Ministry of Health
The Republic of Zambia

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR UPGRADING OF LUSAKA HEALTH CENTRES TO DISTRICT HOSPITALS
IN
THE REPUBLIC OF ZAMBIA

MARCH 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

THE CONSORTIUM OF
NIHON SEKKEI, INC. AND FUJITA PLANNING CO., LTD.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to consist of Nihon Sekkei, Inc. and Fujita Planning Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of Zambia, and conducted a field investigations. As a result of further studies in Japan, 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.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Zambia for their close cooperation extended to the survey team.

March 2013

Nobuko Kayashima
Director General,
Human Development Department
Japan International Cooperation Agency

Summary

1. Introduction

Zambia is a landlocked country located in Southern Africa. Its neighbouring countries are the Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia and Angola. Zambia covers an area of 752,618 km^2, about twice the size of Japan, and its total population is 13.470 million (UN DESA, 2011). The country's per capita GNI (Gross National Income) is US$1,160 (2011).

2. Background of the Project

According to the latest Demographic and Health Surveys, the under-five mortality rate (per 1,000 live births) in Zambia is 157 (in 2000), 138 (in 2005), 111 (in 2010) which figures have declined dramatically since the late 1990s, but more than 10% of children still do not survive to celebrate their fifth birthday. The maternal mortality ratio in the country is 591 (in 2010, per 100,000 live births), which also remains high. These surveys indicate that Zambia still faces a significant challenge that requires further improvement in the health sector of this country.
In response to the challenge, the Ministry of Health in Zambia (hereinafter referred to as 'MOH') has been promoting the National Health Strategic Plan V (2010 - 2015) (hereinafter referred to as 'NHSP V'), which gives priority to cross-sectional themes including the development of health infrastructure / medical equipment. One of the strategies of high priority is to upgrade existing health centres to first level hospitals.

The Health Sector Capital Investment Plan (hereinafter referred to as 'CIP') places great importance on the construction of facilities in nineteen districts that do not have a first level hospital. In line with the programme, an operating theatre is under construction at their expense in five urban health centres (hereinafter referred to as 'UHC').

Now looking at the situation in Lusaka, the capital of Zambia, it has been difficult to satisfy the wide range of health service demands of Lusaka's citizens because there are no primary- or secondary-level hospitals between Zambia's University Teaching Hospital (hereinafter referred to as 'UTH') , the leading central hospital in charge of tertiary-level medical services, and the health centres which are the targets of this project ,besides the Levy Mwanawasa hospital (secondary-level hospital) that was open in 2011. In addition, as patients in the health centres are directly referred to UTH, UTH has to serve not only as a top referral hospital but also as a first level hospital for the Lusaka region, which drives the hospital into a severely and constantly busy, crowded condition.

To address this issue, the Zambian Government requested the Japanese government to implement a grant aid project for the improvement of medical facilities and equipment. The objective was to reinforce the functions of the five health centres in Lusaka to upgrade to first level hospitals. This plan will help improve access to health services for Lusaka's citizens and at the same time, mitigate the crowded condition at UTH so that its original functions as a top referral and a teaching hospital can be restored.

Based on the request, JICA (Japan International Cooperation Agency) sent a team to Uganda in August 2010 to confirm the appropriateness and contents of the request and determine the appropriate scope of the project. The study team engaged in conferences with relevant individuals in Zambia studied the relevant facilities, collected the necessary references, and studied the sites for which construction was planned. Thereafter, the team conducted an analysis of the above items in Japan and held an explanatory meeting on-site for the basic design summary in March 2011, following which the team prepared this preparatory study report.

Recently, the Project had been scheduled for Cabinet Approval in early 2013FY. Since more than a year had passed from the previous Survey, Japan International Cooperation Agency (hereinafter

referred to as ‘JICA’) decided to conduct a Preparatory Survey with the main purpose to re-estimate the Project Cost. Subsequently, the present Preparatory Survey Team was dispatched to Zambia from November 27, 2012 to December 6, 2012 to confirm the latest situation concerning facilities and equipment and to obtain recent data for construction costs and equipment procurement.

Based on this Preparatory Survey, it was found that Levy Mwanawasa hospital had opened in August 2011, as a Secondary Hospital ranked next after UTH with funding from Chinese doners. Otherwise, there were no major changes in the referral situation in Lusaka from the previous study and the congestion at UTH was confirmed to still be severe. The objectives of this Project to strengthen the target Health Centres and elevating them to Primary Hospital level in order to improve health care access for residents of Lusaka while reducing the congestion at UTH and reviving its function as the top referral and educational hospital were reconfirmed to be appropriate.
The basic design concerning facilities and equipment planning were reviewed in light of the increase in population of the Lusaka region due to the delay in opening of the facilities. No changes were required for the facilities, but a minimum change to the equipment plans was decided.
Adjustments to the Project Costs were made based on a re-estimation taking into account the above changes in the Basic Design, rise in construction costs and materials and fluctuations in the currency exchange rates.

3. Results of the Preparatory Study and Contents of the Project

Based on the study and the priorities placed by the Zambian side, the scope of the cooperation project was limited to facilities for which the need for upgrading was confirmed and meeting the criteria of;
1. “Whether any central (primary- or secondary-level) hospitals are present in the same zone”,
2. “Development of a first level hospital by upgrading the existing UHC (Not creating a new first level hospital from scratch), 3. “Whether a sufficient site for the project can be secured”

Finally, the Matero Urban Health Centre (UHC) and the Chilenje Urban Health Centre (UHC) were determined as the two target health centres to be upgraded to District Hospitals with high effectiveness of assistance from project scale.

Thereby, it was concluded that it would be necessary for Matero UHC to receive the new facilities for the outpatient, casualty/ administration building, laboratory, maternity building, adult and paediatric wards and other related facilities, and Chilenje UHC to receive the outpatient, the casualty, maternity ward (delivery department), administration ,medical imaging facilities and other related facilities. The procurement of the medical equipment which would be necessary for the newly constructed sections and some of the existing section were also included.

4. Implementation Schedule and Cost Estimate

The following is the outline of the Project for Upgrading of Lusaka Health Centres to District Hospitals in the Republic of Zambia

Responsible Agency:	The Ministry of Health, the Government of Zambia
Implementing Agency:	Directorate of Policy and Planning The Ministry of Health, the Government of Zambia
Entire project period:	Approximately 22 months, including the detailed design and tender period
Planned construction site:	Site in Matero and Chilenje, Lusaka
Building structure:	Reinforced Concrete Structure

Content of the Project:

Outline of the Cooperation Project for Matero UHC

Project Outline	Detailed Description
OPD （Single Floor/1273.20 ㎡）	OPD: General Outpatient, Dental, ENT, Treatment Room
OPD (Casualty) （Single Floor /384.25 ㎡）	Casualty: Treatment Room, Observation Room, Morgue (BID)
Administration/Laboratory （Single Floor/495.00 ㎡）	Administration: Office、 Superintendent, Matron, Conference Room Laboratory: Sample Collection Room, Laboratory
Maternity Ward （Single Floor/873.00 ㎡）	Maternity: Pre-natal Room, Delivery, Post-natal, Post-natal (Isolation), Treatment Room
Paediatric Ward （Single Floor /428.87 ㎡）	Ward, Treatment Room
Adult Ward （Single Floor /428.87 ㎡）	Ward, Treatment Room
Related Facilities （Single Floor /565.00 ㎡）	Mechanical Unit-1：Pump Room, Cylinder Room Mechanical Unit-2：Generator Room, Main Switch Room, Transformer, Main Distribution Board Elevated Water Tank, Water Reservoir, External Corridor
Total 4448.19 m^2	
Medical Equipment	OPD, Casualty, Admin./Lab., Maternity Ward, Paediatric Ward, Adult Ward, Medical Imaging (Procurement for existing facility)

Outline of the Cooperation Project for Chilenje UHC

Project Outline		Detailed Description
OPD （2 Story/1427.70 ㎡） Slope （210.53 ㎡）	GFL	OPD: Pharmacy, Registry, Treatment Room(casualty), Morgue(BID)
	1FL	OPD: General Outpatient, Dental, ENT, Treatment Room
Maternity/Admin. （2 Story/763.39 ㎡）	GFL	The Medical Imaging Department: X-Ray Room, Ultrasound Room The Maternity Isolation Ward: Ward, Treatment Room
	1FL	Administration: Office, Superintendent, Matron, Conference Room
Related Facilities （Single Floor/364.26 ㎡）		Mechanical Unit-1(32.13 ㎡)：Generator Room Mechanical Unit-2(40.32 ㎡)：Main Switch Room, Transformer, Main Distribution Board Mechanical Unit-3(35.00 ㎡)：Pump Elevated Water Tank, Water Reservoir, External Corridor
Total 2765.88m^2		
Medical Equipment		OPD, Maternity/Administration, Medical Imaging, Labour Ward (Procurement for existing facility)

5. Project Benefits and Justification

Implementing this plan with Japanese Grant Aid can be judged as having validity based on the following matters:

(1) Targets of benefits

Matero UHC, which is the target health centre, is located in the subdistrict of Zone 2, and its target population is 77,813. By making it a district hospital, the direct target population will be 247,451, which is the total population of Zone 2. Meanwhile, Chilenje UHC is located in the subdistrict of Zone 4 with a target population of 77,142. Its direct target population will be 359,753, which is the total population of Zone 4, by making it a district hospital.
However, when considering Lusaka overall, there is no primary medical facility (district hospital) at present and the plan was changed from establishing one district hospital in each zone to provide health services, and the facilities were reduced to these two hospitals. Thus, approximately 1.9 million people, which is the entire population of Lusaka District, will benefit indirectly from these two facilities.

(2) Consistency of the project goal

Facility construction in nineteen districts without a primary-level district hospital is considered a high-priority project in the health strategies and plans of Zambia such as NHSP V, CIP, etc. In addition, there is a plan in Lusaka District to establish one primary-level county hospital in each of the four subdistricts, and the Ministry of Health started implementing this plan through processes to construct operation theatres in the five health centres that demand one at their own expense at the time of the survey. Concerning the implementation of this project, consistency with their top plan is high.

(3) Ensuring autonomous development

While the facility and equipment plan was developed based on standard facility drawings, standard equipment lists, standard human resource assignment, and so forth in Zambia, consideration was also made so that autonomous development will be ensured technically and financially based on the present activity status.
Regarding reinforcement of workers to address the implementation of this plan, it is planned that 5,100 health workers will be employed over three years from 2011 as a strategy to address the shortage of health workers. A budget is included in the ‘2011-2013 MEDIUM TERM EXPENDITURE FRAMEWORK AND THE 2011 BUDGET (GREEN PAPER), August 2010’. Although a rapid increase in staff seems to be difficult to be realised, the subject health centres have already started some of the services to be provided by district hospitals. Thus minimum requisite workers will be approximately merely four doctors and fourteen physician assistants, and it seems feasible as newly trained workers are also included. Also, the plan of new staff allocation for Mateto and Chilenje UHCs is already approved by MOH.
Maintenance and control of facilities and medical equipment are essential in maintaining the quality of medical services. A soft component is planned as a technical assistance for both of them. Overall development of the maintenance and control mechanism of medical equipment is being supported at present in the Health Investment Assistance Project (technical aid project). Development of system is being planned in cooperation with the support.

(4) Necessity for facility improvement

Since Lusaka District does not have hospitals to provide primary and secondary medical services, UTH must play the role of both a primary- and secondary-level hospital in Lusaka District while being the top-referral hospital. It has seriously affected its original functions.

There is a substantial need of efficient provision of medical services depending on the type and seriousness of the disease by reinforcing of the health centres in the district so that they become primary-level hospitals, improving access to health services and establishing the layers of the referral system.

The outputs with expected quantitative effects through implementation of this cooperation target project are listed as follows:

Effects of the project

Indicator		Standard value (2012)	Objective value※1 (2018)	The ratio of reduction in numbers of cases of Ceasarean Sections at UTH※2 2018	Reasons for improvement
①Number of ceserian section	Matero UHC	0	377	11%	Establishment of a maternity surgery ward Reinforcement of the maternity department
	Chilenje UHC	0	357	10%	
	Total	0	734	21%	
		Standard value (2012)	Objective value※3 (2018)	The ratio of reduction in numbers of referrals to UTH※4 2018	
②Number of inpatients in the adult surgery ward	Matero UHC	0	484	6%	Establishment of an adult surgery ward

*1: The required numbers of ceasarean setions for each UHC in 2018 (three years after completion of construction of Project facilities), if the present project is not implemented are derived by taking the referral numbers of required caesareans sections to UTH from each UHC obtained during the 2012 Survey (Table 2-5, 2-15) and multiplying by 110%, the increase in population of Lusaka by 2018, three years after completion of the Project Facilities (Table 2-4) . 60% of this number are capable of being treated at each of the UHC to be constructed by this Project and regarded as the target number for ceasarean sections for 2018.

*2: The number of caesarean sections (3470) that will be performed at UTH in 2018 (three years after completion of construction of Project facilities) in case the Project is not implemented is derived by multiplying 3155, the number of caesarean sections performed at UTH obtained in the 2012 Survey (Table 2-13), by 110%, the increase in population of Lusaka by 2018 , three years after completion of the Project Facilities (Table 2-4).

*3: The number of referral adult surgical patients (968) to UTH in 2018 if the present project is not implemented, is derived by multiplying 880, the number of surgical patients referred to UTH in the 2012 Survey (Table 2-5), by 110% , the increase in population of Lusaka by 2018 , three years after completion of the Project Facilities (Table 2-4). 50% of this number are capable of being treated at each of the UHC to be constructed by this Project and regarded as the target number for adult surgical patients for 2018.

*4: The total number of referral patients (8781) to UTH from Matero UHC in 2018 is derived by multiplying 7983, the total number of referral patients from Matero UHC to UTH in 2012 Survey (Table 2-5), by 110% , the increase in population of Lusaka by 2018, three years after completion of the Project Facilities (Table 2-4).

①Increase in primary-medical-level maternity surgeries

(Matero UHC: 0/2010, Chilenje UHC: 0/2010)

It will be possible to perform primary-medical-level maternity surgeries (mainly Caesarian section), which had conventionally been referred to UTH, by addressing construction of a ward to accommodate patients after maternity surgery and reinforcement of maternity department functions by provision of equipment in this plan.

②Increase in inpatients in the adult surgery ward (Matero UHC: 0/2010)

It will be possible to accept surgery patients who had conventionally been referred to UTH by establishing a surgery ward and providing equipment in related facilities in this plan.

The outputs with expected qualitative effects by implementation of this cooperation target project are listed as follows:

① Improvement in referral system functions in Lusaka District

By establishing primary level healthcare facilities in two of the four zones that presently lack primary level facilities between the tertiary level top referral UTH, the secondary level Levy Mwanawasa Hospital and the health centers, it is expected that the layered structure of the referral system in Lusaka District will be established.

As a result, UTH will be able to regain its fundamental function as the top referral hospital, while improving access to medical services for the residents.

② Improvement in the national health indicators of Zambia
It will contribute to the improvement of health indicators such as infant mortality rate and maternal mortality in Zambia, where more than 10% of infants born die before they reach the age of five, by establishing primary-level hospitals capable of primary-level maternity surgery in the proper regions.

③ Advancement in medical service functions by improvement and concentration of the aging OPD and central examination department
It will be possible to provide medical services more efficiently, and the original examination service functions will be restored by improving and concentrating the OPD and central examination department, which are considered too old to continue using at present and are scattered around the hospital site, and addressing the proper scale for both in this plan.

④ Addressing efficient hospital management
Efficient hospital management will be enabled by reminding the Ministry of Health (including provincial and district health offices), Matero UHC, and Chilenje UHC of the importance of facility and equipment maintenance from each standpoint through technical instruction in the soft component system and developing a proper maintenance and control method based on this recognition. Furthermore, it will be possible to manage the hospital with not only in-hospital infection prevention but also out-of-hospital safety assurance in mind by constructing a medical waste treatment system.

Therefore, the validity of this project is high and it is considered effective.

To make sure that the two facilities to be upgraded from health centres to primary-level hospitals by this project are run smoothly and effectively and to facilitate the delivery of the direct and indirect effects previously described, the following points need to be further improved or established:

1) Regarding the facilities established by this cooperation target project, they must make sure that the facilities and equipment can be used continuously in favourable conditions by ensuring the necessary budget for proper management and maintenance and providing sufficient training for the medical staff and so forth.

2) By including the repair cost for medical equipment in the budget, it is possible to quickly handle sudden equipment failures and minimise the deterioration of medical services. It is also necessary to plan to develop a reserve for purchasing equipment so that equipment whose service lives has expired can be updated smoothly in the future.

3) To address autonomous development by healthy management of the upgraded hospitals, it is important that the financial plans are developed properly, that the revenue and expenditure status is monitored constantly, and that the results are reflected in hospital management in order to address continuous improvement.

4) To improve maintenance skills regarding the maintenance systems and the medical waste and drainage systems in the newly established facilities of the two hospitals, technical instruction utilising a soft component system is being planned. Therefore, it is necessary that preparations be made for receiving instructions to match the timing of technical instruction by the personnel related to maintenance in the Ministry of Health, provincial health office, and district health office in addition to the maintenance personnel who would be in charge of the construction, mechanical facilities, electric facilities, and so forth of these hospitals.

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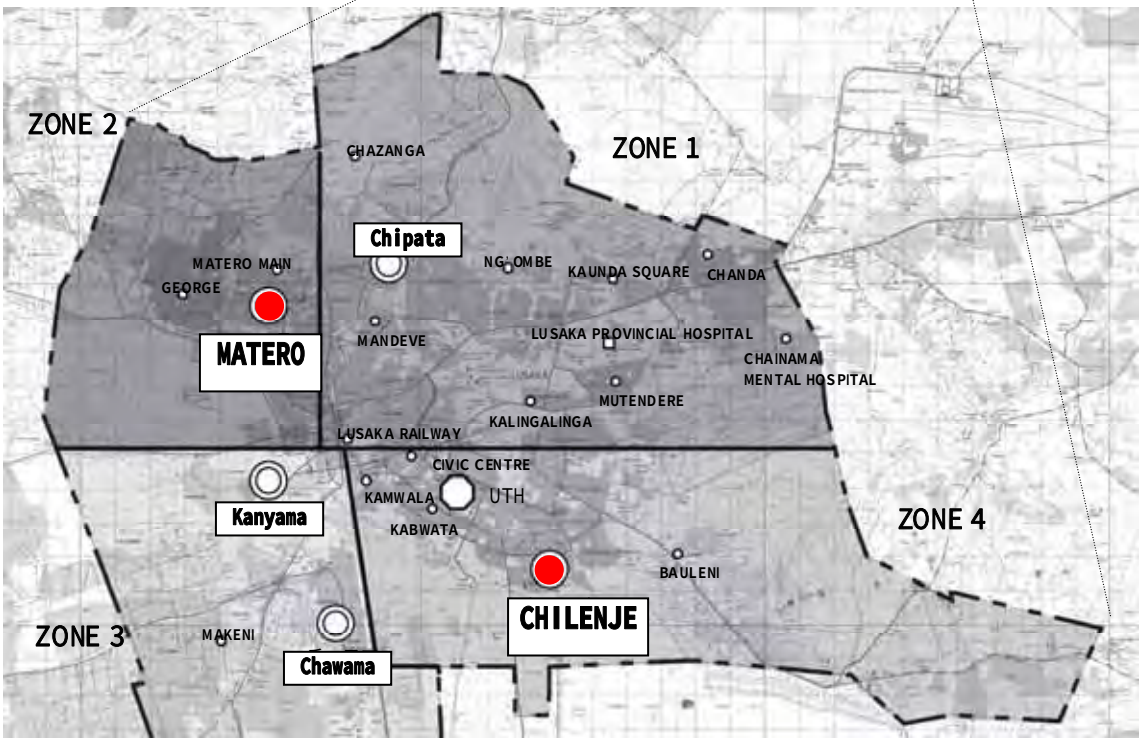
The Republic of Zambia



Locations of Matero and Chilenje in Lusaka District

Perspective (Matero UHC)

Perspective (Chilenje UHC)

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Chapter 2

ABBREVIATIONS

A/P	Authorization to Pay
AIDS	Acquired Immunodeficiency Syndrome
B/A	Banking Arrangement
BS	British Standard
CIP	Health Sector Capital Investment Plan
CIDRZ	Centre Information Disease Research in Zambia
DHMT	District Health Management Team
E/N	Exchange of Notes
EU	European Union
FNDP	Fifth National Development Plan 2006-2010
G/A	Grant Agreement
GDP	Gross Domestic Product
GH	General Hospital
GNI	Gross National Income
HC	Health Centre
HIPC	Heavily Indebted Poor Country
HIV	Human Immunodeficiency Virus
IMF	International Monetary Fund
JASS	Japanese Architectural Standard Specification
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
LDC	Least Developed Countries
MCI	Integrated Management of Childhood Illnesses
MMR	Maternity Mortality Rate
MOH	Ministry of Health
NGO	Non-Governmental Organizations
NHSP IV	National Health Strategic Plan IV, 2006-2010
NRH	National Referral Hospital
ODA	Official Development Assistance
PHAST	Participatory Hygiene and Sanitation Transformation
RRH	Regional Referral Hospital
SABS	South African Bureau of Standards
SWAPs	Sector Wide Approaches
UHC	Urban Health Centre
UN	United Nations
UTH	University Teaching Hospital
VAT	Value Added Tax
VCT	Voluntary Counselling and Testing
WB	World Bank
WHO	World Health Organization

Chapter 1. Background of the Project

CHAPTER 1. BACKGROUND OF THE PROJECT

(1) Background of the Request

The Ministry of Health of Zambia is implementing NHSP IV which regards sector-wide areas, such as development of a health infrastructure and improvement of medical equipment, as priority areas with the aim of achieving the Millennium Development Goals (MDGs).
Except for the Levy Mwanawasa Hospital which opened 2011(as a secondary level hospital), there is no primary or secondary level hospital between UTH, the highest level hospital in Zambia providing tertiary health care services, and health centers in the capital Lusaka (with a population of 1.4 million), thus it is difficult to meet the demand for health care services for the general public in the city. As patients are directly transferred from health centers to UTH, UTH has to function not only as a referral hospital at the highest level but also as a primary level hospital in the Lusaka Area. Such a situation causes critical chronic congestion in UTH.

Against this background, the Government of Zambia submitted a request for grant aid assistance to the Government of Japan for the repair of existing facilities, construction of additional facilities and procurement of medical equipment at two health centers in the city of Lusaka with the aim of establishing functions comparable to those of a district (primary) hospital at these centers. Strengthening of the functions of the five health centers is necessary for the improvement of access to health care services by the residents of the city of Lusaka and the alleviation of congestion and the restoration of the functions of UTH as the top referral and educational hospital.

(2) Outline of the Project

1) Overall Goal
The quality of and access to health care services in the city of Lusaka will be improved by the provision of quality primary health care services as close to the family as possible and strengthening of the referral system.

2) Project Purpose
Functions comparable to those of a district (primary) hospital will be established at the selected health centers in the city of Lusaka.

3) Expected Output
Functions comparable to those of a district hospital will be established by the repair and construction of facilities in the selected health centers.

4) Project Contents
Contents of the request to the Government of Japan:
a. Infrastructure
Repair of existing facilities and construction of new facilities at the selected health centers (in Chipata, Matero Ref, Chilenje, Kanyama and Chawama)

b. Equipment
Medical equipment required for treatment and examination at the selected health centers

Chapter 2. Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Upper-level Objective and Project Objective

According to the latest Demographic and Health Surveys, the under-five mortality rate (per 1,000 live births) in Zambia is 157 (in 2000), 138 (in 2005), and 111 (in 2010), which figures have declined dramatically since the late 1990s, but more than 10% of children still do not survive to celebrate their fifth birthday. The maternal mortality ratio in the country is 591 (in 2010, per 100,000 live births), which also remains high. These surveys indicate that Zambia still faces a significant challenge that requires further improvement in the health sector of this country.

In response to the challenge, the Ministry of Health in Zambia (hereinafter referred to as 'MOH') has been promoting the National Health Strategic Plan V (2010 - 2015) (hereinafter referred to as 'NHSP V'), which gives priority to cross-sectional themes including the development of health infrastructure / medical equipment. One of the strategies of high priority is to upgrade existing health centres to first level hospitals.

The Health Sector Capital Investment Plan (hereinafter referred to as 'CIP') places great importance on the construction of facilities in nineteen districts that do not have a first level hospital. In line with the programme, an operating theater is under construction at their expense in five urban health centres (hereinafter referred to as 'UHC').

The health facilities in Zambia are classified into the five following categories according to their functions to be fulfilled:

Health Level	Target Population	Main Services
(National Level) 3rd Level Hospital	More than 800,000	Internal Medicine, Surgery, Paediatrics, Obstetrics, Gyneacology, Dentistry, Psychiatry, Intensive Care
(Provincial Level) 2nd Level Hospital	From 200,000 to 800,000	Internal Medicine, General Surgery, Paediatrics, Gyneacology, Dentistry, Psychiatry, Intensive Care
(District Level) 1st Level Hospital	From 80,000 to 200,000	Internal Medicine, Surgery, Obstetrics, Paediatrics *Basic Surgery and ceasarian section
Health Centres	Urban areas： From 20,000 to 50,000 Suburban areas：10,000	General Health Services *Normal deliveries, immunization, health education
Health Posts	Urban areas：7,000 Suburban areas：3,500	Community Preventive Health Services *Service based on community-based health staff

Now looking at the situation in Lusaka, the capital of Zambia, it has been difficult to satisfy the wide range of health service demands of Lusaka's citizens because there are no primary- or secondary-level hospitals between Zambia's University Teaching Hospital (hereinafter referred to as 'UTH'), the leading central hospital in charge of tertiary-level medical services, and the health centres which are the targets of this project ,besides the Levy Mwanawasa hospital（secondary-level hospital）that was open in 2011. In addition, as patients in the health centres are directly referred to UTH, UTH has to serve not only as a top referral hospital but also as a first level hospital for the Lusaka region, which drives the hospital into a severely and constantly busy, crowded condition.

To address this issue, the Zambian Government requested the Japanese government to implement a grant aid project for the improvement of medical facilities and equipment. The objective was to reinforce the functions of the five health centres in Lusaka to upgrade to first level hospitals. These plans will help improve access to health services for Lusaka's citizens and at the same time, mitigate the crowded condition at UTH so that its original functions as a top referral and a teaching hospital can be restored.

(2) Overview of the Project

The aim of this project is to enable the referral system in Lusaka District to function more efficiently and to ease crowding at and reduce the burden on UTH, which is the tertiary level hospital, by reinforcing the functions of two health centers in Lusaka District and upgrading them to first level hospitals. The initial request by Zambian side sought improvement of the facilities and equipment at five health centers. In response to this request, Japan dispatched a Study Team to examine the conditions and verify the relevance of going ahead with the project. In addition to conducting a field study and holding discussions with the Ministry of Health, the Provincial Health Office and the District Health Management Team Office, the Study team narrowed down the target facilities of the project to two health centers based on the scale of Japan's cooperation. In order to achieve the above-mentioned aim of this project, as well as improving the facilities and equipment at the two target health centers, a soft component consisting of daily inspection, maintenance and proper operation of the appliances and equipment will be implemented. It is hoped that this will prolong the effective service life of the appliances and equipment and enable efficient healthcare activities. Within this context, the cooperation project targets the construction of an outpatients unit, administration/laboratory building, Maternity building, adult ward and pediatric ward at Matero Reference UHC and an outpatients unit, Maternity/administration building and respective affiliated facilities at Chilenje UHC, and the procurement of equipment for each department, especially the new departments.

Table 2-1 Outline of the Cooperation Project for Matero UHC

Project Outline	Detailed Description
OPD （Single Floor/1273.20 ㎡）	OPD: General Outpatient, Dental, ENT, Treatment Room
OPD (Casualty) （Single Floor /384.25 ㎡）	Casualty: Treatment Room, Observation Room, Morgue (BID)
Administration/Laboratory （Single Floor/495.00 ㎡）	Administration: Office、Superintendent、Matron、Conference Room Laboratory: Sample Collection Room, Laboratory
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Related Facilities （Single Floor /565.00 ㎡）	Mechanical Unit-1：Pump Room, Cylinder Room Mechanical Unit-2：Generator Room, Main Switch Room, Transformer, Main Distribution Board Elevated Water Tank, Water Reservoir, External Corridor
Total 4448.19m^2	
Medical Equipment	OPD, Casualty, Admin./Lab., Maternity Ward, Paediatric Ward, Adult Ward, Medical Imaging (Procurement for existing facility)

Table 2-2 Outline of the Cooperation Project for Chilenje UHC

Project Outline		Detailed Description
OPD （2 Story/1427.70 ㎡） Slope （210.53 ㎡）	GFL	OPD: Pharmacy, Registry, Treatment Room(Casualty), Morgue(BID)
	1FL	OPD: General Outpatient, Dental, ENT, Treatment Room
Maternity/Admin. （2 Story/763.39 ㎡）	GFL	The Medical Imaging Department: X-Ray Room, Ultrasound Room The Maternity Isolation Ward: Ward, Treatment Room
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Related Facilities （Single Floor/364.26 ㎡）		Mechanical Unit-1(32.13 ㎡)：Generator Room Mechanical Unit-2(40.32 ㎡)：Main Switch Room, Transformer, Main Distribution Board Mechanical Unit-3(35.00 ㎡)：Pump Elevated Water Tank, Water Reservoir, External Corridor
Total 2765.88m^2		
Medical Equipment		OPD, Maternity/Administration, Medical Imaging, Labour Ward (Procurement for existing facility)

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Principles

① Function Reinforcement toward Primary (District)-level Hospitals

The plan is for upgrading the targeted health centres to primary (district)-level hospitals to strengthen the referral system in Lusaka City.
By consolidating individual functions such as the surgery department, which is newly created by the Zambia side, and the OPD, maternity department, and laboratory departments currently located apart from each other, the plan aims to improve and streamline medical activities.

② Facility Master Plan

Before establishing a development plan for each facility, we first determine the zoning according to the hospital functions (facility master plan) to be fulfilled in the future. Based on the master plan, the development plan is created.

③ Scale of the Project Facilities

The scale of the target facilities is determined based on firstly, the number of past patients at UTH, the district health office, and each health centre, and secondly, the projected number of patients calculated based on the population growth rate in Zambia for 2020, five years after 2015 when the target facilities are scheduled for completion.

④ Floor Number of Buildings

For the Matero UHC, we can use a vast area, so the facilities will be a flat building considering the efficiency of medical services. For the Chilenje UHC, to make the most of the limited area and at the same time avoid sacrificing the efficiency of the medical services, the facilities will be a two-storey building. A slope will be installed in the OPD building for moving up and down, not elevators or other equipment that require additional maintenance costs.

⑤ Measures against In-hospital Infections

To help prevent in-hospital infections, the routes for patients and for medical staff are laid out separately so that they do not cross.

⑥ Environmental Consideration

The plan incorporates appropriate measures to prevent possible contamination in the facilities and their surroundings.

⑦ Technical and Financial Self-sustainability

Planning of the facilities and equipment is limited to the degree to which both their technical and financial self-sustainability can be ensured, based on the current operational ability (e.g., number of medical staff, technical level, financial capacity, and availability of consumable supplies and replacement parts). Construction materials and equipment are selected based on the criteria that they should be as robust as possible, close to maintenance free, available in the region, and easy to repair and/or replace.

⑧ Construction Plan that Allows Continuous Medical Services

This plan should allow the health centres to continue to provide their current functions during construction as well. For this reason, we will develop a construction plan that will not get in the way of the current medical services provided in the health centres paying attention to how to carry in the construction materials and other necessary factors.

⑨ Equipment Plan

The basic equipment necessary for providing primary medical services will be procured, and equipment that is in short supply will be supplemented to meet the expanded functions.

⑩ Soft Component

In order to build a sustainable facilities and equipment maintenance system, technical training will be provided at the target facilities, using the soft component system.

⑪ Status of Activities of Other Donors

The status of activities of other donors was ascertained and care was taken to avoid duplication of aid among projects implemented by these organizations.

(2) Policy in Regard to Natural Conditions

1) Temperature and humidity

The monthly average maximum temperature in Lusaka is 23 -31 . The maximum temperature sometimes exceeds 31 but the humidity is low, so in principle there are no plans to install air conditioning; adequate ventilation will be provided by ensuring a proper airflow. However, with recent global warming, the temperature sometimes rises close to 40 and air conditioners will be installed in closed rooms, rooms with influence on the spread of infection, delivery rooms where a high level of cleanliness is required and rooms containing expensive equipment such as X-ray machines, where natural ventilation cannot be provided. In addition, between June and October the lowest temperature falls to 10 .

2) Rainfall

Annual rainfall is less than in Japan, but it peaks in November and February and every year flooding occurs over a wide area of Lusaka. In addition, due to the effects of climate change in recent years, the annual rainfall has increased to almost 1,000mm. Peak rainfall of 80mm/hour has been recorded. The rainwater drainage from the roofs and the exterior drainage volume will be determined according to the piping selection method for rainfall in Japan which has stricter safety standards.

3) Solar radiation and ultraviolet rays

The number of hours of sunshine during the dry season averages 9 hours a day and the sun's rays are very strong due to the high altitude and location near to the equator. As a result, consideration will be given to methods of blocking sunshine and solar radiation such as eaves and louvers. In addition, materials that do not deteriorate easily will be selected for the roofs, outer walls, exterior pipes and other parts exposed to direct sunlight.

4) Wind

Due to the S influence of the Westerlies, Zambia gets relatively strong winds from the east, so natural ventilation can be utilized effectively by providing openings on the east and west sides. Consideration will also be given to protection from strong winds during the rainy season.

(3) Principles toward Social Economic Conditions

In the early 2000s, Zambia recorded an inflation rate of around 20% every year, but in the late 2000s, fluctuation has become milder while continuing to move up and down. According to the data of the International Monetary Fund (IMF), the inflation rate increased by 8.227% (in 2010), 7.533% (in 2011), and 6.512% (in 2012), and is expected to keep increasing by 5.504% (in 2013), 5.000% (in 2014), and 5.000% (in 2015). Regarding accumulation, based on the IMF data, we will set an expected price fluctuation from the accumulation start point

(December 2012) to the anticipated bid point (February 2014) to reflect it in the accumulated unit price.

(4) Principles toward Construction Circumstances

We have seen a number of buildings under construction in the capital city, Lusaka, where our cooperation project is taking place, and it seems that the situation surrounding the construction industry is relatively good. The price of construction materials in Zambia is greatly affected by the Republic of South Africa, the main import trading partner. Along with the impacts of international price trends where the price of raw materials including oil and iron ore is on the rise, the overall price in Zambia is expected to keep rising in the future.

(5) Principles toward Industry Specific Conditions / Commercial Practice

In the City of Lusaka, there are many construction materials shops run by foreigners from the Republic of South Africa, India, and other countries, and imported goods from outside the country can routinely be found everywhere in the markets. Considering costs and maintenance readiness after completion of construction, this plan will basically use the materials available in the region to procure general construction materials.

(6) Principles toward Utilisation of Local Staff

In the City of Lusaka, a lot of small- to middle-scale construction work is conducted by local workers, so there should be no problems gathering experienced, skilled workers in the region. This plan will employ a design that incorporates typical construction methods in this region in order to make the most of the ability of local construction companies and workers, and at the same time, to help cut construction costs to the extent possible.

(7) Principles toward Operation and Maintenance Ability of the Implementing Organisation

1) Facility Planning

At present, Environmental Health Officer is in charge of maintenance for all the UHC facilities under the supervision of a matron. They are responsible for maintenance of water supply and discharge, disposal of waste, and teaching of public hygiene. Their responsibility extends to the teaching of public hygiene in the whole region, not just for UHC, so they are not always present in UHC. Therefore, once the health centres are upgraded to first level hospitals, the current maintenance system will not be able to fulfil the expected functions and it will be necessary to reinforce and/or newly hire highly skilled staff to be assigned to each UHC who can handle the maintenance work for the electricity, machinery, and medical equipment.
The most important thing in establishing the plan is to ensure that the maintenance work is easy to conduct and that running costs can be reduced, so we will select and procure equipment of an appropriate quality that can also be maintained on site wherever possible.

2) Equipment Plan

The equipment in this plan will be basic equipment essential for the functioning of the first level hospitals in Lusaka District, equipment that does not incur high maintenance costs and can be used by the hospital staff at their current level of technical skill. In consideration of the instability of the voltage in Lusaka District, in order to protect medical equipment which is highly sensitive to fluctuations in voltage, an automatic voltage regulator (AVR) will be attached to equipment requiring such measures, such as X-ray equipment, biochemical analyzers, blood analyzers and fetal monitors. Also, to prevent the data from being deleted in the event of a power outage, an uninterruptible power supply (UPS) will be attached to ultrasonograph equipment. Taking into consideration the time until management of consumables gets on track after installation of the procured equipment and allowing for the time required from the placement of orders until delivery of the goods, a 3-month supply of consumables is planned in order to ensure that they do not run out. As the replacement parts and consumables for medical equipment vary depending on the manufacturer, to ensure that

the Zambian side can easily obtain replacement parts and consumables, the availability of a dealer in Zambia or in a neighboring country shall be added as a bidding condition. Training in operation of the equipment shall be provided by an engineer from the supplier when the equipment is delivered.

(8) Principles toward Grade Setting of Facilities and Equipment

1) Facility Planning

The design of hospital buildings shall be in accordance with the following standards used in Zambia (the section on hospital facilities and others). The facility planning shall also incorporate appropriate considerations for the environment, prevention of in-hospital infection, attention to people with physical disabilities, and measures at the time of disaster.
British Standards
South African Bureau of Standards
Using examples from similar medical facilities in Zambia regarding department structures and function levels, we will set appropriate grades according to the required performance for each department and room so that we can optimise the cost-effectiveness of the facilities.

2) Equipment Plan

This project aims to improve medical services by replacing aging equipment, supplying new equipment and supplementing equipment that will be in short supply following the upgrading of the target facilities from health centers to primary medical facilities. In addition, the grades of the equipment shall match the technical level of the healthcare staff and the content of the services demanded in each department.

(9) Principles toward Construction / Procurement Methods and Construction Schedule

1) Principles regarding Construction Method

The most typical construction method of low-rise buildings in this area is to employ a steel moment frame, where the foundations, columns, and beams are constructed with reinforced concrete and the walls consist of piled bricks or concrete blocks in the structure frame. This construction method will be used as a basis in this project as well.

2) Principles regarding Procurement Method

For the construction materials, we will use local procurement wherever possible to facilitate maintenance after completion of construction. For the equipment, we will procure it in Japan in principle, because most of the equipment has only basic functions and is easy to maintain. We will consider, however, procuring from a third country some of the equipment to be used in the radiation and delivery rooms, because such equipment requires the help of an agency of the manufacturer for maintenance services. We also want to avoid a situation where competition in bid tendering does not work and fair bidding is not possible because the procurement options are limited to Japanese products.

3) Principles regarding Construction Schedule

There are two main seasons in Zambia: the dry and the rainy seasons. The distinction between the seasons is marked, and in the rainy season, especially in December and January, rainfall exceeds 200 mm. Therefore, it is preferable to start construction in April, when the rainy season has completely finished, and complete the earthwork, land levelling, and construction of the structure including its foundations, underground beams, and floor of the first storey by November, when the rainy season returns. This project assumes fifteen months to be a reasonable construction timeframe.

2-2-2 Basic Plan (Construction Plan / Equipment Plan)

2-2-2-1 Whole Picture of the Target Cooperation Project (Review of Request)

(1) Transition of Request

Figure 2-1 shows the transition from the original request and scope of the project to the final design during the previous survey conducted in 2010:

ZONE	Initial Request August 25, 2009 Target Health Centres and Components	
1	**Chipata UHC**	
	Extended and Existing Site	
	OPD	MCH
	Main Medical Building	ART
	・Laboratory	VCT
	・Medical Imaging	TB
	・Labour	Physiotherapy
	Surgical Ward	Kitchen/Laundry
	・Male/Female/Children	Incinerator
	Isolation Ward	Mortuary
	Medical Equipment Required	
2	**Matero UHC**	
	Existing Site	
	OPD	MCH
	Main Medical Building	ART
	・Laboratory	VCT
	・Medical Imaging	TB
	・Labour	Physiotherapy
	Surgical Ward	Kitchen/Laundry
	・Male/Female/Children	Incinerator
	Isolation Ward	Mortuary
	Medical Equipment Required	
3	**Matero UHC**	
	New Site/ Existing Site	
	OPD	Isolation Ward
	Main Medical Building	MCH
	・Laboratory	ART
	・Medical Imaging	VCT
	・Labour	TB
	Medical Ward	Physiotherapy
	・Male/Female/Children	Kitchen/Laundry
	Surgical Ward	Incinerator
	・Male/Female/Children	Mortuary
	Medical Equipment Required	
3	**Chipata UHC**	
	New Site	
	OPD	Isolation Ward
	Main Medical Building	MCH
	・Laboratory	ART
	・Medical Imaging	VCT
	・Labour	TB
	Medical Ward	Physiotherapy
	・Male/Female/Children	Kitchen/Laundry
	Surgical Ward	Incinerator
	・Male/Female/Children	Mortuary
	Medical Equipment Required	
4	**Chilenje UHC**	
	Extended and Existing Site	
	OPD	MCH
	Main Medical Building	ART
	・Laboratory	VCT
	・Medical Imaging	TB
	・Labour (Post-natal Isolation)	Physiotherapy
	Female Ward	Kitchen/Laundry
	Male Ward	Incinerator
	Surgery Ward	Mortuary
	Isolation Ward	
	Medical Equipment Required	

Priority Order	Final Request September 8, 2010 Target Health Centres and Components
	Matero UHC
	Existing Site
A	OPD
	・Medical Examination
	・Administration
	Main Medical Building
	・Laboratory
	・Medical Imaging
	・Labour
	Surgery Ward
	Paediatric Ward
	Medical Equipment Required
	Chilenje UHC
	Extended and Existing Site
A	OPD
	・Medical Examination
	Medical Equipment Required
B	OPD
	・Administration
	Main Medical Building
	・Medical Imaging
	・Labour (Post-natal Isolation)
	Medical Equipment Required
C	Surgery Ward
	Paediatric Ward
	Medical Equipment Required

Criterias for Site Reduction (Basic Design Stage)
- Priority for zones without core (primary and/or secondary) services.
- Priority for upgrading of UHCs to District Hospitals
- Properly prepared site conditions
  - Urban floods (Kanyama, Chawama)
  - Relocation of existing facilities (Kanyama)
  - Extension site land-use rights (Chilenje)

Criterias for Facilities Reduction (Basic Design Stage)
- Continued use of existing facilities is difficult
  - Ageing (Chilenje OPD)
  - Facilities built for non-hospital purposes (Matro OPD、Main Medical Buildings)
- Theatre (Constructed by Zambia), related facilities and adult and paediatric surgery wards
- Facilities with expected direct benefit for improvement of primary level medical services
  - ×Health Centre Services
  - ×Other services
- Overlapping of other donors
  - ×ART, VCT, TB
- Priority for facilities requiring advanced construction
  - △Ward
- Scale of cooperation

Figure 2-1 Reduction of Scope of Request

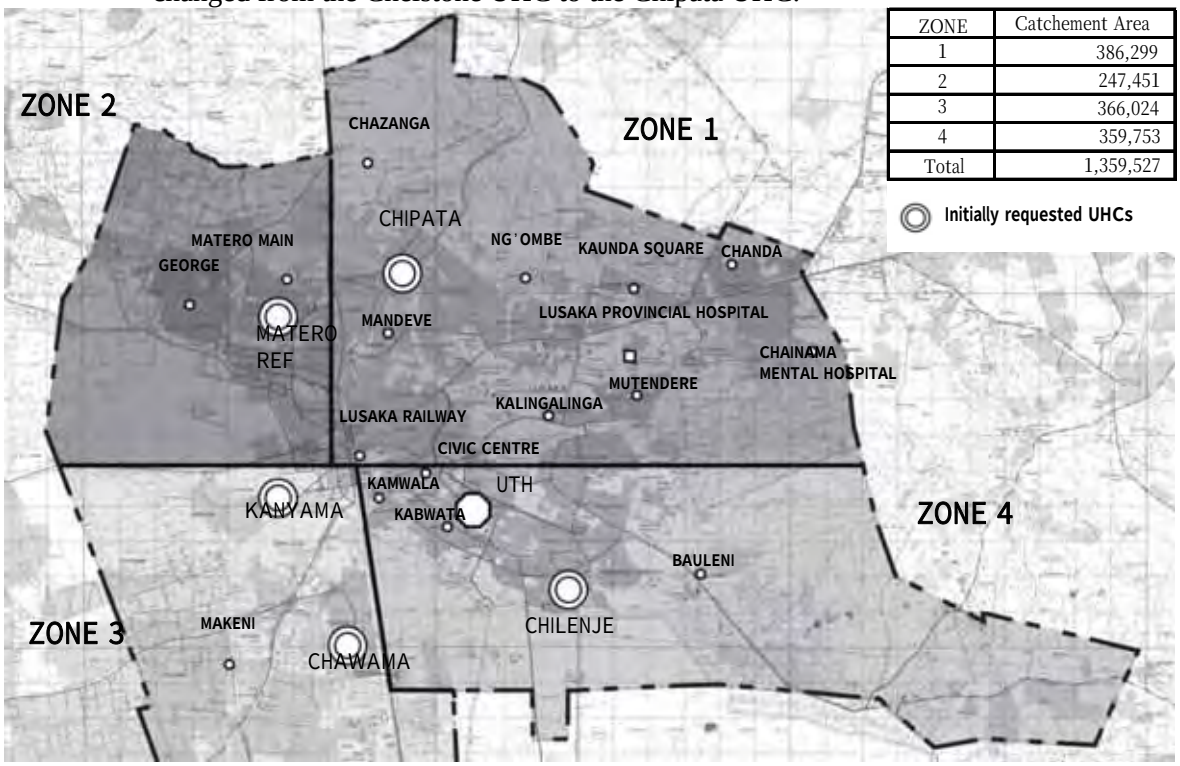
1) Facility Planning

① Original Request for previous Survey (2010)

The original request dated 25 August, 2009, was to strengthen five health centres in Lusaka City to provide equivalent functions of a district (primary)-level hospital and proposed the rehabilitation of the facilities at the five prospective sites, construction of additional facilities, and procurement of medical equipment.

Health Centres Included in the Original Request
- Chawama UHC (Urban Health Centre)
- Chipata UHC [*1]
- Chilenje UHC
- Kanyama UHC
- Matero UHC

[*1] By a letter from the other party as of 21 July, 2010, the requested health centre was changed from the Chelstone UHC to the Chipata UHC.



ZONE	Catchement Area
1	386,299
2	247,451
3	366,024
4	359,753
Total	1,359,527

Figure 2-2 Distribution of Facilities in Lusaka

② Final Request Confirmed through Field Investigation for previous Survey (2010)

The previous Preparatory Survey was conducted from 16 August to 23 September, 2010. To define a final request, we had comprehensive discussions mainly from the following points of view:

< Criteria for Narrowing Down Target UHC >
- Whether any central (primary- or secondary-level) hospitals are present in the same zone
- Development of a first level hospital by upgrading the existing UHC (Not creating a new first level hospital from scratch)
- Whether a sufficient site for the project can be secured

Based on the investigation, we narrowed down the target UHC in this project to two sites: the Matero UHC and the Chilenje UHC. The reasons that other centres were ruled out of the project is because, for the Chipata UHC, there was a secondary (provincial)-level hospital under construction in the same zone with the aid of China, and

for the Kanyama UHC and the Chawama UHC, we could not secure effective space to implement the project.

< Criteria for Narrowing Down Target Facilities >

- Whether the existing facilities are difficult to keep using due to deterioration or other factors
- Whether this is a necessary facility related to the surgery ward (constructed by Zambia)
- Whether the facilities have direct effects on the functions as a first level hospital
- Whether the project for the facilities overlaps with projects of other donors
- Scale of budget and operation

From the above points of view, the OPD building (examination department, administration department), the central examination building (laboratory department, medical imaging department, delivery department), and the surgery / paediatric ward in the Matero UHC are considered to be valid as a target of this project. In the Chilenje UHC, the OPD building (examination department, administration department) and the central examination building (medical imaging department, delivery department) are also considered to be valid. The project targeting the administration department of the OPD building and the central examination building, however, will be implemented on the condition that the right of use for the expanded plan area, which is currently owned by Lusaka City, can be obtained.

2) Equipment plan

As there was no list of the equipment requested by the Zambian side, discussions were held for its review and analysis with the responsible persons from the Ministry of Health, Provincial Health Office and District Health Office based on standard equipment lists for first level hospitals under the Zambian Ministry of Health. The following essential equipment not contained in the standard primary level equipment list was included in the planned equipment list.

Phototherapeutic equipment	Used to treat jaundice in newborns
Micropipette	Used in the clinical laboratory to infuse reagents in small or fixed quantities
Infusion pump	Used to infuse fluids in small or fixed quantities
Safety cabinet	Used to prevent in-hospital infection as tuberculosis tests are performed in the bacteria laboratory
Maintenance set	Used for simple maintenance and repairs in the target facilities
Training table set	Used for training in the target facilities

(2) Facility Planning

1) Review of Necessity and Adequacy of the Requested Facilities

We reviewed the necessity and adequacy of the final request by Zambia as described below.

① Background to Cooperation

a) Why the Matero UHC and the Chilenje UHC were Chosen as a Cooperation Target

Among the twelve national health priorities that the NHSP V mainly focuses on, there is an objective ‘to significantly improve the availability, distribution, and condition of appropriate essential infrastructure so as to improve equity of access to essential health

services'. The priority strategies for this objective include upgrading health centres to primary-medical-level hospitals.

In line with this strategy, since there are currently no primary- or secondary-level hospitals between UTH and UHC in the Lusaka district, other than Levy Mwanawasa Hospital (secondary level hospital, opened in 2011), MOH divides the Lusaka district into four zones and plans to upgrade the health centres with relatively large catchment populations in each zone to first level hospitals so that essential health services can be made equally accessible in the district. As part of this effort, a operation theatres are in preparation for operation in December 2010 in the five health centres in the district including the Matero UHC and the Chilenje UHC, which is a target of this project.

The Matero UHC and the Chilenje UHC belong to different zones from each other and already serve as referral health centres in each zone, so upgrading these hospitals is expected to have meaningful, significant effects.

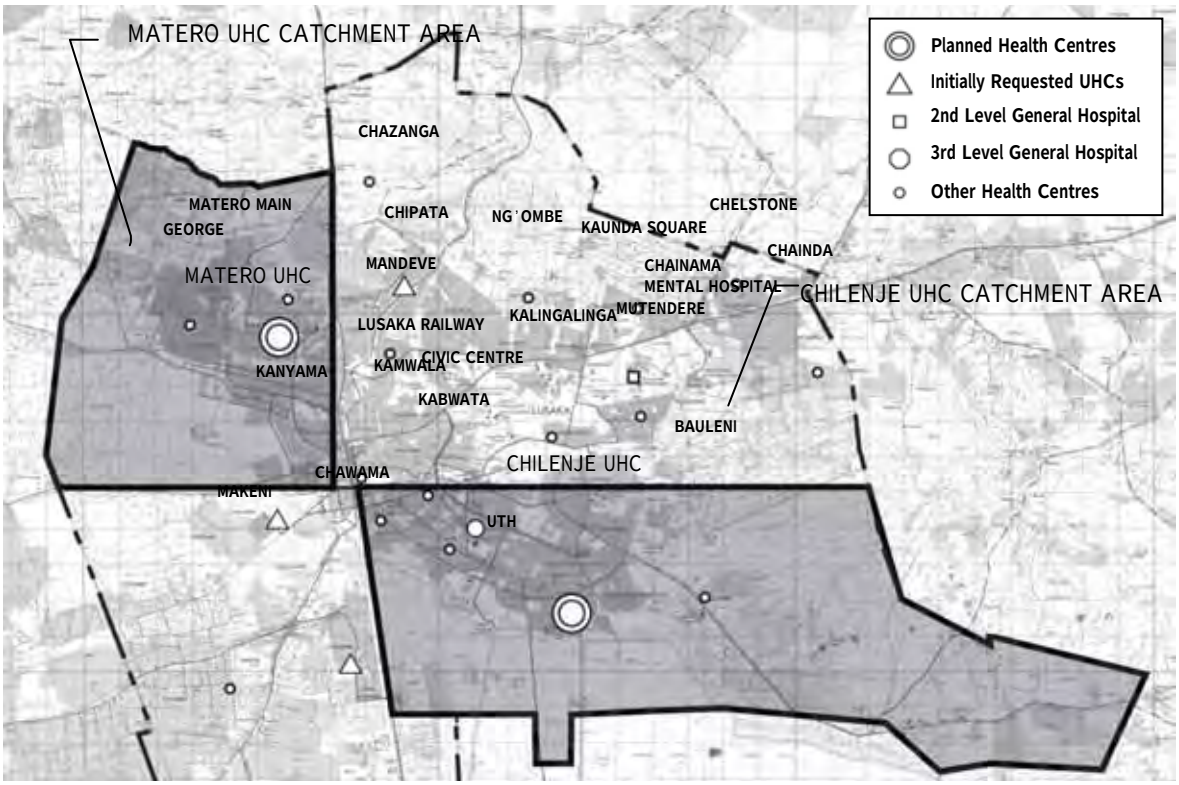


Figure 2-3 Beneficiary Area of Matero UHC and Chilenje UHC

b) Delay in Enhancing the Facilities in Many Years of Medical Activities

Although other donors have been taking care of the facilities and equipment partially for both these UHC, the overall deterioration especially in the OPD and central examination departments is marked because of the coming and going of many patients. These departments were remodelled from other facilities that originally had different functions, and this is one of the reasons that it was difficult to maintain the facilities in a proper way.

Accordingly, the facilities have suffered many problems as shown below in fulfilling their functions as a hospital facility, which requires immediate improvement:

- The quality of medical services is impaired due to poor layout, that is, the OPD and the central examination department are located in a different building.
- There is a risk of in-hospital infections and/or medical accidents as the routes for patients, staff, and goods cross each other in the facilities.
- Discharge of untreated waste materials or water harms the surrounding environment.
- Limited floor area for waiting halls, consultation rooms, and sick wards increases physical and mental burdens on patients (having to wait outdoors for a long time, shortage of hospital beds, etc.).

・ The too-short distance between neighbouring buildings of the facilities results in poor ventilation, limited daylighting, and insufficient protection of privacy. On top of that, the deterioration of each building of the facilities (most of them were built more than thirty years ago) worsens the indoor conditions.

② Review of Necessity and Adequacy of the Requested Facilities

Matero UHC

c) OPD Building

The existing OPD building facility was remodelled from the barn that was built when the site was used as farmland. For this reason, the rooms of the facility have high ceilings for a medical facility and it is obvious that the remodelling was an attempt that was somewhat forced. There are hygiene and privacy problems because the upper part of the walls is left open. The facility was built more than forty years ago, so the deterioration is also severe.

