

**Ministry of Health
The Republic of Zambia**

**PREPARATORY SURVEY (BASIC DESIGN) REPORT
ON
THE PROJECT FOR THE IMPROVEMENT
OF THE MEDICAL EQUIPMENT
OF THE UNIVERSITY TEACHING HOSPITAL
IN
THE REPUBLIC OF ZAMBIA**

November 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

FUJITA PLANNING CO., LTD.

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PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey (basic design) on the Project for the Improvement of the Medical Equipment of the University Teaching Hospital in the Republic of Zambia.

JICA sent to Zambia a survey team from March 21 to April 16, 2009.

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

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

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

November 2009

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

Letter of Transmittal

We are pleased to submit to you the preparatory survey (basic design) report on the Project for the Improvement of Medical Equipment of the University Teaching Hospital in the Republic of Zambia.

This survey was conducted by Fujita Planning Co., Ltd., under a contract to JICA, during the period from March 2009 to November 2009. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Zambia and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

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

Very truly yours,

Tamotsu Nozaki
Project Manager,
Preparatory Survey (Basic Design) team on
the Project for the Improvement of the
Medical Equipment of the University
Teaching Hospital
Fujita Planning Co., Ltd.

Summary

SUMMARY

1. Outline of the Country

The Republic of Zambia (hereinafter referred to as “Zambia”) is a landlocked country in the southern part of Africa. It is surrounded by eight countries, i. e., Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia, Angola and the Democratic Republic of the Congo. A population of Zambia is about 1.2 million, which is one tenth of that of Japan, lives on a land area of 752,612km², which is twice the area of Japan. In the south of the country is the Zambezi River, with a total length of 2,750km, Victoria Falls, one of the largest waterfalls in the world, and Lake Kariba, an artificial lake built for the purpose of power generation, lies on the border with Zimbabwe.

Since the country is located on highlands of 900 - 1,500m above sea level in the tropical zone between the latitudes of 8 and 18 degrees south, it has the relatively mild climate of a tropical savanna. There is greater precipitation in the north of the country than in the south; the annual rainfall in Southern Province is 700mm, while Copperbelt Province in the north has annual rainfall of 1,300mm. There is a clear distinction between the rainy season (November to March) and dry season (April to October).

Since the era of colonization, Zambia has been a monoculture economy dependent on the production of copper, which accounts for about sixty (60) % of the country’s exports; its economy has been greatly affected by fluctuation of the production volume and of the international price of copper. In particular, due to the tendency towards the low international price of copper that began in the latter half of the 1970s, the Zambian economy suffered from a long period of stagnation. To break away from this economic structure, the country has set out as one of its priority initiatives a structural reform of its industries, focusing on the development of agriculture (vast expanses of fertile uncultivated land) and tourism (plentiful tourism resources). From 2006 to around October 2008, when the worldwide financial crisis occurred, the Zambian economy grew steadily, maintaining a real-term GDP growth rate of around 6%. The GNI per capita is 770 US dollars (World Bank, 2007).

As the country reached the completion point of the Highly Indebted Poor Countries (HIPC) Initiative in April 2005, Japan and other donor countries and organisations provided debt relief, which resulted in a significant reduction in external debts. However, because of the worldwide financial crisis that occurred in October 2008, the Zambian Kwacha depreciated by about seventy-three (73) %, which caused a rise in the rate of inflation and in the interest rate on loans from commercial banks, trade deficits and a decline in agricultural production and had an adverse impact on the construction sector.

The biggest problem in the economic and social development of Zambia involves poverty and the spread of HIV/AIDS. More than sixty (60) % of the people in Zambia are poor, living on less than 1 US dollar per day. Also, the adult HIV/AIDS infection rate is high (about 920,000 people are

infected; the infection rate is around seventeen (17) % and the average life expectancy of the people dropped to thirty-eight (38) years in 2004. The decline in the number of people in the prime of their working lives in the rural areas and the increase in the number of children orphaned by HIV/AIDS (about 600,000 children) is particularly serious issues.

2. Background of the Project

In order to achieve the Millennium Development Goals (hereinafter referred to as “MDGs”), the Ministry of Health of Zambia is implementing from 2006 to 2010 a Five Year National Health Strategic Plan IV (NHSP-IV) that prioritizes such cross-sectoral issues as the development of health and medical personnel, the procurement of essential drugs and the improvement of health and medical infrastructure/equipment, in addition to reinforcing individual programmes relating to the health/nutrition of mothers and children, reproductive health, AIDS, tuberculosis and malaria. However, in the interim review of the NHSP-IV carried out in October 2008, it was determined that urgent measures were needed to improve medical facilities and to replace medical equipment that is old and seriously degraded; and accordingly, seven strategies were set out to promote these measures. These strategies include the updating of the basic information system, the establishment of a capital investment basket and the development of a maintenance and management plan for medical facilities/equipment.

The University Teaching Hospital (hereinafter referred to as “UTH”), which is the target facility of this Project, is the top referral hospital in Zambia, engaged in tertiary medical care and clinical education of medical service providers and medical students studying to be doctors and nurses. Moreover, it is the only hospital providing medical services to the citizens of Lusaka, where about fifteen (15) % of the total population is concentrated. The Ministry of Health of Zambia also places great importance on the improvement of the UTH from the policy aspect. However, as the budget was insufficient for replacement of degraded medical equipment as well as maintenance and management of the huge medical facilities, the central air-conditioning and ventilation system of the central operations building degenerated and some of the clinical buildings began to leak rainwater. It is necessary for the Government of Zambia to repair the facilities of the UTH and to replace the degraded medical equipment in order to fulfil the required mission of UTH. For example, forty (40) years have passed since the construction of the central operations building, and more than fifty (50) years have passed since the construction of the obstetrics and gynaecology buildings (Blocks B and C). In addition, more than ten (10) to fifteen (15) years have passed since the installation of the most medical equipment, which is now severely degraded and/or damaged. The situation described above has exerted an adverse influence on medical services, exemplified by the decrease in the number of operations and deliveries per year; the number of operations fell from 16,654 in 2006 to 15,445 in 2007, and the

number of deliveries from 14,356 to 13,414 over the same period.

Confronted with this situation, UTH is making efforts to repair the facilities and equipment with a grant from the Ministry of Health and with self-earned funds (revenues from clinical services). However, as it is difficult to appropriate budget for all the different kinds of repair and construction works at once, construction works have been carried out on a small scale in order of priority. Since the repair of the facilities is currently considered to be the top priority issue, it is difficult to allocate the budget for replacement of degraded medical equipment.

Considering the difficulties of maintaining basic medical equipment due to the budget shortages above mentioned, the Government of Zambia requested the Government of Japan to extend Grant Aid to procure basic medical equipment for the UTH to play a role as the tertiary hospital, improve medical services in the Lusaka metropolitan area and improve the facilities and equipment as training grounds of clinical education for health workers and medical students.

In response to this request, the Preparatory Survey (Preliminary Study) was conducted in October 2008. The Preparatory Survey (Preliminary Study) concluded that the necessity and relevancy of this Project is high in order to contribute to 1) the functional recovery and strengthening of the UTH as a tertiary medical facility, 2) the functional strengthening of the UTH as a teaching hospital, and 3) the strengthening of enhancement of retention rate of medical staff. The Survey also discussed the necessity and relevancy of the contents of requested equipment, and a request was made to Japan concerning procurement of medical equipment in relation to Operating Rooms, Intensive Care Units (ICUs), the Department of Obstetrics and Gynaecology, and the Department of Paediatrics. The initial request included repair of the facilities in addition to improvement of the medical equipment, but the content of the request was revised to include only the procurement of medical equipment, as it was decided that the UTH should cope with the repair of the facilities through an offer from the Government of Zambia. Furthermore, the Survey made a recommendation that the establishment of the preventive maintenance and management system needs to be considered which is necessary for the appropriate maintenance and management of medical equipment.

3. Outline of the Results of the Field Survey and the Contents of the Project

The Government of Japan decided to send a mission to conduct the Preparatory Survey (Basic Design) after carefully examining the results of the Preparatory Survey (Preliminary study) and verifying the necessity and relevance of the Project as a Grant Aid project. In response to this, Japan International Cooperation Agency (JICA) sent a Preparatory Survey (Basic Design) team to Zambia from 21 March to 16 April 2009. The team discussed and confirmed the details of the request with the Ministry of Health, which is the supervisory authority of this Project, and with the UTH, which is the implementing organisation. In addition, the team studied and evaluated the condition of the site and the

details of the equipment, in order to prepare a draft of the basic design. The draft was finalised as the draft final report, which from 16 to 26 August 2009 was explained to and discussed with the parties involved in the Project in Zambia. Since the draft also included some equipment planned in relation to the repair work of the facilities to be carried out by the UTH, the final equipment list was prepared after it was determined whether or not such planned equipment should be included on the basis of confirmation of the progress of the work during the survey to explain the draft final report. This report has been prepared, with modifications made on the basis of the results of the study and discussions.

3.1 Basic Policy

Taking into consideration the request from the Government of Zambia and the results of the field study and discussions, it was decided that the procurement of medical equipment for the UTH should be planned as a Grant Aid project to contribute to the improvement of facility infrastructure, as stated in the NHSP-IV of Zambia and the 2009 to 2011 three-year Action Plan of the UTH, based on the following policies.

- The plan shall involve medical equipment for such major departments as Operating Theatre, Intensive Care Unit (ICU), Obstetrics and Gynaecology, and Paediatrics in order to contribute to the improvement of the clinical services paying attention to the contribution to clinical education at the same time, which is required of the University Teaching Hospital.
- The plan is made based on the replacement of the existing equipment, and replenishment and/or renewal shall be made with appropriate scale to the current situations of the facilities and with minimum quantity necessary for medical services.
- The equipment to be provided shall be such that the UTH is technologically and financially capable of its operation and maintenance. Furthermore, the plan is made for the equipment which requires continuous procurement of expendable supplies and regular maintenance and management with attention to the status of system and capacity such as technological level and existence of agencies in Zambia as well as neighbouring countries.
- The plan excludes equipment which requires high level of maintenance and cost such as blood gas analysis apparatus in the initial request through agreement with the Government of Zambia in view of budget and technical capability.
- The plan excludes washing machines and driers through agreement with the Government of Zambia since the Preparatory Survey (Basic Design) identified that this equipment had already been procured by the UTH.

3.2 Basic Plan

The major planned equipment is as follows:

Department	Medical Equipment
Operating Theatre	Anaesthesia Machine, Suction Machine, Operating Table, Electrosurgical Unit, Autoclave, Operating Light, Patient Monitor, Syringe Pump, etc
Intensive Care Unit (ICU) (Main ICU and Paediatric ICU)	Ventilator, Patient Monitor, Infusion Pump, Defibrillator, Suction Machine, Mobile X-ray Machine, etc
Delivery Room	Ultrasound Machine, Vacuum Extractor, Infant Care Unit, Delivery Table, Cardiotocograph (CTG), etc
Neonatal Intensive Care Unit, (NICU)	Ventilator, Patient Monitor, Infusion Pump, Infant Incubator, Bilirubinometer (Transcutaneous), Haematocrit Centrifuge, Autoclave, Laryngoscope for Infant, etc

3.3 Soft Component (Technical Assistance) Plan

At the UTH, six (6) engineers working in the Biomedical Engineering Department (hereinafter referred to as “BME”) are in charge of the maintenance and management of the medical equipment. The task of the BME is to keep an inventory of the newly-procured equipment and to maintain and manage the existing medical equipment in an adequate manner. While the inventory and daily work records are kept in files for management, there is no adequate organisation, compilation or updating of procurement methods for supplies and spare parts relating to the operation of the equipment, nor of information on the equipment suppliers and after-sales service providers. Moreover, the department has not been fully able to perform the duties required of it, such as giving users instructions on the handling and operation of the equipment, and training and encouraging them to carry out maintenance and inspection of the equipment by themselves. To improve this kind of situation that is often observed at the UTH, it is necessary to introduce an approach that will change the mindset of the BME engineers and users of the equipment and improve the workplace environment, thereby encouraging them to endeavour to maintain and manage the medical equipment appropriately. In this respect, utilization of the soft component by Japanese engineers will be significant in ensuring that the medical equipment to be procured by means of the Grant Aid will be used for an extended period of time and in supporting the smooth start-up of the Project.

In this soft component programme, it is planned to introduce the 5S movement that consists of *Seiri* (Sort), *Seiton* (Set), *Seiso* (Shine), *Seiketsu* (Standardize) and *Shitsuke* (Sustain) as a means to achieve the goals. This Soft Component aims to change the mindset of the hospital staffs and improve the workplace environment, thereby encouraging them to endeavour to maintain and manage the medical equipment appropriately.

4. Implementation Schedule and Project Cost Estimation

It is estimated that completion of this Project will require about eighteen (18) months; four (4) months for the tender, eight (8) months for the manufacture, procurement and installation of the equipment, and an interval of about six (6) months between the installation of the equipment to be procured and the implementation of the second stage of the soft component programme. The Project cost for the Zambian side is estimated to be 744.8 Million ZMK.

5. Project Evaluation and Recommendations

The following direct effects can be expected from the implementation of this Project (project funded by Japan and Zambia).

- 1) Improvement of the equipment used in the Intensive Care Unit (ICU) will result in improved accuracy in diagnosis and treatment, enabling the hospital to provide appropriate medical services to the patients. As a result, the average length of hospitalization, which was 50 days in 2007, will be shortened.
- 2) Improvement of the equipment used in the Operating Theatre will allow an increase in the number of operations, which were 15,445 per year in 2007.
- 3) Improvement of the equipment used in the Obstetrics and Gynaecology department will lead to an improvement of the clinical environment and the provision of appropriate delivery services. Consequently, the number of deliveries, which was 13,414 per year in 2007, will increase.
- 4) Implementation of the soft component will enable the engineers engaged in equipment maintenance and management to formulate appropriate maintenance and management plans and equipment users to develop plans for preventive maintenance and inspection.

The following indirect effects of this Project can also be expected.

- 1) Improved services and performance by the target hospital will result in greater confidence in the hospital, contributing to an increase in the number of patient visits.
- 2) Improvement of the target equipment will enable the hospital to restore its original function as the top referral hospital and to provide appropriate medical care not only to the patients within its clinical zone but also to referred patients, thereby contributing to the improvement of the overall medical service structure of Zambia.
- 3) Since the target hospital also functions as a place of education for medical service providers and medical students, it is expected that the improvement of the medical equipment of this facility will result in the enhancement of its function as a training institute for medical service

providers.

While this Project is expected to produce the effects mentioned above, it will also contribute extensively to the fulfilment of the basic human needs (BHN) of the residents of the target region. Hence, the relevance of this Project as a grant aid project of Japan can be verified. Moreover, it is considered that there is no problem in the structure of the UTH in terms of personnel and funds with respect to the operation and maintenance of the medical equipment to be procured in this Project.

In order that this Project may be implemented more smoothly and effectively, sincere efforts should be made to tackle the issues and recommendations detailed below.

(1) Operation, management and maintenance of equipment

In order for the equipment to be procured to be used more effectively, it is necessary to reinforce the system of daily maintenance and inspection by the users of the equipment. In particular, UTH needs to make efforts to ensure the optimum maintenance and management of equipment the operation of which requires uninterrupted procurement of consumable supplies and reagents and of equipment that it is difficult to repair or control the accuracy of, while endeavouring to build continuous relations with the medical equipment and supplies agents. Implementation of the soft component programme is planned to strengthen the capabilities of the UTH in the operation, maintenance and management of medical equipment, but sustained management and updating of the equipment management logs (maintenance manuals, operation manuals, electric circuit diagrams, tables of equipment manufacturing numbers, etc.) by the BME will enable the establishment of appropriate linkage with external service providers and the sustained and effective operation of the equipment.

(2) Budget appropriation

It has been confirmed that the cost of maintaining the equipment to be procured is within acceptable levels, but the cost of repair tends to be incurred sporadically in the event of equipment breakdown; and in most cases, payment has to be made promptly. It would be very helpful if a budget could be appropriated to provide for cases like this, in order to maintain the quality of medical services.

(3) Introduction and utilisation of an appropriate facility operation evaluation system

In addition to the procurement of medical equipment, a soft component programme is scheduled in this Project for the purpose of enhancing the functions relevant to the operation, maintenance and management of the medical equipment. The seminars and lecture meetings planned in this programme should be made use of to provide the UTH staff with information on the key

performance indicators for evaluation of the operating status of medical facilities and on methods of organising and utilising medical statistics. Typical indicators include hospital bed utilisation, average number of patients per day, outpatient/inpatient ratio, number of patients per doctor and clinical revenue per patient. These indicators should be compiled as baseline indicators during the implementation period of the Project. To achieve efficient operation of the facility and a qualitative improvement in the medical services, it is essential that the aforementioned indicators be monitored and utilised in regular evaluations even after the completion of the Project. It is believed that such a facility operation/maintenance system, when it takes root, will enable the UTH to strengthen its capability to provide medical services, which is integral to the achievement of the objectives of this Project.

