

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT FOR EXPANSION OF  
NATIONAL MATERNAL AND CHILD HEALTH CENTER  
IN  
THE KINGDOM OF CAMBODIA**

February 2014

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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

HM
J R
14-011

## **PREFACE**

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

The survey team held a series of discussions with the officials concerned with the Government of the Kingdom of Cambodia, and conducted a field investigation. As a result of further studies in Japan, the present report was finalized.

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

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

February, 2014

Ms. Nobuko Kayashima  
Director General,  
Human Development Department  
Japan International Cooperation Agency (JICA)

## **Summary**

### **1. Introduction**

The Kingdom of Cambodia (hereinafter referred to as "Cambodia") is located in the Indochina Peninsula and surrounded by Vietnam, Thailand and Laos. It covers approximately 180,000 square kilometers, and its total population is 14,860,000 people (in 2012), of which the Khmers make up about 90%, and its total number of births is 282,000 (in 2010).

Many people were killed in Cambodia, and the social infrastructure was destroyed by the organized purges launched by the Pol Pot regime during the civil war between the 1970s and the 1980s. In particular, the medical and health care systems had been seriously damaged by the systematic genocide of medical human resources and by the serious deterioration of medical facilities and equipment. The country's medical and health care system could not even provide basic, fundamental services to its people for a substantial period of time.

Work to rebuild Cambodia started after the signing of the Paris Peace Agreement in 1991, and it accomplished a satisfactory revival with help from foreign government assistance. The country's average annual GDP growth rate for ten years (1998 to 2007) increased to 9.4% as a result of social and political stability, a result of the Hun Sen Administration, founded in 1998. Although the GDP temporarily dropped for a while after this period, it recovered back to 6.9% in 2011. Despite this progress, Cambodia is still included among the Least Development Countries (LDCs), and its Human Development Index rank is 139<sup>th</sup> out of 187 countries. Insufficient social and economic infrastructure and a shortage of human resources caused by the civil war are major issues of the country's future development.

Organized and combined policies to develop private industries led by private and foreign investments, and technology transfers with foreign economic assistance are necessary in order to solve the economic challenges of the country. The Government of Japan has extended economic assistance to provide infrastructure as well as to develop human resources and political, social and economic systems in Cambodia to enhance socioeconomic foundations. The Government of Japan also assists in developing the investment environment of Japanese companies in Cambodia through the Bilateral Investment Treaty between Japan and Cambodia (effective since 2008) and the Cambodia-Japan Public-Private Sector meetings.

### **2. Background and Overview of the Project**

The major MCH care indicators in Cambodia have significantly improved in the last decade. The maternal mortality rate has improved from 470/100,000 births in 2000 to 206/100,000 births in 2010 (according to the Cambodia Demographic and Health Survey, CDHS 2010). At this rate it is expected to accomplish the Cambodia's Millennium Development Goal (CMDGs) of 250/100,000 births by 2015.

Although overall medical and health care services have significantly improved, the key indices of maternal and child health (hereinafter referred to as “MCH”) care services, including the maternal mortality rate, need further improvement when compared to other neighboring countries. At the same time, Cambodia chronically suffers from shortages of physicians, nurses, midwives and other co-medical staff, in particular severe shortages of midwives in rural areas.

Most maternal deaths are caused by severe bleeding or complication during the perinatal period, and ensuring the required number of the MCH staff and improving their clinical abilities to deal with those cases properly are therefore important to further reduce the country’s maternal mortality rate. The National Strategic Development Plan 2009-2013 (NSDP) focuses on the health sector as a priority mission, and the Health Sector Strategic Plan 2008-2015 (HSP2) emphasizes MCH care as a top priority mission.

The National Maternal and Child Health Center (hereinafter referred to as "NMCHC"), which was constructed by the Grant Aid of the Government of Japan in 1997, has contributed to the qualitative and quantitative improvements of MCH care services in Cambodia with the support of subsequent Technical Cooperation Projects.

Although the number of premature babies accepted at NCU increased from 979 in 2000 to 1,220 in 2009, the prematurity mortality rate was improved from 167 to 150. On the other hand, in unavoidable situations or due to some abnormality, the ratio of cesarean deliveries out of total deliveries increased from 9% in 2000 to 19% in 2009, therefore more advanced perinatal medical care services, including emergency obstetrics care, are required to cope with these situations.

As more diversified, practical and longer period training courses are required to respond to the advanced MCH care services (such as emergency obstetrics care), the NMCHC’s current facilities face difficulties in providing the appropriate training programs, making expansion of its facilities an urgent mission.

The Government of Cambodia requested a Grant Aid Project for the “Project for Expansion of National Maternal and Child Health Center” in order to respond to these circumstances and to allow NMCHC’s functions as a top MCH clinical and training institution in Cambodia.

Key components of the request are listed below:

- Facilities (applicable site area: 1,385 square meters)
  - Construction of a new training center (3,058 square meters, five-story building)
  - Renovation work of the existing facilities of NMCHC
- Equipment

### 3. Overview of Preparatory Survey and Contents of the Project

To respond to the aforementioned requests, JICA determined to implement a Preparatory Survey (Basic Design) (hereinafter referred to as “Preparatory Survey”) and sent the Preparatory Survey (Basic Design) Team from August 4 to August 24, 2013. The survey team had discussions with the Cambodian side, surveyed the NMCHC’s existing facilities and equipment as well as other related facilities. They studied the proposed construction site, reviewed the contents and viability of the requests, and finally drafted the project implementation plans. Furthermore, the survey team finalized the schematic design and preliminary cost estimate through further studies in Japan, and explained the Draft Final Report on the Preparatory Survey (hereinafter referred to as “Draft”) to the Cambodian side from December 22 to December 28, 2013. From this the final Preparatory Survey report was compiled.

The survey team reviewed and confirmed the functions of NMCHC as “clinical care”, “training” and “policy/administration (National MCH Program Offices)” during the field survey. They verified the current activities and utilization status of the NMCHC’s existing main buildings (hereinafter referred to as “the existing Center”), and assessed the current issues that NMCHC faces. The study team also reviewed and confirmed the contents of the original requests through discussions with the Cambodian side, and finalized the requests to reflect the country’s MCH policies and plans. As a result of the above discussions and studies, the team redefined the final requests.

#### 3.1. Construction of a new Training Center

Because the National MCH Program offices, which were not included in the original design, occupy a substantial portion of the third floor of the South Building in the existing Center, the training functions (which used to be located in the same area) did not have enough rooms and sufficient amount of training space. Furthermore, practical training functions including the Problem Based Learning (PBL) and Clinical Simulation Lab (CSL) cannot be conducted effectively due to a lack of appropriate rooms.

Because the existing library is currently used as a management office, it does not allow students and trainees to study or engage in self-study and research.

To improve these situations, it is highly necessary to construct a new Training Center to provide in-service training for the medical staff attached to MCH care services in local areas and pre-service training for medical and co-medical students.

#### 3.2. Renovation work of the existing Center

Although there have been significant improvements in the major MCH care indicators (such as maternal, neo-natal and infant mortality rates) due to a various measures to improve the MCH care services by the Government of Cambodia, the number of high-risk births (such as birth of babies with low birth-weights) is relatively increasing at NMCHC due to the reinforced referral system and the improvement of the traffic network connecting between Phnom Penh and local areas.

According to NMCHC's estimates, about 20% of 7,000 annual deliveries will require treatment at a NCU as high-risk cases. It is therefore necessary to develop the perinatal care systems to deal with approximately 1,400 high-risk cases annually (20% of 7,000 deliveries).

In accordance with the improvement in the MCH care services, the number of deliveries involving surgical operations (such as Cesarean section) is increasing. The number has almost tripled from about 650 cases in 2000 to about 1,700 cases in 2012. In accordance with this trend, the number of operations is increasing, therefore it is necessary in the future to have the ICU and recovery room deal with approximately 2,500 operations annually.

NMCHC plans to offset the increased cost incurred by the improvement of the perinatal care systems (personnel expenses and purchasing medical consumables) against the increased user fees generated from pay-bed ward rooms (1-bed and 2-bed rooms), in particular in the renovated ward to be transferred to the third floor of the South Building.

The survey team therefore reviewed and studied the adequate number of ward room types to achieve a favorable balance between satisfying NMCHC's original goal of providing the poorest segment with maternal and child health care services, and dealing with the increased costs incurred by improving NCUs.

### 3.3. Providing medical equipment and training equipment

The items and quantity of medical and training equipment in the final requests have been determined based on the medical technology level and demands in Cambodia, therefore they have high validation. The final requests include the replacement of the existing equipment as well as new equipment, and the necessity of those equipment components which shall be further studied.

### Contents of the Project

Item	Facility Work	Function, Rooms and Contents of Work	
Facility	Training Center (Total Floor Area: 2,900.13 m <sup>2</sup> )	4FL:     Dormitory: Dormitory, Shower Rm Resource Center:     Resource Center, Self-study Rm, Cafeteria	
		3FL:     Training Center:     Training Rms, Problem-Based Learning (PBL) Rm, Clinical Simulation Lab (CSL) Rm, Training Unit Office	
		2FL:     National MCH Program Offices, Management Office, Director Rms	
		1FL:     Parking, Machine Rooms	
	Renovation Work of the Existing Center (Renovated Area: 1,754.39 m <sup>2</sup> )	Ward:     Total inpatient ward: 134 beds, Total hospital bed: 174 beds 3FL, South Building (Gynecology/Obstetrics Ward): Total 46 beds (8-bed x 4, 4-bed x 2, 2-bed x 1, 1-bed x 4) 2FL, South Building ( Obstetrics Ward) Total 88 beds (8-bed x 8, 4-bed x 4, 2-bed x 2, 1-bed x 4)	
		Perinatal Care Center: NCU: 20 beds, Recovery Rm: 10 beds, ICU: 6 beds, Kangaroo Care Rm: 4 beds	
		Night-duty Rm, Clinical Division Office, Nursing Division Office, Health Finance Committee Office	
		Other Renovation Works: <ul style="list-style-type: none"> <li>• To install new stretcher elevator connecting 1 FL to 3FL at connecting corridor</li> <li>• To replace ward's wood doors to steel doors</li> <li>• To renew control units of the medical gas supply system</li> <li>• To replace damaged portions of the sewage treatment plant</li> <li>• To replace solar heating panels on the roof</li> <li>• To increase power supply capacity to meet demand of renovation work</li> <li>• To add air-conditioning units to meet demand of renovation work</li> <li>• To replace broken parts of the existing incinerator</li> </ul>	
	Equipment	Medical and training equipment to be provided in the proposed buildings	

#### **4. Construction Period and Approximate Cost for the Project**

The entire implementation of the Project consists of the following phases: detail design: 4 months, tender implementation: 3.5 months, and construction of facilities and procurement of equipment: 16.5 months.

The cost of works to be covered by the Cambodian side has been confirmed by the Ministry of Health (hereinafter referred to as MOH), the Government of Cambodia. The MOH pledged to secure the relevant budget based on the Minutes of Discussions (hereinafter referred to as “M/D”) at the Draft Final report explanation on December 27, 2013.

#### **5. Project Evaluation**

##### **5.1. Relevance of the Project**

NMCHC is a top national institute providing MCH care services in Cambodia. Approximately 14.86 million people (the entire population of Cambodia in 2012) indirectly benefit, and approximately 570,000 mothers and children (in 2010) directly benefit from NMCHC’s services annually.

The fundamental policy of the MOH, Cambodia, states that NMCHC is responsible for the “provision of high-quality MCH care services to all mothers and children, including the poor”. This policy remains unchanged after the implementation of the Project.

Furthermore, the improvement of the perinatal care services at NMCHC and training systems in the Regional Training Centers (RTCs) and other relevant institutions in rural areas through the implementation of the Project will enable the improvement of MCH care services in the rural areas significantly.

These activities will help to remove inequality in access to MCH care services between urban and rural areas, promote the Universal Health Coverage (UHC) of MCH care services, and spread the effects of the Project across the country of Cambodia.

##### **5.2. Effectiveness of the Project**

The implementation of the Project is expected to produce the following results and effects. As indicators to measure the achievement of the Project, the following quantitative and qualitative indicators are proposed by setting the baseline year as the average between 2010 and 2012, and the target year as 2020 (approximately three years after the Project facilities begin to operate in the second half in 2016).

###### **5.2.1. Quantitative Indicators**

NMCHC’s major clinical practice activities (such as the number of outpatients, inpatients and deliveries, etc.) have not increased significantly since 2000, because more options to select medical institutions for regular childbirth delivery have been available recently as a result of the increased number of private clinics in Phnom Penh and the development of referral hospitals and Health Centers in the rural areas. Therefore the Project will focus on the qualitative improvement rather than the quantitative expansion of the clinical functions at NMCHC.



On the other hand, the training function will need further quantitative expansion. The Project aims to improve NMCHC's training function to provide pre-service training programs for more than 650 trainees and in-service training programs for more than 2,050 trainees annually.

The quantitative indicators of expected results by implementation of the Project are listed below:

### Quantitative Indicators of the Project

Items	Baseline (Average between 2010 to 2012)	Target (2020) (3 years after Project's Completion)
<b>Perinatal Care Function:</b>		
• The number of high-risk cases treated at NCU (cases/year)	723	1,400
• Rate of the abovementioned high-risk cases out of total deliver cases (%)	Approx. 11.3	Approx. 20
• The number of operations (cases/year)	2,337	2,500
<b>Inpatient Ward:</b>		
• User fees generated by inpatient ward (US\$/year)	419,300	502,600
<b>Training Function:</b>		
• The number of pre-service trainees (persons/year)	522	650
• The number of in-service trainees (persons/year)	1,839	2,050
• Available number of lecture seats (seats/year)	80	120
• Available number of PBL seats (seats/year)	--	40

#### 5.2.2. Qualitative Indicators

The following results are the expected qualitative improvements of the Project.

- Enhancing the perinatal care systems

Improving and expanding the NCU, ICU and Recovery Room to meet the facility's appropriate standards (area, number of beds, air quality etc.) and utilizing the components of equipment required by NMCHC's perinatal care systems will enable establishment of an advanced obstetric care system while preventing nosocomial infection.

- Enhancing the training functions

NMCHC currently offers three types of training programs: "clinical training," "lectures" and "Problem-Based Learning (PBL) Training". However, the existing Center has only conventional lecture rooms, and it cannot provide a variety of practical and clinical training programs that NMCHC plans to implement. The Project will upgrade the training facilities and equipment to meet the purposes of the individual training programs. It will therefore allow NMCHC to implement more efficient and effective training programs.

In conclusion, it is relevant to implement the Project within the framework of a Grant Aid of the Government of Japan, and the appropriateness and necessity of the Project is considered to be very high.

## Table of Contents

### Preface

### Summary

### Contents

### Location Map / Perspectives

### List of Figures & Tables

### Abbreviations

## Chapter 1 Background of the Project

1-1 Background of the Request .....	1
1-2 Outline of the Project .....	2
1-3 Implementation Organization of the Project	
1-3-1 Organization and Staffing.....	4
1-3-2 Status of Major Activities.....	6
1-3-3 Financial Status and Budget.....	9
1-3-4 Status of Existing Facilities and Equipment.....	11
1-4 Condition of the Project Site and Surrounding Area	
1-4-1 Infrastructure Condition of the Project Site .....	23
1-4-2 Current Conditions of Electrical and Mechanical Facilities at Existing NMCHC .....	27
1-4-3 Natural Condition.....	32
1-4-4 Environmental and Social Considerations .....	33

## Chapter 2 Contents of the Project

2-1 Basic Concept of the Project.....	35
2-2 Outline Design of Requested Japanese Assistance	
2-2-1 Design Policy .....	38
2-2-2 Basic Plan	
2-2-2-1 Overview of Project (Review of Requests).....	44
2-2-2-2 Layout Plan for the Site and Facilities .....	65
2-2-2-3 Architectural Plan .....	67
2-2-2-4 Structural Plan.....	96
2-2-2-5 Utility Plans (Electrical and Mechanical Systems).....	100
2-2-2-6 Construction Materials Plan.....	114
2-2-2-7 Equipment Plan .....	116
2-2-3 Outline Design Drawings .....	121
2-2-4 Implementation Plan	
2-2-4-1 Implementation Policy .....	141
2-2-4-2 Implementation Conditions.....	143

- 2-2-4-3 Scope of Works ..... 144
- 2-2-4-4 Consultant Supervision ..... 146
- 2-2-4-5 Quality Control Plan ..... 148
- 2-2-4-6 Procurement Plan ..... 150
- 2-2-4-7 Operational Guidance Plan ..... 152
- 2-2-4-8 Soft Component (Technical Assistance) Plan ..... 153
- 2-2-4-9 Implementation Schedule..... 154
- 2-3 Obligations of Recipient Country ..... 156
- 2-4 Project Operation Plan ..... 158
- 2-5 Project Cost Estimation
  - 2-5-1 Initial Cost Estimation ..... 161
  - 2-5-2 Operation and Maintenance Cost ..... 162

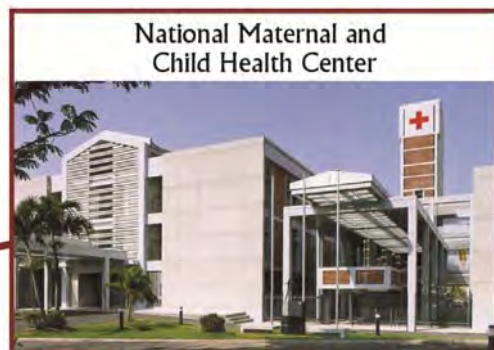
**Chapter 3 Project Evaluation**

- 3-1 Preconditions ..... 171
- 3-2 Necessary Inputs by the Recipient Country for the Achievement of the Project Plans 171
- 3-3 Important Assumptions of the Project..... 172
- 3-4 Project Evaluation
  - 3-4-1 Relevance ..... 174
  - 3-4-2 Effectiveness ..... 175

**Appendices**

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned
4. Minutes of Discussions
5. Record of Renovation Work of the Existing Center

### Location Map





**Perspective**

## List of Figures & Tables

### Chapter 1

Figure 1-1 Organization Chart of MOH	4
Figure 1-2 Organization Chart of NMCHC	4
Figure 1-3 Current Situation of Project Site at NMCHC	11
Figure 1-4 1FL Plan, Existing Center	13
Figure 1-5 2FL Plan, Existing Center	14
Figure 1-6 3FL Plan, Existing Center	15
Figure 1-7 Health Garden Building Plan	18
Figure 1-8 Current Electric Utility Situation, Plan in the Site	23
Figure 1-9 Current Electric Utility Situation, Plan in the Site	24
Figure 1-10 Existing City Water and City Sewage Infrastructure in and around the Site	26
Table 1-1 Staff Allocation of NMCHC	5
Table 1-2 Record of Major Clinical Activities of NMCHC	6
Table 1-3 Current Training Programs	7
Table 1-4 Income and Expenditures of NMCHC	10
Table 1-5 Space Programs, Existing Center	13
Table 1-6 Space Programs, Existing Center	14
Table 1-7 Space Programs, Existing Center	15
Table 1-8 Weather data of Phnom Penh	32

### Chapter 2

Figure 2-1 Relationship between HSP 2 and the Project	35
Figure 2-2 Surrounding Environment of the Project Site	65
Figure 2-3 Existing Facilities and the Layout Plan of New Training Center	66
Figure 2-4 1st Floor Plan	89
Figure 2-5 2nd Floor Plan	90
Figure 2-6 3rd Floor Plan	90
Figure 2-7 4th Floor Plan	91
Figure 2-8 Sectional Diagram	92
Figure 2-9 Renovated Existing Hospital 1st Floor Plan	93
Figure 2-10 Renovated Existing Hospital 2nd Floor Plan	94
Figure 2-11 Renovated Existing Hospital 3rd Floor Plan	95
Figure 2-12 Boring Log	96
Figure 2-13 Conceptual Diagram of Power Supply System	101
Figure 2-14 Site Plan of Power Supply System	101
Figure 2-15 Conceptual Diagram of Telecommunication System	104
Figure 2-16 Site Plan of Telecommunication System	104
Figure 2-17 Infrastructure Plan	108
Figure 2-18 Plumbing schematic diagram	108
Figure 2-19 Air conditioning and ventilation system for a clean room	112
Figure 2-20 Air conditioning and ventilation system for typical air conditioned room	112
Figure 2-21 Ventilation system for typical room	112
Figure 2-22 The Consultant's Supervision Organization	147
Figure 2-23 The Project's Implementation Schedule	155
Figure 2-24 The Area of the Prior Hand-over	155
Figure 2-25 Cambodian Side Work Items	157
Table 2-1 Outline of the Cooperation Project's Scope	37
Table 2-2 Applicable Standard and Grade for the Proposed Facilities	42
Table 2-3 Comparison between the Original and Revised Requests, Training Center	45
Table 2-4 Comparison between the Original and Revised Requests, Renovation Work of the Center	46
Table 2-5 Comparison of Equipment between the Original Request and Revised Request	49

Table 2-6 Validity Study of the Proposed Facilities.....	52
Table 2-7 Review of Existing Activities, 3FL, South Building .....	53
Table 2-8 Operation Record of All the Existing Equipment to be Replaced by the Project.....	54
Table 2-9 Priority Study of the Renovation Works .....	55
Table 2-10 Results of Study/Validation Evidence.....	56
Table 2-11 Results of Detailed Study of Equipment.....	60
Table 2-12 The Proposed Training Programs in 2020.....	68
Table 2-13 Study of the Necessary Number/Sizes of Training Facilities .....	69
Table 2-14 Study of Necessary Number/Sizes of Dormitories .....	70
Table 2-15 Study of Necessary Number/Sizes of Night Duty Rooms.....	70
Table 2-16 Study of Necessary Sizes of the National MCH Program Offices .....	71
Table 2-17 Study of Necessary Sizes of Management Offices .....	71
Table 2-18 Study of Necessary Sizes of Clinical Offices .....	72
Table 2-19 Records of Medical Activities in NCU .....	72
Table 2-20 Study of the Necessary Number of NCU Beds .....	73
Table 2-21 Costs of Drugs and Medical Disposables incurred by NCU.....	74
Table 2-22 Records of Surgical Operations Activities.....	75
Table 2-23 Study of the Necessary Number of ICU Beds .....	76
Table 2-24 Study of the Necessary Number of Recovery Room Beds .....	76
Table 2-25 Costs of Drugs and Medical Disposables incurred by ICU and Recovery.....	78
Table 2-26 Record of BOR by Ward-Room Type.....	80
Table 2-27 BOR of 4 Beds Room which introduced in Obstetric Ward (February – June, 2013).....	80
Table 2-28 Comparison between the Current and Proposed Ward Configurations.....	82
Table 2-29 Study of Ward’s User Fees Incomes by Ward-type(Current) .....	83
Table 2-30 Study of Ward’s User Fees Incomes by Ward-type (Year 2020) .....	83
Table 2-31 User Fee of Wards and Exemption Rates in 2011 .....	84
Table 2-32 Number of Outsourced Bacteriological Test (Year 2012).....	85
Table 2-33 Functional Space Program of the Proposed Facility .....	87
Table 2-34 Floor Area of the Renovation Work .....	88
Table 2-35 Comparison of Foundation Construction Methods.....	97
Table 2-36 Live Load of Main Rooms.....	98
Table 2-37 Lighting Specifications for Main Rooms.....	103
Table 2-38 Exterior Finishing Materials and Construction Method .....	114
Table 2-39 Interior Finishing Materials and Construction Methods.....	115
Table 2-40 Proposed Equipment/Location List.....	117
Table 2-41 Specifications and Usage of the Major Equipment .....	119
Table 2-42 List of Drawings .....	121
Table 2-43 The Project’s Scope of Work to be Covered by Both Sides.....	145
Table 2-44 Procurement Plan for Major Construction Materials and Equipment .....	150
Table 2-45 Outline of the Project’s Proposed Facilities and Renovation Work.....	154
Table 2-46 Cambodian Side Work and Implementation Schedule.....	156
Table 2-47 Staff Allocation of NMCHC.....	158
Table 2-48 Plan of Staff Reinforcement on the Project .....	158
Table 2-49 Expenses to be covered by the Cambodian Side .....	161
Table 2-50 Estimated Annual Operation and Maintenance Costs.....	162
Table 2-51 Electricity Charge.....	162
Table 2-52 Telephone Charge.....	163
Table 2-53 Power Generator Fuel Cost.....	163
Table 2-54 Estimated Water Charge .....	163
Table 2-55 Estimated Building Maintenance Cost.....	164
Table 2-56 Estimated Annual Operation and Maintenance Costs.....	164
Table 2-57 Electricity Charge.....	165
Table 2-58 Telephone Charge.....	165
Table 2-59 Power Generator Fuel Cost.....	165
Table 2-60 Estimated Oxygen Gas Consumption Increased by the Project .....	166
Table 2-61 Estimated Building Maintenance Cost.....	166

Table 2-62 Estimated Equipment Purchase Cost.....	166
Table 2-63 Annual Maintenance Cost of Medical Equipment .....	167
Table 2-64 Record of User Fees.....	168
Table 2-65 Study of Incomes and Expenses Incurred by the Project.....	169
Chapter 3	
Table 3-1 Quantitative Indicators of the Project .....	176



## Abbreviations

### National MCH Programs

Abbreviation	Complete Name
NRHP	National Reproductive Health Program
NNP	National Nutrition Program
ARI-CDD-IMCI	National Program for Acute Respiratory Infection/Control of Diarrhea and Cholera/Integrated Management of Child Illness
NIP	National Immunization Program
PMTCT	National Program for Prevention Mother To Child Transmission

### General

Abbreviation	Complete Name
ADB	Asian Development Bank
AFD	Agence Française de Développement
AIDS	Acquired Immune Deficiency Syndrome
AusAID	Australian Agency for International Development
ALS	Average Length of Stay
AVR	Automatic Voltage Regulator
BEmOC	Basic Emergency Obstetric Care
BOR	Bed Occupancy Rate
BTC	Belgian Technical Cooperation
CCM	Country Coordinating Mechanism
CDC	Centers for Disease Control and Prevention
CDHS	Cambodia Demographic and Health Survey
CEmOC	Comprehensive Emergency Obstetric Care
CMDGs	Cambodia Millennium Development Goals
CPA	Complementary Package of Activities
CSL	Clinical Simulation Laboratory
CSES	Cambodia Socio-Economic Surveys
DFID	Department for International Development
DPT	Diphtheria, Pertussis, Tetanus
EmOC	Emergency Obstetrics Care
EPI	Expanded Immunization Program
EU	European Union
FTI	Fast Track Initiative
GAVI	The Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
GFATM	The Global Alliance for Vaccines and Immunization
H5N1	-
HC	Health Center
HCP	Health Coverage Plan
HISSP	Health Information System Strategic Plan
HIV	Human Immunodeficiency Virus
HP	Health Post
HRDD	Human Resource Development Department
HSP	Health Sector Strategic Plan

Abbreviation	Complete Name
HSSP	Health Sector Support Program
ICU	Intensive Care Unit
JICA	Japan International Cooperation Agency
LDC	Least Developed Countries
LDR	Labor Delivery Recovery
MMR	Maternal Mortality Rate
MOWRAM	Ministry of Water Resources and Meteorology
MVE	Manual Vacuum Extraction
NCU	Neo-natal Care Unit
NICU	Neo-natal Intensive Care Unit
NGO	Non-Governmental Organization
NMCHC	National Maternal and Child Health Center
NSDP	National Strategic Development Plan
NTP	National Tuberculosis Control Program
OD	Operational District
PBL	Problem Based Learning
PHD	Provincial Health Department
PPH	Post Partum Hemorrhage
PRH	Provincial Referral Hospital
RH	Referral Hospital
RTC	Regional Training Center
SBA	Skilled Birth Attendant
TBA	Traditional Birth Attendant
TOT	Training of Trainers
TSMC	Technical School for Medical Care
UHS	University of Health Science
UNDP	United Nations Development Programmed
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

## **Chapter 1. Background of the Project**

## CHAPTER 1. BACKGROUND OF THE PROJECT

### 1-1 Background of the Request

In Cambodia, the entire medical and health care system was seriously damaged during the civil war between the 1970s and 1980s. This was caused by the systematic genocide of medical human resources and serious deterioration of medical facilities and equipment.

After the civil war, donor support from a variety of countries enabled the country to improve its medical and health care system, which resulted in the significant improvement of the maternal mortality rate from 470/100,000 births in 2000, and to 206/100,000 births in 2010 (according to Cambodia Demographic and Health Survey, CDHS 2010). The maternal mortality rate is expected to accomplish the Cambodia Millennium Development Goal (CMDGs) of 250/100,000 births by 2015.

Although overall medical and health care services have significantly improved, the key indices of MCH care services, including the maternal mortality rate, need further improvement when compared to other neighboring countries. At the same time, Cambodia chronically suffers from shortages of physicians, nurses, midwives and other co-medical staff, in particular severe shortages of midwives in rural areas

Most maternal deaths are caused by severe bleeding or complication during the perinatal period, and ensuring the required number of the MCH staff and improving their clinical abilities to deal with those cases properly are therefore important to reduce the country's maternal mortality rate further.

The National Strategic Development Plan 2009-2013 (NSDP) focuses on the health sector as a priority mission, and the Health Sector Strategic Plan 2008-2005 (HSP2) lists MCH care service as one of the top-priority missions.

Japan had dispatched medical advisors to the MOH, Cambodia, from March 1992 to February 1995, and implemented a Grant Aid Project to construct the NMCHC in Phnom Penh to improve MCH care sector, which received little donor support at the time. NMCHC was the largest obstetric hospital in Cambodia and responsible for three functions concerning the country's MCH care services: "clinical care", "training" and "policy and administration (National MCH Programs)." Furthermore, the Government of Japan implemented Technical Cooperation Projects from 1995 to 2005 in order to enhance NMCHC's management and operation capabilities, training activities and the level of clinical care services (Technical Cooperation Project for Improving the Maternal and Child Health Service, Phase 1 and Phase 2).

Japan currently implements "The Project for Improving Maternal and Newborn Care through Midwifery Capacity Development (2010 to 2015)" as a succeeding Technical Cooperation Project, based in NMCHC to enhance the midwifery training system at regional referral hospitals and RTCs,

and to provide evidence-based, high-quality midwifery care services.

NMCHC has contributed to the qualitative and quantitative improvements of MCH care services in Cambodia, with the support of Technical Cooperation Projects.

Although the number of premature babies accepted at NCU increased from 979 in 2000 to 1,220 in 2009, the prematurity mortality rate was improved from 167 to 150. On the other hand, in unavoidable situations or due to some abnormality, the ratio of cesarean deliveries out of total deliveries increased from 9% in 2000 to 19% in 2009, therefore more advanced perinatal medical care services, including emergency obstetrics care, are required to cope with such situations

NMCHC's training facilities were originally designed to accept approximately 560 trainees a year at the time of construction in 1997, but currently accept more than 1,700 trainees a year in response to the increased training need for the country's MCH human resources. As more diversified, practical and longer training courses are required to respond to more advanced MCH care services (such as emergency obstetrics care), the NMCHC's current facilities face difficulties in providing the appropriate training programs, and expansion of its facilities are an urgent need.

Under such circumstances, the Government of Cambodia requested a Grant Aid Project for the "Project for Expansion of National Maternal and Child Health Center" in order to improve NMCHC's functions as a top clinical and training institution for MCH care services in Cambodia.

## 1-2 Outline of the Project

### 1) Overall goal

To improve the quality of MCH care services in Cambodia

### 2) Purpose of the Project

The Project aims to improve the quality of the NMCHC's perinatal care system by constructing a new Training Center, renovating the existing Center and providing medical and training equipment, and to enhance its function as a top obstetrics/gynecology referral hospital in Cambodia.

### 3) Expected outcomes

The Project will enhance NMCHC's capacity to accept patients and trainees.

### 4) Contents of the Project

The requests made to the Government of Japan:

In line with improving the quality of MCH care services in Cambodia, construction of a new Training Center and renovation work of the NMCHC's existing building will enable the facility to accept patients and trainees.

Key components are listed below:

- Facilities (applicable site area: 1,385 m<sup>2</sup>)

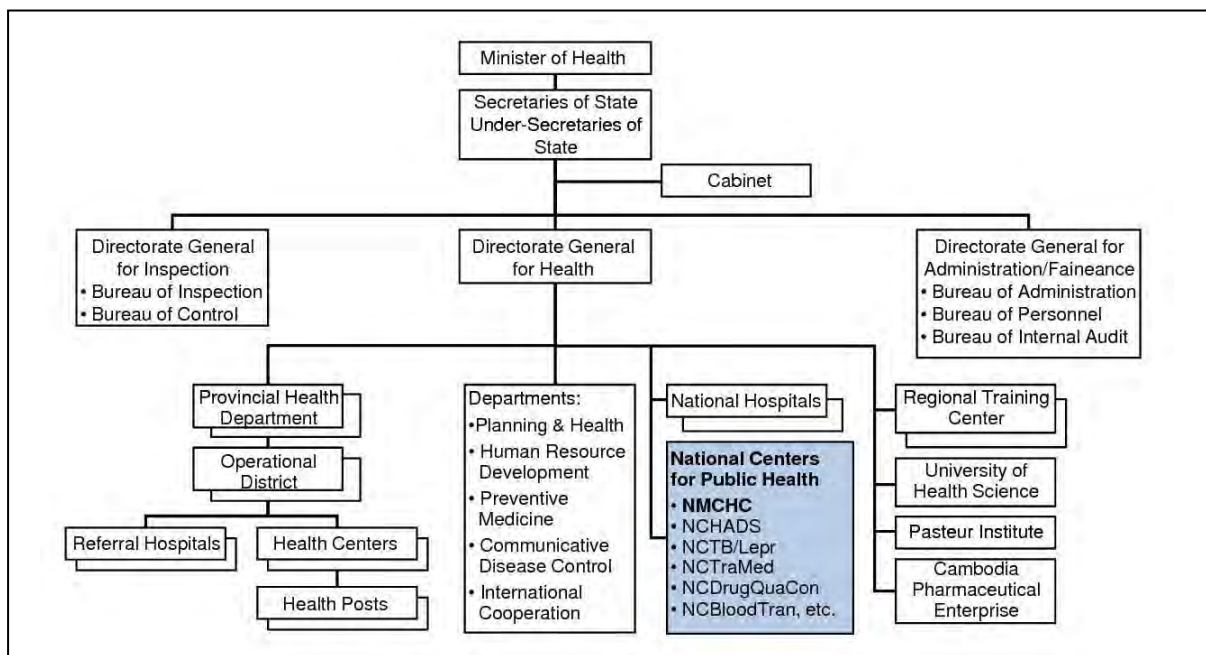
- Construction of a new Training Center (3,058 m<sup>2</sup>, five-story building)
- Renovation work of the existing Center
- Equipment

### 1-3 Implementation Organization of the Project

#### 1-3-1 Organization and Staffing

(1) Responsible Organization and Implementing Agency

MOH, Cambodia, is the organization responsible for the Project, and the NMCHC is the implementation agency for the Project respectively. Figure 1-1 shows the organization chart of MOH.

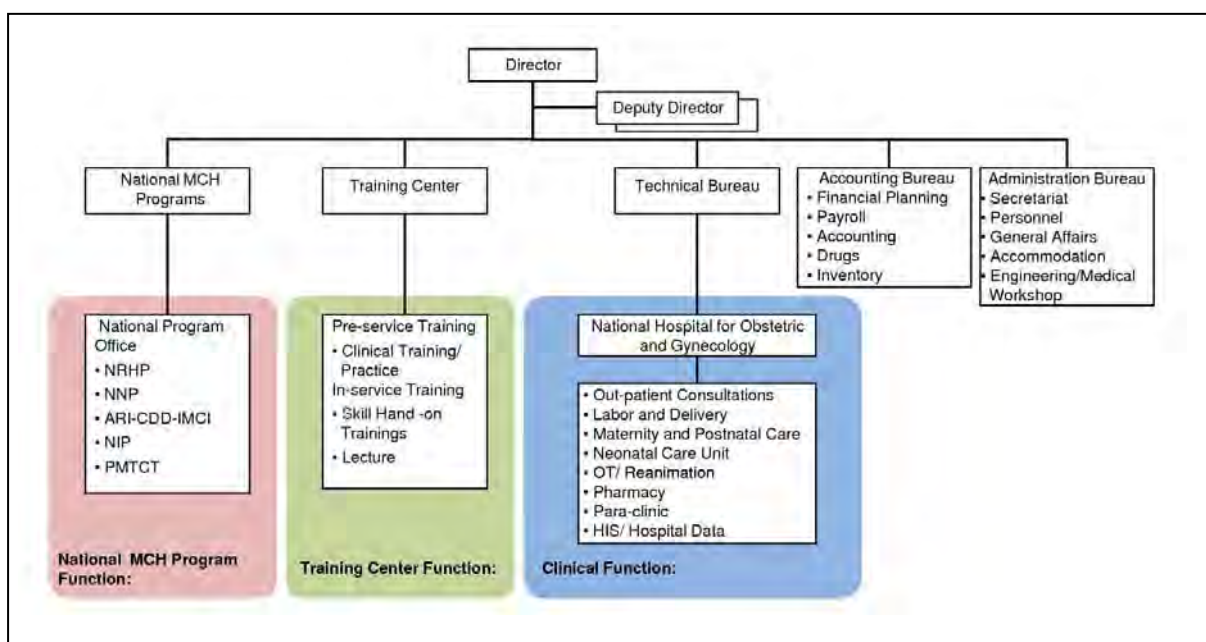


Source: MOH

**Figure 1-1 Organization Chart of MOH**

(2) Organization of NMCHC

Figure 1-2 shows the organization chart of NMCHC.



Source: NMCHC

**Figure 1-2 Organization Chart of NMCHC**

NMCHC's organization consists of a Technical Bureau (provides the clinical activities as the nation's top referral hospital), a Training Center (provides pre-service and in-service training programs to the country's MCH human resources), a National MCH Project Office (plans and manages the national MCH programs) as well as the Management Bureau and Accounting Bureau.

NMCHC's major functions in the framework of the country's MCH care services are:

- A top referral, obstetrics and gynecology hospital
- A top referral hospital with 24-hour obstetric and gynecological emergency medical services
- National training center to provide the pre-service and in-service MCH training programs
- National MCH Program offices
- National MCH research center of (including academic conference presentations and issuance of academic papers)

### (3) NMCHC's Staffing Allocation

NMCHC's organization represents the current three major functions and consists of clinical, training and policy and administrative functions as well as the Management Bureau and Accounting Bureau. Table 1-1 depicts the NMCHC's current and future staffing plans.

**Table 1-1 Staff Allocation of NMCHC**

Department	Specialty	Current		Planned (Year 2020)	
		Permanent	Contract	Permanent	Contract
	Director	1	-	1	-
	Deputy Director	3	-	5	-
Technical Bureau	Medical Doctors	72	-	75	-
	Assistant Medical Doctors	4	-	4	-
	Nurses (Primary & Secondary)	55	-	64	-
	Midwives (Primary & Secondary)	79	-	80	-
	Other Technical Staff	25	-	26	-
National MCH Program	Director	5	-	5	-
	Administrative Staff	63	29	70	26
Training Center	Chief of Center	0	-	1	-
	Administrative Staff	3	-	5	-
	Librarian	0	-	1	-
Administration Bureau	Head of Department	1	-	1	-
	Administrative Staff	10	88	12	90
	Internship Staff	6	-	0	-
	LWOP (without salary)	11	-	8	-
Account Bureau	Director	1	-	1	-
	Administrative Staff	11	11	11	15
Total		350	128	370	131
			478		501

Source: NMCHC



### 1-3-2 Status of Major Activities

#### (1) Status of Clinical Activities

Table 1-2 shows the chronological transactions of the major clinical activities at NMCHC. Although detailed clinical activity data in 1997 (when the Grant Aid project was launched) is not available, major activities (such as outpatients, inpatients, childbirths and cesarean delivery cases) significantly increased from 1997 to 2000. Since 2000, the number of patients in major activities has remained nearly constant, with only slight fluctuations from year to year. The number of outpatients has ranged from 65,000 to 80,000/year, inpatients from 8,000 to 9,000/year, and delivery from 6,000 to 7,500/year.

The population in Cambodia has been increasing at about 1.2%/year, and recently concentrated in the Phnom Penh Area. However, the number of patients at NMCHC has not increased as much as the total population increases in the area. This is because more options for normal childbirth deliveries have become available due to the increase of obstetrics wards at private clinics and public hospitals (such as Calmette Hospital) in the Phnom Penh Area, as well as the development of referral hospitals and Health Centers in the rural areas.

A Grand Aid Project by the Government of Japan (which provided in 1997 with NMCHC facilities and equipment), along with the subsequent Technical Cooperation Projects (which had been implemented from 1995 to 2005), has significantly contributed to the quantitative expansion and qualitative improvement of MCH care services at NMCHC.

**Table 1-2 Record of Major Clinical Activities of NMCHC**

Item	1997	2000	2005	2010	2011	2012
Total Outpatients	38,830	84,861	92,723	60,396	66,998	65,195
Prenatal Care	18,377	24,274	28,530	17,992	21,053	19,237
Gynecology	4,395	4,670	5,489	4,507	4,411	3,866
Family Planning	NA	2,404	1,716	1,398	1,218	1,067
Dental Treatment	NA	919	839	393	409	316
Vaccination	11,433	49,056	43,370	26,708	29,628	30,338
Emergency	NA	3,538	12,779	9,398	10,279	10,371
Total Inpatients	5,998	9,577	9,799	7,775	8,502	9,193
Obstetrics	NA	7,943	8,170	6,468	6,975	7,675
Gynecology	NA	1,634	1,629	1,307	1,527	1,518
Total Number of Inpatients days						
Obstetrics	NA	28,596	30,802	26,845	29,018	29,935
Gynecology	NA	9,396	8,945	7,412	7,835	7,379
BOR (%)						
Obstetrics	NA	75.33	81.14	70.72	76.44	78.86
Gynecology	NA	75.71	72.08	59.73	63.13	59.46
Delivery	3,783	7,236	7,470	5,912	6,380	6,912
Caesarean Section	432	654	857	1,319	1,632	1,707

Source: NMCHC

NMCHC's clinical activities will focus on qualitative improvements and provision of advanced perinatal care services to meet its role as the country's top referral, obstetrics/gynecology hospital rather than focus on the quantitative expansion.

(2) Status of Training Activities

Table 1-3 shows current training activities. NMCHC currently provides pre-service (before graduation) training programs for medical students at the University of Health Science (UHS) and other co-medical students at the Technical School for Medical Care (TSMC) in Phnom Penh, as well as in-service (after graduation) training programs for medical staff working on MCH care services in the provinces. The in-service training programs are further categorized into clinical training (such as emergency obstetrics care, etc.) and National MCH Program training.

Among the pre-service training programs, only clinical training for the general practitioner (GP) training program is provided at NMCHC and theoretical training is provided at UHS.

The number of trainees in both the pre-service and in-service training programs is increasing, and new training programs (emergency neonatal care and National MCH programs) are going to be introduced. Expansion of the training function is urgently required.

**Table 1-3 Current Training Programs**

Training Course	Year	2011	2012
<b>Pre-service Training</b>			
Medical Doctor (GP + Intern)		245	250
Medical Doctor (Specialty)		38	28
Midwife		100	151
Other Co-medical Staff		32	57
Pharmacist		57	70
Foreign Students		6	11
Sub-total		478	567
<b>In-service Training (Clinical Training)</b>			
Health Center Midwife Training (1 month)		59	60
Basic Emergency Obstetric Care (1 month)		40	39
Comprehensive Emergency Obstetric Care (3 months)		10	13
Partgram Training (3 days)		150	160
Manual Vacuum Extraction (3 days)		47	45
MgSO4 Training		62	10
Emergency Neo-natal Care Training		0	204
Training of Trainers, Emergency Obstetric Care		13	15
Sub-total		381	546
<b>In-service Training (National MCH Programs)</b>			
PMTCT Program		438	356
NNP Program		336	288
NRHP Program		144	144
Sub-total		918	788
<b>Total</b>		<b>1,777</b>	<b>1,901</b>

Source: NMCHC

(3) Status of Activities of the National Maternal and Child Health (MCH) Programs

The following five National MCH Programs are ongoing at NMCHC.

1) National Reproductive Health Program (NRHP)

The NRHP implements activities for improving living environments and preventing diseases and illnesses for the purpose of improving women's sexual and reproductive health and their right to sexual fulfillment. In addition to the formulation of clinical guidelines and policy for the Program of the MOH, the NMCHC office supports the assessment of need in applicable sectors, identification and procurement of equipment and materials essential to activities, promotion of training for improving the skills of trainers (TOT), provision of supportive supervision, monitoring and evaluations, and research.

2) National Nutrition Program (NNP)

In a similar fashion to the NRHP, NNP supports policy making and the formulation of nutrition improvement programs of the MOH, implementation and administration of the programs, creation and promotion of training opportunities for developing human resources of program trainers, and monitoring and evaluation of activities.

3) National Program for Acute Respiratory Infection/Control of Diarrhea Disease and Cholera/IMCI (ARI-CDD-IMCI)

To attain the overall improvement of child health, this office supports activities of the MOH in terms of the development of required programs/projects, supervision of implementation, monitoring and evaluation, as well as the creation of training opportunities required for improving the skills of related staff. It supports the processes for the fulfillment of behavioral changes in people (e.g. behavior that requires discipline such as washing hands) that were introduced as preventive measures against childhood illnesses (oral fluid replacement therapy required for curing major illnesses including pneumonia and diarrhea) covered by the IMCI framework. In addition it supports the identification of details concerning standard medical care packages required at a minimum as specified by CPA guidelines.

4) National Immunization Program (NIP)

This Program is designed to block (curb) disease epidemics and illnesses that can be prevented by vaccination. It supports the MOH in terms of organizing the rolling out of the Program, arranging logistics, monitoring and evaluating immunization activities and providing supervision.

5) National Program for Prevention Mother To Child Transmission (PMTCT)

This Program is designed to prevent mother-to-child transmissions of HIV/AIDS. To achieve this, it supports periodical HIV testing, identification of HIV-infected pregnant women, encouragement of infected woman to participate in the PMTCT Program as well as provision of antiretroviral therapies effective for both prevention and therapy, and the facilitation of safe breast-feeding methods for their newborns.

### 1-3-3 Financial Status and Budget

#### (1) Budgetary Allocations of NMCHC

Table 1-4 shows NMCHC's income and expenditures in the last five years (from 2008 to 2012). The income consists of three revenue sources: government (MOH) budget, clinical service fees and tenant fees from parking lots and the Canteen. Although the government budget stays the almost same amount, service fees are gradually increasing. Each item of the expenditures is classified by two revenue sources (government budget and service fees). The government budget is basically allocated to staff salaries, purchase of drug/medical supplies, administrative cost and others; service fees are allocated to incentives for staff, others and purchase of medical equipment.

Total income in 2012 is US\$ 3,646,200, of which the government budget occupies 75%, service fees occupy 24%, and tenant fees occupy the rest. The government budget has remained almost the same level in the last five years, and the increase in expenditures has been covered by the service fees. It is therefore important to secure service fees as an alternative, stable revenue resource.

Total expenditures in 2012 are approximately US\$ 3,652,400. Salary of staff occupies 20% of the government budget revenue, purchase of drug/medical supplies occupies 40%, others occupy 30% and maintenance costs occupy the rest. Incentives for staff occupy 60% of user fee revenue, purchase of drug/medical supplies and other expenditures occupy the rest. "The Others" item consists of government subsidized grants for exempted patients, vehicle maintenance cost and fuel costs, purchase of medical gas, purchase of ingredients for inpatient meals, staff uniforms and staff travel expenses, etc.

Currently, there is no medical equipment maintained under a maintenance service agreement with a medical equipment agent.

**Table 1-4 Income and Expenditures of NMCHC**

(Unit: US Dollars, US\$1 = 4,000 Riel)

	2008	2009	2010	2011	2012	
Incomes	Government Budget	2,644,829	2,542,515	2,808,403	2,630,189	2,762,772
	User Fees	545,636	578,566	484,316	762,015	870,464
	Others (Car parking, canteen)	13,695	11,156	12,446	12,483	13,054
	<b>Total Income</b>	<b>3,204,160</b>	<b>3,132,237</b>	<b>3,305,165</b>	<b>3,404,687</b>	<b>3,646,290</b>
	User Fees / Total (%)	17.03	18.47	14.65	22.38	23.87

	2008	2009	2010	2011	2012	
Expenditures	Operation of NMCHC					
	Government Staff (G)	339,732	383,541	410,330	428,670	485,465
	Contract Staff (U)	6,084	10,335	9,808	16,842	6,261
	Incentive for Staff (G)	90,293	87,695	74,634	67,657	74,076
	Incentive for Staff (U)	327,395	347,140	290,589	457,211	522,278
	Drugs / Medical supplies (G)	807,307	775,967	1,086,363	1,085,569	981,535
	Drugs / Medical supplies (U)	24,644	78,312	23,414	25,554	43,039
	Administrative costs (G)	63,525	66,023	206,004	47,506	120,050
	Administrative costs (U)	63,525	21,374	123,525	22,104	30,386
	Others (G)	834,018	794,828	668,409	737,972	818,827
	Others (U)	61,511	106,397	46,945	61,806	169,589
	Others (Car parking, etc.)	11,253	8,051	9,493	9,337	9,715
	Maintenance					
	Lighting & heating (G)	324,631	232,731	226,535	224,571	228,825
	Lighting & heating (U)	494	0	0	0	0
	Facilities (G)	134,910	86,923	99,363	0	0
	Facilities (U)	0	929	335	525	429
	Purchase of Equipment (G)	50,413	114,808	35,138	35,410	0
	Purchase of Equipment (U)	58,021	96,955	71,839	49,313	104,313
	Equipment Maintenance (G)	0	0	1,628	2,835	53,994
	Equipment Maintenance (U)	5,089	4,277	2,753	7,033	3,652
	<b>Total Expenditures</b>	<b>3,202,845</b>	<b>3,216,286</b>	<b>3,387,105</b>	<b>3,279,915</b>	<b>3,652,434</b>

Remarks: (G) : allocated by Government budget, (U) : allocated by user fees.

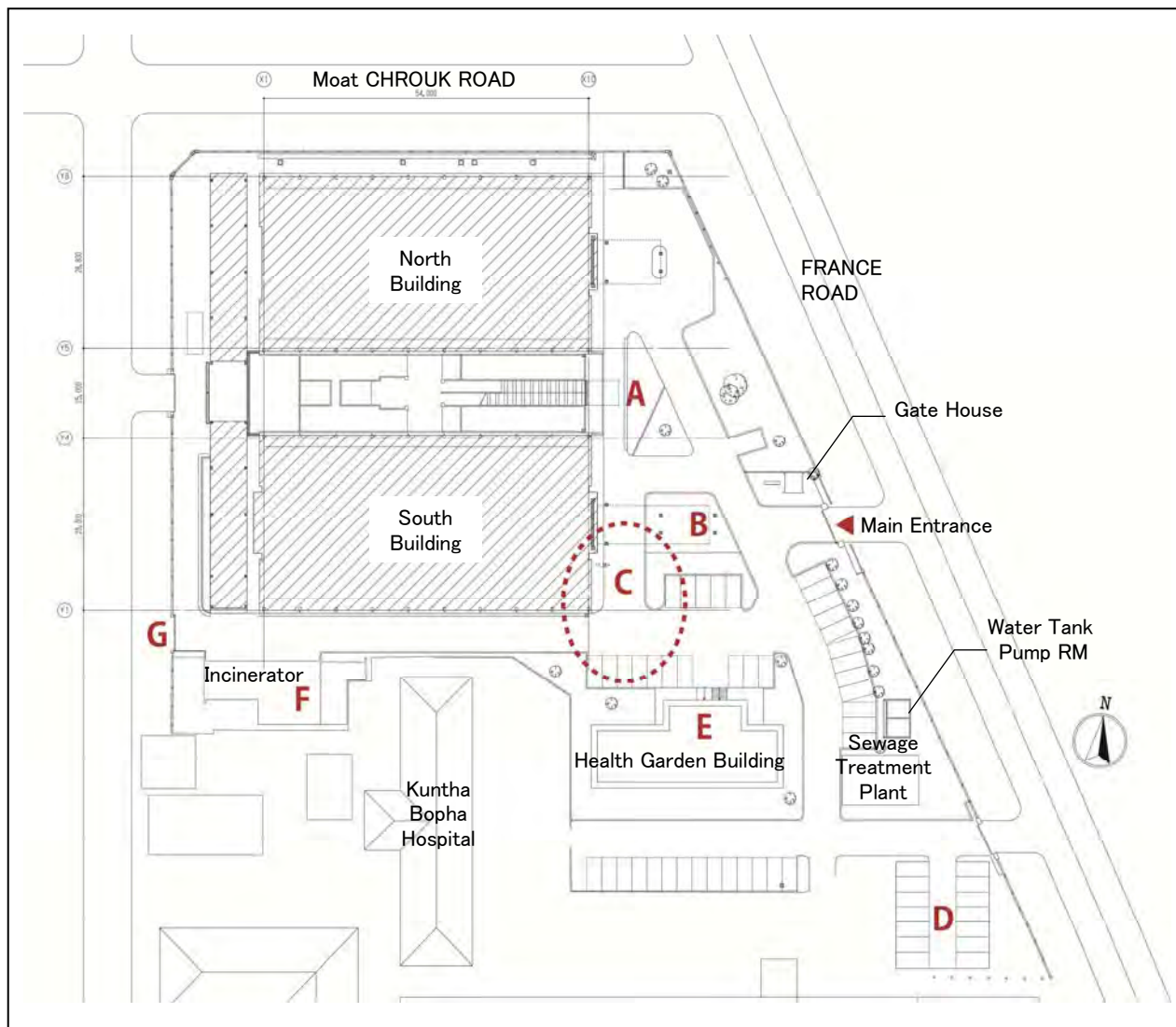
Source: NMCHC

### 1-3-4 Status of Existing Facilities and Equipment

#### (1) Status of Existing Facilities

##### 1) Utilization of the existing NMCHC premises

Since the start of NMCHC services in 1997, facilities have been added to the premises with the funds of Japan's Technical Cooperation Projects and Cambodia's own funds, etc.



Source: Survey Team

**Figure 1-3 Current Situation of Project Site at NMCHC**

Photos of utilization of existing premises



**A:** Access to ramp from ambulance



**B:** Main access to Outpatient Service Department



**C:** Staircase in the South Wing as a junction to the new training center building



**D:** Parking lot on the premises partially utilized by neighboring Kantha Bopha Hospital



**E:** Health Garden Building constructed with the funds of Japan and Cambodia in 2004



**F:** Garbage truck gate constructed with the hospital's



**G:** Incinerator/storehouse modified by Japan's technical assistance in 2001

(2) Current Situation of NMCHC

1) First floor plan

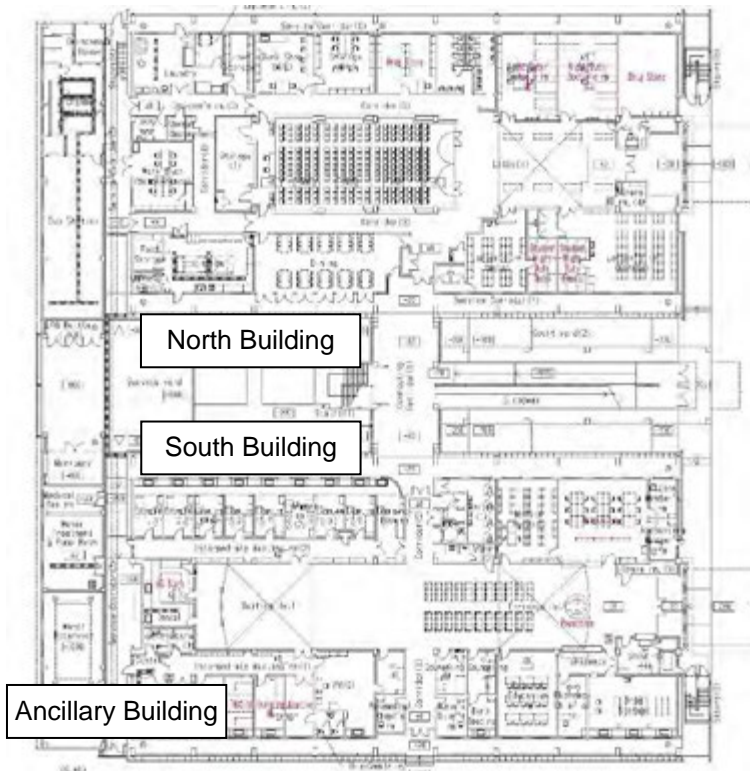


Figure 1-4 1FL Plan, Existing Center

Table 1-5 Space Programs, Existing Center

Current Space Program					
Floor	Section	Room Name	RM Area (sqm)	No. of Room	Area (sqm)
1F North	Administrative 1058.00	Night Duty (M)	51.00	1	51.00
		Night Duty (F)	51.00	2	102.00
		Drug Store	48.00	1	48.00
		Locker RM (F)	82.00	2	164.00
		Locker RM (M)	34.00	1	34.00
		Student Night Duty	21.00	2	42.00
		Storage	36.00	2	72.00
		Storage	40.00	1	40.00
		M/E Workshop	36.00	1	36.00
		Maintenance Workshop	57.00	1	57.00
		Laundry/Linen Store	72.00	1	72.00
		Auditorium	178.00	1	178.00
		Kitchen	72.00	1	72.00
Dining	90.00	1	90.00		
1F South	Out-patient 780.00	Accounting Office	116.00	1	116.00
		Medical Record	51.00	1	51.00
		Emergency Examination	21.00	1	21.00
		Examination RM	18.00	7	126.00
		Treatment RM	18.00	1	18.00
		VCC for Motehr/Child	20.00	1	20.00
		Dental Examination	15.00	1	15.00
		X-ray RM	65.00	1	65.00
		Ultrasound Test RM	36.00	1	36.00
		Counseling RM	18.00	1	18.00
		Abortion Treatment RM	18.00	1	18.00
		PMTCT Program	59.00	1	59.00
		Drug Storage	102.00	1	102.00
Patient Education RM	51.00	1	51.00		
Counseling RM	14.00	2	28.00		
Management Office	12.00	3	36.00		

The typical floor size of NMCHC’s existing building is approximately 28.8 by 54.0 meters, and consists of a central portion (where corridors, toilets and halls are located) and two outside portions (where functional rooms are located).

• North Building

The center portion includes the Auditorium (approx. 220 seats), store and Maintenance Workshop, and the upper portion includes Night-duty Rooms, Drug Store, M/E Worship and Laundry; the lower portion includes Locker Rooms, Student Night-duty Rooms, Dining and Kitchen. A corridor between the Auditorium and Dining is used as storage space for books related to the National MCH programs. The Entrance Hall is also used as storage space for those books. Storage space is generally insufficient.

• South Building

The central portion includes the Entrance Hall and Waiting Space, and the upper portion includes Accounting Office, Examination Rooms and Emergency Room; the lower portion includes Pharmacy, Counseling Room, Patient Education Room, X-ray Room and Ultrasound Room. PMTCT office is also located in this portion; the Outpatient Department is occupied by other functions.

• Ancillary Machine Building

Sub-station, Water Treatment & Pump Room, Water Reservoir Room and other utility rooms are located in the Ancillary Building. These rooms are generally maintained well.



2) Second floor plan



Figure 1-5 2FL Plan, Existing Center

Table 1-6 Space Programs, Existing Center

Current Space Program					
Floor	Section	Room Name	RM Area (sqm)	No. of Room	Area (sqm)
2F North	Central Diagnosis 537.00	Operation Theater	36.00	3	108.00
		CSSD	89.00	1	89.00
		Conference RM	14.00	1	14.00
		Utility RM	8.00	1	8.00
		Changing RM	14.00	2	28.00
		Nurse Station	9.00	1	9.00
		Delivery RM	40.00	2	80.00
		Delivery RM (Infectious)	18.00	1	18.00
		LDR	40.00	1	40.00
		NCU-A	40.00	1	40.00
		NCU-B	42.00	1	42.00
		Solid Utility	10.00	1	10.00
		Changing RM	9.00	1	9.00
		Nurse Station	12.00	1	12.00
	Night Duty	15.00	2	30.00	
	Ward A (Gynecology) 387.00	ICU	46.00	1	46.00
		Recovery RM	46.00	1	46.00
Ward (8-bed)		46.00	4	184.00	
Ward (1-bed)		18.00	2	36.00	
Nurse Station		29.00	1	29.00	
Treatment RM		14.00	2	28.00	
Linen Store	18.00	1	18.00		
2F South	Ward B 405.00	Ward (8-bed)	46.00	5	230.00
		Ward (4-bed)	46.00	1	46.00
		Ward (2-bed)	18.00	1	18.00
		Ward (1-bed)	18.00	2	36.00
		Nurse Station	29.00	1	29.00
		Treatment RM	14.00	2	28.00
	Linen Store	18.00	1	18.00	
	Ward C 405.00	Ward (8-bed)	46.00	6	276.00
		Ward (2-bed)	18.00	1	18.00
		Ward (1-bed)	18.00	2	36.00
Nurse Station		29.00	1	29.00	
Treatment RM	14.00	2	28.00		
Linen Store	18.00	1	18.00		

- North Building

The center portion includes the BOH (back of house) of Operation and Delivery departments (such as Changing Room and Anterooms), Nurse Station and toilet. The upper portion includes Gynecology Ward rooms, ICU, three Delivery Rooms and NCU-1. The lower portion includes three Operation Rooms, CSSD (central sterile supply department) and Gynecology Ward Rooms.

Operation and Delivery rooms are generally maintained well and operated based on the Original Design.

- South Building

The center portion includes two Obstetrics Ward’s Nurse Stations, toilets and void space connecting 1FL to 3FL, which enables natural lighting and ventilation to rooms on 1FL.

Currently this portion is operated as one nursing-unit, a 100-bed total Obstetrics Ward.

An outside stair case and a slope are projected from the corridor (covered by roof) connecting both buildings; patients and staff usually use those routes to access to upper floors. The slope has a gentle pitched floor (approx. 1/12), enabling stretcher’s access to the second floor, but it is not extended to the third floor.

3) Third floor plan

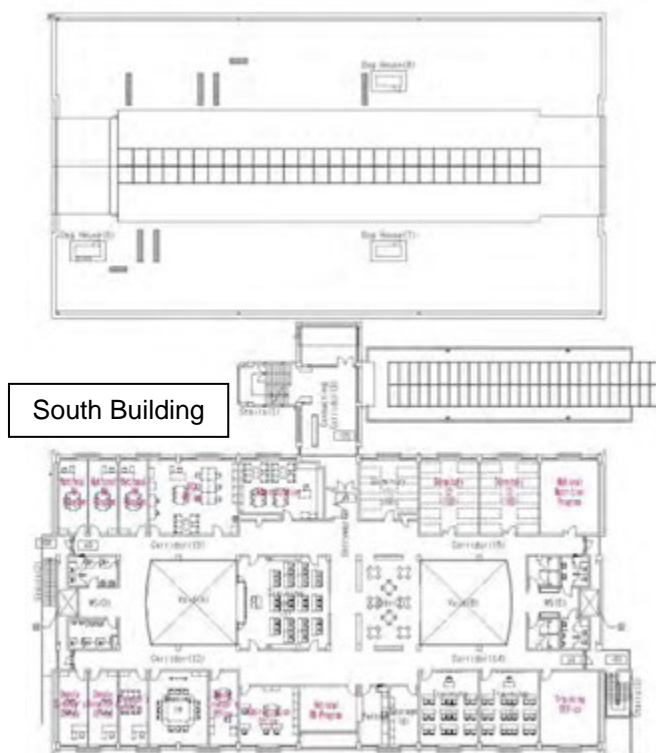


Figure 1-6 3FL Plan, Existing Center

Table 1-7 Space Programs, Existing Center

Current Space Program					
Floor	Section	Room Name	RM Area (sqm)	No. of Room	Area (sqm)
3F South	Training	Training RM (40 seat)	85.00	1	85.00
		Training RM (20 seat)	46.00	2	92.00
	Dormitory	Dormitory (M: 10 bed)	46.00	1	46.00
		Dormitory (F: 10 bed)	46.00	1	46.00
		Dormitory ( F: 6 bed)	36.00	1	36.00
	Management	Director RM	23.00	1	23.00
		Dpy Director RM	23.00	3	69.00
		Administrative Office-1	56.00	1	56.00
		Administrative Office-2	36.00	1	36.00
	National Progra	Meeting RM	46.00	1	46.00
		NRH Program	23.00	3	69.00
		IMCI (ARI)	30.00	1	30.00
		NNP	46.00	1	46.00
		Training Unit Office	46.00	1	46.00
		JICA Expert Office	69.00	1	69.00

- South Building

The central portion includes the Lecture Room (40-seat) and toilets. The upper portion includes two Dormitory Rooms, NNP Office, NRHP Office, JICA Technical Cooperation’s Expert Room. The lower portion includes the Training Unit Office, two Lecture Rooms (20-seat), Management Office, Director and Deputy Director Rooms.

