission
NBC	Nigeria Broadcasting Corporation
NCNE	National Commission for Nomadic Education
NEEDS	National Economic Empowerment and Development Strategy
NEWS/C.AFFAIRES	New and Current Affairs
NFB	Negative Feedback
NITEL	Nigeria Telecommunications
NPC	National Planning Commission
NPC	National Population Commission
NTA	Nigeria Television Authority
NTI	National Teachers' Institute
OAU	Organization of African Unity Note) The OAU (Organization of African Unity) was reorganized and is presently called the African Union (AU).
OJT	On-the-Job Training
PA	Power Amplifier
PEP	Primary Education Project
PHCN	Power Holding Company of Nigeria
RF	Radio Frequency
S/N	Signal-to-Noise (ratio)
UBEC	Universal Basic Education Commission
UNICEF	United Nations Children's Fund
UNPF	United Nations Population Fund
USAID	U.S. Agency for International Development
VSAT	Very Small Aperture Terminal

CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1

BACKGROUND OF THE PROJECT

Since 1999 “The Federal Republic of Nigeria” (hereinafter referred to as “Nigeria”) has taken strong economic measures toward the reconstruction of their own domestic economy and to reduce poverty. Improvement of education both in quality and quantity has been declared in both policy and a development plan. Nearly half of Nigeria’s vast territory is comprised of grasslands where nomadic pastoralists carry out their daily activities; whereas, the coastal region in the South is a wet zone extending over several states where it is difficult to distinguish between coast and land and where many migrant fishermen make their living.

Under such conditions, the effective use of radio broadcasting has come into the spotlight as an important means for improving education. The total household diffusion rate for radios in Nigerian is 76 % and the rate for nomadic pastoralists alone is 86 % (surveyed by “National Commission for Nomadic Education” (hereinafter referred to as “NCNE”), 2004), which is very high. The reason for this is that radio broadcasting is only convenient source of real-time media for migrating communities such as nomadic pastoralists and migrant fishermen. In addition, due to its wave characteristics the coverage area of medium wave radio broadcasting is wide, making it possible to reach areas used by nomadic pastoralists. It also appears to be an effective means for continuous transmission of essential information and literary education.

However, transmitters that were improved in the 1970s under the following economy as a result of the oil boom have deteriorated and performance has also deteriorated. Therefore areas used by nomadic pastoralists that were once covered when broadcasting first began can no longer be reached. Furthermore, due to the current economic situation in the said country, they are unable to improve the base facilities through their own self-efforts. The fundamental notion of providing educational broadcasting as a responsibility of the public broadcasting is now under threat, so the broadcasting may not be continued. In order to improve the situation, Nigeria submitted a request to Japan for the Grant Aid scheme for the renewal of medium wave transmitting stations at “Federal Radio Corporation of Nigeria” (hereinafter referred to as “FRCN”).

The requested components are described as follows.

(Common to all three Abuja, Kaduna and Enugu stations)

- 100 kW transmitters
- Antenna
- Dummy load
- Program input equipment (PIE)
- Test equipment
- Automatic voltage regulator (AVR) and primary distribution board (PDB)
- Spare parts
- Generator

(Only for Abuja station)

- Building construction (assumed to be approximately 400 m²) and studio renovation

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2

CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Objectives

The Nigerian economy has amassed a huge deficit since the wave of prosperity which occurred during the oil boom of the 1970s. The current Obasanjo administration introduced its “Economic Policy for 1999 to 2003” and “National Economic Empowerment and Development Strategy” (hereinafter referred to as “NEEDS”) (2004) with the aim of reforming a failing economy. On the other hand, Nigeria has population of 140 million (140,000,000), the largest in Africa and approximately two and a half times (2.5) larger than Japan. Various races and cultures coexist together, each with its own lifestyle.

Faced with these circumstances, the broadcasting sector has become involved, in a cross-sectional manner, in diversified economic policies taken through NEEDS in particular, and radio broadcasting has positioned itself as the public infrastructure transmitting information in real time to the many diversified peoples. The nation has not only called for the delivery of information necessary to everyday life, but also the providing of information for a physically sound and tasteful life.

One mission of public broadcasting within the public infrastructure that has increased in recent years is the expectation toward educational broadcasting. Since Nigeria boasts a household radio diffusion rate of 76 %, many people who reside not only in urban areas, but also rural areas listen to radio broadcasts and so radio has become deeply rooted in everyday life. In Nigeria, where access to education is poor and the literacy rate remains low, there has been much discussion on the effective utilization of radio which is readily accessible to people as an educational tool. At the present time, Nigerian educational institutions such as the NTI (National Teachers’ Institute) and the NCNE including the UBEC (Universal Basic Education Commission) have effectively utilized this means to provide distance learning and are examining the development of radio broadcasts.

However, since it is difficult to renovate radio broadcast transmitting facilities to meet the large renewal cost required of the exhausted Nigerian economy without assistance, Nigeria submitted a request to the Government of Japan for the Grant Aid scheme. Based on the situation, the overall goal of the Project is “to improve accessibility to education by establishing various educational systems and by providing educational opportunities for more people”. To accomplish the relevant goal, coverage of medium wave radio broadcasting will be expanded and improved.

2-1-2 Outline of the Project

The requested equipment falls under the renewal of the existing system presently being utilized. Its actual condition and problems are shown in the figure at the beginning of this report. From the results of the study, a schematic diagram of the planned facilities and an equipment description for the Project are shown in Figure 2-1-1 and Table 2-1-1 respectively.

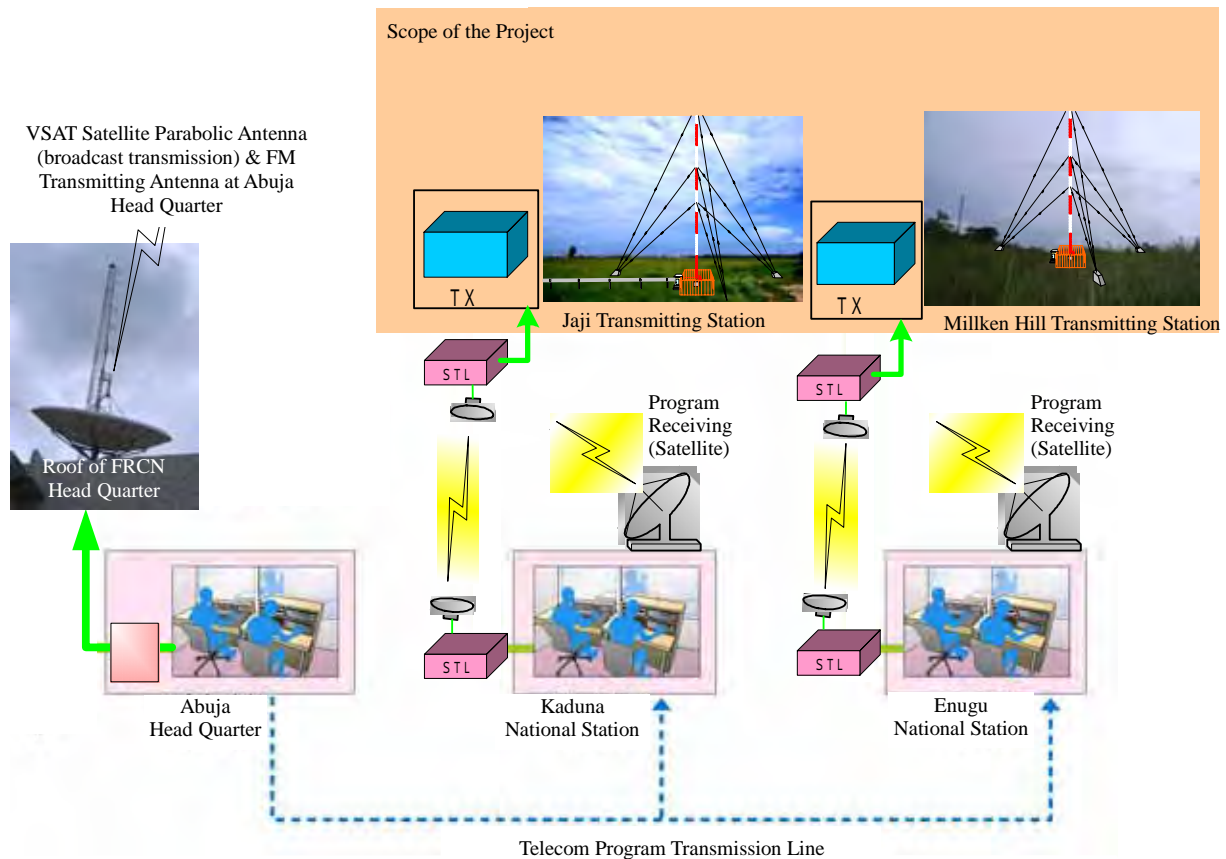


Figure 2-1-1 Schematic Diagram of Facilities Planned under the Project

Table 2-1-1 Contents of Assistance (Draft)

No.	Description	Quantity	
1.	Jaji Transmitting Station (Kaduna)		
(1)	200 kW Medium Wave (MW) Transmitter	1	lot
(2)	200 kW Dummy Load	1	lot
(3)	Program Input Equipment (PIE) Rack	1	lot
(4)	Automatic Voltage regulator (AVR) & Primary Distribution Board (PDB)	1	lot
(5)	Test Equipment	1	lot
(6)	MW Antenna System	1	lot
(7)	Air Conditioning System	1	lot
(8)	Spare Parts	1	lot
(9)	Consumable Parts	1	lot
(10)	Installation Materials	1	lot
2.	Milliken Hill Transmitting Station (Enugu)		
(1)	100 kW Medium Wave (MW) Transmitter	1	lot
(2)	100 kW Dummy Load	1	lot
(3)	Program Input Equipment (PIE) Rack	1	lot
(4)	Automatic Voltage regulator (AVR) & Primary Distribution Board (PDB)	1	lot
(5)	Test Equipment	1	lot
(6)	MW Antenna System	1	lot
(7)	Air Conditioning System	1	lot
(8)	Spare Parts	1	lot
(9)	Consumable Parts	1	lot
(10)	Installation Materials	1	lot

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Concept

Under the Project, a system should be created that will help to expand coverage to the necessary area while taking continuous public broadcasting into consideration primarily through the renewal of equipment. To achieve this goal, the necessary requirements for rehabilitating public broadcasting in the southern and northern regions and the implementation of sustainable educational broadcasting will be promoted. In addition, the minimum and effective amount of equipment necessary is scheduled

based on a survey of all facilities and equipment conditions of the broadcast stations including base station networks and transmitting systems other than medium wave radio broadcasting.

The FRCN has implemented various projects through their own self-supporting efforts mainly to improve studio-related equipment. Consequently, special emphasis should be given to equipment that will provide efficient operational cost and personnel who can utilize the latest equipment so that sustainability will not be hindered following the renovation of facilities and equipment and maintenance after the completion of the Project.

(1) Transmitting Station Lot and Antenna Mast

The lots for a transmitting station includes the construction of a radial earth of the same radius as the antenna height for a 1/4 wave length official transmitting frequency. However, a large area of new land will be difficult to secure, so the existing lot will be utilized as is. Taking into consideration performance degradation due to aging and durability, a new antenna mast will be constructed to realize maximum efficiency of transmission output power.

The antenna tuning unit (ATU) to be improved in the vicinity of the antenna mast was damaged by lightning, so the ATU to be renewed will be designed to withstand lightning strikes in order to keep damage to the transmitter to a minimum.

(2) Output Power

Output power will be decided, and will remain within the scope authorized by license, taking into account the living conditions and activities of the people who will benefit from the implementation of educational broadcasts.

First of all, the Kaduna Station officially covered the entire area north, and people speaking Hausa in the north were classified as listeners of the Kaduna National Station. There is no national station of the FRCN in the north aside from the Kaduna National Station. Even if geological conditions are taken into account, local broadcasting in the Hausa language from Kaduna would appear to be the most efficient method. Approximately 6.5 million nomadic pastoralists live in the relevant area, so it is no exaggeration to say that, for these people, radio is the only source of obtaining information.

At the other site, Enugu National Station, 2.8 million migrant fishermen reside in a delta zone in the south, so transmitting conditions along the southern coast and in the southeast should be improved. In addition, since approximately 2.3 million people of the Igbo (Ibo) tribe (mainly residing in the south) migrate to Plateau and Kano states, broadcasting services which were

provided to those people in the past should also be necessary from the viewpoint of maintaining cultural diversity.

In any event, since nomadic pastoralists in the north and migrant fishermen in the south depend on medium wave radio broadcasting as a means of obtaining real-time information, transmission power output will be designed to meet previous coverage levels under the Project.

(3) Effective Usage of Existing Facilities

Stand-by transmitting equipment will be designed for effective application by utilizing existing transmitters in addition to new equipment as much as possible. For example, taking convenience in operation and maintenance into consideration, by utilizing the stand-by equipment during periodic maintenance or unexpected accident, transmission power output can be reduced during unit replacement while continuing to broadcast.

2-2-1-2 Natural Conditions

(1) Temperatures

High temperatures of 30 °C to 35 °C are experienced throughout the year. To ensure the temperature operating range of the equipment to be adopted under the Project, the required existing buildings will be renovated and the environment for installing the equipment will be improved.

Building renovations will be taken by the Nigerian side and the Japanese side will provide necessary advice and confirmation.

(2) Humidity and Rainfall

Humidity at the project site varies from 60 % to 80 % between May and October and the amount of rainfall is also large. Consequently, special attention should be given to appropriate air conditioning control in order to prevent dew from condensing on broadcasting equipment due to extreme changes in room humidity levels. In addition, rain seepage in existing buildings will be repaired and the environment for installing the equipment will be improved.

As mentioned earlier, building renovation will be taken by the Nigerian side, and the Japanese side will provide necessary advice and confirmation.

2-2-1-3 Socio-economic Conditions

Medium wave broadcasting currently in operation will have to be suspended due to rebuilding of the antenna mast at the existing lot under the Project. Work-in-process is planned for building renovations, equipment installation and antenna mast construction to keep the necessary period of suspension to a minimum.

In the case of formulating a construction plan, a request will be made to Nigeria to provide guards to maintain peace and order during an economic period. In addition, Nigeria will also be requested to take steps to prevent theft of equipment and materials.

2-2-1-4 Procurement Conditions

Medium wave transmitters, program input units, medium wave antenna systems, test equipment, automatic voltage regulators and other major equipment to be procured and installed under the Project are not manufactured in Nigeria. Although they are frequently procured from western nations such as Japan, the United States, England and Switzerland, few manufacturers provide the necessary aftercare service in response to an accident or repairs or for procuring spare parts and consumables. In the discussions with the FRCN, Japanese products were requested for the above-mentioned broadcasting equipment.

In addition, when the Study Team examined the operating condition of existing equipment at transmitting stations subject to the request, it was confirmed that Japanese-made transmitters had been utilized for 27 to 30 years. Although it will be difficult to utilize this equipment for an extended period into the future, they appear to have been adequately maintained. However, the functionality of European-made transmitters have deteriorated, for example, coatings are peeling off and rusting has occurred due to the harsh African environment. Moreover, performance fallen remarkably, such as a drop in output power, for example. Accordingly, the FRCN is familiar with the operation and maintenance of Japanese-manufactured equipment and is also confident about the reliability and an aftercare service provided by Japanese manufacturers.

However, while Nigeria has requested the above-mentioned equipment, one requirement of the Grant Aid scheme is secure and competitive pricing. Therefore, for some equipment, third countries also were considered as suppliers. In order to promote stable operation of socially responsible public broadcasting, a system will be built up collectively before implementing local installation work in order to ensure performance through demonstration testing and consistency in inspection of the entire system.

2-2-1-5 Effective Use of Local Construction Companies

There are numerous construction companies and electric companies in Nigeria. However, none have the level of skills necessary to install broadcasting equipment under the Project. Consequently, Japanese engineers must be dispatched for installation work and to provide technical guidance, quality and process control.

2-2-1-6 Scope of Facilities and Equipment, Grade Setting

(1) Scope of Facilities and Equipment

Conventional transmitters including existing ones are vacuum tube type, and vacuum tubes must be replaced periodically due to deterioration. In addition, the temperature characteristics and operational stability of internal circuits are not very high compared with solid state transmitters adopt the latest semiconductors and are generally not utilized by the public with a change of generation of equipment. Accordingly, solid state transmitters have dominated in recent years. Compared with vacuum tube type transmitters, the following advantages of solid state transmitters can be listed.

- High reliability and long efficient life
- Easy maintenance
(Since a system is composed of several units, should a problem occur, replacement is possible while by taking the minimum unit continuing to broadcast through reduction, so rehabilitation work can be completed in a relatively short time.)
- Low power consumption
(Service voltage is low in comparison to vacuum tube type and approximately 40 % lower in input voltage during 100 % modulation, so efficiency is high.)

As mentioned above, procurement of solid state transmitters is planned.

(2) Grade Setting

The broadcasting equipment can be roughly classified as “equipment for private use” and “equipment for broadcast stations”. Since “equipment for broadcast station” is designed with high reliability or redundancy of electric circuitry in mind, it tends to be expensive. Considering the role of public broadcasting and beneficiary effects to educational broadcasts, “equipment for broadcast stations” will be selected under the Project.

2-2-1-7 Related Infrastructure

Both the Jaji Transmitting Station and the Milliken Hill Transmitting Station project sites are located within the range of GSM cellular phone system, so there are no problems with daily communications. However, hotels in both areas have not yet been upgraded with Internet access and electronic mail. Therefore, if Japanese engineers are dispatched communication equipment such as INMARSAT should always be kept on hand in order to ensure safety and a rapid and smooth mean of contact with the Japanese side.

2-2-1-8 Procurement and Construction Period

The equipment to be procured from Japan or a third country will be transported to Nigeria mainly by sea. The port of discharge in Nigeria will be the Port of Lagos due to the recent peace and order there. In addition, Container trucks will be used for shipping from the Port of Lagos to the project site. The required transportation period from loading at port in Japan or a third country to the project site via the above-mentioned routes including customs clearance at the port of discharge will be approximately 60 days. In the past, imported goods had to undergo a pre-shipment inspection at the place of loading in accordance with Nigerian laws and ordinances. However, in 2006 the legislation was revised, so inspections must be carried out at the loading port in place of pre-shipment inspections. Consequently, in addition to the above-mentioned transportation period, a waiting period for equipment and materials pertaining to the said inspection procedures at the Port of Lagos is anticipated. Therefore related loading documentation should be prepared on time so that transportation procedures can progress smoothly and quickly in cooperation with implementing agencies in the recipient country.

In addition, under the Project present medium wave broadcasting should be suspended during the rebuilding of the antenna mast in the existing lot. A work schedule should be planned in order to minimize the disruption in wave suspension period and to carry out building renovations, equipment installation and antenna mast construction.

2-2-1-9 Environmental and Social Conditions

As mentioned in 2-2-1-3 and 2-2-1-18, substitute broadcasting should be planned during the wave suspension period. The Kaduna National Station and the Enugu National Station of the FRCN carry out short wave broadcasting and FM broadcasting. Substitute broadcasting during the wave suspension period is requested for programming such as essential multilingual news. Wave suspensions and restarting should be implemented carefully in advance in order to prevent confusion among listeners.

2-2-2 Basic Plan

2-2-2-1 Preconditions

The aim of the Project is to repair and renew medium wave broadcast transmitting facilities for the purpose of improving educational broadcasting. As shown in Figure 2-2-1, both aspects of hardware and software were therefore examined and designed. In particular, as shown in 2-2-1-1 (2), the output power was decided on the assumptions of beneficiaries and the realization of educational broadcasting to benefiting areas. As a result, a plan will be formulated to alter the output power at the Jaji Transmitting Station from 100 kW to 200 kW and to utilize the existing power sources and communication lines at the studio.

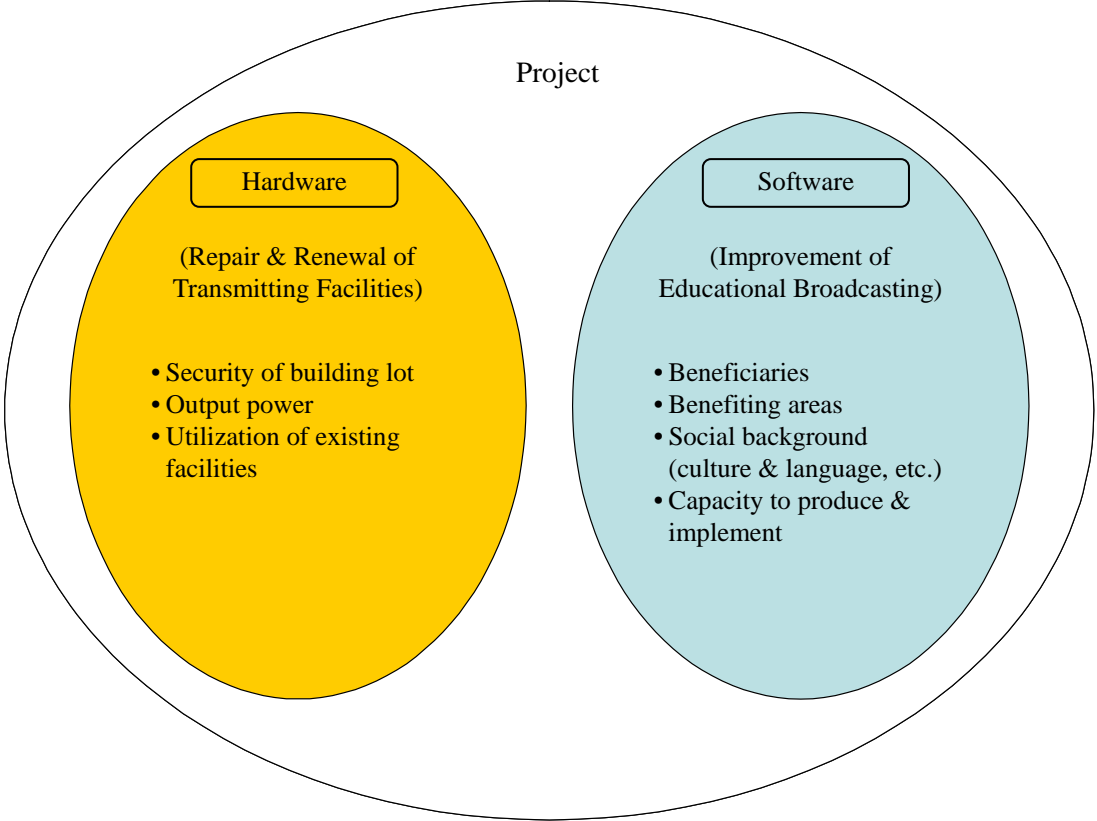


Figure 2-2-1 Main Points of Design in the Project

(1) Transmitters

1) Jaji Transmitting Station (Kaduna)

The present equipment utilization and stand-by equipment system will be applied through 200 kW (new equipment and 100 kW (existing equipment)). Output power at the time of

present operation will be 200 kW. The antenna will be a truss design supported with guy wire.