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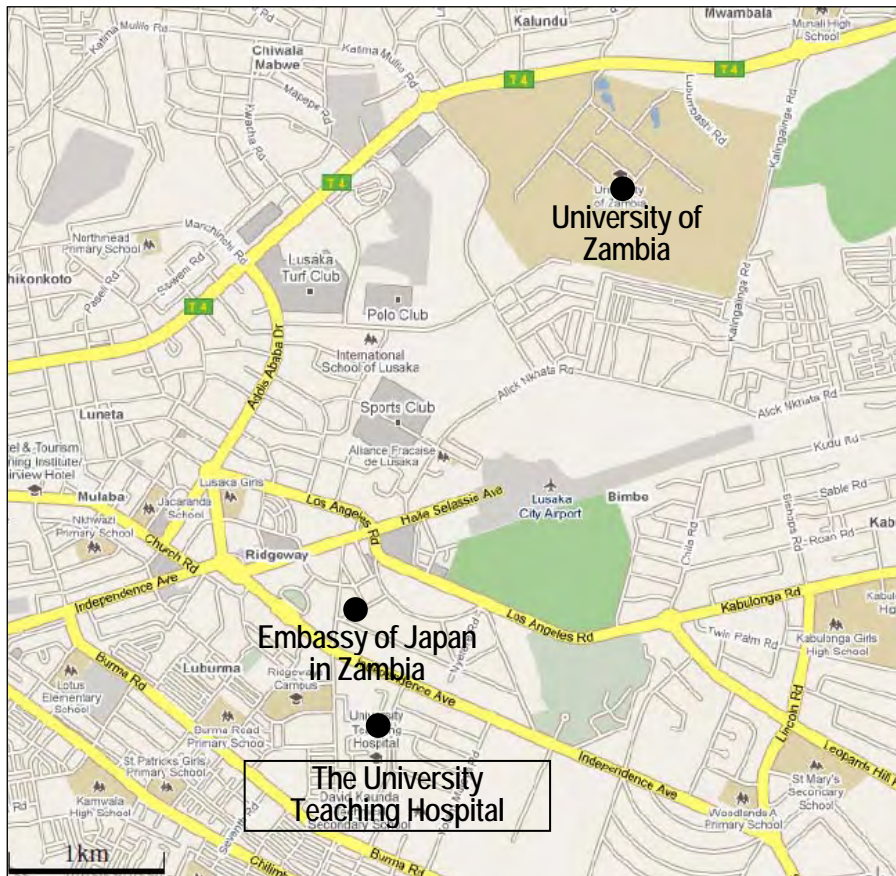
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Abbreviations

A/P	Authorization to Pay
B/A	Banking Arrangement
BHN	Basic Human Needs
BME	Bio-medical Engineering
CSSD	Central Sterilization Supply Department
E/N	Exchange of Notes
G/A	Grant Agreement
GDP	Gross Domestic Product
GNI	Gross National Income
HIPC	Highly Indebted Poor Countries
HMIS	Health Management Information System
IAEA	International Atomic Energy Agency
ICU	Intensive Care Unit
JICA	Japan International Cooperation Agency
M/D	Minutes of Discussions
MDGs	Millennium Development Goals
MICU	Main Intensive Care Unit
MMR	Maternal Mortality Rate
NHSP	National Health Strategic Plan
NICU	Neonatal Intensive Care Unit
PICU	Paediatric Intensive Care Unit
SOU	Special Observation Unit
SPECT	Single Photon Emission Computed Tomography
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UPS	Uninterrupted Power Sources
UTH	University Teaching Hospital
ZKW	Zambia Kwacha (currency)

Location Map



Chapter 1 Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 Background of the Project

The University Teaching Hospital (hereinafter referred to as “UTH”), which is the target facility of this Project, is the top referral hospital in Zambia, engaged in tertiary medical care and clinical education of medical service providers and medical students studying to be doctors and nurses. Moreover, it is the only hospital providing medical services to the citizens of Lusaka, where about fifteen (15) % of the total population is concentrated. The Ministry of Health of Zambia also places great importance on the improvement of the UTH from the policy aspect. However, as the budget was insufficient for replacement of degraded medical equipment as well as maintenance and management of the huge medical facilities, the central air-conditioning and ventilation system of the central operations building degenerated and some of the clinical buildings began to leak rainwater. It is necessary for the Government of Zambia to repair the facilities of the UTH and to replace the degraded medical equipment in order to fulfil the required mission of UTH. For example, 40 years have passed since the construction of the central operations building, and more than 50 years have passed since the construction of the obstetrics and gynaecology buildings (Blocks B and C). In addition, more than ten (10) to fifteen (15) years have passed since the installation of the most medical equipment, which is now severely degraded and/or damaged. The situation described above has exerted an adverse influence on medical services, exemplified by the decrease in the number of operations and deliveries per year; the number of operations fell from 16,654 in 2006 to 15,445 in 2007, and the number of deliveries from 14,356 to 13,414 over the same period.

Confronted with this situation, UTH is making efforts to repair the facilities and equipment with a grant from the Ministry of Health and with self-earned funds (revenues from clinical services). However, as it is difficult to appropriate budget for all the different kinds of repair and construction works at once, construction works have been carried out on a small scale in order of priority. Since the repair of the facilities is currently considered to be the top priority issue, it is difficult to allocate the budget for replacement of degraded medical equipment.

Considering the difficulties of maintaining basic medical equipment due to the budget shortages above mentioned, the Government of Zambia requested the Government of Japan to extend Grant Aid to procure basic medical equipment for the UTH to play a role as the tertiary hospital, improve medical services in the Lusaka metropolitan area and improve the facilities and equipment as training grounds of clinical education for health workers and medical students.

In response to this request, the Preparatory Survey (Preliminary Study) was conducted in October 2008. The Preparatory Survey (Preliminary Study) concluded that the necessity and relevancy of this Project is high in order to contribute to (1) the functional recovery and strengthening of the UTH as a tertiary medical facility, (2) the functional strengthening of the UTH as a teaching hospital, and (3) the strengthening of enhancement of retention rate of medical staff. The Survey also discussed the necessity and relevancy of the contents of requested equipment, and

a request was made to Japan concerning procurement of medical equipment in relation to Operating Rooms, Intensive Care Units (ICUs), the Department of Obstetrics and Gynaecology, and the Department of Paediatrics. The initial request included repair of the facilities in addition to improvement of the medical equipment, but the content of the request was revised to include only the procurement of medical equipment, as it was decided that the UTH should cope with the repair of the facilities through an offer from the Government of Zambia. Furthermore, the Survey made a recommendation that the establishment of the preventive maintenance and management system needs to be considered which is necessary for the appropriate maintenance and management of medical equipment.

1-2 Conditions of the Site and Surrounding Area

1-2-1 Natural Conditions

Zambia is a landlocked country in the southern part of Africa. It is surrounded by eight countries, i. e., Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia, Angola and the Democratic Republic of the Congo. A population of Zambia is about 1.2 million, which is one tenth of that of Japan, lives on a land area of 752,000km², which is twice the area of Japan. In the south of the country is the Zambezi River, with a total length of 2,750km, Victoria Falls, one of the largest waterfalls in the world, and Lake Kariba, an artificial lake built for the purpose of power generation, lies on the border with Zimbabwe.

Since the country is located on highlands of 900 – 1,500m above sea level in the tropical zone between the latitudes of 8 and 18 degrees south, it has the relatively mild climate of a tropical savanna. There is greater precipitation in the north of the country than in the south; the annual rainfall in Southern Province is 700mm, while Copperbelt Province in the north has annual rainfall of 1,300mm. There is a clear distinction between the rainy season (November to March) and dry season (April to October).

1-2-2 Environmental and Social Considerations

It is considered that the equipment to be installed in this Project will not have any adverse effect on the environment. In addition, in order to ensure safety the operators of Mobile X-ray machines wear lead aprons when using the equipment.

Chapter 2 Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

In order to achieve MDGs, the Ministry of Health of Zambia is implementing from 2006 to 2010 a Five Year National Health Strategic Plan IV (NHSP-IV) that prioritizes such cross-sectoral issues as the development of health and medical personnel, the procurement of essential drugs and the improvement of health and medical infrastructure/equipment, in addition to reinforcing individual programmes relating to the health/nutrition of mothers and children, reproductive health, AIDS, tuberculosis and malaria. However, in the interim review of the NHSP-IV carried out in October 2008, it was determined that urgent measures were needed to improve medical facilities and to replace medical equipment that is old and seriously degraded; and accordingly, seven strategies were set out to promote these measures. These strategies include the updating of the basic information system, the establishment of a capital investment basket and the development of a maintenance and management plan for medical facilities/equipment.

The UTH, which is the target facility of this Project, is the top referral hospital in Zambia, engaged in tertiary medical care and the clinical education of medical service providers and medical students studying to be doctors and nurses. Moreover, it is the only hospital providing medical services to the citizens of Lusaka, where about fifteen (15) % of the total population is concentrated. The Ministry of Health of Zambia also places great importance on the improvement of the UTH from the policy aspect. However, as the budget was insufficient for replacement of degraded medical equipment as well as maintenance and management of the huge medical facilities, the central air-conditioning and ventilation system of the central operations building degenerated and some of the clinical buildings began to leak rainwater. It is necessary for the Government of Zambia to repair the facilities of the UTH and to replace the degraded medical equipment in order to fulfil the required mission of UTH. However, as it is difficult to appropriate budget for all the different kinds of repair and construction works at once, construction works have been carried out on a small scale in order of priority. Since the repair of the facilities is currently considered to be the top priority issue, it is difficult to allocate the budget for replacement of degraded medical equipment.

This being the situation, this Project aims to contribute to the improvement of the medical services of the UTH and the health indicators of Zambia through the improvement of the medical facilities and procurement of the medical equipment relating to the medical services provided by the major clinical departments of the UTH, i. e., the Paediatrics Department and the Obstetrics and Gynaecology Department.

2-1-2 Outline of the Project

To achieve the aforementioned objectives, this Project shall make improvements to the UTH as requested by the Zambian government. It is expected that this will lead to the improvement of the hospital medical services for the residents of Lusaka, the capital of Zambia where the UTH is located, and to the enhancement of the function of the UTH as the top referral hospital in Zambia and as a medical institution providing clinical education to medical service providers and students studying to become doctors and nurses. At the same time, it is also expected that the implementation at the UTH of the soft component programme on the maintenance and management of medical equipment will enable the UTH staff to understand the importance of maintenance and management, to use appropriate maintenance and management techniques as part of their daily routine and to improve their ability to take measures to appropriate a budget where necessary.

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal To Contribute MDGs goal in zambia	↓ To improve neonatal death as well as maternal mortality rate (MMR)	HMIS Data	Maintain current medical systems properly
Project Purpose - Medical Services for the Obstetrics & Gynaecology, Paediatrics, Surgical Operation and ICUS are improved and strengthened due to provision of the Medical equipment. - Number of students and trainees is not decreased.	↑ Numbers of outpatient consultation, inpatient admission, and ICU admission patients ↑ Numbers of newborn babies, referral patients from other provinces ↓ Numbers of referral patients from the UTH to other hospitals (in and out of Zambia) → Number of students and trainees	UTH Data Medical Faculty, Nursing School, etc.	- No change disease structure - Budget for operation and maintenance of the medical equipment is disbursed continuously.
Outputs - Medical equipment necessary in the Obstetrics & Gynaecology, Paediatrics, operating Rooms and ICUs are improved. - In addition to the above, hospital infrastructure as a training institution is improved.	↑ Operational condition of the medical equipment is improved.	HMIS Data	The management and administration of the hospital is appropriately performed.
Activities - To conduct site survey properly - To make appropriate basic design for the project - To conduct medical equipment supply	Inputs (Japanese side) - To conduct Basic Design Study - To implement a Grant Project - To procure and install medical equipment - To conduct Soft Component Plan	(Zambian side) - To provide necessary data - To allocate maintenance costs - To conduct rehabilitation of the facilities	- To conduct medical equipment maintenance - Consumables and Spare parts of the equipment will be procured continuously. Pre-condition Number of UTH staff is not decreased.

Figure 2.1 Project Design Matrix

2-2 Basic Design of the Japanese Assistance

Prior to formulating the basic design of the requested Japanese Assistance, design policies should be established taking into account the peculiarities of the ambient environment and local conditions. The plan should be carried out on the basis of these policies.

2-2-1 Design Policy

(1) Examination process

The initial request included repair of the facilities in addition to improvement of the medical equipment, but the content of the request was revised to include only the procurement of medical equipment, as it was decided that the UTH should cope with the repair of the facilities through an offer from the Government of Zambia.

(2) Basic Policy

Basic policies for the equipment plan are as follows:

- The plan shall involve medical equipment for such major departments as Operating Theatre, Intensive Care Unit (ICU), Obstetrics and Gynaecology, and Paediatrics in order to contribute to the improvement of the clinical services paying attention to the contribution to clinical education at the same time, which is required of the University Teaching Hospital.
- The plan is made based on the replacement of the existing equipment, and replenishment and/or renewal shall be made with appropriate scale to the current situations of the facilities and with minimum quantity necessary for medical services.
- The equipment to be provided shall be such that the UTH is technologically and financially capable of its operation and maintenance. Furthermore, the plan is made for the equipment which requires continuous procurement of expendable supplies and regular maintenance and management with attention to the status of system and capacity such as technological level and existence of agencies in Zambia as well as neighbouring countries.
- The plan excludes equipment which requires high level of maintenance and cost such as blood gas analysis apparatus in the initial request through agreement with the Government of Zambia in view of budget and technical capability.
- The plan excludes washing machines and driers through agreement with the Government of Zambia since the Preparatory Survey (Basic Design) identified that this equipment had already been procured by the UTH.

(3) Policy on Institution Infrastructure Influencing the Equipment Plan

Although the results of the field survey indicate that the fluctuation in voltage is no more than around \pm five (5) %, which is not so significant, from interviews with those involved in the hospitals and medical equipment agents, it was learned that the voltage varies greatly according to the season (rainy season and dry season). Therefore, installation of uninterrupted power sources (UPS) will be considered as backup power sources for the artificial ventilators and anaesthesia

machines used in the operating rooms and the intensive care units. Water is sourced from the city water supply, but since it is hard water, the installation of water-softening device for the autoclaves will be considered.

(4) Policy on Implementation Period

The construction period will be around twelve (12) months. It is estimated that eighteen (18) months will be required if the Soft Component Programme is to be included. Moreover, if clinical services at the facility need to be interrupted during the period of delivery and installation of the equipment, the delivery and installation processes will be planned to minimize the impact.

(5) Policy on Spare Parts and Consumable supplies

For those items of equipment covered by the plan that require supplies for their regular operation, the procurement of supplies enabling the operation of the equipment for about three (3) months will be included in the planning of the equipment. The procurement of those spare parts that require replacement about once a year when the equipment is used in a proper manner, such as electrodes and patient cables for patient monitors and patient circuits for anaesthesia machines, will be considered. Generally one (1) set of these parts will be procured for each item. These parts do not include those the installation of which requires the equipment to be dismantled and reassembled using tools.

Specific plans for the medical equipment based on the above basic policies will be considered as follows:

2-2-2 Basic Plan

(1) Overall Plan

The planned equipment will mainly involve the replacement of the existing old equipment. Equipment such as Operating Lights and High Pressure Steam Sterilizers will be removed and new ones installed in their place. Therefore, the existing incidental facilities for electric power, water supply and drainage will be used for the new equipment. The planned equipment is basic medical equipment essential for the supply of hospital medical services, and will be used to improve these medical services and revitalize that have lapsed.

(2) Equipment Plan

The equipment plan is as follows:

1) Operating Rooms (Main Theatre: eight (8) rooms, Emergency: three (3) rooms, Obstetrics & Gynaecology: three (3) rooms, and Paediatrics: three (3) rooms)

The equipment plan in the Preparatory Survey (Preliminary Study) was prepared by combining all the operating rooms, while the equipment plan in the Preparatory Survey (Basic Design) has been developed separately for each of the four (4) blocks, i.e., Main Theatre, Emergency, Obstetrics & Gynaecology and Paediatrics, to make it possible to confirm the

provision of each item of equipment in each operating room. There are seventeen (17) operating rooms in total, but the equipment plan covers the twelve (12) of them that are currently used (Main Theatre: four (4) rooms, Emergency: three (3) rooms, Obstetrics & Gynaecology: three (3) rooms and Paediatrics: two (2) rooms). Since the equipment belonging to the Obstetrics & Gynaecology surgical operation is currently located in the main theatre and hard to distinguish from that properly belonging to the main theatre, the existing equipment of these two (2) blocks were tabulated together. The details are as follows:

(a) Anaesthesia Machine

The plan in Preparatory Survey (Preliminary Study) involved five (5) units of rank A equipment, four (4) units of rank B equipment and four (4) units of rank C equipment, including additional machines. An anaesthesia machine is indispensable for anaesthetising, systemic control and resuscitation of patients in the operating room. At present, UTH uses a total of fifteen (15) anaesthesia machines, consisting of nine (9) in the main theatre, three (3) in the emergency operating rooms (one (1) is non-operational) and three (3) in the paediatric operating rooms (one (1) is non-operational). In the latest survey, it was determined that all the anaesthesia machines that are currently in use, excluding the two (2) machines procured last year for the main theatre, need to be replaced due to aging and deterioration. Therefore, it is planned to replace the two (2) machines in the main theatre, three (3) machines in the emergency operating rooms, two (2) machines in the paediatric operating rooms and three (3) machines in the obstetrics & gynaecology operating rooms. The total quantity, ten (10) machines, is greater than the total of nine (9) machines of rank A and B planned in the Preparatory Survey (Preliminary Study). It is presumed that this is because of the difference in the number of operating rooms in use at the time of the Preparatory Survey (Preliminary study) and the time of the Preparatory Survey (Basic Design).

(b) Suction Machine (Medium and Large)

The plan in the Preparatory Survey (Preliminary Study) covered eighteen (18) units of rank A equipment, eight (8) units of rank B equipment and eight (8) units of rank C equipment, including additional machines. During an operation, a suction machine is used by the surgeon to suction the blood and bodily fluids of the patient and the washing liquid, and by the anaesthesiologist to suction the phlegm, etc. They are indispensable for performing an operation. Currently, UTH has a total of eleven (11) suction machines used for operations, which consist of five (5) in the main theatre, four (4) (two (2) are out of order) in the emergency operating rooms and two (2) in the paediatric operating rooms. In the Preparatory Survey (Basic Design), it was determined that the suction machines that are currently in use, with the exception of one in the paediatric operating room, need to be replaced due to aging and deterioration. It was also determined that additional machines are required for operations to be carried out efficiently. Two (2) suction machines need to be used during an operation in each operating room. One (1) of them is used by the surgeon, while the other is used by the

anaesthesiologist. Since they are used in different areas, it is difficult for machines to be shared. The suction machine used by the anaesthesiologist does not need to be so large as the one used by the surgeon. Therefore, a large-size suction machine for use by the surgeon and a medium-size machine for use by the anaesthesiologist are planned. On the basis of Preparatory Survey (Basic Design), it is planned to provide a total of twenty-three (23) large-size machines (four (4) in the main theatre, three (3) in the emergency operating rooms, two (2) in the paediatric operating rooms and three (3) in the obstetrics & gynaecology operating rooms) and medium-size machines (four (4) in the main theatre, three (3) in the emergency operating rooms, one (1) in the paediatric operating room and three (3) in the obstetrics & gynaecology operating rooms). This quantity, at twenty-three (23), is less than the total of twenty-six (26) machines of rank A and B planned in the Preparatory Survey (Preliminary Study).

(c) Operating Table

The plan developed in the Preparatory Survey (Preliminary Study) involved seven (7) units of rank A equipment, four (4) units of rank B equipment and four (4) units of rank C equipment, including additional operating tables. An operating table is used to place the patient on so that he/she can adopt an appropriate posture for the operation to be performed easily. Currently, UTH has seven (7) operating tables in the main theatre, five (5) (three (3) are out of order) in the emergency operating rooms and two (2) in the paediatric operating rooms, to be used for operations. In the Preparatory Survey (Basic Design), it was found that the operating tables that are currently in use cannot be raised, lowered or tilted right / left due to aging and deterioration, and it was determined that all of them need to be replaced, with the exception of the two (2) tables in the main theatre that were procured last year and one (1) that was procured for the obstetrics & gynaecology operating rooms with the assistance of UNFPA. Therefore, two (2) tables in the main theatre, three (3) in the emergency operating rooms, two (2) in the paediatric operating rooms and two (2) in the obstetrics & gynaecology operating rooms will be replaced. The total quantity of nine (9) is less than the total of eleven (11) tables of rank A and B planned in the Preparatory Survey (Preliminary Study).