A Lounge on the lower portion was converted to the ARI-CDD-IMCI Office.

There was no plan to include the National MCH Program Office on the third floor in the Original Design. As five National MCH Program Offices have been gradually added on the third floor, rooms used for training and management functions have been transferred to those program offices; consequently training functions are now significantly limited.

The total NET area for the training function used to be 279 m<sup>2</sup> in the Original Design has been significantly reduced to 177 m<sup>2</sup>; the Dormitory has been reduced from 174 m<sup>2</sup> to 92 m<sup>2</sup>, and office rooms have been reduced from 312 m<sup>2</sup> to 266 m<sup>2</sup>.

Status of NMCHC's existing facilities

Photos of the utilization of existing facilities - 1



Doctor's Night Duty Room



Brochures in the Entrance Hall on the first floor of the North Building



Brochures in the Corridor next to the Auditorium



PMTCT Office on the first floor of the South Building



Wall installed to renovate NCU-B on the second floor of the North Building



A lining wall installed in the NCU-B



A renovated 4-bed room on the second floor of the South Building



Cubicle space of the 4-bed room

Photos of the utilization of existing facilities - 2



Storage (Dormitory) on the third floor of the South Building



Management Office (Library)



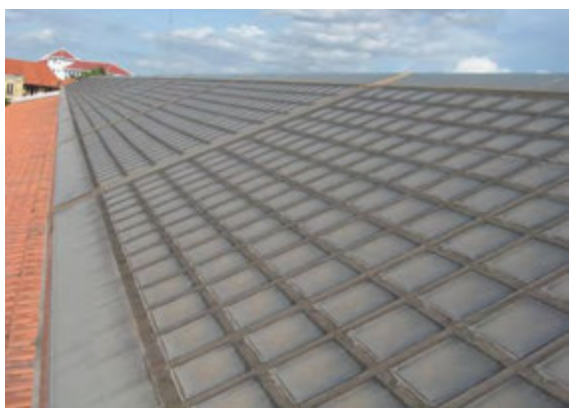
Wall installed in the lounge to make Office Room



Inside ARI-CDD-IMCI Office on the third floor of the South Building



NNP Office on the third floor of the South Building



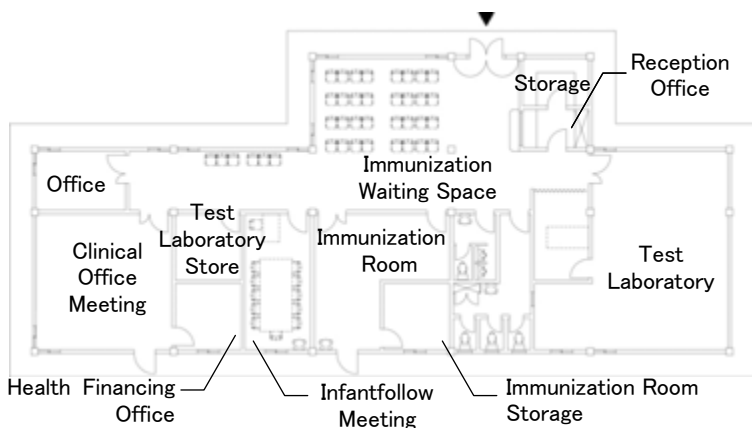
Glass block skylight



Glass block skylight

(3) Health Garden Building

This is a one-story brick building that was jointly funded by Japan’s Technical Cooperation Project and Cambodia in 2004. It is currently utilized as a Test Laboratory for the Outpatient Service Department, an immunization room, a physician’s meeting room as well as other functions.



Room Name	Floor Area (m <sup>2</sup> )	Number	Total Floor Area (m <sup>2</sup> )
Test Laboratory	60.00	1	60.00
Storage	6.60	1	6.60
Immunization Room	27.00	1	27.00
Immunization Room Storage	9.00	1	9.00
Reception Office	5.40	1	5.40
Office	10.80	1	10.80
Clinical Office Meeting	30.00	1	30.00
Test Laboratory Storage	9.00	1	9.00
Health Financing Office	9.00	1	9.00
Infantfollow Meeting	18.00	1	18.00
Immunization Waiting Space	87.50	1	87.50
Male WC	6.00	1	6.00
Female WC	15.00	2	30.00
<b>Total</b>			<b>308.30</b>

Figure 1-7 Health Garden Building Plan



Appearance of Health Garden Building



Immunization waiting space



Clinical Test Laboratory



Clinical Test Laboratory

(4) Status of Existing Medical Equipment

More than half of the equipment available at NMCHC has been in service for over 15 years since its installation in 1997. The equipment is repaired and maintained by engineers working for the hospital and replacement parts are purchased from the hospital budget to repair the equipment. The fully depreciated equipment was found in good condition, which is evidence of the high skill level of local engineers and excellent equipment management capabilities. The availability of the major equipment owned by each department is described below.

1) Outpatient

Medical service activities are performed including obstetrics & gynecology and emergency outpatients. The major equipment includes a Doppler fetus detector, a colposcope, and an examination light. Medical service activities are frequently interrupted by the malfunction of the Doppler fetus detector or burnout of the examination light required for the examination of patients.



Doppler fetus detector



Examination light

2) Diagnostic Imaging Department

The Radiology Department has one general X-ray unit and two mammography (one of them is out of order) available, and the Sonography Department has three sonography systems available. The general X-ray unit has been in service without any major maintenance service since installation in 1997, but can no longer receive maintenance service because the manufacturer of the system was bankrupted. Two ultrasound machines were purchased with private funds in 2012.



General X-ray



Ultrasound machine

3) Laboratory Department

The Laboratory owns a hematology analyzer, a biochemical tester, a centrifuge for hematocrit and a microscope.



Hematology analyzer



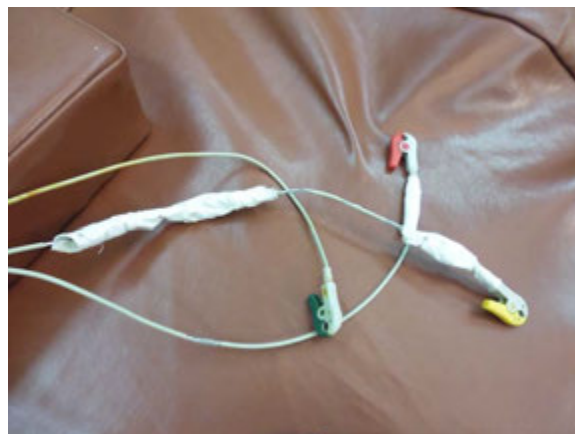
Centrifuge for hematocrit

4) Surgery Department (operating room/ICU/recovery room)

Installed equipment includes anesthesia apparatuses, operation lights, patient monitors, electro surgical units, infant warmers and phototherapy units. The equipment is well maintained without any burnout of the surgical lights. The LED type phototherapy units were provided by another donor. Some wear and damage were found in the patient monitors and other similar frequently-used equipment.



Suction pump



Patient monitor cables

5) Delivery Room

Three delivery rooms are equipped with overhead lights for delivery, while the LDR room is equipped with small examination lights. Frequently used fetus acto cardiograph and fetus detectors have aged.

6) NCU Department

A large amount of neonatal care equipment is used. Some of the equipment was provided under the Technical Cooperation Projects.



Infant warmer



Phototherapy unit



7) Laundry room

The washing machine and spinning machine in the laundry room were installed in 1997. They are over 15 years old and there is concern that their mechanical parts may break down. The spinning machine has been in an irreparable state due to its worn mechanical brake for the past two years. The drum, consequently, needs to be manually stopped after stopping the motor and it poses a safety hazard.



Washing machine



Dryer

## 1-4 Condition of the Project Site and Surrounding Area

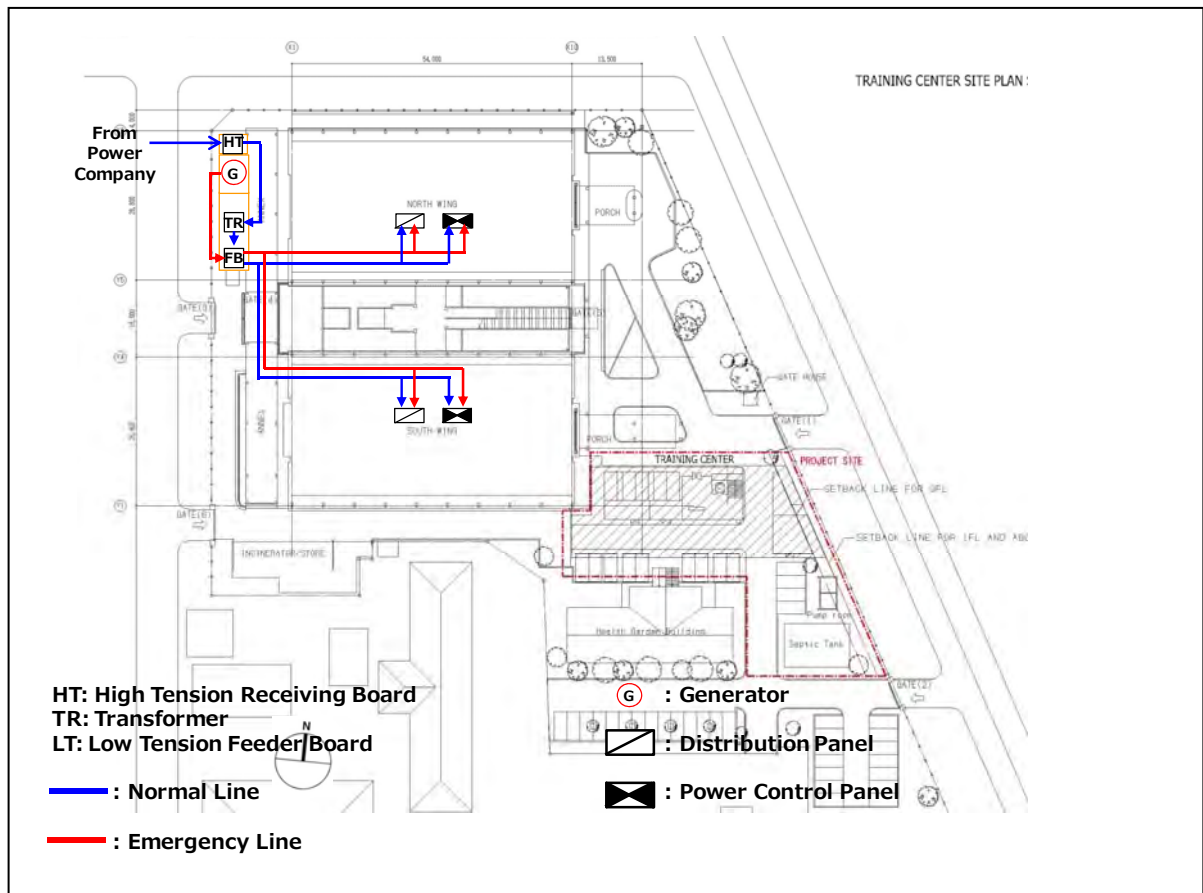
### 1-4-1 Infrastructure Condition of the Project Site

#### (1) Power Supply

According to NMCHC’s Engineering/Medical Workshop staff and the electric power company (EDC: Electricité du Cambodge), the receiving voltage was increased from 15kV (the original voltage at time of completion of the existing Center) to 22kV. This change improved the stability of the electric power supply.

This high tension electricity line is connected to the transformers in the Substation Room via the Gas Circuit Breaker (GCB). Two transformers (three-phase three-wire, 22kV, 50Hz and three-phase four-wire, 380-220V, 50Hz) are used and each of them has a capacity of 500kVA. The total capacity is 1,000kVA. These transformers transform high tension electricity into low tension electricity (three-phase four-wire, 380-220V, 50Hz) and supply electricity to loads on the premises.

Lately, blackouts occur a few times a month in Phnom Penh, though each blackout does not last so long. The frequency and voltage of high tension electricity supplied by the electric power company are stable.

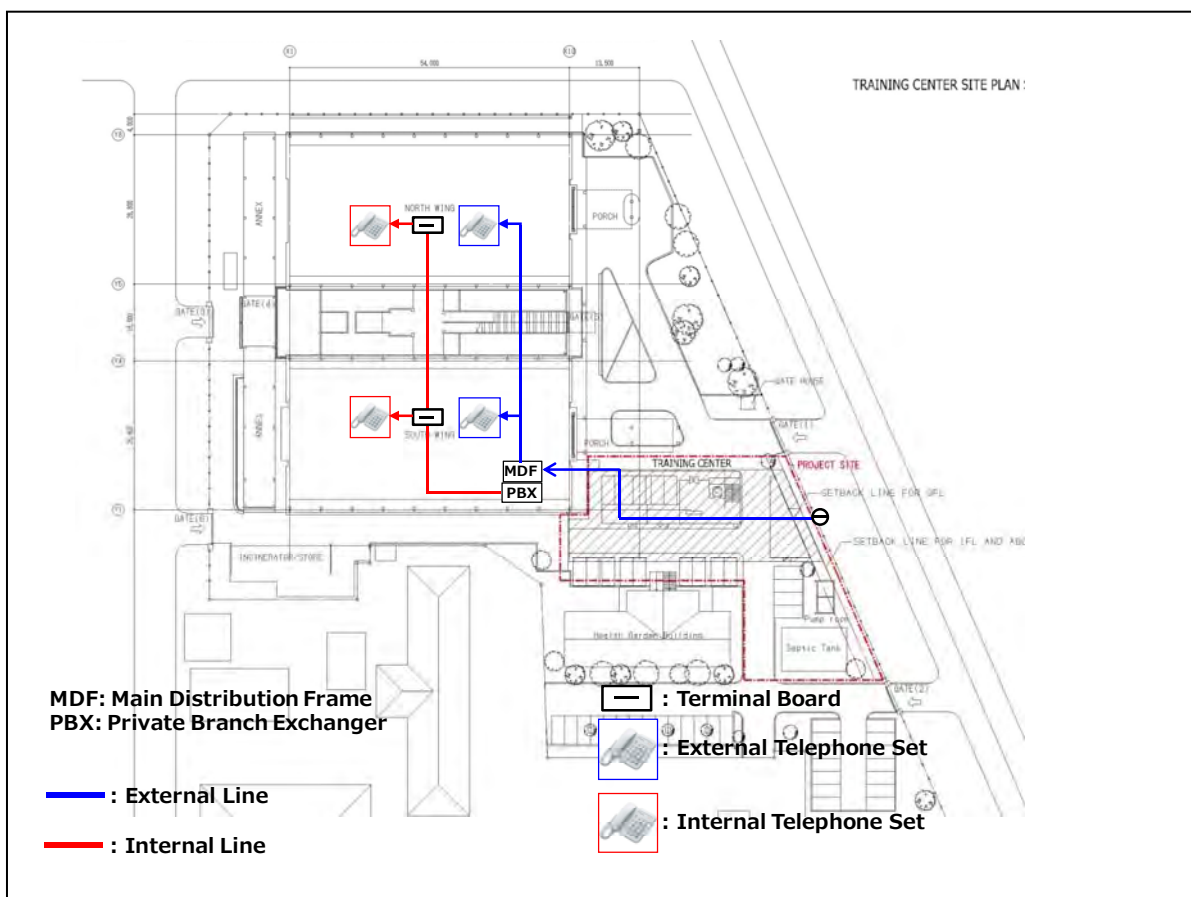


Source: Survey Team

Figure 1-8 Current Electric Utility Situation, Plan in the Site

(2) Telecommunication

Currently NMCHC uses metal cable and optical cable for telephone lines and LAN from a public telecommunication network of the telephone company. These cables are led in from the east side of the premises through an underground conduit and connected to a Main Distribution Frame (MDF) in the Security Room. There are approximately 12 telephone lines for external calls at NMCHC and the metal cable for external calls is directly connected to the external call telephones via MDF. CATV is used for watching TV.



Source: Survey Team

Figure 1-9 Current Electric Utility Situation, Plan in the Site

(3) City Water Supply

City water in Phnom Penh Municipality is managed by Phnom Penh Water Supply Authority. A city water main line of  $\phi 200$ -diameter is covered 1,200mm underground along the road in front of the east side of the NMCHC site, and is branched and led in with a pipe of  $\phi 100$ -diameter to the existing Center. The  $\phi 100$  pipe is capable of supplying a maximum  $2,400\text{mm}^3$  per day.

The water main line can ensure an average supply pressure of  $2.5\text{kgf/cm}^2$  and holds sufficient water pressure. Scheduled water supply cutoffs take place twice a year and each cutoff lasts two hours from 8:30 to 10:30. The cutoff is announced by Phnom Penh Water Supply Authority in advance and the existing Center maintains its services without any problems. Those are the only water supply cutoffs by Phnom Penh Water Supply Authority. The water supply system of Phnom Penh

Water Supply Authority uses a gravity-feed type elevated tank, and water supply is cut off when the power feed to a lifting pump is cut off during a blackout.

Phnom Penh Water Supply Authority applies a water quality standard based on the standards introduced in Japan and Cambodia's own standard in accordance with WHO, and virtually controls the water quality in accordance with WHO and other non-WHO requirements as per the Japanese standard. In light of these facts, the city water infrastructure around the premises may be deemed as satisfactory.

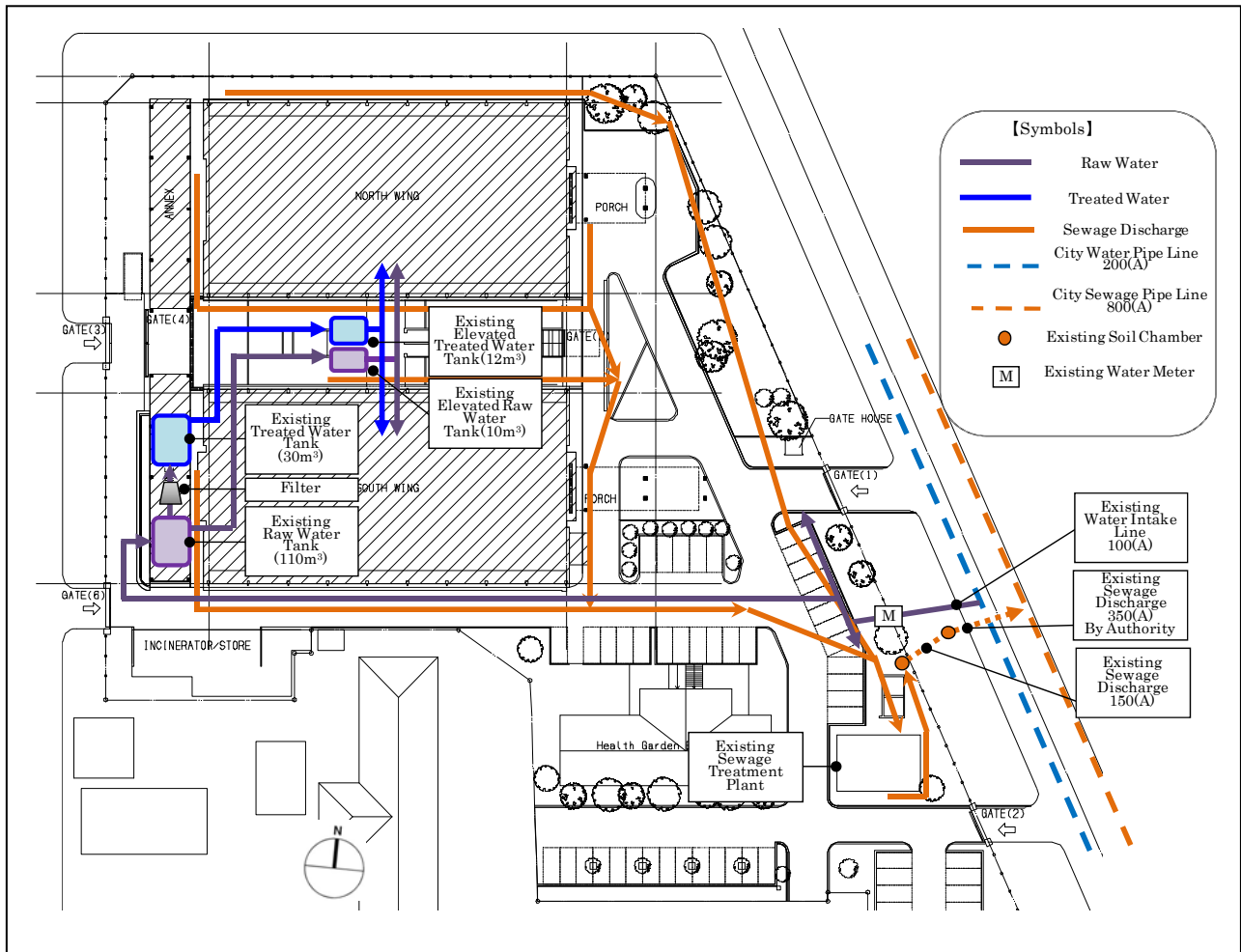
(4) Drainage System

The sewer system in Phnom Penh Municipality is managed by Phnom Penh Ministry of Public Works and Transport. A  $\phi 800$ -diameter city sewage main line is laid underneath the road in front of the east side of the NMCHC premises, and conveys both wastewater and rainwater. The Public Works installed its catch basins at every 25 to 30 meter as standard specifications not only on the NMCHC premises but also in the surrounding areas. Wastewater and rainwater from individual premises are connected to the aforementioned soil chambers and catch basins and release to the sewage main line.

The Public Works installed  $\phi 350$ -diameter connection pipes from the final soil chambers to the sewage main line as a standard installation. A  $\phi 150$ -diameter pipe is used to release wastewater and to connect between the sewage treatment plant and the aforementioned soil chamber, and the rainwater is released to the five catch basins of the Public Works.

Since completion of the existing Center, there has never been a situation of being unable to discharge sewage water. The Phnom Penh Ministry of Public Works had no regulation to specify the quality of wastewater, but gives instructions to avoid releasing acid wastewater.

As stated above, the sewage system around the premises may be deemed as satisfactory.



Source: Survey Team

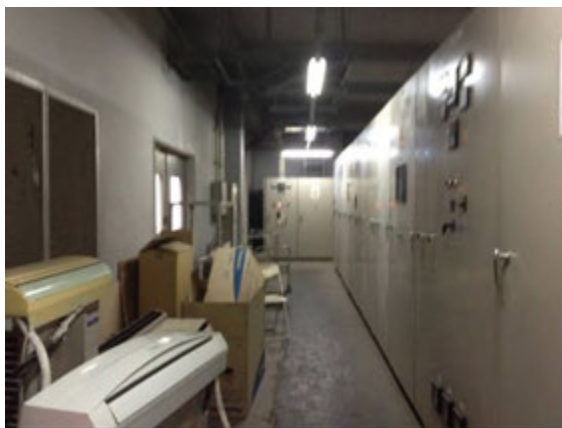
**Figure 1-10 Existing City Water and City Sewage Infrastructure in and around the Site**

## 1-4-2 Current Conditions of Electrical and Mechanical Facilities at Existing NMCHC

### (1) Power Supply

The existing Center receives high tension electricity (three-phase three-wire, 22kV, 50 Hz) from the power grid owned by the EDC and this high tension electricity is connected to the transformers in the Substation Room via Gas Circuit Breakers (GCB). The power receiving and transforming facilities including the transformers have been in service since the completion of the existing Center, and do not have any serious failures or defects. Maintenance activities such as the recording of each meter are diligently performed. The Substation Room is thoroughly cleaned and the electricity supply facilities on the premises appear to be stable. When the battery system for supplying power to emergency lights, etc. in the event of blackout were updated recently, there was an insufficient voltage warning and the cause thereof is still unknown.

Through discussions with the facility manager, it was found that electricity consumption of the existing hospital is approximately 3,000 kWh a day, and that the maximum demand of electricity is 200 kW.



Substation room



Low tension feeder board  
(electricity measurement underway)

### (2) Generator

Since the completion of construction, three diesel-engine emergency generators have been prepared in the Generator room in the event of a blackout at the existing NMCHC. Two of the generators have a capacity of 100kVA and the other has a capacity of 75kVA. To store fuel, a 1,000-liter service tank and a 10,000-liter underground tank are available.

All of the three power generators are in standby mode and can last for a significant time, as the accumulated operation time of generators No. 1 and No. 2 is approximately 6,800 hours, and that of generator No. 3 is 23,000 hours. In addition, regular inspections are conducted and recorded daily. Through discussions with the facility manager, it was found that fuel consumption of the existing hospital is approximately 100 liters a month.

### (3) Telecommunication & LAN

Currently NMCHC uses metal cable and optical cable for telephone lines and LAN from a public telecommunication network of the telephone company. These cables are led in from the east side of the premises through an underground conduit and connected to a main distribution frame (MDF) in the Security Room. The on-site survey found that there were approximately 12 telephone lines for external calls at NMCHC, and there is a private branch exchanger (PBX) with a capacity of 120 extension lines in the Security Room. The PBX is properly functioning, and the telephone numbers list is available with controlled settings.



MDF and alarm board in the Security Room



Existing private branch exchanger

### (4) Water Supply

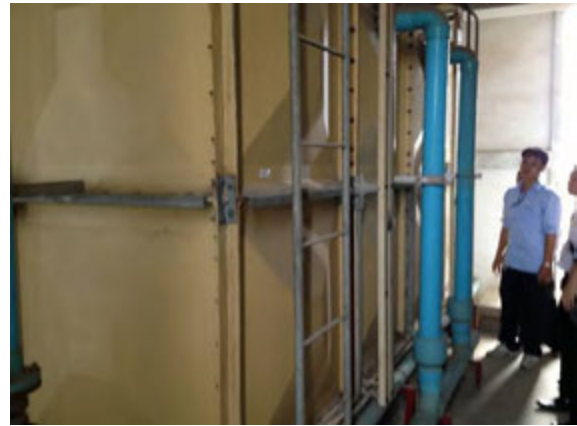
After branching and leading in from the water supply main line, city water is reserved in the underground pit city water reception tank (110m<sup>3</sup>) in the utility room in the Annex. Water for miscellaneous use is directly pumped up to the FRP elevated water tank (12m<sup>3</sup>) to supply water for cleaning washrooms and for sprinklers outside. City water has some odor and color so a filtration system is installed. Only filtered water is reserved as clean water in the FRP panel type single-plate water reception tank (30m<sup>3</sup>) and pumped up to the FRP elevated clean water tank (10 m<sup>3</sup>) for supplying general use water.

Through discussions with the facility manager, it was found that the NMCHC's existing city water reception tank had approximately the same capacity as the daily water supply volume, revealing that the city water receiving tank of the existing hospital had no extra capacity. In the meantime, well water supply piping was installed for backup use but well water is no longer used due to the higher stability of city water.

The maintenance status is deemed satisfactory. If there is water leakage from the FRP water tank, the staff repairs this by themselves to maintain the equipment.



City water reception tank



Elevated water tank

#### (5) Drainage System

Wastewater is discharged through a combined system of sewage (soiled water) and general wastewater. The combined wastewater is treated in an existing sewage treatment plant in the NMCHC premises. This sewage treatment plant can treat  $110\text{m}^3$  wastewater/day (hourly treatment capacity of  $11\text{m}^3/\text{hour}$ ) within water quality standards for wastewater treatment (BOD 100 ppm). Treated wastewater is discharged to the final soil chamber and released into the public sewage main line. Medical wastewater and chemicals are separated and collected; their final treatment is commissioned to a specialized contractor.

The drainage system installed inside the existing Center building is well-maintained, and without any drainage failure resulting from clogged pipes or leakage.

Some portions of the aforementioned existing sewage treatment plant have severely deteriorated, but it is used without any repairs because the repair cannot be made by NMCHC. Hydrogen sulfide contained in wastewater deposits on the concrete surface and turns into sulfuric acid through the action of sulfur-oxidizing bacteria. Then, it chemically reacts to alkaline concrete, causing corrosion.



Corroded effluent pump tank



Corroded sedimentation tank



(6) Hot-water Supply System

In the existing Center, hot water is supplied to one of the two sinks located in each common washroom and in the pantry on the third floor of the South Building. A central hot-water supply system equipped with a solar panel type water heater is used, but the solar water heaters are deteriorated and unusable. Therefore electric water heaters installed at individual hot-water supply points are used to supply hot water.



Installed solar water heaters



Electric water heater  
at the hot-water supply point

(7) Medical Gas System

The existing Center uses a central system to supply oxygen, vacuum and nitrous oxide. Currently, oxygen gas cylinders cannot be automatically switched because the existing oxygen manifold is out of order. The cylinder is manually switched whenever an oxygen pressure drop is noticed by a physician or a nurse.



Existing oxygen gas manifold



Medical gas used at NCU

(8) Medical Wastes Treatment

General wastes are collected and treated by Phnom Penh Municipality. Medical wastes are incinerated in the existing incinerator in the NMCHC premises. The existing incinerator was renewed from the model (BN-1000, manufactured by DAITO) originally installed at the time of construction to the same model in 2010. The updated incinerator has had some failures in the temperature sensor and gratings but cannot be repaired by NMCHC. No troubleshooting actions have been taken.



Overall view of incinerator



Nameplate on the incinerator

### 1-4-3 Natural Condition

#### (1) Temperature and Humidity

Phnom Penh is located at latitude of 11 degrees 33 minutes north and longitude of 104 degrees 55 minutes east, therefore it is tropical monsoon climate. The rainy season runs from May to October, and the dry season runs from November to April. The maximum temperatures range from 30 to 35°C, and the minimum temperatures range from 22 to 27°C throughout the year. The relative humidity typically ranges from 70% to 83% throughout the year. The climate in Phnom Penh is hot and wet year-round.

#### (2) Precipitation

The annual rainfall in Phnom Penh (approximately 1,500 mm/year) is almost the same as that in Tokyo. The city has two distinct seasons: the rainy season and the dry season. Rainfall is extremely low in December through March, and could be zero in one or more of the months of the dry season, depending on the year. The past 15-year statistics show the highest annual rainfall of 2,147.3 mm/year in the year 2000, when the river water level reached 800 mm, just below the top of the banks. Fortunately, it did not reach the river flood level and the past 15-year statistics do not show any records of river flooding.

#### (3) Wind Direction and Velocity

In Phnom Penh, the prevailing winds are from the southeast between February and May, from the west between June and September, and from the north between October and January. The annual average maximum wind velocity is approximately 11 m/sec., and May is the month in which the wind usually reaches the highest velocity, recording approximately 15 m/sec.

#### (4) Earthquakes

Phnom Penh has experienced no serious damage caused by earthquakes, and the government offices keep no records of earthquakes.

**Table 1-8 Weather data of Phnom Penh**

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Average maximum temperature(°C)	31.7	33.3	34.9	35.6	34.7	34.1	33.1	32.8	32.4	31.4	30.8	30.5	32.9
Average minimum temperature(°C)	21.8	22.9	24.4	25.6	25.6	25.3	24.9	26.7	24.7	24.7	24.1	22.5	24.4
Maximum temperature(°C)	34.0	35.3	37.3	38.3	37.1	36.6	35.7	35.1	34.5	33.4	33.2	32.9	35.3
Minimum temperature(°C)	18.6	20.0	22.1	23.3	23.5	23.1	22.9	22.9	23.0	22.9	21.6	19.3	21.9
Average relative humidity(%)	73.3	71.4	70.8	73.3	77.3	77.6	79.9	81.4	83.5	83.6	78.8	73.5	77.0
Rainfall (mm/month)	17.7	7.7	34.2	93.8	146.7	167.1	166.8	194.7	259.5	260.3	119.6	41.1	1,509 (Total)
Most frequent wind direction	N	SE	SE	S / SE	S	W	SW	W	W	N	N	N	
Maximum wind speed(m/s)	9.4	8.4	10.2	10.3	15.2	13.4	13.4	14.2	12.0	11.6	10.4	10.4	11.6

Source : Phnom Penh Ministry of Water Resources and Meteorology

#### **1-4-4 Environmental and Social Considerations**

In developing and planning the Project, it is essential to study whether there are any factors having serious effects on the surrounding environments and the global environment in the course of implementation and operation after the completion of construction. It is also essential to take necessary action in light of on-site situations, and minimize the said effects whenever possible if environmental impact factors are predictable.

(1) Wastewater

Public sewerage is available in Phnom Penh Municipality. The sewer system is managed by Phnom Penh Ministry of Public Works and Transport, including not only the sewer main line, but also the catch basins to connect between the main line and individual premises. By virtue of the well-designed infrastructure, owners of individual premises need only minor construction work to connect a drain pipe to the catch basin, and there is no complicated construction for sewer system.

In the Project, wastewater from the existing Center is to be treated by the renovated existing sewage treatment plant, and wastewater from the proposed Training Center is to be treated by a sewage treatment plant exclusively designed for the building. Phnom Penh Municipality does not have any clearly specified standards for the quality of treated wastewater other than acid effluent. However, the sewage treatment plant of the Project will be designed to satisfy the quality of no more than BOD 100 ppm in consideration of the surrounding environment (similar to the existing sewage treatment plant). Furthermore, a grease trap will be installed to remove oil and grease of soiled water from the Cafeteria Kitchen in the new Training Center in order to minimize the extra load of the treatment plant. No special wastewater treatment facilities are planned because there is no intent to drain special waste water (such as acid, alkali and infectious waste water) from the proposed Training Center.

(2) Medical Waste

In NMCHC, wastes are separated into general wastes and medical wastes, where the general wastes are collected by Phnom Penh Municipality and the medical wastes are incinerated by the existing incinerator located on hospital premises. Because some parts of the existing incinerator are malfunctioned, they will be replaced under the Project by the request of the Government of Cambodia. This may increase the incineration performance of medical waste.

(3) Air Pollution

In the Project, emissions from the power generators and the incinerator are deemed as air pollutants. The power generators run only during blackout or maintenance, therefore this would not cause much air pollution. As the existing incinerator will be used after replacement of some of the parts, the air pollution will remain unchanged.

The Project will introduce environment-friendly air-conditioner refrigerant that features low ozone depletion potential and low global warming potential, and is locally available.

## **Chapter 2. Contents of the Project**

## Chapter 2 Contents of the Project

### 2-1 Basic Concept of the Project

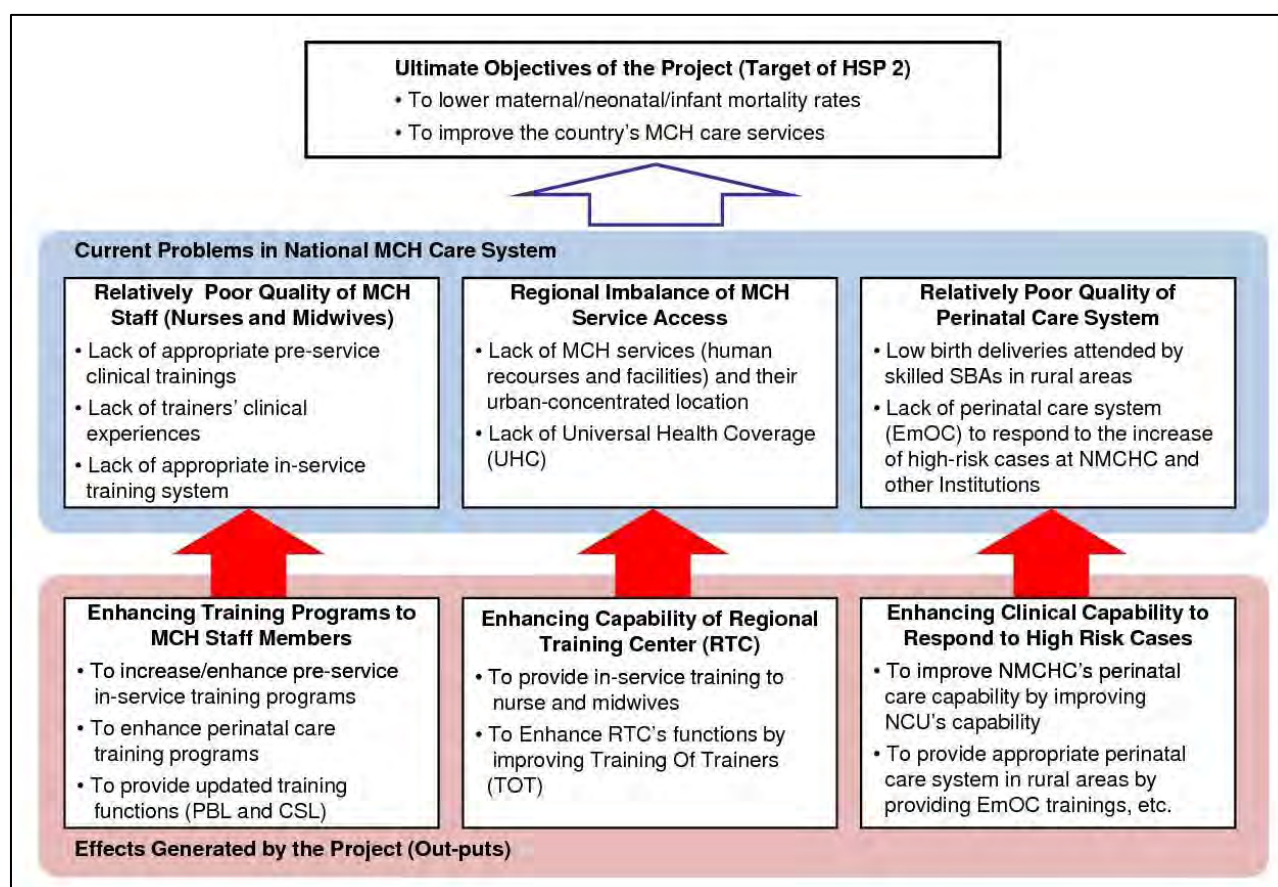
#### (1) Overall Goal and Purpose of the Project

MCH care services represent one of the most important issues within the health sector in Cambodia. According to its “Health Sector Strategic Plan 2008-2015 (HSP2)”, MCH care services represent, along with communicable diseases and non-communicable diseases control, one of three core missions in the health sector plan. The “reduction of maternal, neonatal and infant mortality rates” and the “enhancement of maternal and child health care” are the uppermost objectives of the Project.

To achieve the aforementioned objectives, it is necessary to solve the following three issues the country’s MCH care services face:

- Improvement of the quality of MCH care services
- Regional imbalances in access to MCH care services
- Improvement of the obstetric care systems

Figure 2-1 shows the roles and objectives of the Project implemented to solve the aforementioned issues, as well as their relationship with the country’s related plan.



Source: Survey Team

Figure2-1 Relationship between HSP 2 and the Project

1) To improve the quality of MCH care services

Although there have been significant improvements in its MCH care services, the Government of Cambodia still faces the challenge of ensuring a sufficient number of co-medical staff members who provide high quality services in MCH care services across the country. The Project will contribute to strengthening the training functions for pre-service and in-service training programs, and NMCHC will be able to deliver pre-service training for about 650 trainees and in-service training for about 2,050 trainees annually.

2) To address the regional gap in access to MCH care services

A great gap exists between the urban and rural areas in access to MCH care services. For example, in the Northeast Area, where the average household incomes are relatively lower, prenatal care services and institutional delivery rates are still low. The Project will contribute to closing the regional gaps in access to MCH care services by enabling NMCHC to provide in-service clinical training and National MCH Program training for medical staff engaged in MCH care services in RTCs and Health Centers (HCs). It will also contribute by enhancing the RTC's capability through the Training Of Trainers (TOT) and other related training programs to be provided by NMCHC.

3) To improve the quality of obstetric care systems

To further reduce the maternal mortality rate, it is essential to improve the institutional delivery rate and cope with the increase in the number of high-risk births by improving the emergency obstetric care system. The Project will develop the perinatal care systems of NMCHC to deal with about 1,400 high-risk cases annually through increasing the number of beds in the NCU, ICU and Recovery Room.

(2) Outline of the Project

The Project aims to improve the quality of the NMCHC's perinatal care systems and training systems by constructing a new Training Center, renovating the existing Center, providing medical and training equipment, and contributing to improving its quality of MCH care services in Cambodia.

1) Clinical function

NMCHC provides high quality clinical services to all women, mothers and infants, especially to the poor, as the country's top referral obstetrics/gynecology hospital.

2) Training function

NMCHC is the country's top clinical training institution for medical and co-medical professions, and provides up-to-date, high quality pre-service and in-service training programs in MCH care services.

3) Policy and administrative function (National MCH Programs)

NMCHC holds bureaus for five national MCH programs: National Reproductive Health Program, National Nutrition Program, National Program for ARI/CDD, National Immunization Program and National Program for Prevention of Mother To Child Transmission. These bureaus plan and implement policies and programs to promote MCH care services in Cambodia.

Out of five National MCH Program Offices, the National Immunization Program, which has been moved to a different site, is not covered under the Project.

The basic concept of the project is shown in Table 2-1.

**Table2-1 Outline of the Cooperation Project’s Scope**

Training Center Building			
Department	Room Name	No. Rooms	NET Area
Dormitory	Dormitory (Male)	2	91.50
	Dormitory (Female)	3	135.67
	Shower Room, etc	2	24.76
Resource Center	Resource Center	1	83.83
	Self-study Room	1	45.00
	Waiting Room	1	21.75
	Cafeteria	1	70.34
	Kitchen	1	22.50
Training	Training Unit Office	1	46.81
	Preparation Room	1	37.02
	Training RM (40-seat)	1	90.67
	Training RM (20-seat)	4	183.00
	PBL Room	1	92.83
	Clinical Simulation Lab	1	45.00
National MCH Program	NRHP	1	59.67
	NNP	1	70.34
	ARI-CDD-IMCI	1	38.25
Management	Director RM	1	22.50
	Dpy Director RM	5	114.90
	Management Chief RM	1	22.50
	Administrative Office	1	69.00
	Common Meeting	2	90.00
	Parking and others	1	452.30

To Enhance Training Center Functions	
Dormitory	To provide necessary number of beds Male: 10, Female: 20
Library	To provide Resource Center
Self-study Room	To provide student's Self-study Room
Waiting Room	To provide Intern's changing/waiting room
Cafeteria	To provide amenity space for students
Training Unit Office	To provide office for Training Unit
Preparation Room	To provide Store of training equipment
Training Rooms	To provide training system to train approx. 2,700 trainees per year
PBL Room	To provide practical training facilities
CSL	To provide "Hands-on Training" facilities
National MCH Program	To provide necessary number of seats for each MCH Program
Management Office	To provide necessary number of seats for Management office
Common Meeting RM	To provide necessary number of seats for meeting function
Parking	To provide adequate number of lots

Renovation Work of Existing NMCHC Building				
Department	Contents of Renovation Work			
Gynecology/Obstetrics Ward	To convert 3rd Floor of the South Building from Training Function to Ward.	8-Beds	4 rooms	32 beds
		4-Beds	2 rooms	8 beds
		2-Beds	1 rooms	2 beds
		1-Beds	4 rooms	4 beds
		Total		
Gynecology Ward	To convert some 8-bed Ward to 4-bed.	8-Beds	8 rooms	64 beds
		4-Beds	4 rooms	16 beds
		2-Beds	2 rooms	4 beds
		1-Beds	4 rooms	4 beds
		Total		
Ward Bed Total	134 beds			
Total No. Beds	174 beds			
NCU	20 Beds			
Recovery RM	10 Beds			
ICU	6 Beds			
Kangaroo Care RM	4 Beds			
Pharmacy	To Install additional air-conditioning			
Student Night-duty RM	To provide 10 beds for male/female, each			
Elevator	To install a new stretcher elevator			
Doors	To replace wood doors of ward rooms to steel doors			
Glass Block Roof	To repair water leakage in the glass block skylight			
Medical Gas	To renew control system of oxygen supply			
Sewage	To repair/replace the damaged portion of sewage treatment plant			
Water Supply	To replace solar heating panel			
Electric Power	To increase power supply capacity to meet renovation work			
A/C & Ventilation	To add A/C system to meet renovation work			
Incinerator	To replace broken parts of the existing incinerator			

To Provide Adequate Number of Ward Beds	
Ward	To maintain 12 number 8-bed ward room to provide adequate bed numbers for exempted cases (for poor patients)  To generate extra inpatient ward fees by increasing extra (fewer-bed) ward rooms from 9 (current) to 17, and to allocate the extra fees for operation of Peri-natal care facilities (such as NCU and ICU)  To maintain total number of 134 beds for Gynecology and Obstetric Department

To Provide Adequate Peri-natal Care System	
NCU	To provide the facilities to accept approx. 1,400 high-risk cases per year
Recovery RM	To provide the facilities for approx. 2,500 operation cases per year
ICU	
Kangaroo Care RM	To provide ward for Kangaroo care

Miscellaneous Renovation Work	
Pharmacy	To Install additional air-conditioning
Student Night-duty RM	To provide 10 beds for male/female, each
Elevator	To install a new stretcher elevator
Ward Doors	To replace wood doors to steel doors
Glass Block Roof	To repair water leakage in the skylight

Renovation of Utility System	
Medical Gas	To renew control system
Sewage	To replace the damaged portion of sewage treatment plant
Water Supply	To replace solar heating panel
Electric Power	To increase power supply capacity to meet renovation work
A/C & Ventilation	To add A/C to meet renovation work
Incinerator	To replace broken parts of incinerator

Source: Survey Team



## 2-2 Outline Design of Requested Japanese Assistance

### 2-2-1 Design Policy

#### (1) Basic Policy

The purpose of the Project is to improve the quality of MCH care services in Cambodia by constructing a new Training Center, renovating the existing Center and providing medical and training equipment at NMCHC, which has functions of clinical services, training and policy/administration. The Projects will be designed based on the following policies, the requests of the Government of Cambodia, and the results of the field surveys and discussions.

#### 1) Scope of cooperation plans:

The survey team reviewed and evaluated the contents of the requests and gave priority to the facilities which fulfill the following conditions:

- Facilities to conform to NMCHC's original goal of providing the poor with the proper MCH care services.
- Facilities to conform to the clinical activities required as a top referral obstetrics/gynecology hospital.
- Facilities to satisfy new needs which the existing Center is currently unable to fulfill.

#### 2) Scale of the proposed facilities:

The number and the size of rooms in the Training Center should be determined based on the NMCHC's proposed training plan in 2020, approximately three years after the Project's facilities begin operating. The contents of the renovation work to improve the perinatal systems and obstetrics wards of the existing Center shall be determined based on the number of beds calculated by the current clinical activities and clinical target in 2020.

#### 3) Renovation work of the existing Center:

The existing buildings in the premises of NMCHC, which were constructed and renovated with assistance from the Government of Japan, are as follows:

- a) NMCHC's main buildings (the existing Center): constructed by a Grant Aid Project in 1995.
- b) Health Garden Building: constructed by the Technical Cooperation Project "Maternal and Child Care Project, Phase 2, Follow-up Assistance" in 2004/05.
- c) Renovation work of NCU in the Center: renovated by the Technical Cooperation Project "Project for Improving Maternal and Newborn Care through Midwifery Capacity Development" in 2012/13.

The Project will cover only item a) "NMCHC's main buildings" (the existing Center).

The validity of the Project's renovation work has been properly reviewed and verified based on the following three principles defined in the "Evaluation Guideline for the Grant Aid Cooperation":

- a) To confirm that the renovation work will meet the new needs the existing Center is currently

unable to fulfill.

- b) To confirm that the existing Center has been fully utilized and has achieved the intended outcomes.
- c) To minimize the content and scope of the proposed renovation works.

4) To prevent nosocomial (hospital-acquired) infections:

Rooms requiring higher infection-prevention control (such as NCU and ICU) should be physically separated from other portions of the hospital by providing an anteroom that separates patients with communicable diseases from other patients. Such configurations effectively minimize nosocomial infections.

The aforementioned rooms shall be kept at a positive pressure and outside air will be taken in through filters to remove the infectious substances. Using an appropriate air-conditioning system in those rooms will maintain the cleanliness of the indoor environment and reduce nosocomial infections.

Inpatient ward rooms shall have either natural or mechanical ventilation system designed to secure necessary ventilation rate. Using appropriate ventilation systems will maintain acceptable indoor air quality and minimize the nosocomial infections.

5) To provide continuous medical services in the existing Center during construction/renovation work:

The planned construction site of the Project's new Training Center is located adjacent to the drop-off and main entrance of the existing Center. Because the existing Center will be continuously operated during construction, it is very important to secure a safe and reliable access route for the patients and pedestrians by providing a temporary enclosure and separate access for construction vehicles.

Renovation work of the existing Center will be carried out while having its other portions in operation. The construction procedure and temporary plan of the renovation work should be designed to maintain the clinical activities of the in-service area. Because the east half of the second floor, North Building, is to be renovated while the west half portions (Operation and Delivery Departments) are in operation, it will be necessary to review the following points: installation of a temporary partition from the in-service area, removal/replacement of the utility systems, assurance of the separation of the carry-in/out flow line from the user flow line, and a construction method that minimizes noise and vibration in the surroundings.

6) To design a medical and training equipment plan

Most of the NMCHC's equipment has been provided by the previous Grant Aid Projects and Technical Cooperation Projects implemented by the Government of Japan, and by the assistance of collateral funds and other donors. It is therefore necessary to ensure the consistency between the existing equipment and the equipment to be provided by the Project. The following points shall be followed regarding the design of the equipment plans intended for the perinatal care systems and the Training Center:

- a) To provide equipment that will improve the clinical care service.
- b) To avoid overlap with the existing equipment provided by the previous projects and other donors.

- c) To select specifications of equipment that the Cambodian side will operate and maintain with its capabilities and budgets.

(2) Natural Conditions

1) Temperature and humidity

Phnom Penh is located at latitude of 11 degrees 33 minutes north, and longitude of 104 degrees 55 minutes east; therefore it is tropical monsoon climate. The proposed building shall be planned on an east-west axis, and most of rooms shall face southward or northward in order to minimize heat gain by direct solar radiation. Since roofs tend to be the highest heat gain portion in the building periphery due to the high solar altitude in Phnom Penh, the roof must have effective heat insulation. The façade shall be provided with louvers to prevent direct sun exposure and to reduce the heat load caused by solar radiation. Air-conditioners shall be installed in the rooms where the medical and training activities require temperature control.

2) Precipitation

Rainfall in Phnom Penh is concentrated in short periods, therefore the proposed building's roof pitch, downspout pipe sizes, and overflow devices shall be designed to deal with the concentrated amount of rainfall. An exterior drainage plan within the premises shall also be designed carefully.

3) Wind direction and Velocity

In Phnom Penh, the prevailing winds are from the southeast between February and May, from the west between June and September, and from the north between October and January. The opening of the proposed building shall be designed to utilize natural ventilation in accordance with the prevailing wind directions.

4) Natural disasters (earthquakes)

Phnom Penh has experienced no serious damage caused by earthquakes, and the government offices keep no records of earthquakes.

(3) Socioeconomic Conditions

While Cambodia's economy fluctuated moderately in the early years following 2000, it has been enjoying consistent growth since the later part of the decade. According to the International Monetary Fund (IMF), the inflation rate has increased by 3.997% in 2010, 5.478% in 2011 and 2.925% in 2012, respectively. According to its predictions, the inflation rate will be 3.074% in 2013, 4.293% in 2014 and 3.347% in 2015, respectively. The price inflation rate calculated during the period of time from the cost estimate (August 2013) to the bidding based on the IMF's data will be applied for the preliminary cost estimate of the Project.

(4) Construction/Procurement Circumstances or Local Peculiarities/Business Practices

There are many on-going building construction projects in Phnom Penh, and the construction environment is thriving. The prices of construction materials in Cambodia are significantly influenced by the origins of the materials such as Thailand, Vietnam and China. The prices generally tend to increase

with the increased price trends of the international raw material markets (such as oil and iron ore).

(5) Utilization of Local Companies

Local construction companies carry out the construction work of many large-scale construction projects in Phnom Penh, and there are many available, experienced, skilled laborers. The capabilities of local construction companies and local laborers shall be utilized to reduce construction costs by coordinating the design of the proposed facilities to meet the capabilities of local construction methods. However, the capability of the local subcontractors' construction management shall be carefully assessed for the renovation work of the existing Center, as the air-conditioning work in the NCU, ICU and recovery room will require a relatively high technical skill level.

(6) Operation and Maintenance Capabilities of the Implementing Agency

NMCHC's Administration Department consists of five sections, one of them being the "Engineering/Medical Workshop." The Workshop is responsible for the operation and maintenance of NMCHC's facilities and equipment, which include eight full-time staff members. The Workshop consists of three sub-groups: building, utility and medical equipment maintenance, with the eight staff members rotating the three groups to share the duties. At least one staff member stations on a full-time basis for the operation and maintenance. The Workshop (a room the staff stations) is kept tidy and clean, and maintenance tools and parts are organized properly. Judging from the current operation and maintenance status of the facility and equipment, the Workshop has proper capability, and NMCHC's maintenance systems seem to work properly.

1) Facility maintenance

The Workshop keeps ledger records of utility consumption (such as electric power, water, LPG and oxygen gas), which allows for the proper operation and management of the facilities. The Workshop currently carries out daily, routine inspections of the transformer room and generator room, and the frequent maintenance of other portions of the facilities. It keeps the records of the inspections and maintenance.

These maintenance activities have contributed to the relatively good condition of the utility systems even 15 years after the Center's completion. No serious failures or defects have been found in the electrical systems in the Center.

2) Medical equipment maintenance

The staff members of the Workshop responsible for medical equipment received their training in Cambodia and Japan, under the Technical Cooperation Project: "The Project on Promotion of Medical Equipment Management System." The Workshop has the capability to keep records of equipment and management ledgers, to replace parts, and to compile the maintenance management services in the database. The equipment provided by the previous Grant Aid Projects and Technical Cooperation Projects is well-managed, and the Workshop seems to have the proper capability to operate and maintain the NMCHC's medical equipment. The Workshop currently carries out equipment maintenance work and has spare parts for replacement work.

## (7) To Set Standards of the Facilities and Equipment

## 1) Facility plan

The Project aims to construct a new Training Center and to renovate portions of the existing Center, which commenced operation in 1997. The criteria for facility design and setting standards shall basically conform to those of the existing Center.

**Table2-2 Applicable Standard and Grade for the Proposed Facilities**

Requirements	Applicable Standard and Grade
Building Standard Law, Barrier-free Regulation Quality of Building Materials	To conform to the Cambodian laws and/or the relevant Japanese regulations if not available
Room Area Standard	To conform to the area standard of the existing NMCHC Building Standard area of the major rooms: <ul style="list-style-type: none"> <li>• Training RM: 2.0 to 2.5 sqm/seat</li> <li>• Office: 4.5 sqm/person</li> <li>• Director RM: 20.0 sqm/person (Individual room)</li> </ul>
Grade of Finish Materials	To conform to the finish materials of the existing Center

Source: Survey Team

## 2) Equipment plan

NMCHC is a top referral obstetrics-gynecology hospital in Cambodia, and the Standard Equipment List in the CPA Guideline, established by the MOH of Cambodia, cannot be applied.

The proposed equipment plan shall be designed to follow the quality and quantity of the existing plan. However, more advanced equipment will be required to meet the current and future clinical service levels developed and upgraded by the Japanese Government's Technical Cooperation Projects and other assistance programs. Therefore, grades and specifications of the proposed equipment shall be determined properly by comprehensively considering the mandates, functions, roles and activities of NMCHC as well as its staff members' technical competency.

For some types of medical equipment, the maintenance contracts between NMCHC and the manufacturer's local agent(s) are very important to optimize equipment utilization. It is therefore strongly recommended to make maintenance contracts for the equipment below:

- General X-ray Unit
- Mobile X-ray Unit
- Blood Analyzer (Electrolyte analyzer)
- Blood-gas Analyzer
- CRP Analyzer for Micro Sample

(8) Construction/Procurement Method and Construction Period

1) Construction methods

Local buildings are generally constructed with a combination of reinforced concrete frames (columns and beams) and brick walls finished with mortar and paint (exterior walls and interior partition walls). The existing Center was constructed using the same method. The proposed Training Center shall also be constructed using the same local construction method and this will ensure the expected quality within the appropriate construction costs and period.

Construction work of the Training Center and renovation work of the existing Center shall be carried out while medical activities continue in the existing Center; therefore it is necessary to choose a piling work method and the existing structures removal method which minimizes noise and vibration.

2) Procurement method

Locally procured building materials shall be used as much as possible in order to maintain the buildings easily after their completion. Procurement methods for windows and doors that have higher durability and air-tightness and air-conditioning units that have greater durability and performance will be studied. This does not exclude procurement from a third-country in order to ensure the required quality.

3) Safety policies during construction

The planned construction site of the Training Center is located adjacent to the southeast of the existing Center and beside the drop-off. To avoid interfering with the medical activity of the existing Center, it is necessary to ensure the safety of patients and pedestrians by providing a temporary fence around the construction site and by providing a separate gate for construction vehicles to the site directly from the front road.

4) Policies on the construction period

As construction of the Training Center and renovation work of the existing Center occur simultaneously with the medical activities in the existing Center, works including temporary work, curing and replacement of the existing structures and utility work should be planned as to not affect the on-going medical activities.

Construction of the Training Center will start first, followed by the renovation work of the existing Center. The renovation work of the third floor of the South Building will start 1.5 months before the completion of the Training Center in order to shrink the entire construction period within the required period of time.

## 2-2-2 Basic Plan

### 2-2-2-1 Overview of Project (Review of Requests)

#### (1) Transition of the Requests

During the field survey, the survey team confirmed the activities of NMCHC as “clinical care,” “training” and “policy/administration” (National MCH Programs). The team verified the utilization status of the existing Center and assessed the issues NMCHC is currently facing.

The survey team also reviewed and confirmed the contents of the original requests through discussions with the Cambodian side, and finalized the requests to reflect the country’s MCH policies and plans. As a result of the above discussions and studies, both sides agreed to redefine the following contents as the final requests:

#### 1) Confirmation of requests for the Training Center

As a result of discussions with the Cambodian side during the preparatory survey, the revised requests for the Training Center are finalized as shown in Table 2-3. Major revisions from the original requests regarding the Training Center are as follows:

##### ① Learning Resource Center

The Cambodian side strongly requested a Resource Center, which functions both as a library and a self-study room.

##### ② Training related facilities

In addition to the conventional lecture rooms used mainly for lectures, the following training rooms were requested to respond to the increasingly diverse medical education methods and trends for utilizing practical hands-on training.

- CSL

A training room designed for Basic and Comprehensive Emergency Obstetrics Care (B/C EmOC) and other related training using obstetrics simulators (manikins), which are an effective training method for practicing hands-on training.

- PBL Room

PBL is a discussion-style class where a group of 5 to 15 trainees discuss given topics and finalize the solutions. In the NMCHC’s training programs, this training method is applied to the TOT and training related to the National MCH Programs. Since a lecture room is currently shared by multiple groups at the same time, the Cambodian side requested to provide discussion rooms and tutor spaces designed for the expected number of trainees.

##### ③ National Maternal and Child Health (MCH) Program Office

Originally, the Cambodian side requested offices for the five National MCH Programs. However, the National Immunization Program (NIP) Office moved outside the premises of NMCHC in 2012, and the Cambodian side agreed that the remaining four program offices would be included in the Project.

## ④ Management Office

The Cambodian side requested a Clinical Division Office (MD's Office), a Nursing Division Office and a Health Finance Committee Office, which were not included in the original requests. These requests respond to the lack of an office related to those activities.

## ⑤ Store (Storage)

Storage was originally requested for each department, occupying about 440 sqm in total and accounting for more than 20% of total NET area, which was considered to be excessive. The area was minimized by sharing and integrating storage between departments.

**Table2-3 Comparison between the Original and Revised Requests, Training Center**

Requested Space Program (Original Proposal in August, 2012)					Revised Request (in August, 2013)	
Section	Room Name	RM Area (sqm)	No. of Room	NET Area (sqm)	Section	Added/Revised Request
Dormitory 220.32 m <sup>2</sup>	Dormitory	42.92	2	85.84	Dormitory	<ul style="list-style-type: none"> <li>Number and sizes of rooms are to be determined based on needs of dormitory</li> </ul>
	Dormitory	42.92	2	85.84		
	Shower, etc.	24.32	2	48.64		
Resource Center 144.96 m <sup>2</sup>	Resource Center	62.16	1	62.16	Resource Center	<ul style="list-style-type: none"> <li>Enhancing Resource Center with library function is necessary</li> </ul>
	Self-study Room	44.40	1	44.40		
	Store	38.40	1	38.40		
Others 927.60 m <sup>2</sup>	Waiting Room	22.80	1	22.80	Others	<ul style="list-style-type: none"> <li>No particular revised request</li> </ul>
	Cafeteria	86.00	1	86.00		
	Kitchen	19.20	1	19.20		
	Store	19.20	3	57.60		
	Parking	742.00	1	742.0		
Training 460.80 m <sup>2</sup>	Training Unit Office	40.80	1	40.80	Training	<ul style="list-style-type: none"> <li>Number and sizes of rooms are to be determined based on needs of training plan</li> <li>PBL and CSL may be necessary</li> <li>PC and Server system may be necessary</li> </ul>
	Preparation Room	38.40	1	38.40		
	Training RM (60 seat)	117.60	1	117.60		
	Training RM (20 seat)	40.80	2	81.60		
	Training RM (12 seat)	24.00	2	48.00		
	Store (Small)	19.20	5	96.00		
	Store (Large)	38.40	1	38.40		
National MCH Program 324.00 m <sup>2</sup>	NRHP	45.60	1	45.60	National MCH Program	<ul style="list-style-type: none"> <li>NIP has been moved to outside NMCHC because of space shortage; it may be removed from the proposal</li> </ul>
	NNP	45.60	1	45.60		
	ARI-CDD-IMCI	45.60	1	45.60		
	NIP	45.60	1	45.60		
	PMTCT	45.60	1	45.60		
	Store	19.20	5	96.00		
Management 297.60 m <sup>2</sup>	Director RM	22.80	1	22.80	Management	<ul style="list-style-type: none"> <li>Following office rooms are added: <ul style="list-style-type: none"> <li>Clinical Division Office</li> <li>Nursing Division Office</li> <li>Health Finance Committee Office</li> </ul> </li> <li>Two meeting rooms</li> </ul>
	Dpy Director RM	22.80	5	114.00		
	Administrative Office	45.60	1	45.60		
	Store (Small)	19.20	6	115.20		
Total NET Area (Total store area: 441.60 sqm)				2,375.28		

Source: Survey Team



## 2) Confirming requests for the renovation work of the existing Center

As a result of discussions with the Cambodian side during the preparatory survey, the revised requests for the renovation work of the existing Center are finalized as shown in Table 2-4.

**Table 2-4 Comparison between the Original and Revised Requests, Renovation Work of the Center**

Requested Renovation Work (Original Proposal in August, 2012)						Revised Request (in August, 2013)					
Location	Section	Renovation Work	Type	No. RM	No. Beds	Section	Added/Revised Request				
South Building 3FL	Training	To move National Program office and Training rooms to new Trading Center				Training	Same as the original request				
	Gynecology/ Obstetrics Ward	To convert office and training rooms to Ward	8-bed	3	24	Gynecology/ Obstetrics Ward	To study adequate number of 2-bed and individual rooms	8-bed	4	32	
			4-bed	0	0			4-bed	2	8	
			2-bed	8	16			2-bed	1	2	
			1-bed	6	6			1-bed	4	4	
Total			46		Total			46			
South Building 2FL	Obstetrics Ward	To convert some 8-bed rooms to 4-bed rooms	8-bed	7	56	Obstetrics Ward	To refurbish some 8-bed rooms to 4-bed room	8-bed	8	64	
			4-bed	5	20			4-bed	4	16	
			2-bed	4	8			2-bed	2	4	
			1-bed	2	2			1-bed	4	4	
Total			86		Total			88			
North Bldg	Gynecology		1-bed	2	2		1-bed	0	0		
Inpatient Ward Total				134 beds		Inpatient Ward Total				134 beds	
Hospital Total				165 beds		Hospital Total				174 beds	
South Building 1FL	Laboratory	To move PMTCT Office to Training Center and to improve Clinical Lab				Laboratory	To relocate Clinical Lab to NMCHC building.				
	Radiology	To install radiation protection wall in X-ray Room				Radiology	X-ray machine and Mammography may be used in the same room				
	Pharmacy	To provide Storage ( 100 sqm)				Pharmacy	To install A/C and exhaust fan				
	Tech Bureau	To add Document Storage				Tech Bureau	Book shelf for medical record				
North Building 2FL	NICU	20 beds				NCU	Total 20 beds, NCU not NICU				
	Recovery	6 beds				Recovery	10 beds				
	ICU	5 beds				ICU	6 beds				
	Operation Theater	To provide three Suction Outlets in each To strengthen Anesthetic Ventilator				Kangaroo Care RM	4 beds				
1FL	Laundry	To expand Cloth Washing & Dry Room				Student Night-duty RM	10 beds For Male and Female				
Others	Slope	To extend the existing slope to 3 FL				Laundry	Drying space for Laundry				
	Doors	To replace all wood doors to steel				Slope	To ensure access to Ward on 3FL				
	Wall	To repair and repaint the exterior /interior wall				Ward Door	Ward door should be steel				
	Skylight	To repair sealant of glass block skylight				Wall	To study necessity of repaint				
Ancillary Mechanical Building	Medical Gas	To strengthen medical gas system				Skylight	To repair sealant of glass block skylight				
	Sewage	To strengthen sewage system				Medical Gas	To replace main oxygen control system				
	Water Supply	To strengthen water supply system				Sewage	To repair sewage treatment tank				
	Electric Power	To study necessary capacity of electric power supply system				Water Supply	To replace solar water panel system				
	A/C & Ventilation	To study necessary capacity of A/C system and ventilation				Electric Power	To increase capacity if needed				
						Incinerator	To provide parts for the existing incinerator				

Source: Survey Team

Major revisions from the original requests for the renovation work of the existing Center are as follows:

- ① **Obstetrics/gynecology combined inpatient ward (current gynecology ward)**  
About 13% of the inpatients are from poorer backgrounds and are exempted from medical service fees (paid by the Government of Cambodia). The number of 8-bed rooms was increased from the original request to allow these poor patients better access to inpatient wards (number of 8-bed rooms: increased from 3 to 4).  
  