In addition, as there are not enough consultation rooms for the number of patients and the waiting halls are small, these places are really crowded. Therefore, we considered it appropriate to include the facility in the target of this project.

d) Central Examination Building

The existing delivery department has significantly deteriorated and there are not enough spaces in the labour room and the recovery room for the current number of deliveries. Along with upgrading the facilities, it will be necessary, from a nursing point of view, to plan a ward close to the delivery department to accommodate patients after undergoing Caesarean section to be performed in the surgery room. Therefore, we considered it appropriate to include the facility in the target of this project.

As for the laboratory, there is a hygiene problem because it uses a part of the old, deteriorated OPD building, and we considered it appropriate to include it in the target of this project.

On the other hand, the medical imaging department (X-ray) is in relatively good condition with the walls and fittings of the existing facility shielded, so it has been decided to target the equipment only.

e) Surgery Ward (Males / Females / Children)

As a part of the upgrade of the existing UHC to a primary level hospital, Zambia is preparing for operation of a operation theatre at Matero UHC. It is considered appropriate to include a surgery ward to accommodate patients who have undergone surgery in the Project facilities of both sites in order to realize the full potential of the new operation theatre.

f) Maternal and Child Health, ART/VCT, and Tuberculosis Wards

As for the maternal and child health department included in the original request, we noticed that the existing maternal and child health ward is indeed a little crowded, but the ward as a facility has relatively few problems like deterioration or ageing. Besides, in the light of the selection criteria, the facility does not have direct effects on the functions as a first level hospital, and this is not the kind of facility that requires especially high construction accuracy, so we assume that Zambia can handle it by itself, for example, with expansion of buildings. Therefore, it is agreed with Zambia to rule out the ward from our target. We suggested that Zambia later rehabilitate the old OPD building so that they can use it as a maternal and child health department, as the OPD building will no longer be in use once the construction for the project has been completed and everything has been transferred to a new facility. By doing so, the current crowded condition can be mitigated.

The ART/VCT department also functions properly at the health centre level like the maternal and child health department. There are also donors from other countries who are working on this such as ZEHRPS and CIDRZ, so to avoid any overlap with this project, we agreed with Zambia to rule out the department from our target.

For the tuberculosis department, the facility is relatively new and well maintained, so we agreed with Zambia to rule out the department from our target.

g) Kitchen / Laundry, Incinerator, Morgue

For these facilities that were included in the original request, there is no immediate connection with the functions as a first level hospital, and the existing facility properly functions without any problems, so we agreed with Zambia to rule out the facility from our target.

Chilenje UHC

a) OPD Building

The existing OPD building was built more than fifty years ago, so the deterioration is severe. As there are not enough consultation rooms for the number of patients, we confirmed the waiting halls are considerably crowded. Moreover, two different examinations for different patients are underway in the same consultation room, so there is a problem from the point of view of protecting privacy as well. Therefore, we considered it appropriate to include the facility in the target of this project.

b) Central Examination Building

The existing delivery department uses the facility built with the aid of Ireland. The deterioration is slightly perceptible, but to a degree that Zambia can handle the repair work by itself. Therefore, it is agreed with Zambia to target equipment only here. It is also agreed to include in our target the new ward department to accommodate patients after undergoing Caesarean section to be performed in the new surgery ward in line with the upgrade project of the existing UHC.
For the laboratory, the existing facility is somewhat small but there are no big problems in daily practice, so this is considered to be a low priority. Therefore, we agreed with Zambia to rule out it from our target.
For the medical imaging department (X-ray), examinations are currently provided in the facility without the walls or fittings shielded, so the staff who work here are always exposed to radiation. This is a very dangerous situation, so we considered it appropriate to include the facility in the target of this project.

c) Surgery Ward (Males / Females / Children)

As a part of the upgrade of the existing UHC to a primary level hospital, Zambia is preparing for operation of a operation theatre at Chilenje UHC. It is considered appropriate to include a surgery ward to accommodate patients who have undergone surgery in the Project facilities of both sites in order to realize the full potential of the new operation theatre. However, since it was difficult to secure enough space to construct a new surgery ward and also from the viewpoint of business size, we reached an agreement that Zambia will remodel the existing OPD building into a new ward after the project has been completed, because the construction of a new OPD building will make the existing OPD building available for new application.

d) Maternal and Child Health, ART/VCT, and Tuberculosis Wards

As for the maternal and child health department included in the original request, there is already enough space in the existing maternal and child health ward, and no specific problems such as deterioration or ageing could be confirmed. Therefore, we agreed with Zambia to rule out the department from our target.
For the ART/VCT department, a relatively new facility has already been built by donors from other countries, so to avoid any overlap with this project, we agreed with Zambia to rule out the department from our target.

e) Kitchen / Laundry, Incinerator, Morgue

For these facilities that were included in the original request, there is no immediate connection with the functions as a hospital, and the existing facility properly functions without any problems, so we agreed with Zambia to rule out the facility from our target.

③ Review of Adequacy from the Viewpoints of Human Resources and Budget

The Ministry of Health in Zambia showed us a standard staff assignment list for a first level hospital. Compared with the current staff assignment in the Matero UHC and the Chilenje UHC, we calculated the number of staff necessary for the area of the facilities to be remodelled. According to the calculation, a total of 151 new staff need to be hired for the two facilities, but except for practical nurses, the human resources required will be about two people for each job category. The main personnel will be no more than four doctors and 14 physician assistants. This number is feasible considering the fact that there are sufficient human resources in the health personnel market and we can also count on newly trained staff.
Also, in three years from 2011 the Ministry of Health in Zambia is planning to increase the number of medical staff by 5,100, including needed personnel for the project. In line with this, the Ministry of Finance is now working on securing the budget needed for the project.

2) Review Results for the Requested Facilities

It is true that the facilities and equipment need overall rehabilitation and renewal for the abovementioned reasons, but it will be appropriate for us to limit our cooperation target to the examination department (OPD and central examination) and the surgery ward, which will be necessary for maximising the use of the new operation theatre is in preparation for operation by Zambia,judging the necessity and adequacy of our gratuitous financial aid from viewpoints such as ‘whether the existing facilities are difficult to keep using due to deterioration or other factors’, ‘whether this is a necessary facility related to the surgery ward (constructed by Zambia)’, and ‘whether the facilities have direct effects on the functions as a first level hospital’.

(3) Equipment Plan

1) Equipment review

A summary of the equipment review for each department in the target facilities (Matero UHC and Chilenje UHC) is given below.

Matero UHC

Pharmacy:
In consideration of the water quality in Lusaka District, it is planned to install a distilled water production system. For the specifications, it will be a simple, robust Barnstead-type system.

Consulting room:
The consulting room shall be equipped with a consulting desk set, examination table, examination set, weight scales, etc. and the quantity of each item shall be the quantity appropriate for the number of rooms. The examination lamp shall be of the incandescent type, not the expensive halogen type whose lamp is expensive to replace. In addition, of the seven rooms, one shall be for the gynecology department and shall be equipped with gynecological examination tables.

Dental department:
There are holes in the dentist’s chair, the tray is rusting and the handpiece is in an unusable state. The project plans to provide an all-in-one dental unit consisting of chair, instrument tray, handpiece and light.
As the dental X-ray unit is unusable, it will be replaced.

Emergency unit:
For simple emergency treatment at a first level hospital, in consideration of sterilization time, three operative instrument sets and three pus drainage instrument sets are planned.

Laboratory:
A biochemical analyzer and hemocytometer essential for the functioning of a first level hospital will be provided, as well as a pure water production system (with pre-filter) for the biochemical analyzer.

Microorganism room:
As tuberculosis tests are performed at the target facilities, a safety cabinet is planned in order to prevent in-hospital infection.

Diagnostic imaging:
There is a general X-ray machine that was made in 1999, but it often breaks down and the burden of repair costs has increased in recent years. In addition, the equipment is expected to be in a worse condition in 2013, the planned equipment procurement period in this project, than it is at present, so it is planned to replace the equipment. As the existing X-ray room is robust and quite large enough and is also well protected, a new X-ray room will not be built, but new X-ray equipment will be installed in the existing X-ray room. The quality of the ultrasound images is also conspicuously poor due to aging, so the equipment will be replaced.

Delivery room:
The existing delivery room is very decrepit and rust can be seen here and there, so a simple, robust type of room is planned. In addition, as there is no infant warmer, a new one will be provided.

Premature room:
To relieve the burden of treatment at UTH, a new incubator and phototherapy equipment are planned that will enable a certain degree of treatment of premature babies at the target facilities.

Maintenance:
A tester and tool set are planned to enable preventive maintenance and simple repair of the equipment at the target facilities.

Chilenje UHC

Dental department:
In addition to the dilapidated dentist's unit, in consideration of the sterilization time, three dental instrument sets are planned.

Ophthalmology and ear, nose and throat (ENT) department:
An ophthalmoscope, otoscope and laryngoscope will be provided as the minimum required diagnostic instrument set.

Consulting room:
A basic 3-channel electrocardiograph is planned to enable electrocardiogram testing.

Laboratory:
A micropipette is planned for infusion of small amounts of reagent. There are no plans for construction of a new laboratory and the equipment will be installed in the existing facilities, but it is deemed that, as there are two laboratories, albeit small, in the target facilities, the planned equipment can be installed without problem.

Premature room:
As the single existing infant warmer is decrepit and there is no incubator or light therapy equipment, the infant warmer will be replaced and a new incubator and light therapy equipment will be procured.

Diagnostic imaging:
At present, the x-ray machine of a private company located on the premises of the target facilities is used and the facilities have no x-ray equipment of their own, so new general x-ray equipment will be procured.

Table 2-3 List of requested equipment for consideration and results of consideration

Criteria for selection of equipment

High priority equipment	Low priority equipment
1. The equipment which is indispensable for basic medical treatment in the facility. 2. The equipment which is obviously lacked and need an addition. 3. The equipment which its operation and maintenance can properly implemented in local country. 4. The equipment which is expected to be useful and high cost-benefit performance. 5. The equipment which can be operated with the current engineering level of healthcare personnel in the facility. 6. The equipment which is expected to ensure the healthcare personnel in the facility. 7. The equipment which is suitable for the role of facility (Referral system, medical needs)	1. The equipments which requiring high cost for maintenance. 2. The equipments have limited effect/ the equipments have low cost-benefit performance. 3. The equipments have academic research goal. 4. The equipment which can be replaced by the simpler ones 5. The equipment which can cause environment pollution by its waste. 6. The equipment which is not really necessary(its performance is the same with others) 7. The equipment which is difficult to buy spare parts, consumables in local country. 8. The equipment which is difficult to operate by the current engineering level in the facility. 9. The equipment of which the maintenance personnel is difficult to be ensured in the facility.

Matero UHC

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
Pharmacy																					
W-003	Analytical Balance	1	○		○		○	○	○											○	1
W-036	Drug Cabinet, Lockable	1	○		○		○	○	○											○	1
W-070	Mixer	1	○		○		○	○	○											○	1
W-077	Pharmacy Heavy Duty Trolley	1													○					×	0
W-078	Pharmacy Refrigerator	1	○		○		○	○	○											○	1
W-095	Tablet and Capsule Counter	1									○									×	0
W-096	Tablet Counting Trays	1									○									×	0
W-107	Vaccine Refrigerator	1													○					×	0
W-113	Water Distiller	1	○		○		○	○	○											○	1
Medical Consultation-1, Vitals																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-115	Weighing Scale for Infant	1	○		○		○	○	○											○	1
W-125	ECG	1	○		○		○	○	○											○	1

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
Medical Consultation-2, Pediatrics																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-3, Women																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-4, Women																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-041	Examination Couch, Gynecological	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-109	Vaginal Speculum (L, M, S)	3	○		○		○	○	○											○	3
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-5, Men																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-6, Eye/ENT																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
Medical Consultation-7, ART																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
Medical Consultation-8, Dental																					
W-004	Autoclave, Small	1	○		○		○	○	○											○	1
W-023	Dental Amalgamator	1												○						×	0
W-024	Dental Film Processor	1	○		○		○	○	○											○	1
W-025	Dental Instrument Set	3	○		○		○	○	○											○	3
W-026	Dental Light Curing Unit	1	○		○		○	○	○											○	1
W-027	Dental Suite	1	○		○		○	○	○											○	1
W-028	Dental Treatment Trolley	1											○							×	0
W-029	Dental X-ray Unit	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-105	Ultrasonic Dental Scaler	1	○		○		○	○	○											○	1
Treatment Room																					
W-032	Dressing Instrument Set	6	○		○		○	○	○											○	6
W-035	Drip Stand	2	○		○		○	○	○											○	2
W-040	Examination Couch	2	○		○		○	○	○											○	2
W-042	Examination Light	2	○		○		○	○	○											○	2

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
Casualty																					
W-002	Resuscitation Bag Set	1	○		○		○	○	○											○	1
W-004	Autoclave, Small	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	2	○		○		○	○	○											○	2
W-031	Drainage Set	3	○		○		○	○	○											○	3
W-032	Dressing Instrument Set	3	○		○		○	○	○											○	3
W-035	Drip Stand	3	○	○	○		○	○	○											○	3
W-075	Patient Trolley	2	○		○		○	○	○											○	2
W-042	Examination Light	2	○		○		○	○	○											○	2
W-067	Medicine Trolley	1													○					×	0
W-090	Stretcher on Wheels	2	○		○		○	○	○											○	2
W-091	Suction Pump	1	○		○		○	○	○											○	1
W-116	Wheel Chair	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Casualty, ICU (Observation)																					
W-075	Patient Trolley	3	○		○		○	○	○											○	3
Casualty, BID																					
W-090	Stretcher on Wheels	1	○		○		○	○	○											○	1
Conference Room																					
W-123	Educational Table and Chair Set	11	○		○		○	○	○											○	11
Laboratory, Main Laboratory																					
W-003	Analytical Balance	1	○		○		○	○	○											○	1
W-012	Blood Bank Refrigerator	1	○		○		○	○	○											○	1
W-015	CD4 Counting Machine	1											○							×	0
W-016	Centrifuge	1	○		○		○	○	○											○	1
W-017	Chair for Laboratory Worker	6	○		○		○	○	○											○	6
W-019	Chemistry Analyzer	1	○		○	○	○	○	○											○	1
W-050	Hematology Analyzer	1	○		○	○	○	○	○											○	1
W-054	Hot Air Oven	1	○		○		○	○	○											○	1
W-055	Hot Plate	1	○		○		○	○	○											○	1
W-061	Laboratory Incubator	1	○		○		○	○	○											○	1
W-068	Hematocrit Centrifuge	1	○		○		○	○	○											○	1
W-069	Microscope	2	○		○		○	○	○											○	2
W-076	PH Meter	1	○		○		○	○	○											○	1
W-078	Pharmacy Refrigerator	1	○		○		○	○	○											○	1
W-083	Roller Mixer	1	○		○		○	○	○											○	1
W-112	Water Bath	1	○		○		○	○	○											○	1
W-126	Micro Pipette	2	○		○		○	○	○											○	2
W-084	Rotator	1	○		○		○	○	○											○	1
W-121	Safety Cabinet	1	○		○		○	○	○											○	1
Laboratory, Sterilization																					
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-113	Water Distiller	1	○		○		○	○	○											○	1
Medical Imaging, X-ray Room																					
W-062	Lead Apron	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
W-119	X-ray Unit, Mobile	1									○									×	0
W-120	X-ray Unit	1	○		○	○	○		○											○	1
Medical Imaging, Ultrasound Room																					
W-106	Ultrasound Scanner with Printer	1	○		○	○	○	○	○											○	1

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
Medical Imaging, Dark Room																					
W-044	Automatic Film Processor	1	○		○		○	○	○											○	1
W-118	X-ray Loading Bench (Film Hopper)	1									○									×	0
Delivery, Ante-Natal/ Labor Room																					
W-007	Bed for Adult Set	9	○		○		○	○	○											○	9
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-046	Fetal Doppler	1	○		○		○	○	○											○	1
Delivery, Delivery Room																					
W-021	Cupboard, Lockable	1									○									×	0
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-014	Cardio-Toco Graph Machine	1	○		○		○	○	○											○	1
W-022	Delivery Bed	4	○		○		○	○	○											○	4
W-042	Examination Light	5	○		○		○	○	○											○	5
W-057	Infant Cot with Mattress	4	○		○		○	○	○											○	4
W-034	Dressing Trolley	2													○					×	0
W-035	Drip Stand	2	○	○	○		○	○	○											○	2
W-039	Episiotomy Set/ Delivery Set	8	○		○		○	○	○											○	8
W-048	Glucometer	1	○		○		○	○	○											○	1
W-059	Instrument Trolley	4	○		○		○	○	○											○	4
W-060	Kick About Bowl	1											○							×	0
W-108	Vacuum Extractor	1	○		○		○	○	○											○	1
W-109	Vaginal Speculum (L, M, S)	2	○		○		○	○	○											○	2
W-115	Weighing Scale for Infant	1	○		○		○	○	○											○	1
W-116	Wheel Chair	1	○		○		○	○	○											○	1
W-082	Resuscitator with Timer	3	○		○		○	○	○											○	3
W-040	Examination Couch	1	○		○		○	○	○											○	1
Delivery, Post-Natal Room-1																					
W-007	Bed for Adult Set	4	○		○		○	○	○											○	4
W-057	Infant Cot with Mattress	4	○		○		○	○	○											○	4
Delivery, Post-Natal Room-2																					
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-034	Dressing Trolley	1	○		○		○	○	○											○	1
W-035	Drip Stand	3	○	○	○		○	○	○											○	3
W-048	Glucometer	1	○		○		○	○	○											○	1
W-007	Bed for Adult Set	12	○		○		○	○	○											○	12
W-057	Infant Cot with Mattress	12	○		○		○	○	○											○	12
W-091	Suction Pump	1	○		○		○	○	○											○	1
W-104	Trolley, Medicine	1													○					×	0
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-127	Infusion Pump	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
Premature																					
W-073	Neonatal Incubator	3	○		○		○	○	○											○	3
W-079	Phototherapy Unit	1	○		○		○	○	○											○	1
W-082	Resuscitation Set with	1	○		○		○	○	○											○	1

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
	Timer																				
Maintenance																					
W-122	Maintenance Set	1						○												○	1
Surgical Ward																					
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-007	Bed for Adult Set	24	○		○		○	○	○											○	24
W-030	Diagnostic Set	3	○		○		○	○	○											○	3
W-032	Dressing Instrument Set	5	○		○		○	○	○											○	5
W-034	Dressing Trolley	5	○		○		○	○	○											○	5
W-035	Drip Stand	6	○	○	○		○	○	○											○	6
W-091	Suction Pump	1	○																	○	1
W-104	Trolley, Medicine	1													○					×	0
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-116	Wheel Chair	2	○		○		○	○	○											○	2
W-127	Infusion Pump	1	○		○		○	○	○											○	1
Pediatric Ward																					
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-128	Bed for Child with Side Cabinet	18	○		○		○	○	○											○	18
W-030	Diagnostic Set	3	○		○		○	○	○											○	3
W-032	Dressing Instrument Set	5	○		○		○	○	○											○	5
W-034	Dressing Trolley	5	○		○		○	○	○											○	5
W-035	Drip Stand	6	○	○	○		○	○	○											○	6
W-091	Suction Unit	1	○		○		○	○	○											○	1
W-104	Trolley, Medicine	1													○					×	0
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-116	Wheel Chair	1	○		○		○	○	○											○	1
W-127	Infusion Pump	1	○		○		○	○	○											○	1

Chilenje UHC

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
Pharmacy																					
W-003	Analytical Balance	1	○		○		○	○	○											○	1
W-036	Drug Cabinet, Lockable	1	○		○		○	○	○											○	1
W-070	Mixer	1	○		○		○	○	○											○	1
W-077	Pharmacy Heavy Duty Trolley	1													○					×	0
W-078	Pharmacy Refrigerator	1	○		○		○	○	○											○	1
W-095	Tablet and Capsule Counter	1									○									×	0
W-096	Tablet Counting Trays	1									○									×	0
W-107	Vaccine Refrigerator	1													○					×	0
W-113	Water Distiller	1	○		○		○	○	○											○	1
Medical Consultation-1, Vitals																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-115	Weighing Scale for Infant	1	○		○		○	○	○											○	1
W-125	ECG	1	○		○		○	○	○											○	1

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
Medical Consultation-2, Pediatrics																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-3, Eye/ENT																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-4, Men																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-5, Men																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-6, Women																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-7, Women																					
W-020	Consulting desk and Chair Set	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	1	○		○		○	○	○											○	1
W-041	Examination Couch, Gynecological	1	○		○		○	○	○											○	1
W-042	Examination Light	1	○		○		○	○	○											○	1
W-109	Vaginal Speculum (L, M, S)	3	○		○		○	○	○											○	3
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Medical Consultation-8, Dental																					
W-004	Autoclave, Small	1	○		○		○	○	○											○	1
W-023	Dental Amalgamator	1												○						×	0
W-025	Dental Instrument Set	3	○		○		○	○	○											○	3
W-026	Dental Light Curing Unit	1	○		○		○	○	○											○	1
W-027	Dental Suite	1	○		○		○	○	○											○	1
W-028	Dental Treatment Trolley	1											○							×	0
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-105	Ultrasonic Dental Scaler	1	○		○		○	○	○											○	1
Medical Consultation-9, ART																					
W-020	Consulting Desk and	1	○		○		○	○	○											○	1

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
	Chair Set																				
Dental X-ray																					
W-024	Dental Film Processor	1	○		○		○	○	○											○	1
W-029	Dental X-ray Unit	1	○		○		○	○	○											○	1
Treatment Room																					
W-032	Dressing Instrument Set	6	○		○		○	○	○											○	6
W-035	Drip Stand	2	○		○		○	○	○											○	2
W-040	Examination Couch	2	○		○		○	○	○											○	2
W-042	Examination Light	2	○		○		○	○	○											○	2
Casualty																					
W-002	Resuscitation Bag Set	1	○		○		○	○	○											○	1
W-004	Autoclave, Small	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-030	Diagnostic Set	2	○		○		○	○	○											○	2
W-031	Drainage Set	3	○		○		○	○	○											○	3
W-032	Dressing Instrument Set	3	○		○		○	○	○											○	3
W-035	Drip Stand	2	○	○	○		○	○	○											○	2
W-075	Patient Trolley	2	○		○		○	○	○											○	2
W-042	Examination Light	2	○		○		○	○	○											○	2
W-067	Medicine Trolley	1													○					×	0
W-090	Stretcher on Wheels	2	○		○		○	○	○											○	2
W-091	Suction Pump	1	○		○		○	○	○											○	1
W-116	Wheel Chair	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
Casualty, ICU (Observation)																					
W-075	Patient Trolley	3	○		○		○	○	○											○	3
Casualty, BID																					
W-090	Stretcher on Wheels	1	○		○		○	○	○											○	1
Conference Room																					
W-123	Educational Table and Chair Set	11	○		○		○	○	○											○	11
Laboratory																					
W-003	Analytical Balance	1	○		○		○	○	○											○	1
W-012	Blood Bank Refrigerator	1	○		○		○	○	○											○	1
W-015	CD4 Counting Machine	1											○							×	0
W-016	Centrifuge	1	○		○		○	○	○											○	1
W-019	Chemistry Analyzer	1	○		○	○	○	○	○											○	1
W-050	Hematology Analyzer	1	○		○	○	○	○	○											○	1
W-054	Hot Air Oven	1	○		○		○	○	○											○	1
W-055	Hot Plate	1	○		○		○	○	○											○	1
W-061	Laboratory Incubator	1	○		○		○	○	○											○	1
W-068	Hematocrit Centrifuge	1	○		○		○	○	○											○	1
W-069	Microscope	2	○		○		○	○	○											○	2
W-076	PH Meter	1	○		○		○	○	○											○	1
W-078	Pharmacy Refrigerator	1	○		○		○	○	○											○	1
W-083	Roller Mixer	1	○		○		○	○	○											○	1
W-112	Water Bath	1	○		○		○	○	○											○	1
W-126	Micro Pipette	2	○		○		○	○	○											○	2
W-084	Rotator	1	○		○		○	○	○											○	1
W-121	Safety Cabinet	1	○		○		○	○	○											○	1
Laboratory, Sterilization																					
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-113	Water Distiller	1	○		○		○	○	○											○	1
Medical Imaging, X-ray Room																					

No.	Name of Equipment	Requested Quantity	High Priority							Low Priority										Evaluation	Planned Quantity
			1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10		
W-062	Lead Apron	1	○		○		○	○	○											○	1
W-117	X-ray Film Viewer	1	○		○		○	○	○											○	1
W-119	X-ray Unit, Mobile	1									○									×	0
W-120	X-ray Unit	1	○		○	○	○	○	○											○	1
Medical Imaging, Dark Room																					
W-044	Automatic Film Processor	1	○		○		○	○	○											○	1
W-118	X-ray Loading Bench (Film Hopper)	1									○									×	0
Medical Imaging, Ultrasound Room																					
W-106	Ultrasound Scanner with Printer	1	○		○	○	○	○	○											○	1
W-040	Examination Couch	1	○		○		○	○	○											○	1
W-020	Consulting Desk and Chair Set	1	○		○		○	○	○											○	1
Delivery, Ante-Natal/ Labor Room																					
W-007	Bed for Adult	1	○		○		○	○	○											○	1
W-114	Weighing Scale	1	○		○		○	○	○											○	1
W-046	Fetal Doppler	1	○		○		○	○	○											○	1
Delivery, Delivery Room																					
W-021	Cupboard, Lockable	1									○									×	0
W-005	Autoclave, Medium	1	○		○		○	○	○											○	1
W-058	Instrument Cabinet	1	○		○		○	○	○											○	1
W-014	Cardio-Toco Graph Machine	1	○		○		○	○	○											○	1
W-022	Delivery Bed	3	○		○		○	○	○											○	3
W-042	Examination Light	4	○		○		○	○	○											○	4
W-057	Infant Cot with Mattress	3	○		○		○	○	○											○	3
W-034	Dressing Trolley	2													○					×	0
W-035	Drip Stand	2	○	○	○		○	○	○											○	2
W-039	Episiotomy Set/ Delivery Set	6	○		○		○	○	○											○	6
W-048	Glucometer	1	○		○		○	○	○											○	1
W-059	Instrument Trolley	3	○		○		○	○	○											○	3
W-060	Kick About Bowl	1											○							×	0
W-108	Vacuum Extractor	1	○		○		○	○	○											○	1
W-109	Vaginal Speculum (L, M, S)	2	○		○		○	○	○											○	2
W-115	Weighing Scale for Infant	1	○		○		○	○	○											○	1
W-116	Wheel Chair	1	○		○		○	○	○											○	1
W-082	Resuscitator with Timer	2	○		○		○	○	○											○	2
W-040	Examination Couch	1	○		○		○	○	○											○	1
Delivery, Post-Natal Room																					
W-007	Bed for Adult	11	○		○		○	○	○											○	11
W-057	Infant Cot with Mattress	11	○		○		○	○	○											○	11
Premature																					
W-073	Neonatal Incubator	3	○		○		○	○	○											○	3
W-079	Phototherapy Unit	1	○		○		○	○	○											○	1
W-082	Resuscitator with Timer	1	○		○		○	○	○											○	1
Maintenance																					
W-122	Maintenance Set	1						○												○	1

2-2-2-2 Site / Facility Layout Planning

(1) Matero UHC

1) Shape of the Site and Ground

The vast site of about 3.9 ha has a descending slope toward the northwest with the south of the site facing a street. The existing health centre facility is located almost in the middle of the site with separate buildings. The open area of about 1.2 ha lying to the west of the existing facility is a planned construction site, and there is almost a 4-m difference in height within the site.
According to the ground investigation results, the ground consists of soft sandy soil containing gravel in the ragne from a 1-m to a 3-m depth below the surface, and deeper than that, it is extremely hard silty, sandy soil.

2) Surrounding Environment and Infrastructure Conditions

The Matero UHC is a regional central health centre in Zone 2, lying on the northwest side of the city. The gate of the health centre faces Chitimukulu Street, which is one of the main roads in the city. It is in a residential area where a primary school and a stadium are located nearby.
For electricity supply, the power generated in a hydroelectric plant by ZESCO is supplied to the Matero region. However, power cut occurs about twice a week (two hours for each event) in the dry season and every day (six hours a day) in the rainy season, which is far from a stable supply. At present, 11-kVA high-voltage power of ZESCO is drawn to the 100-kVA transformer of ZESCO from the gradient in the east of the site to distribute power to the health centre and its neighbourhood. The 11-kV high-voltage power line of ZESCO is routed in the frontal street of the site.

According to ZESCO, they are able to provide more stable power if the existing high voltage transformer incoming lines are utilized. It was explained that this line was subject to fewer power outages since it was an extension of the power lines to the nearby stadium completed under funding by China, and recieved power directly from the main central power distribution board of ZESCO.

For water supply, water is reserved in a high-level tank (about 500 m3) located on the hill close to the site and supplied to the target area in the project using a gravity flow system. Old piping was replaced with 250-mm PVC in 2009 with the help of China, so the water pressure is unproblematic. The water supply conditions in the health centre, however, are poor because they use deteriorated piping to connect with it, and on top of that, the water supply is now cut off because the district health office has not paid the water bill. Therefore, they pump water up to an elevated water tank using a well near the morgue and supply the water to each place using a gravity method. During the previous Survey, it was revealed that water supply was unavailable due to the collapse of the old water tower built on weak soil, affecting medical activities. During the present Survey it was found that a small high water tank had been provided and water supply had resumed to UTC.

For a sewerage system, 200 mmφ of public sewerage piping of Lusaka City has been installed and a part of the sewer main crosses the health centre site. The miscellaneous sewerage drainage produced at the site is connected to the public sewerage system and directly discharged. There is a problem however, which is that the exhaust pipe newly installed at the site when constructing the new surgery ward crosses the target site in the project. Therefore, we requested that they relocate the pipe. There is no rainwater drainage network, so the rainwater just passes through the site.

General waste is collected twice a week by the city. Medical waste is collected within the site and disposed of using an incinerator.

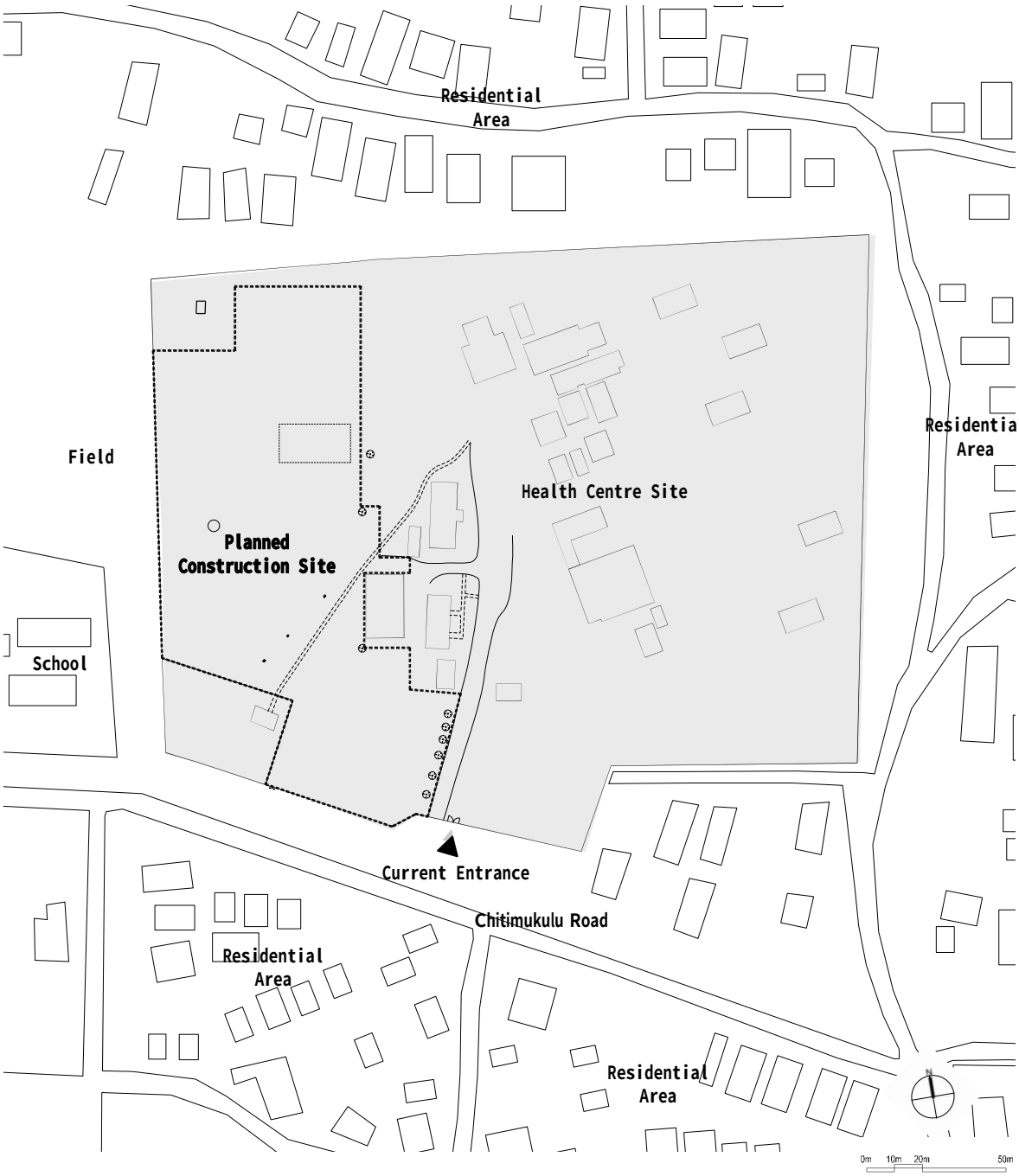


Figure 2-4 Matero UHC Surrounding Environment of Construction Site

3) Land Use Planning

Based on the current situation of the existing facility and the analysis results of the requested plan for the target facility as described above, we will make a master plan to upgrade the Matero UHC in cooperation with the Ministry of Health. On the basis of the master plan, we will plan the layout of the target facility keeping the following points in mind:

① Appropriate routing to make medical services more efficient

--> The OPD and the central examination department will be consolidated.

② Continuous provision of medical services

--> A facility upgrade plan that allows continued medical services during the construction period of the facility will be proposed.

③ Ensuring a proper size of the facility

--> The current number of patients, possible population growth, and number of medical staff will be considered in order to calculate the number of rooms needed.

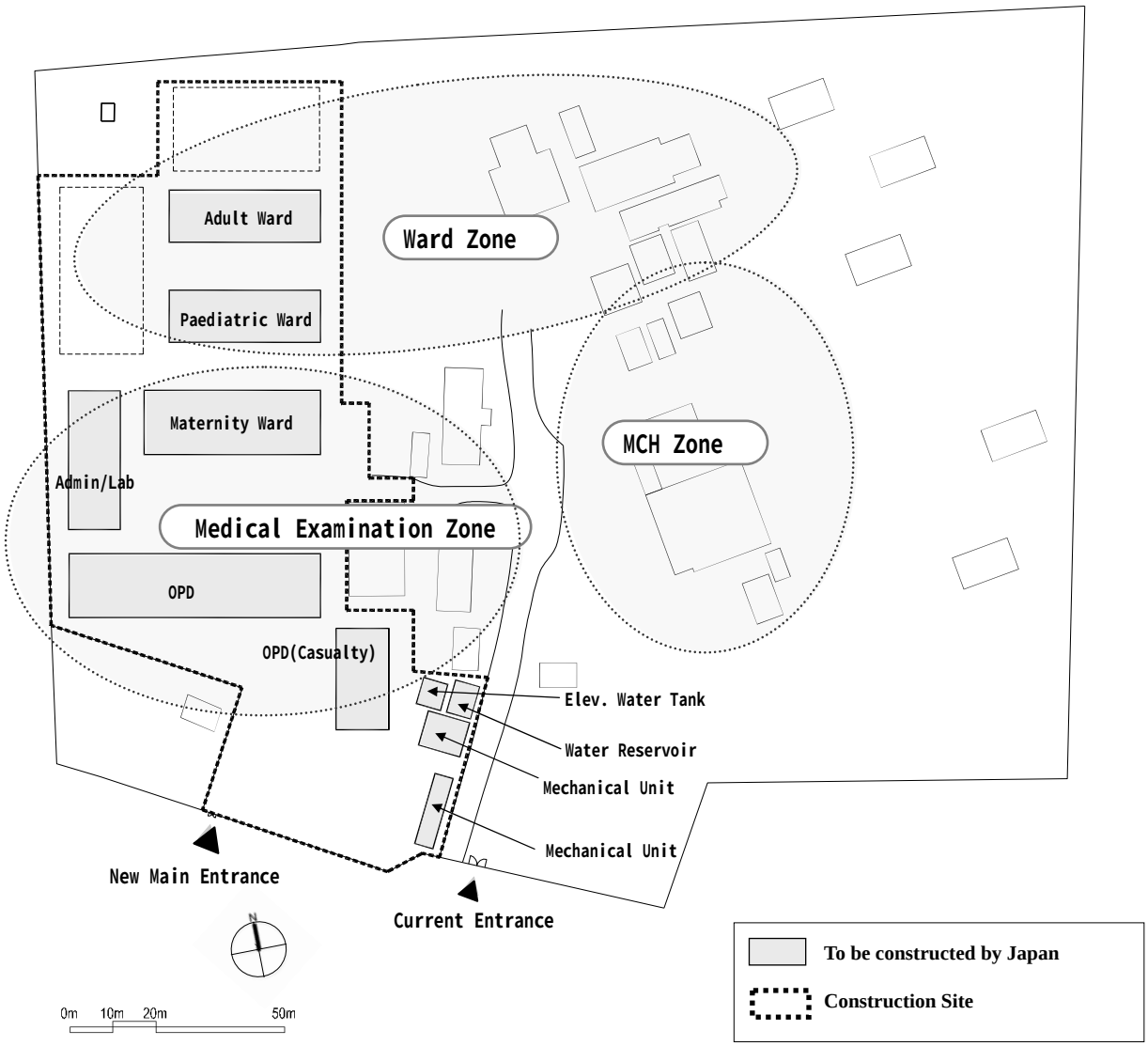


Figure 2-5 Relation between Matero UHC Master Plan and the Present Cooperation Project

4) Facility Layout Planning

The target departments in this project include the OPD (general examination, emergency examination), the laboratory department, the administration department, the maternity ward department, and the adult & Paediatric wards. The existing site has vast, sufficient open area, so we will plan the layout of these facilities so that their coordination with the operation theatre been builting by Zambia can be maximised.

The site has a difference in height, so we will keep the development of the land to a minimum at ground level, which is reasonably achievable from structure and facility viewpoints. To help provide smooth, effective medical services, we will make a section plan with less difference in height inside the facility.

Each department shall be arranged with the exterior corridors running north-south on the site at the core, while paying attention to coordination with the existing facility, prevention of in-hospital infections, effective and efficient administrative operation, clear zoning of each department, and possible extension in the future. The departments will be divided into six

buildings: OPD building, casualty building, administration / laboratory building, maternity building, paediatric ward, and adult ward. To ensure that these departments can coordinate with each other smoothly, each department will be linked with exterior corridors. The plan shall provide a sufficient gap between the neighbouring buildings so that all buildings can enjoy sufficient daylighting and ventilation.

Mechanical-related rooms to stock generators for emergency and other equipment shall be located where it is easy to access existing aisles so that fuel and other things can easily be carried in, and also so that electricity can easily be drawn. The elevated water tank for water supply shall be placed adjacent to the mechanical rooms and in as high a ground position as possible.

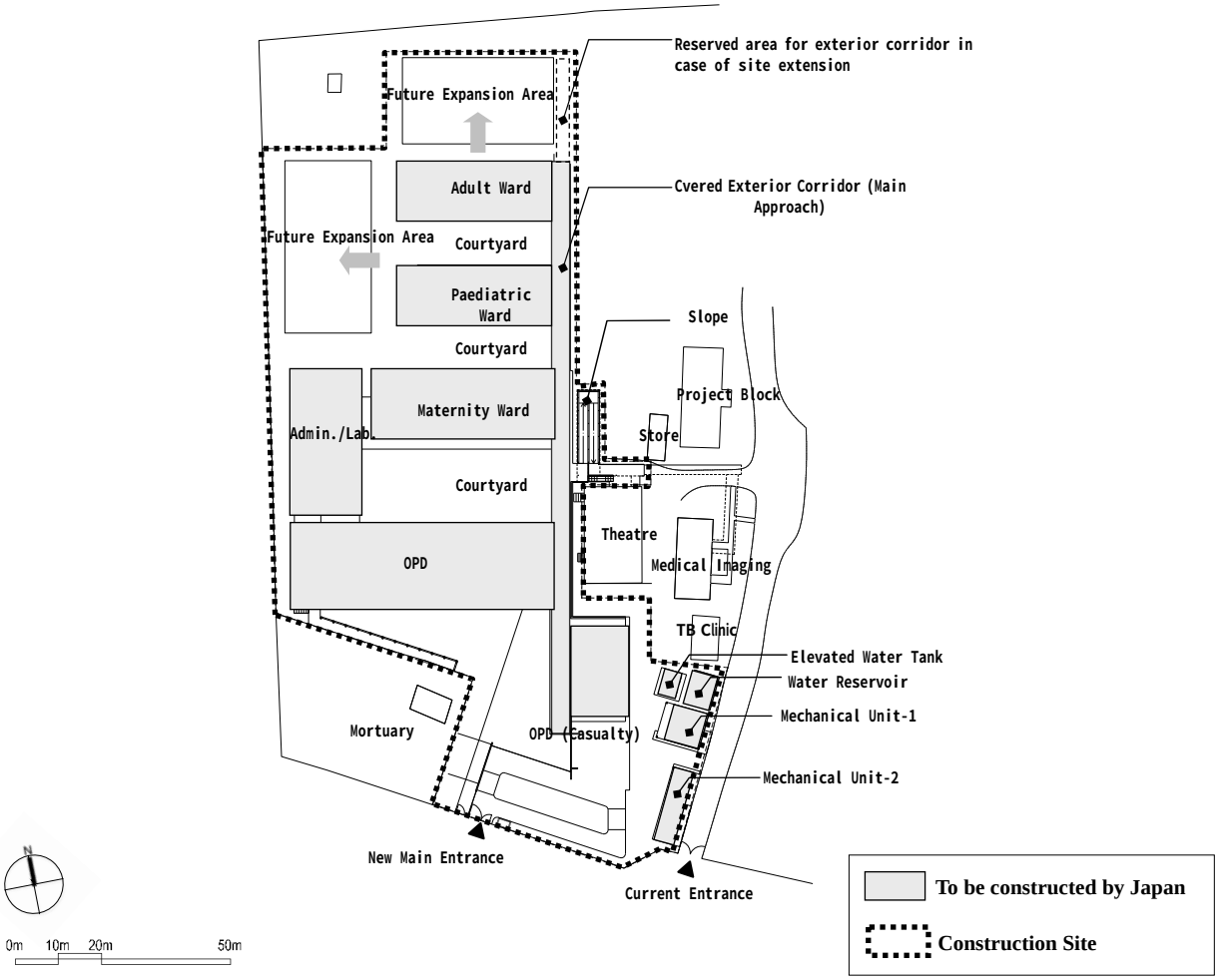


Figure 2-6 Existing facilities and the layout plan of Matero UHC project facilities

(2) Chilenje UHC

1) Shape of the Site and Ground

With about 1.2 ha of nearly flat land, the site of the existing Chilenje UHC faces the road on the northwest and east sides with a community centre and a square located at the south. In addition, about 1,800 m^2 of extension land has been secured by the Ministry of Health to the south of the existing site to be used as land for this project. The extension land is currently owned by Lusaka City, but it was confirmed that the City have already received written approval to transfer the licence from the city council to the Ministry of Health as of October 2010. It was confirmed that this Approval remained in effect as of December 2012.

According to the ground investigation results, the ground consists of silty viscous soil in the range from a 1-m to a 4-m depth below the surface, and deeper than that, it is silty viscous soil

containing gravel. The deeper the ground, the harder it gets, but some places have soft ground from the surface to approximately down to -5 m. There are also some places where limestone is contained in the surface.

2) Surrounding Environment and Infrastructure Conditions

The Chilenje UHC is a regional central health centre in Zone 4, lying to the south of the city's sub-district and located close to the city centre. The gate of the health centre faces Mulamba Street, which is nestled between Chilimbulu and Muramba Streets. It is in a residential area where a court and an assembly house are located nearby.

For electricity supply, the power generated in a hydroelectric plant of ZESCO is supplied to the Chilenje region through a neighbouring special high-voltage substation (33 kV). Power cut occurs about twice a week (two hours for each event) through the whole year, which one can call a reasonably stable supply. The 11-kVA high-voltage power of ZESCO is drawn to the 100-kVA transformer of ZESCO from the south of the site to distribute power exclusively to the health centre. The 11-kV high-voltage power line of ZESCO is routed through Muramba Road, located 80 meters south of the newly purchased extension to the planned construction site.

For water supply, there are draw-in pipes of 25 mmφ and 50 mmφ from the 80-mmφ water supply mains in Mulamba Street running in front of the site, and while water is supplied to the FRP water reserve in the concrete underground, the water is supplied with direct pressure. Water is also pumped up to an elevated water tank using a well near the newly built operation theatre and water is supplied to each place using a gravity method. But at this point, the water reserve is used only for water storage because the pump is broken. In addition, the elevated water tank tower has considerably deteriorated. However, there is quite a big water storage tank that is clean nearby, and an improvement plan is underway for a neighbouring water supply piping network including a water station, so the water supply conditions are expected to considerably improve. It was reported that a new 100mm water main would be laid next year under the road on north side of UHC by City Water Corporation. It was confirmed that the water supply to UHC would be improved.

It was confirmed that the public sewerage mains of Lusaka City has been installed under the front Road and under Muramba Road located 80 meters south of the site.
However, water discharged from the buildings on the south and the newly built operation theatre is drained into the existing simple septic tank and osmotic tank. Since these two tanks are located within our construction site, we requested that they relocate the tanks. There is no rainwater drainage network, so rainwater just passes through the site.

General waste is collected twice a week by the city. Medical waste is collected within the site and disposed of using an incinerator.

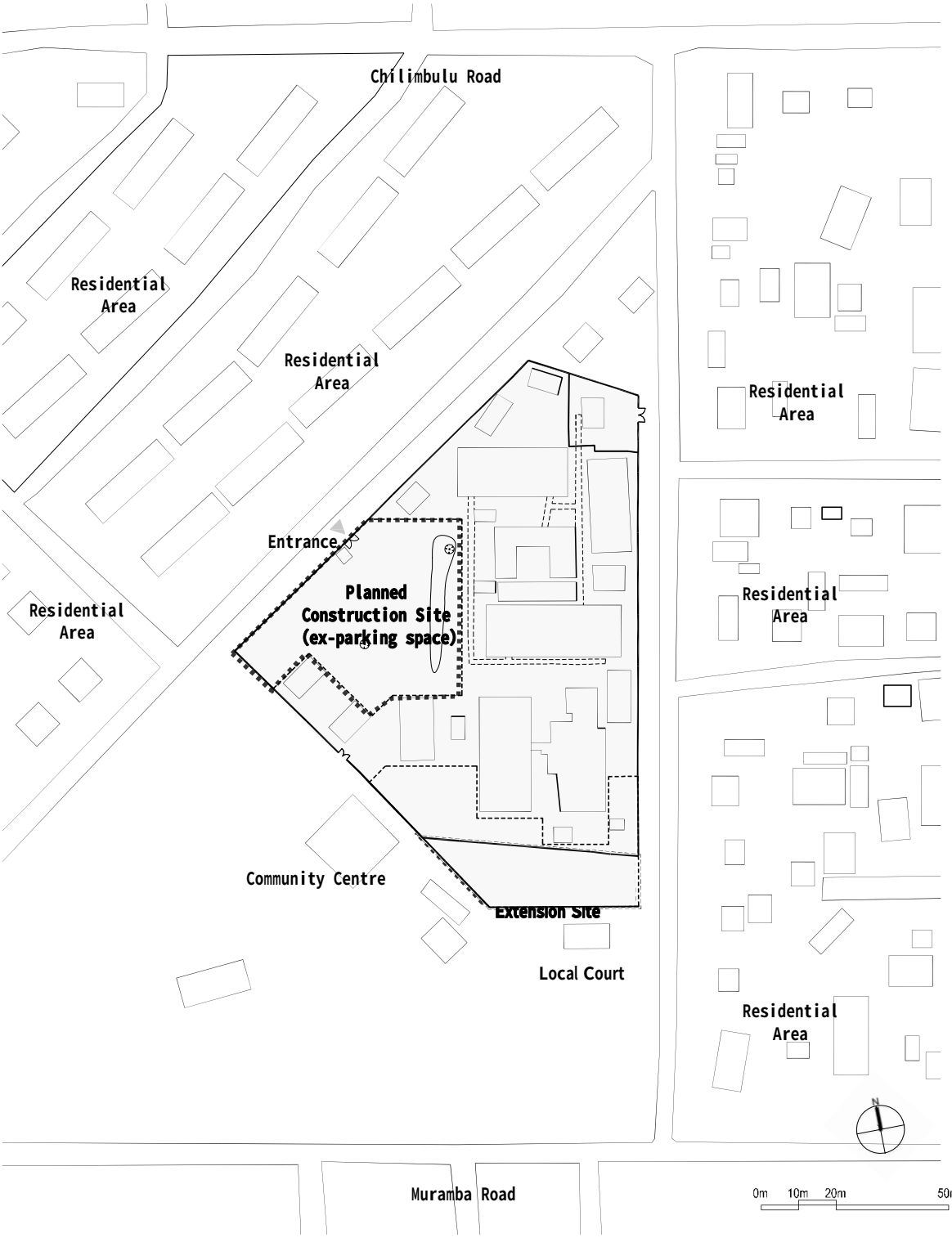


Figure 2-7 Chilenje UHC Surrounding Environment of Construction Site

3) Land Use Planning

In the Chilenje UHC, the general examination and the causalty department are placed in the existing parking space close to the main entrance at the side of the frontal road in the northwest. The medical imaging department, the maternity surgery department, and the administration department are located between the existing surgery department located in the vicinity and the delivery building.

Based on the current situation of the existing facility and the analysis results of the requested plan for the target facility as described above, we will make a master plan to upgrade the Chilenje UHC. On the basis of the master plan, we will plan the layout of the target facility keeping the following points in mind:

① Appropriate routing to make the medical services more efficient

--> The OPD, the central examination department, and the maternity department will be consolidated.

② Continuous provision of the medical services

--> A facility upgrade plan that allows continued medical services during the construction period of the facility will be proposed.

③ Ensuring a proper size of the facility

--> The current number of patients will be considered in order to calculate the number of rooms needed.

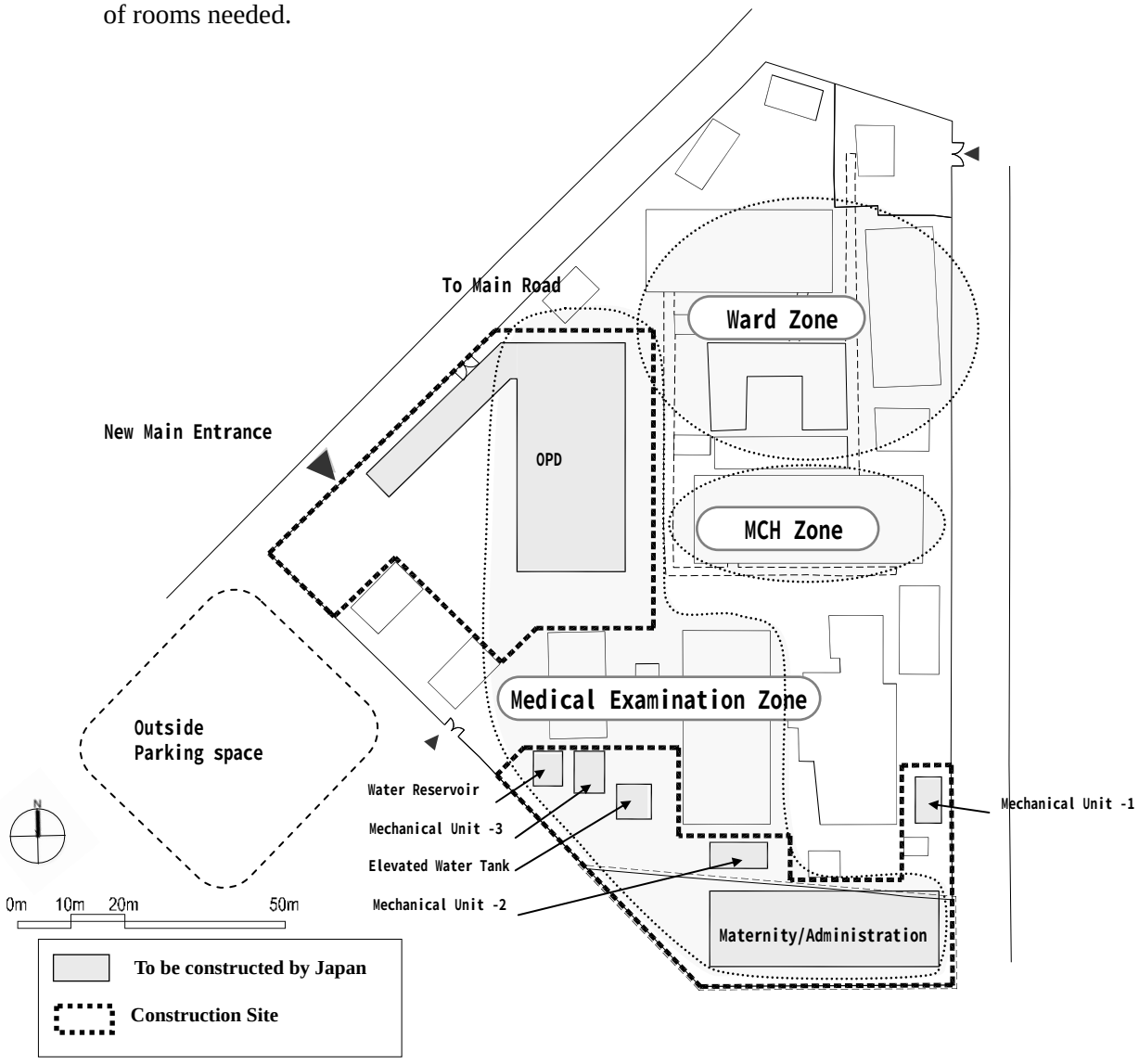


Figure 2-8 Facilities improvement master plan for Chilenje UHC

4) Facility Layout Planning

The target departments in this project include the OPD (general examination, causalty departments), the central examination (medical imaging department, isolation ward), and the administration department. These departments will be divided into two buildings to effectively utilise the planned site: the OPD building, and the maternity / administration building. The OPD building will be located in the existing parking space facing the frontal road for easy access, and the maternity / administration building will be placed at the extension site close to both the existing maternity building and the operation theatre to facilitate coordination between relevant departments. We checked with the Zambia side that using the existing parking space for the

project would be no problem because the UHC has already saved other parking space in south of the site. The two buildings will be linked to each other with covered exterior corridors, and also connected to the existing operation theatre, so that patients and staff can travel smoothly and coordination between facilities can be enhanced.