(d) Electrosurgical Unit

The plan developed in the Preparatory Survey (Preliminary Study) involved seven (7) units of rank A equipment, four (4) units of rank B equipment and six (6) units of rank C equipment, including additional units. An electrosurgical unit is a device used during an operation to stop bleeding in the target area and to perform an incision, exfoliation, etc., while stopping the bleeding. It is a basic piece of equipment for an operating room. At present, UTH has five (5) (one (1) is out of order) electrosurgical units in the main theatre, two (2) (one (1) is out of order) in the emergency operating rooms and two (2) (one (1) is out of order) in the paediatrics operating rooms, and uses them for operations. In the Preparatory Survey (Basic Design), it was determined that although the electrosurgical units that are currently in use are

still operational, they all need to be replaced due to aging and deterioration. Therefore, it is planned to provide four (4) for the main theatre, three (3) for the emergency operating rooms, two (2) for the paediatrics operating rooms and three (3) for the obstetrics & gynaecology operating rooms. The total quantity of twelve (12) is greater than the total quantity of eleven (11) units of rank A and B planned in the Preparatory Survey (Preliminary Study). It is presumed that this is because of the difference in the number of operating rooms in use at the time of the Preparatory Survey (Preliminary Study) and the time of the Preparatory Survey (Basic Design).

(e) Autoclave (Small and Medium)

The plan developed in the Preparatory Survey (Preliminary Study) involved four (4) units of rank A equipment, including additional units. In the Preparatory Survey (Basic Design), it was confirmed that a medium-size autoclave is in use in the main theatre and two (2) small-size autoclaves are also used in the main theatre. However, considering the number of operating rooms, the sterilisation capacity of these autoclaves is certainly insufficient. The medium-size autoclave is more than twenty (20) years old and the small ones are also ten (10) years old. They are both deteriorated and liable to break down. The autoclaves are repaired on a continual basis, and when a breakdown occurs, UTH commissions sterilization to external private hospitals as UTH has no other sterilising equipment. At the same time, the Central Sterilization Supply Department (CSSD) of the UTH has been out of service since last year when a fire occurred. As the sterilization supply department for the whole hospital, the CSSD used to sterilize the tools and gowns used in each clinical department. The tools, drapes and gowns used in operations have conventionally been prepared in the sterilization room attached to each operating room. Although it is better to centralize all the sterilization work for improved operational and economic efficiency, it is difficult to promote centralization within the framework of this Project. In view of these circumstances, it is determined that the autoclaves need to be added to as well as replaced. Consequently, it is planned to provide two (2) autoclaves for the main theatre, one (1) for the paediatric operating room and one (1) for the obstetrics & gynaecology operating room. Due to the constraints of installation space, medium-size autoclaves will be provided for the main theatre and the paediatric operating room, and a small autoclave will be provided for the obstetrics & gynaecology operating room. The total quantity of four (4) is the same as the total quantity of rank A and B autoclaves planned in the Preparatory Survey (Preliminary Study).

(f) Operating Light

The plan in the Preparatory Survey (Preliminary Study) was for nine (9) units of rank A equipment, four (4) units of rank B equipment and four (4) units of rank C equipment, including additional lights. In the Preparatory Survey (Basic Design), it was determined that the operating lights in all seventeen (17) operating rooms, with the exception of three (3) in the obstetrics & gynaecology operating rooms (new ones were procured last year and they will

be installed after the renovation of the facility), need to be replaced due to serious deterioration. Although the equipment itself in emergency operating room No. 2 is relatively new, the angle adjustment function of the lamp has failed, spare parts are not easily available and the lamp itself is also not readily available. Therefore, each of the lights in the twelve (12) rooms covered by this Project will be replaced. The total quantity to be replaced is nine (9), consisting of four (4) in the main theatre, three (3) in the emergency operating rooms and two (2) in the paediatrics operating rooms. This quantity is four (4) units less than the thirteen (13) units of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(g) Patient Monitor

The plan developed in the Preparatory Survey (Preliminary Study) involved seven (7) units of rank A equipment, four (4) units of rank B equipment and four (4) units of rank C equipment, including additional monitors. Currently, UTH has a total of nine (9) patient monitors; one (1) in each of the main theatre Nos. 3, 4, 5 and 6, and five (5) in the paediatric operating rooms. Of these monitors, three (3) in the main theatre are deteriorated and four (4) in the paediatric operating rooms are out of order. The patient monitor is basic equipment used by the anaesthesiologist to monitor the condition of the patient when performing systemic anaesthesia. If it cannot be used, procedures have to be performed with the anaesthetist able only to check the blood pressure and visually examine the patient. Since it is very risky to perform procedures in this way, it is essential that this equipment be introduced. In this Project, a total of ten (10) patient monitors, i.e., three (3) in the main theatre, three (3) in the emergency operating rooms, one (1) in the paediatric operating rooms and three (3) in the obstetrics & gynaecology operating rooms, will be installed. This is one (1) unit less than the total quantity of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(h) Defibrillator (Paediatrics and Adult)

Defibrillators are newly planned as a result of the Preparatory Survey (Basic Design). They were not included in the plan of the Preparatory Survey (Preliminary Study). A defibrillator is equipment used to energize a patient's heart that has developed an arrhythmia (ventricular fibrillation) in order to restore a regular heartbeat. As an arrhythmia often occurs in the patient during an operation or while receiving treatment in the intensive care unit, it is basic equipment for operating rooms and intensive care units. UTH has one (1) unit of deteriorated equipment in the main theatre and one (1) faulty unit of equipment in the paediatric operating room. This Project includes the replacement of each of the defibrillators in the main theatre and the paediatric operating rooms and the addition of a defibrillator in the emergency operating rooms and the obstetrics & gynaecology operating rooms. The total quantity is four (4).

(i) Syringe Pump

Syringe pumps are newly planned in this Preparatory Survey (Basic Design). There were not included in the plan of the Preparatory Survey (Preliminary Study). In the operating room, a syringe pump is used to control the blood pressure of the patient by administering medicine when the blood pressure has dropped due to major bleeding or other causes. A subtle adjustment of the dosage is required when administering medicine to the patient. Currently, it is difficult to make an adjustment because the dosage is administered manually. Therefore, the syringe pumps are included in the plan in order to improve function. It is planned to provide two (2) for the main theatre in which the syringe pumps are highly necessary and one (1) each for the emergency operating rooms and the obstetrics & gynaecology operating rooms.

(j) Infant Resuscitation Machine

It was not planned in the Preparatory Survey (Preliminary Study). The machine is a medical table on which post-natal procedures and resuscitation of newborns in a state of apparent death are performed, and equipped with suction device and oxygen supply/inhaler unit as components. It is necessary to consider that the machine has planned to the obstetrics and gynaecology operating room (caesarean section operating room) because some newborn babies with caesarean section will be delivered in a state of apparent death. The current machine has improper operation and deteriorated considerably. Therefore, it is planned to provide one (1) infant resuscitation machine for the obstetrics & gynaecology operating room as renewal plan.

(k) Laparoscope (for Gynaecology Operating Room)

One (1) set of rank B equipment, including additional equipment, was planned in the Preparatory Survey (Preliminary Study) as equipment for the Obstetrics & Gynaecology Department. As this equipment is used in the operating room, however, in this Project it is regarded as equipment for the obstetrics & gynaecology operating room. A laparoscope is a device to observe the inside of the body and/or perform procedures via metal tubes. A laparoscopic operation requires a high level of skill in the surgeon, and has a low impact on the patient. Currently at the UTH, the Obstetrics & Gynaecology Department and General Surgery have and use one (1) set each. The set in the Obstetrics & Gynaecology Department is capable only of observing the affected area for the examination of the condition of the oviduct of infertile patients. When an abnormality has been detected in this examination, a laparotomy is carried out. A request has been made in the Preparatory Survey (Basic Design) to upgrade the equipment to enable not only examinations but also procedures. It was decided that four (4) specialists in obstetrics & gynaecology will use the equipment. They will have no problem regarding skills in using the equipment since they are being trained by the manufacturer, etc. It is planned to provide one (1) set in this Project. This quantity is the same as the quantity of rank B equipment planned in the Preparatory Survey (Preliminary Study).

(1) Hysteroscope (for Gynaecology Operating Room)

The plan developed in the Preparatory Survey (Preliminary Study) involved one (1) set of rank B equipment, including additional equipment. A hysteroscope is a device with a metal tube that is inserted into the uterus through the vagina to carry out a visual examination of the internal condition, collect samples as necessary and give a diagnosis. This procedure enables a more accurate diagnosis of uterine cancer, etc. Currently, UTH does not have a hysteroscope. The four (4) specialists in obstetrics & gynaecology do not have clinical experience of using a hysteroscope and there is no training plan. As there are concerns about adequate use of this equipment under the current structure, it was decided not to include it in this Project.

**Table 2.1 Comparison of Equipment Plan for Operating Rooms
(Between Preliminary Study & Basic Design)**

No	Name of Equipment	Preliminary Study				Basic Design				
		Total	A	B	C	Total	MOT 4RMs	EOT 3RMs	POT 2RMs	O/G 3RMs
	Anaesthesia Machine	13	5	4	4	10	2	3	2	3
	Suction Machine (Large)	34	18	8	8	12	4	3	2	3
*	Suction Machine (Medium)	-	-	-	-	11	4	3	1	3
	Operating Table	15	7	4	4	9	2	3	2	2
	Electrosurgical Unit	17	7	4	6	12	4	3	2	3
	Autoclave (Medium)	4	4	0	0	3	2	-	1	-
*	Autoclave (Small)	-	-	-	-	1	-	-	-	1
	Operating Light	17	9	4	4	9	4	3	2	-
	Patient Monitor (IBP)	15	7	4	4	3	3	-	-	-
*	Patient Monitor	-	-	-	-	7	-	3	1	3
*	Defibrillator	-	-	-	-	4	1	1	1	1
*	Syringe Pump	-	-	-	-	4	2	1	-	1
*	Infant Resuscitation Machine	-	-	-	-	1	-	-	-	1
**	Laparoscope	1	0	1	0	1	-	-	-	1
**	Hysteroscope	1	0	1	0	-	-	-	-	-

*: Considered as additional equipment on the Preparatory Survey (Basic Design).

** : Those were requested for the Obstetrics & Gynaecology department in the Preparatory Survey (Preliminary Study), but those were allocated to the Obstetrics & Gynaecology Operating Room in the Preparatory Survey (Basic Design).

2) Intensive Care Units

(Main Intensive Care Unit; MICU and Paediatric Intensive Care Unit; PICU)

The plan in the Preparatory Survey (Preliminary Study) involved the equipment of two (2) departments, i.e., the MICU and the PICU, combined. In the Preparatory Survey (Basic Design), a separate plan has been made for each of them. However, since it is difficult to make a comparison with the Preparatory Survey (Preliminary Study) report in this form, for the sake of convenience, the explanation will be given for the two (2) departments combined.

(a) Ventilator (Paediatrics and Adult)

The plan prepared in the Preparatory Survey (Preliminary Study) involved nine (9) units of rank A equipment, four (4) units of rank B equipment and three (3) units of rank C equipment, including additional units. At present, eleven (11) ventilators are installed in the MICU and one (1) (for children and adults) in the PICU. With the exception of one (1) in the MICU that

is out of order, all are operational but are seriously deteriorated. Ventilators are indispensable in the MICU and the PICU, where post-operative and critically-ill patients are cared for. There is a high demand for ventilators for post-operative patients in the MICU and for patients with pneumonia, etc., in the PICU. As basic design, nine (9) units in the MICU and one (1) unit in the PICU were replaced for seriously deteriorated existing equipment. The MICU has ten (10) beds, and each bed would require a ventilator for the benefit of the patients. In this Project, ventilators for children and adults will be installed on nine (9) of the ten (10) beds, and a ventilator for babies and infants, although patients in this category are few in number, will be installed on the remaining one (1) bed. This quantity is less than the total of thirteen (13) units of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(b) Ventilator (Infant)

The plan developed in the Preparatory Survey (Preliminary Study) included one (1) unit of rank A equipment and one (1) unit of rank B equipment. At present, neither the MICU nor the PICU has a ventilator for babies and infants, and a ventilator for children and adults is being used instead. However, as both the MICU and the PICU accept baby and infant patients, it is necessary to install ventilators for babies and infants as well as those for children and adults. Also, it should be noted that ventilators for children and adults cannot be used for babies weighing ten (10) kg or less. This Project includes one (1) ventilator for babies and infants for the MICU and three (3) for the PICU, as newly procured equipment. This quantity is two (2) units greater than the total quantity of two (2) units of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study). The quantity has increased because it was confirmed that more than seventy (70) % of the patients in the PICU are babies and as such, there is a high demand for ventilators for babies and infants. One (1) of the ventilators planned for children and adults was changed to one for babies and infants.

(c) Patient Monitor

The plan developed in the Preparatory Survey (Preliminary Study) involved twenty (20) units of rank A equipment, including additional monitors. At present, the MICU has eight (8) patient monitors and the PICU has seven (7) (two (2) are out of order). Since all are deteriorated, there is a need for replacement. Also, it is essential that patient monitors be installed on all the beds as the MICU and the PICU are wards that accept critically-ill patients. This Project consists of the replacement and addition of patient monitors so that patient monitors can be installed on all beds. This quantity is the same as the total quantity of twenty (20) rank A monitors planned in the Preparatory Survey (Preliminary Study).

(d) Infusion Pump

The plan developed in the Preparatory Survey (Preliminary Study) involved twenty (20) units of rank A equipment, including additional pumps. At present, neither the MICU nor the PICU has an infusion pump. It is an essential piece of equipment for controlling the volume of

infusion at an appropriate rate for critically-ill patients in both the MICU and the PICU. Currently, all infusion is done by gravitational dripping, but it is important in terms of medical technology to enable accurate control of infusions. In this Project, ten (10) infusion pumps, which is equivalent to the number of beds, will be installed in the MICU and five (5), which is half the number of beds, will be installed in the PICU as newly-procured equipment. This quantity is less than the total quantity of twenty (20) rank A pumps planned in the Preparatory Survey (Preliminary Study).

(e) Defibrillator (Paediatrics and Adults)

The plan in the Preparatory Survey (Preliminary Study) involved two (2) defibrillators for adults and one (1) for children as rank A equipment, including additional equipment. Defibrillators for adults and children are separated in the plan of the Preparatory Survey (Preliminary Study), but since such equipment is generally for shared use, this Project deals with defibrillators for both adults and children. Both the MICU and the PICU have one (1) defibrillator each. The one (1) in the MICU is seriously deteriorated and the one (1) in the PICU cannot be used because of the breakage of accessory parts. As both of them need to be replaced, two (2) defibrillators are included in this Project to replace them. This quantity is less than the total quantity of three (3) rank A defibrillators planned in the Preparatory Survey (Preliminary Study).

(f) Suction Machine (Portable and Medium)

In the Preparatory Survey (Preliminary Study), sixteen (16) units of rank A equipment were planned, including additional machines. At present, the MICU has five (5) suction machines, of which one (1) is out of order. Two (2) of them are new. The PICU has three (3) suction machines and all of them are out of order. A suction machine is used to suction the phlegm of a patient who is unable to bring up phlegm by himself/herself. It is essential that the PICU and MICU be equipped with suction machines because these are wards for critically-ill patients. They are particularly essential for patients wearing ventilators. Therefore, the number of suction machines should basically be the same as the number of ventilators in this Project ten (10) for the MICU and six (6) for the PICU, including two (2) to be transferred from the NICU). Considering the quantity of existing equipment, it is planned to provide eight (8) machines for the MICU and six (6) for the PICU. This quantity is less than the quantity of rank A equipment planned in the Preparatory Survey (Preliminary Study).

(g) Blood Gas Analyzer

In the Preparatory Survey (Preliminary Study), two (2) units of rank A equipment were planned, including additional equipment. At present, neither the MICU nor the PICU has a blood gas analyzer. However, a blood gas/electrolyte analyzer is in operation in the central laboratory located next to the MICU. This equipment is used to check the ventilation status of a patient and it is especially necessary for a patient on a ventilator. Nevertheless, it is

expensive to maintain and troublesome to operate. The NICU has a blood gas analyzer, which is new but not made the most of because of various problems including the high cost of maintenance. As it is difficult in practical terms to maintain and manage a blood gas analyzer, it was decided not to include any in this Project and a proposal was made that the equipment in the central laboratory be used when necessary.

(h) Syringe Pump

The plan in the Preparatory Survey (Preliminary Study) involved three (3) units of rank A equipment, one (1) unit of rank B equipment and six (6) units of rank C equipment, including additional pumps. A syringe pump is a device to inject drug solution into a patient, while making subtle adjustments to the volume of the solution. It is used for controlling blood pressure, etc. It is not planned to provide one for the MICU, because the syringe pump in the operating room can also be used in the MICU. On the other hand, in the field of paediatrics, syringe pumps may be required to administer insulin at an appropriate rate to diabetics. This Project will provide three (3) syringe pumps for the PICU, mainly for the purpose of administering insulin to diabetics. Syringe pumps are essential since two (2) or three (3) new patients with diabetes visit the Paediatrics Department per week at present. The planned quantity is less than the total quantity of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(i) Phototherapy Machine

It is determined that this equipment is for use in the PICU. The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment, one (1) unit of rank B equipment and two (2) units of rank C equipment, including additional equipment. A phototherapy machine is used for the treatment of jaundice in the newborn, which is a common symptom of premature babies. A deteriorated phototherapy machine is currently in use. The PICU may also accommodate newborns, but premature babies should be accommodated in the NICU from the viewpoint of nursing management. Premature babies sent from external institutions will be accommodated in the isolation room within the NICU for reasons relating to infectious environment. Therefore, it was decided not to include this equipment in this Project.

(j) Bilirubinometer, Transcutaneous

It is determined that the transcutaneous bilirubinometer is equipment for use in the PICU. The plan developed in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment and one (1) unit of rank C equipment, including additional equipment. There is no existing equipment. A bilirubinometer measures the degree of jaundice in the newborn and it is used in combination with phototherapy equipment. It was decided not to provide this equipment for the PICU because the premature babies on whom this equipment is used should be sent to the NICU.