The basic concept of the original request was to offset the increased operation cost incurred by improving the perinatal care systems (increasing the number beds at NCU, ICU, etc.) against the increased user fees generated by increasing the number of pay-beds.  
  
As a result of relocating the current gynecology ward to the third floor of the South Building, the ward is to be operated as a combined obstetrics-gynecology nursing unit.
- ② **Obstetrics Inpatient Ward (second floor of the South Building)**  
The number of 8-bed rooms was increased for the same reason described in ①.
- ③ **Perinatal Care Center**  
The survey team confirmed that NMCHC would not perform artificial respiration medication or pediatric surgery in the near future. Therefore, it was agreed that a NICU (Neonatal Intensive Care Unit) shall be changed to a NCU instead.
- ④ **ICU and Recovery Room**  
The survey team revised the number of required beds in the ICU and Recovery Room to meet the current and planned clinical activities.
- ⑤ **Kangaroo Care Room**  
Kangaroo Care is a child-care technique wherein the medically stable infants (low-birth-weight babies) are held, skin-to-skin, with the mother over the chest. It is scientifically verified that the technique reduces the mortality and incidence rate of low-birth-weight babies, and it exerts a positive effect on subsequent child care. This room is designed for the low-birth-weight babies and their mothers to practice the technique after leaving the NCU.
- ⑥ **Clinical (Test) Laboratory Room**  
The Cambodian side plans to relocate the Clinical Laboratory Room (which is now situated inside the Health Garden Building) back to its original location by exchanging its position with the PMTCT Program Office (which is in the Outpatient Department). The work including the relocation of services, equipment and furniture shall be borne by the Cambodian side.
- ⑦ **Diagnostic Imaging Department**  
The X-ray equipment and mammography equipment are currently installed in the same room. Because the two pieces of equipment are not likely to be used at the same time, the room will remain the same and no alteration work shall be made by the Project.

⑧ Surgical Operation Rooms

The Cambodian side originally requested minor renovation work, such as the addition of suction units on the wall. As a result of the review of the current usage and discussions during the field survey, the Cambodian side agreed that the request should not be included in the Project.

⑨ Students' Night-duty Rooms

The Night-duty Rooms originally designed for MDs on the first floor of the North Building are currently used by students. Because the sizes of the rooms are too small to accommodate the number of students, Students' Night-duty Rooms were requested in the revised request to accommodate the planned number of trainees.

⑩ Machine Rooms

In addition to the revised requests shown in Table 2-4, the Cambodian side requested a supply of spare parts as these parts are not available in Cambodia to fix the incinerator.

3) Confirming requests for medical and training equipment

As a result of discussions with the Cambodian side during the preparatory survey, the revised requests on the medical and training equipment are finalized as shown in Table 2-5.

**Table2-5 Comparison of Equipment between the Original Request and Revised Request**

Original Request	Qty	Building /Floor	Section/Room	Revised Request	Revised Qty		
General X-ray Unit (digital)	2	South Building 3FL	Patient Ward (Ward A)	Examination Light	2		
Mobile X-ray Unit	2			Suction Pump	2		
Patient Monitor	5			Medical Bed	6		
Endoscope	1			Bedside Table	6		
Ultrasound Color Doppler	2			Drug Store Refrigerator	1		
Ultrasound machine (Bone density machine)	1			Gynecological Examination Table	2		
Surgery Instrument Set	—			Oxygen Concentrator	1		
Office Equipment	—			2FL	Maternity Ward (Ward B/C)	Doppler Fetus Detector	2
Furniture	—					Examination Light	2
				1FL	Imagery	General X-ray Unit	1
		CR Machine	1				
		Dry Imager	1				
		Laboratory	Blood Bank Refrigerator		1		
			Blood Analyzer (Spectro photometer)		1		
			Blood Analyze (Electrolyte analyzer)		1		
			Microscope		1		
		Dental	Dental Chair Treatment Unit		1		
		Pharmacy	Drug Store Refrigerator		1		
			Pharmacy Supply Shelves		1		
		OPD	Examination Light		4		
			ECG		1		
			Doppler Fetus Detector		4		
		North Building 2FL	NCU		Mobile X-ray Unit	1	
				Patient Monitor	5		
				Pulse Oxymeter	10		
				Syringe Pump	10		
				Infusion Pump	5		
				Blood Gas Analyzer	1		
				CRP Analyzer for Micro Sample	1		
				Centrifuge for Hematocrit	1		
				Blood Pressure Monitor	3		
				Neonatal Ultrasound Machine with Cardiac Probe	1		
				Oxygen Concentrator	1		
				Oxygen Flow Meter	10		
				Laryngoscope with Spare light	3		
				Nebulizer	5		
			OT	Oxygen Flow Meter	3		
				Patient Warmer	2		
				Patient Monitor	3		
				Oxygen Concentrator	1		
			Delivery	Fetal Actocardiograph	5		
				Operation Light for Delivery LED	2		
				Doppler Fetus Detector	4		
		ICU/Recovery	Patient Monitor	10			
			Oxygen Flow Meter	10			
			Syringe Pump	4			
			Infusion Pump	4			
			Oxygen Concentrator	1			
			Blood Bank Refrigerator	1			
		1FL	Laundry	Washing Machine	1		
				Spinning Machine	1		
		Training Center	Training Room	Simulation Model Mannequin A	2		
				Simulation Model Mannequin B	2		
			Resource Center	PC for Training	10		
				Printer/Copy Scanner Combined Machine	1		
				Desk and Chair	10 sets		

Source: Survey Team

(2) Review of the Necessity and Validity of Facility Requests

The results of the review of the Cambodian side's final requests are described below:

1) Background of cooperation

MCH care services represent one of the most important issues in the health sectors in Cambodia. According to its Health Sector Strategic Plan 2008-2015 (HSP2), MCH care services represent, in addition to communicable diseases and non-communicable diseases controls, one of three important core missions in the health sector plan. Although overall MCH care services have been significantly improved, the key MCH indices, including the maternal mortality rate, need further improvement in comparison to other neighboring countries.

NMCHC is a top referral obstetric and gynecologic hospital in Cambodia, it is responsible for the training of MCH human resources as the National Training Center, and it is also responsible for policy and administration of the national MCH Programs. NMCHC has three primary functions: clinical care, training, and policy/administration of the country's MCH care services.

Since its facilities and equipment were provided by the Japanese Government's Grant Aid Scheme in 1997, NMCHC has received a series of Technical Cooperation Projects: "The Maternal and Child Health Project (Phase 1 and Phase 2)," and "Project for Improving Maternal and Newborn Care through Midwifery Capacity Development." These projects have significantly contributed to the qualitative and quantitative improvements of the country's MCH care services.

The Project aims to improve the functions of the NMCHC by constructing a new Training Center and by renovating portions of the existing Center. The implementation of the Project is considered highly valid on the grounds that it significantly contributes to the improvement of the country's MCH care services and conforms to the Japanese Government previous assistance programs in MCH care services.

2) Review of necessity and validity

The survey team reviewed and verified the necessity and validity of the major components of the Project: construction of a new Training Center, renovation work of the existing Center, and procurement of medical and training equipment. The results are as follows:

① Construction of a new Training Center

Because the National MCH Program offices, which were not included in the original design, occupy a substantial portion of the third floor of the South Building in the existing Center, the training functions (which used to be located in the same area) did not have enough rooms and sufficient amount of training space. Furthermore, practical training functions including the Problem Based Learning (PBL) and Clinical Simulation Lab (CSL) cannot be conducted effectively due to a lack of appropriate rooms.

Because the existing library is currently used as a management office, it does not allow students and trainees to study or engage in self-study and research.

To improve these situations, it is highly necessary to construct a new Training Center to provide in-service training programs for the medical staff attached to the MCH care services and pre-service training programs for medical students and other co-medical students.

② Renovation work of the existing Center

Although there have been significant improvements in some MCH indicators (such as maternal, neo-natal and infant mortality rates) due to various MCH measures by the Government of Cambodia, the number of high-risk births (such as birth of babies with low-birth-weights) is relatively increasing in NMCHC because of the reinforced referral system and the improvement of the traffic network connecting cities and rural areas.

According to NMCHC's estimate, about 20% of 7,000 annual deliveries will require treatment at a NCU as a high-risk case. It is therefore necessary to develop the perinatal care systems to deal with approximately 1,400 high-risk cases annually (20% of 7,000 deliveries).

In accordance with the improvement in MCH care services, the number of deliveries involving surgical operations (such as Cesarean section) is increasing. The number has almost tripled from about 650 cases in 2000 to about 1,700 cases in 2012. In accordance with this trend, the number of operations is increasing, and therefore it is necessary in the future to have the ICU and recovery room deal with approximately 2,500 operations annually.

NMCHC plans to offset the increased cost incurred by the improvement of the perinatal care systems (personnel expenses and purchasing medical consumables) against the increased user fees generated from pay-bed ward rooms (2-bed and single bed rooms), in particular in the renovated ward to be transferred to the third floor of the South Building.

The survey team therefore reviewed and studied the adequate number of ward room types to achieve a favorable balance between satisfying NMCHC's original goal of providing the poorest segment with maternal and child health care services and dealing with the increased costs incurred by improving NCUs.

Table 2-6 shows the above-mentioned issues for each component, the number and sizes of rooms in the original plan provided by the grant aid project in 1997 (the original design), the original requests and the results of the reviews.

**Table2-6 Validity Study of the Proposed Facilities**

Problems of Existing NMCHC	Current Designs	Relevant Requests	Field Survey Results
<b>Training Function</b> <ul style="list-style-type: none"> <li>• Shortage of Training Rooms</li> <li>• Lack of practical training facilities</li> <li>• Lack of clinical training facilities</li> <li>• Lack of Library and study resources</li> <li>• Lack of amenity space for trainees</li> </ul>	20-seat x2, 40-seat x1 Extra needs (not included in the Original Design) Original Library was converted to office Extra needs	L x1, M x2, S x2 Resource Center, Self-study RM Waiting RM, Cafeteria	40-seat x1, 20-seat x4 PBL RM CSL Resource Center, Self-study RM Waiting RM, Cafeteria
<b>Dormitory</b> <ul style="list-style-type: none"> <li>• Shortage of dormitory for In-service trainees</li> </ul>	8-bed x2	Male x2, Female x2	Male: 5-bed x2, Female: 7-bed x2, 6-bed x1
<b>National MCH Program Office</b> <ul style="list-style-type: none"> <li>• Shortage of Office space</li> <li>• Shortage of Store space</li> </ul>	Extra needs (not included in the Original Design)	Office: 45 sqm x5	Total 180 sqm for 3 Dept. Common Store: 45 sqm
<b>Management Function</b> <ul style="list-style-type: none"> <li>• Shortage of Dpy Director Offices</li> <li>• Shortage of Administration Office</li> <li>• Shortage of Meeting RMs</li> </ul>	23 sqm x3 36 sqm 45 sqm x1	23 sqm x5 Office 45 sqm, Store	23 sqm x5 90 sqm 45 sqm x2 <b>To transfer those functions to Training Center Building</b>
<b>Perinatal Medical Care Function</b> <ul style="list-style-type: none"> <li>• Shortage of NCU beds</li> <li>• Shortage of ICU beds</li> <li>• Shortage of Recovery beds</li> <li>• Lack of Kangaroo Care RM</li> </ul>	NCU: 11 beds 4 beds (Observation) Extra needs (not included in the Original Design)	20 beds 5 beds 6 beds	Existing: 11 + New: 9 6 beds 10 beds 4 beds
<b>Inpatient Ward</b> <ul style="list-style-type: none"> <li>• More fewer-number ward rooms to generate more user fees</li> <li>• lack of patients' privacy</li> </ul>	Extra needs (not included in the Original Design) 8-bed x5, 1-bed x2	8-bed x3, 2-bed x8, 1-bed x6 (More number of 1-bed rooms)	Ward bed configurations designed for poor patients 8-bed x4, 4-bed x2, 2-bed x1, 1-bed x4
<b>Clinical Laboratory</b> <ul style="list-style-type: none"> <li>• Lab is detached from OPD</li> </ul>	Original Lab was converted to office		To relocate Clinical Lab to NMCHC building. <b>To renovate existing NMCHC building to provide those functions</b>

Source: Survey Team

## ③ Confirmation of the intended outcome of the existing Center

The survey team reviewed and confirmed that the existing Center has achieved the intended outcome. The reviews of the third floor of the South Building and the second floor of the North Building in the existing Center are as follows:

- Third floor of the South Building (whole portion):

The east half of this floor is used as lecture rooms and dormitory rooms, and the west half is used as management offices. Table 2-7 shows chronological changes in the number of annual trainees since the operation started in 1997.

The number of the pre-service and in-service trainees after 2000 substantially exceeds the numbers estimated at the time of original design. The survey team concluded that the training function had achieved the originally intended outcome.

**Table2-7 Review of Existing Activities, 3FL, South Building**

Function	Original Design Requirements	2000	2011	2012
Training Function				
Pre-service (person/year)	Approx. 360		478	567
In-service (person/year)	Approx. 204	482	381	546
National MCH Program	Not included		918	788

Source: Survey Team

- Second floor of the North Building (east half):

The east half portion was occupied by the gynecology ward (total 42 beds including ICU) in the original design.

The average annual number of the gynecology ward's inpatients from 2000 to 2012 was about 4,580, which exceeded the number estimated at the time of original design of 4,450. The survey team concluded that the gynecology ward had achieved the originally intended outcome.



- Medical equipment

NMCHC is the obstetrics and gynecology hospital, and medical equipment used at the center is either in operation on a 24-hour basis or on a daily basis. Many pieces of equipment, which were procured by Grant Aid Projects in 1993 and 1997, are exceeding the designed durability period, and most of them need to be replaced. Table 2-8 shows the result of utilization since 1997 of the equipment to be replaced by the Project. The depreciation value of medical equipment in Cambodia is not commonly known but the initial cost to purchase those pieces of equipment has been offset against the incomes gained as user fees.

**Table 2-8 Operation Record of All the Existing Equipment to be Replaced by the Project**

Department	Equipment Name	Present Quantity	Application	Number of Cases	Performance
Maternity Ward (Ward B/C)	Doppler Fetus Detector	5	All in-patient pregnant mothers	7,000/year	Being used for diagnosing on 7,000 Ob/Gy patients per year
	Examination Light	2	All in-patient pregnant mothers	7,000/year	
Imagery	General X-ray Unit	1	Out patients/ In patients	300-1,800/year	Being used for 300-1,800 cases of X-ray for 20 years. Used more than 10,000 cases totally since 1993.
Laboratory	Blood Bank	1	Transfusion	700/year	Transfusions are performed on daily basis. Being used for 700 cases of transfusions per year over 20 years. Microscopes are used for PAP smear as cytodiagnosis since 1993.
	Microscope	5	Cytodiagnosis	-	
Dental	Dental treatment chair unit	1	All pregnant mothers	7,000/year	Being used for dental check up and treatment for all pregnant mothers since 1996.
OPD	Examination light	4	All out-patient	20,000/year	Being used for diagnosis on 20,000 pregnant mothers per year in OPD.
	ECG	1	Out-patients	500/year	
	Doppler Fetus Detector	7	All pregnant out-patients	20,000/year	
NCU	Pulse Oxymeter	8	Neonate in NUC	1,000/year	Being used for 1,000 neonates per year in NCU for diagnosing oxygenation and anemia.
	Centrifuge for hematocrit	2	Neonate in NUC	1,000/year	
OT	Oxygen Flow Meter	3	-	-	Being used for 2,400 patients under operation for oxygenation and monitoring.
	Patient Monitor (Adult)	5	All surgery	2,400/year	
Delivery	Fetal Actocardiograph	4	All delivery	7,000/year	Being used for diagnosing and monitoring over 7,000 pregnant mothers per year.
	Neonatal ultrasound machine	4	All delivery	7,000/year	
ICU/Recovery	Patient Monitor (Neonate)	4	Patients in ICU	700/year	Being used for 700 ICU patients for diagnosing oxygenation and monitoring. Operating 24 hours.
	Oxygen concentrator	1	-	-	
Laundry	Washing Machine	1	-	-	Being used for Linen for 17 years since 1996.
	Spinning Machine	1	-	-	

Source: Survey Team

④ Priorities of renovation work of the existing Center

The survey team gave a priority rating to each component of the renovation work of the existing Center based on study results and discussions during the field survey; the results are shown in Table 2-9 (A: high, B: intermediate and C: low). The components not directly related to the clinical care and training activity or related to the daily maintenance activity (which belongs to the Cambodian side work) were given lower priority ratings.

- a) Extension of slope (ramp)/installation of an elevator:  
An elevator connecting the first floor to the third floor will be installed instead of extending the existing slope. This is a result of the discussion between the MOH, Cambodia, and NMCHC during the field survey.
- b) Laundry room:  
Construction of the linen drying space will be carried out by the Cambodian side.
- c) Repairing and repainting the interior and exterior walls:  
This work is daily maintenance and is implemented by the Cambodian side.

**Table2-9 Priority Study of the Renovation Works**

Study Results of Renovation Work					
Studied Priority	Section	Added/Revised Contents			
Cambodian Side	Training	To relocate National Program office and Training rooms to the Training Center			
			Ward Type	No. of RM	Total Beds
A	Gynecology/ Obstetrics Ward	Relocation and refurbishment of this ward should be appropriate, but the number of 2-bed and individual rooms should be re-studied	8-bed	4	32 beds
			4-bed	2	8 beds
			2-bed	1	2 beds
			1-bed	4	4 beds
			Total		
B	Obstetrics Ward	To refurbish some 8-bed rooms to 4-bed room	8-bed	8	64 beds
			4-bed	4	16 beds
			2-bed	2	4 beds
			1-bed	4	4 beds
			Total		
	2FL North Bldg		1-bed	0	0
	Inpatient War Total		134 beds		
Hospital Total		174 beds			
Cambodian Side	Laboratory	To relocate Clinical Lab to NMCHC building.			
Out of Scope	Radiology	X-ray machine and Mammography may be used in the same room			
C	Pharmacy	To install A/C and exhaust fan			
C	Tech Bureau	Book shelf for medical record			
A	NCU	Total 20 beds, NCU not NICU			
A	Recovery RM	10 beds			
A	ICU	6 beds			
A	Kangaroo Care RM	4 beds			
A	Student Night-duty RM	10 beds For Male and Female			
C	Laundry	Drying space for Laundry			
A	Elevator	To install a stretcher elevator (1FL to 3FL)			
A	Ward Doors	To replace wood doors of Ward to steel doors			
C	Wall	To repair and repaint the exterior /interior wall			
A	Skylight	To repair sealant of glass block skylight			
A	Medical Gas	To replace main oxygen control system			
A	Sewage	To renew necessary portion of sewage treatment tank			
A	Water Supply	To replace solar water panel system			
B	Electric Power	To increase capacity if needed			
B	A/C & Ventilation	To increase capacity if needed			
A	Incinerator	To provide parts for the existing incinerator			

Source: Survey Team

## ⑤ Provision of the medical equipment and training equipment

The final requests of the medical and training equipment are considered sound and reasonable, because they have been determined to meet the local medical technology and NMCHC's clinical demands. The survey team reviewed and studied the necessity and validity of replaced equipment as well as new equipment to be provided. The results are shown in Table 2-10.

**Table2-10 Results of Study/Validation Evidence**

Equipment Name	Purpose of Use	Result of Study/Validation Evidence
General X-ray Unit	To take general X-ray	This existing equipment has been used from 1997, since this building was constructed. It is difficult to make a continuous maintenance contract because the manufacture no longer exists. It has exceeded its usability period and needs to be renewed.
CR Machine	To transfer data from IP cassette. Needs to be Mammography resolution compatible.	Digital X-ray Units have been adopted in other JICA grant aid projects. A photo image can be seen on a PC monitor and used for diagnosis. It is helpful for cost reduction, especially for consumable supplies because Digital X-ray Units do not require X-ray film. Furthermore the digital data is saved onto a data server, so space for X-ray film is no longer necessary.
Dry Imager	To print X-ray film from digital data. Needs to be Mammography resolution compatible.	Images of the Digital X-ray can be printed by using a Dry Imager. The benefit of a Dry Imager is that a developer is no longer necessary. By eliminating the developer, there is no longer worry of the market price rising, or environmental worries regarding disposing waste fluids.
Mobile X-ray Unit	Portable unit to take X-rays in ICU and OT	It is better to use a mobile X-ray unit in NCU because newborn infants are prone to infections and their condition may change suddenly. This machine should be used only in NCU in order to prevent infectious diseases from spreading.
Blood Gas Analyzer	To measure electrolyte and blood gas pressure.	Necessary for controlling neonatal respiratory function. This equipment should provide a diagnosis through only a small sample volume, as it is used for newborns and premature infants.
CRP analyzer for microsample	To measure C-reactive protein.	CRP analyzers provide one of the earlier indicators (C-reactive protein) for infections. Bacteriological examination can be detected earlier, especially for hospital-acquired infections
Dental Treatment Chair Unit	To check and treat patient in dentistry.	Dental check-ups are necessary for all pregnant women. The existing equipment has been used since the completion of the existing building, and some of the functions are not working; therefore it needs to be renewed.
ECG	Records ECG and diagnoses Arrhythmia, Cardiac Infarction and other diseases.	The equipment at the laboratory is out of order and cannot provide electrocardiogram diagnosis.
Patient Monitor	To monitor patients' vital signs in OT and ICU.	For an increasing number of severe and complicated cases, it is necessary to monitor bio-information of patients. This equipment is planned for the expansion of ICU and NCU.
Neonatal ultrasound machine (cardiac echo probe)	To diagnose neonate functions with ultrasound.	Current equipment cannot diagnosis neonatal cases. The planned equipment should diagnosis neonatal hydrocephalus, vitium cordis and other organs.
Simulation Model A	To train medical staff for assisted delivery	For the training of assisted delivery. Existing equipment is available, however it has deteriorated.
Simulation Model B	To train medical staff for the resuscitation	New equipment. It is for the training of emergency resuscitation, which will help to handle more severe cases.

Source: Survey Team

More than half of the medical equipment components used in the existing Center was provided in 1997, and they need to be replaced because they have been used for more than 15 years. With the annual number of deliveries exceeding 7,000, the equipment has been used for 20 patients a day in the Obstetrics Department. It is necessary to review the status of the service activities at each department and to assess the validity and necessity of each piece of equipment in line with the criteria (evaluation priorities) to select the requested equipment. (See Table 2-11: Result of detailed study on requested equipment)

a) Training Center Equipment

Training rooms and a Resource Center are to be located in the new Training Center, and equipment necessary for the clinical, hands-on trainings of midwives (simulation models) and personal computers will be included in the Project.

b) Outpatient Department

NMCHC offers gynecology and obstetrics outpatient and emergency medical services. The Outpatient Department has a Doppler fetus detector, colposcope, examination lights and ECG in addition to the sphygmomanometer, stethoscope and examination tables. However, the Doppler fetus detector and examination lights, which are essential to diagnose pregnant women, frequently suffer from defective probes and blowouts, affecting medical activities at the Department. The ECG is also broken and not functioning. It is necessary to study the components of this equipment to be replaced. Approximately 65,000 patients visit the Outpatient Department annually, and the Doppler fetus detector and ECG are used daily.

c) Diagnostic Imaging Department

The general X-ray unit and ultrasound scanner are in operation at the Department. The general X-ray unit (which was provided in 1997) is difficult to maintain regularly as its manufacturer is bankrupt; therefore replacing it needs study. Introducing the CR machine shall also be studied, as the digital imaging systems have become available in Cambodia. Two ultrasound scanners were purchased in 2012 through the budget of the Government of Cambodia, so the replacement of these machines is not included in the Project.

d) Laboratory Department

The Laboratory Department has a hematology analyzer, blood analyzer (spectrophotometer), centrifuge for hematocrit and microscopes. With the increase in the number of high-risk cases, the number of examination items increased, and it is difficult to cope with the situation with only the existing examination equipment. It is necessary to study additional equipment for the Department. The number of examination cases increased to about 14,000 cases/ year (by 30 - 40%) from 2000 to 2013. A blood analyzer (Electrolyte analyzer) will be newly provided by the Project, for which the Department's current staff members have the capability to operate.

e) Dentistry

NMCHC carries out the dental examinations for all pregnant women. The existing equipment (a dental treatment unit) was installed in 1997, and some parts of its functions are broken. Its renewal is necessary.

f) Operation Department (Operation Rooms /ICU/Recovery Room)

The Operation Rooms are equipped with anesthetic apparatus, operation lights, patient monitor, electrosurgical unit, infant warmer and phototherapy unit. The operation lights have no blowouts and maintenance is carried out properly. Because the LED photo-therapy unit has already been supplied by another donor, it shall not be included in the Project. Patient monitors and other frequently-used equipment seem seriously deteriorated; these pieces of equipment shall be replaced.

g) Delivery Department

Three delivery rooms are equipped with ceiling-mounted delivery lights, and the LDR room is equipped with small examination lights. Because examination lights in the LDR room cannot ensure proper brightness for delivery, it is difficult to perform deliveries appropriately. Therefore, it is necessary to study adding two more delivery lights. A fetal actocardiograph and a Doppler fetus detector and other frequently-used equipment seem deteriorated over time; these pieces of equipment shall be replaced.

h) NCU Department (Perinatal Care Center)

Equipment for infant care is often used in NCUs, and some pieces of the equipment were provided by the Technical Cooperation Projects. As the number of NCU beds is increased by the Project, it is necessary to study adding patient monitors, blood pressure monitors, pulse oxy-meters, infusion pumps and syringe pumps. It is also necessary to study adding a mobile X-ray unit, a blood gas analyzer and a CRP analyzer for micro sample in order to improve diagnostic functions in accordance with the increase in high-risk cases.

i) Laundry Room

A washing machine and spinning machine were provided for the laundry room in 1997, and there is concern about the failure of their mechanical parts over time. The mechanical brake of the spinning machine became irreparable two years ago due to deterioration from aging. After the motor rotation is stopped, the drum is stopped by hand, posing a safety hazard. Because the spinning machine is aging and has gone out of production, repair parts cannot be sourced. Thus, it is necessary to replace these machines in consideration of the operators' safety.

Based on the result of the examinations of the requested equipment, necessity and validity of each piece of equipment have been evaluated by using the 3-level evaluation criteria shown below.

The results are shown in Table 2-11.

- a) Equipment must be essential for the provision of medical services.
  - : Essential for the provision of medical services (2 points)
  - △: Necessary but less frequently used (1 point)
  - ×: Rarely-used for medical services and existing equipment is available (0 point)
- b) Equipment must be of high clinical priority in perinatal care.
  - : Top-priority equipment in perinatal medical care (1 point)
  - △: Necessary but low-priority (0.5 point)
  - ×: Little-used and can be covered with an alternative service (0 point)
- c) Equipment must conform to the technical level of the medical care staff.
  - : Usable given technical level of present medical care staff (1 point)
  - △: Usable given technical level of present medical care staff after receiving training at the time of equipment procurement (0.5 point)
  - ×: Difficult to use with technical level of present medical care staff (0 point)
- d) Status of existing equipment and necessity of renewal and addition
  - : Existing equipment must be renewed/No existing equipment is available and new equipment is necessary (1 point)
  - △: Existing equipment is available but additional equipment is necessary (0.5 point)
  - ×: Existing equipment has no problems and there is no need to provide additional equipment (0 point)

**Table2-11 Results of Detailed Study of Equipment**

No	Equipment Name	Use	Priority	Q'ty	Outcome Measure				Total Point	Priority Reasoning	Remarks
					a	b	c	d			
1	General X-ray Unit	For general X-ray image photograph use. It should have general utility functions.	A	1	○	△	○	○	4.5	Exceeded its service life and needs to be renewed.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life
2	CR Machine	It will be used for reading the data from IP cassette. It should handle general radiology and mammography.	A	1	○	○	△	○	4.5	Necessary for digitalization.	New equipment for digitalization
3	Dry Imager	It will be used for printing from the films. It should handle general radiology and mammography.	A	1	○	○	△	○	4.5	Necessary for digitalization.	New equipment for digitalization
4	Mobile X-ray Unit	It should have general utility functions.	A	1	○	○	△	○	4.5	For image diagnosis for the expansion of NCU function.	It is for image diagnosis of newborn at NCU.
5	Blood Analyzer (Spectro Photometer)	For identifying the quality and quantity of chemical structures dissolved in sample solutions with observing the change in color affected with light.	B	1	○	△	○	△	4.0	Additional equipment is necessary because the number of the samples is increasing even though existing equipment is available. The existing equipment could be able to handle current situation; therefore it is categorized as B.	To handle increased number of samples.
6	Blood Analyzer (Electrolyte Analyzer)	For measuring electrolytes in specimen materials. It should have general utility functions.	B	1	○	△	○	○	4.5	Necessary to improve the current medical service. The blood gas analyzer could function complementally as a part of it; therefore it is categorized as B.	New equipment for improving medical service
7	Blood Gas Analyzer	For measuring electrolyte and partial pressure of blood gas. It should have general utility functions.	A	1	○	○	△	○	4.5	There is no existing equipment to diagnosis respiratory functions for newborn.	For diagnosis newborn respiratory functions
8	CRP Analyzer for Micro Sample	Equipment for measuring CRP reaction	A	1	○	○	△	○	4.5	Necessary for diagnosis of infections.	For diagnosis of infections
9	Centrifuge for Hematocrit	For measuring hematocrit by capillary tubes.	A	1	○	○	○	△	5.0	Necessary for diagnosis of neonatal anemia.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded the service life
10	Microscope	For observing specimens by magnification.	B	1	○	△	○	○	4.5	The existing equipment is usable but some need to be renewed. Current equipment could suffice; therefore it is categorized as B.	To be replaced by the Project, because the existing equipment has exceeded its service life
11	Dental Chair Treatment Unit	For dental check-ups and treatment. It should have general utility functions.	A	1	○	△	○	○	4.5	Has exceeded its service life and needs to be renewed.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life

No	Equipment Name	Use	Priority	Q'ty	Outcome Measure				Total Point	Priority Reasoning	Remarks
					a	b	c	d			
12	ECG	For recording electrocardiograph in order to diagnosis irregular pulse and myocardial infarction. It should have general utility functions.	A	1	○	○	○	○	5.0	Equipment to diagnose cardiology function is out of order at OPD.	To be replaced by the Project, because the existing equipment is non-functional
13-1	Patient Monitor (Adult)	For monitoring patients' bio information at operation theatres and ICU. It should have general utility functions.	B	13	○	○	○	△	4.5	Has exceeded its service life and needs to be renewed. The existing equipment is available but it is necessary for expansion of ICU.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life
13-2	Patient Monitor (Neonate)	For monitoring patients' bio information at NCU. It should have general utility functions.	A	5	○	○	○	△	5.0	Necessary for expansion of NCU.	It is necessary for the expansion of NCU.
14	Pulse Oxymeter	For monitoring fetal pulse and uterine contraction in order to understand fetal well-being, especially in the last-term of pregnancy. It should measure fetal pulse and labor pain at the same time. It should have specifications to diagnosis premature birth, fetal distress and labor with excessive pain. It should have general utility functions.	A	10	○	○	○	△	5.0	Necessary for expansion of NCU.	To be replaced by the Project, because the existing equipment has exceeded its service life. It is necessary for the expansion of NCU.
15	Blood Pressure Monitor	It is for automated measuring for neonatal blood pressure.	A	3	○	○	○	○	5.0	For monitoring bio-information for the expansion of NCU.	New equipment
16	Fetal Actocardiograph	It is to measure fetal pulse and uterine contraction in order to understand fetal' well-being especially in the last-term of pregnancy.	A	5	○	○	○	○	5.0	Has exceeded its service life and needs to be renewed.	To be replaced by the Project, because the existing equipment has exceeded its service life Two components were procured by NMCHC in 2007.
17	Doppler Fetus Detector	It is to measure fetal pulse and its heart rate in order to know its abnormalities if any.	A	10	○	○	○	○	5.0	The existing equipment is available but some of them need to be renewed.	To be replaced by the Project, because the existing equipment has exceeded its service life. One component was procured in 1997 by Japanese Grant Aid and two were renewed in 2004 by Technical Cooperation Project
18	Neonatal Ultrasound Machine	For check-ups of newborn infants' health. It should have general utility functions.	A	1	○	○	△	○	4.5	Necessary to diagnose neonatal cardiac and organ function.	For neonatal cardiac and organ function
19	Examination Light	It is for lighting the examination in Gynecology and Obstetrics.	A	7	○	○	○	○	5.0	Has exceeded its service life and needs to be renewed. Production has been discontinued.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) is out of production



No	Equipment Name	Use	Priority	Q'ty	Outcome Measure				Total Point	Priority Reasoning	Remarks
					a	b	c	d			
20	Operation Light for Delivery	Lighting for duration of labor.	A	2	○	○	○	○	5.0	Necessary for deliveries at LDR.	New equipment at LDR
21	Suction Pump	It is to suck body fluid up during labor as well as surgical treatment.	A	1	○	○	○	○	5.0	Necessary for the improvement of the hospital.	Additional Equipment
22	Syringe Pump	It is for small-scale blood transfusion.	A	14	○	○	○	△	4.5	Necessary for the expansion of NCU.	Additional equipment for the expansion of NCU
23	Infusion Pump	It is for small-scale blood transfusion.	A	9	○	○	○	△	4.5	Necessary for the expansion of NCU.	Additional equipment for the expansion of NCU
24	Oxygen Concentrator	It is to intake air and to send out highly concentrated oxygen.	B	4	△	○	○	○	3.5	The existing equipment is available but some need to be renewed. Production has been discontinued.	To be replaced by the Project, because the existing equipment has exceeded its service life
25	Nebulizer	it is to remove phlegm with micro size particles of expectrant generated by ultrasound oscillation.	C	5	△	△	○	○	3.5	Its priority has been assessed as "C", because the Project's equipment aims to improve the NCU's functions. However, the equipment shall be necessary to treat infant respiratory disease.	New equipment
26	Oxygen Flow Meter	It is to control the amount of oxygen from the terminal of medical oxygen gas. It provides medical oxygen for equipment or patients.	A	23	○	○	○	△	4.5	Necessary for the expansion of NCU/ICU.	It is additional equipment for expansion of NCU/ICU
27	Patient Warmer	It is to control patients' body temperature during surgery.	A	2	○	△	○	○	4.5	Necessary for the management of the patients' body temperature during surgery.	New equipment
28	Laryngoscope	It is for larynges to be intratracheal intubation, transtracheal aspiration and infusion of drugs.	B	3	○	△	△	○	4.0	Necessary for the improvement of the medical service.	New equipment for improving medical service
29	Blood Bank Refrigerator	For storing blood for transfusion	A	2	○	○	○	○	5.0	Has exceeded its service life and needs to be renewed.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life
30-1	Drug Store Refrigerator A	For storing drugs which need to keep refrigerated	A	1	○	○	○	△	4.5	Necessary to handle increasing number of drugs.	To handle increased number of drugs
30-2	Drug Store Refrigerator B	For storing drugs.	A	1	○	○	○	○	5.0	Necessary for the expansion of the hospital.	New equipment for the expansion of the hospital
31	Gynecological Examination Table	For Gynecological examinations	A	1	○	○	○	△	4.5	Necessary for the expansion of the hospital.	New equipment for the expansion of the hospital
32	Medical Bed	Medical beds for patients	A	6	○	○	○	△	4.5	Necessary for the expansion of the hospital.	New equipment for the expansion of the hospital
33	Bedside Table	Bedside table with casters.	A	6	○	○	○	△	4.5	Necessary for the expansion of the hospital.	New equipment for the expansion of the hospital

No	Equipment Name	Use	Priority	Q'ty	Outcome Measure				Total Point	Priority Reasoning	Remarks
					a	b	c	d			
34	Pharmacy Supply Shelves	For storing drugs.	B	1	○	△	○	△	4.0	Necessary to handle increasing number of drugs. It is not directly connected with clinical service, therefore it is categorized as B.	Equipment to handle increasing number of drugs
35	Washing Machine	For washing linens. It should have general utility functions.	A	1	○	○	○	○	5.0	Has exceeded its service life and needs to be renewed.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life
36	Spinning Machine	For spin-drying linens. It should have general utility functions.	A	1	○	○	○	○	5.0	Has exceeded its service life and needs to be renewed. Some of its functions are not available.	To be replaced by the Project, because the existing equipment (Japanese Grant Aid in 1997) has exceeded its service life
37	Simulation Model A	For assisted delivery training.	A	2	○	○	○	△	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions
38	Simulation Model B	For emergency resuscitation training	A	2	○	○	△	○	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions
39	PC for Training	For making necessary materials for training research and document retrieval.	A	10	○	○	○	○	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions
40	Desk	For setting up with PC with chair	A	10	○	○	○	○	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions
41	Chair	For setting up with PC with desk	A	10	○	○	○	○	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions
42	Printer/Copy/Scanner Combined Machine	It is to store and print the materials for training	A	1	○	○	○	○	5.0	Necessary for the expansion of staff training.	Additional equipment for the expansion of training functions

Source: Survey Team

3) Reviews of validity in terms of staffing and budgets

a) Reviews of the staffing allocations

NMCHC is currently operated by a total of 478 staff members, including 235 clinical staff members and 139 administrative staff members. For the Nursing Department, 79 midwives are in charge of the inpatient wards, Outpatient Department and Delivery Department, and 55 nurses are in charge of the NCU, ICU, recovery room, the Operation Department and the Central Sterile Supply Department.

The Project's total number of the inpatient ward beds (134 beds) will remain unchanged. It is basically possible to operate the existing Center with the number of current staff members, as there will be no need to increase the number of staff members after implementing the Project because the Outpatient Department, Delivery Department and operation rooms remain unchanged.

On the other hand, it is necessary to increase the number of staff members for the NCU, ICU, and the recovery room, whose functions are significantly improved by the Project. The improvement of those rooms will require hiring two new MDs and nine nurses.

b) Reviews of the operation and maintenance budgets

Three revenue sources currently provide income: government (MOH) budget, clinical service fees and tenant fees from parking lots and Canteen. Although the amount of government budget has leveled off in recent years, service fees are gradually increasing. Total income in 2012 was US\$ 3,646,200, which the government budget accounted for 75%, service fees accounted for 24%, and tenant fees accounted for the rest. The government budget stayed at almost the same level in the last five years, and the increase in expenditures has been covered by the service fees. It is therefore important to secure service fees as an alternative, stable revenue resource.

Each item of the expenditures is classified by two revenue sources (government budget and service fees). Total expenditures in 2012 were approximately US\$ 3,652,400. Of this amount, staff salaries accounted for 20% of the government budget revenue, purchasing of drug/medical supplies accounted for 40%, other expense accounted for 30% and maintenance costs accounted for the rest. Incentives for staff accounted for 60% of user fee revenue and the purchase of drug/medical supplies and other expenditures accounted for the rest. "Other" items consisted of Government subsidized grants for the exempted patients, vehicle maintenance costs/fuel costs, purchase of medical gas, purchase of ingredients for inpatient meals, staff uniform costs and staff travel expenses, etc.

NMCHC's financial statements in the last five years indicate that it generates small deficits or profits year by year, and the balance is basically filled by the previous year's carried-over profits.

The field survey team studied that a part of the increased cost incurred by the Project would be offset by the increased user fees generated by increasing the number of pay-beds.

### 2-2-2-2 Layout Plan for the Site and Facilities

(1) Location

The site of NMCHC is located in the northeast old Town of Phnom Penh, near the Tonlé Sap River, and extends toward north-northwest from Wat Phnom. The site occupies the north half of the block facing Route 47, and the main buildings of Kantha Bopha Children Hospital occupy the south half of the block.

NMCHC is affectionately called the Japan Hospital by local people.

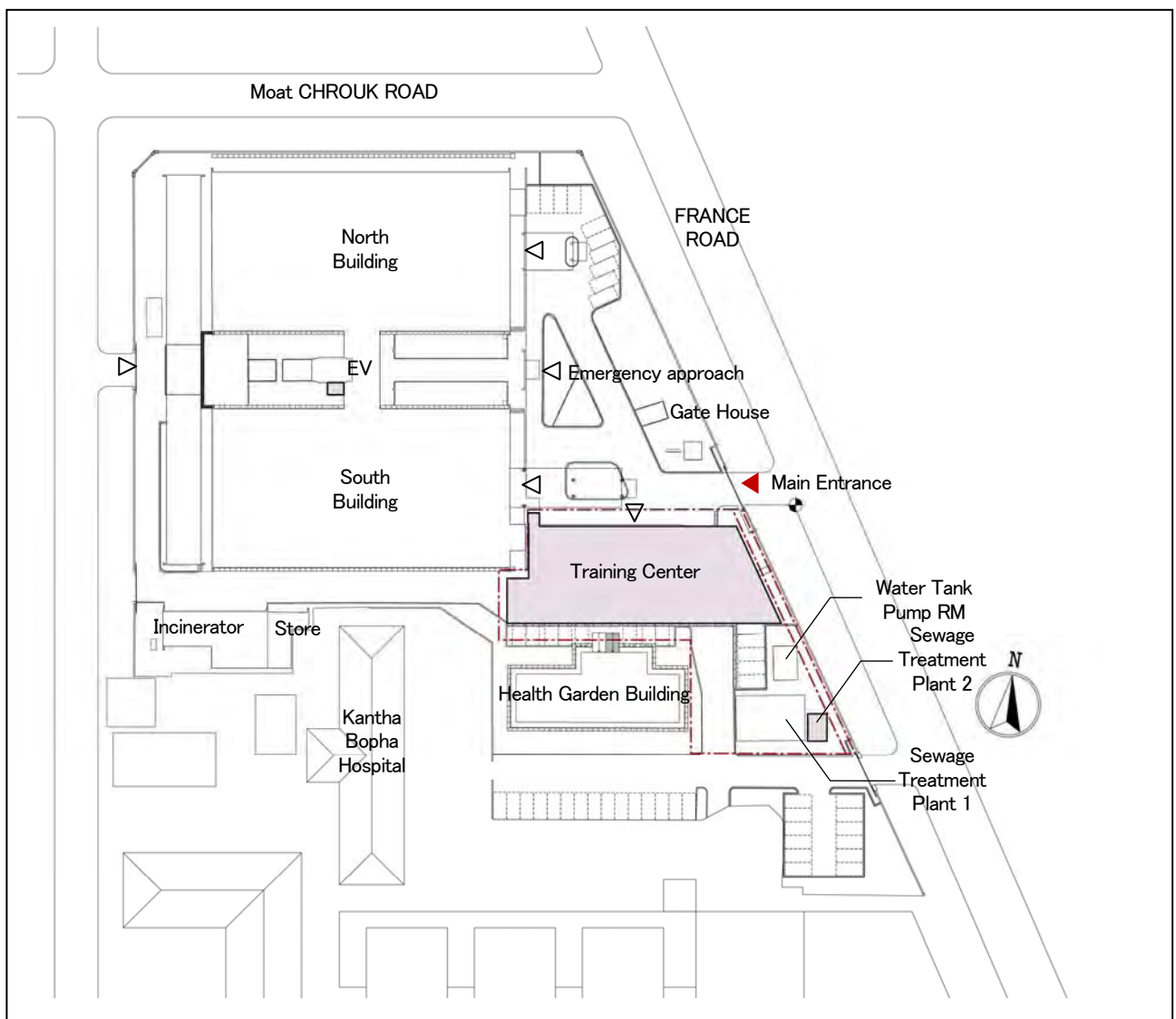


Figure2-2 Surrounding Environment of the Project Site

(2) Site Plan/Facility Layout Plan

The existing Center includes the Training Department as well as general hospital functions; therefore there are flow lines of patients, visitors, staff, services and trainees. Because training functions will be transferred to the new Training Center in this Project, it is necessary to plan a layout that considers the routes around the premise so that these flow lines will not intersect.

The road and traffic circumstances in adjacent areas suggest the main access approach for both patients and staff will be from the front road (FRANCE ROAD). Therefore, the main entrance to the premise faces the front road and a flow line between the North building and the South building is secured for emergency vehicles, as to not intersect with outpatients and staff. The new Training Center shall lie midway between the canopy of the South Wing of the existing hospital and the Health Garden Building as to not intersect with the existing flow line.



Source: Survey Team

**Figure2-3 Existing Facilities and the Layout Plan of New Training Center**

### **2-2-2-3 Architectural Plan**

#### **(1) Functional Space Programs of the Training Center**

##### **1) Review of the NMCHC's training program plan**

Based on the current training activities and the NMCHC's master plans, Table 2-12 shows the results of reviews of the training programs NMCHC plans to implement in 2020 (approximately three years after the Project's facilities begin operating).

NMCHC currently provides pre-service (before graduation) training programs to medical students at the University of Health Science (UHS) and other co-medical students at the Technical School for Medical Care (TSMC) in Phnom Penh as well as in-service (after graduation) training programs to medical staff working on the MCH care services in the local areas. The in-service training programs are further categorized into clinical training (such as emergency obstetrics care, etc.) and National MCH Program training.

Of the latter training programs, the training programs for the National Nutrition Program (NNP) and the Prevention of Mother-to-Child Transmission (PMTCT) are currently being conducted, but five additional programs (National Reproductive Health Program, National Immunization Program, ARI-CDD-IMCI, internal staff training and medical workshop) are to be carried out from 2020 as a target.

Although the number of trainees for each course and the course's frequencies differ, most of the courses have a group of 15 to 20 trainees, which is the maximum size of trainee-group for the clinical training. The training rooms will therefore be designed with 20 seats as standard. There are three types of classes: clinical training, lectures and group discussions (PBL class). It is necessary to reflect upon conditions such as the number of trainees and types of training to determine the number and size of training rooms.

**Table2-12 The Proposed Training Programs in 2020**

	Training Course	Targeted Trainee	Period of Training (week)	No of Trainees (Total)	Frequency (times per year)	No of Trainees (persons/time)	Facility Requirements		
							Training RM Requirements		Dormitory Use
							No. of seats	Use Hour	
<b>Pre-service Training</b>									
Current Course	MD (GP) 6-Grade	UHS	8 weeks	180	12 times	15	20 seats	Clinical Training	Night Duty RM
	MD (Specialty)	UHS	24 weeks	40	2 times	20	20 seats	Clinical Practice: 7:30-11:30 Lecture Hour: 13:30-17:30	Night Duty RM
	MD (Intern)	UHS	24 weeks	90	6 times	15	20 seats		Night Duty RM
	Midwife	TSMC	8 weeks	160	8 times	20	20 seats		
	Technical X-ray	TSMC	4 weeks	15	4 times	4	20seat/PBL		
	Lab Technician	TSMC	4 weeks	45	4 times	11	20 seats		
	Nurse	TSMC	4 weeks	50	4 times	13	20 seats		
	Pharmacist	UHS	8 weeks	70	2 times	35	40 seats		Night Duty RM
<b>Total</b>				<b>650</b>					
<b>In-service Training (Clinical Practice)</b>									
Current Course	HC Midwife Training	Midwife	4 weeks	60	3 times	20	20 seats	Lecture Hour: 13:30-17:30	Dormitory
	BEmOC	MD/Midwife	4 weeks	40	2 times	20	20 seats		Dormitory
	CEmOC	MD	12 weeks	20	2 times	10	20 seats		Dormitory
	Partgram	Midwife (HC)	0.4 weeks	180	12 times	15	20 seats	Lecture Hour: 7:30-11:30 Clinical Practice: 13:30-17:30	
	MVE	MD/Midwife	0.6 weeks	40	4 times	10	20 seats		
	Immediate Neonatal Care		0.4 weeks	120	10 times	12	20seat/PBL		
	MgSO4		0.4 weeks	180	9 times	20	20 seats		
	Suction Curettage		1.6 weeks	100	10 times	10	20 seats		
	TOT for EmOC		1.0 weeks	48	2 times	24	20seat/PBL		
	<b>Total</b>				<b>788</b>				
<b>In-service Training (Health Program Training)</b>									
Current Course	PMTCT	Midwife (HC)	1.0 weeks	500	20 times	25	40seat/PBL	Lecture Hour: 7:30-11:30/13:30-17:30	
	National Nutritoin Program		1.0 weeks	300	15 times	20	20seat/PBL		
Future Course	RH	Provincial Program	1.0 weeks	144	12 times	12	20seat/PBL		
	NIP (EPI)	Manager and Midwife (HC)	1.0 weeks	80	4 times	20	20seat/PBL		
	ARI		1.0 weeks	80	4 times	20	20seat/PBL		
	Internal Staff Training	Midwife/Nurse	1.0 weeks	80	4 times	20	20seat/PBL		
	Medical Workshop		1.0 weeks	80	4 times	20	20seat/PBL		
<b>Total</b>				<b>1,264</b>					

Source: Survey Team

2) Calculation of the number and sizes of the training rooms

Based on the aforementioned training programs, the total use weeks per year for each type of training room (20-seat room, 40-seat room, PBL class room) can be calculated. The required number of rooms is calculated by dividing total use weeks by 48 (maximum usable weeks per year). The results are shown in Table 2-13.

In the General Practitioner (GP) training of the pre-service training programs, only clinical training is provided at NMCHC (as lectures are carried out at UHS).

① Lecture Room

Four 20-seat lecture rooms and one 40-seat lecture room shall be provided. The walls between some lecture rooms will be movable partitions to allow for flexible use.

② PBL (Problem Based Learning) Room

The maximum number of people in the lecture group using the PBL class room is about 40. Therefore, four discussion rooms which can seat 10 people shall be provided.

**Table2-13 Study of the Necessary Number/Sizes of Training Facilities**

Training Course	20-seat Lecture			40-seat Lecture			PBL				
	Total Week			Total Week			Total Week				
	Morning	Afternoon-1	Afternoon-2	Morning	Afternoon-1	Afternoon-2	Morning	Afternoon-1	Afternoon-2		
<b>Pre-service Training</b>											
MD (GP) 6-Grade				(Training for GP is clinical training only)							
MD (Specialty)		24.0 w weeks	24.0 w weeks	(50% of entire lecture hour is distributed to Afternoon-1 and the rest to Afternoon-2)							
MD (Intern)		72.0 w weeks	72.0 w weeks								
Midwife		32.0 w weeks	32.0 w weeks								
Technical X-ray				(50% of entire lecture hour is distributed to Afternoon-1 and the rest to Afternoon-2)				8.0 weeks	8.0 weeks		
Lab Technician		8.0 w weeks	8.0 w weeks								
Nurse		8.0 w weeks	8.0 w weeks								
Pharmacist					8.0 w weeks	8.0 w weeks					
<b>Sub-total</b>	<b>0.0 w weeks</b>	<b>144.0 w weeks</b>	<b>144.0 w weeks</b>	<b>0.0 w weeks</b>	<b>8.0 w weeks</b>	<b>8.0 w weeks</b>	<b>0.0 w weeks</b>	<b>8.0 w weeks</b>	<b>8.0 w weeks</b>		

<b>In-service Training</b>									
HC Midwife Training		6.0 w weeks	6.0 w weeks	(50% of entire lecture hour is distributed to Afternoon-1 and the rest to Afternoon-2)					
BEmOC		4.0 w weeks	4.0 w weeks						
CEmOC		12.0 w weeks	12.0 w weeks						
Partgram	4.8 w weeks	4.8 w weeks	4.8 w weeks						
MVE	2.4 w weeks	2.4 w weeks	2.4 w weeks						
Immediate Neonatal Care							4.0 w weeks	4.0 w weeks	4.0 w weeks
MgSO4	3.6 w weeks	3.6 w weeks	3.6 w weeks						
Suction Curettage	16.0 w weeks	16.0 w weeks	16.0 w weeks						
TOT for EmOC							2.0 w weeks	2.0 w weeks	2.0 w weeks

<b>In-service Training (Health Program Training)</b>									
PMTCT				10.0 weeks			10.0 w weeks		
National Nutritoin Program	7.5 w weeks						7.5 w weeks		
RH	6.0 w weeks						6.0 w weeks		
NIP (EPI)	2.0 w weeks			(50% of entire lecture hour is distributed to Lecture Rm and the rest to PBL Rm)			2.0 w weeks		
ARI	2.0 w weeks						2.0 w weeks		
Internal Staff Training	2.0 w weeks						2.0 w weeks		
Medical Workshop	2.0 w weeks						2.0 w weeks		
<b>Sub-total</b>	<b>48.3 w weeks</b>	<b>48.8 w weeks</b>	<b>48.8 w weeks</b>	<b>10.0 w weeks</b>	<b>0.0 w weeks</b>	<b>0.0 w weeks</b>	<b>37.5 w weeks</b>	<b>6.0 w weeks</b>	<b>6.0 w weeks</b>

**Necessary Number of Training Rooms**

	20-seat Lecture			40-seat Lecture			PBL		
	Morning	Afternoon-1	Afternoon-2	Morning	Afternoon-1	Afternoon-2	Morning	Afternoon-1	Afternoon-2
<b>Total Week</b>	<b>48.3 w weeks</b>	<b>192.8 w weeks</b>	<b>192.8 w weeks</b>	<b>10.0 w weeks</b>	<b>8.0 w weeks</b>	<b>8.0 w weeks</b>	<b>37.5 w weeks</b>	<b>14.0 w weeks</b>	<b>14.0 w weeks</b>
<b>Total Week/48 weeks</b>	<b>1.0</b>	<b>4.0</b>	<b>4.0</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.8</b>	<b>0.3</b>	<b>0.3</b>

Source: Survey Team



## 3) Calculation of the number and sizes of the dormitory and night-duty rooms

Only trainees attending in-service training programs will use the dormitory. Most of the medical students attending pre-service training programs will not stay in NMCHC because they live in Phnom Penh, while only night shift trainees will stay in the student night-duty rooms.

## ① Dormitory

Only training courses exceeding more than four weeks will require dormitory accommodation. Trainees attending training programs of the Health Center (HC) midwives and emergency obstetrics care trainings (B/C EmOCs) can use the dormitory. On the assumption that the male-female ratio of each course is 1:1, based on the current training activities, the number of required beds is shown in Table 2-14.

**Table2-14 Study of Necessary Number/Sizes of Dormitories**

Gender	Training Course Title	Targeted Trainee	No. of Trainees (person/time)	Period of Training	Frequency (times/year)	Maximum No. of Beds
Female	Health Center Midwife Training	Midwife	20	4 weeks	3 times	20
	BemOC	MD/Midwife	10	4 weeks	2 times	10
	CemOC	MD/Midwife	5	12 weeks	2 times	5
Necessary No. of Beds						20
Male	BemOC	MD/Midwife	10	4 weeks	2 times	10
	CemOC	MD/Midwife	5	12 weeks	2 times	5
Necessary No. of Beds						10

Source: Survey Team

## ② Night-duty Room

Only night-shift trainees attending the pre-service training programs will use the night-duty rooms. It is necessary to secure the number of beds for one out of five shifts per day. On the assumption that the male-female ratio is 1:1, based on the current training activities, the number of required beds is shown in Table 2-15.

**Table2-15 Study of Necessary Number/Sizes of Night Duty Rooms**

Gender	Training Course Title	No. of Trainees (person/time)	Necessary No. of beds	Period of Training	Frequency (times/year)	Total No. of Beds*Week
Female	MD (GP)	8	1.5 beds	8 weeks	12 times	144 beds*week
	MD (Specialty)	10	2.0 beds	24 weeks	2 times	96 beds*week
	MD (Intern)	8	1.5 beds	24 weeks	6 times	216 beds*week
	Nurse	8	1.5 beds	4 weeks	4 times	24 beds*week
Total						480 beds*week
Total bed week/total available No. of weeks per year (48 weeks)						10.0 beds
Male	MD (GP)	8	1.5 beds	8 weeks	12 times	144 beds*week
	MD (Specialty)	10	2.0 beds	24 weeks	2 times	96 beds*week
	MD (Intern)	8	1.5 beds	24 weeks	6 times	216 beds*week
Total						456 beds*week
Total bed week/total available No. of weeks per year (48 weeks)						9.5 beds

Source: Survey Team

## 4) National Maternal and Child Health (MCH) Program Office

Out of five program offices under the jurisdictions of NMCHC, the National Immunization Program (NIP) Office has already moved outside NMCHC, and is not included in the Project. The number of persons and required offices for the remaining four National MCH Program Offices are shown in Table 2-16. In the Prevention of Mother-to-Child Transmission (PMTCT) Office, contract staff members occupy the majority (21 out of 28), and the number of staff members may change significantly in the future. It is therefore appropriate that PMTCT Office will not be located in the Training Center but in the Health Garden Building, where extra vacant rooms are available due to the current Clinical Laboratory relocating.

**Table2-16 Study of Necessary Sizes of the National MCH Program Offices**

Department	No. of Person (Contract Staff)	Area/Person	Necessary Area
National Reproductive Health Program	16 ( 3)	4.5 sqm/person	72.0 sqm
National Nutrition Program	13 ( 0)		58.5 sqm
ARI-CDD-IMCI	6 ( 0)		27.0 sqm
PMTCT	28 (21)		126.0 sqm
Source: Survey Team			283.5 sqm

## 5) Management Office

## ① Management office

Office area per person is calculated in accordance with the same area standards as the existing Center. A 20-sqm private room should be provided to the hospital director, deputy hospital director and chief of administration, whereas 4.5 sqm per person should be applied to calculate the shared office area for other office staff members.

**Table2-17 Study of Necessary Sizes of Management Offices**

Designation	No. of Person	Area/Person	Necessary Area
Director	1	20.0 sqm/person	20.0 sqm
Deputy Director	5		100.0 sqm
Chief, Administration	1		20.0 sqm
Staff/Contract Staff	15	4.5 sqm/person	67.5 sqm
Source: Survey Team			207.5 sqm

## ② Clinical Division, Nursing Division and other related Office

Office spaces for the Clinical Division, Nursing Division and Health Financing Committee Offices are calculated based on the same area standard, and Table 2-18 shows the necessary office space for each division. However, these offices are not included in the proposed Training Center, and have been transferred to the third floor of the South Building as a part of the renovation work of the existing Center.

**Table2-18 Study of Necessary Sizes of Clinical Offices**

Department	No. of Person	Area/Person	Necessary Area
Clinical Division Office	16	4.5 sqm/person	72.0 sqm
Nursing Division Office	13		58.5 sqm
Health Financing Committee Office	19		85.5 sqm
Source: Survey Team			216.0 sqm

## (2) Contents of Renovation Work/Functional Space Programs of the of the existing Center

## 1) Study of the number of NCU beds

## ① Status of current clinical activities at NCU

Table 2-19 shows chronological trends of NCU activities (the total number of deliveries, the number of high-risk cases transferred to NCU, etc.) from 2000 to 2012.

The number of deliveries has been kept at about 7,000 cases/year and the rate of high-risk cases increased from 13% in 2000 to 18% in 2008. However, the rate dropped temporarily in 2010 and 2011 because the criteria for admittance to NCU was tightened due to the outbreaks of nosocomial infections (admitted patients were limited and others were transferred to other hospitals).

It is expected that the number of admitted patients would recover to match the average rates in 2007 and 2008, after the Project is implemented and the admittance criteria is relaxed. The Average Length of Hospital Stay (ALS) of NCU over the past 12 years is about 4.24 days.

**Table2-19 Records of Medical Activities in NCU**

Items	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Delivery (A)	7,235	6,467	6,656	6,718	7,154	7,470	7,241	8,183	7,661	7,518	5,912	6,380	6,912	7,039
Number of NCU Bed	16	16	16	16	16	16	16	16	16	16	16	16	11	--
NCU Patients (B)	979	850	887	810	799	891	1,135	1,354	1,446	1,220	783	919	468	965
(B) / (A) (%)	13.53	13.14	13.33	12.06	11.17	11.93	15.67	16.55	18.87	16.23	13.24	14.40	6.77	13.60
Refer to General Ward	794	669	704	644	627	677	969	1,201	1,237	1,052	593	705	203	--
Refer to Outside	16	20	18	11	12	82	42	10	2	16	11	32	180	--
Death in Center	167	156	169	144	158	133	125	135	218	150	180	188	83	--
ALS (day)	4.21	5.41	5.08	4.74	4.80	3.84	3.58	4.09	3.61	3.83	4.78	4.22	3.03	4.24
BOR (%)	70.51	78.27	77.65	64.90	65.46	58.63	69.62	94.33	90.12	79.83	64.21	66.87	21.14	69.34

Source: NMCHC

## ② Calculating the number of NCU beds

NMCHC estimates that the total number of deliveries in 2020 will be about 7,000 cases/year, and about 20% of total deliveries will be high-risk cases. It plans to accept about 3.8 high-risk cases/day to NCU.

It is generally recommended that the maximum limit of the Bed Occupancy Rate (BOR) of the NCU is less than 80% in order to reduce the risk of the nosocomial infections. According to a calculation of the number of NCU beds required in 2020 (based on the above conditions), the appropriate

number of beds will be approximately 20 (20.14).

- $3.8 \text{ cases/day (the number of high-risk cases)} \times 4.24 \text{ days (ALS)} \div 0.8 \text{ (BOR)} = 20.14 \text{ beds.}$

**Table2-20 Study of the Necessary Number of NCU Beds**

Year	High Risk Newborn Babies			Number of Newborn Babies / Day	ALS	Designed BOR Ratio	Required Bed Numbers
	Delivery	High Risk Case (%)	Numbers of High Risk Cases				
2020	7,000	20.00	1,400	3.8	4.24	80%	20.14 (20 Beds)

Source: Survey Team

③ Increase in the operation costs incurred by the implementation of the Project

The increase in operation costs incurred by the increased number of NCU beds by the Project (from 11 to 20) is calculated based on the current operation status and other conditions.

a) Costs of purchasing drugs and medical supplies

The number of NCU beds was officially 16 before it was renovated and expanded to 20 in 2012. Its operation costs (purchase cost for drugs and medical supplies) remained unchanged even after the renovation. The operation cost of the NCU is generally determined by the number of accepted patients, not by the number of its beds. Although the number of beds is increased to 20 by the Project, its operation cost will not be increased in proportion to the number of beds.

The number of patients admitted to the NCU was 1,220 in 2009 and 783 in 2010 (decreased by 437). The purchase cost for drugs and medical supplies was US\$ 49,769 in 2009 and US\$ 42,868 in 2010 (decreased by US\$ 6,901). The number of patients decreased by 35% and the cost decreased by 13.8%. The contents of drugs and medical materials changed due to increases in prices and changes in medical services. Although this relation cannot be applied directly to the Project, when the number of accepted patients in 2020 is estimated to be 1,400/year, (using the number of accepted patients in 2009 as a basis) the number of patients increases by about 15% and the purchase cost for drugs and medical supplies increases by about 6%. However, with consideration of an increase in prices and other price increase incentives up to 2020, it is necessary to consider an increase of 40 to 50% from the 2009 expenditure.

The net increase in the purchase cost of drugs and medical supplies in this Project is therefore expected to be about US\$ 25,000/year.

b) Personnel expenses

Medical personnel expense will increase since the current medical staff members (5 doctors and 14 nurses) will increase by 2 doctors and 6 nurses, resulting in a net cost increase of about US\$ 10,500. (Doctors: US\$ 158/month  $\times$  12 months  $\times$  2 persons = US\$ 3,792, Nurses: US\$ 93/month  $\times$  12 months  $\times$  6 persons = US\$ 6,696, Total: US\$ 10,488)

Total increased costs incurred by the Project are estimated to be about US\$ 35,500; more detailed cost calculations are studied in 2-5-2 "Operation and Maintenance Cost."