2) Milliken Hill Transmitting Station (Enugu)

A parallel combining system of 50 kW (new) + 50 kW (new) will be adopted for 100 kW output power. In a similar manner as the Kaduna National Station, the antenna mast will be a truss design supported with guy wire.

(2) Improvement in Environment for Equipment Installation

To improve the environment for equipment installation, general building equipment work will be conducted by repairing and finishing the existing floors, walls and ceilings. In particular, the air tightness of a transmitter room will be increased to prevent accumulation of dust and cooling efficiency will be improved by constructing new partitions. After completing the installation work, a favorable environment for equipment will be maintained by ensuring that shoes are removed before entering. In addition, an air chamber will be installed in the fresh air intake to cool the dummy load in order to prevent dust accumulation.

(3) Power Supply facility

At both transmitting stations at the project site, the Study Team measured the source voltage supplied to existing transmitters and other broadcasting equipment from the city power source and emergency generators via an automatic voltage regulator (AVR) utilized under the following conditions.

1) Jaji Transmitting Station (Kaduna)

Period : September 21 (13:15) to 22 (00:04), 2006

Location : Control room

Result : Refer to Figure 2-2-1

According to the measurement records, although the service voltage is approximately 194 V on average at all times, power blackouts are occasionally observed. The power blackouts were a result of temporary outbreaks when switching over to an emergency generator at the relevant transmitting station due to a stoppage of city power.

Since the equipment to be procured under the Project will have a rated voltage of 400 / 230 V, for normal safe equipment operation, a voltage of within $\pm 10\%$ of the above-mentioned rate should be adjusted and maintained.

However, it is difficult for the city power source and AVR to supply the above-mentioned voltage to the present relevant transmitting station within the above-mentioned normal operative range.

Accordingly, an AVR corresponding to the power consumption of the equipment to be procured should be included in the plan.

In addition, the power consumption of the equipment to be procured (including air conditioning) will be approximately 370 kW, which is approximately 60 % of the capacity of 640 kW of the existing emergency generator. Therefore, a new emergency generator should not be necessary in the implementation of the Project.

2) Milliken Hill Transmitting Station (Enugu)

Period : September 25 (16:59) to 25 (23:38), 2006

Location : Control room

Results : Refer to Figure 2-2-2

According to the measurement records, there were no particular power blackouts in the electrical supply to the broadcasting equipment and the power supply was kept constantly at approximately 230 V. However, since the normal operative range of the broadcasting equipment was observed to exceed the voltage (242 V), the existing AVR may not function properly.

On this account, an AVR corresponding to power consumption of the equipment to be procured should be included in the plan.

In addition, power consumption of the equipment to be procured (including air conditioning) will be approximately 100 kW, which is approximately 25 % of the capacity of 400 kW of the existing emergency generator. Therefore, a new emergency generator should not be necessary in the implementation of the Project.

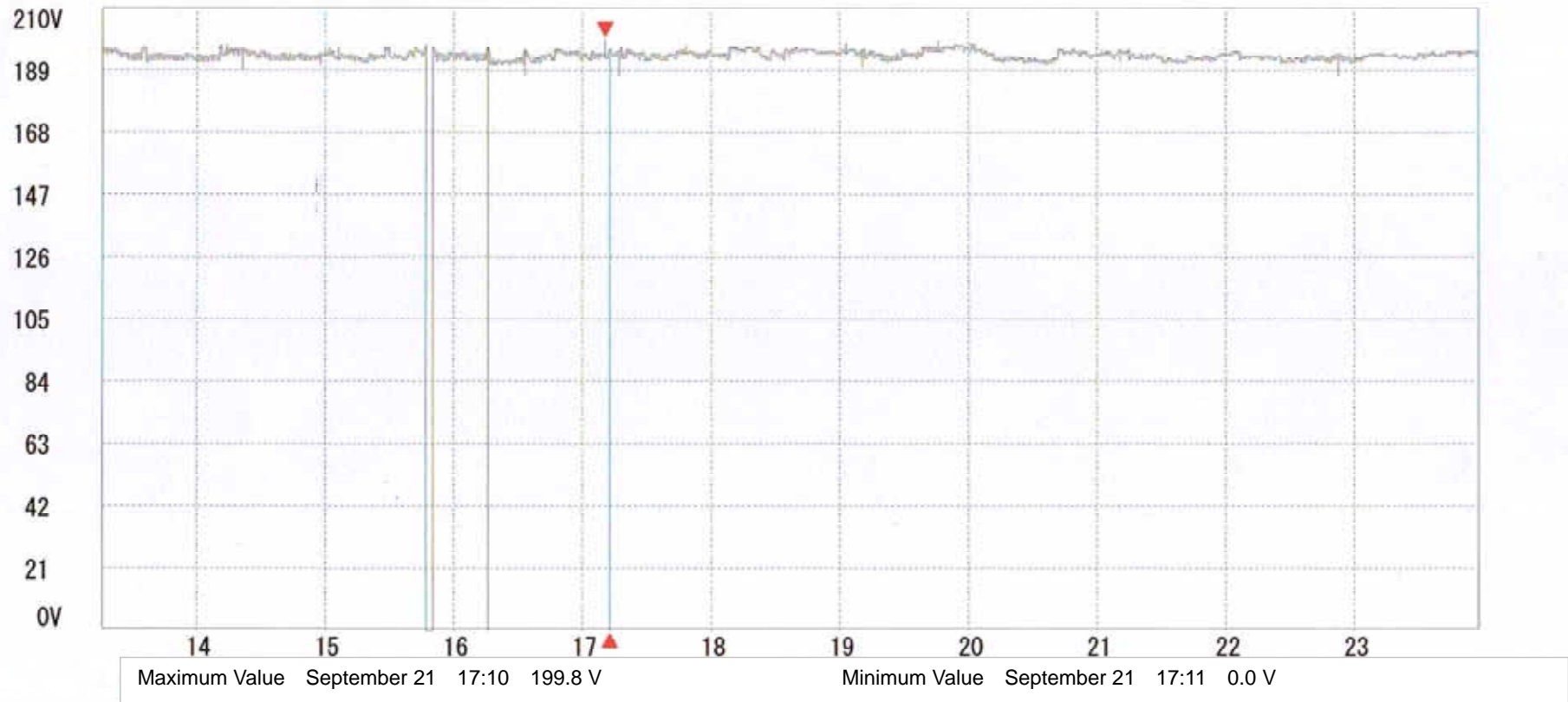


Figure 2-2-2 Results of Voltage Measurement at Jaji Transmitting Station (Kaduna)

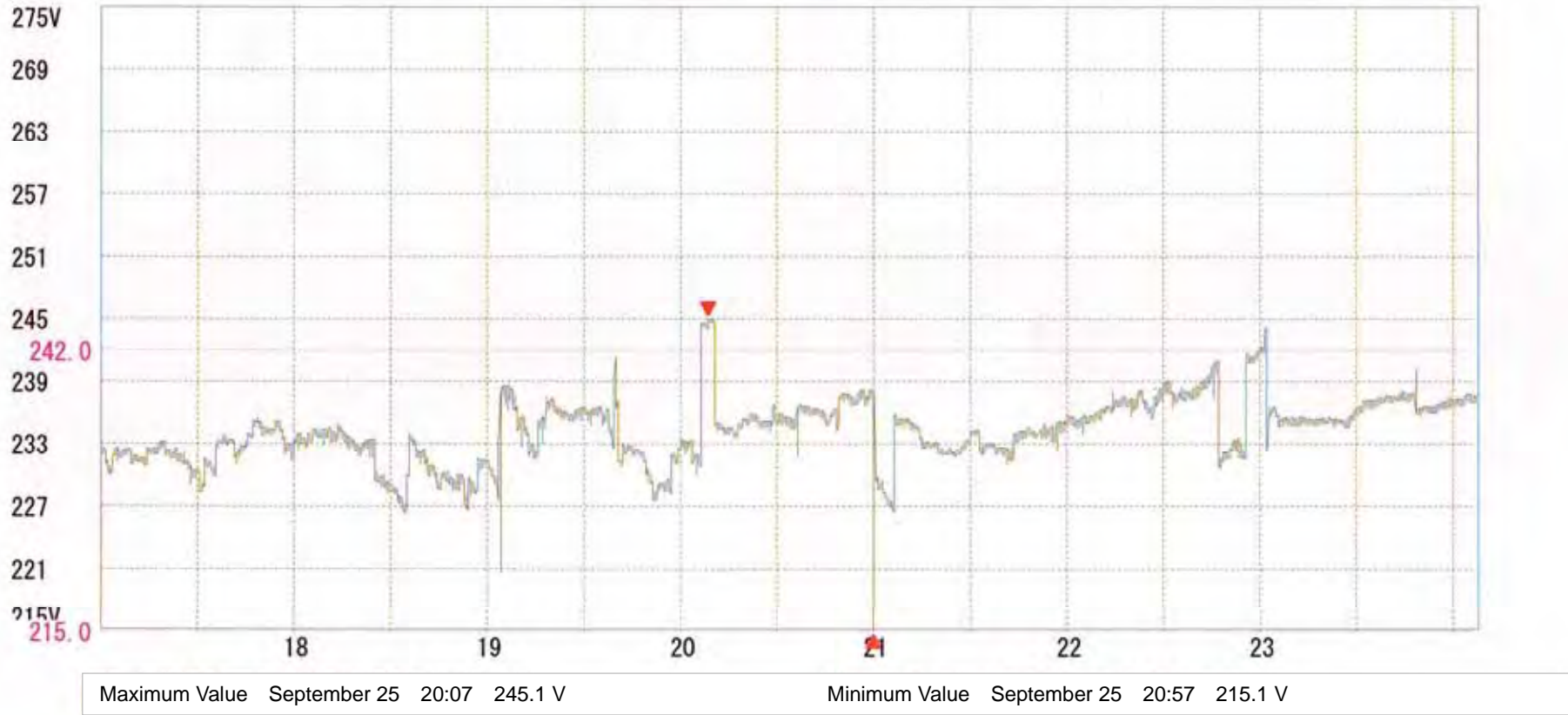


Figure 2-2-3 Results of Voltage Measurement at Milliken Hill Transmitting Station (Enugu)

(4) Air Conditioning Installation

Broadcasting equipment are precision instruments, so air conditioning should be appropriately controlled in order to prevent from excess dew condensation due to rapid changes in indoor temperature and humidity. The Study Team measured the change in indoor and outside temperature and humidity by utilizing a digital measuring instrument used to record changes over an extended period of time in order to confirm the operating capacity and effects of the existing air conditioning system under the following conditions.

1) Jaji Transmitting Station (Kaduna)

Period : September 21 (12:53) to 22 (12:38), 2006

Location: New transmitter room

Control room

Back face of the existing 100 kW transmitter

Back face of the existing 100 kW transmitter

Outdoor (fresh air)

Results : Refer to Figure 2-2-3

From the measurement results, the temperature at each measuring location ranged from approximately 28 °C to 33 °C, so a sudden rise in temperature as a result of heat from broadcasting equipment or long term high temperatures was not observed. In addition, since humidity observed at each measuring location continuously exceeded 70 % during periods of rain or morning mist, dew condensation is expected to occur during the operation of new broadcasting equipment under the Project.

As described above, from the viewpoint of preventing dust and dew condensation from entering the broadcasting equipment, the room will be sealed when installing the new transmitter and the air conditioning system.

2) Milliken Hill Transmitting Station (Enugu)

Period : September 25(16:43) to 26(16:28), 2006

Location: Existing short wave transmitter room

Existing medium wave transmitter room

Control room

Corridor in front of the existing medium wave transmitter room (which will be the location of the new transmitter room by installing new partition walls)

Outdoor (fresh air)

Results : Refer to Figure 2-2-4

From the measurement results, the temperature at each measuring location ranged from approximately 22 °C to 33 °C, so a sudden rise of temperature as a result of heat from broadcasting equipment or long term high temperatures was not observed. In addition, since humidity observed at each measuring location continuously exceeded 90 % during periods of rain or morning mist, dew condensation is expected to occur during the operation of new broadcasting equipment under the Project.

As described above, in order to prevent dust and dew condensation from entering the broadcasting equipment, the room will be sealed when installing the new transmitter and air conditioning system.

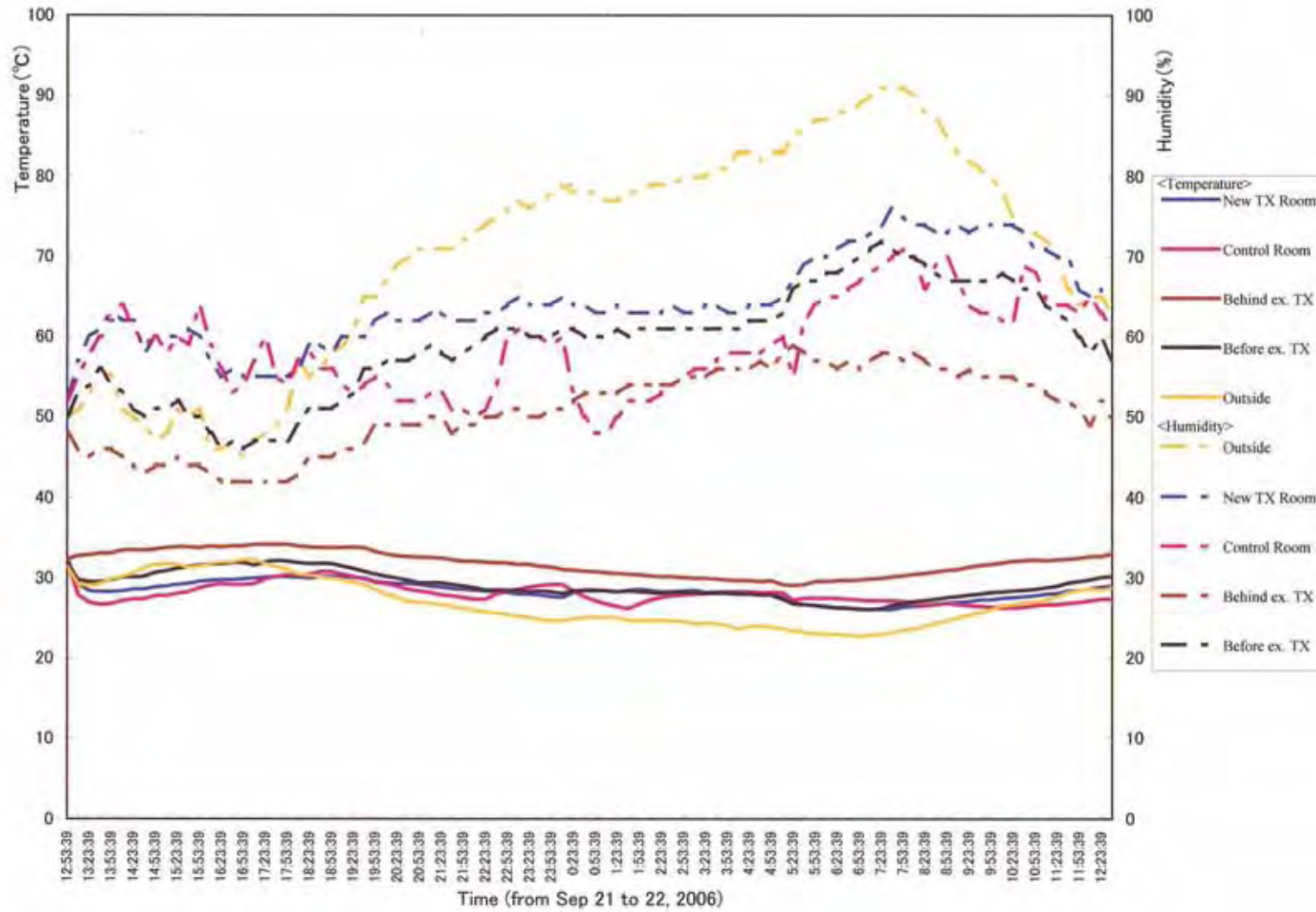


Figure 2-2-4 Results of Indoor and Outdoor Temperature and Humidity Measurements at Jaji Transmitting Station (Kaduna)

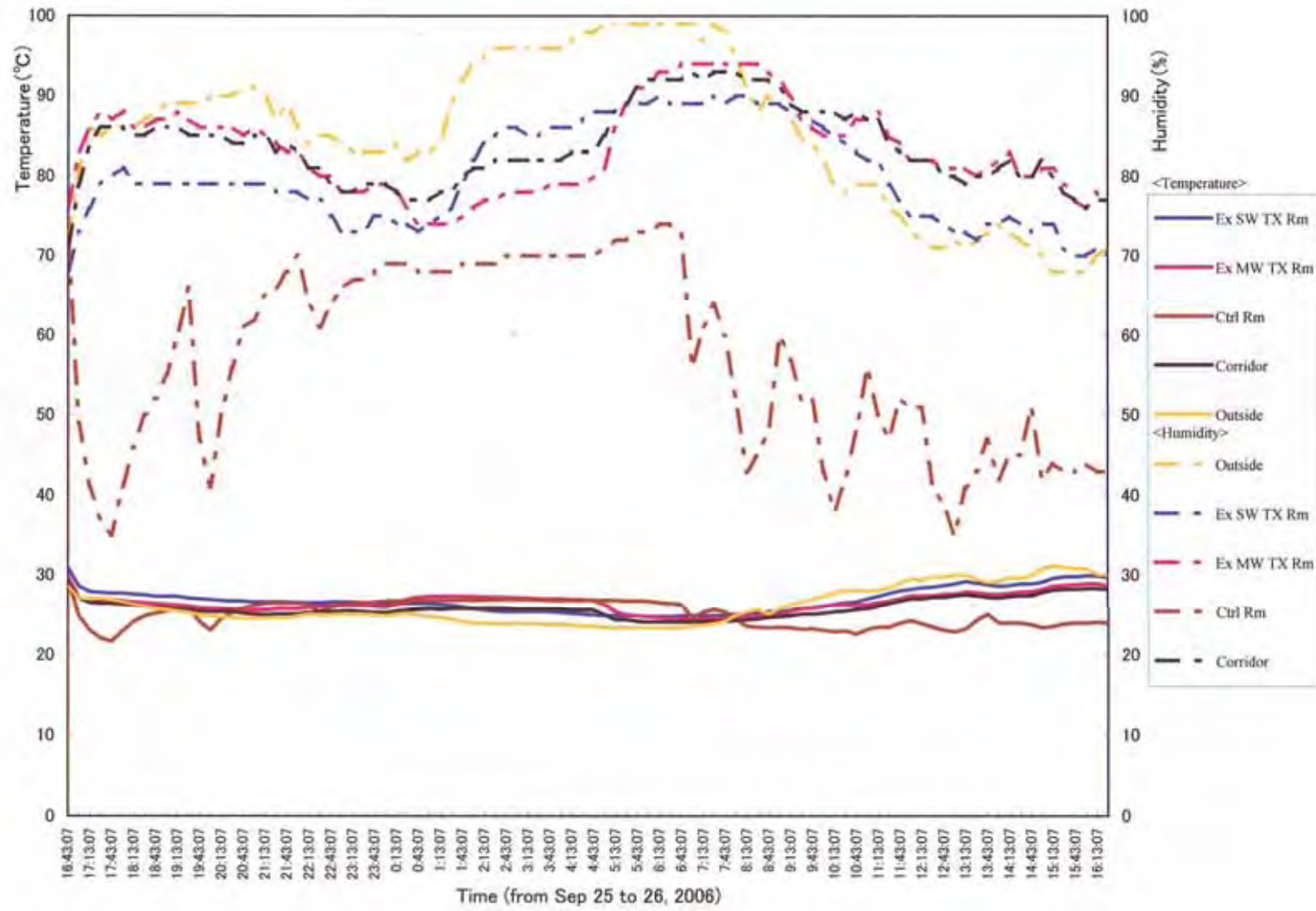


Figure 2-2-5 Results of Indoor and Outdoor Temperature and Humidity Measurements at Milliken Hill Transmitting Station (Enugu)

2-2-3 Basic Design Drawings

An equipment list (draft) of the broadcasting equipment and basic design drawings subject to the Project are listed as follows.