(k) Haematocrit Centrifuge

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment and one (1) unit of rank C equipment, including additional equipment. There is one (1) unit of existing equipment, which is out of order. This equipment is also used mainly for premature babies. Since the premature babies on whom this equipment is used should be accommodated in the NICU, it was decided not to include it in the plan for this department.

(l) Oxygen Tent

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. The plan in the Preparatory Survey (Preliminary Study) involves one (1) unit of rank A equipment and one (1) unit of rank C equipment. Currently, there are two (2) oxygen tents, but they are broken and not used. Moreover, there is little evidence that this equipment was used in the past. This equipment is sometimes used for the oxygen inhalation of asthma patients, but since oxygen inhalation can also be done using other methods, it was decided not to include it in the plan for this department.

(m) X-Ray, Mobile

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. In the Preparatory Survey (Preliminary Study), one (1) unit of rank A equipment was planned as additional equipment. There is no existing equipment. This equipment is used to take X-rays pictures of patients who cannot be moved. It will be essential for the PICU, where many ventilators will be used in the future. Therefore, one (1) unit of mobile X-ray equipment will be included in this Project as newly-procured equipment.

(n) Infant Incubator

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment and four (4) units of rank C equipment, including additional equipment. There is no existing equipment. This equipment is also used mainly for premature babies. Therefore, since it is appropriate that premature babies on whom this equipment is used be accommodated in the NICU, it was decided not to include it in the plan for this department.

(o) Infant Incubator, Transport

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment and one (1) unit of rank C equipment, including additional equipment. This equipment is also used mainly for premature babies. Therefore, since it is appropriate that premature babies on whom this equipment is used be accommodated in the NICU, it was

decided not to include it in the plan for this department.

(p) Autoclave (Table Top)

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. It is possible for the MICU to use the steriliser in the main theatre located next to it. The plan in the Preparatory Survey (Preliminary Study) involves one (1) unit of rank A equipment, including additional equipment. While sterilisation may be necessary in the PICU, the quantity of items to be sterilized must be small. Although installation space can be secured, it would be necessary to assign an operator to the equipment. Since it has been determined that it is difficult to secure an operator in the PICU at present, it was decided not to include this equipment in the plan for this department.

(q) Autoclave (Medium)

It is presumed that in the Preparatory Survey (Preliminary Study) this equipment was planned for the PICU. It is possible for the MICU to use the steriliser in the main theatre located next to it. The plan in the Preparatory Survey (Preliminary Study) involves one (1) unit of rank A equipment, including additional equipment. In addition to the reasons given for the medium-size autoclave above, it would be necessary to select an appropriate area for installation and consider the improvement of infrastructure, such as the water supply and drainage system. Since it is difficult at present to specify such an area or to secure an operator in the PICU, it was decided not to include this equipment in the plan.

(r) Ultrasound Machine, Colour Doppler (PICU)

This equipment was not planned for in the Preparatory Survey (Preliminary Study), but it has been added to the plan as a result of the Preparatory Survey (Basic Design). This equipment will be used in the PICU and the Outpatient Paediatric Department adjacent to the PICU. It is used on patients with cardiac disease or acute abdominal condition and more than eighty (80) such patients visit the hospital every week. There is a high demand for this equipment as the number of patients is large. At present, the Department of Radiology is requested to perform examinations, but since it is some distance from the PICU and a prompt response to a request can be difficult, this has a heavy impact on the patients. The doctors who will use the equipment have been identified and the equipment will also be useful in the clinical training of about twenty (20) interns. Therefore, it is planned to provide one (1) unit as newly-procured equipment.

(s) ICU Bed (MICU)

In the Preparatory Survey (Preliminary Study), there was no plan for the replacement of this equipment. Upon evaluation in Preparatory Survey (Basic Design), it was determined that although the equipment was still usable, it was in a state of deterioration as the beds could not easily be raised or lowered, and the angle of the backrest could not easily be adjusted. The

mattresses were also found to have deteriorated. This Project will include the replacement of the ten (10) ICU beds.

(t) Nebuliser (MICU)

In the Preparatory Survey (Preliminary Study), this equipment was not included in the plan. At present, the MICU has one (1) deteriorated nebuliser. A nebuliser is often used for the treatment of patients who have been taken off a ventilator, and is an essential piece of equipment. The replacement of the deteriorated nebuliser and procurement of two (2) additional nebulisers will be included in this Project.

Table 2.2 Comparison of Equipment Plan for ICUs

(Between Preliminary Study & Basic Design)

No	Name of Equipment	Preliminary Study				Basic Design		
		Total	A	B	C	Total	MICU	PICU
	Ventilator (Paed & Adult)	16	9	4	3	10	9	1
	Ventilator (Infant)	2	1	1	0	4	1	3
	Patient Monitor	20	20	0	0	20	10	10
	Infusion Pump	20	20	0	0	15	10	5
	Defibrillator (Adult)	2	2	0	0	2	1	1
	Defibrillator (Paediatrics)	1	1	0	0	-	-	-
	Suction Machine (Portable)	16	16	0	0	6	-	6
*	Suction Machine (Medium)	-	-	-	-	8	8	-
	Blood Gas Analyzer	2	2	0	0	-	-	-
	Syringe Pump	10	3	1	6	3	-	3
	Phototherapy Machine	4	1	1	2	-	-	-
	Bilirubinometer, Transcutaneous	2	1	0	1	-	-	-
	Haematocrit Centrifuge	2	1	0	1	-	-	-
	Oxygen Tent	2	1	0	1	-	-	-
	X-Ray, Mobile	1	1	0	0	1	-	1
	Infant Incubator	5	1	0	4	-	-	-
	Infant Incubator, Transport	2	1	0	1	-	-	-
	Autoclave (Table Top)	1	1	0	0	-	-	-
	Autoclave (Medium)	1	1	0	0	-	-	-
*	Ultrasound Machine (CD)	-	-	-	-	1	-	1
*	ICU Bed	-	-	-	-	10	10	-
*	Nebulizer	-	-	-	-	2	2	-

*: Considered as additional equipment in the Preparatory Survey (Basic Design).

3) Delivery Room

There are four (4) delivery rooms, each of which is equipped with four (4) delivery beds. In addition, a Special Observation Unit (SOU) is located in the connecting corridor to Block C to accommodate patients with eclampsia, etc. for advanced observation and procedures. The SOU also has a delivery bed, which is used for delivery. To develop this Project, equipment for these delivery rooms as well as for the room in which procedures are performed on newborns and tools and devices are sterilised was studied.

(a) Ultrasound Machine

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank B equipment and one (1) unit of rank C equipment, including additional equipment. In the

delivery room, an ultrasound machine is used to gain an understanding of the condition of unborn baby during delivery. At present, only the Outpatient Department has an ultrasound machine. As it is difficult to move the patient during delivery, it cannot be used in the delivery room. Continuous monitoring is done using a cardiotocograph, but to check for abnormalities an ultrasound machine needs to be used in combination with a cardiotocograph. Therefore, it is essential equipment for a delivery room. Also, since doctors will be allocated where necessary, there is no problem in keeping this equipment in a delivery room which is normally staffed only with midwives. Consequently, one (1) ultrasound machine will be included in this Project. This quantity is the same as the quantity of rank B equipment planned in the Preparatory Survey (Preliminary Study).

(b) Vacuum Extractor

The plan in the Preparatory Survey (Preliminary Study) involved three (3) units of rank A equipment, one (1) unit of rank B equipment and one (1) unit of rank C equipment, including additional equipment. At present, there is one (1) electric vacuum extractor, which is out of order due to deterioration. Since the electric one cannot be used, a manual vacuum extractor is used to perform procedures. The vacuum extractor is used in about one (1) % of all deliveries, but since this facility handles a very large number of deliveries, there is a high demand for the equipment. It is used twice or three times per week on average. Considering that an extractor needs to be washed and disinfected after use, multiple units are required. Therefore, two (2) vacuum extractors will be included in this Project. This quantity is less than the total quantity of four (4) extractors of rank A and rank B planned in the Preparatory Survey (Preliminary Study).

(c) Infant Resuscitation Machine

The plan in the Preparatory Survey (Preliminary Study) involved three (3) units of rank A equipment, one (1) unit of rank B equipment and one (1) unit of rank C equipment, including additional equipment. This equipment is a medical table on which post-natal procedures and resuscitation procedures for asphyxiated newborns are performed. Attached to it are a suction machine and an oxygen inhaler necessary for these procedures. It is desirable that one be installed in each of the four (4) delivery rooms. At present, there is one (1) unit each in the three (3) delivery rooms. However, it was determined that two (2) of them need to be replaced. In this Project, a total of three (3) machines should be planned, for the replacement of the two (2) determined machines and the addition of one (1) machine.

(d) Infant Incubator

The plan in the Preparatory Survey (Preliminary Study) involved a total of seven (7) units; two (2) units of rank A equipment, one (1) unit of rank B equipment and four (4) units of rank C equipment. When premature babies and other newborns that require heat retention are being cared for in the infant incubators, it is desirable that the newborns be transferred to the

neonatal intensive care unit (NICU) rather than keeping them in the delivery room. Therefore, it was decided to exclude this equipment from the list of planned equipment in the Preparatory Survey (Basic Design).

(e) Delivery Bed

The plan in the Preparatory Survey (Preliminary Study) involved ten (10) units of rank A equipment, including additional beds. A delivery bed is a bed on which the expectant mother adopts the appropriate posture for delivery. All the delivery beds that are currently in use are severely deteriorated because of the large number of deliveries and the age of the beds; and some of their functions (the function to allow the patient to take the lithotomy position and the function to elevate the bed) have failed. Due to the lack of equipment, a normal bed is sometimes used instead of a delivery bed. The mattresses are also severely deteriorated. In view of these circumstances, it was determined that it is desirable in this Project to replace all the delivery beds and so it was planned that all seventeen (17) delivery beds will be replaced. This quantity is greater than the quantity of ten (10) rank A beds planned in the Preparatory Survey (Preliminary Study).

(f) Cardiotocograph (CTG)

The plan in the Preparatory Survey (Preliminary Study) involved three (3) units of rank A equipment and one (1) unit of rank C equipment, including additional equipment. A cardiotocograph is equipment that is used to determine any abnormality during a delivery by means of continuous monitoring. It is essential in the delivery room. Despite the problem that it restrains the patient, ideally, it is desirable that it be used on all expectant mothers to allow continuous observation up until delivery. However, since its operation requires a large quantity of recording paper, the procurement of the paper and its cost should also be taken into consideration. In addition, there are at present two (2) cardiotocographs, of which one (1) is out of order due to deterioration. In this Project, it is planned to provide three (3) units based on the presupposition that one (1) unit should be installed in each delivery room. This quantity is the same as the quantity of three (3) rank A units planned in the Preparatory Survey (Preliminary Study).

**Table 2.3 Comparison of Equipment Plan for Delivery Room
(Between Preliminary Study & Basic Design)**

No	Name of Equipment	Preliminary Study				Basic Design	
		Total	A	B	C	Total	Delivery Room
	Ultrasound Machine	2	0	1	1	1	1
	Vacuum Extractor	5	3	1	1	2	2
	Infant Resuscitation Machine	5	3	1	1	3	3
	Infant Incubator	7	2	1	4	-	-
	Delivery Bed	10	10	0	0	17	17
	Cardiotocograph (CTG)	4	3	0	1	3	3

4) Neonatal Intensive Care Unit (NICU)

In principle, the NICU accepts patients up to twenty-eight (28) days after birth. The NICU consists of three partitioned NICUs, two (2) isolation rooms and a general area. Critically-ill babies are accommodated in the three (3) partitioned NICUs, babies with infection are accommodated in the isolation rooms and other babies are accommodated in the general area. The ward was quite congested and it was ascertained that sometimes more than one baby was accommodated in a single incubator.

(a) Ventilator (Infant)

The plan in the Preparatory Survey (Preliminary Study) involved five (5) units of rank A equipment and one (1) unit of rank C equipment, including additional equipment. A ventilator is used for a baby with inferior ventilation. As far as the current NICU is concerned, it is an essential piece of equipment. There are two (2) ventilators at present, but adult and infant patient circuits, which are accessory parts, seem to be mixed together and cannot be distinguished adequately, and this hinders the proper operation of the equipment. These ventilators were procured with the cooperation of UNICEF, but adequate instructions on the operation of the equipment were not given when the equipment was handing-over. Also, because the procurement process and channels are complicated, it is difficult for the hospital to request training in the operation of the equipment or to purchase additional patient circuits and other accessories when they wish to. Considering these circumstances, it was determined that it is difficult for these two (2) ventilators to be operated as equipment for newborns. In this Project, a proposal was made for the ventilators to be transferred to the PICU to be used as equipment for adults and children, and the hospital agreed to this. A total of three (3) ventilators for newborns will be planned instead to install one (1) in each NICU, in view of the number of assigned nurses. This quantity is less than the quantity of five (5) rank A ventilators planned in the Preparatory Survey (Preliminary Study).

(b) Patient Monitor

The plan in the Preparatory Survey (Preliminary Study) involved five (5) units of rank A equipment, including additional monitors. A patient monitor is equipment used to monitor continuously the heart and respiration/ventilation condition of the patient to enable prompt procedures. It is an essential piece of equipment for the NICU, where critically-ill babies are accommodated. In this Project, it is planned to provide two (2) units for each of the three (3) partitioned NICUs. Since two (2) new patient monitors are currently in use, four (4) units will be planned to make the total up to six (6), which is the necessary number. This quantity is less than the quantity of five (5) rank A monitors planned in the Preparatory Survey (Preliminary Study).

(c) Blood Gas Analyzer and Electrolyte Analyzer

The plan in the Preparatory Survey (Preliminary Study) involved one (1) rank B blood gas

analyzer and one (1) rank A electrolyte analyzer, including additional unit. At present, equipment that combines a blood gas analyzer and an electrolyte analyzer is used extensively and is readily available on the market. In the Preparatory Survey (Basic Design), studies were conducted based on the presupposition that a combination model would be adopted. This equipment is used to check the ventilation and electrolyte status of the patient, and it is especially necessary for a patient on a ventilator. However, it is expensive to maintain and is troublesome to operate. Currently, the NICU has one (1) integrated blood gas/electrolyte analyzer. This equipment was procured with the assistance of UNICEF, but adequate operating instructions were not given when the equipment was handing-over. The procurement process was also complicated and the transfer procedure was not completed properly. Consequently, supplies cannot be easily procured due to the constraints in commodity management. To operate this equipment, it is necessary to have a continuous supply of expensive reagents. Because of these management troubles and similar troubles that are anticipated, it was decided not to include this equipment in the Project.

(d) Infusion Pump

The plan in the Preparatory Survey (Preliminary Study) involved twenty (20) units of rank A equipment, including additional equipment. At present, the NICU has thirteen (13) new infusion pumps. They were procured with the cooperation of UNICEF, but adequate operating instructions were not given when they were handing-over. In addition, upon checking the working condition the hospital found that some of them are out of order. The infusion sets that are compatible with these pumps have to be imported from Spain, which means that it is difficult to procure them. Moreover, the procurement process is complicated and at present technical cooperation from the supplier is not available. However, this equipment is especially necessary for the NICU. Therefore, in this Project, six (6) of the existing infusion pumps will be replaced and two (2) units will be procured for each of the three (3) partitioned NICUs. This quantity is less than the total quantity of twenty (20) rank A and rank B pumps planned in the Preparatory Survey (Preliminary Study).

(e) Ultrasound Machine, Colour Doppler

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank C equipment, including additional equipment. Currently, the NICU has one (1) monochrome ultrasound machine. Since more than ten (10) years have passed since this equipment was procured, it has deteriorated. Because of the inferior image quality and other reasons, it is not suitable for performing examination. In this Project, it is planned to provide one (1) unit as a replacement for this machine. At present, this machine is frequently used to examine the heads of newborns, but it is also used frequently in examinations to diagnose congenital heart disease. As the colour Doppler imaging function is required for examinations of this kind, the specifications of the machine will be such as to match this purpose. An ultrasound machine of rank C was planned in the Preparatory Survey (Preliminary Study), but in the Preparatory

Survey (Basic Design) it was recognised that it was necessary and appropriate to include a colour Doppler ultrasound machine in the plan.

(f) X-Ray Film Marker

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank B equipment, including additional equipment. An X-ray film marker is a device used by the radiologist to print the patient's name and ID number on the X-ray film. Considering the function of the NICU, this device is not necessary for the NICU, but it should be provided in the X-ray room. For this reason, it was decided not to include one in the Project.

(g) Infant Incubator, Transport

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank B equipment and one (1) unit of rank C equipment, including additional equipment. An infant transport incubator is an incubator used to transport a newborn in poor condition to another place while retaining heat and moisture, providing oxygen and performing infusion. Currently, the NICU has one (1) infant transport incubator. Since this equipment is large and not easy to use, simple and easy-to-use equipment was requested. Newborns are transported to the operating room next to the NICU. Such equipment is needed because various procedures are being performed on the newborns while they are being transported. However, it is difficult to perform these procedures with a simple infant transport incubator and the newborns will end up being transported in the same method as now, that is, carried by the nurse. Therefore, it was considered appropriate to continue with the current practice of choosing whether to carry the infant or transport it in a large infant transport incubator, depending on the condition of the newborn; and it was decided not to include one in the Project.

(h) Infant Incubator

The plan in the Preparatory Survey (Preliminary Study) involved eight (8) units of rank A equipment, two (2) units of rank B equipment and eight (8) units of rank C equipment, including additional equipment. An incubator is a device to provide a premature baby with an environment similar to that of the mother's uterus until the baby's weight approaches normal weight. Premature babies tend to have other problems besides low weight, and procedures to remedy these problems are performed in the incubator. Therefore, it is an indispensable piece of equipment for the treatment of premature babies. At present, twenty-five (25) incubators are installed in the NICU, of which seven (7) are out of order due to deterioration. All eighteen (18) incubators that are currently in use are also severely deteriorated with problems such as breakage of accessories and inability to control humidity. In view of these circumstances, it was determined that all the incubators need to be replaced. This Project will involve the replacement of a total of eighteen (18) incubators, i.e., six (6) for each of the three (3) partitioned NICUs. This quantity is equivalent to the total quantity of rank A, rank B and rank C equipment planned in the Preparatory Survey (Preliminary Study).