**Table2-21 Costs of Drugs and Medical Disposables incurred by NCU (unit: US dollar)**

NO	Description	Unit Cost	Q'ty by Year			Total Amount by Year		
			2009	2010	'13 (Jan-Jun)	2009	2010	'13 (Jan-Jun)
1	Paracetamol syrup 60ml	0.66	0	33	10	0.00	21.78	6.60
2	Promethazine	0.72	0	0	5	0.00	0.00	3.60
3	Ampicilline	1.22	716	385	287	873.52	469.70	350.14
4	Calcium gluconate 10%	3.25	1,201	477	461	3,903.25	1,550.25	1,498.25
5	Dexamethasone 4mg/ml	0.55	97	96	22	53.35	52.80	12.10
6	Diazepam 10mg/2ml (Valium)	0.80	33	13	28	26.40	10.40	22.40
7	Furosemide	0.50	0	0	2	0.00	0.00	1.00
8	Gentamycine 80mg/2ml	1.12	1,040	775	272	1,164.80	868.00	304.64
9	Hydrocortisone 100mg/2ml	3.22	24	26	9	77.28	83.72	28.98
10	Sodium Bicarbonate 8.4%	8.05	8	8	2	64.40	64.40	16.10
11	Vitamine K1	2.37	696	640	402	1,649.52	1,516.80	952.74
12	Water for injection	0.29	11,700	8,900	1,350	3,393.00	2,581.00	391.50
13	Dextrose 5% + set	6.91	121	77	40	836.11	532.07	276.40
14	Dextrose 10% + set	6.15	802	632	280	4,932.30	3,886.80	1,722.00
15	Dextrose 50% 50ml	0.12	5	5	0	0.60	0.60	0.00
16	NSS 0.9% + set	8.53	84	54	30	716.52	460.62	255.90
17	Ringer Lactate + set	8.84	16	14	11	141.44	123.76	97.24
18	Providone Iodine 10%	5.16	48	50	24	247.68	258.00	123.84
19	Tranexamic Acide 0.5g	1.02	0	7	37	0.00	7.14	37.74
20	Safety box	1.12	50	75	30	56.00	84.00	33.60
21	Syringe 1ml + needle 26G	0.03	15,700	17,500	5,800	471.00	525.00	174.00
22	Adhesive Tape Zinc Oxide	2.95	303	129	43	893.85	380.55	126.85
23	Catgeter IV 24G	1.00	0	0	1,720	0.00	0.00	1,720.00
24	Gloves Exam. Non-sterile L	0.31	37,900	35,100	25,600	11,749.00	10,881.00	7,936.00
25	Needle disp. 1 1/2	0.10	0	0	600	0.00	0.00	60.00
26	Needle disp. 19G	0.11	1,200	1,300	0	132.00	143.00	0.00
27	Needle disp. 21G	0.10	1,600	1,200	0	160.00	120.00	0.00
28	Needle disp. 25G	0.11	0	600	0	0.00	66.00	0.00
29	Syringe disp. + needle 23G	0.40	1,800	1,600	500	720.00	640.00	200.00
30	Syringe disp. + needle 25G	0.29	14,200	14,300	3,400	4,118.00	4,147.00	986.00
31	Syringe disp. 10ml 3 part	0.06	500	800	500	30.00	48.00	30.00
32	Syringe disp. 50ml	0.34	3,129	3,845	1,645	1,063.86	1,307.30	559.30
33	Tube nasogastric / Feeding	0.37	746	1,465	580	276.02	542.05	214.60
34	Tube suction disp.	0.30	1,100	1,290	260	330.00	387.00	78.00
35	Thermometer Oral/rectal	0.61	50	26	24	30.50	15.86	14.64
36	Multivitamine syrup	1.67	0	6	2	0.00	10.02	3.34
37	Aminophilline 10ml	0.61	0	0	56	0.00	0.00	34.16
38	Ceftriaxone 1g + Sulbactate 500mg	3.70	470	686	229	1,739.00	2,538.20	847.30
39	Ceftriaxone 1g (Triacef)	5.40	439	13	0	2,370.60	70.20	0.00
40	Glucose 50% 10ml	500.00	0	0	7	0.00	0.00	3,500.00
41	Anios special	6.75	0	0	10	0.00	0.00	67.50
42	Microlax baby gel	1.58	0	32	48	0.00	50.56	75.84
43	Hexanions	19.50	0	0	25	0.00	0.00	487.50
44	Daktarin oral gel (miconazol)	4.10	66	76	36	270.60	311.60	147.60
45	Gentamycine eye drop 0.3%	1.02	233	207	128	237.66	211.14	130.56
46	Gentamycine cream 0.1%	0.50	51	61	35	25.50	30.50	17.50
47	Milk powder 400g	5.21	24	82	6	125.04	427.22	31.26
48	Milk powder 900g	10.42	80	36	31	833.60	375.12	323.02
49	Adhesive sterile (neoplast)	0.01	0	3,700	1,300	0.00	37.00	13.00
50	Infusion set for pediatric	2.62	140	294	127	366.80	770.28	332.74
51	One touch glycemine test	6.50	0	6	6	0.00	39.00	39.00
52	Extension set ET100	0.89	320	500	180	284.80	445.00	160.20
53	Lame pour raser	0.07	1,650	1,640	720	115.50	114.80	50.40
54	Oxisensor II	45.11	2	6	8	90.22	270.66	360.88
55	Scalp vein 27G x 30mm	0.23	536	803	454	123.28	184.69	104.42
56	Dermanios scrub + chorexidine	6.75	138	135	0	931.50	911.25	0.00
57	Adrenaline 1mg/ml	0.07	14	17	0	0.98	1.19	0.00
58	Aminophylline 250mg/10ml	0.61	119	97	0	72.59	59.17	0.00
59	Bandage crepe 8cmx4m	0.16	5	0	0	0.80	0.00	0.00
60	Catheter IV25G	1.00	3,967	4,143	0	3,967.00	4,143.00	0.00
61	Incubation tube 3, 3.5	0.36	0	66	0	0.00	23.76	0.00
62	Stethoscope + Sphygmomanometer	20.73	5	3	0	103.65	62.19	0.00
63	Phenobarbital 100mg	0.07	0	100	0	0.00	7.00	0.00
Total						49,769.52	42,868.15	24,960.38

## 2) Study of the number of ICU beds and Recovery Room beds

## ① Status of current operation activities

Table 2-22 shows chronological trends in the number of operations and their breakdown at NMCHC. The number of operations increased continuously; approximately 1,400 operations were performed in 2000, 1,600 in 2005, 2,000 in 2010 and approximately 2,400 in 2012. The number of Cesarean section operations increased about threefold from approximately 650 in 2000 to approximately 1,700 in 2012, and this is the major reason of the increase in the operations at NMCHC.

**Table2-22 Records of Surgical Operations Activities**

Type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Caesarean Section	654	588	620	671	807	857	901	1,264	1,083	1,459	1,319	1,797	1,707
Other Obstetrics Operation	91	85	104	71	87	118	164	205	183	188	168	165	191
Gynecological Operation	646	564	604	585	610	597	596	606	577	560	522	598	545
Total	1,391	1,237	1,328	1,327	1,504	1,572	1,661	2,075	1,843	2,207	2,009	2,560	2,443
Number of Operation / Day	3.81	3.39	3.64	3.64	4.12	4.31	4.55	5.68	5.05	6.05	5.50	7.01	6.69

Source: Survey Team

## ② Calculating the number of ICU beds and Recovery Room beds

NMCHC estimates that the total number of operations in 2020 will be about 2,500 (about 7.2 operations per day).

It is important to note that most of the operations performed at NMCHC are Cesarean sections, and approximately 50% patients who received Cesarean sections are referred from other provincial hospitals outside Phnom Penh. Therefore it is recommendable to set the target number of operations in 2020 to 2,500 per year (which is almost the same as the current level), because the Government of Cambodia is planning to improve the quality of MCH care services and to provide the CPA3 hospitals with facilities to deal with Cesarean sections in rural areas. This target number is also reasonable, as NMCHC will not deal with the surgical treatment for infants in the future.

Most of the patients after the Cesarean sections are transferred to and observed at the Recovery Room, because their post-surgical courses are mostly treated with the lumbar anesthesia. According to the results in 2012, about 70% patients were transferred to the Recovery Room after operations such as Cesarean sections, and about 30% patients were transferred to the ICU after gynecological-related operations (such as the removal of a uterus or ovary).

Similar to the NCU, the upper limit of the BOR at ICU and Recovery Room shall be 80% in order to reduce the risk of nosocomial infections.

a) Determining the number of ICU beds

Assuming that about 30% of post-surgical patients are transferred to the ICU, the appropriate number of ICU beds in 2020 is calculated to be 6 (5.4 based on the current ALS).

- $2,500 \text{ cases/year} \times 30\% \div 350 \text{ days (annual number of days of medical operation)} = 2.14 \text{ cases/day}$
- $2.14 \text{ cases/day (number of transferred patients a day)} \times 2.0 \text{ days (ALS)} \div 0.8 \text{ (BOR)} = 5.4 \text{ beds}$

**Table2-23 Study of the Necessary Number of ICU Beds**

Year	Number of Surgical Operation			Number of Patients per Day	ALS	BOR	Number of Beds
	Total Numbers of Operation	% of Accommodated in ICU	Number of Patients				
2020	2,500	30%	750	2.14 person/day	2.0 day	80%	5.4 (6 Beds)

Source: Survey Team

b) Determining the number of the Recovery Room beds

According to the same calculation method as the ICU, assuming that about 70% of the post-surgical patients are transferred to the Recovery Room, the appropriate number of its beds in 2020 is calculated to be 10 (9.4 based on the current ALS).

- $2,500 \text{ cases} \times 70\% \div 350 \text{ days} = 5 \text{ cases/day}$
- $5 \text{ cases/day (number of transferred patients a day)} \times 1.5 \text{ days (ALS)} \div 0.8 \text{ (BOR)} = 9.4 \text{ beds}$

**Table2-24 Study of the Necessary Number of Recovery Room Beds**

Year	Number of Surgical Operation			Number of Patients per Day	ALS	BOR	Number of Beds
	Total Numbers of Operation	% of Accommodated in Recovery	Number of Patients				
2020	2,500	70%	1,750	5.00 person day	1.5 day	80%	9.4 (10 Beds)

Source: Survey Team

③ Increase in operation costs incurred by the implementation of the Project

In the project, the number of ICU beds is increased from 5 to 6, and Recovery Room beds is increased from 6 to 10 to improve the perinatal care systems. Increase in operation costs will be calculated based on the current operation status:

## a) Cost of purchasing drugs and medical supplies

The chronological comparison in costs of drugs and medical supplies at the ICU and Recovery Room among 2009, 2010 and 2013 shows no significant difference depending on the number of accepted patients (the annual purchase cost is estimated based on the results of the first half of the fiscal year). The target number of patients (2,500), based on which the appropriate number of ICU beds in 2020 is calculated, will not increase significantly from the number of patients in recent years. The Project (which increases the number of ICU and Recovery Room beds) doesn't intend to increase the number of patients accepted there, but rather to ensure the proper BOR of both rooms. Therefore, costs to purchase drugs and medical supplies are not likely to increase in proportion to the number of beds increased by the Project. Figures of annual expenditure for drugs and medical supplies in 2013 were used to predict the purchase cost of drugs and medical supplies in 2020. In 2013, the annual expenditure was estimated at US\$ 82,500 (by doubling the figure for the first half of the year). When the prices escalation rate is set to 2% annually,<sup>1</sup> the purchase cost of drugs and medical supplies in 2020 is estimated at 14.8% higher than in 2013. This corresponds to an increase in cost of US\$ 12,210 from the year 2013.

## b) Personnel expenses

Currently, 13 nurses are in charge of the ICU and Recovery Room (which have total 11 beds), and a nurse is responsible for 0.85 beds on average. Using the current nursing system as a reference, it is desired to ensure 16 nurses for the ICU (6 beds) and Recovery Room (10 beds) in order to maintain the general concept of "one nurse per bed". Therefore it is necessary to hire three additional nurses. The increased personal expenses will be  $\text{US\$ } 93/\text{month} \times 12 \text{ months} \times 3 \text{ nurses} = \text{US\$ } 3,348$

Total increased costs incurred by the Project are estimated to be about US\$ 15,500; more detailed cost calculations are studied in 2-5-2 "Operation and Maintenance Cost."

---

<sup>1</sup> According to the IMF, prices escalation in August 2013 was 3.1% compared to July 2013 (announced in October 2013). But food prices as well as exchange market show very stable situation. Therefore, IMF predicates that a price escalation rate is carried out gradually, maintaining a fall tendency. It would be progressed at about 2% annually ( $\text{US\$}82,500 \times 1.02^7 = \text{US\$ } 94,710$ ).



Table2-25 Costs of Drugs and Medical Disposables incurred by ICU and Recovery

(unit US dollar)

NO	Description	Unit Cost	Q'ty by Year			Total Amount by Year		
			2009	2010	'13 (Jan-Jun)	2009	2010	'13 (Jan-Jun)
1	Adrenaline 1mg/1ml	6.75	95	38	0	641.25	256.50	0.00
2	Ampicilline 1g	0.64	6,805	6,063	3,817	4,355.20	3,880.32	2,442.88
3	Atropine Sulphate 1mg/1ml	1.54	10	30	0	15.40	46.20	0.00
4	Butycolopolamine 20mg/1ml	1.85	27	29	19	49.95	53.65	35.15
5	Calcium gluconate 10% 1g/10ml	1.79	261	132	117	467.19	236.28	209.43
6	Carbocrom 1.5mg (Adrenoxyl) 2ml	4.36	78	0	0	340.08	0.00	0.00
7	Dextrose 50% 50ml	4.91	16	21	7	78.56	103.11	34.37
8	Diazepam 10mg/2ml	0.81	104	76	8	84.24	61.56	6.48
9	Digoxine 0.5mg/2ml	2.03	46	64	0	93.38	129.92	0.00
10	Dopamine 200mg/5ml	2.91	55	52	8	160.05	151.32	23.28
11	Ergometrine Maleat 0.5mg/1ml	1.79	3	0	0	5.37	0.00	0.00
12	Fantanyl 0.1mg/2ml	2.49	17	40	9	42.33	99.60	22.41
13	Furosemide 20mg 2ml	1.86	1,129	948	346	2,099.94	1,763.28	643.56
14	Hydralazine 20mg/ml	7.81	1,054	939	477	8,231.74	7,333.59	3,725.37
15	Hydrocortisone 100mg	5.02	81	104	30	406.62	522.08	150.60
16	Ketamine 500mg/10ml	2.34	1	2	0	2.34	4.68	0.00
17	Magnesium sulphate 10ml 50%	23.98	1,131	930	500	27,121.38	22,301.40	11,990.00
18	Metoclopramide 10mg/2ml	0.39	38	75	33	14.82	29.25	12.87
19	Metronidazole 500mg/100ml	3.98	1,346	1,452	1,628	5,357.08	5,778.96	6,479.44
20	Morphine 10mg/1ml	12.9	0	0	26	0.00	0.00	335.40
21	Neostigmine 0.5 mg/1ml	1.23	0	1	0	0.00	1.23	0.00
22	Potassium chloride 10ml 10%	0.15	88	102	40	13.20	15.30	6.00
23	Sodium bicarbonate 8.4% 20ml	3.35	11	4	0	36.85	13.40	0.00
24	Suxamethonium 500mg/10ml (Succinyl)	2.26	4	8	0	9.04	18.08	0.00
25	Thiopental 1g/5ml	7.28	3	1	0	21.84	7.28	0.00
26	Vitamin K1 10mg/1ml	1.35	77	84	34	103.95	113.40	45.90
27	Water for injection 5ml	0.25	3,200	1,000	6,050	800.00	250.00	1,512.50
28	Aluminium hydroxide 500mg	0.02	0	9	0	0.00	0.18	0.00
29	Amoxilline 250mg	0.11	134	637	179	14.74	70.07	19.69
30	Bromhexine 8mg	0.01	50	166	86	0.50	1.66	0.86
31	Charcoal activated 500mg	0.02	6	9	0	0.12	0.18	0.00
32	Cotrimoxazol 400+80mg	0.01	45	0	20	0.45	0.00	0.20
33	Diazepam 5mg	0.01	51	49	12	0.51	0.49	0.12
34	Digoxine 0.25mg	0.06	20	14	0	1.20	0.84	0.00
35	Ferrosulfate+Folic acid 200+0.40mg	0.01	265	266	283	2.65	2.66	2.83
36	Furosemide 40mg	0.01	14	31	0	0.14	0.31	0.00
37	Hydralazine 25mg	0.49	8	23	0	3.92	11.27	0.00
38	Methyldopa 250mg (aldomet, dopegit)	0.19	84	58	29	15.96	11.02	5.51
39	Metronidazole 250mg	0.03	120	238	98	3.60	7.14	2.94
40	Misoprostol 200mcg (Cytotec)	2.05	204	146	90	418.20	299.30	184.50
41	Chlopheniramine 4mg	0.01	12	25	0	0.12	0.25	0.00
42	Multivitamin	0.05	23	230	62	1.15	11.50	3.10
43	Nifedipine 20mg	0.07	232	313	139	16.24	21.91	9.73
44	Ofloxacin 200mg	0.02	2	0	0	0.04	0.00	0.00
45	Paracetamol 500mg	0.02	343	795	753	6.86	15.90	15.06
46	Promethazine 25mg (Phenergan)	0.01	0	12	6	0.00	0.12	0.06
47	Salbutamol 4mg	0.02	8	9	0	0.16	0.18	0.00
48	Tranexamic acid 500mg (Nexi)	0.22	11	51	54	2.42	11.22	11.88
49	Dextrose 10% (+set) 500ml	4.01	139	205	28	557.39	822.05	112.28
50	Dextrose 5% (+set) 500ml	4.31	450	435	276	1,939.50	1,874.85	1,189.56
51	Dextrose 5%+0.45% NaCl (+set) 500ml	1.67	840	0	0	1,402.80	0.00	0.00
52	NSS 0.9% + set 1000ml	4.01	73	116	61	292.73	465.16	244.61
53	Plasma substitute +set 500ml	8.89	159	126	18	1,413.51	1,120.14	160.02
54	Ringer lactate (+set) 1000ml	1.98	2,947	2,873	1,752	5,835.06	5,688.54	3,468.96
55	Chlorexidine gluconate 1.5% + Cetrimide	36.75	2	11	0	73.50	404.25	0.00
56	Chlorexidine gluconate 20% 1000ml	113.75	6	0	0	682.50	0.00	0.00
57	Chlorpromazine 50mg/ml	4.75	11	1	0	52.25	4.75	0.00
58	Adhesive tape 5cmx5cm	4.15	39	6	0	161.85	24.90	0.00
59	Adhesive tape 18cmx5cm	2.06	40	36	14	82.40	74.16	28.84
60	Blade for surgical knife #22	0.15	10	5	0	1.50	0.75	0.00
61	Catheter foley CH 14	2.32	205	197	93	475.60	457.04	215.76
62	Catheter foley CH 16	0.15	37	0	0	5.55	0.00	0.00

NO	Description	Unit Cost	Q'ty by Year			Total Amount by Year		
			2009	2010	'13 (Jan-Jun)	2009	2010	'13 (Jan-Jun)
63	Catheter IV 18G	1.09	1	1	0	1.09	1.09	0.00
64	Catheter IV 20G	1.06	184	147	45	195.04	155.82	47.70
65	Catheter IV 22G	1.25	380	380	145	475.00	475.00	181.25
66	Extension tube ET 100	0.69	140	190	30	96.60	131.10	20.70
67	Glove surgical sterile 7	0.45	300	350	150	135.00	157.50	67.50
68	Glove surgical sterile 7.5	0.64	300	150	150	192.00	96.00	96.00
69	Incubation tube no 6.5	0.82	0	5	0	0.00	4.10	0.00
70	Needle disposable 1-1/2 19G	0.07	1,400	1,900	1,400	98.00	133.00	98.00
71	Needle disposable 1-1/2 21G	0.07	1,000	1,600	1,100	70.00	112.00	77.00
72	Needle disposable 25G	0.01	1,200	1,200	0	12.00	12.00	0.00
73	Oxygen mask with reservoir bag	3.46	20	10	1	69.20	34.60	3.46
74	Safety box	1.01	50	55	20	50.50	55.55	20.20
75	Scalp vein 23G	0.16	4	0	0	0.64	0.00	0.00
76	Scalp vein 25G	0.07	2	2	0	0.14	0.14	0.00
77	Sphygmomanometer	29.25	2	2	2	58.50	58.50	58.50
78	Stetoscope	4.04	0	3	0	0.00	12.12	0.00
79	Syringe disposable & needle 23G 10ml	0.3	5,150	3,000	0	1,545.00	900.00	0.00
80	Syringe disposable & needle 23G 5ml	0.03	700	500	5,100	21.00	15.00	153.00
81	Syringe disposable & needle 23G 50ml	0.24	250	0	0	60.00	0.00	0.00
82	Syringe disposable & needle 21G	0.21	200	1,200	2,380	42.00	252.00	499.80
83	Syringe disposable 50ml	0.32	0	150	50	0.00	48.00	16.00
84	Tube suction disposable CH16	1.25	0	20	0	0.00	25.00	0.00
85	Tube suction disposable CH8	0.19	0	10	0	0.00	1.90	0.00
86	Tube nasogastric/feeding CH 14	0.84	22	18	23	18.48	15.12	19.32
87	Ultrasound gel	16.25	250	200	0	4,062.50	3,250.00	0.00
88	Demianios scrub chlorhexidine 500ml	5.25	104	101	10	546.00	530.25	52.50
89	Eau Oxygene 50ml	0.07	2	2	0	0.14	0.14	0.00
90	Spafon inj 4ml	0.75	21	0	3	15.75	0.00	2.25
91	Gentamycine cream 0.1%	0.4	5	2	0	2.00	0.80	0.00
92	Iod polyvidone	1.87	104	87	54	194.48	162.69	100.98
93	Aminophylline 250mg inj 10ml	0.42	12	45	1	5.04	18.90	0.42
94	Becomplet inj	0.5	381	662	517	190.50	331.00	258.50
95	Bromhexine 4mg 2ml	0.23	143	104	23	32.89	23.92	5.29
96	Ceftriaxone 1g	4	937	870	615	3,748.00	3,480.00	2,460.00
97	Dexamethasone 5mg	0.05	355	354	217	17.75	17.70	10.85
98	Diclofenac 75mg/3ml	0.06	3,620	3,275	2,740	217.20	196.50	164.40
99	Ephedrine 50mg	3.75	1	2	1	3.75	7.50	3.75
100	Gentamycine 80mg 2ml	0.08	5,131	4,661	2,946	410.48	372.88	235.68
101	Magnesium sulphate 10ml 10%	0.5	450	329	0	225.00	164.50	0.00
102	Oxytocine 10UI	0.11	1,635	2,042	1,792	179.85	224.62	197.12
103	Tramadol 50mg	0.65	792	2,580	2,818	514.80	1,677.00	1,831.70
104	Lidocaine 2% 50ml	2.12	2	0	0	4.24	0.00	0.00
105	Winalgin	0.28	4,602	2,823	0	1,288.56	790.44	0.00
106	Exacil 0.5g 5ml	0.92	6	30	0	5.52	27.60	0.00
107	Gentamycin eye drop	0.75	23	16	20	17.25	12.00	15.00
108	Bag urine collect 2l	0.37	258	226	96	95.46	83.62	35.52
109	Cotton hygienic	0.5	1,020	880	270	510.00	440.00	135.00
110	Electrode disposable for ECG	0.15	810	905	450	121.50	135.75	67.50
111	Glove examination non-sterile	0.07	3,300	2,550	13,200	231.00	178.50	924.00
112	Infusion set	0.06	180	81	0	10.80	4.86	0.00
Total						79,807.57	69,399.89	41,211.04

## 3) Inpatient Ward

## ① Status of current ward activities

Studying the BOR of the inpatient wards over the past three years reveals that 8-bed room is the least used, and its BOR is kept at about 60%. On the other hand, the BORs of 1-bed room and 2-bed room are kept at about 80 to 90%. The package delivery fees (including inpatient ward fees, delivery fees and other additional charges) of 1-bed room or 2-bed room are higher than those of 8-bed room. However, the BOR of fewer bed-rooms is higher because of an increase in the number of patients who can afford to pay the higher fees and prefer privacy.

**Table2-26 Record of BOR by Ward-Room Type**

Type of Room	Department	Number of Beds	Total Number of patient Days and BOR						Average BOR (3 years)	Average BOR By Type
			2010		2011		2012			
8 Bed Room	Obstetrics	96	22,459	64.1%	23,596	67.3%	24,404	69.6%	67.02	64.90
	Gynecology	32	6,806	58.3%	7,066	60.5%	6,639	56.8%	58.53	
2 Bed Room	Obstetrics	4	924	63.3%	1,143	78.3%	1,270	87.0%	76.18	76.18
	Gynecology	-	-	-	-	-	-	-	-	
1 Bed Room	Obstetrics	4	1,189	81.4%	1,314	90.0%	1,418	97.1%	89.52	84.09
	Gynecology	2	487	66.7%	558	76.4%	559	76.6%	73.24	

Remark: Average of BOR by room type (3 years; from 2010 to 2012): 8 Bed Rooms; 64.90%, 2 Bed Rooms; 76.18%, Single Bed Rooms; 84.09%

Source: NMCHC

An 8-bed room in the obstetrics ward was modified into a 4-bed room in January, 2013. The BOR of this 4-bed room from February to June 2013 are shown in Table 2-27.

**Table2-27 BOR of 4 Beds Room which introduced in Obstetric Ward (February – June, 2013)**

Type	Number of Rooms	Number of Beds	Total number of Patients days / BOR (%)										Average BOR (%)
			Feb		Mar		Apr		May		Jun		
4 Bed Room	1	4	90	80.4	90	72.6	69	57.5	90	72.6	95	79.2	72.33

Source: NMCHC

## ② Studying the appropriate ward room types

The demand for ward rooms with sufficient space around the bed (1-bed and 2-bed room) is high because relatives generally stay with pregnant patients in Cambodia.

NMCHC plans to increase the number of more expensive pay-bed wards to compensate for the increase in operation costs incurred by the improvement of the perinatal care systems (increase in the number of NCU and ICU beds and staff members, etc.) by the Project.

The survey team therefore reviewed and studied the adequate number of ward room types to achieve a favorable balance between satisfying NMCHC's original goal of providing the poorest segment of the community with MCH care services and dealing with the increased costs incurred by improving NCUs.

a) Studying the necessary number of 8-bed rooms

Any situation where the NMCHC cannot accept patients who can only afford to stay in 8-bed rooms (which is the most inexpensive ward room) should be avoided. The impact of decreasing the number of 8-bed rooms and increasing the number of fewer bed rooms has been thoroughly studied. The BOR of 8-bed rooms for the past three years (from 2010 to 2012) has been kept at about 65%. It is generally considered that the maximum limit BOR for obstetrics inpatient ward is about 90%. There were sixteen 8-bed rooms (128 beds in total) until 2012 and now fifteen 8-bed rooms, after NMCHC converted in 2013 an 8-bed room to a 4-bed room by using the fund from the Technical Cooperation Project.

Based on the average BOR for the past three years, the BOR is 86.5% if there are twelve 8-bed rooms (96 beds in total). Therefore it is necessary to secure at least twelve 8-bed rooms to conform within the maximum BOR of 90%.

b) Studying the number of fewer-bed ward rooms

In the NMCHC's plan, the total number of beds will not be increased. The remaining 38 beds (134-96) shall be allocated among fewer-bed rooms (1-bed, 2-bed and 4-bed rooms). As shown in Table 2-26, the BOR of fewer-bed rooms is kept higher than that of 8-bed rooms. To level out the BOR, it is highly appropriate to increase the number fewer-beds rooms.

Table 2-28 shows the study results to allocate the remaining 38 beds to fewer-bed rooms. The combination of two 4-bed rooms for each nursing unit (6 rooms in total), one 2-bed room for each nursing unit (3 rooms in total) and four 1-bed rooms for each floor (8 rooms in total) will be most appropriate in order to distribute fewer-bed rooms in each nursing unit.

Increasing the number of 1-bed and 2-bed rooms enables providing for the individual care of pregnant women and family attendants, which contributes to the improvement of the midwifery care quality and realization of "friendly care to women and babies", which is promoted by the Technical Cooperation Projects by Japan.

Since 1996 in Cambodia, the user fee system has been introduced as compensation for basic medical care services in national hospitals. In order to secure incomes to operate the hospital properly, it is appropriate to ensure more user fees by increasing the number of fewer-bed rooms.

**Table2-28 Comparison between the Current and Proposed Ward Configurations**

Existing				Study Result			
Ward Type	Room Type	No. of Rooms	No. of Beds	Ward Type	Room Type	No. of Rooms	No. of Beds
Gynecology 2FL, North Bldg	8-bed	4	32	Obstetrics/ Gynecology 3FL, South Bldg	8-bed	4	32
	4-bed	-	-		4-bed	2	8
	2-bed	-	-		2-bed	1	2
	1-bed	2	2		1-bed	4	4
	Total		34		Total		46
Obstetrics 2FL, South Bldg	8-bed	11	88	Obstetrics 2FL, South Bldg	8-bed	8	64
	4-bed	1	4		4-bed	4	16
	2-bed	2	4		2-bed	2	4
	1-bed	4	4		1-bed	4	4
	Total		100		Total		88
Ward Total			134	Ward Total			134
NCU	5+6-bed	1+1	11	NCU	20-bed	1	20
ICU	5-bed	1	6	ICU	6-bed	1	6
Recovery RM	6-bed	1	5	Recovery RM	10-bed	1	10
				Kangaroo Care	4-bed	1	4
Hospital Total			156	Hospital Total			174

Source: Survey Team

c) Estimating medical service fees by the planned patient room type

Table 2-29 and Table 2-30 show the results of a simulated increase in revenue for this Project based on the average bed operation rate from 2010 to 2012 (for 4-bed rooms, average bed operation rate from February to June in 2013).

**Table2-29 Study of Ward's User Fees Incomes by Ward-type(Current)**

Current								
Ward	Type of Room	Number of Rooms	Number of Beds	Correction to Actual Bed Numbers			Costs per day/	Income
				BOR	Deduction of 14%	Number of Bes		
Ward A (Gyn)	8 Bed	4 Room	32 Bed	64.9%	86.0%	17.9 Bed	\$13.1	\$234.42
	4 Bed	0	0	72.3%	100.0%	0.0 Bed	\$22.5	\$0.00
	2 Bed	0	0	76.1%	100.0%	0.0 Bed	\$20.6	\$0.00
	1 Bed	2 Room	2 Bed	84.1%	100.0%	1.7 Bed	\$28.1	\$47.31
	Total		34 Beds			19.5 Beds		
Ward B (Obs)	8 Bed	5 Room	40 Bed	64.9%	86.0%	22.3 Bed	\$13.1	\$293.02
	4 Bed	1 Room	4 Bed	72.3%	100.0%	2.9 Bed	\$22.5	\$65.07
	2 Bed	1 Room	2 Bed	76.1%	100.0%	1.5 Bed	\$20.6	\$31.39
	1 Bed	2 Room	2 Bed	84.1%	100.0%	1.7 Bed	\$28.1	\$47.31
	Total		48 Beds			28.4 Beds		
Ward C (Obs)	8 Bed	6 Room	48 Bed	64.9%	86.0%	26.8 Bed	\$13.1	\$351.63
	4 Bed	0	0 Bed	72.3%	100.0%	0.0 Bed	\$22.5	\$0.00
	2 Bed	1 Room	2 Bed	76.1%	100.0%	1.5 Bed	\$20.6	\$31.39
	1 Bed	2 Room	2 Bed	84.1%	100.0%	1.7 Bed	\$28.1	\$47.31
	Total		52 Beds			30.0 Beds		
Total Number of Bed			134 Beds			78.0 Beds	Daily Income	\$1,148.8
							Annual Income	\$419,327.24

**Table2-30 Study of Ward's User Fees Incomes by Ward-type (Year 2020)**

Planned								
Ward	Type of Room	Number of Rooms	Number of Beds	Correction to Actual Bed Numbers			Costs per day	Income
				BOR	Deduction of 14%	Number of Bes		
Ward A (Mixed)	8 Bed	4 Room	32 Bed	64.9%	86.0%	17.9 Bed	\$13.1	\$234.42
	4 Bed	2 Room	8 Bed	72.3%	100.0%	5.8 Bed	\$22.5	\$130.14
	2 Bed	1 Room	2 Bed	76.1%	100.0%	1.5 Bed	\$20.6	\$31.39
	1 Bed	4 Room	4 Bed	84.1%	100.0%	3.4 Bed	\$28.1	\$94.61
	Total		46 Beds			28.5 Beds		
Ward B (Obs)	8 Bed	4 Room	32 Bed	64.9%	86.0%	17.9 Bed	\$13.1	\$234.42
	4 Bed	2 Room	8 Bed	72.3%	100.0%	5.8 Bed	\$22.5	\$130.14
	2 Bed	1 Room	2 Bed	76.1%	100.0%	1.5 Bed	\$20.6	\$31.39
	1 Bed	2 Room	2 Bed	84.1%	100.0%	1.7 Bed	\$28.1	\$47.31
	Total		44 Beds			26.8 Beds		
Ward C (Gye)	8 Bed	4 Room	32 Bed	64.9%	86.0%	17.9 Bed	\$13.1	\$234.42
	4 Bed	2 Room	8 Bed	72.3%	100.0%	5.8 Bed	\$22.5	\$130.14
	2 Bed	1 Room	2 Bed	76.1%	100.0%	1.5 Bed	\$20.6	\$31.39
	1 Bed	2 Room	2 Bed	84.1%	100.0%	1.7 Bed	\$28.1	\$47.31
	Total		44 Beds			26.8 Beds		
Total Number of Bed			134 Beds			82.2 Beds	Daily Income	\$1,377.2
Source: Survey Team							Increased Revenue / day	\$228.4
							Annual Income	\$502,678.00
							Increased Revenue / year	\$83,350.76

As shown in the above examination, increasing the rate of patient rooms with fewer beds leads to an increase in revenue by about US\$ 83,300 annually. The revenue shall be allocated to the operation and maintenance of the facilities which are likely to require increased operation costs.

The following two items shall be adopted as preconditions.

- **Precondition 1:**

Adjustment of the number of beds: The number of beds is adjusted in consideration of the bed operation rate and the deduction rate of hospitalization costs for the poorer patients with respect to the actual number of beds. Taking 8-bed rooms (4 rooms, 32 beds) in Ward A shown in Table 2-29 as an example, the number of revenue-producing beds is decreased from 32 to 17.9 ( $32 \text{ beds} \times 64.9\% \times 86.0\% = 17.9 \text{ beds}$ ) due to considerations regarding the bed operation rate (64.9%) and the deduction rate of medical care costs (14.0%). The substantial number of beds which can produce hospitalization revenue is 17.9. A hospitalization cost deduction rate of 14% is based on the hospitalization revenue data from 2011. Using 2011 as an example, Table 2-31 shows that 13.53% of hospitalization revenue is deducted; therefore the deduction rate is set at 14%. The 14% deduction rate shall be applied only to 8-bed rooms, not to other patient rooms with fewer beds.

- **Precondition 2:**

Hospitalization cost: Ordinary delivery cost (Cost for delivery and three-day hospitalization is specified for each room type. Hospitalization cost for one day is obtained by dividing the cost into four equal parts to proceed with the simulation. The package cost, including 3-day hospitalization cost shall be as follows:

- 8-bed room: US\$ 52.5 (per day: US\$ 13.1)
- 4-bed room: US\$ 90 (per day: US\$ 22.5)
- 2-bed room: US\$ 82.5 (per day: US\$ 20.6)
- 1-bed room: US\$ 112.5 (per day: US\$ 28.1)

**Table2-31 User Fee of Wards and Exemption Rates in 2011**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Numbers of 100% Exemption	9	10	10	10	8	12	15	7	3	5	6	14	109
Numbers of Partial Exemption	60	29	32	25	51	70	82	65	68	83	74	70	709
<b>Total</b>	<b>69</b>	<b>39</b>	<b>42</b>	<b>35</b>	<b>59</b>	<b>82</b>	<b>97</b>	<b>72</b>	<b>71</b>	<b>88</b>	<b>80</b>	<b>84</b>	<b>818</b>
Amount of Exemption (unit: 1,000 Riel)	11525	4511	7640	7859	13843	19830	22362	17338	16068	20654	19828	23973	185431
The Numbers Patients paid by the Government (Remark 1)	25	15	19	19	16	33	18	17	21	25	23	18	249
Remark 1: US\$ 20 is subsidized for 1 case (US\$ 20 x 249 = US\$ 4,980)								Amount of Deduction (US\$); A					46,358
								Total Income (US\$); B					342,558
								A / B (%)					13.53

Source: Survey Team

## 4) Clinical Laboratory

## ① Status of the Clinical Lab

Bacterial examinations and pathological examinations are not performed by NMCHC and are outsourced. Bacterial examinations are outsourced to the Pasteur Institute and National Public Health Institute while pathological examinations are outsourced to UHS. The number of outsourced examinations is small. The number of bacterial examinations was 368 in 2011 and 310 in 2012; representing about one examination per day.

Deaths of infant sepsis caused by possible nosocomial infections consecutively occurred in 2011. Therefore NMCHC outsourced the blood culture examinations of the patients in NCU to the Pasteur Institute with assistance of the Technical Cooperation Project. Table 2-32 shows the results. However, those bacterial examinations were a temporary action after an outbreak of nosocomial infections.

**Table2-32 Number of Outsourced Bacteriological Test**

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Examination	24	13	30	16	19	30	11	6	3	152
Expenses	920.93	411.20	525.15	637.90	801.80	524.90	196.85	84.40	42.20	4,145.33

Examined by Pasteur Institute in Phnom Penh, unit is US dollars; duration is April to December 2012

Source: JICA Technical Cooperation Project Team

## ② Design policy of the Clinical Laboratory

NMCHC has no system to perform bacterial examinations on a routine basis. Because it has no plan to perform the bacterial examinations inside, and the number of examinations is few (one examination per day), it is recommendable to outsource the bacterial examinations to outside institutions.

If bacterial examinations are introduced to NMCHC in the future, it will be necessary to provide a room separate from the general laboratory room with separate ventilation and exhaust system, to prepare laboratory equipment (such as safety cabinet, incubator) and to purchase materials for the dyeing and cultivation of samples. In consideration of these points, it will be very difficult to operate the bacterial test laboratory at NMCHC with a fee of US\$ 5 per examination since the number of tests at NMCHC is relatively few.

Moreover, WHO carries out measures for reinforcing examination networks related to bacterial examinations. After collecting samples from neighboring areas, examinations are carried out at six organizations selected at the national level. There is an extensive effort underway to improve infrastructure such as the equipment in each facility. The network mechanism system is to be established and reinforced in the future. In view of the ongoing reinforcement of the examination network, it is considered appropriate to conduct the bacterial examinations through outsourcing.

The six selected organizations are as follows:

- National Public Health Institute



- National Pediatric Hospital
- Kossamak Hospital (the above three organizations are located in Phnom Penh)
- Takeo Provincial Hospital
- Battam Bang Provincial Hospital,
- Kampong Cham Provincial Hospital (the above three are CPA hospitals)

(3) Room Allocations of the Training Center

Table 2-33 shows the above-mentioned rooms organized by department and floor.

All the requested rooms can be secured with four layers of a typical floor plate that has a NET area (area of usable rooms excluding corridor and toilets, etc.) of 540 m<sup>2</sup>. Rooms with similar in functions shall be located together on the same floor. The appropriate layout is as follows:

- ① First Floor: The first floor is Piloti (built on top of pillars) in order to keep a clear access route for vehicles to the North Wing and Parking lot at first floor level. The only functional rooms at this level are a lobby and machine room
- ② Second floor: The Management Department and the National Program Secretariat Department shall be placed together.
- ③ Third floor: This floor shall provide training functions centrally, and shall be connected to the existing South Wing, thereby allowing for functionally integrated use with the Clinical Training Department.
- ④ Fourth floor: Lodging Department, resource center for clinical training, cafeteria and other amenity functions are provided together.

**Table2-33 Functional Space Program of the Proposed Facility**

Floor	Section	Room Name	RM Area (sqm)	No. of Room	Area (sqm)	Remarks	
4F	Dormitory 251.93	Dormitory (Male)	46.50	1	91.50	5 persons/each	
		Dormitory (Male)	45.00	1		5 persons/each	
		Dormitory (Female)	45.00	2	135.67	7 persons/each	
		Dormitory (Female)	45.67	1		6 persons/each	
		Shower Room	12.05	1	24.76		
		Shower Room	12.71	1			
	Resource Center 128.83	Resource Center	83.83	1	83.83		
		Self-study Room	45.00	1	45.00		
	Others 114.59	Waiting Room	21.75	1	21.75		
		Cafeteria	70.34	1	70.34		
		Kitchen	22.50	1	22.50		
	Common Store		21.72	1	21.72		
	4F Net Area					517.07	
	Corridor, WC, Stairs					242.69	
	4F Total Area					759.76	
3F	Training 312.33	Training Unit Office	46.81	1	46.81		
		Preparation Room	37.02	1	37.02		
		Training RM (40-seat)	90.67	1	90.67	Movable wall	
		Training RM (20-seat)	45.00	2	183.00		
		Training RM (20-seat)	46.50	2			
		PBL Room	92.83	1	92.83	10 seatsx4	
		Clinical Simulation Lab	45.00	1	45.00		
	Common Store		21.72	1	21.72		
	3F Net Area					517.05	
	Corridor, WC, Stairs					237.82	
3F Total Area					754.87		
2F	National MCH Program 168.26	NRHP (National Reproductive Health	59.67	1	59.67		
		NNP (National Nutrition Program)	70.34	1	70.34		
		ARI-CDD-IMCI	38.25	1	38.25		
	Management 204.00	Director RM	22.50	1	22.50		
		Dpy Director RM	22.50	3	114.90		
		Dpy Director RM	23.40	1			
		Dpy Director RM	24.00	1			
		Management Chief RM	22.50	1	22.50		
		Administrative Office	69.00	1	69.00		
	Common Meeting	45.00	2	90.00			
	Common Store		45.88	1	45.88		
2F Net Area					533.04		
Corridor, WC, Stairs					209.04		
2F Total Area					742.08		
1F		Parking and others	452.30	1	452.30		
		MR	110.29	1	110.29		
		Reception	80.83	1	80.83		
	1F Net Area						
Corridor, WC, Stairs							
1F Total Area					643.42		
Total Area					2,900.13		

Source: Survey Team

(4) Setting the Contents of the Renovation Work of the existing Center

Table 2-34 shows the areas related to the relocation of functions and the renovation of the existing Center.

**Table2-34 Floor Area of the Renovation Work**

Floor	Section	Room Name	RM Area(sqm)	No. of Room	Area (sqm)	Before Renovation	
South Wing 3F	Ward C	Ward (8-bed)	46.00	4	184.00	Office	
		Ward (4-bed)	46.00	2	92.00	Office	
		Ward (2-bed)	18.00	1	18.00	Administration	
		Ward (1-bed)	18.00	4	72.00	Administration	
		Nurse Station(NS)	29.00	1	29.00	Training RM	
		Treatment RM	14.00	1	14.00	Training RM	
		Conference RM	14.00	1	14.00	Training RM	
		Night Duty	18.00	1	18.00	Administration	
		Meeting RM	30.00	1	30.00	Office	
		Storage	18.00	3	54.00	Office	
		WS	54.00	1	54.00	WS	
		Training	Night Duty for Students	46.00	2	92.00	Dormitory
	Storage		46.00	1	46.00	Office	
	Others	Clinical Division Office	46.00	1	46.00	Training RM	
		Nursing Division Office	46.00	1	46.00	Training RM	
		Health Financing Committee Office	46.00	1	46.00	Training RM	
	Corridor					367.00	
	3F Renovation Area					1,222.00	
	North Wing 2F	Perinatal Center	NCU-C	92.00	1	92.00	Ward
			ICU	92.00	1	92.00	Ward
Recovery			92.00	1	92.00	Ward	
Kangaroo Care RM			46.00	1	46.00	Ward	
Lounge			29.00	1	29.00	NS	
Resting room			14.00	2	28.00		
Corridor					124.20		
2F Renovation Area					503.20		
Elevator					29.19		
Renovation Area Total					1,754.39		

Source: Survey Team

(5) Planning Configurations

The concept of each floor plan is as follows:

1) First floor

The first floor of the new Training Center shall include outside space within a columned area to allow for circulation to the existing facilities, and shall consist of a Training Center entrance, machine room and generator room with a driveway and parking space.

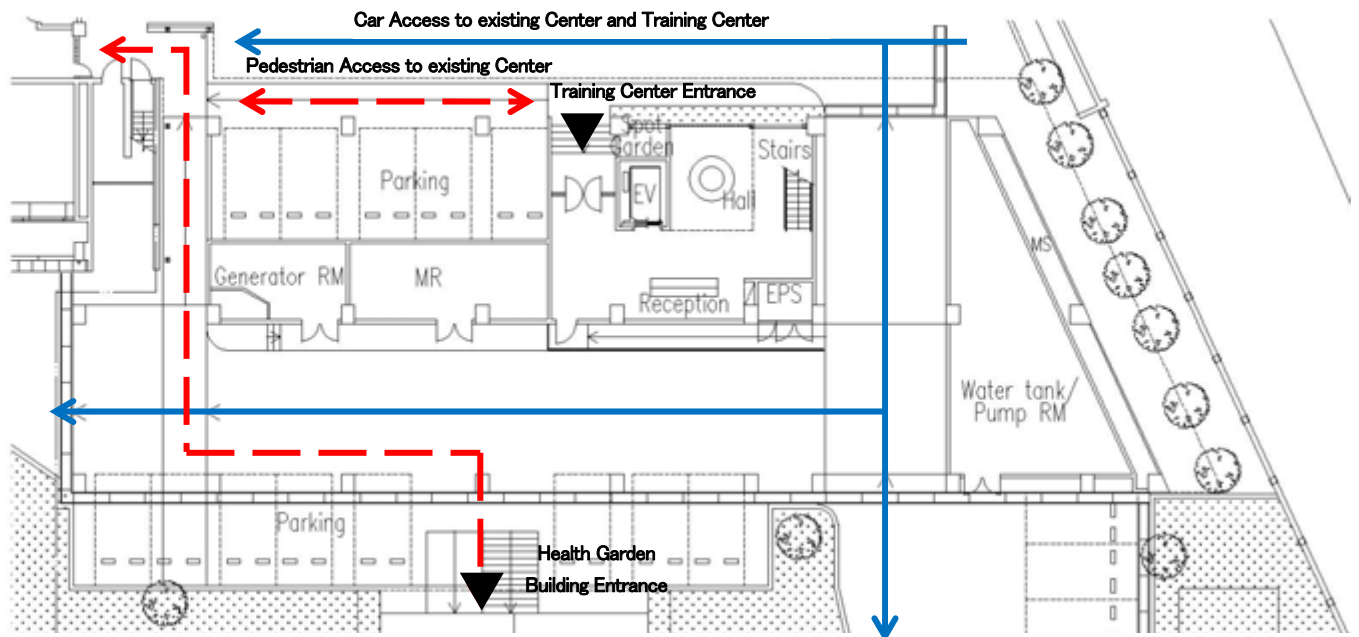


Figure2-4 Training Center 1<sup>st</sup> Floor Plan

2) Second floor

The second floor of the new Training Center consists of the Management Department and the National Program Secretariat. The floor shall be connected with the existing facilities through a bridge, securing access to existing facilities in case of emergency. The shared corridor and stairs, which are not air-conditioned, shall be semi-exterior spaces and shall be provided with operable windows to promote ventilation as needed, thus reducing heat gain.

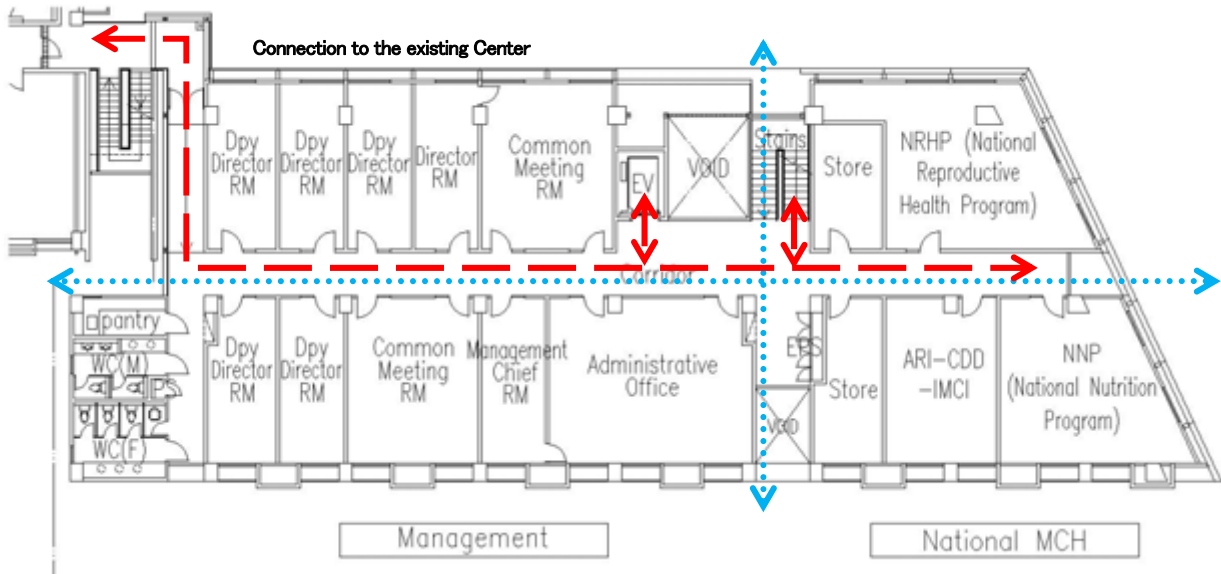


Figure2-5 Training Center 2<sup>nd</sup> Floor Plan

3) Third floor

The third floor of the new Training Center shall contain the Training Department. The floor shall be connected with the existing South Wing via a bridge, thereby allowing for a functionally integrated use with the Clinical Training Department.

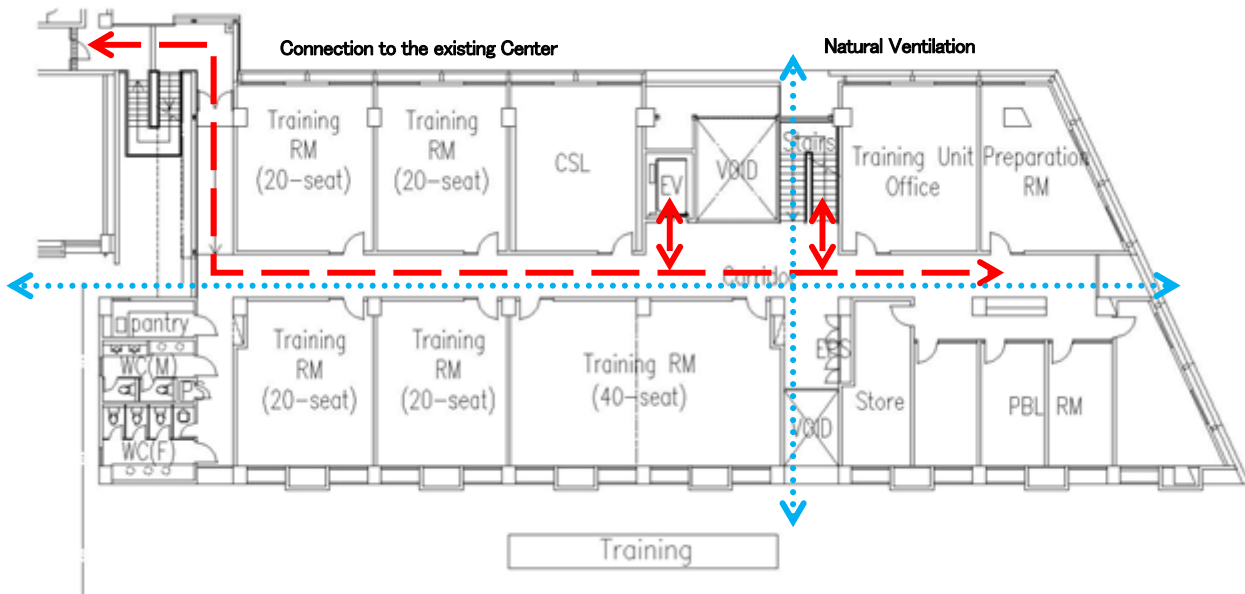
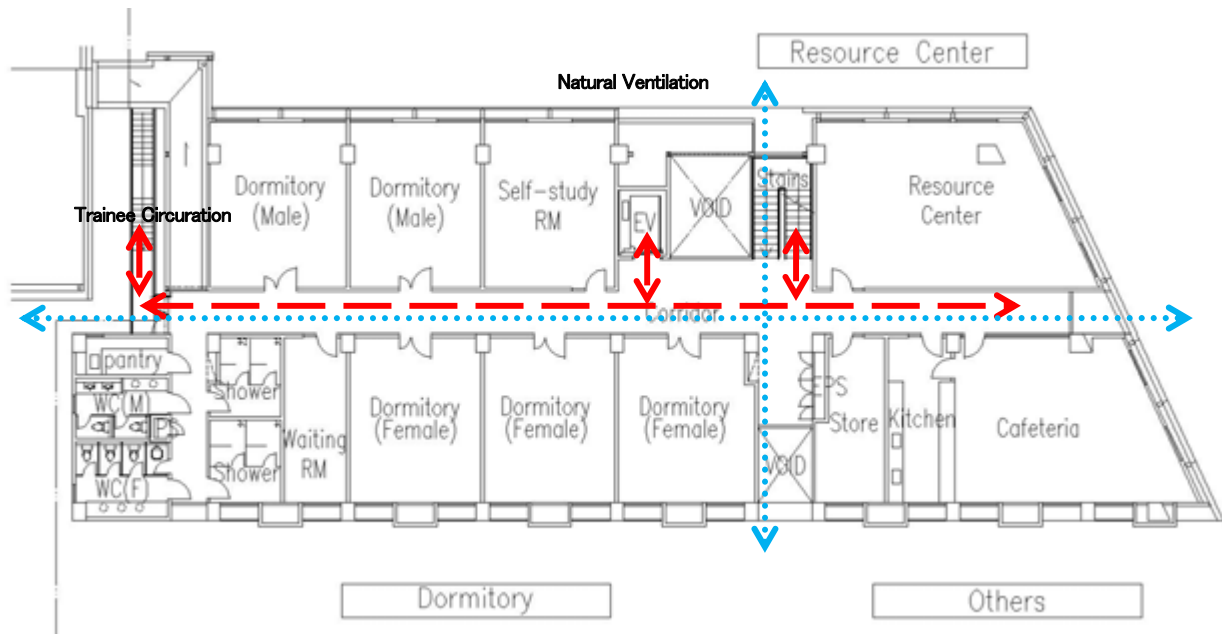


Figure2-6 Training Center 3<sup>rd</sup> Floor Plan

## 4) Fourth floor

The fourth floor of the new Training Center shall consist of the dormitories, the resource center for clinical training, the cafeteria, the waiting area and related rooms. The roof shall have heat insulation to prevent heat gain, allowing a reduction in electricity usage for the air-conditioned rooms.



**Figure2-7 Training Center 4<sup>th</sup> Floor Plan**

## (6) Sectional Elevation Plan

## 1) Elevation plan (shape and finishing material)

The facility shall be a high strength reinforced-concrete rigid frame structure with brick exterior walls. This type of construction is common in the local area. The facility shall be mainly mortar-coated and paint-finished while some surrounding portions of the main entrance shall be tile-finished. The facility shall be flat-roofed in consideration of cost efficiency and workability through the use of RC slabs. The floor shall also be constructed with RC slabs.

The south wall shall be provided with pipe spaces (PS) for equipment piping so that maintenance is possible from the indoor side. The north wall, which faces the entrance space of the existing Center facility, shall be provided with a panel to prevent exposure of air-conditioning piping at a location where the line of sight from the rooms is not obstructed. The east wall shall be provided with louvers for shielding direct sunlight, thus reducing the air-conditioning load of the rooms.

For exterior fixtures, weatherproof aluminum fixtures shall be adopted. The rooms shall be provided with operable windows that are capable of adjusting the amount of ventilation depending on the weather.

2) Section and elevation

In section, the Training Center floor levels of the second and third floors shall be the same height as the existing Center to maintain a direct access route between two buildings. The floor height of the fourth floor shall be 4 meters. Machine rooms will be concentrated on the first floor, where they can be approached directly from the outside to allow maintenance.

For the corridor of each floor, natural ventilation shall be ensured by opening the windows directly to the outside. In the corridor of the fourth floor, natural ventilation and light shall be ensured by means of an operable high side window.

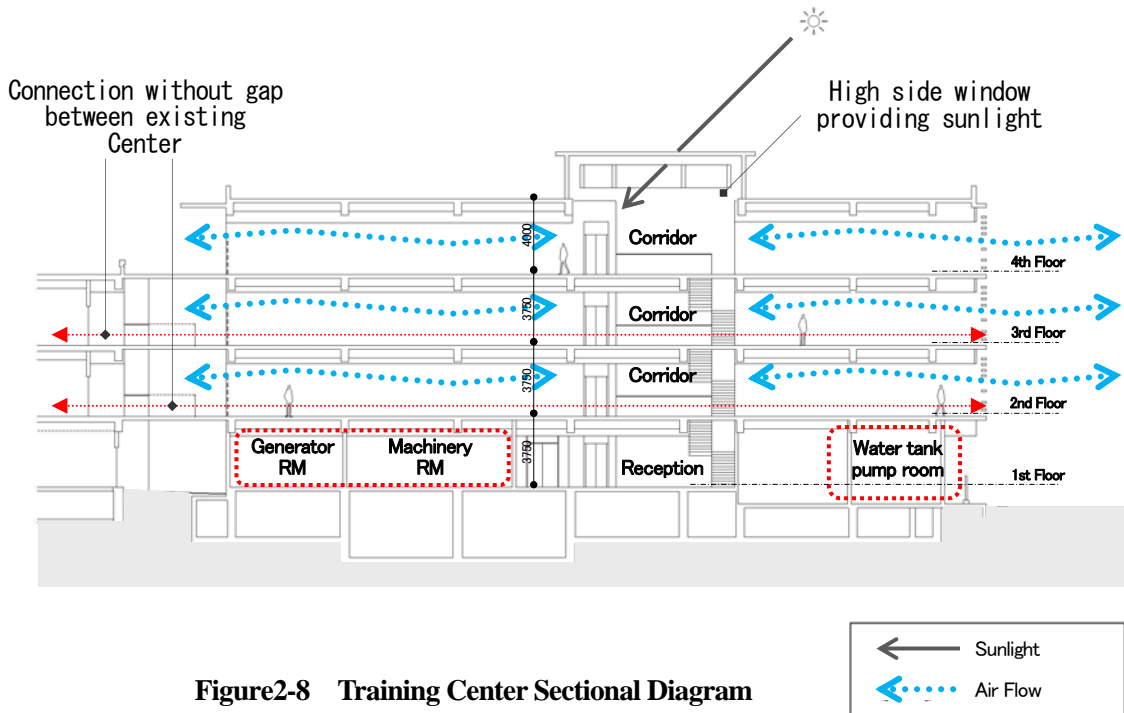


Figure2-8 Training Center Sectional Diagram

(7) Renovation Work of the Existing Center

1) First floor

Major renovation work of the first floor includes installing a new elevator connecting the first floor to the third floor at a corridor connecting the North and South Buildings, installing air conditioners in Pharmacy and fixing the medical gas supply system in the machine room.

Work to relocate the Clinical Lab to the Outpatient Department from the Health Garden Building should be carried out by the Cambodian side.

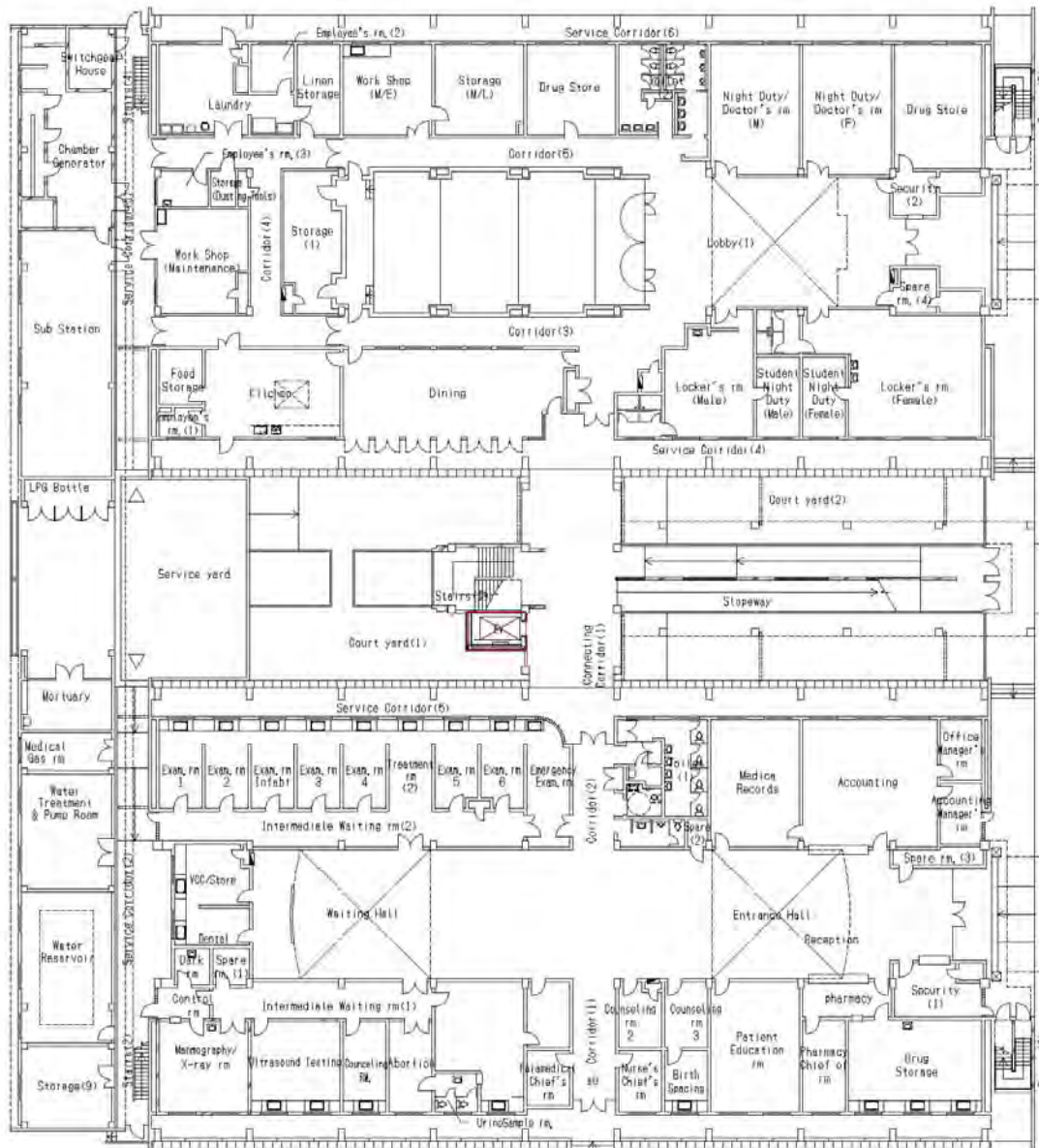


Figure2-9 Renovated Existing Center 1<sup>st</sup> Floor Plan



2) Second floor

- North Building

The existing gynecology ward will be renovated to NCU, ICU, Recovery Room and Kangaroo Care Room, and the existing nurse station will be used as a waiting space for the patients' relatives.

- South Building

Three out of eleven 8-bed ward rooms in the existing obstetrics ward in the South Building will be renovated to 4-bed rooms.