The mechanical building to stock generators for emergency and other equipment shall be arranged to the north of the existing incinerator and away from the wards, considering power supply to the new buildings, easy draw-in from the roads, and prevention of possible noise. The other mechanical rooms and the elevated reservoir shall be placed adjacent to the south of the existing surgery ward considering effective utilisation of the planned site and easy access for maintenance.

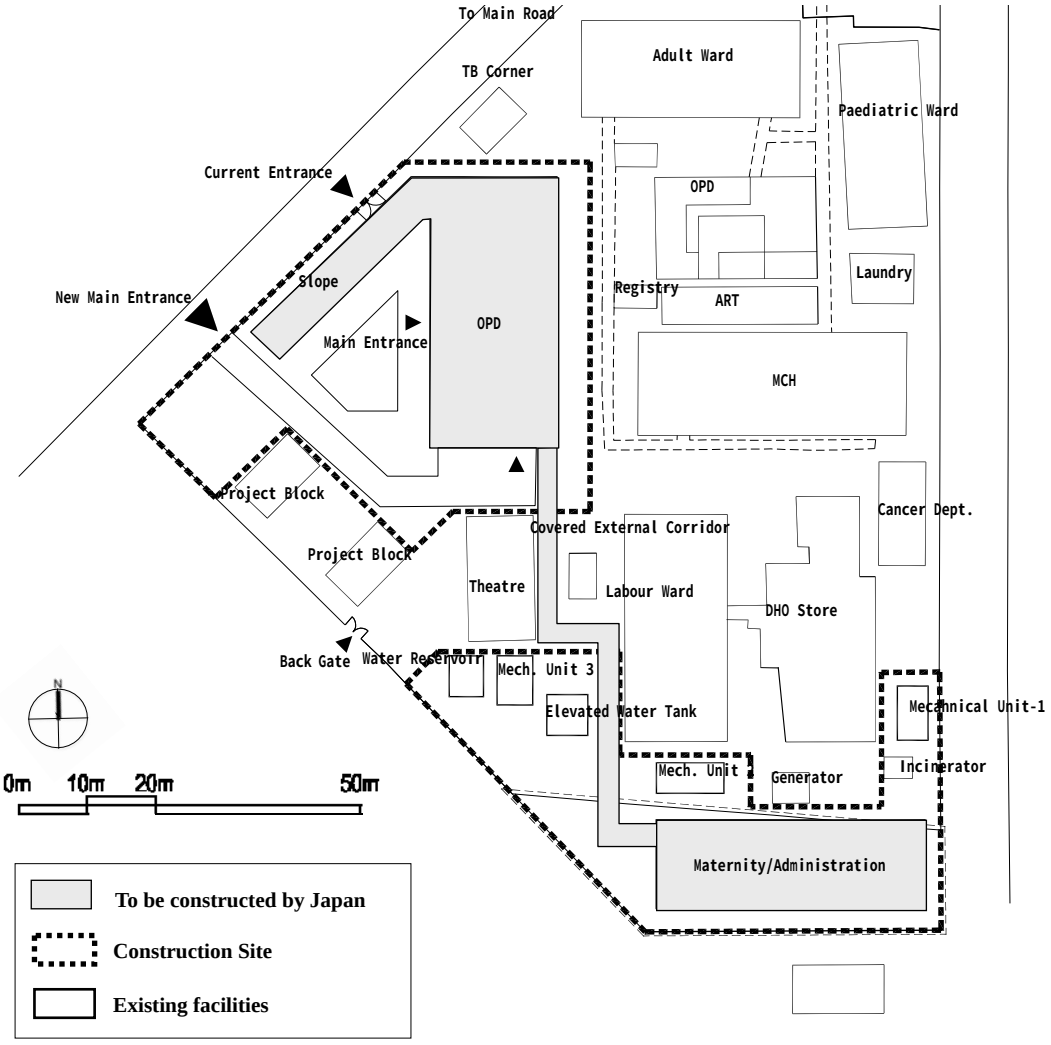


Figure 2-9 Facilities planning layout for Chilenje UHC

2-2-2-3 Facility Plan

I. Architectural Plan

(1) Setting Conditions for the Scale of the Facility

Once the project has been completed, the health centre will be upgraded to a primary (district)-level hospital, so that patients needing primary-level medical services can be examined in the facility without having to be referred to UTH.
Therefore, to define an appropriate scale for various rooms in the target departments of the project, we have to consider the number of patients receiving existing medical services and the number of patients of a primary medical level out of the number of patients currently referred to UTH in addition to the estimated number of patients for 2020, five years after the scheduled completion date of 2015 for the target facilities. Based on these numbers, we will calculate the number of rooms and beds needed using the following prerequisites. Estimation of the number of patients is based on past data from UTH, the district health office, and each health centre as well as the population growth rate in Zambia.

1) Population in Lusaka City and Estimated Number of Patients

Based on the assumption that the number of patients is proportional to the population, we will first estimate the population in Lusaka City for 2020 from the population growth rate.
The population growth rate is supposed to be calculated from past population statistical data, but when we checked the population statistical data of the Zambia Central Statistical Office, we noticed that there are variations in the numbers since they used a different method of collecting data before 2007.
Therefore, we agreed with the district health office to employ 1.6% of the population growth rate in Lusaka City for estimating the number of patients to be used in the project, which is the recommended official number by the Zambia Statistical Office in the 'Lusaka District Health Plan 2009 (hereinafter, LDHP)'.
The following table shows the estimated population for 2020 calculated using the growth rate. We will utilise these figures to estimate the number of patients and the number of beds to be allocated to the medical facilities.

Table 2-4 Population Forecast of Lusaka

				Completed Plan					5 Years After
	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	1,917,976								
Predicted Population		1,948,664	1,979,842	2,011,520	2,043,704	2,076,403	2,109,626	2,143,380	2,177,674
Annual Expected Increase	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
Predicted Population Growth		30,688	31,179	31,677	32,184	32,699	33,222	33,754	34,294
Annual Growth (2010 as base)		1.6%	3.2%	4.9%	6.6%	8.3%	10.0%	11.8%	13.5%

5 year population growth prediction (2015-2020)	113.5%

Source: Lusaka District Health Plan , MOH

2) Prerequisites for Medical Activity in Both Health Centres

Medical activities other than surgery / special outpatient activities and laboratory work are available every day including weekends.
The number of operating days a year and hours a day in each department are as follows:

Outpatient Department Working Hours

Department	Days/Year	Hours/Day
General Outpatient, Paediatric	365	9
Surgery, Special Clinic	260	9
Casualty	260	15(24)

Central Diagnosis Department Working Hours

Department	Days/Year	Hours/Day
Surgery	365	24
Maternity Surgery	365	24
Laboratory	260	9

260 days = Everyday except weekends (Saturday and Sunday)

Source: Interviews with UHC and the District Health Office

(2) Facility Planning for the Matero UHC

1) Review by Department

① Number of Patients

・Number of Patients of a Primary Level who are Currently Referred to UTH

Once the project has been completed, the health centre will be upgraded to a first level hospital, so that patients needing primary-level medical services can be examined in the facility without having to be referred to UTH.
Based on data collected by the Matero UHC regarding the number of patients who were referred to UTH from 2010 to 2012, the expected increase in the number of patients of a primary medical level after completion of the project is as follows:

Table 2-5 Current patient referrals to UTH

			2010	2011	2012	Average	Patient Increase After Completion of Project			
							Primary Level Patients (35%)	Basic Surgical Level Patients		Others (50%)
Number of referrals to UTH			7,918	8,045	8,174	7,983	2,794		1,397	1,397
Adults	General Outpatient		4,643	4,717	4,793	4,681	1,638	819	880	819
	Surgery		269	274	278	271	95	47		47
	Gynecology		74	75	76	74	26	13		13
	Maternity	Cesarean	535	543	552	539	—	535	629	—
		Others	535	544	553	540	189	94		94
Children	Paediatrics		1,862	1,892	1,922	1,877	657		328	328

※1：The basic assumption is that all obstretic patients are cesarean section cases (人)

Source：Health Information Management System (HIMS), UHC and District Health Office

・Number of Patients Receiving Existing Medical Services

OPD

The table below shows the number of outpatients for four years from 2008 to 2012 in the Matero UHC.
We calculate the average using of these 5 years to determine the scales.

	2008	2009	2010	2011	2012	Average
Patient visits (Current)	149,883	115,091	142,770	155,189	142,985	**141,109**

Source：HIMS

Maternity Departmentd

The table below shows the number of maternity (normal delivery) patients for five years from 2008 to 2012 in the Matero UHC:

	2008	2009	2010	2011	2012	Average
Normal Deliveries	4,786	5,452	4,404	4,319	4,816	**4,753**

Source：HIMS

② Determination of Scale

Using the setting conditions described above, the number of rooms needed for the health centre is determined.

Sick Ward Department

According to the final request, to maximise the use of the surgery ward newly built by Zambia, our target buildings in this project will be the trauma department to treat patients after undergoing basic surgery out of adult patients of a primary medical level who used to be referred to UTH, and the sick ward to treat all paediatric patients of a primary medical level. We will determine the number of beds needed for each building based on the breakdown of the number of patients who are currently referred to UTH as shown in the above table.

Annual patient-days (days / year) = Annual number of inpatients (persons / year) x Average length of hospital stay (days / person)
Estimated patient-days for 2020 (days / year) = Annual patient-days (days / year) x Estimated patient growth rate (times)
Estimated patient-days when setting the bed occupancy to 80% (days / year) = Estimated patient-days for 2020 (days / year) / 80%
Number of beds needed (beds) = Estimated patient-days when setting the bed occupancy at 80% (days) / 365 days

Table 2-6 Required Number of Beds in Matero UHC

		Number of patients per year(persons/year)	Average days of hospitalisation(days/person)	Annual days of hospitalisation(days/year)	Rate of Increasing Population	Estimated No. of daily patients in 2018 (days/year)	Estimated No. of daily patients in 2018 (days/year) with 80% bed occupancy	No. of required beds	No. of rooms
		A	B	C=A*B	D	E=C*D	F=E/80	F/365	
Adult	General Outpat	819	-						-
	Surgical	47	-						-
	Materntiy	13	-						-
		880	7	6,158	113.5%	6,991	8,739	23.94	24.00
Paediatric		657	7	4,599	113.5%	5,221	6,526	17.88	18.00

Table 2-7 shows bed occupancy rates in the existing buildings.
Considering the fact that in Zambia the number of patients significantly increases when some disease like malaria becomes epidemic, these numbers should be maintained so that the same level of medical services can be provided as before.
Therefore, we consider it appropriate to develop new buildings in the project to accommodate inpatients of a primary medical level who are currently referred as shown

above, because the number will increase when upgrading the health centre to a first level hospital.

Table 2-7 Number of Patients in Matero UHC

	2008	2009	2010	2011	2012	Average	Average Hospitalisation (Days)	Beds	Bed Occupancy	Occupancy expected in 2018 (13% increase)
Existing Adult Ward	1,094	640	2,945	1,628	1,654	1,592	4	20	87%	99%
Existing Paed. Ward	602	250	756	619	629	571	4	14	45%	51%
Total (Avg.)	1,696	890	3,701	2,246	2,282	2,163	4	34	70%	79%

Source：Interviews at UHC and the District Health Office

Maternity Ward

The project is mainly targeted at delivery-related rooms in the maternity department, so we will make a plan for the prenatal rooms (including labour rooms), the delivery rooms, and the postnatal rooms. The necessary prenatal and postnatal rooms have already been calculated in the calculation table for the sick ward departments.

Average delivery count per day (persons / day) = Annual delivery count (persons / year) / Annual operating days (days / year)
Estimated average number of patients per day for 2020 (persons / day) = Average delivery count per day (persons / day) x Estimated patient growth rate
Number of delivery bed needed (beds) = Estimated average number of patients per day for 2020 (persons / day) / Average delivery count per bed (persons / day * bed)

Table 2-8 Required Beds for Matero UHC Maternity Ward

	Annual deliveries (p/year)	Annual working days (days/year)	Average daily deliveries (p/day)	Rate of increasing population	Estimated No. of patients in 2018 (/day)	Maternity (Incl. labour)			Delivery			Post-natal			
						Average waiting time (day/p)	No. of required beds	No. of beds	No. of deliveries per bed (persons/day/bed)	No. of deliveries	No. of deliveries +1 (emergency)	Average recovery time (days/p)	No. of required recovery beds	No. of beds	No. of beds (Maternity surgery)
	A	B	C=A/B	D	E=C*D	F	G=E*F		H	I=E/H		J	K=E*J		
Normal Deliveries	4,753	365	13	113.5%	14.78	0.5	7.392	8	5	2.96	4	0.25	3.7	4	
Primary Level Patients (Cesarean section et.al)	629	365	1.72	113.5%	1.958	0.5	0.979	1				6	11.7		12
Total								**9**			**4**			**4**	**12**

OPD

Average number of patients per day (persons / day) = Annual number of patients (persons / year) / Annual operating days (days / year)
Estimated average number of patients per day for 2020 (persons / day) = Average number of patients per day (persons / day) x Estimated patient growth rate (times)
Number of patients who consulted / were treated (persons / room * day) = Clinic open time (minutes / day) / Average amount of time a doctor spends with a patient per room (minutes * rooms / person)
Number of rooms needed (rooms) = Estimated average number of patients per day for 2020 (persons / day) / Number of patients who consulted / were treated (persons / room * day)

Table 2-9 Required Number of Consultation Rooms for OPD in Matero UHC

		Annual No. of Outpatients (p/year)	Annual working days (day/year)	Opening hours (min/day)	Average No. of daily patients (p/day)	Rate of increasing population	Expected No. of daily patients in 2018 (p/day)	Consultation Room			
								Average consultation time per room (min*room/p)	Maximum No. of daily patients per room (p/day*room)	Required No. of consultation rooms	No. of rooms
		A	B	C	D=A/B	E	F=D*E	G	H=C/G	I=F/H	
1	Current OPD Services	141,109									
2	Current primary level case referrals	2,794									
Total		143,902	365	600	394	113.5%	448	10	60	7.46	8

2) Floor Space Needed

Based on the calculation results regarding the number of beds needed for each room and the number of rooms needed as described above, we will calculate the gross floor space required for the building plan. To set the floor space for each room in our cooperation target facility, we will use the standard drawing for primary (district)-level hospitals prepared by Zambia's Ministry of Health and the standard drawing for medical facility floor spaces in Japan (by the Architectural Institute of Japan, Architectural Design Data Corpus, etc.) as a reference while keeping in mind the current situation in the existing facility.

We will consider the layout of medical equipment planned for each room, the number of patients, the number of medical staff, and other necessary factors comprehensively in specifying the floor space needed for each room.

Table 2-10 Floor Area of Each Room of the Subject Facility in Matero UHC

OPD GFL

Dept.	Room	Floor Area (m2)	Size (m)
General Examination	Records-1	18.00	6.00 × 3.00
	Records-2	9.00	3.00 × 3.00
	Registry-1	18.00	6.00 × 3.00
	Registry-2 (Paed.)	9.00	3.00 × 3.00
	Cashier	9.00	3.00 × 3.00
	Dispenser	9.00	3.00 × 3.00
	Sorting RM.	9.00	3.00 × 3.00
	Pharmacy	36.00	6.00 × 6.00
	Consultation RM-1(Vital)	18.00	3.00 × 6.00
	Waiting Hall-1	243.00	27.00 × 9.00
	Waiting Hall-2	69.50	10.00 × 6.95
	Consultation RM-7(ART	17.40	3.00 × 5.80
	Consultation RM-8(Dent	22.50	3.00 × 7.50
	Dental X-ray	2.89	1.70 × 1.70
	Waiting Hall-1 (Dental)	18.00	6.00 × 3.00
	Waiting Hall-2 (Paed.)	27.00	6.00 × 4.50
	Store-1	27.00	6.00 × 4.50
	Store-2	2.21	1.30 × 1.70
	Store-3	12.00	3.00 × 4.00
	Staff RM.	12.00	3.00 × 4.00
	Consultation RM-3 (F)	12.00	3.00 × 4.00
	Consultation RM-4 (F)	12.00	3.00 × 4.00
	Consultation RM-5 (M)	12.00	3.00 × 4.00
	Consultation RM-6 (ENT	12.00	3.00 × 4.00
	Consultation RM-2 (Paed	16.00	4.00 × 4.00
	Treatment RM	20.00	5.00 × 4.00
	Triage	18.00	3.00 × 6.00
	Corridor	117.00	3.00 × 39.00
	PS/EPS	2.50	1.25 × 2.00
		810.00	
Others	WC1～3	45.00	3.00 × 15.00
	Exterior Corridor	418.20	
	OPD Total	**1273.20**	

OPD (Casualty) GFL

Emergency Examniation	Nurse Station (NS)	11.25	3.00 × 3.75
	Obersvation RM	18.00	3.00 × 6.00
	Treatment RM	31.50	4.50 × 7.00
	Sterilisation RM	4.00	2.00 × 2.00
	Sluice RM	5.00	2.50 × 2.00
	Store-1	9.00	3.00 × 3.00
	Store-2	6.45	2.15 × 3.00
	Doctor's RM	9.00	3.00 × 3.00
	Staff RM	9.00	3.00 × 3.00
	Police	8.25	2.75 × 3.00
	Morgue/BID	24.00	4.00 × 6.00
	Corridor	42.19	2.25 × 18.75
	WC1～2	16.88	4.50 × 3.75
	PS/EPS	4.89	
		199.41	
	Exterior Corridor	184.84	
	OPD (Casualty) Total	**384.25**	

Administration/Laboratory GFL

Administration	Kitchen	18.00	3.00 × 6.00
	Conference RM	54.00	9.00 × 6.00
	Matron	18.00	6.00 × 3.00
	Superintendent	18.00	6.00 × 3.00
	Secretaries	18.00	6.00 × 3.00
	Hospital Administratio	18.00	6.00 × 3.00
	Store-2	6.00	4.00 × 1.50
	Office	22.00	4.00 × 5.50
	Corridor	37.65	3.00 × 12.55
	WC1～2	24.40	4.00 × 6.10
	PS/EPS	2.00	0.60 × 3.33
		236.05	
Laboratory	Staff RM	9.00	3.00 × 3.00
	Store-1	9.00	3.00 × 3.00
	Laboratory-1	18.00	6.00 × 3.00
	Laboratory-2	18.00	6.00 × 3.00
	Laboratory-3	18.00	6.00 × 3.00
	Sterilisation RM	9.00	3.00 × 3.00
	Sluice RM	9.00	3.00 × 3.00
	Registry	12.00	4.00 × 3.00
	Sample Collection RM	14.40	4.00 × 3.60
	WC (Urinalysis)	9.60	4.00 × 2.40
	Corridor	24.00	2.00 × 12.00
		150.00	
	Exterior Corridor	108.95	
	Admin./Lab. Total	**495.00**	

Maternity Ward GFL

Dept.	Room	Floor Area (m2)	Size (m)
Isolation Ward	Post-natal RM-2 (Isolation)	72.00	12.00 × 6.00
	Store-2	16.20	3.00 × 5.40
	Treatment RM-2	18.00	3.00 × 6.00
	Doctor's RM	18.00	3.00 × 6.00
	Kitchen	9.00	3.00 × 3.00
	Shower Room	3.60	3.00 × 1.20
	WC, Staff WC 1～2	23.40	3.00 × 7.80
	Corridors	58.50	3.00 × 19.50
	PS/EPS	5.20	
		223.90	
Labour Ward	Staff RM	17.70	6.00 × 2.95
	Store-1	9.30	3.10 × 3.00
	Waiting Hall	22.50	4.50 × 5.00
	Nurse Station (NS)	4.50	1.50 × 3.00
	Post-natal RM-1	36.00	6.00 × 6.00
	Shower RM 1～2	4.29	1.30 × 3.30
	Pre-natal RM	72.00	12.00 × 6.00
	Sluice RM	11.00	2.75 × 4.00
	Delivery RM 1～4	48.00	12.00 × 4.00
	Treatment-1	12.00	3.00 × 4.00
	Premature RM	18.00	4.50 × 4.00
	WC	6.21	3.45 × 1.80
	Corridors	140.10	3.00 × 46.70
		401.60	
	Exterior Corridors	247.50	
	Maternity Ward Total	**873.00**	

Paediatric Ward GFL

Dept.	Room	Floor Area (m2)	Size (m)
Paediatric Ward	Kitchen	12.45	3.00 × 4.15
	Staff RM	18.00	3.00 × 6.00
	Store-1	11.22	5.10 × 2.20
	Store-2	5.70	1.50 × 3.80
	Store-3	18.00	3.00 × 6.00
	Treatment RM	18.00	3.00 × 6.00
	Nurse Station	17.10	4.50 × 3.80
	Office	16.88	4.50 × 3.75
	Side Ward-1	10.69	2.85 × 3.75
	Side Ward-2	10.69	2.85 × 3.75
	Sterilisation RM	4.95	2.25 × 2.20
	Sluice RM	4.95	2.25 × 2.20
	Ward-1 (Isolation)	81.00	13.50 × 6.00
	Ward-2 (Medical)	81.00	13.50 × 6.00
	Shower RM 1～5	13.45	
	Corridor	50.29	3.00 × 16.79
	WC1～3, Staff WC	45.04	
	PS/EPS	9.46	
	Paediatric Ward Total	**428.87**	

Adult Ward GFL

Dept.	Room	Floor Area m2)	Size (m)
Adult Ward	Kitchen	12.45	3.00 × 4.15
	Staff RM	18.00	3.00 × 6.00
	Store-1	11.22	5.10 × 2.20
	Store-2	5.70	1.50 × 3.80
	Store-3	18.00	3.00 × 6.00
	Treatment RM	18.00	3.00 × 6.00
	Nurse Station	17.10	4.50 × 3.80
	Office	16.88	4.50 × 3.75
	Side Ward-1	10.69	2.85 × 3.75
	Side Ward-2	10.69	2.85 × 3.75
	Sterilisation RM	4.95	2.25 × 2.20
	Sluice RM	4.95	2.25 × 2.20
	Ward-1 (F)	81.00	13.50 × 6.00
	Ward-2 (M)	81.00	13.50 × 6.00
	Shower RM 1～5	13.45	
	Corridor	50.29	3.00 × 16.79
	WC1～3, Staff WC	45.04	
	PS/EPS	9.46	
	Adult Ward Total	**428.87**	

MATERO Main Building Floor Area	**3883.19**

Related Facilities

Mechanical Unit-1	82.00	10.00 × 8.20
Mechanical Unit-2	72.24	4.20 × 17.20
Elevated Water Tank	39.00	6.00 × 6.50
Water Reservoir	53.76	8.40 × 6.40
Exterior Corridor	318.00	
Related Facilities Total	**565.00**	

MATERO Total Floor Area	**4448.19**

3) Facility Structure (Function)

The structure of the target facilities in the project is as follows:

Table 2-11 Facility Configurations of the Divisions within the Scope of this Project in Matero UHC

Building/Floor		Outline
OPD	GFL	OPD (general examination[M, F, Pead, EYE/ENT, Dental, ART, Vital],pharmacy)
OPD (Casualty)	GFL	OPD (Casualty) ,Morgue
Admin./Lab.	GFL	Admin./Lab.
Maternity Ward	GFL	Maternity department (Maternity,The isolation ward)
Paediatric Ward	GFL	Paediatric Ward (26beds)
Adult Ward	GFL	Adult Ward(26beds)
Related Facilities		Machine/Mechanical Units, Elevated Water Tank, Water Reservoir
Medical Equipment		OPD, Casualty, Administration, Laboratory, Maternity Ward, Paediatric Ward, Adult Ward

4) Floor Planning

The plane composition for the entire project facilities is designed so that the OPD (general examination), the OPD (emergency examination), the administration department, the laboratory department, the labour ward, the isolation ward, and the sick ward department will be located in six buildings with exterior corridors at the core, and coordination between the departments can be maximised.

In particular, the OPD (emergency examination) is placed near the entrance for easy access of ambulance cars and in readiness for emergency transfer of severe patients. For other departments, the plan has to ensure smooth movement from the OPD (general examination) to the laboratory department, from the labour ward to the new operation theatre (building planned by Zambia), and from the operation theatre to the sick ward department by connecting these departments with the core exterior corridors and the subsidiary exterior corridors facing the inner courtyards. The covered exterior corridors serving as a link to each department can also be used as a waiting space for the OPD, the labour ward, and the laboratory department, service routes for each department and an evacuation route, as well as a maintenance space for equipment.

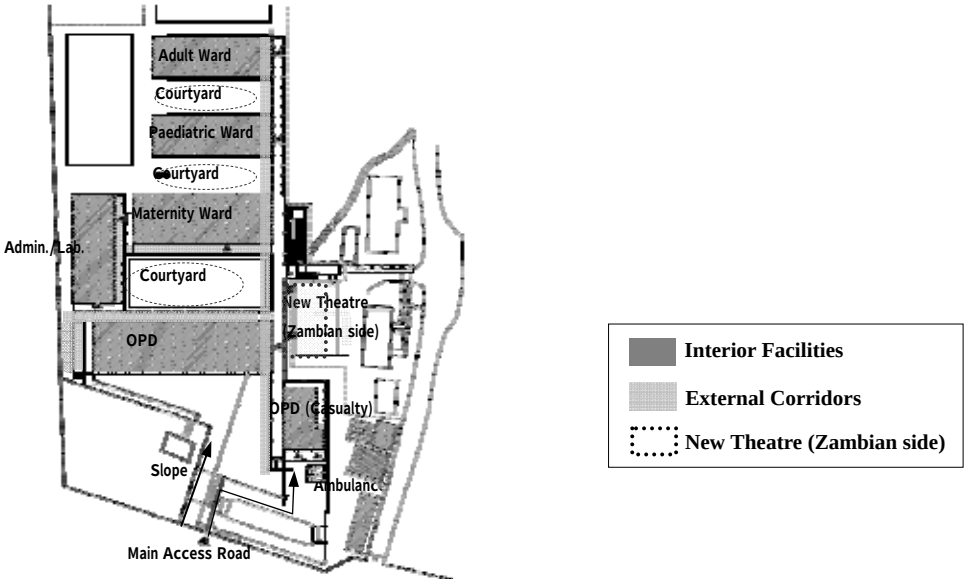


Figure 2-10 Matero UHC Facility Floor Planning

・Concept of the OPD (General Examination Department)

The plane composition for the general examination department is designed to connect the two waiting spaces with an axis line stretching east to west: one belonging to the registry and the other belonging to the consultation rooms. Providing such separate waiting spaces for each of these two different functions allows the hospital to unify its management and operation, as well as permitting outpatients to smoothly use each space and travel between areas according to their purpose.

The general examination department consists of consultation rooms for males, females, children, ENT, dental, and ART. For consultation rooms related to each other with regard to examination content, the plan will ensure that these rooms are linked by providing routes for doctors and nurses at the window side so that smooth, effective treatment can be administered in a cross-departmental way. The paediatric department is located in a more independent place so that it will have less interaction with other departments to avoid in-hospital infections.

We will make sure that the exterior corridors facing the inner courtyard can also be used as a waiting space for patients and their families when a lot of patients visit at the same time. The toilets for patients are collectively located at the west end of the exterior corridors to maintain good hygiene and avoid possible transmission of odour.

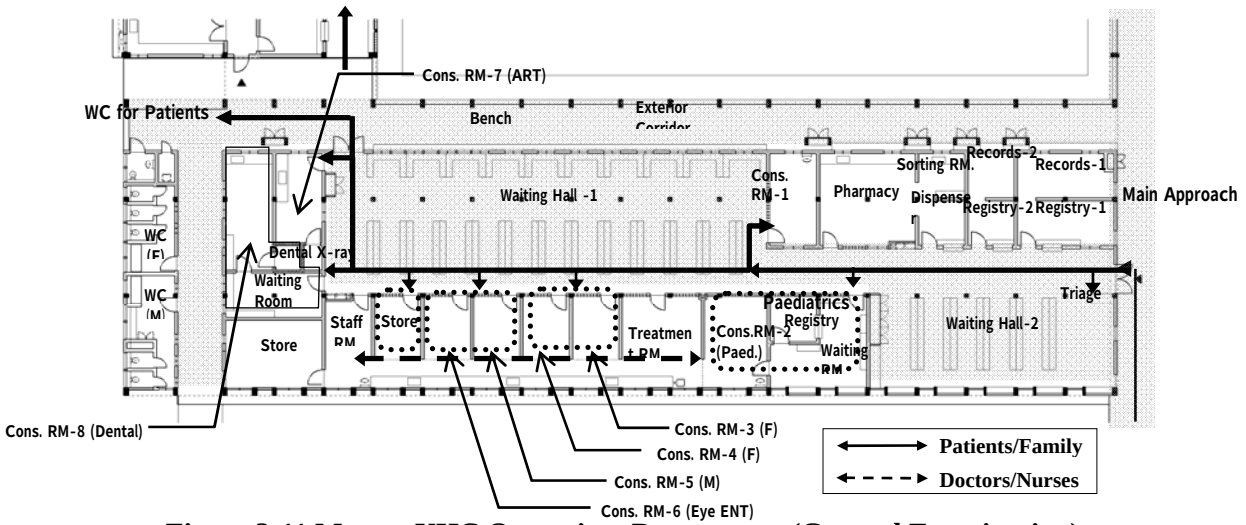


Figure 2-11 Matero UHC Outpatient Department (General Examination)

・Concept of the OPD (Emergency Examination Department)

The emergency examination department is to be located at the south end of the OPD building (emergency examination department) close to the entrance of the premises for easy access of ambulance cars. The plane composition employs a middle corridor type, so that continuous, prompt medical activities can be provided by simplifying the routes for transferring severe patients from the special gate to various treatment / operation theatre .

The plan shall also allow such a route so that severe patients transferred in an ambulance car are first washed in a shower at the entrance, and then carried to a treatment room. The nurse station is to be located at the north end of the building so that the nurses can pay careful attention to the observation room where patients undergoing treatment are staying, and at the same time, they can receive patients transferred from the triage in the general examination department. For the morgue, we will provide an entrance that interfaces with the outside with the aim of easy transfer when a body is carried in from outside, and we will also create a waiting room for the police next to it so that autopsies can be smoothly conducted.

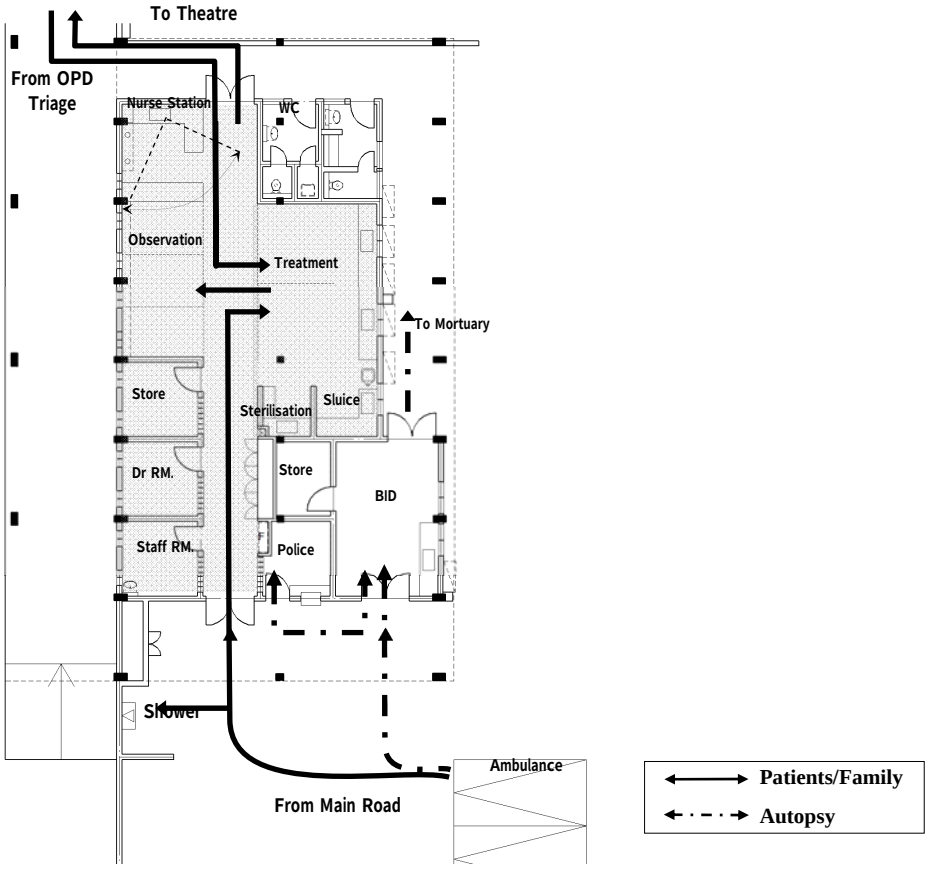


Figure 2-12 Matero UHC Outpatient Department (Emergency Examination)

・Concept of the Laboratory Department

The laboratory department is for conducting physiology / pathology tests, consisting of a sample collection room, toilets for urinary tests, laboratories, a sluice room, and a sterilisation room. The plane composition employs two different routes: a middle corridor for the staff route, and exterior corridors for the patient route. Staff will be able to access each room from the middle corridor, and patients will be able to access the registry and the sample collection room only from the exterior corridors. We will install some benches in the exterior corridors in front of the door of the rooms so that the space can also be used as a waiting space as well an access route for patients. Laboratory 3 is to be used exclusively for tubercular patients. By separating it from other rooms in this way, spread of the infection can be prevented.

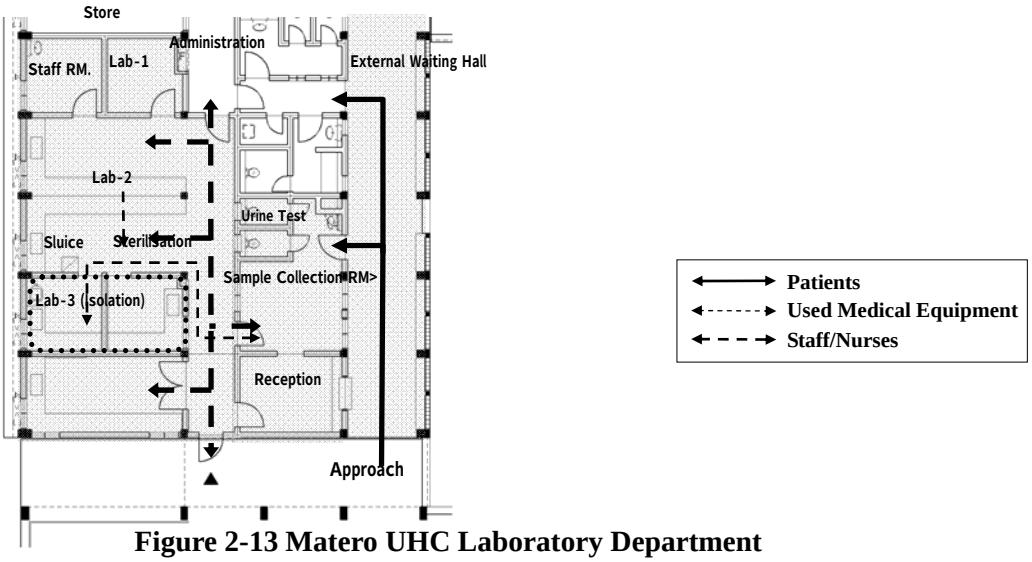


Figure 2-13 Matero UHC Laboratory Department

・Concept of the Administration Department

The administration department consists of a superintendent's room, a matron's room, a secretaries' room, a hospital administration room, an office, and a conference room. We will provide a kitchen for exclusive use by staff in such a place that can be accessed from both the inside and outside the rooms. The toilets are positioned in such a place that is available from both the inside of the rooms and the exterior corridors.

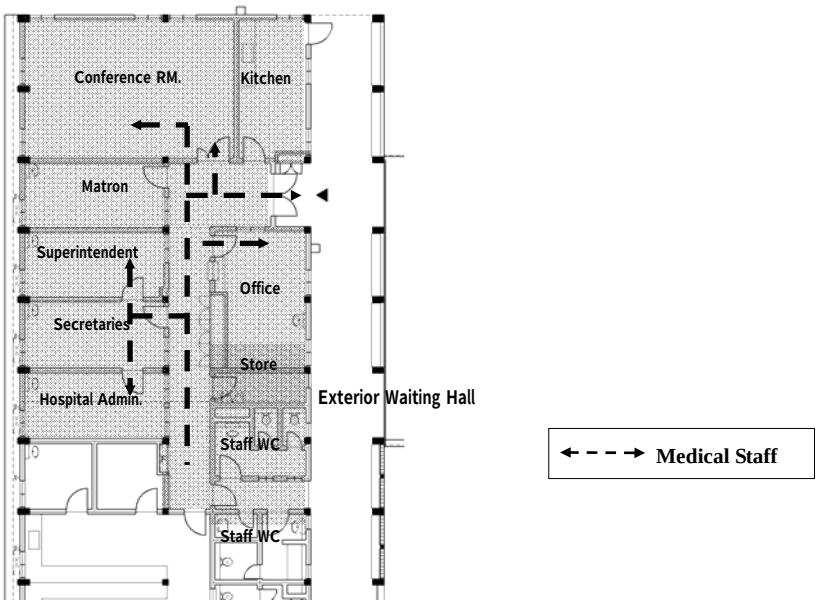


Figure 2-14 Matero UHC Administration Department

・Concept of the Maternity Ward

The plane composition for the maternity building is designed by locating the labour ward at the west side and the isolation ward at the east side of the building with the nurse station placed in the middle, and connecting both departments with a middle corridor. The labour ward is intended to provide unified medical activities to take care of the labour, delivery, and postnatal treatment of patients. On the other hand, the isolation ward is located in such a place that will allow easy transfer to the existing operation theatre to strengthen cooperation between the departments.

The maternity ward contains different rooms including a ante-natal room (a labour room), delivery rooms, a premature room, postnatal rooms, a treatment room, and a sluice room. For the delivery rooms, we will prepare a route for doctors and nurses at the window side to link the rooms with the treatment and sluice rooms to ensure that the routes for transferring instruments and articles before and after surgery do not cross. We will locate the postnatal rooms for both the maternity labour ward and the isolation ward in such a place that allows direct access to the toilets and showers.

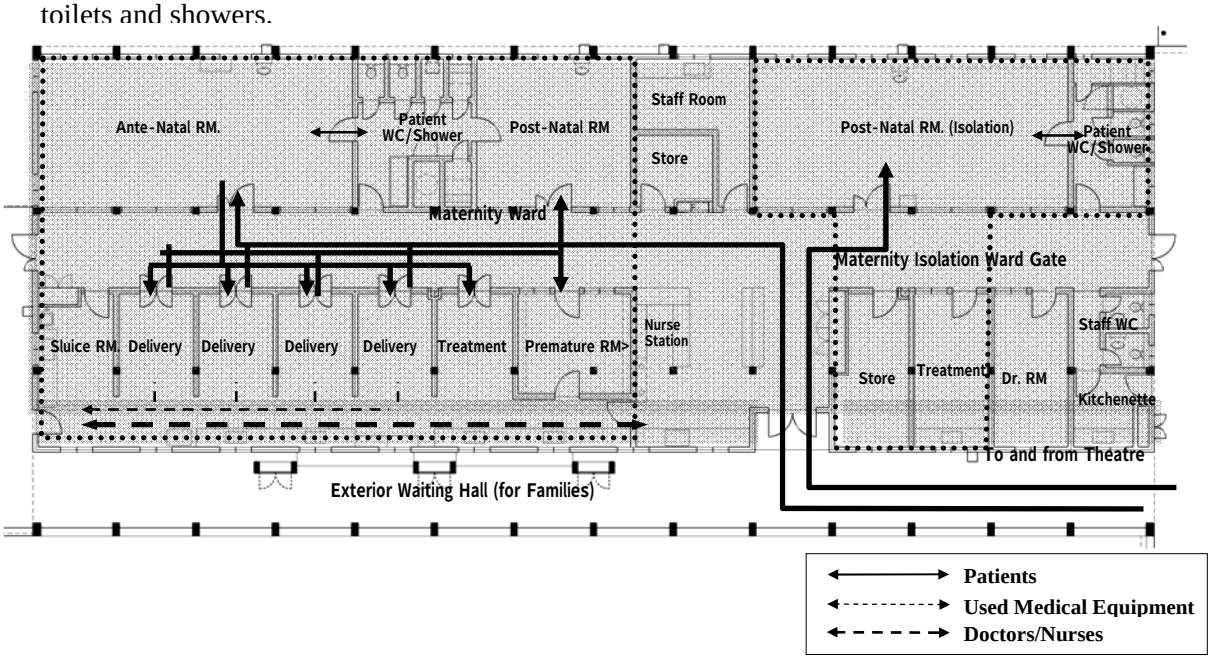


Figure 2-15 Matero UHC Maternity Ward

5) Elevation Planning (Shape and Finishing Materials)

We will employ a steel moment frame made of concrete, which is a typical method in the area, and the external walls will be of masonry construction made of concrete blocks. Both will be paint finished with mortar setting. The roof will be a shed roof using a folded metal plate for its good economic efficiency and easy construction, in such a shape that will help secure a rain water drainage route.

For the buildings facing the inner courtyard, we will use a wall column with a rectangular cross section for the columns at the circumference of the buildings, which can serve as a louvers to keep strong sunlight from coming into the buildings to the maximum extent, and at the same time, will form a space to place some waiting benches that will also used as a bed in the case of emergency.

A pipe space (PS) for equipment piping is located in the external walls to facilitate maintenance work. We will use weather-resistant aluminium fittings for the window frames considering the strong sunlight. We will use as much space as possible for the window opening other than the PS and washbowl counter at the room side, and the elevation planning is created based on the fenestration. For rooms that do not require as much brightness such as the postnatal rooms, we will employ a high side window.

6) Section Planning

The floor height will be basically 3.55 m considering the ceiling height necessary for various rooms and the necessary space for equipment piping, for example, for water supply and discharge. We will utilise some space under the first floor, which is created due to a difference in geographical height, as equipment piping spaces and/or maintenance spaces, to minimise the number of pits.

Outside corridors will be positioned in such a place that faces the inner courtyard to keep sunlight from coming into the building with the deep-eaved section planning.

We will make certain that the plan allows sufficient opening for common areas like corridors and waiting spaces for patients, and we will install pullout windows on high sides to promote natural ventilation.

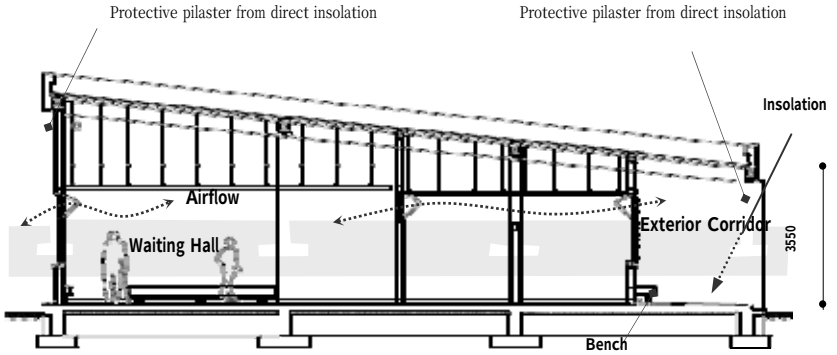


Figure 2-16 Matero UHC Cross-Section of Outpatient Department

(3) Facility Planning for Chilenje UHC

1) Review by Department

① Number of Patients

・Number of Patients of a Primary Level who are Currently Referred to UTH

Like the Matero UHC, once the project has been completed, the health centre will be upgraded to a primary (district)-level hospital, so that patients needing primary-level medical services can be examined in the facility without having to be referred to UTH. In the Chilenje UHC, however, the breakdown of patients referred to UTH is not recorded, so we will use the ratio of normal delivery patients vs. basic surgery patients in the Matero UHC to calculate the number of patients, which is necessary to determine the scale of the isolation ward targeted in the project.

The number of patients referred to UTH from the Chilenje UHC is extremely low even taking the ratio of the zone population into consideration, compared with the number of patients referred to UTH from the Matero UHC. Chilenje UHC and UTH are located in the same zone and are close to each other. This is probably because many patients living in the zone visit UTH directly because the

The number of patients who visit UTH directly can be obtained by subtracting the number of patients referred to UTH from the Chilenje UHC from the number of patients living in the same zone as the Chilenje UHC out of the total number of patients needing a primary level of maternity services currently provided in UTH. Since one of the main purposes of the project is to make the referral system work well in the Lusaka district, we will make a building plan on the assumption that the Chilenje UHC will start to examine about half of the patients who used to visit UTH directly. We will use the zone population ratio to calculate the number of patients living in the same zone as the Chilenje UHC.

Table 2-12 Number of patients referred from Chilenje UHC to UTH

	08-12 Average	Primary Level Patients (Approx. 35% of total referrals)
Referrals to UTH	3,330	1,166

Source：Interviews with UHC and the District Health Office

Table 2-13 Number of cesarean section surgeries

	2008	2009	2010	2011	2012	08-12 Average	90%*
Cesarean section surgeries	3,076	3,100	3,150	3,200	3,251	3,155	2,840

Source: HIMS

***According to Interviews with UTH, about 10% of patients reffer from outside of district.**

Table 2-14 Primary Level Maternity Surgeries based on the Zone Population Ratio (The average of 2010-2012)

Zone	UHC	Zone Population ('10-'12 Average)	Population Ratio	Primary Level Maternity Surgeries
1	Chipata	519,411	28%	806
2	Matero	333,315	18%	517
3	Kanyama	492,748	27%	765
4	Chilenje	484,307	26%	752
Total		**1,829,780**	**100%**	**2,840**

Table 2-15 Number of Primary Level Maternity Surgery Patients

	Matero UHC			Chilenje UHC	
	Normal Deliveries	Primary Level Maternity Patients (Cesarean section etc.)	Patient Ratio	Normal Deliveries	Primary Level Maternity Patients (Cesarean section etc.)
From the viewpoint of current referrals; the number of primary level maternity patients (surgeries)	4,753	629	13.2%	2,504	332 … a
From the viewpoint of zone population ration; the number of primary level maternity patients refferred from UTH (surgeries)	-				752 … b
(b-a) × 50%	-				210
Total	-				542

Source：Interviews with UHC and the District Health Office

・Number of Patients Receiving Existing Medical Services

OPD

The table below shows the number of outpatients for four years from 2008 to 2012 in the Chilenje UHC. We calculate the average using those five years to determine the scales.

	2008	2009	2010	2011	2012	平均
Patient Visits (Current)	153,498	155,954	158,449	160,984	163,560	**158,489**

Source：HIMS

Maternity Department

The table below shows the number of maternity (normal delivery) patients for five years from 2008 to 2012 in the Chilenje UHC:

	2008	2009	2010	2011	2012	Average
Normal Deliveries	2,401	2,757	2,392	2,465	2,504	**2,504**

Source：HIMS

2) Determination of Scale

Using the setting conditions as described above, the number of rooms needed for the health centre is determined.

Maternity Ward

In the project, we will make a plan for a postnatal room to accommodate patients of a primary medical level such as those undergoing Caesarean section, as well as a nursery room to accommodate premature babies, in the labour ward.

Average delivery count per day (persons / day) = Annual delivery count (persons / year) / Annual operating days (days / year)
Estimated average number of patients per day for 2020(persons / day) = Average delivery count per day (persons / day) x Estimated patient growth rate
Number of delivery bed needed (beds) = Estimated average number of patients per day for 2020(persons / day) / Average delivery count per bed (persons / day * bed)

Table 2-16 Required Number of Beds for Matero UHC Maternity Ward

						Maternity (incl.labour)			Delivery			Post-natal		
	Annual deliveries (p/year)	Annual working days (days/year)	Average daily deliveries (p/day)	Rate of increasing population	Estimated No. of patients in 2018 (p/day)	Average waiting time (day/p)	No. of required beds	No. of beds	No. of deliveries per bed (p/days/bed)	No. of deliveries	No. of deliveries +1 (emergency)	Average recovery time (days/p)	No. of required recover beds	No. of beds
	A	B	C=A/	D	E=C*D	F	G=E*F		H	I=E/H		J	K=E*J	
Primary Level Patients (Cesarean section etc.)	542	365	1.48	113.5%	1.68	0.5	0.84	1				6	10.11	11

OPD

Average number of patients per day (persons / day) = Annual number of patients (persons / year) / Annual operating days (days / year)
Estimated average number of patients per day for 2020 (persons / day) = Average number of patients per day (persons / day) x Estimated patient growth rate (times)
Number of patients who consulted / were treated (persons / room * day) = Clinic open time (minutes / day) / Average amount of time a doctor spends with a patient per room (minutes * rooms / person)
Number of rooms needed (rooms) = Estimated average number of patients per day for 2020(persons / day) / Number of patients who consulted / were treated (persons / room * day)

								Consultation Room			
		Annual No. of Outpatients (p/year)	Annual Working days (day/year)	Opening hours (min/day)	Average No. of daily patients (p/day)	Rate of increasing population	Expected No. of daily patients in 2018 (p/day)	Average consultation time per room (min*room/p)	Maximum No. of daily patients per room (p/day*room)	Required No. of consultation rooms	No. of rooms
		A	B	C	D=A/B	E	F=D*E	G	H=C/G	I=F/H	
1	Current OPD Services	158,489									
2	Primary level case referrals	1,223									
Total		159,711	365	600	438	113.5%	496.813	10	60	8.28	**9**

3) Floor Space Needed

Like the Matero UHC, based on the calculation results regarding the number of beds needed for each room and the number of rooms needed as described above, we will calculate the gross floor space required for the building plan. To set the floor space for each room in our cooperation target facility, we will use the standard drawing for primary (district)-level hospitals prepared by Zambia's Ministry of Health and the standard drawing for medical facility floor spaces in Japan (by the Architectural Institute of Japan, Architectural Design Data Corpus, etc.) as a reference while considering the current situation in the existing facility.

We will consider the layout of medical equipment planned for each room, the number of patients, the number of medical staff, and other necessary factors comprehensively in specifying the floor space needed for each room.

Table 2-17 Floor Area of Each Room of the Subject Facility in Chilenje UHC

OPD GFL

Dept.	Room	Floor Area (m2)	Size (m)
General Examination	Waiting Hall	149.64	9.00 × 16.63
	Triage	9.00	3.00 × 3.00
	Pharmacy	36.00	6.00 × 6.00
	Sorting RM	9.00	3.00 × 3.00
	Dispenser	9.00	3.00 × 3.00
	Cashier	9.00	3.00 × 3.00
	Registry	18.00	3.00 × 6.00
	Records-1	18.00	3.00 × 6.00
	Records-2	9.00	3.00 × 3.00
	PS/EPS	5.46	0.70 × 7.80
	Total	272.10	
Emergency Examination	Treatment RM	36.00	6.00 × 6.00
	Sterilisation RM	6.90	3.00 × 2.30
	Sluice RM	9.00	3.00 × 3.00
	Morgue/BID	24.00	4.00 × 6.00
	Police	6.00	2.00 × 3.00
	Store-1	11.40	3.80 × 3.00
	Store-2	6.00	2.00 × 3.00
	Observation RM	18.00	3.00 × 6.00
	Staff RM	9.00	3.00 × 3.00
	Doctor's RM	11.40	3.80 × 3.00
	Nurse Station (NS)	9.00	3.00 × 3.00
	Corridor	42.00	2.00 × 21.00
	Total	188.70	
Others	WC1～2, Staff WC1～2	34.20	3.80 × 9.00
	Exterior Corridor	235.80	3.00 × 78.60
	Total	270.00	
OPD GFL Total		**730.80**	

OPD 1FL

Dept.	Room	Floor Area (m2)	Size (m)
General Examination	Registry (Paediatric)	9.00	3.00 × 3.00
	Consultation RM-2(Pa	12.00	4.00 × 3.00
	Waiting Hall-1 (Paed.)	25.00	5.00 × 5.00
	Waiting Hall-2 (Dental	18.00	3.00 × 6.00
	Consultation RM-8(D	18.00	3.00 × 6.00
	Dental X-ray	2.72	1.60 × 1.70
	Consultation RM-3(E	12.00	4.00 × 3.00
	Consultation RM-4(M	12.00	4.00 × 3.00
	Consultation RM-5 (M	12.00	4.00 × 3.00
	Consultation RM-6 (F	12.00	4.00 × 3.00
	Consultation RM-7 (F	12.00	4.00 × 3.00
	Treatment RM	22.50	5.00 × 4.50
	Consultation RM-1(Vi	18.00	3.00 × 6.00
	Consultation RM-9(Al	18.00	3.00 × 6.00
	Staff RM	12.00	4.00 × 3.00
	Store-1	7.20	2.40 × 3.00
	Store-2	2.08	1.60 × 1.30
	Waiting Hall	189.00	9.00 × 21.00
	Corridor	60.00	2.00 × 30.00
	PS/EPS	3.50	0.70 × 5.00
	Total	477.00	
	Exterior Corridor	219.90	3.00 × 73.30
OPD 1FL Total		**696.90**	
OPD All Total		**1427.70**	

Maternity/Administration 1F

Dept.	Room	Floor Area (m2)	Size (m)
Isolation Ward	Nurse Station	18.00	6.00 × 3.00
	Staff RM	9.00	3.00 × 3.00
	Treatment RM	18.00	3.00 × 6.00
	Doctor's RM	9.00	3.00 × 3.00
	Post-natal RM-1 (Isolation)	54.00	9.00 × 6.00
	Post-natal RM-2 (Isolation)	54.00	9.00 × 6.00
	Premature RM	18.00	3.00 × 6.00
	Shower RM 1～3	8.70	
	WC 1～2, 4～6	17.10	
	Corridor	104.70	3.00 × 34.90
	PS/EPS	4.50	
	小計	315.00	
Medical Imaging	Waiting Hall	54.29	12.00 × 4.52
	Ultrasound RM	13.50	3.00 × 4.50
	Radiographer's RM	27.04	4.00 × 6.76
	X-ray RM	30.00	5.00 × 6.00
	Dark RM	18.00	3.00 × 6.00
	Store-2	4.50	3.00 × 1.50
	Changing RM 1～2	3.51	1.30 × 2.70
	WC3	2.16	1.20 × 1.80
	Total	153.00	
	Exterior Corridor	33.90	
Maternity/Administration 1F Total		**501.90**	

Maternity/Administration 1FL

Dept.	Room	Floor Area (m2)	Size (m)
Administration	Kitchen	11.10	3.00 × 3.70
	Hospital Administratio	20.40	6.00 × 3.40
	Superintendent	22.20	6.00 × 3.70
	Secretaries	11.10	3.00 × 3.70
	Conference RM	54.00	9.00 × 6.00
	Matron	18.00	3.00 × 6.00
	Store-1	4.50	1.50 × 3.00
	Store-2	4.50	1.50 × 3.00
	Office	33.00	5.50 × 6.00
	Corridor	60.30	3.00 × 20.10
	WC7～8	11.10	3.00 × 3.70
	PS/EPS	1.80	3.00 × 0.60
		252.00	
	Corridor	9.49	
iministration 1FL Total		**261.49**	
Maternity/Admin. All Total		**763.39**	

CHILENJE Main Building Floor Area 2191.09

Slope

Slope	165.53	
Cylinder RM	15.00	6.00 × 2.50
Maintenance RM	30.00	12.00 × 2.50
Slope Total	**210.53**	

Related Facilities

Mechanical Unit-1	32.13	4.20 × 7.65
Mechanical Unit-2	40.32	9.60 × 4.20
Mechanical Unit-3	35.00	5.00 × 7.00
Elevated Water Tank	39.00	6.00 × 6.50
Water Reservoir	34.56	5.40 × 6.40
Exterior Corridor	183.25	2.50 × 73.30
Related Facilities Total	**364.26**	

CHILENJE Total Floor Are 2765.88

4) Facility Structure (Function)

The structure of the target departments in the project is as follows:

Table 2-18 Facility Configurations of the Divisions within the Scope of this Project in Chilenje UHC

Building/Floor		Outline
OPD	GFL	OPD(pharmacy ,emergency examination), Morgu
	1FL	OPD (general examination[M, F, Pead, EYE/ENT, Dental, ART, Vital])
Maternity/ Admin.	GFL	The isolation ward, The medical imaging department
	1FL	Administration department
Related Facilities		Machine/Mechanical Units, Elevated Water Tank, Water Reservoir
Medical Equipment		OPD, Maternity/Administration, Medical Imaging

5) Floor Planning

The plane composition for the entire project facilities is designed like the Matero UHC region central hospital by locating the OPD (emergency examination), the OPD (general examination), the isolation ward, the medical imaging department, and the administration department in two buildings, so that coordination between the new departments and the departments in the existing building can be maximised. The building will be two-storey for effective use of the land, and we will install a slope for moving up and down, instead of elevators or other equipment that would need periodic maintenance.