(i) X-Ray, Mobile

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank C equipment, including additional equipment. In the NICU, it is difficult to take all the babies to the X-ray room to take X-ray pictures because of hygiene problems and the possibility of infection. A mobile X-ray is used for taking X-ray pictures of such newborns and is essential for the NICU. It will be of even greater necessity in the future, as it will also be used to verify the intubation of ventilators fitted on patients. At present, the NICU has one (1) unit of deteriorated faulty mobile X-ray, with which X-ray pictures are taken. The taking of X-ray pictures is delayed when this equipment is broken, which impacts examinations and treatment. This Project should include replacement of the existing equipment. In the Preparatory Survey (Preliminary Study), the mobile X-ray was planned as rank C equipment and it will be included in the Project as such, since its necessity and appropriateness were confirmed in the Preparatory Survey (Basic Design).

(j) Bilirubinometer, Transcutaneous

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment, including additional equipment. A bilirubinometer is an instrument used to measure the degree of jaundice, which is a common symptom in newborns. Phototherapy may be applied depending on the results of the measurement. Currently, the NICU has a new bilirubinometer, which was also procured with the assistance of UNICEF and is now unusable, because no operating instructions were given when the equipment was transferred and no operating manual was provided. Also, because of the complicated procurement channels, technical cooperation from the supplier is not available at all. This Project should involve the replacement of this bilirubinometer. The existing equipment measures blood samples taken with a micropipette, but transcutaneous bilirubinometers, which carry out the measurement based on the skin colour and do not have a heavy impact on babies, are also widely available at present. The specifications of the planned equipment should be determined accordingly. The quantity of one (1) is the same as the total quantity of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(k) Haematocrit Centrifuge

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment, including additional equipment. A haematocrit centrifuge is a piece of apparatus used to measure the ratio of erythrocytes in a blood sample taken with a micropipette by means of centrifugal separation, in order to measure the degree of anaemia. At present, the NICU has one (1) unit, but it is already deteriorated. It is not currently used because some parts (rubber gaskets) are broken and it is highly likely that the micropipette to be used will break when the apparatus is operated for centrifugal separation. The replacement of this haematocrit centrifuge should be planned in this Project. The quantity of one (1) is the same of the total quantity of rank A and rank B equipment planned in the Preparatory Survey

(Preliminary Study).

(l) Phototherapy Machine

The plan in the Preparatory Survey (Preliminary Study) involved four (4) units of rank C equipment, including additional equipment. A phototherapy machine is used in the treatment of jaundice, which is frequently seen in newborns. The NICU currently uses two (2) phototherapy machines, which are markedly insufficient, considering the number of patients. Phototherapy may not be used adequately on newborns with mild jaundice at present because bilirubin, which is an indicator of jaundice, cannot be measured; instead judgment is made from the colour of the urine. In view of this situation, the provision of four (4) machines, i.e., two (2) to replace the existing machines and two (2) additional machines, should be planned. One (1) machine should be installed in each of the three (3) partitioned NICUs and another one should be installed in the general area. A phototherapy machine was included in the plan in the Preparatory Survey (Preliminary Study) as rank C equipment. It should be included in the Project since it was recognized in the Preparatory Survey (Basic Design) to be necessary and appropriate.

(m) Syringe Pump

The plan in the Preparatory Survey (Preliminary Study) involved two (2) units of rank B equipment and eighteen (18) units of rank C equipment. A syringe pump is used when a small amount of drug solution is to be administered continuously to a baby. Currently, the NICU has five (5) new syringe pumps. Although they are usable, they are not used at present because of difficulty in procuring extension tubes. As a similar situation may occur even if syringe pumps are procured in this Project, it was decided not to include them in the Project for this department.

(n) Autoclave (Table Top)

The plan in the Preparatory Survey (Preliminary Study) involved one (1) unit of rank A equipment, including additional equipment. This autoclave is a tabletop autoclave and it is used for sterilising small articles in the NICU. Currently, the NICU has one (1) deteriorated autoclave, but sterilisation cannot be done with confidence because this autoclave may leak steam and the internal temperature may not rise sufficiently. Therefore, it should be replaced in this Project. The quantity is the same as the total quantity of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(o) Laryngoscope, Neonatal

The plan in the Preparatory Survey (Preliminary Study) involved ten (10) sets of rank A equipment, including additional equipment. A laryngoscope is a basic piece of apparatus to be used when intubation is performed on a baby for respiratory management. At present, intubation is performed using the existing three (3) sets, but they are deteriorated. The

replacement of the existing deteriorated laryngoscopes and the provision of additional equipment should be planned in this Project. Two (2) sets should be provided for each of the three (3) partitioned NICUs. This quantity is less than the total of ten (10) units of rank A and rank B equipment planned in the Preparatory Survey (Preliminary Study).

(p) Suction Machine (Portable)

A suction machine is a basic device used for suctioning various liquids from the trachea of a baby, such as phlegm, for example. It is particularly indispensable for patients on a ventilator. Currently, the NICU has five (5) suction machines, of which one (1) is out of order. The remaining four (4) machines are also seriously deteriorated. As three (3) ventilators will be procured, three (3) suction machines should be planned in this Project to replace the deteriorated machines. Although this was not planned in the Preparatory Survey (Preliminary Study), it was decided to include it in this Project because in the Preparatory Survey (Basic Design) it was recognised to be necessary and appropriate.

(q) Infant Resuscitation Machine

It was not planned in the Preparatory Survey (Preliminary Study). An infant resuscitation machine is a medical table on which post-natal procedures and resuscitation of newborns in a state of apparent death are performed. Attached to it are a suction machine and an oxygen inhaler necessary for these procedures. It is an essential piece of equipment for the NICU because it is often difficult to perform these procedures in an incubator. The NICU currently has three (3) infant resuscitation machines. They are relatively new and have been procured with the assistance of UNICEF, like some of the equipment mentioned previously. However, the heating function of two (2) of them has failed and it is difficult to repair them. In this Project, a total of three (3) machines should be planned, for the replacement of the two (2) failed machines and the addition of one (1) machine. Although it was not planned in the Preparatory Survey (Preliminary Study), it was decided to include this in the Project because in the Preparatory Survey (Basic Design) it was recognised to be necessary and appropriate. Also, while the Preparatory Survey (Preliminary Study) report mentioned that the NICU had four (4) infant resuscitation machines, only three (3) machines were confirmed in the Preparatory Survey (Basic Design).

Table 2.4 Comparison of Equipment Plan for NICU

(Between Preliminary Study & Basic Design)

No	Name of Equipment	Preliminary Study				Basic Design	
		Total	A	B	C	Total	NICU
	Ventilator (Infant)	6	5	0	1	3	3
	Patient Monitor (Infant)	5	5	0	0	4	4
	Blood Bas Analyzer	1	0	1	0	-	-
	Infusion Pump	20	20	0	0	6	6
	Ultrasound Machine	1	0	0	1	-	-
*	Ultrasound Machine, Color Doppler	-	-	-	-	1	1
	X-Ray Film Marker	1	0	1	0	-	-

No	Name of Equipment	Preliminary Study				Basic Design	
		Total	A	B	C	Total	NICU
	Electrolyte Analyzer	1	1	0	0	-	-
	Infant Incubator, Transport	2	0	1	1	-	-
	Infant Incubator	18	8	2	8	18	18
	X-Ray, Mobile	1	0	0	1	1	1
	Bilirubinometer, Transcutaneous	1	1	0	0	1	1
	Haematocrit Centrifuge	1	1	0	0	1	1
	Phototherapy Machine	4	0	0	4	4	4
	Syringe Pump	20	0	2	18	-	-
	Autoclave (Table Top)	1	1	0	0	1	1
	Laryngoscope, Neonatal	10	10	0	0	6	6
*	Suction Machine (Portable)	-	-	-	-	3	3
*	Infant Resuscitation Machine	-	-	-	-	2	2

*: Considered as additional equipment on the Preparatory Survey (Basic Design).

Note: Infant Resuscitation Machine: The quantity described in the Minutes of Discussions of the Preparatory survey (Basic Design) was two (2). But, the correct quantity is three (3). This quantity was modified in the Minutes of Discussions at the time of the draft explanation.

5) Laundry

In the Preparatory Survey (Preliminary Study), a washing machine and a vehicle were requested in addition to the planned equipment. However, it turned out that the capacity of the laundry is not all that insufficient; two (2) pieces of equipment, including a roll ironer, had already been purchased, and the request had been made in consideration of future plans. Therefore, it was decided not to include laundry-related equipment in this Project.

The equipment requested in the list of requests in the Preparatory Survey (Preliminary Study) was considered in terms of the conditions of the clinical environment relevant to the progress of the facility renovation work, the needs of the medical services, the skill level of the medical service providers and the ease or difficulty of maintaining and managing the equipment; and up to this point the results of this review have been discussed. The results of the study of the planned equipment in view of the equipment selection criteria given below are summarized and attached as Appendix.

- (A) Sufficient number of target patients.
- (B) No overlapping of equipment, e.g., the same equipment is not currently owned and separate procurement is not planned.
- (C) Availability of medical staff to operate the equipment.
- (D) Sufficient capacity to maintain and manage the equipment for operation (within the hospital or outsourced from an agent).
- (E) Availability of the budget needed to operate, maintain and manage the equipment.
- (F) Equipment of a technological level appropriate for the achievement of the objectives (The equipment is not advanced medical equipment).
- (G) No rainwater leakage in the area where the equipment is to be installed.
- (H) An appropriate operational environment in the area where the equipment is to be installed.
 - (a) Temperature, humidity, ventilation, availability of air-conditioning
 - (b) Electricity supply, water supply and drainage, supply of medical gas
 - (c) Others
- (I) If the planned installation area is inappropriate because it does not fulfil conditions (G) and/or (H), such renovation works should be completed before the equipment installation by the Project.

6) Planned Equipment

The equipment procured for the Project and the specifications of the major equipment are as follows:

Table 2.5 List of Planned Equipment

No	Name of Equipment	Departments*								Total
		A	B	C	D	E	F	G	H	
1	X-Ray, Mobile	1				1				2
2	Ultrasound Machine, Color Doppler	1				1				2
3	Ultrasound Machine		1							1
4	Patient Monitor	10		3	1			10	3	27
5	Patient Monitor with IBP						3			3
6	Patient Monitor, Infant					4				4
7	Defibrillator	1		1	1		1	1	1	6
8	Anaesthesia Machine			3	2		2		3	10
9	Ventilator, Infant	3				3		1		7
10	Ventilator, Paediatric & Adult	1						9		10
11	Operating Table			2	2		2		3	9
12	Operating Light				2		4		3	9
13	Electrosurgical Unit			3	2		4		3	12
14	Laparoscope			1						1
15	Suction Machine, Large			3	2		4		3	12
16	Suction Machine, Medium			3	1		4	8	3	19
17	Suction Machine, Portable	6				3				9
18	Nebulizer							2		2
19	Laryngoscope, Neonatal					6				6
20	Infusion Pump	5				6		10		21
21	Syringe Pump	3		1			2		1	7
22	ICU Bed							10		10
23	Delivery Bed		17							17
24	Infant Resuscitation Machine		3	1		3				7
25	Infant Incubator					18				18
26	Phototherapy Machine					4				4
27	Bilirubinometer, Transcutaneous					1				1
28	Cardiotocograph (CTG)		3							3
29	Vacuum Extractor		2							2
30	Autoclave, Medium				1		2			3
31	Autoclave, Small			1						1
32	Autoclave, Table Top					1				1
33	Haematocrit Centrifuge					1				1

Department:

A: Paediatric Intensive Care Unit (PICU), B: Delivery Rooms, C: Obstetrics & Gynaecology Operating Rooms
D: Paediatric Operating Rooms, E: Neonatal Intensive Care Unit, F: Main Operating Rooms, G: Main Intensive Care Unit, H: Emergency Operating Rooms

Table 2.6 Technical Specifications of the Major Equipment

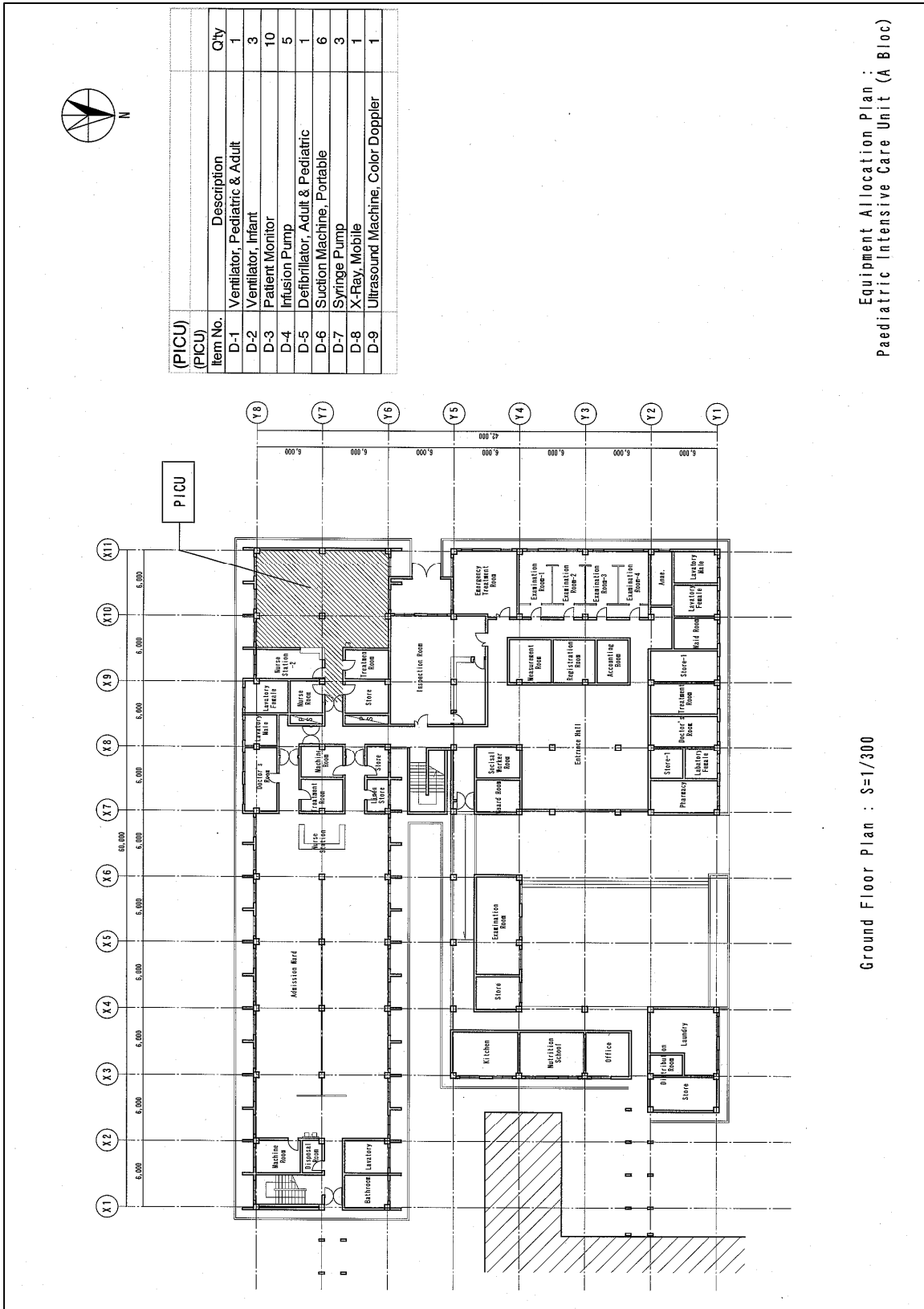
No	Equipment	Q'ty	Equipment Components and Major Specifications		Purpose for Use Level of Specifications
1	X-Ray. Mobile	2	Outputs: Tube voltage: Driving unit:	12kW or more 4-125kV or more Motor-driven, Battery powered	- Used for inpatient wards, and general X-Ray examination/ - Equivalent grade with the existing one.
2	Ultrasound Machine, Color Doppler	2	Scanning methods: Display modes: Transmitting/Receiving: Transducers:	Convex, Linear, Sector B, M, etc. Digital beam forma Convex, Linear, Sector	- Used for imaging diagnosis of disease morphology and tissue conditions by sending ultrasound to the patient's body and analyzing transmitted or reflected waves.
3	Ultrasound Machine	1	Scanning methods: Display modes: Transmitting/Receiving Transducers:	Convex, Linear B, M, etc. Digital beam forma Convex, Linear	- Used for imaging diagnosis of disease morphology and tissue conditions by sending ultrasound to the patient's body and analyzing transmitted or reflected waves.
4	Patient Monitor	34	Measuring items:	ECG / HR / NIBP / TEMP / RESP / SpO2 by pulse, or more	- Monitoring patient vital sign during surgical operation as well as patients who are treating in ICU.
8	Anaesthesia Machine	10	O2, N2O: Vaporizer: Ventilation: Tidal volume:	2 to 10 l/m, 0.5 to 10 l/m or more Halothane vaporizer. Volume/Time cycle 50 to 1,200 ml/min or more	- For carrying out surgical operations safely without pains to patients. - A ventilator carries out ventilation for patients who cannot do spontaneous breathing.
9	Ventilator (Infant)	7	Control: Ventilation mode: PEEP/CPAP: Tidal volume:	Volume or pressure limited IMV, SIMV, PS/CPAPA, etc 0 to 20cmH2O or more 10 to 350ml or more	- Used for assist-control ventilation of infants with spontaneous respiration.
10	Ventilator (Adult)	10	Control Ventilation mode: PEEP/CPAP: Tidal volume:	Volume or pressure limited IMV, SIMV, NPPV, PS/CPAP, etc 0 to 20cmH2O or more 100 TO 2,000ml or more	- Used to take over respiration in a patient who lacks or has lost the ability to breathe a surgical operation, etc. Equipment is using for a patient whose weights over 10kg.
12	Operating Light	9	Type: Light intensity:	Combination type Main: 130,000 lux or more Anxiously: 100,000 lux or more	- Lighting for surgical operations in the operating theatres.
14	Laparoscope	1	Component:	2 kinds of Telescopes, Light source, Camera control / head. TV monitor, Cart for component, etc.	- Rigid endoscope is used for surgical operations without celiotomy incision, especially in gynaecological fields.
28	Cardiotocograph (CTG)	3	Heart rate connecting range: Input mode: Display: Recorder: Others:	50-210 bpm. 2-ch for twins Digital Equipped Uterine contraction measurement by toco-transducer	- Monitoring the pregnant women during the labor and delivery.
30	Autoclave (Medium)	3	Capacity: Control: Display: Others: Sterilizing temperature:	440 ml or more Microprocessor Timer, Temp, Pressures, etc. With water softner, boiler 121 to 134L or more	- Sterilizing surgical instruments, gowns for surgical operations.