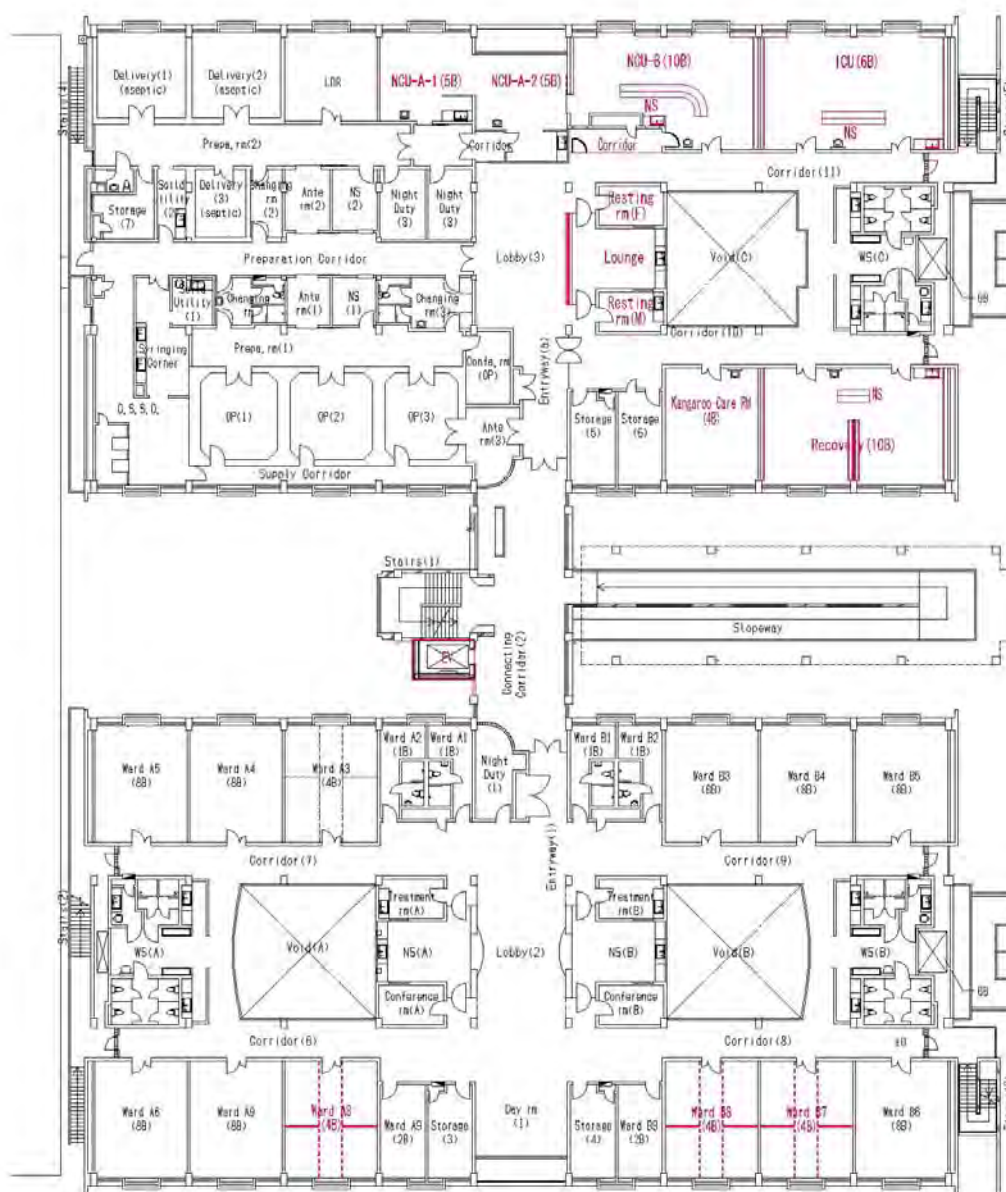


Figure2-10 Renovated Existing Center 2<sup>nd</sup> Floor Plan

3) Third floor

The existing management offices, dormitories and other related rooms on the third floor of the South Building will be renovated to become the obstetrics-gynecology combined inpatient ward, night-duty rooms and Clinical Division Offices.

The existing Center building and the new Training Center will be connected on this floor with a bridge, and the Training Department on the third floor in the Training Center and the clinical training functions of the existing Center can be used integrally.

The existing Center only has stairs between the second and third floors. As the third floor is renovated to the obstetrics-gynecology combined inpatient ward, and patients using stretchers and wheel chairs would need to move between the first and third floors; a new elevator connecting the first floor to the third floor at a corridor connecting the North and South Buildings shall be installed.

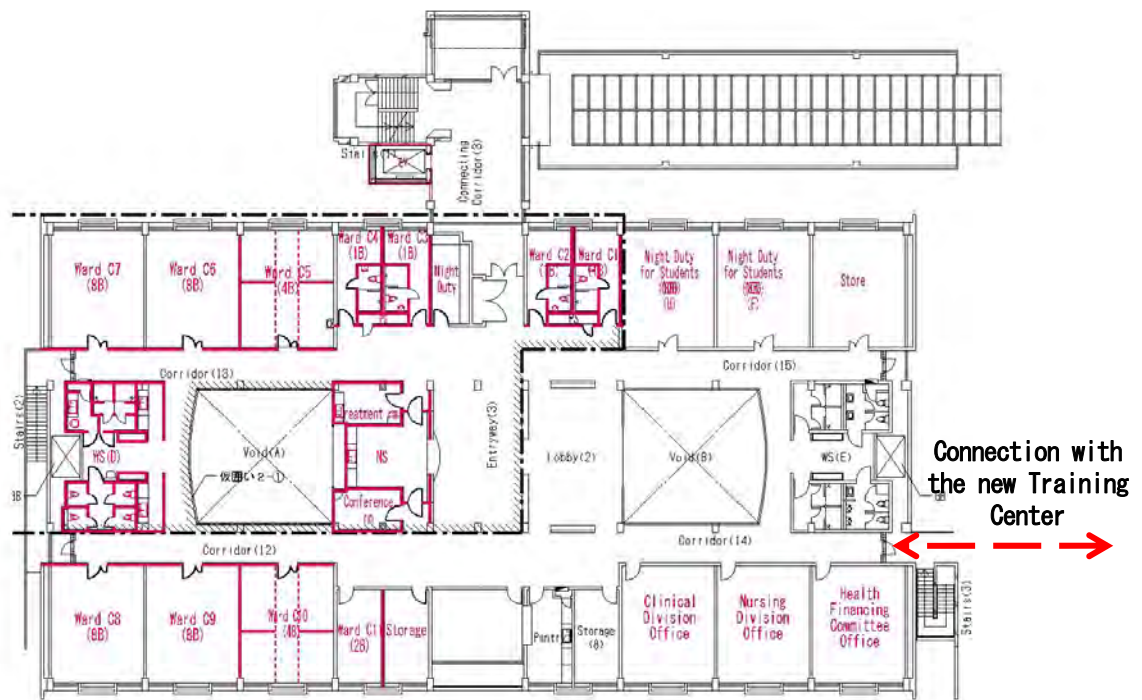
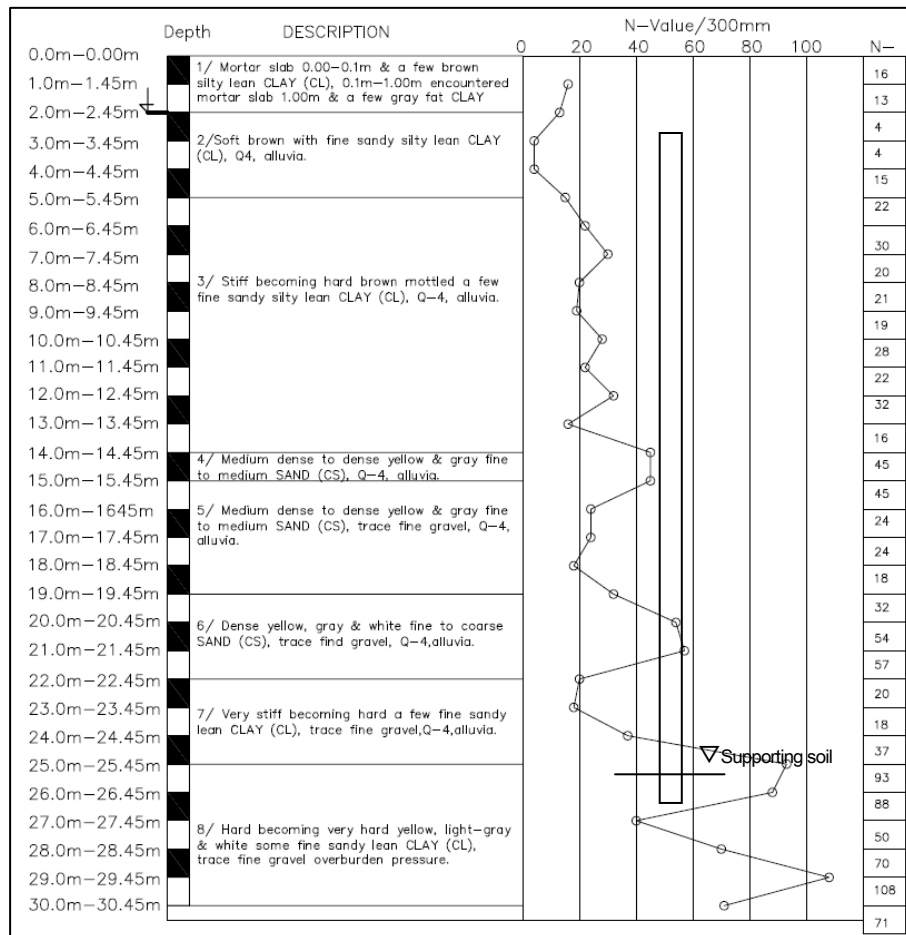


Figure2-11 Renovated Existing Center 3<sup>rd</sup> Floor Plan

**2-2-2-4 Structural Plan**

(1) Status of Soil on the Premises

According to the soil survey, a layer of soft clay mingled with fine sand and rubble is deposited at a depth of 1 to 5 meters from the ground surface, a hard clay layer at a depth of 5 to 14 meters, a wet sandy soil layer at a depth of 14 to 22 meters and a hard gravel layer at a deeper level. The water level is around -2.0 m from ground level.



Source: Survey Team

**Figure2-12 Boring Log**

(2) Foundation Plan

1) Foundation type

In the existing Center, soil improvement work (deep soil mixing method) with supporting soil at -5.5 meters from the ground level was adopted. The soil improvement work was implemented after the clay layer at a depth of 2 to 3 meters from the surface layer was replaced with sandy soil based on results of the blending test.

It is important to ensure safety and less noise to the existing Center to design the foundation construction method of the proposed Training Center. Therefore there are two possible construction methods that both comparatively produce less noise: soil improvement and bore pile. A comparison of the two construction methods is shown in Table 2-35.

It is necessary to consider the following points with respect to the foundation of the building: the soil mainly consists of clay-like soil, which is susceptible to consolidation settlement under the building load, and the fact that there is a possibility of unequal settling of this ward and the existing ward because the two buildings are to be connected at the second and third floors with connecting corridors. The result of a comparison of the foundation construction methods shows that the bore pile method is less expensive while the soil improvement method requires a shorter construction period. Consolidation settlement may occur in the case of soil improvement. On the other hand, consolidation settlement is not likely to occur in the bore pile method because the pile extends to a level deeper than the clay layer. Unequal settling with the existing ward may occur in the case of soil improvement. On the other hand, unequal settling is less likely to occur in the bore pile method unless the surrounding soil has settled factors such as the use of underground water. From the above, the bore pile method shall be adopted to the foundation of the building.

**Table2-35 Comparison of Foundation Construction Methods**

Method	Soil Improvement (Deep Soil Mixing Method)	Bore Pile
General Description	A method which soil shall be stirred in cement in order to harden.	Concrete shall be poured into a bored deep hole and column of re-bar shall be inserted.
Supporting Soil	GL-5.5 meter Clay stratum(N-value =15)	GL-25 meter Clay stratum(N-value =over 50)
Remarks	<ul style="list-style-type: none"> <li>This method is applied to existing building.</li> <li>Certain amount of cement and soil must be shipped to Japan for chromium pollution test to be carried out.</li> </ul>	<ul style="list-style-type: none"> <li>Becoming common in Cambodia in recent years</li> <li>Test pile shall be constructed to confirm its bearing load.</li> </ul>
Ratio of Cost	1.6	1.0
Construction Period	32 days (with one auger)	45 days (with two augers)
Possibility of Consolidation Settling	Clay stratum beneath supporting soil may course consolidation	Less likely for pile bored into firm stratum with N-value over 50.
Possibility of Unequal Settling between the Existing Building	Consolidation of clay stratum settles ninety percent of its amount in the first decade after the completion of building. The existing building was built in 1997, so is considered that most of the settling has been finished. In case this building starts to settle, unequal settling may occur.	It is less likely to settle, and settlement of the existing building has mostly finished, so possibility of unequal settling is small. But in case surrounding soils starts to settle, gaps may occur. Therefore the boundary of the building shall be carefully designed.

Source: Survey Team

### (3) Structure Plan

The main structure of the building shall be reinforced concrete which is locally common. The frame type shall be a simple rigid framed structure both in X and Y directions without brace or seismic walls. The height of the main floor shall be 3.75 meters and the main span shall be 6 × 8.4 meters. The main slab thickness shall be 150 mm and only the slab of the first floor shall be 200 mm. The lower part of the slab on the first floor shall be provided with pits and the bottom plate slab thickness shall be 350 mm to improve waterproofing performance, given the high water level. The penthouse shall be provided with an elevated tank with a frame made of steel-reinforced concrete.

Presently there is no structural design standards in Cambodia, so stress calculation of the frame shall be performed in accordance with standards specified by the Architectural Institute of Japan, as it is done for the existing Center.

(4) Design Load

1) Fixed load

For employed materials, calculate the dead weight to obtain the fixed load.

4) Live load

Live loads shall be adopted in line with the current conditions in consideration of Japan's Building Standard Law.

**Table2-36 Live Load of Main Rooms (Unit : N/sqm)**

Name of room \ Load	Slab and sub-beam	Beam and column	Seismic
Dormitory	1,800	1,300	600
Class room	2,300	2,100	1,100
Office	2,900	1,800	800
Parking	5,400	3,900	2,000

Source: Survey Team

2) Wind load

In Cambodia, records of damage caused by strong winds such as typhoons are not available, but the existing ward has no damage due to wind. The wind load shall be the same as that of the existing ward. Wind pressure shall be calculated in accordance with Japan's Building Standard Law with a reference wind speed set at 30 meters per second, and the terrain category to III (corresponding to "general urban area" in Building Standard Law).

$$q = 0.6E \cdot V_0^2$$

Where  $q$ : velocity pressure

$E$ : value according to building height and terrain category

$V_0$ : reference wind speed of 30 m/s

3) Earthquake load

Based on the survey, Cambodia's past seismic damage record is not available. Although Cambodia is out of the Pacific-rim focal region, in consideration of the possibility of small-scale seismic movement propagated from neighboring Vietnam, 1/5 of the seismic force in accordance with the Japanese Building Standard Law shall be specified. This seismic force is the same as that of the existing ward.

For the underground seismic coefficient and the design of the projecting portion such as the penthouse, 1/5 of the horizontal seismic coefficient specified in the Japanese Building Standard Law shall be taken into consideration.

$$C_i = Z \cdot R_i \cdot A_i \cdot C_0$$

Where  $C_i$  : seismic shear coefficient in layer i

$Z$  : zone coefficient, 1.0

$R_i$  : vibration characteristic coefficient, 1.0

$A_i$  : coefficient indicating the distribution of seismic shear coefficient in height direction

$C_0$  : standard shear coefficient,  $0.2 \div 5 = 0.04$

(5) Structural Materials

1) Concrete

Normal concrete

2) Reinforcing bar

Material strength: SD295A, SD345

Diameter: D6, D10, D12, D16, D22, D25

(6) Expansion Joint

The building has a rectangular planar figure and the length of the long side is about 50 meters. Given that concrete has a thermal expansion coefficient of  $10 \times 10^{-6}$ /degrees centigrade, the frame is elongated only by 5 mm when the temperature is increased by 10 degrees centigrade. Therefore the frame shall be provided with no expansion joints and shall be planned as a single structure.

The access way connecting between the Training Center and the existing Center shall be provided with a 200-mm clearance in consideration of the deformation of the two buildings and constructability.

### 2-2-2-5 Utility Plans (Electrical and Mechanical Systems)

#### (1) Electrical System

##### 1) Design policies

The following three basic design policies apply to the electrical system under this Project.

- Stabilize Power Supply
- Save Electricity
- Save Maintenance

##### 2) Legal requirements and standards

The design of equipment, facilities and buildings shall be in accordance with local laws and regulations in principle. Legal requirements and regulations implemented in Japan or international requirements and regulations may also apply “mutatis mutandis” if necessary.

- Building Standards Act of Cambodia
- Fire and Disaster Management Act of Cambodia
- IEC: International Electro-technical Commission
- JIS: Japanese Standards
- BS: British Standard

#### (2) Summary of Electrical System Plan

##### 1) Power supply system

The existing Center receives high tension electricity (three-phase three-wire, 22 kV, 50 Hz) from the power grid owned by the EDC. This high tension electricity line is led in through the underground conduit from the northwest of the premises and connected to the high tension receiving board (HTRB) located in the electricity receiving room. A watt-meter of the electric power company is located in the electricity receiving room.

This high tension electricity line is connected to the transformers in the Substation room via the GCB. Two transformers (three-phase three-wire, 22 kV, 50 Hz and three-phase four-wire, 380-220 V, 50 Hz) are used and each of them has a capacity of 500 kVA for the total capacity of 1,000 kVA. These transformers transform high tension electricity into low tension electricity (three-phase four-wire, 380-220 V, 50 Hz) and supply electricity to loads on the premises.

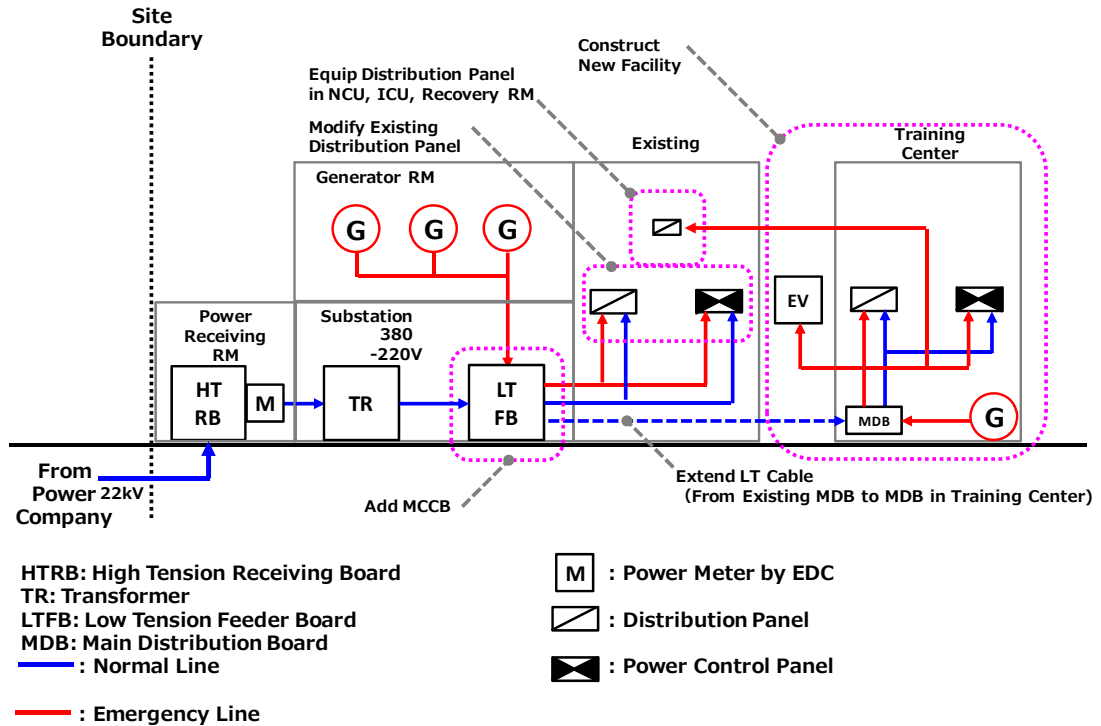
In this project, the electrical load capacity for the Training Center is estimated as 150kVA. The electrical load capacity for the existing Center is estimated as 500kVA by the site survey. The capacity of the existing transformers can sufficiently cover the whole premises following the Project’s building expansion.

In this case, the low tension electricity line will be extended from the low tension feeder board in the Substation room to the Main Distribution Board (MDB) in the Training Center.

Figure 2-13 represents a conceptual diagram of the power supply system in this project site.

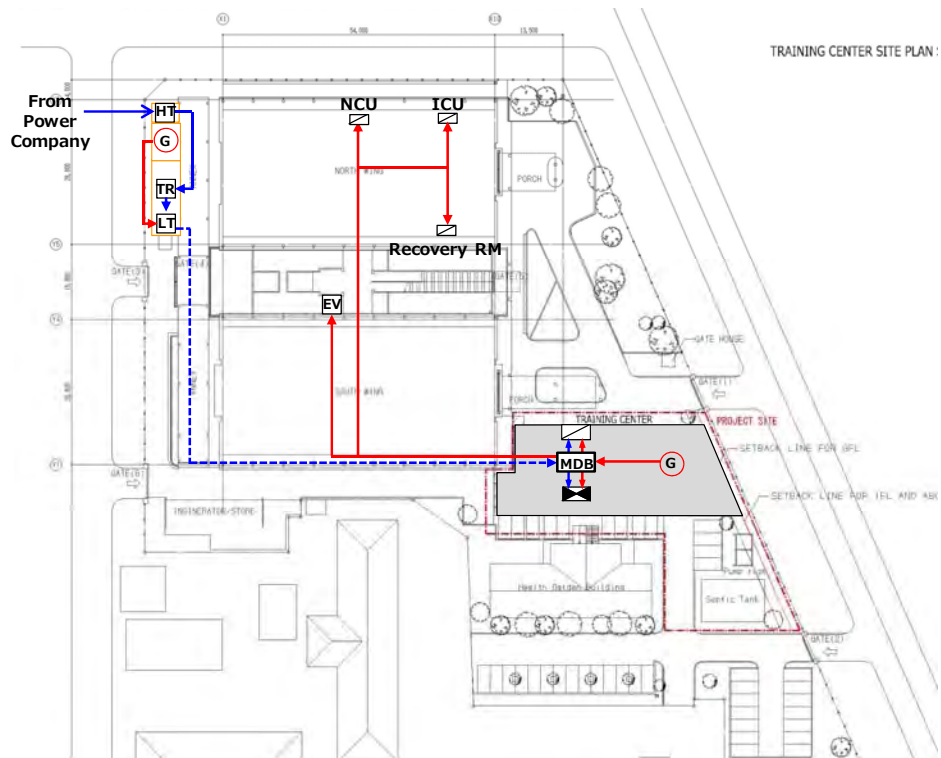
Figure 2-14 represents a site plan of the power supply system in this project site.

The voltage and frequency of high tension electricity supplied by the electric power company are stable and do not require the use of an Automatic Voltage Regulator (AVR). In addition, power panels will be installed in the utility room and in the outdoor unit area to supply power to pumps, air-conditioners, fans and other power loads.



Source: Survey Team

Figure2-13 Conceptual Diagram of Power Supply System



Source: Survey Team

Figure2-14 Site Plan of Power Supply System



## 2) Generator system

Lately, blackouts occur a few times a month in Phnom Penh, though each blackout does not last so long.

At the existing Center, three diesel-engine emergency generators are located in the Generator room and are ready for use in the event of a blackout. Two of them have a capacity of 100kVA and the other has a capacity of 75kVA. To store fuel, a 1,000-liter service tank and a 10,000-liter underground tank are available. In this project, the emergency load capacity for the Training Center is estimated as 100kVA. This load capacity includes the following loads that will be added through renovation of the existing Center.

- Emergency lighting, emergency receptacle and plumbing system in the Training Center
- The new NCU, ICU and Recovery Room after renovation work of the existing Center
- Other specific loads in the renovated rooms (if necessary)
- Two Elevators (in the existing Center and the Training Center)

Each of the three existing power generators will supply emergency power to specific loads in the existing Center. In other words, the capacity is limited and insufficient to cover all loads in the facility of the proposed Training Center. Therefore, a new generator system will be installed to the facility of this project as part of Japan's construction efforts.

## 3) Lighting/Receptacle

In the design of lighting system, JIS or IEC will be applied for illuminance level. The Training Center will use fluorescent lighting fixtures in principle, and will select lamps featuring high efficiency, long service life, and highly procurable whenever possible for the purpose of reducing maintenance costs. Basically local switches will be installed for turning lights on/off. In addition, a timer will be used for automatic control in the common space such as a corridor, while a motion detector will be installed for auto control in toilets and locker rooms. Additionally, emergency lights and evacuation lights with battery will be installed at necessary locations for the purpose of facilitating evacuations.

Basically the type of receptacle outlet shall be planned as 3 prong plug including a grounding prong. Distribution voltage will be 220V, single-phase two-wire. Some of the lighting fixtures and receptacles, as well as special medical equipments should be planned to have power supplied by the emergency generators in the event of a blackout. For the new NCU, ICU and Recovery Room that are to be renovated, all loads, including air conditioners, will be backed up by the new generator system in order to improve the stability of the power supply. A dedicated distribution panel will be installed in each room for connecting the low tension electricity line to the main distribution board in the Training Center. Table 2-37 lists the lighting specification for the main rooms.

**Table2-37 Lighting Specifications for Main Rooms**

Area	Room Name	Illuminance	Fixture Type	Switching
Existing Center	NCU	300 lx	Recessed Type with Acrylic Cover	Local Switch
	ICU	300 lx	Recessed Type with Acrylic Cover	Local Switch
	Recovery	300 lx	Recessed Type with Acrylic Cover	Local Switch
	Ward	100 lx	Recessed Type	Local Switch
Training Center	Office	300 lx	Recessed Type with louver	Local Switch
	Training Room	300 lx	Recessed Type with louver	Local Switch
	Storage	100 lx	Bracket Type	Local Switch
	Corridor	100 lx	Down Light	Local Switch and Timer
	Toilet	100 lx	Down Light	Local Switch and Motion Sensor

Source: Survey Team

#### 4) Telecommunication & LAN system

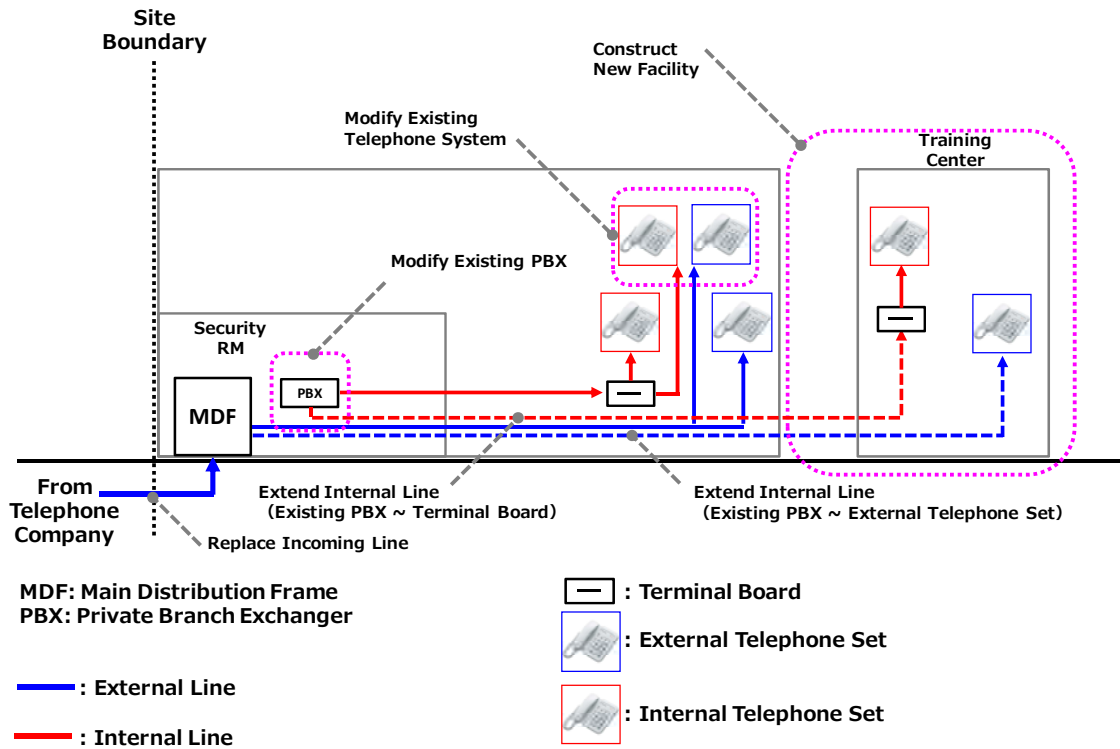
The existing Center uses metal cable and optical cable for the telephone line and LAN from a public telecommunication network of the telephone company. These cables are led in from the east side of the premises through an underground conduit and connected to the Main Distribution Frame (MDF) in the Security Room. According to the on-site survey results, there are approximately twelve telephone lines for external calls of NMCHC, and the metal cable for external calls is directly connected to the telephones for external calls via MDF. In this project, the external line for the Training Center is estimated as 10 lines.

Additionally, the private branch exchanger (PBX) installed in the Security Room has the capacity for 120 extension lines. In this project, the extension line for the Training Center is estimated as 30 lines. The extension line of the existing building is about 80 lines by the site survey. This leads to the determination that the existing PBX has sufficient capacity to cover the entire premises following expansion of the building.

In this case, the telephone line for external calls will be extended from the MDF located in the Security Room to the telephones for external calls located in the Training Center. As for the extension lines, the main telephone line will be extended from the PBX located in the Security Room to the terminal board in the Training Center. With regard to a LAN system, a cabling route or piping will be planned so that computers can be used for training in the Training Center.

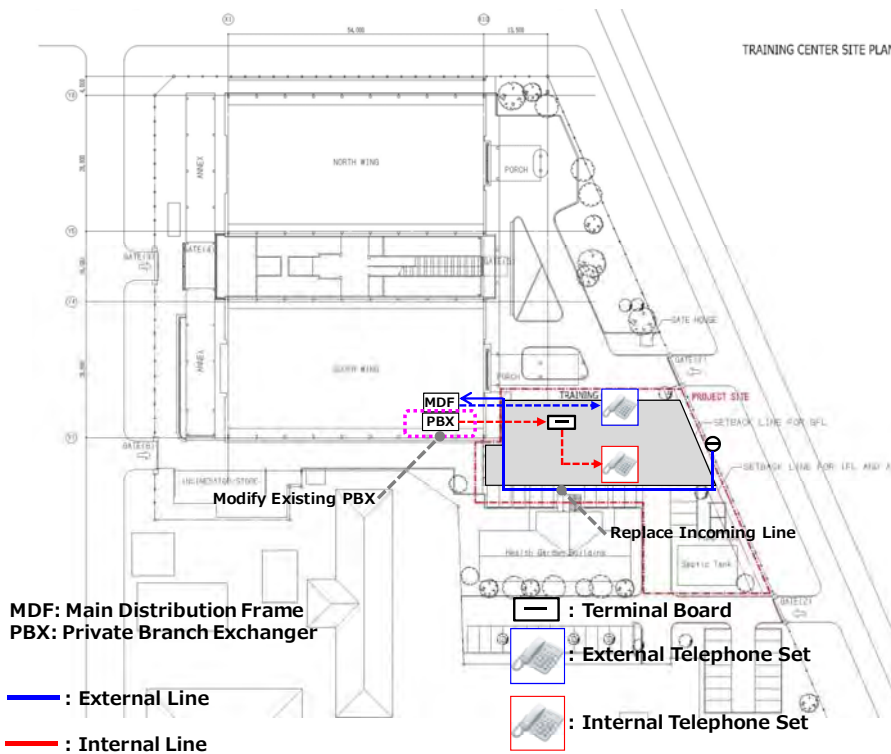
Figure 2-15 represents a conceptual diagram of the telecommunication system in this project site.

Figure 2-16 represents a site plan of the telecommunication system in this project site.



Source: Survey Team

Figure2-15 Conceptual Diagram of Telecommunication System



Source: Survey Team

Figure2-16 Site Plan of Telecommunication System

## 5) Fire alarm system

The existing Center has a fire alarm system consisting of emergency buttons and indicator lights, and the same system is planned for the Training Center. If an emergency button is pressed when fire is detected, the alarm board located in the Security Room will activate and trigger the indicator lights to start blinking and buzzers to go off. In the Training Center, a new alarm board shall be installed in the office room. In the event of a fire signal, it will be sent from the Training Center to the alarm board located in the Security Room of the existing Center.

## 6) Lightning protection system

The existing Center has a lightning protection system consisting of a lightning conductor and a grounding electrode for lightning protection. The same system is planned for the Training Center.

## 7) Grounding system

An independent grounding system is planned for the Training Center in order to protect electric equipments and communication equipments.

## (3) Mechanical System

A mechanical system is planned based on the following concepts.

- A safe and stable system that will allow operation/management for a certain period of time after interruption of the infrastructure.
- Simple system for easy equipment maintenance.
- A system taking account of environmental-friendliness such as natural ventilation and the utilization of solar water heaters and rainwater collection.
- A piping system providing for uninterrupted operation/management during renovation such as exposed floor piping and external piping.

## 1) Related laws and regulations

The mechanical plan will comply with laws, regulations and standards implemented in Cambodia in principle, but the laws and regulations implemented in Japan and/or other countries may be applied as necessary.

## 2) Water supply system

Through discussions with the NMCHC's Engineering/Medical Workshop staff, it was found that the water receiving tank of the existing Center has a capacity approximately equal to the daily water supply volume, which revealed that the tank had no leeway. The proposed Training Center will have a water supply system separate from the one installed at the existing Center. The water supply is led in by the  $\phi$  100-pipe from the  $\phi$  200-public-water-main-line. This is more than sufficient capacity for the water supply volume for the existing Center and can also cover the water supply volume for the Training Center; therefore the existing water supply lead-in line will be utilized.

## ① Proposed Training Center

For easier maintenance of the facilities, two systems will be laid out to supply treated water and raw water in the same fashion as the water supply system for the existing Center. Water will be supplied

by the gravity water supply system consisting of a water receiving tank, a lifting pump and an elevated reservoir tank.

For the Training Center, a  $\phi$  40-pipe will be used to branch after the existing water supply meter from the existing  $\phi$  100-city-water-lead-in line.

After storing city water in the pit water receiving tank, raw water will be directly lifted to the elevated reservoir tank designed for raw water and then will be supplied for use to flush the toilets and sprinkle water outdoors. City water has some odor and color. Therefore, in the same fashion as the existing facility, a filtration system will be installed to store only filtered city water in the aboveground frame water receiving tank for supplying treated water.

Moreover, rainwater will be utilized as water for miscellaneous use for the purpose of conserving water resources.

For both treated water and raw water, a double-tank system will be introduced to avoid water supply cutoff during the cleaning of water tanks.

The water tank will be able to store water equal to the water supply volume for one day and ensure a water source in the event of water supply cutoff.

② Renovation work of the existing Center

The renovation plan will utilize the existing water supply system given that the renovation will neither change the number of beds nor have significant effects on the consumption of utilities. The renovation work will need to be handled without any interruption to the functions of the existing Center. Therefore the use of a piping method such as exposed floor pipes and outside pipes will be considered to have less effect on the lower floor without damaging the structural frame.

3) Hot-water supply system

① Proposed Training Center

A hot-water supply system utilizing solar energy is planned as part of environmentally-friendly facility. Hot water will be supplied to the shower rooms and cafeteria kitchen, and electric water heaters will be installed as backups in case of malfunction or rainy weather.

② Renovation work of the existing Center

The renovation plan will not upgrade the existing hot water supply system because the renovation will neither change the number of general beds nor have significant effects on utility consumption.

The existing solar water heaters, however, have severely aged and are out of order, so they will be replaced with new solar water heaters.

The renovation work will need to be handled without any interruption to the functions of the existing Center. Therefore the use of a piping method such as exposed floor pipes and outside pipes will be considered to have less effect on the lower floor without damaging the structural frame.

4) Drainage system

Through discussions with the NMCHC's Engineering/Medical Workshop staff, it was found that the existing sewage treatment plant had a capacity approximately equal to the daily water supply volume, which revealed that the treatment plant of the existing Center had no extra capacity. Therefore the proposed Training Center will have a sewage treatment system separate from the existing one. On the other hand, the existing  $\phi 150$  sewer line to the public sewage main has some extra capacity to deal with wastewater to be released from the proposed Training Center in addition to wastewater volume released from the existing Center. Therefore this existing sewer line will be utilized for both buildings.

① Proposed Training Center

On the premises, wastewater will be separated from rainwater. For the operation and maintenance of facilities, wastewater will be treated by a sewage treatment plant and released to the existing final soil chamber with a wastewater quality complied with the standard (BOD 100 ppm), in similar fashion to the sewage system of the existing Center. As the premises do not have much available space left, the pit below the piloti area on the first floor of the Training Center will be used as a tank for the sewage treatment plant, and the locations of manholes will be taken into consideration to avoid any interruptions to operations and traffic.

② Renovation work of the existing Center

The renovation plan will utilize the existing sewage treatment plant given that the renovation will neither change the number of general beds nor have significant effect on utility consumption.

However, because some portions of the existing sewage treatment plant have severely deteriorated, the deteriorated portions will be modified.

The renovation work will need to be handled without any interruption to the functions of the existing Center, thus the use of a piping method that will have less effect on the lower floor without damaging the structural frame will be considered.

Figure 2-17 and Figure 2-18 represent the diagrams of the infrastructure plan and outline of the plumbing system respectively.

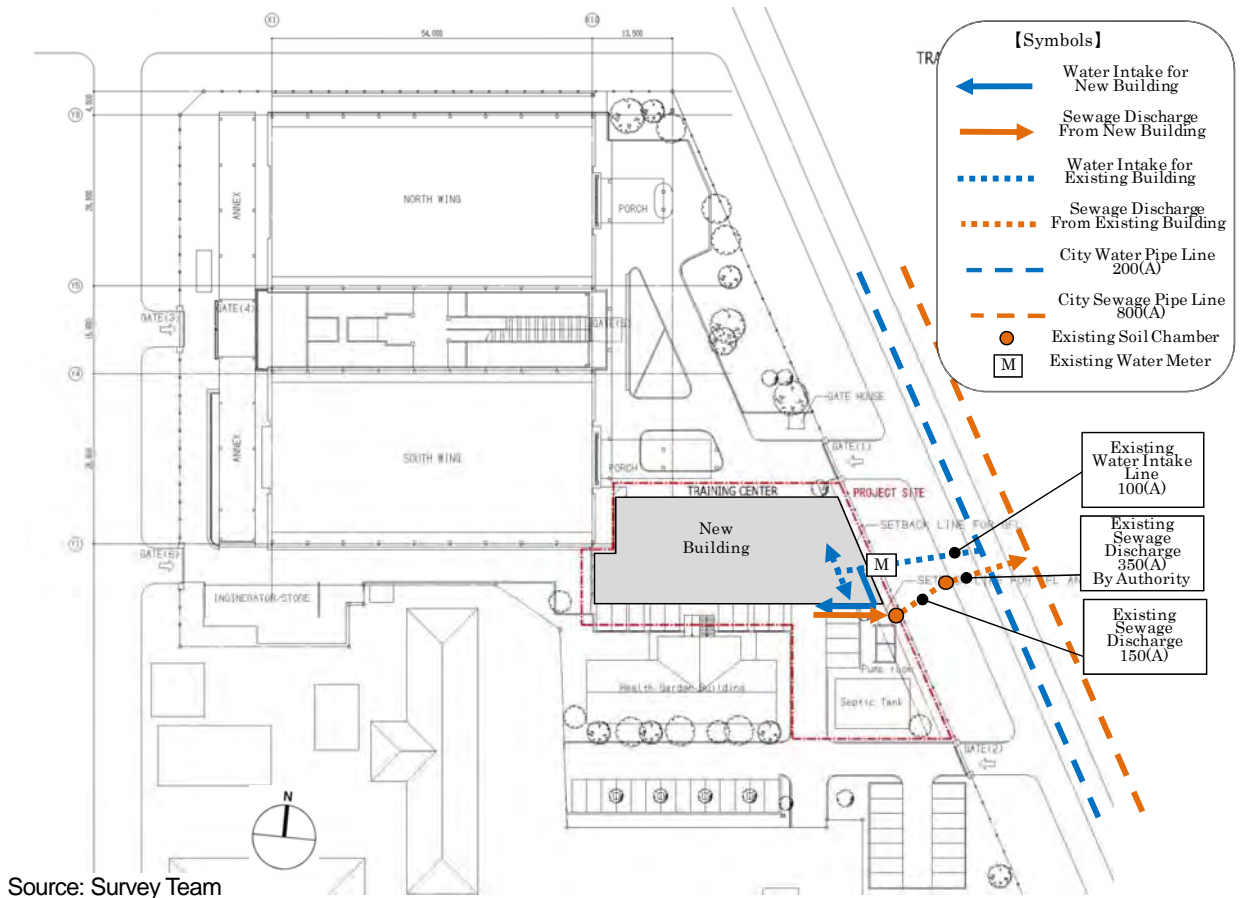


Figure2-17 Infrastructure Plan

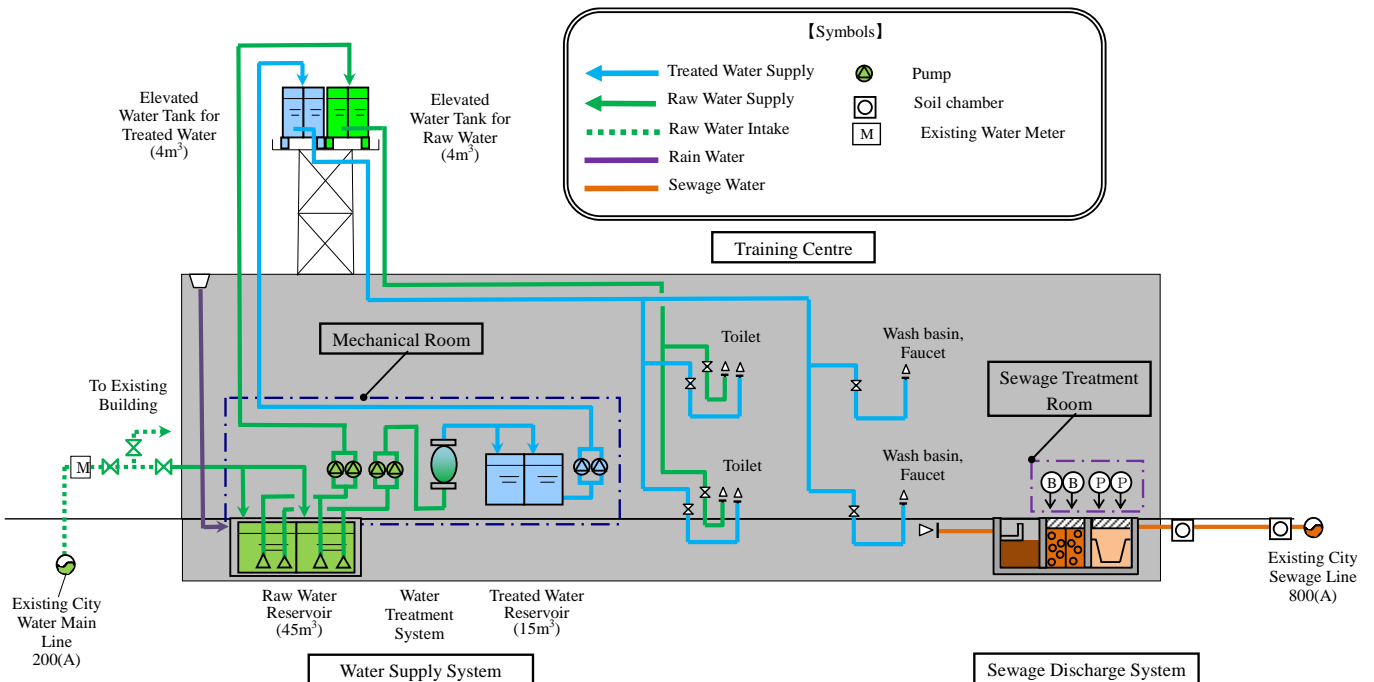


Figure2-18 Plumbing schematic diagram

5) Sanitary fixture

Western style and some Asian style water closets are installed in the common washrooms for patients in the existing Center. Water flushing faucets are installed in the patients' toilet booths and water faucets are installed in the staff toilet booths. All of the booths are of the wet type.

① Proposed Training Center

Sanitary fixture will be selected with due consideration for the local circumstances. The sanitary fixture shall be procured locally so they can be replaced easily when damaged or broken.

Water closets in the common washrooms shall be western style in consideration of users, and flushing will be the low flush tank type, which is commonly used locally. The toilet booths will have a faucet, and the inside of the booths will be of the wet type. Wash basins and sinks shall be locally procured. In the existing Center, liquid soap dispensers are installed but none of them are used; therefore the proposed buildings will have no soap dispenser. The showers shall be the hand shower type.

② Renovation work of the existing Center

The renovation plan will change the room use and add some wash basins, etc. Locally procured types will be selected for easy replacement in case of damage or breakage.

Additionally, there were no requests for sanitary equipment other than the scope of architectural renovation work, and the existing equipment does not have any failures restricting operation. Therefore, no renovation will be made to the sanitary equipment other than to the scope of architectural renovation work.

6) Firefighting system

The existing Center takes precautions through the provision of indoor fire hydrants and fire extinguishers. Rather than installing an independent water tank as a water source, a water tank for raw water is made available and a fire hydrant pump is used to pump water. An elevated reservoir tank for raw water is also made available as a backup water tank for firefighting use.

① Proposed Training Center

Through discussions with the Fire Department, it was instructed to comply with standards implemented in individual countries. Firefighting system shall be installed that consists of indoor fire hydrants and fire extinguishers consistent with the existing Center and in accordance with Japanese standards in principle. As per instructions to ensure water for firefighting in the event of a water supply cutoff, an independent reservoir tank for firefighting use will be installed, and the elevated reservoir tank for raw water will play the additional role of a backup water tank for firefighting use.



② Renovation work of the existing Center

In the renovation plan, indoor fire hydrants will be relocated if necessary according to changes in the architectural plan.

7) Medical gas system

The existing Center uses a central system to supply oxygen, vacuum and nitrous oxide. The oxygen and vacuum outlets are available in the observation room (currently ICU), delivery rooms, the emergency examination room and the 1-bed rooms, as well as NCU-A and B, which were renovated in 2012. The operation rooms have outlets for oxygen, vacuum and nitrous oxide. All the outlets are of the wall-mounted type. A shutoff valve is installed at every important location and an alarm panel is installed in the Security Room on the first floor.

① Proposed Training Center

No medical gas system will be installed in the Training Center.

② Renovation work of the existing Center

The renovation plan will install wall-mounted oxygen and vacuum outlets in the NCU, ICU, Recovery Room and 1-bed rooms according to the architectural plan and medical equipment plan.

The number of medical gas outlets will increase, but the capacity of the medical gas equipment will not be increased in this renovation work because such increase can be coped with by reviewing the current replacement interval of oxygen gas cylinders. However, the existing manifold is out of order, and currently requires manual operation to switch over to the oxygen gas cylinders. The manifold is not locally replaceable, and thus will be replaced as part of the works undertaken by the Project.

The renovation work will need to be handled without any interruption to the function of the hospital; therefore the use of a piping method such as exposed pipes will be considered in order to have less effect on the lower floor without damaging the structural frame.

8) Waste disposal & treatment facilities

Currently general wastes and medical wastes are separated when collected. Treatment and disposal of the general wastes are commissioned to a contractor, while medical wastes are incinerated in the existing incinerator.

① Proposed Training Center

Only general wastes will be generated and collected in the same way as the existing Center.

② Renovation work of the existing Center

The existing incinerator has some problems with the parts of the temperature sensor and gratings, but cannot be locally repaired. These parts will be supplied and mounted as a part of the works of the Project.

## 9) LPG system

LPG cylinders and pipes dedicated to the kitchen are installed.

## ① Proposed Training Center

For the planned cafeteria kitchen, the supply of LPG to the cafeteria kitchen will be considered depending on what will be offered there.

## ② Renovation work of the existing Center

No problems or troubles were found and no points were raised at the hearing. Thus the LPG system will not be included in the Project.

## 10) Air conditioning &amp; ventilation system

The existing Center has air conditioners and ventilation fans installed in the patients' rooms and offices, but only the minimal amount that require such installation for functional reasons. Other general inpatient wards and rooms are naturally ventilated through operable windows and grilles, and have only ceiling fans installed. Nevertheless, the hospital has added a great deal of air conditioners since the completion of construction in 1997. In the rooms to which an air conditioner was added, windows and grilles are closed and thus lack ventilation.

## ① Proposed Training Center

In consideration of the written request and the circumstances of the existing Center, air conditioners and ventilation fans will be installed in each of the training rooms. The fresh air supply for every training room will be ventilated through door grilles or grilles.

## ② Renovation work of the existing Center

The renovation plan will install air conditioners and ventilation fans in the residential rooms as functionally required according to the architectural plan. The NCU, ICU and Recovery Room require a highly sanitary room environment and will have a ceiling cassette-type air conditioner with a moderate-performance filter built in.

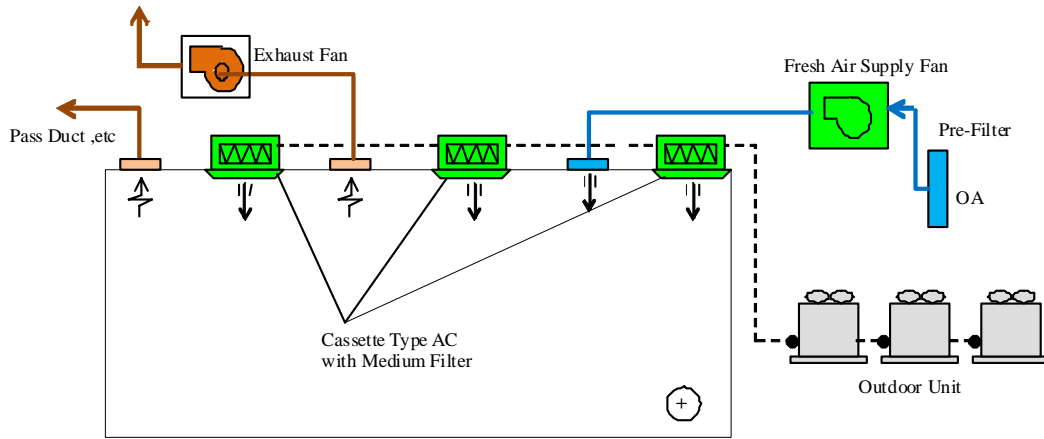
1-bed, 2-bed and 4-bed rooms will have wall-mounted air conditioners and a ventilation fan, and 8-bed rooms will be naturally ventilated through windows and grilles with ceiling fans added. The existing pharmacy is well ventilated but not air-conditioned, impairing the room environment. Therefore, a wall-mounted air conditioner will be installed as part of the works of the Project.

With regard to poor ventilation in rooms where air conditioners were added by NMCHC, ventilation improvement was suggested, and agreed to by NMCHC.

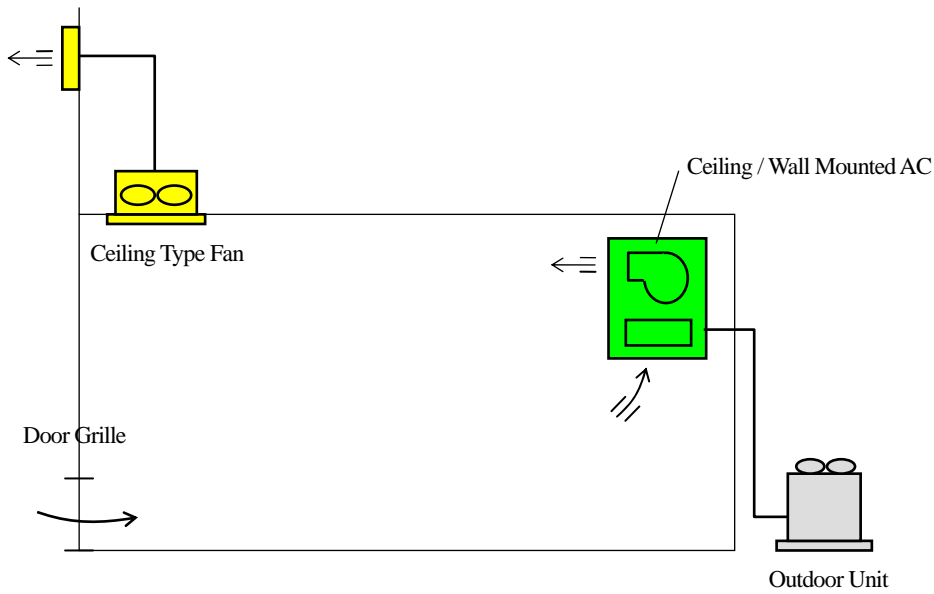
Figure 2-19 represents a conceptual diagram of the air conditioning & ventilation system for a high cleanliness room.

Figure 2-20 represents a conceptual diagram of the air conditioning & ventilation system for a typical air-conditioned room.

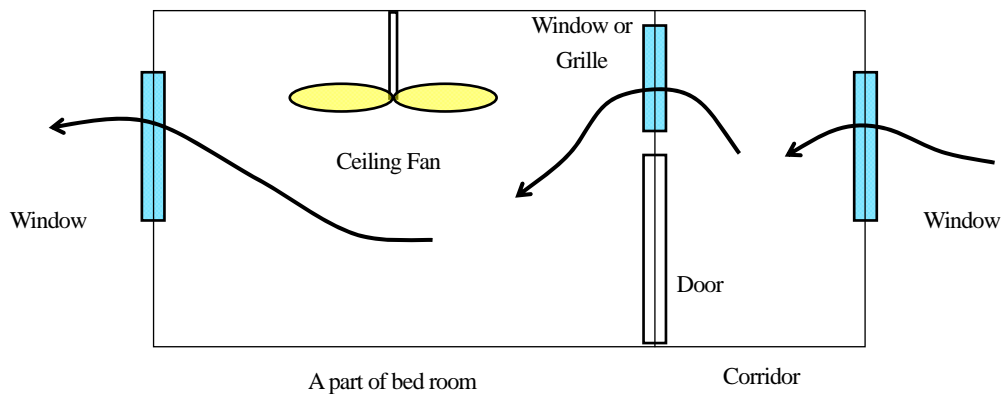
Figure 2-21 represents a conceptual diagram of ventilation for a typical naturally ventilated room.



**Figure2-19 Air conditioning and ventilation system for a clean room**



**Figure2-20 Air conditioning and ventilation system for typical air conditioned room**



**Figure2-21 Ventilation system for typical room**

11) Elevator system

① Proposed Training Center

Speed: 1.0 m/s

Capacity: 11 to 15 people (Japanese standard) or 18 to 21 people (overseas standard)

Weight: 750 to 1,000 kg (Japanese standard) or 1,275 to 1,600 kg (overseas standard)

Drive system: Inverter control (rope)

② Renovation work of the existing Center

Speed: 1.0 m/s

Capacity: 11 to 15 people (Japanese standard) or 18 to 21 people (overseas standard)

Weight: 750 to 1,000 kg (Japanese standard) or 1,275 to 1,600 kg (overseas standard)

Drive system: Inverter control (rope)

**2-2-2-6 Construction Materials Plan**

To ensure maintainability, construction materials and equipment will be selected from products and construction methods by considering the procurability of accessories and replacement parts in Cambodia.

Construction materials, methods and key points are described below for each major area.

(1) Exterior Finishing Materials

1) Roof

The roof shall be of the concrete slab flat roof type taking account of economy and easy construction, and will have a waterproofing membrane in the same fashion as the existing building. Thermal insulators shall be added under the ceiling slab to ensure inner insulation for the purpose of avoiding heat gain in the building interior and reduce the air conditioning load.

2) Exterior walls and fittings

For the purpose of maintainability following the completion of construction, exterior walls of the building shall use a locally available coating. Additionally, in consideration of the temperature and humidity in Cambodia, exterior fittings shall use aluminum sashes. Jalousie sashes shall be selected for the stairs and hallways without air conditioners in order to ensure natural ventilation. Steel fittings characterized by high sound insulation and durability shall be selected for the utility rooms.

3) Walkways and driveways

High-durability interlocking block shall be used for outside walkways, while concrete slabs shall be used for driveways and parking lots under columned space of the building. The outer periphery of the building shall be asphalt-paved.

**Table2-38 Exterior Finishing Materials and Construction Method**

Building Element		Adopted Construction Method	Rational for Adoption
Exterior	Roofs	Deck Roofs	Easy to maintain
	External Walls	Brick wall + Mortar + Paint finishing	Painting material is required to be high durability in terms of maintenance
	Fittings	Stainless-steel door (Entrance)	High durability and easy to clean
		Steel door (Machinery Room, etc.)	Strong and unbreakable
		Aluminum window, door	Common in the region, highly resistant to weather and easy to maintain
	Exterior of Building	Asphalt pavement	High durability and easy to maintain
Interlocking concrete block pavement		High durability and easy to maintain. To be used around the entrance.	

Source: Survey Team

(2) Interior Finishing Materials

1) Floors

The hallways exposed to outdoor air shall be covered with anti-slip tiles so that they remain walkable even when the floor is somewhat wet. Rooms not exposed to outdoor air shall use the following materials depending on intended use and required performance:

- General rooms:  
This area, which is to be accessible to trainees and staff, shall be covered with high-durability tiles that are easily cleaned.
  - Sanitary areas:  
The washrooms, showers and pantry shall be asphalt-waterproofed and covered with high-durability tiles.
- 2) Interior walls  
In general, walls shall be coat-finished on the mortar undercoat. Walls in the sanitary areas that may be exposed to contaminants, such as washrooms and shower rooms, will be covered with tiles that can be easily wiped clean.
- 3) Ceilings  
The skylight areas, hallways and stairs shall be coat-finished on the mortar undercoat and will partially use wooden louvers to hide piping, etc. The general rooms shall have a system ceiling that lays rock wool sound absorber on the T-shaped light gage steel backing.
- 4) Fittings  
For movable partitions in the training rooms and for PBL classroom and cafeteria, light aluminum fittings suitable for application shall be used. For general fittings in the building, wooden fittings shall be used for maintainability.

**Table2-39 Interior Finishing Materials and Construction Methods**

Area		Adopted Construction Method	Rational for Adoption
Interior	Floor	Porcelain tile	High durability and easy to maintain. To be used for common use area and rooms.
	Internal Walls	Mortar + Paint finishing	Common in the region, easy to maintain. To be used for rooms.
		Porcelain tile (Wet area)	Common in the region, easy to maintain in areas where water is used. To be used for wet rooms(Toilet, Shower room)
	Ceiling	Rockwool acoustic board	Common in the region, easy to maintain in areas where water is used. To be used for rooms
		Wooden louver	Covering of laid pipes. To be used for the entrance and corridor
	Fixture	Wooden door	Easy to maintain. To be used for rooms.
		Steel door	High durability. To be used for inspection openings.

Source: Survey Team

**(3) Materials & Equipment for Facilities**

The service life of the equipment for facilities is usually 7 to 13 years, which is much shorter than that of the construction materials. Locally proven equipment manufactured in Japan or other third countries will be procured for facilities whenever possible, while ensuring a certain level of quality so that renewal and maintenance of facility equipment can be smoothly performed in Cambodia after completion of construction and handover.

### **2-2-2-7 Equipment Plan**

#### (1) Overall Plan

##### 1) Allocation of equipment

The project's equipment shall be allocated in the existing Center and a new Training Center.

##### 2) Peripheral conditions for receiving/accepting equipment

- ① Electricity: The voltage and frequency of high tension electricity supplied by the Cambodian electric power company are stable and do not require use of an automatic voltage regulator. As a measure in case of blackout, which may occur a couple of times a month, ultrasonic diagnostic machine and CR machine for X-ray machine requiring data storage shall have UPS (uninterrupted power supply).
- ② Water quality: City water has some odor and color and a filtration system will be installed in the same fashion as the existing facilities. Only filtered city water will be used, and water quality will not be controlled on the equipment side.
- ③ Equipment distributors: Some of the equipment requires maintenance services or consumables for the daily use. For such equipment, the existence of a local distributor in Cambodia is one of the qualifications to be a bidder.

##### 3) Intended applications

This equipment plan will procure equipment required for providing MCH services at the existing building, and then be modified for providing training to medical specialists in the Training Center.

##### 4) Allocation

The equipment shall be allocated as shown in Table 2-40.

**Table2-40 Proposed Equipment/Location List**

No	Equipment Name	Q'ty	Training Center		1FL					2FL										3FL									
			CSL	Resource Center	X-ray Room	Dental Room	Laboratory	Pharmacy	OPD	Laundry	Treatment Room A	Treatment Room B	Operation Room 1	Operation Room 2	Operation Room 3	Delivery Room 2	Delivery Room 3	LDR	NCU-A-1	NCU-A-2	NCU-B	ICU	Recovery	Treatment Room	Nurse Station	Room C1	Room C2	Room C3	Room C4
1	General X-ray Unit	1			1																								
2	CR Machine	1			1																								
3	Dry Imager	1			1																								
4	Mobile X-ray Unit	1																1											
5	Blood Analyzer (Spectro Photometer)	1					1																						
6	Blood Analyzer (Electrolyte Analyzer)	1					1																						
7	Blood Gas Analyzer	1																		1									
8	CRP Analyzer for Micro Sample	1																		1									
9	Centrifuge for Hematocrit	1																		1									
10	Microscope	1					1																						
11	Dental Chair Treatment Unit	1				1																							
12	ECG	1																											
13-1	Patient Monitor (Adult)	13											1	1	1							6	4						
13-2	Patient Monitor (Neonate)	5																5											
14	Pulse Oxymeter	10																	5	5									
15	Blood Pressure Monitor	3																	3										
16	Fetal Actocardiograph	5													2	1	2												
17	Doppler Fetus Detector	10								4		1	1				2												
18	Neonatal Ultrasound Machine	1																	1										
19	Examination Light	7								4		1	1											1					
20	Operation Light for Delivery	2															2												
21	Suction Pump	1																						1					
22	Syringe Pump	14																5	3	2	4								
23	Infusion Pump	9																		5	4								
24	Oxygen Concentrator	4												1						1		1	1						
25	Nebulizer	5																		5									



No	Equipment Name	Q'ty	Training Center		1FL						2FL										3FL									
			CSL	Resource Center	X-ray Room	Dental Room	Laboratory	Pharmacy	OPD	Laundry	Treatment Room A	Treatment Room B	Operation Room 1	Operation Room 2	Operation Room 3	Delivery Room 2	Delivery Room 3	LDR	NCU-A-1	NCU-A-2	NCU-B	ICU	Recovery	Treatment Room	Nurse Station	Room C1	Room C2	Room C3	Room C4	Room C11
26	Oxygen Flow Meter	23										1	1	1				5	5		6	4								
27	Patient Warmer	2										1	1																	
28	Laryngoscope	3																		3										
29	Blood Bank Refrigerator	2					1														1									
30-1	Drug Store Refrigerator A	1						1																						
30-2	Drug Store Refrigerator B	1																						1						
31	Gynecological Examination Table	1																					1							
32	Medical Bed	6																							1	1	1	1	2	
33	Bedside Table	6																							1	1	1	1	2	
34	Pharmacy Supply Shelves	1						1																						
35	Washing Machine	1											1																	
36	Spinning Machine	1										1																		
37	Simulation Model A	2	2																											
38	Simulation Model B	2	2																											
39	PC for Training	10		10																										
40	Desk	10		10																										
41	Chair	10		10																										
42	Printer/Copy/Scanner Combined Machine	1		1																										

Source: Survey Team

## (2) Equipment Plan

The specifications and intended use of major equipment to be procured under this Project are listed in Table 2-41.