(1) Equipment List

Table 2-2-1 Draft Equipment Configuration at Jaji Transmitting Station (Kaduna)

No.	Description	Q'ty	
1	200 kW Medium Wave Transmitter	1	lot
1.1	200 kW Medium Wave Transmitter	1	set
1.2	Output Change-over Switch (U-link)	1	set
1.3	Impedance Matching Unit, 50 ohm to 230 ohm (200 kW)	1	set
1.4	Impedance Matching Unit, 230 ohm to 50 ohm (100 kW)	1	set
2	200 kW Dummy Load	1	lot
3	Program Input Equipment (PIE) Rack	1	lot
3.1	Audio Processor Amplifier	1	set
3.2	Control Panel (Input Select Switch, Meter Panel and Monitor Switcher)	1	set
3.3	Monitor Amplifier	1	set
3.4	Monitor Speaker	1	set
3.5	ON AIR Monitor Receiver with Receiving Antenna	1	set
3.6	Audio Jack Panel	1	set
3.7	Audio Distribution Amplifier (ADA)	1	set
3.8	NFB Panel	1	set
3.9	Rack	1	set
4	AVR & PDB	1	lot
4.1	450 kVA Automatic Voltage Regulator & Primary Distribution Board (PDB)	1	set
4.2	450 kVA Isolation Transformer	1	set
5	Test Equipment	1	lot
5.1	Distortion Meter / Oscillator	1	set
5.2	Audio Attenuator	1	set
5.3	Oscilloscope	1	set
5.4	Frequency Counter	1	set
5.5	Circuit Tester	1	set
5.6	Impedance Bridge, Receiver / Generator	1	set
5.7	Field Strength Meter	1	set
5.8	High Voltage Probe	1	set
6	MW Antenna System	1	lot
6.1	Antenna Mast	1	set
6.2	Austin Transformer	1	set
6.3	OB Lighting System	1	set

No.	Description	Q'ty	
6.4	Radial Earth	1	set
6.5	Antenna Tuning Unit (ATU)	1	set
6.6	ATU Compartment	1	set
6.7	Auxiliary Materials for ATU Compartment	1	set
6.8	Feeder, 230 ohm	1	set
7	Air Conditioning System	1	lot
7.1	Air Conditioning	6	sets
7.2	Air Intake Filter and Louver for Dummy Load	1	set
8	Spare Parts	1	lot
8.1	PA Module for MW Transmitter (1pc each type)	1	set
8.2	Power FET for PA Module	1	set
8.3	RF Driver Unit for MW Transmitter	1	set
8.4	Power Supply Module for MW Transmitter (1pc each type)	1	set
8.5	TX Control Board for MW Transmitter	1	set
8.6	TX Monitor Board for MW Transmitter	1	set
8.7	Printed Board for AVR Control	1	set
8.8	Maintenance Kit for ATU	1	set
9	Consumable Parts	1	lot
9.1	Fan unit for TX	1	set
9.2	Air Filter for TX	1	set
9.3	Fuse for TX	1	set
9.4	Surge Absorber for Isolation Transformer	1	set
9.5	Lamp for MW Antenna	1	set
9.6	Fuse for PIE	1	set
9.7	Fuse for AVR	1	set
9.8	Air Filter for Dummy Load Room	1	set
10	Installation Materials	1	lot
10.1	Power Cable	1	set
10.2	Audio Cable	1	set
10.3	Control Cable	1	set
10.4	Earthing Cable	1	set
10.5	Cable Rack	1	set
10.6	Cable Tray	1	set
10.7	Copper Bar for Cable Tray and Shielding	1	set
10.8	Indoor Feeder	1	set

Table 2-2-2 Draft Equipment Configuration at Milliken Hill Transmitting Station (Enugu)

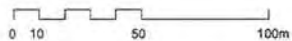
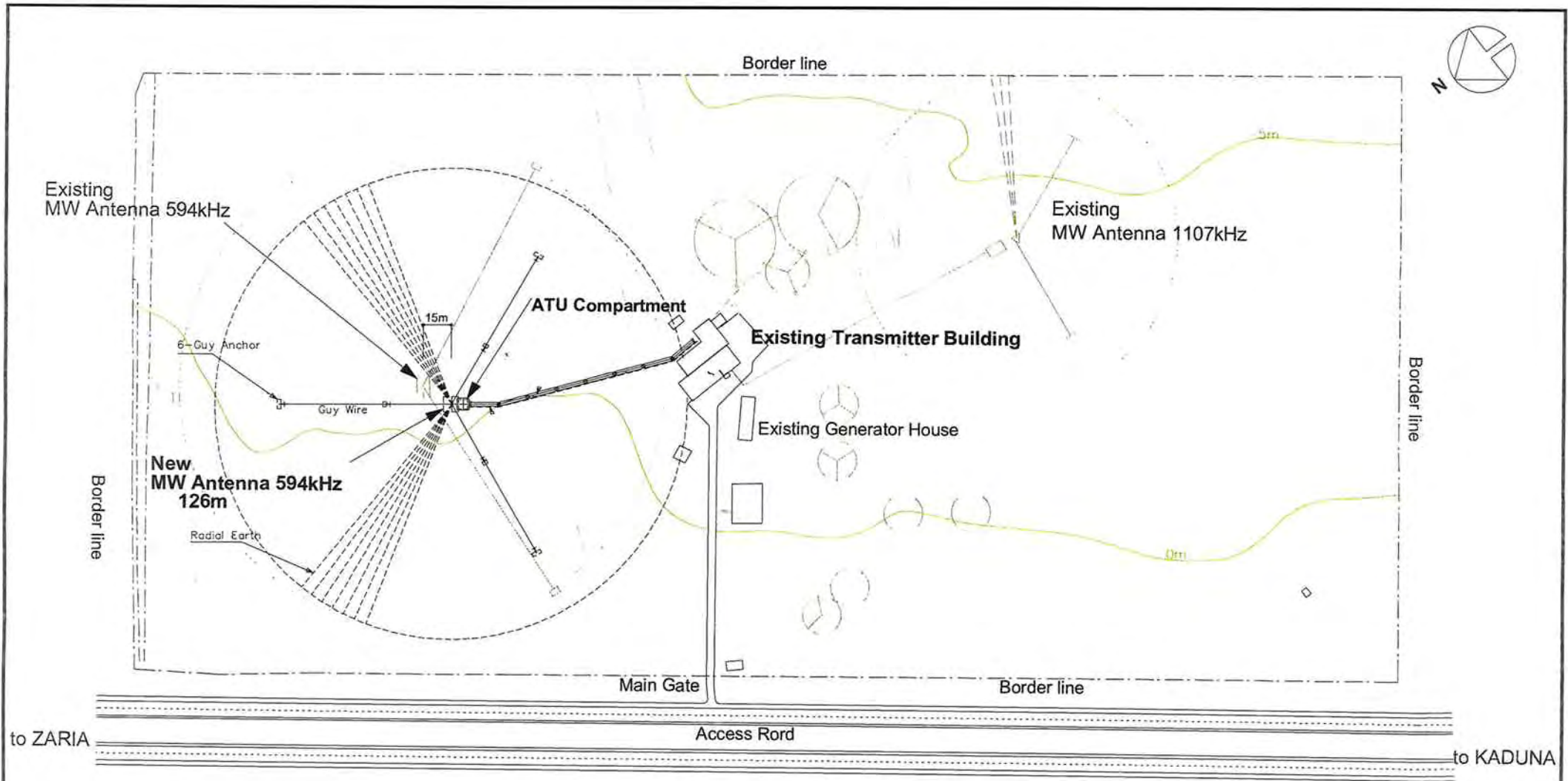
No.		Description	Q'ty	
1		100 kW Medium Wave Transmitter (50 kW+50 kW Combine system)	1	lot
	1.1	50 kW Medium Wave Transmitter	2	sets
	1.2	50 kW+50 kW Parallel Combining Equipment	1	set
	1.3	Impedance Matching Unit, 50 ohm to 230 ohm (100 kW)	1	set
2		100 kW Dummy Load	1	lot
3		Program Input Equipment (PIE) Rack	1	lot
	3.1	Audio Processor Amplifier	1	set
	3.2	Control Panel (Input Select Switch, Meter Panel and Monitor Switcher)	1	set
	3.3	Monitor Amplifier	1	set
	3.4	Monitor Speaker	1	set
	3.5	ON AIR Monitor Receiver with Receiving Antenna	1	set
	3.6	Audio Jack Panel	1	set
	3.7	RF Exciter Unit	1	set
	3.8	Operation / Indication Panel for 50 kW+50 kW Combine System	1	set
	3.9	Automatic Control Unit	1	set
	3.10	NFB Panel	1	set
	3.11	Rack	1	set
4		AVR & PDB	1	lot
	4.1	260 kVA Automatic Voltage Regulator & Primary Distribution Board (PDB)	1	set
	4.2	260 kVA Isolation Transformer	1	set
5		Test Equipment	1	lot
	5.1	Distortion Meter / Oscillator	1	set
	5.2	Audio Attenuator	1	set
	5.3	Oscilloscope	1	set
	5.4	Frequency Counter	1	set
	5.5	Circuit Tester	1	set
	5.6	Impedance Bridge, Receiver / Generator	1	set
	5.7	Field Strength Meter	1	set
	5.8	High Voltage Probe	1	set
6		MW Antenna System	1	lot
	6.1	Antenna Mast	1	set
	6.2	Austin Transformer	1	set
	6.3	OB Lighting System	1	set
	6.4	Radial Earth	1	set
	6.5	Antenna Tuning Unit (ATU)	1	set
	6.6	ATU Compartment	1	set
	6.7	Auxiliary Materials for ATU Compartment	1	set
	6.8	Feeder, 230 ohm	1	set

No.	Description	Q'ty	
7	Air Conditioning System	1	lot
7.1	Air Conditioning	5	sets
7.2	Air Intake Filter and Louver for Dummy Load	1	set
7.3	Fan for Dummy Load Room	1	set
8	Spare Parts	1	lot
8.1	PA Module for MW Transmitter (1pc each type)	1	set
8.2	Power FET for PA Module	1	set
8.3	RF Driver Unit for MW Transmitter	1	set
8.4	Power Supply Module for MW Transmitter (1pc each type)	1	set
8.5	TX Control Board for MW Transmitter	1	set
8.6	TX Monitor Board for MW Transmitter	1	set
8.7	Printed Board for AVR Control	1	set
8.8	Maintenance Kit for ATU	1	set
9	Consumable Parts	1	lot
9.1	Fan unit for TX	1	set
9.2	Air Filter for TX	1	set
9.3	Fuse for TX	1	set
9.4	Surge Absorber for Isolation Transformer	1	set
9.5	Lamp for MW Antenna	1	set
9.6	Fuse for PIE	1	set
9.7	Fuse for AVR	1	set
9.8	Air Filter for Dummy Load Room	1	set
9.9	Fan for Dummy Load Room	1	set
10	Installation Materials	1	lot
10.1	Power Cable	1	set
10.2	Audio Cable	1	set
10.3	Control Cable	1	set
10.4	Earthing Cable	1	set
10.5	Cable Rack	1	set
10.6	Cable Tray	1	set
10.7	Copper Bar for Cable Tray and Shielding	1	set
10.8	Cable Trough	1	set
10.9	Indoor Feeder	1	set
10.10	Outdoor Feeder	1	set

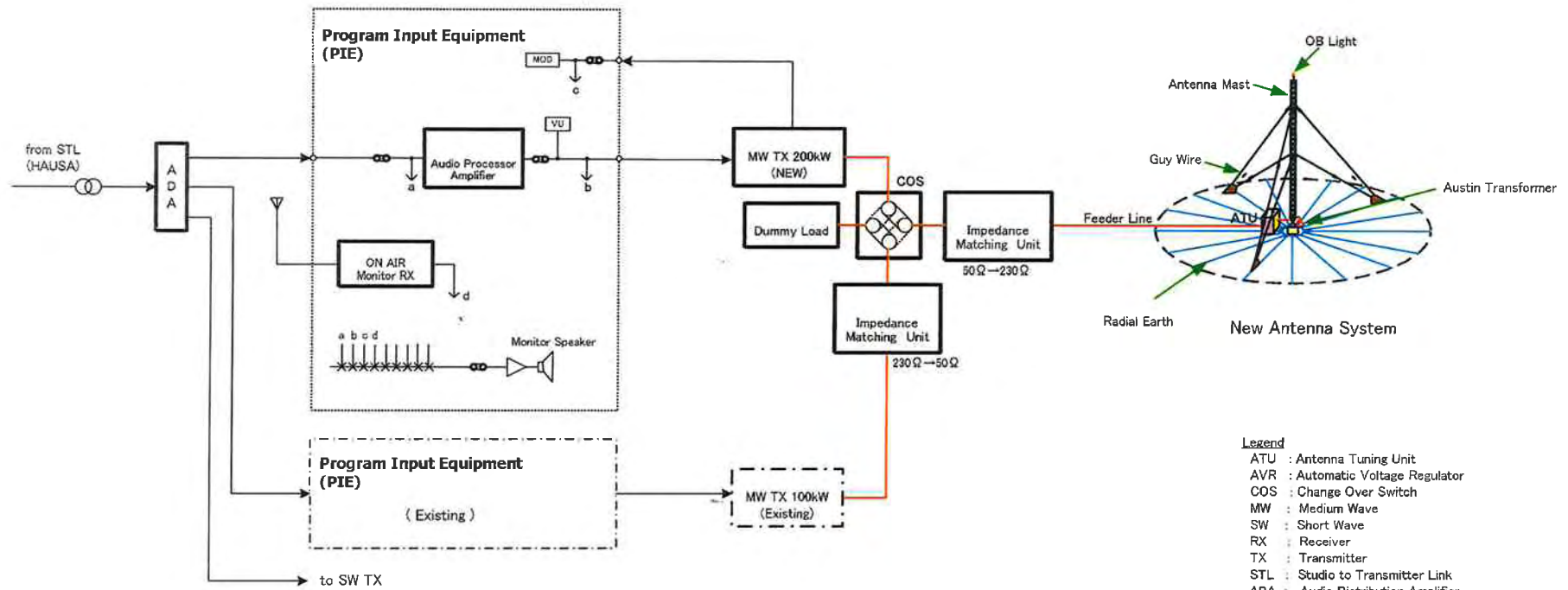
(2) Basic Design Drawings

<u>Drawing No.</u>	<u>Title</u>
K-01	SITE PLAN OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-02	BLOCK DIAGRAM OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-03	FLOOR PLAN OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-04	SECTION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-05	EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (Ground Floor)(KADUNA)
K-06	EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (1 st Floor)(KADUNA)
K-07	ANTENNA SITE LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-08	ANTENNA ELEVATION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-09	ANTENNA DETAIL VIEW OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-10	ANTENNA FOUNDATION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)
K-11	ATU COMPARTMENT MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)

<u>Drawing No.</u>	<u>Title</u>
E-01	SITE PLAN OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-02	BLOCK DIAGRAM OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-03	BUILDING PLAN OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-04	EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-05	ANTENNA SITE LAYOUT OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-06	ANTENNA ELEVATION OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-07	ANTENNA DETAIL VIEW OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-08	ANTENNA FOUNDATION OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)
E-09	ATU COMPARTMENT MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)

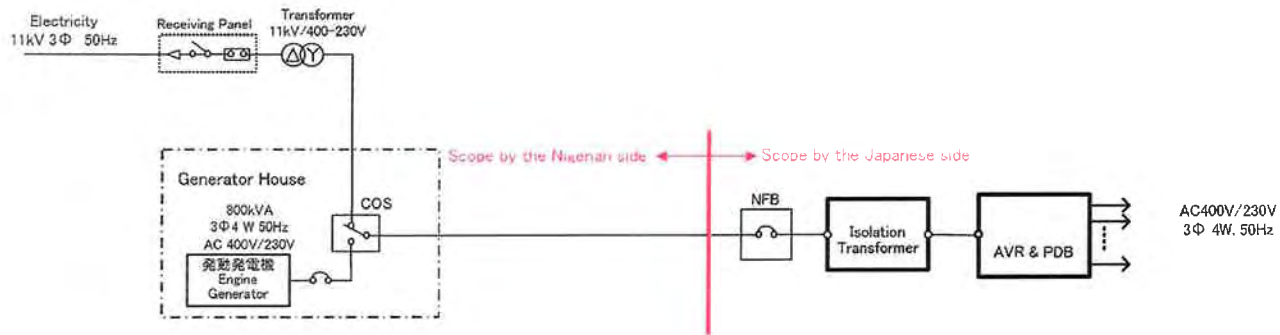


The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				SCALE
				1/3000
Title				DWG. No.
SITE PLAN OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YACHIKYO ENGINEERING CO., LTD. TOKYO, JAPAN				

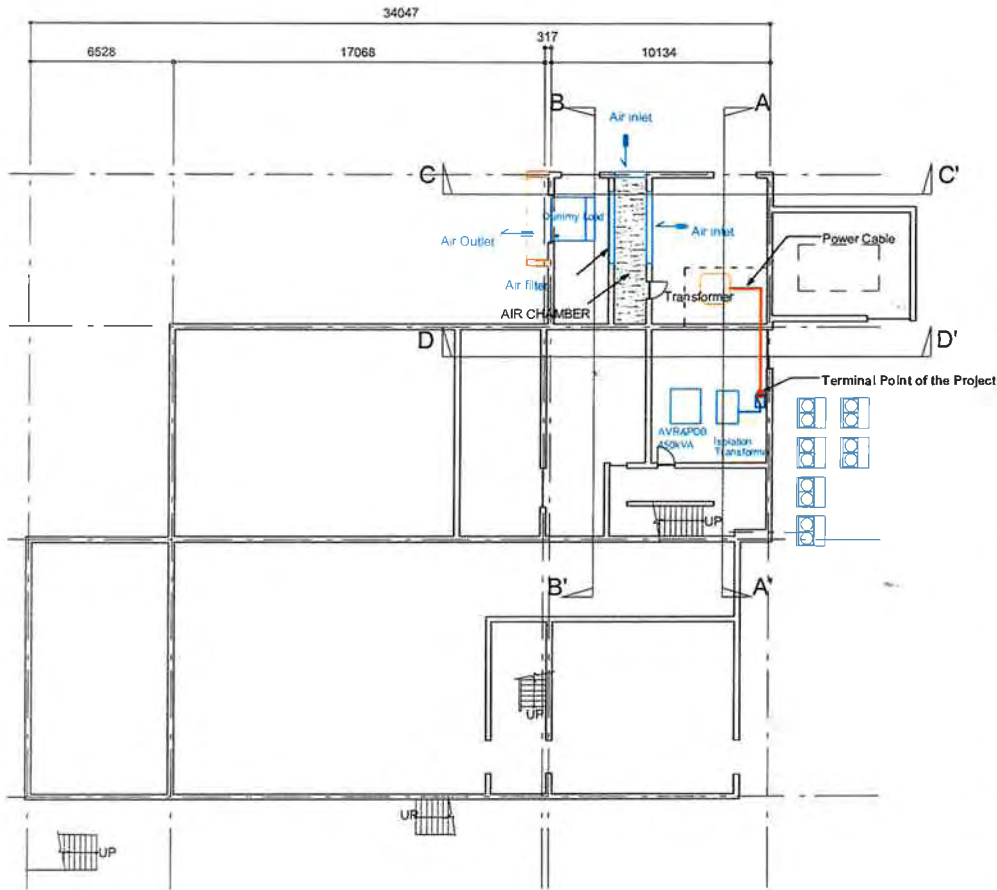


- Legend**
- ATU : Antenna Tuning Unit
 - AVR : Automatic Voltage Regulator
 - COS : Change Over Switch
 - MW : Medium Wave
 - SW : Short Wave
 - RX : Receiver
 - TX : Transmitter
 - STL : Studio to Transmitter Link
 - ADA : Audio Distribution Amplifier
 - OB : Obstruction (Light)

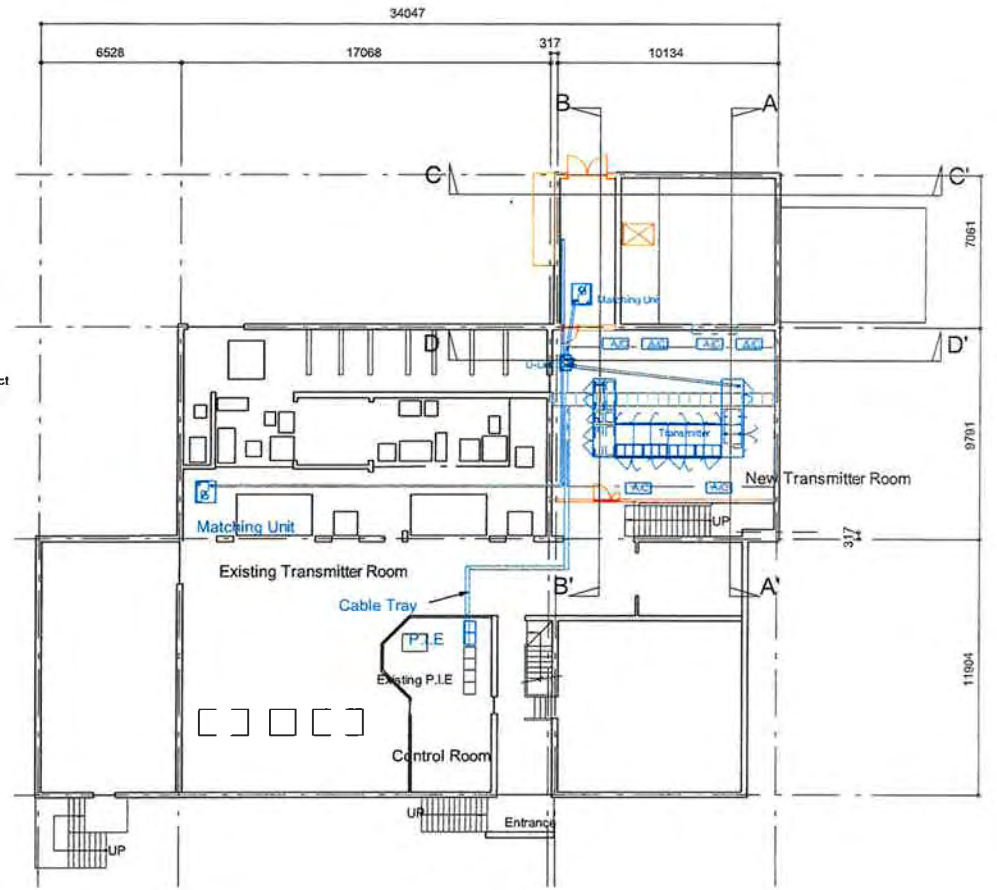
- Symbol**
- : Molded Case Circuit Breaker
 - : VU (Audio Level) Meter
 - : Modulation Percent Meter
 - : Audio Jack



The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				SCALE
Title				---
BLOCK DIAGRAM OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				DWG. No K-02
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Wada	Konayashi	Tanaka	
YACHIYO ENGINEERING CO., LTD. TOKYO JAPAN				