2-2-3 Basic Design Drawing

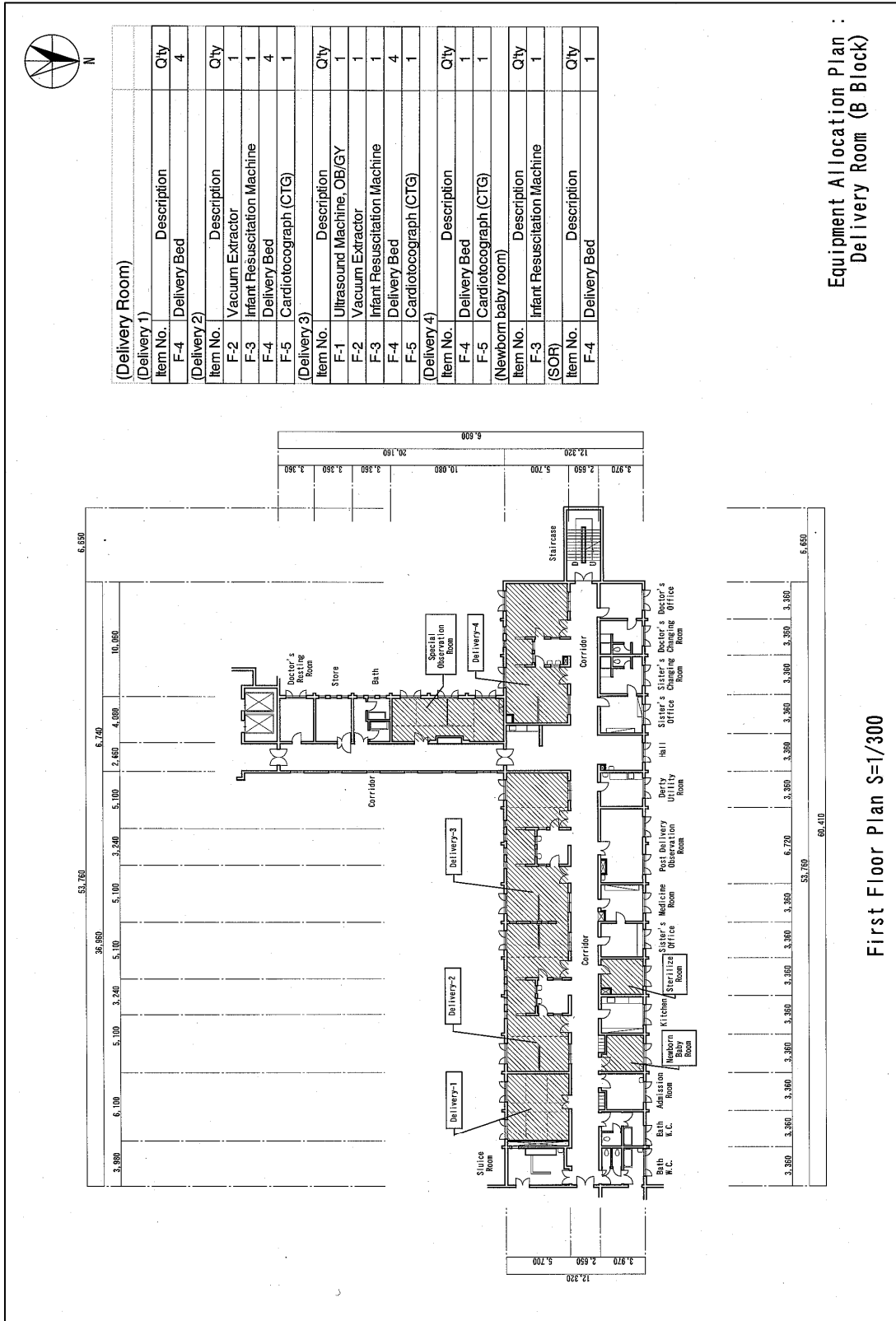
The distribution plan of the medical equipment to be procured in this Project is in accordance with the lists of drawings on the following pages.

- Paediatrics Intensive Care Unit (PICU)	Block A	p. 32
- Obstetrics examination building	Block B	p. 33
- Obstetrics & Gynaecology Operating Room	Block C	p. 34
- Neonatal Intensive Care Unit (NICU) and Paediatrics Operating Room	Block D	p. 35
- Main Theatre and Main Intensive Care Unit (MICU)	Phase III building	p. 36
- Emergency operating rooms	Phase V building	p. 37

Paediatrics Intensive Care Unit (PICU): Block A



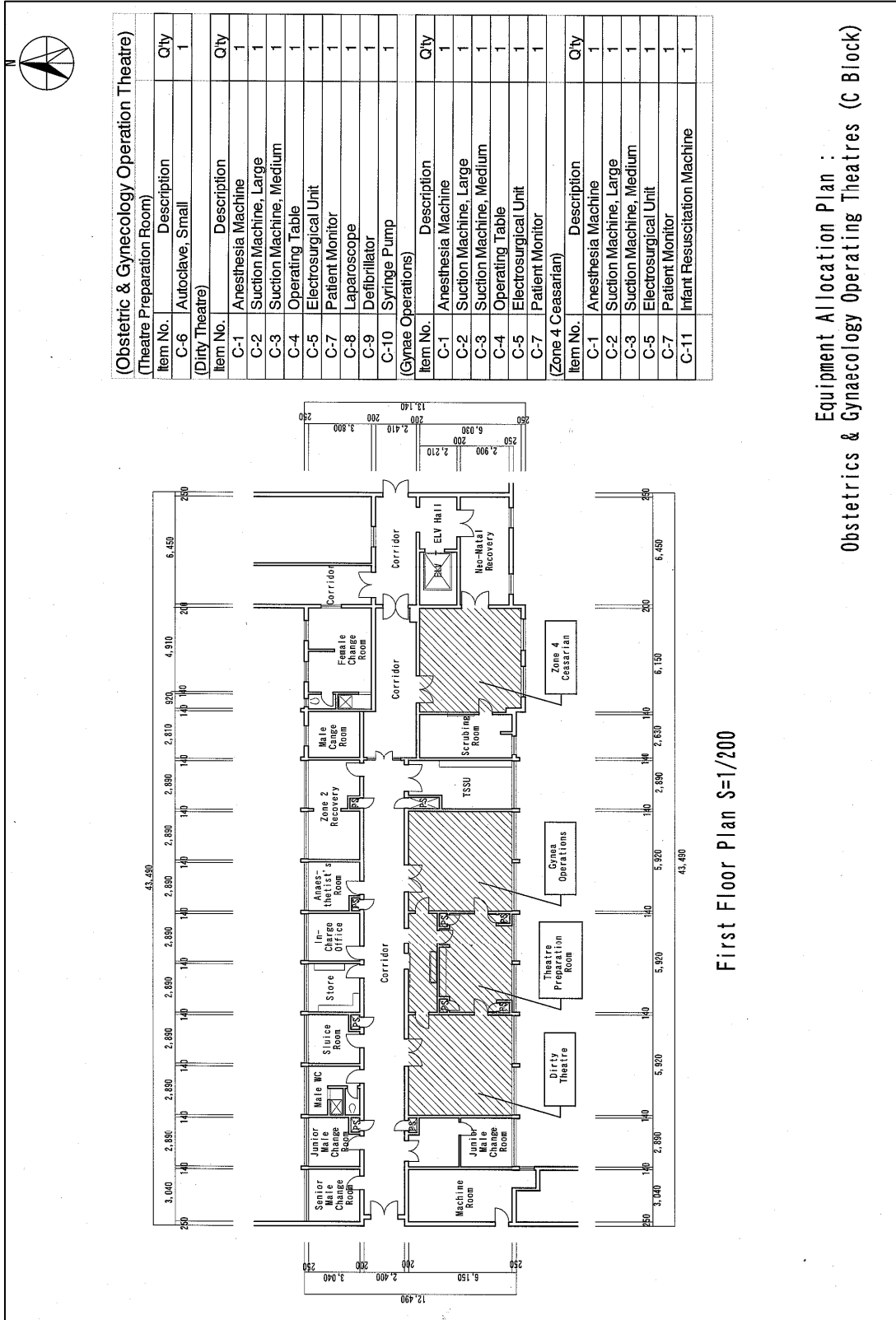
Obstetrics examination building: Block B



Item No.	Description	Qty
(Delivery Room)		
(Delivery 1)		
F-4	Delivery Bed	4
(Delivery 2)		
Item No.	Description	Qty
F-2	Vacuum Extractor	1
F-3	Infant Resuscitation Machine	1
F-4	Delivery Bed	4
F-5	Cardiotocograph (CTG)	1
(Delivery 3)		
Item No.	Description	Qty
F-1	Ultrasound Machine, OB/GY	1
F-2	Vacuum Extractor	1
F-3	Infant Resuscitation Machine	1
F-4	Delivery Bed	4
F-5	Cardiotocograph (CTG)	1
(Delivery 4)		
Item No.	Description	Qty
F-4	Delivery Bed	1
F-5	Cardiotocograph (CTG)	1
(Newborn baby room)		
Item No.	Description	Qty
F-3	Infant Resuscitation Machine	1
(SOP)		
Item No.	Description	Qty
F-4	Delivery Bed	1

First Floor Plan S=1/300

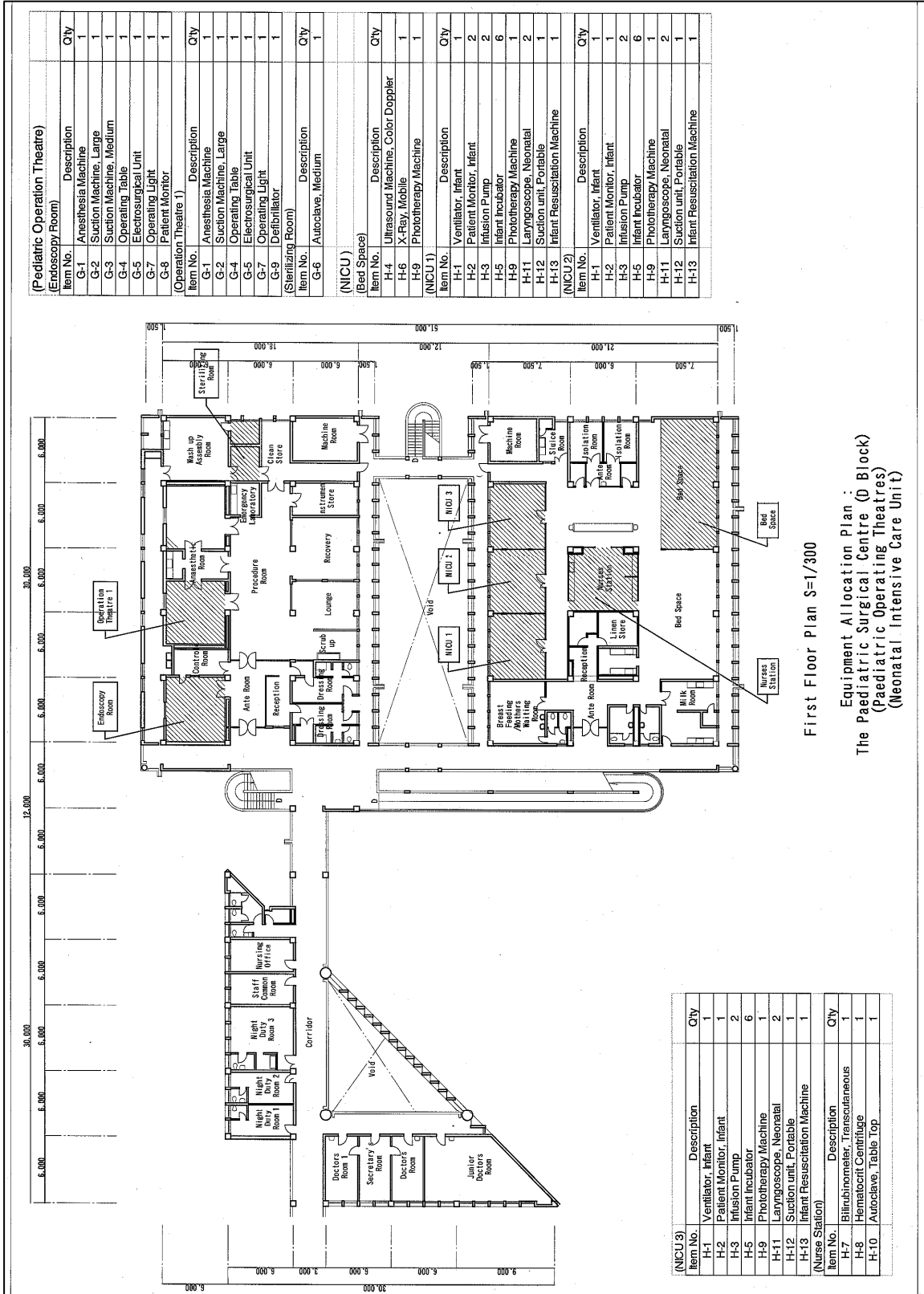
Obstetrics & Gynaecology Operating Room: Block C



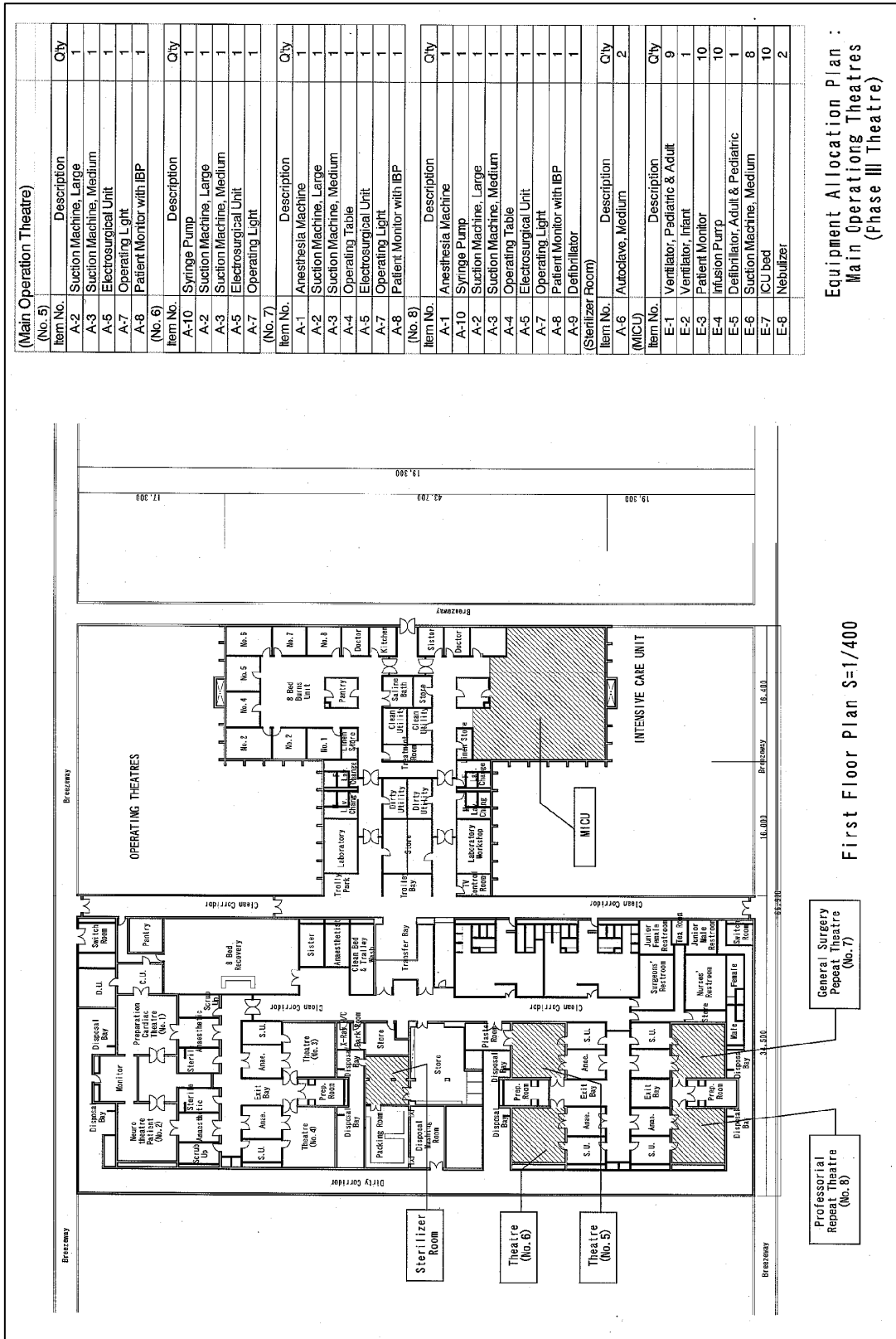
Equipment Allocation Plan :
Obstetrics & Gynaecology Operating Theatres (C Block)

First Floor Plan S=1/200

Neonatal Intensive Care Unit (NICU) and Paediatrics Operating Room: Block D



Main Theatre and Main Intensive Care Unit (MICU): Phase III building



(Main Operation Theatre)		
Item No.	Description	Qty
A-1	Anesthesia Machine	1
A-2	Suction Machine, Large	1
A-3	Suction Machine, Medium	1
A-4	Electrosurgical Unit	1
A-5	Operating Light	1
A-6	Patient Monitor with IBP	1
(No. 6)		
Item No.	Description	Qty
A-10	Syringe Pump	1
A-2	Suction Machine, Large	1
A-3	Suction Machine, Medium	1
A-4	Operating Table	1
A-5	Electrosurgical Unit	1
A-7	Operating Light	1
A-8	Patient Monitor with IBP	1
(No. 8)		
Item No.	Description	Qty
A-1	Anesthesia Machine	1
A-10	Syringe Pump	1
A-2	Suction Machine, Large	1
A-3	Suction Machine, Medium	1
A-4	Operating Table	1
A-5	Electrosurgical Unit	1
A-7	Operating Light	1
A-8	Patient Monitor with IBP	1
A-9	Defibrillator	1
(Sterilizer Room)		
Item No.	Description	Qty
A-6	Autoclave, Medium	2
(MICU)		
Item No.	Description	Qty
E-1	Ventilator, Pediatric & Adult	9
E-2	Ventilator, Infant	1
E-3	Patient Monitor	10
E-4	Infusion Pump	10
E-5	Defibrillator, Adult & Pediatric	1
E-6	Suction Machine, Medium	8
E-7	CJ bed	10
E-8	Nebulizer	2