**Table2-41 Specifications and Usage of the Major Equipment**

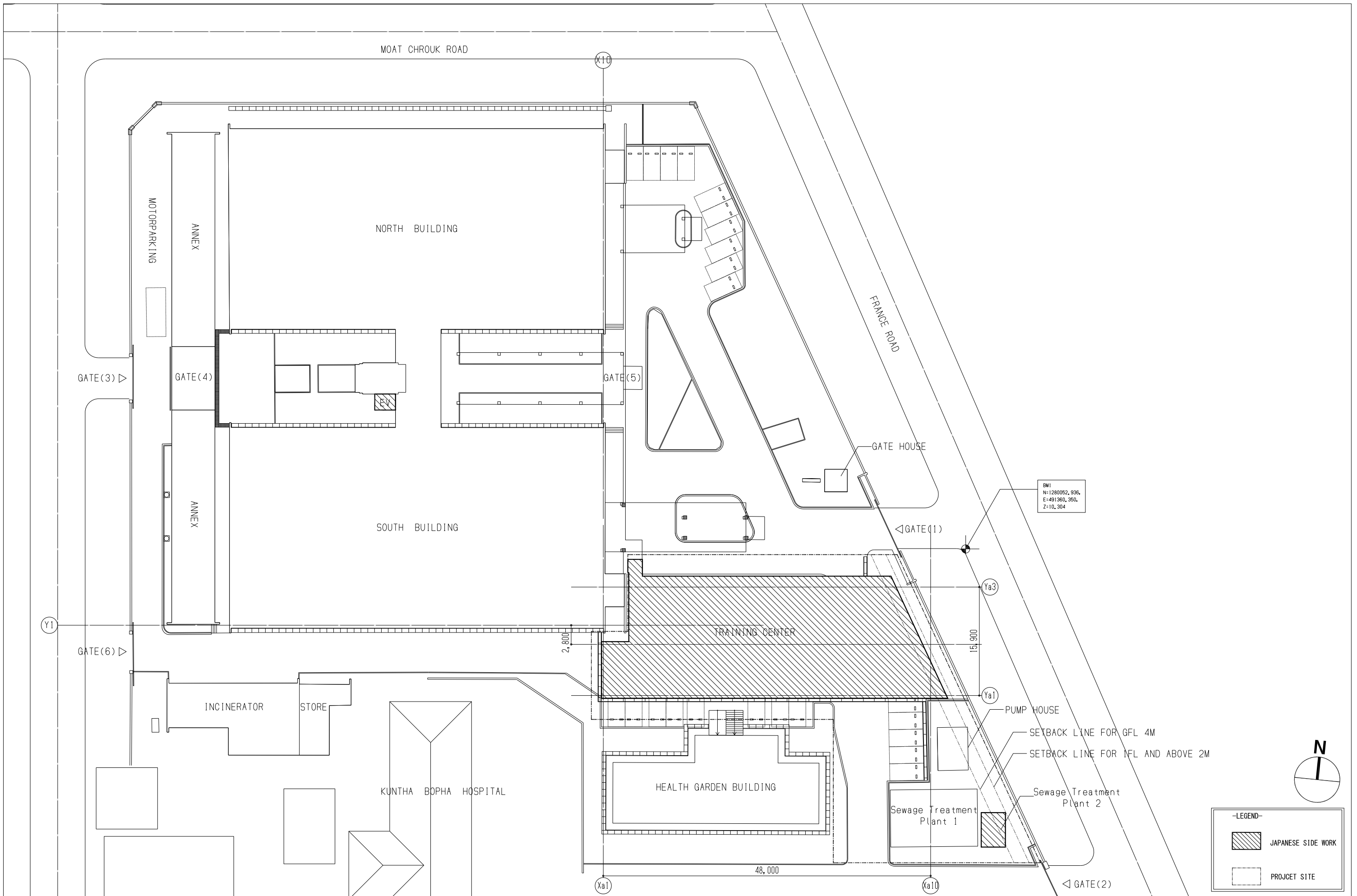
No	Equipment Name	Q'ty	Major Specifications and Compositions		Purpose of Use
1	General X-ray Unit	1	Generator Capacity Tube Voltage Focus Size	30kW or more Max 150kV or more 0.6/1.2mm	For general X-ray image use. It should have general utility functions.
2	CR Machine	1	IP slot Grayscale Resolution Spatial Resolution Pitch Size Processing Speed	1 12bits or more 20 pixel/mm 50µm or smaller 40 cassette/hour	To be used for reading data from IP cassettes. It should handle general radiology and mammography.
3	Dray Imager	1	Pixel Size Resolution Grayscale Resolution Film Size	50µm or smaller 500 dpi or higher 14bits or more 10x12 inch, 8x10 inch	To be used for printing film. It should handle general radiology and mammography.
4	Mobile X-ray Unit	1	Generator Capacity Tube Voltage Focus Size	15kW or more Max 120kV or more 0.6mm	For X-ray imaging in NCU. It should have general utility functions.
5	Blood Analyzer (Spectro Photometer)	1	Wave Length Spectrum Band Light Source Optical System Display	200~800nm or wider 5nm Halogen or Xenon Single Beam LED or LCD	For identifying the quality and quantity of chemical structures dissolved in sample solutions with observing the change in color affected by lights.
6	Blood Analyzer (Electrolyte Analyzer)	1	Measuring Items	Na, K, Cl or more	For measuring electrolytes in specimen materials. It should have general utility functions.
7	Blood Gas Analyzer	1	Measuring Items Sample Volume	Na, K, Cl, Ca, pH, PaO <sub>2</sub> , PaCO <sub>2</sub> , HCO <sub>3</sub> <sup>-</sup> , BE Micro Sample	For measuring electrolyte and partial pressure of blood gas. It should have general utility functions.
8	CRP Analyzer for Micro Sample	1	Processing Speed Sample Volume	5 test/hour or more Micro Sample	Equipment for measuring CRP reaction
11	Dental treatment chair unit	1	Composition	Compressor, Doctor's Chair, Dental Chair, Light, Suction, Ultrasound Scaler, Accessory Table, Handpiece (Turbine 2, Micromotor 1)	For dental check-ups and treatment. It should have general utility functions.
12	ECG	1	Channel Display	12 channel 3 waves	For recording electrocardiographs in order to diagnosis irregular pulse and myocardial infarction. It should have general utility functions.

No	Equipment Name	Q'ty	Major Specifications and Compositions		Purpose of Use
13-1	Patient Monitor (Adult)	13	Monitoring Item Display Number of waves Others	ECG, Resp, SpO2, Temp, NIBP or more Color LCD, 10.4 inch or more 5 waveforms or more Cart	For monitoring patients' bio information at operation theatres and ICU. It should have general utility functions.
13-2	Patient Monitor (Neonate)	5	Monitoring Item Display Number of waves Others	ECG, Resp, SpO2, Temp, NIBP or more Color LCD, 10.4 inch or more 5 waveforms or more Cart	For monitoring patients' bio information at NCU. It should have general utility functions.
16	Fetal Actocardiograph	5	Heart beat range HR mode HR input Sensitivity of Contraction Strength Fetus movements record	50-210 bpm or wider Autocorrelation Function Method Ultrasonic Doppler 20mm/100g  Print on Records	For monitoring fetal pulse and uterine contraction in order to understand fetal well-being especially in the last-term of pregnancy. It should measure fetal pulse and labor pain at the same time. It should have specifications to diagnosis premature birth, fetal distress and labor with excessive pain. It should have general utility functions.
18	Neonatal Ultrasound Machine	1	Scan Method Monitor Mode Probe	(Neonate/Infant) Convex, Linear 9 inch or more B, M, B/M, Color Doppler (Neonate/Infant) Convex, Cranial	For check-up of newborn health. It should have general utility functions.
35	Washing Machine	1	Load Volume	30kg	For washing linens. It should have general utility functions.
36	Spinning Machine	1	Load Volume	30kg	For spin-drying linens. It should have general utility functions.
37	Simulation Model A	2	Type	Simulator for Birth Attendant (Auto Delivery Function)	For training of assisted-delivery.

Source: Survey Team

**2-2-3 Outline Design Drawings****Table2-42 List of Drawings**

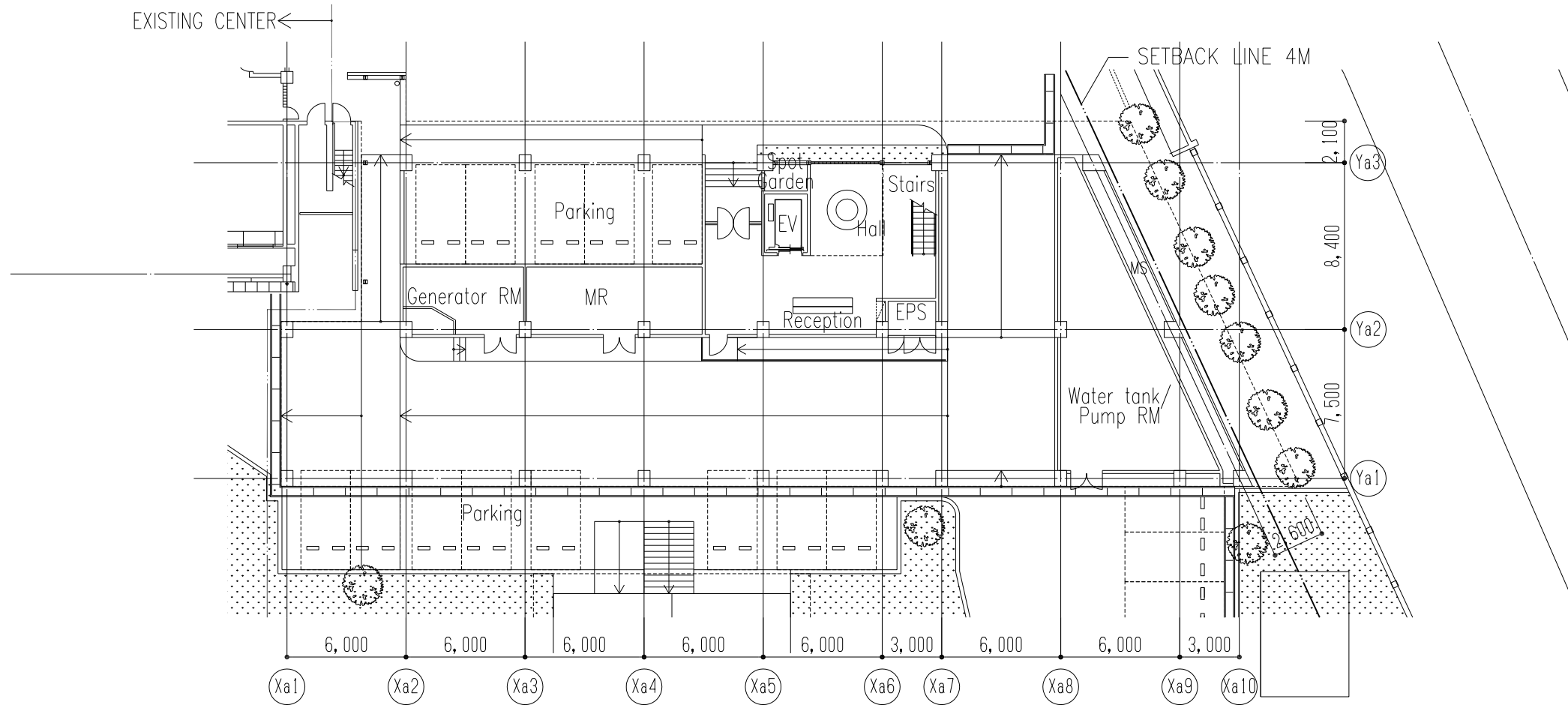
Drawing Items		Scale	Page
1	Site Plan	1/500	123
2	Training Center Basement Floor Plan, 1st Floor Plan	1/300	125
3	Training Center 2nd Floor Plan, 3rd Floor Plan	1/300	127
4	Training Center 4th Floor Plan, Roof Plan	1/300	129
5	Training Center Elevation	1/300	131
6	Training Center Section	1/300	133
7	Renovated Existing Center 1st Floor Plan	1/300	135
8	Renovated Existing Center 2nd Floor Plan	1/300	137
9	Renovated Existing Center 3rd Floor Plan	1/300	139



THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA

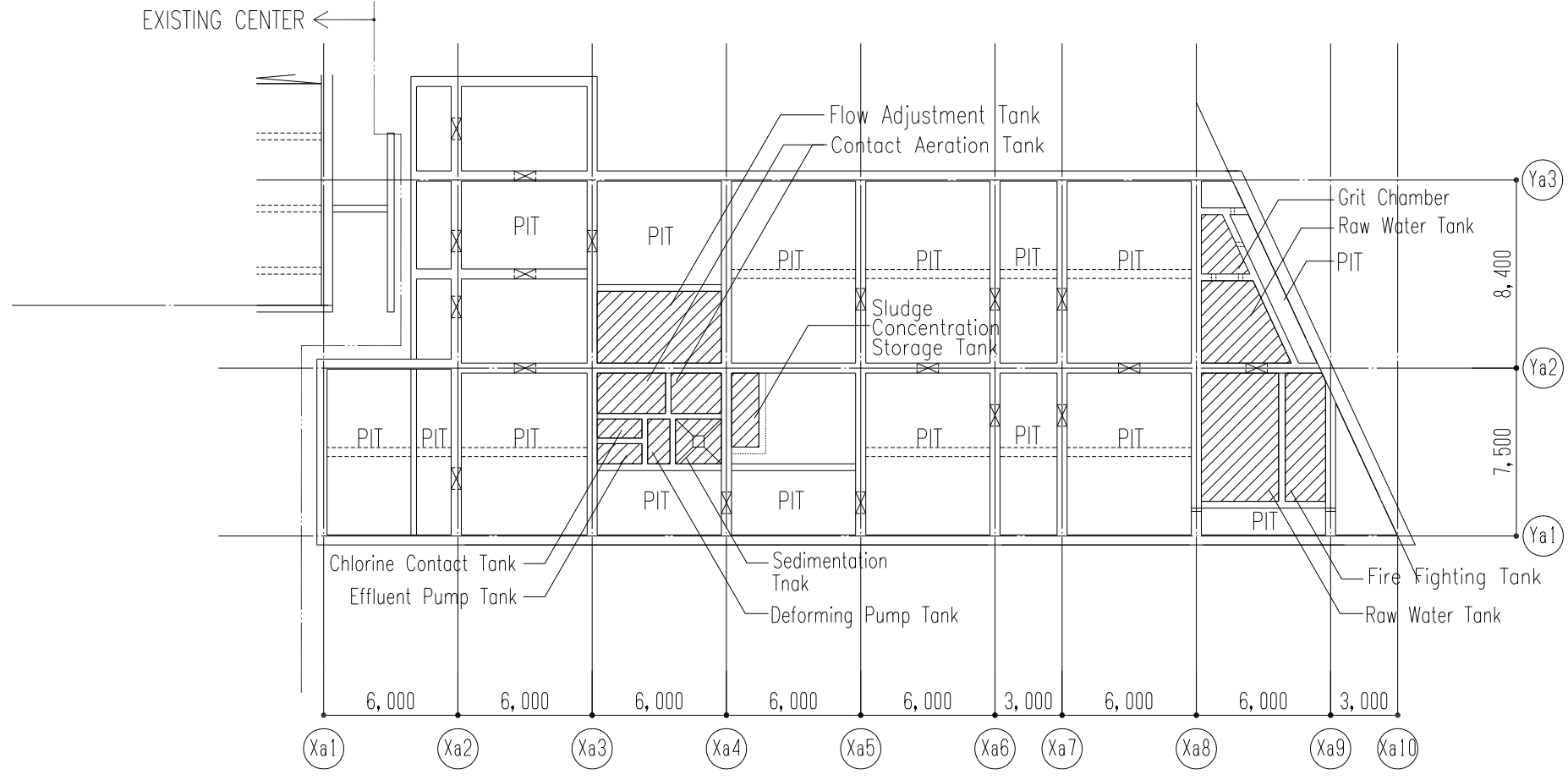
TITLE	Site Plan
SCALE	1/500

EXISTING CENTER ←

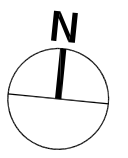


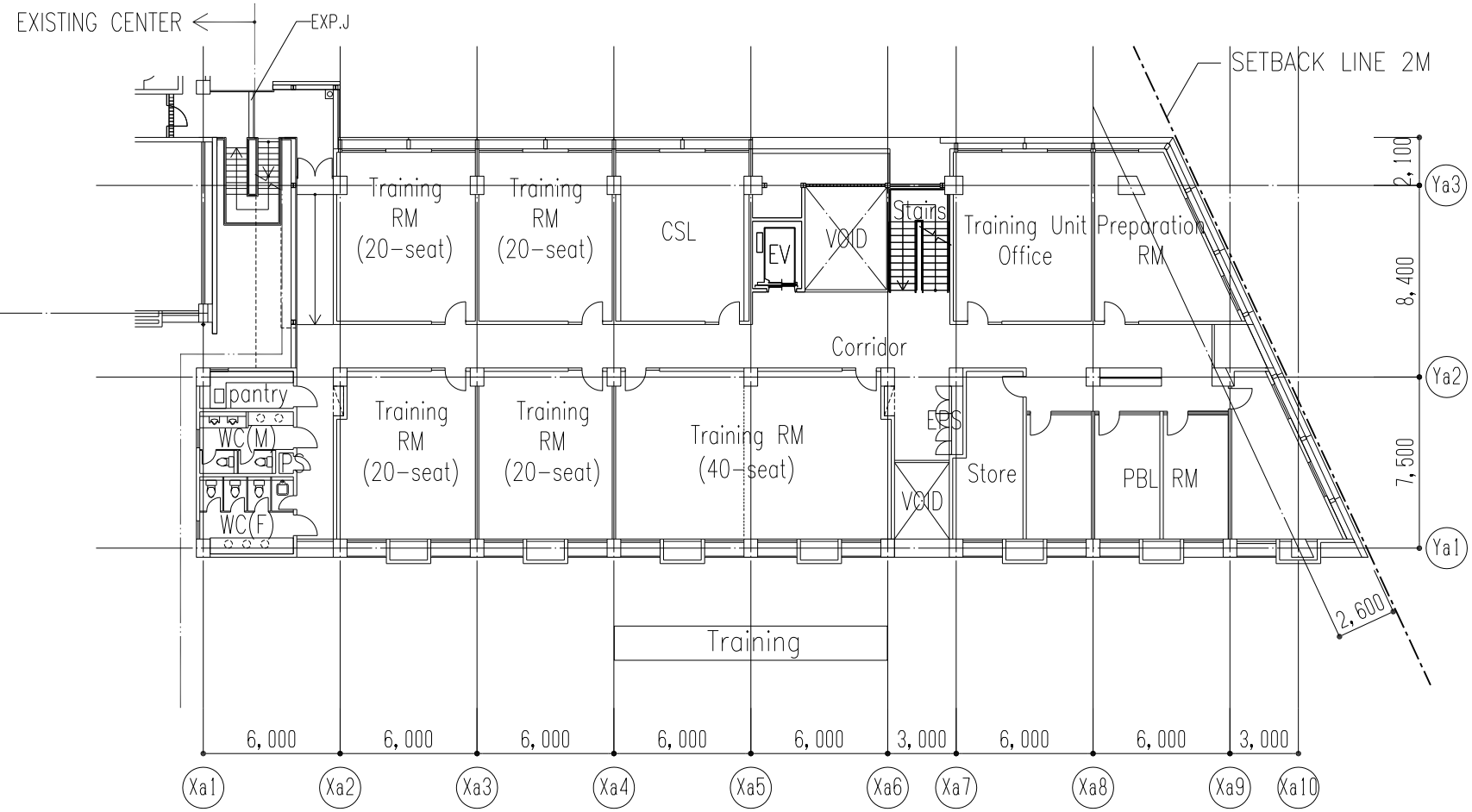
2 1F PLAN

EXISTING CENTER ←

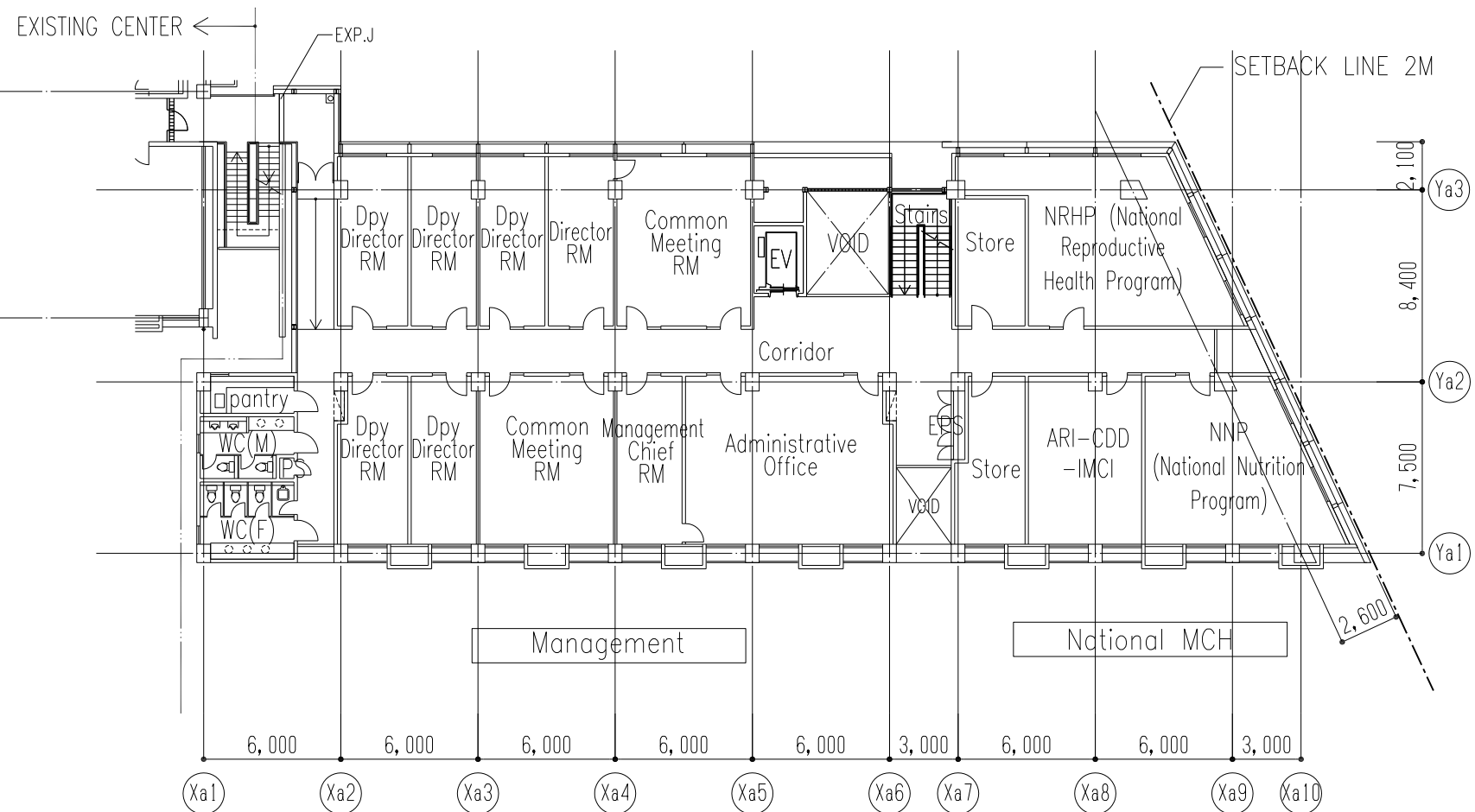


1 B1F PLAN

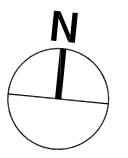




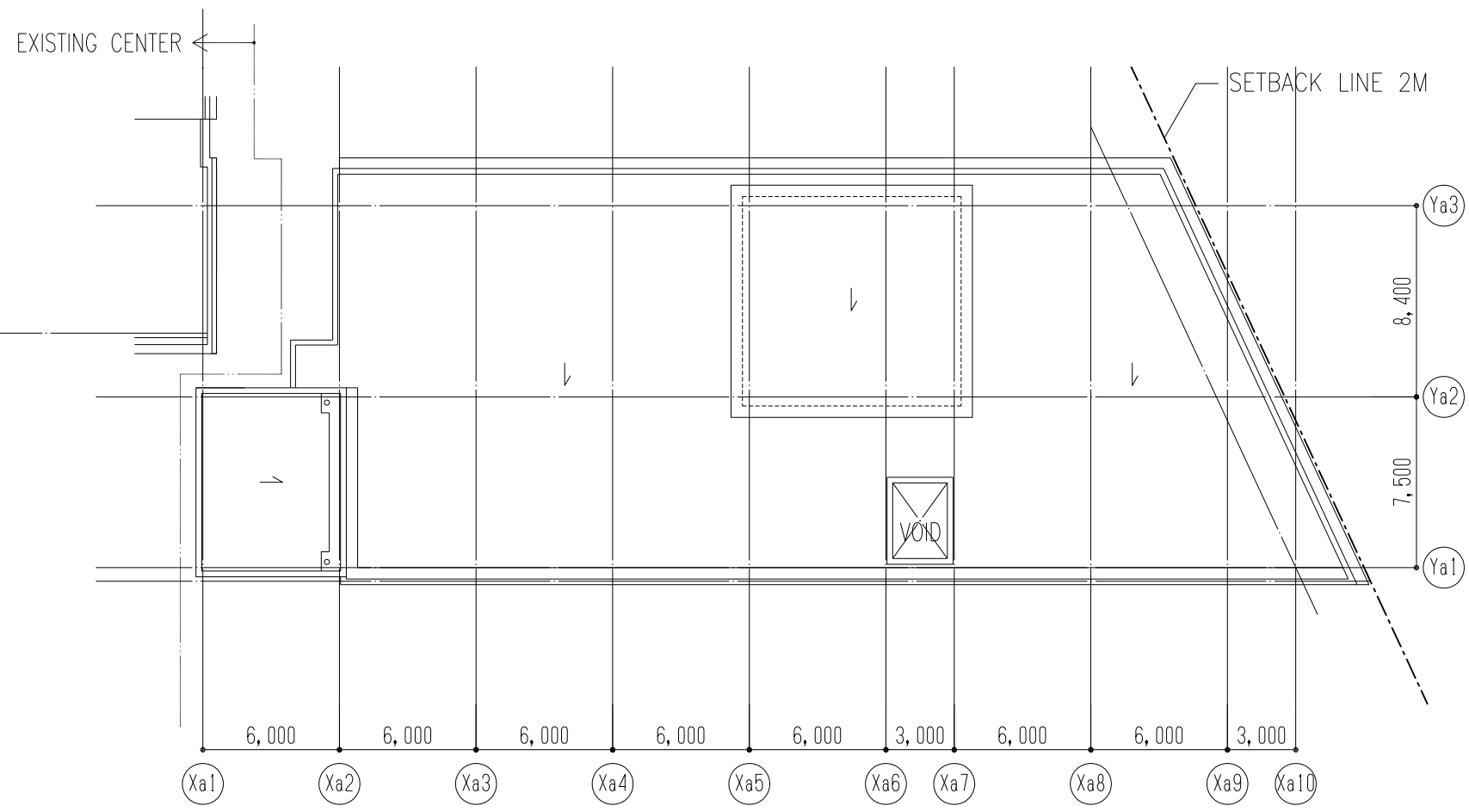
2 3F PLAN



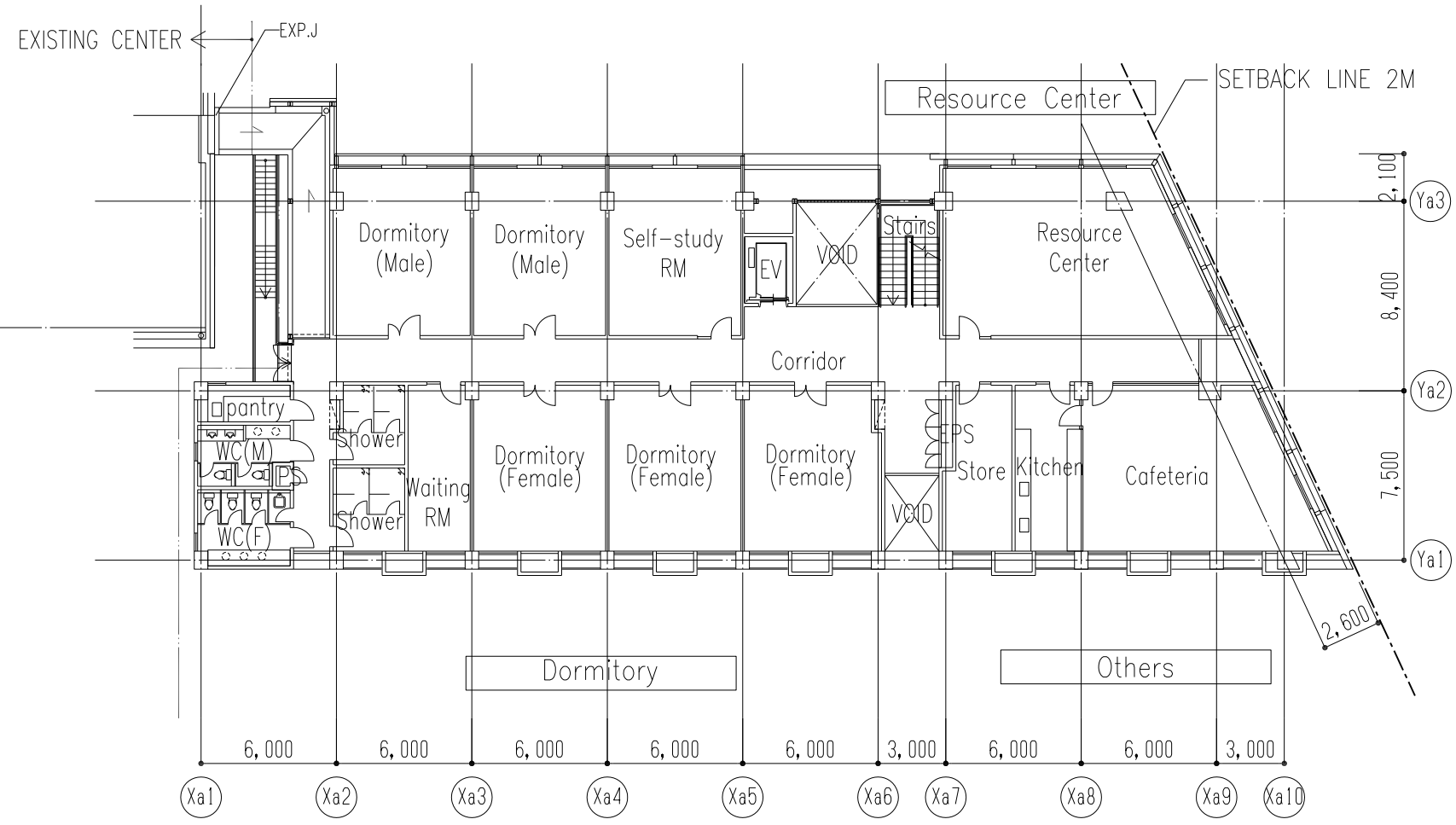
1 2F PLAN



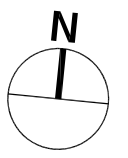
THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA		TITLE Training Center 2nd Floor Plan, 3rd Floor Plan
		SCALE 1/300



2 RF PLAN

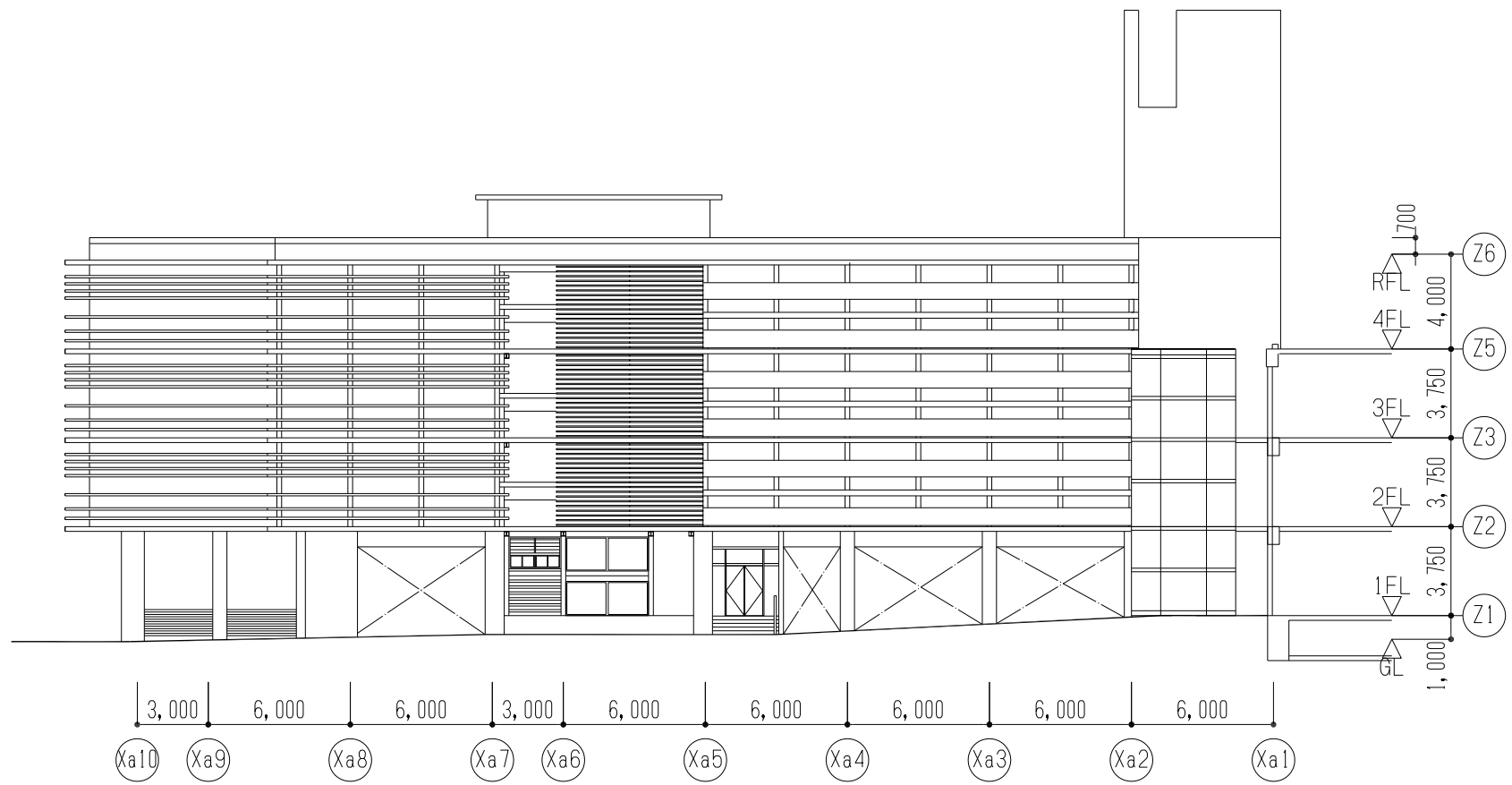


1 4F PLAN

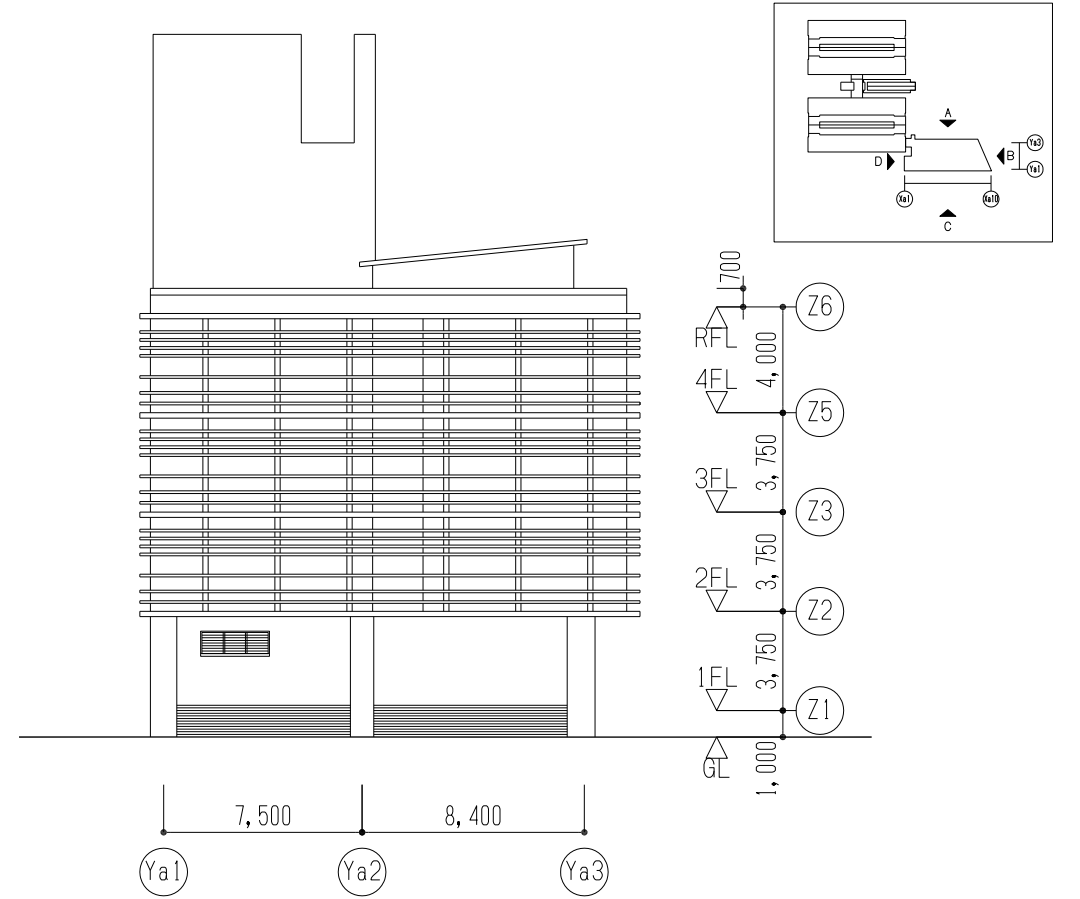


THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA		TITLE	Training Center 4th Floor Plan, Roof Plan
		SCALE	1/300

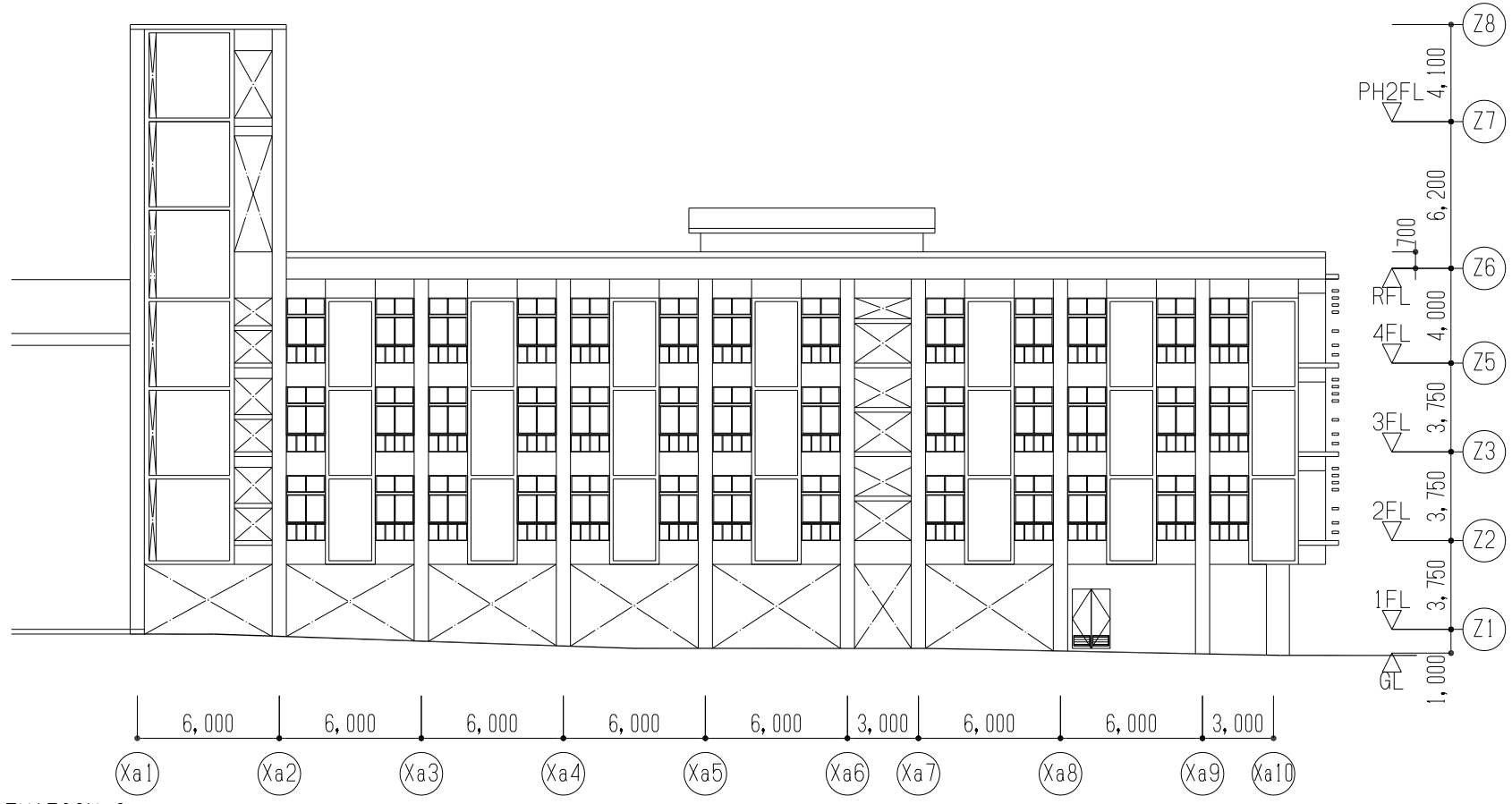




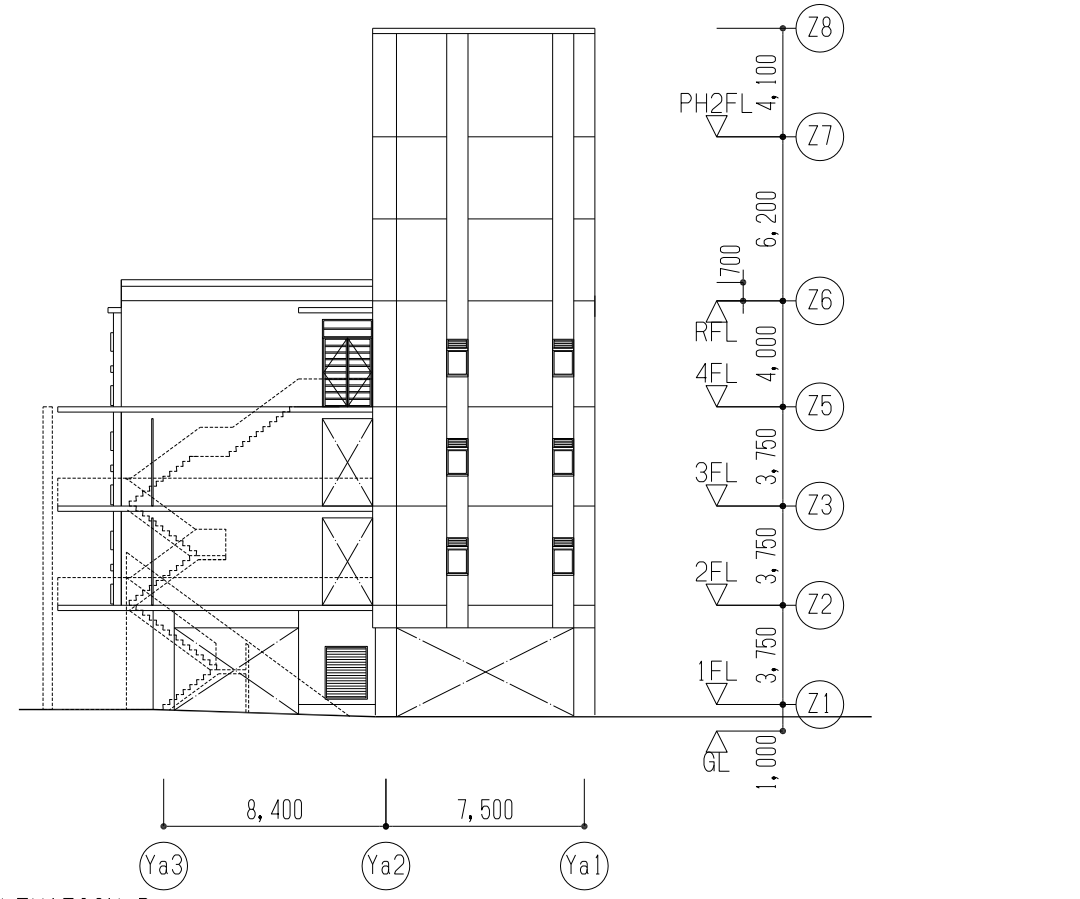
1 ELEVATION A



2 ELEVATION B

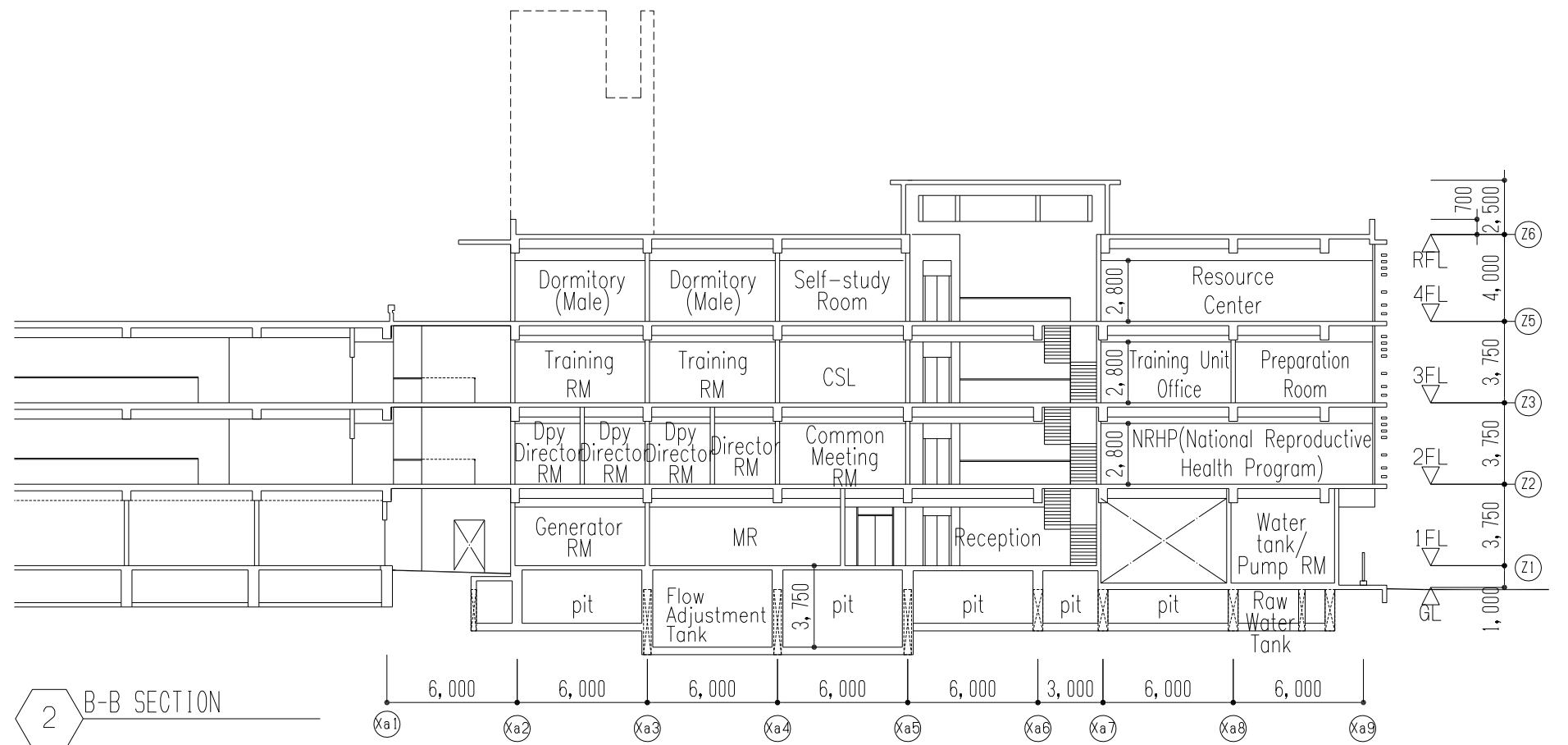
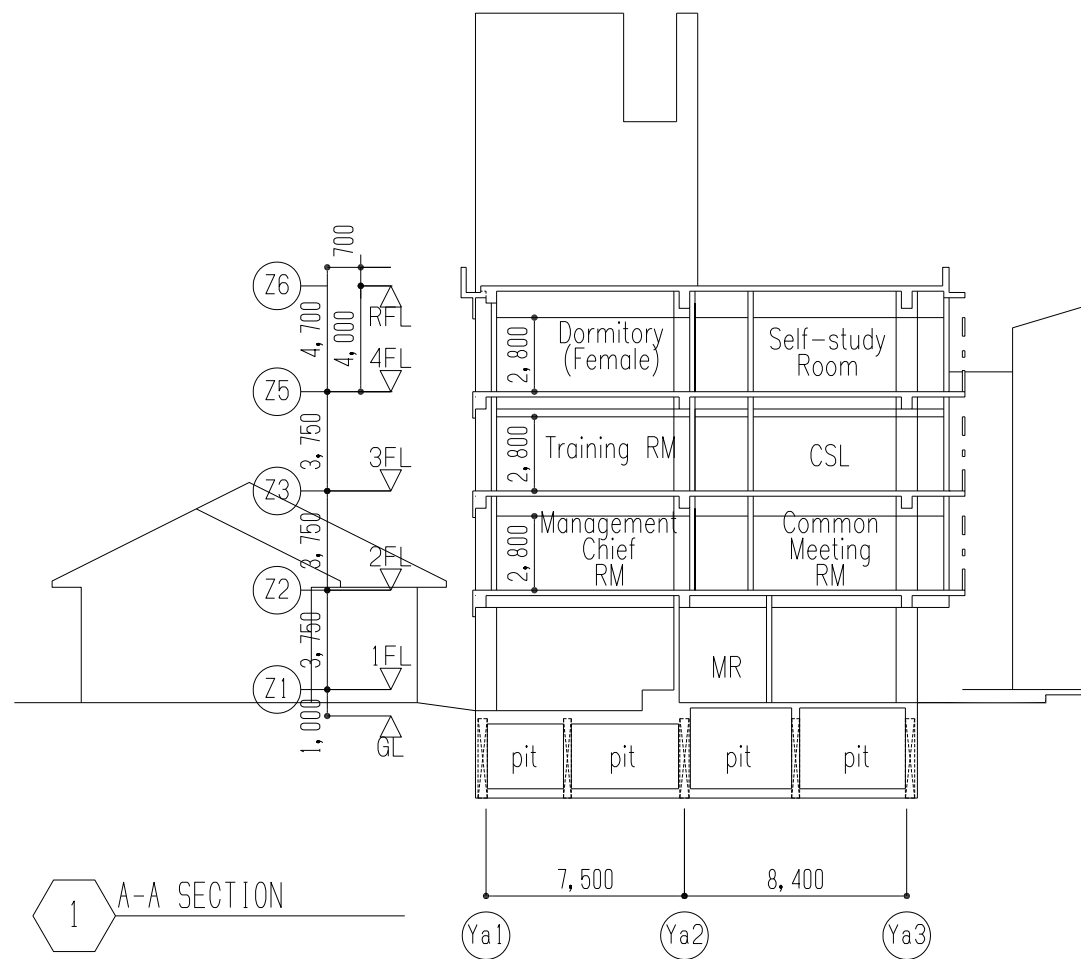
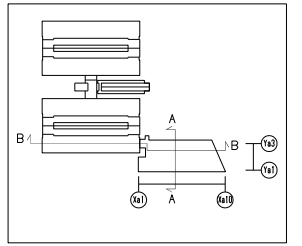


3 ELEVATION C



4 ELEVATION D

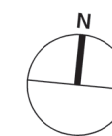
<p>THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA</p>	<p>TITLE Training Center Elevation</p>
	<p>SCALE 1/300</p>



THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA

TITLE  
Training Center  
Section

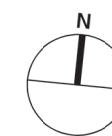
SCALE  
1/300



-LEGEND-  
— JAPANESE SIDE WORK

THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA

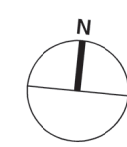
TITLE	Renovated Existing Center 1st Floor Plan
SCALE	1/300



-LEGEND-  
— JAPANESE SIDE WORK

THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA

TITLE	Renovated Existing Center 2nd Floor Plan
SCALE	1/300



-LEGEND-  
— JAPANESE SIDE WORK

THE PROJECT FOR EXPANSION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER IN THE KINGDOM OF CAMBODIA

TITLE	Renovated Existing Center 3rd Floor Plan
SCALE	1/300

## 2-2-4 Implementation Plan

### 2-2-4-1 Implementation Policy

The Project consists of construction work to build a new Training Center and to renovate the existing Center and equipment work to procure, install and test medical and training equipment.

The Project's scope of work covered by the Japanese side will be implemented in accordance with the Grant Aid Scheme of the Government of Japan, after concluding the Exchange of Notes (E/N) and the Grant Agreement (G/A) between both governments followed by obtaining approval of the Japanese Cabinet meeting.

The responsible organization of the project is MOH and the implementation agency is NMCHC. After the E/N is signed, MOH and a Japanese consulting company will make and enter into a consultancy agreement, and the consulting company will proceed to the detailed design of the Project. After completion of the detailed design, Japanese contractors and equipment suppliers will be invited to tender, and successful bidders will carry out the construction work and equipment work respectively.

Key considerations for implementing the Project are described below.

#### (1) Implementing Organization

The responsible organization of the project is MOH and the implementation agency is NMCHC. MOH will make and enter into the consultancy agreement, construction work contract, and equipment work contract of the Project.

NMCHC will be responsible for work to be undertaken by the Cambodian side to implement the Project, and will manage and maintain the facilities and equipment of the Project.

#### (2) Consultancy

After both governments make and agree upon the E/N and G/A the consulting company will make and enter into a consultancy agreement with MOH. Cambodia shall carry out the following duties in accordance with the Grant Aid Scheme of the Government of Japan. It is important to finalize the agreement promptly after conclusion of the G/A in order to implement the Project on schedule, and the agreement will take effect upon approval from JICA.

##### 1) Detailed design

The consulting company will review the details of the architectural plan and the equipment plan and prepare a bidding document package consisting of detailed design drawings, specifications, instructions to bidders and a draft construction/equipment work contracts based on the preparatory survey.

##### 2) Tender assistance

The consulting company will attend the bid to be managed by the implementing organization to select the contractors of construction and equipment works, assist in administrative work and related processes, and report to the Government of Japan.

3) Construction supervision

The consulting company shall confirm that the construction work contractor and equipment supplier perform the work in accordance with the respective contracts and ensure that the contracts will be performed and fulfilled properly.

(3) Placement of Orders for Construction Works and the Procurement of Equipment

The contractors of the Project shall consist of a contractor to build the Training Center and renovate the existing Center, and an equipment supplier to procure, install and test medical equipment and training equipment. The contractor and equipment supplier are restricted to Japanese companies meeting certain qualifications, and will be selected by a public tender. In principle, successful bidders will be determined through negotiation with the lowest bidders.

MOH Cambodia will conclude construction work and equipment work contracts with each successful contractor selected by the bidding process and receive the authorization of those contracts from JICA.

After the authorization, the contractor and equipment supplier will commence their work (construction and renovation work of the facilities, procurement, installation and commissioning of equipment) and execute it in accordance with the contract.

## 2-2-4-2 Implementation Conditions

### (1) Schedule Management

The Project consists of the construction of a new Training Center and renovation work of the existing Center. The construction of the Training Center starts prior to the renovation work because office and training rooms on the third floor of the existing South Building need to move to the Training Center before starting the renovation work of the existing Center.

The earthwork of the Training Center shall start during the dry season. After starting with a concrete-placed lower floor, exterior wall masonry, plastering, engineering and finishing work will commence. These works will proceed simultaneously with the building's structure work of the upper floors in order to manage the construction schedule within the timeframe and to secure workers continuously.

The renovation work of the existing Center shall be undertaken while the other portions are in operation. The renovation work will be implemented in four phases: (1) the northwest portion on the third floor of South Building, (2) the southwest portion on the third floor of South Building, (3) the southeast portion on the second floor of North Building and (4) the northeast portion on the second floor of North Building. The contractor will hand-over the phased portion after the relevant portion is completed. NMCHC will relocate services after completion of each phase. The subsequent renovation phase cannot start unless the relocation is complete. Therefore schedule management is required and includes coordination of the relocation schedule.

### (2) Temporary Work Plan

The Training Center shall be constructed in the NMCHC's premises and situated between the existing drop-off and the Health Garden Building. Therefore temporary fences shall be installed to avoid interrupting on-going medical service activities of the existing Center and Kuntha Bopha Hospital. In addition, a separate gate for construction work facing the front road will be installed to ensure construction vehicles do not interrupt the patients accessing NMCHC and the Health Garden Building. The renovation work also includes the temporary fences inside the center, as to not interrupt the ongoing medical functions.

### (3) Dispatch of Equipment Installation Engineers

It is necessary to provide the proper instructions to NMCHC's staff members at the time of installation in order to operate and maintain the Project's equipment properly, and the equipment supplier shall dispatch qualified equipment installation engineer(s) to provide technical instructions meeting the level of the NMCHC's medical staff and engineers, particularly for new equipment.

The equipment supplier shall provide applicable instruction manuals translated into the Cambodian language and attached to the equipment requiring accurate operation control.



### 2-2-4-3 Scope of Works

The demarcation of the works between the Japanese and Cambodian sides is clearly determined in order to implement the Project smoothly. The scope of works undertaken by the both sides will follow the general policies stated below. Table 2-43 shows the details.

(1) Works Undertaken by the Japanese Government

The Japanese side shall be responsible for consulting services, construction of the Training Center, renovation work of the existing Center and the procurement/installation of equipment under the Project.

Water supply/sewage pipes for the existing Center are laid underground in the area where the Training Center will be constructed, and will need to be relocated prior to the commencement of construction. Those works will require high construction accuracy to ensure a proper gradient for waste water in the small space on the border with Health Garden Building and laid underground pipes. Moreover, proper schedule management is required in order to avoid affecting medical service activities of the existing Center. It is appropriate to include those works in the scope of works undertaken by the Japanese side.

(2) Works Undertaken by the Cambodian Government

The Cambodian side will be responsible for duties associated with the application for and the acquisition of permission for construction facilities; securing a planned construction site as well as a temporary site and tax exemptions.

**Table2-43 The Project's Scope of Work to be Covered by Both Sides**

Item	To be Covered by Japanese Side	To be Covered by Cambodian Side
I. Project Site		To secure proposed building site and temporary site
II. Building Permission		To obtain building permissions
III. Preparation of Site	To relocate existing NMCHC's utility pipes <ul style="list-style-type: none"> <li>Underground pipes of water supply, drainage and telephone laid through the site should be relocated before the work</li> </ul>	To clear and prepare the site <ul style="list-style-type: none"> <li>To remove existing structures</li> <li>To relocate existing utility pipes if any</li> </ul>
IV. Exterior Work	Exterior Work around Training Centre <ul style="list-style-type: none"> <li>Grading, Parking and Roads within the site</li> </ul>	Exterior Work <ul style="list-style-type: none"> <li>Renovation of Drop-off</li> <li>Repair of fences and gates</li> </ul>
V. Facilities Work	<ol style="list-style-type: none"> <li>Training Center Building <ul style="list-style-type: none"> <li>Architectural, Electrical, Mechanical Work</li> <li>Elevator Work</li> </ul> </li> <li>Renovation of Existing NMCHC <ul style="list-style-type: none"> <li>Architectural, Electrical, Mechanical Work</li> <li>Elevator Work</li> <li>Others (Medical Gas Supply, Solar Panel)</li> </ul> </li> <li>Furniture <ul style="list-style-type: none"> <li>Training Furniture</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>Renovation of Existing NMCHC <ul style="list-style-type: none"> <li>To add drying space in front of Laundry RM</li> </ul> </li> <li>Furniture <ul style="list-style-type: none"> <li>General furniture</li> <li>Curtain and blinds</li> </ul> </li> </ol>
VI. Equipment Work	Medical and Training Equipment	Dispose of existing equipment to be replaced by the project
VII. Moving of Equipment and Services		<ol style="list-style-type: none"> <li>Moving to Training Center <ul style="list-style-type: none"> <li>Moving from 3FL, South Bldg to Training Center</li> </ul> </li> <li>Moving within NMCHC <ul style="list-style-type: none"> <li>Moving from 2FL, North Bldg to 3FL, South Bldg</li> <li>Other relevant moving if any</li> </ul> </li> <li>Renovation of Health Garden Bldg <ul style="list-style-type: none"> <li>Secure of temporary entrance</li> <li>Relocation of Lab and PMTCT Office</li> </ul> </li> </ol>

Source: Survey Team

#### **2-2-4-4 Consultant Supervision**

A Japanese consulting company (the Consultant) will conclude a consultancy agreement with MOH, carry out the detailed design of the Project (preparation of tender documents, etc.), and will provide tendering and construction/equipment work supervision. The construction supervision is intended to ensure proper fulfillment of the construction/equipment contracts, including monitoring the all the works are performed according to the design documents. When instructing, advising and coordinating during the construction period, the consulting company will ensure quality and schedule management. The construction supervision consists of the following duties:

(1) Assistance in the Tendering and Award of the Contracts

The Consultant shall prepare tender documents required to determine contractors for construction and equipment works and perform works related to tendering (including notice of the tenders, acceptance of intention to tender, screening of qualifications, briefing of the tender brief, distribution of tender documents, acceptance of the tender documents and evaluation of the tender results). Furthermore, it shall advise and assist to conclude the construction/equipment contracts between the selected contractors and the MOH of Cambodia.

(2) Instruction/Advice/Coordination for Contractors

The Consultant shall review the construction schedule, the construction plan, the construction materials procurement plan, the equipment procurement & installation plan and other similar factors, and provide instructions and advice to contractors and coordinate with them.

(3) Inspection & Approval of Construction Drawings, Fabrication Drawings, etc.

The Consultant shall review construction drawings, shop drawings and other similar documents submitted by contractors, and provide necessary instructions and approvals.

(4) Confirmation & Approval of Construction Materials and Equipment

The Consultant shall confirm the consistency of construction materials and equipment to be procured by constructors with reference to construction/equipment contracts and other documents, and give approval to select and use them.

(5) Construction Inspection

If necessary, The Consultant shall inspect the manufacturing plants of the construction materials and equipment, witness construction tests and inspect quality and required performance.

(6) Reporting Work Progress

The Consultant shall monitor the progress of the construction schedule and construction works on-site, and report work progress to the relevant organizations of both countries.

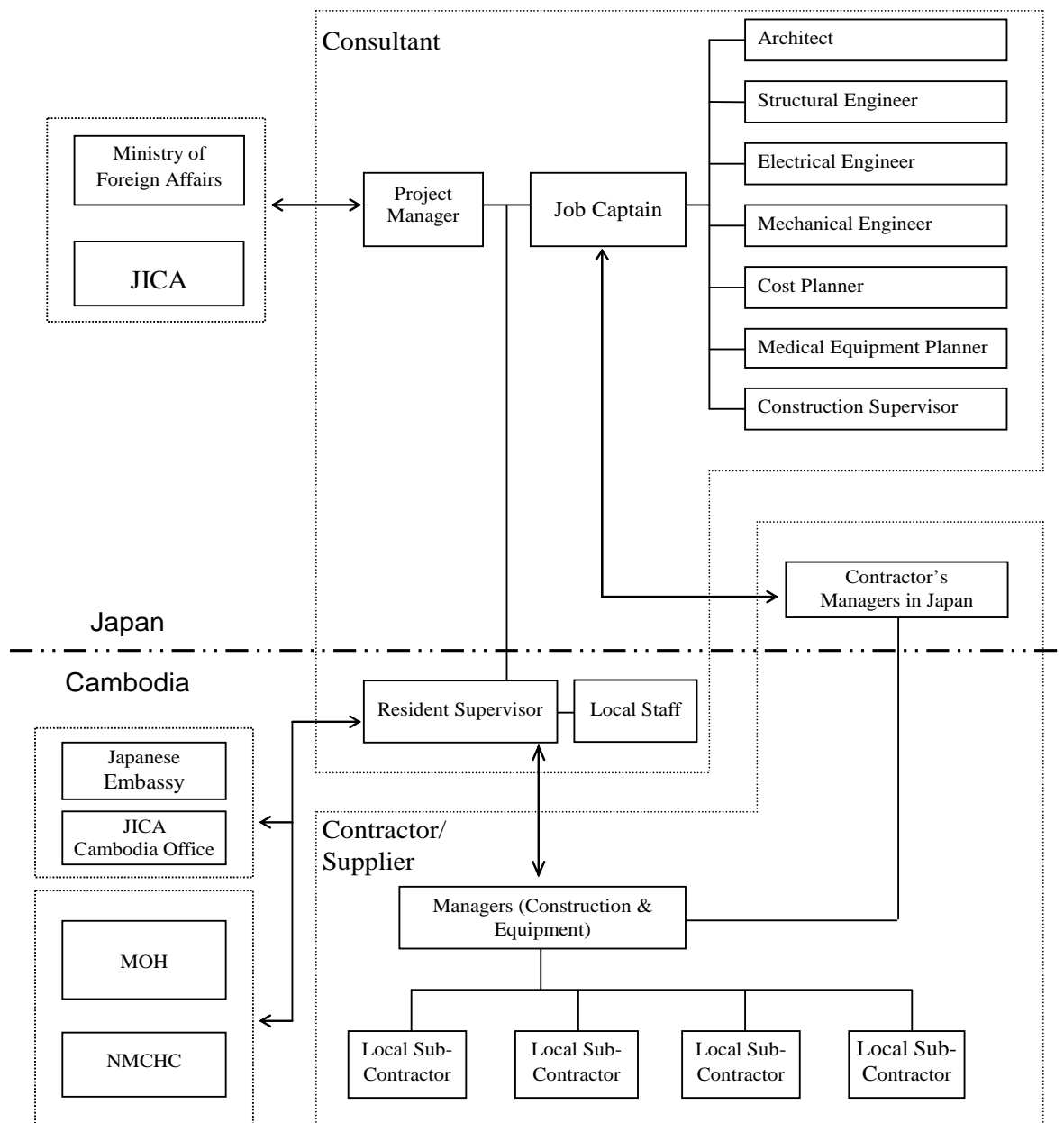
(7) Completion Inspection and Operation Test

The Consultant shall conduct a completion inspection of the facilities and equipment, and attend the tests to verify that the performance stated in the construction/equipment contracts is ensured, and submit an inspection report to the MOH.