GROUND FLOOR PLAN



1st FLOOR PLAN

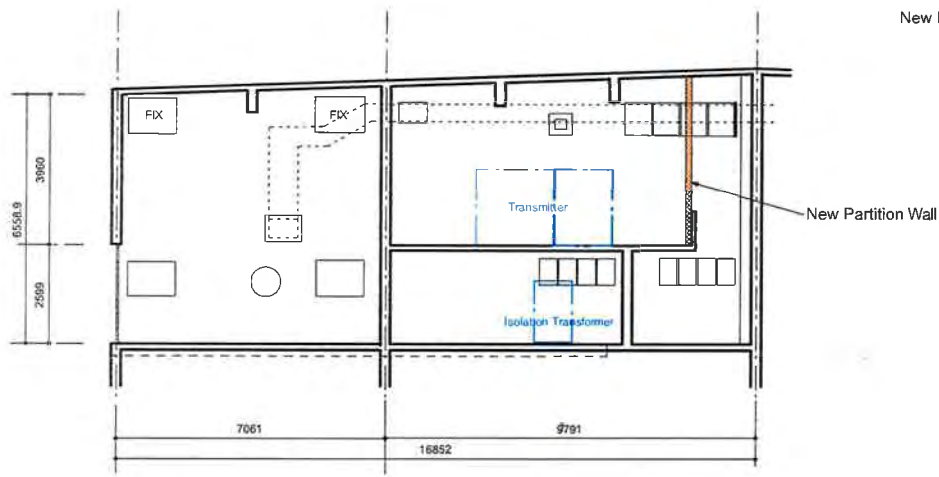


Scope by the Japanese side

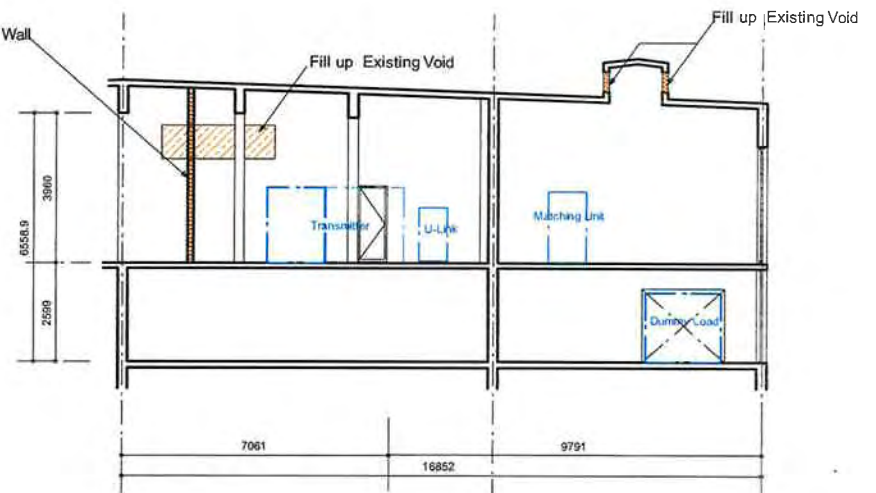


Scope by the Nigerian side

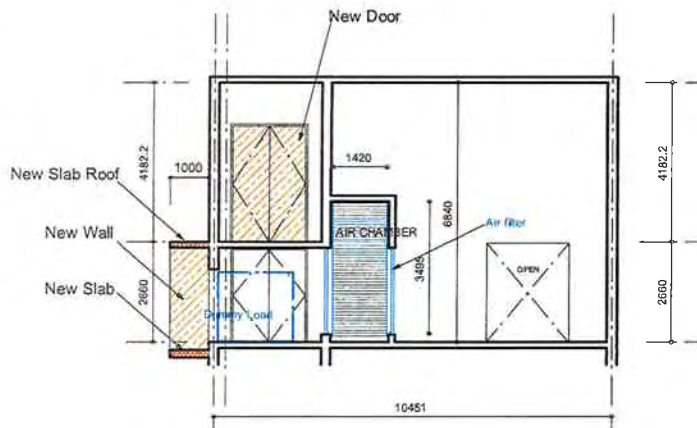
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The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/350	
Title				DWG. No.	
FLOOR PLAN OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-03	
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN					



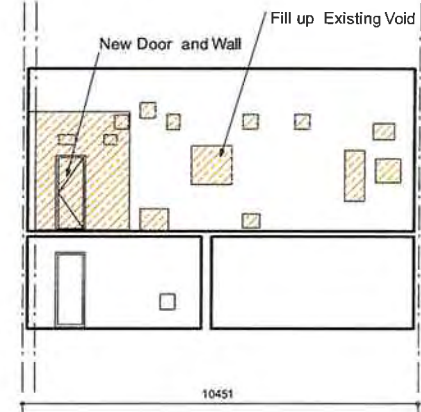
A-A' SECTION





B-B' SECTION



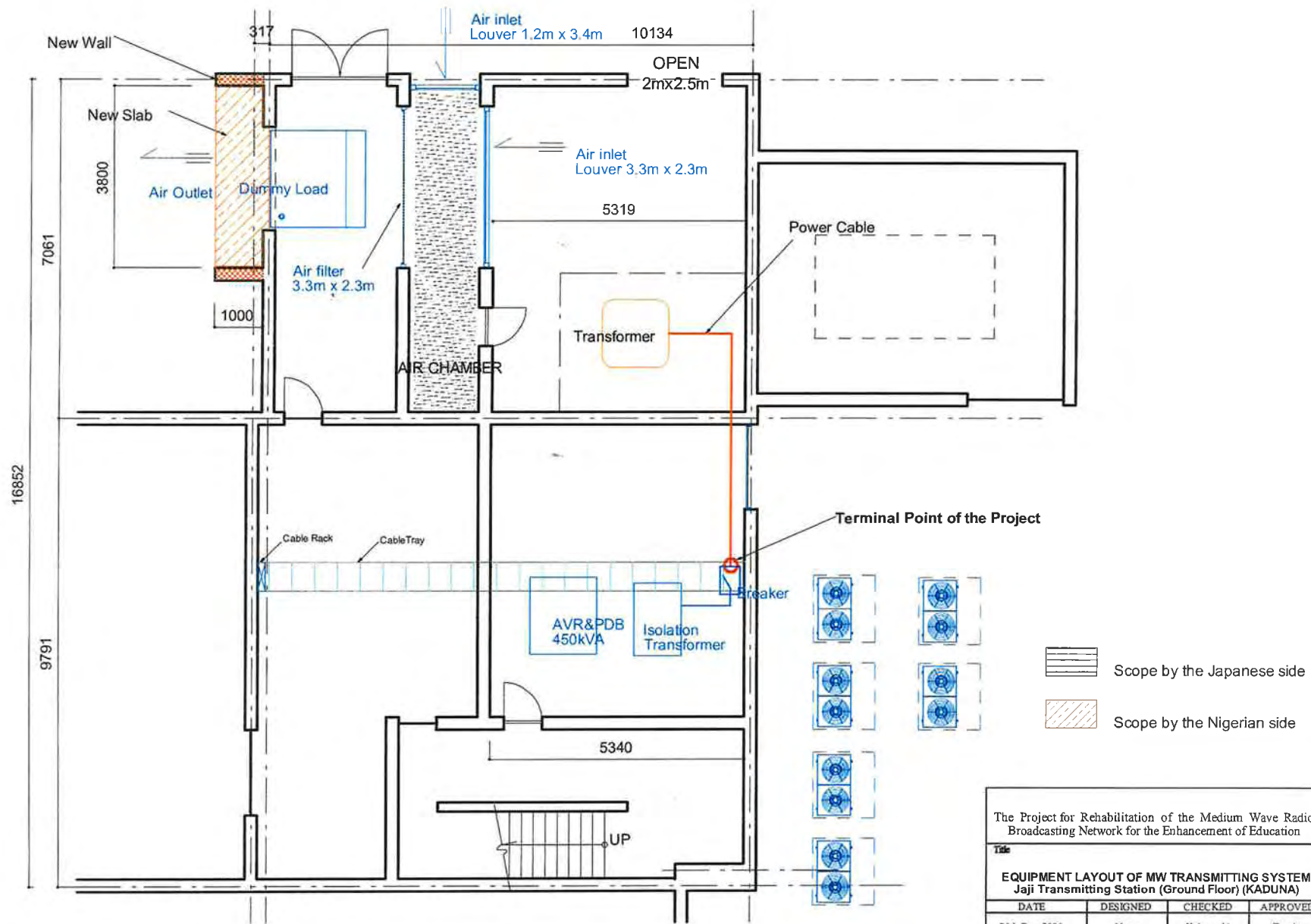
C-C' SECTION



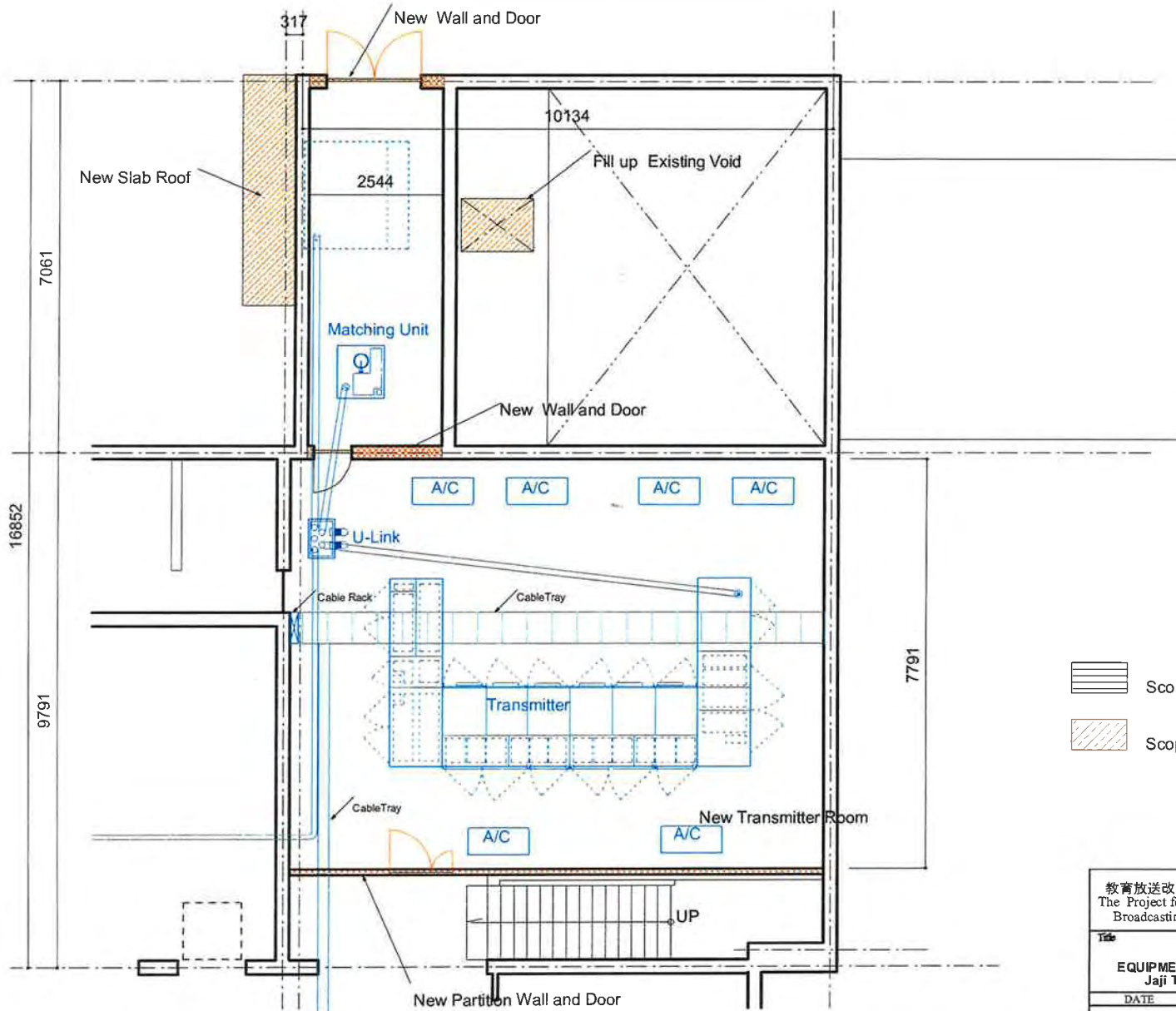
D-D' SECTION

 Scope by the Japanese side
 Scope by the Nigerian side

					SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					1/200
Title					DWG. No.
SECTION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)					K-04
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
Yec YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN					

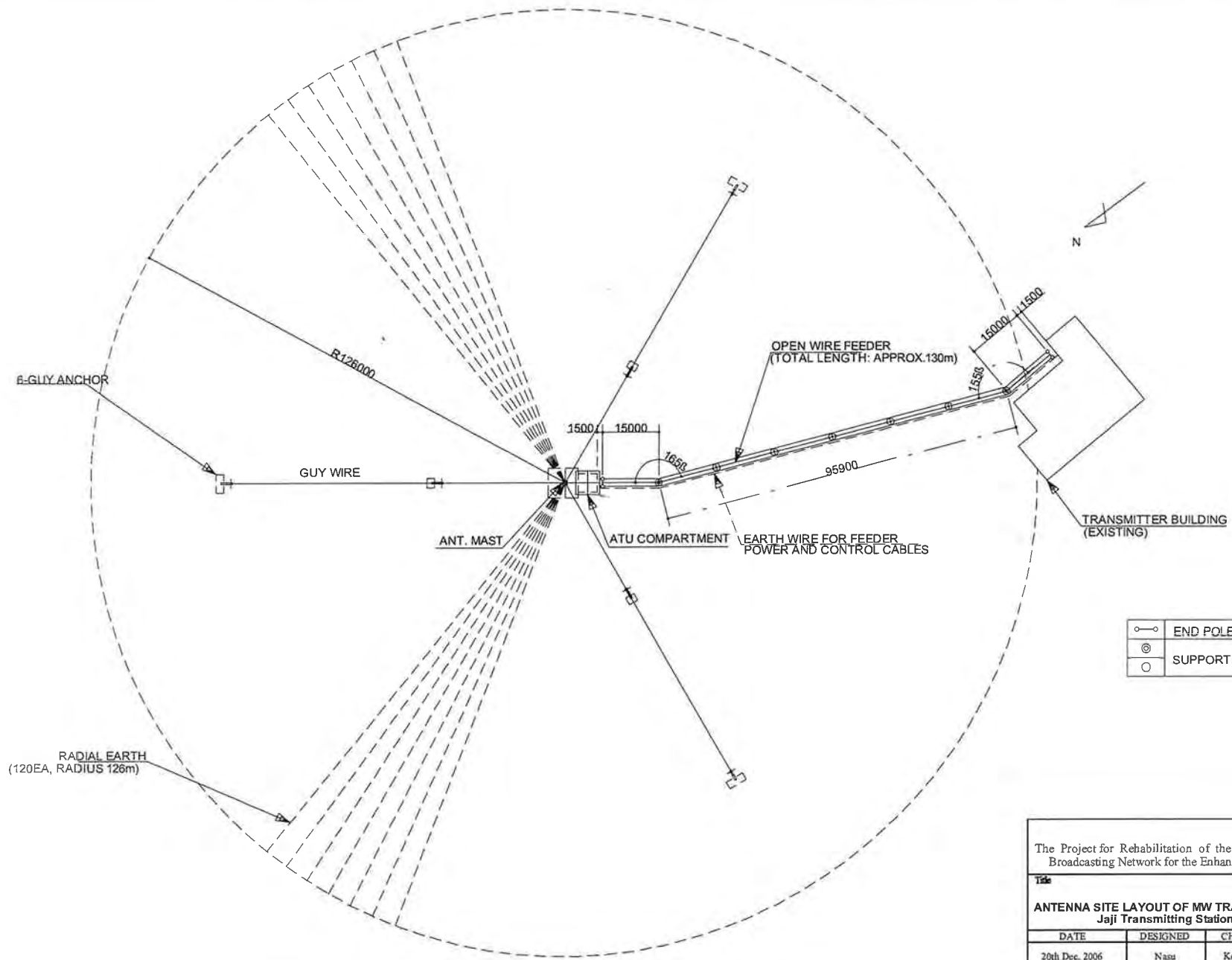


The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					SCALE
					1/120
EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (Ground Floor) (KADUNA)					DWG. No.
					K-05
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN					



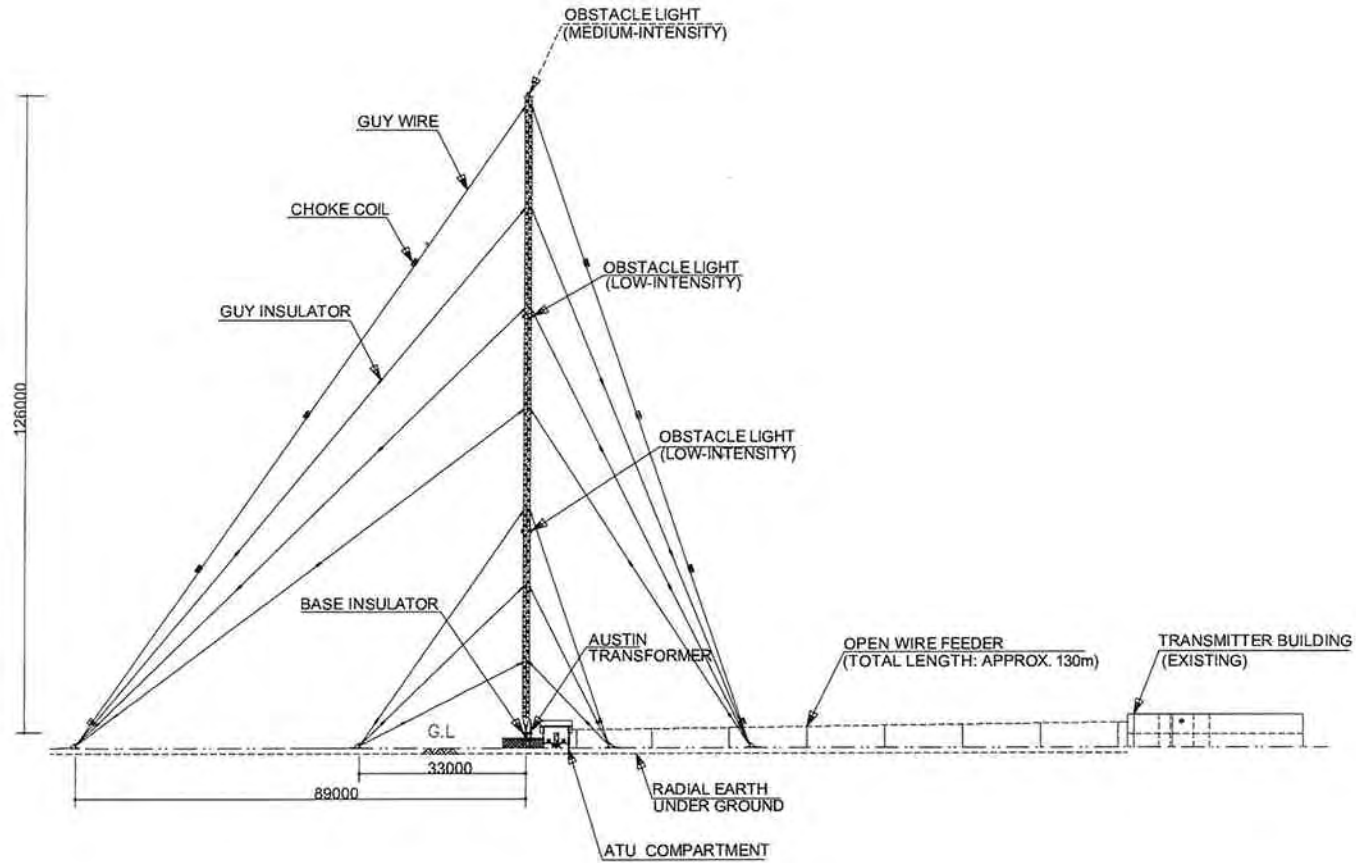
- Scope by the Japanese side
- Scope by the Nigerian side

教育放送改善のための中波放送局リハビリテーション計画 The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				SCALE
				1/120
Title				DWG. No.
EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (1st Floor) (KADUNA)				K-06
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN				

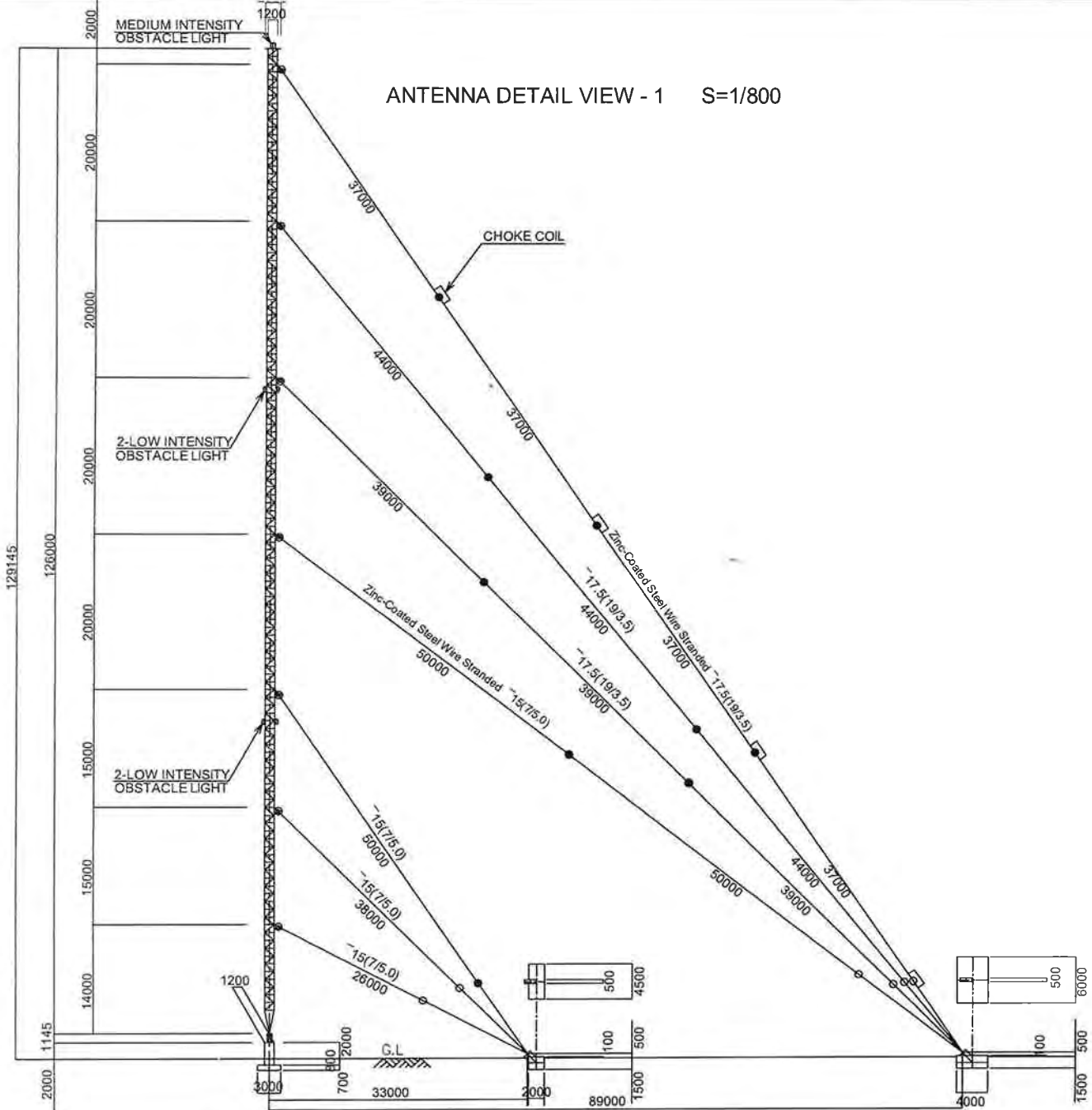


○	END POLE
⊙	
○	SUPPORTING POLE

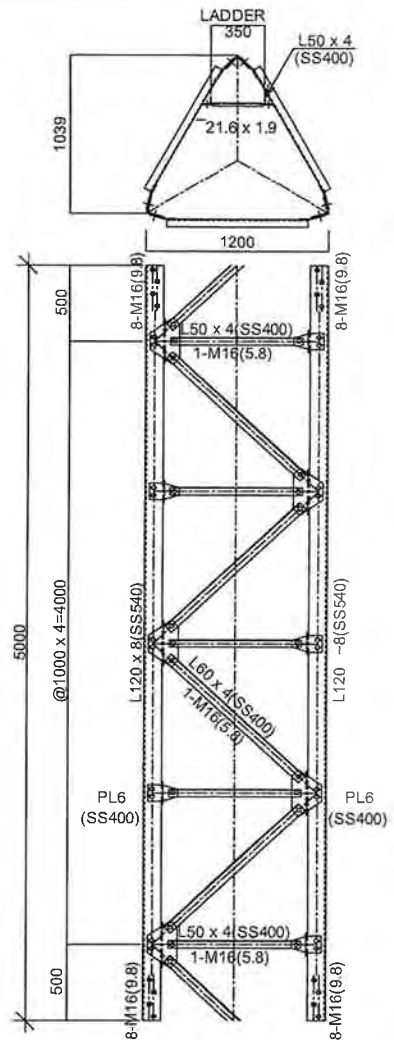
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				SCALE
				1/1500
Title				DWG. No.
ANTENNA SITE LAYOUT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-07
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YACHTYO ENGINEERING CO., LTD. TOKYO, JAPAN				