The emergency department will be positioned on the first floor facing the frontal road so that it will be easy to access from the newly built entrance. It is expected that patients will be transferred more often between the existing operation theatre, the OPD (emergency examination), and the isolation ward, so these departments will be connected to each other with covered exterior corridors to allow easy, efficient movement with wheelchairs and/or stretchers. The OPD will be established in the building in front of the road, with the emergency department and the pharmacy department built together on the first floor, and with the general examination department established on the second floor. In addition, the exterior corridors will run in front of each facility serving as a main access route to each department, each service route, and/or evacuation route, as well as a maintenance space for equipment.

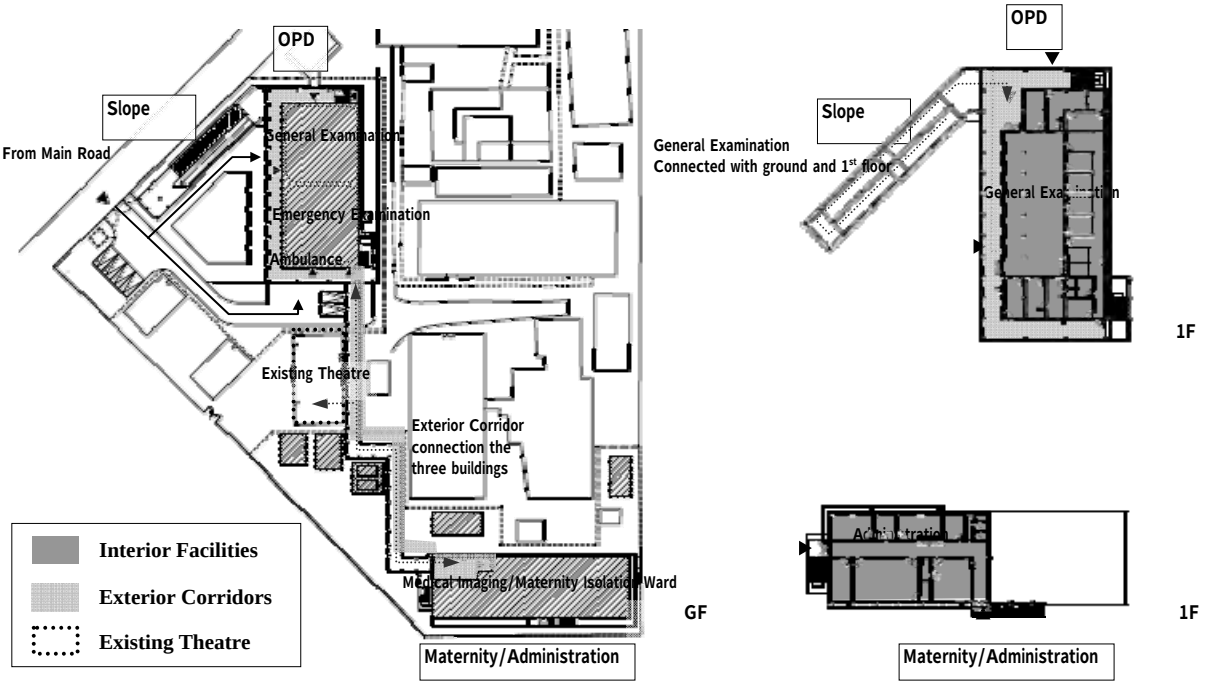


Figure 2-17 Chilenje UHC Facility Floor Planning

・Concept of the OPD (General Examination / Emergency Examination Departments)

The plane composition for the OPD is designed so that it can provide access to each room with the exterior corridors built in the circumference of the building and the slope that links the ground floor with the first floor. The emergency examination department is placed on the south side of the ground floor for easy access of ambulance cars and prompt treatment. For the general examination department, the registry and the cashier are placed on the ground floor and other consultation rooms are positioned on the first floor so that the department can provide smooth management and use according to its purpose.

The general examination department consists of consultation rooms for males, females, children, ENT, dental, and ART. For consultation rooms related to each other with regard to examination content, the plan will ensure that these rooms linked by providing routes for doctors and nurses at the window side so that smooth, effective treatment can be administered in a cross-departmental way.

For the emergency examination department, the plane composition employs a middle corridor type, so that continuous, prompt medical activities can be provided by simplifying the routes for transferring severe patients from the special gate to various treatment /operation theatre. The plan shall also allow such a route so that severe patients transferred in an ambulance car are first washed in a shower at the entrance, and then carried to a treatment room. The nurse station is to be located between the observation room and the general examination department so that the nurses can pay careful attention to the observation room where the patients undergoing treatment are staying, and at the same time, they can receive patients transferred from the triage in the general examination department. For the morgue, we will provide an entrance that interfaces with the outside with the aim of easy transfer when a body is carried in from the outside, and we will also create a waiting room for the police next to it so that autopsies can be smoothly conducted. The toilets for staff and patients are located in such a place that is accessible from the outside to maintain good hygiene.

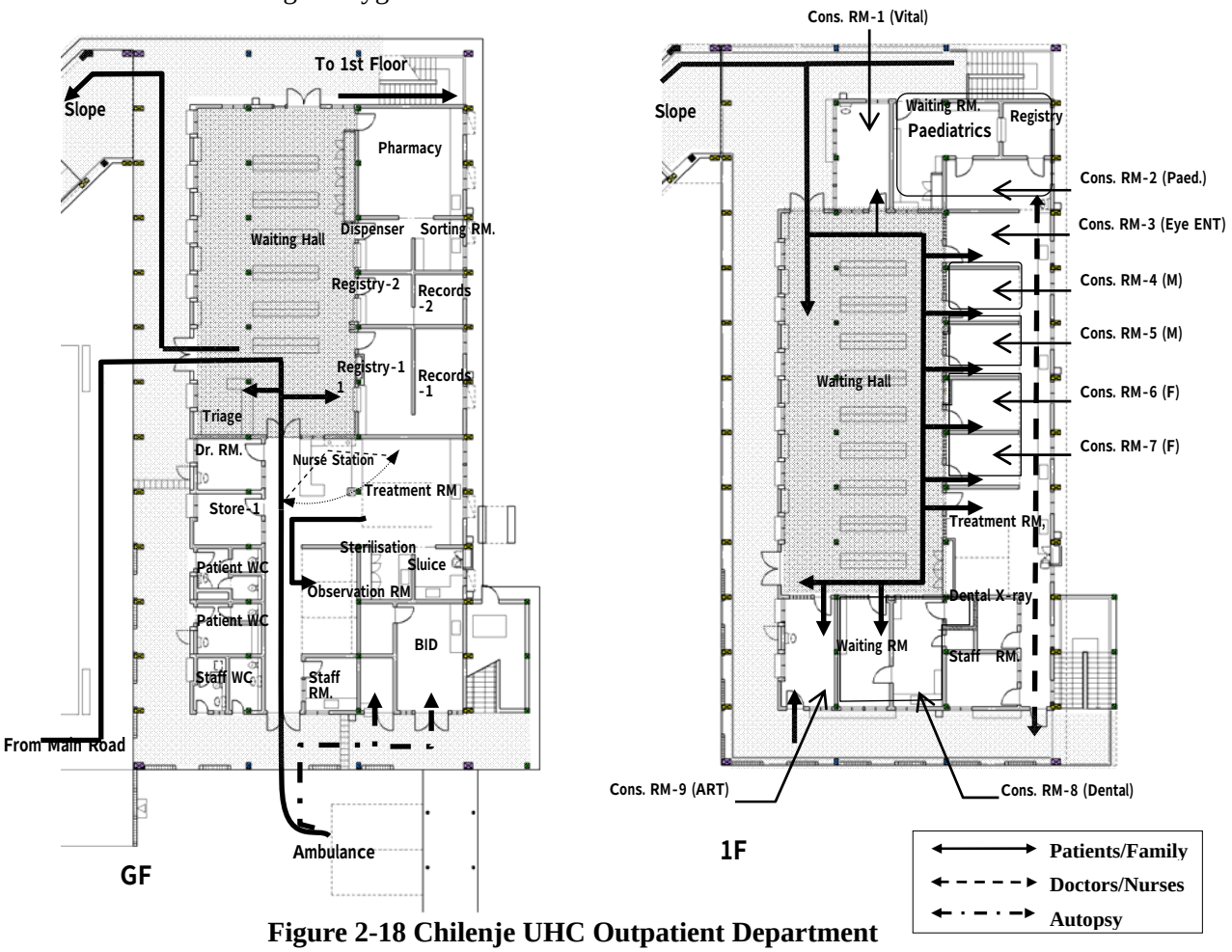


Figure 2-18 Chilenje UHC Outpatient Department (General Examination/Emergency Examination)

・Concept of the Maternity Isolation Ward

In the project, we will make a plan for a building dedicated to women after delivery by means of surgery. For the prenatal labour room, normal delivery, and operation theatre, the existing building will be utilised.

The maternity isolation ward is located on the ground floor to ensure smooth transfer from the existing operation theatre. The plane composition employs a middle corridor type with a wide range so that the nurses can see far into the postnatal room and the premature room from the nurse station. Since a noisy generator room is located next to the building, the postnatal room is placed on the opposite side to ensure a sufficient distance. The upper walls of the premature room and the postnatal room are to be covered with glass, and toilets and showers are provided in the postnatal room.

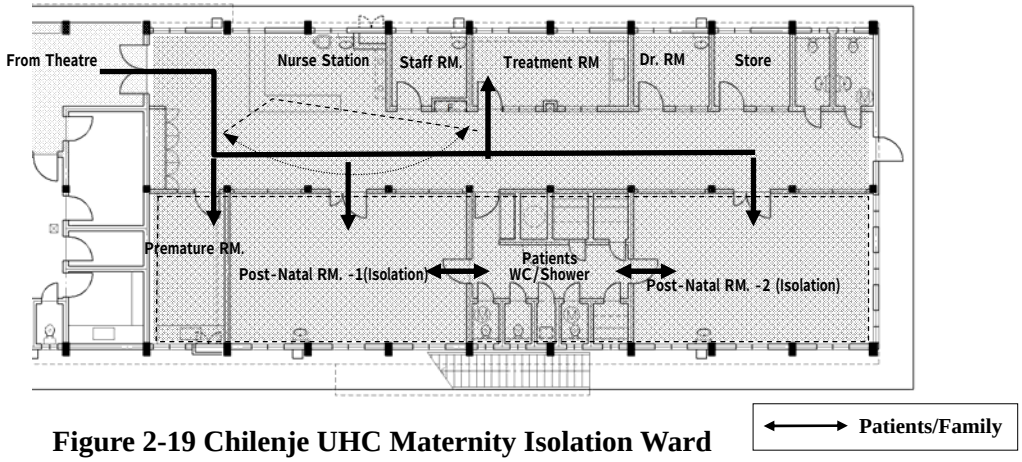


Figure 2-19 Chilenje UHC Maternity Isolation Ward

・Concept of the Medical Imaging Department

The medical imaging department is for performing X-ray and ultrasound examinations. Since the maternity isolation ward is located adjacent to it, the X-ray room is located as far from it as possible. The route for patients is designed so that they can access the changing room and the ultrasound room directly from the outside waiting hall, while care is taken so that the patient route and the staff route do not cross.

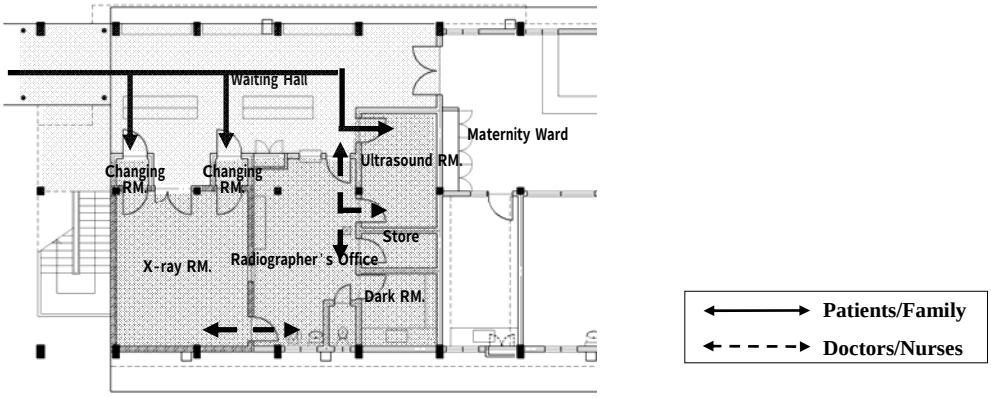


Figure 2-20 Chilenje UHC Medical Imaging Department

・Concept of the Administration Department

The administration department is located on the first floor, consisting of a superintendent's room, a matron's room, a secretaries' room, a hospital administration room, an office, and a conference room. A kitchen and toilets for exclusive use of the staff will be built side by side.

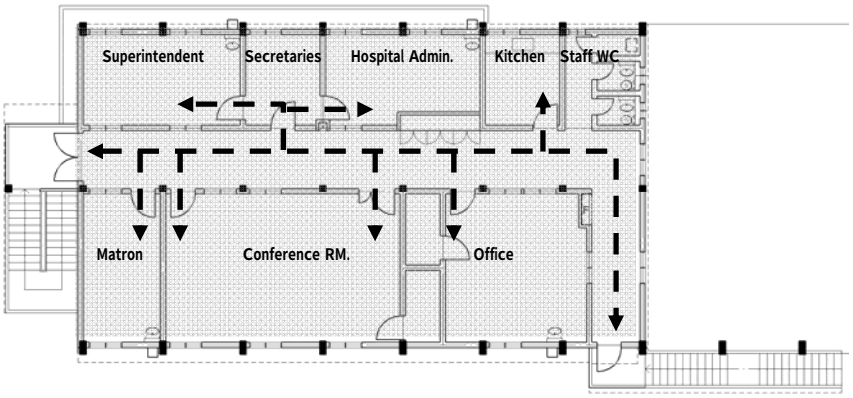


Figure 2-21 Chilenje UHC (1st Floor) Administration Department

6) Elevation Planning (Shape and Finishing Materials)

We will employ the same elevation planning as that for the Matero region central hospital in terms of both structure and finishing. We are planning to build an outside waiting space in the outdoor aisle surrounding the building. For the space, we provide some walls constructed of hollow concrete blocks as necessary to lessen the sunlight from the east and west side and also to block any unwanted attention to patients who are transferred to the emergency department.

7) Section Planning

Like the Matero UHC region central hospital, the basic floor height will be 3.8 m considering the ceiling height necessary for various rooms and the necessary space for equipment piping, for example, for water supply and discharge.
Outside corridors will be positioned on the west side of the outpatient building to protect inside of building from direct sunlight.
We will make certain that the plan allows sufficient opening for common areas like corridors and waiting spaces for patients, and we will install pullout windows on high sides to promote natural ventilation.

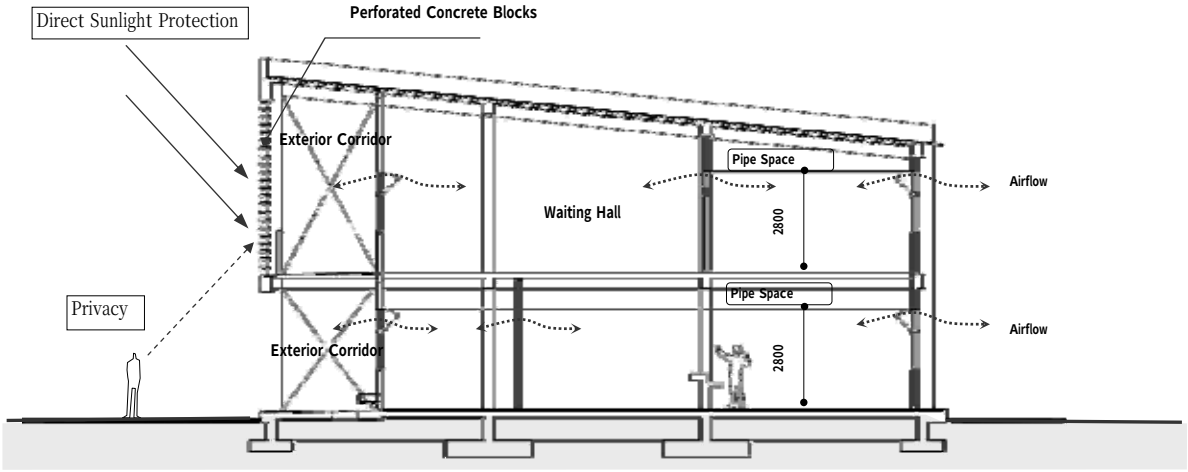


Figure 2-22 Chilenje UHC Cross-section of Outpatient Department

II Structure Plan

(1) Ground Conditions of the Planned Construction Site

We commissioned RANKIN, a ground investigation company located in Lusaka City, to conduct a ground investigation. Based on the investigation results, the ground condition of the planned construction sites is summarised below.

1) Matero UHC

According to the ground investigation results, the ground consists of soft sandy soil containing gravel in the range from a 1-m to a 3-m depth below the surface, and deeper than that, it is extremely hard silty, sandy soil.

2) Chilenje UHC

According to the ground investigation results, the ground consists of silty viscous soil in the range from a 1-m to a 4-m depth below the surface, and deeper than that, it is silty viscous soil containing gravel. The deeper the ground, the harder it gets, but some places have soft ground from the surface to approximately down to -5 m. There are also some places that contain limestone in the surface.

3) Recommended Allowable Soil-bearing Capacity by the Ground Investigation Company

The following table outlines the foundation depth and allowable soil-bearing capacity for each site recommended by the ground investigation company. The Chilenje site has viscous soil, so the recommended allowable soil-bearing capacity is lower considering consolidation settlement.

Table 2-19 Recommended Foundation Bearing Capacity and Soil Depth

Site	Building (Location)	Recommended base depth (m)	Recommended allowed soil bearing capacity (kPa)
Matero	Maternity	1.0	400
	Elevated Water Tank	1.0	450
	Paediatric Ward	1.8	300
	Surgery	2.6	250
	OPD	3.0	150
	Casualty and WC	1.8	200
Chilenje	OPD	2.0	100
	Elevated Water tank	3.0	100
	X-ray and Maternity	1.0	100

(2) Foundation Planning

1) Matero UHC

The foundation shall be basically a spread foundation using the silty, sandy soil present from 1 m to 3 m below ground as a bearing stratum. Although the depth from a ground surface to a bearing stratum depends on a bulding location in the wide site, a soil replacement commensurate with local ability may be adopted and also shallower stratum may be selected as a bearing stratum by adjusting the area of a spread foundation.
The ground surface slopes, and the maximum difference in height from the design GL is about 3 m. The difference will be adjusted by the length of the foundation pillars from the slanted ground surface to the first-floor level. If the foundation pillars are long, we plan to install a stretcher (foundation beam) at the column base of the foundation pillars.
The elevated water tank will be designed with a gravity foundation to prevent turnover.

2) Chilenje UHC

The foundation shall be basically a spread foundation using the silty, viscous soil present from 1 m to 4 m below ground as a bearing stratum. Although the depth from a ground surface to a bearing stratum depends on a bulding location like the Matero site, a soil replacement commensurate with local ability may be adopted and also shallower stratum may be selected as a bearing stratum by adjusting the area of a spread foundation.
For the elevated water tank, we will plan it using a gravity foundation like for Matero.

(3) Structure Planning

1) Matero UHC

Each building will be a one-storey building with a basic grid of 3 m x 6 m, and will employ a pure steel moment frame made with RC to enhance the freedom of the building plan. The roof will be designed with RC slabs, but we will use folded-plate metal sheets for finishing with the necessary thickness as a lightweight solution. The drainage slope will be designed by slanting the roof slabs.
Backfilling the slanted ground under the first floor to make the first floor a concrete slab-on-grade will lead to harmful degeneration and/or cracking, so the slabs for the first floor will be designed using RC slabs.

2) Chilenje UHC

Each building will be a two-storey building with a basic grid of 3 m x 6 m, and will employ a pure steel moment frame made with RC to enhance the planar freedom. We will employ the same method for designing the roof as Matero with a slope.
The viscous soil under the first floor makes is making us concerned about possible consolidation settlement, so the first floor will be designed using RC slabs.

(4) Design Load

1) Fixed Load

The fixed load will be calculated from the weight of construction materials, finishing materials, and other building fixtures such as equipment piping and ducts.

2) Movable Load

The movable load will be set according to the British Standard (BS CP3 Ch.V. Pt.1) and the Building Standards Act in Japan. The table below shows the movable load for the main rooms:

Table 2-20 Loading Capacity of the Main Rooms

Room Name	Movable Load（N/m^2）	Remarks
Pitched Roof	500	
Various Hospital Facilities, Lavatory, Toilet	2,000	
Office, Consulting Room, Treatment Room	3,500	
Corridors, Stairs	4,000	
Waiting Room	5,000	

3) Wind Load

The wind load will be determined based on the British Standard (BS CP3 Ch.V. Pt.2). Since observation of wind speed started in July 2000, the maximum speed recorded is 4.1 m/s in September 2006. To use the data as they are, however, the amount of statistics is obviously insufficient. Therefore, as a wind speed for the design, we will employ 38 m/s, the minimum value of the fifty-year return period expectation in the BS.

The wind load can be calculated using the following formula:

$F=Cf \cdot q \cdot A$

$q=1/2\rho \cdot V^2$

Where:

Cf	: Wind factor (1.2)
A	: Area to receive wind
ρ	: Air density (=1.01 N/m^3, considering an altitude of 1200 m in Lusaka City)
V	: Wind speed for design (38 m/s)
q	: Velocity pressure for design (729 N/m^2)

4) Seismic Load

Since no earthquakes have been recorded in Zambia and we have no calculation base for seismic loads, we assume CB = 0.05 for the base shear coefficient.

5) Structure Calculation

Structure calculation is made according to the limit state design of the British Standards. Combinations of loads are presented below. Please note that the coefficient of a seismic load here is the same as that of a wind load.

① $1.4\ G_k+1.6\ Q_k$
② $0.9\ G_k+1.4\ W_k$
③ $0.9\ G_k+1.4\ E_k$
④ $1.2\ G_k+1.2\ Q_k+1.2\ W_k$
⑤ $1.2\ G_k+1.2\ Q_k+1.2\ E_k$

Here:

G_k	: Fixed load
Q_k	: Movable load
W_k	: Wind load
E_k	: Seismic load

III Mechanical and Electrical (M/E) Systems

(1) Electrical Equipment

The key points in making an electrical equipment plan for the project are follows:

a. Considering the fact that the building will be used as a hospital and the infrastructure around the building has yet to be fully developed, planning should focus on improving the power supply conditions.
b. Considering the difficulty in procuring spare parts or other necessary parts in the region, maintenance work must be streamlined.
c. Energy-saving-type devices should be selected.

1) Power Supply Equipment

To supply power to the target facility, the Basic Design draws high-voltage 11-kV three-phase power generated by Zambia ' s electrical power company (ZESCO) into the electrical room to be provided by the Japanese side within the project site from the front Road (case-1) or from the existing transformer (case-2) at Matero and from Muramba Road at Chilenje. The power will then be stepped down by transformers, and distributed to each power requirement at 380 V/220 V 50 Hz in four three-phase wires. Power is also to be supplied to the existing buildings.
The decision on case-1 or case-2 at Matero will be made by ZESCO after receiving the formal application from MOH.
The power necessary in this project is estimated to be about 200 - 300 kVA for both Matero and Chilenje including the existing facilities. The Zambia side will take care of the primary-side high-voltage draw-in work to the electrical room and the power distribution work from the low-voltage distribution board to the existing branch board. The Japan side will be responsible for installing the necessary transformers, the trunk line, the distribution board, and the main breaker board for transfer just before the main power board, the power distribution work to the facilities, the branch breaker to the existing board, and piping work at the site. Zambia will be in charge of removing and disposing of existing transformers as necessary.
The voltage of commercial power supply fluctuates a lot, so for devices readily affected by such voltage fluctuation, we will provide AVR (automatic voltage regulator) for the equipment.
In Zambia, as power cut occurs several times a month, it is imperative to install a diesel power generator as an emergency power system. The devices to be provided with such emergency power will be equipment that cannot be stopped due to power cut, air conditioners, ventilation fans, lighting sockets, etc. to be used in the emergency department, and for these devices, a generator will be provided with the minimum necessary capacity. The design of the generator will be the package type with fuel supply from a service tank (day tank). Appropriate sound isolation, noise reduction, and vibration control will be provided to avoid causing nuisance to the surrounding environment. The capacity is estimated to be 100 kVA.
Currently, some of the lightings for the maternity building in other hospitals are powered by an alternative power source such as solar cells during the blackouts. Thus the project will also install the similar alternative power supply for the maternity lighting.

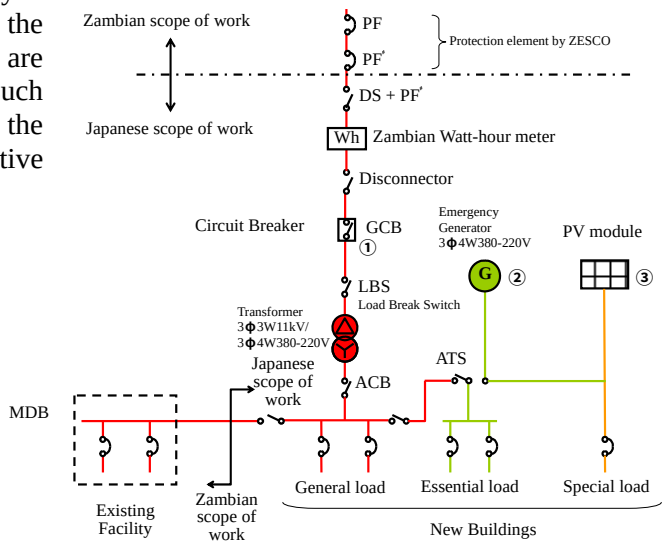


Figure 2-23 Electrical System Schematics

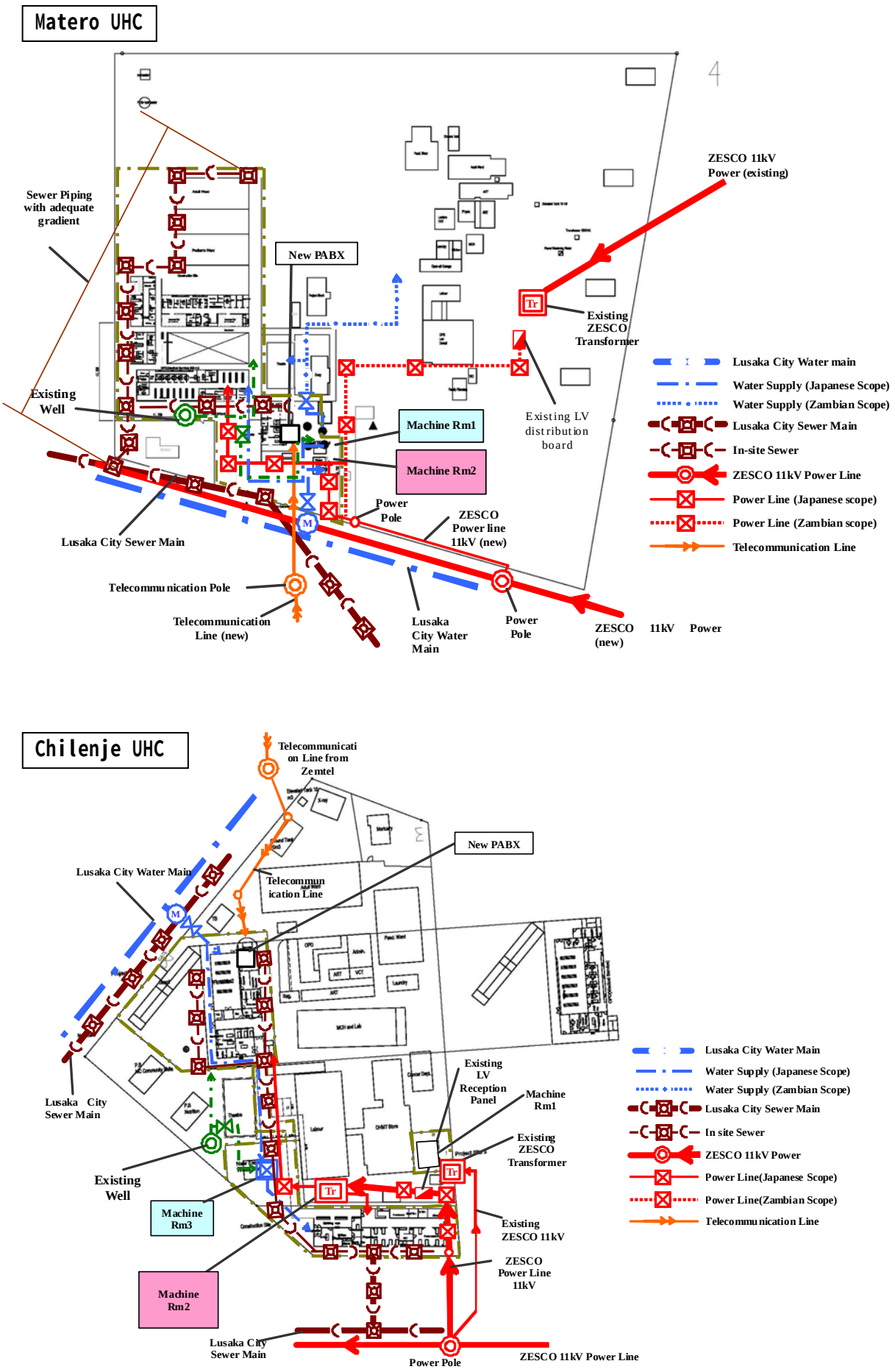


Figure 2-24 Utility Plan

2) Electrical Light Socket Equipment

The design illuminance will be set to approximately 30 - 50% of the applicable JIS standard. The light source used will be principally fluorescent lamps, most widely used in the region with good energy efficiency. The zoning of the switches will be segmented in an effort to reduce the running cost.
The sockets will be basically BS standard sockets (with a switch), which are generally used in Zambia, and we will define the position and specifications according to the type of power source, capacity, and connection method of the devices to be used.

3) Lightning Protection / Grounding Equipment

The region experiences high frequency of lightning cases, so that the external lightning protection with aerial conductor and/or roof-ridge conductor shall be installed to protect the facilities from lightning strikes. Lighting arrestors will be installed at the draw-in side of high voltage system.
Grounding system necessary for the medical equipment, power devices, communication devices, and so on shall be provided according to the specifications of each device.

4) Telephone Installation

To introduce telephone installation, the existing trunk line fabricated by Zamtel has been installed on the frontal road of the site. Telephone lines will come from the fabricated trunk line to the MDF (main distribution frame) newly built by the Japan side. The phone capacity necessary for the target facilities is expected to be maximum of five external lines and between fifty and a hundred extension lines (planned at 0.02 lines per m2 floor area of the building) or so. Japan side will be responsible for installing the MDF, PABX (private automatic branch exchanger), terminal board, wirings in the rooms, and telephone equipment. We will also look into how we can provide telephone lines for the existing buildings as well.

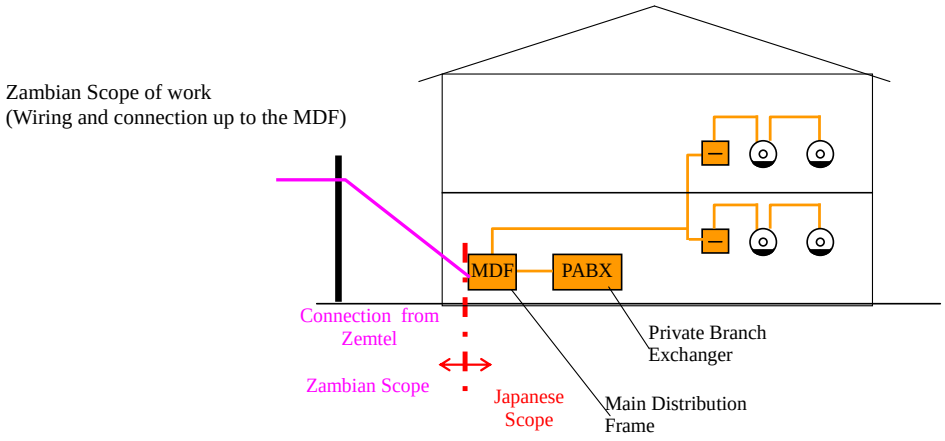


Figure 2-25 Telecommunication Schematic

5) Public Address System

A new main amplifier for a public address system shall be installed so that doctors can be called or information shared whatever necessary for the target facility with a central control system, calls for evacuation issued, instructions given on the way out and so on. A nurse call system will be provided in patients ' rooms. Also individual call system to call patients in the waiting halls or other area from receptions, etc. shall be considered.

6) Fire Alarm System

A fire alarm system incompliance with the rules and standards in Zambia shall be installed. Emergency exit sign lighting shall also be installed. These are only applied to the buildings included in the scope of work.

7) Television Audience Equipment

The Japan side shall be responsible for installing an antennae, distributors, wiring and outlets, and the hospital shall be responsible for installing the televisions. Basically, outlets will be provided in each of the waiting halls and the staff rooms.

8) Conduit Works for Information Network

Wiring conduit and outlets from the shaft on each floor to necessary areas shall be installed for the information network system. Additionally, to connect the system with the existing network system, conduit work and hand holes up to the connection point shall be installed.
Zambia side will be moving the emergency telephone and radio equipment to the facility and Japan side will be responsible for the conduit work and the hand holes on the site.

(2) Mechanical Equipment

The key points in making a mechanical equipment plan for the project are as follows:

a. Considering the fact that the building will be used as a hospital and the infrastructure around the building has yet to be fully developed, planning shall ensure a safe and stable system that allows continuity of operations for certain time even when the infrastructure breaks down.
b. Considering the difficulty in procuring commodities in the region, planning shall employ a simple system so that maintenance work will be easy to conduct.
c. A system that is environmentally friendly should be established by utilising the natural environment of the target site with, for example, natural ventilation, rainwater utilisation, and solar water heaters including a building plan.

1) Water Supply System

In the project, water will be supplied using two different lines: clean water and general service water.
The source of clean water will be city water and the water will be used for medical purposes. City water will be drawn through a water main close to the project site, stored temporarily in an aboveground water reserve, pumped up to an elevated water tank, and supplied to each area using a gravity method. Water examination of the city water revealed that the water hardness is too high to be used for medical purposes and no residual chlorine was detected, so we will install water-softening apparatus and a chlorine steriliser. The water reserve to be used here is concrete on the ground with a compartment installed to avoid disruption of water supply during cleaning of the tank. We will plan the capacity of the water reserve to be sufficient to stock more than one day ' s amount of water supplied to the whole site including the existing facilities (about 70 m^3 for Chilenje and about 90 m^3 for Matero), considering the fact that water stoppage is very common in this region. We also plan to supply water to the water reserve by branching the existing well piping for emergencies. The Zambia side will take care of the work on the existing well piping, and the Japan side will take of the work after the branch. The work will be separated at the branch valve.
For the general-service water line, it is requested that the water be used as supply water during emergencies in the existing building, so we will connect it with the existing water supply piping. Zambia will be in charge of the piping work from the branch of the existing water supply piping to the site, and Japan will take over the work to be conducted on the site after the branch. The work will be separated at the branch valve to be installed at the target site.
Japan will be responsible for the construction of the water supply facility at the target site. On the other hand, Zambia will take care of installation of a draw-in pipe from the city water main to the boundary of the site, other work needed for draw-in such as installing a meter, and water supply work outside the site for connection with the existing system.

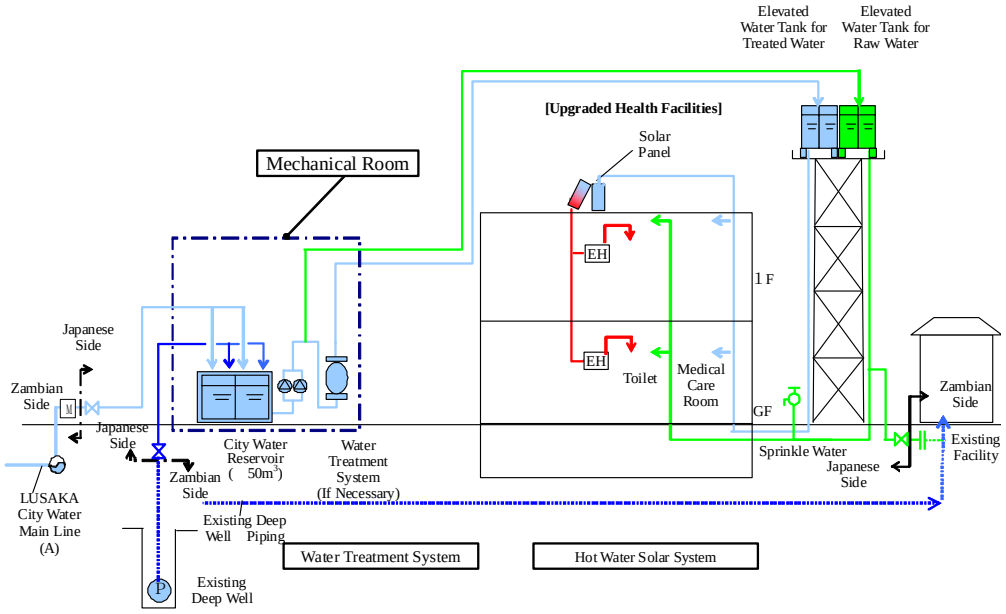


Figure 2-26 Water/Hot water Supply Flow

2) Drainage Equipment

There is a public sewerage system established in the Matero and Chilenje regions, so living drainage (sewage water / miscellaneous drainage) is connected to the sewage main via sewage piping. Therefore, we will connect the drainage piping for the facility to be newly built with the sewage main in the same way.

The special drainage resulting from examination and medical activities shall be discharged to the sewage main after neutralising and sterilising treatment according to the drainage standards in Zambia. There is no laboratory in Chilenje, however, so we will not install a neutralising / sterilising device there.

The Japan side will take care of building the drainage facility including the drainage treatment to be installed at the target site. On the other hand, the Zambia side will be in charge of constructing the drainage facility beyond the boundary of the site.

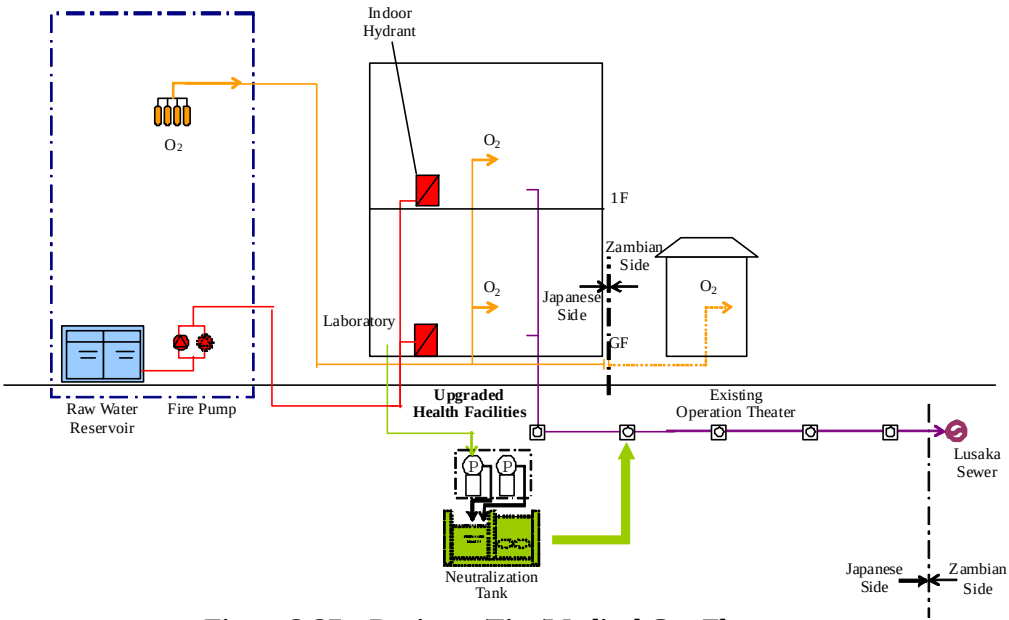


Figure 2-27 Drainage/Fire/Medical Gas Flow

3) Hot-water Supply Equipment

In principle, hot-water supply equipment shall be provided individually for any necessary areas including showers, wash bowls, and the sluice room. As hot-water supply equipment, we will install a hot-water stock-type electrical water heater in places where they are required. We will

also install a solar water heater in important places (labour, casualty, peadeatric) as an auxiliary heating source. A solar water heater works as a backup power supply in case of the electrical water heater is malfunctionning or maintenance.

4) Sanitary Apparatus Equipment

The toilet basins to be used shall be the Western type. The flushing apparatus for toilet basins is to be the tank type, which is commonly used in this region. If the tank for the toilet basin is in a lower position, many people tend to place their hand on the tank and put their weight on it, which will eventually break the basin. Therefore, we will place the tank in a higher position and come up with a solution to prevent it from being easily broken, for example, by providing some reinforcement.
For wash bowls and sinks to be installed at clean sites, we will make sure to incorporate measures against in-hospital infections by mounting elbow water faucets. For shower apparatus, we will basically employ the fixed type, instead of the hand type, placing top priority on durability.

5) Fire Control Equipment

After holding discussions with the Lusaka fire department, we decided to plan the fire control equipment basically according to Zambia's fire control installation standards, and we will also refer to BS and Japan's standards as necessary. In the project, we will install an indoor fire hydrant (hose reel), outdoor fire hydrant, and extinguishers. The Lusaka fire department requested that we install a dedicated plug for the fire service as well, but to decide whether to install it or not will need further consideration with reference to various standards. There are several types of extinguisher, such as the bubble, water, powder, and CO2 type, and we are required to install several types according to its application.

6) Medical Gas Equipment

We will plan medical gas equipment newly for the target facilities. The medical gas needed will be oxygen only, and we will install outlets in the rooms, and a cylinder and manifold in the outside mechanical room. In response to a request from the Ministry of Health, we will pipe the oxygen piping with the existing surgery room, and the piping can be closed with the branch valve at the site. We will also make a plan of the manifold and piping size together with the usage capacity in the surgery room.

Table 2-21 Rooms required Medical Gas Supply

Room Name	O2	Note
Casualty	○	ceiling or wall
Maternity	○	wall
Recovery	○	wall
Treatment	○	wall
Ward(part of them)	○	wall
(Existing Theatre)	○	only main piping

7) Waste Disposal Facility

For the waste produced in each hospital, general waste and medical waste are separately collected in different places in the health centres. General waste is regularly collected and disposed of in a landfill by city services, while medical waste is disposed of using the existing incinerator at the site. Therefore, we consider it unnecessary to install a new incinerator in the project.

8) LPG Equipment

We will consider supplying LPG to safety cabinets and so on in the laboratory and to the dental laboratory.

9) Air Conditioning / Ventilation Equipment

We will basically employ a natural ventilation method for the consultation rooms, wards, general offices, and waiting rooms in the facility, and we will provide fanlights above door areas. We will also install ceiling fans in the rooms.

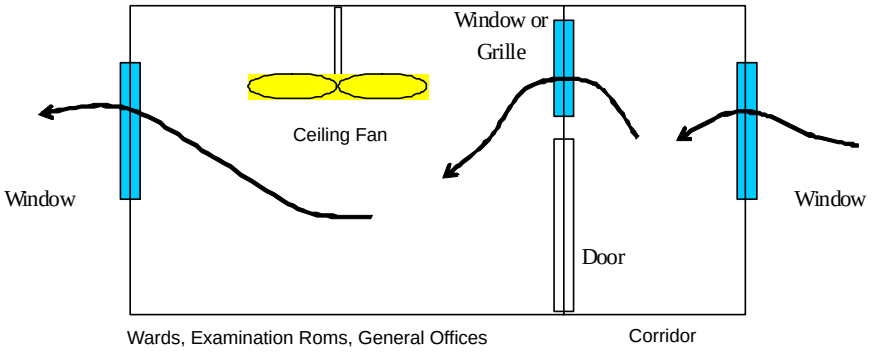


Figure 2-28 Ventilation System for Wards, Examination Rooms and General Office

For areas that require an air conditioning system as part of the medical activities including the emergency, laboratory, and delivery departments, we will install an air conditioner (cooling and heating as necessary) individually. For rooms that require a certain level of cleanliness, we will choose an independent type of ceiling cassette air conditioner with a filter. For other rooms, we will choose a wall-type air conditioner with a recyclable, standard type of filter. To reduce the required cleaning maintenance frequency to the extent possible, we will generally use a long-life-type filter with a wide area of dust removal.

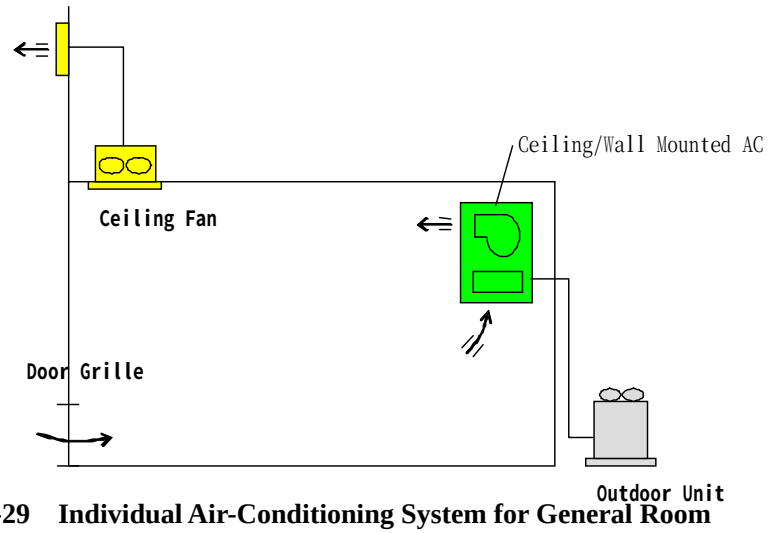


Figure 2-29 Individual Air-Conditioning System for General Room

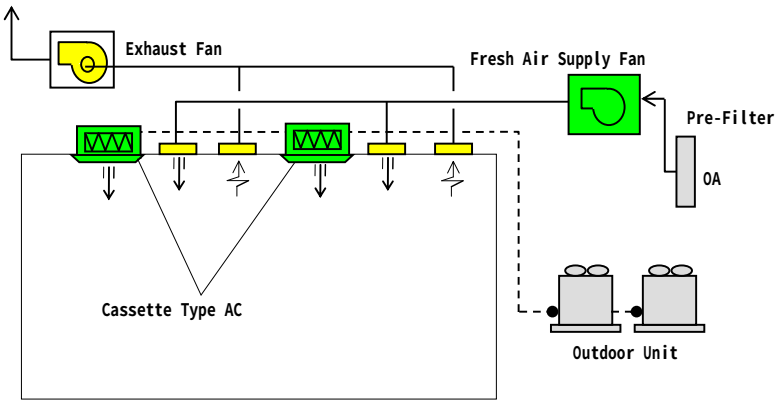


Figure 2-30 Individual Air-Conditioning System for Casualty and others

The table below shows the main rooms provided with an air conditioning system and its air conditioning method. We will further discuss the details later.

Table 2-22 Main rooms with air conditioning and its air conditioning method

Room	Air Conditioner 1)	Room Pressure 2)	Air filter 3)	Remark 4)
Emergency	C	P	L	Cooling and heating *
X-ray	W	E	L	Cooling and heating
Nursery	W	P	L	Cooling and heating *
Delivery	C	P	L	Cooling and heating *
Special Laboratory (microorganisms)	W	E	L	
Pharmacy	W	E	L	*
VIP Office	W	E	L	

Note 1) C: Ceiling Cassette Type; W: Wall Type
2) P: Positive Pressure; N: Negative Pressure; E: Equal Pressure
3) M: Medium Efficiency; L: General
4) *: The air conditioner will operate with the power supplied from an emergency generator during an emergency.

IV Construction Material Plan

In selecting building materials, the main criteria will be whether the materials or construction method are rooted in Zambia so that they are easy to maintain. The following points are to be kept in mind in selecting basic materials for both hospital facilities: the Matero UHC and the Chilenje UHC.

(1) Building Frames

1) Ordinary Portland Cement

There are several ordinary Portland cement (compliant with the Zambia Bureau of Standards) products manufactured in this region including that made by LAFARGE CEMENT ZAMBIA PLC, a France-based company. The price is equivalent to that in Japan.

2) Aggregate

Aggregate is mined in the Lusaka suburbs. Coarse aggregate and fine aggregate are processed.

3) Mixing Water

The mixing water shall be equivalent to clean water and in principle, recovered water will not be used.

4) Admixture

As a general rule, admixture will not be used. In the case where it is needed, however, it may be used.

5) Ready-mixed Concrete

There is a company that supplies ready-mixed concrete in the Lusaka suburbs. The company has a concrete-mixing vehicle and a concrete-pumping vehicle as well. Using a single source for ready-mixed concrete, however, makes it difficult to respond to unforeseen situations, so the basic strategy is to mix it on site. The concrete grades used are 15 MPA, 20 MPA, 25 MPA, 30 MPA, and 35 MPA.
The conditions for mixing will be basically according to the Japanese Architectural Standard Specifications and JASS5 (Architectural Institute of Japan).

6) Reinforcing Steel

Reinforcing steel is not manufactured in Zambia. The main steel distributed here is that made in the Republic of South Africa (compliant with SABS: South African Bureau of Standards), and there are round bars and deformed reinforcing bars. The diameter of reinforcing steel ranges from R6, D8, D10, D12, D16, D20, D25, D32, D40, to D50. The strengths of reinforcing steel used are 250 N/mm2 and 450 N/mm2.

7) Iron Frames

Iron frames are not manufactured in Zambia. The main kind of frame distributed here is that made in the Republic of South Africa (compliant with SABS: South African Bureau of Standards).

(2) Exterior Finishing Materials

1) Roofs

To avoid water leakage, which promotes deterioration of buildings, the roofs will have slope of about 1/10. We will place folded metal plates over concrete slabs as a finishing material. The folded metal plates to be chosen here should be procurable in the region, making them easier to maintain.

2) External Walls

To ensure easy-to-maintain property, external walls will be paint-finished on a mortar setting over concrete block masonry, which is commonly used in the region. The paint to be selected here is one that can follow cracks to prevent deterioration of the buildings.

(3) Interior Finishing Materials

1) Floors

For areas where many patients gather including OPD, administration rooms, wards, and patients' rooms, the floor will be terrazzo fabricated on site or tiles, which are easy to clean and are highly durable.

2) Internal Walls

For specific rooms using water including toilets and the shower room, we will employ tiled walls, which are easy to wipe off. Other general areas will be paint-finished on a mortar setting.
For rooms where radioactive rays are used, we will employ a reinforcing steel concrete wall, which has the ability to protect from radioactive rays and protect the walls with iron / lead materials.
In areas where stretchers or other equipment might bump against the walls of corridors, internal walls, arrises of columns, and so on, we will install a stretcher guard or corner guard, which can also serve as a handrail.

3) Ceilings

① For rooms using water including toilets and the shower room, as well as the treatment room in the emergency examination building that requires high cleanliness, the ceilings will be paint-finished on a calcium silicate plate, which is easy to clean and whose cleanliness is easy to maintain.
② For the testing and sterilisation rooms with ceilings placed to prevent grit or dust from falling down and the general-purpose rooms, the ceiling will be finished with rockwool acoustic board. We will employ direct finishing for the waiting spaces.