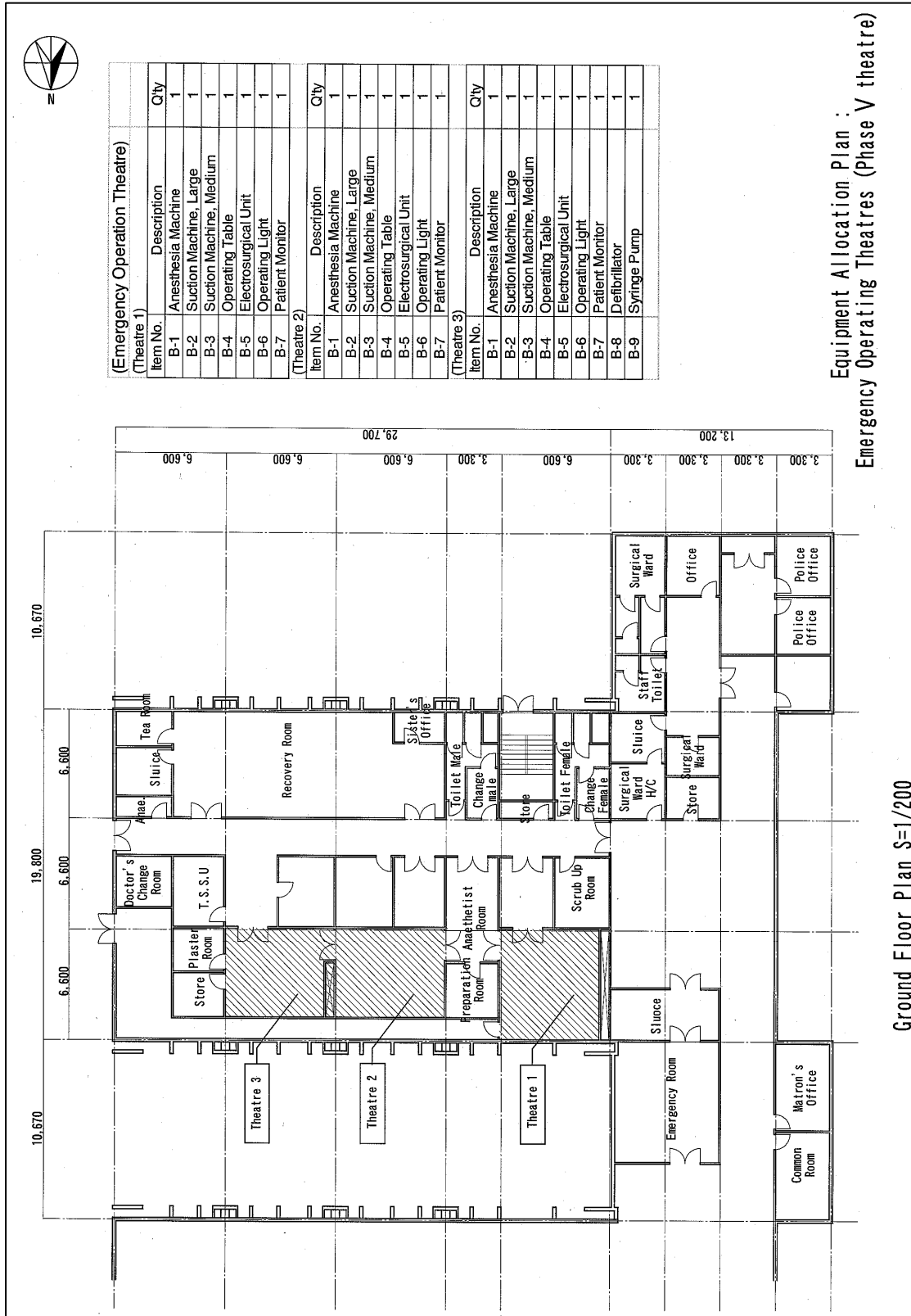
Equipment Allocation Plan :
Main Operating Theatres
(Phase III Theatre)

First Floor Plan S=1/400

General Surgery Repeat Theatre (No. 7)

Professional Repeat Theatre (No. 8)

Emergency operating rooms: Phase V building



(Theatre 1)		
Item No.	Description	Qty
B-1	Anesthesia Machine	1
B-2	Suction Machine, Large	1
B-3	Suction Machine, Medium	1
B-4	Operating Table	1
B-5	Electrosurgical Unit	1
B-6	Operating Light	1
B-7	Patient Monitor	1
(Theatre 2)		
Item No.	Description	Qty
B-1	Anesthesia Machine	1
B-2	Suction Machine, Large	1
B-3	Suction Machine, Medium	1
B-4	Operating Table	1
B-5	Electrosurgical Unit	1
B-6	Operating Light	1
B-7	Patient Monitor	1
(Theatre 3)		
Item No.	Description	Qty
B-1	Anesthesia Machine	1
B-2	Suction Machine, Large	1
B-3	Suction Machine, Medium	1
B-4	Operating Table	1
B-5	Electrosurgical Unit	1
B-6	Operating Light	1
B-7	Patient Monitor	1
B-8	Defibrillator	1
B-9	Syringe Pump	1

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Standard Implementing Procedure of the Grant Aid Project

Implementation of the Project will be decided through the review of this report by relevant governmental agencies in Japan and an approval by the Japanese Cabinet. After the approval of the Project, the Exchange of Notes (hereinafter referred to as “E/N”) will be signed between Japanese and Zambian governments and Grant Agreement (hereinafter referred to as “G/A”) on the Project will be signed between implementation agencies of Zambia and JICA. The Project will be implemented after completing these processes. In accordance with the Japan’s Grant Aid scheme, a consultant and an equipment supplier will conclude agreements/contracts with the government of Zambia to implement the Project. Approvals by JICA will be required for these agreements/contracts.

(2) Project Implementation System

This Project will be implemented under the supervision of the Ministry of Health of Zambia. The Directorate of Policy and Planning of the Ministry of Health of Zambia will be the party to the agreement for the consulting services, equipment procurement contract, Banking Arrangement (hereinafter referred to as “B/A”), and other such agreements to be concluded for the Project. The medical equipment specialist, belongs to the directorate of Medical Services will be in charge of arranging discussions and coordinating technical details and other matters concerning the specific contents of the Project.

(3) Consultant

Following the signing of the E/N and G/A, the Ministry of Health of Zambia shall conclude an agreement for consulting services with the Japanese consultant firm, with regard to the detail design (including tender-related works) and the supervision of the procurement / installation. Said agreement is subject to verify of JICA. For the smooth implementation of the Project, it is important to conclude the agreement immediately after the signing of the E/N and G/A. Upon conclusion of the agreement and Japanese government verifies the said agreement, the consultant will immediately start services based on this report with the Ministry of Health of Zambia and related authorities concerned, then, prepare tender documents, obtain the approval, conduct the tender, and supervise the procurement / installation works following to the scope of works under the tender conditions.

(4) Equipment Supplier

The equipment supplier to procure and install the equipment for the Project shall be selected through competitive tendering. As a rule for the tender, the bidder offering the lowest price as well as technical consistencies shall be successful bidder. The Ministry of Health of Zambia will then conclude the supply contract with the successful bidder of the equipment and obtain the verification of JICA. The equipment supplier shall complete required works within the period

specified in the contract, and handover the equipment to the Ministry of Health of Zambia after conducting final inspection at the UTH.

2-2-4-2 Implementation Conditions

In implementing the project, special attention should be paid to the following points:

(1) To minimize the Interruption of Clinical Services during Installation Period

Because the hospital covered by the Project need to continue their routine clinical services during the installation period, the period in which the services are interrupted must be minimized. In order to minimize the interruption, the procurement process of the equipment should be strictly supervised, and the installation and inspection schedule should be formulated through discussion in advance and strictly observed with those related to the UTH. In addition, certain measures should be taken to ensure the safety of patients and medical staff at UTH.

(2) Transport/Delivery Route

The equipment will be unloaded at the Port of Durban, South Africa. After the customs clearance in Durban, it will be transported inland for about 2,400km by truck, following the route from the Port of Durban, South Africa to Zambia via Botswana. Adequate care should be taken in the scheduling of transport and customs clearance because two land borders will be crossed on the way, which may require a considerable number of days for customs clearance.

As points of concern, the shipping documents, such as pro forma invoice shall be submitted to the Ministry of Health of Zambia before the shipment so that the procedure of customs clearance will be conducted in advance.

2-2-4-3 Scope of Works

The Project will be implemented under the cooperation of the governments of Zambia and Japan. The works to be borne by both parties are as follows.

(1) Works to be carried out by the Government of Japan

- 1) Execute the procurement of the equipment on the Project,
- 2) Transport the equipment to the UTH, which includes marine and inland transportation in Zambia,
- 3) Install and set up the equipment, and
- 4) Perform the test run, give instructions / training for operation and maintenance and do final inspection for all equipment.

(2) Works to be carried out by the Government of Zambia

- 1) Present data, documents, and other information necessary for the installation and set up of the equipment,
- 2) Remove old equipment and prepare the rooms to which the new equipment is to be installed,

- 3) Prepare facility infrastructures, such as electricity, water supply / drainage, in the sites where the new equipment will be installed,
- 4) Provide places to unload the equipment,
- 5) Temporary storage spaces for the equipment until the installation,
- 6) Secure delivery routes especially for the equipment which is required to install in the facilities, and
- 7) All of UTH renovation plan includes UTH three (3)-years (2009-2011) action plan

2-2-4-4 Consultant Supervision

Based on the Japanese Grant Aid scheme, the Japanese consultant shall conclude the agreement for consulting services with the Ministry of Health of Zambia, according to which the consultant will render detailed design (including tender-related works) and perform procurement supervisory services. The purpose of consultant supervision is to make certain that the equipment supplier selected through public tender is properly carrying out its assigned obligations according to the contract concluded with the Ministry of Health of Zambia and to give guidance and make necessary adjustments from an objective viewpoint to ensure proper execution. The supervisory work consists of the following services.

(1) Assistance with Tender Procedure and Contracting

To select a Japanese trading company to take charge of the equipment procurement / installation, the consultant will prepare tender documents, announce the tender publicly, distribute the tender documents to bidders, accept and evaluate tenders offered, and give advice with regard to the contract to be concluded between the Ministry of Health of Zambia and the selected supplier.

(2) Instructions, Advice, and Coordination for the Supplier

The consultant will examine the procurement / installation plan and give instructions and advice to the supplier to make certain adjustments if necessary.

(3) Inspection and Approval of Related Documents

The consultant will examine the equipment procurement / installation schedule and its management structure by staff concerned, technical documents related to the equipment, and other necessary documents to be submitted from the supplier, give advice as necessary, and approve the documents.

(4) Report on the Progress of the Work

The consultant will monitor the progress of actual work against the proposed plan, and report to the related parties in Japan and Zambia.

(5) Inspection and Testing upon Completion

Upon completion of the work, the consultant will attend the on site inspection and

test-run of the equipment in order to confirm that the equipment is consistent with provisions of the contract. Final inspection report will be submitted to authorities concerned on the Zambian side.

2-2-4-5 Procurement Plan

In procuring the equipment for the Project, the following points should be noted:

(1) Country of Origin of the Planned Equipment

The equipment for this Project will be procured from Japan, as well as certain third countries, such as USA and European Countries. As third-country products Ventilators (Adult and Infant), Anaesthesia Machines, Autoclaves, Patient Monitors (Adults and Neonates), Electrosurgical Units, X-Ray Mobile, Ultrasound Machines, Infusion Pumps and Syringe Pumps will be considered for the sustainable operation and maintenance of the equipment at UTH as well as fair competition on the public tender.

(2) Transportation Period

It is estimated to take a total of about forty (40) to forty-five (45) days to transport the equipment. It will take twenty-five (25) to thirty (30) days to transport the equipment items to be procured from Japan and third countries to the Durban port in South Africa, and additional ten (10) to fifteen (15) days or so for customs clearance procedure and inland transportation from Durban port in South Africa to Lusaka, Zambia.

2-2-4-6 Operational Guidance Plan

Equipment to be procured in the Project requires basic operation and maintenance skills. It will be necessary to train the clinical staff and maintenance staff in operation and troubleshooting of the equipment during the period of installation, adjustment, and test running. The consultant will give the necessary instructions of the training programme implemented by the equipment supplier.

2-2-4-7 Soft Component (Technical Assistance) Plan

At the UTH, six (6) engineers working in the Biomedical Engineering Department (hereinafter referred to as "BME") are in charge of the maintenance and management of the medical equipment. The task of the BME is to keep an inventory of the newly-procured equipment and to maintain and manage the existing medical equipment in an adequate manner. While the inventory and daily work records are kept in files for management, there is no adequate organisation, compilation or updating of procurement methods for supplies and spare parts relating to the operation of the equipment, nor of information on the equipment suppliers and after-sales service providers. Moreover, the BME has not been fully able to perform the duties required of it, such as giving users instructions on the handling and operation of the equipment, and training and encouraging them to carry out maintenance and inspection of the equipment by themselves. To improve this kind of situation that is often observed at the UTH, it is necessary to introduce an

approach that will change the mindset of the BME engineers and users of the equipment and improve the workplace environment, thereby encouraging them to endeavour to maintain and manage the medical equipment appropriately. In this respect, utilization of the soft component by Japanese engineers will be significant in ensuring that the medical equipment to be procured by means of the Grant Aid will be used for an extended period of time and in supporting the smooth start-up of the Project.

In this soft component programme, it is planned to introduce the 5S movement that consists of Seiri (Sort), Seiton (Set), Seiso (Shine), Seiketsu (Standardize) and Shitsuke (Sustain) as a means to achieve the goals. This Soft Component aims to change the mindset of the hospital staffs and improve the workplace environment, thereby encouraging them to endeavour to maintain and manage the medical equipment appropriately.

2-2-4-8 Implementation Schedule

(1) Tender and Tender related Works

Tender and tender related works include final confirmation of the technical specifications of the equipment and preparation of the instruction to tenderers. This set of documents needs to be approved by the Zambian side. Then, the consultant will announce applicants, hold the tender, evaluate the submitted documents from applicants, nominate the winner and help to conclude the supply contract between the Ministry of Health of Zambia and the supplier. This stage takes about four (4) months.

(2) Procurement and Installation of Equipment

After JICA verifies the supply contract between the Ministry of Health of Zambia and the equipment supplier, the supplier starts procuring the equipment in compliance with the contract documents. The works related to the equipment procurement, transportation and installation in the UTH takes about eight (8) months.

Based on the above, the work process after the signing of the E/N and G/A is outlined in Figure 2.2 below. The second stage of the Soft Component Programme is planned to be carried out six (6) months later after installation of the equipment. All components of the Project take about eighteen (18) months after the signing of the E/N and the G/A.

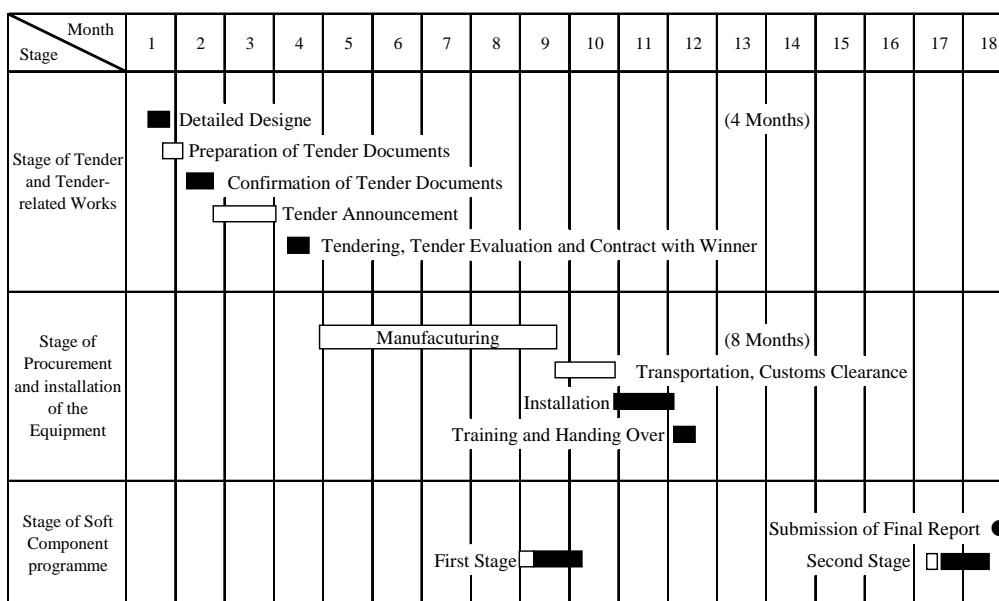


Figure 2.2 Project Implementation Schedule

2-3 Obligations of the Recipient Country

General obligations of the Government of Zambia in relation to the implementation of the Project are as follows:

- To provide the necessary information and data for the Project,
- To provide support for the supplier, such as prompt customs clearance of the equipment under the Project at ports of disembarkation in and outside Zambia,
- To exempt Japanese nationals who are staying in Zambia for providing services in connection to the implementation of the Project, from customs duties, internal taxes and fiscal levies which may be imposed in Zambia,
- To accord necessary promotion and security measures to Japanese nationals entering or staying in Zambia for the purpose of providing services and to their equipment brought in for the implementation of the Project,
- To conduct the Banking Arrangement (B/A), and to pay commissions (Advising commissions of A/Ps and payment commissions) associated with the issuance of the Authorization to Pay (A/P),
- To allocate the personnel / budget required for the effective implementation of the Project (including operation and maintenance costs of equipment procured using Grant Aid), and
- To bear all other expenses except covered by Japan, associated with the implementation of the Project.

2-4 Project Operation Plan

The BME engineers are in charge of the maintenance and management of the medical equipment. Management of equipment precision and response to breakdowns at the request of the users of the equipment comprises the routine work of the BME engineers. They used to teach users how to operate the equipment on a regular basis, but they do not do this now. However, it seems that they sometimes carry out training in equipment operation for the medical service providers who are participating in the training programmes at the School of Anaesthesia, which is one of the affiliated organisations of the UTH.

With respect to the equipment relating to nuclear medicine that has been installed in the UTH in the last two or three years (SPECT¹ and two single-head gamma cameras), the purchasing terms and conditions included five-year maintenance contracts (regular quarterly inspections) and maintenance skill training of the UTH engineers by the equipment manufacturers². Also, with regard to the four artificial dialysis machines (products of Fresenius Medical Care, Germany), an agreement has been reached between the Ministry of Health and the manufacturer's agent located in South Africa for the continual provision of consumables (patient circuits and dialysers) for a charge.

With the exception of the aforementioned special cases, no maintenance service contract has been concluded. When the BME engineers find problems too difficult for them to handle by themselves, they contact the manufacturer or the agent to have them repair the equipment. Furthermore, although a management system is in place whereby the inventory of newly-procured equipment and equipment repair records are to be entered in ledgers, unfortunately the relevant information has not been properly updated.