				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/1500
Title				DWG. No.
ANTENNA ELEVATION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-08
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
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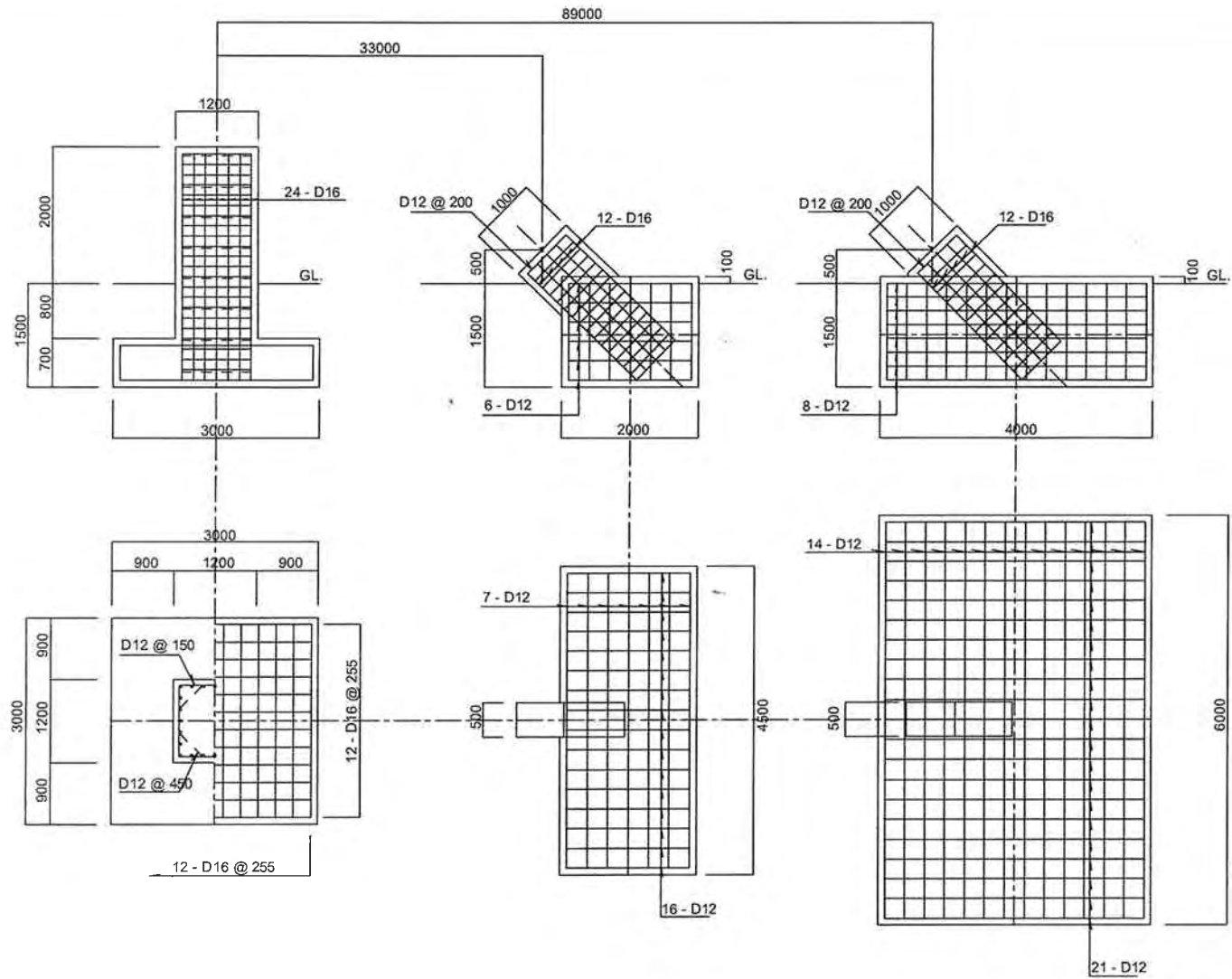


ANTENNA DETAIL VIEW - 1 S=1/800



ANTENNA DETAIL VIEW - 2 S=1/50

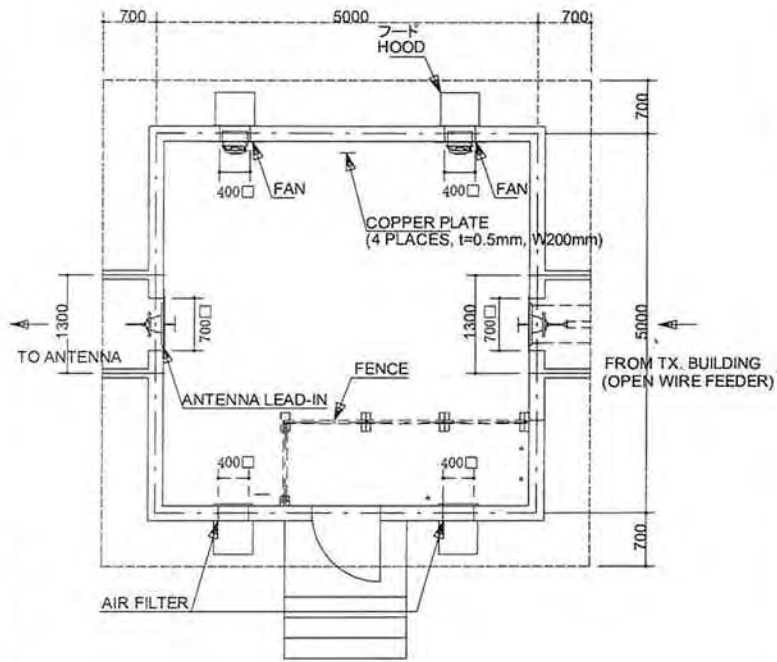
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The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/800 1/150
Title				DWG. No.
ANTENNA DETAIL VIEW OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-09
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN				



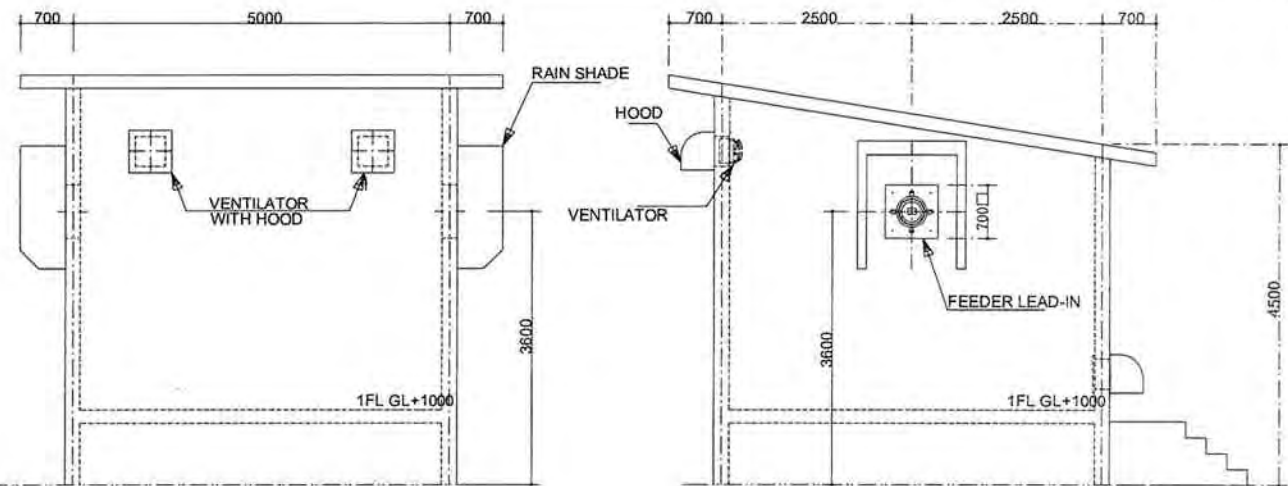
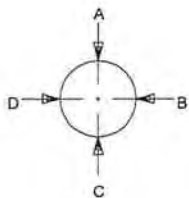
NOTE

1. MIN. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS = $F_c 18 N/mm^2$
2. REINFORCEMENT OF BAR :SD295

				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/100
Title				DWG. No.
ANTENNA FOUNDATION OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-10
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YACHYO ENGINEERING CO., LTD. TOKYO, JAPAN				

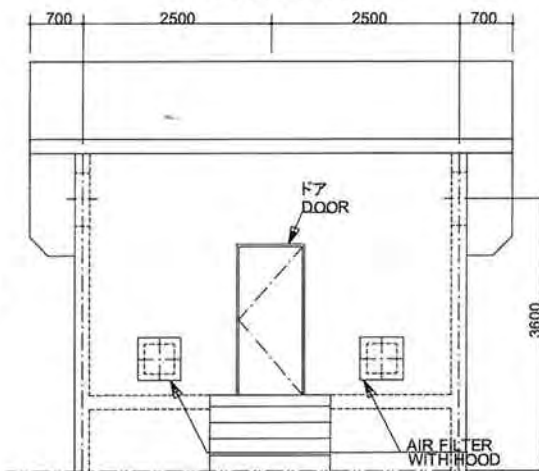


ATU COMPARTMENT PLAN

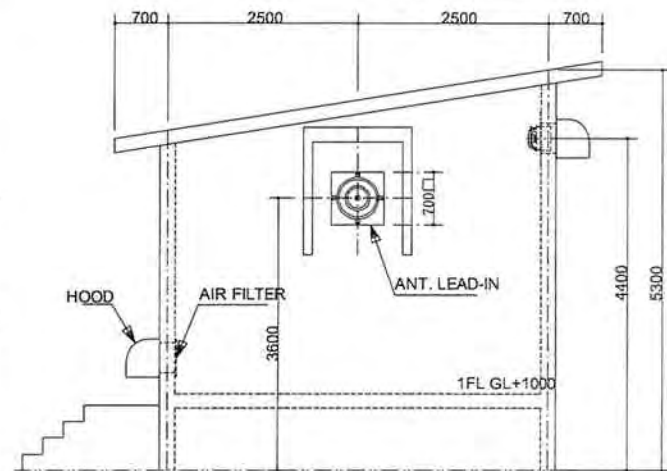


A SIDE VIEW

B SIDE VIEW



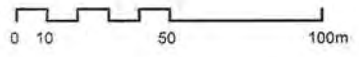
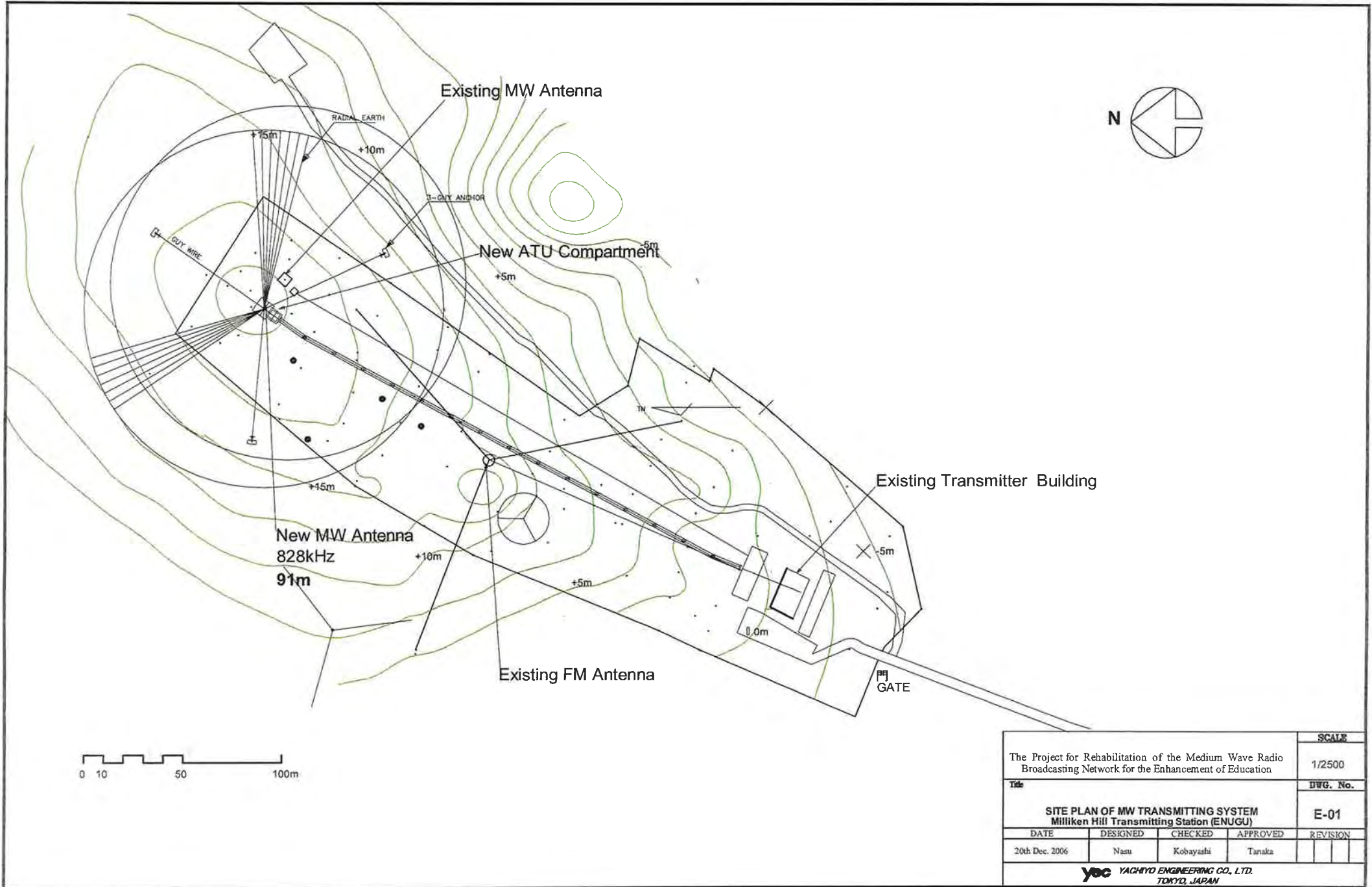
C SIDE VIEW



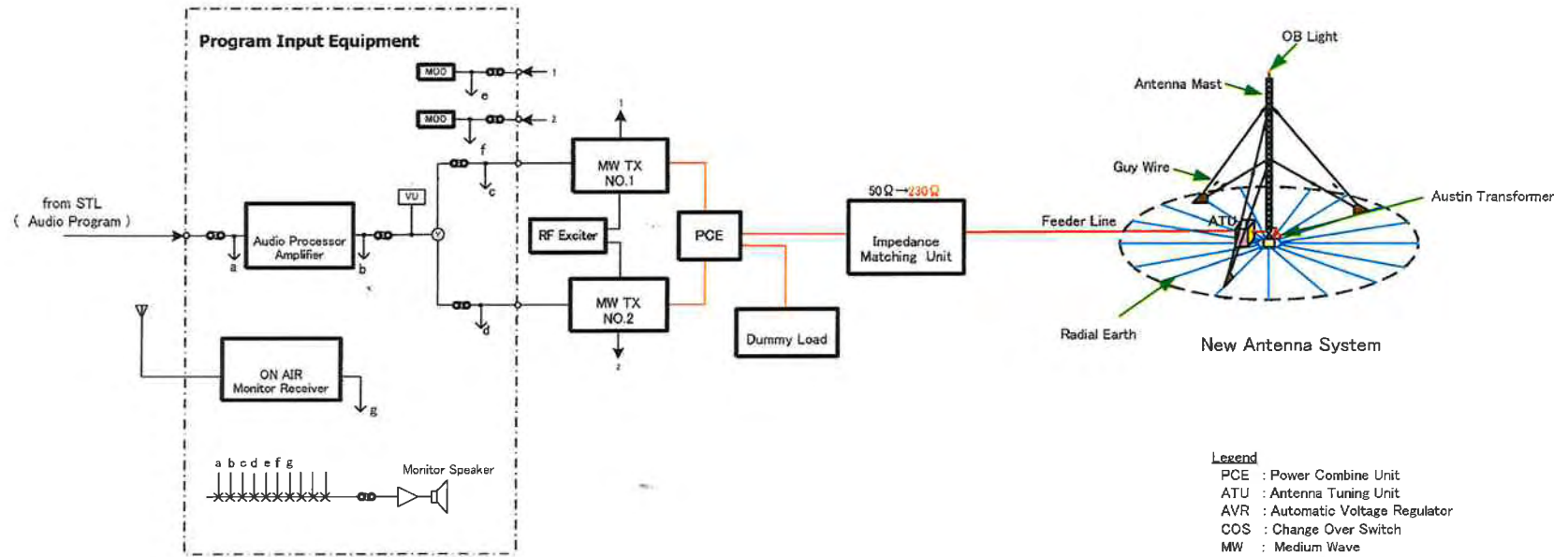
D SIDE VIEW

				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/100
Title				DWG. No.
ATU COMPARTMENT OF MW TRANSMITTING SYSTEM Jaji Transmitting Station (KADUNA)				K-11
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Naru	Kobayashi	Tamaka	
YACHYO ENGINEERING CO., LTD. TOKYO, JAPAN				

2-35

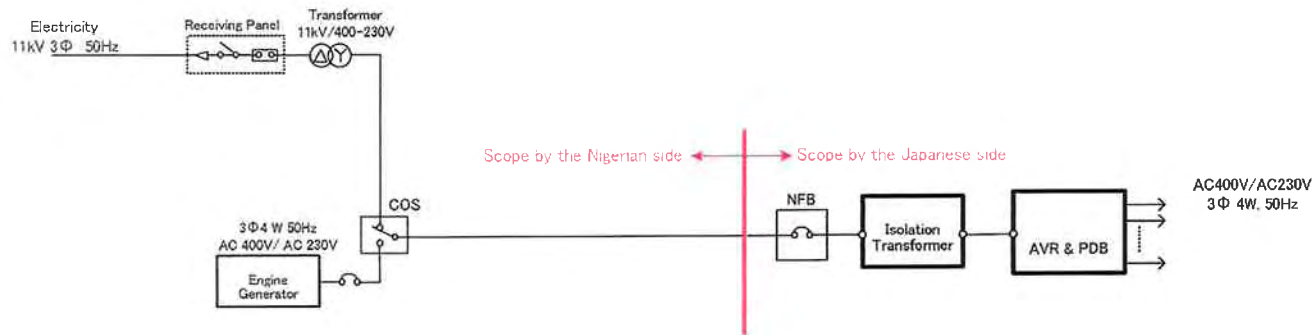


				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/2500
Title				DWG. No.
SITE PLAN OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)				E-01
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN				

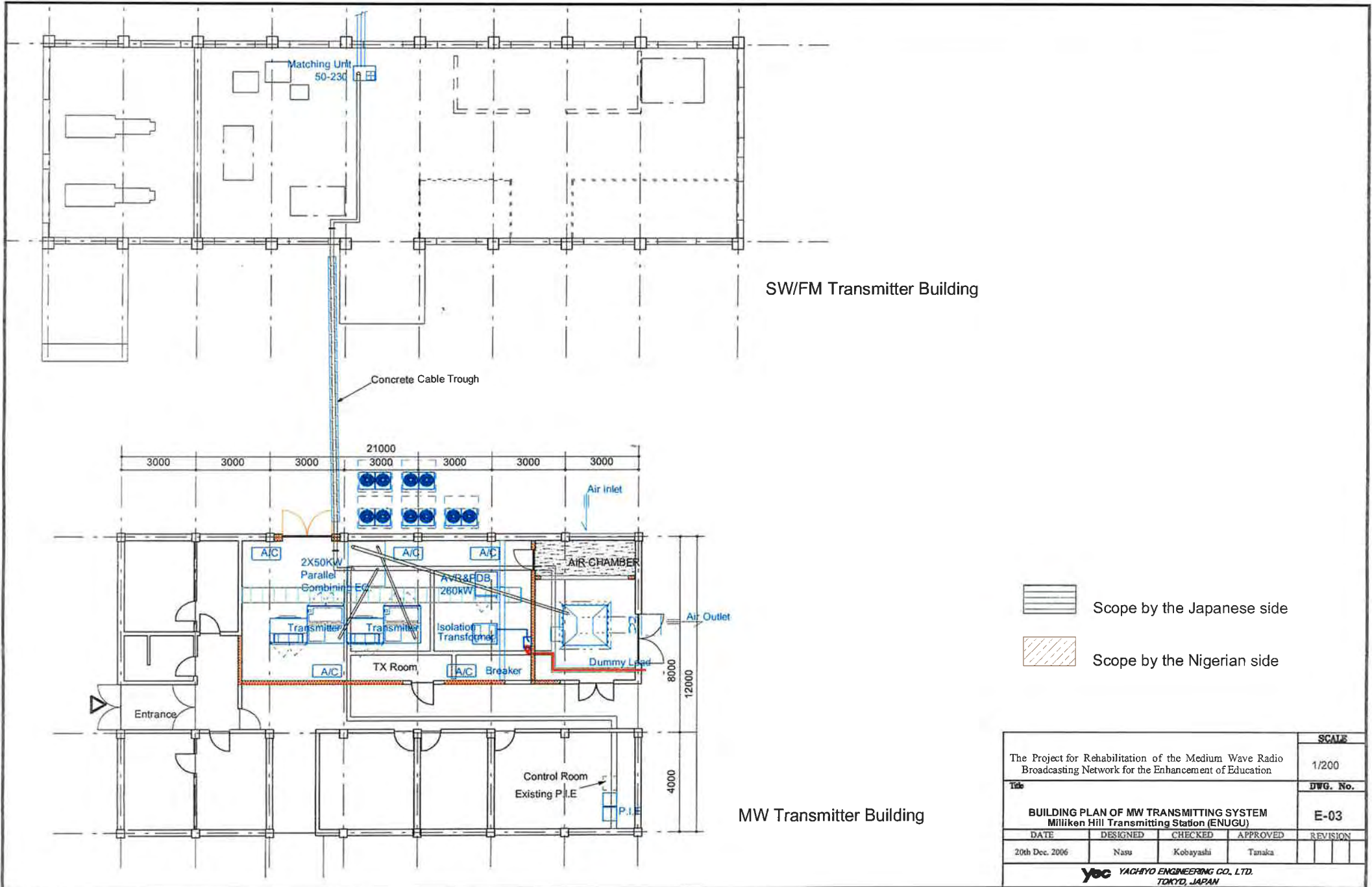


- Legend**
- PCE : Power Combine Unit
 - ATU : Antenna Tuning Unit
 - AVR : Automatic Voltage Regulator
 - COS : Change Over Switch
 - MW : Medium Wave
 - RX : Receiver
 - RF : Radio Frequency
 - TX : Transmitter
 - STL : Studio to Transmitter Link
 - PDB : Power Distribution Board
 - OB : Obstruction (Light)