(4) Fittings and Others

For external fittings, we will employ aluminium sashes because they are highly resistant to weather. For the delivery rooms that need to be easy to clean and highly durable, we will choose stainless doors.
For general-purpose internal fittings, we will employ lightweight steel fittings. For the equipment mechanical room, we will use steel fittings for noise reduction and durability. In addition, the fittings to be used in the rooms that require radioactive ray protection such as the X-ray room will be backed with lead plates.
The table below summarises the finishing materials and their related construction method as mentioned above:

Table 2-23 Finishing Materials and Construction Method

Area	Construction Method Common in the Regions (inc. existing buildings)	Construction Method to Use	Reason
Roofs	Pitched roof (with folded galvalume plate placed)	Pitched roof (with folded metal plate placed)	Easy to maintain
External Walls	Mortar setting + EAP paint finishing	Mortar setting +EAP paint finishing	Common construction method in the region They know how to maintain it very well.
Floors	Terrazzo fabricated on site	Terrazzo fabricated on site	The materials are commonly used in the region. Relatively easy to maintain, easy to clean
Walls	Mortar setting + EP finishing	Mortar setting + EP finishing	Common in the region, relatively easy to maintain
Ceilings	Rockwool acoustic board	Rockwool acoustic board	Common in the region, relatively easy to maintain
Fittings	Steel window Aluminium window	Aluminium window	Aluminium is widely used in the region and highly resistant to weather.
	Wood door Steel door	Lightweight steel fittings	High durability and operability, easy to maintain with re-painting To be used inside
		Steel fittings	Good sound insulation To be used in the mechanical room, etc.
		Stainless fittings	High durability and easy to clean To be used for main gates, gates of surgery rooms, etc.

(5) Equipment and Instruments

Most equipment and instruments have a service life between about ten and fifteen years, which is way shorter than the service life of building materials. Therefore, it is very important to ensure that the equipment to be chosen here has a certain level of quality so that the Zambia side will be able to maintain the equipment without any problem including the renewal procedures once construction has been completed. For these reasons, we will consider procuring equipment from a local source or a third country with experience in use (e.g., South Africa) wherever possible; but giving priority to the quality and functions of the equipment, we will need to select products made in Japan or by Japanese companies located in Southeast Asia. In the latter case, sufficient consideration should be given with regard to, for example, whether they have an agency nearby, how to maintain the equipment, and how to respond to a failure.

2-2-2-4 Equipment Plan

The list of planned equipment for procurement in this project and the specifications and purpose of use of the main equipment are shown in Table 2-24.

Table 2-24 Equipment List

Matero UHC

No.	Name of Equipment	Q'ty
Pharmacy		
W-003	Analytical Balance	1
W-036	Drug Cabinet, Lockable	1
W-070	Mixer	1
W-078	Pharmacy Refrigerator	1
W-113	Water Distiller	1
Medical Consultation-1, Vitals		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-114	Weighing Scale	1
W-115	Weighing Scale for Infant	1
W-125	ECG	1
Medical Consultation-2, Pediatrics		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-3, Women		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-4, Women		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-041	Examination Couch, Gynecological	1
W-042	Examination Light	1
W-109	Vaginal Speculum (L,M, S)	3
W-117	X-ray Film Viewer	1
Medical Consultation-5, Men		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-6, Eye/ENT		
W-020	Consulting desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
Medical Consultation-7, ART		
W-020	Consulting desk and Chair Set	1
Medical Consultation-8, Dental		
W-004	Autoclave, Small	1
W-024	Dental Film Processor	1
W-025	Dental Instrument Set	3
W-026	Dental Light Curing Unit	1
W-027	Dental Suite	1
W-029	Dental X-ray Unit	1
W-058	Instrument Cabinet	1
W-105	Ultrasonic Dental Scaler	1
Treatment Room		
W-032	Dressing Instrument Set	6
W-035	Drip Stand	2
W-040	Examination Couch	2
W-042	Examination Light	2

No.	Name of Equipment	Q'ty
Casualty		
W-002	Resuscitation Bag for Adults and Children	1
W-004	Autoclave, Small	1
W-030	Diagnostic Set	2
W-031	Drainage Set	3
W-032	Dressing Instrument Set	3
W-035	Drip Stand	3
W-042	Examination Light	2
W-058	Instrument Cabinet	1
W-075	Patient Trolley	2
W-090	Stretcher on wheels	2
W-091	Suction Pump	1
W-116	Wheel Chair	1
W-117	X-ray Film Viewer	1
Casualty, ICU (Observation)		
W-075	Patient Trolley	3
Casualty, BID		
W-090	Stretcher on Wheels	1
Conference Room		
W-123	Educational Table and Chair Set	11
Laboratory		
W-003	Analytical Balance	1
W-012	Blood Bank Refrigerator	1
W-016	Centrifuge	1
W-017	Chair for Laboratory Worker	6
W-019	Chemistry Analyzer	1
W-050	Hematology Analyzer	1
W-054	Hot Air Oven	1
W-055	Hot Plate	1
W-061	Laboratory Incubator	1
W-068	Hematocrit Centrifuge	1
W-069	Microscope	2
W-076	PH meter	1
W-078	Pharmacy Refrigerator	1
W-083	Roller Mixer	1
W-084	Rotator	1
W-112	Water Bath	1
W-121	Safety Cabinet	1
W-126	Micro Pipette	2
Laboratory, Sterilization		
W-005	Autoclave, Medium	1
W-113	Water Distiller	1
Medical Imaging, X-ray Room		
W-062	Lead Apron	1
W-117	X-ray Firm Viewer	1
W-120	X-ray Unit	1
Medical Imaging, Ultrasound Room		
W-106	Ultrasound Scanner with Printer	1
W-020	Consulting Desk and Chair Set	1
W-040	Examination Couch	1
Medical Imaging, Dark Room		
W-044	Automatic Film Processor	1
Delivery, Ante-Natal/ Labor Room		
W-007	Bed for Adult with Side Cabinet and Over Bed Table	9
W-046	Fetal Doppler	1
W-114	Weighing Scale	1
Delivery Room		
W-005	Autoclave, Medium	1
W-014	Cardio-Toco Graph Machine	1
W-022	Delivery Bed	4

No.	Name of Equipment	Q'ty
W-035	Drip Stand	2
W-039	Episiotomy Set/ Delivery Set	8
W-040	Examination couch	1
W-042	Examination Light	5
W-048	Glucometer	1
W-057	Infant Cot with Mattress	4
W-058	Instrument Cabinet	1
W-059	Instrument Trolley	4
W-082	Resuscitator with Timer	3
W-108	Vacuum Extractor	1
W-109	Vaginal Speculum (L,M, S)	2
W-115	Weighing Scale for Infant	1
W-116	Wheel Chair	1
Delivery, Post-Natal Room		
W-007	Bed for Adult with Side Cabinet and Over Bed Table	16
W-030	Diagnostic Set	1
W-034	Dressing Trolley	1
W-035	Drip Stand	3
W-040	Examination Couch	1
W-042	Examination Light	1
W-048	Glucometer	1
W-057	Infant Cot with Mattress	16
W-058	Instrument Cabinet	1
W-091	Suction Pump	1
W-114	Weighing Scale	1
W-127	Infusion Pump	1
Premature		
W-073	Neonatal Incubator	3
W-079	Phototherapy Unit	1
W-082	Resuscitator with Timer	1
Maintenance		
W-122	Maintenance Set	1
Surgical Ward		
W-005	Autoclave, Medium	1
W-007	Bed for Adult with Side Cabinet and Over Bed Table	24
W-030	Diagnostic Set	3
W-032	Dressing Instrument Set	5
W-034	Dressing Trolley	5
W-035	Drip Stand	6
W-058	Instrument Cabinet	1
W-091	Suction Pump	1
W-114	Weighing Scale	1
W-116	Wheel Chair	2
W-127	Infusion Pump	1
Pediatric Ward		
W-005	Autoclave, Medium	1
W-030	Diagnostic Set	3
W-032	Dressing Instrument Set	5
W-034	Dressing Trolley	5
W-035	Drip Stand	6
W-058	Instrument Cabinet	1
W-091	Suction Unit	1
W-114	Weighing Scale	1
W-116	Wheel Chair	1
W-127	Infusion Pump	1
W-128	Bed for Child with Side Cabinet	18

Chilenje UHC

No.	Name of Equipment	Q'ty
Pharmacy		
W-003	Analytical Balance	1
W-036	Drug Cabinet, Lockable	1
W-070	Mixer	1
W-078	Pharmacy Refrigerator	1
W-113	Water Distiller	1
Medical Consultation-1, Vitals		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-114	Weighing Scale	1
W-115	Weighing Scale for Infant	1
W-125	ECG	1
Medical Consultation-2, Pediatrics		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-3, Eye/ENT		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-4, Men		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-5, Men		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-6, Women		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-040	Examination Couch	1
W-042	Examination Light	1
W-117	X-ray Film Viewer	1
Medical Consultation-7, Women		
W-020	Consulting Desk and Chair Set	1
W-030	Diagnostic Set	1
W-041	Examination Couch, Gynecological	1
W-042	Examination Light	1
W-109	Vaginal Speculum (L, M, S)	3
W-117	X-ray Film Viewer	1

No.	Name of Equipment	Q'ty
Medical Consultation-8, Dental		
W-004	Autoclave, Small	1
W-025	Dental Instrument Set	3
W-026	Dental Light Curing Unit	1
W-027	Dental Suite	1
W-058	Instrument Cabinet	1
W-105	Ultrasonic Dental Scaler	1
Medical Consultation-9, ART		
W-020	Consulting Desk and Chair Set	1
Dental X-ray		
W-024	Dental Film Processor	1
W-029	Dental X-ray Unit	1
Treatment Room		
W-032	Dressing Instrument Set	6
W-035	Drip Stand	2
W-040	Examination Couch	2
W-042	Examination Light	2
Casualty		
W-002	Resuscitation Bag for Adults and Children	1
W-004	Autoclave, Small	1
W-030	Diagnostic Set	2
W-031	Drainage Set	3
W-032	Dressing Instrument Set	3
W-035	Drip Stand	2
W-042	Examination Light	2
W-058	Instrument Cabinet	1
W-075	Patient Trolley	2
W-090	Stretcher on Wheels	2
W-091	Suction Pump	1
W-116	Wheel Chair	1
W-117	X-ray Film Viewer	1
Casualty, ICU (Observation)		
W-075	Patient Trolley	3
Casualty, BID		
W-090	Stretcher on Wheels	1
Conference Room		
W-123	Educational Table and Chair Set	11
Laboratory		
W-003	Analytical Balance	1
W-012	Blood Bank Refrigerator	1
W-016	Centrifuge	1
W-019	Chemistry Analyzer	1
W-050	Hematology Analyzer	1
W-054	Hot Air Oven	1
W-055	Hot Plate	1
W-061	Laboratory Incubator	1
W-068	Hematocrit Centrifuge	1
W-069	Microscope	2
W-076	PH Meter	1
W-078	Pharmacy Refrigerator	1
W-083	Roller Mixer	1

No.	Name of Equipment	Q'ty
W-084	Rotator	1
W-112	Water Bath	1
W-121	Safety Cabinet	1
W-126	Micro Pipette	2
Laboratory, Sterilization		
W-005	Autoclave, Medium	1
W-113	Water Distiller	1
Medical Imaging, X-ray Room		
W-062	Lead Apron	1
W-117	X-ray Film Viewer	1
W-120	X-ray Unit	1
Medical Imaging, Dark Room		
W-044	Automatic Film Processor	1
Medical Imaging, Ultrasound Room		
W-020	Consulting Desk and Chair Set	1
W-040	Examination Couch	1
W-106	Ultrasound Scanner with Printer	1
Delivery, Ante-Natal/ Labor Room		
W-007	Bed for Adult	1
W-046	Fetal Doppler	1
W-114	Weighing Scale	1
Delivery, Delivery Room		
W-005	Autoclave, Medium	1
W-014	Cardio-Toco Graph Machine	1
W-022	Delivery Bed	3
W-035	Drip Stand	2
W-039	Episiotomy Set/ Delivery Set	6
W-040	Examination Couch	1
W-042	Examination Light	4
W-048	Glucometer	1
W-057	Infant Cot with Mattress	3
W-058	Instrument Cabinet	1
W-059	Instrument Trolley	3
W-082	Resuscitator with timer	2
W-108	Vacuum Extractor	1
W-109	Vaginal Speculum (L, M, S)	2
W-115	Weighing Scale for Infant	1
W-116	Wheel Chair	1
Delivery, Post-Natal Room		
W-007	Bed for Adult	11
W-057	Infant Cot with Mattress	11
Premature		
W-073	Neonatal Incubator	3
W-079	Phototherapy Unit	1
W-082	Resuscitator with timer	1
Maintenance		
W-122	Maintenance Set	1

Table 2-25 Specifications for Main Equipment

Equipment Name	Main Specifications
X-ray Unit	Inverter 50kW type, Tube Voltage: 40～150kV,with X-ray Tube Floor Support Unit, Bucky Table and Bucky Stand
Lead Apron	Size: L, Lead equivalent:0.25mmPb
Laboratory Incubator	Capacity: 90L or more, Temperature range: 5-60℃
Centrifuge	Table top type, Maximum Speed range: 5800rpm or wider, with Roter, tuberack and tube bucker
Autoclave (Small)	Chamber capacity: 15L or more, Sterilizing range：121/134℃
Hot Air Oven	Capacity: 150L or more, Temperature range：40-260℃
Patient Trolley	Size：L1900×W600×H610～850mm、Manual Adjustable Height and Back section
Instrument Cabinet	Material: Stainless steel
Dressing Trolley	Material: Stainless steel
Whell Chair	Aluminum alloy, Wheel:22" solid type, Caster:6"solid type
Blood Bank Refrigerator	Capacity: 290L or more, Temperature range: 4℃
Examination Light	Bulb: Screw type, Flexible (Goose neck) type
Micoroscope	Eyepiece Magnification:10x, Objective Lens Magnification: 10x, 20x, 40x, 100x(oil)
Water Bath	Capacity: 70L or more, Temperature range: 5-80℃
Phototherapy Unit	Stand type, Inverter Five Lamp
Consulting Desk and Chair set	Doctor's Desk, Doctor's Chair, Patient Chair
Dental Suite	With Light, Instrument tray, Handpiece and Air compressor
X-ray Film Viewer	Desk type, Film capacity:3 films in one step
Water Purifying Apparatus	Product Capacity: 1L/h, Cartridge type
Water Distiller	Banstead type, Product capacity: 3L/hr, with Pre-filter
Infant Cot with Mattress	Size：W800×D430×H920mm
Diagnostic set	Ophtalmoscope, Otoscope, Laryngoscope(Balde:S,M,L)
Electrocardiograph	12 lead ECG, 3/6 traces, with printer
Resuscitation Bag for Adult and Children	Material:Silicone
Weighing Scale	Capacity : 150kg or more, Sensitivity:500g or less
Weighing Scale for Infant	Capacity : 20kg, Sensitivity: 50g or less
Ultrasound Scanner with Printer	Probe: Convex and linear, Black and White 12 " monitor, with caster
Analytical Balance	Weighing capacity: 2100g or more, Minimum weighing value: 0.001g
Examination Coouch, Gynecological	Manual type, with Knee crutches
Delivery Bed	Manual type, with Knee crutches and Waste receptacle can
Neonatal Incubator	Servo and Manual controls, skin temp. Setting range:35.0-37.5℃
Maintenance set	Tester and Tool set
Drug Cabinet, Lockable	Material: Frame ABS resin
Pharmacy Refrigerator	Capacity: 290L or more, Temperature range: 2-14℃
Drip Stand	Material: Stainless steel, Five legs base with casters
Autoclave, Medium	Chamber capacity: 32L or more, Sterilizing range：105～128℃

2-2-3 Outline Design Drawings

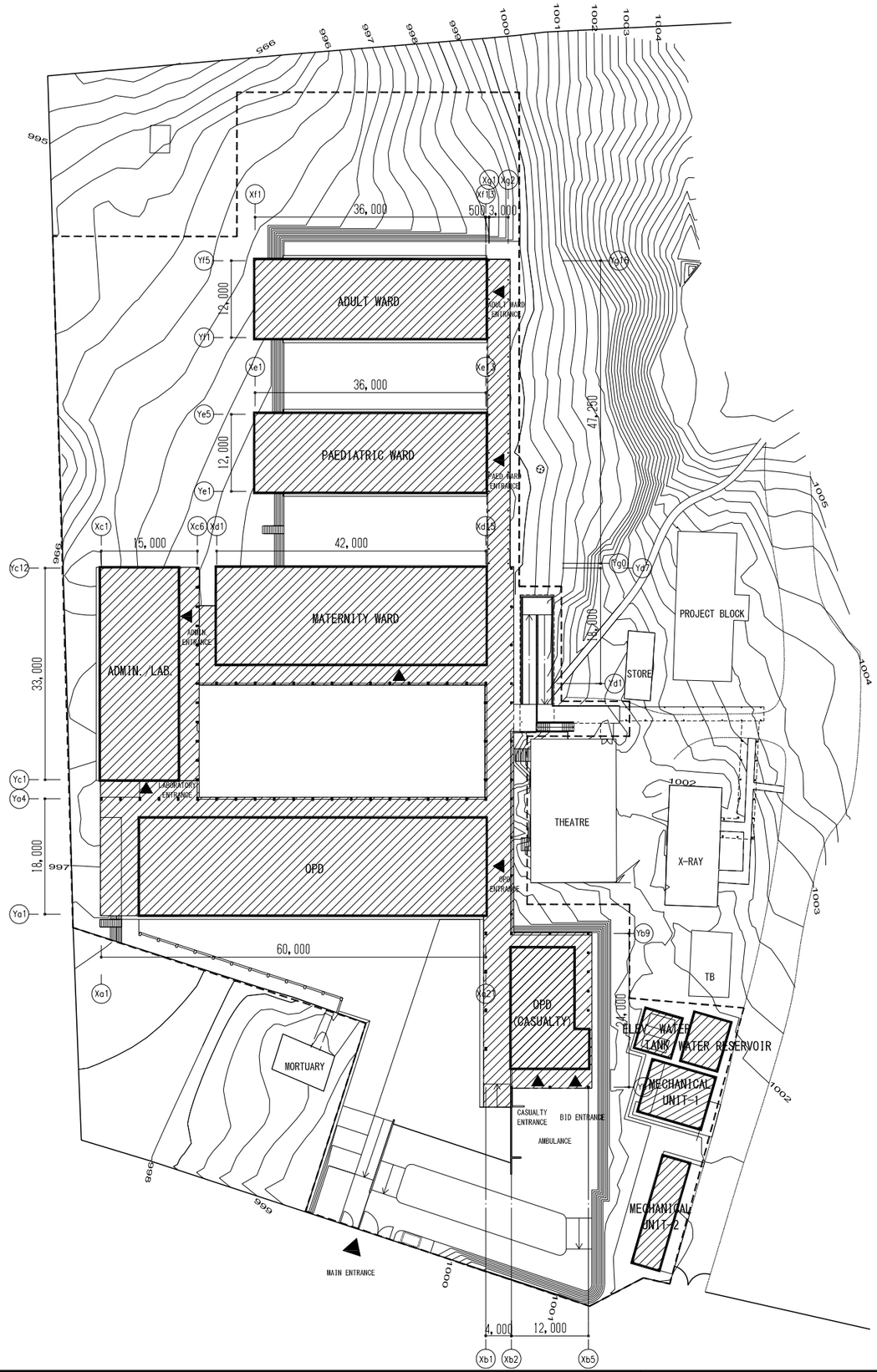
Table 2-26 List of Drawings

Matero UHC

	Facility Name	Drawing Items	Scale	Page
1	All Buildings	Site Plan	1/800	71
2	OPD, Admin./Lab., Maternity Ward	Roof Plan-1	1/300	73
3	Paediatric Ward, Adult Ward, OPD (Casualty)	Roof Plan-2	1/300	75
4	OPD, Admin./Lab., Maternity Ward	Ground Floor Plan-1	1/300	77
5	Paediatric Ward, Adult Ward, OPD (Casualty)	Ground Floor Plan-2	1/300	79
6	OPD, Admin./Lab., Maternity Ward, Paediatric Ward, Adult Ward	Section	1/300	81
7	Paediatric Ward, Adult Ward, OPD (Casualty)	Elevation	1/300	83

Chilenje UHC

	Facility Name	Drawing Items	Scale	Page
1	All Buildings	Site Plan	1/800	85
2	OPD, Maternity/Admin. and annexes	Roof Plan	1/300	87
3	OPD	GFL and 1FL Plan	1/300	89
4	Maternity/Administration, OPD	GFL and 1FL Plan, Section	1/300	91
5	OPD, Maternity/Administration	Elevation	1/300	93



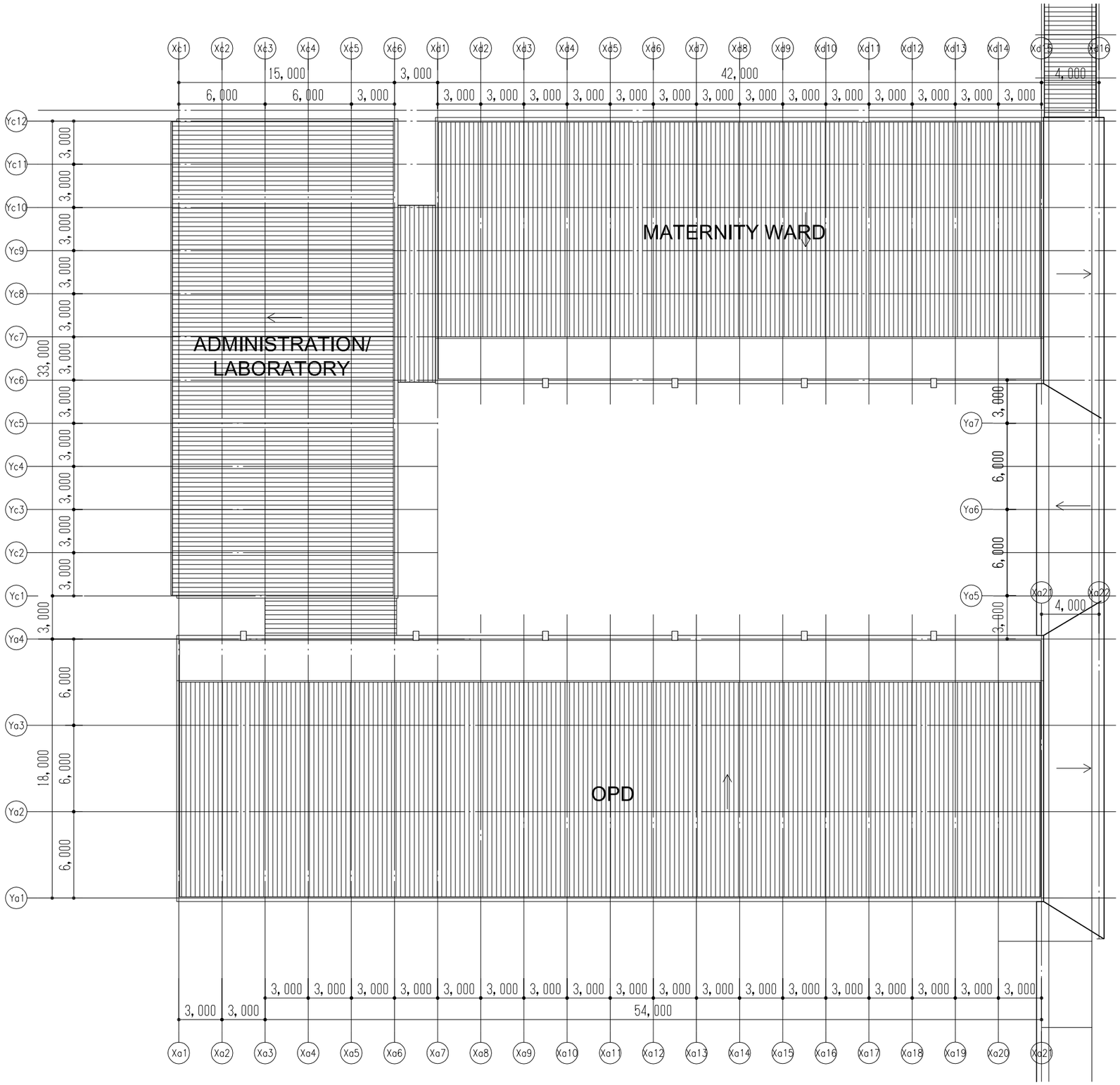
-LEGEND-

FACILITIES CONSTRUCTED BY JAPANESE SIDE

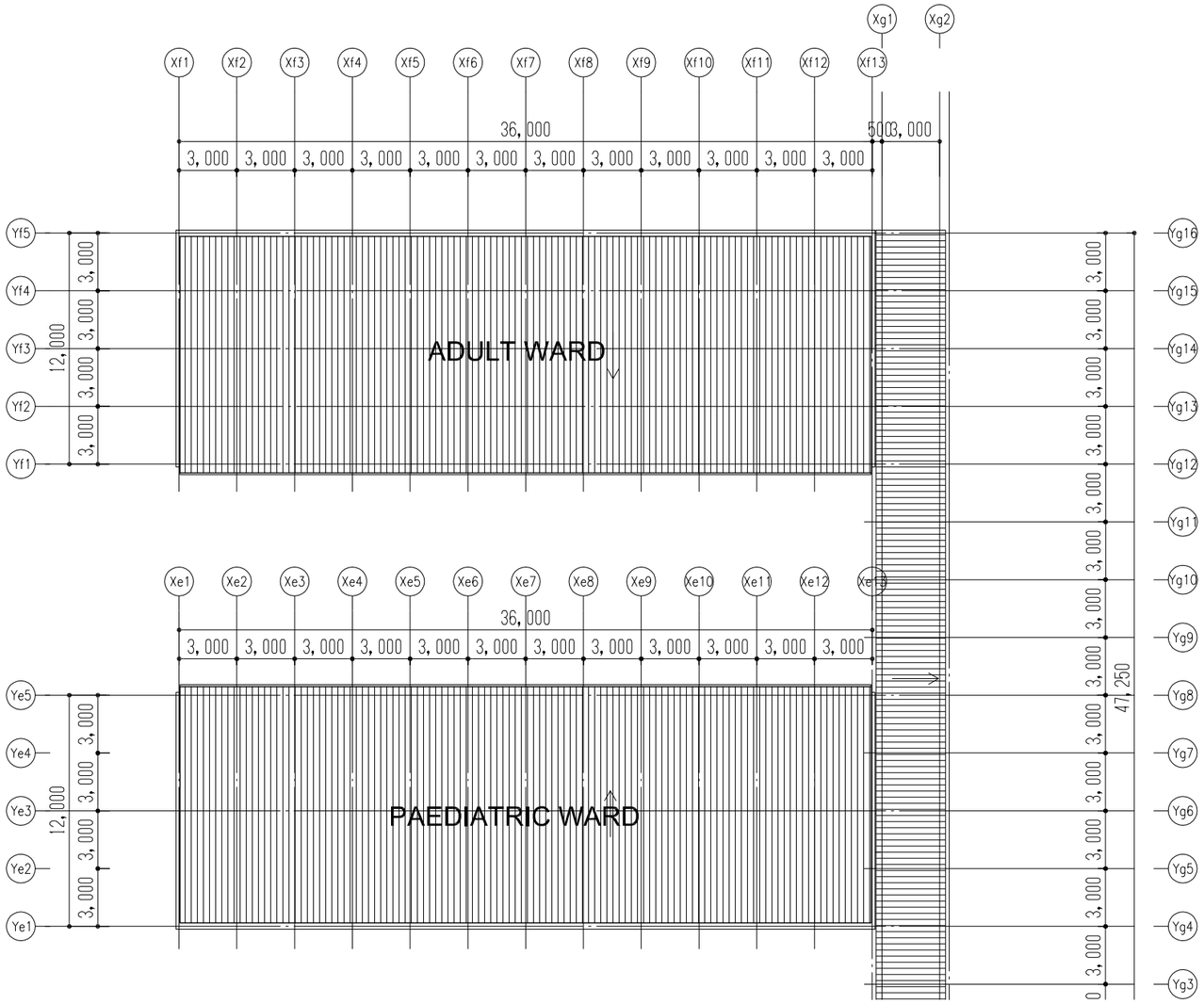
CONSTRUCTION AREA

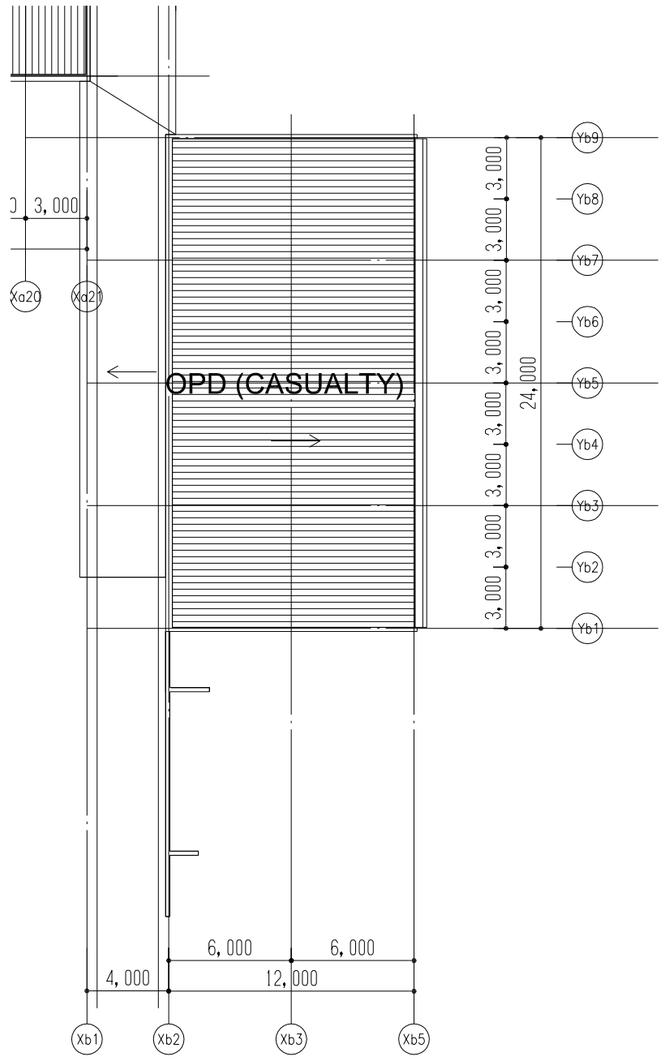
	MATERO	SITE PLAN
		1/800

N



	MATERO	ROOF PLAN-1
		1/300





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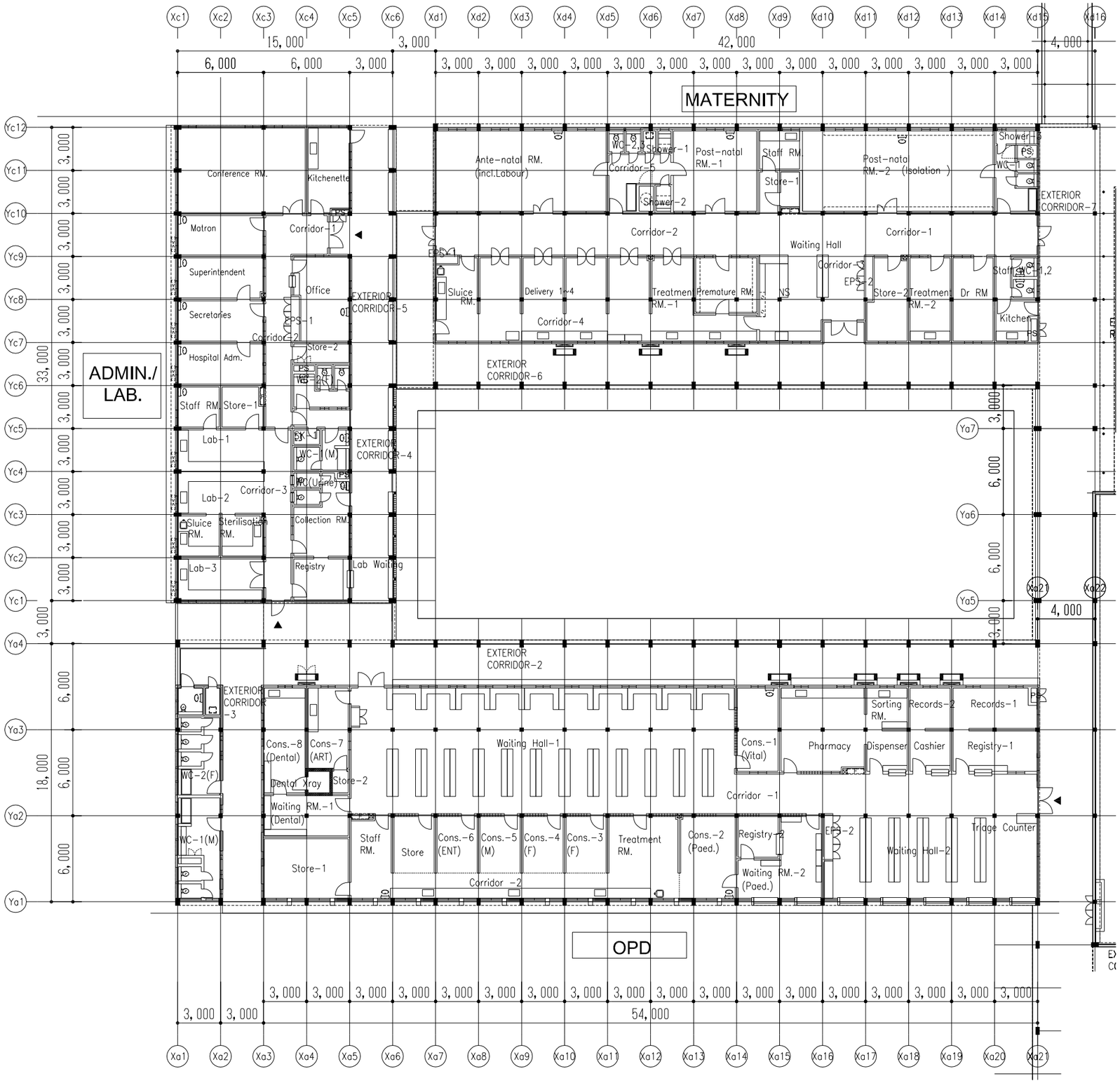

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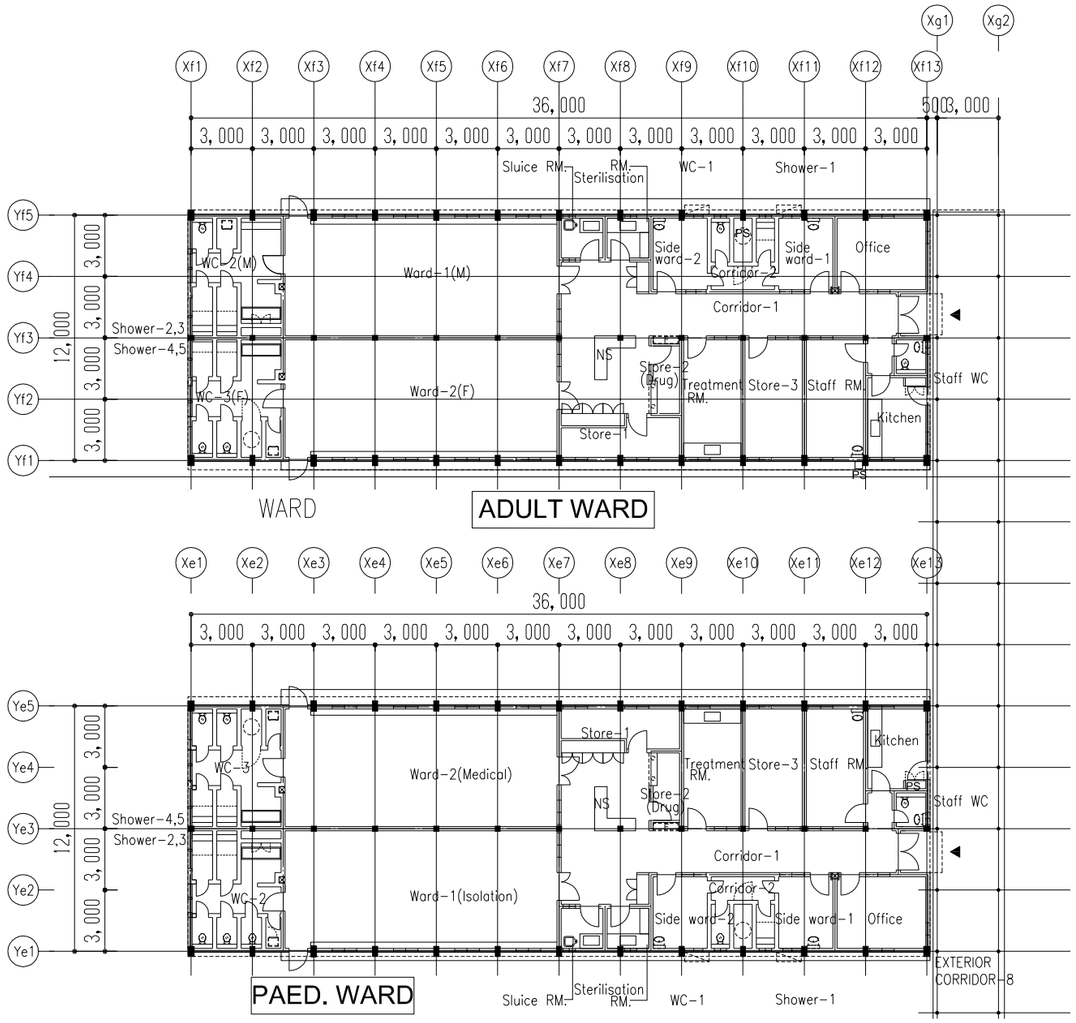

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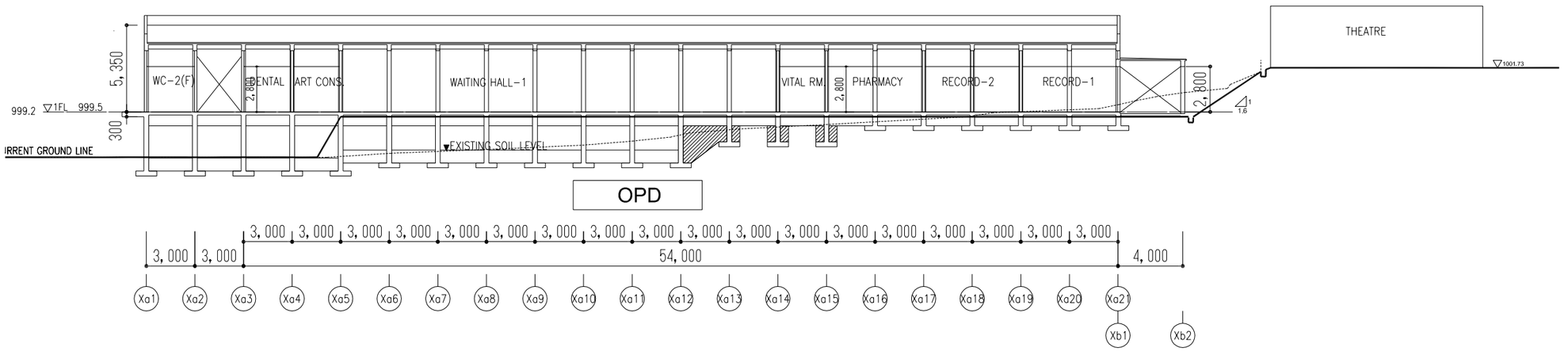
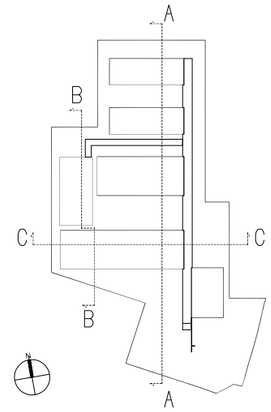


C-C SECTION



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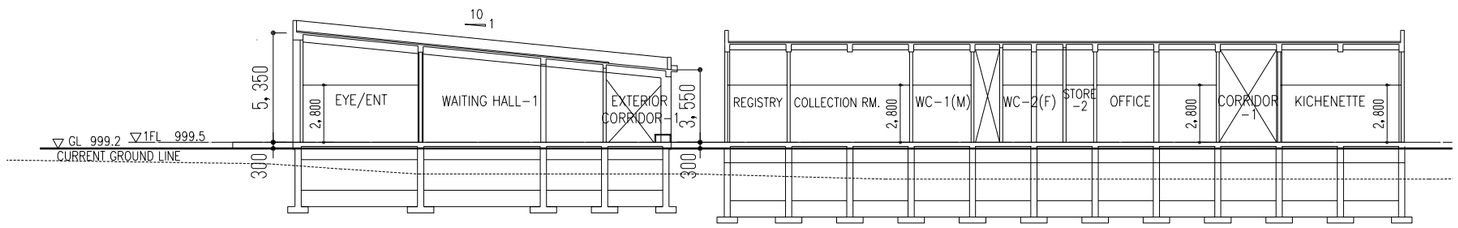

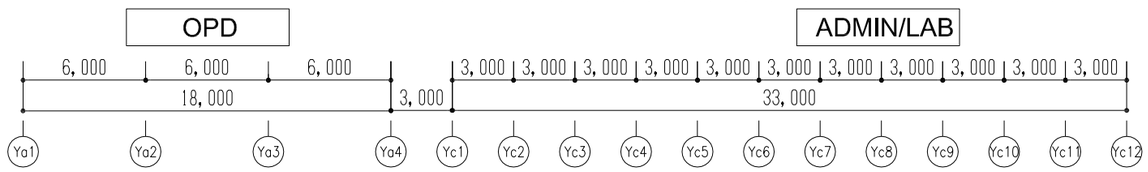

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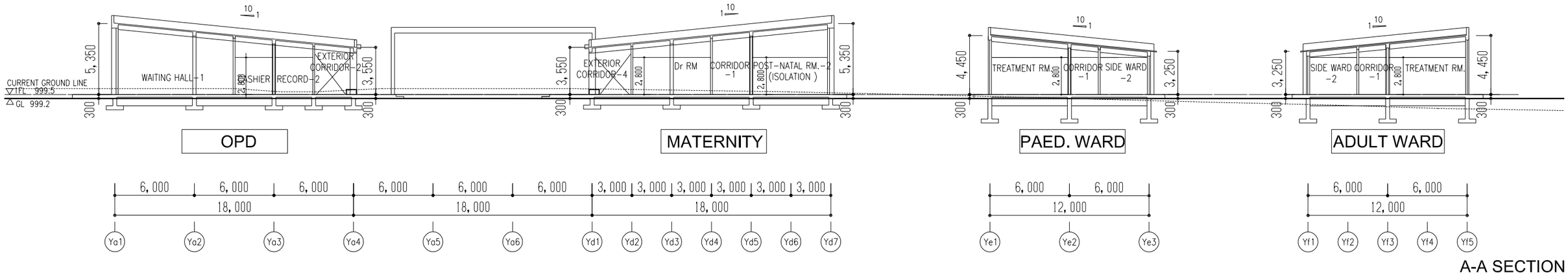
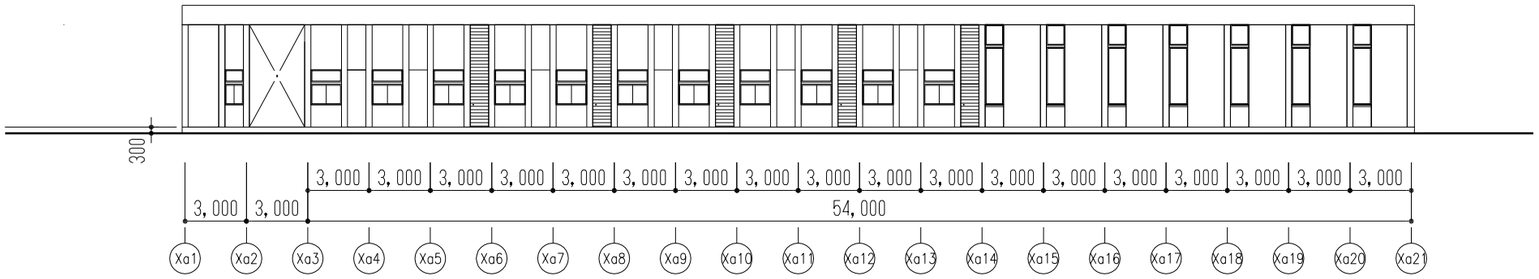
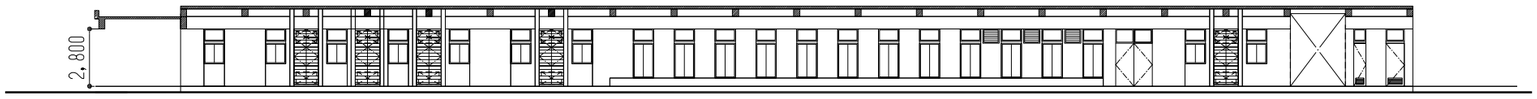


A-A SECTION

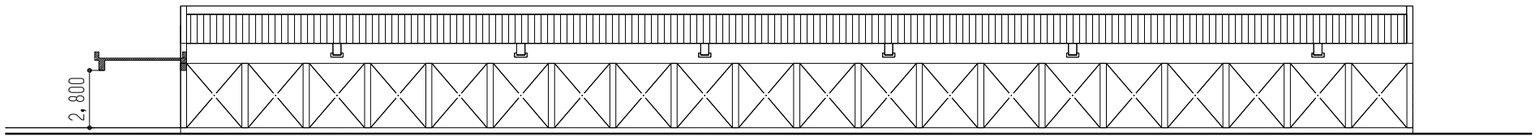
	MATERO	SECTION
		1/300



OPD-a-ELEVATION



OPD-c'-ELEVATION



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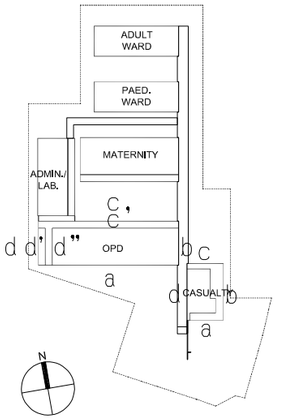
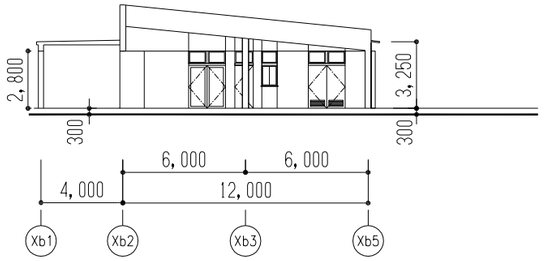
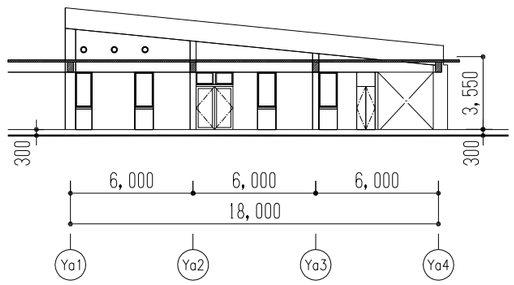


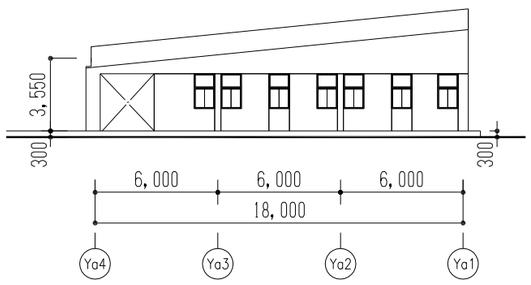
KEY PLAN



OPD-d"-ELEVATION



OPD-b-ELEVATION



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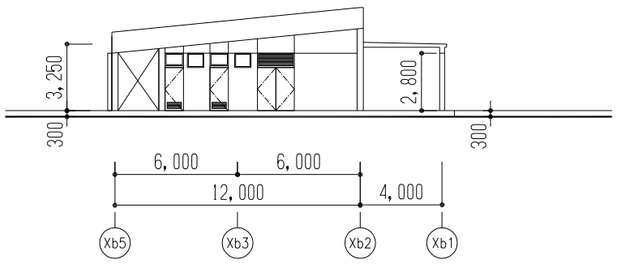
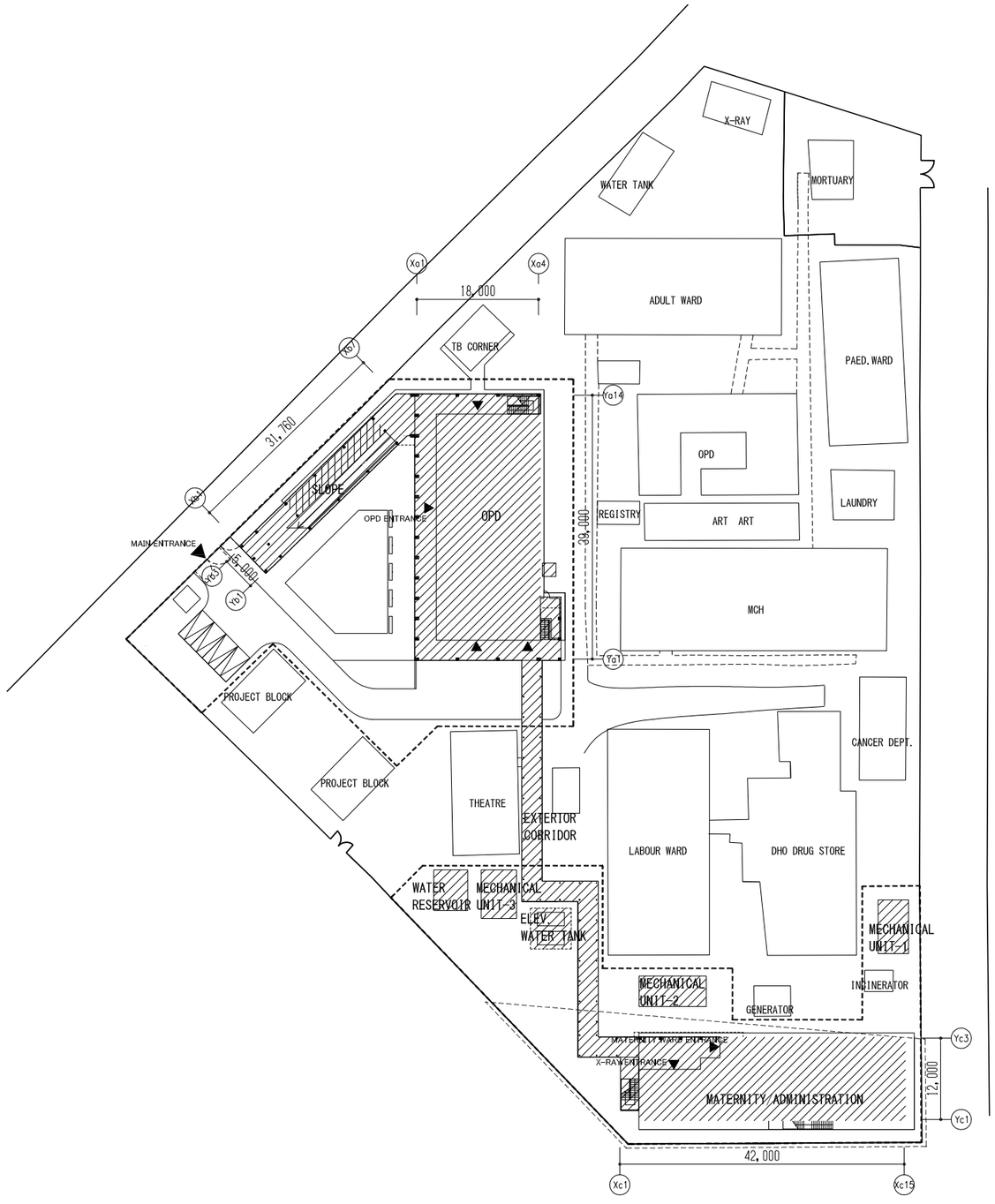


OPD-d'-ELEVATION

	MATERO	ELEVATION
		1/300



-LEGEND-

FACILITIES CONSTRUCTED BY JAPANESE SIDE

CONSTRUCTION AREA

	CHILENJE	SITE PLAN
		1/800

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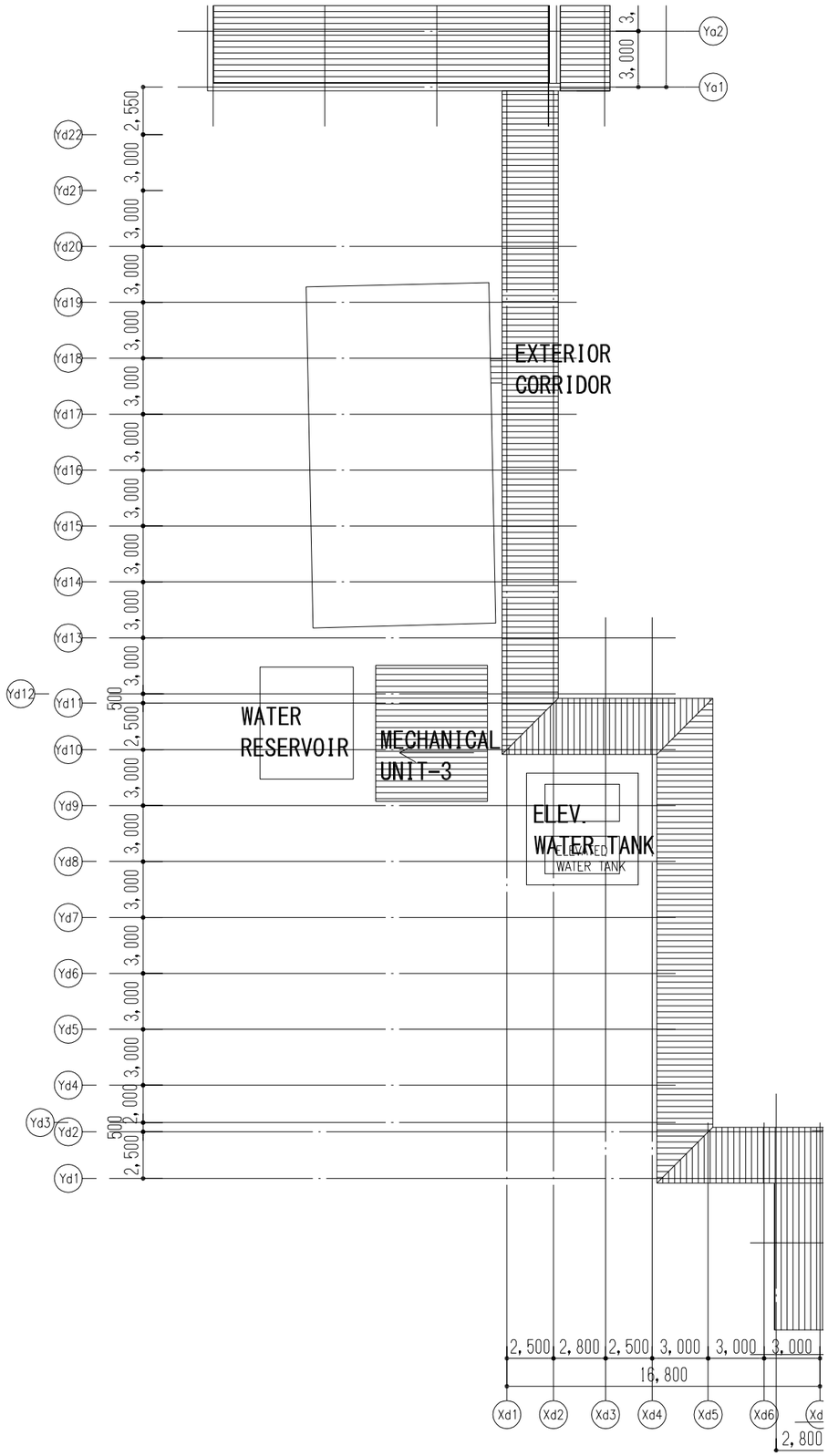