(8) Construction Supervision System

The Consultant will assign one resident supervisor to the site to carry out the aforementioned works. In addition, specialty engineers of each field will be dispatched to perform the necessary consultations, inspections, guidance and coordination according to the progress of work. At the same time, engineers stationed in Japan shall also be assigned to carry out technical reviews and communications with the site. Additionally, necessary information of the Project progress (including work progress, application for the payments and final handing-over, etc.) shall be reported to the relevant government agencies in Japan.

Figure 2-22 represents a construction supervision system.



Source: Survey Team

Figure2-22 The Consultant's Supervision Organization

### 2-2-4-5 Quality Control Plan

#### (1) Concrete Work

The quality control plan for concrete work shall follow Standard Specifications for Public Works Construction (Public Buildings Association) and JASS 5 (Architectural Institute of Japan) that are implemented in Japan; however, a general Cambodian quality control plan may apply when appropriate.

##### 1) Mix proportion plan

A mix proportion plan shall be determined following a trial mixing. The trial mixing shall be repeated until a planned slump, a planned air-entrain, a required air-dried weight per unit volume and strength for proportioning are achieved.

##### 2) Curing

Test cylinders shall be subject to underwater curing at the job site. A cure temperature should be as close to the temperature of the building as possible. Test cylinders shall be taken every day of concrete placement and every 150 m<sup>3</sup>.

##### 3) Strength test

The strength for concrete shall be determined by checking compressive strength of 7-day and 28-day cured test cylinders, unless otherwise specified. The compressive strength of the test cylinders shall be tested by a third-party organization.

##### 4) Chloride content

The chloride content shall be checked by using a method generally used in Japan to verify that it does not exceed 0.30 kg/m<sup>2</sup>.

#### (2) Reinforcement Work

Any and all reinforcement work shall be performed on-site. Quality control and inspection shall be performed for reinforcement bar manufacturing and assembly process in accordance with the Standard Specifications for Public Works Construction (Public Buildings Association) and JASS5 (Architectural Institute of Japan).

##### 1) Inspection of reinforcement bar arrangement

The contractor shall be subject to inspection of the reinforcement bar arrangement, as conducted by the resident supervisor prior to concrete placement after assembly of the reinforcement bar. The resident supervisor shall provide instructions regarding inspection locations.

##### 2) Tensile test

The contractor shall conduct a tensile test on reinforcing bars to check the strength. The resident supervisor shall provide instructions regarding the test period.

(3) Form Work

Quality control and inspection shall be performed for the form work in accordance with the Standard Specifications for Public Works Construction (Public Buildings Association) and JASS5 (Architectural Institute of Japan). The contractor shall be subject to an inspection conducted by the resident supervisor with regard to a gap between the formworks and the outermost reinforcement bar prior to concrete placement. The resident supervisor shall provide instructions regarding inspection locations.

(4) Inspection on Structural Concrete Finish and Thickness of the Cover

As for structural concrete, member position, cross-sectional dimension, surface finish flatness, concrete placement defect and cover thickness shall be inspected in accordance with the Standard Specifications for Public Works Construction (Public Buildings Association) and JASS 5 (Architectural Institute of Japan). If the results of the inspection on structural concrete finish and cover thickness do not meet the requirements, necessary action shall be taken as per the instructions of the resident supervisor.

## 2-2-4-6 Procurement Plan

### (1) Procurement of Construction Materials

Construction materials originating from Cambodia is limited to sand, gravel, aggregate, lumbers and unglazed roof tiles. Other materials are imported from Thailand and Vietnam and generally available from local distributors. This Project will select and use materials procurable within Cambodia and apply construction methods that can be handled with the local construction engineering level in due consideration of future maintainability and other similar factors.

**Table2-44 Procurement Plan for Major Construction Materials and Equipment**

Type of Work	Material and Equipment	Procurement			Note
		Local	Japan	Third Country	
Reinforced concrete work	Portland cement	○			
	Fine aggregate	○			
	Coarse aggregate	○			
	Concrete	○			
	Deformed bar	○			
	Form	○			
Steel work	Steel frame	○			
Extruded cement panel work	Extruded cement panel		○		Surrounding countries cannot supply, procured from Japan
Masonry	Brick	○			
Waterproofing work	Silicon sealing material (for pane and sash peripheral sealing)	○			
Plastering work	Cement mortar	○			
Tile work	Tiles	○			
Wooden fixture work	Fixture	○			
Metal work	Light-weight ceiling substrate	○			
	Decorated metal ware, handrail	○			
	Curtain rails for ward	○			
	Aluminum ceiling access hatch, aluminum expansion joint, grating cover and manhole cover,	○			
Wooden fitting work	Door, frame	○			
Metal fixture work	Aluminum fixtures	○			
	Stainless-steel fixture	○			
	Steel fixture	○			
	Metal parts for fixture	○			
Glass work	Ordinary sheet glass	○			
	Glass block	○			
Paining work	Interior painting	○			
	Exterior painting	○			
Interior finish work	Gypsum board	○			
	System ceiling of mineral fiber decorative acoustic panel	○			
	Calcium silicate board	○			
	PVC ceiling cornice	○			
Finishing unit work	Sink, medical sink	○			
	Overhead cabinet	○			
	Wooden furniture	○			
	Doorplate, guide plate, etc., building plaque	○			

Type of Work	Material and Equipment	Procurement			Note
		Local	Japan	Third Country	
Exterior work	Interlocking block	○			
	Curb stone	○			
	Galvanized grating	○			
Electrical work	Generator	○			
	Board	○			
	lighting equipment	○			
	Wiring accessories	○			
	Phone equipment	○			
	Fire alarm	○			
	Lightning protection	○			
	Electric wire	○			
	Power cable	○			
	Communication cable		○		For quality
Mechanical work	Piping	○			
	Air conditioner	○			
	Supply and exhaust fan	○			
	Duct material		○		For quality
	Elevated water tank		○		For quality
	Sanitary fixture	○			
	Piping material	○			
	Water lift pump, drain pump		○		For quality
	Medical gas system		○		For renovation
	Sewage treatment system		○		For renovation and same system as existing
	Raw water treatment system		○		Same system as existing
	Incinerator		○		For renovation
Fire fighting (fire hydrant pump)		○		For quality	
Fire fighting (fire hydrant cabinet, fire extinguisher)	○				

Source: Survey Team

## (2) Equipment Procurement Plan

- 1) Policy for the effective use of materials and equipment locally available or procurable from local distributors or a neighboring country (Thailand)

Much of the equipment to be procured is made in Japan and some distributors offer good after-sales service programs. Equipment to be procured locally in Cambodia or from a third country includes patient monitors, tacomonitors, cardiographs, infusion pumps, syringe pumps, blood gas analyzers, CRP analyzer, biochemical testers, electrolyte inspection devices, blood refrigerators, and multifunction machines (printer/scanner/copier). Since no medical equipment is manufactured in Cambodia, after-sales service programs will be ensured and secured by qualified procurement source countries including EU nations, U.S. and DAC member countries and local distributors in Thailand, and other neighboring counties in addition to Cambodia.

## (3) Transportation Plan

The major and common transportation route from Japan to Phnom Penh is to unload at Sihanoukville Port and transport via Route 4.



#### **2-2-4-7 Operation Guidance Plan**

The operation and maintenance of the existing NMCHC's facilities and equipment are currently managed by the "Engineering/Medical Workshop", which includes the NMCHC's eight full-time staff members.

The Workshop consists of three groups: building, utility and medical equipment maintenance. The eight members rotate the three groups to share duties. At least one staff member stations on a full-time basis to work on operation and maintenance. The Workshop has its own workshop room and maintenance tools.

Its staff members have developed technical and management knowledge to operate and maintain the facilities and equipment through technologies transferred by the previous Technical Cooperation Projects by the Government of Japan (such as "The Maternal and Child Health Project (1995-2000)" and "The Maternal and Child Health Project (Phase 2) (2000-2005)").

The survey team confirmed and assessed that the operation and maintenance status of the existing facilities and equipment is relatively good, and the Workshop's staff members have the appropriate capabilities to operate and maintain the NMCHC's facilities and equipment. The Workshop has operated and maintained the NMCHC's facilities and equipment very well for 15 years since its operation started in 1997.

However, some components of equipment procured by the Project require knowledge to operate and maintain properly. Therefore the on-site initial operation and management guidance programs for the Workshop's staff member to obtain the knowledge to operate and maintain those components of equipment will be implemented through the installation, adjustment, commissioning test and inspection work. The Consultant will supervise those training programs to be covered by the contractor.

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

Current status of operational and management of existing medical equipment in NMCHC is good. It is considered that NMCHC maintenance organization has adequate technical expertise and experience on them and further provision of soft component is not necessary.

### 2-2-4-9 Implementation Schedule

Figure 2-23 shows the implementation schedule after the G/A is concluded. The schedule consists of the Consultant's detailed design work, tender and supervision work, as well as the contractor's building construction work.

(1) Detailed Design Work

A Consultant agreement shall be concluded between the MOH, Cambodia, and a Japanese consulting company to carry out the Project's detailed design (preparation of tender documents), and the Consultant shall obtain the authorization for the Consultant agreement from the Government of Japan. After that the Consultant shall prepare tender documents based on this preparatory survey report in consultation with MOH, Cambodia, and obtain its approval. The period to prepare the detailed design (preparation of tender documents) is estimated to be four months.

(2) Tender Stage Work

The period to implement the tender stage is estimated to be 3.5 months.

(3) The Contractor work and the Consultant's Supervision Work

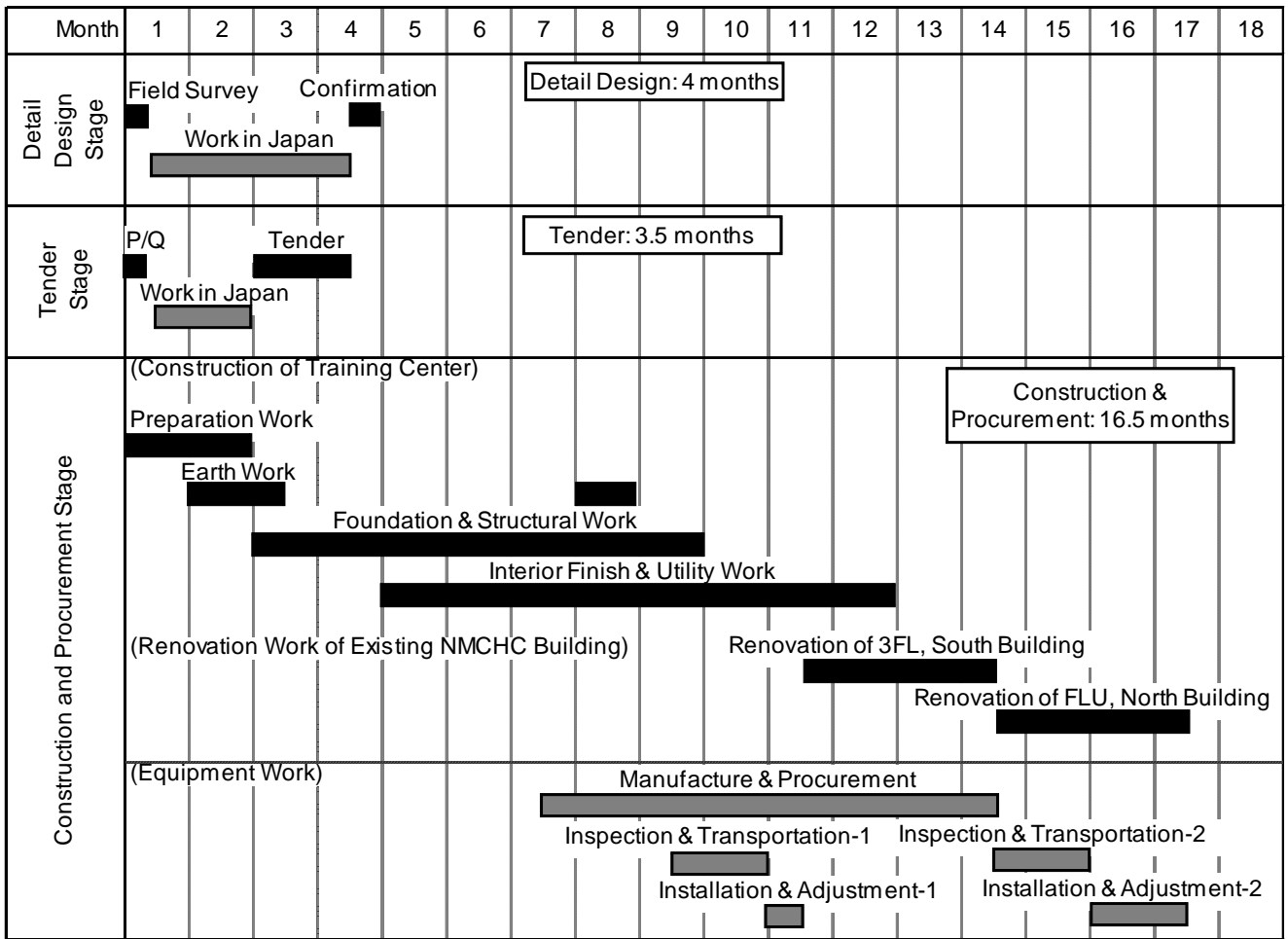
After concluding the construction contract, the contractors shall commence the building construction work and equipment work respectively. The Consultant shall commence the construction/equipment supervision work at the same time. Table 2-45 shows the outline of the building construction and renovation work of the Project.

**Table2-45 Outline of the Project's Proposed Facilities and Renovation Work**

Item	Facilities/Renovation Work
Training Center	4FL Dormitory, Resource Center, Cafeteria, Self-study Rm
	3FL Training Rm (20-seat×4, 4-seat×1), CSL, PBL, Training Unit Office
	2FL Administration Office, Meeting Rm, National MCH Program Office
	1FL Parking, Mechanical Rm
3FL, South Bldg	To refurbish existing office to Gynecology/Obstetrics Ward (8-bed×4, 4-bed×2, 2-bed×1, 1-bed×4)
2FL, North Bldg	To refurbish existing ward to Perinatal Care Center

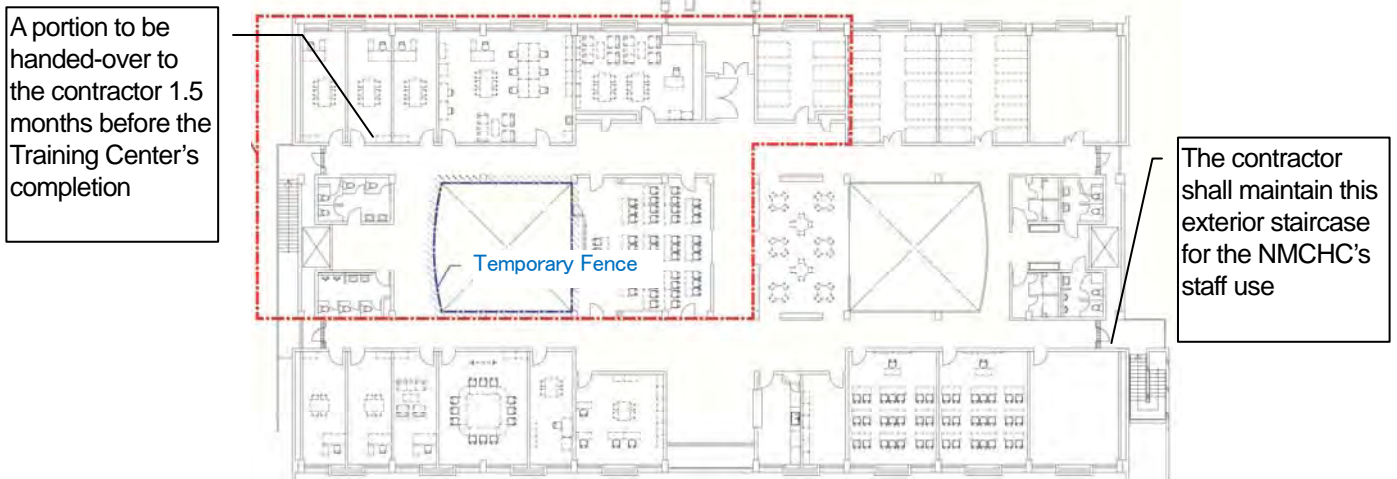
Source: Survey Team

NMCHC will hand over the area on the third floor of the South Building, shown in Figure 2-24, to the contractor 1.5 months in advance of the completion of the Training Center. This partial hand-over will enable the entire building construction period to be 16.5 months. The contractor shall maintain outdoor stairs on the South Building's east side available for the NMCHC's staff members.



Source: Survey Team

**Figure2-23 The Project's Implementation Schedule**



Source: Survey Team

**Figure2-24 The Area of the Prior Hand-over**

(4) Procurement Supervision Duties

After the conclusion of an equipment delivery agreement, the vendors will commence with the procurement of equipment. At the same time, the Consultant will start supervising procurements. Equipment procurement and installation is expected to take approximately 10 months, as shown in the schedule in Figure 2-23.

### 2-3 Obligations of Recipient Country

The principle measures and works to be undertaken by the Cambodian side to implement the Project are described below:

(1) Measures and Procedures

- ① To apply for and obtain the building permits required for the proposed buildings.
- ② To issue a Banking Arrangement (B/A) and an Authorization to Pay (A/P) and bear all fees and charges that arise.
- ③ To ensure prompt unloading, tax exemption and customs clearance for imported materials and equipment, and ensure expeditious inland transport.
- ④ To make arrangements for Japanese nationals and third party countries citizens whose services may be required in connection with the supply of products and the services under the verified agreement to enter Cambodia, and stay therein for the performance of their work.
- ⑤ To ensure that the customs duties, internal taxes and other fiscal levies which may be imposed in Cambodia with respect to the purchase of the products and the services under the verified agreement are exempted.
- ⑥ To ensure budgetary allocations for the effective operation/management and maintenance of facilities constructed and equipment procured by the Grant Aid.
- ⑦ To take procedures, manage contracts and bear charges regarding electricity, telecommunication, gas and water supply and sewerage by the cooperation Project.

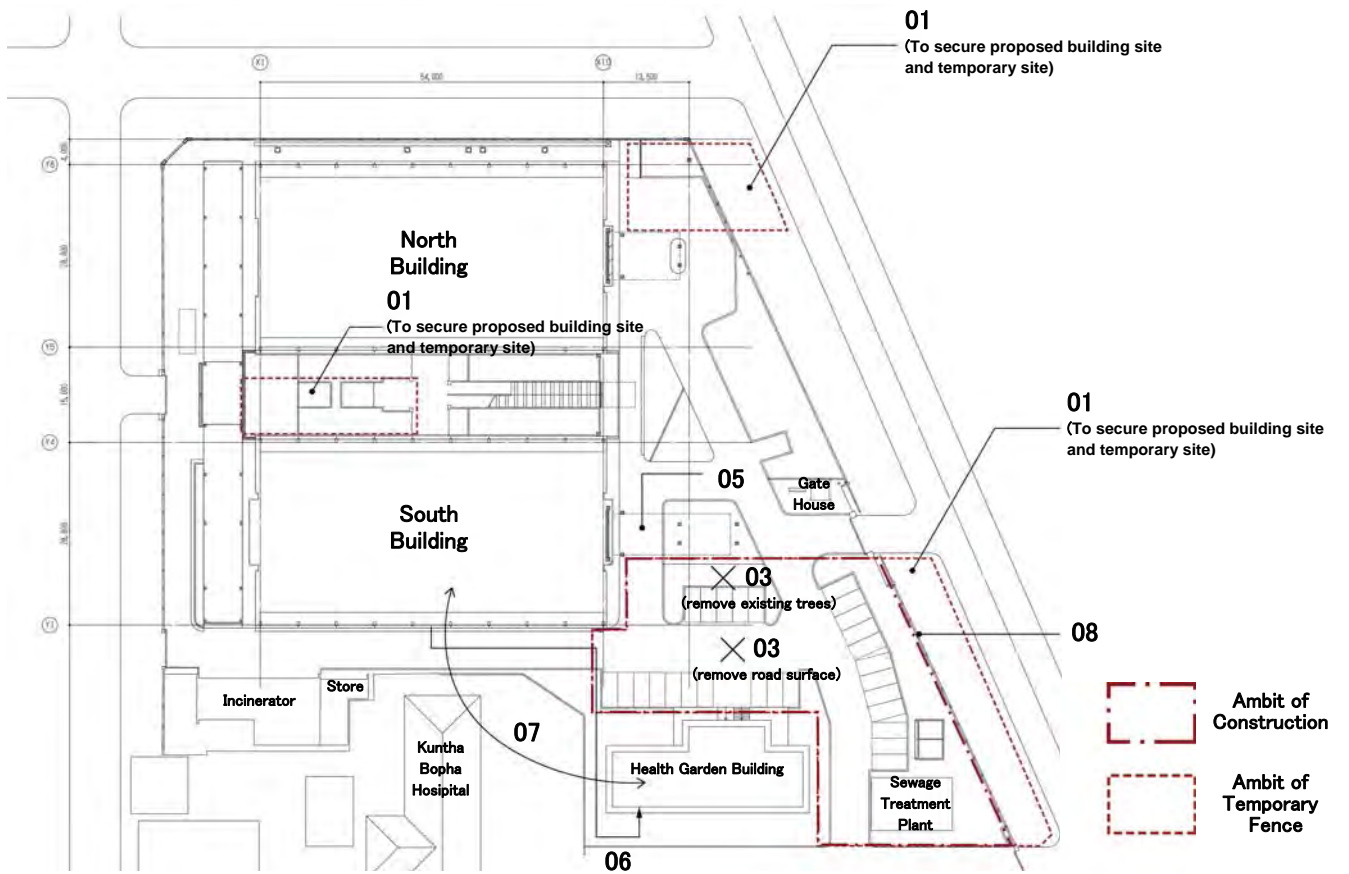
(2) Works Related to the Construction Work for Facilities of this Project

All the works to be undertaken by the Cambodian side and their schedule consisting of “before tender,” and “upon completion of facility construction” are indicated in Table 2-46. The budgetary actions need to be taken at the proper time.

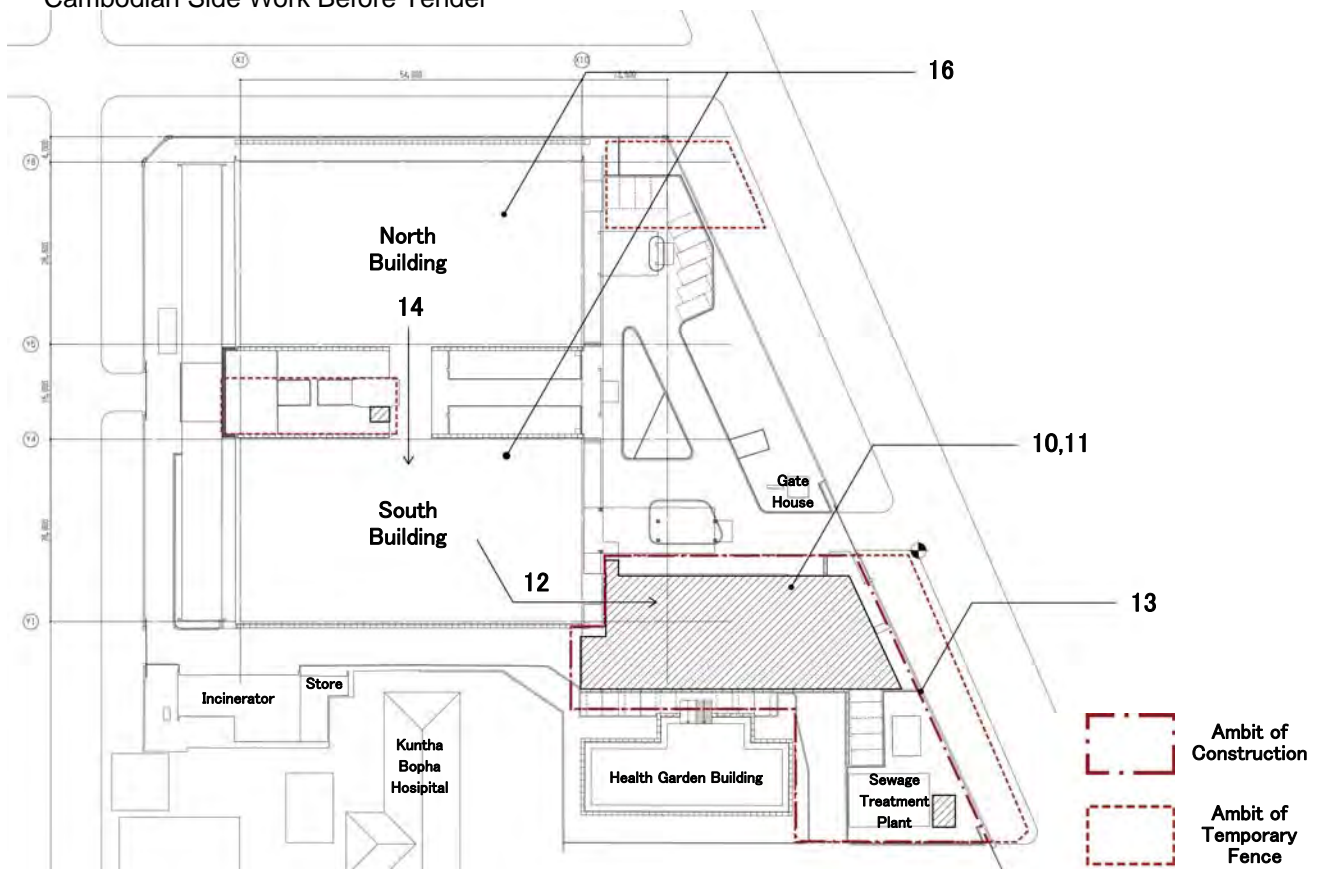
**Table2-46 Cambodian Side Work and Implementation Schedule**

Item		Deadline
01	To secure proposed building site and temporary site	Before Tender
02	To obtain building permissions	
03	To remove existing structures (inc. underground structures)	
04	To relocate existing underground utility pipes if necessary	
05	To renovate Drop-off of NMCHC	
06	To secure temporary access and entrance of Health Garden Building	
07	To relocate Lab in Health Garden Building and PMTCT Office	
08	To create opening on existing fence and temporary gate	
09	To hand over the specified zone on the 3FL, South Building to the contractor 1.5 month before Training Center's completion	Before Training Center's Completion
10	To move general furniture to Training Center	Upon Facility's Completion
11	To install curtain and blinds in Training Center	
12	To move equipment and services from 3FL, South Bldg to Training Center	
13	To repair fences and gates around the Project site	
14	To move equipment and services from 2FL, North Bldg to 3FL, South Bldg	
15	To move equipment and services on the 2FL, North Bldg	
16	To renovate existing NMCHC facilities if necessary	
17	To dispose of existing medical equipment to be replaced by the Project	

Source: Survey Team



Cambodian Side Work Before Tender



Cambodian Side Work upon Facilities Completion

Figure2-25 Cambodian Side Work Items

## 2-4 Project Operation Plan

### (1) Personnel Plan

Table 2-47 shows the NMCHC's current and planned (in 2020) staff allocation. NMCHC plans to hire four more staff members for the Training Center Department to deal with the increased training activities by the Project. The training programs will be carried out by MDs, nurses and midwives at the Technical Bureau and by staff members at the National MCH Program Office.

**Table2-47 Staff Allocation of NMCHC**

Department	Specialty	Current		Planned (Year 2020)	
		Permanent	Contract	Permanent	Contract
	Director	1	-	1	-
	Deputy Director	3	-	5	-
Technical Bureau	Medical Doctors	72	-	75	-
	Assistant Medical Doctors	4	-	4	-
	Nurses (Primary & Secondary)	55	-	64	-
	Midwives (Primary & Secondary)	79	-	80	-
	Other Technical Staff	25	-	26	-
National MCH Program Office	Director	5	-	5	-
	Administrative Staff	63	29	70	26
Training Center	Chief of Center	0	-	1	-
	Administrative Staff	3	-	5	-
	Librarian	0	-	1	-
Administration Bureau	Head of Department	1	-	1	-
	Administrative Staff	10	88	12	90
	Internship Staff	6	-	0	-
	LWOP (without salary)	11	-	8	-
Account Bureau	Director	1	-	1	-
	Administrative Staff	11	11	11	15
Total		350	128	370	131
			478		501

Source: NMCHC

The optimum number of medical staff members to perform ongoing clinical activities, including MDs, nurses and midwives, is generally ensured in NMCHC. Table 2-48 shows the necessary number of additional staff members to increase the number of NCU and ICU beds and to improve the perinatal care systems within the framework of the Project. NMCHC and MOH confirmed to increase the number of required medical staff for the implementation of the Project.

**Table2-48 Plan of Staff Reinforcement on the Project**

Department	Doctor	Nurse	Remarks
NCU	2	6	Current: Doctor 5, Primary/secondary nurses 14
ICU and Recovery	-	3	Current: Primary/secondary nurses 13
Total	2	9	

Source: Survey Team

## (2) Operation/Management and Maintenance Plan

### 1) Facilities (buildings, mechanical and electrical systems) operation/management system

NMCHC's Administration Department consists of five sections, and one of them is the "Engineering/Medical Workshop".

The Workshop is responsible for the operation and maintenance of NMCHC's facilities and equipment, which includes eight full-time staff members. The Workshop consists of three sub-groups: building, utility and medical equipment maintenance. The eight members rotate the three groups to share the duties. At least one staff member stations on a full-time basis for operation and maintenance. The workshop (a room the staff stations) is maintained tidy and clean, and maintenance tools and parts are arranged orderly. Judging from the current operation and maintenance status of the facility and equipment, the Workshop has proper capability, and NMCHC's maintenance system works properly.

The Workshop keeps the ledger records of utility consumption (such as electric power, water, LPG and oxygen gas), and this contributes to the proper operation and management of the facilities. The Workshop is currently carrying out daily, routine inspections of the transformer room and generator room, and the frequent maintenance of the other portion of the facilities. It keeps record of inspections and maintenance.

These maintenance activities have contributed to the relatively good condition of the utility systems even 15 years after the Center's completion. No serious failures or defects have been found in the electrical systems in the Center.

### 2) Budget for maintenance

#### ① Utility cost

Utility costs, including electricity, city water, sewage and medical waste disposal/treatment costs are disbursed from the government budget, amounting to approximately US\$ 24,700 on average over the past five years.

#### ② Maintenance cost

The average building rework and repair cost for the past five years amounts to approximately US\$ 68,000 (the total of disbursements from the government budget and medical service fee).

### 3) Medical and training equipment operation/management system

The "Engineering/Medical Workshop" is responsible for the operation and maintenance of NMCHC's medical equipment, and a few staff members are usually assigned to an "equipment maintenance" sub-group.

The staff members have continuously engaged in training in Cambodia, Japan and third countries. They obtain skills to daily inspect and repair the medical equipment, as well as manage methods provided by the Technical Cooperation Projects such as "Project on Promotion



of Medical Equipment Management System” and “Project for Strengthening Medical Equipment Management in Referral Hospitals. They have developed capabilities to keep the database record of the equipment repairs, and inventories of spare parts. The survey team confirmed and assessed that the Workshop’s staff members have appropriate capabilities to operate and maintain the NMCHC’s medical equipment.

The average cost in the last five years to purchase new pieces of medical equipment was US\$ 123,000, and the cost to operate and maintain the equipment was US\$ 16,000. Those costs were covered by the MOH budget and medical service fees.

## 2-5 Project Cost Estimation

### 2-5-1 Initial Cost Estimation

#### (1) Expenses of the Cambodian Side Work

Table 2-49 shows the expenses to be covered by the Cambodian side.

**Table2-49 Expenses to be covered by the Cambodian Side**

Items	Expenses(US\$)	Responsible Organization
A. Preparation of the project site	14,000	NMCHC
B. Purchase of furniture and fittings (including curtains, blinds and alteration of drying space adjacent to laundry room)	34,500	NMCHC
C. Provision of a temporary entrance of the Health Garden Building during construction work	3,800	NMCHC
D. Renovation work of Clinical Lab in Health Garden Building to Office	10,000	NMCHC
E. Expensed for moving	6,000	NMCHC
F. Dispose of existing medical equipment to be replaced	3,400	NMCHC
G. Banking Arrangement (B/A) and Authorization-to-Pay (A/P)	12,500	MOH
Total	84,200	

#### (2) Cost Estimation Conditions

- ① Time of cost estimation: August 2013
- ② Currency exchange rate: US\$ 1 = JPY 100.47, THB 1 = JPY 3.33
- ③ Project schedule: The period of detailed design, tenders and building construction/ renovation work and equipment procurement are as shown in the project implementation schedule.
- ④ Others: The Project will be implemented in accordance with the Japanese Government's Grant Aid Scheme.

## 2-5-2 Operation and Maintenance Cost

### (1) Operation and Maintenance Cost of the Proposed Training Center

Annual operation and maintenance costs of the proposed Training Center for the initial year following its completion and the costs for the following year are estimated in Table 2-50 separately.

**Table2-50 Estimated Annual Operation and Maintenance Costs**

Unit: US\$

Item	Initial Year	Following Year
① Electricity charge	86,400	86,400
② Telephone charge	1,080	1,080
③ Generator fuel cost	720	720
④ Water charge	2,040	2,040
⑤ Elevator maintenance cost	1,800	1,800
⑥ Building maintenance cost	0	30,160
Total ①~⑤	92,040	122,200

Source: Survey Team

#### ① Electricity charge: US\$ 86,400 /year

Electricity to be consumed by the proposed Training Center is calculated based on the assumptions of transformer capacity: 150 kVA, average demand factor: 50%, average demand electricity: 75 kW. The applicable electricity rates are determined based on the survey results during the preparatory survey.

- Transformer capacity: 150 kVA
- Average demand electricity: 75 kW
- Metered charge: US\$ 0.20 /kWh

**Table2-51 Electricity Charge**

	Rate (US\$)	Demand (kW)	Used hour (h)	Day	Month	Total (US\$)
Basic rate	0					0
Metered rate	0.20	75	16	30	12	86,400
Total						86,400

#### ② Telephone charge: US\$ 1,080 /year

The proposed Training Center has ten external telephone lines. The telephone charge is calculated on the assumption that each telephone line is used three times/day, 1 minute/call. Only domestic calls are taken into account because most of the calls would be domestic calls and overseas calls would be rarely made. The applicable telephone rate is determined based on the survey results during the preparatory survey.

- Rate for domestic call US\$ 0.10 /min

**Table2-52 Telephone Charge**

	Rate(\$)	Used hour (min/time)	Frequency (time/day)	Day	Month	Total (US\$)
Metered rate	0.10	1	30	30	12	1,080

## ③ Generator fuel cost: US\$ 720 /year

A new power generator system is installed in the proposed Training Center, and its capacity is 100 kVA and fuel consumption is 30 litter /hour. Power failures in Phnom Penh occur a couple of times a month, and their durations are relatively short. The fuel cost is calculated based on assumption that the power generator would run three times/month, one hour/time. The applicable fuel rate is determined based on the survey results during the preparatory survey.

- Power generator fuel consumption: 30 litter /hour
- Unit cost of fuel: US\$ 1.00 /litter

**Table2-53 Power Generator Fuel Cost**

	Rate (US\$)	Consumption (litter)	Used hour (hour)	Operations/ month	Months	Total (US\$)
Fuel Cost	1.00	30	1	2	12	720

## ④ Water charge: US\$ 2,040 /year

Water to be consumed by the new Training Center is calculated based on the load factor: 0.60 (which is calculated from the ratio of the assumed total number of users (approximately 48,000 users) in “Training Plan 2020” to the maximum number of users per day (245 users) multiplied by 365 days). The applicable water rate is determined based on the survey results during the preparatory survey.

- Daily water consumption: 31 m<sup>3</sup>/day
- Metered water rate : US\$ 0.3\$/m<sup>3</sup>

**Table2-54 Estimated Water Charge**

	Rate (US\$)	Daily Consumption (m <sup>3</sup> /day)	Day	Load Factor	Total (US\$)
Metered rate	0.3	31	365	0.60	2,040

## ⑤ Elevator maintenance cost: US\$ 1,800 /year

An annual maintenance cost for an elevator to be installed in the proposed Training Center is estimated based on the surveys with local maintenance companies during the preparatory survey.

## ⑥ Building maintenance cost: US\$ 27,840 /year

Base unit cost for maintenance of the proposed Training Center is calculated based on the average cost of the “Building Maintenance” and the “Equipment Maintenance” in the “User Fees Report 2008-2012” and the “National Budget Report 2008-2012”. The load factor is assumed 0.8 based on the difference in intended functions between the existing Center and the Training Center. Note that these costs will arise during and after the second year.

- Base unit cost: US\$ 13 m<sup>2</sup>/year (Average of actual data from 2008 to 2012)

**Table2-55 Estimated Building Maintenance Cost**

	Unit Cost (US\$)	Total Floor Area(m <sup>2</sup> )	Load Factor	Total (US\$)
Maintenance cost	0.3	2,900	0.80	2,040

⑦ Utility and other equipment maintenance costs

NMCHC carries out 90% of maintenance of utility and other equipment maintenance by themselves and occasionally outsource other remaining work to contractors. Those costs are included in ⑥ Building maintenance cost, and the costs are not calculated in this section.

(2) Operation and Maintenance Cost for the existing Center (including the Renovated Portions)

Annual operation and maintenance costs of the existing Center (including the renovation portions) for the initial year following the renovation work's completion and for the following year are estimated in Table 2-56 separately. The current annual operation and maintenance costs of the existing Center are calculated based on "User Fees Report 2008-2012" and "National Budget Report 2008-2012". Except for the increased costs incurred by the improvement of the perinatal care systems of the Project (US\$ 52,200), the estimated costs are almost the same as the current ones.

**Table2-56 Estimated Annual Operation and Maintenance Costs**

Unit: US\$

Item	Initial Year		Following Year	
	Whole building	Cost Incurred by the Project	Whole building	Cost Incurred by the Project
①Electricity charge	216,000	(21,600)	216,000	(21,600)
②Telephone rate	2,160		2,160	
③Power generator fuel cost	1,200		1,200	
④Water rate	12,800		12,800	
⑤Oxygen gas rate	82,800	(28,800)	82,800	(28,800)
⑥Elevator maintenance cost	1,800	(1,800)	1,800	(1,800)
Building running cost	112,000		123,200	
⑧Equipment purchase cost	130,600		130,600	
Total ①~⑧	557,560	(52,200)	570,560	(52,200)

Source: Survey Team

① Electricity charge: US\$ 216,000 /year

Electricity demand to be consumed by the entire existing Center (including the renovated portions) is calculated approximately 3,000 kWh/ day based on the survey results during the preparatory survey. Electricity demand increased by the renovated portions of the Project (enhancement of air-conditioning systems in NCU, ICU and Recovery Room, etc.) is estimated approximately 10% of the whole existing Center.

- Demand electricity: 3,000 kWh (Increase of the renovated portions: 300 kWh)
- Metered charge: US\$ 0.20 /kWh

**Table2-57 Electricity Charge**

	Rate (US\$)	Daily demand (kW)	Day	Month	Total (US\$)	Increase by the Project
Basic rate	0					0
Metered rate	0.20	3,000	30	12	216,000	(21,600)
Total						86,400

## ② Telephone charge: US\$ 2,160 /year

The existing Center has twenty external telephone lines. The telephone charge is calculated on the assumption that each telephone line is used three times/day, 1 minute/call. Only domestic calls are taken into account because most of the calls would be domestic calls and overseas calls would be rarely made.

- Rate for domestic call                      US\$ 0.10 /min

**Table2-58 Telephone Charge**

	Rate(\$)	Used hour (min/time)	Frequency (time/day)	Day	Month	Total (US\$)
Metered rate	0.10	1	60	30	12	2,160

## ③ Generator fuel cost: US\$ 1,200 /year

In the renovation plan, the existing power generators will remain unchanged. Generator fuel currently consumed by the entire existing Center is calculated approximately 100 liters /month based on the survey results during the preparatory survey.

- Power generator fuel consumption:                      100 liter /month
- Unit cost of fuel:    US\$ 1.00 /liter

**Table2-59 Power Generator Fuel Cost**

	Rate (US\$)	Consumption (ℓ)	Month	Total (US\$)
Fuel Cost	1.00	100	12	1,200

## ④ Water charge: US \$ 12,800 /year

The number of general inpatient beds is not changed by the renovation plan of the Project; water demand volume after the renovation work will not be substantially changed. Water consumption of the entire existing Center is calculated based on the current amount indicated in “Expense Report 2012”.

## ⑤ Oxygen gas charge: US\$ 82,800 /year

The Project’s renovation work removes oxygen and vacuum outlets in two 1-bed rooms and ICU (4 beds) on the second floor of the North Building, and install new outlets in the refurbished NCU (B) (10 beds), ICU (6 beds), Recovery Room (10 beds) on the second floor of the North Building and four 1-bed rooms on the third floor of the South Building. Oxygen consumption to be increased by that renovation work is estimated below.

**Table2-60 Estimated Oxygen Gas Consumption Increased by the Project**

	Rate(\$)	Consumption (litter)	Operation days (time/day)	Annual Consumption	Load factor	Total (US\$)
Increase by the Renovation work	0.003	24,840	365	9,066,600	1.0	28,800

Annual oxygen consumption charge of the existing Center is currently US\$ 54,000 /year according to “Expense Report 2012”. Therefore, an annual oxygen consumption charge of the entire building is approximately US\$ 82,800 /year (US\$ 28,800 + US\$ 54,000).

⑥ Elevator maintenance cost: US\$ 1,800 /year

An annual maintenance cost for an elevator to be installed newly in the existing Center is estimated based on the surveys with local maintenance companies during the preparatory survey.

⑦ Building maintenance cost: US\$ 123,200 /year

Building maintenance cost of the entire existing Center is estimated based on the average of the current costs shown in “Building Maintenance” and “Equipment Maintenance” costs in “User Fees Report 2008-2012” and “National Budget Report 2008-2012”. A load factor of 1.1 that is determined by intended use/density of the renovated portions is applied. Note that these costs will arise after the second year. The current maintenance cost will remain unchanged in the initial year following the renovation work’s completion.

- Base entire cost: US\$ 112,000 /year (Average of actual data from 2008 to 2012)

**Table2-61 Estimated Building Maintenance Cost**

	Total Cost	Load Factor	Total (US\$)
Maintenance cost	112,000	1.1	123,200

⑧ Utility and other equipment maintenance costs:

NMCHC carries out 90% of maintenance of utility and other equipment by themselves and outsources occasionally other remaining work to contractors. Those costs are included in ⑦ Building maintenance cost, and the costs are not calculated in this section.

⑨ Equipment purchasing costs:

The existing Center currently purchases equipment and spare parts to maintain the existing medical equipment and utility systems. NMCHC will likely continue to carry out those maintenance and renovation works in the portions other than covered by the Project; the similar costs are estimated based on the current purchasing budgets.

**Table2-62 Estimated Equipment Purchase Cost**

	Current Cost	Load Factor	Total (US\$)
Purchase cost	130,600	1.0	130,600

## (3) Operation and Maintenance Costs for Medical and Training Equipment

Operation and maintenance costs of the existing equipment to be replaced by the Project have been already allocated in the current NMCHC's budget, and they are not included in this estimate.

Table 2-63 shows the operation and maintenance costs of equipment newly provided by the Project in order to improve NMCHC's perinatal care systems, or equipment with a quantity increase by the Project.

**Table2-63 Annual Maintenance Cost of Medical Equipment**

No	Equipment Name	US Dollar	Consumables
(1) NCU related Equipment			
7	Blood gas analyzer	10,000	Fees for service contract, reagents and thermal paper
8	CRP analyzer for micro sample	3,000	Fees for service contract and reagents
9	Centrifuge for hematocrit	470	Peripheral
13-2	Patient Monitor (neonate)	700	Electrode
18	Neonatal ultrasound machine	5	Gel and thermal paper
22	Syringe pump	430	Syringe
23	Infusion pump	830	Infusion line
	Total	15,435	
(2) ICU/Recovery related Equipment			
13-1	Patient Monitor (adult)	860	Electrode
	Total	860	
(3) Other Equipment			
1,4	X-ray units (general and mobile)	5,000	Fees for service contract
5	Blood analyzer (spectrophotometer)	100	Printer paper
6	Blood analyzer (electrolyte analyzer)	4,300	Fees for service contract and reagents
10	Microscope	110	Optical oil
12	ECG	250	Cream and paper
16	Fetal Actocardiograph	9	Gel
17	Doppler fetus monitor	240	Gel
	Total	10,009	
	Total	26,304	

Source: Survey team      Remarks: US\$ 1=100 Yen, US\$ 1=4,000 Riel

## (4) Feasibility Study of Increase in the Incomes and Expenditures Incurred by the Project

- Increase in incomes (user fees)

Table 2-64 shows trends and breakdowns of user fees for five years (from 2008 to 2012). Although user fee amount temporarily dropped in 2010, when the number of patients was temporarily decreased, the amount has been generally increasing for the past five years. Approximately 50% of total use fees are from the inpatient ward; the remaining 50% are from the Outpatient Department and Laboratory examination fees.

As stated in 2-2-2-3 "Architectural Plan", the Project intends to generate approximately US\$ 83,300 as additional increase in the inpatient ward's user fees of by increasing the proportional number of pay-beds in the inpatient ward on the third floor of the South Building.



Moreover, it is expected that the Project will generate approximately US\$ 45,000 as an additional increase in the Outpatient Department and laboratory user fees, taking account of the steadily increasing trend of user fees in the last five years, and the improvement of laboratory services by the Project.

Total amount of user fees to be increased by the Project will be estimated approximately US\$ 128,300.

**Table2-64 Record of User Fees**

(Unit: US\$)

Items	2008	2009	2010	2011	2012
Total Income from the Patients (User Fees)	545,636	578,566	484,316	762,015	870,464
Income by Outpatient Clinic and Examinations	297,249	315,066	258,661	406,900	451,137
Income by Inpatient (Wards) Services	248,387	263,500	225,655	355,115	419,327

Source: NMCHC

Remark: US\$ 1 = 4,000 Riel

- Increase in operation and maintenance costs by the Project

The increased operation and maintenance costs incurred by the renovation work of the existing Center is estimated as US\$ 129,560, and the increased operation and maintenance cost by the Training Center estimated as US\$ 122,200.

Table 2-65 shows the increased operation and maintenance costs NMCHC shall allocate for the Project.

The increased user fees by the Project are estimated as US\$ 128,300. During the field survey of the Project, MOH and NMCHC agreed to allocate the necessary budget to cover a balance between the increased operation and maintenance costs and the increased user fees.

**Table2-65 Study of Incomes and Expenses Incurred by the Project**

(Unit: US\$)

Assumption of the Increased Income	Amount	Remarks
Outpatient Clinic, Examination and Treatment	(45,000)	
Inpatients (Wards) Services	(83,30)	Refer to 2-2-2-3
Income Total	128,300	
Costs to be Increased by the Project	Amount	Remarks
1) Training Center		
1-1) Operation and Maintenance Costs	122,200	Refer to Table 2-50
- Electricity Charge	(86,400)	
- Telephone Charge	(1,080)	
- Generator Fuel Cost	(720)	
- Water Charge	(2,040)	
- Elevator Maintenance Cost	(1,800)	
- Building Maintenance Cost	(30,160)	
Training Center Total	122,200	
2) Existing Center		
2-1) Operation and Management Costs of NCU	50,923	
- Cost of Additional Personnel	(10,488)	Refer to 2-2-2-3
- Drugs and Medical Disposables	(25,000)	
- Medical Equipment Maintenance Costs	(15,435)	Refer to Table 2-63 (1)
2-2) Operation and Management Costs of ICU & Recovery	16,418	
- Cost of Additional Personnel	(3,348)	Refer to 2-2-2-3
- Drugs and Medical Disposables	(12,210)	
- Medical Equipment Maintenance Costs	(860)	Refer to Table 2-63 (2)
2-3) Operation and Management Costs of Facilities	52,200	Refer to Table 2-56
- Electrify Charge	(21,600)	
- Oxygen Gas Charge	(28,800)	
- Elevator Maintenance Cost	(1,800)	
2-4) Other Medical Equipment Maintenance Costs	10,009	Refer to Table 2-63 (3)
Existing Center Total	129,550	
Expenditure Total	251,750	

Source: Survey Team

## **Chapter 3. Project Evaluation**

## CHAPTER 3. PROJECT EVALUATION

### 3-1 Preconditions

To smoothly implement the processes of the entire Project, obligations and undertakings to be covered by the Cambodian side, as stated in “2-3 Obligations of Recipient Country”, should be thoroughly carried out with proper timing before and during the construction work in the framework of this cooperation project.

### 3-2 Necessary Input by the Recipient Country for the Achievement of the Project Plans

Sixteen years have been passed since NMCHC started its operations in 1997. As a top national institution providing MCH care services in Cambodia, NMCHC has established and developed the roles and functions as the country’s center in three MCH care services: “clinical care,” “training” and “policy/administration” (National MCH Programs). It has made great contributions to the improvement of the quality of MCH care services in Cambodia.

It is recommendable that the following issues be addressed by the Cambodian side in order to implement the Project effectively and efficiently and to further improve the quality of MCH care services provided by NMCHC.

- (1) To increase and ensure personnel in order to improve the function as the Perinatal Medical Care Center:

It is fundamental and ultimately necessary to increase the number of medical staff, including MDs and nurses, in order to operate the increased number of beds at NCU, ICU and the Recovery Room properly and to improve functions of the perinatal care systems at NMCHC. It is also necessary to increase the number of midwives in order to rearrange the inpatient wards. This is because the ward to be transferred to the third floor of the South Building will become a mixed (obstetrics and gynecology) ward, and the obstetrical nursing units will be expanded to the third floor in addition to the existing nursing unit on the second floor.

Furthermore, it is also important to deploy an optimum number of high-quality medical and midwifery staff in order to make effective use of the facilities and medical equipment provided by the Project.

The above issues are to be prioritized by the Cambodian side.

- (2) To prepare the clearly stated TOR and determine explicit roles of each department of NMCHC:  
The field survey confirmed that NMCHC has been a top national institution covering three MCH care service functions: “clinical care,” “training” and “policy/administration.” However, the Terms Of References (TOR), which explicitly clarifies the roles and activities to achieve the objectives and goals of individual sections and departments, have not been prepared. In particular, the division of services between clinical departments (e.g. division of services between the gynecology-obstetrics and the neonatology) has not been explicitly clarified, and this makes it difficult to determine the goals of current and future activities and to share those goals with third-party assistance members.

NMCHC currently provides dental services and mammography screenings at the Gynecology Department as well. Such medical activities should be carried out in accordance with the TOR, stating the roles that NMCHC plays in the MCH care services in the communities.

While the TOR of the Neonatology Department was prepared by the Technical Advisors, JICA Experts, the NMCH Director and the Medical Director in association with the on-site survey for the Project, the Cambodian side is expected to prepare the TOR of all the departments of NMCHC.

- (3) To enhance and increase the efficiency of the operations and management system: Calmette Hospital, which is located near NMCHC, has an obstetrics ward which is the same size as NMCHC and deals with the same number of annual birth deliveries as NMCHC. Its medical services in the obstetrics ward, NCU and laboratories are performed efficiently based on manuals. Additionally, the environment inside and outside of the hospital is operated and maintained well. Calmette Hospital is the tertiary hospital, and its management policy is different from NMCHC's; therefore a simple comparison between the two hospitals cannot make sense. However, NMCHC shall enhance the efficiency and improve the quality of operations and management system of its clinical departments in order to provide high quality services in the future.

As the "training" and "policy/ administration" functions are transferred and integrated into a new Training Center through the Project, the existing Center will be dedicated only to the "clinical care" function. Therefore it is highly desirable to improve the NMCHC's efficient and effective operation in order to provide patient-oriented clinical care services.

### **3-3 Important Assumptions of the Project**

- (1) Consistency of the National Mater Plans in MCH Services  
The "Health Sector Strategic Plan 2008-2015 (HSP2)" focuses on MCH care services as one of the important commitments in the country's health sector, in addition to communicable diseases control and non-communicable diseases control; this defines the targets of the individual MCH indicators (such as maternal mortality rate, neonatal mortality rate, infant mortality rate, ratio of birth delivered by skilled birth attendants, institutional delivery rate, etc.). Its ultimate goal is to achieve "a reduction of the incidence rate and mortality rate of neonates, children and pregnant women, as well as enhancement of maternal and child health."

The framework of this cooperation Project has been developed based on these Master Plans. Therefore the Cambodian Government's continuous commitment to MCH care services shall be critical and necessary to achieve the Project's objectives.

(2) Maintaining the Three Functions of NMCHC

The “Policy/Administration” function is one of the three functions of NMCHC, their offices consist of the following five National MCH Programs. They plan and implement policies and health sector programs for the purpose of increasing MCH care services in Cambodia.

- National Nutrition Program (NNP)
- National Reproductive Health Program (NRHP)
- National Immunization Program (NIP)
- National Integrated Management Program of Childhood Illness  
(National Program for Acute Respiratory Infection/Control of Diarrhea Disease and Cholera Infections, ARI-CDD-IMCI)
- National Program for Prevention of Mother To Child Transmission  
(HIV Mother To Child Transmission Prevention Program, PMTCT)

Along with the increased personnel and resources in line with expansion of the program, the National Immunization Program (NIP) was transferred in 2012 to the complex of the Ministry of Health in Svay Chur, located in the northeast of Phnom Penh. The Cambodian side confirmed that the remaining four National MCH Program offices would stay at NMCHC to perform their activities. The new Training Center will accommodate offices of these National MCH Program offices, and maintaining NMCHC’s three functions is a fundamental precondition.

### 3-4 Project Evaluation

#### 3-4-1 Relevance

The expected results of the Project are described below, and implementing it as a Grant Aid Project by the Government of Japan is assessed as appropriate for the following reasons:

(1) Beneficiaries of the Project

NMCHC is a top national institute providing MCH care services in Cambodia. Approximately 14.86 million people (the entire population of Cambodia in 2012) indirectly benefit, and approximately 570,000 mothers and children (in 2010) directly benefit from NMCHC's services annually.

The fundamental policy of the Ministry of Health, Cambodia, states that NMCHC is responsible for the "provision of high-quality MCH care services to all mothers and children, including the poor." This policy remains unchanged after the implementation of the Project.

Furthermore, the improvement of the perinatal care services at NMCHC and training systems in the RTCs and other relevant institutions in rural areas through the implementation of the Project will enable the improvement of MCH care services in the rural areas significantly.

These activities will help to remove inequality in access to MCH care services between urban and rural areas, promote the Universal Health Coverage (UHC) of MCH care and spread the effects of the Project across the country of Cambodia.

(2) Relevance of the Project Goals

The Project is designed to resolve issues and problems of MCH care services in Cambodia by enhancing the functions of NMCHC. As mentioned above, one of the policies of the Ministry of Health is to extensively provide NMCHC's services to everyone, including mothers and children in the poorest segment and/or those living in rural areas.

The Project is deemed as highly valid on the grounds that it makes great contributions to the health and welfare of the Cambodian people and contributes greatly to addressing the Basic Human Needs (BHN) in Cambodia from the viewpoint of Human Security.

(3) Consistency with Health Sector Policies of Cambodia

MCH care services are one of most important issues in the medical and health sector in Cambodia. The Government of Cambodia defines that the provision of good MCH care services is one of the three high-priority core missions (in addition to communicable diseases control and non-communicable diseases control) under the Health Sector Strategic Plan 2008-2015 (HSP2), and determines the targets in the major MCH indicators.

(4) Consistency with Health Sector Assistance Policies of Japan

The Government of Japan has carried out programs to strengthen the health system, aiming at the improvement of health care under the promotion of social development (which is one of three top-prioritized assistance areas defined in its “The Country Assistance Policy to Cambodia, April 2012”).

The Government of Japan implemented the “National Maternal and Child Health Center Construction Project” (a Grant Aid Project in 1997), through which the existing Center of the Project was constructed. It has significantly contributed to the improvement of MCH care services in Cambodia through “The Maternal and Child Health Projects Phase 1 and Phase 2 (Technical Cooperation Projects from 1995 to 2005)”.

Furthermore, it has assisted in upgrading the health facilities in regional MCH care services through projects including: “The Project for Improvement of Kampong Cham Hospital in Kampong Cham Province” (Grant Aid Project in 2007), “The Project for Improvement of Sihanouk Province Referral Hospital” (Grant Aid Project in 2013) and improving technical standards through “The Project for Improving Maternal and Child Health Service in Rural Areas” (Technical Cooperation Project from 2007 to 2010), and “The Project for Improving Maternal and Newborn Care through Midwifery Capacity Development” (Technical Cooperation Project from 2009 to 2014).

The Project will strengthen the Japanese government’s assistance policy to Cambodia and the previous assistance for MCH care services. The Project therefore has a high consistency with the Japanese government’s assistance policy.

### 3-4-2 Effectiveness

The implementation of the Project is expected to produce the following outputs and effects. As indicators to measure the achievement of the Project, the following quantitative and qualitative indicators are proposed by setting the baseline year as the average between 2010 and 2012, and the target year as 2020 (approximately three years after the Project facilities begin to operate in the second half in 2016).

(1) Quantitative Indicators

NMCHC’s major clinical practice activities (such as the number of outpatients, inpatients and deliveries, etc.) have not increased significantly since 2000, because more options to select medical institutions for regular childbirth delivery have been available recently as a result of the increased number of national hospitals and private clinics in Phnom Penh and the development of referral hospitals and Health Centers in the rural areas. Therefore the Project will focus on the qualitative improvement rather than the quantitative expansion of the clinical functions at NMCHC.

On the other hand, the training function will need quantitative expansion. The Project aims to improve NMCHC’s training function to provide pre-service training programs for more than 650 trainees and in-service training programs for more than 2,050 trainees annually.



The results listed in Table 3-1 are the expected quantitative indicators of the Project.

**Table 3-1 Quantitative Indicators of the Project**

Items	Baseline (Average between 2010 to 2012)	Target (2020) (3 years after Project 2012he Projec
Perinatal Care Function:		
• The number of high-risk cases treated at NCU (cases/year)	723	1,400
• Rate of the above mentioned high-risk cases out of total deliver cases (%)	Approx. 11.3	Approx. 20
• The number of operations (cases/year)	2,337	2,500
Inpatient Ward:		
• User fees generated by inpatient ward (US\$/year)	419,300	502,600
Training Function:		
• The number of pre-service trainees (persons/year)	522	650
• The number of in-service trainees (persons/year)	1,839	2,050
• Available number of lecture seats (seats/year)	80	120
• Available number of PBL seats (seats/year)	--	40

Source: Survey Team

(2) Qualitative Indicators

The following results are the expected qualitative improvements of the Project.

1) Enhancing the perinatal care systems

Improving and expanding the NCU, ICU and Recovery Room to meet the facility's appropriate standards (area, number of beds, air quality etc.) and utilizing the components of equipment required by NMCHC's perinatal care systems will enable the establishment of an advanced obstetric care system while preventing no-socomial infection.

2) Enhancing the training functions

NMCHC currently offers three types of training programs: "clinical training," "lectures" and "Problem-based Learning (PBL) Training." However, the existing Center has only conventional lecture rooms, and it cannot provide a variety of practical and clinical training programs that NMCHC plans to implement. The Project will upgrade the training facilities and equipment to meet the purposes of the individual training programs, and will allow NMCHC to implement more efficient and effective training programs.

## **Appendices**

## Appendices

### 1. Member List of the Study Team

#### (1) Preparatory Survey (August 4 to August 24, 2013)

NO.	NAME	ROLE	INSTITUTION
1	Mr. Koichiro KOROKI	Leader	Human Development Department, Japan International Cooperation Agency
2	Dr. Azusa IWAMOTO	Technical Advisor	2 <sup>nd</sup> Expert Service Division, Bureau of International Medical Cooperation, National Center for Global Health and Medicine (NCGM)
3	Ms. Ayako OI	Cooperation Planning	Health Division 3, Health Group 2, Human Development Department, Japan International Cooperation Agency
4	Mr. Hiroshi ITO	Project Manager & Architectural Planner	Nihon Sekkei, Inc.
5	Mr. Satoshi OKAMOTO	Acting Project Manager Architectural Design & Natural Conditions Survey	Nihon Sekkei, Inc.
6	Mr. Shigeki HARIO	Facilities Planner	Nihon Sekkei, Inc.
6	Mr. Tamotsu NOZAKI	Health System Planner	Fujita Planning Co., Ltd.
7	Mr. Hiroshi YOSHINO	Equipment Planner/ Procurement & Cost Planner	Fujita Planning Co., Ltd.
8	Mr. Yasuhiko YANAGI	Construction & Cost Planner	Nihon Sekkei, Inc.
9	Ms. Aiko KOISHI	Architectural Planner (addition)	Nihon Sekkei, Inc.
10	Mr. Yosuke OTANI	Facilities Planner -2 (addition)	Nihon Sekkei, Inc.

#### (2) Explanation of Draft Report (December 15 to December 28, 2013)

NO.	NAME	ROLE	INSTITUTION
1	Mr. Koichiro KOROKI	Leader	Human Development Department, Japan International Cooperation Agency
3	Ms. Ayako OI	Cooperation Planning	Health Division 3, Health Group 2, Human Development Department, Japan International Cooperation Agency
4	Mr. Hiroshi ITO	Project Manager & Architectural Planner	Nihon Sekkei, Inc.
5	Mr. Tamotsu NOZAKI	Health System Planner	Fujita Planning Co., Ltd.
6	Mr. Yasuhiko YANAGI	Construction & Cost Planner	Nihon Sekkei, Inc.