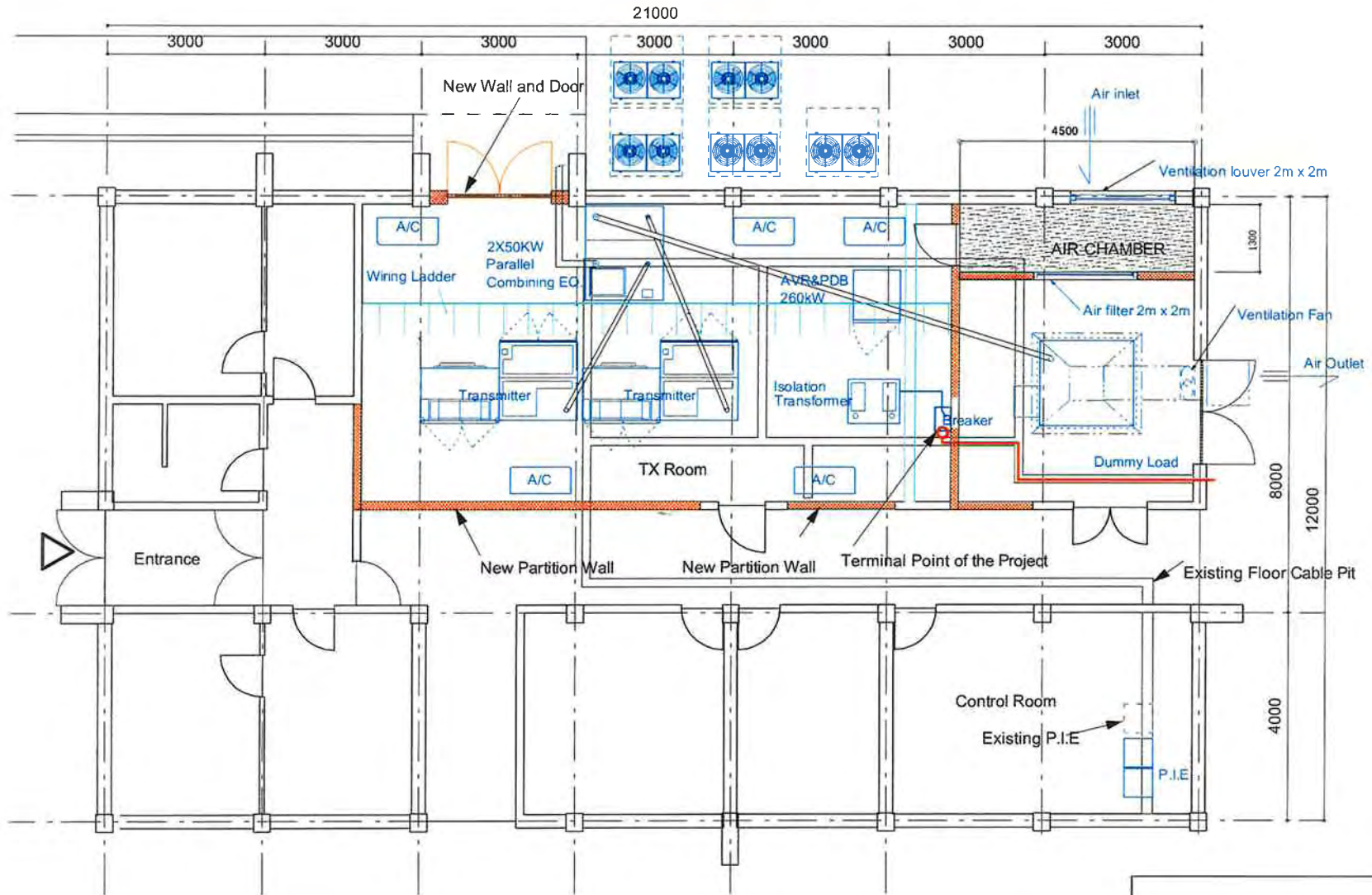
- Symbol**
- : Molded Case Circuit Breaker
 - : VU (Audio Level) Meter
 - : Modulation Percent Meter
 - : Audio Jack





The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					SCALE
Title					DWG No.
BLOCK DIAGRAM OF MW TRANSMITTING SYSTEM Milken Hill Transmitting Station (ENUGU)					E-02
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Wada	Konayashi	Tanaka		
YSC YACHIYO ENGINEERING CO., LTD. TOKYO JAPAN					

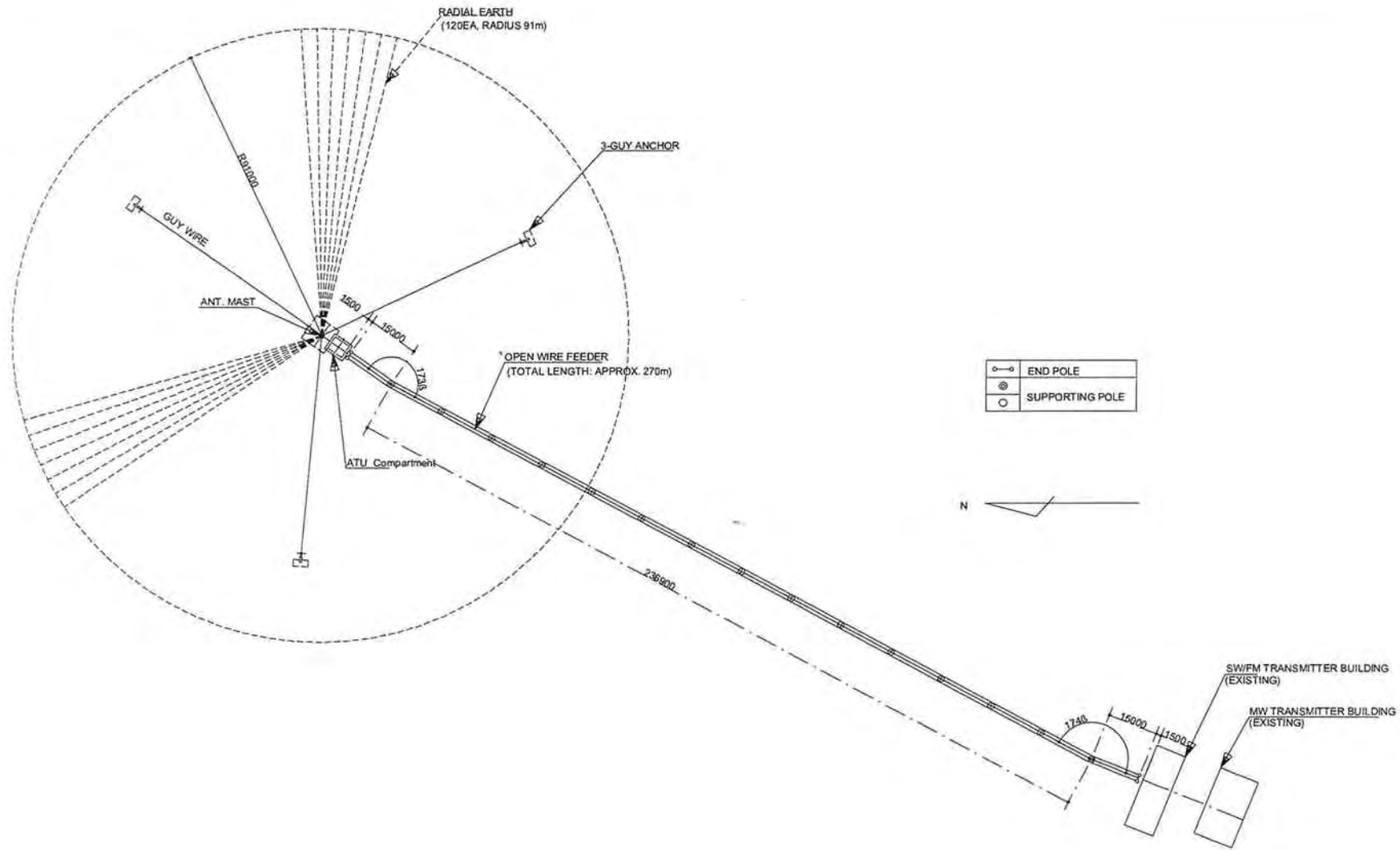


					SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					1/200
Title					DWG. No.
BUILDING PLAN OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)					E-03
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
YOC YACHYO ENGINEERING CO. LTD. TOKYO, JAPAN					

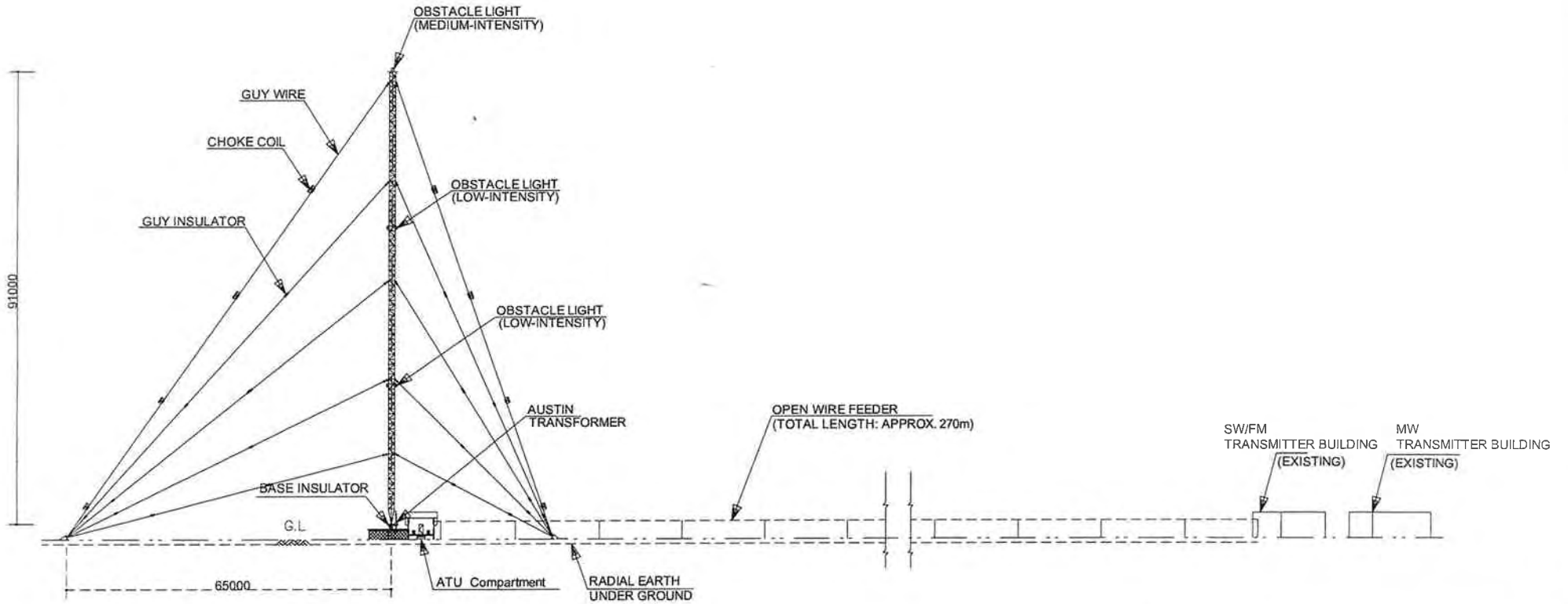



-  Scope by the Japanese side
-  Scope by the Nigerian side

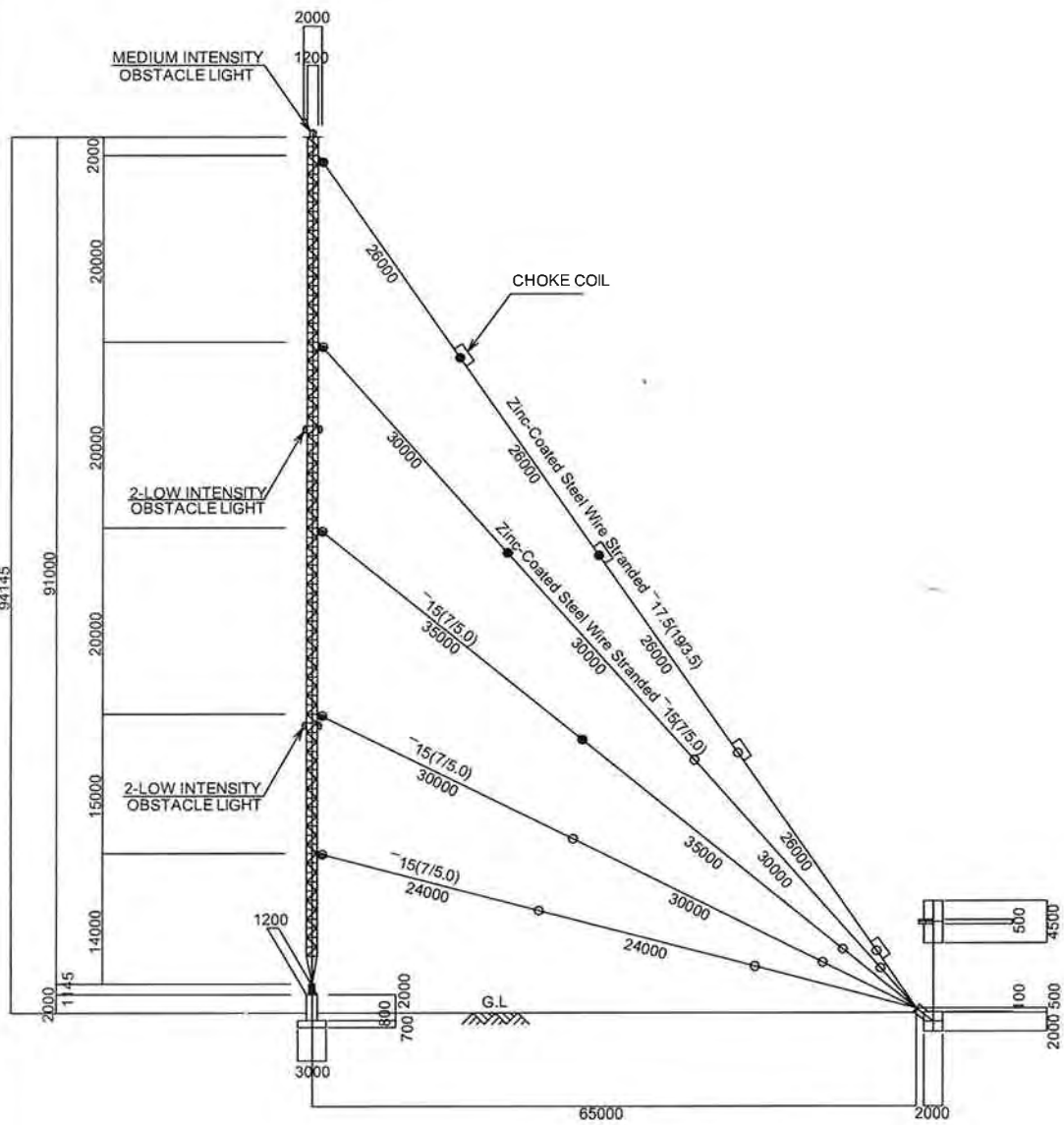
					SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					1/120
Title					DWG. No.
EQUIPMENT LAYOUT OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)					E-04
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN					



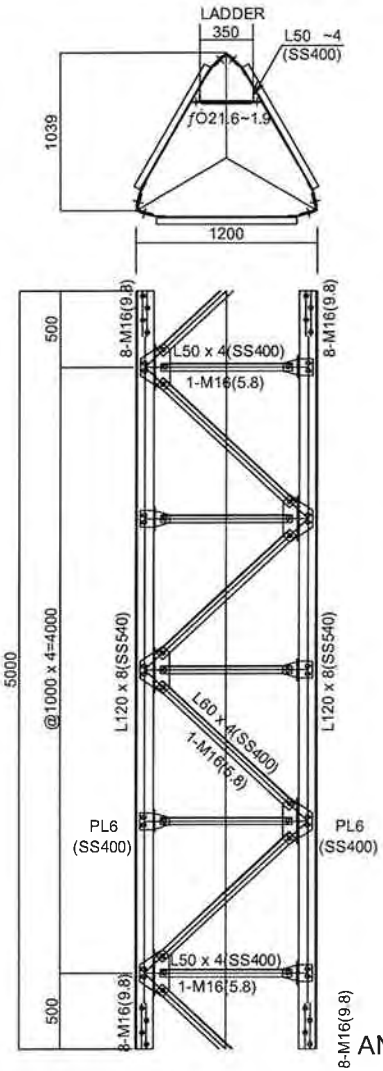
				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/1800
Title				DWG. No.
ANTENNA SITE LAYOUT OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)				E-05
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN				



The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education					SCALE
					1/1200
Title					DWG. No.
ANTENNA ELEVATION OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)					E-06
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
 YACHIO ENGINEERING CO., LTD. TOKYO, JAPAN					

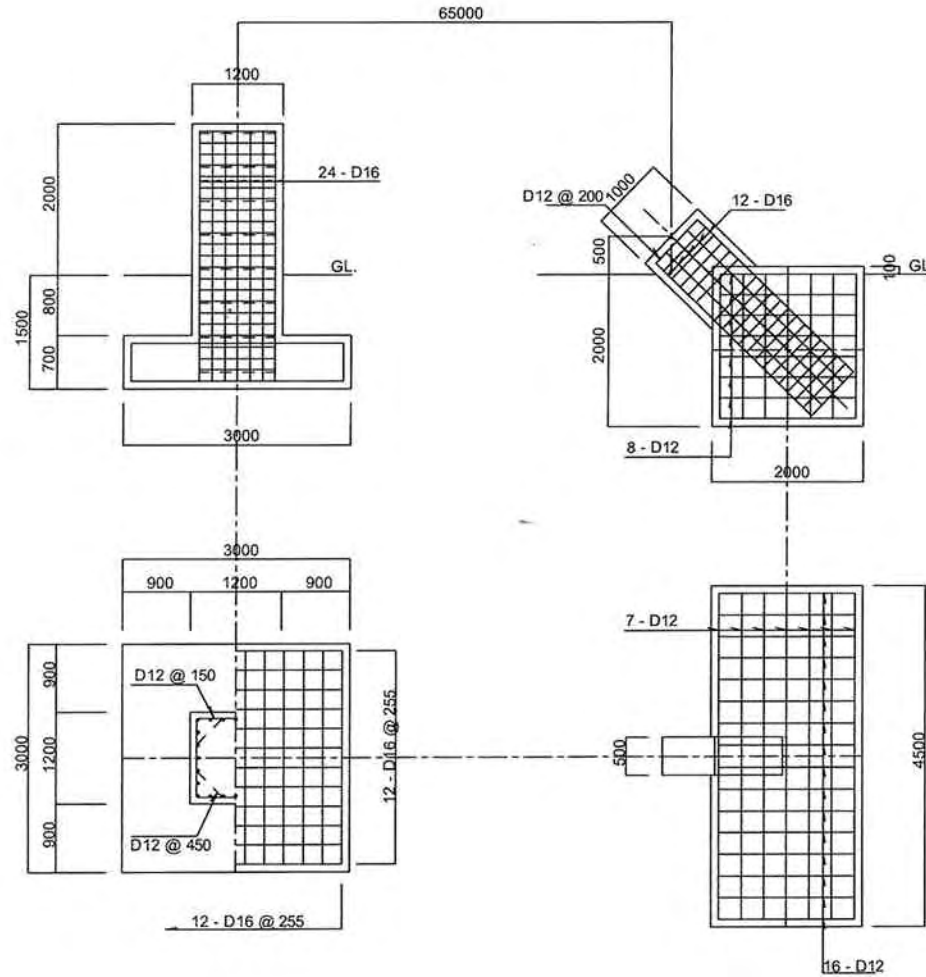


ANTENNA DETAIL VIEW -1 S=1/800




ANTENNA DETAIL VIEW -2 S=1/50

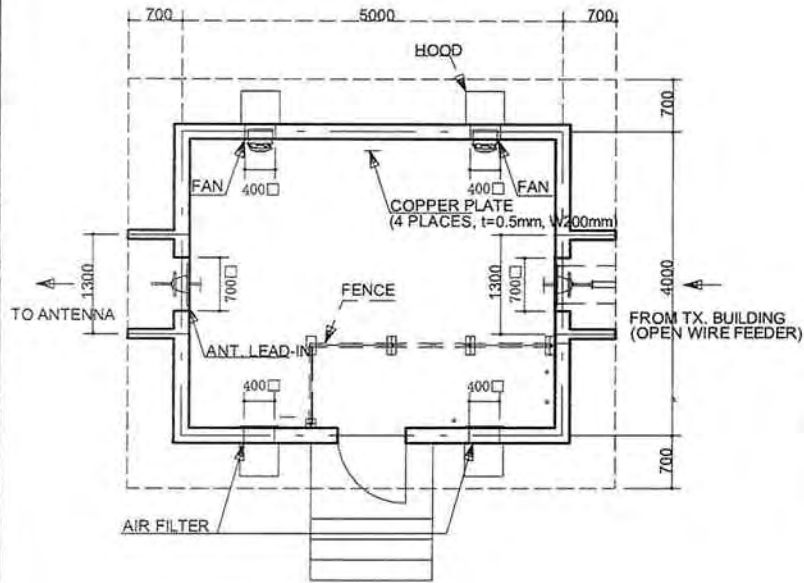
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				SCALE 1/800 1/50	
Title				DWG. No.	
ANTENNA DETAIL VIEW OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)				E-07	
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
20th Dec. 2006	Nasu	Kobayashi	Tanaka		
YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN					