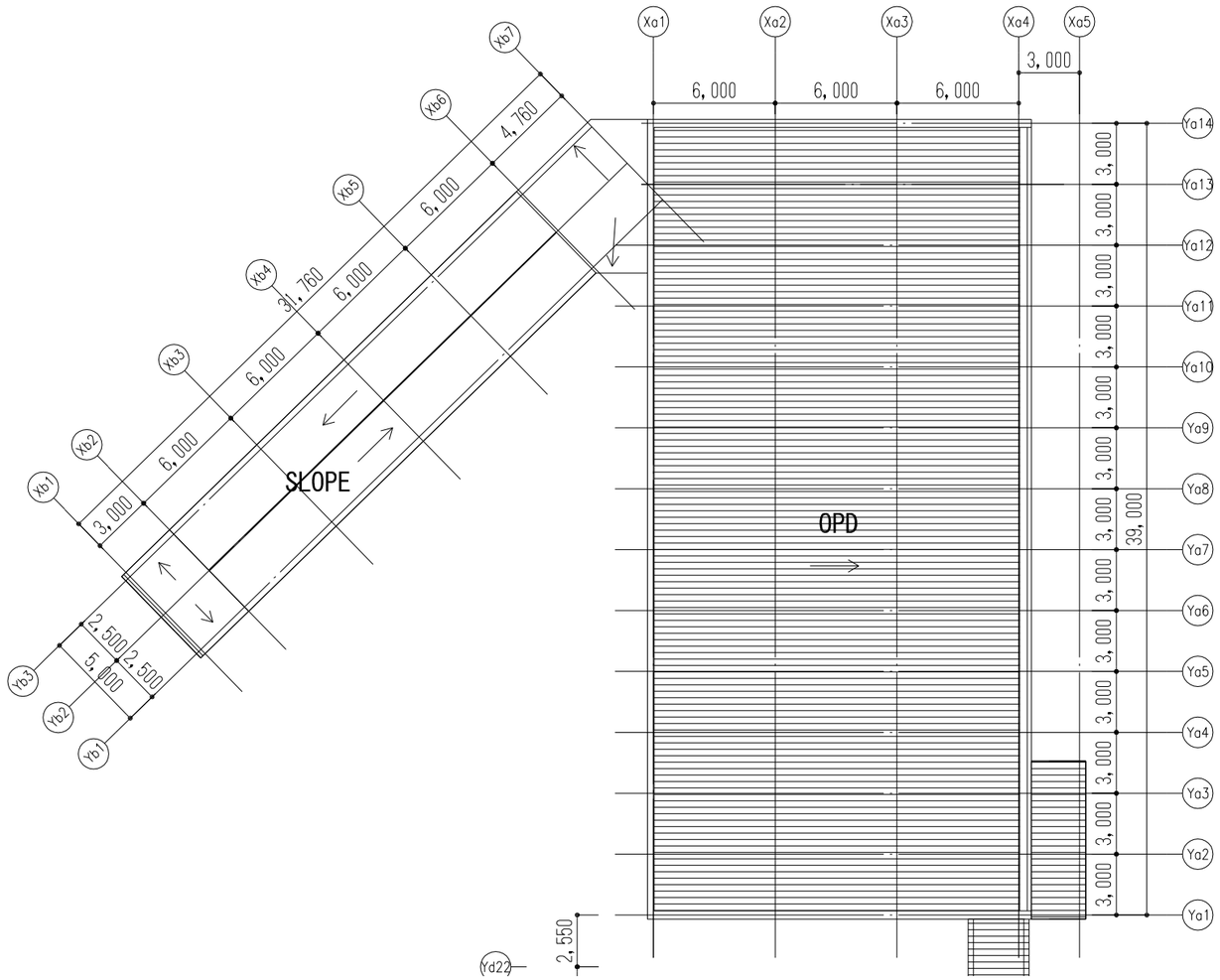

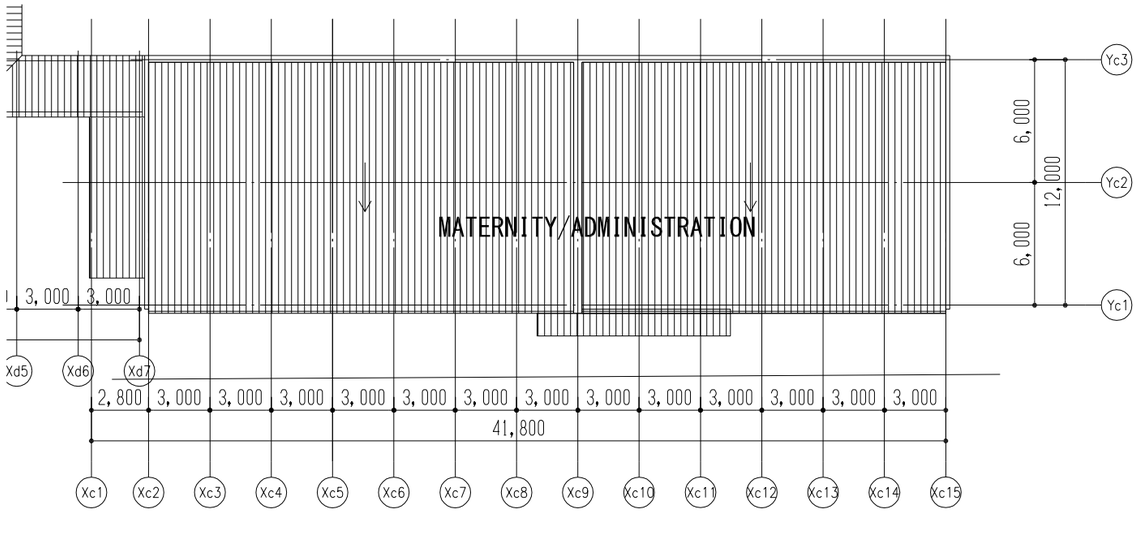

	CHILENJE	ROOF PLAN
		1/300

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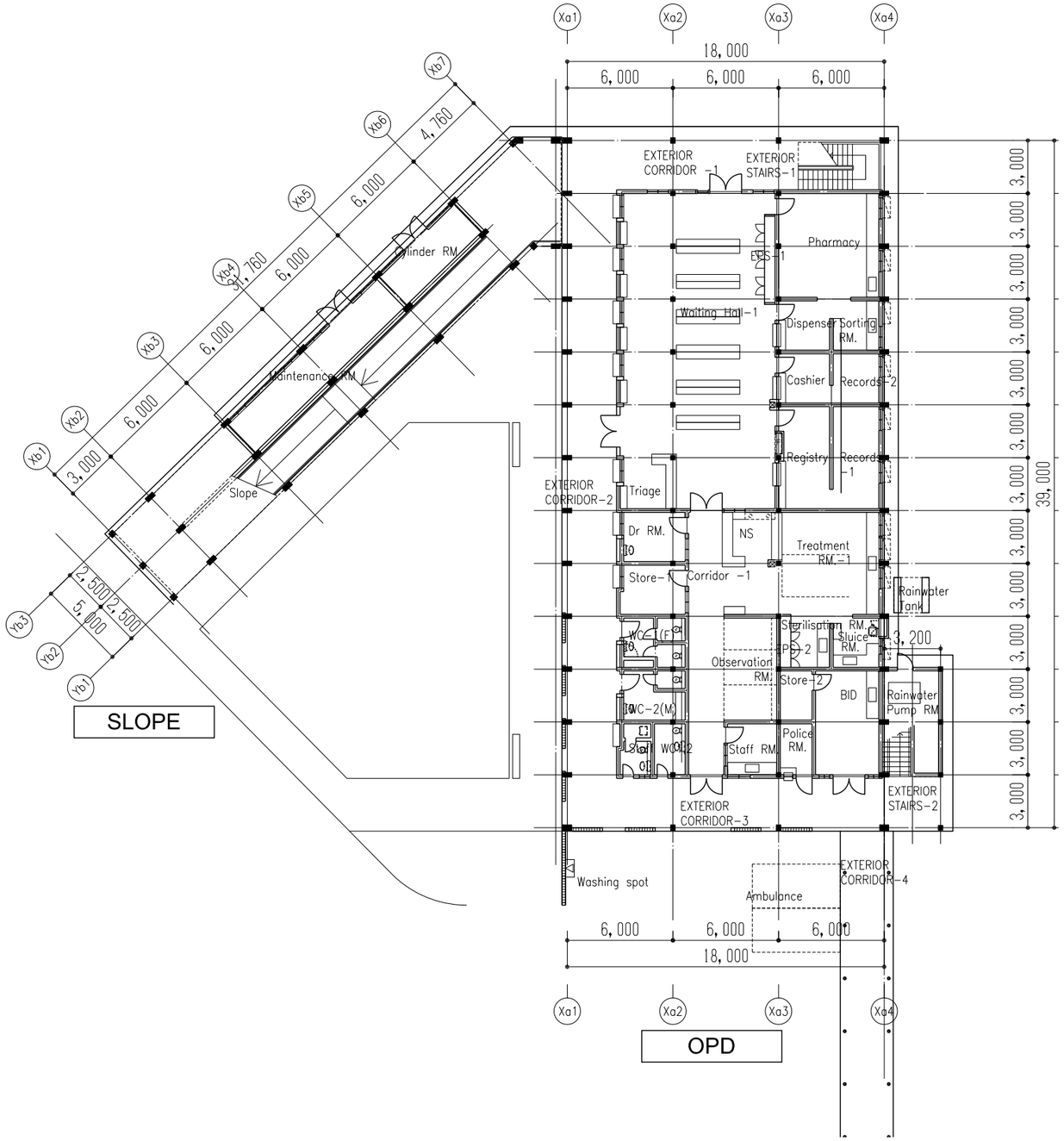
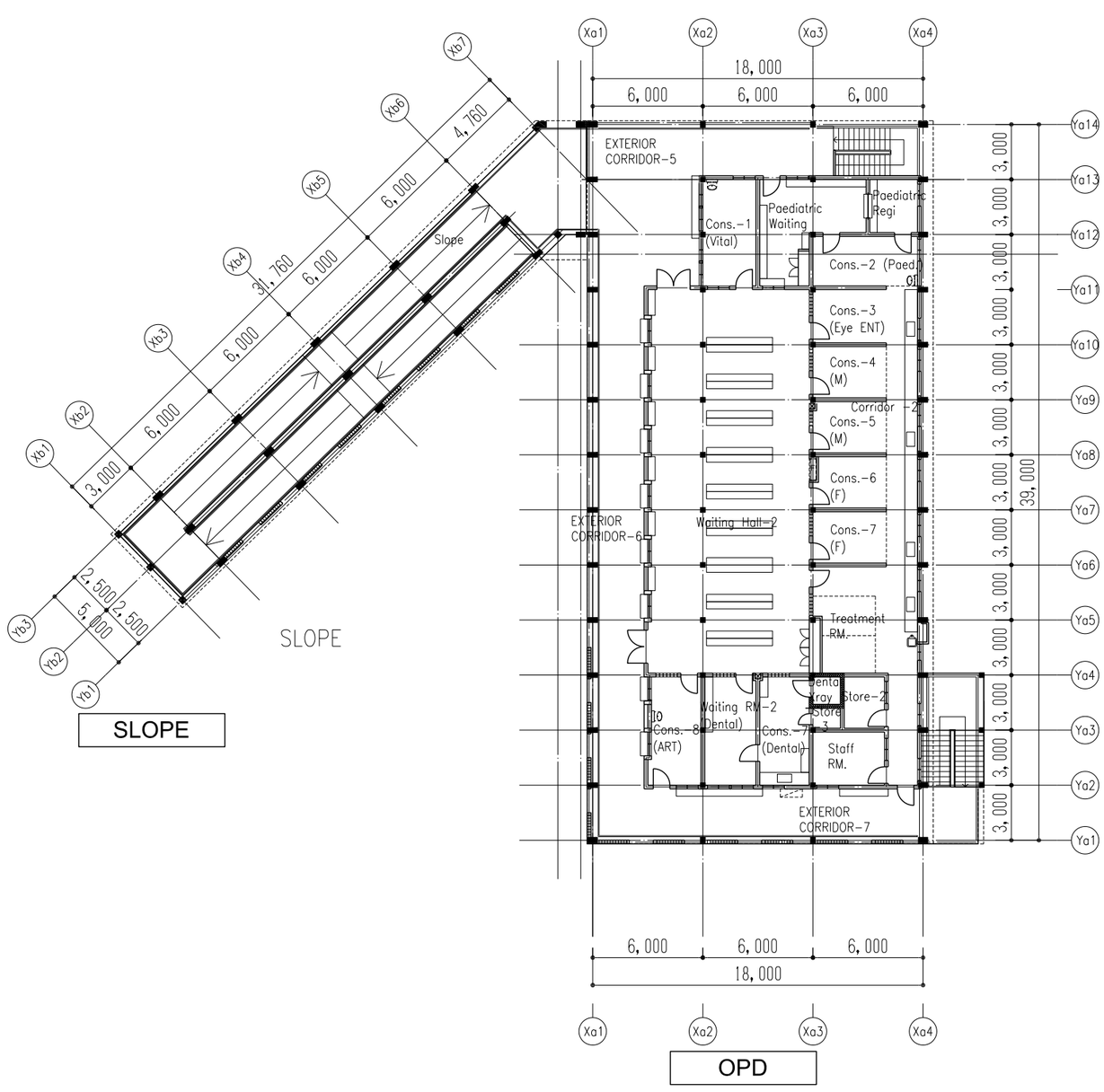


GROUND FLOOR PLAN



FIRST FLOOR PLAN

THE PROJECT FOR UPGRADING OF LUSAKA HEALTH CENTERS IN THE REPUBLIC OF ZAMBIA	**CHILENJE**	PLAN-1 1/300

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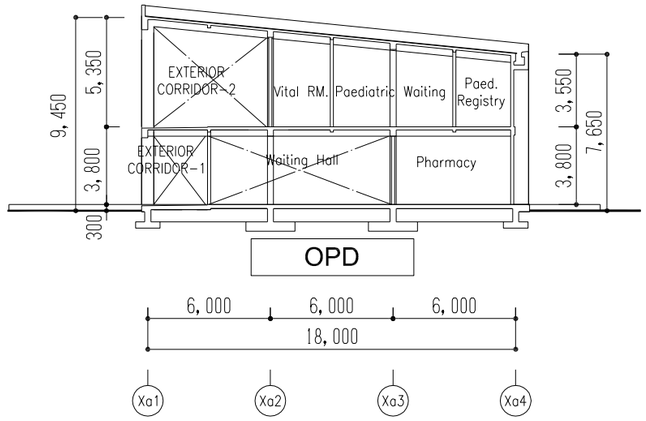
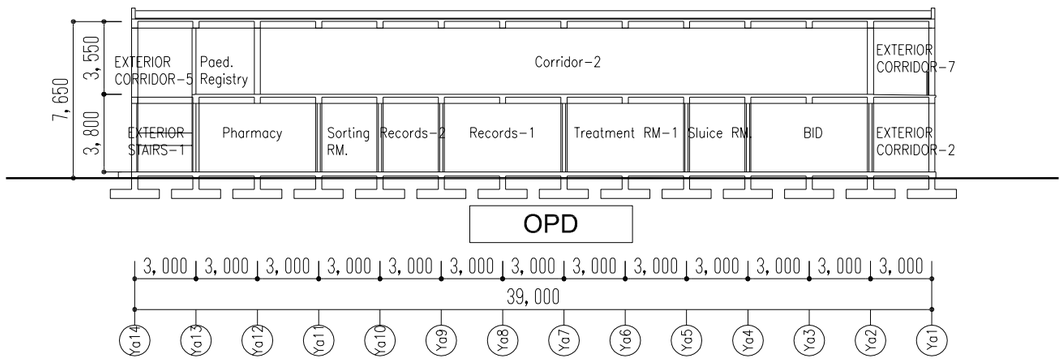
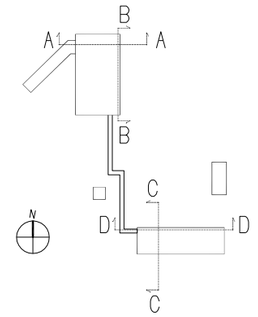


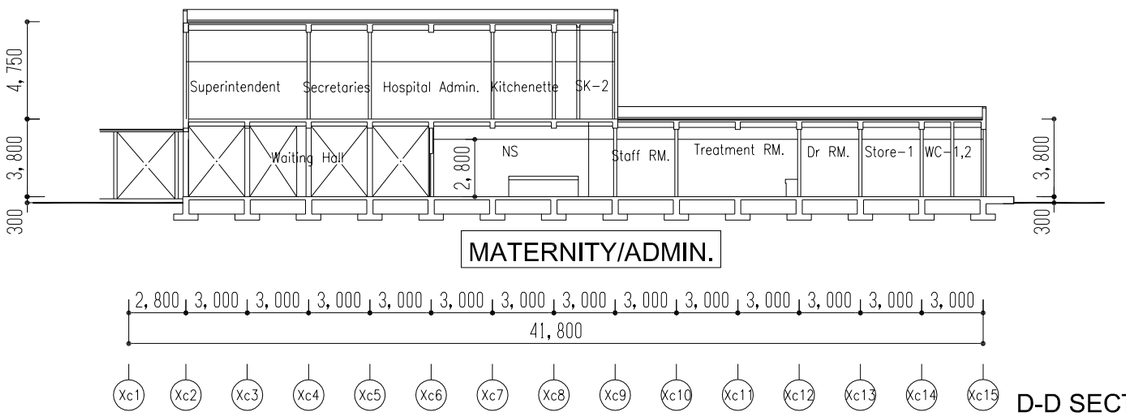
A-A SECTION



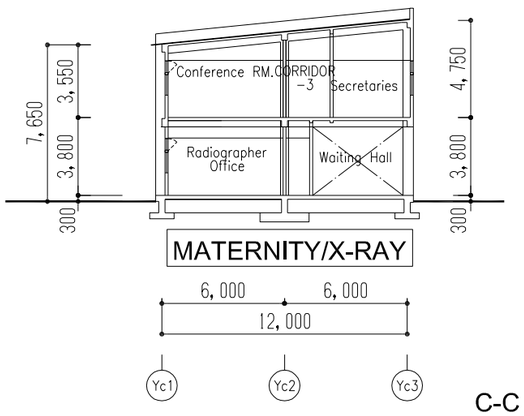
B-B SECTION



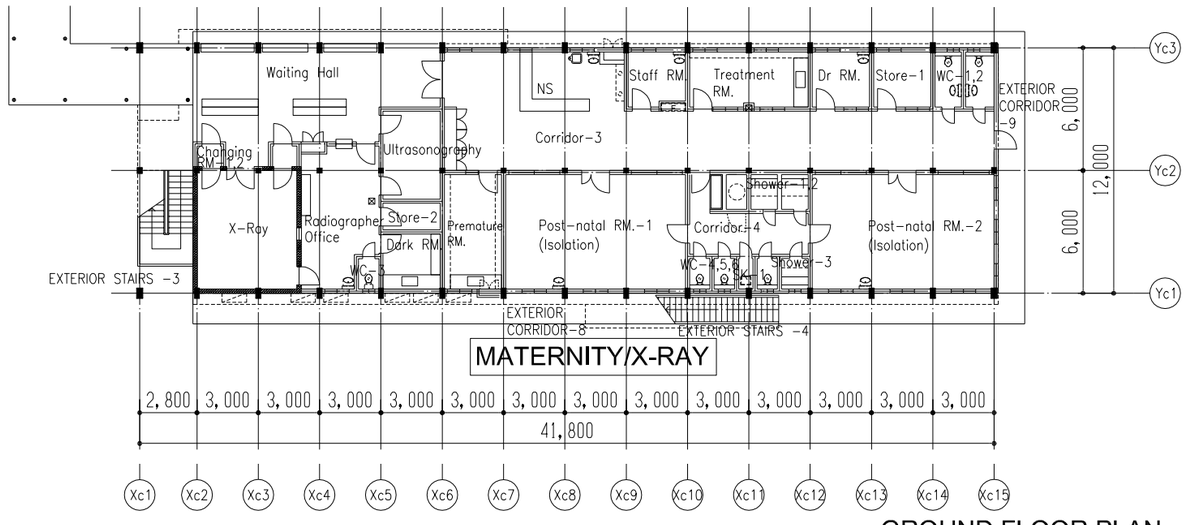
KEY PLAN



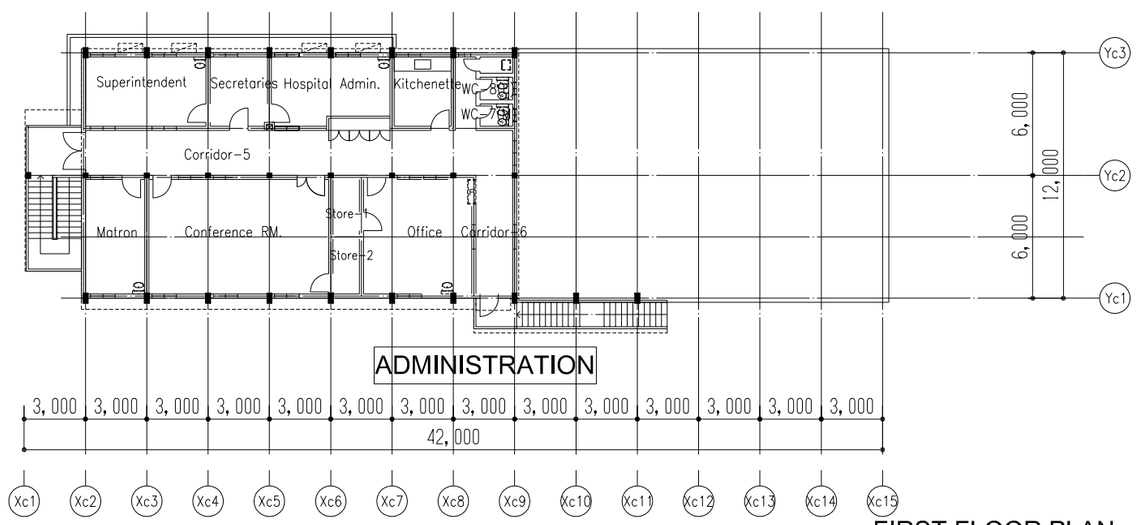
D-D SECTION



C-C SECTION



GROUND FLOOR PLAN



FIRST FLOOR PLAN

	CHILENJE	PLAN-2 SECTION 1/300

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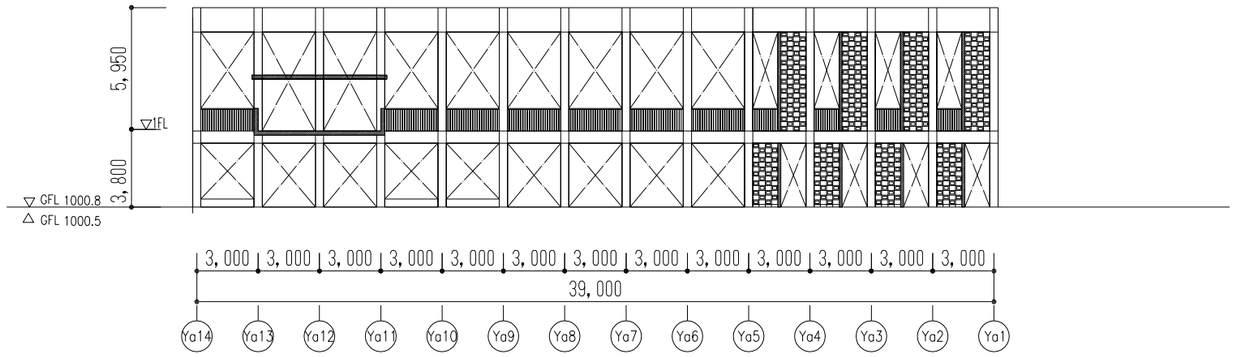
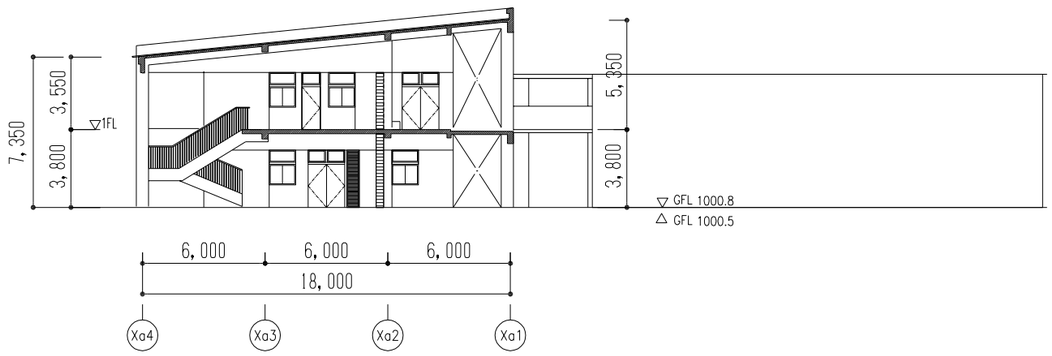
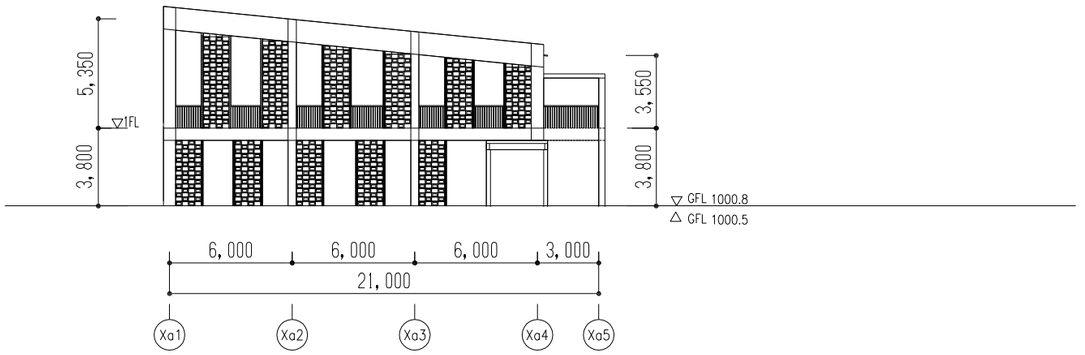


OPD-d-ELEVATION

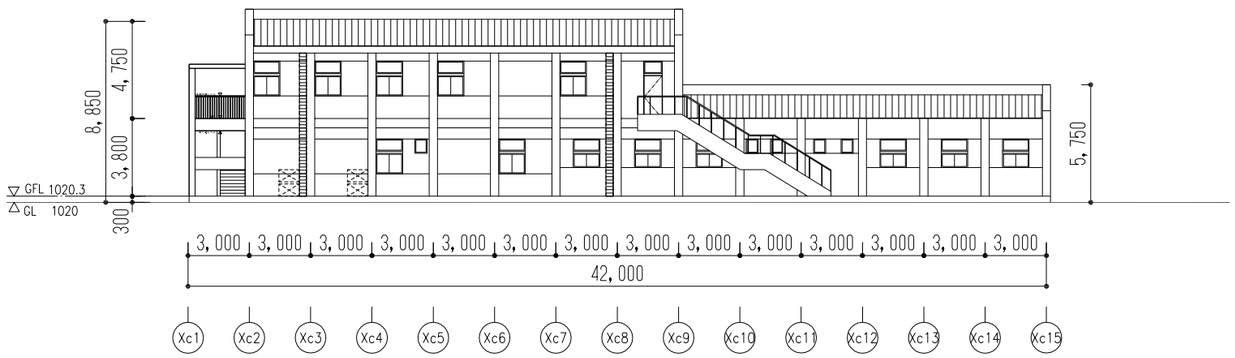


OPD-c'-ELEVATION

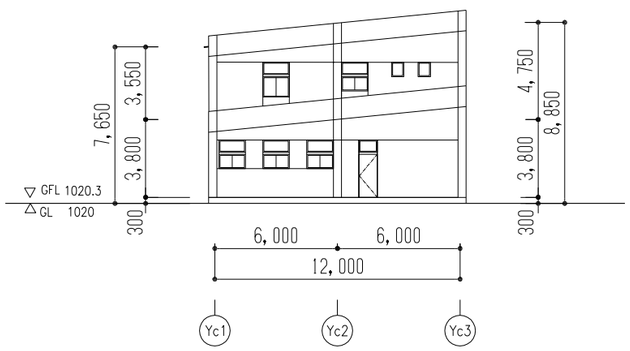
OPD-d'-ELEVATION



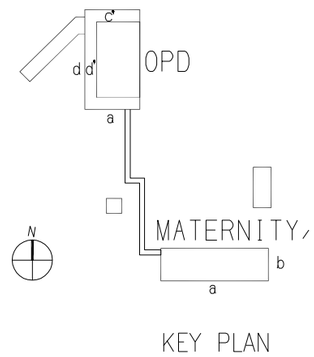
OPD-a-ELEVATION



MATERNITY/ADMIN.-a-ELEVATION



MATERNITY/ADMIN.-b-ELEVATION



KEY PLAN

	CHILENJE	ELEVATION
		1/300

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Project Implementation Structure

The project will be carried out according to the grant aid system of the Japanese government with the cabinet approval of the Japanese government after the exchange of notes (E/N) and grant agreement (G/A) related to the project are signed with Zambia.
The organisational body implementing the project is the Policy / Planning Bureau in the Ministry of Health with the cooperation of the provincial health office and the district health office. The contracting party on the Zambia side is the Ministry of Health, who will conclude a consultant agreement and a construction / equipment contract and conduct the works that Zambia is in charge of related to the project. An organisation chart is presented in Figure 2-31:

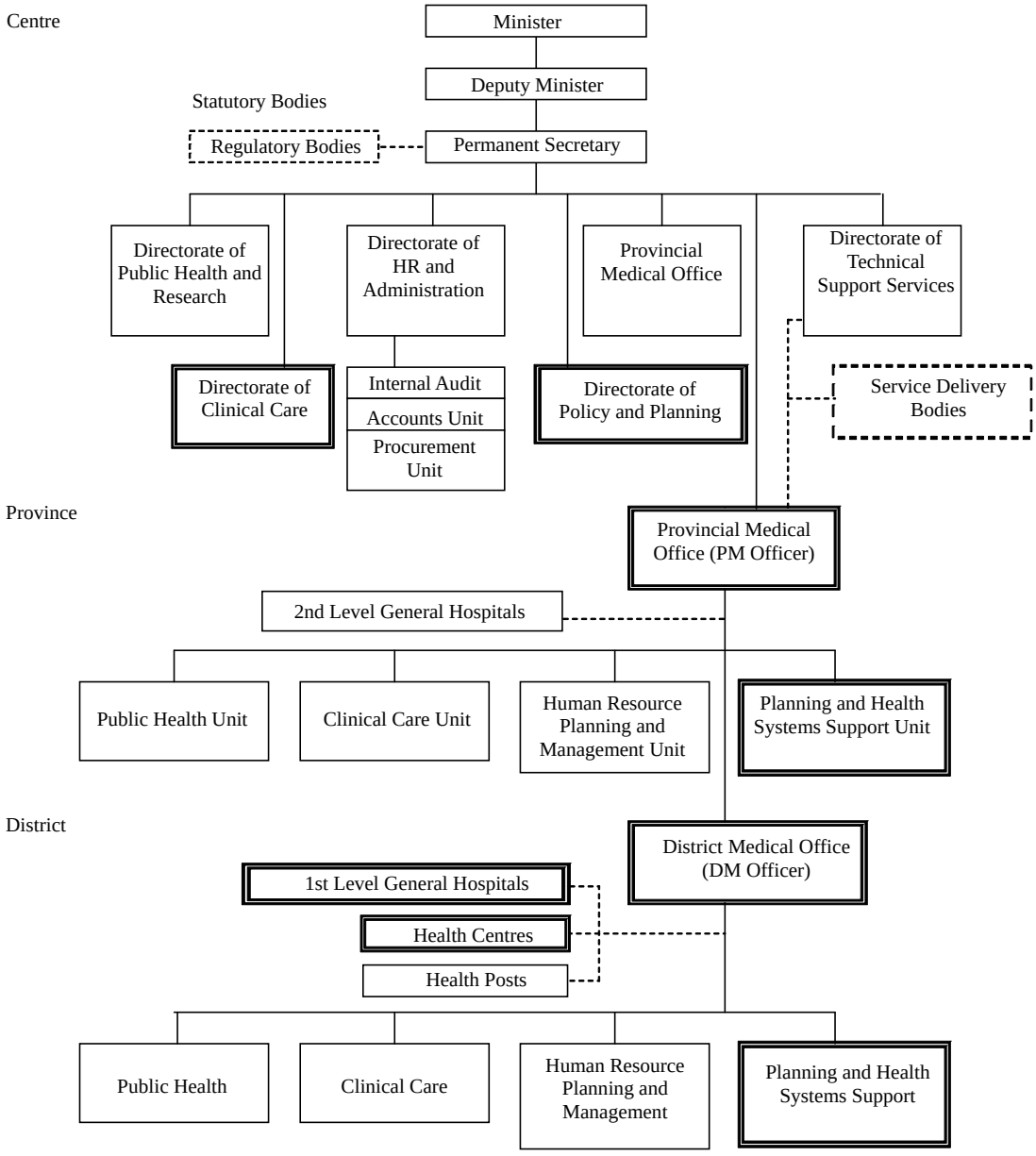


Figure 2-31 Project Implementation Structure

(2) Consultant

After the exchange of notes and grant agreement are signed, the Ministry of Health will conclude a consultant agreement regarding detailed design and construction administration with a consultant company of a Japanese corporate body. A consultant agreement document will be issued with the approval of JICA. To proceed with the project smoothly, it is important to sign a consultant agreement promptly after concluding the grant agreement. Once the contract is made, the consultant will need to prepare bidding documents (detailed design drawings / specifications, etc.) based on the investigation report through consultation with the Ministry of Health and obtain content confirmation from Zambia according to the aforementioned approval procedures. Bidding tasks and construction administration work will be carried out according to the bidding documents.

(3) Contractor

There are two types of works related to the cooperation project: i) construction work to construct the facilities and ii) equipment procurement for the procurement, installation, and trial runs of medical equipment. The companies that each work task is given out to are restricted to Japanese corporate bodies with a certain level of qualification. Contractors will be selected by general competitive bidding that is restricted by qualification.
The Ministry of Health will enter into a contract agreement with each of the contractors selected by bidding to be in charge of the construction work and/or equipment procurement, and the contract documents are to be approved by JICA. After this, the contractors responsible for each part of the construction work and equipment procurement will promptly initiate their work to accomplish the work according to the work contract document.

(4) Utilisation of Local Consultants

In work administration, help from local architectural and facility engineers will be utilised in addition to resident Japanese administrators because the works employ a construction method widely used in the region.

(5) Utilisation of Local Architectural Engineers and Dispatch of Japanese Professional Engineers

There are no relevant Japanese companies that have branches in Zambia, and at this point, only a small number of companies are proceeding with road works related to grant assistance. Local construction companies are mostly small- or middle-scale firms, and most of the large-scale works in Lusaka City are carried out by major construction companies of the Republic of South Africa. There are, however, many small- to mid-scale construction works ongoing in Lusaka City, and there are also some cases where local construction companies take part in large-scale works as companies cooperating with foreign construction companies that are in charge of the work. Therefore, we believe it will be no problem to proceed with works of this planned scale in a structure that uses local construction companies as firms cooperating with the original Japanese contractor if Japanese engineers pay careful attention to such aspects as process, quality, and safety control, as well as giving detailed technical guidance.
In most construction sites in Zambia, local workers undertake the work tasks. Therefore, we do not see any problems in procuring experienced, skilled workers in Lusaka City, the capital of Zambia, but for some special equipment and works requiring highly advanced techniques, we plan to give technical guidance and manage construction by sending professional engineers from a third country such as the Republic of South Africa or Japan as needed.

2-2-4-2 Implementation Conditions

(1) Makeshift Planning

The construction planning sites of both the Matero and Chilenje areas, the target of the cooperation project, lie on the premises of existing hospitals. For the Matero area, we will install a gate for works on the frontal road side separately from the main gate of the existing hospital to provide a carry-in route that will not affect the daily medical services to be offered as a hospital. In the case of the Chilenje area, the buildings to be newly constructed are located in two separate areas on the small site, so we need to provide a gate for works individually for each area. Both gates can be installed to face the frontal road, and the gates will be planned in such a way that their routes do not cross the route of the existing hospital. Additionally, there is no room on the site for makeshift buildings (temporary office, construction shed, material storage, processing area, etc.) or vehicles for works, so the construction planning will be made on the premise that the public open area lying to the west of the site is used. (We have already made a request of Zambia's Ministry of Health that the makeshift site be offered in the September 2010 Technical Memorandum.) For both the Matero and Chilenje areas, we will install a temporary enclosure with corrugated galvanised steel sheets including a makeshift area to prevent any possible accidents causing injury to a third person and to ensure safety for security reasons.

(2) Material Procurement

Almost no construction industrial materials are manufactured in Zambia except for wood products and concrete products including cement, concrete blocks, precast concrete, bricks, and interlocking blocks. Most of them used here are imported products from the Republic of South Africa. Imported products, however, are mostly provided by manufacturers with agents in Zambia, and many of the construction materials are sold at domestic markets on a daily basis. Therefore, in procuring general construction materials, we will basically use products that can be purchased locally considering cost and maintenance availability after completion of construction. However, for products and facility equipment requiring customisation including metal fittings, we also need to consider imported products from Japan or a third country including the Republic of South Africa.

(3) Special Construction Method

To reduce construction costs in the project, we basically utilise materials / products that can be procured locally wherever possible and avoid employing any particular kind of construction method so that local contractors can undertake the construction with no problems.

(4) Equipment Procurement

There are some tasks in the medical equipment-related works that have blurry boundaries with the construction works: for example, installation of the general X-ray equipment and water supply / discharge equipment work required for a dental unit. For these tasks, the consultant will need to coordinate among the construction contractors and give them necessary instructions. Equipment installation work will need to be performed so as not to interfere with the activities of the hospitals. In the project, there is the task of procuring simple equipment, for example, medical furniture, which is to be undertaken by the Zambia side, so we need to discuss and adjust the schedule and process of procurement and transfer of equipment with the target facilities to ensure smooth implementation.

2-2-4-3 Scope of Works

To proceed with the cooperation project smoothly, work responsibilities are to be clearly defined between the Japan and the Zambia sides as shown in the table below:

Table 2-27 Scope of Work between Zambia and Japan (Matero and Chilenje)

To be covered by the Japanese Side	To be covered by the Zambian side
	To secure and prepare land
	To get building permission (EIA)
	To clear, level and reclaim the site when needed 1) Dismantle unnecessary structures. 2) Dismantle existing building within the site 3) Relocate existing electrical power cable crossing the site 4) Relocate existing telephone line crossing the site 5) Relocate existing water pipe crossing the site 6) Relocate existing sewer
	To construct gates and fences in and around the site
To construct roads 1) Within the site	To construct roads 1) Outside the site
To construct Exterior Work within the site 1) Grading, Lighting, Storm Drainage Ditch	To construct Exterior Work 1) Outside the site
Building Construction 1) Architectural Work Incl. built-in furniture and medical curtains 2) Electrical Work Power Supply, Lighting and Socket Outlet, Lightning Protection and Earthling, Telephone Piping, Public Address, Intercom, Fire Alarm, Piping for PC Network. 3) Mechanical Work Water Supply, Drainage, Hot Water Supply, Sanitary, Fixture, LPG Supply, Fire Fighting, Air Conditioning and Ventilation, Rain Water Utilization 4) Other Work Generator, Oxygen Gas Supply, Laboratory Waste Water Treatment System, Water Tank (Only Matero)	
Electricity, Telephone, Water Supply, Drainage and other supply 1) Electricity a. Drop wiring and internal wiring within the site b. Main circuit breakers and transformer c. Piping to the main circuit breaker from site boundary, including manholes and handholes d. Branch breaker and piping system to existing main distribution panel within the site 2) Water Supply ① Provide on-site facilities with tank, elevated water tower, water reservoir, water supply to new buildings ② Provide water supply capacity and piping to existing facilities within the site 3) Drainage a. On-site drainage 4) Telephone System a. Provide wiring on-site and for new buildings b. Provide on-site piping and hand hole 5) Other Infrastructure a.Wireless radio, power supply and plumbing for emergency telephone 6) Furniture and Equipment a. Curtain rails and medical curtains b. Medical furniture and fixed furniture c. Supply and installation of medical equipment	Electricity, Telephone, Water Supply, Drainage and other supply 1) Electricity a. Medium voltage 11KVA power supply to new substation and metering devices for the Project. b. Connection cabling work between substation and existing main distribution panel and work on-site and off-site construction changes 2) Water Supply a. Lusaka water main to the site b. Connetion work of City Water to site, including meter installation c. Work on-site and off-site construction changes and well piping construction 3) Drainage a. Off-site plumbing and draiange（Incl. connection pit） b. Work on-site and off-site construction changes 4) Telephone System a. Telephone cabling b. Provide telephone main trunk line to the main distribution frame/panel (MDF)（Off-site poles, installation of hand holes and wiring） c. Work on-site and off-site construction changes 5) Other Infrastructure a.Relcation of radio, antenna and cabling for wireless radio system if necessary 6) Furniture and Equipment a. Curtains and blinds b. General furniture c. Linnen

The important point in facilitating the project smoothly is to control each process properly between the various works of construction, electricity, and machine equipment and equipment installation works. The people involved in the works will need to adjust the construction schedule, with full understanding of the conditions and contents of medical equipment installation. The project includes such works as removal of existing buildings, infrastructure improvement, and outdoor facility work at the expense of Zambia, Although some of the works have been started, it will be necessary to monitor the progress of the works on both sides. For infrastructure improvement (electricity, water, etc.), we have received a commitment from Zambia to finish the tasks by the time of the start of the works. We need to have a close meeting with Zambia taking this opportunity, and other opportunities, to explain the design to make sure that the tasks are completed by the start of construction and that they not affect the whole schedule. Prior to the various works to upgrade the infrastructure, makeshift work of pumping and routing to the existing buildings is also needed.

2-2-4-4 Consultant Supervision

A consultant company of a Japanese corporate body will conclude a consultant agreement with the Ministry of Health to make a detailed design (preparation of bidding documents, etc.) and conduct bidding and construction administration works for the cooperation project.

The purpose of construction administration is to ensure that the contents of the work contracts are properly handled including whether the works are conducted according to the design documents. They will perform quality assurance and process control by giving instructions or advice and coordinating each party as necessary during the construction period. Construction administration works include the following:

(1) Cooperation regarding Bidding and Contract

They will be responsible for various bidding-related tasks needed to determine the contractors of the construction and equipment works, including invitation to bidding, acceptance of bidding application, qualification examination, holding a bidding explanatory meeting, distribution of bidding documents, acceptance of bidding documentation, and evaluation of bidding results. They will also offer advice and/or support in signing work contracts between the contractors winning the bids and the Ministry of Health in Zambia.

(2) Giving Instructions / Support to Contractors

They will provide instructions, advice, or support to the contractors as necessary by reviewing the construction schedule, construction planning, construction material procurement planning, and equipment procurement / installation planning.

(3) Review and Approval of Construction Drawings and Manufacturing Drawings

They will review the construction drawings, manufacturing drawings, and documentation submitted by the contractors and give approval after providing necessary instructions.

(4) Verification and Approval of Construction Materials and Equipment

They will verify whether the construction materials and equipment to be procured by the contractors are consistent with the work contract documents, and give approval to use them.

(5) Work Inspection

They will conduct inspection at any factory manufacturing the construction materials and equipment, witness work tests, and perform any necessary inspection to ensure quality and performance.

(6) Report on Work Progress

They will keep track of the situation on the construction site against the construction schedule to report the work progress to the organisations involved in both countries.

(7) Completion Inspection and Trial Run

They will perform a completion inspection and trial run inspection regarding construction, related facilities, and equipment, verify that the performance is ensured as described in the work contract documents, and submit an inspection report to the Ministry of Health.

(8) Structure of Construction Administration

The consultant will assign local resident administrators to accomplish the aforementioned tasks. They will also send engineers with individual applicable expertise to the site according to the progress of the work, and take necessary actions including holding discussions, conducting inspections, giving instructions, and coordinating each party. On the other hand, they will allocate responsible engineers within Japan to have them review technical matters and serve as a

contact window for the site. They will also report necessary items regarding the progress situation, payment procedures, and completion handover of the cooperation project to Japanese government-related organisations.
The chart below shows the construction administration structure:

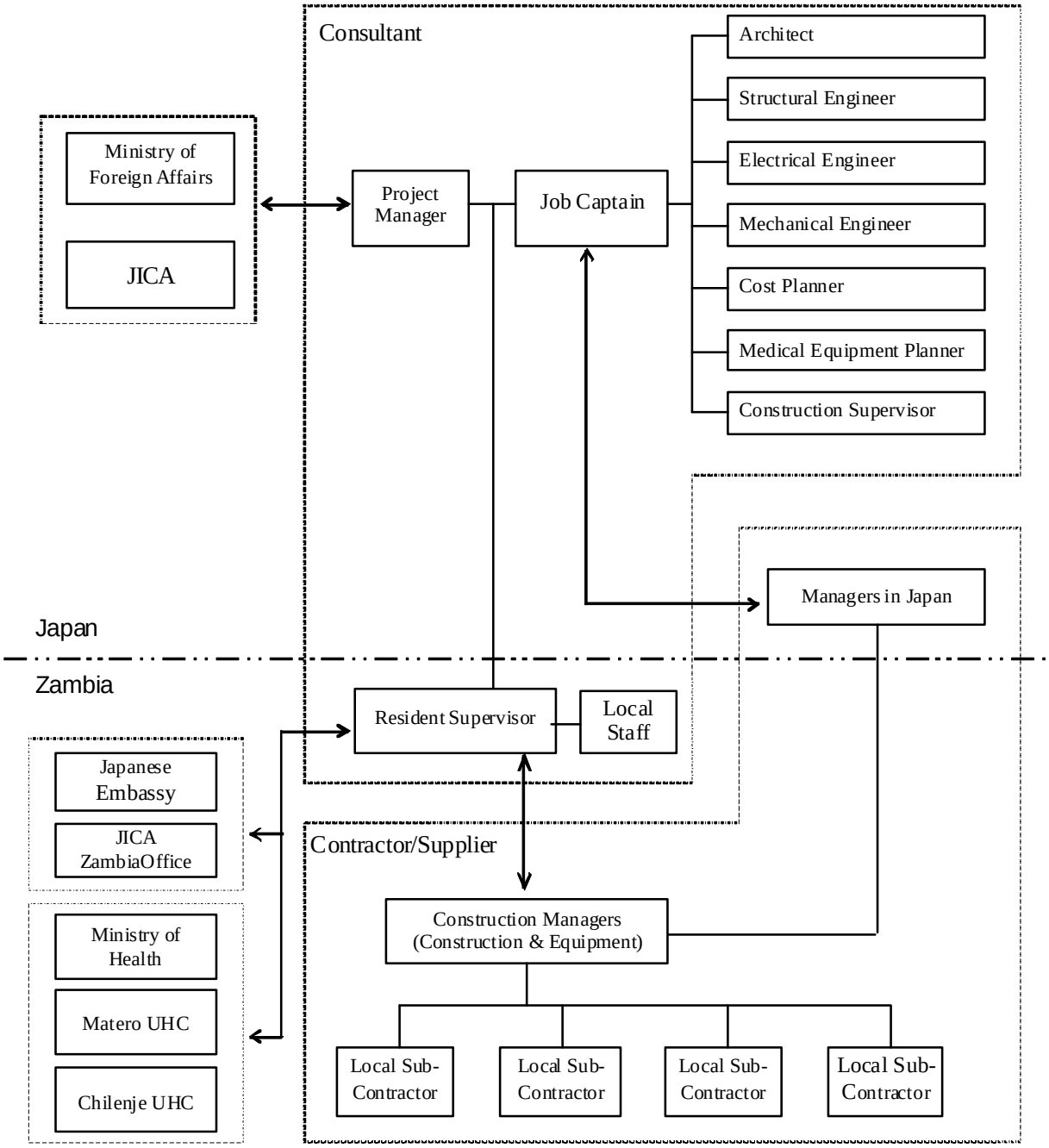


Figure 2-32 Supervision System

2-2-4-5 Quality Control Plan

(1) Concrete

We will basically use the Japanese standard for the quality management planning of concrete, which is the public building work standard specification (Public Buildings Association) and JASS5 (Architectural Institute of Japan), and we will also refer to the quality management planning commonly used in Zambia as needed.

1) Specified Mix Proportion

The specified mix proportion will be determined based on trial mixing. Trial mixing should continue until the specified slump, specified air capacity, required air-dried weight per unit volume, and required average strength can be obtained.

2) Curing

Curing of specimens is to be on-site underwater curing. The curing temperature should be as close to the conditions of the buildings as possible. The specimens are to be sampled once per 150 m^3 on each day of casting.

3) Average Strength Required

In principle, the average strength required is to be checked by the compressive strength of twenty-eight-day-old material. The compression test on the specimens should be conducted at a third-party organisation, a university for example.

4) Chloride Quantity

The chloride quantity is to be checked using a method commonly used in Japan if it is under 0.30 kg/m^3.

(2) Reinforcement Work

There is one place where reinforcement can be processed in Lusaka City, but in view of unexpected situations, reinforcement will be processed on site. We will basically use the public building work standard specifications (Public Buildings Association) and JASS5 (Architectural Institute of Japan) for the quality management and inspection of reinforcement processing / assembling, and we will also refer to the quality management planning commonly used in Zambia as needed.
The builders will undergo a bar arrangement inspection by the work administrators after reinforcement assembling and before concrete casting. The areas to be inspected are according to the instructions of the work administrators.

(3) Formwork

We will basically use the public building work standard specifications (Public Buildings Association) and JASS5 (Architectural Institute of Japan) for the quality management / inspection of formwork, and we will also refer to the quality management planning commonly used in Zambia as needed.
The builders will undergo an inspection by the work administrators before concrete casting regarding the gap between the sheathing and the outermost reinforcement. The areas to be inspected are according to the instructions of the work administrators.

(4) Inspection of Finishing of Concrete in a Structure and Covering Depth

We will basically use the public building work standard specifications (Public Buildings Association) and JASS5 (Architectural Institute of Japan) for inspection regarding the position of the materials, cross-sectional dimensions, surface finishing conditions, finishing flatness, and any flaws in casting of the concrete in a structure as well as covering depth, and we will also refer to the quality management planning commonly used in Zambia as needed.
The actions needed when the inspection results for the finishing of the concrete in a structure and covering depth do not meet the requirements will be according to the instructions of the work administrators.

2-2-4-6 Procurement Plan

(1) Procurement of Construction Equipment

Given that the cooperation project is to construct a hospital facility, we will select equipment that is easy to keep clean, easy to maintain, and robust in order to meet the requirements as a hospital facility. Regarding the applicable standard for the materials of the equipment, we will use materials that comply with BS, which is commonly used in the region, but we will select materials with no applicable standard according to JIS. The procurement principles are as follows:

1) Local Procurement

To facilitate repair and/or maintenance works after completion, the equipment to be used will be procured locally wherever possible. In this context, imported products that can be obtained freely in Zambia's markets (equipment that is invariably sold at markets for which importation procedures are unnecessary) are considered to be local products. Most of the construction materials sold at markets are made in South Africa.

2) Procurement of Imported Products

For equipment that is difficult to obtain locally, that cannot meet the required quality, or that is considered to have unstable supply quantity, we will procure imported products from a third country including South Africa or Japan. In this case, it is important for the contractors to communicate with the Ministry of Health regarding importation / customs clearing to facilitate the advance procedure including tax exemption measures so that it does not affect the construction schedule. In importing from South Africa, most products are transported from Johannesburg, the economic central city, and then travel by land via Botswana. Since Zambia is an inland state, the main transportation route for the construction materials procured from a third country or Japan will be ocean transportation up to the Port of Durban, the main trade port in South Africa, and surface transportation from Durban to Zambia via Botswana. The Port of Durban is the biggest trade port in South Africa, serving as a trading hub with all the countries of the world. Almost all construction materials including steel products, glass, and tiles are made in South Africa. For facility equipment, we will consider the optimum import procurement from a broad range of options including Southeast Asian nations, keeping in mind a maintenance system after completion as well.

3) Transportation Planning

It takes about seven days to transport goods from the Port of Durban in South Africa to Lusaka City including the various procedures to be taken. Since mining resources are actively distributed, transportation roads located on the transportation route, including Botswana's, are well maintained.

4) Procurement Planning

Based on the abovementioned considerations, the main construction equipment to be procured is presented in the table below by classification into local procurement, procurement from Japan, and procurement from a third country:

Table 2-28 Procurement Plan for Major Construction Materials and Equipment

Type of work	Material and equipment	Procurement			Note
		Local	Japan	Third country	
Reinforced concrete work	Fine aggregate	○			
	Coarse aggregate	○			
	Concrete	○			
	Deformed bar	○			
	Form	○			Products from Republic of South Africa can be procured.
	Fine aggregate	○			
Steel work	Steel frame (small and ordinary steel members)	○			Products from Republic of South Africa can be procured.
Masonry	Concrete block	○			
	Ventilation block	○			
Waterproofing work	Silicon sealing material (for pane and sash peripheral sealing)	○			Products from Republic of South Africa can be procured.
Plastering work	Cement mortar	○			Local products
Tile work	Tiles	○			Products from Republic of South Africa can be procured.
Stone work	Terrazzo block work	○			
Carpentry	Timber for fitting works	○			
Roofing work	Steel folded plate	○			Products from Republic of South Africa can be procured.
Metal work	Light-weight ceiling substrate	○			Products from Republic of South Africa can be procured.
	Decorated metal ware, handrail	○			Products from Republic of South Africa can be procured.
	Curtain rails for ward	○			Products from Republic of South Africa can be procured.
	Aluminium ceiling inspection hole, Aluminium expansion joint, Grating cover Manhole cover,	○			Products from Republic of South Africa can be procured.
Wooden fixture work	Door, fixture, frame	○			Local products
Metal fixture work	Aluminium fixtures			○	Imported and procured from Republic of South Africa .
	Light steel fixture			○	Imported and procured from Republic of South Africa .
	Steel fixture (airtight)			○	Imported and procured from Republic of South Africa .
	X-ray shielding door, window			○	Imported and procured from Republic of South Africa .
	Metal parts for fixture			○	Imported and procured from Republic of South Africa .
Glass work	Ordinary sheet glass, 6mm	○			Products from Republic of South Africa can be procured.
	Glass block	○			Products from Republic of South Africa can be procured.
Paining work	Interior painting	○			Products from Republic of South Africa can be procured.
	Exterior painting	○			Products from Republic of South Africa can be procured.
Interior finish work	PVC sheet with welding method	○			Products from Republic of South Africa can be procured.
	System ceiling of mineral fibre decorative acoustic panels	○			Products from Republic of South Africa can be procured.
	Calcium silicate board	○			Products from Republic of South Africa can be procured.
	PVC ceiling cornice	○			Products from Republic of South Africa can be procured.