## 2. Study Schedule

### (1) Preparatory Survey (August 4 to August 24, 2013)

Members			JICA			Consultant									
			Leader (JICA)	Technical Advisor (NCGM)	Cooperation Planning (JICA)	Project Manager/ Architectural Planning	Health System Planner	Acting Project Manager/ Architectural Design/ Natural Cond. Survey	Architectural Planner (addition)	Equipment Planner/ Cost Planner	Facilities Utility Planner	Construction Planner/ Cost Planner	Facilities Utility Planner-2 (addition)		
Date			Koichiro Koroki	Azusa Iwamoto	Ayako Oi	Hitoshi Ito	Tamotsu Nozaki	Satoshi Okamoto	Aiko Koishi	Hiroshi Yoshino	Shigeki Haro	Yasuhiko Yanagi	Yosuke Otani		
6	August 4	Sun				Lv. Tokyo Ar. Phnom Penh									
7	August 5	Mon				* Courtesy call to JICA Phnom Penh Office, MOH, NMCHC and JICA Technical Cooperation Team * Explaining/discussing IC/R, Survey schedule and framework									
8	August 6	Tue				* Explaining Questionnaire to NMCHC and fixing survey schedule * Discussing requested facilities/equipment, Peri-natal care system in Cambodia, clinical/training plans at NMCHC, project site, etc									
9	August 7	Wed				* Surveying project site/infrastructure at NMCHC * Surveying the NMCHC's existing building									
10	August 8	Thu				* Survey other hospitals in PP * Surveying similar IT training institutes in PP * Surveying laboratory's outsourcing and other activities									
11	August 9	Fri				* Gathering answers of questions at NMCHC * Discussing plans of the proposed Training Center Building * Discussing renovation plans of the existing building									
12	August 10	Sat				* Studying project framework		* PO of soil survey		* Equipment					
13	August 11	Sun				* Internal meeting/Making report									
14	August 12	Mon				* Presenting/discussin the internal survey results to MOH/NMCHC * Studying project framework									
15	August 13	Tue	Lv. Tokyo Ar. Phnom Penh			* Studying project framework		* Studying facilities design		* Equipment		* Studying/discussing infrastructure			
16	August 14	Wed				* Reporting/reviewing the survey results within the Survey Team * Courtesy call to Japanese Embassy to Cambodia, JICA, MOH/Explaining/discussing survey results									
17	August 15	Thu				* Surveying project site/infrastructure and the NMCHC's existing building * Discussing with MOH/NMCHC the proposed contents, overall peri-natal health care system				* Studying equipment		* Studying infrastructure			
18	August 16	Fri				* Discussing plans of Training Center Building and renovation plans of the existing building * Internal meeting/Making MOD Draft				* Studying equipment		* Studying Authorities			
19	August 17	Sat				* Internal meeting/Making report		* PO of soil survey		* Internal meeting/Making report			Lv. PP Ar. Tokyo		
20	August 18	Sun				* Internal meeting/Making report									
21	August 19	Mon				* Discussing with MOH/NMCHC facilities/equipment plans * Explain the survey results/MOD		* Supplement survey		* Discussing with Authorities		* Studying local agents		* Studying procurement	
22	August 20	Tue				* Explaining MOD at MOH/Signing MOM * Reporting the results to JICA		* Supplement survey		* Studying existing grant-aid buildings		* Studying procurement		* Studying local building	
23	August 21	Wed	Lv. Phnom Penh Ar. Tokyo			* Supplement survey/discussing at MOH/NMCHC				Lv. PP Ar. Bangkok		* Studying const industry		Lv. PP Ar. Bangkok	
24	August 22	Thu				Lv. Phnom Penh		* Supplement survey at NMCHC		* Studying local agents		* Studying procurement		* Studying const industry	
25	August 23	Fri				Ar. Japan		* Making Technical Memorandum Draft		* Studying local agents		* Studying procurement		* Studying const industry	
26	August 24	Sat				* Discussing Technical Memo at NMCHC * Signing Technical Memorandum				* Studying procurement		* Studying procurement		* Studying procurement	
						Lv. Phnom Penh Ar. Tokyo				Lv. Bangkok Ar. Tokyo		Lv. PP Ar. Tokyo		Lv. Bangkok Ar. Tokyo	

## (2) Explanation of Draft Report (December 15 to December 28, 2013)

Date				JICA		Consultant		
				Koichiro Koroki	Ayako Oi	Hitoshi Ito	Tamotsu Nozaki	Yasuhiko Yanagi
				Leader	Cooperation Planning	Project Manager/ Architectural Planning	Health System Planner	Construction Planner/ Cost Planner
1	22-Dec	Sun	AM			Lv. Osaka, Ar. Phnom Penh	Lv. Tokyo, Ar. Phnom Penh	
			PM					
2	23-Dec	Mon	AM	Lv. Tokyo, Ar. Phnom Penh				
			PM	Courtesy call to JICA Phnom Penh Office, MOH, NMCHC and JICA Technical Cooperation Team Explaining/Discussing Schedule for Explanation of Draft Report				
3	24-Dec	Tue	AM	Explaining/Discussing Draft Report at MOH Explaining/Discussing Draft Report at NMCHC				
			PM					
4	25-Dec	Wed	AM	Explaining/Discussing Draft Report at NMCHC				
			PM					
5	26-Dec	Thu	AM	Internal Meeting / Making MOD Draft				
			PM	Explaining/Discussing MOD Draft at NMCHC and MOH				
6	27-Dec	Fri	AM	Explaining MOD at MOH / Signing MOM				
			PM	Reporting results to EOJ and JICA				
				Lv. Phnom Penh		Lv. Phnom Penh		
7	28-Dec	Sat	AM	Ar. Tokyo		Ar. Osaka		Lv. Phnom Penh, Ar. Tokyo
			PM					

### 3. List of Parties Concerned

(1) Ministry of Health of Cambodia

Prof. Eng Hout

Secretary of State for Health

Dr. Or Vandin

Director, Department of International  
Cooperation

Dr. Cheu Sivuthy

Chief of Hospital Services and Bio Medical  
Engineering Bureau

“Project for Human Resources Development System of Co-medicals”

Dr. Noriko Fujita

Chief Advisor

Mr. Shinichiro Kojima

Project Coordinator/Monitoring & Evaluation

“Project on Strengthening of Medical Equipment Management in Referral Hospitals”

Mr. Takeshi Matsuo

Chief Advisor

(2) National Maternal and Child Health Center (NMCHC)

Prof. Tung Rathavy

Director

Prof. Keth Ly Sotha

Deputy Director

Mr. Ma. Huot Khom

Chief of Administration

Mr. Prak Somaly

Vice Chief of Technical Bureau

Mr. Hab Soksammy

Engineer

Mr. Ngeth Titya

ME Maintenance Staff

Mr. Chum Toma

Electrical Maintenance Staff

“Project for Improving Maternal and Newborn Care through Midwifery Capacity Development”

Dr. Yuriko Egami

Chief Adviser

Ms. Yuko Takahashi

Project Coordinator/Monitoring & Evaluation

Ms. Kanako Fukushima

Improvement of Midwifery Assessment

(3) Technical Care for Medical Care (TSMC)

Assistant Prof. Iem Sopal

Director

(4) National Pediatric Hospital

Dr. Srour Yina

Chief of ICU

(5) Kossamak Hospital

Mr. Khamdyn Daraphac

Vice Chief of Technical Bureau

Dr. Ky Sivantha

Chief of Pediatric Department

- (6) Calmette Hospital  
Prof. Chheang Ra Director General  
Dr. Kruey Leang Sim Technical Advisor of Maternity  
Ms. Dm Chheng Sy Head Nursing in charge of Hospital  
Mr. Seanf So Hea Head Nurse  
Dr. Im Sethikar Chief of NCU
- (7) Khmer Soviet Hospital  
Dr. Tan Phally Chief of Gynecology Department
- (8) Cambodia-Japan Cooperation Center (CJCC)  
Mr. Kozo Watanabe Senior Adviser/Program Coordinator
- (9) Department of Land Management, Urban Planning and Construction  
Mr. Sar Bammang Dy. Director  
Mr. Sing Soohara Dy. Director  
Mr. Dy Sanith Dy. Director
- (10) Ministry of Water Resources and Meteorology  
Mr. Mao Hak DDG of Technical Affairs and Director of  
Department of Hydrology and River Work
- (11) Phnom Penh Water Supply Authority  
Mr. Ma Noravin Director of Production and  
Distribution Department
- (12) Ministry of Public Works and Transportation Department  
Mr. Chou Kimtry Deputy Director MSc. Civil Engineer
- (13) Ministry of Interior General Department of National Police Department of Arms,  
Explosives & Fire Fighting Training Office ANG Fire Fighting ING  
Mr. Van Samnang Major, Training Manager
- (14) Embassy of Japan in Cambodia  
Mr. Sninichi Tamamitsu First Secretary  
Mr. Moriyasu Yonamine Second Secretary

(15) Japan International Cooperation Agency (JICA) Cambodia Office

Mr. Hiroshi Izaki	Chief Representative
Mr. Hiroshi Takeuchi	Senior Representative
Mr. Hitoshi Hirata	Senior Representative
Mr. Masakazu Fukuwaka	Project Formulation Adviser
Ms. Shoko Kanazawa	Representative
Mr. Kunihiro Inokuchi	Representative
Ms. Saya Uchiyama	Staff



**MINUTES OF DISCUSSIONS  
ON PREPARATORY SURVEY ON THE PROJECT FOR  
REHABILITATION OF NATIONAL MATERNAL AND CHILD HEALTH CENTER  
IN THE KINGDOM OF CAMBODIA**

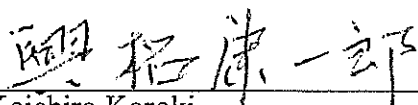
In response to the request from the Government of the Kingdom of Cambodia (hereinafter referred to as “Cambodia”), the Government of Japan decided to conduct a Preparatory Survey on the Project for Rehabilitation of National Maternal and Child Health Center in Cambodia (hereinafter referred to as “the Project”) and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as “JICA”).

JICA dispatched to Cambodia the Preparatory Survey Team (hereinafter referred to as “the Team”), headed by Mr. Koichiro KOROKI, Senior Assistant Director, Human Development Department, JICA and was scheduled to stay in the country from 4 August to 24 August 2013.

The Team held discussions with the officials concerned of the Government of Cambodia and conducted a field survey.

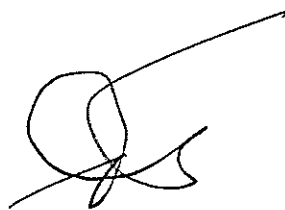
As the result of discussions and field survey, both sides confirmed the main items described in the attached sheets.

Phnom Penh, 20 August 2013



---

Mr. Koichiro Koroki  
Leader, Preparatory Survey Team  
Japan International Cooperation Agency  
Japan



---

Professor Eng Huot  
Secretary of State  
Ministry of Health  
The Kingdom of Cambodia

## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to improve the quality of health services and trainings provided at the National Maternal and Child Health Center by renovation and construction of facilities and procurement of medical and training equipment.

### 2. Project Site

The Project site is the National Maternal and Child Health Center in Phnom Penh as per Annex-1.

### 3. Responsible and Implementing Organizations

The responsible and implementing organizations of the Project are the Ministry of Health and the National Maternal and Child Health Center.

### 4. Items Requested by the Government of Cambodia

4-1. The final requested facilities and their priorities are described in Annex-2.

4-2. The final requested medical and training equipment and their priorities are described in Annex-3.

4-3. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

### 5. Japan's Grant Aid Scheme

5-1. The Cambodian side understands the Japan's Grant Aid Scheme which was explained by the Team as described in Annex-4.

5-2. The Cambodian side will take necessary measures, described in Annex-5, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

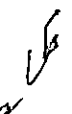
### 6. Schedule of the Study

6-1. The consultants will proceed with further studies in Cambodia until 24 August 2013.

6-2. JICA will prepare the draft preparatory survey report, and dispatch a mission team after the consent of the Government of Japan in order to explain the contents of the report to the Cambodian side in late December 2013.

6-3. In case that the contents of the report is accepted in principle by the Government of Cambodia, JICA will complete the final preparatory survey report and send it to the Ministry of Health, Cambodia.

6-4. The above schedule is tentative and subject to change.



## 7. Other Relevant Issues

7-1. Both sides recognized the role of the National Maternal and Child Health Center as follows:

- 1) The National Maternal and Child Health Center is the highest national institution in maternal and child health in Cambodia holding functions in clinical services, training and policy and administration (national programs within the National Maternal and Child Health Center).
- 2) (Clinical service) The National Maternal and Child Health Center provides high quality clinical services to all women, mothers and infants, especially to the poor, as the country's top referral hospital.
- 3) (Training function) The National Maternal and Child Health Center is the country's top clinical training institution for medicals and co-medicals, and provides up to date and high quality in-service and pre-service trainings in maternal and child health.
- 4) (Policy and Administration) The National Maternal and Child Health Center holds bureaus for five national programs – National Nutrition Program, National Reproductive Health Program, National Immunization Program, National Program for Acute Respiratory Infections/ Control of Diarrhea Diseases and Cholera and National Program for Prevention of Mother-to-Child Transmission of HIV – which plan and implement policies and programs to promote maternal and child health in Cambodia.
- 5) Organizational structure of the National Maternal and Child Health Center is described in Annex-6.

7-2. The Cambodian side agreed to secure sufficient budget for the operation and maintenance of the facilities and medical and training equipment provided.

7-3. The Cambodian side agreed to secure sufficient staff in accordance with the expansion of facilities and for the sound operation of the National Maternal and Child Health Center.

7-4. The Team recommended to the Cambodian side to ensure ventilation system be in place when installing air conditions in wards and other sections of the facilities.

Annex-1: Project Site for Training Center

Annex-2: List of Requested Facilities with Priority

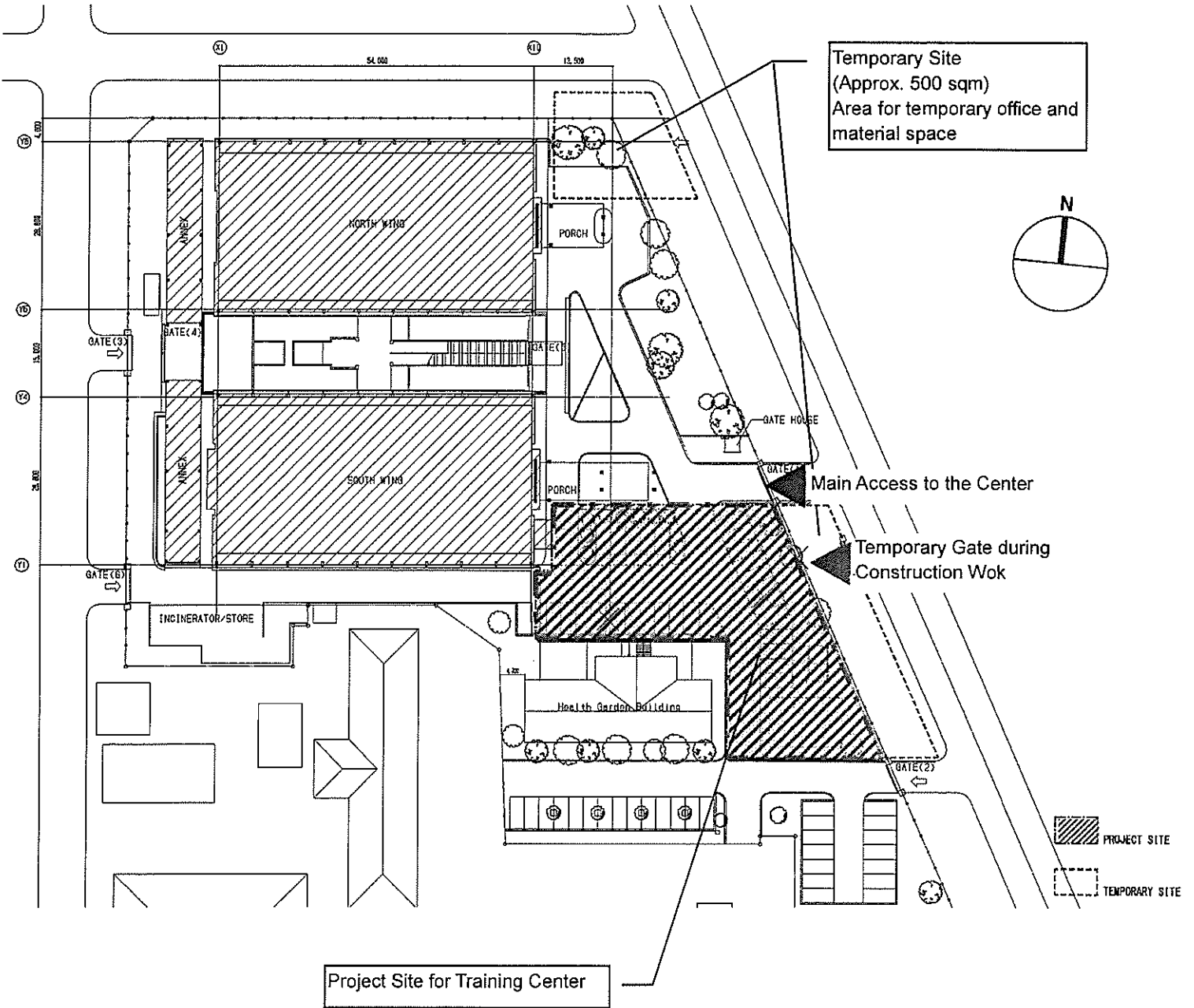
Annex-3: List of Requested Medical and Training Equipment with Priority

Annex-4: Japan's Grant Aid

Annex-5: Major Undertakings to be taken by Each Government

Annex-6: Organizational Structure of the National Maternal and Child Health Center

### Project Site for Training Center



### List of Requested Facilities with Priority

- Training Center Building

Priority	Floor	Section	Room Name	No. of Room	Remarks
A	4F	Dormitory	Dormitory (Male)	2	8 persons/each
			Dormitory (Female)	3	8 persons/each
			Shower Room	2	
		Resource Center	Resource Center	1	
			Self-study Room	1	
		Others	Waiting Room	1	
			Cafeteria	1	
			Kitchen	1	
			Common Store	1	
		A	3F	Training	Training Unit Office
Preparation Room	1				
Training RM (40-seat)	1				
Training RM (20-seat)	4				
PBL Room	1				
Clinical Simulation Lab	1				
Common Store	1				
A	2F	National MCH Program	NRHP (National Reproductive Health)	1	
			NNP (National Nutrition Program)	1	
			ARI-CDD-IMCI	1	
			PMTCT (National Program for Prevention Mother To Child)	1	This office is relocated in Health Garden Building.
		Management	Director RM	1	
			Dpy Director RM	5	
			Management Chief RM	1	
			Administrative Office	1	
			Common Meeting	2	
			Common Store	1	
A	1F		Parking and others	1	

Priority: A: Higher, B: Intermediate, C: Lower, -: Cambodian Side

- Renovation Work of the Existing Center

Priority	Section/Room	Contents of Renovation Work			
-	Training	Moving equipment and furniture of Training Center will be done by Cambodian Side			
A	Ward A (Gynecology/ Obstetrics)	To convert existing office and training rooms to Ward A	8-Beds	4 rooms	32 beds
			4-Beds	2 rooms	8 beds
			2-Beds	1 rooms	2 beds
			1-Beds	4 rooms	4 beds
			Total		46 beds
B	Ward B (Obstetrics)	To refurbish some 8-bed rooms to 4-bed rooms; others are unchanged	8-Beds	4 rooms	32 beds
			4-Beds	2 rooms	8 beds
			2-Beds	1 rooms	2 beds
			1-Beds	2 rooms	2 beds
			Total		44 beds
B	Ward C (Obstetrics)	To refurbish some 8-bed rooms to 4-bed rooms; others are unchanged	8-Beds	4 rooms	32 beds
			4-Beds	2 rooms	8 beds
			2-Beds	1 rooms	2 beds
			1-Beds	2 rooms	2 beds
			Total		44 beds
	North Building		1-Beds	0 rooms	0 beds
	Ward Total		134 beds		
Total No. of Hospital Beds			174 beds		
-	Laboratory	Lab's relocation work will be done by Cambodian Side			
-	Radiology	X-ray machine and Mammography may be used in the same room			
C	Pharmacy	A/C and exhaust fan			
C	Technical Bureau	Book shelf for medical record			
A	NCU	20 Beds			
A	Recovery	10 Beds			
A	ICU	6 Beds			
A	Kangaroo Care RM	4 Beds			
C	Laundry	Drying space for Laundry			
A	Student Night-duty RM	Adequate number of Beds for M/F			
A	Elevator	To ensure access to Ward A on 3FL			
A	Doors	Ward doors on 3FL should be steel			
C	Wall	To repair and repaint the exterior/interior wall			
A	Roof	To fix water leaking of glass block roof			
C	Security System	Security system + Surveillance camera			
A	Medical Gas	To replace main oxygen control system			
A	Sewage	To repair sewage tank			
A	Water Supply	To replace solar water panel system			
B	Electric Power	To increase capacity if needed			
C	A/C & Ventilation				
A	Incinerator	To provide parts for the existing incinerator			

Priority: A: Higher, B: Intermediate, C: Lower, -: Cambodian Side

### List of Requested Medical and Training Equipment with Priority

- Training Center Building

Section/Room	Equipment Name	Quantity	Priority
Training Room	Simulation Model (Mannequin) 1	2	A
	Simulation Model (Mannequin) 2	2	A
Resource Center	PC for Training	10	A
	Desk	10	A
	Chair	10	A
	Printer/Copy/Scanner Combined Machine	1	A

- Existing Center Building

Section/Room	Equipment Name	Quantity	Priority
Patient Ward (Ward A)	Examination Light	2	A
	Suction Pump	2	A
	Medical Bed	6	A
	Bedside Table	6	A
	Drug Store Refrigerator	1	A
	Gynecological Examination Table	2	A
	Oxygen concentrator	1	A
Maternity Ward (Ward B/C)	Doppler Fetus Detector	2	A
	Examination Light	2	A
Imagery	X-ray Unit	1	A
	CR Machine	1	A
	Dry Imager	1	A
Laboratory	Blood bank refrigerator	1	A
	Blood analyzer (Spectro photometer)	1	B
	Blood analyzer (Electrolyte Analyzer)	1	B
	Microscope	1	B
Dental	Dental chair treatment unit	1	A
Pharmacy	Drug Store Refrigerator	1	A
	Pharmacy Supply Shelves	1	B
OPD	Examination light	4	A
	ECG	1	A
	Doppler fetus detector	4	B
NCU	Mobile X-ray Unit	1	A
	Patient Monitor	5	A
	Pulse Oxymeter	10	A
	Syringe Pump	10	A
	Infusion Pump	5	A
	Blood Gas Analyzer	1	A
	CRP analyzer for micro sample	1	A
	Centrifuge for hematocrit	1	A
	Blood Pressure Monitor	3	A
	Neonatal ultrasound machine with cardiac ec	1	A
	Oxygen Flow Meter	10	A
	Oxygen concentrator	1	B
	Laryngoscope with spare light	3	B
	Nebulizer	5	C
OT	Oxygen Flow Meter	3	A
	Patient Monitor	3	B
	Oxygen concentrator	1	B
	Patient warmer	2	A
Delivery	Fetal Acto Cardiograph	5	A
	Operation light for delivery LED	2	A
	Doppler Fetus Detector	4	B
ICU/Recovery	Patient Monitor	10	A
	Oxygen Flow Meter	10	A
	Syringe Pump	4	A
	Infusion Pump	4	A
	Oxygen concentrator	1	B
	Blood Bank Refrigerator	1	B
Laundry	Washing Machine	1	A
	Spinning Machine	1	A

## JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as “the GOJ”) is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

### 1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as “the G/A”)
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

### 2. Preparatory Survey

#### (1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.



- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

#### (2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

#### (3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

### 3. Japan's Grant Aid Scheme

#### (1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

#### (2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

#### (3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services

of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

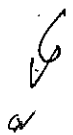
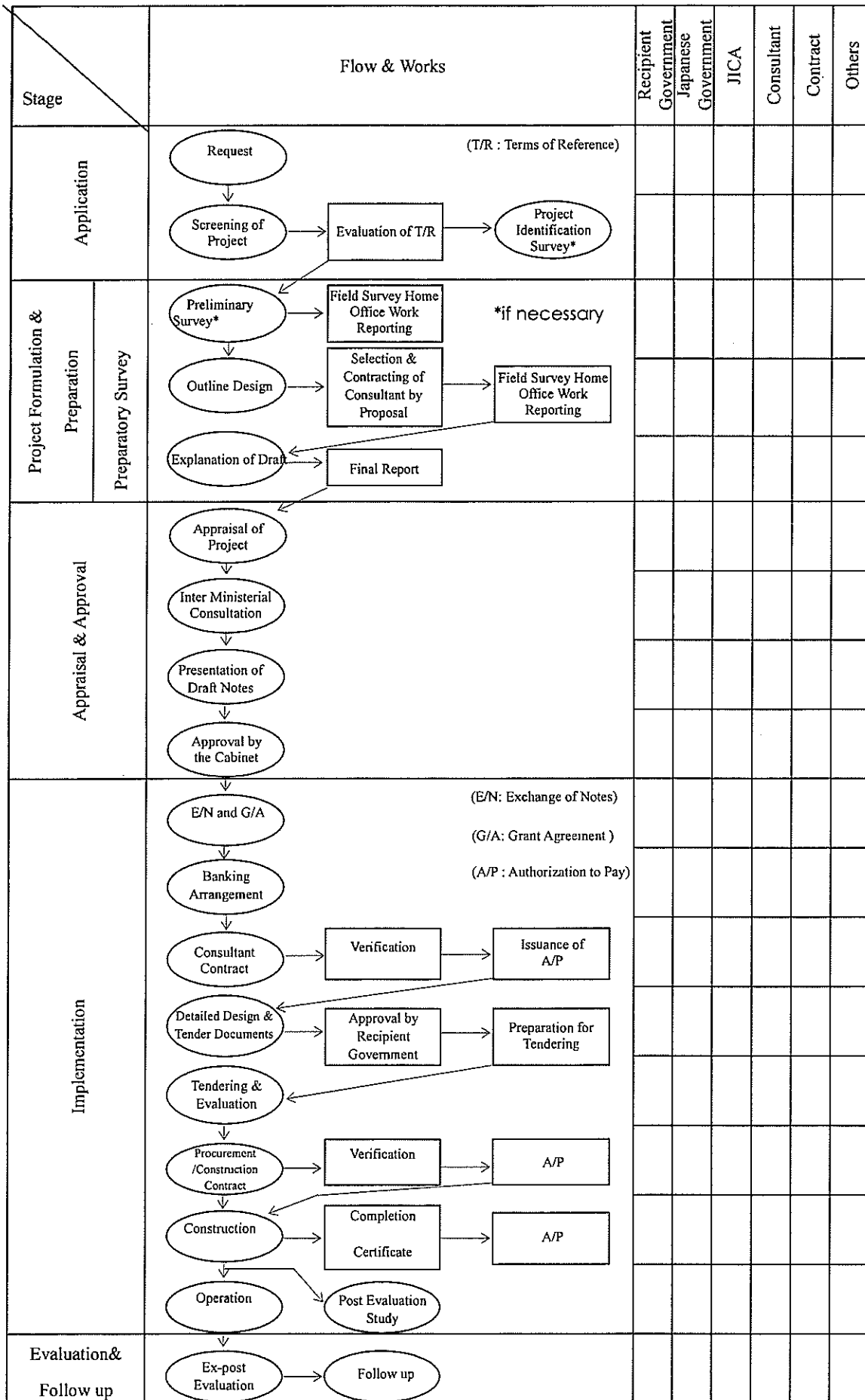
(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

## FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



## Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure a lot of land necessary for the implementation of the Project and to clear the site		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site		●
	6) The temporary parking lot for patients and staff during construction stage		●
	7) The temporary entrance of "Health Garden Building" during construction		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site		
	1) Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products.		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted.		●
6	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●
11	To move the existing equipment and furniture to the new training center and renovated rooms		●
12	To relocate Lab and PMTCT Office before the construction work		●
13	To secure the temporary site necessary for the site office and materials during construction		●

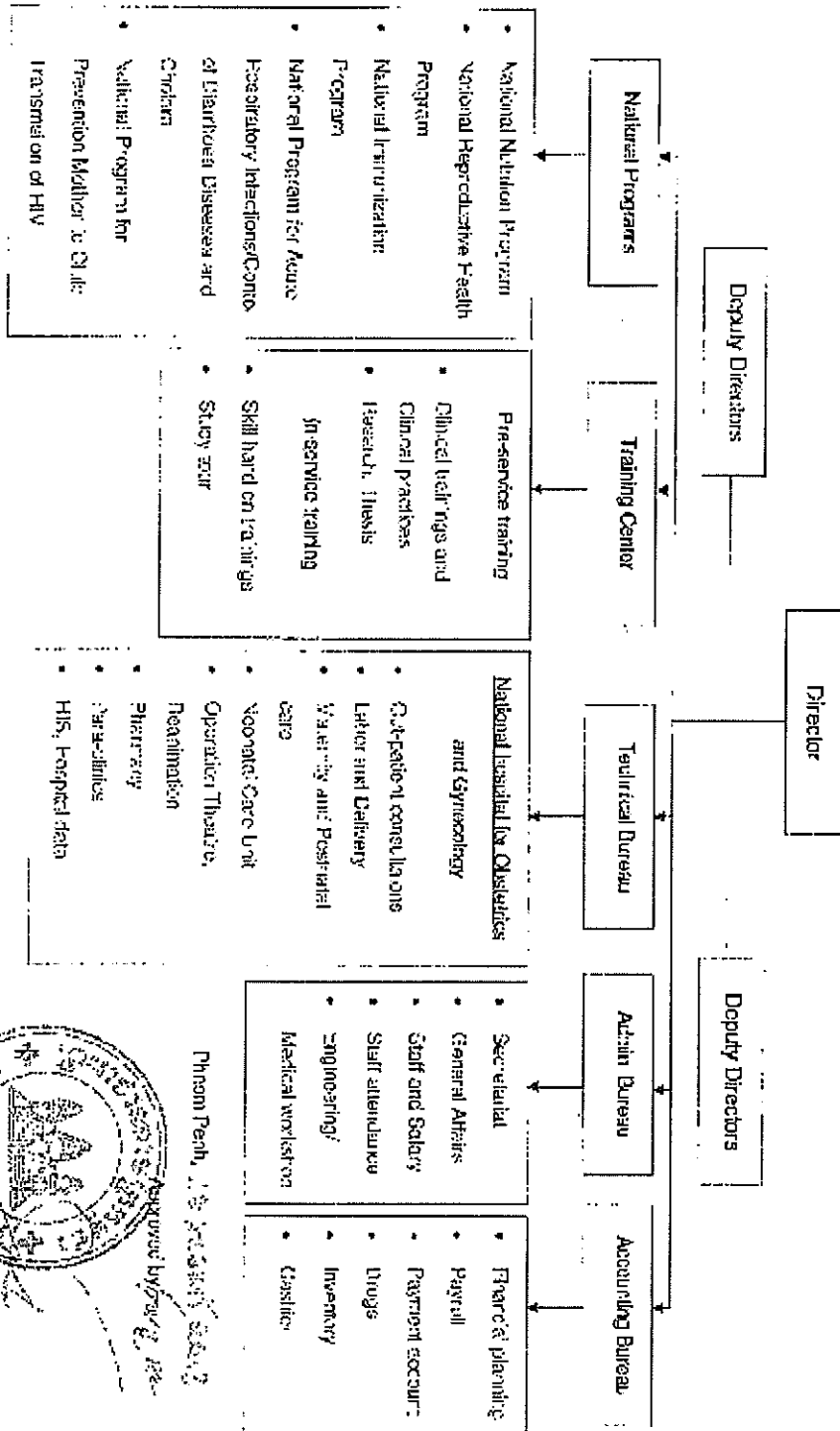
(B/A : Banking Arrangement, A/P : Authorization to pay)


✕

e 6

Organizational Structure of the National Maternal and Child Health Center

Organizational Chart of the National Maternal and Child Health Center



Phnom Penh, 11<sup>th</sup> January 2012  
 Approved by  
  
**PROF. ENG. HOOT**  
 SECRETARY OF STATE

Handwritten mark

Handwritten mark

**MINUTES OF DISCUSSIONS**  
**ON THE EXPLANATION OF THE DRAFT REPORT OF THE PREPARATORY SURVEY**  
**FOR THE PROJECT FOR EXPANSION OF**  
**NATIONAL MATERNAL AND CHILD HEALTH CENTER**  
**IN THE KINGDOM OF CAMBODIA**

In August 2013, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on the Project for Expansion of National Maternal and Child Health Center (hereinafter referred to as "the Project") to the Kingdom of Cambodia (hereinafter referred to as "Cambodia"), and through discussions, field surveys and technical examination of the results in Japan, JICA prepared the draft report of the preparatory survey.

In order to explain and to consult the contents of the draft report with the Ministry of Health, Cambodia, JICA sent to Cambodia the Draft Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Koichiro Koroki, Senior Assistant Director, Human Development Department, JICA from 23 to 27 December 2013.

As a result of the series of discussions, the Ministry of Health, Cambodia, and the Team (hereinafter referred to as "both sides") have confirmed the main items described in the attached sheets.

Phnom Penh, 27 December 2013

大#

---

Mr. Koichiro Koroki  
 Team Leader,  
 Draft Report Explanation Team  
 Japan International Cooperation Agency  
 Japan

---

Professor Eng Huot  
 Secretary of State  
 Ministry of Health  
 The Kingdom of Cambodia

shce

## ATTACHMENT

### 1. Components of the Draft Report:

The Cambodian side agreed and accepted in principle the contents of the draft report and the outline of the Project explained by the Team (Annex-1).

### 2. Schedule of the Study:

JICA will complete the final report in accordance with the confirmed items and send it to the Cambodian side by the end of March 2014.

### 3. Japan's Grant Aid scheme:

The Cambodian side understands Japan's Grant Aid scheme and necessary measures to be taken by the Cambodian side which was explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions signed by both sides on 20 August 2013.

### 4. Measures to be taken by the Cambodian side:

- 4-1. In case the Project will be implemented, the Cambodian side agreed to take necessary measures listed in Annex-2 for the smooth implementation of the Project.
- 4-2. To assure effectiveness and sustainability of the Project, the Ministry of Health and the National Maternal and Child Health Center agreed to allocate necessary staff and cover the costs for operation and maintenance shown in Annex-3.
- 4-3. The Cambodian side will make a contract with the local agent regarding periodical maintenance for medical equipment in Annex-4 after 1 year warranty.
- 4-4. It was agreed that the existing equipment procured by Japanese Grant or assistance to be renewed under the Project would be disposed prior to the set up of the new equipment. The Cambodian side will request for the approval for the disposal of the equipment to the Embassy of Japan in a written letter.
- 4-5. During the 1.5 months in which the construction work will take place both in the existing center and the training center, the Cambodian side agreed to ensure an alternative space for offices affected during the construction (Annex-5).
- 4-6. To secure the temporarily site necessary for the office and materials during construction, the Cambodian side agreed to obtain permissions and take other necessary measures to secure the site.

### 5. Other Relevant Issues:

#### 5-1. Confidentiality of the Project Cost Estimation

The Team explained the cost estimation of the Project described in Annex-6. Both sides agreed that the Project Cost Estimation should never be duplicated or released to any outside parties before signing of all the Contract(s) for the Project. The Cambodian side understands that the Project Cost Estimation is not final and is subject to change.

#### 5-2. Modification of the Project title

Both sides agreed to modify the Project title from the “Project for Rehabilitation of National Maternal and Child Health Center” to the “Project for Expansion of National Maternal and Child Health Center”.

Annex-1: The contents of the Project

Annex-2: Estimated costs and obligation of work to be taken by the Cambodian side

Annex-3: Estimated costs for staff allocation and operation and maintenance

Annex-4: List of medical equipment which need maintenance contract with local agent(s)

Annex-5: Tentative Project schedule

Annex-6: Estimated costs to be borne by the Japanese side

✕

6



## The contents of the Project

## The outline of the Project

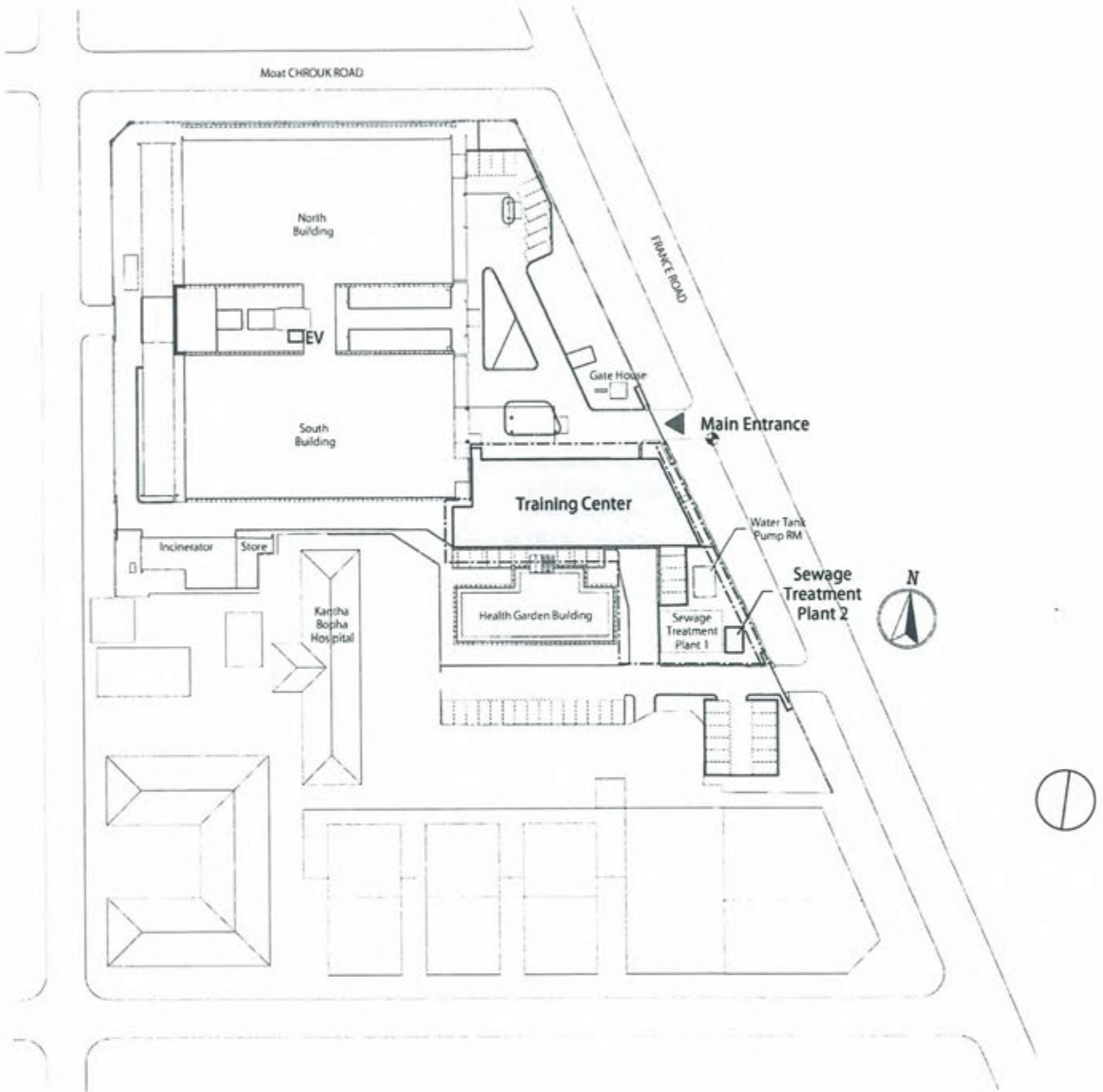
Item	Facility Work	Function, Rooms and Contents of Work		
Facility	Training Center	4FL: Dormitory: Dormitory, Shower Rm Resource Center: Resource Center, Self-study Rm, Cafeteria		
		3FL: Training Center: Training Rms, Problem-based Learning (PBL) Rm, Clinical Simulation Lab (CSL) Rm, Training Unit Office		
		2FL: National MCH Program Offices, Management Office, Director Rms		
		1FL: Parking, Machine Rms		
	Renovation Work of the Existing Center	Ward: Total inpatient ward: 134 beds, Total hospital bed: 174 beds 3FL, South Building (Gynecology/Obstetrics Ward): Total 46 beds (8-bed x 4, 4-bed x 2, 2-bed x 1, 1-bed x 4) 2FL, South Building ( Obstetrics Ward) Total 88 beds (8-bed x 8, 4-bed x 4, 2-bed x 2, 1-bed x 4)		
		Peri-natal Care Center: NCU: 20 beds, Recovery Rm: 10 beds, ICU: 6 beds, Kangaroo Care Rm: 4 beds		
		Night-duty Rm, Clinical Division Office, Nursing Division Office, Health Finance Committee Office		
		Other Renovation Works:		
		<ul style="list-style-type: none"> <li>• To install new stretcher elevator connecting 1 to 3FL at connecting corridor</li> <li>• To replace ward's wood doors to steel doors</li> <li>• To renew a control units of medical gas supply system</li> <li>• To replace damaged portion of sewage treatment plant</li> <li>• To replace solar heating panels on the roof</li> <li>• To increase power supply capacity to meet demand of renovation work</li> <li>• To add Air-conditioning units to meet demand of renovation work</li> <li>• To replace broken parts of the existing incinerator</li> </ul>		
Equipment	Medical and training equipment to be provided in the proposed buildings			
	Section/Room	Equipment Name	Quantity	
	Training Room Resource Center	Simulation Model (Mannequin) 1	2	
		Simulation Model (Mannequin) 2	2	
		PC for Training	10	
		Desk	10	
		Chair	10	
		Printer/Copy/Scanner Combined Machine	1	
	Patient Ward (Ward A)	Examination Light	1	
		Suction Pump	1	
Medical Bed		6		
Bedside Table		6		
Drug Store Refrigerator		1		
Gynecological Examination Table		1		
Maternity Ward (Ward B/C)	Oxygen Concentrator	1		
	Doppler Fetus Detector	2		
Imagery	Examination Light	2		
	General X-ray Unit	1		
	CR Machine	1		
	Dry Imager	1		

Equipment	Medical and training equipment to be provided in the proposed buildings		
	Section/Room	Equipment Name	Quantity
Equipment	Laboratory	Blood Bank Refrigerator	1
		Blood Analyzer (Spectro photometer)	1
		Blood Analyzer (Electrolyte Analyzer)	1
		Microscope	1
	Dental	Dental Chair Treatment Unit	1
	Pharmacy	Drug Store Refrigerator	1
		Pharmacy Supply Shelves	1
	OPD	Examination Light	4
		ECG	1
		Doppler Fetus Detector	4
	NCU	Mobile X-ray Unit	1
		Patient Monitor	5
		Pulse Pxymer	10
		Syringe Pump	10
		Infusion Pump	5
		Blood Gas Analyzer	1
		CRP Analyzer for Micro Sample	1
		Centrifuge for Hematocrit	1
		Blood Pressure Monitor	3
Neonatal Ultrasound Machine with Cardiac Echo Probe		1	
Oxygen Concentrator		1	
Oxygen Flow Meter		10	
Laryngoscope with Spare Light		3	
Nebulizer		5	
OT	Oxygen Flow Meter	3	
	Patient Monitor	3	
	Oxygen Concentrator	1	
	Patient Warmer	2	
Delivery	Fetal Acto Cardiograph	5	
	Operation Light for Delivery LED	2	
	Doppler Fetus Detector	4	
ICU/Recovery	Patient Monitor	10	
	Oxygen Flow Meter	10	
	Syringe Pump	4	
	Infusion Pump	4	
	Oxygen Concentrator	1	
	Blood Bank Refrigerator	1	
Laundry	Washing Machine	1	
	Spinning Machine	1	

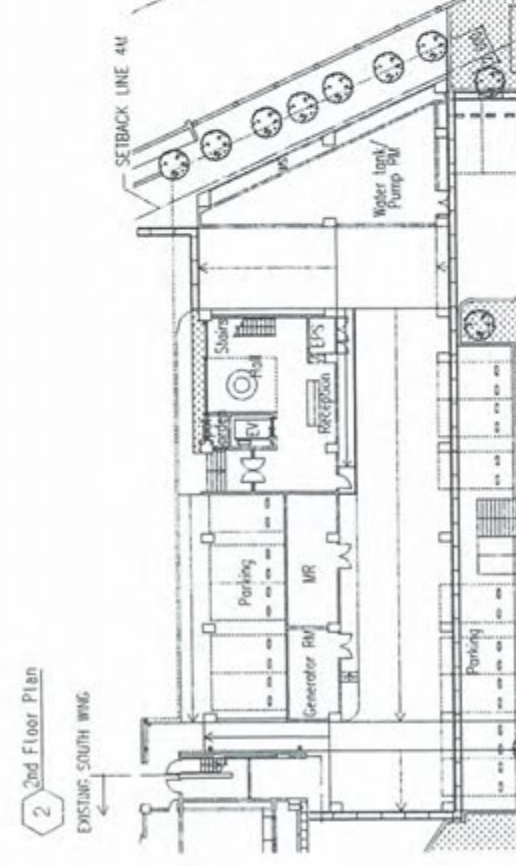
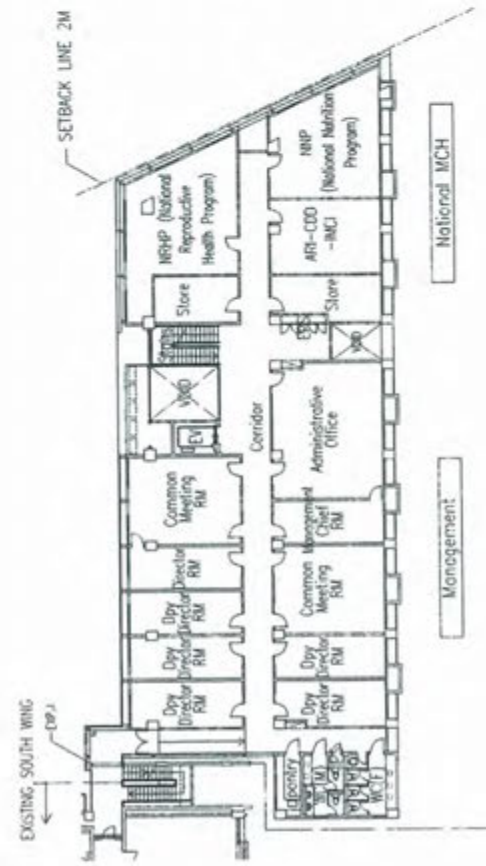
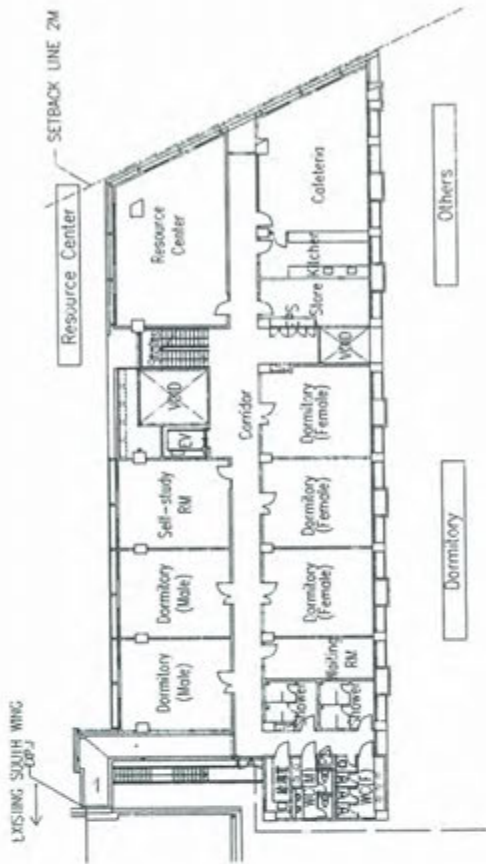
K

5

# Site plan



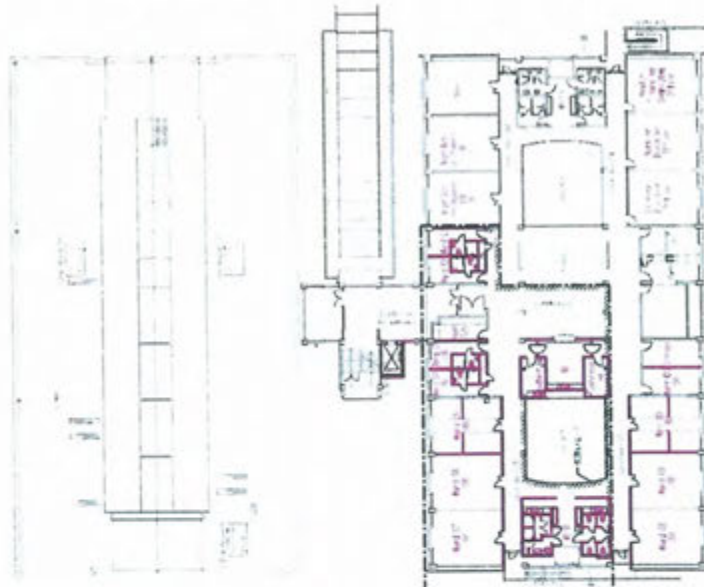
# Plans, Training center



Handwritten mark resembling a stylized 'X' or '2'.

Handwritten mark resembling a stylized 'S' or '3'.

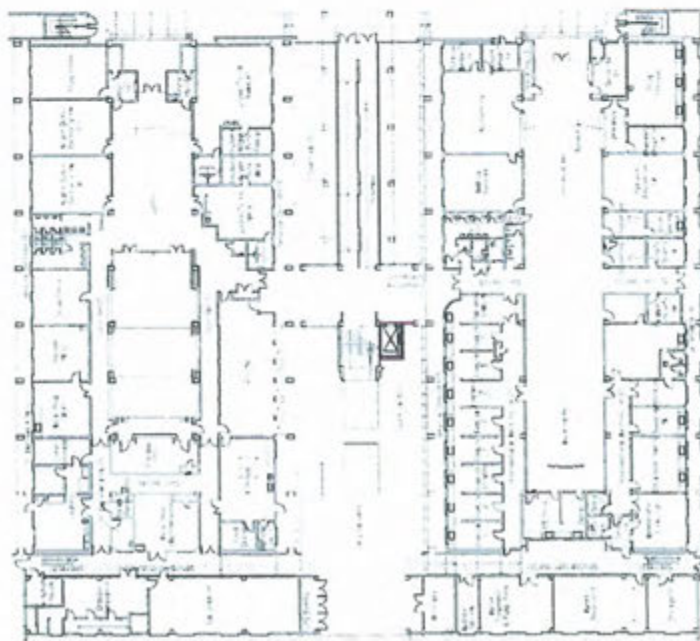
Plans, Renovation work of the existing center



3 Renovated Existing Hospital 3rd Floor Plan



2 Renovated Existing Hospital 2nd Floor Plan



1 Renovated Existing Hospital 1st Floor Plan



K

3

## Estimated costs and obligation of work to be taken by the Cambodian side

### Estimated costs and measures to be taken by the Cambodian side before construction

Items	Expenses(US\$)	Responsible Organization
A. Preparation of the project site	14,000	NMCHC
B. Purchase of furniture and fittings (including curtains, blinds and alteration of drying space adjacent to laundry room)	34,500	NMCHC
C. Provision of a temporary entrance of the Health Garden Building during construction work	3,800	NMCHC
D. Renovation work of Clinical Lab in Health Garden Building to Office	10,000	NMCHC
E. Expenses for moving	6,000	NMCHC
F. Dispose of existing medical equipment to be replaced	3,400	NMCHC
G. Banking Arrangement (B/A) and Authorization-to-Pay (A/P)	12,500	MOH
<b>Total</b>	<b>84,200</b>	

### Quantity Survey Conditions

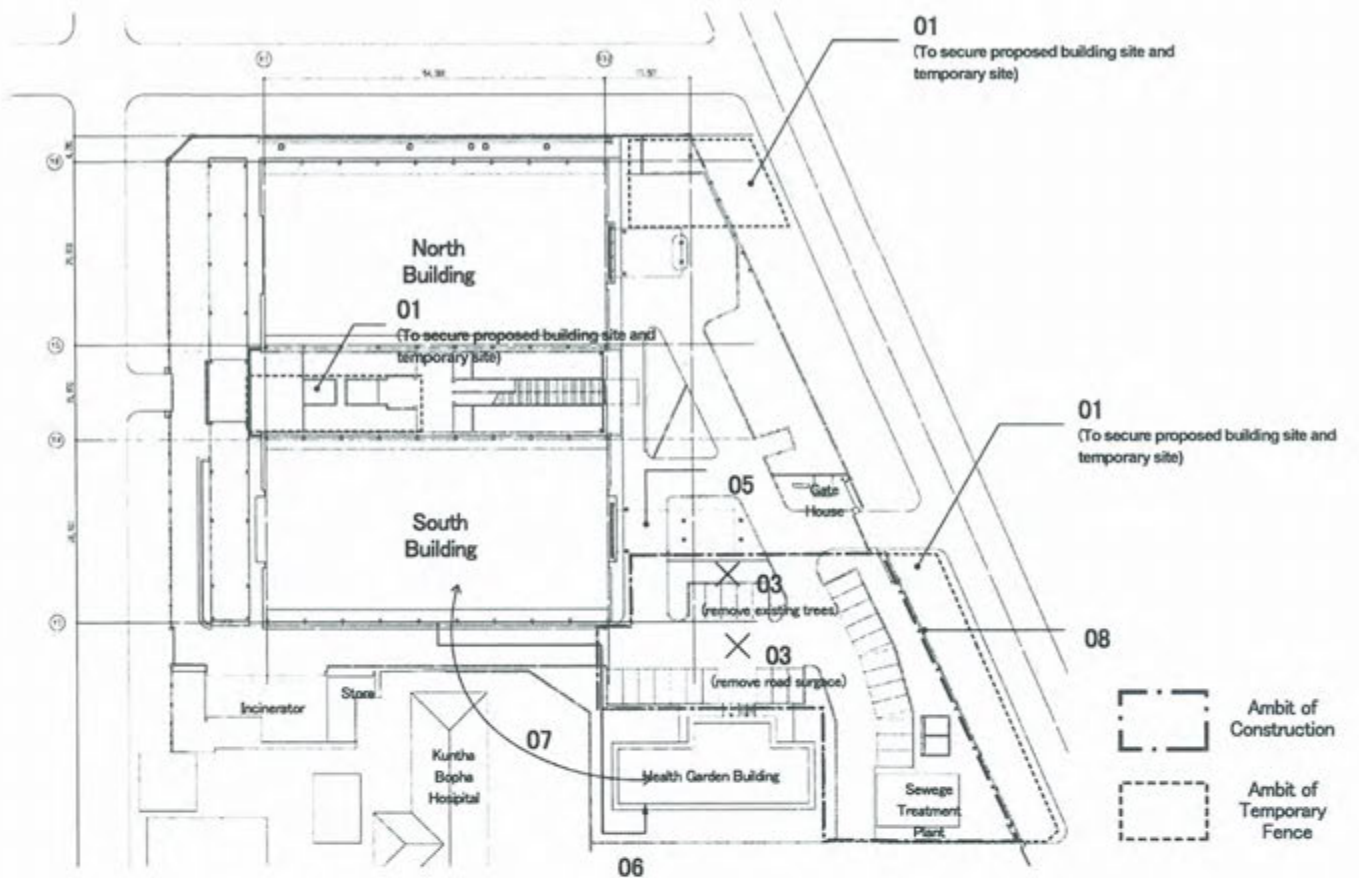
- Quantity survey timing: August 2013
- Exchange rate: 1 USD = 100.47 JY, 1 THB = 3.33 JY
- Construction schedule: Detailed design, tender and construction schedules as per the implementation schedule.
- Others: This Project will be implemented in accordance with Japanese Government's grant aid scheme.

### Obligation of work to be taken by the Cambodian side and implementation schedule

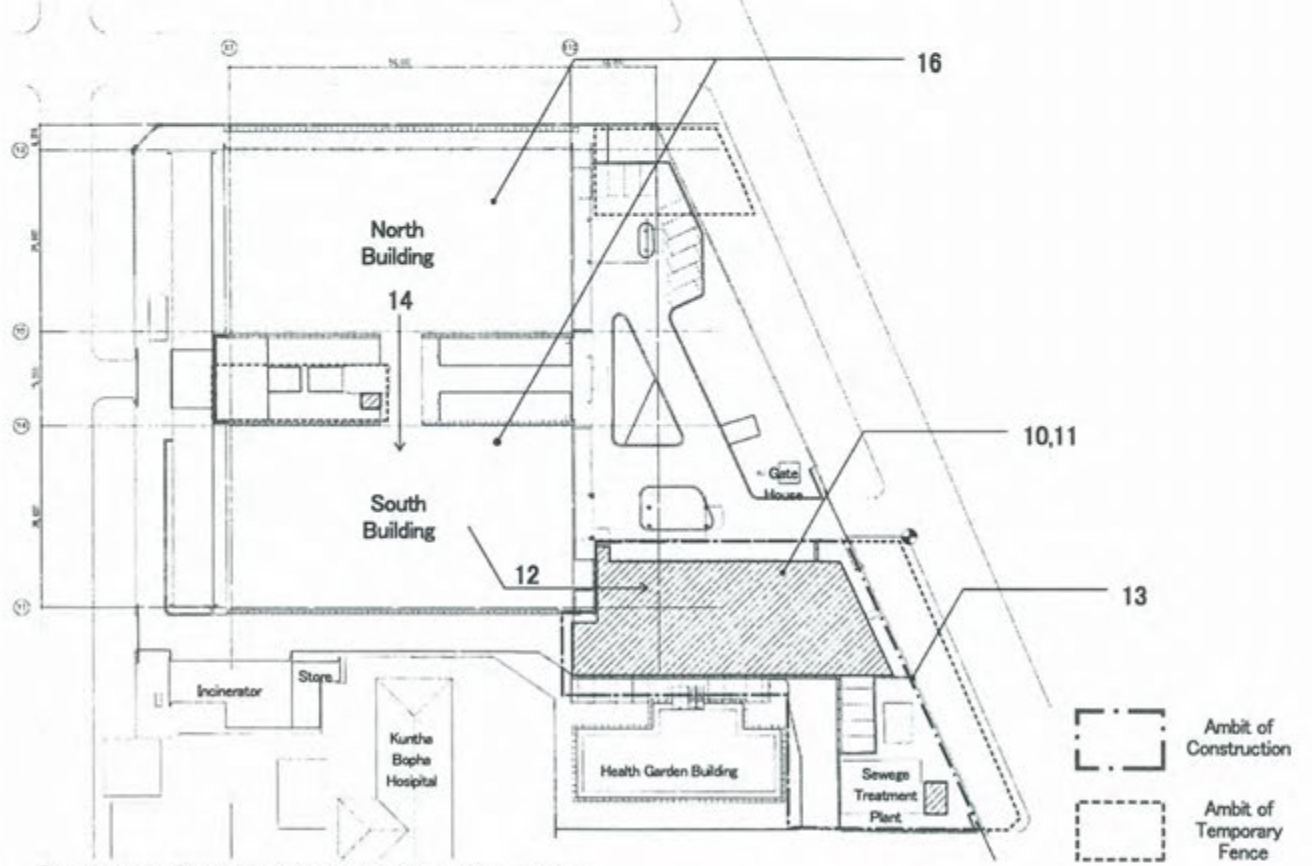
Item	Deadline
01 To secure proposed building site and temporary site	Before Tender
02 To obtain building permissions	
03 To remove existing structures (inc. underground structures)	
04 To relocate existing underground utility pipes if necessary	
05 To renovate Drop-off of NMCHC	
06 To secure temporary access and entrance of Health Garden Building	
07 To relocate Lab in Health Garden Building and PMTCT Office	
08 To create opening on existing fence and temporary gate	
09 To hand over the specified zone on the 3FL, South Building to the contractor 1.5 month before Training Center's completion	Before Training Center's Completion
10 To move general furniture to Training Center	Upon Facilities Completion
11 To install curtain and blinds in Training Center	
12 To move equipment and services from 3FL, South Bldg to Training Center	
13 To repair fences and gates around the Project site	
14 To move equipment and services from 2FL, North Bldg to 3FL, South Bldg	
15 To move equipment and services on the 2FL, North Bldg	
16 To renovate existing NMCHC facilities if necessary	
17 To dispose of existing medical equipment to be replaced by the Project	

K

G



Cambodian Side Work Before Tender



Cambodian Side Work Upon Facilities Completion

K

G

## Estimated costs for staff allocation and operation and maintenance

	Items	Amount (US \$)
Incomes	Outpatient Department/Clinical Lab	45,000
	Inpatient Ward Fees	83,300
	<b>Income Total</b>	<b>128,300</b>
Expenditures	<b>Training Center</b>	
	Increased Personnel	0
	<b>Facilities Operation and Maintenance</b>	
	Electricity charge	86,400
	Telephone charge	1,080
	Generator fuel cost	720
	Water charge	2,040
	Elevator maintenance cost	1,800
	Building maintenance cost	30,160
	<b>Training Center Total</b>	<b>122,200 (A)</b>
	<b>Renovation Work of the Existing Center</b>	
	<b>NCU</b>	
	Increased Personnel	10,498
	Drugs and medical disposables	25,000
	Medical equipment maintenance cost	15,435
	<b>Sub-total</b>	<b>50,933</b>
	<b>ICU/Recovery Room</b>	
	Increased Personnel	3,348
	Drugs and medical disposables	12,210
	Medical equipment maintenance cost	860
	<b>Sub-total</b>	<b>16,418</b>
<b>Facilities Operation and Maintenance</b>		
Electricity charge	21,600	
Oxygen gas charge	28,800	
Elevator maintenance cost	1,800	
<b>Sub-total</b>	<b>52,200</b>	
<b>Other medical equipment maintenance cost</b>	10,009	
<b>Sub-total</b>	<b>10,009</b>	
<b>Existing Center Total</b>	<b>129,560 (B)</b>	
<b>Expenditure Total (A)+(B)</b>	<b>251,760</b>	

K

G



**List of medical equipment which need maintenance contract with local agent(s)**

- General X-ray Unit
- Mobile X-ray Unit
- Blood Analyzer (Electrolyte Analyzer)
- Blood-gas Analyzer
- CRP Analyzer for Micro Sample

X

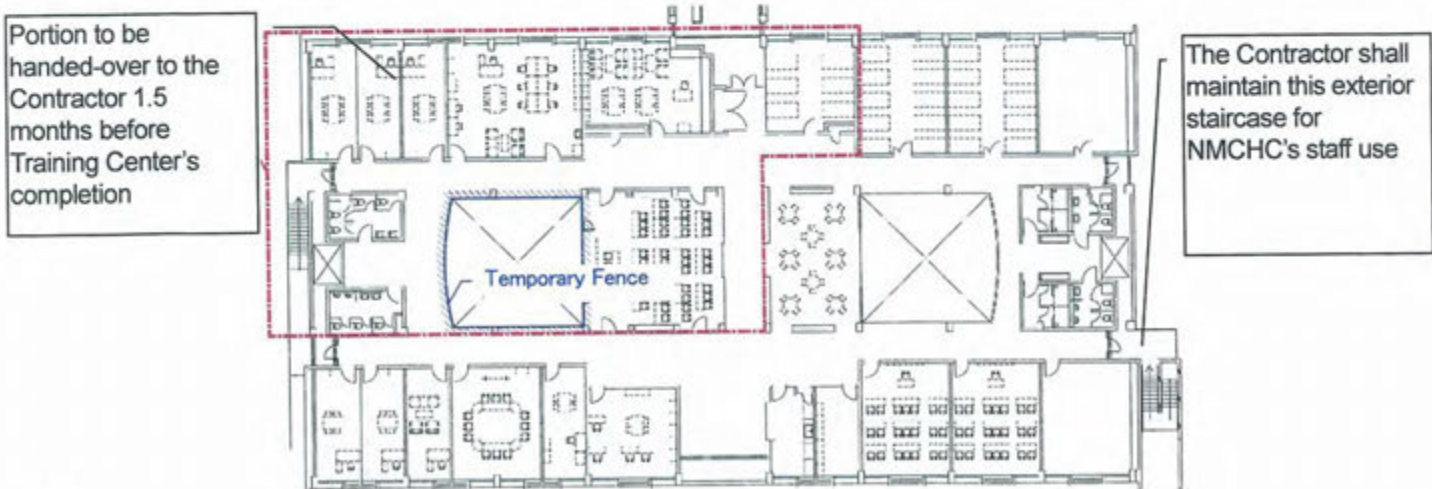
6

Tentative Project schedule

The Project's implementation schedule

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Detail Design Stage	Field Survey		Confirmation		Detail Design: 4 months															
	Work in Japan																			
Tender Stage	P/Q	Tender		Tender: 3.5 months																
	Work in Japan																			
Construction and Procurement Stage	(Construction of Training Center)												Construction & Procurement: 16.5 months							
	Preparation Work		Foundation & Structural Work				Interior Finish & Utility Work													
	Earth Work																			
	(Renovation Work of Existing NMCHC Building)										Renovation of 3FL, South Building				Renovation of FLU, North Building					
	(Equipment Work)						Manufacture & Procurement				Inspection & Transportation-1		Inspection & Transportation-2		Installation & Adjustment-1		Installation & Adjustment-2			

Area to be handed-over by the Cambodian side



K

6

## 5. Record of Renovation Work of the Existing NMCHC Building

The following table shows renovation/remodeling work of the existing NMCHC building since its operation in 1997:

Location	Function Before the Renovation	Contents of Renovation Work	Function After the Renovation	Reason	Timing	Financial Source
1. 3FL South Bldg A Training Rm	Training Rm	(Converting Function)	Training Unit Office	Lack of office space for training unit	1998	Cambodian Side
2. 3FL South Bldg A Dormitory Rm	Dormitory	(Converting Function)	National MCH Program Office	Lack of office space for National MCH Program Office	1998	Cambodian Side
3. 1FL, North Bldg Clinical Office	Clinical Div. Office	To install walls to divide into three rooms	Night-duty Rm (M/F), Drug Store	Changing to 24-hour shift required larger Night-duty Rms.	1999	Cambodian Side
4. 1FL, South Bldg Clinical Lab	Clinical Lab Counseling Rm	To install opening and door on wall between the Lab and Counseling Rm	PMTCT Office	Clinical Lab was too small for PMTCT Office; connected two rooms were occupied by PMTCT.	2004	JICA Technical Cooperation/ Cambodian Side
5. 3FL South Bldg Library	Library	(Converting Function)	Administration Office	Lack of office space for administration staff	2005	Cambodian Side
6. 3FL South Bldg Lounge	Lounge (corridor)	To install a wall to separate the room from corridor.	National MCH Program Office	Lack of office space for National MCH Program.	2007	Cambodian Side
7. 2FL, North Bldg NCU	NCU Dayroom	To install a wall and window to separate the additional NCU from corridor and generate larger NCU.	NCU	To improve NCU capability to meet increase of high-risk cases.	Approx. 2009	Cambodian Side
8. 2FL, North Bldg Labor Rm	Labor Rm	To install partition walls.	LDR (Labor Delivery Recovery)室	To provide better environment for patients by enabling patients staying with them.	2011	JICA Technical Cooperation
9. 2FL South Bldg Ward	8-bed Ward Rm	To install partition walls to make cubicles.	4-bed Ward Rm	To provide cubicles where patients' families stay.	2011	JICA Technical Cooperation
10. 2FL, North Bldg NCU	NCU	To relocate a window to original position and to renovate ventilation system.	NCU	To prevent nosocomial infectious cases caused by inadequate ventilation and provide space for a bed.	2012	JICA Technical Cooperation