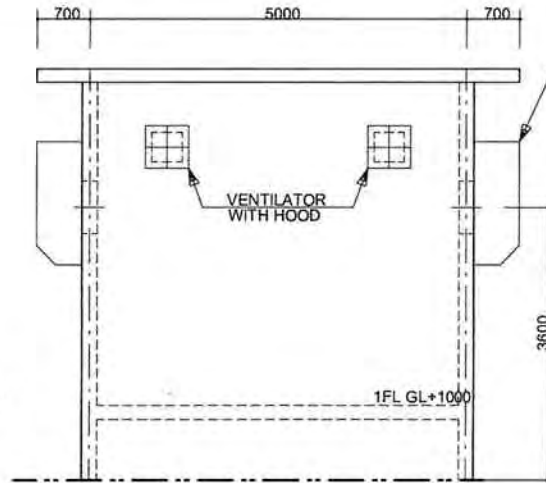
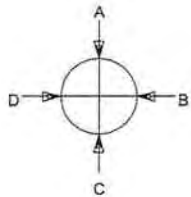
NOTE

1. MIN. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS = $F_c 18 \text{ N/mm}^2$
2. REINFORCEMENT OF BAR :SD295

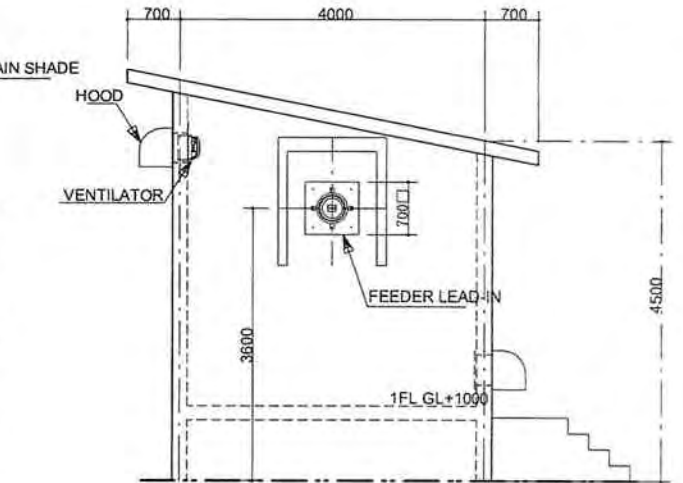
				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/100
Title				DWG. No.
ANTENNA FOUNDATION OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)				E-08
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
 YACHIO ENGINEERING CO., LTD. TOKYO, JAPAN				



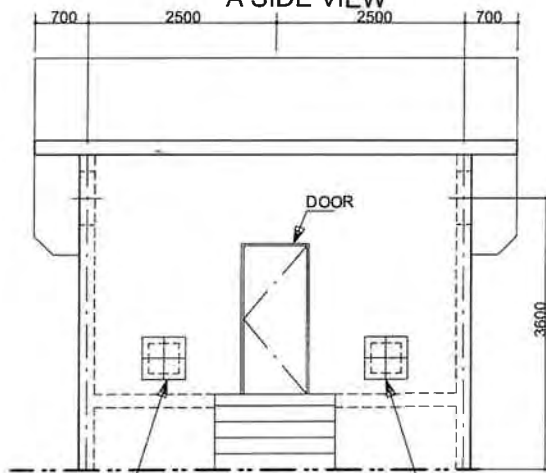
ATU COMPARTMENT PLAN



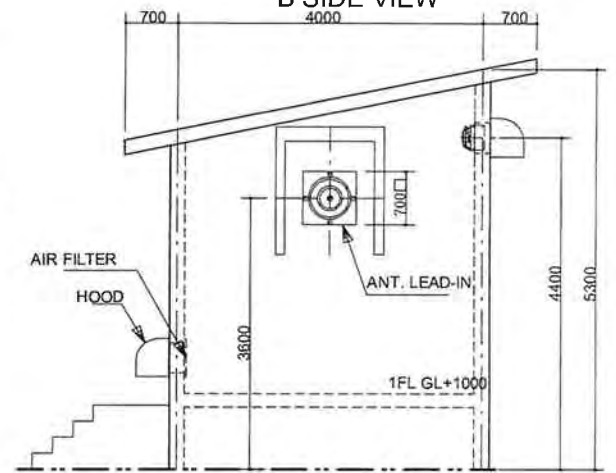
A SIDE VIEW



B SIDE VIEW



C SIDE VIEW



D SIDE VIEW

				SCALE
The Project for Rehabilitation of the Medium Wave Radio Broadcasting Network for the Enhancement of Education				1/100
Title				DWG. No.
ATU COMPARTMENT OF MW TRANSMITTING SYSTEM Milliken Hill Transmitting Station (ENUGU)				E-09
DATE	DESIGNED	CHECKED	APPROVED	REVISION
20th Dec. 2006	Nasu	Kobayashi	Tanaka	
YEC YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN				

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project will be implemented in accordance with the Japan's Grant Aid scheme. Accordingly, its implementation will only take place after Project approval by the Government of Japan and the Exchange of Notes (E/N) between the Government of Japan and the Government of Nigeria. The basic issues and points to note in the process of implementing the Project are described as follows.

(1) Project Implementation Body

The agency responsible for implementation of the Project on the Nigerian side is the Federal Ministry of Information and Communications and the implementing agency is the Federal Radio Corporation of Nigeria (FRCN). The Department of Engineering Services at the head office will carry out the Project as the implementing section of the FRCN. After completing the relevant facilities, the Kaduna National Station and the Enugu National Station of the FRCN which has jurisdiction over both transmitting stations will operate and maintain the facilities. Accordingly, the Engineering Services at the Headquarters will be required to appoint a person responsible for the Project who will stay in close contact with the Japanese consultant and equipment suppliers in order to ensure smooth implementation of the Project.

(2) Consultant

A Japanese consultant will conclude a consulting services agreement with the FRCN and will provide detailed design and work supervision for the Project to realize the planned procurement and installation of equipment and materials. The consultant will also prepare tender documents and provide necessary assistance for the FRCN, the Project implementation body, and conduct tenders.

For the implementation of equipment procurement and installation work under the Project, a Japanese consultant will conclude a consultancy agreement with the FRCN to carry out a detailed design and work supervision pertaining to the Project. The consultant will also prepare tender documents and act tenders for the FRCN, which is a main body of the implementation of the Project.

(3) Equipment Suppliers

In accordance with the Japan's Grant Aid scheme, an equipment supplier of a Japanese juridical person selected by the Nigerian side through competitive tendering will carry out the procurement and installation of equipment and materials. As it is deemed necessary that the contract to provide aftercare service including continuous supply of spare parts and an appropriate response to breakdowns even

after completing the Project, the equipment supplier should establish a liaison system with the FRCN after the relevant equipment and materials are handed over.

(4) Necessity for Dispatch of Japanese Engineers

In the rehabilitation work of the Jaji Transmission Station and Milliken Hill Transmission Station subject to the Project, since the facilities under the Project will be improved in lots at the stations, temporary suspension of the present broadcasting is expected in order to proceed with the work. It is also necessary to carry out re- installation, installation, adjustment, combination processing of the used Japanese-made transmitters. In addition, in the case of implementing operations, an effort should be made to prevent electrical shocks and accidents from occurring due to electrostatic induction, falls during high places of work and public accidents by isolating the work zone. Accordingly, Japanese experts with experience in the transference of radio transmitting stations should be dispatched for advance preparation and planning by the recipient country and to pay special attention to its completion within the prescribed work period of the plan.

2-2-4-2 Implementation Conditions

Although aggregates, cement and reinforcements, etc. to be utilized for foundation work of medium wave antennas require control and guidance of quality and the delivery period, they are locally available and often adopted in Nigeria. Consequently, in the case of formulating an implementation plan including foundation work for the broadcasting equipment to be procured from Japan or a third country, locally available materials will be adopted whenever possible.

2-2-4-3 Scope of Work

Japan will undertake procurement and installation of the broadcasting equipment, and Nigeria will undertake removal of the existing equipment, renovation and expansion of the existing facilities necessary for the implementation of the said construction work. A detailed description of the work demarcation between the Japanese and Nigerian sides is shown in Table 2-2-3.

Table 2-2-3 Work Demarcation of the Project (Draft)

Work Item	Responsibilities		Remarks
	Japan	Nigeria	
1. Common to the both Transmitting Stations			
(1) Equipment procurement	○		Including air conditioning system
(2) Equipment transportation to project site	○		
(3) Equipment installation work	○		
(4) Testing & training at project site	○		
(5) Test Broadcasting	(Advice)	○	
(6) To accord Japanese nationals, whose service may be required in connection with the supply of the products and the services under the verified contact, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		○	
(7) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		○	
(8) To bear the following commissions of the Japanese bank for banking services based upon the B/A - Advising commission of A/P - Payment commission		○	
(9) To maintain and use properly and effectively the facilities contracted and equipment provided under the Grant Aid		○	
(10) To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		○	
2. Jaji Transmitting Station (Kaduna)			
(1) Removal work of existing equipment - Antenna including antenna tuning unit, radial earth, stay wires & foundations - Land clearance after removing the above-mentioned antenna - Air chamber - Other equipment unnecessary for the Project		○	To be completed before work by the Japanese side begins
(2) Building renovation & repair work - Wall: Repair, paint & hole filing - Floor 1: Removal of existing tiles & dust proof floor finishing - Ceiling: Repair & paint - Roof: Repair & renewal (including removal of existing ventilating opening) - Installation of partition for new TX room (block, mortar finish & paint) - Door: Ironwork - Room light: Renew (especially in new TX room)		○	Same as above

Work Item	Responsibilities		Remarks
	Japan	Nigeria	
(3) Electrical work & power supply - Transformer for new TX (about 500 to 800 kVA) - Cable & connection work from city power & generator up to new PDB via transformer - Appropriate maintenance of emergency generators		○	Same as above (However, new PDB will be provided by the Japanese side & is the terminal point of work between the Japanese & Nigerian sides.)
(4) Security of new TX & loading entrance for other equipment		○	Same as above
(5) Installation of fence in the periphery of project site		○	Same as above
(6) Security of city power and water supply		○	A well should be constructed immediately.
3. Milliken Hill Transmitting Station (Enugu)			
(1) Removal work of existing equipment - Antenna (including antenna tuning unit, radial earth, stay wires & foundations) - Land clearance after removing the above-mentioned antenna - Removal of air filter around air chamber room (including air chamber room cleaning) - Other equipment unnecessary to the Project		○	To be completed before work by the Japanese side begins
(2) Building renovation & repair work - Wall: Repair, paint & hole filing - Floor 1: Removal of existing tiles & dust proof floor finishing - Ceiling: Repair & paint (waterproofing of rain leakage areas) - Roof: Repair & renew (waterproofing of rain leakage areas) - Installation of partition for new TX room (block, mortar finish & paint) - Door: Ironwork - Room light: Renew (especially in new TX room)		○	Same as above
(3) Electrical work & power supply - Connection work from city power or emergency generator up to new PDB via above-mentioned transformer - Appropriate maintenance of emergency generators & transformers		○	Same as above (However, new PDB will be provided by the Japanese side & is the terminal point of work between the Japanese & Nigerian sides.)
(4) Security of new TX & loading entrance for other equipment		○	Same as above
(5) Security of access roads until antenna installation spots		○	Same as above
(6) Installation of fence in the periphery of project site		○	Same as above
(7) Security of city power and water supply		○	Same as above

(Note) ○ denotes the side responsible for the work.

(B/A: Banking Arrangement, A/P: Authorization to Pay)

2-2-4-4 Construction Supervision

(1) Basic Principles of Work Supervision

The consultant is responsible for smooth implementation of the detailed design and work supervision through the creation of a project team in due consideration of the Japan's Grant Aid scheme and the objectives of the basic design. The consultant also should endeavor to provide schedule control, quality control, finished work quality control and safety control based on planning by dispatching experts in conformity with work progress such as equipment installation work, field testing and adjustment, and by instructing and supervising equipment suppliers. The consultant is also responsible for preventing trouble before it occurs by conducting pre-shipment testing of equipment prior to its delivery.

Major points to be noted in the case of work and procurement supervision are described as follows.

1) Schedule Control

The consultant should ask equipment suppliers to strictly observe the work completion period clarified in the contract and supervise its progress on a weekly and monthly basis. If a delay of work is anticipated, the consultant should issue a warning to the equipment supplier and request the supplier to submit recommended countermeasures. Planned work and progress work will be compared primarily through confirmation of the following items.

- Confirmation of quantity of work completed (equipment manufactured at the factory and shipment volume)

- Confirmation of quantity of equipment delivered

- Confirmation of actual number of engineers, skilled workers and laborers and their ratio compared with the original plan

2) Quality, Finished Work Quality Control

The consultant will provide quality control and finished work quality control in accordance with the following items so that the equipment to be procured will satisfy quality and finished work quality as clarified in the contract drawings. As a result of confirmation and checking, if it is doubtful of securing quality or finished work quality, the Consultant should immediately request the equipment supplier to make corrections, changes or modifications.

- Checking specifications of equipment and materials

- Checking shop drawings and specifications of equipment and materials

- Witnessing factory inspections and checking factory inspection results

- Checking installation manuals

Checking equipment trial runs, adjustment and testing of equipment and inspection manuals
Supervision of onsite equipment installation work and witnessing trial runs, adjustment, testing and inspections

3) Labor Control

Onsite industrial accidents during the construction period and injuries or accidents to a third person should be prevented before they happen by sufficiently discussing with persons responsible for safety control at equipment suppliers. Important points with respect to onsite safety supervision are described as follows.

Establishment of safety control rules and appointment of a manager

Formulation of service routes of construction vehicles and transportation machinery, etc. and strict enforcement of safety running

Welfare program for workers and the practice of taking holidays

Security measures during the stay

Figure 2-2-6 shows the interrelationship between participants in the implementation of the Project.

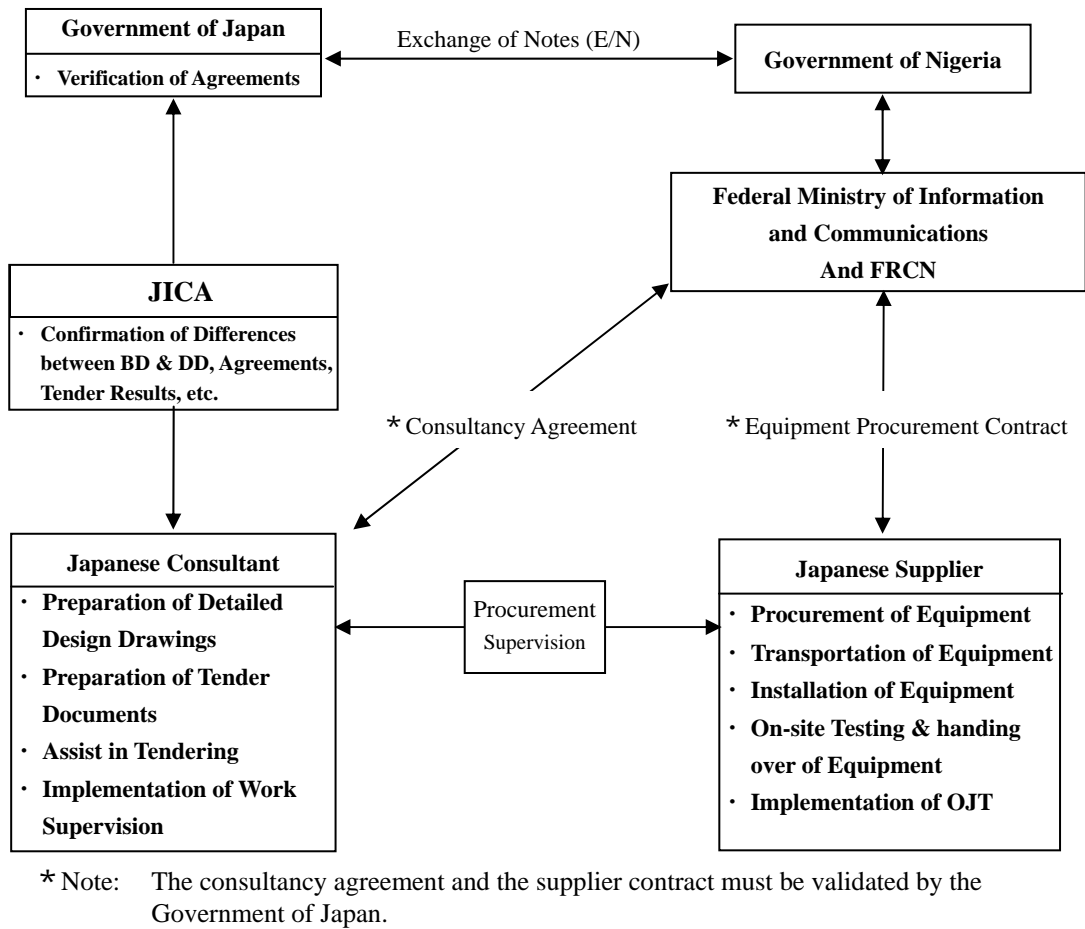


Figure 2-2-6 Project Implementation Relationship

(2) Work Supervisors

The equipment supplier will procure and deliver equipment and also carry out installation work. Since the equipment supplier will be required to fully understand the contents of a local subcontractor with regard to the work schedule, work quality and compliance with the specifications and safety measures, the equipment supplier will dispatch Japanese engineers with overseas experience similar to the Project to provide guidance and training to local companies.

2-2-4-5 Quality Control Plan

Confirmation whether or not the equipment to be procured conforms to technical specifications specified in the tender documents will be strictly performed at the pre-shipment inspection. At the time as site construction, quality control will be taken in accordance with construction control standards specified in the construction manual.

2-2-4-6 Procurement Plan

Since equipment and materials to be procured under the Project will not be manufactured in Nigeria, some equipment and materials will be procured from Japan and third countries.

In the case of implementing the Project, the term of a guarantee by an equipment manufacture is one year. Procurement of spare parts in case of an emergency is scheduled and the minimum one-year portion of necessary consumables is scheduled. The breakdown is shown in Table 2-2-4. Consequently, Nigeria should provide funds to purchase essential spare parts and consumable parts one year following the completion of the Project and utilize it.

Table 2-2-4 Spare Parts and Consumable Parts to be procured under the Project

Description		Unit	Jaji Transmitting Station	Milliken Hill Transmitting Station
1	Spare Parts	lot	1	1
1.1	PA Module for Medium Wave (MW) Transmitter (1 pc each type)	set	1	1
1.2	Transistor for PA Module (PET)	set	1	1
1.3	RF Driver Unit for MW Transmitter	set	1	1
1.4	Power Module for MW Transmitter (1 pc each type)	set	1	1
1.5	Control Board for MW Transmitter	set	1	1
1.6	Monitor Board for MW Transmitter	set	1	1
1.7	Control Board for Automatic Voltage Regulator (AVR)	set	1	1
1.8	Maintenance Kit for Antenna Tuning Unit	set	1	1
2	Consumable Parts	lot	1	1
2.1	Fan Unit for MW Transmitter	set	1	1
2.2	Air Filter for MW Transmitter	set	1	1
2.3	Fuse for MW Transmitter	set	1	1
2.4	Surge Absorber for isolation Transformer	set	1	1
2.5	Lamp for MW Antenna	set	1	1
2.6	Fuse for Program Input Equipment (PIE)	set	1	1
2.7	Fuse for AVR	set	1	1
2.8	Air Intake Filter for Dummy Load Room	set	1	1
2.9	Fan for Dummy Load Room	set	0	1

2-2-4-7 Operation Guidance Plan

Broadcasting equipment such as analog transmitters has been used and maintained in Nigeria for more than 50 years, so no specific technical problems in its operation and maintenance are anticipated. However, the transmitter to be improved at this time is a high power medium wave transmitter of AM modulation type through digital signal processing technology, which Nigeria has no experience with. Although careful care should be given to safety hazards from electromagnetic induction at transmission stations where high power medium wave broadcasting is used, since the FRCN lacks experience on operation and maintenance of the latest digital equipment, counterpart (C/P) training with respect to quality control and a quality control scheme will be provided for engineers responsible for administration at the FRCN during the factory inspection period for equipment to be procured in Japan. Moreover, during the installation, Japanese engineers will be required to provide technical guidance on operation and maintenance, emergency response procedures, handling of spare parts and daily inspections.

In addition, since training will be limited to transmitter maintenance, technology transfer through counterpart training and OJT is more appropriate.

2-2-4-8 Implementation Schedule

The project implementation schedule in the following figure is planned based on the timetable required by the Japan's Grant Aid scheme.