Type of work	Material and equipment	Procurement			Note
		Local	Japan	Third country	
Finishing unit work	Sink, medical sink	○			Products from Republic of South Africa can be procured.
	Overhead cabinet	○			
	Wooden furniture	○			
	Doorplate, guide plate, etc., building plaque	○			Products from Republic of South Africa can be procured.
Exterior work	Interlocking block	○			
	Curb	○			
	Galvanized grating	○			Products from Republic of South Africa can be procured.
Electric facility work	Power generator	○			Products from Republic of South Africa or from Europe can be procured.
	Boards		○		Procured from Japan for quality
	Lighting equipment	○	○	○	Special equipment and semi-primary products to be imported from Republic of South Africa. Pipes and cables to be procured from Japan for quality. Others to be procured from Republic of South Africa..
	Wiring accessory	○	○		Products from Republic of South Africa can be procured. Or Procured from Japan for quality.
	Wires, cables	○	○		Local products (Underground trunk cables and communicationcables are procured from Japan, if there are no domestic products.)
	Interphone		○		Procured from Japan for quality
	Automatic Fire alarm	○	○		Pipes and cables to be procured from Japan for quality. Equipments can be procured from Republic of South Africa or from Europe.
Machine facility, Installation	Air conditioner		○		Procured from Japan for quality.
	Forced and exhaust ventilator	○			Procured from Republic of South Africa.
	Duct material		○		Procured from Japan for quality.
	Elevated water tank		○		Procured from Japan for quality.
	Sanitary ware	○	○		Procured from Republic of South Africa or Japan for quality and price. Urinals, sink, sewage, chemical faucet and plaster trap can be procured from Japan.
	Piping material	○	○		Procured from Republic of South Africa or Japan for quality and price. Products except for Polyvinyl chloride pipe can be procured from Japan.
	Pump	○	○		Procured from Japan for quality Only drain pump can be local products
	Medical gas facility		○		Procured from Japan for quality
	Special wastewater treatment tank	○	○		Procured from Japan for quality Fire hydrant and fire extinguisher box can be local products

(2) Procurement of Medical Equipment

Since the equipment to be used in the project is mostly basic and easy-to-maintain apparatus, we will basically procure it from Japan. For some of the equipment to be used in the radiation rooms and delivery rooms, however, a manufacturer's agent is necessary for maintenance management services, so we will consider procuring products from a third country without restriction to Japanese products. When there are only a limited number of manufacturers in Japan, bidding competition will be inhibited making it impossible for fair bidding to take place, so we will consider procuring third-country products as well.
The following table shows the procurement source candidates for the main equipment:

Table 2-29 Procurememnt of major equipment

Medical Equipment	Local Procurement	Japan Procurement	Third Country Procurement
X-ray Unit, Ultrasound Scanner, Electrocardiograph, Cardio-tocograph Machine, Neonatal Incubator, Infant Warmer, Chemistry Analyser, Blood Bank Refrigerator, Safety Cabinet, Water Purifying Apparatus, etc.	—	○	○
Dentail Suite, Dental X-ray Unit, etc.	—	○	—

2-2-4-7 Operational Guidance Plan

(1) Initial Handling Training

For basic methods of operating equipment, an engineer sent by the equipment supplier at the time of carry-in and installation of the equipment procured will provide training to the medical staff in the target facilities. The training will include initial operation guidance, special notes on maintenance, explanation of the daily checkup method, and brief description of troubleshooting for equipment needing installation.

(2) Planning of Operation Guidance

In response to a request from the Ministry of Health, we will give instructions on operational maintenance of equipment to personnel including maintenance staff in the target facilities utilising soft components. This will include holding a seminar on the importance of equipment maintenance, checkup, and operation. By having all maintenance staff members in the Ministry of Health, provincial health office, and district health office participate, we plan to enhance the maintenance skills of every related organisation.

2-2-4-8 Soft Component (Technical Assistance) Plan

(1) Background to Soft Component Planning

By upgrading the Matero UHC and the Chilenje UHC located in the Lusaka district to first level hospitals, the project aims to make the referral system work and at the same time, mitigate the crowded condition and burden in the University Teaching Hospital, a tertiary-level medical facility located in the same Lusaka district. The components of the facility works and equipment procurement include the construction of an OPD examination building, emergency examination building, inspection building, sick ward, and administration building for the Matero UHC, and an OPD examination building, emergency examination building, and administration building for the Chilenje UHC as well as provision of the necessary medical equipment for both health centres.
The investigation team has presented the following concerns regarding the current facilities and equipment maintenance methods based on the field investigations conducted from 27November to 6 December, 2012:

① The maintenance staff members in the district health office are in charge of maintenance works in several health centres, but it is difficult for them to give close attention to each individual health centre.
② The medical service level is impaired due to breakdown of facility equipment and medical apparatus.
③ Medical water discharge and medical waste are not disposed of correctly, which poses a risk of deteriorating the surrounding environment and causing in-hospital infections.

Regarding the above problems, implementation of technical trainings will be crucial for the Zambian side on maintenance of the newly built facility and its equipment, and on management of the medical waste and water discharge system.

After the implementation of grant aid, the Ministry of Health is planning to newly establish a maintenance department for the in-hospital facility and medical equipment to take care of the maintenance work of the hospital facility and medical equipment with human resources reinforced and coordinated with various agents in Zambia to ensure that operation maintenance is performed properly for the facility and equipment in the Matero UHC and Chilenje UHC in accordance with the project.
In Zambia, there are people in charge of facilities and equipment in the Ministry of Health, provincial health office, and district health office individually, but there is no one in charge at the health centre level. Once both UHCs are upgraded to first level hospitals through the project, it is essential to allocate facility and equipment maintenance staff in the hospitals for administrative reasons. It is not only necessary to recruit new staff members, but it will also be necessary for the hospitals to recognise the importance of the facility / equipment maintenance department as a part of the hospital functions to work on maintenance activities from a preventive maintenance viewpoint. Regarding waste disposal, sorted collection has been conducted to some degree, but we need to raise the awareness of each engineer and enhance their knowledge and technical level while helping establish an appropriate maintenance system. Therefore, with the upgrade of the health centres to first level hospitals, the project will incorporate support for establishing a maintenance system for the facilities and the equipment including coordination between the maintenance department to be newly established and the warehouse for equipment consumables and replacement parts as well as the establishment of an in-hospital medical waste collection / disposal system based on the waste sorting method used in hospitals recommended by WHO (colour coating) as a soft component. For the equipment, preventive maintenance including daily checkups will be incorporated so that the equipment can be used for a long time in good condition.
The main items whose improvement is expected through implementation of technical training in the soft component are as follows:

① From the viewpoint of the surrounding environment, in-hospital infections, and continuity of medical services, have the medical staff recognise the importance of maintaining the facility apparatus and medical equipment, and enhance the knowledge and technical level of the staff while raising and maintaining awareness.

② With the effect of preventive maintenance by establishing a management system that can keep track of inventory books, failure history, and places to which facility apparatus and medical equipment have been allocated, an inventory system to control consumables and replacement parts, and a system for daily and periodic checkups, which will make the budget available, shorten the failure period, reduce the risk of in-hospital infections, and maintain the medical service level, will be created.

③ By optimising the operation of the medical waste and water discharge systems, the environment both inside and outside the hospitals will be improved.

In implementing the soft component, we will employ a participatory method of planning to enhance the development of self-reliance, in which we will put together a plan and its contents by holding workshops. For the formats of the medical equipment maintenance system and the ledger, we will make sure to take over the outcome of ongoing technical cooperation projects so that there will be no conflict in the contents and it will smoothly coordinate with the other technical cooperation projects.

(2) Soft Component Targets

① To have the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC recognise the importance of establishing a medical facility / equipment maintenance system

② To establish a maintenance system for the facility and the medical equipment in the Matero UHC and the Chilenje UHC

③ To establish a medical waste and water discharge disposal system in the Matero UHC and the Chilenje UHC

(3) Soft Component Outcome (Direct Effect)

Table 2-30 Soft Component Direct Effect

Technical Training	Direct Effect
To teach the importance of a maintenance system	・The importance of strengthening the maintenance system will be understood. ・An independent maintenance system will be established to secure appropriate personnel. ・The concept of preventive maintenance will be fully recognised.
To help establish a maintenance system and enhance management ability	・The maintenance ability level of the staff will be enhanced. ・It is ensured that the facility will be properly utilised and operated, handling ability against breakdown will be improved, and periodic checkups will be implemented.
To help create and implement an annual maintenance plan	・Appropriate personnel will be secured (in terms of number of personnel and ability). ・An annual maintenance plan, which will make the budget available, will be created. ・It will help keep track of the names of consumables and spare parts, the quantity, and the expenditure necessary for the next year, which ensures smooth implementation.
To help establish a medical waste and water discharge disposal system	・It will raise awareness toward waste disposal at each department, which will ensure that infectious waste will be separately collected. ・The incinerators will be properly operated.

(4) Verification of Outcome Achievement

Table 2-31 Verification of Outcome Achievement

Item	Verification Method
To teach the importance of a maintenance system	・Maintenance personnel are ensured. ・The maintenance budget is secured. ・A preventive maintenance system is recognised.
To help establish a maintenance system and enhance the management ability	・A maintenance system flow is prepared. ・An equipment ledger is created. ・Regular checkups and adjustments are planned. ・Preventive maintenance is conducted. ・The maintenance department will give explanations and/or guidance to doctors and nurses if necessary.
To help create and implement an annual maintenance plan	・Documentation including facility / equipment apparatus ledgers, maintenance records, and annual maintenance plans are put together. ・A maintenance budget plan for the next year is prepared.
To help establish a medical waste and water discharge disposal system	・A medical waste disposal manual is prepared. ・An incinerator operation system is established.

(5) Soft Component Activities (Input Planning)

Table 2-32 Soft Component Activities

Item	Activities	Affected Department	Outcome	
			Japan	Zambia
To teach the importance of a maintenance system	・By holding a workshop separately for the administration department and the maintenance department, the importance of maintenance from the viewpoint of the surrounding environment, in-hospital infections, and continuity of medical services is stressed. ・A maintenance system will be introduced in Japan, and the gist of the maintenance system idea and a rough work flow will be prepared as common practice. In addition, there will be on-the-job investigation and maintenance work for the existing facilities. For the medical equipment, however, we will take over the contents and outcomes from other technical cooperation projects. [Technical Level] ・A technical level higher than that of the technologists or technicians is needed, and all the staff in the maintenance department have reached this level.	Ministry of Health, provincial health office, district health office, superintendent, maintenance department	・Maintenance system created in Japan and through technical cooperation projects	・Rough idea of the maintenance system ・Organisation chart ・Staff assignment plan
To help establish a maintenance system and enhance management ability	・Existing maintenance practice will be checked, and a maintenance system flow, a work flow chart, and various formats utilising cases in Japan will be created. ・A workshop targeting doctors and nurses will be held in the hospitals and a maintenance request format will be created. ・An equipment ledger will be created for the facility apparatus and medical equipment. [Technical Level] ・A technical level higher than that of the technologists or technicians will be needed, and all the staff in the maintenance department have reached this level.	District health office, each department in the hospital, maintenance department	・Maintenance system flow created in Japan and by the technical cooperation project ・Equipment ledger created in Japan and various formats created by technical cooperation projects	・Maintenance work planning ・Various formats ・Ledger of facility and equipment apparatus

Item	Activities	Affected Department	Outcome	
			Japan	Zambia
To help create and implement an annual maintenance plan	・How to create an annual maintenance plan will be taught. ・How to prepare an annual budget will be taught. ・How to place an order for replacement parts and the inventory method will be taught. ・On-the-job maintenance training will be provided. [Technical Level] ・A technical level higher than that of the technologists will be needed, and the chief and assistant leaders in the maintenance department have reached this level.	Provincial Health Office, district health office, superintendent, accounting department, Maintenance Department	・Annual maintenance plan created in Japan ・Maintenance budget plan created in Japan ・Each plan created by a technical cooperation project	・Annual maintenance plan ・Maintenance budget plan
To help establish a medical waste and water discharge disposal system	・It will help in establishing waste collection routes and a waste sorting (colour coating) system and in providing instructions. ・It will help in establishing the operation system of the neutralisation tank and in providing instructions. ・It will help in establishing measures against in-hospital infections and in providing instructions. [Technical Level] ・A technical level higher than that of the technologists will be needed, and the chief and assistant leaders in the maintenance department have reached this level.	District health office, superintendent, each department in the hospital, waste disposal personnel	・Medical waste disposal manual created in Japan ・Manual created through technical cooperation projects	・Medical waste operation plan ・Neutralisation tank operation plan ・In-hospital infection measures manual

(6) Resource Procurement Method to Implement Soft Components

Soft components will be the direct support type. There are no local consultants or facility / equipment maintenance companies in Zambia that are specialised in maintenance works for facilities and equipment.

(7) Soft Component Implementation Process

A consultant responsible for training will determine the details of training and cooperation as well as the whole schedule based on prior agreement with those involved in the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC, and proceed with the technical training while evaluating the input and outcome from time to time. The total flow is assumed to be as described below. For the facility apparatus, we will prepare the formats and system in Japan so that they will be suitable for the project and we will adjust them on site accordingly, but for the medical equipment, we will basically take over the formats and system created by other technical cooperation projects.

1) Advance Preparation in Japan

In Japan, we will prepare materials, various formats, workflow charts, and others regarding the maintenance system and medical waste disposal system for the assumed facilities, so that we can present them as sample cases at the first workshop together with the formats created by technical cooperation projects.

2) First Field Training

We will educate leaders and staff members in the facility / equipment maintenance department to strengthen the maintenance system through workshops, and at the same time, we will shed light on problems lurking in the current maintenance works to create an input planning idea. We will also verify whether an acceptance system and a maintenance organisation of the hospitals have been established or not. In concrete terms, at the workshop, we will teach how to create an equipment ledger for the facilities and for the medical equipment in the existing buildings, and we will instruct them to proceed with maintenance operation using the formats created until the next training. To provide the abovementioned education and training, we will send one engineer

in charge of facility maintenance and one staff member in charge of medical equipment / waste maintenance.

3) Second Field Training

We will check the operation status of various formats and the maintenance / medical device waste system created in the first field training, and with adjustment needed for the system and various formats, provide additional training as necessary.
The facility equipment (air conditioners / medical gas / water discharge disposal / receiving power system / generators / light electrical appliances, etc.) and medical equipment to be used in the project will have been selected by the start time, and some of the equipment will have started to be carried onto the site, so we will teach how to create an equipment ledger more concretely using the newly built facility and the equipment apparatus. For the remainder of the ledger that could not be created during training, the engineers in the hospitals will continue to prepare them after the trainers return to their own countries. We will send one engineer in charge of facility maintenance and one staff member in charge of medical equipment maintenance to provide education and training.

4) Tasks to be Performed in Japan

We will put together the results of the first and second technical trainings, gather items requiring final training, and adjust the flow chart and formats. At this point, we will readjust the maintenance system against the facilities and equipment to be installed.

5) Third Field Training

We will conduct final confirmation and adjustment for each ledger and format created during the second field training, and we will teach how to create a final maintenance plan proposal for the newly built facilities and medical equipment according to the final training items prepared in Japan. While checking the facility apparatus / equipment already installed on site, we will give final technical training. In particular, we will teach how to prepare an annual maintenance plan / annual maintenance budget plan / spare parts management plan, and how to report the final version of a maintenance plan. We will send one engineer from facility maintenance I (air conditioners / hygiene / water discharge disposal / medical gas), one staff member from facility maintenance II (responsible for receiving power system equipment / generators / light electrical appliance equipment), and one equipment / medical waste management engineer from Japan.

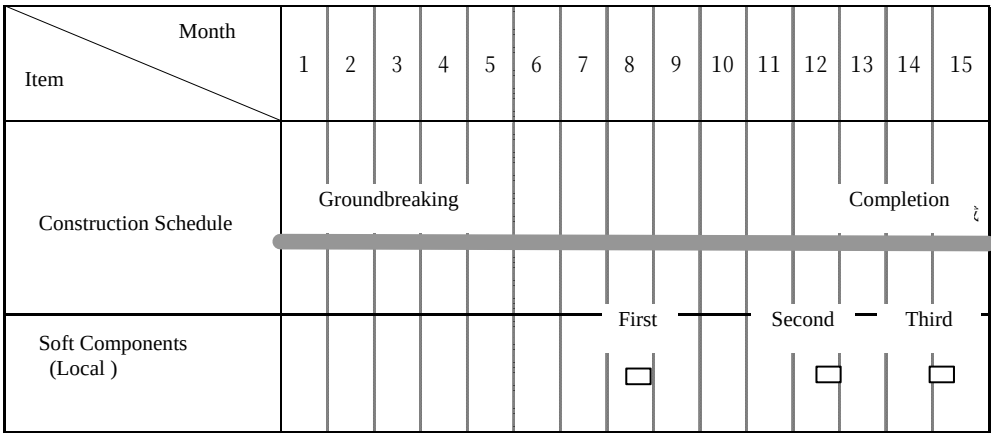
6) Tasks to be Performed in Japan

We will put together the results of the first, second, and third technical trainings and we will create a final report.

The following three engineers are to be sent as Japanese consultants in order to transfer technical skills to the hospitals:

a. Facility maintenance engineer I: To deal with air conditioner equipment, hygiene equipment, and special facilities
b. Facility maintenance engineer II: To deal with receiving power system equipment and light electrical appliances
c. Management engineer in charge of equipment / medical waste: To deal with the equipment / medical waste collection system

Table 2-33 Soft Component Implementation Process Chart (Proposal)



(8) Soft Component Outcome

Table 2-34 Soft Component Outcome

Item	Outcome
To teach the importance of a maintenance system	・Rough maintenance system ・Maintenance organisation chart ・Staff assignment plan
To help establish a maintenance system and enhance management ability	・Maintenance work plan, preventive maintenance plan ・Various formats ・Ledger of facility and equipment apparatus
To help create and implement an annual maintenance plan	・Annual maintenance plan ・Maintenance budget plan
To help establish a medical waste and water discharge disposa system	・Medical waste collection disposal plan ・Incinerator operation plan

(9) Responsibility of Zambia's Implementing Organisation

Since the soft component will be implemented to ensure the self-reliant development of Zambia, all training should employ a method that will help promote spontaneous activities on the Zambia side wherever possible. For this reason, it is essential that the implementing organisation on the Zambia side fully understand and cooperate in the soft component.
Concretely speaking, each personnel member responsible in the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC will first need to understand and take care of the targets and operating procedures of the cooperation project. The most important thing is to allocate necessary personnel accordingly in order to implement the soft component, and before implementing the soft component, it will be necessary to hire facility maintenance engineers and medical equipment maintenance engineers with a certain level of technical ability. The Japan side will provide technical training and cooperation to these engineers through implementation of the soft component. In addition, from the implementation period to after completion of the soft component, each person responsible in the implementing organisations, that is, the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC including the superintendent, is required to continue to give training and perform management for the maintenance of the facility and medical equipment as responsible management of the Matero UHC and the Chilenje UHC.

2-2-4-9 Implementation Schedule

Figure 2-33 shows the work implementation process after concluding the exchange of notes and grant agreement. The contents consist of detailed design and bidding tasks by a consultant, construction works by contractors, and construction administration work by a consultant.

(1) Detailed Design Tasks

A consultant agreement regarding detailed design (preparation of bidding documents) for the project will be made between the Ministry of Health in Zambia and a consultant company of a Japanese corporate body, and the contract document will be approved by JICA. After this, the consultant will prepare bidding documents through discussions with Zambia's Ministry of Health based on the investigation report, which shall be approved by Zambia's Ministry of Health.
The detailed design tasks (preparation of bidding documents) are expected to take four months to complete.

(2) Bidding Tasks

The bidding tasks are expected to take three months to complete.

(3) Construction Works by Contractors and Construction Administration Work by the Consultant

After the work contract is signed, the contractors will initiate the works. At the same time, the consultant will start the construction administration work.
The work period is expected to be fifteen months. The tables below show the contents of the works:

Table 2-35 Matero UHC Description of Work

Project Outline	Detailed Description
OPD（Single Floor）	OPD：General Outpatient, Dental, ENT, Treatment Room
OPD (Casualty) （Single Floor）	Casualty：Treatment Room, Observation Room, Morgue (BID)
Admin./Lab.（Single Floor）	Administration: Office、Superintendent、Matron、Conference Room Laboratory: Sample Collection Room, Laboratory
Maternity Ward （Single Floor）	Maternity: Ante-natal Room, Delivery, Post-natal, Post-natal (Isolation), Treatment Room
Paediatric Ward （Single Floor）	Ward, Treatment Room
Adult Ward（Single Floor）	Ward, Treatment Room
Related Facilities （Single Floor）	Mechanical Unit-1：Pump Room, Cylinder Room Mechanical Unit-2：Generator Room, Main Switch Room, Transformer, Main Distribution Board Elevated Water Tank, Water Reservoir
Medical Equipment	OPD, Casualty, Admin./Lab., Maternity Ward, Paediatric Ward, Adult Ward, Medical Imaging (Procurement for existing facility)

Table 2-36 Chilenje UHC Description of Work

Project Outline		Detailed Description
OPD (2 Story)	GFL	OPD:Pharmacy, Reception, Treatmentroom(casualty), Morgu
	1FL	OPD: General Outpatient, Dental, ENT, Treatment Room
Maternity/Admin. （2 Story）	GFL	Maternity : The isolation ward, The medical imaging department
	1FL	Administration Office, Superintendent, Matron, Conference Room
Related Facilities (Single Floor)		Mechanical Unit-1: Generator Room Mechanical Unit-2: Main Switch Room, Transformer, Main Distribution Board Mechanical Unit-3: Pump Room Elevated Water Tank, Water Reservoir
Medical Equipment		OPD, Maternity/Administration, Medical Imaging, Labour Ward (Procurement for existing facility)

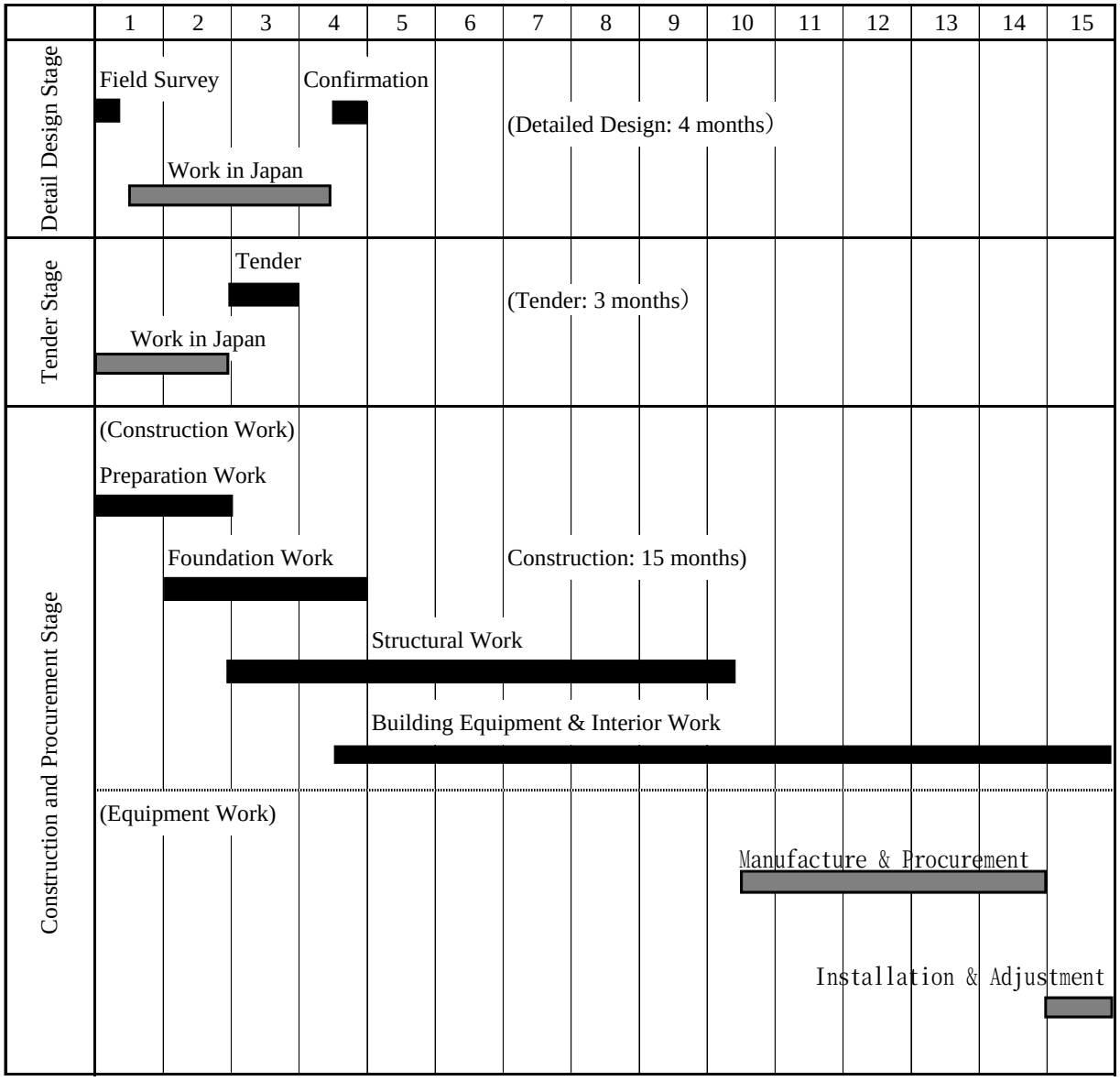


Figure 2-33 Project Schedule

2-3 Obligations of Recipient Country

The main items that Zambia is in charge of are as follows:

(1) Procedures

① To file and obtain any necessary approvals and licenses to obtain building permission regarding the cooperation target project
② To issue banking arrangement (B/A) and authority to pay (A/P) and bear any additional charges for services related to the procedures
③ To ensure prompt discharge of cargo containing imported equipment, tax exemption, and customs clearance, and to ensure prompt inland transport
④ For the Japanese who attempt to supply necessary equipment and accomplish tasks according to the certified contract, to provide full facilities necessary to enter and stay in Zambia
⑤ For the Japanese who attempt to supply necessary equipment and accomplish tasks according to the certified contract, to exempt them from all customs charges and various taxes in Zambia
⑥ To ensure that the facilities built and the equipment procured with gratuitous financial aid are properly and effectively managed and maintained
⑦ To make arrangements, sign contracts, and bear necessary costs for the electricity, telephone, gas, and sewage related to the cooperation target project

(2) Tax Exemption

It is agreed that the Ministry of Health will ensure that all taxes imposed on Japanese companies, the Japanese, and equipment related to the project will be exempted by taking any necessary actions toward the relevant organisations.

Items subject to tax exemption in Zambia are those that are necessary for implementing the project only, as specified in the Customs and Excise Regulations (2000, statutory instrument). Especially for construction equipment, if 'Temporary Importation' is applied for based on the premise that it will be brought back after the project has been completed, taxes will be exempted, but if its usage is going to continue in Zambia after the project has been completed, the corresponding customs must be paid.

For the Ministry of Health to arrange tax exemption with the Bureau of Budget in the Ministry of Finance and National Planning, we need to prepare an endorsement letter from the Ministry of Health, a list of imported equipment, and a bilateral agreement document. We also need to have a bill of lading when the Zambian Revenue Authority (ZRA) conducts inspections of imported goods upon request of the Bureau of Budget.

If we are unable to obtain approval before arrival at the Zambian customs because of necessary tax exemption procedures as described above, a builder / procurement supplier may have to pay the taxes to get the goods through and claim a refund for the customs charges later. We ask Zambia side to be cautious, however, since it seems that it has been difficult to get refunds in other ongoing projects.

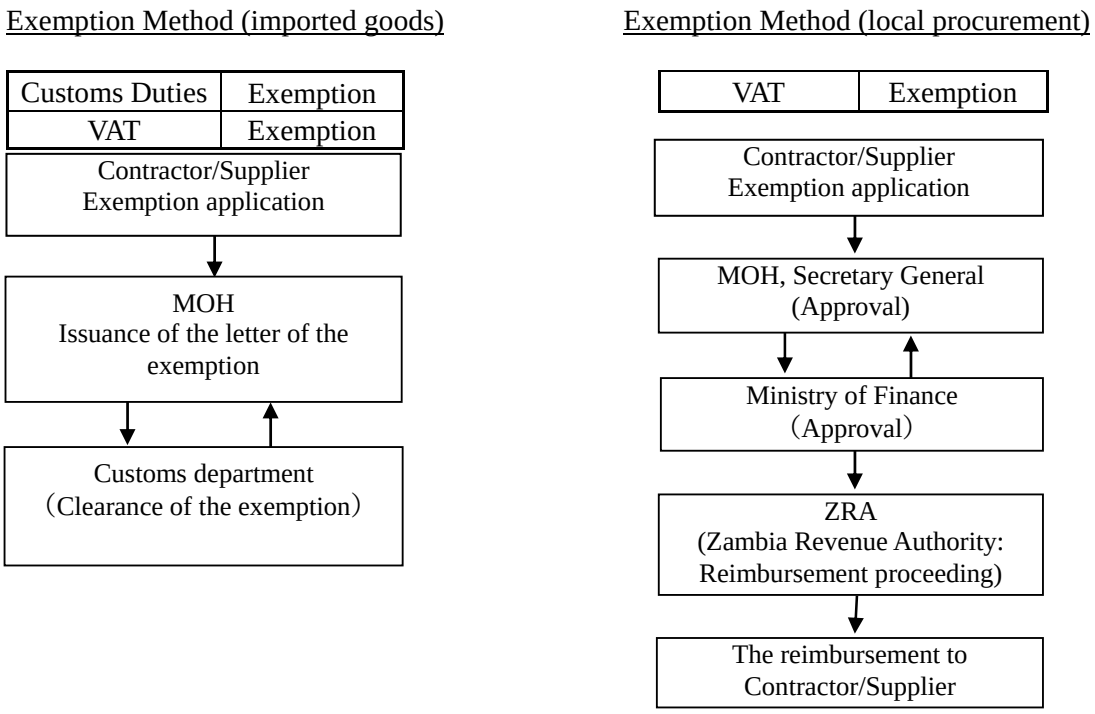


Figure 2-34 Flowchart of Tax Exemption

(3) Related Construction

The table below shows the construction and its timeline to be taken care of by Zambia:

Matero UHC

Table 2-37 Zambian side Scope of Work and Schedule for Matero UHC

Items		Schedule
MA-1	Relocate main sewer piping and catch basins within site and protect the relocation piping and ensure coordination of new facilities being built.	Before Construction October – December, 2013
MA-2	Relocate deep well water piping within site and protect the relocation piping and ensure coordination of new facilities being built.	
MA-3	To relocate current cholera tent foundations	
MA-4	To clear Project Site of trees, shrub and containers.	
MA-5	To use south Mortuary entrance during construction time	
MA-6	To prepare the Project Site and clear of all obstacles, including pathways.	
MA-7	Relocate telephone cabling	
MA-8	Demolish the manual borehole	
MA-9	To protect Lusaka main sewer at the site entrance	
MA-10	Ensure temporary site during construction time	
MA-11	To move medical services from current facilities to new facilities	After Construction August-September 2015
MA-12	Proposed relocation plan to move MCH to vacant OPD building（Proposal）	
MA-13	To create a new entrance to site	

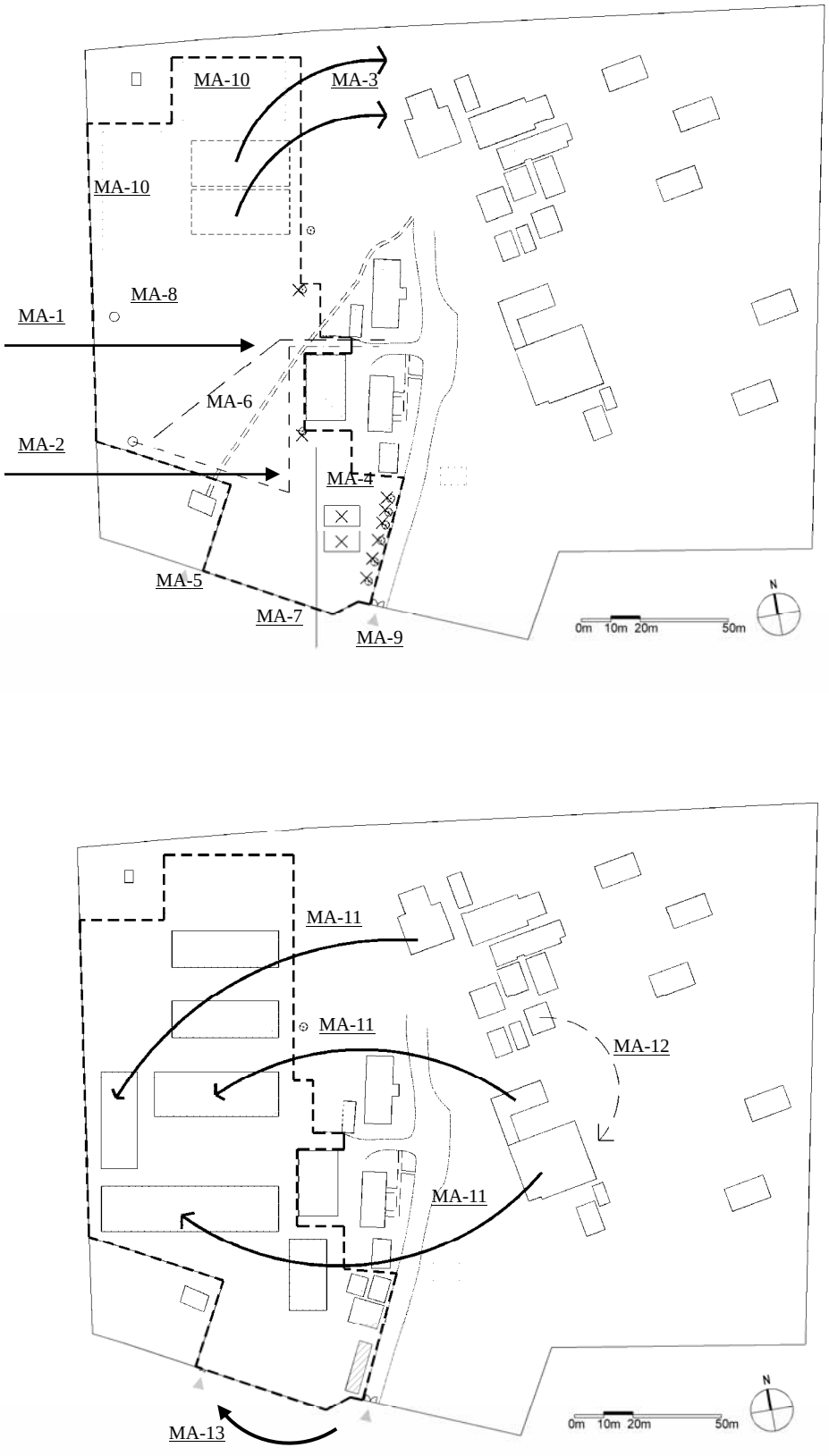


Figure 2-35 Matero UHC Zambian Side Scope of Work

Chilenje UHC

Table 2-38 Zambian side Scope of Work and Schedule for Chilenje UHC

Items		Schedule
CH-1	To demolish toilet structure	Before Construction October – December, 2013
CH-2	To relocate current main entrance during construction time	
CH-3	To clear Project Sites of trees, shrub and garbage	
CH-4	To provide access between Project Sites.	
CH-5	Relocate main sewer piping and catch basins within site and protect the relocation piping and ensure coordination of new facilities being built.	
CH-6	To ensure use of gate for Project Block patients during construction time	
CH-7	To demolish the gate house	
CH-8	Relocate septic tank and soak pit	
CH-9	Change the location of antenna support cables to ensure construction period access and post-construction access from OPD/Theatre to Maternity and Administration Block	
CH-10	Reroute north side sewer line in the site	
CH-11	Demolish the boundary wall in the site	
CH-12	Protect the existing deep well water supply line.	
CH-13	Ensure temporary site during construction time	
CH-14	To move medical services from current facilities to new facilities	After Construction August-September, 2015
CH-15	Proposed relocation plan to move Wards to current OPD building （Proposal）	
CH-16	To create a new entrance to site in addition to ensure other entrances such new as service entrances	

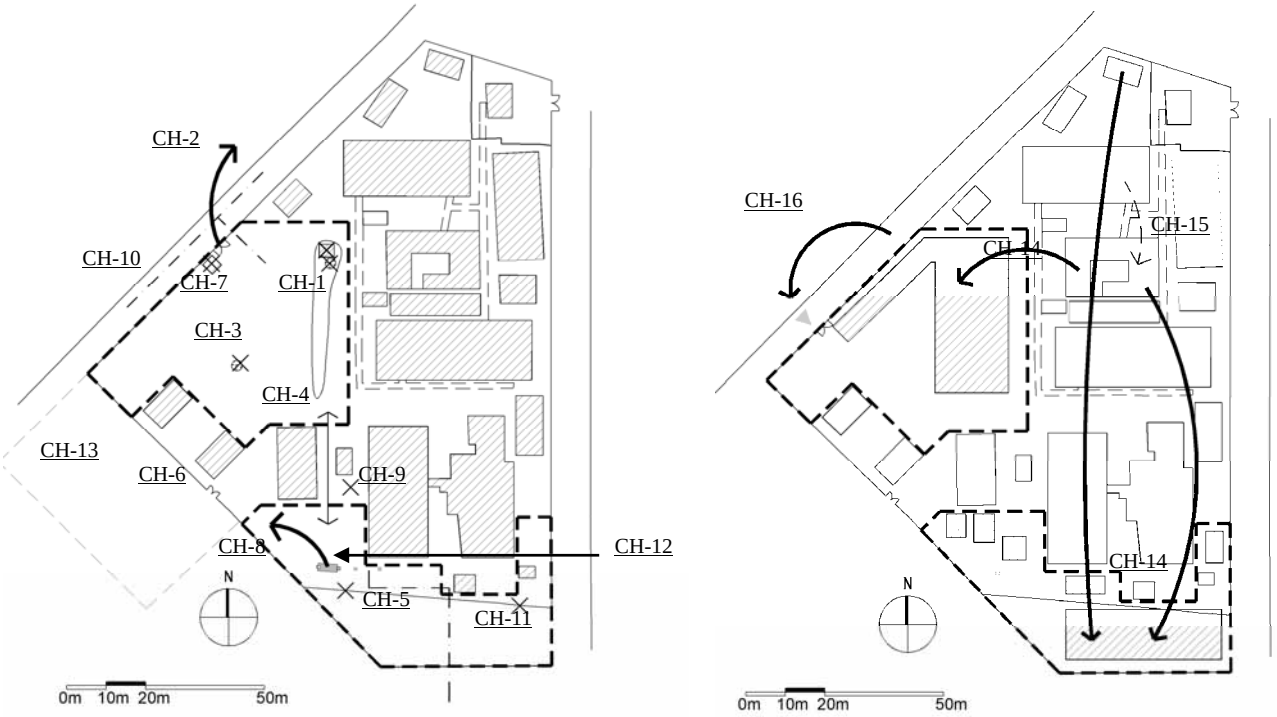


Figure 3-36 Chilenje UHC Zambian Side Scope of Work

2-4 Project Operation Plan

(1) Management / Maintenance Planning

For the facilities to be utilised most effectively after the construction of the facilities and equipment has been completed, it is imperative that Zambia take care of the maintenance work for the facilities and equipment continuously.
To maintain the facility functions, including the existing system in a sustainable fashion, it is vital to change the mindset of each staff member, enhance their technical abilities, strengthen the coordination function between the maintenance department and the district health office, provincial health office, and MOH, hire mechanical, electrical, and equipment technicians for the first level hospitals, utilise tool-supplementing maintenance activities considering preventive maintenance, and establish an annual budget and maintenance plan to support these activities. Therefore, we need to make a plan to introduce soft components.

1) Facilities

At present, two Environmental Health Officer (④ and ⑤ in the table below) is in charge of maintenance for all the health centre facilities under the supervision of a matron. They are responsible for maintenance of water supply and discharge, disposal of waste, and teaching of public hygiene. Their responsibility extends to the teaching of public hygiene in the whole region not just for the health centres, so they are not always present in the health centres. Therefore, a public hygiene administrator in district health management team office (DHMT) visits the health centres on a regular basis to check the maintenance situation. For air conditioners, exhaust fans, and electrical matters, there are no staff responsible for them in the health centres, so a member of DHMT in charge of equipment maintenance comes to check the maintenance situation regularly. When an electrical issue occurs, a matron calls DHTM and the person in charge will then visit to make a repair. Since there is no special equipment in the current facilities other than a private electric generator, it seems that they have managed to conduct maintenance work using the current system.
To provide appropriate medical services as a facility that is upgraded to a first level hospital, it will be necessary to hire new full-time maintenance staff members with special knowledge. The kind of equipment / systems that each staff member is responsible for is presented below. The following also shows an organisation chart relating to maintenance work in a first level hospital and job descriptions ① - ③ of new maintenance staff.

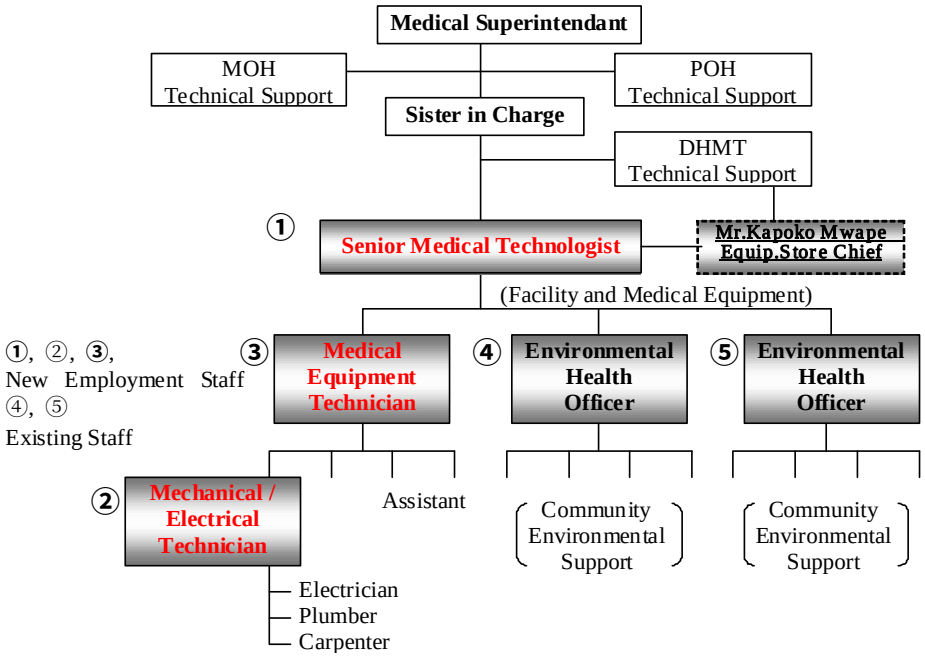


Figure 2-37 Organisation chart relating to maintenance work in a first level hospital

Job Description of New Maintenance Staff:

① Chief Technician (Engineer)
   a) To manage overall maintenance (coordinate with the superintendent, the district, the province, and MOH)
   b) To maintain the annual budget
   c) To plan and implement maintenance for hospital facilities / medical equipment
   d) To educate and train technicians / staff
   e) To keep track of high-voltage power-receiving systems, air conditioning systems, water discharge- / treatment-related systems

②-1 Mechanical Technician (to double as ②-2)
   a) Operation management of air conditioners, pumps, and fans
   b) Operation management of medical gas systems
   c) Operation management of water treatment and drainage treatment systems
   d) Operation management of solar panels
   e) Maintenance of medical equipment (related to mechanical matters)

②-2 Electrical Technician
   a) Operation management of transformers
   b) Operation management of high-voltage / low-voltage switchgears
   c) Operation management of generators
   d) Maintenance of medical equipment (related to electrical / electronic matters)
   e) Operation management of communication devices

③ Equipment Technician
   a) Maintenance of equipment

Even though the organisation chart for maintenance requires three maintenance staff for maintaining the facilities / equipment, MOH exlained that it may be difficult to hire three more people.

On the other hand, it is advised that MOH, the provincial health office, and district health office work with each other and with the first level hospitals finding a mutually complementary relationship to establish an effective maintenance system after implementing the project. In the meantime, we were explained that the Ministry of Health considers the possibility as well of relocating maintenance staff working full-time in the district health office to the first level hospitals.

During this study, we again requested MOH, the provincial health office, and district health office to recruit at least three more maintenance staff. As a result, it was promised to hire three more maintenance staff and the fact was recorded on the technical meeting minutes.

We also made the suggestion of coordinating education and training for the maintenance staff in charge of facilities / equipment at MOH at the provincial and district levels (primary- / secondary- / tertiary-level hospitals). The following chart shows how each department coordinates with and complements each other for maintenance:

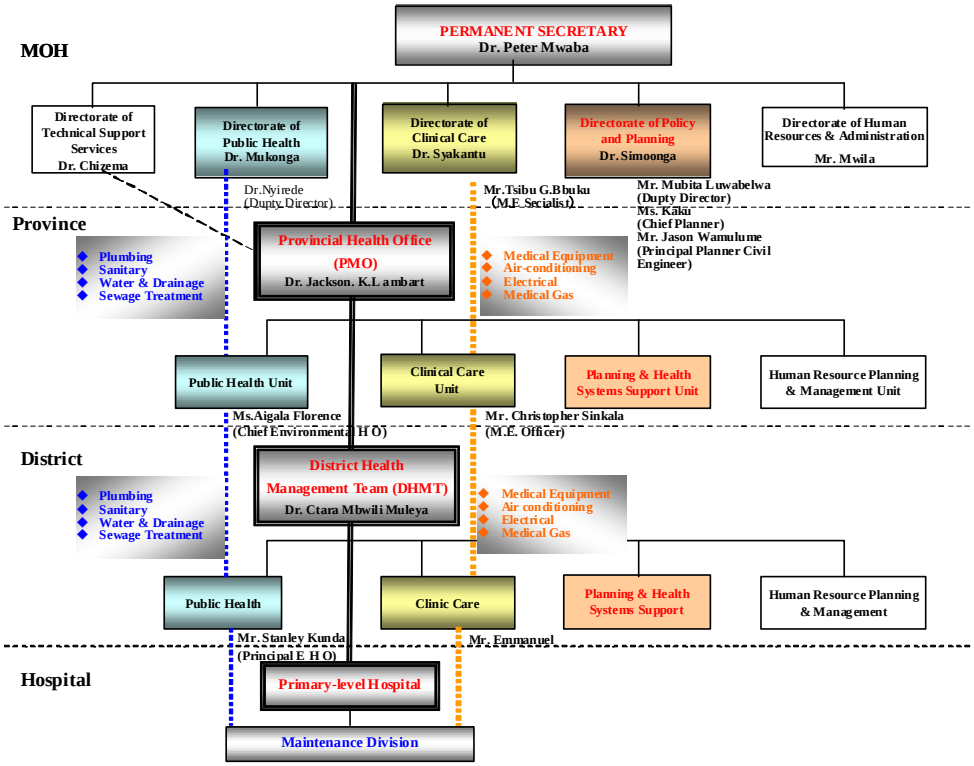


Figure 2-38 Organisation chart of Coordination of each department for maintenance

2) Equipment

- It will be necessary to secure the hospital management capacity on the Zambian side, in other words, the financial resources necessary for operation and maintenance of the equipment, budgetary measures, personnel deployment, and scale and specifications based on technical standards.
- The functions required of a first level hospital, the hospital management plan based thereon and the maintenance capacity of the Zambian side will be duly reviewed, and consideration will be given to the optimum equipment and specifications.
- The equipment should be the minimum basic equipment required at a first level hospital and ensure low operating costs and simple maintenance.

(2) Estimation of Approximate Project Cost

We have seen a number of buildings under construction in the capital city, Lusaka, where our cooperation project is taking place, and it seems that the situation surrounding the construction industry is relatively good. According to the International Monetary Fund (IMF), the consumer price index increased by 8.227% in 2010, 7.533% in 2011, and 6.512% in 2012.

The price of construction materials in Zambia is greatly influenced by the South African Republic, the main import trading partner. Along with the impacts of international price trends where the price of raw materials including oil and iron ore is on the rise, the overall price in Zambia is expected to keep rising in the future.

In calculating an approximate project cost, we usually had an outline design strategy meeting and prepared outline design documents, and based on these documents, the approximate project cost will be determined. The approximate project cost has to include the price increase rate expected by the time of bidding with sufficient margin that can allow an error of +10% after the outline design and the implementation design. A rough estimation at this point is determined mainly based on our experience, considering the characteristics of each room's applications and the size of the project buildings.

Considering the scale of the buildings (total of the two sites: about 7,600 m^2) and the particularity of the application (medical facilities), the unit price of the project construction will be about 210,000 yen / m^2.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Expenses to be Borne by Zambia

The expenses to be borne by Zambia will be:

Table 2-39 Expenses to be Borne by Zambia (Matero UHC)

Construction Expense Item	Expenses (million Kwacha)
A. Demolition of the existing facilities and site preparation of the construction sites	60.39
B. Replacement of the existing infrastructure in the construction sites	356.90
C. Distribution of infrastructure to the sites	85.10
D. Relocation to the new buildings (incl. purchase of furniture and supplies)	120.70
Total	623.09

Table 2-40 Expenses to be Borne by Zambia (Chilenje UHC)

Construction Expense Item	Expenses (million Kwacha)
A. To relocate current main entrance during construction time	10.98
B. Demolition of the existing facilities and site preparation of the construction sites	32.78
C. Replacement of the existing infrastructure in the construction sites	82.60
D. Distribution of infrastructure to the sites	302.50
E. Relocation to the new buildings (incl. purchase of furniture and supplies)	109.80
F. To create a new entrance to site	10.90
Total	549.56

As a procedure-related cost, Zambia will also have to assume a figure about 2 million yen, which is needed for issuing the banking arrangement (B/A) and authority to pay (A/P) with accompanying charges for services.

(2) Accumulation Conditions

① Start Point: December 2012
② Exchange Rate: 1 USD = 80.18 yen
1 kwacha = 0.01584 yen
1 Euro = 101.58 yen
1 ZAR = 10.89 yen
③ Construction Period: The detailed design, bidding, and construction timeline are as presented in the project implementation schedule.
④ Others: The project will be implemented according to the grant aid system of the Japanese government.

2-5-2 Operation and Maintenance Cost

(1) Maintenance Cost

The maintenance costs of the target facilities are projected as follows taking into consideration an expected reduction in electricity charges due to the introduction of a high-voltage receiving power system and an efficient air conditioning system. A reduction of water charges are also projected due to a rainwater harvesting system. The table below presents preliminary calculation results for annual maintenance costs of the target facilities for the initial year and after the second year.

Matero UHC

Table 2-41 Calculation Results of Maintenance Costs

Unit: K

Expense Item	First Year	Second Year and Beyond
① Electricity Charge	156,147,600	156,147,600
② Phone Charge	11,736,000	11,736,000
③ Generator Fuel Charge	44,943,360	44,943,360
④ Water Charge	69,120,000	69,120,000
⑤ Oxygen Gas Charge	14,256,000	14,256,000
⑥ Building Running Cost	0	15,360,000
⑦ Outsourcing Cost for Facility Equipment Maintenance	0	36,000,000
Subtotal ① - ⑦ (Facility Maintenance Cost)	296,202,960	347,562,960
⑧ Medical Equipment Maintenance Cost	254,189,000	254,189,000
Total ① - ⑧	550,391,960	601,751,960

① Electricity Charge ····· 156,147,600K/ Year

The amount of electricity used in the target facilities is estimated as follows based on the scale and properties of the facilities. The amount of electricity to be used due to the extensions is calculated on the assumption that about 75% of the installed capacity (200 kVA) will be the electricity load capacity (150 kVA) on average with a demand factor of 40%. Considering the application of the facilities as a hospital, the operating time is assumed to be 24 hours / day, 30 days / month, and 12 months / year.

Table 2-42 Estimated Amount Electricity Used

	Transformer Capacity (kVA)	Electricity Load Capacity (kVA)	Amount of Electricity Used per Hour (kW/h)
Newly Built Facilities	200	150	60

Demand Factor: 0.4

・Electricity Rate Structure

Basic Electricity Rate: 52,300 K/Month

Meter Rate: 300 K/kWh

・Electricity Charge

Table 2-43 Electricity Charge

	Charge (K)	Amount Used (kW/h)	Hours (h / day)	Days	Months	Total (K)
Basic Rate	52,300	—	—	—	12	627,600
Meter Rate	300	60	24	30	12	155,520,000
Total						156,147,600

② Phone Charge …… 11,736,000 K/ Year

The charge for fixed-line phones will depend on how many times the phones are used, so the charge is calculated as follows based on assumed use frequency in each facility.

・Rate Structure

Domestic Call Rate: 1,200 K/min
International Call Rate: 86,000 K/min

Table 2-44 Phone Charge

Pay-as-you-go	Charge (K)	Calling Time (min / call)	Number of Calls (calls / day)	Days	Months	Total
Domestic	1,200	1	20	30	12	8,640,000
International	86,000	1	0.1	30	12	3,096,000
						11,736,000

③ Generator Fuel Charge……44,943,360K/ Year

In Matero, the frequency of power cut is different between the rainy and dry seasons, so the fuel charge is calculated separately according to the power cut situation in each season.
The generator capacity in this project is around 100 kVA, and the load factor during use of the generator is assumed to be 60% of the rated capacity on average.
For the frequency of power cut, it is assumed that the situation at the time of the hearing on site will continue into the future.

1) Rainy Season

The rainy season continues for five months a year. According to the hearing conducted on site, the actual frequency of power cut during the season is eight times per month and each power cut lasts for about six hours. Therefore, the fuel charge is calculated on the assumption that the generator operates for six hours per power cut event.