The BME engineers are graduates of electrical or electronic engineering technical schools. After graduation, they try to improve their technical skills by taking training courses on maintenance skills held by overseas equipment manufacturers or agents with the support of donors and organisations, and/or by making use of the opportunities afforded by the consignment and delivery inspections carried out by the companies in charge of installing the procured medical equipment.

It is planned that the soft component programme will be incorporated into this plan to reinforce the medical equipment maintenance and management structure in the UTH and to provide training to ensure the sustainable use of the procured equipment.

¹ Single Photon emission computed tomography

² This equipment was procured with the support of the IAEA (International Atomic Energy Agency).

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

Project cost born by the Zambian side is estimated to be Approximately 744.8 Million ZMK (14.7 Million Yen).

Table 2.7 Project Cost born by the Zambian Side

Item	Roughly Estimate Cost
Operation and Maintenance Cost	728.3 Million ZMK (14.4 Million Yen)
Payment Commission	16.2 Million ZMK (0.3 Million Yen)
A/P Advising Commission	0.3 Million ZMK (0.006 Million Yen)

Conditions in Cost Estimate

Time of Cost Estimate : April 2009

Exchange Rate : 1US\$ = 96.08 Yen, 1 Euro = 126.04 Yen

: 1 ZKW = 0.01977 Yen

Procurement Period : Approx 18 months, including the Plan of Soft Component

Other : Cost Estimate is implemented in accordance with the Guideline of Japan's Grant Aid.

2-5-2 Operation and Maintenance Cost

As shown in Table 2.8, it is estimated that the annual maintenance costs of the medical equipment to be procured under this plan will amount to approximately 728 million ZMK, which accounts for about 9 % of the total expenditure on medical equipment maintenance in fiscal 2008 (8.4 billion ZMK). With respect to that part of the planned equipment the procurement of which is scheduled to add to the existing equipment to meet the required number of equipment and the equipment that is to be newly procured in the departments concerned, the total estimated amount of the annual maintenance cost has been included in the cost estimation. With respect to the equipment that is to be procured to replace existing equipment, an amount equivalent to 30% of the estimated annual maintenance costs has been included as the estimated increment, as maintenance costs tend to increase after equipment replacement because of increased use of the equipment and other reasons.

Table 2.8 Operation and Maintenance Costs for the Planned Equipment

No	Equipment	Q'ty	Breakdown		Unit Price (ZMK)	Total (ZMK)
1	Anaesthesia Machine	10	Rep	10	19,600,000	58,800,000
2	Patient Monitor	34	Rep	19	3,180,000	18,126,000
			Add	15		47,700,000
3	Cardiotocograph (CTG)	3	Rep	1	3,490,000	1,047,000
			Add	2		6,980,000

No	Equipment	Q'ty	Breakdown		Unit Price (ZMK)	Total (ZMK)
4	Ventilator	17	Rep	12	25,000,000	90,000,000
			Add	1		25,000,000
			New	4		100,000,000
5	Syringe Pump	7	New	7	3,200,000	22,400,000
6	Infusion Pump	21	Rep	6	4,290,000	7,722,000
			New	15		64,350,000
7	Mobile X-ray Machine	2	Rep	1	59,000,000	17,700,000
			New	1		59,000,000
8	Ultrasound Machine	3	Rep	1	54,000,000	16,200,000
			New	2		108,000,000
9	Operating Light	9	Rep	9	2,830,000	7,641,000
10	Autoclave (Medium)	3	Rep	2	1,010,000	606,000
			Add	1		1,010,000
11	Defibrillator	6	Rep	4	1,600,000	1,920,000
			Add	2		3,200,000
12	Electrosurgical Unit	12	Rep	8	910,000	2,184,000
			Add	4		3,640,000
13	Infant Care Unit	7	Rep	5	1,900,000	2,850,000
			Add	2		3,800,000
14	Nebulizer	2	Rep	1	200,000	60,000
			Add	1		200,000
15	Suction Machine	40	Rep	22	1,900,000	12,540,000
			Add	18		34,200,000
16	Laryngoscope	6	Rep	3	150,000	135,000
			Add	3		450,000
17	Haematocrit Centrifuge	1	Rep	1	150,000	45,000
18	Phototherapy Unit	4	Add	4	400,000	1,600,000
19	Infant Incubator	18	Rep	18	1,710,000	9,234,000
Total						728,340,000

Remarks:

Rep: Replacement of old existing equipment, Add: Additional procurement, New: Newly introduced equipment

As explained above, although it is estimated that the maintenance cost for the medical equipment that the UTH is required to procure from 2011 onwards will be higher than current costs, it will not result in a drastic increase; actual expenditure in fiscal 2008 had a rate of increase of 9.5%, and the budget for equipment maintenance and management has been increasing at an adequate rate since 2006. It is also possible for part of the self-raised funds (revenue from clinical services), which amount to about 10 billion Zambian Kwacha every year, to be allocated for this purpose. Therefore, it is determined that the UTH will be able to bear these maintenance costs.

2-6 Other Relevant Issues

(1) Allocation of Medical Staff

For the UTH to be able to perform its current functions, retention of at least the current level of medical staffing is essential. Measures must continue to be taken to combat the outflow of medical staff.

(2) Secure the Operation and Maintenance Costs for the Equipment

There is a need for the continued allocation of government grants and self-raised funds (revenue from clinical services, etc.) to cover maintenance costs.

Chapter 3 Project Evaluation and Recommendations

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

The implementation of this plan can be expected to produce following effects.

Table 3.1 Project Effect

Current situation and problems	Measures included in the Project	Direct effects/degree of improvement	Indirect effects/degree of improvement
The target hospital, which is the top referral hospital in Zambia, is unable to provide adequate medical services in terms of quality and quantity due to the deterioration/lack of facilities/equipment.	Improvement of the equipment in the following departments - Operating Theatre (Obstetrics and Gynaecology, Paediatrics, General) - Intensive Care Unit (Neonatal, Infant, General) - Obstetrics and Gynaecology (Delivery room)	- Number of operations per year will increase from 15,445 (2007). - Number of deliveries per year will increase from 13,414 (2007). - Average length of stay in ICU will be reduced from 50 days (2007).	Contribution to the qualitative improvement of medical services for patients and their families
The medical equipment is not appropriately maintained or managed and failed equipment is left in the treatment room without being disposed of or is abandoned with no attempt at repair.	Implementation of the soft component for the purpose of strengthening the maintenance and management of the medical equipment	Maintenance engineers will be enabled to develop appropriate plans for equipment maintenance and management and equipment users will be enabled to develop plans for preventive maintenance.	Contribution to the qualitative expansion of medical services for patients and their families

3-2 Recommendations

It has been determined that Zambia should work on the following issues with regard to the equipment to be procured under this Project so that it can be used, maintained and managed effectively and on a continual basis.

(1) Operation and maintenance of equipment

In order for the equipment to be procured to be used more effectively, there is a need for reinforcement of the system of daily maintenance and inspection by the users of the equipment in the medical facilities. In particular, each medical facility needs to make efforts to ensure the optimum maintenance and management of equipment the operation of which requires uninterrupted procurement of consumable supplies and reagents and of laboratory equipment that it is difficult to repair or control the accuracy of, while endeavouring to build continuous relations with the medical equipment and supplies agents. Implementation of the soft component programme is planned to strengthen the structure of the UTH in the operation and maintenance of medical equipment, but the

sustained management of the equipment management logs (maintenance manuals, operation manuals, electric circuit diagrams, tables of equipment manufacturing numbers, etc.) by the persons in charge at the facility is essential and will enable the establishment of appropriate linkage with external service providers and effective utilisation of the equipment.

(2) Budget appropriation

It has been confirmed that the cost of maintaining the equipment to be procured is within acceptable levels, but the cost of repair tends to be incurred sporadically in the event of equipment breakdown; and in most cases, payment has to be made promptly. It would be very helpful if a budget could be appropriated to provide for cases like this, in order to maintain the quality of medical services.

(3) Introduction and utilisation of an appropriate facility operation evaluation system

In addition to the procurement of medical equipment, introduction of a soft component is scheduled in this Project for the purpose of strengthening the structure for the operation and maintenance of the medical equipment. In the implementation of this Project, in addition to the provision of equipment, training and discussion sessions will be held for the benefit of UTH staff, to teach them about the key performance indicators for evaluation of the operating status of medical facilities and about how to organise and utilise medical statistics. Typical indicators include hospital bed utilisation, average number of patients per day, outpatient/inpatient ratio, number of patients per doctor and clinical revenue per patient. During the implementation period of the Project, these indicators will be extracted and compiled as baseline data to be used as reference indicators. To ensure efficient operation of the facilities and a qualitative improvement in the medical services, it is essential that these indicators be monitored and evaluated even after the completion of the Project. It is believed that the establishment of this kind of operational structure will lead to the improvement in the health and medical care services that is the objective of this Project.

Appendices

1. Member List of the Study Team

(1) Preparatory Survey (Basic Design)

No	Name	Role	Institution
1	Mr. Ikuo Takizawa	Leader	Regional Project Formulation Advisor (Health), JICA Regional Support Office for Africa, Kenya
2	Dr. Hironori Okabayashi	Technical Advisor (Hospital Management)	Expert Service Division, Bureau of International Cooperation, IMCJ
3	Ms. Yukie Suzuki	Project Planning	Health Systems Division, Health Systems and Reproductive Health Group, Human Development Department, JICA
4	Mr. Tamotsu Nozaki	Equipment Plan I	Fujita Planning Co., Ltd.
5	Mr. Akio Kaneko	Equipment Plan II	Fujita Planning Co., Ltd.
6	Mr. Shoichi Tashiro	Facility Plan	Fujita Planning Co., Ltd.
7	Ms. Michiko Fujimoto	Procurement Plan	Fujita Planning Co., Ltd.

(2) Explanation of Draft Report

No	Name	Role	Institution
1	Mr. Shiro Nabeya	Leader	Chief Representative, JICA Zambia Office
2	Ms. Yukie Suzuki	Project Planning	Health Systems Division, Health Systems and Reproductive Health Group, Human Development Department, JICA
3	Mr. Tamotsu Nozaki	Equipment Plan I	Fujita Planning Co., Ltd.
4	Mr. Akio Kaneko	Equipment Plan II	Fujita Planning Co., Ltd.

2. Study Schedule

(1) Preparatory Survey (Basic Design)

No	Date		JICA Members	Consultant Members			
				Equipment I	Equipment II	Facility	Procurement
1	21 March	S		Lv. Narita 19:00 (SQ011) →			
2	22 March	S		Av. Singapore 01:25 Lv. Singapore 02:30 (SQ478)→Av. Johannesbrug 07:10			
3	23 March	M		Lv. Johannesbrug 11:50 (SA062) →Av. Lusaka 13:50			
4	24 March	T		JIAC Office, University Teaching Hospital (UTH)			
5	25 March	W		Equipment Agents, Survey on UTH Facilities			Meeting Equipment Agents (EA)
6	26 March	T		Survey on UTH Facilities, Meeting with MoWS			Meetin with EA
7	27 March	F		Survey on UTH Facilities			Meetin with EA
8	28 March	S		Survey UTH, Meeting with Medical Equipment Specialist of Ministry of Health of Zambia, Meeting with UNFPA			
9	29 March	S		Documentation			
10	30 March	M		Lv. Narita →	Survey on UTH Facilities		
11	31 March	T	①Mr. Takizawa Av. Lusaka (10:10) ②Dr. Okawayashi and Ms. Suzuki Av. Lusaka (12:55), Meeting with JICA Zambia Office Officials, Meeting with EOJ Officials			Meetin with EA	
12	1 April	W	Meeting UTH, Survey on UTH Facilities			Meetin with EA	
13	2 April	T	Survey on UTH Facilities			Meetin with EA	
14	3 April	F	Meeting with Ministry of Health of Zambia, Discussion on Minutes of Discussions (M/D), Survey on UTH Facilities			Meetin with EA	
15	4 April	S	Documentation, preparation of M/D, Meeting within the Survey Team Members				
16	5 April	S	Documentation			Lv. Lusaka 13:50 (SA063) → Johannesbrug 16:00	
17	6 April	M	Discussion on M/D, Survey on UTH Facilities			Meeting with EA in S. Africa	
18	7 April	T	Signing M/D	Survey on UTH Facilities		Meeting with EA in S. Africa	
19	8 April	W	Report to JICA Zambia Office, and EOJ, Survey on UTH Facilities			Meeting with EA in S. Africa	
20	9 April	T	①Lv. Lusaka, Dr. Okabayashi and Ms. Suzuki (07:15) → ②Lv. Lusaka, Mr. Takizawa (11:10) → Av. Nairobi		Survey UTH	Lv. Johannesbrug 13:30 (SQ479) →	
21	10 April	F	Av. Narita	Documentation (National Holiday)		Via Singapore 09:50 (SQ012) → Av. Narita 17:20	
22	11 April	S	Documentation				
23	12 April	S	Lv. Lusaka 13:50 (SA063) → Av. Johannesburg 16:00				
24	13 April	M	Documentation (National Holiday)				
25	14 April	T	Meeting with EA in S. Africa				
26	15 April	W	Lv. Johannesbrug 13:30 (SQ479) →				
27	16 April	T	Av. Singapore 05:55 → Lv. Singapore 09:50 (SQ012) → Av. Narita 17:20				

(2) Explanation of Draft Report

Date			JICA Members		Consultant Members	
			Leader	Project Planning	Equipment I	Equipment II
1	16 August	S		Lv. Narita →		
2	17 August	M		Singapore → Johannesburg → Av. Lusaka (12:55)		
			Meeting with JICA Zambia Office Officials			
3	18 August	T	Meeting with UTH Members (Explanation of Draft Basic Design, and Responsibilities of Zambian side for the project, etc Survey on Renovation works to be covered by UTH, Meeting with EOJ Officials, Meeting with Ministry of Health of Zambia			
4	19 August	W	Preparation of Minutes of Discussions (M/D)		Meeting with UTH Officials, and Equipment Agents in Lusaka City	
			Meeting within the Survey Team Members			
5	20 August	T	Meeting with Ministry of Health of Zambia, Q&A concerning the Draft Basic Design Report, Discussions on M/D			
			Preparation of M/D		Meeting with UTH Officials	
			Meeting within the Survey Team Members			
6	21 August	F	Meeting with MoWS Member, Survey on UTH Facilities			
			Submission of M/D		Meeting with UTH BME Members	
7	22 August	S	Documentation			
8	23 August	S	Documentation			
9	24 August	M	Meeting with JICA Zambia Officials		Meeting with UTH Officials	
			Report to EOJ			
10	25 August	T		Lv. Lusaka → Av. Johannesburg →		
11	26 August	W		Singapore → Av. Narita (17:35)		

3. List of Parties Concerned in the Recipient Country

(1) Ministry of Health

Dr. O.M. Chimfwenbe	Director of Policy and Planning
Dr. Christopher Simoonga	Deputy Director of Policy and Planning
Dr. Mubita Luwabelwa	Deputy Vice Director of Policy and Planning
Dr. Gardner Syakantu	Vice Director of Medical Services
Ms. K.C. Mulalelo	Senior Architect, Policy and Planning
Mr. Tsibu J. Bbuku	Medical Equipment Specialist

(2) Ministry of Works and Supplies

Mr. Joackim Longwe	Senior Architect
Mr. B. Chiyaba	Senior Architect

(3) University Teaching Hospital (UTH)

Dr. Peter Mwaba	Managing Director
Dr. Lackson Kasonka	Assistant Director
Mr. F.B. Mponela	Finance Director
Mr. David Daka	Chief Engineer, Infrastructure Dept
Mr. Dennick Mayungo	Chief Engineer, Biomedical Engineering Dept
Dr. Feluza Ismailova	Head of Anaesthesia Dept
Dr. Bellington Vwalika	Head of Obstetrics and Gynaecology Dept
Dr. Mukunba	Specialist, Obstetrics and Gynaecology
Dr. Kaseba	Specialist, Obstetrics and Gynaecology
Dr. Somwe wa Somwe	Head of Paediatric Dept
Dr. Kankasa	Assistant Head of Paediatric Dept
Ms. Joyce Menda Menda	Assistant Head of Nursing Dept, OT and ICU
Ms. Mable Cimuchimba	Chief Nurse, Central OT
Ms. Esther Banda	Chief Nurse, Central ICU
Ms. Zyuulu Modesta	Chief Nurse, Emergency Dept
Ms. Sherern Mwila	Chief Nurse, Obstetrics & Gynaecology
Ms. Chijikwa Chereho	Chief Nurse, Obstetrics & Gynaecology
Ms. Rhoda Amahwh	Chief Nurse, Obstetrics & Gynaecology, Delivery
Ms. Getrude Kamwi	Chief Nurse, Paediatric ICU
Ms. Shanzi	Chief Nurse, Neonatal ICU
Ms. Mwangi	Chief Nurse, Neonatal ICU

(4) UNFPA

Dr. Sarai Bvulani Malumo	Programme Officer
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(5) Private Companies (Lusaka City)

• Specialised Systems Limited, Zambia

Mr. Santosh Mayekar	Director
Mr. Trevor Siakamba	Chief Sales Dept

- Geocy Medical & Diagnostics Ltd., Zambia
Mr. Georege K. Mwanza President
- Clinical Investment (Z) Ltd., Zambia
Ms. Pamela Mapenzi Hamweemba Director, Sales Dept
- Netpharm Enterprises Ltd., Zambia
Mr. John Mumba President
- Electrical Maintenance Lusaka, Zambia
Mr. Jean Marie Ilunga Director, Sales Dept
- Medisys Ltd., Zambia
Mr. Chandan Singh Yadav President
- CK Scientific Group Zambia Ltd., Zambia
Mr. Christopher C.K. kangwa President
- Bio-group Zambia Ltd., Zambia
Mr. Madhan U. R President
- ORET Project, Lusaka Office
Mr. Marcel Groenen Chief Consultant
- New Medica, South Africa
Mr. Patrick Kruger President
- AXIM (Africa X-Ray Industrial & Medical), South Africa
Mr. Alan Trappitt President
- Indigenous Systems, South Africa
Mr. Charles Phippips President
- Drager South Africa, South Africa
Mr. John Wales Manager, Export Dept
- (6) Embassy of Japan in Zambia
Mr. Toshihiko Horiuchi Minister - Counsellor
Dr. Hiroaki Yamashita, M.D. Counsellor and Medical Attache
Mr. Hitoshi Suzuki Second Secretary
- (7) JICA Zambia Office
Mr. Shiro Nabeya Resident Representative
Mr. Ippei Matsuhisa Assistant Resident Representative, Health Sector
Ms. Likwasi Priscilla Consultant, Health Sector