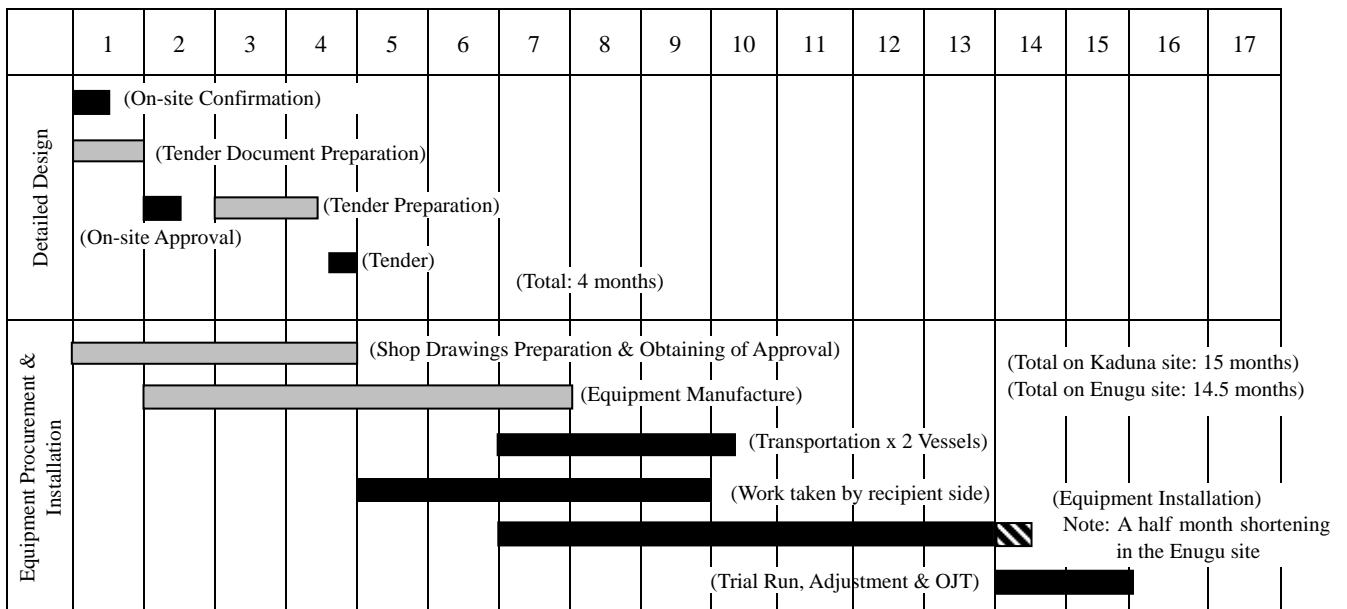


Figure 2-2-7 Project Implementation Schedule

2-3 Project Operation Plan

2-3-1 Basic Concept

The FRCN is required to procure and renew the equipment in accordance with the FRCN budget and planning in order to fulfill their role as a public broadcaster. Accordingly, periodical renewal will be taken into account in the maintenance plan for equipment to be procured under the Project. The maintenance plan is shown in Table 2-4-1.

Parts that are assumed will be constantly utilized and soon utilized such as fan units and air filters for medium wave transmitters will be replaced every one to three years. Fuses for all equipment or lamps for the OB lighting system will be replaced when necessary at the time of consumption or breakdown. Taking depreciation or technical innovation into consideration, program input equipment (PIE) will be completely replaced 10 years following the start of service.

Table 2-3-1 Equipment Maintenance Plan

Replacement Period	Targeted Part
Every Year	Air Filters
At the time of Consumption or Breakdown	Various Fuses, surge absorbers for isolation transformers, lamps for OB lighting systems
Every Three Years	Fan units for medium wave transmitters
Ten Years Later	System units of MW transmitters, program input equipment, etc.

2-3-2 Regular Inspections

In addition improved reliability and durability due to recent technological innovation, the frequency of equipment malfunctions is falling due to a decrease in the number of component parts. In response to this trend, the maintenance interval for equipment has been getting longer, even in Japan.

However, in order to effectively utilize the equipment over an extended period of time, since daily and periodical inspections are essential, all the more, it is important for an organization such the FRCN, which cannot replace equipment regularly due to financial restrictions, to carry out inspections. Consequently, a system should be prepared to prevent equipment problems from occurring before they happen by establishing the minimal necessary maintenance standards for daily and periodical inspections. Items for daily and periodical inspections of equipment to be procured under the Project and required measuring instruments are shown in Table 2-3-2.

Table 2-3-2 Items and Required Instruments for Equipment Inspection

Description	Item	Required Measuring Instruments
Dairy & Pre-operation Inspection	Various kinds of meters & visual inspection	Audio monitors
	Visual inspection of joints	Tool set
Six-month Inspection (Characteristic Test)	Characteristic measurement of sound equipment (frequency characteristics & S/N), distortion rate, level diagram	Distortion meter & signal generator, oscilloscope
	Measuring of power source voltage and other voltages	Oscilloscope, tester, high voltage probe
Annual Inspection (Characteristic Test)	Transmit frequencies Antenna characteristics Electric field strength	Frequency counter, impedance bride, field strength meter

2-4 Project Cost Estimation

2-4-1 Initial Cost Estimate

The total cost of the Project to be implemented in accordance with the Japan's Grant Aid is estimated to be approximately ¥1,200 million. As mentioned earlier, the breakdown of expenses for both sides based on the Scope of Work (S/W) between Japan and Nigeria is estimated to be as follows based on estimated conditions. However, the estimated project cost is provisional and does not reflect limited assistance in accordance with the Exchange of Notes (E/N). The cost will be reviewed further during implementation of the requested Japanese assistance.

(1) Expenses to be taken by Japan

Approximately ¥1,168 million

Description	Amount (million yen)		
	Jaji Transmitting Station (Kaduna)	Milliken Hill Transmitting Station (Enugu)	Total
Equipment Procurement & Installation Cost			
(1) Medium Wave (MW) Transmitter			
(2) Dummy Load			
(3) Program Input Equipment (PIE) Rack			
(4) Automatic Voltage regulator (AVR) & Primary Distribution Board (PDB)			
(5) Test Equipment	591	481	1,072
(6) MW Antenna System			
(7) Air Conditioning System			
(8) Spare Parts			
(9) Consumable Parts			
(10) Installation Materials			
Detailed Design & Supervision Cost	51	45	96

(2) Expenses taken by recipient country

Approximately 30 million naira

Items, description and amounts to be taken by Nigeria are shown as follows. The cost to Nigeria will be approximately 10 % of the balance of FRCN 2006 budget. And 30 million naira has been judged to be a manageable figure for the new project.

Item	Estimation (thousand naira)	Remarks
1. Jaji Transmitting Station (Kaduna)	21,430	
(1) Removal of existing equipment	1,500	Including antenna mast, antenna foundation, & land clearing
(2) Building renovation & repair work	6,190	
(3) Electrical work & power supply	500	
(4) Security of new TX & loading entrance for other equipment	40	
(5) Installation of fence along the periphery of project site	10,500	
(6) Securing of water supply	2,700	
2. Milliken Hill Transmitting Station (Enugu)	8,730	
(1) Removal work of existing equipment	1,700	Including antenna mast, antenna foundation, & land clearing
(2) Building renovation & repair work	2,310	
(3) Electrical work & security of power supply	500	
(4) Security of new TX & loading entrance for other equipment	20	
(5) Securing of access roads until antenna installation sites	200	
(6) Installation of fence along the periphery of project site	4,000	
Total (1 + 2):	30,160	

(3) Estimated Conditions

1) Estimated date : October 2006

2) Exchange rate : \$1 US = ¥116.37
1 naira = ¥ 0.90

3) Implementation period : Construction work will be divided into 2 phases. The required detailed design and construction period are shown in the implementation schedule.

4) Other : The Project will be implemented in accordance with the Guidelines for Japan's Grant Aid.

2-4-2 Operation and Maintenance Cost

The equipment to be procured under the Project should be adequately renewed so that each National station at the FRCN can carry out broadcasting with sound fiscal conditions in the future. Accordingly, in addition to the maintenance cost for new and existing equipment, a maintenance plan to estimate the cost of periodical equipment renewal, as shown later, should be prepared.

(1) Setting Conditions

Presumed conditions for operation expenditure and revenue were established as follows.

1) Expenditure

Equipment to be procured under the Project will go into operation between 2009 (at Kaduna) and 2010 (at Enugu). Ten years later, in 2019 and 2020, assuming a savings of approximately half (approximately ¥500 million) the cost necessary for renewal through self-supporting efforts utilizing an annual reserve fund, one goal is the estimation of annual expenditure. An increase in advertising revenue and reduction in production cost are regarded to be reserve funds. With respect to production cost, it aims at keeping an increase of approximately 0.9 % is possible to meet demand. Other expenditure items and the method of establishing the budget are shown in Table 2-4-1.

Table 2-4-1 Budget Setting

(Unit: thousand naira)

Operation Expenditure	Method for setting up budget	Required Budget
Personnel expenses (maintenance & personnel expenses in administration dept.) Program production cost	The average expenditure in the past 3 years (estimated between 2004 and 2006) will be adopted. (Estimated index aims at ensuring maintenance cost through a slight increase in expenditure (1 % annually) taking into consideration the reduction in production cost due to improvements in production efficiency through digital studio equipment and massive new employment.)	1,359,855
Repair part cost (parts for radio transmitter maintenance)	Although necessary expenses will be appropriated for equipment maintenance in accordance with the above-mentioned 2-4 "Project Cost Estimation", the repair cost for broadcasting equipment generally tends to increase with age. Consequently, the cost to purchase parts for the relevant transmitter is estimated to be 500,000 naira annually for the Kaduna National Station until the 7 th year and 1 million naira afterward that. It is also estimated to be 200,000 naira every year for the Enugu National Station until the 7 th year and 400,000 naira afterward that.	500: Kaduna Station 200: Enugu Station (Reference: Repair parts for radio equipment in 2006: approx. 2 million naira)
Maintenance cost (building, vehicles, studio equipment, etc.)	The average expenditure for a three-year period (2003 to 2005) will be adopted.	69,044
Telephone charges, satellite transmission charges)	The average expenditure for a three-year period (2003 to 2005) will be adopted.	44,477
Training expenses	The average expenditure for a three-year period (2003 to 2005) will be adopted.	37,667

Operation Expenditure	Method for setting up budget	Required Budget
Electricity charges	The average expenditure for a three-year period (2003 to 2005) will be adopted. * Power consumption for transmitters to be procured under the Project will be reduced to about 40 % in comparison with the conventional type. Accordingly, an increase in electricity charges due to an increase in transmission output will be not be taken into account.	207,195
Travel expenses, transportation cost	The average expenditure for a three-year period (2003 to 2005) will be adopted.	112,320
Other general expenses such as insurance	The average expenditure for a three-year period (2003 to 2005) will be adopted.	280,316

2) Revenue

Operating revenue will be estimated by adding sponsor program charges or spot advertising charges (CM charges) obtained by the FRCN from companies or organizations and other revenue such as rental fees from open halls. They have succeeded in drastically expanding broadcasting charges by opening FM stations in all states (presently 22 stations have already being opened). In addition, with the holding of the 2006 FIFA World Cup™ last year, funding has been obtained. Annual revenue is shown in Table 2-4-2.

With respect to the increase in revenue, it is generally understood that broadcasting revenue is proportionate to GDP. According to NEEDS, since growth outside the petroleum industry is estimated to 3.6 % to 7 % in the future, 3.6 % of the lowest value was adopted as the index.

Table 2-4-2 Annual Revenue

(Unit: thousand naira)

Revenue Item	Setting Method	Revenue (Annual)
Radio Broadcasting Fees	The average revenue for 3 years (2004 and 2006) (on a proposal budget basis) will be adopted.	715,778
Other Revenue	The 2006 revenue amount will be adopted.	46,773

3) Government Subsidies

Personnel expenses at the FRCN are paid by the government and are at the same level as civil servants. The number of staff at the FRCN has been increasing in recent years due to the opening of new FM stations in each state, so it is expected to increase in the next few years. In other words, subsidies are expected to increase from 2007. Consequently, as an index for formulating a maintenance plan, the budget in last year was adopted by regarding it to be the lowest value. Table 2-4-3 shows the annual subsidy. In addition to personnel expenses through a general account, the

deficit of expenses necessary for equipment maintenance, etc. is compensated through a special government account.

Table 2-4-3 Annual Subsidies

(Unit: thousand naira)

Subsidy	Setting Method	Subsidy Amount (Annual)
Federal Government	2006 subsidy amount was adopted (on a approval budget basis).	1,622,480

(2) Estimated Results

Table 2-4-4 shows the estimated revenue until the time of renewal of equipment 10 years later based on the above-mentioned setting conditions. Therefore, reserve funds for the equipment renewal can be secured in 2020. According to the FRCN, necessary expenses for equipment renewal 10 years later can also be secured due to a reduction in maintenance cost or an increase in advertising income.

Table 2-4-4 Estimation of Operating Cost and Maintenance Cost at FRCN

(Unit : 1,000Naira)

Phase-1	Kaduna Site	Completion of the Project	1	2	3	4	5	6	7	8	9	10	11	12	13
Phase-2	Enugu Site	Completion of the Project	1	2	3	4	5	6	7	8	9	10	11	12	
No	Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
A.	Product														
	Commercial Radio	715,778	741,546	768,242	795,899	824,551	854,235	884,987	916,847	949,853	984,048	1,019,474	1,056,175	1,094,197	1,133,588
	Other	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773	46,773
	TOTAL [A]	762,551	788,319	815,015	842,672	871,324	901,008	931,760	963,620	996,626	1,030,821	1,066,247	1,102,948	1,140,970	1,180,361
B	Charge														
	Personal Fee, Program Production	1,359,855	1,361,215	1,362,576	1,363,939	1,365,303	1,366,668	1,368,035	1,369,403	1,370,772	1,372,143	1,373,515	1,374,888	1,376,263	1,377,640
	Spare Parts for Radio Transmitter (Kaduna)	2,000	500	500	500	500	500	500	500	1,000	1,000	1,000	1,000	1,000	1,000
	Spare Parts for Radio Transmitter (Enugu)	2,000	2,000	200	200	200	200	200	200	200	400	400	400	400	400
	Maintenance (Building, Car and Studio equipment)	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044	69,044
	Telecommunication, INTERSAT	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477	44,477
	Training Fee	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667	37,667
	Light and Heating	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195	207,195
	Transportation	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320	112,320
	Other Expense	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316	280,316
	TOTAL [B]	2,114,873	2,114,733	2,114,294	2,115,657	2,117,021	2,118,386	2,119,753	2,121,121	2,122,990	2,124,561	2,125,933	2,127,306	2,128,681	2,130,058
C	(A-B) = C	-1,352,322	-1,326,414	-1,299,279	-1,272,985	-1,245,696	-1,217,378	-1,187,992	-1,157,501	-1,126,364	-1,093,740	-1,059,686	-1,024,358	-987,711	-949,696
D	Grant	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480
	Governmental Budget	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL [D]	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480	1,622,480
E	E=(C-D)	270,158	296,066	323,201	349,495	376,784	405,102	434,488	464,979	496,116	528,740	562,794	598,122	634,769	672,784
F	Reserve Fund	270,158	296,066	323,201	349,495	376,784	405,102	434,488	464,979	496,116	528,740	562,794	598,122	634,769	672,784
	Total Reserve Fund		566,225	619,267	672,696	726,279	781,886	839,590	899,467	961,096	1,024,857	1,091,534	1,160,915	1,232,890	1,307,553

2-5 Other Relevant Issues

2-5-1 Tax Exemption

In the procedures for tax exemption (including value added taxes) on the Nigerian side with respect to equipment and materials to be procured under the Project, approval is obtained from the Federal Ministry of Finance after an equipment supplier submits an application for tax exemption to the FRCN via the National Planning Commission (NPC). Special attention should therefore be given to this so that delays in the procedures for tax exemption do not have an effect on the progress of the Project.

2-5-2 Other

Process control should be taken when removing the existing antenna to be taken by the Nigerian side so that local installation work of equipment to be procured under the Project can be smoothly implemented. In addition, it is necessary to grasp the maintenance conditions of the existing transmitters which will become stand-by equipment during the implementation of the Project, the malfunction of equipment at the program production studio, the presence of equipment renewal, and a suitable environment for maintaining program production (change in implementing system for educational program production).

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effects

The expected effects of the Project are described as follows.

(1) Direct Effects

Current Situation and Problems	Remedial Measures under the Project (Requested Japanese Assistance)	Positive Effects and Degree of Improvement
It is difficult to obtain spare parts for medium wave transmitters which are feasible for radio broadcasting over wide area and continued public broadcasting.	Antennas & transmitters will be renewed.	It will be possible to continuously utilize transmitters necessary for public broadcasting and therefore provide stable broadcasting signal.
Due to their age and weak coverage area the current transmitters are inadequate for conveying information to residents distributed over the vast national territory.		Since coverage will be expanded ten fold, the directly benefiting population will increase from about 12 million people to 86 million people. Accordingly, real-time information on education, agriculture, health services and news, etc. can be provided to a larger number of people.
It is often difficult to listen to broadcasting due to poor sound quality.		Broadcast contents will be expanded through improved sound quality.

(2) Indirect Effects

Current Situation and Problems	Remedial Measures under the Project (Requested Japanese Assistance)	Positive Effects and Degree of Improvement
It is difficult to utilize adult education or distance learning due to the weak coverage area.	Antennas & transmitters will be renewed.	Distance learning will be improved under the cooperation with educational agencies, and will contribute to an improvement in educational levels.
Since broadcasting fees are high programs provided by educational agencies are also high, so cooperative projects with agencies do not progress smoothly.		The number of listeners will increase seven times due to the expansion in coverage; advertising revenues will be increased and lower broadcasting charges will be encouraged, enabling more broadcasts of educational programs.
Since many people reside in areas where radio broadcasting cannot be received and other effective media do not exist, an information gap exists.		Broadcasting of various content such as educational programs and news to a larger number of people is expected to lessen the information gap.

3-2 Recommendations

3-2-1 Recommendations to be Taken by Recipient Country

The following tasks should be taken by the Nigerian side so that the effects of the Project can be displayed and be sustainable.

(Issues to be taken by FRCN)

- 1) In order to properly operate the equipment after handing over at the project site, engineers should be secured and be appropriately arranged.
- 2) In order to properly maintain the facilities to be improved under the Project, funding for repair parts, etc. should be ensured.
- 3) In order to maintain the prescribed output and to properly operate the equipment to be improved under the Project, air conditioning, etc. should be maintained. Consequently, the interior of the building will be repaired for appropriate air conditioning prior to the start of construction work under the Project. Periodical repair and maintenance will be also implemented even after the start of service.
- 4) If educational agencies other than the following joint implementation scheme provide educational programming, it should offer an advantage in broadcasting charges.

(Issues to be taken in cooperation between FRCN and Educational Institutions)

- 5) A distance learning effectively utilizing radio broadcasting in collaboration between broadcasters and educational agencies is essential in due consideration of the educational situation in Nigeria. Since formal education should be provided so that the curriculum can be completed in line with cumulative education records prescribed by the Ministry of Education, the creation of a collaborative implementation scheme related to educational broadcasting is being requested by promoting cooperation between FRCN and educational agencies.
- 6) In the collaborative implementation scheme in 5) mentioned above, a distance learning that utilize radio broadcasting should be established as a system in order to provide programming that will contribute to non-formal and formal education.
- 7) An educational broadcasting plan should be formulated in order to accomplish MDGs and that will contribute to "Education for All" by substantiating educational programs produced through a collaborative implementation scheme and by responding to the broadcasting needs of Nigeria.

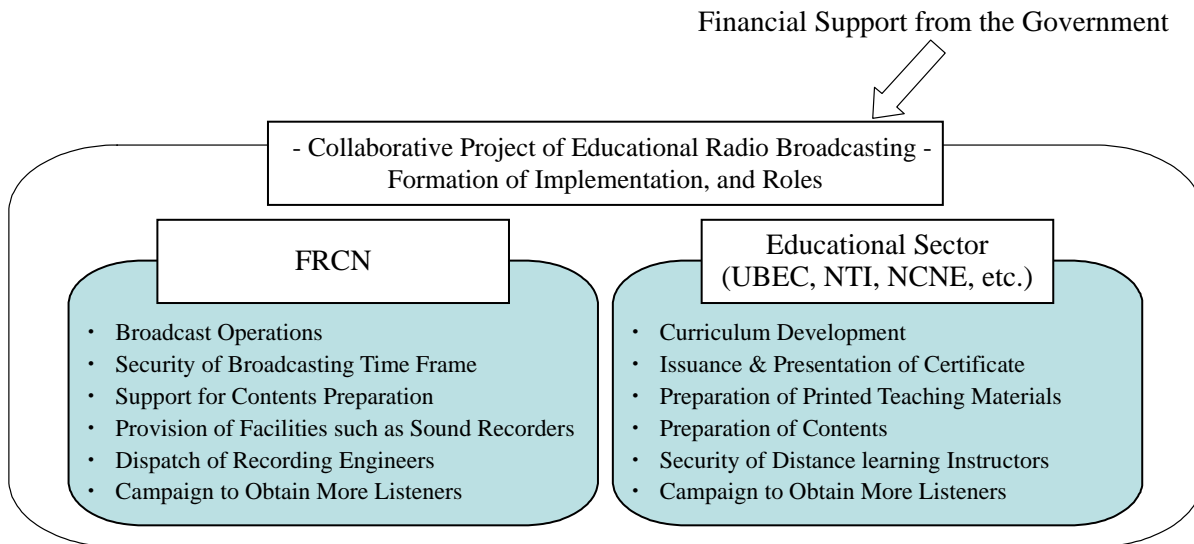


Figure 3-2-1 Educational Broadcasting Collaborative Project Scheme

3-2-2 Technical Cooperation and Coordination with Other Donors

As mentioned in the preceding section “Recommendations to be taken by Recipient Country”, a collaborative project scheme (Refer to Figure 3-2-1) should be implemented between educational agencies and the FRCN in order to develop educational broadcasting currently conducted by the FRCN and to promote educational broadcasting in the formal educational sector.

Under the Project, the launch of a collaborative project is being recommended to Nigeria as an ideal approach to future educational broadcasting. On the other hand, for Nigeria to implement sustainable and high quality educational broadcasting over the long term, if the FRCN is able to obtain some kind of technical cooperation from donor communities by broadly promoting the Project among donors involved in educational broadcasting such as DFID, additional benefits from the Project can be expected. In addition, as an alternative to concrete technical cooperation, technical cooperation in implementing formal educational broadcasting by studying successful model systems such as the University of the Air, a collaborative project between “broadcasting” and “formal education” in Japan, can also be expected.

The competent ministries for the University of the Air are the Ministry of Education, Culture, Sports, Science and Technology, and the Ministry of Internal Affairs and Communications. Therefore, to ensure the success of formal education, competent agencies responsible for education and broadcasting must collaborate appropriately. Although collaboration between all parties is evident in meetings being held, even during the study period, by parties concerned at the UBEC and the FRCN, a collaborative formation has still not yet been established. After a formation is created by the recipient government, if technical cooperation is provided through human resources in both broadcasting and educational areas, the effects of the Project could be enhanced.