2) Dry Season

The dry season continues for seven months a year. According to the hearing conducted on site, the actual frequency of power cut during the season is twice a week and each power cut lasts for about two hours. Therefore, the fuel charge is calculated on the assumption that the generator operates for two hours per power cut event.

・Rate Structure

Amount of Generator Fuel Consumption: 28 ℓ/h
Fuel Unit Price: 7,600 K/ℓ

・Fuel Charge

Table 2-45 Generator Fuel Charge

Season	Charge (K)	Amount Used (ℓ/h)	Hours (h)	Power Cut (events / month)	Months	Load Factor	Annual Amount Used (ℓ)	Total (K)
Rainy	7,600	28	6	8	5	0.6	4,032.0	30,643,200
Dry	7,600	28	2	8	7	0.6	1,881.6	14,300,160
Total							5,913.6	44,943,360

④ Water Charge ……69,120,000 K/ Year

The amount of water consumed in the target facilities is shown below:

Table 2-46 Estimated Amount of Water Used

	Amount of Water Supply per Day (m^3 / day)	Days	Months	Annual Amount of Water Supply Used (m^3)
Whole Year	60	30	12	21,600
Total				21,600

・Rate Structure

Metered Water Charge (average) 4,000 K/m^3

・Water Charge

Table 2-47 Water Charge

	Charge (K)	Amount of Water Supply (m^3)	Utilisation Factor	Total
Newly Built Facilities				
Metered Water Charge	4,000	21,600	0.8	69,120,000
Total				69,120,000

⑤ Oxygen Gas Charge……14,256,000 K/ Year

Oxygen will be used in the operation theatre, recovery room, and other necessary rooms. The amount of oxygen used in the newly built facilities is estimated as follows:

Table 2-48 Amount of Oxygen Gas Power

Name of Facilities	Application	Amount Used per Month (cylinders / month)
Newly Built Facilities	operation theatre, casualty, etc.	10
Total		10

・Rate Structure

O_2 Gas Charge: 198,000 K / cylinder

・Oxygen Gas Charge

Table 2-49 Oxygen Gas Charge

	Charge (K)	Amount Used (cylinders / month)	Months	Annual Amount Used (cylinders)	Load Factor	Total (K)
O_2 Gas Charge	198,000	10	12	120	0.6	14,256,000
Total						14,256,000

⑥ Building Running Cost ····· 15,360,000 K/ Year

We have selected materials relatively easy to maintain for the target buildings in the project including external and internal finishing. Accordingly, it is assumed that the building running cost required for maintenance of the interior and exterior of the buildings, electricity, purchasing of repair / replacement parts for water supply / discharge, and air conditioning devices will be about a half to a third of similar examples currently in use in Japan. This cost will be needed from the second year or beyond.

・Rate Structure: 6,000 K/m^2/year

・Building Running Cost

Table 2-50 Building Running Cost

	Cost (K/$m^{2/}$/year)	Area (m^2)	Days	Months	Load Factor	Total
Building Running Cost	6,000	3,200	—	—	0.8	15,360,000
Total						15,360,000

⑦ Outsourcing Cost for Main Equipment Maintenance ····· 36,000,000 K/ Year

In this project, it is necessary to outsource the maintenance work for the main equipment, and the cost is estimated as follows. The calculation is based on discussions we held with a local maintenance company.

Table 2-51 Estimated Outsourcing Cost for Main Equipment Maintenance

Equipment System	Maintenance Outsourcing Cost (K)	Periodic Check Frequency
Air Conditioner	12,000,000	Once a Year
Medical Gas System	6,000,000	Once a Year
Generator / Receiving Transformer	12,000,000	Once a Year
Treatment of Experiment Drainage Water	6,000,000	Once a Year
Total	36,000,000	

⑧ Equipment Maintenance Cost ····· 254,189,000 K/ Year

Equipment planning is established mainly with a view to procuring the equipment necessary to meet the demands for medical services and supplementing missing equipment. The scope of the planning is kept to a manageable level so that the Ministry of Health can perform maintenance. Therefore, the Ministry of Health needs to consider how to make a budget for the increase in equipment maintenance cost due to equipment procured for the newly built facilities. The expected cost increase due to the project will be about 254,189,000 K, and the breakdown is as follows:

Table 2-52 Equipment Maintenance Cost

No.	Name of Equipment	Quantity	Item	Unit Price (thousand yen)	Total (thousand yen)
1	X-ray unit	1	X-ray film	143	143
2	Automatic X-ray film processor	1	Developer / Fixer	254	254
3	X-ray film viewer	7	Lamp	6	42
4	Ultrasound scanner	1	Gel, etc.	142	142
5	Electrocardiograph	1	Recording paper, etc.	54	54
6	Fetal doppler	1	Gel	21	21
7	Cardio-toco graph machine	1	Gel etc.	64	64
8	Vacuum extractor	1	Catheter, etc.	13	13
9	Phototherapy unit	1	Lamp, etc.	33	33
10	Neonatal incubator	3	Probe, etc.	79	237
11	Resuscitator with timer	4	Probe, etc.	32	128
12	Dental X-ray unit	1	X-ray film	30	30
13	Dental X-ray film processor	1	Developer / Fixer	91	91
14	Examination light	16	Lamp	3	48
15	Suction pump	4	Catheter, etc.	13	52
16	Infusion pump	3	Infusion, set	145	435
17	Chemistry analyser	1	Reagent, etc.	1,111	1,111
18	Hematology analyser	1	Reagent, etc.	302	302
19	Safety cabinet	1	Filter, etc.	235	235
20	Water distiller	1	Cartridge, etc.	652	652
21	Glucometer	2	Measurement chip	315	630
22	Blood bank refrigerator	1	Recording paper, etc.	16	16
Subtotal (254,189,044 K by conversion)					4,733

Chilenje UHC

Table 2-53 Calculation Results of Maintenance Cost

Unit: K

Expense Item	First Year	Second Year and Beyond
① Electricity Charge	125,043,600	125,043,600
② Phone Charge	10,008,000	10,008,000
③ Generator Fuel Charge	24,514,560	24,514,560
④ Water Charge	46,080,000	46,080,000
⑤ Oxygen Gas Charge	8,553,600	8,553,600
⑥ Building Running Cost	0	12,480,000
⑦ Outsourcing Cost for Main Equipment Maintenance	0	30,000,000
Subtotal ① - ⑦ (Facility Maintenance Cost)	214,199,760	256,679,760
⑧ Equipment Maintenance Cost	234,854,000	234,854,000
Total ① - ⑧	449,053,760	491,533,760

① Electricity Charge ……125,043,600 K/ Year

The amount of electricity used in the target facilities is estimated as follows based on the scale and properties of the facilities. The amount of electricity to be used due to the extensions is calculated on the assumption that about 60% of the installed capacity (200 kVA) will be the electricity load capacity (120 kVA) on average with a demand factor of 40%.

Considering the application of the facilities as a hospital, the operating time is assumed to be 24 hours / day, 30 days / month, and 12 months / year.

Table 2-54 Estimated Amount of Electricity Used

	Transformer Capacity (kVA)	Electricity Load Capacity (kVA)	Amount of Electricity Used per Hour (kW/h)
Newly Built Facilities	200	120	48

Demand Factor: 0.4

・Rate Structure

Basic Electricity Rate: 52,300 K/ Month
Meter Rate: 300 K/kWh

・Electricity Charge

Table 2-55 Electricity Charge

	Charge (K)	Amount Used (kW/h)	Hours (h / day)	Days	Months	Total
Basic Rate	52,300	—	—	—	12	627,600
Meter Rate (daytime)	300	48	24	30	12	124,416,000
Total						125,043,600

② Phone Charge ·····10,008,000 K/ Year

The phone charge will depend on how many times the phones are used, so the charge is calculated as follows based on assumed use frequency in each facility.

・Rate Structure

Domestic Call Rate: 1,200 K/min
International Call Rate: 86,000 K/min

Table 2-56 Phone Charge

Pay-as-you-go	Charge (K)	Calling Time (min / call)	Number of Calls (calls / day)	Days	Months	Total
Domestic	1,200	1	16	30	12	6,912,000
International	86,000	1	0.1	30	12	3,096,000
						10,008,000

③ Generator Fuel Charge ·····24,514,560 K/ Year

According to the hearing conducted on site, the actual frequency of power cut through a whole year is twice a week and each power cut lasts for about two hours. Therefore, the fuel charge is calculated on the assumption that the generator operates for two hours per power cut event.

The generator capacity in this project is around 100 kVA, and the load factor during use of the generator is assumed to be 60% of the rated capacity on average.

For the frequency of power cut, it is assumed that the situation at the time of the hearing on site will continue into the future.

・Rate Structure

Amount of Generator Fuel Consumption: 28 ℓ/h
Fuel Unit Price: 7,600 K/ℓ

・Fuel Charge

Table 2-57 Generator Fuel Charge

Season	Charge (K)	Amount Used (ℓ/h)	Hours (h)	Power Cut (events / month)	Months	Load Factor	Annual Amount Used (ℓ)	Total (K)
Whole Year	7,600	28	2	8	12	0.6	3,225.6	24,514,560
Total								24,514,560

④ Water Charge ·····46,080,000 K/ Year

The amount of water consumed in the target facilities will be as follows:

Table 2-58 Estimated Amount of Water Used

	Amount of Water Supply per Day (m^3 / day)	Days	Months	Annual Amount of Water Supply Used (m^3)
Dry Season (April - October)	40	30	12	14,400
Total				14,400

・Rate Structure

Metered Water Charge (average): 4,000 K/m^3

・Water Charge

Table 2-59 Water Charge

	Charge (K)	Amount of Water Supply (m^3)	Utilisation Factor	Total
Newly Built Facilities				
Metered Water Charge	4,000	14,400	0.8	46,080,000
Total				46,080,000

⑤ Oxygen Gas Charge ……8,553,600 K/ Year

Oxygen will be used in the operation theatre, recovery room, and other necessary rooms. The amount of oxygen used in the newly built facilities is estimated as follows:

Table 2-60 Amount of Oxygen Gas Power

Name of Facilities	Application	Amount Used per Month (cylinders / month)
Newly Built Facilities	operation theatre, casualty, etc.	6
Total		6

・Rate Structure

O_2 Gas Charge: 198,000 K / cylinder (1600-L type)

・Oxygen Gas Charge

Table 2-61 Oxygen Gas Charge

	Charge (K)	Amount Used (cylinders / month)	Months	Annual Amount Used (cylinders)	Load Factor	Total (K)
O_2 Gas Charge	198,000	6	12	72	0.6	8,553,600
Total						8,553,600

⑥ Building Running Cost …… 12,480,000 K/ Year

We have selected materials relatively easy to maintain for the target buildings in the project including external and internal finishing. Accordingly, it is assumed that the building running cost required for maintenance of the interior and exterior of the buildings, electricity, purchasing of repair / replacement parts for water supply / discharge, and air conditioning devices will be about a half to a third of similar examples currently in use in Japan. This cost will be needed from the second year or beyond.

・Rate Structure: 6,000 K/m^2/year

・Building Running Cost

Table 2-62 Building Running Cost

	Cost (K/m^2/year)	Area (m^2)	Days	Months	Load Factor	Total
Building Running Cost	6,000	2,600	—	—	0.8	12,480,000
Total						12,480,000

⑦ Outsourcing Cost for Main Equipment Maintenance……30,000,000 K/ Year

In this project, it is necessary to outsource the maintenance work for the main equipment, and the cost is estimated as follows. The calculation is based on discussions we held with a local maintenance company.

Table 2-63 Estimated Outsourcing Cost for Main Equipment Maintenance

Equipment System	Maintenance Outsourcing Cost (K)	Periodic Check Frequency
Air Conditioner	12,000,000	Once a Year
Medical Gas System	6,000,000	Once a Year
Generator / Receiving Transformer	12,000,000	Once a Year
Total	30,000,000	

⑧ Equipment Maintenance Cost …… 234,854,000 K/ Year

Equipment planning is established mainly with a view to procuring the equipment necessary to meet the demands for medical services and supplementing missing equipment. The scope of the planning is kept to a manageable level so that the Ministry of Health can perform maintenance. Therefore, the Ministry of Health needs to consider how to make a budget for the increase in the equipment maintenance cost due to equipment procured for the newly built facilities. The expected cost increase due to the project will be about 234,854,000 K annually, and the breakdown is as follows:

Table 2-64 Equipment Maintenance Cost

No.	Name of Equipment	Quantity	Item	Unit Price (thousand yen)	Total (thousand yen)
1	X-ray unit	1	X-ray film	143	143
2	Automatic X-ray film processor	1	Developer / Fixer	254	254
3	X-ray film viewer	8	Lamp	6	48
4	Ultrasound scanner	1	Gel, etc.	142	142
5	Electrocardiograph	1	Recording paper, etc.	54	54
6	Fetal doppler	1	Gel	21	21
7	Cardio-toco graph machine	1	Gel, etc.	64	64
8	Vacuum extractor	1	Catheter, etc.	13	13
9	Phototherapy unit	1	Lamp, etc.	33	33
10	Neonatal incubator	3	Probe, etc.	79	237
11	Resuscitator with timer	3	Probe, etc.	32	96
12	Dental X-ray unit	1	X-ray film	30	30
13	Dental X-ray film processor	1	Developer / Fixer	91	91
14	Examination light	14	Lamp	3	42
15	Suction pump	2	Catheter, etc.	13	26
16	Infusion pump	1	Infusion set	145	145
17	Chemistry analyser	1	Reagent, etc.	1,111	1,111
18	Hematology analyser	1	Reagent, etc.	302	302
19	Safety cabinet	1	Filter, etc.	235	235
20	Water distiller	1	Cartridge, etc.	652	652
21	Glucometer	2	Measurement chip	315	630
22	Blood bank refrigerator	1	Recording paper, etc.	16	16
Subtotal (234,854,994 K by conversion)					4,385

(2) Financial Situation

1) The national budget, the budget for the Ministry of Health and the budget for Lusaka District

The national budget in 2012 will be 122.42% larger than that in 2011. The budget for the Ministry of Health (approved) in 2012 accounts for 12.5% of the total national budget, which indicates that the country places great importance on the health sector among national development strategies. The operation budget for the both the Matero and Chilenje facilities will come from the budget, and we believe that there will be no financial problems since the budget itself is on the rise.

Table 2-65 The national budget, the budget for the Ministry of Health and the budget for Lusaka District

	2010	2011	2012	2013	2014	2015	Unit: Billion kwacha
National Budget	14,534	16,717	20,466	25,054	30,672	34,548	Applied the increase rate of 122.42% in 2012 from 2013-2015
Budget for the Ministry of Health	1,371	1,758	2,566	3,745	5,467	7,979	Applied the increase rate of 145.96% in 2012 from 2013-2015
Percentage of MOH Budget in National Budget	9.4	10.5	12.5	14.9	17.8	21.3	
Increase Rate of MOH Budget		128.23	145.96	145.96	145.96	145.96	Applied the increase rate in 2012 from 2013-2015
Budget for Lusaka District Health Office	18	23	33	48	70	103	Applied the increase rate of MOH

Sourse: MOH

2) The budgets of the Matero and Chilenje Health Centres

Budgets allocated from the Lusaka District Health Office have increased steadily each year. In addition to referral income from health centres of their jurisdictional areas, additional 8,000 kwacha of governmental grants (¥ 127 million) will be also allocated to Matero and Chilenjye health centres in 2015, when their construction are completed. Therefore, income of facilities will increase and it will be enough to cover the maintenance costs as well.

Table 2-66 Matero health center

	2010	2011	2012	2013	2014	2015	Unit: Million kwacha
Government Subsidy						8,000	
Allocation from the District Health Office	786	996	1,454	2,122	3,097	4,520	
Referral Income						1,288	Equivalent to 30% of each health centre's income from Zone2
Income from Practice						400	Equivalent to 5% of government subsidy based on the comparison with UTH
Total Income	786	996	1,454	2,122	3,098	14,208	
Expenditure as Maintenance Cost						710	Equivalent to 5% of the income

Source: MOH, the District Health Office

Table 2-67 Chilenje health center

	2010	2011	2012	2013	2014	2015	Unit: Million kwacha
Government Subsidy						8,000	
Allocation from the District Health Office	760	971	1,418	2,069	3,021	4,409	
Referral Income						1,932	Equivalent to 30% of each health centre's income from Zone2
Income from Practice						400	Equivalent to 5% of government subsidy based on the comparison with UTH
Total Income	760	971	1,418	2,069	3,021	14,741	
Expenditure as Maintenance Cost						737	Equivalent to 5% of the income

Source: MOH, the District Health Office

Once the current health centres are upgraded to first level hospitals through implementation of the project, the budget will be given to the hospitals directly from the Ministry of Health, and at the same time, all the health centres located in the same zone as the hospitals will provide 30% of their budget to the hospitals as an administrative cost for being a referral hospital. Therefore, the target hospitals will gain two additional income sources along with the upgrade. In addition,

they continue to act as health centres, so they will acquire budget from the district health office as well. Combined with the income from daily practice, the hospitals will be able to take care of operation and maintenance on their own.

(3) Financial Situation and Maintenance Cost

The Ministry of Health will ensure that the both the Matero and Chilenje facilities receive the appropriate budget, so we believe that the target hospitals will be able to handle the increase in the maintenance cost with no problems.

- In line with the upgrade of the Matero and Chilenje facilities from health centres to first level hospitals, the Ministry of Health is going to allocate a budget of 8,000 million K (127 million yen), which will allow the hospitals to start operation as first level hospitals.

- If the Ministry of Health is able to secure the budget at the increase rate planned in 2015, when the construction of the target facilities is scheduled for completion, the total budget for Matero for 2015 will be ca. 14,208 million K (ca. 225 million yen) with a maintenance cost of 710 million K (ca. 11 million yen). Likewise, the total budget for Chilenje will be ca. 14,746 million K (ca. 233 million yen) with a maintenance cost of 737 million K (ca. 11 million yen).

In conclusion, we consider the operation maintenance planning to be appropriate since the maintenance budget has been secured for the project.

Chapter 3. Project Evaluation

CHAPTER 3 PROJECT EVALUATION

3-1 Recommendations

3-1-1 Preconditions

In addressing Matero UHC and Chilenje UHC to be established in this project smoothly and effectively, it would appear that Zambia should implement the following matters:
In implementing the overall process of this project smoothly, it is important that the work share for Zambia described in '3-3 Projects to be conducted by Zambia' is implemented without fault before the start of the work of this cooperation target project.

3-1-2 External conditions to be addressed in the overall project

(1) Issues to be handled by Zambia and suggestions

To make sure that the two facilities to be upgraded from health centres to primary-level hospitals by this project are run smoothly and effectively and to facilitate the delivery of the direct and indirect effects previously described, the following points need to be further improved or established:

1) Regarding the facilities established by this cooperation target project, they must make sure that the facilities and equipment can be used continuously in favourable conditions by ensuring the necessary budget for proper management and maintenance and providing sufficient training for the medical staff and so forth.

2) By including the repair cost for medical equipment in the budget, it is possible to quickly handle sudden equipment failures and minimise the deterioration of medical services. It is also necessary to plan to develop a reserve for purchasing equipment so that equipment whose service lives has expired can be updated smoothly in the future.

3) To address autonomous development by healthy management of the upgraded hospitals, it is important that the financial plans are developed properly, that the revenue and expenditure status is monitored constantly, and that the results are reflected in hospital management in order to address continuous improvement.

4) To improve maintenance skills regarding the maintenance systems and the medical waste and drainage systems in the newly established facilities of the two hospitals, technical instruction utilising a soft component system is being planned. Therefore, it is necessary that preparations be made for receiving instructions to match the timing of technical instruction by the personnel related to maintenance in the Ministry of Health, provincial health office, and district health office in addition to the maintenance personnel who would be in charge of the construction, mechanical facilities, electric facilities, and so forth of these hospitals.

(2) Technical aid and coordination with other donors

We implemented the 'National Health Facility Census' as a basic foreign survey in 2004 to 2006 in Zambia to grasp the detailed current status of medical services, currently owned equipment, status of facility infrastructures, human resource information, and so forth in all public medical institutes. Furthermore, the 'Assistance Project for Developing a Health Sector Capital Investment Plan' was implemented over two years from 2006 to 2008 to utilise the data along with other health indicators, specify the facilities that require medical facility infrastructure establishment, and reinforce the ability to reflect them in the development of the Health Sector Capital Investment Plan.

In December 2009, the 'Health Investment Assistance Project', which is a project to supplement the above 'Assistance Project for Developing a Health Sector Capital Investment Plan', was begun in three states of Lusaka, East, and West as target work areas, and the objective of the project is to 'improve the medical equipment and device maintenance skills at the medical institutes at each level (primary to tertiary) through health investment planning and efficient management'. Since the technical aid project will have outcome presentations and training sessions in Lusaka, it is expected that the outcomes can be shared by coordinating the knowledge, skills, and so forth obtained in its process with the parties concerned in this project.

At present, the People's Republic of China is building Chainama State Hospital (secondary medical service, state level) with 150 beds in Lusaka District, and its completion is planned for December 2010. When the facilities of this project are opened, Chainama State Hospital will serve as the secondary hospital with UTH at the top, and the two hospitals in this plan, which will be the district hospitals, will provide primary medical services. It would be possible to form the foundation of a referral system by addressing coordination between them and to contribute to mitigation of burdens on UTH and fair access for patients to medical services.

Also, the People's Republic of China built Levy Mwanawasa Hospital (secondary medical service, state level) with 150 beds in Lusaka District. When the facilities of this project are opened, Levy Mwanawasa Hospital will serve as the secondary hospital with UTH at the top, and the two hospitals in this plan, which will be the district hospitals, will provide primary medical services. It would be possible to form the foundation of a referral system by addressing coordination between them and to contribute to mitigation of burdens on UTH and fair access for patients to medical services.

3-2 Project Evaluation

3-2-1 Relevance

Implementing this plan with Japanese Grant Aid can be judged as having validity based on the following matters:

(1) Targets of benefits

Matero UHC, which is the target health centre, is located in the subdistrict of Zone 2, and its target population is 77,813. By making it a district hospital, the direct target population will be 349,261, which is the total population of Zone 2. Meanwhile, Chilenje UHC is located in the subdistrict of Zone 4 with a target population of 77,142. Its direct target population will be 507,475, which is the total population of Zone 4, by making it a district hospital.

However, when considering Lusaka overall, there is no primary medical facility (district hospital) at present and the plan was changed from establishing one district hospital in each zone to provide health services, and the facilities were reduced to these two hospitals. Thus, approximately 1.9million people, which is the entire population of Lusaka District, will benefit indirectly from these two facilities.

(2) Consistency of the project goal

Facility construction in nineteen districts without a primary-level district hospital is considered a high-priority project in the health strategies and plans of Zambia such as NHSP V, CIP, etc. In addition, there is a plan in Lusaka District to establish one primary-level county hospital in each of the four subdistricts, and the Ministry of Health started implementing this plan through processes to construct surgery rooms in the five health centres that demand one at their own expense at the time of the survey. Concerning the implementation of this project, consistency with their top plan is high.

(3) Ensuring autonomous development

While the facility and equipment plan was developed based on standard facility drawings, standard equipment lists, standard human resource assignment, and so forth in Zambia, consideration was also made so that autonomous development will be ensured technically and financially based on the present activity status.

Regarding reinforcement of workers to address the implementation of this plan, it is planned that 5,100 health workers will be employed over three years from 2011 as a strategy to address the shortage of health workers. A budget is included in the '2011-2013 MEDIUM TERM EXPENDITURE FRAMEWORK AND THE 2011 BUDGET (GREEN PAPER), August 2010'. Although a rapid increase in staff seems to be difficult to be realised, the subject health centres have already started some of the services to be provided by district hospitals. Thus minimum requisite workers will be approximately merely four doctors and fourteen physician assistants, and it seems feasible as newly trained workers are also included. Also, the plan of new staff allocation for Mateto and Chilenje UHCs is already approved by MOH.

Maintenance and control of facilities and medical equipment are essential in maintaining the quality of medical services. A soft component is planned as a technical assistance for both of them. Overall development of the maintenance and control mechanism of medical equipment is being supported at present in the Health Investment Assistance Project (technical aid project). Development of system is being planned in cooperation with the support.

(4) Necessity for facility improvement

Since Lusaka District does not have hospitals to provide primary medical services, UTH must play the role of both a primary- and secondary-level hospital in Lusaka District while maintaining its role as the top-referral hospital. The combined roles has seriously affected its original functions. The present Preparatory Survey of 2012 has confirmed that the severe congestion at UTH remains although Levi Muwanawasa Secondary Hospital by Chinese donors was opened in August 2011.

There is a substantial need of efficient provision of medical services depending on the type and seriousness of the disease by reinforcing of the health centres in the district so that they become primary-level hospitals, improving access to health services and establishing the layers of the referral system.

3-2-2 Effectiveness

(1) Quantitative effects

The outputs with expected quantitative effects through implementation of this cooperation target project are listed as follows:

Table 3-1 Effects of the project

Indicator		Standard value (2012)	Objective value※1 (2018)	The ratio of reduction in numbers of cases of Ceasarean Sections at UTH※2 2018	Reasons for improvement
①Number of ceserian section	Matero UHC	0	377	11%	Establishment of a maternity surgery ward
	Chilenje UHC	0	357	10%	Reinforcement of the maternity department
	Total	0	734	21%	
		Standard value (2012)	Objective value※3 (2018)	The ratio of reduction in numbers of referrals to UTH※4 2018	
②Number of inpatients in the adult surgery ward	Matero UHC	0	484	6%	Establishment of an adult surgery ward

*1: The required numbers of ceasarean setions for each UHC in 2018 (three years after completion of construction of Project facilities), if the present project is not implemented are derived by taking the referral numbers of required caesareans sections to UTH from each UHC obtained during the 2012 Survey (Table 2-5, 2-15) and multiplying by 110%, the increase in population of Lusaka by 2018, three years after completion of the Project Facilities (Table 2-4) . 60% of this number are capable of being treated at each of the UHC to be constructed by this Project and regarded as the target number for ceasarean sections for 2018.

*2: The number of caesarean sections (3470) that will be performed at UTH in 2018 (three years after completion of construction of Project facilities) in case the Project is not implemented is derived by multiplying 3155, the number of caesarean sections performed at UTH obtained in the 2012 Survey (Table 2-13), by 110%, the increase in population of Lusaka by 2018 , three years after completion of the Project Facilities (Table 2-4).

*3: The number of referral adult surgical patients (968) to UTH in 2018 if the present project is not implemented, is derived by multiplying 880, the number of surgical patients referred to UTH in the 2012 Survey (Table 2-5), by 110% , the increase in population of Lusaka by 2018 , three years after completion of the Project Facilities (Table 2-4). 50% of this number are capable of being treated at each of the UHC to be constructed by this Project and regarded as the target number for adult surgical patients for 2018.

*4: The total number of referral patients (8781) to UTH from Matero UHC in 2018 is derived by multiplying 7983, the total number of referral patients from Matero UHC to UTH in 2012 Survey (Table 2-5), by 110% , the increase in population of Lusaka by 2018, three years after completion of the Project Facilities (Table 2-4).

During the 2012 Preparatory Survey, it was confirmed that UTH was the only hospital with surgery facilities in Lusaka District. All patients requiring surgical operations are referred to UTH and this is considered to be one of the main causes of the severe, chronic congestion at UTH. The implementation of the Project will alleviate the requirement for primary level surgical procedures such as caesarean sections at UTH.

The project facilities and equipment procurement are to be conducted in concurrence with the provision of the operating theatres at both sites under funding by the Zambian Government. The quantitative evaluation criteria expected for the project shall be based on an increase in the following values at the target facilities:

①Increase in Caesarean section

(Matero UHC: 0/2012, Chilenje UHC: 0/2012)

It will be possible to perform primary-medical-level maternity surgeries (mainly Caesarian section), which had conventionally been referred to UTH, by addressing construction of a

ward to accommodate patients after maternity surgery and reinforcement of maternity department functions by provision of equipment in this plan.

②Increase in patients refered to UTH in the adult surgery ward

(Matero UHC: 0/2012)
It will be possible to accept surgery patients of primary-medical-level who had conventionally been referred to UTH by establishing a surgery ward and providing equipment in related facilities in this plan.

(2) Qualitative effects

The outputs with expected qualitative effects by implementation of this cooperation target project are listed as follows:

Matero UHC and Chilenje UHC

①Improvement in referral system functions in Lusaka District

By establishing primary level healthcare facilities in two of the four zones that presently lack primary level facilities between the tertiary level top referral UTH, the secondary level Levy Mwanawasa Hospital and the health centers, it is expected that the layered structure of the referral system in Lusaka District will be established.
As a result, UTH will be able to regain its fundamental function as the top referral hospital, while improving access to medical services for the residents.

②Improvement in the national health indicators of Zambia

It will contribute to the improvement of health indicators such as infant mortality rate and maternal mortality in Zambia, where more than 10% of infants born die before they reach the age of five, by establishing primary-level hospitals capable of primary-level maternity surgery in the proper regions.

③Advancement in medical service functions by improvement and concentration of the aging OPD and central examination department

It will be possible to provide medical services more efficiently, and the original examination service functions will be restored by improving and concentrating the OPD and central examination department, which are considered too old to continue using at present and are scattered around the hospital site, and addressing the proper scale for both in this plan.

④Addressing efficient hospital management

Efficient hospital management will be enabled by reminding the Ministry of Health (including provincial and district health offices), Matero UHC, and Chilenje UHC of the importance of facility and equipment maintenance from each standpoint through technical instruction in the soft component system and developing a proper maintenance and control method based on this recognition. Furthermore, it will be possible to manage the hospital with not only in-hospital infection prevention but also out-of-hospital safety assurance in mind by constructing a medical waste treatment system.

This projects is not only expected to provide the benefits described above, but also enables the elevation of existing health centers to primary-level hospitals, one of the priority strategies promoted by MOH in the NHSP V. Therefore this project has high validity and exhibits excellent effectiveness.

Appendices

1. Member List of the Survey Team

Preparatory Survey (November 27 to December 6, 2012)

No.	Name	Assignment title	Organization
1	Mr. Yoshihide TERANISHI	Leader	Chief Representative, Japan International Cooperation Agency Zambia Office
2	Ms. Kaoru OHZEKI	Project Coordinator	Japan International Cooperation Agency Zambia Office
3	Mr. Masahiro IKAWA	Project Manager, Architectural Planner 1 & Facilities Planner 1	Nihon Sekkei, Inc.
4	Ms. Makiko UEMURA	Deputy Project Manager, Architectural Planner 2 & Architectural Designer	Nihon Sekkei, Inc.
5	Mr. Yasuhiko YANAGI	Construction & Cost Planner 1	Nihon Sekkei, Inc.
6	Mr. Takashi OGAWA	Equipment Planner & Cost Planner 2	Fujita Planning, Co., Ltd.
7	Mr. Takahisa ISOBE	Facilities Planner 2	Nihon Sekkei, Inc.

2. Study Schedule

			Consultant Members				
			Project Manager, Architectural Planner 1 & Facilities Planner 1	Deputy Project Manager, Architectural Planner 2 & Architectural Designer	Construction & Cost Planner 1	Equipment Planner & Cost Planner 2	Facilities Planner 2
			Masahiro IKAWA	Makiko UEMURA	Yasuhiko YANAGI	Takashi OGAWA	Takahisa ISOBE
1	27 Nov	Tue	Leave Tokyo -				
2	28 Nov	Wed	- Arrive at Lusaka PM: Courtesy Call to JICA Zambia Office				
3	29 Nov	Thu	AM: Meeting with MOH (presence of PMO/DHMT)		AM: Market Survey etc.		same as PM
			PM: Survey on Matero UHC				
4	30 Nov	Fri	AM: Survey on Chilenge UHC				
			PM: Survey on Provincial Hospital (Levy Mwanawasa Hospital), UTH		PM: Market Survey etc.		PM: Power Company etc.
5	1 Dec	Sat	Market Survey, Survey on UHCs(if necessary), Team Meeting				
6	2 Dec	Sun	Team Meeting				
7	3 Dec	Mon	AM: Meeting with JICA Zambia Office PM: Meeting with MOH (presence of PMO/DHMT)				
8	4 Dec	Tue	AM: Meeting with MOH PM: Signing of Minutes of Discussion, Report to JICA Office & EOJ				
9	5 Dec	Wed	Leave Lusaka -				
10	6 Dec	Thu	Arrive at Tokyo				

3. List of Parties Concerned in the Recipient Countries

	Name	Organisation
	Zambia side	
1	**Ministry of Health**	
	Dr. Peter Mwaba	Acting Permanent Secretary
	Dr. C. Simoonga	Acting Director (Planning and Budgeting)
	Mubita Luwabelwa	Acting Deputy Director (Planning and Budgeting)
	K.C. Mulalelo	Chief Planner
	Tsibu G. Bbuku	Medical Equipment Specialist
	Wamulume Jason	Principal Planner
2	**Provincial Health Office**	
	Dr. Tackson Lambart	Lusaka PMO
	Christopher Sinkala	Principal Medical Equipment Officer
	Terence Siansalama	Planner, Lusaka
	Janet S. Chilepa	Assistant Accountant
	Ngala Florence	Chief Enu Officer
3	**District Health Office**	
	Roy Chawuma	District Medical Officer
	Clara Mbwili-Muleya	Acting District Medical Officer
	Stanley Kunda	Principal Environment Health Officer
	Emmanuel Musiwa	Medical Equipment Co-ordinator
	Dr. Matimba M Chiko	Ag. MPD
	Dalitso Sakala	Environmental Health Technologist
	Happy N. Chipulu	Assistant Nursing Officer, Nursing Care Department
	Wendy Kumbuyo	RM-MCH Department
	Clevinah Mizanda	Environmental Health Technologist
	Eddie C. Musonda	Manager Administration
	Getrude Nkonde Kasankha	Senior Human Resource Manager Officer
	Fredrick Muleya	Assistant Account
	George Kadimba	Lusaka DHO Pharmacist
	Lazarus Sibanda	Procurement Officer
	Doreen Mwondela	Oral/School Health Programme Officer
	Dr. M. Masaninga	CCE LDHMT
	Dr. C.Y Msiska	District Medical Office
	Nsama Davy	Chief Laboratory Scientist
4	**Chilenje Health Centre**	
	Mrs. M.S. Chibbela	Health Centre In-Charge
	Dr Kasanda	Medical Superintendent
	Mrs A.N. Chisanga	Environmental Health Technologist
	Mrs. M.M. Chomba	Environmental Health Technologist
	Mrs M. Chilonga	OPD In-Charge
	Mr M. Kalezhi	Nutritionist
	Mr Mutale	Lab Technician
	Ms J. Chama	Mental Health Dept.
	Mrs. J. Chipanda	MCH In-Charge

	Name	Organisation
	Dr Munira	Dental Surgeon
	Mrs N. Silwimba	ART Department
	Mrs Monde	Dental Technician
5	**Kanyama Health Centre**	
	Victoria N. Ndhlovu	Health Centre In-Charge
6	**Chawama Health Centre**	
	Evelyn Nkhata Tembo	Sister-in-Charge
	Aripdjanova Nozima	Medical Doctor
	Evans Mukalula Mwango	Environmental Health Technologist
7	**Chipata Health Centre**	
	Veronica Katubikonki	Registered Nurse
8	**Matero Ref. Health Centre**	
	Mrs Catherine C. Kasanga	Sister-in-Charge
9	**University Teaching Hospital**	
	Dr Jackson Kasoka	Senior Medical Superintendent
	Mr F. B. Mponela	Director of Finance
	Mr Richard Tumeo	Health Information Systems Officer
	Mr Gift Mumombo	Medical Records Officer
	Dr Laston Chikoya	Head Clinical Care
10	**Kafue District Hospital**	
	Dr. M.K. Lembalemba	District Medical Officer
	Dr Patrick Djemo	Position
	Ms Zgambo Timalizge	Hospital Administrator
	Mr M.P. Hodkinson	Community member, Chairman, Kafue Hospital Development Committee
	Mr Fredrick Kasonde	Hospital Information Officer
11	**Ministry of Works and Supply**	
	Boster H. Chiyaba	President, Secretariat at Buildings Department
	Wiza Kabagne	Architect Ministry of Works and Supply HQ
12	**ZESCO Power Company**	
	Mr. Augustine Musumali	Director, Engineering Development
	Mr. Daniel Mvula	Principal Engineer, Township Electrication
	Mr. Asheri Chimponaa	Engineering
	Mr. Brigh C. Kombe	Regional
	Mr. Crispin Chewe Nkonde	Regional manager (West regen _Matero)
	Mr.Hadley C.Habeene	Regional manager (Chilenge)
13	**Lusaka Water and Sewage Co. Ltd**	
	Mr. Nyonge Phiri	Senior Engineer
	Ms. Josephine Moono	Branch Engineer
	Mr. Ndoma Joseph	Senior Engineer(Matero Area)
	Ms.Mwiche S Musabaila	Branch Engineer of Kubulonga Branch (Chilenge Area)
	Mr. Chipili Chikamba	Asset Manager
14	**Lusaka City Council**	
	Ms Mainza Simoonga	Assistant Director, Engineering Service
	Mr. Amos M. Musonda	Director of Public Health Service

	Name	Organisation
15	**Zamtel**	
	Mr. Chirwa	Engineer
16	**Other**	
	Prof. L. Munkonge	Lusaka Apex Medical University (LAMU)
	Dr. John Mundenda	Lusaka Apex Medical University
	Japan Side	
17	**JICA Zambia Office**	
	Yoshihide Teranishi	Resident Representative
	Katsuji Miyata	Deputy Resident Representative
	Kaoru Ozeki	Assistant Resident Representative
	Likwasi Priscilla	Consultant, JICA Zambia Office

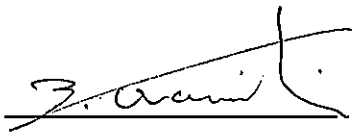
MINUTES OF DISCUSSIONS
ON PREPARATORY SURVEY
ON THE PROJECT FOR UPGRADI
NG OF LUSAKA HEALTH CENTRES TO DISTRICT HOSPITALS
IN THE REPUBLIC OF ZAMBIA
(IMPLEMENTATION REVIEW STUDY)

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Preparatory Survey (Outline Design and Explanation on Draft Report) Team on the Project for Upgrading of Lusaka Health Centres to District Hospitals (hereinafter referred to as "the Project") to the Republic of Zambia (hereinafter referred to as "Zambia") in August 2010 and in March, 2011.
The Project however did not go through the approval process of the Government of Japan.
In order to re-examine the validity and cost estimation of the Project, JICA decided to conduct an implementation review study on the Project and sent to Zambia the Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Mr. Yoshihide TERANISHI, Chief Representative of JICA Zambia office, from 28 November to 5 December, 2012.In the course of discussions, both parties confirmed the main items described in the attached documents.

Lusaka, 4th December, 2012

Dr. Peter Mwaba
Permanent Secretary,
Ministry of Health

Zambia



Mr. Yoshihide Teranishi
Chief Representative,
Japanese International Cooperation
Agency Zambia Office
Japan

ATTACHMENT

1. Scope of the Project

The Team conducted the Study basically in line with the scope of the Project set by the previous Preparatory Survey. Both sides confirmed that the major scope of the project had not been changed since the Survey Report for the Project was submitted to the Government of Zambia in May 2011.

2. Schedule of the Study

JICA will complete the final report and send it to the Government of Zambia by May 2013. Final Cost estimation of the Project will be subscribed in the report after the estimation work in Japan.

3. Confidentiality of the Project Design

Both sides confirmed that detailed specification of the facilities, the equipment and other technical information and cost estimation shall not be released to any outside party before the signing of verification of contract(s) for the Project.

END

PM

5. Soft Component (Technical Assistance) Plan

THE PROJECT FOR UPGRADING OF LUSAKA HEALTH CENTRES TO DISTRICT HOSPITALS IN THE REPUBLIC OF ZAMBIA

Plan of Technical Assistance (Soft-Component)

INDEX

March 2013

The Consortium of
Nihon Sekkei, Inc. and Fujita Planning Co., Ltd.

(1) Background to Soft Component Planning

By upgrading the Matero UHC and the Chilenje UHC located in the Lusaka district to first level hospitals, the project aims to make the referral system work and at the same time, mitigate the crowded condition and burden in the University Teaching Hospital, a tertiary-level medical facility located in the same Lusaka district. The components of the facility works and equipment procurement include the construction of an OPD examination building, emergency examination building, inspection building, sick ward, and administration building for the Matero UHC, and an OPD examination building, emergency examination building, and administration building for the Chilenje UHC as well as provision of the necessary medical equipment for both health centres.
The investigation team has presented the following concerns regarding the current facilities and equipment maintenance methods based on the field investigations conducted from 27 November to 6 December, 2012:

1. The maintenance staff members in the district health office are in charge of maintenance works in several health centres, but it is difficult for them to give close attention to each individual health centre.
2. The medical service level is impaired due to breakdown of facility equipment and medical apparatus.
3. Medical water discharge and medical waste are not disposed of correctly, which poses a risk of deteriorating the surrounding environment and causing in-hospital infections.

Regarding the above problems, implementation of technical trainings will be crucial for the Zambian side on maintenance of the newly built facility and its equipment, and on management of the medical waste and water discharge system.

After the implementation of grant aid, the Ministry of Health is planning to newly establish a maintenance department for the in-hospital facility and medical equipment to take care of the maintenance work of the hospital facility and medical equipment with human resources reinforced and coordinated with various agents in Zambia to ensure that operation maintenance is performed properly for the facility and equipment in the Matero UHC and Chilenje UHC in accordance with the project.
In Zambia, there are people in charge of facilities and equipment in the Ministry of Health, provincial health office, and district health office individually, but there is no one in charge at the health centre level. Once both UHCs are upgraded to first level hospitals through the project, it is essential to allocate facility and equipment maintenance staff in the hospitals for administrative reasons. It is not only necessary to recruit new staff members, but it will also be necessary for the hospitals to recognise the importance of the facility / equipment maintenance department as a part of the hospital functions to work on maintenance activities from a preventive maintenance viewpoint. Regarding waste disposal, sorted collection has been conducted to some degree, but we need to raise the awareness of each engineer and enhance their knowledge and technical level while helping establish an appropriate maintenance system. Therefore, with the upgrade of the health centres to first level hospitals, the project will incorporate support for establishing a maintenance system for the facilities and the equipment including coordination between the maintenance department to be newly established and the warehouse for equipment consumables and replacement parts as well as the establishment of an in-hospital medical waste collection / disposal system based on the waste sorting method used in hospitals recommended by WHO (colour coding) as a soft component. For the equipment, preventive maintenance including daily checkups will be incorporated so that the equipment can be used for a long time in good condition.
The main items whose improvement is expected through implementation of technical training in the soft component are as follows:

1. From the viewpoint of the surrounding environment, in-hospital infections, and continuity of medical services, have the medical staff recognise the importance of maintaining the facility apparatus and medical equipment, and enhance the knowledge and technical level of the staff while raising and maintaining awareness.
2. With the effect of preventive maintenance by establishing a management system that can keep track of inventory books, failure history, and places to which facility apparatus and medical equipment have been allocated, an inventory system to control consumables and replacement parts, and a system for daily and periodic checkups, which will make the budget available, shorten the failure period, reduce the risk of in-hospital infections, and maintain the medical service level, will be created.
3. By optimising the operation of the medical waste and water discharge systems, the environment both inside and outside the hospitals will be improved.

In implementing the soft component, we will employ a participatory method of planning to enhance the development of self-reliance, in which we will put together a plan and its contents by holding workshops. For the formats of the medical equipment maintenance system and the ledger, we will make sure to take over the outcome of ongoing technical cooperation projects so that there will be no conflict in the contents and it will smoothly coordinate with the other technical cooperation projects.

(2) Soft Component Targets

1. To have the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC recognise the importance of establishing a medical facility / equipment maintenance system
2. To establish a maintenance system for the facility and the medical equipment in the Matero UHC and the Chilenje UHC
3. To establish a medical waste and water discharge disposal system in the Matero UHC and the Chilenje UHC

(3) Soft Component Outcome (Direct Effect)

Table 1 Soft Component Direct Effect

Technical Training	Direct Effect
To teach the importance of a maintenance system	・The importance of strengthening the maintenance system will be understood. ・An independent maintenance system will be established to secure appropriate personnel. ・The concept of preventive maintenance will be fully recognised.
To help establish a maintenance system and enhance management ability	・The maintenance ability level of the staff will be enhanced. ・It is ensured that the facility will be properly utilised and operated, handling ability against breakdown will be improved, and periodic checkups will be implemented.
To help create and implement an annual maintenance plan	・Appropriate personnel will be secured (in terms of number of personnel and ability). ・An annual maintenance plan, which will make the budget available, will be created. ・It will help keep track of the names of consumables and spare parts, the quantity, and the expenditure necessary for the next year, which ensures smooth implementation.
To help establish a medical waste and water discharge disposal system	・It will raise awareness toward waste disposal at each department, which will ensure that infectious waste will be separately collected. ・The incinerators will be properly operated.

(4) Verification of Outcome Achievement

Table 2 Verification of Outcome Achievement

Item	Verification Method
To teach the importance of a maintenance system	・Maintenance personnel are ensured. ・The maintenance budget is secured. ・A preventive maintenance system is recognised.
To help establish a maintenance system and enhance the management ability	・A maintenance system flow is prepared. ・An equipment ledger is created. ・Regular checkups and adjustments are planned. ・Preventive maintenance is conducted. ・The maintenance department will give explanations and/or guidance to doctors and nurses if necessary.
To help create and implement an annual maintenance plan	・Documentation including facility / equipment apparatus ledgers, maintenance records, and annual maintenance plans are put together. ・A maintenance budget plan for the next year is prepared.
To help establish a medical waste and water discharge disposal system	・A medical waste disposal manual is prepared. ・An incinerator operation system is established.

(5) Soft Component Activities (Input Planning)

Table 3 Soft Component Activities

Item	Activities	Affected Department	Outcome	
			Japan	Zambia
To teach the importance of a maintenance system	・By holding a workshop separately for the administration department and the maintenance department, the importance of maintenance from the viewpoint of the surrounding environment, in-hospital infections, and continuity of medical services is stressed. ・A maintenance system will be introduced in Japan, and the gist of the maintenance system idea and a rough work flow will be prepared as common practice. In addition, there will be on-the-job investigation and maintenance work for the existing facilities. For the medical equipment, however, we will take over the contents and outcomes from other technical cooperation projects. [Technical Level] ・A technical level higher than that of the technologists or technicians is needed, and all the staff in the maintenance department have reached this level.	Ministry of Health, provincial health office, district health office, superintendent, maintenance department	・Maintenance system created in Japan and through technical cooperation projects	・Draft of the maintenance system ・Organisation chart ・Staff assignment plan
To help establish a maintenance system and enhance management ability	・Existing maintenance practice will be checked, and a maintenance system flow, a work flow chart, and various formats utilising cases in Japan will be created. ・A workshop targeting doctors and nurses will be held in the hospitals and a maintenance request format will be created. ・An equipment ledger will be created for the facility apparatus and medical equipment. [Technical Level] ・A technical level higher than that of the technologists or technicians will be needed, and all the staff in the maintenance department have reached this level.	District health office, each department in the hospital, maintenance department	・Maintenance system flow created in Japan and by the technical cooperation project ・Equipment ledger created in Japan and various formats created by technical cooperation projects	・Maintenance work planning ・Various formats ・Ledger of facility and equipment apparatus

Item	Activities	Affected Department	Outcome	
			Japan	Zambia
To help create and implement an annual maintenance plan	・How to create an annual maintenance plan will be taught. ・How to prepare an annual budget will be taught. ・How to place an order for replacement parts and the inventory method will be taught. ・On-the-job maintenance training will be provided. [Technical Level] ・A technical level higher than that of the technologists will be needed, and the chief and assistant leaders in the maintenance department have reached this level.	Provincial Health Office, district health office, superintendent, accounting department, Maintenance Department	・Annual maintenance plan created in Japan ・Maintenance budget plan created in Japan ・Each plan created by a technical cooperation project	・Annual maintenance plan ・Maintenance budget plan
To help establish a medical waste and water discharge disposal system	・Establishing waste collection routes and a waste sorting (colour coding) system and in providing instructions. ・Establishing the operation system of the neutralisation tank and in providing instructions. ・Establishing measures against in-hospital infections and in providing instructions. [Technical Level] ・A technical level higher than that of the technologists will be needed, and the chief and assistant leaders in the maintenance department have reached this level.	District health office, superintendent, each department in the hospital, waste disposal personnel	・Medical waste disposal manual created in Japan ・Manual created through technical cooperation projects	・Medical waste operation plan ・Neutralisation tank operation plan ・In-hospital infection measures manual

(6) Resource Procurement Method to Implement Soft Components

Soft components will be the direct support type. There are no local consultants or facility / equipment maintenance companies in Zambia that are specialised in maintenance works for facilities and equipment.

(7) Soft Component Implementation Process

A consultant responsible for training will determine the details of training and cooperation as well as the whole schedule based on prior agreement with those involved in the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC, and proceed with the technical training while evaluating the input and outcome from time to time. The total flow is assumed to be as described below. For the facility apparatus, we will prepare the formats and system in Japan so that they will be suitable for the project and we will adjust them on site accordingly, but for the medical equipment, we will basically take over the formats and system created by other technical cooperation projects.

1) Advance Preparation in Japan

In Japan, we will prepare materials, various formats, workflow charts, and others regarding the maintenance system and medical waste disposal system for the assumed facilities, so that we can present them as sample cases at the first workshop together with the formats created by technical cooperation projects.

2) First Field Training

We will educate leaders and staff members in the facility / equipment maintenance department to strengthen the maintenance system through workshops, and at the same time, we will shed light on problems lurking in the current maintenance works to create an input planning idea. We will also verify whether an acceptance system and a maintenance organisation of the hospitals have been established or not. In concrete terms, at the workshop, we will teach how to create an equipment ledger for the facilities and for the medical equipment in the existing buildings, and we will instruct them to proceed with maintenance operation using the formats created until the next training. To provide the abovementioned education and training, we will send one engineer in charge of facility maintenance and one staff member in charge of medical equipment / waste maintenance.

3) Second Field Training

We will check the operation status of various formats and the maintenance / medical device waste system created in the first field training, and with adjustment needed for the system and various formats, provide additional training as necessary.
The facility equipment (air conditioners / medical gas / water discharge disposal / receiving power system / generators / light electrical appliances, etc.) and medical equipment to be used in the project will have been selected by the start time, and some of the equipment will have started to be carried onto the site, so we will teach how to create an equipment ledger more concretely using the newly built facility and the equipment apparatus. For the remainder of the ledger that could not be created during training, the engineers in the hospitals will continue to prepare them after the trainers return to their own countries. We will send one engineer in charge of facility maintenance and one staff member in charge of medical equipment maintenance to provide education and training.

4) Tasks to be Performed in Japan

We will put together the results of the first and second technical trainings, gather items requiring final training, and adjust the flow chart and formats. At this point, we will readjust the maintenance system against the facilities and equipment to be installed.

5) Third Field Training

We will conduct final confirmation and adjustment for each ledger and format created during the second field training, and we will teach how to create a final maintenance plan proposal for the newly built facilities and medical equipment according to the final training items prepared in Japan. While checking the facility apparatus / equipment already installed on site, we will give final technical training. In particular, we will teach how to prepare an annual maintenance plan / annual maintenance budget plan / spare parts management plan, and how to report the final version of a maintenance plan. We will send one engineer from facility maintenance I (air conditioners / hygiene / water discharge disposal / medical gas), one staff member from facility maintenance II (responsible for receiving power system equipment / generators / light electrical appliance equipment), and one equipment / medical waste management engineer from Japan.

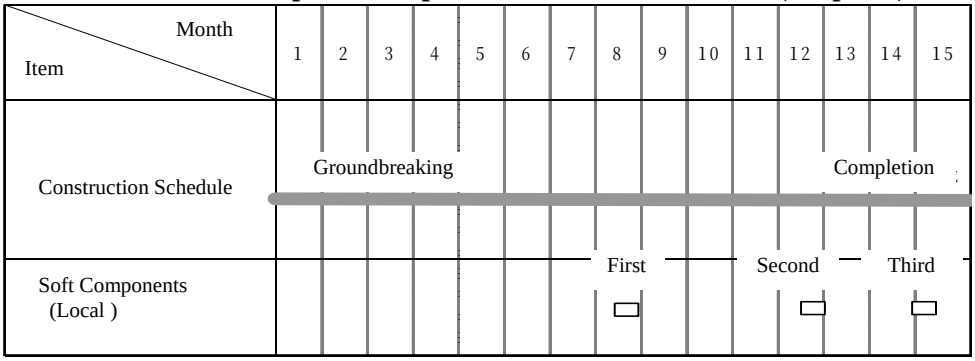
6) Tasks to be Performed in Japan

We will put together the results of the first, second, and third technical trainings and we will create a final report.

The following three engineers are to be sent as Japanese consultants in order to transfer technical skills to the hospitals:

a. Facility maintenance engineer I: To deal with air conditioner equipment, hygiene equipment, and special facilities
b. Facility maintenance engineer II: To deal with receiving power system equipment and light electrical appliances
c. Management engineer in charge of equipment / medical waste: To deal with the equipment / medical waste collection system

Table 4 Soft Component Implementation Process Chart (Proposal)



(8) Soft Component Outcome

Table 5 Soft Component Outcome

Input	Outcome
To teach the importance of a maintenance system	・Draft maintenance system ・Maintenance organisation chart ・Staff assignment plan
To help establish a maintenance system and enhance management ability	・Maintenance work plan, preventive maintenance plan ・Various formats ・Ledger of facility and equipment apparatus
To help create and implement an annual maintenance plan	・Annual maintenance plan ・Maintenance budget plan
To help establish a medical waste and water discharge disposal system	・Medical waste collection disposal plan ・Incinerator operation plan

(9) Approximate Project Cost for Soft-Component

See the attached document.

(10) Responsibility of Zambia's Implementing Organisation

Since the soft component will be implemented to ensure the self-reliant development of Zambia, all training should employ a method that will help promote spontaneous activities on the Zambia side wherever possible. For this reason, it is essential that the implementing organisation on the Zambia side fully understand and cooperate in the soft component.

Concretely speaking, each personnel member responsible in the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC will first need to understand and take care of the targets and operating procedures of the cooperation project. The most important thing is to allocate necessary personnel accordingly in order to implement the soft component, and before implementing the soft component, it will be necessary to hire facility maintenance engineers and medical equipment maintenance engineers with a certain level of technical ability. The Japan side will provide technical training and cooperation to these engineers through implementation of the soft component. In addition, from the implementation period to after completion of the soft component, each person responsible in the implementing organisations, that is, the Ministry of Health, provincial health office, district health office, the Matero UHC, and the Chilenje UHC including the superintendent, is required to continue to give training and perform management for the maintenance of the facility and medical equipment as responsible management of the Matero UHC and the Chilenje UHC.